OUR TOWN'S ENVIRONMENT

Report on Environmental Resources and Issues in Atlantic Highlands

Prepared by the
Environmental Commission
Borough of Atlantic Highlands, New Jersey
November 2000

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Prepared by the Environmental Commission
of the Borough of Atlantic Highlands, Monmouth County, New Jersey
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November 2000

COVER PHOTO by Paul Royce. Reforestation in Lenape Woods Nature Preserve on Earth Day, April 1999, by Girl Scouts of Hartshorne Service Unit with Joseph Reynolds, steward.

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INTRODUCTION

We have not inherited the earth from our parents.
We have borrowed it from our children.

Proverb from Kenya

To be good environmental stewards requires, first of all, that we become close observers of the resources surrounding us and develop solid knowledge of their nature and value. Even in a small town like Atlantic Highlands, such knowledge is typically not readily at hand and organized. That's why it is important to pool information from all available sources to put together an environmental resource inventory (ERI). That's what the present report tries to do.

At its second meeting in March 1998, the new Environmental Commission of Atlantic Highlands began preparing the document you are now reading. An ERI is often one of the first projects for Environmental Commissions to undertake as a kind of reconnaissance, stock-taking and backgrounder for later activities. We decided to create it by our own efforts in cooperation with other officials and townspeople, instead of contracting a firm of planners or engineers as some other towns have done. In this way, Commission members would have a learning experience of continuing value, build our local knowledge and competence and expand our ability to contribute to environment-related dialogue and decision-making now and in times to come. We have titled the report "Our Town's Environment" to reflect our commitment to strong local ownership and community oversight of the many kinds of resources this document describes.

Environmental Resource Inventory: a "notebook" of accumulated information about our area

One way of encouraging such wider participation is to ask residents what they think about environmental issues. This was done in two ways. In November 1999, the Borough Council placed a referendum question on the election ballot concerning open space. Voters approved by 2.5 to 1 the establishment of a dedicated open space tax -- a higher vote margin than for any issue or candidate in memory (1,106 to 435). In April 2000, the Environmental Commission mailed out a survey on environmental topics that generated responses from 24 per cent of households (an unusually high return), including a large volume of comments in addition to check-off answers. The vote and the survey show that our town has high environmental literacy, interest and ideas. The present report tries to build on these assets.

This environmental resource inventory compiles text and visual information into a factual report about the natural resource characteristics and environmental features of the area. It provides baseline documentation for measuring and evaluating resource protection issues. While it searches for generally acknowledged best practices in resource management, the ERI is an objective listing rather than an interpretation or recommendation. By first identifying and characterizing significant environmental resources, our town can plan to protect and preserve them.

The ERI is a living document, not cast in concrete. The commission and others should add to it and revise and refine it as we gain new knowledge and more data become available. It is a "notebook" of accumulated information about our area.

This ERI document will "live" in the most meaningful way if it can be used as a tool for planning and decision-making in our community, and as a basis for resource protection initiatives that manage our children's legacy well so it can be handed back to them with a good rate of return. To that end, it is essential to note that ERIs are not one-time, short-term activities and that, under state laws, New Jersey towns have an ongoing mandate to conduct ERIs. That mandate is in the legislation for the establishment and functioning of environmental commissions and in the state's Municipal Land Use Law specifying the information on land use and natural resources which is required in towns' master plans (respectively N.J.S.A. 40:56A, and N.J.S.A. 40:55 D-27b and D-28 b(2)).

In its ERI task, the Atlantic Highlands Environmental Commission benefitted from the very practical support of two institutions whose active involvement also augurs well for continuing and improving this data base and putting it to work for our town. The Borough Council and the New Jersey Department of Environmental Protection approved 50-50 matching grants that financed the costs of this ERI and the Environmental Survey. Among other things, that funding made it possible to produce and digitize six of the maps printed herein using the Geographical Information System (GIS) format and to provide them on CD-ROM for continuing use and analysis for all purposes in the Borough.

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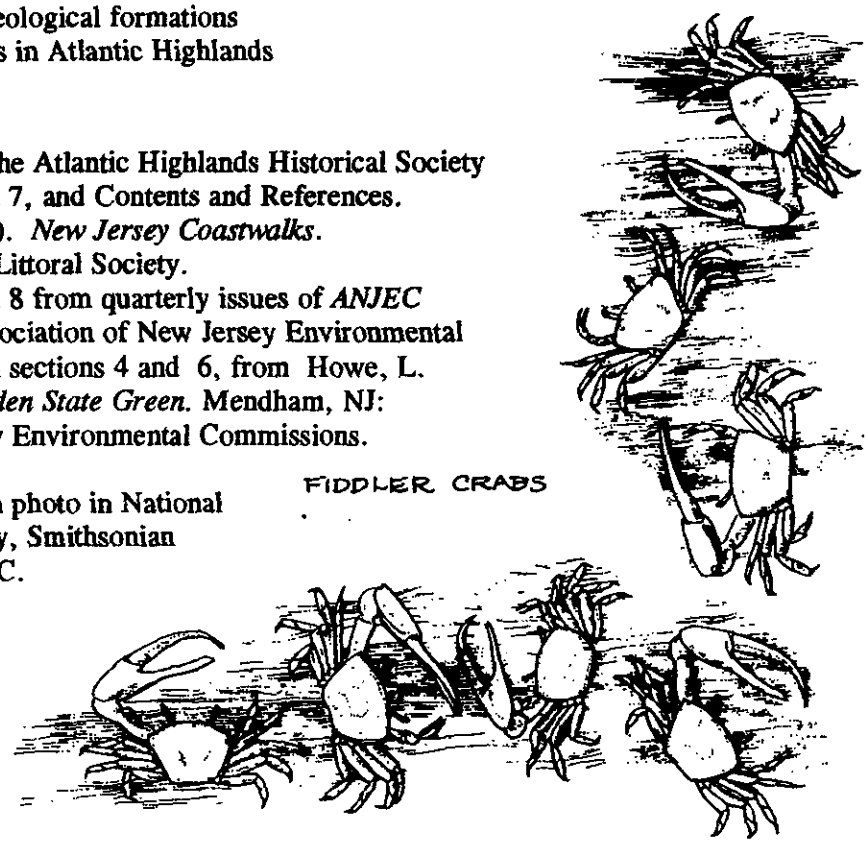
Illustrations

Elly Huson	Drawing in section 2, for the Atlantic Highlands Historical Society
Maria Levine	Drawings in sections 3 and 7, and Contents and References. From Bennett, DW. (1987). *New Jersey Coastwalks*. Highlands, NJ: American Littoral Society.
Barbara Pretz	Drawings in sections 1 and 8 from quarterly issues of *ANJEC Report*. Mendham, NJ:Association of New Jersey Environmental Commissions. Drawings in sections 4 and 6, from Howe, L. (1989). *Keeping Our Garden State Green*. Mendham, NJ: Association of New Jersey Environmental Commissions.
Paul Royce	Cover photo
Smithsonian	Drawing in section 5, from photo in National Museum of Natural History, Smithsonian Institution, Washington, DC.



Section 1

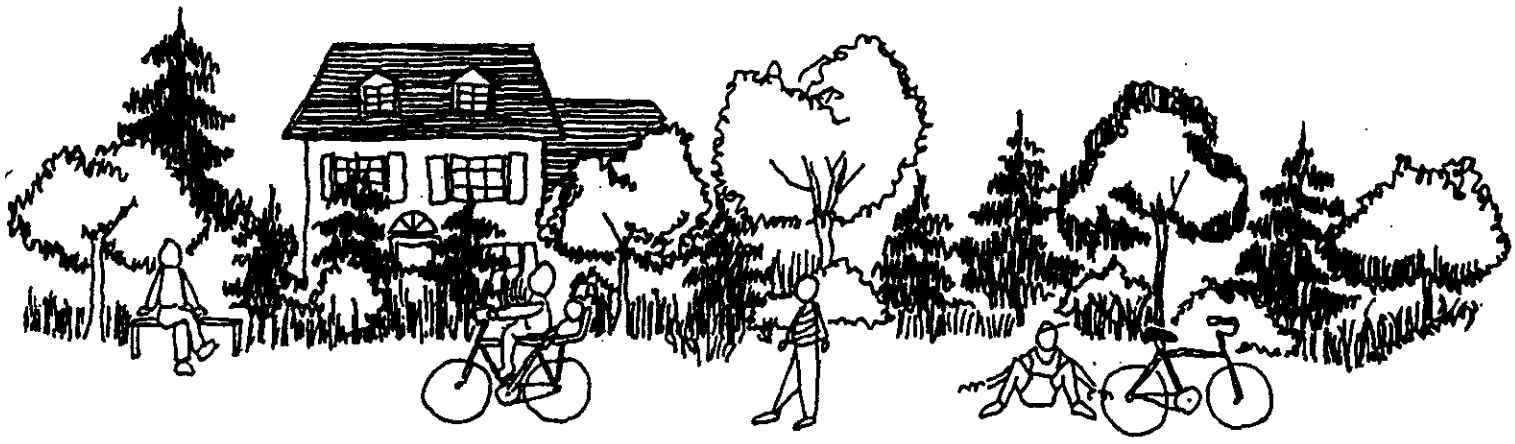
THE SETTING

The town

The Borough of Atlantic Highlands is a small, highly developed community located on Sandy Hook Bay in northeastern Monmouth County (see Map 1 - Regional location, and Map 2 - Aerial view). The Borough's small size, 1.2 square miles in area, places it 35th in the total land area among Monmouth County's 53 municipalities.

Atlantic Highlands has a reputation as an attractive, small-town residential community beside a long waterfront and large harbor. Its bayside location fostered the town's original growth and helps sustain it today. As the area changed from early Native American settlements to European settlers' farms, its produce, timber and fish became marketable items and were shipped and sold in New York and northern New Jersey. Atlantic Highland's proximity to these urban areas, as well as the pleasant confluence of mountains and shore, contributed to its development as a popular summer community in the late 1800s and early 1900s. Today, it qualifies as a suburb in the metropolitan region of New York, with daily ferry service from the Atlantic Highlands Marina to New York's Wall Street as well as regional train, bus and highway connections for resident commuters. Its downtown is a well-known destination in the region, with its harbor and the restaurant, entertainment and shopping district along First Avenue.

Other environmental and topographic features are also part of its attraction. A designated "Tree City," Atlantic Highlands has trees lining its major thoroughfares as well as residential streets. It also has areas of dense mature woods which are preserved by homeowners and by public parks and nature preserves. From the high hills and the curving roads that climb them, and from the flatlands beside the bay, there are frequent open views over the water toward Sandy Hook, the Atlantic Ocean, the bayshore stretching toward Keyport, the Long Island coast and the Manhattan skyline. At its western and eastern ends and next to the marina, the town also has sandy beaches and fertile wetlands.



The people

Population figures. According to the 1980 census, the population in Atlantic Highlands was 4,950 persons. By 1990, the figure went down to 4,629 persons. From 1990 to 2000, the population increased 3.2 percent, reaching 4,777 as estimated by the Monmouth County Planning Board. The population is projected to increase to 4,842 by the year 2005.

In breakdowns from the 1990 census, the population was 51.3 percent female (2,253) and 48.6 percent male (2,376). In the same year, approximately 96 percent of the population was White, while 4 percent were listed as African American, Asian, Hispanic, or other racial/ethnic groups.

Population density. With 1.2 square miles (768 acres) within the Atlantic Highlands borders, the population density was 3,858 persons per square mile in 1990 and increased to 3,981 in 2000. This is three times the average density in Monmouth County, which had 1,323 persons per square mile in 2000.

Households and housing. The total number of households in Atlantic Highlands in 1990 was 1,774. Average household size was 2.6 persons per household. The vast majority of households had no children at home (1,205 without children vs. 569 households with children). The total number of housing units in 1998 was 1,987 (up from 1,932 in 1990). Over two-thirds of the housing was in single-family, detached dwellings (67.6%). About one-fourth of housing units were occupied by renters (25.7%).

Age distribution. In 1990, 64.4 percent of the population was working age (18-64 years), 14.1 percent were 65 years and older, 663 children were school age (5-17 years) and 334 children were preschool age (under 5 years). Monmouth County overall has a slightly lower percentage of seniors (12.7% county-wide) and a slightly younger median age (median age in Atlantic Highlands is 36.1 years vs. 35.0 years county-wide).

Exhibit 1.1: Age distribution, 1990 Census

Age group	Number of persons	Percent
Preschool: 4 years and younger	334	7.2
School age: 5 - 17 years	663	14.3
Working age: 18-64 years	2,980	64.4
Seniors: 65 years and older	652	14.1
Total	4,629	

Employment. The unemployment rate was 2.8 percent in Atlantic Highlands in 1998, equal to 83 unemployed people out of a total of 2,980 people in the labor market. By comparison, the overall unemployment rate in Monmouth County was 4.0 percent in 1998. The occupations of a third of Atlantic Highlands workers were in managerial/professional fields (32%). Another third (31%) were classified as technicians or in sales and clerical fields; 23 percent work in crafts, repairs and fabrication or as laborers; and 12 percent are in service fields.

According to data compiled by the Northern Monmouth Chamber of Commerce in 1998, in travelling to work, 72.0 percent of the working population of Atlantic Highlands drives alone in a car and 14.7 percent drive in a car pool. Other commuting methods are working at home (4.3%), bus (2.9 %), walking to work (2.8%), commuter ferry (1.5%), railroad (1.1%), and other means (0.7%). As for the time spent in commuting, one-fourth of workers take 15 minutes, 26 percent spend 15 to 30 minutes, 18 percent spend between half an hour and an hour, and 16 percent travel more than an hour.

Education. Data from the 1990 census indicate that 29.2 percent of Atlantic Highlands residents over 25 years of age graduated from high school, 15.4 percent have Bachelor's degrees and 11.6 percent have graduate degrees. Monmouth County in general has a slightly lower percentage of graduate degrees (10.7%) and slightly higher percentage of people with bachelor's degrees (17.7%).

Sources of information for this section were: demographic and employment data from the Monmouth County Planning Board based on data from the U.S. Bureau of the Census and NJ State Data Center; and commuting information from the Northern Monmouth Chamber of Commerce.

KEY MAP

UNION COUNTY

STATEN ISLAND

BROOKLYN

QUEENS

N

RARITAN BAY

ATLANTIC OCEAN

MIDDLESEX COUNTY

ATLANTIC HIGHLANDS BORO

UNION BEACH

KEANSBURG

ABERDEEN

KEYPORT

HAZLET

MATAWAN

HIGHLANDS

Navesink River

HOLMDEL

MIDDLETOWN

FAIR HAVEN

RUMSON

Shrewsbury River

RED BANK

COLTS NECK

TINTON FALLS

ATLANTIC OCEAN

MONMOUTH COUNTY

MERCER COUNTY

0 1 2 3 4 5 6 Miles

Borough of Atlantic Highlands

MONMOUTH COUNTY, NEW JERSEY

MAP 1:

REGIONAL LOCATION

LEGEND:

- Lakes/rivers
- Atlantic Highlands
- Municipal boundaries
- County boundaries
- New York

Bay Pointe ENGINEERING

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Borough of Atlantic Highlands

MONMOUTH COUNTY, NEW JERSEY

MAP 2:

AERIAL VIEW

LEGEND:

- Lenape Woods Nature Preserve
- Atlantic Highlands
- Municipal boundaries

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Section 2

HISTORY OF ATLANTIC HIGHLANDS

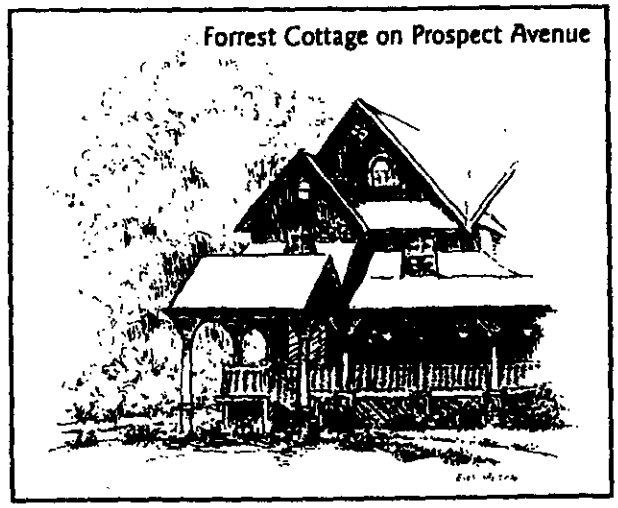
The four eras

Atlantic Highlands: the name says exactly what it is geographically. The town overlooks where the Atlantic Ocean meets Raritan Bay at Sandy Hook, and its hills mark the highest point on the eastern seaboard of the United States between Maine and Florida. Atlantic Highlands is also a meeting point historically, during four main eras:

Lenape lands. For thousands of years, the original inhabitants lived along its cliffs and creeks, where we still find rich evidence of their activities. Here the Lenape people first encountered European explorers, including Henry Hudson in 1609. Soon they were trading with Dutch merchants. In 1664 English settlers bought the whole Navesink peninsula from the Lenape, including our area which they called Portland Poynt.

Colonial farms. Colonists convened the first Assembly of New Jersey in Atlantic Highlands in 1667. During Revolutionary War years, loyalists to the English crown and patriots of the new America clashed in repeated raids and counterattacks across these lands. And here passed retreating English troops after their 1778 defeat by Washington at Monmouth Battlefield.

Victorian resort. A century later, a handful of peaceful farms met an onrush of resort developers, church groups and town builders. They created the Victorian core of the larger town we know today, attracting thousands of visitors and year-round residents.


Forrest Cottage on Prospect Avenue

Bayside village. Today, from its ridges and bayside, we see the Manhattan skyline. From its harbor sail parades of pleasure, fishing and commuter boats. And from its past comes a rich legacy of people and events, landscapes and buildings, memories and traditions which we carry with us into the 21st century.

Based on this chronology, a more complete historical portrait is sketched out below.

Lenape lands -- 11,000 years ago

There is much evidence that the first Americans crossed from Siberia across the Bering Strait to Alaska 13,000 years ago, though data suggesting other routes and earlier dates have emerged recently. It is believed that some of these people eventually reached the Atlantic Coast about 12,000 years ago. Evidence of Native Americans in Monmouth County is 11,000 years old. By the 1600s, the Navesink peninsula had at least two Lenape Indian settlements of more than transient duration and size; they were Usquaanunk and Shaquaset, which are today's village of Navesink and the historic center of Middletown on King's Highway. Trails ran

between these two settlements, south to ocean shore points, west to the Delaware River and north to New York. Navesink, a Lenape word, means place you can see from afar – a perfect description of the highland ridge here.

Campsites also existed in today's Atlantic Highlands. Among the locations that seem possible from early deeds or artifact findings is one near Many Mind springs on the south slope of the highland ridge, another near Wagner Creek, and a third in the area of the old railroad line near the high tide point of Many Mind Creek. For many centuries, the Lenape people farmed, made pottery, knives, bows and arrows, axes and spearpoints, and traded with other areas by canoe and land. They hunted and gathered wild food throughout the woods and wetlands, fished in the bay and creeks, and took fresh water from the "spout" (today called "Henry Hudson Springs"). From the hills, they saw Hudson's *Half Moon* anchor in September 1609 and canoed out for a shipboard meeting, and then received the Dutch explorers on land under the "great store of very goodly Oakes," as the ship's journal says (Moss, 1990).

After settling in Manhattan, the Dutch traded with the Lenape around the bay. Some ships took on water at the Atlantic Highlands' "spout" for long ocean trips.The Dutch established "Rensselaer Dock" here, but few tried to settle. They lost out in March 1664. English colonists from Long Island purchased Racko Rumwaham (Sandy Hook) and lands as far west as Shaquaset (Middletown) from the Lenape in a deed signed by chief Popamora, including lands along Cuppanickinn (Many Mind) Creek in Atlantic Highlands. Their deed included the earliest map of the Navesink peninsula, containing both Lenape place names and partial English translations (see Map 3). Some Lenape remained in this area until at least 1678. By 1750, disease claimed many Lenape lives and most survivors had sold their land and left New Jersey.

Colonial farms: 1600s to 1800s

Five Long Islanders, including William, John and James Bowne, moved to the Navesink peninsula in 1664 and began building homes. In 1665 the colonial Governor confirmed their purchase in a document called "the Monmouth Patent." In 1667 ten home lots were laid out in Portland Poynt – seven lots on the nearly flat lands running up from the west bank of Many Mind Creek, and three lots west of today's Avenue D including the lot where the old Bowne House still stands. In 1671, Richard Hartshorne bought the eastern peninsula, raised 40 cows, and purchased deer and fish from the Lenape. He and John Bowne held public offices at local and colony level. The part of Hartshorne's land where Atlantic Highlands stands passed to his grandson Esek Hartshorne in 1748. The area had extensive cornfields, vegetable plots and orchards.

During the Revolutionary War, the coasts of the bay and nearby ocean were largely controlled by British ships, and the Navesink peninsula was frequently traversed by contending forces. Beginning in July 1776, a British fleet was anchored almost constantly within Sandy Hook Bay, and the Hook itself had a camp of British troops and loyalists. From there, river pirates and prowling bands raided the mainland, burning houses, carrying off sheep and cattle, and obtaining other supplies. The citizenry, and even such individual families as the Bownes, were divided between the British loyalist and American revolutionary sides. American militia units engaged in numerous smaller battles with these invaders. Middletown (which then included Atlantic Highlands) was the site of at least four such skirmishes between 1777 and 1780. The biggest troop movement was in June-July 1778 when the British army retreated after its defeat by George Washington at Monmouth Battlefield near Freehold. For a week, these troops marched through and camped in our area before crossing a pontoon bridge between the Highlands and the Hook and leaving on ships from Sandy Hook Bay.

By 1840, Portland Poynt was basically divided into four farms owned by the Brown, Hooper, Roberts, and Patterson-Woodward families. Brown built the first dock in 1834 at the end of today's First Avenue, and

his lands later made up most of downtown Atlantic Highlands. In 1867 Brown sold his property to Thomas Leonard. He, in turn, gave it to his son Thomas Henry Leonard, who became a main founder, promoter and historian of the town.

Victorian resort: from the 1880s

In 1879, the younger Leonard split his farm into building lots between First and Fourth Avenues from the bay to Mount Avenue. Sales paid for extending Brown's Dock to accommodate steamboats, and New York churches began making excursions. In 1881 Methodists created the Atlantic Highlands Association, bought Hooper Farm and other properties, and set up a camp meeting ground in a natural auditorium in the bluffs along the bay.#In a tourist boom, over two dozen hotels and boarding houses soon opened. The most fashionable ones were on Bay View Avenue, today's lower Ocean Boulevard. Bathing beaches and pavilions were also established.

In 1887 Atlantic Highlands separated from Middletown and became an independent borough, with Leonard as first Mayor. In 1892 the Central Railroad came to town, building a boat and train pier 2,400 feet into the bay. By 1893, there were 2,000 permanent residents and 6,000 summer visitors, up from 40 and zero in 1880. Between 1879 and 1890, 153 houses were built in town, with elaborate "cottages" climbing most of the hillside and each level offering a bayview.

Bayside village: 20th century

Today, a sizeable number of late 1800s structures survives and there are efforts to preserve and restore this rich legacy (see following section). More than 240 buildings are over 100 years old, according to the computerized tax assessment files maintained by New Jersey State, but not all have retained their original appearance. Two historic districts have been designated.

During the 20th century, housing development expanded into the wooded eastern hills. Clifftop outlooks to Manhattan, an ocean-view park, a bayside beach and the forested slopes of Lenape Woods offer a range of scenic and recreational opportunities along both sides of the high ridge. Downtown, the old steamer-boat and railroad pier has been replaced by New Jersey's second largest municipal harbor. It provides docks for private boats, fishing charters and a Manhattan commuter ferry. The main road to the bay, First Avenue, is now a shopping, entertainment and services zone with restaurants and stores for many needs and tastes.

Historic preservation today

In Atlantic Highlands, two districts, 42 individual structures and the sites of two scenic views have so far been given an historic designation, either by the Monmouth County Historical Association or the Borough Council with advice from the Historical Society (see Map 4). These sites are in two main areas:

- The "First Avenue streetscape" for the two blocks between Bay and Mount Avenues is the "historic business district," with buildings in Victorian vernacular style made of brick or frame. In addition, three individual commercial buildings are historic sites.

- The "Atlantic Highlands district," a residential area on the slope east of First Avenue, is where most of the designated historic sites are located. The district extends from Fourth to Hooper Avenues and from Ocean Boulevard to East Mount Avenue and part of East Highland Avenue. Some consideration has been given to expanding the district to include Second and Third Avenues between Mount Avenue and Ocean Boulevard, and the block bounded by East Highland, Mount, Seventh and Eighth Avenues.

Individual sites in this district include 22 residences built in the boom time of the late 1880s/early 1900s Victorian period, two churches in Gothic Revival and Romanesque Revival styles, public stairways made of "peanut stone," and the Stone Bridge. Most of the houses are frame, 2 1/2 and 3 storeys, with irregular plans and porches a dominant feature. On concentric roads which circle the steep slope rising 120 feet above the bay are such architectural styles as Stick, Shingle, Queen Anne, Free Classical, Colonial Revival and Carpenter Gothic.

Almost at the hilltop is an elaborate Queen Anne house built in 1893, known as the Strauss Mansion after its first owner (site no. 22). Restored by Atlantic Highlands Historical Society, the 23-room house has a conical tower and hexagonal one, two-storey porches on all sides, wide views over the bay, and many original details. It serves as a museum, library and headquarters for the Society.

Beyond these two designated districts are such sites as St. Agnes Church, two special scenic views, and the two houses which partly predate the Revolutionary War -- the large stone and frame structure at "Point Lookout" and the "Spout House" near Henry Hudson Springs. Not listed in any inventory are a number of Victorian houses on the west side of town.

At the end of this section, Exhibit 2.1 provides an inventory of historic districts and sites in Atlantic Highlands and the sites are numbered and plotted on Map 4 . These sites are listed in the Borough Master Plan, which acknowledges that the list is probably incomplete. During the year 2000, the Atlantic Highlands Historical Society has contacted the owners of the 240 structures which are 100 years of age and older, aiming to determine which of these structures are in historically appropriate condition and would warrant receiving a "Century House" plaque. One result may be the nomination of additional sites for inclusion in the inventory.

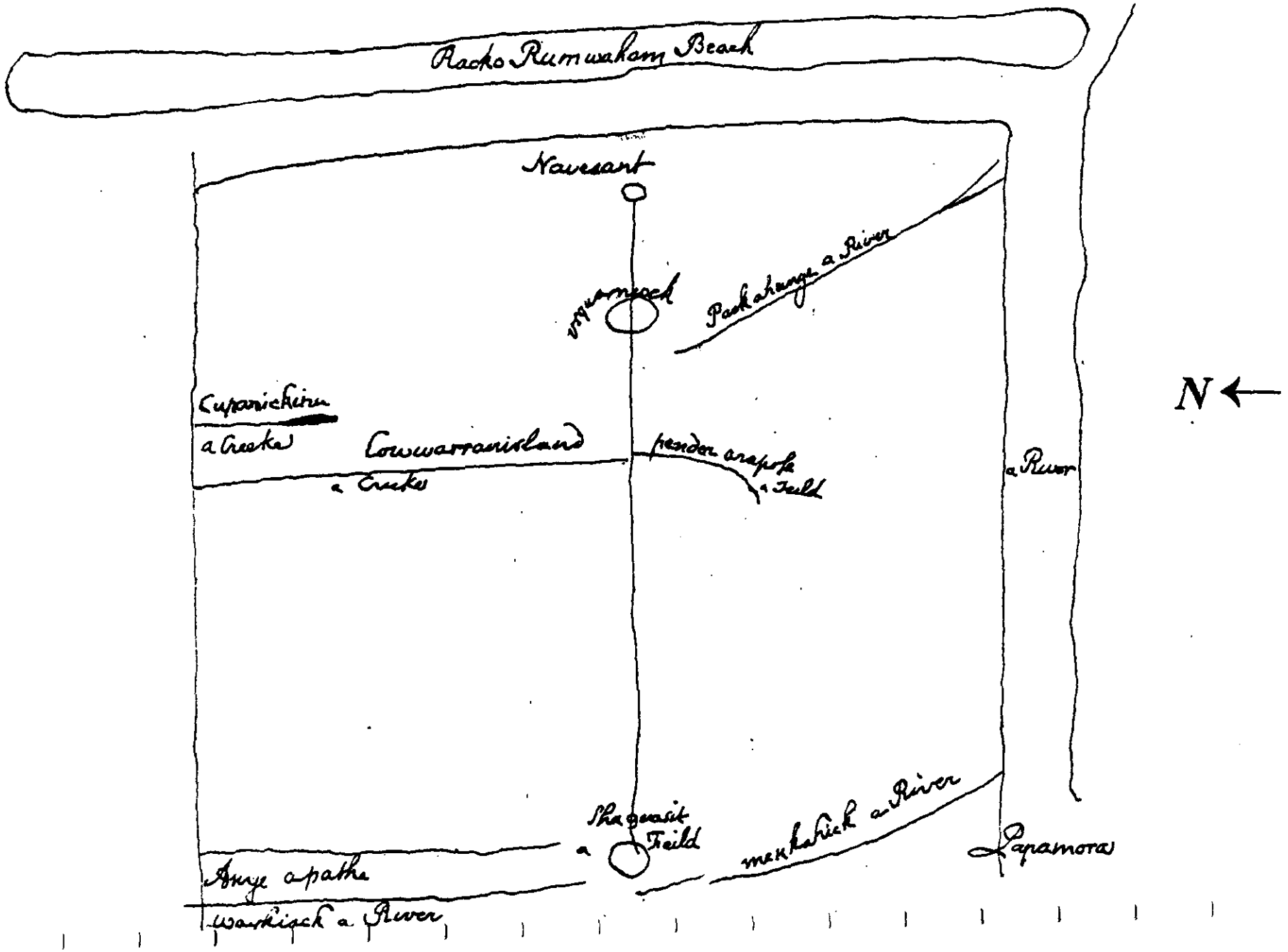
The Borough Master Plan lists the 43 sites in a background section which is for information only and has no "teeth" regarding the protection and preservation of historic sites. The Master Plan also has a section titled "Landmark Preservation Element" which briefly notes some ideas about use and preservation of landmark sites but in a general and open-ended way, mentioning preservation possibilities rather than requirements.

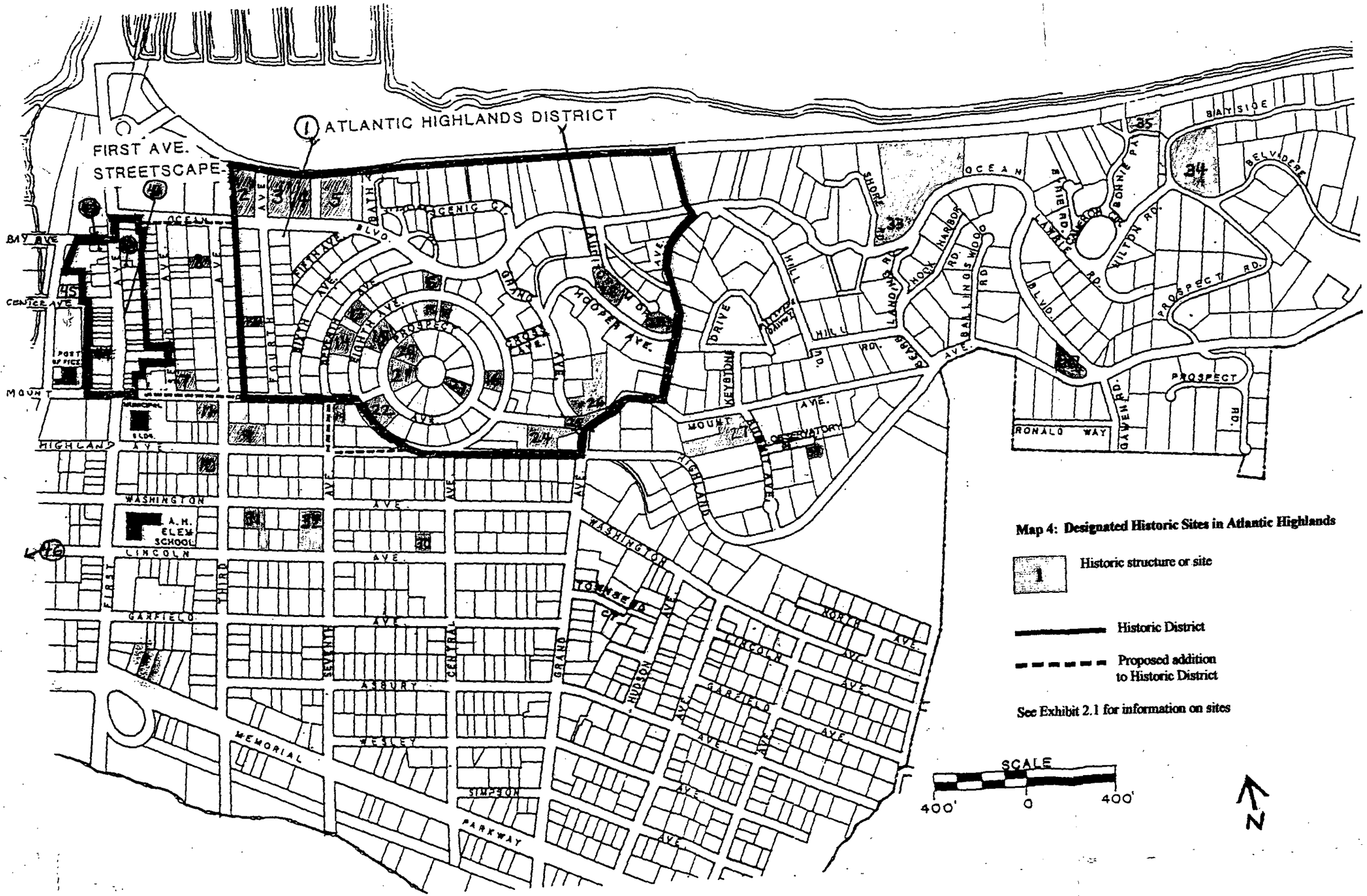
In addition, Article 8 of the Borough Development Regulations has two sections setting out some general ideas but no stated requirements and enforceable regulations. The Article mentions factors to weigh before approving a development plan which involves demolishing or relocating an historic building; the desirability of compatibility and visual harmony between an historic building and a neighboring building being built or renovated; protection of "desirable architectural details" on facades; and the design of compatible accessory buildings. It lists factors to weigh in such cases, using terms like "bulk and scale" and "materials and textures" but not defining them in a way that helps in actual evaluation.

A number of other towns in New Jersey have stronger regulations with active preservationist goals. Many have historic preservation commissions, with specialists to be consulted about any development that would affect an historic structure. The Borough Council had a workshop with the Atlantic Highlands Historical

Society in early 2000 to consider possible stronger provisions for historic preservation. Among the ideas aired were: give formal legal meaning rather than only "honorary" status to designated historic sites and districts; formulate more specific and substantive planning guidelines, design standards, and review and approval procedures for historic districts and structures; and focus on saving good existing historic buildings and encouraging restoration of historic buildings that used to be good and still can be.

Map 3: 1664 Lenape-English Deed Map of Navesink Highlands
Part of deed dated March 25, 1664 between Lenape chief Popamora and English settlers





Map 4: Designated Historic Sites in Atlantic Highlands

1 Historic structure or site

Historic District

Proposed addition to Historic District

See Exhibit 2.1 for information on sites

Exhibit 2.1: Historic Districts and Sites

(See Map 4 to locate numbered sites and structures)

Address	*Description*	*NRHP Site Eligibility*	*Map Nos*
	(1) RESIDENTIAL ZONES		
ATLANTIC HIGHLANDS DISTRICT (not a designated district for zoning and regulation purposes):			
District as a whole:	Fourth to Hooper; Ocean Blvd to Mount; N. side of E. Highland from 8th to Grand	Yes	1 *
Individual structures:			
38 Ocean Boulevard	"Barre Harbor Cottage" - Queen Anne style	---	2
44 Ocean Boulevard	"Peck House" - Queen Anne style	---	3
48 Ocean Boulevard	"How Kola" - Colonial Revival		4 *
54 Ocean Boulevard/5th	Colonial Revival/neo-Classical	---	5
Ocean Blvd/east of 7th	Peanut stone steps/Victorian house	---	6
Second and Mount Aves	"Old Red Homestead" - Leonard House	---	7
Third Ave (Ocean/Mount)	First wooden house in Borough	---	8
Third and Highland Aves NE corner	Central Baptist Church - Romanesque Revival style	Yes	9 *
Third and Highland Aves SW corner	A.H. Presbyterian Church - Gothic revival style	No	10 *
Third and Mount Aves SW corner	Site of 1st Methodist Church	--	11
33 Fourth Avenue	Stick Style residence	Yes	12 *
12 Seventh Ave	Queen Anne/Stick Style	---	13 *
28 Seventh Avenue	Queen Anne style residence	---	14 *
16 Eighth Avenue	Victorian style residence	District	15 *
60 Eighth Avenue	Carpenter Gothic residence	Yes	16 *
78 Eighth Avenue	Queen Anne style residence	Yes	17 *
Eighth Ave. next to #78	Peanut stone steps	---	18
Mount & 7th Aves	"Woodmanse House" - Queen Anne with Colonial elements	---	19
12 Prospect Avenue	Carpenter/Queen Anne style	District	20 *
22 Prospect Avenue	Colonial Revival on Shingle/Queen Anne	Yes	21 *
27 Prospect Avenue	"The Towers" (Strauss Mansion) - Queen Anne style:	Possible	22 *
46 Prospect Avenue	"Forest Cottage" - Shingle Style	District	23 *
95 Mount Avenue	Queen Anne style residence	District	24 *
Mount Ave. bridge	Stone bridge (Ouenokhoi) over Grand Ave	District	25 *
102 Mount Avenue	"The Stable House "	---	26
Mount & Summit Aves	"Crawford Cottage" - Victorian style	---	27
43 Hooper Avenue	Queen Anne style	District	28 *
27 Hooper Avenue	Craftsman Style residence	---	29

Exhibit 2.1 (continued)

Address	*Description*	*NRHP Eligibility*	*Map Nos*
OTHER RESIDENTIAL AREAS:			
South of E. Highland Avenue (in the R-1 zone)			
58 E. Lincoln Avenue	Queen Anne style residence	Yes	30 *
27 E. Washington Ave	Late Queen Anne residence	No	31 *
37 E. Washington Ave	Late Queen Anne residence	No	32 *
East side (in the R-2 zone)			
170 Ocean Blvd	"Point Lookout" - portion predates Rev. War	---	33
26 Belvidere Rd	"Spout House" - Colonial style	---	34
Hilton at Bayside Drive	Henry Hudson Springs	---	35
230 E. Highland Ave 36	Rustic bay cottage (Note: undone by remodeling)		
Observatory Place	Water tower and observatory	---	37
West side (in the R-1 zone)			
Center Ave and Ave C	St Agnes Church	---	38 (not on Map 4)
	(2) SCENIC VIEWS (not on Map 4)		
Piers in harbor	View of bay and New York City skyline	---	39
Ocean Blvd at Hofbrauhaus	Clifftop view of bay, Sandy Hook, NYC skyline	---	40
	(3) NON-RESIDENTIAL ZONES (designated districts for zoning and regulation purposes)		
Historic Business District (HBD)			
a) First Avenue streetscape:	First Avenue between Mount Ave./OceanBlvd	No	41 *
b) Individual structures:			
33 First Avenue/Bay Ave	AH National Bank	Possible	42 *
42 First Avenue	Commercial building	No	43 *
85 First Avenue	Commercial building	No	44 *
Central Business District (CBD)			
Center & West Aves, NE corner	Stainless steel diner (slated for removal as of November 2000)	No	45 *
Light Industrial zone (LI)			
South side of W. Lincoln, west of West Ave.	Industrial buildings (now NJ NaturalGas)	No	46 *

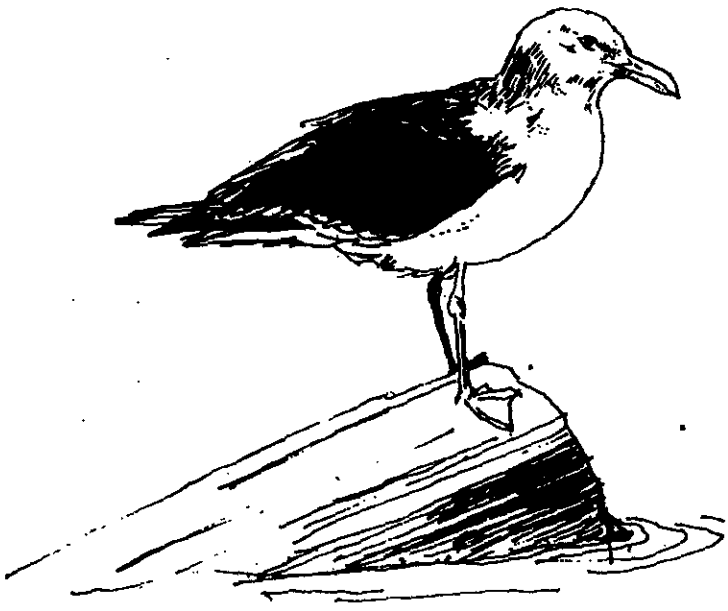
Notes:

- The Atlantic Highlands District was defined in a 1984 Survey by the Monmouth County Historical Association (MCHA). The district includes parts of two single-family residential zones; the R-1 zone where lots are a minimum of 7,500 square feet, and the R-2 zone with lots a minimum of 5,000 square feet.
- NRHP = National Register of Historical Places. The entry "district" in this column means the site is eligible for inclusion in the Register as a contributing element in an historic district, not by itself. NRHP eligibility was determined in the 1984 sites inventory by MCHA.

