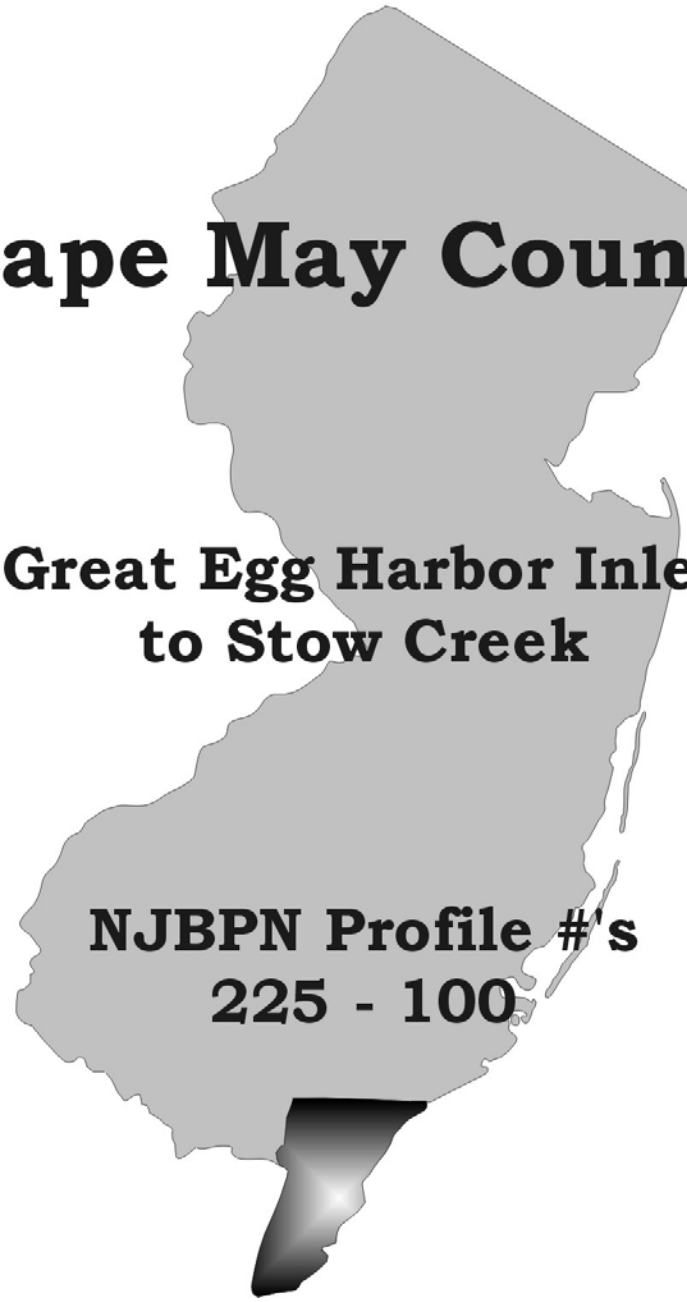
New Jersey Beach Profile Network

Cape May County



Great Egg Harbor Inlet to Stow Creek

NJBPN Profile #'s 225 - 100

New Jersey Beach Profiles Network
Cape May County Profile Site Locations

Figure 81

There are twenty-nine NJBPN survey sites along the beaches of Cape May County, which are a combination of barrier islands, coastal headlands and bayshore. Twenty-five sites are Atlantic Ocean profiles and the remaining four are set along the Delaware Bay shoreline of western Cape May County. The ocean profile sites are located in the following municipalities: the City of Ocean City, Strathmere in Upper Township, the City of Sea Isle City, the Borough of Avalon, the Borough of Stone Harbor, North Wildwood, the City of Wildwood, Lower Township, the City of Cape May, and the Borough of Cape May Point. Profile #112 on South Pointe in Stone Harbor was lost due to continuous erosion and was replaced by profile #212, which is located south of 121st Street in Stone Harbor. The four Delaware Bay profiles are located in the communities of Reeds Beach in Middle Township, Villas in Lower Township, North Cape May in Lower Township and at the Higbee Beach State Park.