* An asterisk next to a site number means the site was listed in the MCHA 1984 inventory. All other sites were selected by the Atlantic Highlands Planning Board in consultation with the Atlantic Highlands Historical Society and are listed in the 1990 Master Plan of Atlantic Highlands, Table 24.

Section 3

COAST



HERRING GULL

The biggest, most visible and most appreciated feature of Atlantic Highlands is its coastline along Sandy Hook Bay. The waterfront stretches 2.5 miles from west to east along the southern edge of the bay. Behind this shore, the territory of the town is a relatively narrow strip ranging in width from only a half mile to one mile maximum. Seen from many vantage points -- whether above on the highland ridge or down at the tidal flats -- the coast is an important defining factor in the environment and life of the Borough.

When residents were asked recently to specify attractive features of living in Atlantic Highlands, the coast figured in two of the top five choices made by respondents. 89 per cent checked off "waterfront and views" and 72 per cent named the "boat harbor." In addition, 31 per cent chose "fishing." (See section 10 for details on the Environmental Survey.)

Undoubtedly, the same attraction held true for the original inhabitants, the Lenape; for the first European settlers in the 1660s; for the founders of the Victorian resort town of Atlantic Highlands during the "golden age of the Jersey Shore" in the late 1800s; and for many other newly arriving settlers up to the present time.

Main waterfront uses

Looking at the entire waterfront segment-by-segment reveals three main types of uses: natural, recreational, and residential, with a few commercial uses mixed in.

• **Sandy beaches.** Nature and nature-based recreation are combined at two sandy beaches at opposite ends of the coastline. Both beaches are available for swimming and other public uses, contain some grassy sand dunes, wetlands and woodlands, and are permanently dedicated as open space.

One beach, next to Wagner Creek at the western border with Leonardo, covers about 400 feet of bayfront. It forms part of the Center Avenue Park owned by the Borough.

The other beach, next to the eastern border with neighboring Highlands, is about 1,600 feet long. It is part of Popamora Point, a County-owned park. Inland from its dunes will be built the eastern segment of the bayshore bike-and-hike trail which will run the length of Atlantic Highlands and for which construction permits are awaited as of mid-2000.

The currently available recreational uses and other details of these two parks are given in section 8.

• **Coastal bluffs section.** Natural elements currently prevail below the high coastal bluffs between the eastern end of the harbor and Henry Hudson Springs. While residential structures top bluffs as high as 100 and 200 feet above sea level, below them is a narrow strip about 1,800 feet along the waterside, which contains a small beach area and fringe wetlands. At water's edge is the rocky coastal embankment of a railroad line which used to parallel the shoreline. The area will be developed recreationally as part of the bayshore bike-and-hike trail, while retaining its natural character as much as possible. (See section 8 for more information on this plan, and section 7 for descriptions of the vegetation and wildlife found along the proposed trail route.)

• **Below Bayside Drive.** Natural vegetation also prevails on the more gentle slopes rising from the water below Bayside Drive east of Henry Hudson Springs. This segment, which covers about 3,200 feet of shore length, also contains a few wetland pockets and the rocky fringe of the former railroad's embankment. Here, too, the bike-and-hike trail is planned as an active recreational use running through the preserved natural setting.

• **Marina and boat storage areas.** The main recreational use of the coastal zone is boating. The total water frontage devoted to boating uses is about 4,800 feet, with the bulkheaded part of the marina accounting for 1,180 feet of this. In addition, the Hobie Cat club based at the Center Avenue Park uses the bay-edge of the beach for launching boats and the back beach for summer boat parking. The total footage includes not only the active docks and rented boat slips of the Atlantic Highlands Marina (detailed below), but also boat storage on the eastern end of the marina, along the mouth of Many Mind Creek east of Avenue A (Skipper's Shop yards), and east of the beach at Center Avenue Park (Blackfoot Mobile Marine boatyard). On the bayfront of the same private property which contains the Skipper's boatyard, there is also a curved sandy beach between Avenue A and First Avenue; only a 50-foot-wide portion of this beach on the Avenue A end is Borough-owned and has public access. Commercial facilities at the Marina are three restaurants, a bait and fishing supply shop, day-tripper fishing boats, and the commuter ferry to Manhattan.

• **Residential uses** line most of the northern edges of the slopes, hills, cliffs and bluffs which rise from the bay shore. Public access to coastal lands is permitted below most of these residential areas. However, there is no public access along one 1,250-foot waterfront segment between Avenue A and Avenue D which is lined with private residences relatively close to the water (see public access discussion, below).

On the following pages are 1998 aerial photographs of four sections of the Atlantic Highlands coastline (taken in March when tree cover was sparse so that other features would show better). Going from west to east, Exhibit 3.1 is Wagner Creek at the border with Leonardo, showing its wetlands, estuary, beach and offshore delta. Exhibit 3.2 is Many Mind Creek west of the harbor, showing its wetlands, estuary, beach and offshore delta. Exhibit 3.3 is the marina and boat harbor, showing the seawall, the peninsula (former rail/steamboat pier), Frank's pier, boat piers 1 to 6, launch ramps, winter boat storage on land, and the dredge spoils pit. Exhibit 3.4 is Popamora Point with its beach , dunes, wetlands and cliffs.

Public access

Along most of the Atlantic Highlands waterfront, public access is allowed as noted above. The 1996 Master Plan of the Borough has a "Waterfront Design Element" which states that "future development must respect the public interest in maintaining and enhancing this area as a community resource," including the need for "public access to the waterfront." There are also guidelines and standards about public access to waterfronts

and to coastal water views which have been issued by the New Jersey Department of Environmental Protection (NJ DEP), especially under the Coastal Areas Facilities Review Act (CAFRA).

On the publicly owned segments, such access is a guaranteed right. The sandy beaches at the east and west ends of town are open to all comers without restriction. A 50-foot wide sand beach at the end of Avenue A is Borough-owned. The public can also walk along the foot of the coastal bluffs and below Bayside Drive on the path of the former bayfront railroad which is Borough-owned property. While it is now difficult to go through some sections because of rocks, brush, bay tides and several water outfalls from the land, this difficulty will disappear when the bike-and-hike trail is built. As is true now, there will be public access via four main entry points to the trail: from the east end of the marina, downhill from Henry Hudson Springs, at the former Hilton Station of the railroad off Bayside Drive, and from Shore Drive in the Highlands.

In the municipal marina, the waterfront promenade behind the bulkhead line is fully open for public use, and some docks have pedestrian foot traffic, while others are limited to boat-owners who rent mooring slips.

Four other areas of the waterfront are bordered by private property, and so public access is not guaranteed above the high water line. From east to west, these are: 1) the peninsula of the old railroad-steamboat pier at the western end of the marina; 2) the sandy beach running west of that, to Avenue A; 3) the waterfront downslope from private residences on Harbor View Drive, where physical blockages prevent access from both ends (at Avenue A and Avenue D); 4) west of Avenue D at the bulkheaded waterfront bordering the boat storage facility of Blackfoot Mobile Marine.

Marina

The Atlantic Highlands marina is the second largest municipal harbor in New Jersey. Its attraction derives partly from its location, which leads directly to several different waterways for fishing, touristic cruises, pleasure boating and water travel. It is near the meeting point of Sandy Hook Bay and the Atlantic Ocean, just north of the Navesink and Shrewsbury Rivers, and southeast of the Raritan River. Less than an hour's ferry ride leads due north to Manhattan.

It is, in effect, the largest industry in Atlantic Highlands, as well as a significant tourist and recreation resource. The scenery is unparalleled – nestled at the foot of the wooded Navesink Highlands, with open views to the coves and beaches of Sandy Hook, the Atlantic Ocean, and the Manhattan skyline. It is also a significant source of revenue for the town government, paying for such services as streets and roads, police, fire and first aid, water and sewer, trash removal, and administrative costs of support services provided by the Borough. For the year 2000, harbor payments to the Borough amounted to $775,000. The harbor receives income from renting slips to both commercial and private boats, winter boat storage, a launch ramp for day boating, fuel sales, the three restaurants and the commuter ferry. The marina is open every day of the year except Thanksgiving, Christmas and New Year's day.

The marina has many facilities and services for boaters, commuters and tourists:

- 168 moorings and 480 docking slips at ten piers, including 7 fixed and 3 floating piers. They are in a cove protected by a new bulkhead 1,180 feet long.
- A 3,000 foot long sea wall inside Sandy Hook Bay.
- Launching ramp, bait and tackle shop, and small-boat rentals.
- Ice, gas, diesel, and sanitary pump-out at the gas dock. A laundromat is nearby.
- Nine party fishing boats, available for trips lasting half a day, three-quarters of a day, and a full day.
- Fifteen charter boats, which can be booked for private parties.

- Dockside dining and snacks, both outdoors on a deck and indoors with water views; a large formal restaurant which hosts many events of the region; and a yacht club.
- Catamaran ferry for six daily round-trips on weekdays to Wall Street and East 34th Street in New York City, carrying hundreds of passengers a day. On weekends, whale watching and cultural and tourist excursions are offered.
- Summer land storage of boats on trailers up to 30 feet; also winter boat storage
- Plenty of free parking, and easy access from State Highway 36.

For landlubbers, there is a paved waterside promenade along the bulkhead line, with small roofed bench structures, Victorian style lamp-posts, and flower boxes on the fence. The farthest east pier, newly built and open in 1998, is designated for public fishing and includes fish cleaning stations. The harborside park has tennis courts, a tot lot for children's recreation, a Victorian-style gazebo which is used as a concert bandstand on summer Sundays, and a full-size model of the Argonaut, an early submarine which was invented, built and tested here in 1896 by Simon Lake, a renowned resident and the namesake of a road in the harbor. There are some trees and grass in this park section, but nearly all the rest of the harbor is paved and with sparse vegetation.

History of town docks. The first public dock at the end of First Avenue was built in 1834. From there, boats went mainly to New York City, carrying such goods as local farm produce (including watermelon, asparagus, fruits) and logs for firewood and construction, and returning with goods and supplies not available locally.

In 1879, the dock was extended 1,350 feet into the bay to accommodate steamboats for summer tourists. This opened the way for resort development. Right next to the bay at the end of First Avenue, Foster's Atlantic Hotel was built in 1880, including a restaurant, bathing pavilion and hotel rooms. Also in 1880 the Bay View House was built on today's lower Ocean Boulevard at Fourth, and became noted for summer fishing parties, bathing, crabbing, and evenings of dancing and entertainment. Another hotel, the Sea View House at Ocean near Grand, had a dock and bathing pavilion at the cove. The house still at 48 Ocean Boulevard was built in 1890 as the headquarters of the Pavonia Yacht Club and 40 boats were docked in the cove, until the building was converted into a residence in 1905.

In 1892 the Central Railroad built a pier 2,400 feet into the bay, making the area into a major crossroads and meeting point. The pier could dock three steamers and had four train platforms. Travelers could come in by steamship and transfer at the pier to a local train which ran along the shorefront eastward to Highlands, Sandy Hook and Long Branch. Or they could ride the inland railroad line from New York to Leonardo or the Atlantic Highlands dock and continue from there by steamboat or shorefront train. Central Railroad passenger service to the pier stopped in 1951 and freight service ended in 1971.

Before cars were invented, the lower decks of steamers were often full of bicycles. People would bike to Long Branch or even Asbury Park, have a meal, and then bike back for an evening boat. One eyewitness of that time remembered that "First Avenue was so crowded with boat passengers you could hardly get through there" (William Burdge Mount, 1973 personal interview). History seems to repeat, since similar remarks can now be heard about streams of ferry passengers driving through downtown on weekday mornings and evenings, and about the parade of boaters' vehicles coming and going to the marina on summer weekends.

The big pier burned down in the 1960s on a July 4th weekend. Only two mementos of the railroad and steamboat era remain: the rows of pilings still in the water at the end of the peninsula extending into the bay, and a section of railroad track still embedded in that strip of land.

From 1914 to 1938, there was a second large public dock, 900 feet long at the foot of Avenue A. The steamboat "Mandalay" made three round trips a day between New York City and this dock, with up to 2,000 passengers and music and dancing on board. The attraction they came for was the Atlantic Beach Amusement Park whose rides, concessions, games and entertainment spots spread out behind the bayfront between Avenues A and D. In 1938, the "Mandalay" was rammed in the fog by a cruise ship heading for Bermuda and sank, but all 325 passengers were rescued. In 1939, the Mandalay pier burned down. In 1940 the amusement park closed.

For many years a third pier, actually a narrow catwalk, extended about a half mile into the bay from near Avenue D. Built by the Standard Oil Company (which became Exxon), this narrow private pier ran above an oil supply pipeline terminating at a berth and table where small barges docked and unloaded oil into the mouth of the pipe. At the land end of the pipe, oil fed into a cluster of storage tanks above the bay shore west of Avenue D, from which trucks supplied oil to customers in Atlantic Highlands and all over Monmouth County. The pier suffered storm damage, fell into disrepair and was eventually dismantled some years ago. One of the large bollards still out in the bay where the end of the pier once was is now being used by Osprey which have successfully had chicks in 1999 and 2000. The storage tanks at the fuel depot were removed and the land is now leased by a storage facility for pleasure boats.

When the core of today's municipal harbor was being planned in 1937-1938, it was conceived as a harbor of refuge where boats could anchor during storms. This enabled the Borough to acquire funds from the Federal government, the Works Progress Administration and the State of NJ. Some Borough money was also used for construction and some for acquisition of riparian rights.

The harbor land was created in 1939-1940 by a massive landfill operation that turned the rounded bay cove into flat land with a straight waterfront enclosed by a curving breakwater wall offshore. The former shoreline was at the bottom of the hill which rises directly behind the flat land of the harbor. Along the Ocean Boulevard hillside, the existing row of large Victorian-era houses looking down on the harbor used to front directly on the bay.

The harbor today. Today, the official total area of Borough-owned land making up the municipal harbor zone is about 35 acres. Of this total, 24.7 acres are defined as protected public open space on the official DEP Green Acres inventory. This includes Piers 1 through 6 and their surrounding water 400 feet out from the bulkhead (10 acres); the land behind the bulkhead west of the harbor office -- promenade, parking areas, boat storage, maintenance garage building, harbor office and senior citizens building (11 acres) ; and the harbor park with its gazebo/bandstand, tennis courts, children's playground and related parking lot (3.7 acres).

In addition, the Borough owns two land areas which are not on the DEP inventory: 1) about 2.3 acres which it leases to the restaurant "Pete's on the Bay," the ferry office and Shore Casino; and 2) about 8 acres of land on the eastern end of the harbor, plus the adjacent bay waters which contain two floating docks and the fixed fishing pier. Part of this eastern land was recently filled and covered with gravel as access to the launch ramp and day parking for boat trailers. The next part farther east contains a dredge disposal site (details below). Still farther east the Borough owns a coastal fringe of lands that used to be the right of way of the railroad heading toward the Highlands, now destined to become part of the bayshore bike-and-hike trail.

Management. The marina operation is run as a municipal utility under the guidance of the Mayor and Council of the Borough. It is governed by an appointed Harbor Commission of five members and two Borough Council representatives. The Commission oversees harbor operations and finances, sets fee rates for all users, adopts utilization rules and regulations, generally ensures good upkeep and repair, and develops improvement

projects subject to Council approval. A full-time Harbormaster is responsible for planning and supervising daily operations of all types.

Regulations. The Borough Council has adopted ordinances for the municipal harbor which regulate car and boat speed limits; boat engine operation; swimming and diving; fishing, crabbing and fish cleaning; signs; waste disposal; and parking. There are also prohibitions on loudspeakers, bullhorns, soliciting and hawking, and other noise, and on running bikes and motorcycles on docks.

Rebuilding in the 1990s. In December 1992, a nor'easter packing hurricane force winds and exceptional tides slammed Atlantic Highlands and its municipal harbor. The storm caused an estimated $3.5 million in damage to the piers, bulkhead and promenade, with the worst damage to pier 6. A major reconstruction task was required. By late spring 1993 all piers were back in operation, but building a new pier 6 took longer. By 1998, an entirely new bulkhead made of coated steel was installed on 1,180 feet of waterfront. In 1997-1998, a new macadam promenade with fencing, old-style lighting and benches was laid out. In 1999, timber bulkheads were installed in the eastern part, and two floating docks were extended landward and connected to the existing fixed pier by a ramp. Significant funding for the repair and rebuilding came from the Federal Emergency Management Agency (FEMA).

Dredging. Dense development and land uses that do not adequately protect the surface soils in Atlantic Highlands create erosion which washes sediment and silt into the bay. When this human-created erosion is added to the shifting of bottom sediments and shoals caused by natural movement of bay waters in a boating area, dredging is required to deepen the navigation channels. The entire municipal harbor has been dredged at one time or another. Dredging was done after the winter storm of 1992. Additional dredging was done in the winters of 1993 and 1994. At low tide the mooring field is about 11 to 12 feet deep and the water at the piers along the bulkhead is about 8 feet deep.

A new round of dredging was done in 2000 in the western area of the harbor. This deepened the inlet between the former railroad-steamboat peninsula and Frank's Pier (unnumbered pier named after Frank's boat rental business once located there). At the same time, some dredging was done near the pilings at the west end of the breakwater wall. The dredge area extended over 1,000 feet out from the bulkhead, covered 1.65 acres, and yielded about 11,800 cubic feet of material. Material proposed to be dredged was first tested for any contaminants and NJ Department of Environmental Protection reviewed and approved the planned operation. This dredging was done to prepare for a proposed reconfiguration of Frank's pier, including the relocation of the dock for the commuter ferry dock and providing it with a second berth.

In 1988, an upland disposal site for dredged materials was authorized for construction at the eastern end of the harbor. It received its first dredged materials in 1990. Since then, it has taken in about 70,000 cubic yards of material from all harbor dredging operations, not counting material it was to receive from the dredging in 2000. The site is at least 118 feet back from the shoreline, about 1,400 feet long and a maximum of 192 feet wide. It is surrounded by mounded earthen berms rising about 22 feet above sea level (see Exhibit 3.3).

Dredged material is vacuumed up from the harbor bottom through a pipe, a method which minimizes the amount of suspended sediments that can be harmful to shellfish. The pipe carries this material in liquid slurry form to the upland dredge disposal site. Dredged material is diked and contained by the berms in order to avoid effects on the nearby lands and hydrology; there are freshwater wetlands to its west and south. By volume, 90 per cent of the pumped material is water which is allowed to drain back down to the bay so that the remaining solids dry out. (Source: Maser Consulting, "Application for Waterfront Development Permit and CAFRA Permit." Submitted to NJ-DEP, November 1999).

Fuel. At the southeastern corner of the paved harbor parking area, fuel is stored in above-ground tanks. These tanks are encased in concrete containment walls of wider diameter to trap overflow in case of accident and thus prevent fuel spills in the bay. The on-land tanks provide gas and diesel to all fire, first aid and trash trucks of the Borough and to Henry Hudson School buses. A fuel dock sells fuel to all boaters.

Environmental factors. By definition, operating a large harbor involves many environmental factors. Careful and sensitive management is required to deal with -- and preferably to avoid, as much as possible -- the many problems which can and do arise. Problems include: boaters' activities such as painting hulls, fueling, and pump-outs; rainwater runoff from the large paved area which receives pollutants from cars, boats and pedestrians; pollution coming from marine sources such as oil spills, boat trash, and transported litter from lands all around the bay; blocked drainage from the slopes and wetlands; sediment washdown from the land and underwater sediment movement which can constrict navigation channels; dredging of bottom materials and their safe removal into the bay-side dewatering pit without harming neighboring trees and habitat; etc.

Coastal and bay habitat

There is evidence that bay waters, including in the municipal harbor area, have become much cleaner in recent years, for several reasons. New York City has worked to clean up its waterways by maximizing the secondary treatment of sewage and better controlling the disposal of solid wastes such as washed ashore in New Jersey and caused many beach closings a few years ago. Also, the State of New Jersey has mandated and helped to finance increased facilities for boats to pump out their sewage and waste water for safe disposal on land. Finally, State regulations now require that antifreeze and oils must be recovered rather than be dumped on land, in drains or the water. And paint scrapings from boats must be bagged for proper disposal, keeping these pollutants out of the water.

One result of these clean-ups is that fish and shellfish survive better in the bay and are more often safe to eat. However, the entire water area within the Atlantic Highlands municipal harbor is classified as "prohibited" for the purposes of harvesting of oysters, clams and mussel. No mussel, oyster, surf or soft clam beds are mapped inside the breakwater wall, but hard clams occur within the harbor (NJDEP shellfish documents).

Section 7 of this report includes a section on the coastal zone's rich habitat for vegetation and animal life in the bay waters, along the shores and in wetlands. It discusses the many dozens of species of fish, invertebrates, reptiles and amphibians to be found there, and describes the resident and migratory bird life, including water fowl, songbirds and raptors.

Shared interests along the coast

The bayshore towns from Keyport to the Highlands have an obvious shared interest in the resources of the coastal zone and bay waters. The effects of whatever Atlantic Highlands does along its 2.5 mile shoreline can influence resources depended on by other municipalities, and vice versa. Ecologically and economically, we are "all in the same boat."

The common environment-related concerns of these towns regarding the coastal zone include water quality; point and non-point pollution of the water from all sources around the bay and as far north as Manhattan; fish and shellfish habitat and harvesting; the variety and survival of other aquatic life; the biogenesis, natural habitat and water purification functions of bordering wetlands and tributary streams; beach

and dune preservation; upland stability and erosion, including woodland protection of watersheds; sediment transport and deposit; the effects of coastal flooding, hurricanes and other storms; water traffic by commercial and private boats, two commuter ferry lines (with a third now proposed), and large military ships at Earle Naval Weapons Station in Belford; and recreational activities and facilities, including the Henry Hudson Trail which parallels the coastline from Keyport to (eventually) Sea Bright.

Many of these issues have been addressed by planning, advisory or regulatory bodies at the bayshore, state and bi-state/federal levels, in addition to the municipal ordinances of the individual towns:

- The Bayshore Development Office, a local outpost of the NJ State Department of Commerce and Development, encourages and supports coastal towns from Keyport to Sea Bright in the promotion of tourism, regional transport and economic growth.

- A "Watershed Management Partnership" has been formed covering all municipalities in Monmouth and Middlesex Counties (from Brielle in the southeast to Old Bridge in the northwest) whose waters flow into lower Raritan Bay, Sandy Hook Bay or the Atlantic Ocean. This constitutes Watershed Management Area 12 (WMA 12) in the Statewide program developed by NJ DEP. In 1999, with guidance from the Monmouth County Planning Board, gatherings of local representatives began developing goals, strategies and projects for better management and protection of streams and outflows in this area. Subgroups have been created for parts of the WMA, including one for the Bayshore.

- At the State level, three main laws regulate coastal development: the Coastal Areas Facilities Review Act (CAFRA), the Wetlands Act of 1970, and the Waterfront Development Law. Under these laws, the NJ DEP has developed a permitting process for various forms of coastal development, seeking a balance with environmental factors.

-At the Federal level, the Harbor Estuary Program (HEP) brings together all Federal, State (New Jersey and New York) and local bodies concerned with restoring the environment of greater New York Bay with its numerous stream estuaries. The HEP produced numerous studies, syntheses and action plans as a basis for remedying the most serious problems and improving the most critical natural-biological functions in this wide circle of water and coast.

Several non-governmental environmental organizations also have roles in coastal protection and improvement through technical research, policy and program advocacy, public education, coalition-building among interested groups, advisory assistance and "watchdog" functions. These groups include the American Littoral Society, the New York/New Jersey Baykeeper, Clean Ocean Action, and the Audubon Societies.

In the year 2000, the New Jersey State Planning Commission approved the application of Atlantic Highlands to become a "Designated Center" within the framework of the New Jersey Development and Redevelopment Plan. This means that preservation and rejuvenation of the traditional town center will be emphasized -- mainly the business district and adjoining waterfront area (see discussion in section 9).

Future of the waterfront and marina

There has been debate for some years in town about various ideas for continuing to improve the "downtown waterfront." The term refers to the coastal lands between Avenue A on the west and the farthest eastern end of the harbor lands where the dredge disposal site is located below the coastal bluffs. This area -- the geographic centerpiece of the Atlantic Highlands coastline -- has the greatest public visibility, the most boat and vehicular traffic and, in general, the greatest volume of public use (actual and potential) of any coastal section. It connects directly to the business district on First Avenue and to Highway 36.

Reporting on this debate becomes clearer when it is divided according to the four kinds of uses currently located in the downtown waterfront. They will each be covered in turn below, going from west to east.

1. The west

The largest remaining open space in the Borough is the largely unbuilt land west of First Avenue and north of Bay Avenue on both sides of Many Mind Creek. There is a curve of sandy beach on the bayfront. The upland is currently used partly for commercial boat storage and partly for free parking of ferry passengers' cars. It contains a wetland in a rectangular area which had originally been excavated in 1918 to be a "boat basin." The southern and western boundaries are entirely lined with mature pine trees, and the eastern boundary along First Avenue contains a small grove of mature holly trees.

Geographically and topographically, the area can be seen as one large tract of 10.7 acres, which is square on three sides and diagonal on the bayfront side. However, it actually consists of five lots,. of which the Borough owns only two unconnected lots totaling about 1 1/3 acre. The lion's share of the acreage is private ownership of the Giuliani and Hess tracts. Therefore, any proposals to reconfigure these lands for public purposes depend on these owners becoming willing sellers, the Borough being willing to finance the purchase costs, and a plan and layout being agreed as to how to use this space. So far it has not been possible to achieve sale of these lands to the Borough.

At this stage, only tentative planning work has been done to assess the various possibilities, and thus community consultations have also been limited. In simple terms, the utilization ideas so far put forward involve two contrasting approaches in two different halves of the tract:

One approach would tend to emphasize commercial interests and construction work between the eastern bank of Many Mind Creek and the west side of First Avenue. It would blueprint retail store structures, a ferry terminal, a car drop-off loop, with parking space as large or perhaps larger than is now provided. This development would create a designed connection between the business and harbor districts. In addition, there would be a public waterfront park or plaza. Concept plans along similar lines were drafted in the mid-1990s by a consulting firm hired by the Borough, and were also aired in the 1996 town Master Plan document.

The other approach focuses more on natural park and beachfront uses by the public on both banks of Many Mind Creek and westward to Avenue A. From Bay Avenue to the Bay would be a pedestrian greenway, part of a longer creekside greenway extending to Highway 36. From the creek's west bank to Avenue A and from Bay Avenue to the beachfront would be park, with an unbroken water view. The only commercial use might be a one-story building along Bay Avenue containing - for example -- a cafe/snack store with a deck looking toward the water, a rooftop lookout with public access, perhaps two other small stores and public restrooms. Such ideas have been aired during discussions about restoration of the creek corridor after NJ Natural Gas has decontaminated it.

2. The peninsula

The undeveloped peninsula of land which used to be part of the old railroad and steamboat pier juts far out into the bay. Its water edges are currently lined with concrete rubble and beyond its tip lies the watery "field" containing over 1,500 wood pilings of the former pier. It is privately owned. Ideas so far mentioned would transform it into a pedestrian walkway and observation point. It is understood that no structures, or perhaps only a wall-less pavilion, might be permitted by DEP on this peninsula. In October 2000 a proposal was made and permits were being sought to reconfigure Frank's pier with berths for two commuter ferries and to connect the pier and the peninsula by a passenger bridge.

3. The core harbor

The permanently developed central core of the harbor as defined by the bulkhead, piers, parking lots, Shore Casino, harbor office and harbor park is owned by the Borough. Following the rebuilding of the bulkhead and promenade in the 1990s and the lighting and seating improvements there, suggestions have been made to provide for more trees and landscaping to relieve and soften the macadam paving which prevails throughout the harbor, except for the harbor park area. In a successful drive to accommodate increased boating demand and gather more revenue (partly offsetting homeowners' taxes), the harbor has constantly expanded, developed and become hard-surfaced over the years.

Whether and how such development should continue, or whether growth has reached a desirable limit, is a question which townspeople debate, as indicated in the response to the Environmental Survey (see section 10). One further development in this area which the Survey showed is widely favored is the planned bayshore bike-and-hike trail; its harbor segment would run eastward from First Avenue along the inland boundary on the south side of the core harbor, before turning out toward the coastline at the eastern end of the boat storage areas.

Where opinion seems divided, however, is what should happen west of First Avenue (see item 1 above) and on the east end of the harbor (see item 4 below).

4. The east end

New piers for boats and for fishing have recently been installed here along the water, near an existing ramp for boat launching. Some edges near the water have been built up inside a deposited border of broken concrete. Behind this, the land is surfaced partly in gravel and partly with packed soil, and the far eastern side contains the dredge disposal site. Near the waterline and next to the wetland areas there is vegetation of phragmites and spartina grass. Until the recent deposits in the dredge disposal site it too was colonized by phragmites. Presumably, some natural enhancements on the land will accompany the planned bike-and-hike trail where it will turn toward and run along the bay here. While other development possibilities are not clear, in time this area is a likely focus for the discussion about further growth or its limits.

Exhibit 3. 1: WAGNER CREEK – wetlands, estuary, beach and delta

Exhibit 3. 2: MANY MIND CREEK – wetlands, estuary, beach and delta

Exhibit 3. 3: MARINA AND BOAT HARBOR --
seawall, peninsula, Frank's pier, boat piers 1 to 6, launch ramps, boat storage, and dredge spoils pit

Exhibit 3. 4: POPAMORA POINT –
beach , dunes, wetlands and cliffs

Section 4

WATER RESOURCES:

Watersheds, Streams, Stormwater, Wetlands and Flood Plains

Because Atlantic Highlands looks out to a large bay and the vast Atlantic Ocean, the water resources in its land area of only 2.5 square miles may seem small by comparison -- but they have important impact on the local environment and quality of life. Sound conservation, protection and management of these water resources on the land begin with awareness of the watershed where we live, its behavior and effects. It requires understanding of rainfall and natural water drainage from the hills and in the flatlands; underground water buried in aquifers; surface water flows in creeks, springs, wetlands and flood zones; and tide-water influences on stream mouths, shorelines and salt marsh. This hydrological system has positive and life-sustaining value -- but also entails some risks and negative effects if engineering and development actions are not carefully planned.

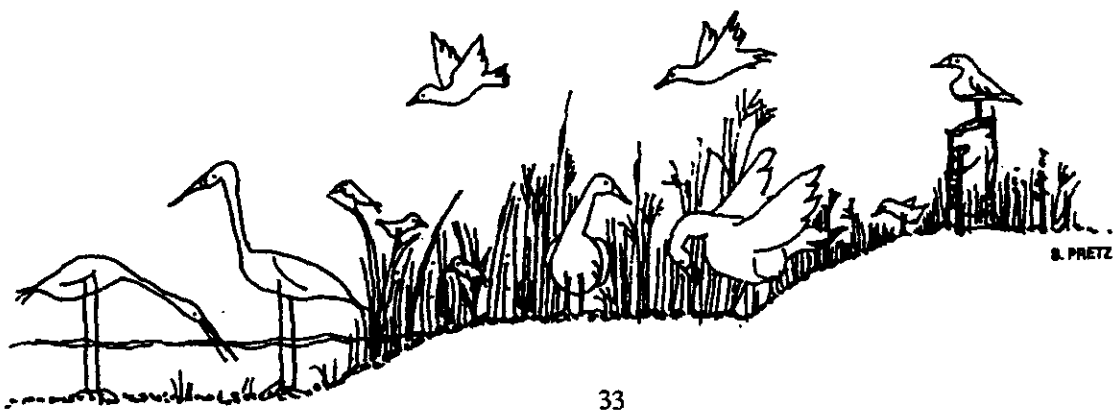
Watersheds

The rainwater which is shed by your roof gurgles down the rainspouts. Small currents also run off your lawn and such paved surfaces as the patio, walking paths and driveway. These small flows are channeled to the nearest road gutter or storm drain, heading downhill. Eventually this stormwater run-off makes its way into a creek and from there into Sandy Hook Bay.

You are part of a watershed -- a large area of land which sheds water into ravines, ponds, lakes, wetlands, brooks and creeks, and then from these tributaries into the bay. Each tributary receives drainage from its own defined watershed area, and in turn all the tributaries together make up the larger watershed of the bay.

Immediate watershed. Many Mind Creek and Wagner Creek are the main drainage channels for the territory of Atlantic Highlands. They carry almost all the surface water runoff from the borough northward toward the bay. Some runoff enters these creeks directly over the land, some is retained in creekside wetlands, and some runs in stormwater drainage pipes which are embedded under the streets and empty into the creeks.

At their mouths, the two creeks are partially mixed estuaries , with a mix of seawater beneath a surface layer of freshwater moving seaward. Both creeks deposit sediments in a fan-shaped delta beneath the shallow bay-edge waters. Aerial views of these estuaries and deltas (with waterfront beaches) can be seen in section 3 (Exhibits 3.1 and 3.2). The wetlands along Many Mind Creek appear as light purple shading in Map 5 on land cover/land use, and the storm sewer network of the Borough is traced in Map 6 on sewer infrastructure.



A smaller amount of runoff from the borough is carried by a number of gullies and ravines in the steep slopes above the bay shore, between the eastern end of the harbor and near the border with the Highlands. Between storms some of these water courses are dry. As these waters enter the low-lying shore lands, some cross directly into the bay and some are retained for a period in isolated wetlands, also visible in Map 5.

One area of the Borough is in a different watershed which drains southward to the Navesink River. This is the slope below East Highland Avenue between upper Prospect Avenue and Scenic Ridge. Runoff from there starts downhill by feeding an intermittent stream which goes through Middletown lands parallel to and then crossing Highway 36. It becomes a perennial tributary of Clay Pit Creek in the Navesink Estates townhouse development, passes through a culvert under Navesink Avenue, and heads to the estuary of Clay Pit Creek south of the old iron bridge.

Larger watershed. The total watershed territory which drains into Raritan Bay/Sandy Hook Bay extends 18 miles east-west along the bayshore, between the Highlands and South Amboy. A total of 13 creeks, including Many Mind and Wagner Creeks, carry water northward from sources one to four miles inland and empty into the bay.

Pollution occurring in these tributaries has a combined impact when it moves out to the bay. It affects water quality, fish, vegetation, other aquatic life, swimmability, other recreation uses by people, and local livelihoods. By just one economic measure, the waters of northern Monmouth County cover shellfish beds that produce almost 40 million clams a year, and an annual payroll that local fishermen estimate at $7 million (Asbury Park Press, 1999).

For such reasons, State, County and municipal groups have come together in a new watershed management program for 20 areas of New Jersey. Water Management Area No. 12 (WMA #12) covers the southern shore of Raritan/Sandy Hook Bays and the Atlantic Ocean shore from Sandy Hook to the Manasquan River. The area of the 13 creeks along the bayshore constitutes one of the five watersheds in WMA #12.

Taking this wide view makes it possible to track current water resource trends, project future trends, define water resource problems, and identify pollution sources within the interconnected ecosystems of each watershed. Also, specific water resource goals and measurable environmental objectives can be developed for each issue, such as percentage targets for pollution reduction, and timetables for elimination of projected water supply deficits. One broad-based planning tool is calculations of water capacity in terms of "Total Maximum Daily Loads (TDMLs)" -- for example, specifying what are the limits in the water supply for withdrawing surface water, for absorbing pollution from point, non-point and atmospheric sources, and for meeting certain watershed protection goals. This work contributes to the State-wide goal in New Jersey of protecting 100,000 acres of watershed within the 1 million additional acres to be preserved as open space. It also relates to new watershed rules proposed by the Department of Environmental Protection which require that impacts on water supply be considered before new development is planned. The overall goal is for all surface waters to be "swimmable and fishable."

Runoff and pollution

Average rainfall is 44 inches per year in the Atlantic Highlands area. Over half of that returns to the air by evaporation and the balance remains on the land. When land is forested and has natural ground cover, about 17 inches will soak into the ground and fewer than 3 inches are likely to run off over land. However,

these figures change dramatically when more land has impervious cover or hard surfaces that make rain water run off the land -- such as roofs, driveways, parking lots, paved walkways and streets. Exhibit 4.1 summarizes how impervious cover increases runoff. Exhibit 4.2 visualizes the decreases in evapo-transpiration and infiltation caused by expansions of impervious surface, as well as the runoff increase.

Exhibit 4. 1: Effect of Impervious Cover on Runoff

Share of land with impervious cover	**Share of rainwater that becomes runoff**
Zero: natural ground cover	10 per cent
10-20 per cent	20 per cent
35-50 per cent	30 per cent
75-100 per cent	55 per cent

(Source: "Planning for Clean Water: The Municipal Guide")

The problem with increased stormwater runoff is that it washes into waterways large quantities of pollutants which accumulate on these impervious surfaces. Because this pollution derives from diffuse sources that are often dispersed and difficult to trace and control, rather than from single identifiable points, it is known as non-point pollution. Caused by carelessness on the part of people, it is sometimes called "people pollution" and "the thousand points of blight." Non-point pollution is "the number one problem affecting New Jersey's coastal water quality" according to Clean Ocean Action. The United States Environmental Protection Agency (EPA) considers that nonpoint pollution is currently the most serious water quality problem in the country, now that many specific sources of water pollution such as sewage flows and oil spills are coming under better control. This runoff is the main reason why nearly 40 per cent of the nation's lakes and streams remain unfishable and unswimmable.

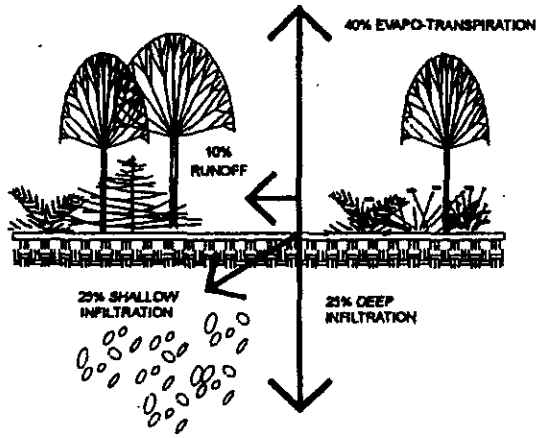
From residential areas, the pollutants carried by stormwater runoff include sand and dirt, pet waste, toxic household cleaners, pesticides, corrosion of metal downspouts and gutters, and excessive nutrients from fertilizers, leaves, and grass clippings in residential areas. From commercial and highway development, pollutants in runoff include oil and grease drippings and heavy metals from cars and trucks, as well as street litter and other debris left by the public. Many of these contaminants also settle from the atmosphere. For details on sources and effects, see box, "Pollutants Carried in Stormwater."

All these types of non-point source pollution are harmful to the coastal ecosystem and to public health. They contaminate waterways, lead to closing of beaches and shellfish beds, cause algae blooms which can lead to fishkills, adversely affect the life cycles of aquatic organisms, and can lead to public health risks and to fish consumption advisories.

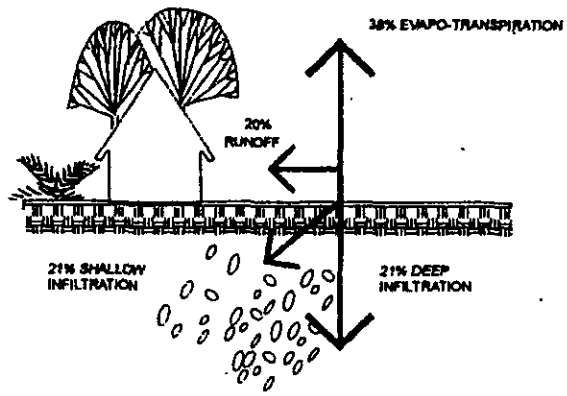
With less absorption of rainwater into the ground, the increased runoff moves faster and collects more pollutants from the surface, promoting erosion which damages steam banks and dumps sediment into stream beds. The changed natural cycle results in more water pollution.

The runoff carries such nutrients as nitrogen and phosphorus which encourage the growth of algae in downstream waterways. This leads to a decline in water clarity, the loss of aquatic grasses, and a dramatic shift in the species present in the water body. If left unchecked, even more serious effects may result such as the release of noxious odors and massive die-offs of fish and other aquatic creatures.

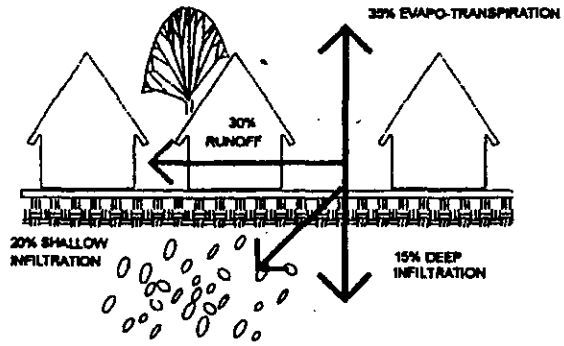
Exhibit 4.2: Increased runoff and decreased evapo-transpiration and infiltation caused by expansion of impervious surface
(Source: "Planning for Clean Water: The Municipal Guide")



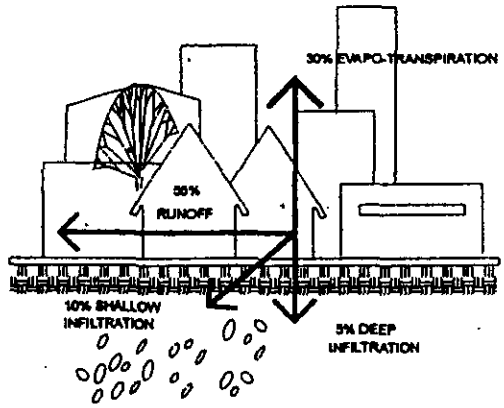
NATURAL GROUND COVER



10-20 % IMPERVIOUS SURFACE



35-50 % IMPERVIOUS SURFACE



75-100 % IMPERVIOUS SURFACE

In addition to chemical and physical contaminants, runoff from impervious surfaces also carries another form of pollution: heat. Storm water running off an asphalt road or parking lot becomes superheated in the summer. Cool rain hits pavements which have collected the heat and the temperature of the run-off can reach 83 degrees F. or more in the summer. Sensitive species such as trout prefer a temperature of 68 degrees or less and begin dying when water temperature reaches 77 degrees F.

Increased watershed imperviousness leads to a reduction in the diversity of fish species inhabiting the streams draining each watershed. Diversity is a measure of the overall health of a fish community. Studies throughout the US and Canada show that a significant decline in stream quality occurred when 10 per cent or more of a watershed was rendered impervious. It was also determined that most of the fish in a stream would die at a watershed imperviousness of 25 per cent. A watershed which is 10 per cent impervious would have an average of one house for every two acres or 320 houses per square mile. The average impervious cover is 33 per cent of the land in the western two-thirds of Atlantic Highlands, from Wagner Creek to Sears Avenue/Sears Landing Road (with beige color shading on Map 5).

POLLUTANTS CARRIED IN STORMWATER

The following pollutants collected and carried in stormwater runoff can seriously degrade water quality in our community:

•***Nutrients*** include nitrogen and phosphorus, which plants need to grow. However, high levels can cause a health hazard in drinking water and stimulate excessive aquatic plant growth, which can ultimately lower dissolved oxygen levels in the water, causing fish and other aquatic life to smother. Algae blooms are examples of how excess nutrients pollute. Sources of excess nutrients include animal waste, fertilizers, septic systems, road salt applications and auto emissions. About half of the fertilizers applied to lawns in the New Jersey coastal zone enter streams and head for the bay and ocean.

• ***Pathogens*** are disease-causing bacteria and viruses associated with the presence of fecal matter. They affect human health directly when people contact contaminated water and consume shellfish. Sources include failing septic systems, animal waste and boat sanitation facilities.

• ***Sediment*** is fine particles of eroded soil or sand. Common origins are concentrated, excessive stormwater runoff from construction sites. Sediment smothers aquatic habitat, carries pollutants bound to soil particles, makes water cloudy and inhibits the breeding and movement of aquatic species.

• ***Toxic contaminants*** include pesticides as well as heavy metals such as copper, lead and zinc which are commonly found in old paint, tires, lawn chemicals and preservatives. They attach to sediments, resist breakdown, accumulate in organisms and represent threats to the food chain.

• ***Debris*** consists of various items of trash, such as old tires, shopping carts and plastics. It comes from illegal dumping, street litter and boating waste. It threatens aquatic life and detracts from recreational and aesthetic values.

• ***Oil*** is one of the worst offenders. One gallon of oil dumped down a storm drain can create a slick up to 8 acres and may pollute up to 1 million gallons of water.

• ***Thermal stress*** from elevated water temperatures reduces survival rates and disease resistance of valued native species and allows the spread of non-native (exotic) species. Water temperature rises because of increased pavement near streams, loss of vegetated stream buffers and stream channelization.

Source: ANJEC Report, Spring 1998, and Clean Ocean Action

Stormwater management

Many measures can be taken to reduce the volume of stormwater run-off and the non-point source pollution it carries. Among the measures are the following:

- At construction sites, control soil erosion and trap sediment by covering exposed soil with straw mulch or sowing grass seed, erecting a black cloth silt fence along the edge of sites. Studies

show that mud pollution from construction sites must be reduced by 90 per cent or more to protect sensitve aquatic resources.

- Limit the percentage of lot area which can be disturbed by construction and the area which is allowed to have impervious cover.
- Pass municipal regulations and educate homeowners to preserve trees and retain natural land cover that will absorb water into the soil, hold soil in place instead of eroding, and reduce the amount of sediment entering streams.
- Provide for tree canopy over streams and other bank vegetation to reduce water temperature, act as a soil stabilizer and keep erosion in check.
- Reduce or eliminate the use of fertilizers, herbicides and pesticides on lawns and gardens because these degrade water quality.
- Create ponds which can keep 40 to 60 per cent of the nutrients and toxic metals out of nearby waterways.
- Stencil signs on storm drain covers to indicate what bodies of water they flow into and discourage people from discarding pollutants in gutters and drains.

In its Development Regulations, the Atlantic Highlands government has established standards for the planning of storm water management which must be followed for any proposed development or redevelopment site. These standards seek to minimize off-site runoff, and protect against flooding, waterborne pollutants and channel erosion by controlling both the rate and volume of storm water discharge and runoff produced by development. Systems are encouraged which emphasize "natural as opposed to engineered drainage strategies" as much as possible. Storm water management plans are to be based on environmentally sound site planning, engineering and architectual techniques, and on the best available technology, which may include stormwater basins, contour terraces, swales and other methods (Borough Development Regulations 9.2.G).

In addition to the standards, Borough regulations contain detailed construction specifications for storm water management (Borough Development Regulations 9.3.F, pages 9-47 to 9-69). These include how to calculate runoff peak rates and runoff volume of discharge in order to plan adequate pipes, channels, other flow control structures, and detention and retention facilities if required.

New Jersey's Stormwater Management Act of 1981 sets out ways to manage stormwater from new development and incorporate stormwater management into planning. One State standard is that there should be sufficient stormwater detention capacity to hold and slowly release the runoff from storms that have a likelihood of recurring once every two, 10 and 100 years. Some sites may be able to achieve this control with vegetative swales and buffers, and landscaping to control non-point source pollution. Other sites may require the building of a stormwater basin.

Stormwater basins are built to temporarily hold runoff which moves more quickly into natural waterways from developed, impervious surfaces than from unbuilt lands. The basins are designed to avoid rapid and excessive filling of creeks and flooding of their banks. They do this by slowly releasing stormwater to the waterway through an outlet structure, at a rate similar to the natural runoff rate before development. By slowing down runoff, stormwater basins also cause many pollutants, like sediment and heavy metals, to settle out, and dissolved pollutants can also be absorbed by plants in the basin.

There are two types of stormwater basins, and both are present in Atlantic Highlands:

- Detention basins, sometimes called "dry ponds", are built to detain storm water for a period and are designed to be dry between rain events. Atlantic Highlands has two detention basins, which were built as part

of the last two multiple dwelling developments in town -- the townhouses at Scenic Ridge and the single-family houses at Victorian Woods.

- Retention basins or "wet ponds" also detain water for a period and slowly release it, but are designed to retain some water as a permanent pool, mimicking natural lakes. There is one such basin in Atlantic Highlands, created by the Borough on West Highland Avenue next to Many Mind Creek. Mandated by the New Jersey Department of Environmental Protection, this pond was part of an improved storm drain system aimed at alleviating flooding of residential areas on the west side.

The most widespread form of stormwater management in the Borough is the storm drains which are set in many streets and the underground pipes which carry storm water away to the creeks and the bay. Storm drains are present everywhere in flatland areas of the Borough where the problem is to control flooding. Street drains and piping systems are gradually being extended in the eastern hills section where the problem is to control erosion and slope instability.

Map 6 traces the stormwater management system currently in place. This complex network includes several hundred intake structures which capture stormwater runoff ; they appear as small boxes on the map. The intakes feed water into pipelines which discharge water at almost 50 outfall points. Twenty of the outfalls go directly into the bay. In addition, 25 outfalls discharge into Many Mind Creek and two go into Wagner Creek -- and that water also ends up in the bay.

Many Mind Creek

When European settlers arrived in the late 1660s by sloop from Gravesend in southwestern Long Island, a favorable landing spot was the bay cove which then existed east of the mouth of Many Mind Creek. The same cove later housed a shipping dock, then a steamboat and railroad terminal, and finally in the 1940s was filled in to become today's marina. As a natural focus of the area and a source of fresh water, the creek invited the settlers' exploration to its source. They found that its route goes south from the bay for a half mile, turns east-southeast for about a mile, and then heads north for around three-quarters of a mile to its origin in the hills. The creek changes its mind as it flowed, which is why the colonists named it Many Mind.

Today, the segment of the creek between the bay and Highway 36 cuts through Borough lands paralleling West Avenue and First Avenue. Upstream the creek forms the town's southern border with the Navesink section of Middletown Township. The creek is crossed by eleven roads where it flows under bridges and through culverts.

It is joined by four small tributaries -- north of W. Highland Avenue next to West Avenue, south of Leonard Avenue near Firemen's Field, behind the Dairy Queen on Highway 36, and part way up the hill along Sears Avenue. At the last three locations, wetlands are associated with the stream intersections.

The west bank of the creek was the border for seven of the ten first lots for European settlers which were laid out in 1667, running up from the creekside fringe of wetland or swamp on to a western boundary at today's Avenue D. They used the creek for drinking and domestic purposes and for watering livestock and crops. Farms continued this pattern until the late 1800s when more intensive development replaced farms and brought more houses as well as businesses, a west-side school and streets to the creek zone. During the 1900s light industry, apartments, boat storage and ferry parking were added to the mix.

One of the businesses, near the creek off West Lincoln Avenue, was a plant which made coal-tar gas for sale as an energy source. This production began in 1910 and continued until 1949, and its byproducts included contaminants which entered the creek and neighboring soil. Other areas of the creek suffered abuse and neglect, including elimination of natural buffers, landfill and wall-building on tis banks, and stressful compaction of its borders, until much of it became unhealthy, unpleasant and nearly invisible. Finally in 1998, after long legal and regulatory struggles, the current owners of the gas plant, New Jersey Natural Gas Company, were required by the New Jersey Department of Environmental Protection to clean up the creek from Highway 36 to the Bay. This involves dredging and removal of a very large tonnage of contaminated sediments out of the creek bed, as well as from its banks along several stretches. It is to conclude with restoration of the creekbed and bank-sides, including appropriate plantings and measures to abate erosion and flooding. Work is expected to continue until at least 2001.

The Borough's draft open space and recreation plan submitted to "Green Acres" in July 2000 calls for creating a greenway along Many Mind Creek between Highway 36 and the bay. It would provide a public trail along one bank; make a link between Henry Hudson Trail and the Bayshore Trail at the marina; incorporate fringe wetland plantings on the lower banks and upland trees and other vegetation on the upper banks; ensure the maximum possible erosion and flood control; and enhance the "backyard" appeal of the First Avenue business district. Beyond this downtown area, the open space plan foresees a greenway that would follow the entire route of Many Mind Creek along the border with Middletown up to Sears Avenue and East Washington Avenue (from there to the source is already protected as part of the Lenape Woods Nature Preserve).

Wagner Creek

Wagner Creek runs along the western border of the Borough next to the Leonardo section of Middletown Township. From source to mouth, It is about a half-mile long from its source near Highway 36 to its mouth at the bay. Along its final stretch before emptying into the bay next to Center Avenue Park, the creek is bordered by extensive wetlands on the Atlantic Highlands (or east) side. The wetlands provide food and cover for various waterfowl and small semi-aquatic animals, as well as a favorable breeding and nutrition zone for fish. Along the Leonardo (or west) bank is a commercial boatyard.

The area between Center Avenue and the bay on the east bank of Wagner Creek is protected as part of the Borough-owned Center Avenue Park, which also includes neighboring woodland, beach grass and sandy beach, a playing field and tot lot, and related parking. The Borough's draft open space plan, as submitted to the State "Green Acres" program, envisages extending the protected area all along Wagner Creek as far upstream as the Henry Hudson Trail next to Highway 36. Creekside land would be set aside to provide a buffer for flood control needs, preserve habitat, and create a greenway with public access and a connection to the Trail.

Other surface water

While the two creeks are the most evident carriers of surface water, there are other less visible, less voluminous flows in the Borough, mostly in the eastern hills section. These include:

- small spring-fed streams which have been channeled into underground pipes, such as fromOcean Boulevard below Grand Avenue to the bay;

- intermittent streams which flow only when it rains or at times of the year when soils are heavily saturated, such as the gullies or ravines off Ocean Boulevard next to unpaved Shore Drive and below Cameron Circle;
- open springs which maintain steady output, such as Henry Hudson Springs off Bayside Drive, or flow periodically as can be seen in winter ice patches on some slopes above Bayside Drive;
- saturated wetlands where water is visible all year or nearly so, such as several locations behind the bayfront at the bottom of tall bluffs between the eastern end of the marina and the Highlands border.

Wetlands

Wetlands are areas that are inundated or saturated by surface or groundwater often and long enough to support vegetation adapted to survive in saturated soil, according to the definition used by the New Jersey Department of Environmental Protection. Wetlands generally occur in relatively flat areas between deep water and uplands, such as along Sandy Hook Bay, Many Mind Creek and Wagner Creek. They are variously referred to as salt marshes, tidal marshes, salt meadows, wet meadows, shrub swamps, swamps or bogs, depending on their locations and characteristics. Development patterns can change wetlands or even unintentionally create wetlands if the capacity of a land area to drain or infiltrate water becomes overburdened.

For a long time, especially in the 1900s, wetlands were looked upon as unproductive swamps that should be drained or filled in and used for building. This happened in many places around the world, not excluding Atlantic Highlands. Both saltwater and freshwater wetlands surrounding long stretches of Many Mind Creek were eliminated, especially between Highway 36 and the bay but also along parts of the creek paralleling Highway 36. Nevertheless, hydric soils, high water tables, wetland types of vegetation and other characteristic wetland features are still present, together with some flooding since wetlands and their absorptive role have been reduced or eliminated.

However, bad experience and good science have progressively demonstrated that wetland areas are essential to maintaining a healthy ecosystem. They provide important plant, fish and wildife habitat, flood protection, erosion control, water quality maintenance, and recreation. Wetlands act as natural detention basins, temporarily store flood waters, lower downstream flood crests, and slow the velocity of destructive water flow. They help maintain stream flow, reduce silt loads, filter chemical and organic pollutants, and serve as buffers to protect upland areas.

The two main types of wetlands, estuarine and palustrine, are both found in Atlantic Highlands:

Estuarine wetlands are formed in coastal areas along Sandy Hook Bay where the tide ebbs and flows, and at the mouths of Many Mind and Wagner Creeks where bay tides meet the stream current. These salt and brackish marshes are home to myriad life forms, provide an integral link in the ecological food chain, and serve as a nursery and feeding habitat for food fish (see Section 7). However, increases of stormwater runoff can change the salinity of the creeks and their estuaries and add unwanted fertilizers and pollutants. Aquatic life which relies on an estuarine habitat is very sensitive to these human-induced changes. As the quality of the habitat is reduced, so will the variety and number of resident species decrease.

Palustrine forested wetlands are areas of freshwater marshes, bogs or swamps which are scattered along streams. Freshwater marshes also have great ecological value, support basic elements of the food chain, and are home to many fish, turtles, amphibians and mammals, as well as a refuge for various birds and waterfowl.

In 1987, New Jersey passed the Freshwater Wetlands Protection Act in recognition of the importance of such wetlands and the need to preserve them and their buffers. Formal determination of wetland areas are based on three main factors: the presence of "hydrophytic" vegetation which prefer or can tolerate saturated soil conditions; the presence of wetland or "hydric" soils; and an evaluation of the soil's ability to support wetlands vegetation.

To preserve wetland areas, development in Atlantic Highlands is subject to the Wetlands Act of 1970, the Freshwater Wetlands Act of 1987, the Flood Hazard Act, the Coastal Areas Facilities Review Act (CAFRA), and plan evaluation by the Army Corps of Engineers.

Flooding and flood plains

For planning of flood control measures, it is necessary to know the runoff rate and volume of water produced by certain sized storms. A basis for these calculations comes from historical statistics on how frequently storm of certain intensity are known to occur -- every 2, 10, 25 and 100 years (FEMA, 1981). A two-year storm has an intensity that, based on historical statistics, could be expected to occur once every two years; a much stronger 100-year storm is expected every 100 years and therefore has a 1 per cent chance of occuring in a given year.

The approximate boundaries of flood-prone areas in Atlantic Highlands are traced on Map 5. These boundaries are based on natural shoreline and land conditions and do not take account of flood control structures which have been built, such as the bulkhead wall along the water-edge in the harbor. The boundaries show how high flood waters would rise on the land elevations along the coastal elevations of the land (called "base flood elevations" or "BFEs").

There are three different markings on Map 5 to show which land areas are vulnerable to flooding from storms of different strength:

- The orange diagonal hatching represents flooding plus hazard from high-velocity waves in a 100-year storm (which has a 1 per cent chance of occurring in a given year). The lands affected are those with the lowest elevation located nearest to the shore line along the entire bay coast of Atlantic Highlands.

  Flood water would cover lands up to 12 feet above sea level, with effects from waves and winds as high as 17 feet above sea level .

- The red vertical hatching represents flooding on lands in a higher band of elevations which would be affected by a 100-year storm but not face additional wind and wave effects. This type of flood zone extends inland along the banks of Many Mind and Wagner Creeks, which receive both storm water running downstream off the land and bay waters extending upstream beyond the normal limit of tidal movement. Another such flood zone covers a strip of land along much of Bayside Drive and behind the dunes at Popamora Point.

- Blue horizontal hatching is on lands in the next higher band of elevations. This is the area which would be flooded by a stronger storm such as can be expected at 500-year intervals (which has a 0.2 per cent chance of occurring in a given year). It also could be flooded by less than a foot of water in a 100-year storm.

It is important to protect the land in flood plains, stream corridors and adjacent woodlands in all planning and zoning. Floodplains provide wide areas where water can lie without causing downstream flooding, siltation and erosion. In addition, they retard excess runoff and provide natural detention areas. Adjacent woodlands and vegetated areas also serve to retard excess runoff. The best protection for the Borough would come from implementing its draft open space plan, which would ensure undisturbed buffer zones along stream corridors and protect associated flood plains.

Water quality in streams

Since 1998, volunteers working with the Atlantic Highlands Environmental Commission have done monthly water sampling and testing in Many Mind Creek and Wagner Creek. The readings obtained in this period have all been in the normal range. Data are recorded for the following four variables:

- Turbidity, which records the visual quality and clarity of water, to see whether excessive sedimentation is occurring.
- Water temperature. 77 degrees F. is the highest tolerable by sensitive fish species such as trout.
- The balance between acidity and alkalinity (represented by the symbol "pH")
- Dissolved oxygen levels. The minimum level for maintaining fish and plant life and biological balance in estuarine waters is 4.0 milligrams per liter.
- Nitrates and phosphates. If these levels go above 0.89 milligrams per liter of nitrates or 0.10 milligrams per liter of phosphates, the result is increased aquatic plant growth which uses up too much of the dissolved oxygen in the water and smothers fish.

Along the bayshore between Aberdeen and Atlantic Highlands, 30 similar data collection activities are being carried out on 20 creeks, brooks and lakes. Most of them cover the same variables as Atlantic Highlands. In addition, at six of these water bodies the Monmouth County Health Department also collects data on fecal coliform counts quarterly and nutrient levels twice a year. The data collected are shared at the county level to assemble a picture of non-point source pollution and contribute to watershed planning efforts.

Clean bay and ocean

Litter, debris and other pollutants enter the bay and ocean both from boats and from wash-downs off the land. In Atlantic Highlands there are ordinances and fines aimed at preventing boaters and pedestrians from bespoiling the harbor, with enforcement by harbor security officers. Also, every spring and fall, the Atlantic Highlands Environmental Commission organizes and sponsors a beach clean-up by community volunteers in the area west of the harbor. In so doing, they join many other bayside and oceanside towns which take part in these region-wide "sweeps" organized by Clean Ocean Action.

The waters in the entire estuary of Raritan/Sandy Hook Bays and the lower Hudson River have improved in recent years. This is the result of increased secondary treatment of sewage, better control of solid waste disposal, more pump-out facilities for boats, and less dumping of automotive antifreeze and oils.

In 1996 an agreement was reached to end the dumping in the ocean of contaminated materials dredged up when deepening shipping channels in the bay. It was agreed to close the "Mud Dump Site" where these materials had been deposited in the ocean around six miles off Sandy Hook. Instead, the contaminated area, which is 15 square miles or ten times the size of Atlantic Highlands, was to be capped with clean sediments as protection against the pollutants already there. This news was welcomed by the hundreds of boaters who

dock in the Atlantic Highlands harbor and by thousands of boaters, commercial fishing operators, environmental and tourism people, beach-goers and local residents all along the coastal zone.

Since then, however, 3 million tons of new material have been deposited at the site under the name of capping and "remediation" of existing dump. However, nearly one million tons of this exceeds the latest definition of limits for toxic contaminant PCBs, and other pollutants were also present. This prompted a new campaign against ocean dumping led by Clean Ocean Action with a coalition of ocean advocacy groups. Over 200,000 people signed petitions and 100 local governments passsed resolutions opposing continued dumping and pressing for promised new definitions of permissible material to use in capping the site. During the summer of 2000, an eight-day, 150 mile protest march was held from one end of the Jersey Shore to the other, and other events and supporting actions were held by groups ranging from surfers to business owners.

Water conservation at home

Everywhere on earth, potable water is available in defined and limited amounts. There is concern that, with continuous development and population growth, Monmouth County is pushing the limits. The County is classified as a "critical area" for water supply from its underlying aquifers, according to the New Jersey Department of Environmental Protection (DEP). It regulates how much water can be drawn by our town and others which rely on these underground sources and monitors the balance between withdrawal and recharge from rainfall and surface waters. For details, sees the information on "drinking water supply" in section 9.

Conserving this vital natural resource as much as possible begins at home. Every household can take steps to reduce its water use, targeting wasteful practices which can be curbed without impact on lifestyles. Exhibit 4.3 lists 25 ways of conserving water at home.

Exhibit 4.3: Saving Water at Home

Water waster	What you can do to save water	Amount saved
Shower	**Shorter lighter showers.** Turn off water while soaping up. See how light a spray you can wash with. It is not necessary to shower longer than five minutes. Remodel with low consumption (2.6 gpm) shower-heads.	Large
Pipes	**Insulate hot water pipes.** Water is wasted if you turn on hot water tap and wait for hot water to "come up." To reduce waste, wrap hot water pipes with insulating material. Turn off faucets when not in use.	Medium
Faucets	**Repair leaks.** Check all faucets, including outside hose connections, for leaks. Replace worn washers, O-rings, packing and faulty fixtures. Do periodic "leak check" at least twice a year on all faucets, cellar to attic.	Medium
Bath tub	**Don't waste cold water.** Stopper tub before turning on water and warm initial cold water by adding hot water later. Small kids can go in together. Recycle bath water (if not too dirty) for heavy cleaning jobs.	Medium
	Don't overfill tub. It holds up to 50 gallons but you can bathe well with 1/4 of that. Clean tub while you are in it.	Large
	Switch to showers. Mark height of water with tape during bath. Next time, take shower with tub stopper, compare water level and see savings.	Large
Bathroom	**Shave and brush teeth the water-saving way.** Quickly rinse shaving razor, shutting faucet each time. Use electric razor; it uses energy but saves water, soap, laundry and blades. Rinse teeth using cup, not running faucet. Remodel with low consumption (0.5 gpm) faucet aerators.	Small
Toilet	**Add bottles or dam to tank.** Use plastic bottles filled with water and weighted with pebbles to displace water in tank. Do not use bricks or obstruct float. Install a dam. Remodel with low consumption toilets (1.5 gal/flush or less)	Large
	Repair leaks. Add drops of food coloring to water in tank. If coloring appears in toilet without flushing, there is a leak. Listen for running water or pump.	Medium
	Flush less often. Flush only feces, urine, toilet paper, no other waste. Flush only if necessary; urine is not offensive, solids may be..	Large
Utility sink	**Hand-wash efficiently.** Soak items in smallest possible quantity of low suds detergent. Save rinse water for next wash. Just add soap. Presoak very dirty items overnight. Install low consumption (0.5 gpm) faucet aerators.	Large
Washing machine	**Buy a water saver.** When buying new machine, select one that uses least water per pound of wash and least energy. Get suds-saver attachment.	Large
	Wash efficiently. Use selector for large or small loads if there is one, or wash only full loads. Use cold water. You won't save water but you will save energy and money. Try using less detergent.	Large
Housecleaning	**Use less water.** Recycled water is great for heavy cleaning followed by clean rinse. Use least possible soap or cleaner.	Small
Dishwasher	**Use it efficiently.** Scrape dishes and use shortest possible cycle. Soak pots/ pans overnight if necessary. Wash only full loads. To reduce suds residue, experiment to discover least possible detergent necessary.	Medium
Kitchen sink	**Handwash efficiently.** Scrape dishes and rinse all at once. Soak pots/ pans overnight if very dirty. Reduce clean-up by serving single pan meals.	Medium
	Defrost without water. Plan ahead to thaw frozen foods and ice trays in the air. Or force-thaw by placing food in bowl of cold water, to re-use.	Small

Exhibit 4.3: (continued)

Water waster	What you can do to save water	Amount saved
	Clean vegetables and fruit efficiently with brush or use hand-sprayer in short bursts. Remodel with low consumption (2 gpm) faucet aerators.	Small
Garbage grinders	**Use as little as possible.** Collect food waste for starting a compost pile. Compost vegetable waste at the base of trees and shrubs can help retain water and provide nutrients. If using grinder, use recycled water.	Small
Drinking water	**Promote water conservation at the table.** Don't let waiter bring water or refill glass unless you request it. Use durable cup at drinking fountains to avoid water and paper or plastic waste.	Small
	Keep bottle of drinking water in refrigerator. Don't run tap water for cold water without collecting for other nonconsumptive uses. Make only the amount of coffee or tea you are going to drink. Use ice cubes to cool water. Recycle leftover drinking water.	Small
Backyard pool	**Prevent evaporation and splashing.** Cover pool when not in use to prevent evaporation. Don't fill pool high -- water splashes easily. Recycle wading water for plants, shrubs, lawns.	Large
Decks, driveway or street	Sweep down decks, driveways and other pavement instead of hosing them down. If you need to wash car often, use a car wash that recycles water (many do). At home, turn hose off between rinses to save up to 150 gallons per washing, and wash car near hedges, shrubs, for "a free drink."	
Lawn and garden	**Practice water-saving lawn care.** Mow with blades set for 2 to 3 inch grass length to provide natural ground shade and promote water retention by the soil.	Large
	Plant to save water by using indigenous species suited to your area and save as much as 54 per cent of the water used on outdoor plants. ask local nursey for plant and grass species that require less water. In water-short areas, re-landscape with gravel and succulents and use mulch.	Large
	Make all water count. Collect rainwater from downspouts in barrels to use in watering plants. Use drip irrigation systems and water timers. Water no more than 1 inch per week, applied slowly and thoroughly to prevent run off. Water at night to minimize evaporation. Aerate lawn.	Large

Sources: New Jersey Rural Water Association, and U.S. Environmental Protection Agency "Fact Sheet" on water conservation.

Borough of Atlantic Highlands

MONMOUTH COUNTY, NEW JERSEY

MAP 5:

LAND COVER AND LAND USE

LEGEND:

- Streams
- Lenape Woods Nature Preserve
- Parks
- Atlantic Highlands
- Municipal boundaries
- Roads

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Borough of Atlantic Highlands

MONMOUTH COUNTY, NEW JERSEY

MAP 6:

STORM SEWERS AND SANITARY SEWERS

LEGEND:

- Streams
- Lenape Woods Nature Preserve
- Atlantic Highlands
- Municipal boundaries

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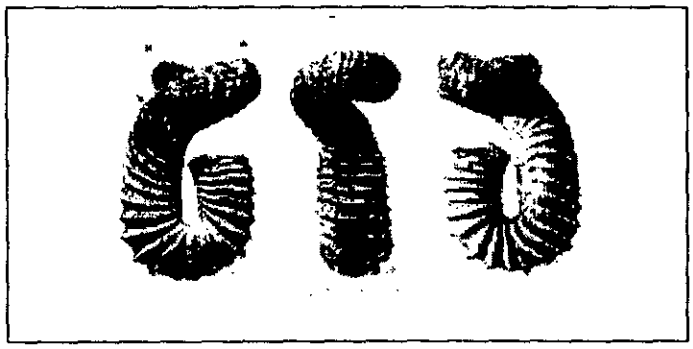
Section 5

GEOLOGY AND SOILS



Above: Ammonite fossils from 70 to 100 million years old, found in Atlantic Highlands (see Box 5.1)

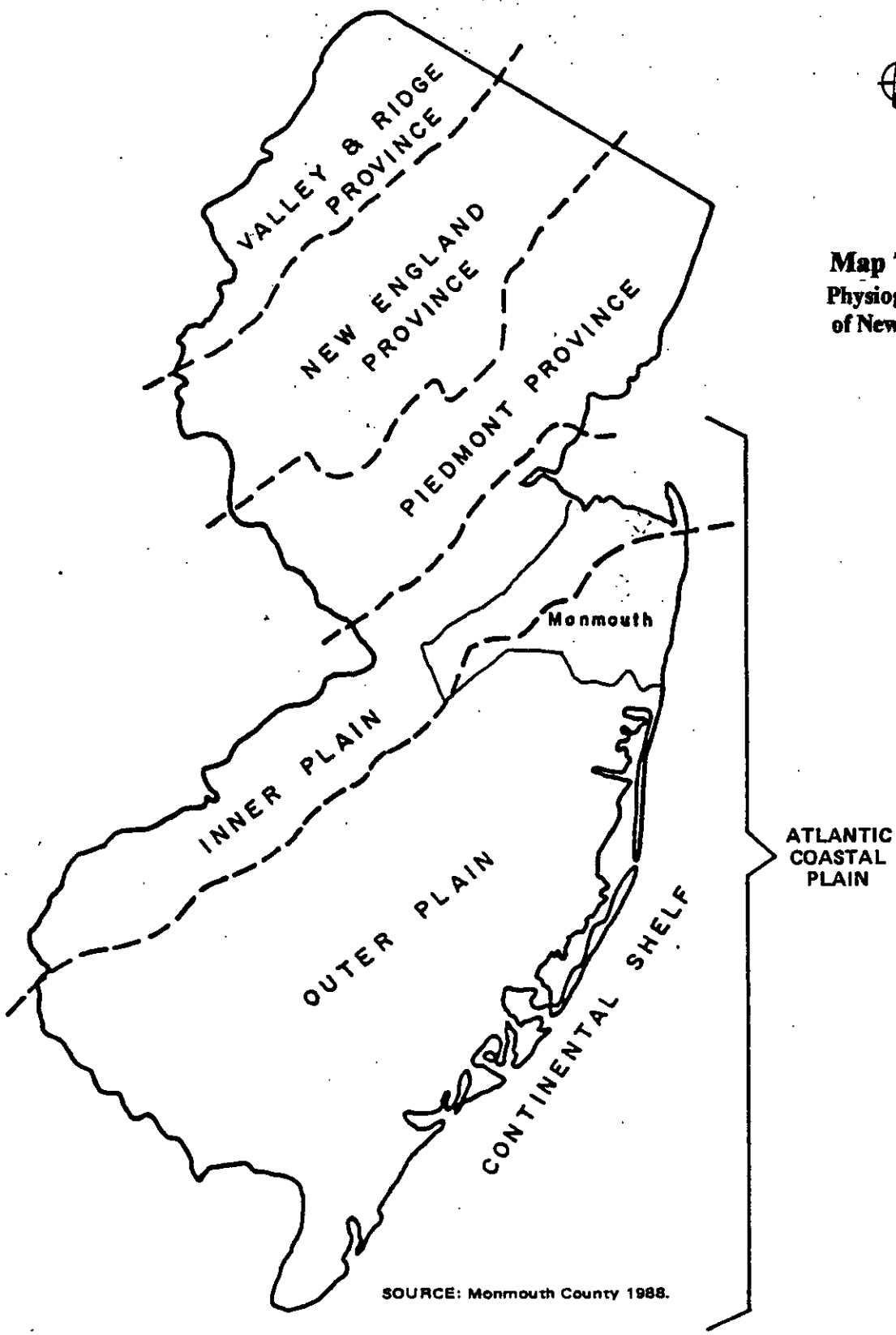
Due south of Manhattan, at the northeastern land's-end corner of the ocean and bay, is an unusual piece of New Jersey – a hilly peninsula known as the "the Highlands of Navesink." The reasons for the name are plain on the map: its southern border is the Navesink River, and its bluffs include the highest point on the eastern seaboard between Maine and Florida -- Mount Mitchill, rising to 266 feet above sea level.

Sitting right next to the ocean and bay coasts, these highlands have for centuries been, and still are, an early landfall and major landmark for ships arriving from the Atlantic Ocean to the east and going to harbors surrounding New York City. The highland bluffs are so prominent that the original Native American inhabitants gave them the name Newasingh, which means "place you can see from afar" in the Lenape language. English colonists sometimes recast this name as Neversink, because these coastal ridges seemed to never sink on the horizon when sailing away from them.

The thickly wooded slopes and ridge-tops on this peninsula are markedly different from the area directly south where the lands are flat, elevations are almost all below the 100 foot contour line, soils are sandy and tree cover is neither dense nor especially tall. These differences signify that the two areas are in different physiographic regions (see Map 7, Physiographic Provinces of New Jersey). The Navesink Highlands ridges and slopes are an arm of the Inner Coastal Plain which is the interior third of New Jersey's southern half. South of that, the long flat sandy beach oceanfront forms part of the Outer Coastal Plain

The land formation called Navesink Highlands contains three municipalities -- the boroughs of Atlantic Highlands and the Highlands, and the township of Middletown. The ridge top of this formation is the dividing line between streams that drain to the bay (such as Many Mind and Wagner Creeks in Atlantic Highlands) and to the ocean via the Navesink River (such as Clay Pit Creek in Middletown).

This section describes the underlying geology and surface soils which provide the foundation for all other environmental resources and for human settlement in the Atlantic Highlands area. Geology and soils affect topography and slope, the stability and fertility of the land, the existence of vegetation and wildlife, and the availability and quality of water supply. They also help to determine building codes, potential development areas, well locations, and the environmental sensitivity of lands. It is important to understand that there are limits to the uses which can be made of these resources, limits which planners and local government cannot ignore.



Map 7:
Physiographic Provinces of New Jersey

Geologic formations

Looking at the bluff edge and steep slopes along the bay shore in eastern Atlantic Highlands, many people wrongly assume that this ridge was created by glacier movement pushing masses of rock and soil southward during the Ice Age. However, the ice stopped north of here, along the Raritan River valley and Staten Island whose southern shore on Raritan Bay marks the terminal moraine of what is called the Wisconsin glacier.

In fact, the Inner Coastal Plain, including the Navesink Highlands, originated much earlier. It was formed by marine and continental sediments chiefly deposited between 70 and 100 million years ago as sea levels rose and fell during the Late Cretaceous period. The formations are composed of sand, silt, and clay with glauconitic sands and minor amounts of gravel. Laid down on top of bedrock which slopes seaward to the southeast, the sediments also dip in the same direction. Their lower levels make up a wedge of unconsolidated sediments -- that is, particles are not cemented together as in a sandstone rock. However, portions of the upper layer are cemented together by gravel or iron to form rocklike, erosion-resistant caps. Also in some of these marine deposits were found mollusks whose fossilized shells began being discovered along the coastal bluffs of Atlantic Highlands in the 1820s (see Box 5.1).

Box 5.1 Marine fossils in the coastal bluffs of Atlantic Highlands

In the lower reaches of the steep, high bluff facing Sandy Hook Bay below the lookout bridge on Ocean Boulevard is a fossil site. The fossils were numerous species of ammonites -- shells of invertebrate mollusks which are chambered and shaped like spirals or whorls. Most were in the lower part of the 25-foot thick Navesink Formation, largely consisting of the typical greensand of the area.

This layer was formed 70 to 100 million years ago, during the late Cretaceous period (coming after the notorious Jurassic) when toothed birds and dinosaurs died out and early mammals and flowering plants developed. It is believed that, during its formation, the layer was part of the outer continental shelf under 180 to 350 feet of ocean water, thus explaining the presence of marine fossils.

Fossil discoveries along this bluff were first reported in 1820. Up to the 1970s only a few species were identified. But then an active group of amateur collectors began finding many additional species. Hundreds of specimens turned up, with diameters ranging from 1/3 inch to 2 1/3 inches. Some of these are now in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., and the Peabody Museum of Archaeology and Ethnology, Cambridge, Massachusetts.