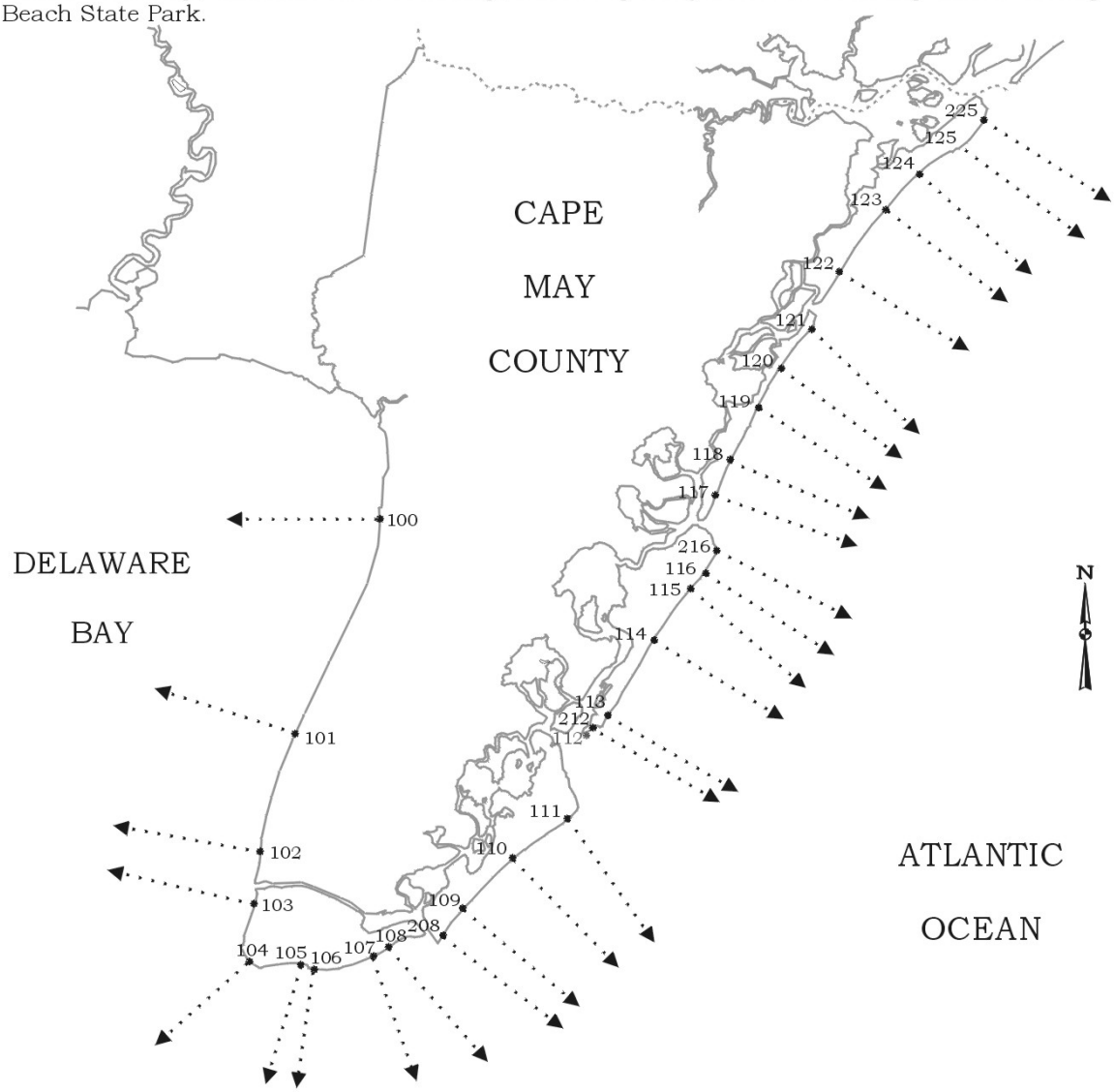


TABLE 13
CAPE MAY COUNTY
ANNUAL BEACH VOLUME CHANGES
FALL 1999 - FALL 2000 & SPRING 2000 - SPRING 2001

		Survey 19-21	Survey 20-22
PROFILE SITE	**LOCATION**	**F1999 - F2000**	**S2000- S2001**
		(volume expressed as cubic yards per foot)	
225:	Ocean City, Gardens Rd.	55.06	23.70
125:	Ocean City, 6th St.	-14.64	115.27
124:	Ocean City, 20th St.	-23.58	-14.67
123:	Ocean City, 34th St.	7.14	3.13
122:	Ocean City, 56th St.	5.63	37.20
121:	Strathmere, Williams Rd.	2.01	133.17
120:	Sea Isle City, 1st St.	-16.49	30.45
119:	Sea Isle City, 25th St.	15.85	-5.86
118:	Sea Isle City, 57th St.	-7.92	19.59
117:	Sea Isle City, 80th St.	8.98	-5.67
216:	Avalon, 9th St.	-53.08	-11.38
116:	Avalon, 23rd St.	-40.88	2.69
115:	Avalon, 35th St.	-18.45	-1.13
114:	Avalon, 70th St.	11.32	6.33
113:	Stone Harbor, 90th St.	11.02	3.32
212:	Stone Harbor, 121st St.	-7.31	-4.46
112:	Stone Harbor, South Pointe	** NO LONGER ACTIVE **	
111:	North Wildwood, 15th Ave.	-50.08	-28.59
110:	Wildwood, Cresse Ave.	36.40	9.34
109:	Lower Township, Raleigh Ave.	28.38	18.59
208:	Lower Township, U.S.C.G. Base	14.66	1.69
108:	Cape May, Beach Club	15.26	-7.38
107:	Cape May, Baltimore Ave.	13.25	5.81
106:	Cape May, Broadway Ave.	13.67	22.96
105:	Cape May, Nature Conservancy	-7.16	-28.69
104:	Cape May Point, Lake Dr.	5.39	20.15
103:	Higbee Beach State Park	-3.32	-9.73
102:	North Cape May, Whittier	1.93	-7.18
101:	Villas, Pacific Ave.	1.66	-3.13
100:	Reeds Beach, Beach Ave.	-1.07	0.28