The rugged topography in Atlantic Highlands is caused by the sandy permeable nature of the sediments and the resistant layers of rock which are present locally. The permeability of the unconsolidated materials allows water to pass through the sediments instead of eroding the surface, and the layers of rock resist erosion by water and create steep slopes. This geology resulted in a very distinctive feature in Atlantic Highlands called a cuesta – a ridge with a steep escarpment on one side (the bluffs on the bay side of Ocean Boulevard) and a long, gentler slope on the other side, running downhill from East Highland Avenue. The hills in Atlantic Highlands are remnants of the cuesta.

Exhibit 5.1: Geologic Time Scale of Monmouth County

Era	Period	Epoch	Formation or Rock (Approx. Thickness in Ft.)	In Atl. Hlds?	Approx. Age Million Years before Present
CENOZOIC	Quaternary	Recent (Holocene)	Beach sand & gravel Soil & alluvium		0–0.01
		Pleistocene	Cape May formation (0–30) Pensauken formation (0–10) Bridgeton formation (0–30)		0.01–1
	Tertiary	Pliocene	Beacon Hill formation (0–20)		1–11
		Miocene–Pliocene	Cohansey formation (0–100)	✓	
		Miocene	Kirkwood formation (0–100)		11–25
		Oligocene	Not present in county		25–40
		Eocene	Manasquan formation (0–25)		40–60
		Paleocene	Vincentown formation (100) Homerstown formation (20–30)	✓ ✓	60–70
MESOZOIC	Cretaceous	Upper Cretaceous	Red Bank sand/Tinton sand (0–140) Navesink formation (25–40) Mount Laurel formation (35–70) Wenonah formation (35–70) Marshalltown formation (30) Englishtown formation (140) Woodbury formation (50) Merchantville formation (50–60) Magothy formation (25–175) Raritan formation (150–300)	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	70–100
		Lower Cretaceous	Not present in county		100–135
	Jurassic		Not present in county		135–180
	Triassic		Not present in county		180–225
PALEOZOIC	Permian		Not present in county		225–270
	Carboniferous				270–350
	Devonian				350–400
	Silurian				400–440
	Ordovician				440–500
	Cabrian				500–600
PRE-CAMBRIAN			"Basement" Gneiss, age and thickness uncertain		600+

Source: Zapecza, Otto S., "Hydrogeologic Framework of the New Jersey Coastal Plain," (Modified from Seaber, 1965. Table 3)

Exhibit 5.1 is a geologic time scale of Monmouth County. It starts with the basement bedrock 600 million years ago which is comprised of crystalline rocks, metamorphic schist and gneiss, basalt, sandstone, shale, and diabase. On top of this bedrock 21 formations were deposited like a giant layer cake, as listed from bottom up in the exhibit. Predominating the geology of the area is a series of sedimentary formations dating from the Upper Cretaceous period 70 to 100 million years ago -- the "thickest and most complete series" of such deposits in the coastal plain of New Jersey, according to the US Geological Survey (Minard 1969, 1).

Among these 21 formations in the County, 11 are present beneath the Atlantic Highlands area, as checked off in Exhibit 5.1. To learn about the composition, coloration, depth and other characteristics of a specific formation, look for its number in the more detailed descriptions contained in Attachment 1 at the back of this report. The attachment also contains two graphics giving the cross-section and the stratigraphic column of formations underlying the Atlantic Highlands area.

Out of the 11 formations present beneath Atlantic Highlands, six of them have visible outcrops or exposures on the surface of the land in our area, as listed in Exhibit 5.2.

Exhibit 5.2: Visible Geological Outcrops in Atlantic Highlands Area

Formation name	Age	Outcrop location
Englishtown	66 million years	Bank above beach east of Center Avenue Park
Navesink	70-100 million years	Bluffs along Sandy hook Bay
Red Bank Sand	70-100 million years	Bluffs along Sandy Hook Bay
Tinton Sand	70-100 million years	Bluffs along Sandy Hook Bay, pits along Highway 36
Hornerstown Sand	60-70 million years	Pits along Highway 36
Cohansey Sand	11 million years	Pits along Highway 36

Soils

Soil, the weathered surface layer of the earth, consists of a variety of components and hosts many life forms. Topsoil is created by nature very slowly. Adding about an inch can take hundreds of years. Soil is made up of mineral particles, living and dead organic matter, and air or water between these components. One acre of soil contains five to ten tons of animal life. It is constantly being processed by invertebrates, fungi and microbes which digest and recycle nutrients and organic matter and enrich the soil. The soil surface is home to many kinds of vegetation, which in turn supports birds, mammals and other animals.

Soil texture largely depends on the size and shape of its mineral particles. The sizes range from clay with the smallest particles, to silt at intermediate size, to sand at the largest. Loam is made up of these three minerals in combination. The texture of soils affects how well they hold and infiltrate water or drain it away. Soils with large grains and high organic content retain water which then infiltrates into soil layers on and near the surface, while fine grained silts and clay hold less water and drain faster. Infiltration of water and its percolation through deeper layers adds to the water table below, a process known as groundwater recharge.

The soil type, the depth of the water table and the soil's capacity to shrink or swell with moisture are important considerations in the building and maintenance of roads, basements and other structures. Different soil types are rated for their ability to support dwellings with or without basements, roads and streets, septic

absorption fields, excavations, etc. Soil types also affect land cover, whether hardwood trees, coniferous plants, wetland plants or shallow water, and the habitat for wildlife adapted to open land, woodland and wetland.

Box 5.2

Peanut stone

Real Atlantic Highlanders are intrigued by the "peanut stone" found all around town. Locals long ago gave this name to the rocks which are inset with pebbles the size, shape and/or color of peanuts. Since at least the 1880s, builders have used peanut stones to construct gate posts, garden walls, fireplace chimneys and even entire house walls.

The "old stone bridge," which carries Mount Avenue over Grand Avenue in one lane, has always been faced with peanut stone. When it needed major reconstruction in the 1990s, townspeople refused any changes in its placement, width, shape or facing. They contributed additional peanut stone so that the rebuilding would produce a bridge which is restored to its exact original appearance. As a result, it won a prize for historic preservation.

The pebbles which led to the name peanut stone usually consist of creamy or yellowish colored granules made of quartz. They are typically imbedded in rock made of densely packed hard sand which has been cemented by iron oxide and therefore has turned reddish brown to moderate brown. This is the most recent geological deposit in our area, which explains why peanut stone is so often near the surface. But the formation is actually 11 million years old and is known as Cohansey sand (see text about this formation in Attachment 1). So, next time a peanut stone turns up in your garden, give it some respect, OK?

Five types of characteristics are used to distinguish soils:

Content: In general, soils are described by their components of sand, silt, clay or loam. A loam soil is a relatively equal mixture of sand and silt with a somewhat smaller portion of clay. The terms are also used in combination with one another (e.g. "sandy loam" -- a mixture having slightly more sand than "loam" soil).

Depth: The soil is also described by intervals down to a general depth of 60 inches identified as surface layer, subsurface, subsoil, and substratum.

Slope: The slope characteristics of each soil type are described, ranging from level (0 per cent slope) to gently sloping (0 to 10 per cent) and steep (up to 25 per cent).

Permeability: Soil permeability, or the ability for precipitation to pass through the soil to the water table, is also identified.

Capability: Descriptions of each soil type's ability to support different land uses such as for building site development, sanitary facilities, water management, recreational development, trees and other vegetation, and wildlife habitat are given.

The definitive source on soil characteristics is "Soil Survey of Monmouth County" compiled by the U.S. Department of Agriculture, Soil Conservation Service. It describes the ten soil types which are found in Atlantic Highlands. The distribution of these soils over the surface of Atlantic Highlands is shown on Map 8 by color coding. Their characteristics and prevalence are described in Attachment 2 at the end of this report.

The three most common soil series in the Borough are Tinton loamy sand - urban land complex, 0 to 5 per cent slopes; Udorthents - urban land complex, 0 to 3 per cent slopes; and Phalanx loamy sand, 10 to 25 per cent slopes:

Tinton loamy sand soils are typically found on uplands and terraces ranging from flat to 5 per cent slopes and between streams and drainage basins and on side slopes. This is true in Atlantic Highlands. Tinton soils cover most of the areas between Wagner Creek and Many Mind Creek on the west side of Atlantic Highlands, the area which historically was the site of most farming by the early European settlers. Tinton soils also make up the surface of the gentle slopes between First and Third Avenues and in the central southern

section of town almost as far east as Sears Avenue. The Urban land complex of Tinton soils consists of areas covered by impermeable surfaces such as dwellings, roads and streets, shopping centers, and industrial parks.

Udorthents soils were brought in as fill to make up the entire surface in three areas: between the east bank of Many Mind Creek and First Avenue, from the Foodtown shopping center to the harbor; all along the harbor lands and beyond its eastern end; and for three or four blocks near both sides of the southernmost point of Atlantic Highlands. The filled areas are on floodplains, in tidal marshes, and on areas of moderately well drained to very poorly drained soils. The Urban land complex of Udorthents soils consists of areas covered by impermeable surfaces, such as dwellings, roads, shopping centers, parking lots, and industrial parks.

Phalanx soils make up the entire hills section of Atlantic Highlands -- along Ocean Boulevard and East Highland Avenue from about Third Avenue to the border with the Highlands, paralleling the bay. Typical of Phalanx soils, this area has slopes as steep as 25 per cent and is almost entirely wooded. Common tree species on this type of soil are chestnut oak, black oak, white oak, Virginia pine, and pitch pine. In the past in Atlantic Highlands, these lands were used for woodland production or pasture, but not for common field crops, hay and vegetables; farming was done elsewhere, mainly on the flatlands. The main limitations to use of this soil as sites for dwellings and some other types of development are the cement pan sandstone layers, the caving of cutbanks for excavation, and slope. Runoff from rainfall is rapid to very rapid and erosion is a severe hazard as a result.

Slump Blocks

Definition. Geological studies, as well as experience in construction and the courtroom, testify to the unique fragility of the slopes of the Highlands of Navesink and the risks of tampering with them. Documentation of the risk and its occurrences goes back as far back as two centuries and as recently as the 1970s. The problem is so clearly established that it has been assigned a specific geological name: slump blocking. The main study was done in 1974 by James P. Minard for the US Geological Survey (USGS) and is the source of geological information in this text. Slump blocking is a fundamental issue for the Atlantic Highlands area.

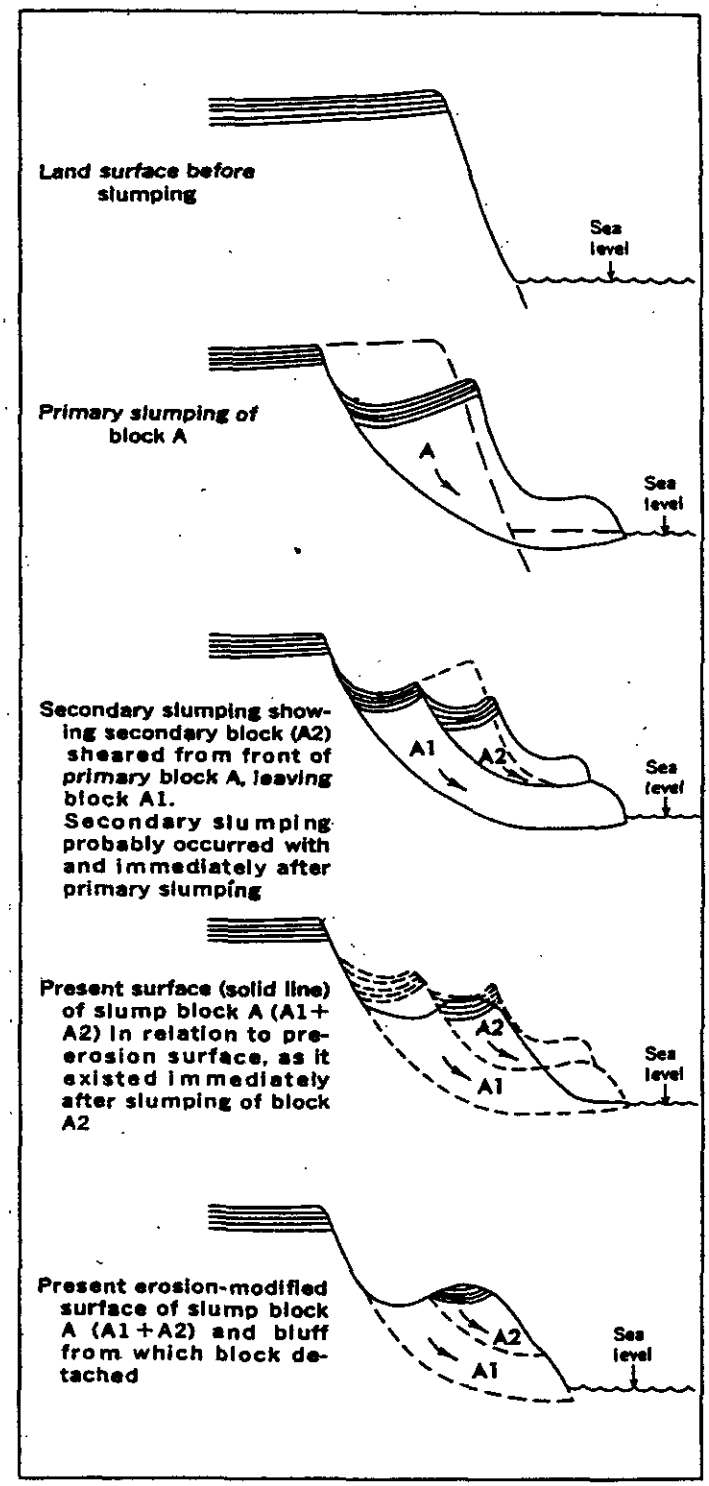
At the outset, it is important to be clear about what slump blocking *is not.* It is not erosion -- the wearing away of the earth's surface by natural processes such as water flows. It is not a landslide -- the sliding of a mass of loosened rocks or earth down along the surface of a hillside or slope. In erosion and landslides, materials at higher elevations become loosened from their setting and tumble or slide or wash down to lower elevations.

In contrast, slump blocking is not mere surface movement. It means that an entire block of land slips downward. The soil in the displaced block remains intact, in one piece, undisturbed. The top of the block ends up being lower than its headlands; the toe of the block now rests at a lower point of the slope; all soil in the block between top and toe has moved down with them; and all parts of the block stay part of the block, in the same formation and sequence of layers as before. There is also rotational movement of the block, which tilts its upper surface inward. Slump blocks can be quite large, with some in this area measuring up to 590 feet in width, 2,950 in length, and dropping vertically up to 85 feet. Thus, while the issues of geology and slump blocking relate to generalized concerns about protecting steep slopes, they are more fundamental and far-reaching than ordinary slope instability. Exhibit 5.3 shows stages of an actual slump block movement in Atlantic Highlands.

USGS findings. Minard's paper on "slump blocking" described the geological composition and structure (physiography) of the Navesink Highlands slopes as unlike that of any other coastal area in New Jersey. It includes a base of deposits of minerals and clay, with the remaining layers made up of various types of sand. The base layer, as well as parts of the upper strata, contain abundant amounts of glauconite, whose presence means susceptibility to slumping is higher. This substance, in the presence of water saturation, undergoes physical and chemical changes that reduce the stability of the base of the slope and have been directly associated with slumping. Under normal rain conditions and with no barriers, water filters through the sand layers, hits impervious clay, and moves laterally in search of lower ground to drain. However, during periods of heavy rain, or in the presence of structures that block drainage, water builds up into the sandy layer and alters its cohesiveness as well as increasing the weight of the slope. Construction produces high frequency vibration and undermines and overloads the slope. These activities can activate a slump.

For about 4 miles, the Navesink Highlands ridge is punctuated by 14 slump block lines which Minard mapped. Included are seven locations where Minard says slumping has definitely occurred, and seven where it "probably has occurred". It has taken place mainly at elevations between 100 and 200 feet above mean sea level along the steeper northern side of the ridge. Because this side faces the bay and prized water views, it has been far more disturbed

Exhibit 5.3: Slump Block Movements of Coastal Bluff in Atlantic Highlands
(Source: Minard, 1974)



by construction than the inland-facing gentler southern slopes, which contain much of the mature forested slopes known as Lenape Woods. However, Minard makes clear that the whole zone is "an area of possible geologic hazards." Parts of five geological formations have been identified as being in the slumping movement. From top to bottom, they are Cohansey Sand, Vincentown Formation, Hornerstown Sand, Tinton Sand, and Red Bank Sand, including both Shrewsbury and Sandy Hook Members(see Geology section, above). Described as a layercake of sand, silt and clay, these formations are the geological content of the Atlantic Highlands hills.

Beyond mapping these zones, Minard's USGS report presented findings on the causes for slump blocking and on actions to avoid triggering it.

- Causes: Two main causes are 1) removal of material from the toes of critical slopes, which disturbs the vertical anchoring of the slump blocks, and 2) excessive water infiltration in the blocks of uniform soil which become heavier and then slump.

- Precautions: The report calls for "careful thought, planning, investigations, tests, and analyses" before construction in this entire "area of geological hazards." Precautions should include "avoidance of the removal of material from the toes of possibly critical slopes, [and] prevention of excessive water infiltration in the ground in critical areas...."

The case of Mount Mitchill. Far-reaching measures for protection of Mount Mitchill have been taken at taxpayer expense since the 1970s -- at the top, the bottom and the middle of its steep northern slopes. These add up to a powerful lesson about the fragility of this land. In chronological order:

• First was the creation of a Monmouth County park called Mount Mitchill Scenic Outlook at the far eastern end of town (see its location on Map 5). Begun with five acres in 1974, the park now occupies 12 acres of relatively level top land above the cliffs looking over Sandy Hook, the Bay and the Ocean toward Manhattan. At the same time there were plans to build a 15-story high-rise tower known as Eastpointe on immediately adjacent top land in the neighboring Borough of Highlands. Construction of the tower in the mid-1970s, despite public warnings from Minard of USGS, triggered faults in soil blocks and produced actual movement on the cliffside. These conditions of risk required forever closing the County route known as Ocean Boulevard which then ran in front of Eastpointe. To avoid this danger zone, a new Boulevard route was constructed to swing farther south, away from Eastpointe, at taxpayer expense. One of the County's public exhibits in the park has graphics and texts giving geological and historical evidence about slump blocking in the area.

• Second, efforts began in 1986 to protect a 13-acre triangle of beach, dune, wetland and cliff along the bayshore coast directly below Mount Mitchill, at the Atlantic Highlands/Highlands border. The cliffs are the toe of a slumped block of soils from the slopes of Mount Mitchill. This slump occurred in April 1782: "a considerable quantity of land, some say 40 acres, gave way...and sunk directly down, a considerable depth" with a noise "heard for a distance of several miles" (Barber and Howe, 1844, p. 357). The block that slumped measured about 400 feet wide and 2,500 feet long, according to Minard. In 1986, a developer's plan to build 400 town houses beside the toe of the slumped land raised the specter of additional slump blocking, as well as obliteration of a scenic and recreation area. The history and continuing risk of slumping were among the counts in legal actions aimed at stopping the project, which New Jersey Superior Court decided to do. Finally, after long efforts to acquire and protect this beachfront, it became a County park in 1997 and has been left in its natural condition, with no construction of roads or structures and no change in access or environmental features. In the year 2000, it was named Popamora Point -- a site on the Bayshore Trail which is being developed between the Atlantic Highlands harbor and the border of the Highlands.

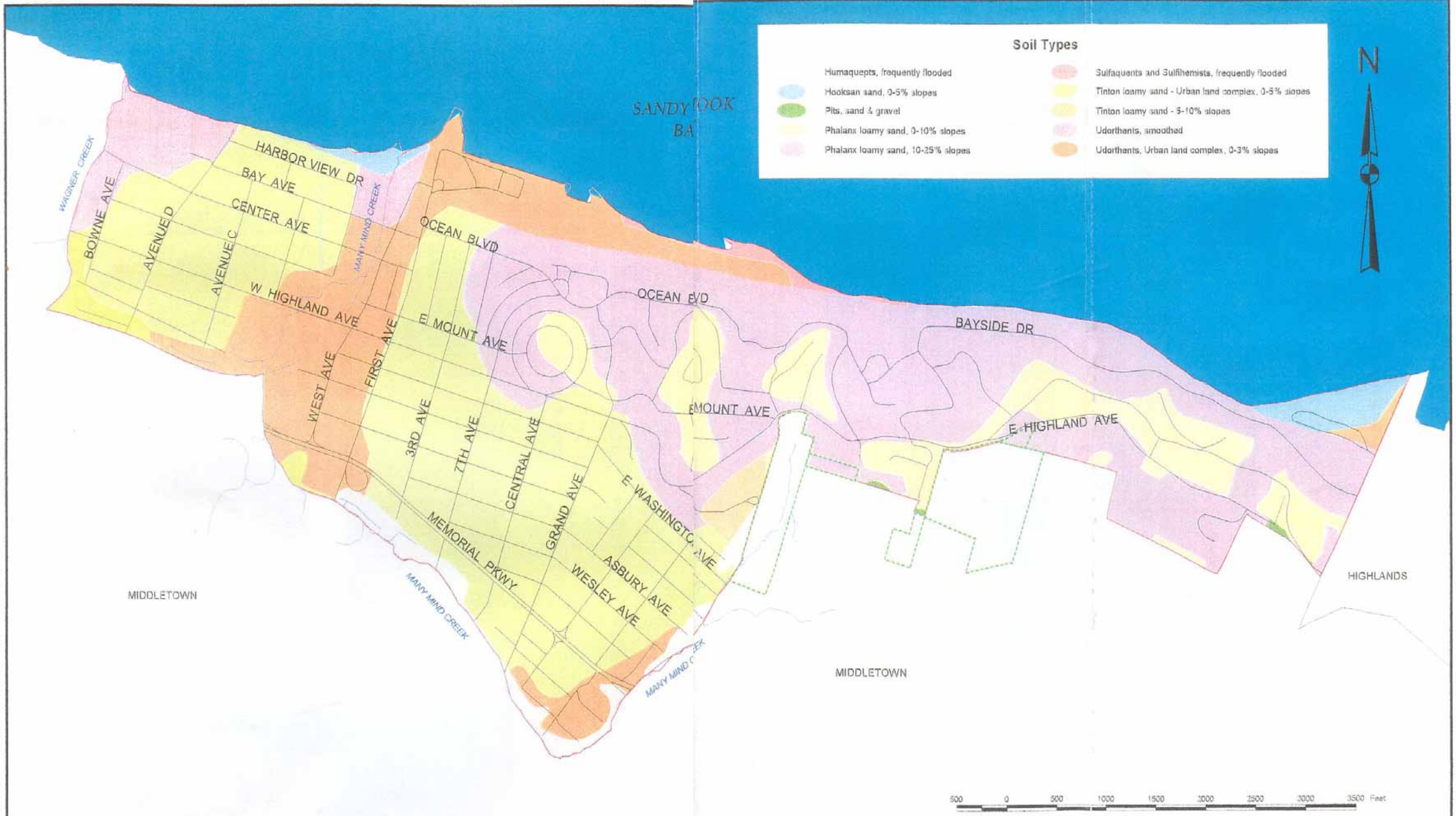
• Third, between the beachfront park at the foot of Mount Mitchill and the Scenic Outlook park at its top are steep slopes which eventually reach 266 feet above mean sea level. Steps have also now been taken to ensure public protection of these fragile land's-end slopes with a long history of slumping. The County recently bought four houses for demolition -- one at the top, one in the middle and two nearer the bottom -- and three have so far come down. Clearing away these structures allowed the County to institute uniform measures to protect soils and vegetation and eliminate impervious cover and access all across these steep slopes.

The case of Cameron Circle. Minard's 1974 USGS report mapped one slump block in the area below Cameron Circle/Eyrie Road in Atlantic Highlands and noted problems arising from excavation and construction work for a sewer outfall pipeline along the bayshore. Between 1972 and 1976, homeowners there experienced slump blocking, property loss and structural damage, attributed to the construction. Eleven homes and backyards were affected; one homeowner's porch collapsed and others had to jack up sagging floors. The residents blamed installation of the sewerage pipe at the cliff base for damming underground water and starting the slumping. Three lawsuits by homeowners were entered in New Jersey Superior Court seeking $500,000 in damages from the builder, the Monmouth County Bayshore Outfall Authority.

In April 1976, Judge Andrew A. Salvest decided for the homeowners. He concluded that the pipe blocked natural water drainage on the lower slope and backed up water into soil blocks, which then slumped of their own increased weight. The Judge's decision said that "the damming effect" created by the pipeline was "a proximate cause" for the "sliding and damage to the property owners' buildings" (Russell et al, Tosi et al, and Day et al. Dockets no. L-30624-72, L 36710-72 and L 41330-73, p.6).

The case of the "Sudden City" construction plan. In the 1990s, a developer proposed a large construction project in neighboring Middletown just below the far eastern end of Atlantic Highlands. The plan called for five towers of 6 and 7 stories with 467 dwelling units on the southern slopes of Mount Mitchill. Its location was to be between roughly 100 and 200 feet of elevation in the same geological formations where most slumping has occurred on northern slopes. The project's size and urban mass led neighborhood groups in the community associations known as the Lenape Woods Coalition to label the project "Sudden City." Following several years of lawsuits and State agency hearings aimed at stopping the project, the project was not approved by the Middletown Planning Board in March 1999, based partly on a geologist's testimony about the risks of slump blocking at the site. The developer's plan would have taken exactly the two risks which Minard warned against. It would have cut away 1.35 acres of steep slope at the foot of Mt. Mitchill's southern slopes, eliminating the stable base which has held up the slope since time immemorial; and built walls 600 feet long and 10 feet high, creating a barrier to back up rain water into the slope and increase its weight and the downward force of gravity.

A second developer acquired the property in 1998 and by October 2000 reduced the planned size of the project to 180 units and its acreage to less than a third of the tract. Also late in 2000, negotations were under way for the Borough of Atlantic Highlands to buy the acreage not scheduled for building, including most of the steep slope area, and to preserve it for open space and recreation purposes.



Borough of Atlantic Highlands

MONMOUTH COUNTY, NEW JERSEY

MAP 8:

SOILS

LEGEND:

- Streams
- Lenape Woods Nature Preserve
- Atlantic Highlands
- Municipal boundaries
- Roads

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Section 6

LAND COVER AND LAND USE

Over centuries, land use in the Atlantic Highlands area has evolved from relatively sparse settlement and little disturbance of natural resources by the original Native American inhabitants, the Lenape, to today's very densely populated and built-up suburban residential community.

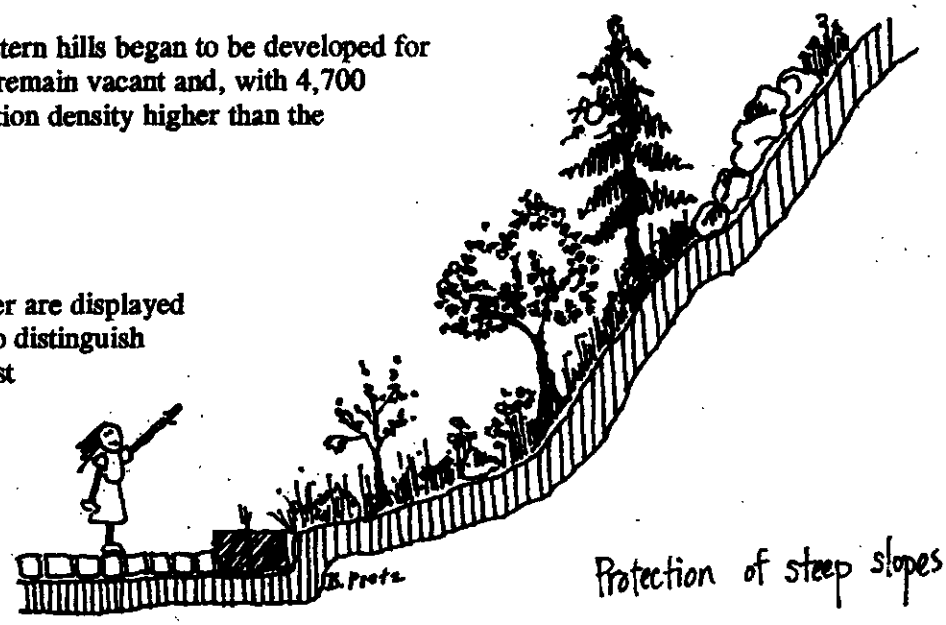
Until the 1600s, small Lenape bands lived in a few clusters of bark-covered wigwams. They used the land to gather native plants, nuts and fruit, grow corn and beans, hunt game and small animals, and obtain raw materials, such as clay for pottery. They fished and left shell mounds along creek banks. Footpaths and canoes connected them to natural resources they needed, to other nearby settlements and to other clans and trading partners farther away.

In 1667, the first European settlers laid out seven house and farm lots along the west bank of Many Mind Creek and three more west of Avenue D, each lot being about eight acres in size. Soon, they also divided up meadows and saltmarshes farther west into lots and pastures and brought in livestock. Lenape trails evolved into horsepaths and cartways.

Until the late 1800s, the main land uses were produce farming and fruit-tree crops in the flatlands,. especially asparagus, watermelon, berries, and apple (Leonard, 1923:30) and logging in the hills, both for local use and for export to New York by boat. Naturally, land use was greatly influenced by access to the bay. The cove next to Many Mind Creek was good for launching and landing small boats used in shipping, clamming and fishing. The logical route for traffic to and from this harbor was the level land along the foot of the hills, eventually becoming the commercial center which today is known as First Avenue.

Created mostly in the 1880s and 1890s, the modern town rose from essentially four large farms and several hundred people. It quickly became a grid of streets with many houses, hotels and shops in the flatland and uphill as far as Hooper Avenue. The year-round population grew to 2,000.

After World War II, the eastern hills began to be developed for housing. Today, few buildable lots remain vacant and, with 4,700 residents, the borough has a population density higher than the average in New Jersey as a whole.



Land cover

The main types of land cover are displayed in Map 5, which has color coding to distinguish the kinds of development which exist in different parts of the borough territory, as follows:

Residential (33% impervious). As shown by beige coloring on the map, the largest share of the land in the borough is devoted to relatively

dense residential use, with an average 33 per cent of the land surface occupied by impervious structures and paving. This basic characteristic applies to the western two-thirds of town, between the border at Wagner Creek over to Lookout Bridge and the Sears Avenue border. Impervious cover increases stormwater runoff which washes large quantities of pollutants -- for example, from roads and driveways -- into waterways. Studies have shown that a watershed with 10 per cent impervious area results in a serious decline in stream quality, as shown in studies reported by Community and Environmental Defense Services (CADS, undated).

Wooded/residential areas. From Lookout Bridge and the Sears Avenue border eastward to the Mt. Mitchell county park, there is less impervious cover because lots are larger, houses are more spread out, more natural land remains and tree growth is denser. Colored yellow and labeled "wooded/ residential areas" on Map 5, this is the second largest category of land use/land cover in the borough.

Freshwater woodlands. These exist in almost a dozen locations in the borough, as shown by light purple shading on Map 5 (map is in section 4). The longest stretches are found next to Many Mind Creek between South Avenue and Highway 36, along the southern borders of town, and beside its two tributaries near West Avenue and Leonard Avenue respectively.

Flood plains. Wider than the woodlands are the flood plains around Many Mind Creek between the bay and the Jackson Bridge at First Avenue south of Highway 36. The three flood plain zones in the borough are discussed in section 4 and shown by different hatching on Map 5.

As the Borough became more fully developed during the 1900s, the pressures that raised land values and interest in building led to the development of areas along creeks which are woodlands and floodplains and have very shallow depths to water table. When landfill was brought in to raise surface elevations, this did not necessarily reduce subsurface permeation by water or avoid having basements prone to flooding. Landfill also narrowed creek channels that had previously accommodated floods, which now created erosion, overflow of banks and flooding.

Steep slopes

Another important consideration in land use planning, in addition to woodlands and flood plains, is the steep slopes which limit land use in the eastern two-thirds of the borough (see Map 9). Slope is measured as the change in elevation (vertical distance) over horizontal distance and it is expressed as a percentage. For example, a 10 foot elevation over 100 feet of distance (10/100) is a 10 per cent slope.

Atlantic Highlands has very steep slopes of 20 per cent or greater on a large share of its land, mostly in the eastern two-thirds of the borough (colored red on Map 9). Slopes of 10 to 15 per cent also cover a significant area (colored yellow).

Slopes greater than 12 to 15 per cent are potentially critical environmental impact areas, and experts agree that efforts should be made to keep them in their natural state. Slopes increase stormwater runoff rates and, when disturbed, are subject to erosion. They can be difficult to stabilize with vegetative cover. Slopes greater than 10 per cent pose a much greater risk of erosion hazard than do more gentle slopes and flatlands. Slopes denuded of vegetation can result in nearby water bodies being subject to considerable sediment loads during rainstorms with an attendant loss of wildlife, water quality and aesthetic landscape.

In construction, slopes can require more sophisticated footings and pilings to support structures. Slopes greater than 10 per cent cause problems in roadway and driveway design. Slopes can also increase the cost of grading.

Despite these predictable problems for the environment and for construction stability, areas with steep slopes in the borough were increasingly used as development sites during the latter decades of the 1900s. This trend was fed as population growth stimulated housing demand, suburban living became increasingly popular, coastal zones attracted high-end land prices, and economic prosperity made it all affordable.

Preservation actions

In the second half of the 1980s and during the 1990s, in reaction to the more compacted neighborhoods and the loss of open space and recreation lands which resulted from the real-estate boom, public counter-moves aimed at public land conservation began to gather steam. In Atlantic Highlands, two significant results were achieved:

• A steep slope ordinance was passed by the Borough Council in 1989 which sets limits on the development of slopes greater than 10 per cent and specifies the detailed studies to be made when applying for permission to build on such slopes. The ordinance takes into account such factors as the extent of erosion and the potential for more; soil stability; maximum preservation of trees and other vegetation on site and in the surrounding area; the need to limit the extent of impervious surface to be constructed and the lot area to be disturbed; etc.

• Community groups launched two successful campaigns for open space preservation. One campaign stopped a waterfront townhouse development and saved an area of beach, dunes, wetland and steep slopes along the borough's eastern coast; now owned by the Monmouth County Park System, the area is known as Popamora Point and will include a stretch of a proposed hiking and biking trail along the bayshore. The second campaign, which cooperated with the borough government's own efforts, opposed two large-construction projects – development of 150 townhouses in Lenape Woods off Ocean Boulevard, and a cluster of large apartment towers in neighboring Middletown below the East Highland Avenue/Scenic Ridge section of Atlantic Highlands. The momentum carried over into a voter referendum in November 1999 which approved by a margin of 2.5 to 1 the creation of a borough trust fund for open space preservation, financed by a dedicated new tax.

Land use shares and categories

There are eight categories of land use in Atlantic Highlands. Exhibit 6.1 below provides statistics on the land area covered by each category, both in acres and as a percentage of total land in the borough, and on the shares of assessed value represented by five of these categories which are subject to property taxes.

Residential land use includes single-family housing, houses occupied by two to four families, and apartment buildings and other larger structures for multiple family use.

- The dominant dwelling type in the borough is detached single-family housing, representing over half of all land in the borough.
- A small number of buildings contains two to four families, using less than one per cent of borough lands. Most were created by converting single-family dwellings.
- Larger multi-family structures, including apartment complexes, condominiums and townhouses, accounted for over 3 per cent of land use as of 1988. Since then, Portland Pointe, an apartment building devoted to senior housing, was constructed.

Exhibit 6.1: Land use by category (1988) and per cent of assessed value (1995)

CATEGORIES OF LAND USE	Size of area used (as of 1988) Acres	Per cent	Share of total assessed value (as of 1995) Per cent
Residential:			84.8
Single family	398.2	51.9	
2 to 4 family	5.6	0.7	
Apartment and Multi family	24.3	3.2	3.2
SUBTOTAL	428.1	55.8	
Commercial:			9.0
Retail/service	38.8	5.0	
Mixed use (commercial/residential)	0.6	0.0	
Office/professional	2.4	0.3	
Home/profession or occupation	0.7	0.1	
SUBTOTAL	42.5	5.4	
Industrial	0.9	0.1	0.7
Vacant land:			2.3
Public ownership	26.9	3.5	
Private ownership	61.5	8.0	
Public/quasi-public facilities:			Not assessed
Public	33.2	4.3	
Quasi-public facilities	9.6	1.3	
Park and recreation	14.0	1.8	
SUBTOTAL	146.1	19.0	
Municipal Marina	15.4	2.0	Not assessed
Streets and roads	136.0	17.7	Not assessed
SUBTOTAL	151.4	19.7	
TOTAL	768.0	100.0	

Notes: Percentages are rounded in the subtotal and total lines. Figures in the first two columns are from the Atlantic Highlands 1990 Master Plan, and in the third column from "Monmouth County - At A Glance"

Commercial facilities include retail and service businesses, mixed commercial/residential uses, and professional businesses which operate in offices or houses.

The main commercial uses, which accounted for 5.5 per cent of land use or around 4.2 acres in 1988, are centered in two areas. The most extensive area is First Avenue in the eight blocks between the shopping center at the Highway 36 intersection and Bay Avenue/Ocean Boulevard. There are also some businesses is along West Avenue. A wide variety of business, entertainment and professional service activities are based in these two areas. Included are banks, travel agency, stores for gifts, novelties, hobbies, clothing, liquor and other retail items, gas stations, auto services and parts, boating supplies and services, bicycles, printers and publishers, office supplies and services, electronics, laundry, upholstery, framing, hair dressers, dance studio, used books, video rental and tanning, movie theater, playhouse, restaurants and food services, pharmacy, and professional services in legal, dental, real estate, architectural and other fields.

In addition, several businesses are on lands bordering the harbor, including three restaurants, a fishing supply store, the commuter ferry, and charter fishing and pleasure boats which dock at and operate from the waterfront.

Light industry uses are a much smaller component, accounting for less than one acre or 0.1 per cent of land use in the borough in 1988. These uses are mainly between West Avenue and Many Mind Creek.

Public facilities include those provided and used by Borough government departments and operating services, as well as public school and postal facilities. These uses occupied approximately 33 acres or around 4 per cent of the Borough land in 1988.

Facilities of Borough government departments and services include the following:

- Borough Hall, which contains municipal offices, police headquarters, town public library, and auditorium/courtroom -- First Avenue between East Mount and Highland Avenues.
- Emergency Services Building, which houses the Fire Department and First Aid. The building fronts on both East Mount Avenue and East Highland Avenue east of First Avenue.
- Borough Water Department, recycling center, public works garage and yard -- off West Lincoln Avenue.
- Pumping station of Atlantic Highlands-Highlands Regional Sewer Authority -- First Avenue north of Bay Avenue.
- Atlantic Highlands Elementary School and playground.
- United States Post Office.
- Municipal Marina, including pier areas and the Shore Casino Restaurant (leased from Borough).

Quasi-public facilities include places of worship, private school facilities, community and fraternal organizations. These uses occupied approximately 9.57 acres, or less than 2 per cent of the Borough land area in 1988. Houses of worship located in Atlantic Highlands include the Central Baptist Church, First Presbyterian Church, Kings Highway Faith Fellowship, Living Word Christian Church, Saint Agnes Roman Catholic Church, Saint Paul Baptist Church and United Methodist Church. Other quasi-public uses include the Saint Agnes School on Central Avenue, the Strauss Mansion Museum of the Atlantic Highlands Historical Society, and the Masonic Hall on Garfield Avenue.

Parks and recreation category includes lands owned by the Borough and the County which are preserved as open land and devoted to active or passive recreation. All existing open space which is dedicated

to park and recreation uses is detailed in section 8 of this report, together with the 5-year plan for acquiring additional open space with New Jersey State funding under an application which was submitted to the "Green Acres" program in July 2000.

The Borough owns seven small parks or tot lots of a half-acre or less (2.85 acres total), one multi-use park with a beach on the bay (7.5 acres), and the old railroad right-of way between the harbor and the Highlands border which is slated to become the Bayshore Trail for hiking and biking (12 acres); these represent about 3 per cent of the land area as of 2000. In addition, the Borough owns the 40-acre Lenape Woods Nature Preserve, of which 3 acres are inside the borough borders and 37 acres are in neighboring Middletown. The playing fields of Firemen's Field (6.8 acres) are privately owned by the Firemen's Association, not by the Borough. (The marina and boat basin, covering 20.8 acres including water areas around the piers, is counted under "public facilities" above.)

The Monmouth County Park System owns two land areas in the Borough -- Mt. Mitchill Scenic Overlook Park (12 acres), and an area along the Bayshore Trail next to the Highlands border which is called Popamora Point (13 acres).

Vacant private land is very limited in the Borough, and infill development occurring in recent years has reduced it further. In 1964 vacant land was over 15 per cent of the Borough total area, of which a majority was "unsuitable for development "(Borough Master Plan 1996, 5-1). By 1988, this figure had reduced to 11.5 per cent and was still lower by 2000. The remaining vacant lands are in scattered small lots an acre or less in size, except for two lots which are around 6 acres each.

Streets and roads account for approximately 136 acres or about 18 per cent of all land in the Borough.

Development guidance

Guidance for the development and redevelopment of the borough is provided in two key documents.

The Borough Master Plan contains a longer term vision; discusses broad goals, available options, and desirable patterns to be weighed and pursued over the coming six years; and is reviewed and revised as necessary every six years as mandated by State law.

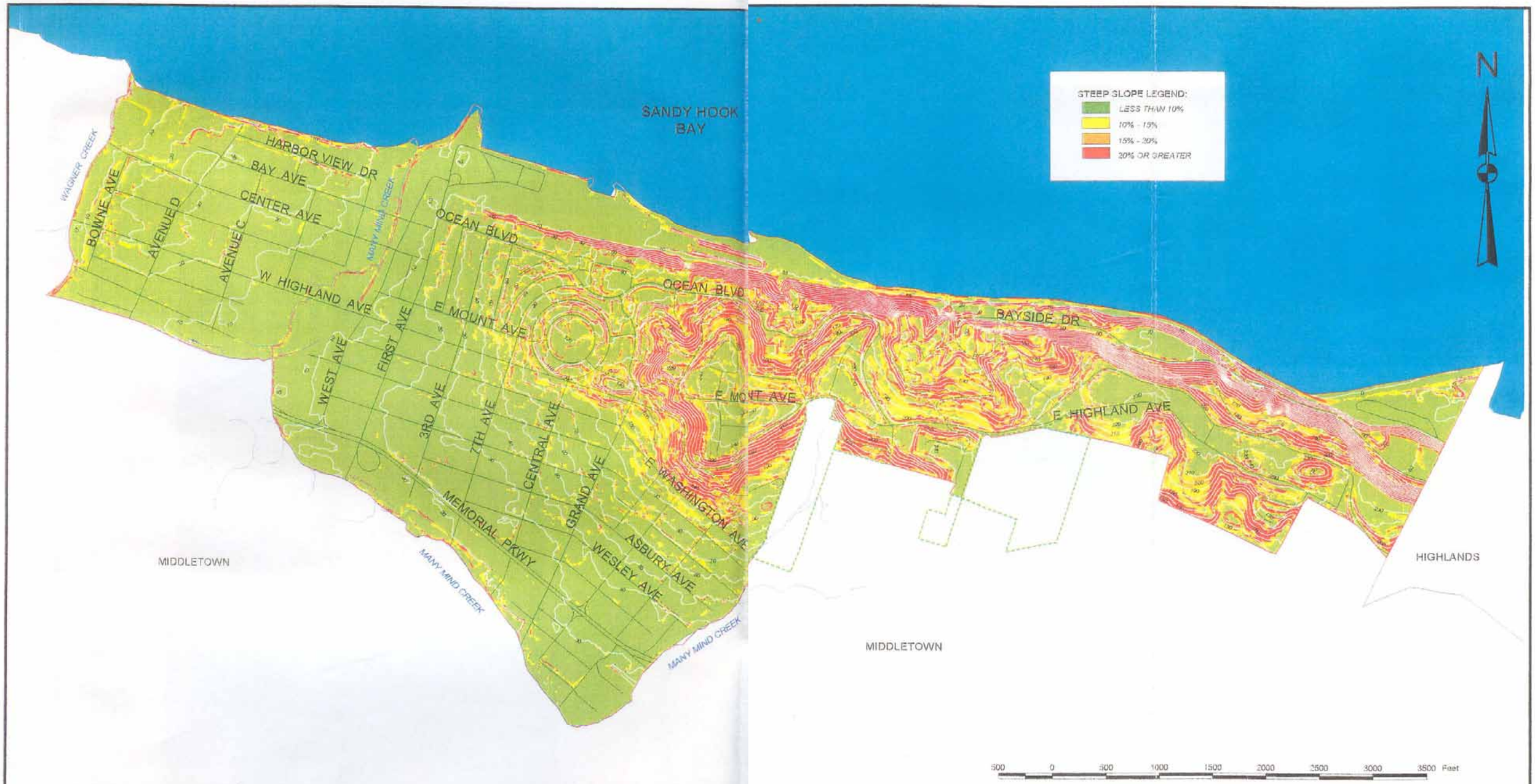
The Borough Development Regulations establish specific zones for particular types of land use so that neighboring uses will be as compatible and harmonious as possible; and they elaborate standards, criteria and construction specifications to be followed by developers. The regulations cover where land can be developed, what uses are permitted and prohibited in each zone, how intensive development may be in terms of building bulk, height, lot coverage and other measurable factors, and how to plan for drainage, off-street parking, landscaping, lighting, signage and other similar amenities and appurtenances. Also, specific requirements are laid down regarding building size, land disturbance, preservation of vegetation and other factors which are especially important in steep slope areas.

There are 16 zoning districts in the Borough, as displayed on Map 10 and described in Exhibit 6.2.

Exhibit 6. 2 : Zoning District Descriptions and Standards

Zone	Description	Standards
Seven residential districts:		
R-1	Single-Family Residential, detached	Minimum 7,500 square foot lots and 75 foot frontage
R-2	Single-Family Residential, detached	Minimum 15,000 square foot lots and 100 foot frontage
RTH	Residential Townhouse and attached single family residential	Maximum 8 dwelling units per acre
SC	Senior Citizen Residential	Maximum 30 dwelling units per acre and 5 story maximum
MF1	Multi-Family Garden Residential	Maximum 16 dwelling units per acre
MF-2	Multi-Family Mid-rise	Maximum 25 dwelling units per acre and 4 story maximum
OR	Office-Residential: detached single-family residential, professional and business offices scaled to be compatible with residential design, home occupations, and conversion of dwellings to office use	Minimum 10,000 square foot lot and 20 foot frontage
Four business districts:		
HBD	Historic Business District on 1st Avenue. Oriented to pedestrians. Parking consolidated in public lots. Architectural controls coordinated with streetscape improvements. New developments must demonstrate adequate capacity in off-street parking facilities.	Minimum 4,000 square foot lot and 35 foot frontage. No front or side yard setback required. 3 story maximum.
CBD	Central Business District. Oriented to First Avenue with on-site parking required.	10,000 square foot minimum lot lot area and 100 foot frontage. 2 story maximum.
HB	Highway Business oriented to automobile access from Highway 36	Minimum 20,000 square foot lot and 100 foot frontage.
WB	Waterfront Business encouraging new retail and water-oriented uses to link HBD and marina. Pedestrian orientation, architectural and streetscape controls required. Off-site parking consolidated in shared lots. Visual and physical access to waterfront required.	Minimum 40,000 square foot lot. 2 1/2 story maximum.
Other districts:		
LI	Light Industrial district west of West Avenue.	Minimum 40,000 square foot lot and 100 foot frontage.
MR	Marine Recreation district for water-dependent and water-related uses supporting marina and recreation activity. Visual and physical access to waterfront required	Minimum 40,000 square foot lot. 2 story maximum.
MC	Marine Conservation to maintain open bay	
PB	Public Open Space/Recreation District	
ST	Steep Slope Overlay Area	

(Source: Borough Master Plan . See section 2 concerning historic districts, which are not regulated zones.)



Borough of Atlantic Highlands

MONMOUTH COUNTY, NEW JERSEY

MAP 9:

STEEP SLOPES

LEGEND:

- Streams
- Lenape Woods Nature Preserve
- Atlantic Highlands
- Municipal boundaries
- Elevation contour lines
- Roads

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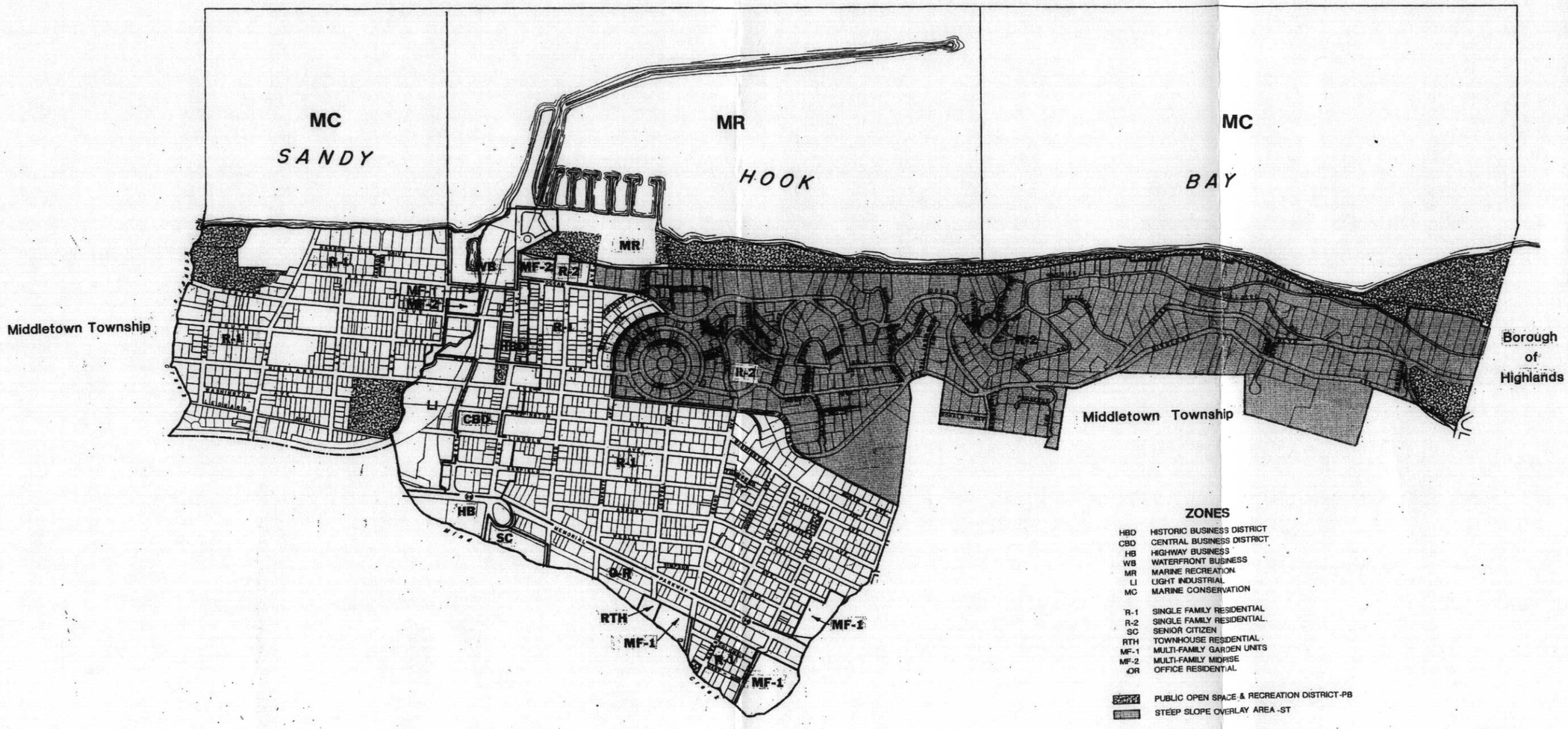
Map 10: Zoning Districts

ZONING MAP

BOROUGH OF

ATLANTIC HIGHLANDS



ZONES

HBD	HISTORIC BUSINESS DISTRICT
CBD	CENTRAL BUSINESS DISTRICT
HB	HIGHWAY BUSINESS
WB	WATERFRONT BUSINESS
MR	MARINE RECREATION
LI	LIGHT INDUSTRIAL
MC	MARINE CONSERVATION
R-1	SINGLE FAMILY RESIDENTIAL
R-2	SINGLE FAMILY RESIDENTIAL
SC	SENIOR CITIZEN
RTH	TOWNHOUSE RESIDENTIAL
MF-1	MULTI-FAMILY GARDEN UNITS
MF-2	MULTI-FAMILY MIDRISE
OR	OFFICE RESIDENTIAL

PUBLIC OPEN SPACE & RECREATION DISTRICT-PB

STEEP SLOPE OVERLAY AREA -ST

TOWNPLAN Associates

BASE MAP PREPARED BY: MONMOUTH COUNTY PLANNING BOARD DECEMBER, 1986. REVISIONS: 5/88, 11/88, 3/71, 11/72, 7/74, 4/76, 2/79, 5/80, 7/82, 7/83, 7/84, 12/87. TOWNPLAN ASSOCIATES: 1/89.

Section 7

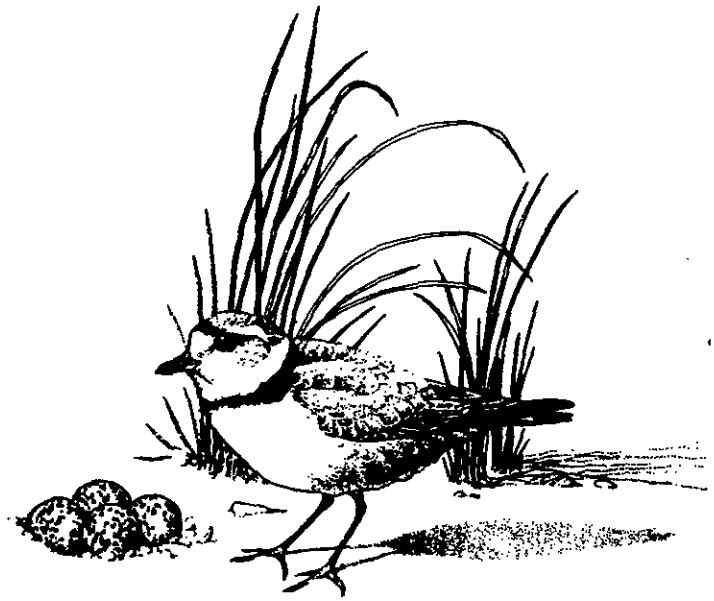
VEGETATION AND WILDLIFE

Atlantic Highlands once supported a rich diversity of native vegetation and wildlife. Over the past century, residential and commercial expansion cost Atlantic Highlands many of its woodlands, wetlands, fields, and wildlife and left only small areas of unbuilt open space. Ongoing encroachment into open space everyday continues to cause increasing loss of wildlife habitat.

Today, the remaining natural habitats of vegetation and wildlife in Atlantic Highlands can be divided into three general categories: (a) upland forests with mixed tree species, (b) tidal (estuarine) wetlands along Many Mind Creek and Wagner Creek with fringe communities of saltgrass and freshwater vegetation, and (c) shoreline (littoral) vegetation along Sandy Hook Bay including isolated freshwater wetlands.

Upland forest vegetation

Aside from its long bay shoreline and creekside lands, most of Atlantic Highlands remains well-drained upland forests that contain a mixture of tree species even in its residential areas. The most forested area is along the ridges and slopes of the topographic formation known as the Navesink Highlands, which includes eastern Atlantic Highlands as well as parts of the Borough of the Highlands and Middletown Township.



In September 1609, when Henry Hudson's ship was met by Lenape people at the bay, crew members went on land and climbed up into the woods with its "great store of very goodly Oakes" (Moss, 1990, p.2). After 1625, when Dutch ships filled their water tanks at our shoreside springs (Henry Hudson Springs) for the ocean voyage back to Holland, they would also have carried out instructions to load "all sorts of wood...so that the ships do not come home empty" – shipbuilding timber being a prime resource after furs (Bachman, 1969, p. 62). In 1637, Captain Jan van Schellinger's storm-damaged ship spent 18 days by

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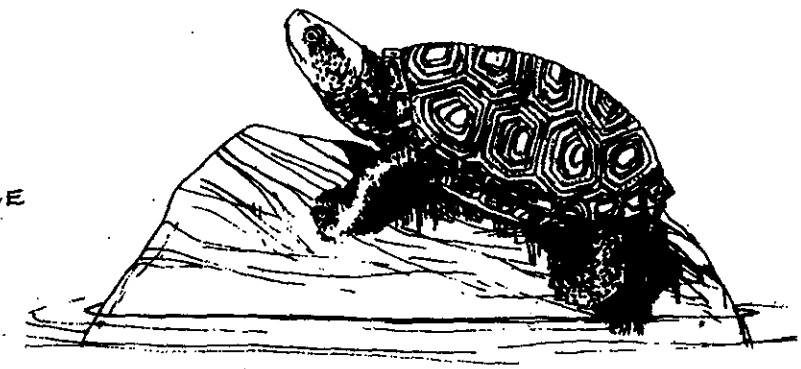


DIAMONDBACK TERRAPIN

our bay shore to make repairs using timber from these shores, cut and load fire wood, and fill the ships' casks at the springs. After European settlers arrived in the 1660s, they cut trees for housing, fencing, and fuel and cleared land to graze cattle, sheep, and pigs. In the 1700s, navigation maps portrayed the tall "Indian Trees" atop the Navesink Highlands at Chapel Hill to mark the channel point where ships passing Sandy Hook needed to turn north toward Manhattan. In the 1880s, Methodist founders of Atlantic Highlands used a 50-acre grove of tall chestnut and oak trees in a wide circular ravine as a natural amphitheater for large gatherings, surrounding today's road named "Auditorium Drive."

Almost 40 acres of forest in eastern Atlantic Highlands have been acquired by the Borough and designated the Lenape Woods Nature Preserve as permanent public open space for hiking, nature observation, and a buffer from neighboring development. Instigating and supporting this conservation effort was a group of concerned citizens and neighborhood associations called the Lenape Woods Coalition. From 1996-98, five tracts of land were purchased with 50-50 State and Borough funding. The Environmental Commission is responsible for planning management of the Preserve and educational outreach programming. To connect and extend Lenape Woods, the Borough is considering the purchase of additional unbuilt adjacent parcels under a 5-year Open Space and Recreation Plan submitted in July 2000 for State "Green Acres" co-funding.

The Lenape Woods Nature Preserve is technically termed an Oak-Heath Forest (Breden, 1989) with oak canopy trees and an understory that is primarily heath plants including mountain laurel (*Kalmia latifolia*). Timber cutting and other development over the years have produced fragmented and successional woods. The oldest tree to have survived is an approximately 160-year-old white oak. American chestnut and elm trees were destroyed by foreign parasites which were accidentally introduced many years ago. Thinning of the forest has reduced its use by migrating songbirds and butterflies. Since it became a Preserve, however, habitat restoration and reforestation by youth groups and others are proceeding with the planting of hundreds of tree seedlings and some mature evergreens. The plans to extend the Lenape Woods greenway by further public acquisition will also help protect existing wildlife corridors.

Over a 3-year period (1997-1999), Joseph Reynolds II, Environmental Commission member and land steward of the Preserve, observed and recorded the herbaceous plants, trees, mammals, birds, butterflies, reptiles and amphibians, common insects, and spiders in Lenape Woods Nature Preserve (see listing in Exhibit 7.1). He observed 34 species of herbaceous plants including at least two endangered species (Trailing arbutus and Pink lady slipper), and 30 tree species. He also noted 14 mammals and 53 bird species, including Osprey and Red-shouldered hawk (on the New Jersey list of threatened species), and a Bald eagle (on Federal and State registers of endangered species).

Tidal wetlands vegetation

The two creeks in Atlantic Highlands, Many Mind Creek and Wagner Creek, contain tidal wetlands along their lower reaches near Sandy Hook Bay. In these estuarine areas of the creeks, the bay tides meet freshwater currents. The downstream banks host saltgrass communities, while the upstream banks are bordered by freshwater wetland vegetation.

Estuarine saltgrass fringe communities are flooded twice daily during high tides and are dominated by saltmarsh cordgrass (*Spartina*). Saltgrass is typical of East Coast saltmarshes and provides the basis of the vital estuarine food chain. Decomposition of the spartina stems and other sources provide nutrients necessary for the growth of plankton that is a food source for zooplankton. Zooplankton is the primary food supply of minnows and many other baitfish as well as young game fish such as striped bass, blue fish, fluke, and weakfish which find refuge and nutrition among the saltgrass stems at high tide. Egrets, herons, and other

wading birds, young ducks and geese, and various mammals can be observed on the saltmarsh community in search of food. Shellfish are all dependent on these wetland areas, and fiddler crabs, some mussels and snails also live there. Preservation of this nursery community is vital for the continued survival of many species. This nursery community is highly susceptible to silting-over caused by erosion, oil spills, and other pollutants discharged upstream or along the banks of streams by homeowners and businesses.

Wagner Creek. Along the northern portion of Wagner Creek, from its mouth at the bay to Center Avenue is a mix of wetland and woodland on the east bank. This forms part of the Borough's waterfront park and beach known as Center Avenue Park. The main wetland vegetation is phragmites, a non-native plant. The western bank is part of the Leonardo section of Middletown and is mostly used as a boat yard.

Many Mind Creek. Detailed information is available about the wetland zones along Many Mind Creek from studies which the New Jersey Natural Gas company (NJNG) prepared for the New Jersey Department of Environmental Protection (DEP). These studies were required as a basis for NJNG proposals and DEP permits for wetlands restoration that will follow the dredging and decontamination of the lower Creek which NJNG began in 1999 between Highway 36 and the Bay (NJNG, 1998).

The wetlands along the main branch of lower Many Mind Creek and its tributaries total 3.8 acres. Included are tidal wetlands from Sandy Hook Bay to approximately South Avenue, and freshwater wetlands from South Avenue to Route 36 as well as along a tributary entering from the west (see Map 5). The wetlands are also shown on the NJDEP tidal wetlands map for the Atlantic Highlands Yacht Harbor-Sandy Hook area, and the National Wetlands Inventory for Sandy Hook (NJDEP GIS CD series 1, 1996).

The NJNG wetland restoration plan discusses five wetland sections and the attendant forest, shrub and herbaceous vegetation which existed there in October 1998 before Creek remediation began:

> ***Section 1:*** In this fringe wetland from Highway 36 to near South Avenue is a mix of wetland and nonwetland plant species: red and silver maple, cottonwood, black willow, green ash, box elder, sweet gum, touch-me-not, soft rush, arrow-leafed tearthumb, yellow pond lily, cattail, arrowhead, common reed, blue verain, and Japanese honeysuckle.
> ***Section 2:*** Along a tributary on the west side of Many Mind Creek, this fringe wetland had similar vegetation to Section 1 but also had straw-colored sedge and boneset.
> ***Section 3:*** This fringe wetland along a tributary east of Many Mind Creek had very dense hydrophytic vegetation similar to sections 1 and 2 but also included Japanese knotweed.
> ***Section 4:*** Along a small tributary entering the main Creek near South Avenue, the dominant vegetation was box elder, Japanese knotweed, and common reed, and upland banks containing box elder, sweet gum, Japanese knotweed, honeysuckle, poison ivy, and trumpet vine.
> ***Section 5:*** In this tidally influenced section from South Avenue to the Bay was a typical salt marsh with marsh elder, common glasswort, cord grass, and groundsel tree in very sandy soils.

To achieve decontamination and restore the Creek, NJNG removed significant amounts of soil and vegetation from the Many Mind banks between Highway 36 and West Highland Avenue (wetland sections 1 and 3). Less contamination had been detected between West Highland Avenue and the Bay and thus minimal disturbance of stream bank vegetation is expected to be needed in sections 1 north of Highland Avenue, 2, 4 and 5. In all sections, the NJNG restoration plan envisaged that "lost wetland vegetation will be replaced in kind or better with species of similar composition to those existing before remediation activities" and will likely include Marsh elder (*Iva frutescens*) and Smooth cordgrass (*Spartina alterniflora*) (NJNG, 1998, page 12-13). The NJNG plan also calls for re-establishing the creek banks in the same form as before -- relatively steep and square-edged, without the fringe wetland and floodplain areas typical for a tidal creek.

In August 1999, the Atlantic Highlands Environmental Commission submitted a report to the Borough Council with comments and proposals concerning the NJNG restoration plan based on analyses and recommendations which the Commission obtained from a stream restoration specialist, Steve Barnes. As the Conservation Director of the NY/NJ Baykeeper, an arm of the American Littoral Society, Mr. Barnes has worked on many streams all around Raritan/Sandy Hook Bays. After several site visits accompanied by Baykeeper Conservation Projects Manager Greg Remaud, Mr. Barnes stated that there is "an opportunity for restoration activities that would provide flood abatement benefits and improve the Creek's habitat and esthetic qualities." He recommended the following restoration activities wherever feasible:

- eradicate invasive vegetation, primarily of Japanese knotweed, Japanese honeysuckle and Common reed growing abundantly in exposed, insufficiently vegetated areas
- regrade the bank to decrease its slope, allowing flood waters to move inside a wider channel instead of overflowing the banks
- establish a sufficient buffer along the creek banks (50 feet width is recommended) and stabilize it with vegetation at two levels
- plant saltmarsh cordgrass (*Spartina alterniflora*) at the toe of the banks to create a fringe low marsh, which would help abate floods and reduce erosion
- replant the upper bank areas using native plant species, which would stabilize the upper banks create a stream canopy. The only grasses used should be perennial native grasses and sedges (e.g. *Andropogon*) instead of the annual grasses in NJNG's plan (for the complete text of his recommendations, see Atlantic Highlands Environmental Commission, 1999).

The Environmental Commission (AH Environmental Commission, 1999) analyzed the existing vegetation species NJNG would be removing (19 native and 7 non-native species) and the vegetation they plan to replant (13 native species and 1 non-native species). The Commission recommended replanting a greater variety and larger number of native vegetation species (e.g. Northern bayberry, American holly, New England aster, Atlantic white-cedar, Swamp white oak, blue verain, soft rush, silver maple, green ash, box elder, sweet gum, ferns, birch). These species would achieve increased biomass with broader biodiversity and make a more effective food chain, especially for smaller species like insects, worms, and crustaceans which in turn are a primary food source for numerous other organisms. Native vegetation species are emphasized because they tend to be non-invasive, remain in ecological balance, and are well adapted to the local environment. Native plants lure back native birds, butterflies, and small animals and provide a more hospitable natural zone for small mammals, reptiles, amphibians, insects, and fish. Native plants also provide a healthier, more stable ecology.

Shoreline vegetation along Sandy Hook Bay

Along Sandy Hook Bay east of the marina over to the border with the Highlands, the fringe of lands behind the shoreline (littoral fringe) contains six different types of habitat and vegetation: woodland communities in upland dry areas; woodland communities in swampy freshwater wetlands; tidal freshwater wetlands dominated by *Phragmites;* tidal saltmarsh wetlands dominated by *Spartina*; beach and dunes; and estuarine shallow water habitat, where bay tides meet freshwater flows from the land.

A recent survey completed by engineers at Maser Consulting (April 2000) identified 34 species of vegetation along shoreline lands, including 18 species in the upland woodland area, 11 species in the wetlands areas, 5 species in the beach and dune areas, and none in the estuarine shallow water. The full vegetation list appears in Exhibit 7.2. The survey identified isolated freshwater wetlands existing in several sections of the

waterfront land -- areas inundated or saturated by such freshwater sources as rainfall and surface water runoff. Some of these wetlands were caused naturally, and others resulted from the retention of water in the soil behind such structures as shoreline bulkheads and berms containing the dredge spoil site east of the harbor.

The majority of these wetland areas are classified as having intermediate resource value. They are characterized by their hydric (wet) soils and the prevalence of hydrophytic vegetation which is typically adapted for life in saturated soil conditions. According to the survey report, the plant communities in these wetlands "are generally successional, consisting of a number of alien species and native species adapted to human disturbance." The inventory was completed as part of the Borough's application to DEP for a CAFRA (Coastal Area Facility Review Act) permit to construct the Atlantic Highlands section of the Bayshore Bicycle and Walking Trail, a continuation of the Henry Hudson Trail that begins in Keyport.

Birds, fish and other wildlife

The viability of wildlife always depends on the availability of food, water, cover, and the presence of predatory species. Favorable conditions for fish, birds, small animals, and other wildlife persist to a certain extent in some areas of Atlantic Highlands. Favorable wildlife habitat includes the water and water-related environments in and along Sandy Hook Bay shoreline and the Borough's two creeks; the preserved wooded areas; and residential areas which have not been converted entirely into lawns and flower beds and which have retained a proportion of full natural vegetative cover. Opportunities for continuing and increasing natural habitat currently exist, provided that pollution, contamination, human traffic and encroaching development are excluded or at least carefully controlled. Homeowners can also enhance the ability of their land to attract and sustain wildlife, and some steps for this purpose are described below.

Birds. A broad estimate is that, during the year, approximately 300 species of birds may be observed in the Atlantic Highlands area, including nearly 250 common and 50 nomadic birds (Nature Conservancy, 1989). Careful observation and enumeration of birds has recently been done in two specific areas: in Lenape Woods Nature Preserve, where 53 species of birds have been observed over a three-year period (see listing in Exhibit 7.1); and in the harbor area where 19 bird species were counted on the Audubon Society's December count in 1999 (see Exhibit 7.3). Other places to bird-watch in the Borough are Mount Mitchill and Popamora Point along the shore near Highlands.

The harbor enumeration was part of the 25th annual "Sandy Hook December Bird Count" sponsored by New Jersey Audubon Society, which tallied over 42,000 birds of 113 species that day on Sandy Hook and along the coast between Keansburg and the Navesink River. Atlantic Highlands observations covered the area between the mouth of Many Mind Creek and the marina area just east of the launching ramps. The count was 629 individuals of 19 species. Almost all were water fowl or birds that frequent watery areas. About 40 per cent were from three species of Gull, and 25 per cent were Brant, followed by American Black Duck and Red-breasted Merganser. Other species that occurred during previous years' December bird counts included the Red-throated Loon, Common Loon, Northern Gannet, Greater Scaup, Common Goldeneye, Peregrine Falcon, Killdeer, and Bonaparte's Gull.

Active bird feeding activity typically occurs on the extensive tidal flats at the mouth of Many Mind Creek where ample sea lettuce (*Ulva*) grows. Bird use indicates that it is a rich feeding habitat despite the developed areas nearby. The site is used heavily by Cormorants, Brant, Great Scaup, Oldsquaw, Common Goldeneye, and Bufflehead, with some use by shorebirds, Gulls, and Terns. Clusters of shorebirds also frequent the bay waters next to the mouth of Wagner Creek along the Borough's eastern border and the tranquil cove waters near the Popamora Point beach. (NJ Audubon Society, 1994).

The Atlantic Coastal flyway for migratory birds lies directly over Sandy Hook Bay and the Atlantic Highlands area (Bennett, 1987). From late March through May and again from August through November, the area hosts thousands of migratory species stopping enroute northward or staying here to breed. Migrating birds arrive about the end of March and nest building peaks by May. After hatching their young, by August birds must again prepare for migration – putting on weight and some species molting to achieve peak physical condition for long journeys to winter feeding grounds. Their destinations may be as much as 7,000 miles away in the southern hemisphere, with some shorebirds wintering as far south as the Pampas of Argentina.

Some birds which were migratory have evolved into residents and no longer migrate, the most obvious example is the Canada Goose. Crows, Mourning Doves, and most Cardinals seen in Atlantic Highlands have adapted this way by relying on bird feeders and berry trees. Mourning Doves occasionally use already built nests left vacant by migratory birds and relying on bird feeders and berry trees. In the spring, these birds have a jump-start on acquiring prime breeding sites and food supplies long before the rush of spring migration.

Fish. One hundred eighteen species of fish have been reported to occur in the waters of Sandy Hook Bay. Most of these species are probably occasional visitors to the Atlantic Highlands bayfront area which is 2.5 miles long east to west.

Some species known to spawn in the Bay include bay anchovy, winter flounder, windowpane, Atlantic silverside, northern pipe fish, sculpin, spotted seahorse, goby, mummichog, killifish, butterfish, sea robin, menhaden, sand lancer, croaker, pollack, and Atlantic herring. Fish commonly caught in the Bay from fishing piers and boats include summer flounder (fluke), winter flounder, striped bass, bluefish, windowpane, weakfish, black sea bass, porgy, squirrel hake (ling), tautog (blackfish), and American eel. Other common fish of the mid-Atlantic potentially within Atlantic Highlands waters include Atlantic mackerel baitfish (silversides, killies, bay anchovy, menhaden, alewife, sea robin, toadfish), cunner (Bergal) false albacore, kingfish, whiting (silver hake), Northern puffer, and sea raven (American Littoral Society, 1993; Levine, 1994).

Fishing is a popular recreation as can be seen by the daily volume of boat traffic along the Atlantic Highlands bayfront in season. Many of the mooring and docking slips in the marina are filled with the boats of fishing enthusiasts. Based here are nine party fishing boats, available for half, three-quarter or full day trips. Sport fishing is also popular on the newly constructed fishing pier and from the peninsula of land on the western side of the marina. Some residents even remember fishing in Many Mind Creek in the "olden days" and hope this will revive (at least for baitfish) when the creek is cleaned up and restored.

Shellfish, reptiles, and amphibians. The waters in the Atlantic Highlands areas support a variety of mature and immature shellfish which live on the bay floor, bay edges or pilings. Hard clams, soft clams, and blue claw crabs are found in large number. In recent years as water quality has improved, more clamming boats and rakes can be seen on the bay.

Horseshoe crabs, which are known as pre-dinosaur survivors more closely related to spiders than to crabs, can also be found along the bay. During the nights of the spring tide in late spring and early summer, horseshoe crabs come into the shallows to mate and lay their eggs, especially along the waterfront east of the harbor (Bennett, 1987). Many shore birds rely on excess crab eggs as food for the final leg of their spring

Bluefish, bunkers, gulls and ospreys

Live report from our bay shore, August 10, 2000

The rivers and bay are loaded with "cocktail blues" this week. These two-pound bluefish are in a heavy feeding mode, dining on baby moss bunkers. They are chasing them up the rivers, in the coves, under the bridges, and on to the beaches.

I had a report from Jim Hensle of Atlantic Highlands. He was walking his dog Sunday morning at the Harbor when he spotted a massive swarm of gulls working the shores for scraps of bunkers. The bluefish were in a feeding frenzy because they had an acre-large school of bunkers trapped in by the jetty. Jim alerted his two sons, Chris and Jason, who quickly showed up with some spinning gear and metal lures about two inches long (the same size as the bunkers). They followed the action for an hour or so, throwing them all back in as they headed along the bay beach.

Jim also witnessed some other unusual fishing participants from the air. Three ospreys were in on the action, dive bombing the boil of the water and coming up with fish in their talons. No doubt bringing them back to their perch for Sunday brunch!

From the "No Bull Fishing Report" In Atlantic Highlands Herald, August 10, 2000 (www. ahherald.com). By Jay Cosgrove of Bahr's Landing Marina and Restaurant, Highlands.

migration from South America. Environmentalists are concerned that this delicate balance is at risk with overharvesting of horseshoe crabs which are used as bait for fishing.

Acorn barnacles are also found, as well as ribbed mussels, periwinkle snail, fiddler crab, sea anemones, polychaete worms, and two species of shrimp. Blue mussels, barnacles and starfish form colonies on harbor pilings. The wetlands associated with the bay and Many Mind Creek also serve as a habitat for water snakes, Eastern tiger and Eastern mud salamanders, three kinds of frogs (green frogs, bullfrogs, and leopard frogs), and four kinds of turtles (map, painted, snapping, and musk turtles).

Stewardship of preserved and threatened areas

Trees, shrubs and other vegetation play a number of important roles in the Borough's environmental and economic life. Particularly significant is the stabilizing effect of vegetation in the extensive steep slope areas. Root systems help to hold soil in place, prevent erosion from surface drainage and take up moisture that would otherwise saturate and add weight to soil blocks that are prone to slumping -- a unique and high-risk phenomenon in the eastern hills section (see "slump block" discussion in the geology section above). Slope protection also modifies and reduces downhill drainage that can contribute to flooding in flatland areas and sedimentation that can raise creek and bay bottoms and require dredging.

The existence of protected natural open spaces such as woodlands which provide hiking trails, nature observation and other recreational opportunities also has positive effects on property values. Such amenities rate high in many home buyers' real estate searches -- among the ten most-wanted features according to Wall Street Journal reports.

Trees and other plants also reduce air pollution arising from automobiles because they restore oxygen to our atmosphere through photosynthesis, filter dust from the air and absorb pollutants. Trees serve as windbreaks in the winter and natural air conditioners in the summer. Finally, a landscape which is well planted with trees, shrubs and a variety of mature vegetation is attractive as habitat for birds and other wildlife, and has esthetic value for people.

Over the years, increased development, loss of natural habitat, introduction of non-native species, and pollutant gases in the atmosphere have led to an environment that is dominated by non-native species and deficient in biodiversity. The natural succession and growth of the vegetation in Lenape Woods Nature Preserve, for example, no longer operate as effectively as before. These effects are widespread in all rapidly developing areas of New Jersey where, out of approximately 2,100 native plant species, more than 300 are currently listed as "endangered" and more than 700 as "threatened" species (New England Wild Flower Society, 1998).

Atlantic Highlands holds a surprising variety of plants and animals, considering its location near the urban and suburban sprawl of the New York City metropolitan area. Yet with each passing spring, bird-watchers have noted fewer migrant birds coming to the area. With each newly developed lot, expanded building footprint, paved road lane or parking lot, and tree removal, a variety of plant and animal life is forced to retreat as its habitat disappears. Even many elaborate "landscaping" plans simply obliterate the native environment. They replace it with designed cluster and specimen plantings of non-native species; these require expensive and harmful amounts of water, fertilizer and pesticide in order to survive and are generally inhospitable to wildlife.

Many actions taken by every homeowner, business owner, potential developer and municipal official affect the existence and survival of vegetation and wildlife. That is why local regulations and standards exist for land use, tree cover and other plantings, landscape improvement, drainage, and environmentally respectful development on private and public property. There are also protective laws and penalties to prohibit point and non-point pollution and other abuses of local land and water. Finally, that is why special measures are taken by local, county, state and federal governments to preserve and improve the integrity of stream corridors and permanently set aside woodland and park areas that provide a sanctuary for wildlife and green open spaces for people.

Homeowners and businesses can also advance environmental values on their own properties. They can allow native vegetation to remain wherever possible, especially in buffer zones bordering wood lots or stream corridors, thus providing green space as well as sanctuaries for wildlife. Residents may also want to consider creating their own "backyard wildlife sanctuaries" -- an inexpensive way to help support diverse species, improve the local environment and understanding of it, and contribute to the quality of life (Adams, 1993; Hawking, 1997). Many small efforts can add up to a large effect (Parren, 1993; Natural Resources Conservation Services, 1998). Here are some steps that would help:

- Plant and preserve trees and shrubs which provide shelter and nesting for many types of wildlife. Trees producing nuts, berries and seeds are prime food sources for many wildlife. Consider planting native species that require less water. Standing dead trees (non-threatening), preferably with exposed cavities, provide nesting or perching sites for many birds and animals
- Collect rainwater from roof gutters and rainspouts by directing it into storage containers, instead of going into paved channels and storm drains as runoff. Use it to water vegetation in the home yard. Water plants in the early morning; less water is lost through evaporation than in the middle of the day, and plants will be less stressed and obtain nutrition more efficiently.