TABLE 14
CAPE MAY COUNTY
ANNUAL SHORELINE CHANGES
FALL 1999 - FALL 2000 & SPRING 2000& SPRING 2001

PROFILE SITE LOCATION		Survey 19-21 F1999 - F2000 (shoreline change expressed in feet)	Survey 20-22 S2000 - S2001 (shoreline change expressed in feet)
225:	Ocean City, Gardens Rd.	146.1	17.4
125:	Ocean City, 6th St.	-12.9	176.9
124:	Ocean City, 20th St.	-45.1	24.8
123:	Ocean City, 34th St.	-11.3	46.4
122:	Ocean City, 56th St.	-4.4	64.2
121:	Strathmere, Williams Rd.	80.3	175.3
120:	Sea Isle City, 1st St.	-24.4	84.1
119:	Sea Isle City, 25th St.	-6.7	107.6
118:	Sea Isle City, 57th St.	-80.7	40.4
117:	Sea Isle City, 80th St.	-9.3	-7.4
216:	Avalon, 9th St.	-110.3	70.0
116:	Avalon, 23rd St.	-52.9	96.9
115:	Avalon, 35th St.	-67.3	9.8
114:	Avalon, 70th St.	57.5	39.2
113:	Stone Harbor, 90th St.	20.3	71.4
212:	Stone Harbor, 121st St.	-8.2	-9.9
112:	Stone Harbor, South Pointe	** NO LONGER ACTIVE **	
111:	North Wildwood, 15th Ave.	-62.5	-22.9
110:	Wildwood, Cresse Ave.	-25.5	48.1
109:	Lower Township, Raleigh Ave.	42.4	82.0
208:	Lower Township, U.S.C.G. Base	86.1	36.7
108:	Cape May, Beach Club	28.9	-25.9
107:	Cape May, Baltimore Ave.	2.8	-1.1
106:	Cape May, Broadway Ave.	38.4	31.7
105:	Cape May, Nature Conservancy	174.3	-34.4
104:	Cape May Point, Lake Dr.	2.8	28.8
103:	Higbee Beach State Park	-11.9	-8.1
102:	North Cape May, Whhittier	6.3	-0.8
101:	Villas, Pacific Ave.	-30.0	6.6
100:	Reeds Beach, Beach Ave.	-2.3	0.3

TABLE 15
CAPE MAY COUNTY
SEASONAL BEACH VOLUME CHANGES

PROFILE SITE LOCATION	Survey	19-20 F99 - S00	20-21 S00 - F00	21-22 F00 - S01	19-22 F99 - S01
		(volume expressed as cubic yards per foot of beachfront)			
225:	Ocean City, Gardens Rd.	-26.60	81.76	-58.68	-1.09
125:	Ocean City, 6th St.	-25.68	11.75	122.43	94.50
124:	Ocean City, 20th St.	-26.06	3.88	-19.81	-40.30
123:	Ocean City, 34th St.	3.17	5.39	10.02	9.56
122:	Ocean City, 56th St.	14.37	-8.73	46.01	51.44
121:	Strathmere, Williams Rd.	-53.14	56.99	73.02	71.38
120:	Sea Isle City, 1st St.	-18.42	1.60	31.35	11.92
119:	Sea Isle City, 25th St.	5.48	12.82	-15.11	1.04
118:	Sea Isle City, 57th St.	-22.81	15.68	5.51	-2.33
117:	Sea Isle City, 80th St.	11.75	-3.04	-1.96	7.20
216:	Avalon, 9th St.	36.71	-94.46	79.53	28.07
116:	Avalon, 23rd St.	-35.86	-4.44	7.13	-33.80
115:	Avalon, 35th St.	-6.00	-14.39	11.96	-4.82
114:	Avalon, 70th St.	-9.23	21.89	-14.57	-3.17
113:	Stone Harbor, 90th St.	-0.01	13.13	-9.60	1.48
212:	Stone Harbor, 121st St.	2.06	-8.93	2.24	-2.76
112:	Stone Harbor, South Pointe		** NO LONGER ACTIVE **		
111:	North Wildwood, 15th Ave.	-34.96	-15.06	-13.57	-63.32
110:	Wildwood, Cresse Ave.	9.86	25.17	-15.33	20.37
109:	Lower Township, Raleigh Ave.	15.60	12.62	5.96	33.68
208:	Lower Township, U.S.C.G. Base	13.18	1.77	0.15	14.80
108:	Cape May, Beach Club	16.57	-1.68	-5.92	9.32
107:	Cape May, Baltimore Ave.	13.09	0.62	6.66	20.57
106:	Cape May, Broadway Ave.	9.83	3.82	19.15	32.63
105:	Cape May, Nature Conservancy	-8.82	0.94	-33.60	-33.64
104:	Cape May Point, Lake Dr.	-1.29	4.07	15.50	19.42
103:	Higbee Beach State Park	-1.30	-2.79	-7.80	-11.19
102:	North Cape May, Whittier Ave.	-2.42	2.65	-9.80	-8.41
101:	Villas, Pacific Ave.	1.97	0.39	-3.97	-0.91
100:	Reeds Beach, Beach Ave.	-1.38	0.41	-0.10	-1.23

TABLE 16
CAPE MAY COUNTY
SEASONAL SHORELINE CHANGES

PROFILE SITE LOCATION		Survey 19-20 F99 - S00	20-21 S00 - F00	21-22 F00 - S01	19-22 F99 - S01
		(shoreline change expressed in feet)			
225:	Ocean City, Gardens Rd.	-24.5	170.6	-153.2	-7.1
125:	Ocean City, 6th St.	-38.5	25.6	151.3	138.5
124:	Ocean City, 20th St.	-57.6	12.5	12.3	-32.8
123:	Ocean City, 34th St.	-14.2	2.9	43.5	32.2
122:	Ocean City, 56th St.	31.3	-35.7	99.9	95.5
121:	Strathmere, Williams Rd.	-130.5	210.7	-35.4	44.8
120:	Sea Isle City, 1st St.	-32.5	8.1	76.0	51.6
119:	Sea Isle City, 25th St..	-89.0	82.3	25.3	18.6
118:	Sea Isle City, 57th St..	-110.8	30.2	10.3	-70.4
117:	Sea Isle City, 80th St..	-17.6	8.3	-15.7	-25.0
216:	Avalon, 9th St.	-22.0	-88.3	158.4	48.1
116:	Avalon, 23rd St.	-118.6	65.7	31.2	-21.7
115:	Avalon, 35th St.	-21.9	-45.4	55.2	-12.0
114:	Avalon, 70th St.	-46.4	103.9	-64.8	-7.2
113:	Stone Harbor, 90th St.	-71.1	91.4	-19.9	0.3
212:	Stone Harbor, 121st St.	-16.0	7.8	-17.7	-25.9
112:	Stone Harbor, South Pointe		** NO LONGER ACTIVE **		
111:	North Wildwood, 15th Ave.	-90.6	28.1	-51.0	-113.5
110:	Wildwood, Cresse Ave.	-29.9	4.3	43.8	18.2
109:	Lower Township, Raleigh Ave.	-33.1	75.5	6.5	48.9
208:	Lower Township, U.S.C.G. Base	-6.9	93.0	-56.3	29.7
108:	Cape May, Beach Club	41.2	-12.3	-13.6	15.3
107:	Cape May, Baltimore Ave.	33.6	-30.8	29.7	32.6
106:	Cape May, Broadway Ave.	-2.6	41.0	-9.3	29.0
105:	Cape May, Nature Conservancy	118.3	56.0	-90.3	83.9
104:	Cape May Point, Lake Dr.	-5.9	8.7	20.1	23.0
103:	Higbee Beach State Park	-9.3	-2.6	-5.5	-17.4
102:	North Cape May, Whittier Ave.	-4.9	11.2	-12.0	-5.7
101:	Villas, Pacific Ave.	-24.8	-5.3	11.9	-18.2
100:	Reeds Beach, Beach Ave.	-4.0	1.8	-1.5	-3.7