- Bees pollinate numerous kinds of vegetation. To protect them, never spray plants in bloom or saturate the ground with pesticides. Bees are extremely sensitive to many common insecticides. They are attracted to germinating plants and especially to blue and yellow flowers. Sow different garden species that bloom in the spring, summer and fall respectively.
- The loss of fields and meadows has significantly reduced the butterfly population. Adult butterflies require liquid food from the nectar of flowers and the juices of extra-ripe fruit. The type of flowering plants you grow will determine the variety of butterflies you attract.
- Toads, frogs, lizards, turtles and snakes all have a function in a healthy environment. All species encountered in Atlantic Highlands feed on destructive insects or rodents. Rocks in a sunny spot with shade tolerant groundcover provide an ideal habitat for reptiles and amphibians.
- The loss of suitable nesting sites has become a major element in the diminution of song birds in Atlantic Highlands. Native birds also compete for prime nesting sites with non-native birds, such as House sparrows and Starlings. Dead, dying, and hollow trees as well as wooden fence posts once provided vital nesting cavities in earlier times. If they don't pose a safety hazard, old logs and stumps in gardens can meet nesting needs. Birdhouses also help. Select a variety of birdseed and place feeders and baths ten feet from trees. Avoid placing feeders and birdbaths near sizable shrubbery that can hide a cat or other predators.

Exhibit 7.1: Inventory of flora and fauna in Lenape Woods Nature Preserve

Herbaceous Plants *34 Species*

Arrow Arum (*Peltandra virginica)*
Axseed (*Coronilla varia*)
Autumn Wild Onion (*Allium stellatum*)
Bloodroot (*Sanguinaria canadensis*)
Canadian Dwarf Cinquefoil (*Potentilla canadensis)*
Common Dandelion (*Taraxacum officinale*)
Common Plantain (*Plantago major*)
Common Winter Cress (*Barbarea vulgaris*)
Cord Grass (*Spartina alterniflora*)
Dwarf Ginseng (*Panax trifolium*)
English Plantain (*Plantago lanceolata*)
Highbush blueberry (*Vaccinium corymbosum)*
Indian Pipe (*Monotropa uniflora*)
Japanese Honeysuckle (*Lonicera japonica)*
Japanese Knotweed (*Polygonum cuspidatum*)
Maple Leaf Viburnum (*Viburnum acerifolium*)
Marsh Fern (*Thelypteris palustris*)
Morning Honeysuckle (*Gaura angustifolia)*
Mountain Laurel *(Kalmia latifolia)*
New York Aster (*Aster novi-belgii*)
Partridge Berry (*Mitchella repens*)
Pink Azalea (*Rhododendron nudiflorum)*
Pink Lady's Slipper (*Cypripedium acaule*): **endangered**
Pipsisewa (*Chimaphila umbellata*)
Poison Ivy (*Rhus radicans*)
Poison Sumac (*Rhus vernix*)
Pokeweed (*Phytolacca americana*)
Skunk Cabbage (*Symplocarpus foetidus*
Smooth Crabgrass (*Digitaria ischaemum*)
Swamp Dewberry (*Rubus hispidus*)
Trailing Arbutus (*Epigaea repens*): **endangered**
Wild Sarsaparilla (*Aralia nudicauis*)
Wild Oats (*Uvularia sessilifolia)*
White Wood Aster (*Aster divaricatus*)

Trees (Deciduous and Conifers) *30 Species*

American beech (*Fagus grandifolia*)
American chestnut saplings (*Castanea dentata*)
American holly (*Ilex opaca*)
American Mountain ash (*Sorbus americana)*
Black Oak (*Quercus velutina*)
Black locust (*Robinia x holdtii*)
Black walnut (*Juglans nigra*)
Eastern hemlock (*Tsuga canadensis*)
Eastern Red cedar (*Juniperus virginiana)*
Flowering dogwood (*Cornus florida*)
Gray birch (*Betula populifolia*)
Honey locust (*Gleditsia triacanthos*)
White oak (*Quercus alba*)
Sweet birch (*Betula lenta)*
White cedar (*Thuja occidentalis*)
White pine (*Pinus strobus*)
Northern Pin oak (*Quercus ellipsoidalis*)
Northern Red oak (*Quercus ruba*)
Norway maple (*Acer platanoides*)
Pin oak (*Quercus palustris*)
Redbud (*Cercis canadensis*)
Red maple (*Acer rubrum)*
Sassafras (*Sassafras albidum*)
Scarlet oak (*Quercus coccinea*)
Staghorn sumac (*Rhus typhina*)
Sycamore maple (*Acer pseudoplatanus*)
Tree of Heaven (*Ailanthus altissima*)
Tulip tree (*Liriodendron tulipifera*)
Turkish Sweet Gum (*Liquidambar orientalis)*
White ash (*Fraxinus americana*)

Mammals *14 Species*

Big Brown Bat (*Eptesicus fuscus*)
Deer Mouse (*Peromyscus maniculatus*)
Eastern Chipmunk (*Tamias striatus*)
Eastern Cottontail Rabbit (*Sylvilagus floridanus*)
Eastern Mole (*Scalopus aquaticus*)
European Red Fox (*Vulpes vulpes*)
Gray Squirrel (*Sciurus carolinensis*)
Northern Flying Squirrel (Glaucomys sabrinus)
Norway Rat (*Rattus norvegicus*)
Raccoon (*Procyon lotor*)
Short-tailed Shrew (*Blarina brevicauda*)
Virginia Opossum (*Didelphis virginiana*)
White-tailed Deer (*Odocoileus virginianus*)
Woodchuck (*Marmota monax*)

Exhibit 7.1 (continued)

Birds ***53 Species***

American Kestrel *(Falco sparverius)*
American Robin *(Turdus migratorius)*
Black-capped Chickadee *(Parus atricapillus)*
Bald Eagle *(Haliaeetus leucocephalus):* **Federal: endangered/threatened. State: endangered**
Black-billed Cuckoo *(Coccyzus erythropthalmus)*
Blue Jay *(Cyanocitta cristata)*
Bobwhite *(Colinus virginianus)*
Brown Creeper *(Certhia familiaris)*
Brown Thrasher *(Taxostoma rufum)*
Brown-headed Cowbird *(Molothrus ater)*
Cardinal *(Cardinalis cardinalis)*
Common Crow *(Corvus brachyrhynchos)*
Common Flicker *(Colaptes auratus)*
Common Grackle *(Quiscalus quiscula)*
Dark-eyed Junco *(Junco hyemalis)*
Downey Woodpecker *(Picoides pubescens)*
Eastern Phoebe *(Sayornis phoebe)*
Fox Sparrow *(Passerella iliaca)*
Golden Eagle *(Aquila chrysaetos)*
Gray Catbird *(Dumetella carolinensis)*
Great Horned Owl *(Bubo virginianus)*
Hairy Woodpecker *(Picoides villosus)*
House Finch *(Carpodacus mexicanus)*
House Sparrow *(Passer domesticus)*
House Wren *(Troglodytes aedon)*
Mockingbird *(Mimus polglottos)*
Mourning Dove *(Zenaida macroura)*
Osprey *(Pandion haliaetus):* **State: threatened**
Peregrine Falcon *(Falco peregrinus)*
Pileated Woodpecker *(Dryocpus pileatus)*
Pine Warbler *(Dendroica pinus)*
Red-bellied Woodpecker *(Centurus carolinus)*
Red-eyed Vireo *(Vireo olivaceus)*
Red-shouldered Hawk *(Buteo lineatus)* **State: threatened**
Red-tailed Hawk *(Buto jamaicensis)*
Red-winged Blackbird *(Agelaius phoeniceus)*
Ruby-throat Hummingbird *(Archilochus colubris)*
Rufous-sided Towhee *(Pipilo erythrophthalmus)*
Saw-whet Owl *(Aegolius acadicus)*
Scarlet Tanager *(Piranga olivacea)*
Screech Owl *(Otus asio)*
Song Sparrow *(Melospiza melodia)*
Starling *(Sturnus vulgaris)*
Swamp Sparrow *(Melospiza georgiana)*
Tree Swallow *(Iridoprocne bicolor)*
Tufted Titmouse *(Parus bicolor)*
Turkey Vulture *(Cathartes aura)*
Veery *(Catharus fuscescens)*
White-breasted Nuthatch *(Sitts carolinensis)*
White-throated Sparrow *(Zonotrichia albicollis)*
Wood Thrush *(Hylocichla mustelina)*
Yellow-bellied Sapsucker *(Sphyrapicus varius)*
Yellow Warbler (Dendroica petechia)

Butterflies ***6 Species***

Cabbage *(Pieris rapae)*
Monarch *(Danaus plexippus)*
Mourning Cloak *(Nymphalis antiopa)*
Red Admiral *(Vanessa atalanta)*
Spring Azure *(Celastrina agriolus)*
Viceroy *(Limenitis archippus)*

(Note: 21 additional butterfly species observed by others include: Black, Eastern Tiger, and Spicebush Swallowtails; Clouded and Orange Sulphurs; American Copper; Gray Hairstreak; Eastern Tailed-blue; Summer Azure; Pearl Crescent; Question Mark; American Lady; Red-spotted Purple; Silver-spotted, Common Checkered, Hobomok, and Broad-winged Skippers; Wild Indigo Duskywing; Common Sootywing; Sachem)

Reptiles and amphibians ***5 species***

Common Garter Snake *(Thamnophis sirtalis)*
Eastern Box Turtle *(Terrapene carolina)*
Northern Red Salamander *(Pseudotriton ruber)*
Red-spotted Eastern Newt *(Notophthalmus viridescens)*
Spotted Salamander *(Ambystoma maculatum)*

Common Insects and Spiders ***13 Species***

American Cockroach *(Periplaneta americana)*
Deer Flies *(Tabanidae family)*
Eastern Wood Tick *(Ixodidae family)*
Mosquitoes *(Culicidae family)*
Nine-spotted Ladybug Beetle *(Coccinella novemnotata)*
Northern Katydid *(Pterophylla camellifolia)*
Northern Walkingstick *(Diapheromera femorata)*
Painted Lady Caterpiller *(Cynthia cardui)*
Praying Mantis *(Mantis religiosa)*
Red-tailed Bumble Bee *(Bombus ternarius)*
Short-legged Shield-back Katydid *(Atlanticus testaceus)*
Tent Caterpillars *(Lasiocampidae family)*
Yellow Jackets *(Vespidae family)*

Exhibit 7.2: Dominant vegetation species along bay shoreline in Atlantic Highlands

Upland forest/woodland communities
Northern Red Oak (Quercus rubra)
Black Oak (*Quercus velutina*)
Black Cherry (*Prunus serotina*)
Tree of Heaven (*Ailanthus altissima*)
Black Locust (*Robinia pseudoacacia*)
White Mulberry (*Morus alba*)
Big-toothed Aspen (*Populus grandidentata*)
Quaking Aspen (*Populus tremuloides*)
Eastern Cottonwood (*Populus deltoides*)
Silver Maple (*Acer saccharinum*)
Japanese Knotwood
Mugwort (*Artemesia vulgaris*)
Wild Grape (*Vitis spp.*)
Vine Honeysuckle (*Lonicera spp.*)
Queen Anne's Lace (*Daucus carota*)
Poison Ivy (*Toxicodendron radicans*)
Gill-Over-The-Ground (*Glechoma hederacea*)
Switchgrass (*Panicum virgatum*)

Dune community
Bayberry (*Myrica pensulvanica*)
Small White Aster (*Aster vimineus*)
Sweet Goldenrod (*Solidago odora*)
Mugwort (*Artemesia vulgaris*)
Virginia Creeper (*Parsthenocissus quinquefolia*)
Emergent Wetland Communities
Common Reed (*Phragmites australis*)
Forested&Scrub-ShrubWetland Communities
Weeping Willow (*Salix babylonica*)
Black Birch (*Betula lenta*)
Smooth Alder (*Alnus serrulata*)
Seaside Alder (*Alnnus maritima*)
Ironwood (*Carpus caroloniana*)
Shadbush (*Amelanchier canadensis*)
Common Reeds (*Phragmites australis*)
Jewelweed (*Impatiens capensis*)
Scouring Rush (*Equissetum hyemale*)
Long-Bristled Smartweed (*Polygonum cespitosum*)

Source: Maser Consulting, "Application for CAFRA Permit, Bayshore Trail - Atlantic Highlands Section," April 2000, p. 22

Exhibit 7. 3: Birds observed in Atlantic Highlands harbor on annual Audubon Society count, December 1999

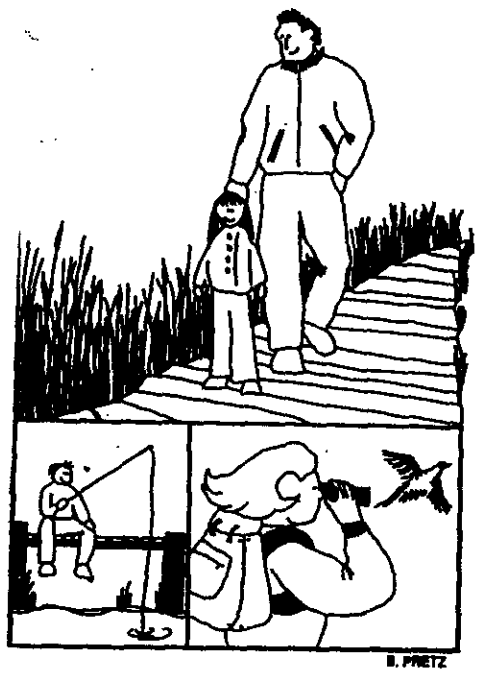
Double-crested Cormorant (10)
Great Blue Heron (3)
Brant (160)
Canada Goose (20)
American Black Duck (40)
Mallard (10)
Oldsquaw (20)
White-winged Scooter (1)
Bufflehead (29)
Red-breasted Merganser (40)
Turkey Vulture (1)
Ruddy Turnstone (2)
Purple Sandpiper (4)
Ring-billed Gull (7)
Herring Gull (167)
Great Black-backed Gull (74)
Rock Dove (19)
Belted Kingfisher (2)
American Crow (20)

Note: Birds counted in 6-hour period in Atlantic Highlands Harbor area, from the mouth of Many Mind Creek to the area just east of the launching ramps. Birds are listed in taxonomic order with number of individuals of each species observed in parentheses. Source: Scott Barnes, Chair, Audubon Society Sandy Hook December Bird Count.

Section 8

OPEN SPACE AND RECREATION

At the request of the Borough Council, the Atlantic Highlands Environmental Commission prepared a draft of a 5-year plan for open space acquisition and updated the Borough's recreation and open space inventory (ROSI). The draft plan was submitted to the Green Acres Program of the New Jersey Department of Environmental Protection on July 28, 2000 as part of a funding request. Because the Borough has established an open space tax, it is eligible for 50-50 matching grants and fast-track treatment from Green Acres under its Planning Incentive program.



Summary of needs

Atlantic Highlands is a small town in a special setting. Its very name describes high hills overlooking the great ocean. Its waterfront has beaches, dunes, woodlands and a thriving harbor for fishing and boating. Its steep slopes are forested and even flatter areas have substantial tree cover. At the same time, the town's small area of 1.2 square miles is almost fully built out -- about 95 per cent of the land is developed-- and densely populated.

The population of about 4,770 people (1999 estimate) represents a density of 3,959 per square mile, over three times the average for New Jersey.

The movement to protect remaining open space in and surrounding Atlantic Highlands derives from this basic geography and demography. Beyond these figures, it also springs from the increased demand for active recreation by children, youth and adults which outstrips available facilities. And it is fed by growing public concern about preserving woodlands, waterfront, stream corridors and woodlands for purposes of both passive recreation and conservation of natural resources and habitat. Strong public and governmental awareness of all these factors has driven past actions and future plans for open space and recreation development as an important way of maintaining and improving the quality of small town life in Atlantic Highlands.

The draft Open Space and Recreation Plan (OSRP) covers six proposed acquisition projects which are accessible to all parts of the Borough. Five of these projects would add about 73 acres to public open space within and along its borders, if seller willingness and funds available make it possible for Atlantic Highlands to obtain all the lands. The sixth project, which involves a mix of regional partners, covers about 40 acres of land in a neighboring town. In combination, these actions would serve a range of open space functions, including active and passive recreation; natural resource conservation; protection of sensitive areas such as steep slopes, flood plains and watersheds; and preservation of scenic resources which contribute to community character and the aesthetic quality of neighborhoods.

Origin of plan and planning process

Atlantic Highlands has shown a strong commitment and a long history of providing recreation opportunities and preserving open space resources for public purposes. In recent years, Atlantic Highlands has been acquiring open space for public access and use as a deliberate policy. Since 1996, it has created the Lenape Woods Nature Preserve (two sections totaling 38.8 acres) and a Cliffside Trails area (about 1.7 acres). As an example of the Borough's commitment, it purchased Lenape Woods Nature Preserve through a bond ordinance while waiting Green Acres co-funding which was subsequently approved and received.

The November 1999 election ballot in Atlantic Highlands included an open space referendum which the voters approved by a margin of 2.5 to 1 (1,106 yes and 435 no). Accordingly, in December 1999 the Borough Council adopted an Ordinance establishing a dedicated open space tax of 1 cent per $100 of assessed valuation, which came into effect with property tax bills issued in July 2000.

The Open Space and Recreation Plan (OSRP) represents the next step in the process. Developing the draft Plan provided an excellent opportunity to enlarge and enrich collaborative planning for present and future needs -- a citizen/municipality partnership for open space and recreation. Its preparation brought together ideas, initiatives and goals of residents, the Environmental Commission, the Borough Council, and the Planning Board.

After voting overwhelmingly in favor of the open space tax, residents received an Environmental Survey in April 2000 and 24 per cent of households responded -- an extraordinary return rate for such surveys (see Section 10). Their replies showed strong support for preserving open space in specific terms. For example, 80 per cent favored establishment of a Many Mind Greenway. Respondents also commented that they wanted Lenape Woods Nature Preserve expanded and confirmed that they would like public open space to be emphasized in future town actions.

To obtain residents' participation and comment in the process of creating the Open Space and Recreation Plan, a public meeting was held to introduce and discuss the proposal to submit a Planning Incentive application and a draft OSRP to Green Acres. The meeting, advertised in the newspaper as an open space hearing, was held as part of a regular Borough Council session. The Mayor announced that the discussion would continue at the next Borough Council meeting and that other public hearings would be held before the final OSRP is adopted. At the next Borough Council meeting, after further public discussion about the Open Space Plan, the Borough Council adopted the resolution which enabled the municipality officially to apply to Green Acres. The Council also completed and certified its 2000 Recreation and Open Space Inventory (ROSA) and agreed to permanently hold all lands currently dedicated to recreation and conservation purposes.

Purposes of OSRP

The purpose of the OSRP is to provide a vision of the Borough's open space and recreation aspirations and a blueprint for their realization as far as possible. It also identifies logical and feasible ways of creating a comprehensive open space system which can serve the unmet needs and growing interests of the population. It foresees acquisition of most vacant properties which have substantial conservation and recreation value. If the plan were fully realized, therefore, it would achieve what is probably the ultimate possible pattern of open space and recreation in the Borough and its adjoining lands. In terms of funding, the purpose of the OSRP is to demonstrate to taxpayers, citizen groups and official bodies of the Borough what can be accomplished if

the necessary financing is made available, and to build on the new dedicated open space tax by taking maximum advantage of state funds available through the Green Acres program.

Philosophy and goals for open space and recreation

The OSRP grew out of community concerns and decisions regarding open space and recreation resources and a philosophy which has clearly emerged of Atlantic Highlands as a small town that wants to keep that character. As the environmental survey indicated, the community expressed strong preference for restraining further development, that as much unbolt land as possible should be preserved in its small territory, and that neighboring lands should also be considered for acquisition and preservation as necessary.

A second element in the philosophy which motivated the OSRP was to widen the opportunities and enrich the experiences available for recreation and outdoor enjoyment -- in terms of geographic access, types of activities, and the population segments being served. The range of interests to be served goes from bird watching to boating, from environmental education to soccer, from steep slope protection to slides and swings for tots. The Borough is committed to keeping all its recreation facilities open and accessible to the public and to serving the needs of all residents, including children, youth, adults, senior citizens and those with special needs.

The OSRP provides a comprehensive set of goals and objectives designed to identify and address both the short and long term needs of present and future residents of the Borough. The proposed acquisition projects would serve the following specific recreation and conservation goals of the Borough:

- provide increased active and passive recreation for children and adults, including active recreation such as ball games and swimming, and passive pursuits such as hiking and nature observation.
- offer trail access and other open space amenities to additional neighborhoods
- help restrain growth in housing and population density in the Borough, thus maintaining both quality of life and property values.
- reduce the danger of over-intensive development along our borders
- protect natural resources such as creeks and banks, bay coast and beaches, steep slopes and slump block zones, forests and woodlands
- preserve and enhance the environment by maintaining existing buffers against highway noise and air pollution, saving natural habitat needed by birds and wildlife, and preserving tree mass which moderates temperature and wind effects.
- add to natural/environmental education opportunities available to children and adults.

Action plan to achieve the goal

First priority in funding will be to obtain grants, such as the 50-50 matching grants available under the Planning Incentive program of Green Acres. Other sources and formulae will come into play as required, sometimes in combination, such as the following examples. Green Acres also offers 30-year loans at 2 per cent interest, which could be advantageous in certain circumstances. The open space tax is a new policy venture which Borough voters endorsed. Anticipated annual revenue can be used to create access to larger sources of funding and to repay any debt entered for land preservation. In recent years, heavy development pressures on unbolt lands with high value as open space have led the Borough to pass bond ordinances meant for land purchase; one purchase action was completed and has since generated reimbursement of half the cost by Green Acres (Lenape Woods Nature Preserve), and a second possible purchase is still under negotiation with the landowner.

Objectives to be served. The OSRP supports acquisition of types of land which can provide open space for:

- Natural resource protection -- including plant and animal life; fish and wildlife habitats; streams, marshes, estuaries and bay areas which are important for water quality, filtering pollutants, and reproduction and survival of fish and other water life; and stream banks, bay beaches, dunes, woodlands and other areas of environmental importance or sensitivity.
- Outdoor recreation -- including areas which are particularly suited for parks and active recreation, provide access to beaches and streams, trail systems, scenic corridors and utility easements, and serve as links with other recreation and open space lands.
- Protection of public health and safety -- including areas needing special management or regulation because of hazards or special conditions such as steep slopes, flood plains, watersheds, erosion and siltation.
- Community character -- including woodlands, open water, scenic resources, historic sites, and townscapes which have visual impact, contribute to the community's image and add aesthetic value to the surrounding built environment.

The Borough plans to cooperate with other federal/state/county/local governmental organizations as well as private foundations and citizens in the joint planning of an acquisition, co-funding for purchase of lands, shared development of recreation facilities, and/or participation in a common scheme for management and operation of park land.

Selection criteria. The process of selecting properties for acquisition is, of course, dynamic and opportunity-driven. Numerous factors will influence the actual decision-making process, including site availability, owner willingness, development pressure, funding availability, recreation needs, and critical environmental issues.

Acquisition methods. A wide array of methods can be utilized to save land and will be considered and suggested as appropriate when negotiating with landowners. Such methods include outright donation, donation by will, donation with life rights, gifts, outright sale, bargain sale, installment sale, sale with life rights, conservation easements, deed restrictions, conditional transfers, mutual covenants, leases, and management agreements. The Borough will always make every effort to negotiate an amicable and fair transaction.

Land use regulation. Resource protection depends partly on having regulations that ensure conscientious land development practices through the review and approval processes of the Planning Board; a role is also played by Borough inspection and certification procedures. In addition, public acquisition is appropriate and necessary when natural resources (such as woodlands) cannot be protected by regulatory means. In the Borough Development Regulations, the Borough Master Plan and the practices of the Planning Board, objectives and implementation measures have been established for protecting steep slopes, soils, tidal and freshwater woodlands, beach and dune areas, stream and stream corridors, tree and vegetation cover, and environmentally sensitive lands in particular, and for preserving "vacant land parcels," "neighborhood character" and natural resources in general.

Within the five-year scope of this OSRP, the required periodic re-examination of the Master Plan is scheduled for 2002. As part of that process, the experience obtained in implementing the OSRP will be analyzed to determine whether land use regulations need to be added or revised to facilitate the open space program.

Lands held for recreation and conservation purposes

Lands held by three types of owners are devoted to recreation and conservation in Atlantic Highlands -- the Borough government, the Monmouth County Park System, and the Firemen's Association. These lands are described in Exhibit 8.1.

The Borough-owned lands are officially devoted to public use and are conserved under law for that purpose forever. These lands are recorded in a "Recreation and Open Space Inventory (ROSI)" which is updated periodically and submitted to the State Department of Environmental Protection. As of July 2000, the ROSI lists a total of 88.55 acres of Borough-owned open space and recreation lands. Of these, 34.88 acres are developed and partially developed lands, including parklands, and 53.67 acres are wholly undeveloped lands.

The Monmouth County Park System owns two parks totaling 25 acres in Atlantic Highlands – Mount Mitchill Scenic Overlook and Popamora Point on the Bay near the Highlands border.

The association of Atlantic Highlands firefighters owns ballfields on a tract of 6.8 acres. In addition, land areas owned by the Atlantic Highlands Elementary School (public) and St. Agnes School (parochial) both include playground facilities for their students.

Assessment of resources and recreational needs

Environmental Commission members made an inventory of unbuilt land in and surrounding the Borough in order to identify and assess potential resources for meeting open space and recreation needs. The strongest unmet recreational needs are for playing fields, hiking trails, biking trails, swimming areas. Three broad categories of land were identified: parcels of larger size within the Borough; large tracts in neighboring Middletown in order to provide an open space buffer; and unbolt parcels in the Borough that offer opportunities for expansions of existing public open space, additional access to trails, protection of critical natural resources (such as creek buffers and steep slopes), and relief from existing or potentially high density of development.

From these analyses, we identified a number of desirable land acquisitions which are grouped into six projects according to location, resources, topography and possible uses. As a whole, these projects have features, new capacities and potential uses which would satisfy a significant portion of identified unmet needs, probably reaching close to the limit of what is physically possible to achieve on existing unbolt lands.

The proposed OSRP and 5-year action plan includes projects which would create linear facilities such as trails, bike paths and greenways, link existing recreation/open space sites of the Borough in an integrated system, connect with three County facilities (Mt. Mitchill, Popamora Point, and Henry Hudson Trail), help protect streams, forest lands and wildlife, contribute to control of flooding, steep slope erosion and sedimentation, increase access to coastal and inland waters, and develop active recreation sites. These are exactly the types of resources which Atlantic Highlands wishes to acquire and protect and which the Planning Incentives guidelines indicate are a close match with Green Acres' interests. Map 11 titled "Atlantic Highlands Open Space and Recreation Plan."

shows the location and configuration of all existing public and private sites for open space and recreation, as well as a general depiction of additional lands which the Borough would like to acquire. The proposed acquisition projects are described below.

Proposed acquisition projects

1. Lenape Woods Greenway

This project has been partly implemented by Atlantic Highlands with New Jersey State Green Acres assistance. Two sections of Lenape Woods have been acquired with a Green Acres grant covering 50 per cent of preparatory and purchase costs. This land, covering around 40 acres, has been set aside as a Nature Preserve which is managed for the Borough with the guidance of the Environmental Commission. Major work so far undertaken or underway on these lands includes trash removal, reforestation, trail improvement, signage, and building of a nature arena. In the recent Environmental Survey of households in Atlantic Highlands, respondents expressed strong support for expanding the Preserve and "keeping it natural."

The proposed next stage of land acquisition with Green Acres matching funds would create a trail corridor to join the two existing sections, and extend the area to the east and south by incorporating neighboring forested slopes that are unbolt. If sellers agree and funding is available, these lands would add some 42 acres of public open space. This greenway, if completed, would be a linear park in the eastern half of the Borough, running along a major portion of the southern border of Atlantic Highlands and Middletown.

2. Waterfront at town center

The Borough has long wanted to obtain the privately owned lands in the waterfront zone west of the municipal harbor between the bay and Bay Avenue. These unbolt lands consist of about nine acres (not counting surrounding waters) and include:

- The peninsula extending into the bay and related neighboring mainland. Fishing and pedestrian strolling take place on the peninsula, where there was a railroad/steam boat pier beginning in the 1890s. Mainland portions are largely used for ferry and marina parking.
- The curve of bayfront beach running from the foot of First Avenue westward to Avenue A. The beach and bay waters here are suitable for swimming and related water recreation. Also, the neighboring bay edge has low-water sand flats formed as a "delta" by the mouth of Many Mind Creek and frequently used for feeding by water birds. The western portion of the beach is backed by a dune grass border. (Pending a possibly larger beach acquisition, the Borough is considering developing a small vest-pocket park on a piece of beachfront and adjoining land at the foot of Avenue A which is Borough-owned – an unpaved "paper street" portion of Avenue A).
- On the western portion behind the beach, about half a square block extending back to Bay Avenue. This large lot is bisected by Many Mind Creek and contains about an acre of woodlands. Mature pine trees line its Avenue A and Bay Avenue borders. Most of the land is presently the boat storage yard of the Skipper Shop.

Various ideas have been aired involving different mixes of open space/public recreation uses for these lands, assuming they can be acquired from the present owners. In addition, the Borough already owns a portion of the lands bordered by and west of First Avenue, currently mainly used for ferry parking. This area would also be incorporated in the utilization plans to be developed for the wider western waterfront zone at the town center.

3. Many Mind Creek Greenway

The Environmental Commission has developed specific proposals for creating a greenway along the banks of Many Mind Creek between the bay and Highway 36. This lower reach of the Creek is in the center of the town's population and geography. The current decontamination and earth replacement work by New Jersey Natural Gas presents a one-time opportunity. Done right, we can fashion a creek corridor which is better managed, better serves the needs of landowners, business and the public, and is a more attractive and sustainable natural resource.

The key requirements covered by these proposals for this lower stretch are appropriate bank sloping and vegetation, including fringe wetland species to the high water mark; effective protection against flooding, erosion and degradation of water quality; restoration of natural habitat including shade cover; provision of creekside trails; pedestrian crossing bridges and neighborhood access from the west side of town and to the "backyard" of the business district; and linkage to the Henry Hudson Trail. To achieve these objectives, the basic guideline is to establish a fifty-foot wide buffer on stream corridors in relatively urbanized areas, such as this downstream portion of Many Mind Creek. The property owners involved here include the Borough itself as owner of several tracts, and consultations are needed with several private owners.

The upstream reaches of the creek form the southern and eastern borders of the Borough with Middletown (except for the segment nearest the creek's source inside the western section of Lenape Woods Nature Preserve). On the Atlantic Highlands side of the creek are fairly dense residential neighborhoods. Here the needs for better management of water flows and banks are similar to the downstream portion as described above. A protected buffer is important both for those purposes and for guarding against overintensive development on either side of our Middletown border. Ways of creating or maintaining such a buffer have to be worked out in consultation with owners along both banks.

In some upstream sections, public trail development seems feasible on the buffers to be established along the creek, but this has to be assessed lot-by-lot on both banks. In the meantime, there exists a largely cleared corridor running parallel to and between Highway 36 and the southern stretches of Many Mind Creek. This route contains power lines and poles owned and managed by JCP&L and parts of it are used by some residents as a walkway. Official easements for public access should be negotiated for this corridor. The JCP&L corridor also provides an important inter-town greenway connection: it continues through neighboring Navesink and connects to Hartshorne Woods county park near the iron bridge which crosses Clay Pit Creek.

4. Wagner Creek/Center Avenue Park extensions

Wagner Creek, the only other perennial stream in Atlantic Highlands, forms the western border of the Borough with the Leonardo section of Middletown and requires protection by natural buffers for the same reasons as Many Mind Creek. On one bank of its northern portion are several acres of mixed woodland/wetland protected by the Borough-owned Center Avenue Park. The park also has an upland area used for T-ball, tot lot and parking, and a beach area which is shared between swimming, sunning and walking by the general public and boat launchings by a Hobie cat club boats which leases an adjoining storage yard. This protected zone should be extended in two directions: Eastward along the beach as far as Avenue D, in order to increase public recreational uses of the bayfront and Southward for four blocks along Wagner Creek to provide a buffer and greenway to serve flood control needs, preserve habitat, provide a connection to the Henry Hudson Trail near Highway 36, and achieve other benefits. These acquisitions might be accomplished mainly by negotiating easements or outright purchase for buffers 50 feet wide. It may also be desirable for purposes of neighborhood vest-pocket parks, road

access, wetland protection and/or flood control to add unbolt full lots (e.g. privately owned, land for a paper street owned by the Borough, etc.).

5. Bayside Drive bluffs

Bayside Drive on the eastern end of Atlantic Highlands is bordered on its north side by the bay coast and on its south side by steep slopes and bluffs which rise to 260+ feet above sea level -- the highest point on the Atlantic seaboard of the U.S. Some coastal land in this corridor has experienced and continues to be at risk of "slump blocking." Because of this geological phenomena, it is crucial to protect the slopes from several dangers. These include excessive water permeation and water back-up (e.g. from walls) which increase the weight and the slip and slump tendencies of soil blocks; disturbance of the slope toe which serves as a "foundation" and support for sharp bluffs above; deforestation and heavy drainage which destroy soil stability; etc.

Several conservation areas have been established on the water edge, slope sides and bluff top to offer such protection. The planned Bayshore Trail for hiking and biking along the coast will run parallel to Bayside Drive; its existence as publicly protected and permanently dedicated open space will ensure that the coastal base areas of the bluffs are not excavated or otherwise undermined.

A number of additional very steep areas, however, remain unprotected against development that could seriously undermine their stability and that of lower elevations. In addition, there are important opportunities along this corridor for public access to stunning scenic water views, beautiful forested slopes, and passive recreation opportunities such as hiking. The Environmental Commission proposed that the Borough should be capable of moving to acquire -- and thus to rescue, conserve and dedicate as public open space -- such important segments of land along the Bayside Drive bluffs as they become available.

6. Lenape Woods South

South of the Highway 36 jughandle and west of the King James Care Center is a large semi-circle of flatlands on several levels. Behind are steep slopes with a wooded swale in the eastern area. A number of active sports groups, including local primary and secondary schools and Little League and soccer groups, are working to acquire and preserve these "sandy fields."

Exhibit 8.1: Recreation and open space lands as of July 2000

ACTIVE RECREATION AREAS (Borough owned)	
East Avenue Playground	Half acre, at East Garfield and East Avenues. Regulation basketball half-court. Tot lot: jungle gym, slide, swings (2 toddler, 4 regular), 6 benches
South Avenue Playground	6/10 acre, at Avenue A next to Many Mind Creek. Regulation basketball half-court. Jungle gym and slide, tires for climbing, 2 platform "forts", 2 seesaws, bunny ride, swings (1 tot, 2 regular). Bench. Park to be renovated 2000.
Many Mind Avenue Playground	Half acre, at Navesink and Many Mind Avenues. Regulation basketball half-court. 2 picnic tables and toddler activities.
Harbor Park	4/10 acre, at First Avenue and Sutton Walk. Tot lot 3 tennis courts; Victorian-style gazebo (stage and audience park benches for summer band concerts); and model of "Argonaut" submarine built here in 1896 by Simon Lake, namesake of road in harbor.
Marina and boat basin	20.8 acres, at north end of First Avenue along bayfront. New Jersey's second largest municipal harbor. Inside a 3,000-foot sea wall on Sandy Hook Bay, with access to Atlantic Ocean. Run as a self-supporting Borough utility, the marina provides 168 moorings and 480 docking slips and related launching ramp, supplies ice, gas, diesel, bait/tackle, sanitary pump-out and small boat rentals. Charter boats for fishing and pleasure trips. Waterside promenade and fishing piers. In the harbor area (but outside the dedicated open space) three restaurants, a yacht club, boat storage, and high-speed ferry to Manhattan, whale watching, dinner cruises, and cultural and tourist excursions.

Exhibit 8.1 (continued)

ACTIVE RECREATION AREAS (Borough owned)	
Center Avenue Park and Beach	7.5 acre bayfront park at the western end of Atlantic Highlands next to Wagner Creek. The park is bordered by the bay and Center Avenue. - Unfenced grass field for T-ball games and two covered wooden dugouts - Fenced area of 3/4 acre for storage of sailboats e.g. Hobie Cats and windsurfers. The area is rented with a long-term lease from the Borough by the Sandy Hook Bay Catamaran Club as private facility for members. The Club is responsible to keep beach clean for public. - Public sand beach for fishing, beach walking, sunbathing, wading, windsurfing, canoeing, birding and has gazebo and grills. Beach access is by trail leading from grass field, past the fenced Hobie Cat storage area. - Woodland and woodlands cover several acres bordering Wagner Creek between Center Avenue and the mouth of the creek next to the bay beach. A few narrow pedestrian-made trails wind through the phragmites here, but no organized access and pathway. - Gravel parking lot with 37 spaces for the public and boat owners.
Bayshore Trail (in development)	12 acres. When built, trail will run about 2.7 miles in Atlantic Highlands from western border (Leonardo at Highway 36) to eastern border at Highlands. Continues existing Henry Hudson Trail of Monmouth County Park System, starting in Aberdeen and continuing 12 miles along line of old Central Railroad of New Jersey. Eastward from harbor, trail will follow former rail line along shore, partly on boardwalks through marsh grasses, below cliffs and Bayside Drive, through Popamora Point to the Highlands border. Plans are not yet finalized for route through western Atlantic Highlands where properties are not owned by Borough.
ACTIVE RECREATION (not borough owned)	
Fireman's Memorial Field (owned by town Fireman's Association)	6.8 acres, at West Highland Ave, south of Avenue B. 3 baseball fields, converted for fall football, bleachers, dug-outs, electric scoreboards, PA system, night lights. Cinder track at borders and beside Many Mind Cree Tot lot near Leonard Avenue entrance and parking lot. Field house with restrooms and concession stand.
Popamora Point (owned by Monmouth County Park System)	13 acres, bayfront at eastern border with Highlands. Will be destination within Bayshore Trail for hiking and biking. 1,600-foot long sandy bayfront beach, backed by dunes, trails, woodlands, cliffs. No vehicle access; enter from Shore Drive in the Highlands.

PEDESTRIAN MINI-PARKS (Borough owned)	
Civic Center Park	Half acre, opposite Borough Hall at mid-point of First Avenue business district. Also called "Veterans Memorial Park" and "the town square." Victorian-style pedestal clock at entrance, brick walkway among grass and trees, 4 benches, stone markers for war veterans, flagpole.
Library Plaza	1/10 acre, on East Highland Avenue next to Borough Hall. Cement walks, trees, grassy areas, bike rack, book drop-off box.
Many Mind Creek grasslands	1/4 acre, on West Avenue between Bay/Mount Avenues. Tree-bordered grasslands beside creek, being restored in 2000 as part of creek clean-up.
CONSERVATION AREAS (Borough owned):	
Lenape Woods Nature Preserve	40 acres, with sections at three locations: a) Eastern section: enter at Ocean Boulevard/East Highland Avenue west of Hofbrauhaus; b) Western section: enter at Sears/Washington Avenues, and Mount/East Highland Avenue junction; and c) Cliffside section: below Hillside Avenue along Bayside Drive. Forested slopes with mature oaks, mountain laurels, scenic lookouts, and abundant wildlife. Low-impact uses such as hiking, bird-watching, nature observation. Eastern section trails mostly wood-chipped, includes rustic log-bench "nature arena." Western section contains source of Many Mind Creek. When Bayshore Trail is built, Cliffside section will link it with Ocean Boulevard.
CONSERVATION AREAS (owned by Monmouth County Park System)	
Mount Mitchill Scenic Park	12 acres, east end of Ocean Boulevard, environmentally sensitive hillside down to Bayside Drive. Clifftop outlook to bay, Sandy Hook, and Manhattan (266 feet above sea level). Pavilions, benches, and telescopic viewers. Display panels about landmarks from Mt. Mitchill, coastal habitat, littoral drift, slump block geology. Bike rack, parking for 42 vehicles, port-a-john, flagpoles, swings, jungle gym, picnic tables, short walking trails.