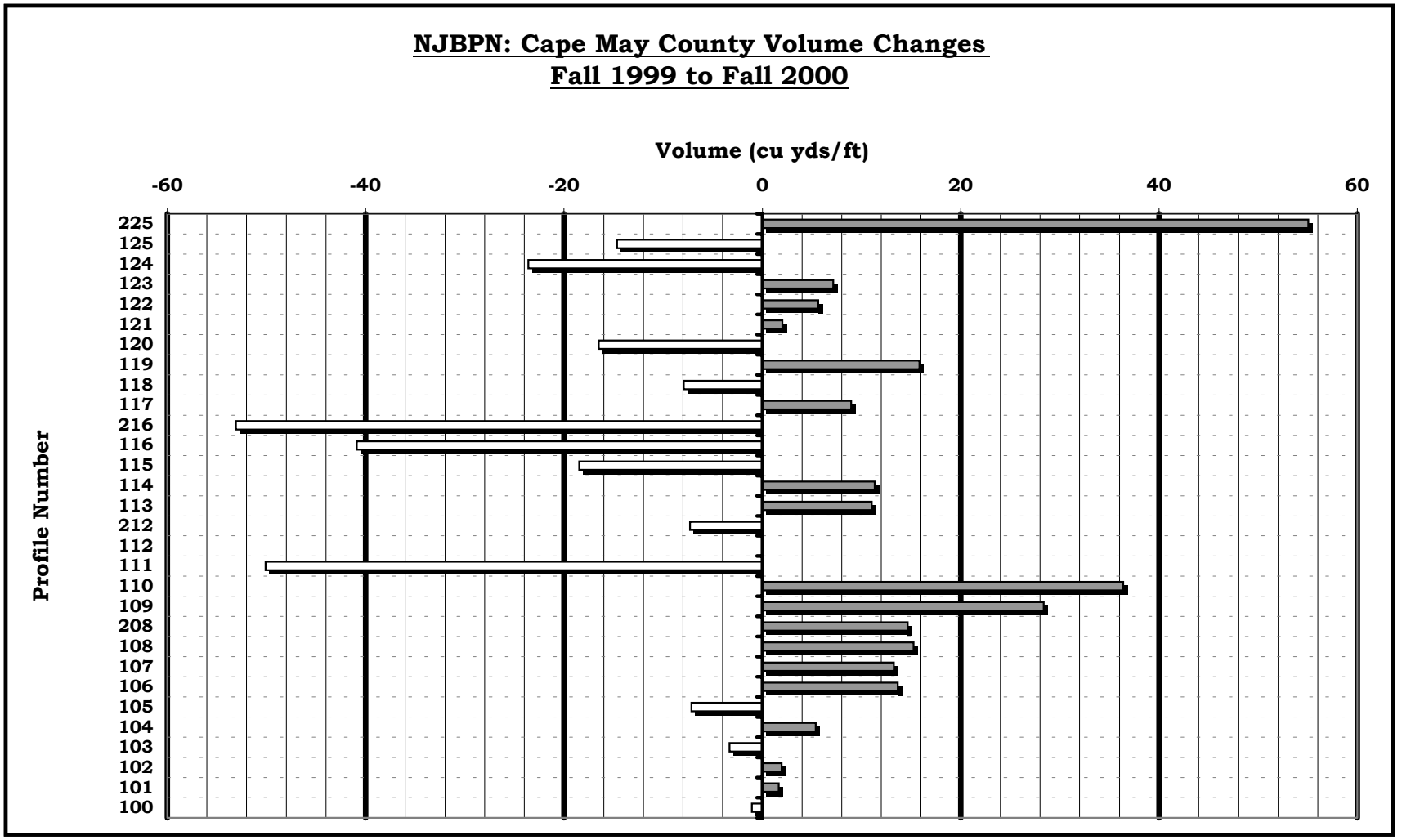


Figure 82a. Large-scale changes occurred at the south side of each of the inlets on Cape May Barrier islands. The increase in sand at site #225 in Ocean City was due to the start of US Army Corps of Engineers (ACOE) maintenance filling. Most of the other changes were positive. The modest beachfill done by Avalon eroded back to the pre-construction volume of sand on the three northern profile sites.

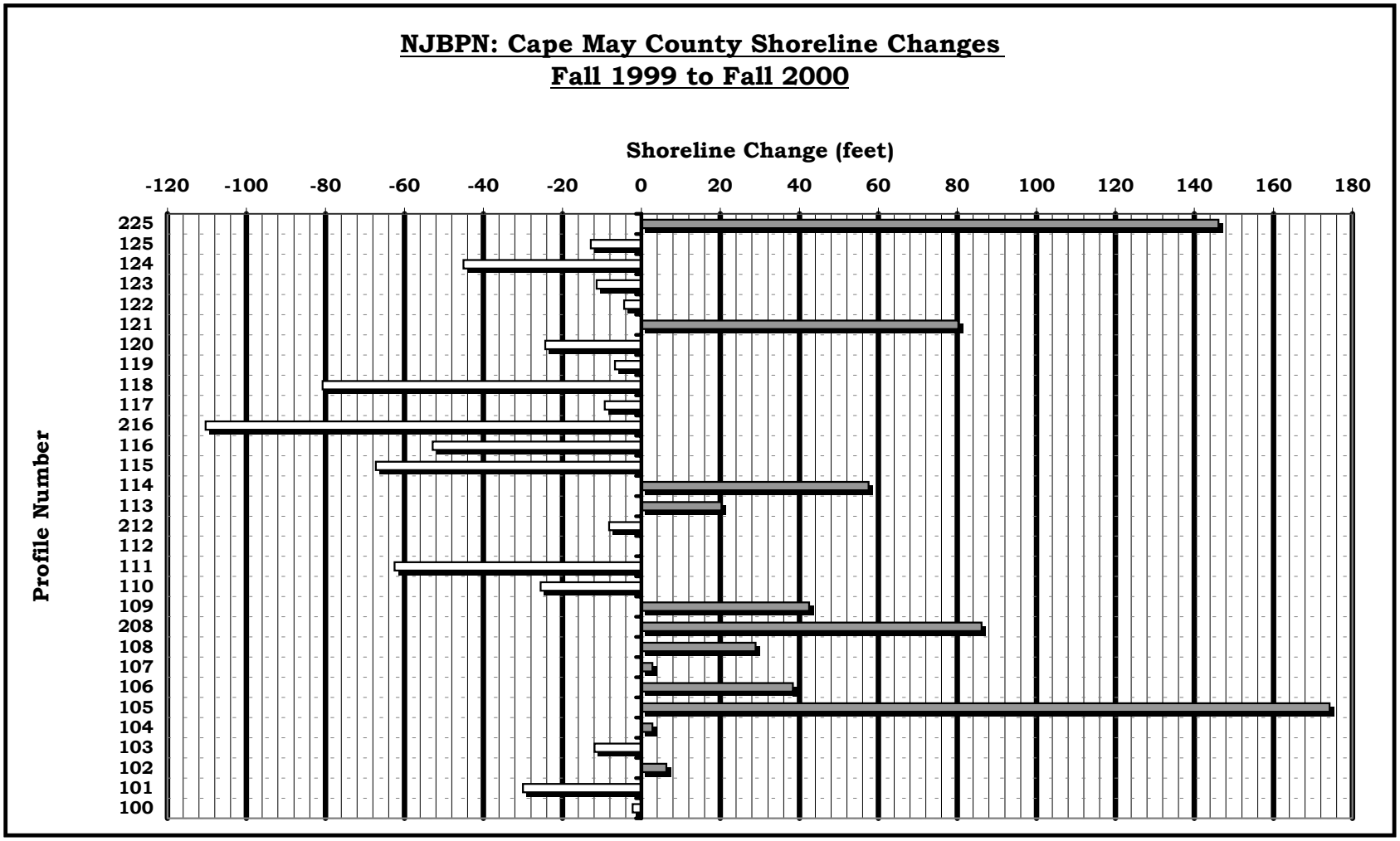


Figure 82b. Shoreline changes were relatively evenly distributed between advance and retreat. The Avalon cross-sections lost beach width due to beachfill loss shown in Figure 82a, above. The Cape May Meadows site had the largest advance in shoreline position.