Atlantic Highlands Open Space and Recreation Plan

Existing Recreation/Conservation Lands
- Parks, Nature Preserve
- Bayshore Trail
- Harbor lands and piers

Proposed Acquisitions
- Nature Preserve, waterfront, greenways
- Bayside Bluffs (properties as available)

- Municipal Borders
- Creeks (also marks W and SW borders)

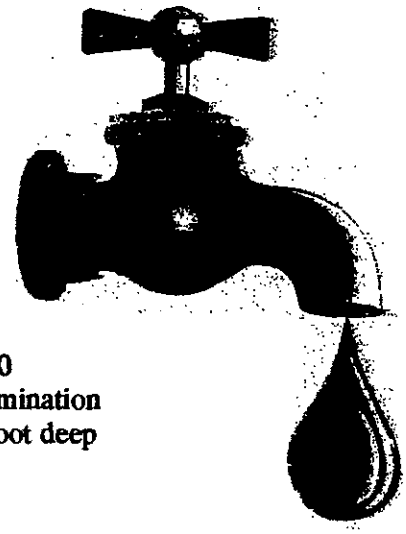
GIS map by David Palamara
Borough of Atlantic Highlands
July 2000

Section 9

INFRASTRUCTURE AND REGIONAL RELATIONSHIPS

Atlantic Highlands infrastructure includes all the services that make a community function effectively with highest standards of safety, security, and public health. Beginning with the drinking water supply, this section discusses sewers, septic systems, recycling, energy sources, transportation, and Borough services such as public works, police and fire fighting as well as agencies specializing in planning, environment, and recreation. The Borough also has collaborating or regulatory relationships with county and state agencies in such areas as soil conservation, watershed management, and economic development.

Drinking water supply



Where does the Borough's drinkable water come from? Is there enough? What treatment does it get? Is it safe? How does it get distributed in town? Who manages all of this?

Sources: All drinkable water in Atlantic Highlands comes from natural water-bearing layers deep under ground, known as aquifers. No surface water is used. This groundwater is drawn from four active wells which tap into the Raritan and Englishtown aquifers 600 feet and 250 feet below the surface. Natural layers of clay protect the wells from contamination which may be in the ground. For example, the driller's log for one 600-foot deep well shows 343 feet of clay in seven layers between 4 and 660 feet under ground, like a multi-layered sandwich.

Atlantic Highlands is allowed to draw about 198 million gallons of water per year from these aquifers, but actual usage was 182 million in 1999 and will perhaps be only 170 million in 2000 with its cooler summer. These aquifers serve wide areas of the state so the New Jersey Department of Environmental Protection (DE) monitors the balance between extraction and natural replenishment, telling towns how much they can draw.

Exhibit 9.1: Your water supply

Wells	No. 1	No. 4	No. 5	No. 6
Location	Lincoln Ave. plant	Lincoln Ave. plant	Leonard Avenue	East Avenue
Depth	600 feet	600 feet	600 feet	250 feet
Aquifer	Raritan formation	Raritan formation	Raritan formation	Englishtown formation
Allowed draw	118.5 million gallons per year			79.2 million gals./year
Average use	Winter: 400,000-600,000 gallons per day. Summer: 600,000-900,000 gallons/day			

DEP is concerned about depletion of aquifers underlying Monmouth County, which is classified as a "critical area." Aquifers are recharged by water infiltrating from surface outcrops, wetlands, stream corridors,

and soils which allow deep penetration of water. If natural recharge areas are developed or covered by impervious surfaces, infiltration can be adversely affected. All Raritan formation outcrops are in Middlesex County. The Englishtown aquifer is recharged along a band of land running from Belford, Port Monmouth and Ideal Beach along the bay shore, southwest 20 miles into Monroe Township in Middlesex County. In Atlantic Highlands it is regularly monitored at a well off East Highland Avenue operated by the US Geological Survey (NJ District).

Treatment: Water pumped from the wells is piped into the central treatment and *distribution plant on West Lincoln Avenue. There, raw well water goes through several steps -- aeration to remove any odor-causing hydrogen sulfide, clarification by adding lime and alum which coagulates iron and settles it into a sludge pit, and filtering to "polish" the water and remove any residual color. Chlorine is added as mandated by DE at the rate of one to two pounds in the 500,000 gallons of water used per day (average), leaving a minuscule residual (0.3 parts per million). The importance of the treatment process is emphasized by the U.S. Environmental Protection Agency which warns that "inadequately treated water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches."

Distribution: After treatment, water is pumped to two storage tanks at high elevations in town so as to maintain water pressure and use gravity for distribution downhill. The tank at Observatory Place holds a million gallons, and 200,000 gallons can go in the tank above East Highland Avenue and Eastpoint shopping center. This is about a two-day supply in summer and three days in winter. If an emergency ever cut off our supply, service could be provided by a connection at neighboring Leonardo with the New Jersey American Water Company.

The distribution system needs constant maintenance and is regularly upgraded; perhaps a fourth of it is over 100 years old. A new valve recently installed on the East Highland Avenue tank increased water pressure between the bayside and the hilltop. Eight-inch pipes have replaced all two-inch and many four-inch ones to expand flow volume. Annual flushing scours out the pipes. Over 200 hydrants provide fire protection, including several dozen recently added.

Such improvements have reduced residents' complaints. There is still occasionally low water pressure in some locations. Dirty water can occur temporarily when sediments which collect in pipelines are disturbed by flushing, firefighting use or illegal opening of hydrants. Some problems are caused by sediment gathering in water main dead-ends, but these will all eventually be eliminated, as already done next to Sears Avenue/Many Mind Creek.

Testing: Water samples from around the Borough are regularly tested by independent water-quality laboratories, and results go to the Borough and DE. Federal and State governments have established test procedures and limits called maximum contaminant levels (MCLs) for over 80 substances found in water. All results from our water tests show no contaminants are present, except for six substances which sometimes occur in minuscule amounts very far below the enforced MCL limits. Our required water tests cover:

- Microbes such as viruses and bacteria -- 6 samples per month. Results are all negative.
- 16 inorganic chemicals. For four years, no lead and copper were found, so testing was reduced from 40 samples a year to 20 samples once every three years; a small amount of lead was detected in the sample from one location in 1999. Very low levels of naturally occurring fluoride and barium have also been detected.
- 62 volatile organic chemicals (VOCs) from industrial and petroleum by-products. Testing four times a year found none, so DE reduced test frequency to once per year.
- Radioactive contaminants occur naturally or from oil, gas or mining activities. Testing is on a reduced frequency of once every four years. Only one contaminant, alpha emitters, was found at very low levels in 1999.

Other tests check on 15 secondary contaminants, which have no health impact but may affect water's odor, taste or appearance or have cosmetic effects on skin or teeth. Chloride levels have remained minimal and steady for many years, indicating that salty sea water is not invading the aquifer. Iron and manganese, tested once every three years, were present in small amounts in this year's results.

Under Federal law, all water users now receive an annual report on drinking water quality, listing only those contaminants which were detected in the water. Our town's first report, covering 1998, was mailed in February 2000. The 1999 report was provided in July 2000 (available from Borough Hall).

Administration: The entire operation is run by the Atlantic Highlands Water Department, an independent, self-sustaining utility within the Borough government. It has 1,800 customers, revenues of $1.83 million a year, and four full-time employees, including one licensed to operate treatment facilities. Its budget comes entirely from user fees.

Sanitary sewers and septic systems

Of the 2,410 units in Atlantic Highlands, 1,946 or approximately 81 percent are serviced by the Borough's sanitary sewer system (See Map 6). A unit is defined as a single-family residence, an apartment, a rented room with private bath, a school, a separate building connected to the sanitary sewer system, or a business with separate toilet facilities. The Borough installs and manages the entire sanitary sewer system.

The homes not presently connected to the sewer system are mainly on the east side of town, such as the areas in the hill section along Ocean Boulevard (east of about 136 Ocean Blvd.) and upper East Highland Avenue and their connecting roads as well as Bayside Drive. The 458 property owners (19 %) not connected to the sewer system utilize septic sewer systems.

Property owners connected to sewers are responsible to maintain their pipe until it reaches the sewer line. Sewer charges are based on the amount of water a property owner uses. Average output per home in Atlantic Highlands is about 260 gallons of wastewater per day. Residents receive a quarterly bill for sewer and water. The current rates as of April 2000 are:

Exhibit 9.2: Quarterly sewer and water rates

Cubic ft. of water used per unit	Water rate per unit	Sewer rate per unit based on water use
From 0 - 500	$ 35.35	$ 88.35
Over 500 - 1,000	45.85	106.40
Over 1,000 - 2,000	* see below	123.50
Over 2,000 - 3,500	* see below	141.55
Over 3,500	* see below	149% of water charge

* Note. Water rate for 1,000 to 3,500 cubic feet is $45.85 plus $2.75 for each extra 100 cubic feet over 1,000 cubic feet; water rate over 3,500 is $224.55 plus $3.30 for each extra 100 cubic feet over 3,500.

Sewer collection and treatment system. Management and operation of the pipelines and pumping system are the responsibility of the Atlantic Highlands - Highlands Regional Sewerage Authority. Beyond the boundary lines of individual property owners, the sanitary sewer system operates primarily by gravity through pipelines running mostly under the streets. The age and condition of the pipes in the system vary greatly. Many pipes are from the original system, dating back to the mid-1890s. As funding becomes available older pipes are being repaired or replaced. All pipelines feed into the main pumping station on the west side of First Avenue across from the Laundromat. A bypass pipe was recently installed at the pumping station to handle any obstruction in the flow.

From the pumping station, sewerage from Atlantic Highlands is then pumped through pipes running north-northwest for about three miles to a secondary treatment plant in Belford on Center Avenue. The plant is operated by the Township of Middletown Sewage Authority (TOMSA) as a regional facility. It receives sewerage from three towns: Atlantic Highlands, Highlands, and Middletown Township. In contrast to Atlantic Highlands, all Middletown and Highlands property owners are on the municipal sewer system.

Maximum plant capacity is 10.8 million gallons per day (mgd), as authorized by the New Jersey Department of Environmental Protection. It currently treats 9 million gallons per day leaving a reserve capacity of 1.8 mgd.. The largest share -- 6.9 mgd -- comes from Middletown Township, whose residents all have sewers. Atlantic Highlands is entitled to send up to 1.3 mgd to the Belford plant. Average Atlantic Highlands' flow in 1999 was 1.2 mgd and it has gone as low as 900,000 gallons per day.

Treatment starts by separating wastewater from solids through a series of large concrete tanks. The solids or sludge generated by the treatment process is trucked to a landfill in Pennsylvania where it is composted. The wastewater is chemically treated to kill any remaining pathogens.

Treated wastewater is then discharged into an outfall pipe 48 inches in diameter. The pipe goes underground back through Atlantic Highlands and Highlands along the bayfront, crosses over Sandy Hook, and then discharges into the Atlantic Ocean approximately 4,000 feet off Sandy Hook. This pipeline is maintained by the Monmouth County Bayshore Outfall Authority.

Stormwater inflow and infiltration of sewer system. Heavy rain or snowmelt draining to the First Avenue pumping station is the most difficult situation for the Borough's system. This stormwater can increase flows up to 1/3 above normal. Basement sump pumps often discharge directly into sewer lines. The Borough has worked to reduce inflow and infiltration over the years. When the reductions are completed, it is expected that enough capacity will be freed up for the Borough to include the remaining 400 residential units if the sewage collection system can be extended.

Septic systems. Homes in Atlantic Highlands which are not connected to sanitary sewers (458 units or 19% of total housing units) are mostly in the steep slope areas in the eastern section of town. These homeowners have septic sewer systems on their properties, whose regular servicing and maintenance is their individual responsibility. The main components in septic sewer systems are a large concrete or steel tank which is buried in the yard, a leach field, and related pipes.

The tanks can hold up to 1,000 gallons. Wastewater comes from the sewer pipes in the house, flows into the tank at one end, and leaves the tank at the other end after a decomposition process that involves three layers. Anything that floats, such as grease, rises to the top and is known as the scum layer. Anything heavier than water sinks to form the sludge layer. Anaerobic bacteria digest the scum and sludge layers. This

decomposition liquefies up to 50 per cent of the solids and scum. In the middle is a layer of fairly clean water. This water contains bacteria and chemicals like nitrogen and phosphorous that act as fertilizers, but it is largely free of solids.

A septic system is normally powered only by gravity. Water flows down from the house to the tank, and down from the tank to the drain field. As new water enters the tank it displaces water already there. This water flows out of the tank to a leach or drain field. A leach field is made of perforated pipes buried in trenches filled with gravel. The water is slowly absorbed and filtered by the soil in the drain field. The size of the field is determined by how well the ground absorbs water and the number of bathrooms and other wastewater sources in the home. In places where the soil contains a lot of clay, a larger drain field is required than where the soil is sandier.

Septic systems need to be managed properly in order to operate efficiently. Yearly checking is recommended and the tank should be pumped periodically. Depending on size and volume of use, pumping may be needed every year, every three years, or as infrequently as every five years. Disposal of certain materials should be avoided or controlled. Pesticides, motor oil, gasoline, paints, thinners, and chemicals pollute groundwater and kill microorganisms that maintain a healthy septic system. Materials such as greases that add to the scum layer and solids that do not decompose readily should also be avoided. Garbage disposals add to the solids and greases in the system and may shorten the time between pump outs.

Older septic systems, as well as ones that are poorly managed, can be subject to decay, breakdown, blockage, and malfunction. This creates not only household problems but also environmental impacts which are risky for the land. The steep slopes already face major water infiltration by drainage from natural surfaces and from building on more and more lots; the addition of septic systems at new houses and the malfunction of aging systems further strains the absorptive capacity of their soils. Waterlogged slopes are more likely to slump or slide because of the added weight and lubrication.

The Environmental Commission has begun collecting information that will lead to a cost/benefit feasibility study of extending sewers into the eastern hills section. The question for many homeowners is whether municipal sanitary sewer coverage can be provided soon, or whether instead they need to invest in the replacement of aging septic systems that may be 30 to 50 years old. The feasibility study would consider extending the current gravity-fed system as well as alternative sewer technologies such as those that involve less slope and property disturbance and lower installation costs. Extensive public input will be invited. If eventual elimination of septic systems proves feasible, its benefits will include reduced environmental risks and environment repair costs, elimination of operation-and-repair responsibilities for homeowners, and maintenance of property values. It is also possible that Atlantic Highlands sewer rates could be reduced since more users would be in the system sharing the fixed debt costs incurred when the Belford treatment plant was expanded some years ago.

Solid waste and recycling

Garbage -- the more we create, the less we know how to handle it. The average New Jersey resident generates approximately *5 pounds of solid waste each day*. This adds up to over 1,800 pounds each year (ANJEC, 2000). Waste management is handled in three ways -- collection and disposal of solid wastes from residences, special handling of restricted and hazardous wastes at the County level, and recyling and waste avoidance measures.

Residential solid waste. The Atlantic Highlands Sanitation Department makes curbside pick-ups of household solid waste twice weekly. Solid waste is disposed of at the landfill of the Monmouth County Reclamation Center on 6000 Asbury Avenue in Tinton Falls. A tipping fee of $55.25 is charged per ton of material for the Borough or for individuals.

Atlantic Highlands alone generated 4,195 tons of solid waste in 1998 (the latest available figures). Regular solid waste totalled 3,491 tons per year and bulk materials and cleanup contributed an addition 704 tons. In 1987, before recycling, Atlantic Highlands generated 5,400 tons per year. Since 1987, Atlantic Highlands' landfill contribution has remained relatively stable, but has risen slightly each year.

At the County Reclamation Center, each day the solid waste is baled, deposited in the landfill, and covered with soil and sand. Each day, the Reclamation Center takes in approximately 1,350 tons of solid waste and has averaged over the past 3-4 years about 450,000 tons per year. Although this figure is down from about 3,000 tons per day before compulsory recycling began in 1987, County residents still generate a huge amount of waste. According to Mr. Lawrence Zaayenga, Monmouth County's Solid Waste Coordinator, in one year, the solid waste generated by Monmouth County residents represents a large 9-story building covering 7.5 acres. He said that the Center is expected to meet County needs until about 2015 before expansion will become necessary. Apparently expansion is not a problem should it become necessary.

Materials banned from the Monmouth County landfill are:

- Newspapers
- Glass food and beverage containers
- Aluminum, tin, and steel food and beverage containers
- White goods (washers, dryers, etc)
- Leaves, stumps, and large tree parts (greater than 3 inches in diameter)
- Concrete, brick, and asphalt
- Pallets and untreated wood
- Hazardous and liquid waste
- Batteries (household and automotive
- Appliances containing freon (refrigerators, air conditioners, dehumidifiers)
- Grass and leaves

Special handling of restricted and hazardous wastes. There are special requirements for disposing of three categories of restricted waste:

- Since asbestos shingles and siding are classified as a restricted waste, the Monmouth County Reclamation Center must be contacted prior to disposal (732) 918-0142. Asbestos is accepted on Wednesdays and Saturdays only, and special bags and labeling are required. Large fines (up to $50,000) can be assessed for improper asbestos disposal.

- Construction debris is also a special case. The Borough will not collect construction debris, so residents must make arrangements for disposal with a private hauler or take debris to the landfill themselves.

- Grass cannot be mixed with waste, but is accepted at a special grass site located at the landfill during normal business hours. Ultimately grass clippings are transported to a compost site. Fees for grass clippings are $3 per carload or $35 per ton. See recycling section below for further details, including disposal of hazardous household waste.

Glass clippings provide a special opportunity for careful environmental action. In New Jersey nearly a third of all summer waste going into landfills consists of grass clipping – a costly and wasteful thing to do. The dollar costs include the charges for the haulers and the fees for the landfill. In addition grass clippings decompose slowly because of the lack of oxygen in landfills. Instead, homeowners can leave clippings on the lawn when mowing. They provide a natural and healthy fertilizer for a growing lawn. Citizens can save the time of bagging clippings and making trips for disposal. An environmentally friendly and useful brochure available at Borough Hall is titled "Grass: Cut it and leave it."

In addition, many types of waste involve pollution hazards and require special handling by the County Household Hazardous Waste Facility, located on Shaft Road in Tinton Falls. It accepts household hazardous wastes such as pesticides, lawn and garden chemicals (fertilizers, herbicides), household cleaners, paints, solvents, thinners, varnishes, pool chemicals, propane BBB tanks, gasoline, motor oil, anti-freeze, batteries and other toxins. Materials must be in marked containers with original labels. Maximum 200 pounds of dry material and 20 gallons of liquid material per visit. The facility requires advance notice to schedule an appointment (732-922-2234). For information call (732) 577-8400 or visit its website on the internet (www.njhazwaste.com).

Recycling. Recycling became compulsory in New Jersey in 1987 with the passage of the Statewide Mandatory Source Separation Act. The goals of the legislation are to extend the life span of existing landfills, recover natural resources, and reduce pollution by encouraging remanufacturing.

Atlantic Highlands recycles a total of about 2,300 tons. This means each household recycles about a ton of waste per year. Recycling saves on dumping fees at the County landfill, and makes our recycling self-financing. Recycling is the law in Atlantic Highlands as provided in Borough Ordinance 894. Violators are subject to penalties under the law including fine, jail or community service. It is a punishable violation if you put recyclables in with regular garbage. If the County finds recyclables mixed when garbage goes to the landfill, the Borough is subject to fines. The recycling program in Atlantic Highlands is overseen by the Atlantic Highlands Sanitation Department.

Monmouth County publishes a recycling directory (available at Borough Hall) with valuable information on many topics including "environmental" shopping, reducing junk mail, chemical-free lawn and garden care, home composting, and where to recycle items such as packing materials, eyeglasses, books, computer printer cartridges, and tires, as well as recycling resources on the internet. Recorded messages are available 24 hours, 7 days a week at Monmouth County Recycling Hotline (732) 577-8400.

When recycling became mandatory, a market existed for recycled items such as glass, metal, and newspapers, and towns could sell these items to offset the cost of pickup. As more and more towns began recycling, the supply of recyclables outpaced the demand, and now the Borough must pay to dispose of these

items. The cost to dispose of recyclables in this way is still cheaper than to have them dumped at the Monmouth County Landfill. For example, it may cost $5 per ton to have newspaper hauled away by a recycler, but disposing of the same ton of newspaper at the landfill would cost over $55. This is known as "cost avoidance."

Residential curbside collection is twice each month. For this purpose, the Borough is divided into two zones: Zone 1 has pickups on the first and third Wednesdays of each month and Zone 2 has pickups on the second and fourth Wednesdays. Downtown businesses have recyclables picked up every Wednesday.

Materials picked up curbside are:

Newspapers - tied in bundles, 8 to 10 inches high
Corrugated cardboard - flattened and tied in bundles
Place the following in rigid containers, comingled, not separated:
Aluminum cans
Tin, steel and bi-metal cans
Glass bottles and jars
Plastic #1 and 2, but not margarine/butter tubs or baby wipe containers

Large items are picked up twice a month on the Saturday following the Wednesday pickup. Trucks automatically go to all streets and pick up bulky trash such as computers, televisions, furniture (upholstered, wood, metal, glass), carpeting, mattresses. For appliances, Borough Hall must be notified to arrange for special pick-up; the trucks do not pick-up construction or demolition debris. The Borough notifies residents about the seasonal schedule for pick up of brush, yard waste (no grass), and leaves.

The Borough Recycling Center is located at the end of West Lincoln Avenue, to the west of West Avenue. The Center accepts the same items as the curbside pickup plus mixed paper (junk mail, magazines, catalogs), high grade paper (letterhead, computer paper), phone books, brush and yard waste (no grass), used motor oil and anti-freeze, and car batteries. Paint cans which are empty and dry with lids removed can be placed with regular trash or recyclables. Household batteries are accepted at Borough Hall during business hours.

WHY RECYCLE?

It has economic and environmental benefits. This stuff no longer goes into landfills. As much as possible, it's re-manufactured into new products -- glass reshaped, newspaper remade as paper; plastic drink containers become lumber. Recyling saves resources/raw materials.

It costs you nothing. Atlantic Highlands recycles about 2,300 tons, or a ton per household, every year. It sells the stuff, but not at a profit. But it saves on dumping fees at the County landfill, and makes our recycling self-financing.

It's the law as provided in Borough Ordinance 894. Violators are subject to penalties under the law, including fine, jail and/or community service. It's a punishable violation if you put recyclables in with regular garbage, and if the County finds them mixed when garbage goes to the landfill, the Borough gets fined.

Contacts: Clarify what to do: call Borough Hall at 291-1444. Give ideas for a cleaner community.

Becoming a green consumer. Recycling is one way to reduce this flow of waste, but practicing source reduction when shopping is the best way to reduce our growing waste stream. Consider the statement that almost $1.00 of every $10.00 on the average grocery bill goes towards packaging costs (Koster, 2000). The Association of New Jersey Environmental Commissions (ANJEC) suggests ways all of us can become green consumers by practicing the Four "R's" of Environmental Shopping:

- REDUCE the amount of trash discarded (e.g. stop unwanted junk mail by mailing your name, home address, and signature to: Mail Preference Service, Direct Marketing Association, PO Box 9008, Farmingdale, NJ 11735-9008).
- REUSE containers and products (e.g. use rechargeable batteries, refillable containers, reusable cloth grocery bags, and bulk products)
- RECYCLE as much as possible
- REJECT excessive packaging, non-recyclable packaging and products that are harmful to the environment (e.g. buy local products, use cardboard alternatives to styrofoam products or paper rather than plastic products).

Every household can make earth-friendly decisions that will go a long way towards solving solid waste problems.

Electricity

Electricity can be generated in a number of ways with different impacts on the environment. Electric generation, transmission, and distribution are the services that consumers use and pay for when they receive electricity. First, electricity is produced or generated at power plants or generating stations. From there, electric energy is transmitted on high-voltage lines to areas where it will be used. Then, the local electric company, like GPU Energy, uses its wires, transformers, substations, and other equipment to deliver the electricity to homes and businesses.

Until recently, one company, GPU Energy, our current Electric Distribution Company (EDC), handled both the supply and delivery of electricity. Now with the restructuring of the electric utility industry, consumers can shop, compare, and choose a company to supply their electricity, the Electric Generation Supplier (EGS). The intention was greater energy savings for the consumer and the chance to choose cleaner power and help protect the environment.

Restructuring of the New Jersey electric utility industry began in 1998. Through New Jersey's Energy Choice Program, consumers were able to choose an electric generation supplier other than their local utility. Consumers' electric bills now provide separate information (called unbundling) about electricity generation, transmission, and distribution. Whether or not consumers chose a new electric generation supplier before August 1999, GPU Energy continued to be the sole distributor to homes in Monmouth County, and to read electric meters in our service area and prepare electric bills. GPU also supplies electricity for customers who do not choose an alternative electric generation supplier. Rates for the local electricity delivery company (GPU Energy) are overseen by the New Jersey Board of Public Utilities.

Consumers who wish to select a generation supplier other than GPU may wish to contact New Jersey Energy Choice at its toll-free telephone hotline (1-877-655-5678) or its webpage (www.njenergychoice.com) and get a list of electric generation suppliers provisionally licensed by the New Jersey Board of Public Utilities. Before making any changes in an energy supplier, consumers should be sure to ask questions about price, cancellation terms, billing, how electricity is generated, and the fuel mix and environmental impact of the

electricity that will be purchased. For further information contact the New Jersey Board of Public Utilities at (973) 648-4443 or www.njbpu.com.

GPU's current energy sources for electricity are: coal (49 per cent), nuclear (34 per cent), gas (7 per cent), oil (6 per cent), large hydroelectric (2 per cent), and renewable energy from solid waste (2 per cent). No other renewable energy sources such as captured methane gas, fuel cells, geothermal, small hydroelectric, solar, wind, wood or other biomass are currently used to generate GPU's electricity. According to GPU statements, "GPU has made no guarantee as to the environmental characteristics of the energy it currently supplies." A report GPU sent to its customers in October 2000 shows the amount of air pollution associated with GPU's electricity generation in the region compared to the New Jersey benchmark for all generation suppliers. These data show that GPU's "greenhouse gas" and acid rain components have higher pollution levels than the benchmarks. GPU's carbon dioxide air emissions were 126 per cent vs. 100 per cent for the NJ Benchmark; nitrogen oxide emissions were 153 per cent vs. 100 per cent for the NJ benchmark; and sulfur dioxide emissions were 396 per cent vs. 100 per cent for the NJ benchmark. According to GPU, greenhouse gas (carbon dioxide) "may contribute to global climate change" and other components (sulfur dioxide and nitrogen oxides) "react to form ground level ozone, an unhealthful component of smog." (GPU customer insert, October 2000).

During critical hot or cold months when extra power is needed, electricity is purchased from out of state utilities and transferred over a power grid. Nuclear power used by GPU is produced through the Oyster Creek Nuclear Power Plant located in Lacey Township and owned by GPU. New Jersey's Energy Supply Master Plan encourages the trend away from nuclear power. One solution is to encourage energy conservation.

Natural gas

Natural gas service is provided by the New Jersey Natural Gas Company, headquartered on Highway 34 in Wall Township. It currently supplies natural gas to more than 161,793 customers/households in Monmouth County. Natural gas pipelines cover almost all of Atlantic Highlands.

Transportation

Ferry. A ferry line run by Seastreak provides daily service between the municipal harbor of Atlantic Highlands and Manhattan. The 45-minute trip goes to Pier 11 at the foot of Wall Street and to East 34th Street and the East River. As of mid-year 2000, there were four morning and four afternoon/evening departures from Atlantic Highlands to the city, and two morning and seven afternoon/evening arrivals in Atlantic Highlands from the city. Hundreds of commuters from surrounding areas and many local residents travel on these boats every day. Schedule information is available by phone at 1-800-BOATRIDE. Seastreak also offers service to and from neighboring Highlands. New York Fast Ferry provides another service operating from Highlands.

Bus and train service. Local bus lines are operated by New Jersey Transit. The M24 bus stops at First Avenue and Center Avenue in the Borough and takes passengers through Leonardo to Campbell's Junction in Belford, Red Bank, Highlands and points between.

Academy Bus lines stops on Highway 36 at both Grand Avenue and First Avenue for service to the Port Authority Terminal on West 42nd Street in Manhattan. In our area, it makes stops all along Highway 36 between Keyport and Highlands, and some runs also make side loops off Highway 36 to the bay shore in Keansburg and to Middle Road in Hazlet.

New Jersey Transit's North Jersey Coast line provides train service between New York Penn Station, Newark, several stations in our area, and as far south as Long Branch and Bay Head. The nearest stations to Atlantic Highlands are Red Bank and Middletown.

Highways. Parallel to the southern border of Atlantic Highlands runs State Highway 36, a four-lane road which is integrated with the street grid of the Borough. From First Avenue eastward, this roadway is deliberately designed to be different from the rest of the Highway, which is an unrelieved paved ribbon coming from Keyport. Here, it has a median strip planted in grass, contains flagpoles and ornamental light posts, and is known as Memorial Parkway. Unlike the dense commercial strip along the rest of Highway 36, most of this Parkway section in Atlantic Highlands is bordered by residential housing, with some houses on the eastbound side used by small business and professional offices.

Highway 36 is a main channel for road traffic between Highlands, Atlantic Highlands, Belford and towns all the way to Keyport. There, it links to limited-access long distance tolls roads: the Garden State Parkway at Exit 117, which leads north to connect with the New Jersey Turnpike at Exit 14. For travel southward, road travelers from Atlantic Highlands access the Garden State Parkway at Exit 109 in Red Bank.

Local streets and roads. First Avenue and Ocean Boulevard are the only two Monmouth County routes in Atlantic Highlands and they are maintained by the County. All other Borough roadways, except State Highway 36/Memorial Parkway, are maintained, repaired and repaved by the Atlantic Highlands street department. The department keeps a running list of avenues and streets in need of repaving, and each year the most needy cases are scheduled for work within the available budgetary resources. The department also prepares road signs as mandated by the Borough with advice from the Police Department regarding traffic and safety concerns.

Marina

The second largest municipal harbor in New Jersey, the Atlantic Highlands Marina is run as a municipal utility under the guidance of the Mayor and Council of the Borough. It is governed by an appointed Harbor Commission of five members and two Borough Council representatives. The Commission oversees harbor operations and finances, sets fee rates for all users, adopts utilization rules and regulations, generally ensures good upkeep and repair, and develops improvement projects subject to Council approval. A full-time Harbormaster is responsible for planning and supervising daily operations of all types. Details on the marina facilities and activities are given in section 4, "Coast and Bayshore."

Borough government structures

Under the guidance of the Mayor and Council, the Borough government has responsibility for a number of facilities and services which are part of the infrastructure of the town:

Public Works. In this department are two utilities, both of which are self-financing: the harbor (described in section 4) and the water supply and sewer system (detailed above). The department also includes staff and equipment devoted to street maintenance and repair, sanitation and recycling, and garage and mechanic services. The Borough Administrator is the manager of these operations. In addition, the harbor is governed by an appointed Harbor Commission.

Police Operations and emergency services. The Atlantic Highlands Police Department provides public safety services for the town as a whole as well as Harbor Security which serves the marina. The Borough Administrator and the Police Chief have oversight of these services. The Fire Department and the First Aid Squad, as well as emergency planning and management functions, are supervised and staffed by volunteers, and work in liaison and coordination with the Borough Administrator.

Commissions and agencies in specialized fields. The Mayor and Council appoint selected citizen-volunteers to twelve such groups which have specialized mandates. These include five groups which deal with physical facilities and nature issues -- the Planning Board, Harbor Commission, Regional Sewerage Authority (joint with the Highlands), Environmental Commission and Shade Tree Commission. Seven other bodies are mainly focused on community services, including the Recreation Committee, Library Board, and Youth Committee as well as groups concerned with senior citizens recreation, firemen's field house, public assistance and rent leveling.

Administrative support. The staff responsible for administrative support include the Borough Clerk; finance staff such as the Chief Financial Officer, the Tax Office, and Utility Collections staff, with review by the independent Borough Auditor; specialists in physical development plans and actions such as the Borough Engineer, the Construction Office and the Code Enforcement and Zoning Officer; and library and special services staff. Legal services are provided by the Municipal Court Judge, the Borough Prosecutor and the Borough Attorney.

Planning and regional/state relationships

Borough level. Development in Atlantic Highlands is guided by the Borough Council and by the Planning Board whose responsibilities include zoning issues. The Borough has adopted a comprehensive set of "Development Regulations" which define policies, standards, practices and procedures to be followed in all aspects of development, ranging from building specifications, drainage and steep slope protection, to lighting, signage and parking provisions. The Borough Engineer and the Code Enforcement and Zoning Officer advise on development prospects and actions. Since its first meeting in February 1998, the Environmental Commission has responded to a number of requests for comments from the Planning Board. It has also prepared reports which suggest policies and regulations for Lenape Woods Nature Preserve; analyze plans for post-dredging restoration of Many Mind Creek and recommend creation of a greenway; propose a five-year Open Space and Recreation Plan for the Borough and for possible "Green Acres" funding from the State; and collate information for residents on selected environmental topics (a series of "Greensheets").

In March 2000, following extended study and documentation, the Borough was named a designated "Center" under the State Development and Redevelopment Plan. This designation has significance for the Borough's future in several ways. It signifies that our town center is a focal point for the surrounding region in terms of downtown renovation, transport links, coastal role, and similar elements of infrastructure and development. It entails the incorporation in Borough regulations and ordinances of the standards and other requirements laid down under the Coastal Area Facility Review Act (CAFRA), which in turn provides the Borough with preferred fast-track treatment of its applications for CAFRA permits (see CAFRA details under "state level" below). And it opens up improved opportunities for State grants and co-funding of Borough revitalization programs.

County level organizations also have roles in the planning process. The Monmouth County Planning Board establishes broad guidelines, projections and databases relating to development and growth. The County Park System, governed by the Board of Park and Recreation Commissions, has major programs for open space preservation and parkland acquisition, in addition to its ongoing tasks of operating and maintaining over 10,000 acres of existing county parks. Recently, the Monmouth County Planning Board and the county's Environmental Council helped establish nine regional councils to coordinate watershed planning and management in various subregions of the county, as mandated by the New Jersey Department of Environmental Protection (DE). Atlantic Highlands is part of the Bayshore Regional Council which oversees the watersheds of 13 creeks that drain into the bay as well as four lakes. For further information, see the watersheds discussion in Section 4 and www.shore.co.monmouth.nj.us/area12 for County information.

State level. Among New Jersey State organizations, the Department of Environmental Protection has considerable influence over all municipalities' plans and actions concerning such fields as watershed management, drinking water supply, land use, coastal facilities, open space and recreation, historical preservation and archaeological sites. It develops substantive guidelines and legal regulations, as well as education and public information programs, for many environment-related issues and provides matching funds for certain priority areas, including "Green Acres."

The DE administers the Coastal Area Facility Review Act (CAFRA), originally enacted by the legislature in 1977 and amended in 1994, which provides for DE to assess and decide on plans for the use and development of coastal resources. The primary purpose of CAFRA is to provide added protection to sensitive coastal areas located along the edge of the Atlantic Ocean, Raritan Bay/Sandy Hook Bay, and Delaware Bay. CAFRA legislation attempts to provide "adequate environmental safeguards" for shore development while encouraging "the development of compatible land uses in order to improve the overall economic position of the inhabitants of that area." If a proposed development project is within the CAFRA region, it is required to adhere to the CAFRA regulations and to apply to DE for the relevant permits under CAFRA.

CAFRA regulations permit three acceptable levels of development: high, moderate, and low intensity expressed as the percentage of an area which can be potentially used. For example, the guidelines for low intensity development allow structures and impervious paving up to a maximum of 3 percent of the area; for the moderate and high intensity levels of development, the maximum figures are 30 percent and 80 percent. However, certain "special areas" on the coast are not to be developed, including navigation channels, marina moorings, intertidal and tidal shallows, filled water's edges, flood hazard areas, wetlands, wetland buffers, intermittent stream corridors, steep slopes, historic and archaeological resource sites and special hazard areas.

Under the New Jersey Department of Agriculture, 16 soil conservation districts are responsible for implementing state laws to ensure control of soil erosion and sedimentation, reduce the danger from stormwater runoff, and retard non-point source pollution from sediment. Their staff review and approve plans for these purposes from all development and construction projects involving disturbance of more than 5,000 square feet of land for public, commercial, and industrial facilities (including parking lots), two or more single-family homes or multi-family residences. Monmouth and Middlesex Counties make up the "Freehold Soil Conservation District" which has its office in Manalapan.

Interstate and Federal levels. The U.S. Army Corps of Engineers is also involved in design and approval of projects for dredging, flood control, navigation improvements and similar purposes, including collaboration with the state DEP in those fields. In addition, the Port Authority of New York-New Jersey has a role in harbor and navigation activities. The Federal Emergency Management Agency has assisted in harbor restoration in the aftermath of damaging hurricanes and storms.

Section 10

ENVIRONMENTAL SURVEY

Purpose

This report summarizes the results of the survey developed by the Atlantic Highlands Environmental Commission and conducted in Spring 2000. The overall goals of the survey were to help the Environmental Commission open doors of communication to the community, identify ideas for future projects, and encourage community participation in positive ways. The long-term purpose was to provide information to elected officials as they plan for the Borough's future. Borough Council members and administrative staff were invited to make suggestions and approved the final drafts of the survey.

The specific purpose of the survey was to obtain residents' views on the following environmental issues: attractive features of Atlantic Highlands; opinions on future development; familiarity with and suggestions or comments about Lenape Woods Nature Preserve; reactions to the idea of creating a Many Mind Creek Greenway; topics felt to be most important for the Environmental Commission to address; and willingness to help with the work of the Environmental Commission.

Methods and response

In mid-March, the Atlantic Highlands Environmental Commission mailed the survey to the 2,600 households and businesses in town. Posters inviting all residents to complete their surveys were hung in store windows along First Avenue. The survey instructed that one adult per household was to complete the survey.

A total of 433 surveys were returned out of an estimated total of 1,774 households in 1999. This represents a return of 24 percent, an unusually high response for a community survey. The survey gave residents an opportunity to check off responses, but also invited comments. Most respondents (about 80%) seemed to welcome the opportunity to write in comments, both many positive suggestions and a few critical comments.

In order to determine if the people who responded to the survey represent a cross-section of the Borough, the survey asked about the respondents' age and number of children under 18 living at home. As shown below, the percentage of survey respondents by age category (18 years and over) was similar to the overall population characteristics of Atlantic Highlands as reported by the Monmouth County Planning Board based on the 1990 Census of Population.

Exhibit 10.1: Comparison of survey respondents to percentages in population by age group

Age Group	Percent responding	Percent of Atlantic. Highlands adult population as of 1990 Census
18-19 yrs	1%	4%
20-40 yrs	30%	44%
41-65 yrs	50%	35%
over 65 yrs	19%	17%

The age group 41-65 years was somewhat overrepresented in our survey (50% vs. 35%) and the age group 20-40 years was underrepresented (30% vs. 44%). Compared to the 1990 Census, adults in households without children in our survey were similar to the estimates in the 1990 Census (71% in our survey vs. 68% in the 1990 Census). One third of respondents (35%) have lived in Atlantic Highlands 5 years or less, 28 percent have lived in town 6 to 19 years, and 36 percent are long-term residents -- 20 or more years (including 15% who have lived in town 40 or more years). Based on a sample of this size, one can say with 95 percent confidence that the results reported here could be less than five percentage points in either direction (the margin of error).