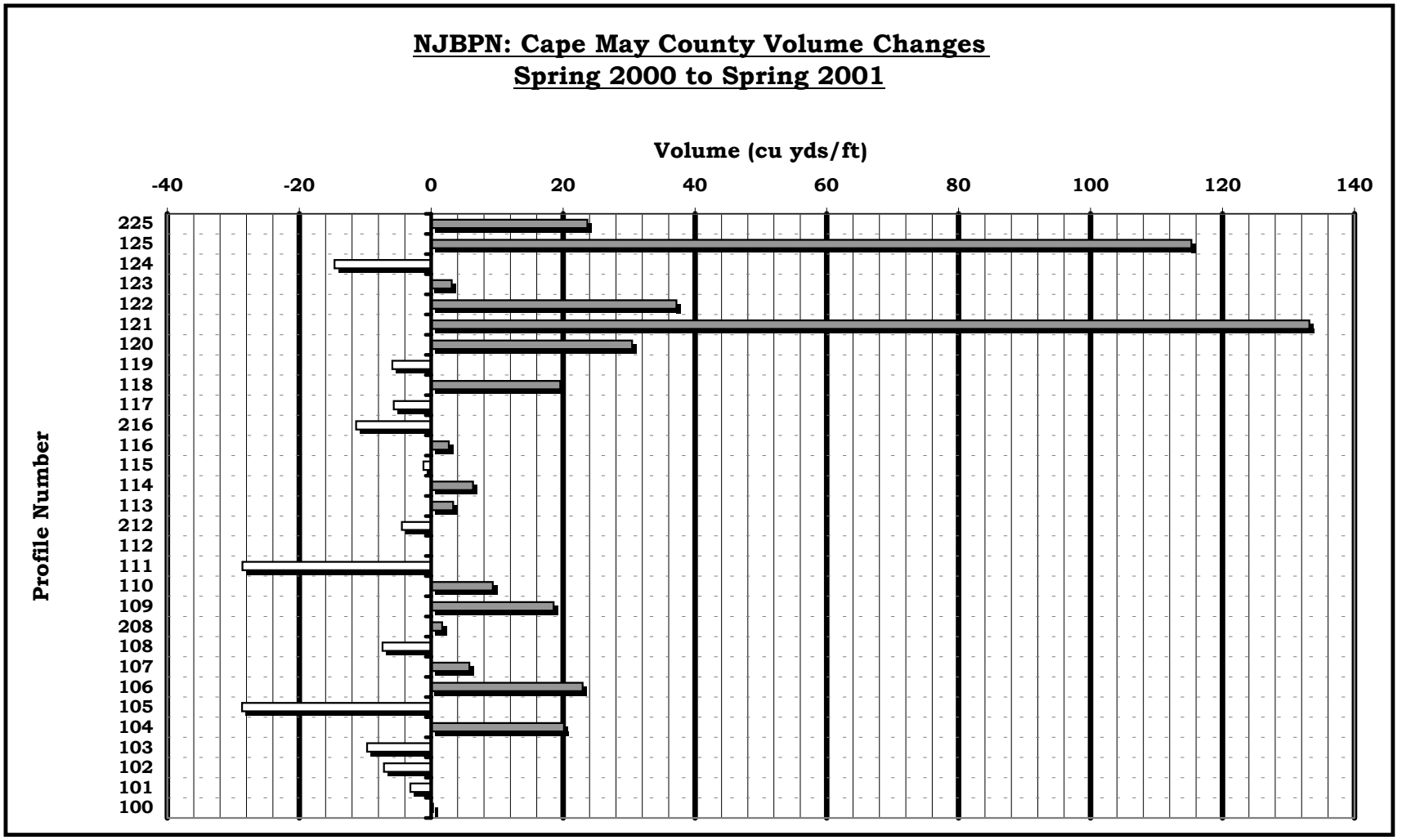


Figure 82c. Volume gains were notable in Ocean City because the Army Corps was doing a beach maintenance at sites 225 and 125. The huge gain at site 121 (Williams Avenue, Strathmere) was the result of the onshore migration of large volumes of sand. Other changes were relatively minor.