Summary of findings

The actual survey with the tally of total number of responses is shown in Exhibit 10.2.

Question 1: What do you find attractive about living in Atlantic Highlands? Residents were close to unanimous in their agreement on this item. The feature that was cited as most attractive was "small town atmosphere" selected by 90 percent of the respondents, followed closely by waterfront and views (89%), natural beauty (79%), and boat harbor (79%). The commuter ferry to New York City was selected by 51 percent of respondents and Lenape Woods Nature Preserve was also reported as a major attraction by 48 percent of respondents. Other characteristics mentioned by respondents related to downtown (e.g. "great downtown," "ability to walk to town to shop"); recreation (e.g. proximity to the ocean, County parks, bike trails, and Sandy Hook); "great people;" "Victorian town/historical aspects;" police/fire services; "very clean town;" stable housing; no mega-housing developments; and Many Mind Creek.

Question 2: How would you like to see our town develop in the future? The highest percentage of residents chose a future with more public open space (48%). Those requesting more retail shops (39%) specified more high quality restaurants/shops and expressed impatience with the planned construction of a bed and breakfast. A total of 174 respondents (40%) offered a variety of other suggestions about future development. The highest number of suggestions related to completion of the bike/walking trail along the waterfront. The next highest number of comments related to more activities for children and youth (e.g. recreation center for teens, skateboard park). Others expressed strong preferences related to limiting development (e.g. "NO! more housing," "fewer big houses on small lots," "NO more offices or shops" and "No Burger King-type of development").

Suggestions were made for a cleaner, more attractive First Avenue (e.g. Victorian/historical or seaport-type town); more parking; a bus to the harbor; clean up Route 36 highway properties; better use of harbor area (not all for parking) and expand old pier property for business and recreation; more swimming beaches, a swimming pool, tennis courts, bowling, jazz concerts, town/block parties; control tree destruction; expand nature areas (instead of macadamizing the harbor for a parking lot); better schools; more effective removal of large items, leaves, and brush; improved roads and more sidewalks. Other requests included sewers, cooperative gardens, minorities on the police force, a better library, restrictions on cats and dogs, and better public transportation (shuttle to train station).

Question 3. Have you walked in the Lenape Woods Nature Preserve? The results of the survey show that the Preserve is quickly gaining visibility and is actively used by close to half of the respondents. A total of 193 respondents (48% of the 399 people who answered this question) said they walked in the Preserve. Fifty-two percent (206 people) said they had not walked in the Preserve including people who said they were too old or disabled or just had not had time to go but intend to walk there in the future. Less than one-fourth (23%) of the 399 respondents (N=91) said that they don't know where it is.

Question 4. What are your comments or suggestions about the Lenape Woods Nature Preserve? About half of the respondents (N=209) took the time to offer suggestions and comments about the Preserve. The comments were overwhelmingly positive and enthusiastic; only a handful of residents (N=4) made negative comments such as "waste of good land" or "bad investment." Examples of the strongly positive comments include "great job on the woods," " given the density of homes any effort to expand green space is highly desirable," "Love it," GREAT," "Good job, " "Expand it, connect the 2 sections," "Wish more could be saved." A common suggestion, which Scouts and the Environmental Commission are working on, was a request for better signs and trail markings and maps. Other suggestions were requests for more publicity about events in the Preserve as well as self-guided nature trails, bird feeders, benches, handicapped accessibility, better parking, continuation of community clean-up events and involvement of school and youth groups. Two respondents requested mountain biking trails, but three residents said " No bicycles." One resident made several suggestions about dumping and parking problems.

Question 5. What is your reaction to creating a Many Mind Creek Greenway? Almost everyone answered this question (430 of the 433 respondents) and the overwhelming majority (80%) thought it was a "Very good idea." Only 10 percent thought it was "not important" and the remaining 10 percent thought it was a "so/so idea." This provides a strong mandate for the Environmental Commission and the Borough government to act expeditiously on the Many Mind Creek Greenway concept plan to the extent possible.

Question 6. What are your comments and suggestions about Many Mind Creek and the Greenway idea? Apparently Many Mind Creek and the Greenway idea touched a very important topic for Atlantic Highlands residents. A total of 210 people wrote comments, predominately favorable and enthusiastic. Examples of strong positive comments are: "Excellent, great idea, very important to have access to our many resources, hurry up, what you propose sounds great, another town asset waiting to happen, we need this, accelerate the studies, then DO IT!!" Several residents commented on the responsibilities of New Jersey Natural Gas to continue and finish the clean-up. Only 14 residents made negative comments (e.g. "more important projects, don't waste any money on it, save the money and open up our harbor to us, it is one big parking lot.") and 4 people did not know the location of Many Mind Creek.

Opinions and comments about other topics. Respondents selected the 5 topics they thought most important for the Environmental Commission to address. Rank ordering of the most important topics were:

1. Bike paths, walking trails, greenways	59% (N=255)
2. Harbor	52% (N=225)
3. Trees and slope preservation	51% (N=222)
4. Lenape Woods Nature Preserve	34% (N=149)
5. Storm water runoff and drainage	33% (N=145)
6. Many Mind Creek	32% (N=139)

The remaining topics in rank order were the town's natural resources (N=134), environmental education in schools (N=121), air quality (N=109), recycling (N=107), other open space (N=106), and noise (N=67).

1. Bicycle paths, walking trails, greenways (59%). This topic, the highest ranking topic, generated many comments strongly in favor of finishing the path as soon as possible (e.g." waited years for bike/hike trail along beach - just do it!" "Bike paths are fabulous." Only 4 of the 50 comments made in this section were negative (e.g. "we have enough," "no bikes near harbor"). Respondents wrote many comments in favor of the bike path in several other sections of the survey, particularly in response to the question: "How would you like to see our town develop in the future?"

2. Harbor (52%). Comments under this topic, ranked the second most important, were generally positive (e.g. "excellent job," "best in New Jersey," "our greatest asset--progressing nicely") with several complaints and suggestions. Residents requested cleaning and maintaining the old pier west of the harbor to encourage windsurfers and kayakers, more slips, more small sailboat activities, limiting growth of harbor, additional parking, concern about debris dumping in the Harbor, and better use of area instead of a mass "parking lot where cars get a million dollar view free for the day."

3. Trees and slope preservation (51%), also ranked highly with respondents. Residents were knowledgeable about the necessity of trees for slope security, erosion control, and our special ecosystem. They also expressed strong interest in limiting building on the slopes, and vigilance about banning harmful construction.

4. Lenape Woods Nature Preserve (35%). Comments in this section essentially repeated earlier positive comments in Question 4 (e.g. "important to have places like this" "good idea--keep it up.") and requests for expansion of Preserve, and better mapping.

5. Stormwater runoff and drainage (34%) was another very important topic for residents (N=145). Many residents commented that the situation was inadequate/disgraceful, often clogged, needs attention, and a big problem on many streets. They also noted that the drainage problems affect our rivers and bays.

6. Many Mind Creek (32%). Comments in this section repeated or expanded on issues discussed more fully in Question 6 above. Some points mentioned included "is this really safe?" "make it pollution-free," "is our water supply contaminated from Many Mind Creek pollution and is the ground is contaminated?" They also suggested complete remediation of the creek, leaving the banks natural, and education/enforcement of upstream dumping.

7. Town's natural resources (31%). Only 8 comments were noted here; all were covered in other sections.

8. Environmental education in schools (28%). Comments on this topic involved the idea that "Education is key" and stressed the importance of learning about pollution, littering, recycling, and appreciating Many Mind Creek.

9. Air quality (25%). Comments related to the idea that air quality is a state or regional issue and criticism about approval of the new Burger King Restaurant because it will contribute to pollution from increased traffic.

10. Recycling and the recycling center (25%). Comments included requests for more and longer hours particularly during the weekend, better organization and improvement of the recycling center, information about location, increase in number of types of recyclables (e.g. cereal boxes, milk cartons), have topsoil and mulch available, and weekly garbage service instead of biweekly to allow for more frequent pickup of larger items including yard debris.

11. Other open space (24%). Comments were similar to those made in sections discussed above. Comments repeated here included limit development in town, create a new master plan with larger lots, save as much as we can for quality of life, and create more parks. Specific suggestions included natural area along the bay, control of the waterfront, and acquisition of properties such as the old Clearwater Pool ("Sudden City") and along the Harbor.

12. Noise (15%). Complaints concerned airplanes, motorcycles, car radios, fire sirens, barking dogs, and traffic exceeding speed limits.

13. Other topics (40%). Approximately 175 residents specified other topics that were important to them. The most common issue mentioned was replacing septic systems with sewers. Protecting drinking water also received a good bit of attention. Residents also expressed concerns about litter, garbage, and dog clean-up; road repair and enforcing the speed limit; flooding on First Avenue; responsible development (e.g. "strengthen zoning laws to discourage subdivision of existing large lots"); recreation for children and young adults; light pollution; more fishing piers; bathing beach; swimming pool; and historic preservation.

"Would you like to help with the work of the Environmental Commission?" The final section of the survey asked for volunteers. A grand total of 100 different people volunteered to help with the work of the Commission and many volunteered to help in more than one area. A total of 42 people volunteered to help in Lenape Woods Nature Preserve (e.g. maintaining trails, planting native species), 15 volunteered for educational programs for adults or youth, 53 people signed up for community clean-up including beach and trails, 12 offered to help with fund raising or publicity, and 19 were interested in water quality monitoring (some people volunteered for several tasks). Other interests and skills that were offered included computer work and repair, photography, organizing town picnics, public speaking, research, PC skills, typing and editing, web page development, writing, engineering (roads, storm sewer, etc), contributions to harbor (including band concerts), and even membership on the Environmental Commission. Those who signed up for community clean-up were contacted in April 2000 and invited to participate in the Earth Day beach debris collection as part of Clean Ocean Action's efforts. About 30 people including children filled many garbage bags with Atlantic Highlands beach litter. The Commission plans to invite all volunteers to form committees to further the work of the Commission.

Exhibit 10.2: Environmental Survey

W A N T E D: YOUR OPINIONS ABOUT OUR TOWN'S ENVIRONMENT

A Survey of Residents by the Atlantic Highlands Environmental Commission

Last November, Atlantic Highlands residents voiced their opinions about open space. They overwhelmingly voted to establish an open-space preservation program to buy, preserve, and improve lands for open space, recreation, and parkland. The vote was 1,106 yes and 435 no. Now we would like to know your thoughts about other environmental issues.

Please take a few minutes to complete the survey and return it to us as soon as possible, but no later than March 27, 2000. You may use the enclosed envelope (don't forget a stamp) or drop it off in designated boxes in Borough Hall or the Atlantic Highlands Library. Please see that an adult completes only one survey per household. Thanks very much, we appreciate your thoughts.

A. GENERAL QUESTIONS

1. What do you find attractive about living in Atlantic Highlands? (Check all that apply):

(79%) 343 natural beauty
109 recreation
(90%) 390 small town atmosphere
(72%) 312 boat harbor
(89%) 387 waterfront and views
136 fishing
146 biking
84 athletic fields
(51%) 222 commuter ferry to NYC
123 availability of buses and trains
105 schools
184 access to NYC cultural events
15 job opportunities
(48%) 210 Lenape Woods Nature Preserve
___ other (specify)_____
_____

2. How would you like to see our town develop in the future? (Check all that apply):

168 more retail shops
(48%) 206 more public open space
137 more active recreation
89 stay the same
39 more offices/industry
15 more housing
101 more entertainment
___ Other (specify)_____
_____

B. LENAPE WOODS NATURE PRESERVE

The Environmental Commission plans trails and works with community groups on projects to help restore and maintain the Nature Preserve for the Borough. The Preserve is currently 40 acres and has two ridge-top entrances (at East Highlands Ave. near junction with Ocean Blvd. and at East Highland Ave. near Sears Landing Road) and an entrance downhill (at the end of E. Washington and Sears Avenues). The Commission has sponsored such educational community events as hikes, bird walks, poster contests, and environmental fairs around Earth Day in April and Green Sunday in October.

3. Have you walked in the Lenape Woods Nature Preserve? Yes 48% (193); No 52% (206); Don't know where it is 23% (91) Tot.399

4. What are your comments or suggestions about the Lenape Woods Nature Preserve?

_____

_____

[PLEASE TURN PAGE]

C. MANY MIND CREEK - Many Mind Creek originates in the hills of Lenape Woods Nature Preserve, runs along streets behind Route 36 to the Foodtown, then crosses under Route 36, runs parallel to First Avenue, and then ends at the Bay. The Environmental Commission is gathering information about creating a Greenway along the part of Many Mind Creek that runs through town from Route 36 and the Bay. The Greenway would be a place to walk and enjoy nature.

5. What is your reaction to creating a Many Mind Creek Greenway?

Very good idea 80% (342) So/so 10% (44) Not important 10% (44) Tot.430

6. What are your comments and suggestions about Many Mind Creek and the Greenway idea?

_____

_____

D. YOUR OPINIONS ABOUT OTHER TOPICS - For the topics listed below, please indicate the 5 topics that you think are most important for the Environmental Commission to address. Circle the letter next to the 5 topics you selected. Add any comments on the topic in the space provided and use another sheet of paper for additional comments if you wish.

	(Circle 5 topics)	Comments?
	109 a. Air quality	
#1	255 b. Bike paths, walking trails, greenways	
	121 c. Environmental education in schools	
#2	225 d Harbor	
#4	149 e. Lenape Woods Nature Preserve	
	139 f. Many Mind Creek	
	67 g. Noise	
	106 h. Other open space	
	107 i. Recycling and Recycling Center	
#5	145 j. Stormwater runoff and drainage	
	134 k. Town's natural resources	
#3	222 l. Trees and slope preservation	
	175 m. Other topics? (specify)	

E. ABOUT YOU

7. Your age?under 20 yrs 5(1%);20-40 yrs 126(30%);41-65 yrs 214 (50%);over 65 yr 81(19%).tot.426

8. How many children under 18 years are living at home? 0=71%;1 child=13%;2=12%;3+=4%.tot.395

9. How many years have you lived in Atlantic Highlands? <= 1yr=9%; 2-5 yrs=26%; 6-10 yrs=13%; 11-19 yrs=15%; 20-39 yrs=21%; 40+ yrs=15%. Total 403

F. Would you like to help with the work of the Environmental Commission? (check all that apply. If you would like to be contacted please give us your name and phone number.)

42 Lenape Woods Nature Preserve (e.g. maintain trails, plant native species)
15 Educational programs for adults or youth
53 Community clean-up including beach and trails
12 Fund raising or publicity
19 Water quality monitoring (e.g. Many Mind Creek)
___ Other interests and skills you would like to contribute?_____

Name _____ (optional) Telephone_____(optional)

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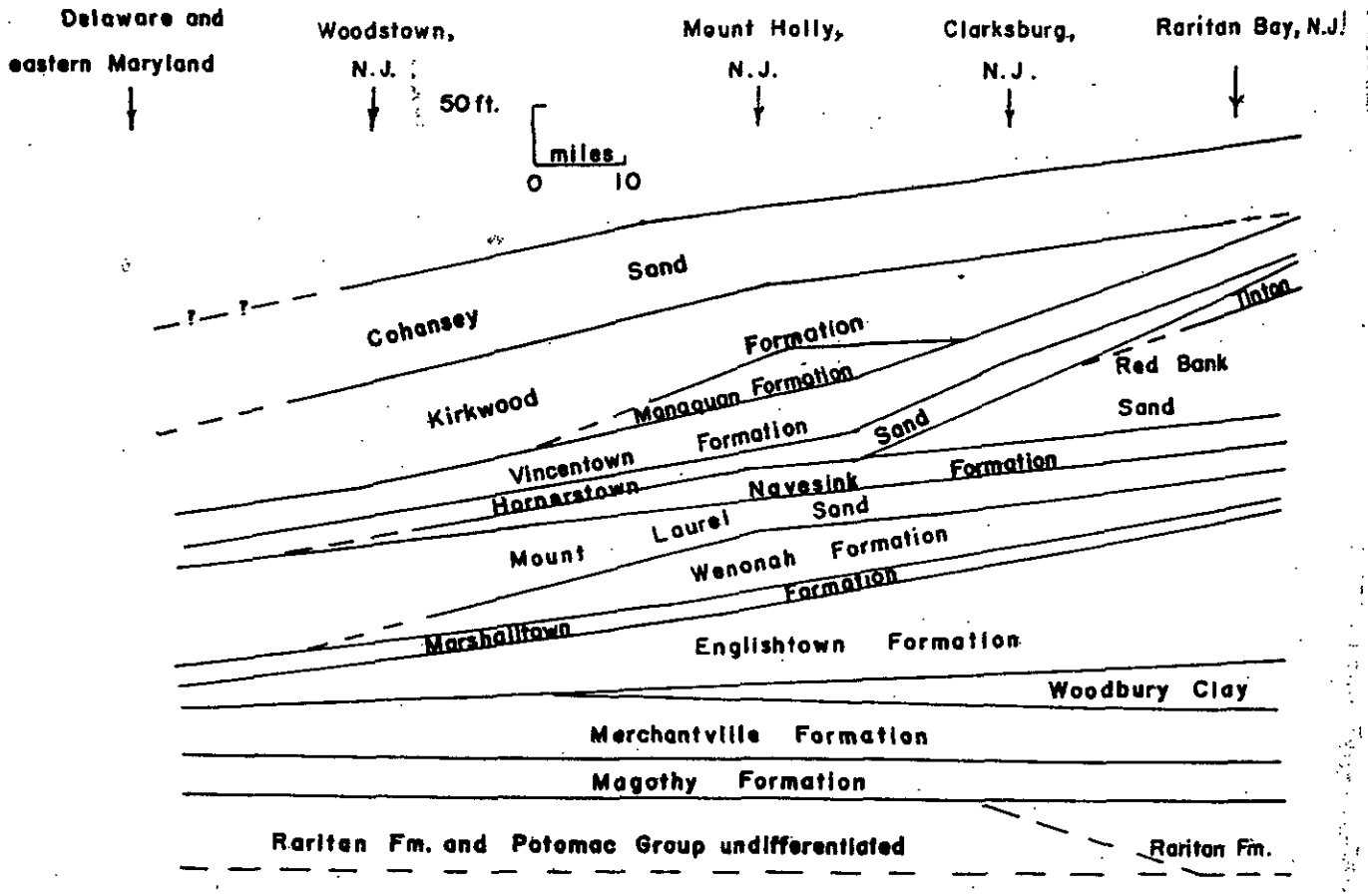
Detailed Descriptions of Geological Formations



Above: Generalized cross section of geological formations from Rewritten/Sandy Hook Bays, N.C. to eastern Maryland, showing approximate thickness and lateral relations of the Coastal Plain formations.

Cretaceous Period

The deposit of Coastal Plain sediments began during the Late Jurassic or Early Cretaceous period, about 144 million years ago, after the formation of the early Atlantic Ocean.

1. Potomac-Rewritten-Magothy Formation and aquifer system. Across the Atlantic Coastal Plain of New Jersey, three sedimentary formations are indistinguishable from each other and are generally described as a single geologic unit: the Potomac, Rewritten and Magothy Formations. These deposits underlie Atlantic Highlands but little information is available on their specific locations in this area.

Potomac: The oldest group of sediments consists of Lower Cretaceous continental deposits identified as the Potomac Group. This unit consists of alternating clay, sand and gravel.

Rewritten: The overlying Rewritten Formation consists of deposits made from river or continental sources. The sediments are generally similar to those in the Potomac Group, but some areas contain additional materials: glauconite, a greenish micaceous mineral; and shell beds, which indicate a more marine origin.

Magothy: The Magothy Formation overlies the Rewritten Formation. It is a sheet-like deposit composed mostly of coarse beach sand and other associated near-shore marine deposits.

In these formations are major water-bearing layers or aquifers. They are tapped by wells of the Atlantic Highlands Water Department. The two main aquifers are known as the Farrington and Old Bridge aquifers. Nine distinct geologic layers of alternating sand and clay are present within the Rewritten and Magothy Formations, according to data from outcrops and a well log. There are no visible surface occurrences, or outcrops, of the Rewritten Formation in Monmouth County; they are in neighboring Middlesex County, where recharge of surface water into the aquifer takes place..

2. Merchantville-Woodbury Confining Bed. This bed is located between two aquifer-bearing formations – the Magothy beneath and the Englishtown aquifer above. It is the most extensive confining bed within the Coastal Plain. These sediments are from the late Cretaceous age, approximately 66 million years ago.

Merchantville: The Merchantville Formation is the oldest outcropping of glauconite beds in the Coastal Plain. It also contains thick-bedded layers of micaceous clays and clayey silts.

Woodbury: The overlying Woodbury Clay is essentially a thick, massive, clayey silt.

Upper Cretaceous and Lower Tertiary Period

These sediments are composed chiefly of quartz, glauconite, montmorillonite, mixed-layer clay, kaolinite, muscovite, chlorite, lignite, feldspar, and pyrite. The Cretaceous materials were deposited 70 to 100 million years ago (nos. 3 to 8 below), and the Tertiary period deposits occurred between 11 and 70 million years ago (nos. 9 to 11 below)

3. Englishtown Formation and aquifer system. The Englishtown Formation was laid down about 66 million years ago in the late Cretaceous epoch. In the vicinity of Atlantic Highlands, the entire formation is described as acting as a single water-bearing hydrogeologic unit and is approximately 40 feet thick. It is the oldest exposed formation in Atlantic Highlands, and is found in a small bank on the beach between the Atlantic Highlands Yacht Harbor and Wagner Creek. The Englishtown aquifer is recharged from an area between Belford and Ideal Beach along the bay shore, going southwest 20 miles as far as Monroe Township in Middlesex County.

The Englishtown is comprised predominantly of fine to medium-grained sands and some silt. Locally, it is described as very fine to medium quartz sand with coarse to very coarse sand beds present. Minor amounts of minerals such as rose quartz, feldspar, muscovite, mica, lignite, and pyrite may also be present. Much of the sand is weathered and is cemented into massive beds of sandstone. The clay and sand bedding suggest that deposition took place in a shallow-water to beach-complex environment. Color varies from pale yellowish brown to yellowish grey or greyish yellow and yellowish orange.

According to some reports, the Englishtown Formation has an outcrop under Sandy Hook Bay, which may indicate possible entry of salt water into the aquifer at the outcrop.

4. Marshalltown-Wenonah Confining Bed. Overlying the Englishtown aquifer system, this confining bed is composed of the Marshalltown Formation and the fine-grained lower part of the Wenonah Formation, both of late Cretaceous age.

Marshalltown: This formation is typically made up of clayey quartz, green glauconite sand, and silt, with a depth estimated at 30 to 40 feet. The quartz is greenish-black and massive bedded. The minerals present include clay-sized quartz, kaolinite, muscovite, chlorite, montmorillonite clay, tourmaline and staurolite, as well as pyrite and siderite near the bottom of unweathered deposits.

Wenonah: This formation has uniform texture, color and mineral content. Quartz sand and silt typically make up between a third and three-fourths of the formation. The sand is in thick to massive beds, medium-dark-grey in color, and fine to very fine in texture. The formation contains a few small pieces of lignite coal and abundant colorless muscovite and green mica, and small clusters of pyrite crystals are common in unweathered areas. Other minerals in the clay include quartz, kaolinite, and chlorite, and such heavy minerals as zircon, tourmaline, staurolite, garnet, and epodite. There are sporadic occurrences of shark teeth fossils. In the Atlantic Highlands area the formation is 25-30 feet thick.

5. Mount Laurel Sand Formation. This late Cretaceous formation underlies the lower slopes of hills and valley bottoms throughout Atlantic Highlands. The bottom of the formation consists of glauconitic quartz sand, inter-bedded with clay and silt. The quartz sand is thinly bedded and very fine to medium in texture. Colors are yellowish-grey, dark yellowish-orange and light grey where weathered, and greenish gray to dark greenish-grey where fresh. Both horizontal and cross-bedded deposition is present in the sand but the clay and silt beds are horizontal. Some layers contain lignite coal, colorless muscovite, green mica, and glauconite.

The upper 5-10 feet of the formation is also glauconitic sand, but many of its characteristics are different than the lower part. The sand is pebbly medium to coarse in texture and thick bedded. It colors range from light olive grey and yellowish grey where weathered, to dark grey and dark greenish grey to greenish black where freshly exposed. Quartz granules and pebbles are abundant. Glauconite may constitute as much as half the material within the top 2 feet.

Fragments of fossils and animal borings filled with glauconite sand are also present. They are located in the upper portion of the sand, in contact with the overlying Navesink formation. Included are cylindrical or conical fossils from the internal shell of cephalopods (Belementilla americana and Exogyra costata), shark and crocodilian teeth, and gastropods.

6. Navesink Formation. This late Cretaceous formation is approximately 25 feet thick in the Atlantic Highlands area. It underlies lower and middle slopes in the hills of most of the area and is exposed in many areas. The best exposure is in the bluffs along Sandy Hook Bay.

The unweathered Navesink Formation is about 70 per cent sand and 30 per cent clay and silt in beds that are thick to massive in size. The sand is glauconitic, very fine to coarse in texture, and dusky-green to greenish-black and olive black in color. Small amounts of quartz and pyrite are common. Clay-size minerals include kaolinite, montmorillonite, chlorite, muscovite, quartz, and sparse heavy clay minerals (tourmoline and staurolite).

Fossils are abundant in some outcrops along Sandy Hook Bay in the base and middle of the formation. These include: Choristothyrus plicata; Gryphaea convexa; Gryphaea mutabilis; Pecten venustus; Exogyra costata; Ostrea falcata; and Belemnitella americana. (See box 5.1 in section 5)

7. Red Bank Sand Formation. This Cretaceous formation is approximately 120 feet thick in the vicinity of Atlantic Highlands. It underlies the middle and upper slopes of the most of the hills and is visible along the bluffs beside Sandy Hook Bay.

Sandy Hook Member: This lower portion of the formation is between 15 and 30 feet thick. Its color typically is dark-greyish and brownish-black. Its contents range from massive-bedded feldspathic quartz of very fine texture, to fine sand that is clayey and silty. It also contains abundant colorless muscovite and green chloritized mica. Sand-size lignite coal and pyrite crystals are present and glauconite is abundant.

Both microfossils and megafossils are present in several outcrops. Megafossils occur as both molds and calcareous shells within the bottom ten feet, and include Trigonia sp., Ostrea sp., Turritella vertebroides, and Eutrephoceras dekayi. Microfossils are predominantly Foraminifera which are well preserved. The best exposure is along the bluffs of Sandy Hook Bay.

Shrewsbury Member: This upper portion of the Red Bank Sand formation is up to 100 feet thick. It is composed of silty feldspathic quartz sand which is massive-bedded. The sand is generally fine to medium in texture with some coarse and very coarse grains. Its colors include yellowish grey, grayish orange pink, and reddish brown in light and moderate hues. Rock fragments of shale, sandstone, and schist are abundant. The member is characteristically oxidized to shades of reddish brown, but is generally grey where not oxidized. Ledges and masses of iron oxide-cemented sandstone are present and may have bizarre shapes.

8. Tinton Sand Formation. The last in the Cretaceous series, this is a quartz sand which mixes feldspathic and glauconitic quartz and is massive bedded. It is poorly sorted and grain size ranges from clay and silt to very coarse sand. It is stained, crusted and cemented by iron oxide. Colors range from dark yellowish orange and light brown to moderate brown and moderate yellow brown, and from light olive grey to greyish olive. Glauconite composes 60-80 percent of the sand fraction, and the formation is up to 20 feet thick.

It underlies steep, middle to upper slopes of the highest hills of Atlantic Highlands and is well exposed along the bluffs of Sandy Hook Bay, and in the pits along Highway 36. Only a few, poorly preserved, fossils have been found in the Atlantic Highlands area.

9. Hornerstown Sand Formation. This deposit from the Tertiary period 60 to 70 million years ago is typically clayey glauconite sand and massive-bedded. Its colors are dusky-green to grayish-olive and grayish-olive-green. The formation ranges in thickness from 5 to 15 feet. In the upper few feet it is oxidized and is a reddish brown and dusky red. The contents are up to 30 percent sand and grain size ranges from clay to coarse sand. The sand is mostly glauconite and quartz, and a little coarse mica is present. In the clay, glauconite is abundant with sparse other heavy minerals that include horneblend, muscovite, staurolite, tourmaline, and zircon.

No fossils have been documented in the vicinity of Atlantic Highlands in the formation but are present elsewhere. It is present in the middle to upper slopes of the highest hills and forms a narrow band around those hills. The best observations of the formation are in the pits along Route 36 below the Lenape Woods Nature Preserve, north of Highway 36.

10. Vincentown Formation. Also from the Tertiary period 60 to 70 million years ago, the Vincentown is a glauconitic quartz sand of medium size in thick-to-massive beds. It is typically light greenish to yellowish-grey, but where oxidized becomes a mottled moderate red or moderate olive brown. Some iron oxide cementation is present at or near the base of weathered sections. Glauconite constitutes nearly half the sand fraction in the

bottom few feet; the remainder is quartz. The formation is medium to coarse sand and is fairly loose, but some areas may have up to 25 percent clay.

No fossils were found in the vicinity of Atlantic Highlands, but elsewhere in the Coastal Plain it is one of the most fossiliferous formations. It underlies steep, middle and upper slopes of the highest hills and forms a narrow band around those hills, although locally it may be cut off in some areas by the overlying Cohansey Sand.

11. Cohansey Sand Formation . This formation, 11 million years old, is a medium to coarse quartz sand, somewhat pebbly, with much fine and very coarse sand and granules also present. The sand is typically yellowish grey and greyish to pale yellowish orange, except where stained grayish red to moderate brown by iron oxide. About 1 percent is clay; weathered feldspar is present in small amounts; and ilminite, a black iron oxide mineral, is abundant. Pebbles are mainly quartz, but some are chert or sandstone, and a few are metamorphic rocks. The upper layers are cemented by iron oxide into ledges and may include layers of loose sand.

It is found in the highest areas of Atlantic Highlands and can be seen exposed in the pits along Route 36. No specific depth is described for it, because the formation is discontinuous.

Characteristics of Soil Types in Atlantic Highlands

Below are descriptions of the main characteristics of the soil types found in Atlantic Highlands, based on "Soil Survey of Monmouth County" compiled by the U.S. Department of Agriculture, Soil Conservation Service. The distribution of these soils over the surface of Atlantic Highlands is shown on Map 8 by color coding.

Five types of characteristics are used to distinguish soils:

Content: In general, soils are described by their components of sand, silt, clay or loam. A loam soil is a relatively equal mixture of sand and silt with a somewhat smaller portion of clay. The terms are also used in combination with one another. An example would be "sandy loam" – a mixture having slightly more sand in it than "loam" soil.

Depth: The soil is also described by intervals down to a general depth of 60 inches identified as surface layer, subsurface, subsoil, and substratum.

Slope: The slope characteristics of each soil type are described, ranging from level (0 per cent slope) to gently sloping (0 to 10 per cent) and steep (up to 25 per cent).

Permeability: Soil permeability, or the ability for precipitation to pass through the soil to the water table, is also identified.

Capability: Descriptions of each soil type's ability to support different land uses such as for building site development, sanitary facilities, water management, recreational development, trees and other vegetation, and wildlife habitat are given.

Tinton Series Soils

Tinton soils, which are deep and well drained, are typically found on uplands and terraces which range from flat to 5 per cent slopes and are located between streams and drainage basins and on side slopes. This is true in Atlantic Highlands. Tinton soils cover most of the areas between Wagner Creek and Many Mind Creek on the west side of Atlantic Highlands, the area which historically was the site of most farming by the early European settlers. They also make up the surface of the gentle slopes between First and Third Avenues and in the central southern section of town almost as far east as Sears Avenue.

These soils were formed in Coastal Plain sediments that are acid and loamy. They contain 10 to 40 percent glauconite, a greenish micaceous mineral composed of silica, potassium, aluminum, and iron. The surface layer is loamy sand. It is generally described as having a depth of more than 20 inches with a subsoil of sandy clay loam. Rounded quartzose pebbles and/or iron-cemented sandstone fragments also are present up to a 20 percent concentration of the soil.

Tinton loamy sand (ToC), 5 to 10 percent slopes. This is a moderately sloping, well-drained soil on side slopes. Typically the surface layer is dark brown loamy sand 7 inches thick. The subsurface is a yellowish brown loamy sand 25 inches thick. The subsoil is dark yellowish brown sandy clay loam 14 inches thick. The substratum is dark yellowish brown loamy sand to a depth of 60 inches or more.

Permeability of the soil is moderately rapid in the subsoil and moderate or moderately rapid in the substratum. The available water capacity is moderate. The seasonal high water table is at a depth of more than

6 feet. Runoff from rain is medium and water erosion is moderate hazard. Wind erosion is a moderate hazard in unvegetated areas.

Common woodland vegetation includes: northern red oak, Virginia pine, shortleaf pine, white oak, and black oak. The main limitations on use of this soil as sites for dwellings and some other types of development are the tendency of excavation cutbanks to cave in and the sloping of the land.

Tinton loamy sand, Urban land complex (TUB), 0-5 per cent slopes. This soil type consists of nearly level to moderately sloping Tinton loamy sand (as described above) which is deep and well-drained. The Urban land complex consists of areas covered by impermeable surfaces such as dwellings, roads and streets, shopping centers, and industrial parks. Permeability where soil is present on the surface is moderately rapid in the subsoil and moderate or moderately rapid in the substratum. The available soil water capacity for plants is moderate, and the seasonal high water table is at a depth of more than 6 feet.

Phalanx Soils

The entire hills section of Atlantic Highlands has Phalanx soils -- along Ocean Boulevard and East Highland Avenue from about Third Avenue to the border with the Highlands. It is characteristic for this soil type to be located on higher ground and slopes as steep as 25 per cent. Phalanx soils are deep and well drained. The surface layer is loamy sand, generally more than 20 inches thick. The subsoil is loamy sand and sandy loam.

Almost all Phalanx soils are wooded. In the past in Atlantic Highlands, they were used for woodland production or pasture, but not for common field crops, hay and vegetables; farming was done elsewhere, mainly on the flatlands.

Phalanx loamy sand (PhB), 0-10 percent slopes. This is a nearly level to moderately sloping, well-drained soil on divides, the higher ground between streams or drainage basins, and side slopes. In the hills section of Atlantic Highlands, this soil tends to provide the relatively level top surfaces of steep slopes.

Typically, the surface layer is dark brown loamy sand 2 inches thick. The subsurface layer is brown loamy sand 5 inches thick. The subsoil is a strong brown and yellowish red sand and sandy loam 31 inches thick. The substratum extends to a depth of 60-inches or more, and is yellowish red loamy sand that has hardened layers of iron-cemented sandstone.

Permeability of this soil is moderate or moderately rapid in the subsoil and moderately rapid in the substratum. The available water capacity in the soil is moderate. The seasonal high water table is at a depth of more than 6-feet. Rainfall runoff is slow to medium and the water erosion hazard is slight to moderate. Wind erosion is moderate on unvegetated soil.

Common tree species: chestnut oak, black oak, white oak, Virginia pine, and pitch pine. The main limitations to use of this soil as sites for dwellings and some other types of development are the cement pan sandstone layers, cutbanks for excavations caving, and slope.

Phalanx loamy sand 10 to 25 percent slopes (PhD). This soil is found on the steeper slopes which cover the entire eastern hills section of Atlantic Highlands, from Third Avenue to the border with Highlands, largely paralleling the bay. It is on slopes whose steepness ranges up to 25 per cent. Almost all areas of this soil are wooded. This soil has the same characteristics as PhB above, except for two important differences.

Runoff from rainfall is rapid to very rapid and erosion is a severe hazard as a result. The organic matter content is low to moderate.

Sulfaquents and Sulfihemists (SS), or tidal marsh soils

In Atlantic Highlands, these soils are at several nearly level locations – along Wagner Creek between West Highland Avenue and the bay and in Center Avenue Park; in the marsh and estuary area on both sides of Many Mind Creek north of Bay Avenue; and a small coastal strip of tidal flats east of the harbor.

These consist of nearly level, poorly drained and very poorly drained soils. They are tidal flats, marshes, and estuaries that are adjacent to bays and streams, and are subject to frequent tidal flooding. Sulfaquents have a surface layer of mucky silt loam. The substratum is loamy sand and sand. Sulfihemists have surface and subsurface layers of muck, and the substratum is sand.

Permeability of these soils is moderate or moderately rapid in the substratum. The available water capacity is high and the water table fluctuates with the tide. These soils are subject to frequent flooding and runoff is slow. Organic content is high.

These soils are typically used as wildlife habitat and for recreation. The main limitations to use of these soils for dwellings and some other types of development are tidal flooding and seasonal high water table. However, in some areas, they can be filled in and used as sites for marinas or other community buildings.

Udorthents

These soils were brought in as fill to make up the entire surface in three areas: between the west bank of Many Mind Creek and First Avenue, from the Foodtown shopping center to the harbor; all along the harbor lands and beyond its eastern end; and for three or four blocks near both sides of the southernmost point of Atlantic Highlands.

These soils are modified wet soils, similar to those identified immediately above, which have been altered by excavating or filling and which have been so disturbed during construction that the original soil profile cannot be recognized.

Udorthents, smoothed (UA). In filled areas these soils consist of loamy material that is more than 20 inches thick. The filled areas are on floodplains, in tidal marshes, and on areas of moderately well drained to very poorly drained soils. Other areas consist of soils that have similar textures and have been excavated.

Udorthents-Urban land complex (UD), 0 to 3 percent slopes. Thickness and locations are the same as for smoothed Udorthents (above). These soils are nearly level and gently sloping and have been altered by excavation or filling. Urban land complex consists of areas covered by impermeable surfaces, such as dwellings, roads and streets, shopping centers, parking lots, and industrial parks.

Humaquepts

Humaquepts (HV) soils are long narrow formations alongside the eastern and southern channels of

Many Mind Creek on the south side of Atlantic Highlands. Mucky and sandy, they are located in floodplains and on lowlands, along perennial and intermittent streams, and are frequently flooded mainly in early spring or after a heavy rainfall.

Humaquepts soils are nearly level, deep soils which are somewhat poorly drained to very poorly drained. The surface layer and the subsoil contain stratified layers of sandy loam, loam, and silt loam.

These soils support freshwater wetland vegetation, and such common tree species as pitch pine, sweet gum, white oak and pin oak. They are poorly suited to most building and development uses because of a high seasonal water table and frequent flooding.

Hooksan

Two sites containing Hooksan sand (HwB) are located in Atlantic Highlands. One is adjacent to Sandy Hook Bay on the dunes and uplands behind the coastal beach at Popamora Point at the eastern border of Atlantic Highlands. The other is on the floodplain on both sides of the mouth of Many Mind Creek at the bay.

This soil is nearly level to gently sloping (0 to 5 per cent) and is excessively drained. Typically the surface layer is greyish brown sand 6 inches thick, and the pale yellow sand substratum extends to a depth of 60 inches or more. Permeability is rapid in the subsoil and substratum. Available water capacity is low and seasonal high water is below 6 feet. Hazards of water and wind erosion are high.

Common herbaceous and shrub species are poison ivy, beach plum, smooth sumac, and prickly pear cactus. Common trees include pitch pine, eastern red cedar, and American holly. The main limitation to use of this soil as sites for dwellings and other types of development are sandiness, poor filtering, excavation cutbanks caving, and flooding.

Pits, sand and gravel (PT)

These areas have been excavated to take away sand and gravel as construction material. The excavations left pits whose northern rims are at three locations just inside the Atlantic Highlands border in the eastern hills section. The pits contain sandy material, differing amounts of gravel and fragments of iron-cemented sandstone (sometimes in large boulders 2 to 15 feet in diameter). A few pits have been smoothed, and others have mounds of soil and steep escarpments. Some older areas have reverted to trees.