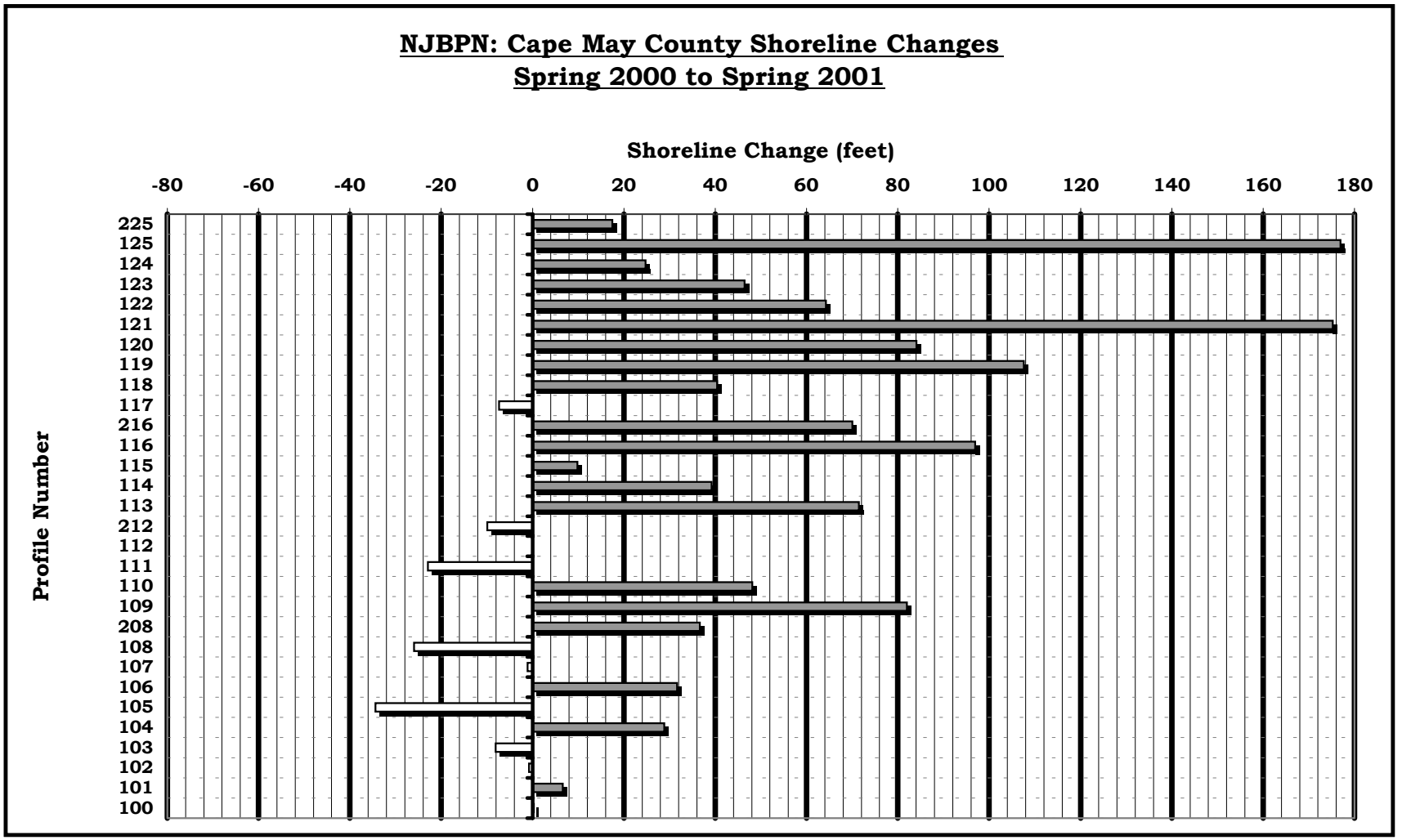


Figure 82d. The shoreline positions advanced at most sites during the spring-to-spring comparison. The largest advances were due to beach nourishment (#125) and a natural welding of large volumes of inlet ebb-tidal delta sand onto the beach at Williams Avenue in Strathmere (#121).

SUMMARY OF INDIVIDUAL SURVEY STATIONS
LOCATED IN CAPE MAY COUNTY

- **Profile #225 – Gardens Road, Ocean City, Cape May County** (fig. 83)

This site was added to the network in 1994 to monitor the shoreline near Great Egg Inlet at the north end of Peck's Beach in Ocean City. The profile starts at the seaward end of Gardens Road and it crosses over Beach Road and continues over a 200 foot-wide dune system. The landward dune slope and crest are very stable, covered in a dense blanket of dune grass mixed with a few Bayberry shrubs and Seaside Goldenrod plants. The elevation of the primary dune crest is about 17 feet NGVD. From the primary crest seaward to the foredune, dune grass flourishes with a few goldenrod and Sea Rockets that inhabit the foredune. The initial foredune ridge was very stable during the recent study intervals with a crest elevation of nearly 14 feet NGVD. This feature in combination with the primary dune forms the 200-foot wide dune system. A new secondary foredune hummock has developed on the upper beach over the past few years in direct response to the ongoing beach nourishment and maintenance project. Between cycles of maintenance renourishment when the beach retreated landward the seaward slope of this new feature has been subject to several episodes of erosion that cut away 20 feet of the seaward slope after the December 1999 survey and prevented additional seaward expansion. The elevation of this feature is low at about 10 feet NGVD and was about 60 feet wide during the May 2001 survey. This beach has developed a wide dune system partially due to a landward offset in the street ends. The wider natural area begins near North Avenue a few blocks south of the site and continues north past Gardens Road towards Great Egg Inlet.

The Philadelphia District Corps of Engineers project for beach restoration in Ocean City is co-sponsored by the State of New Jersey and local municipality and was started in the summer of 1992. The Corps of Engineers is committed to a 50-year program to maintain these beaches in Ocean City. This site is very sensitive to gains or losses because inlet tidal currents combine with waves to move sand quickly off the beach or further into the inlet along the shoreline. Northerly littoral currents have acted to move substantial quantities of sand from the oceanfront shoreline to the inlet beaches. These processes continued to erode the beach from the seaward crest of the new foredune to the offshore seafloor, near the profile limit between December 1999 and April 2000. A renourishment maintenance cycle was completed just prior to the November 2000 survey, which added 81.76 yds^3/ft to the profile volume and allowed the shoreline to advance 171 feet. The waves and currents acted quickly to remove an alarmingly large portion of this fill volume and transport it away from the site. Only a minor quantity of sand eroded from the placement loss zone was added to the offshore seafloor on the line. The resulting beach configuration was nearly identical to the shape surveyed on December 2, 1999. Consequently, a comparison between the initial (survey 19) and final surveys (survey 22) in this report interval shows almost no net volume change (-1.09 yds^3/ft) and 7 feet of shoreline retreat.

- **Profile #125 – 6th Street, Ocean City, Cape May County** (fig. 84)

The site was established in 1982, prior to the cooperative beach nourishment between Ocean City and the State of New Jersey and the ACOE. This profile was set at the seaward end of 6th Street and includes the street end wooden bulkhead and boardwalk. Situated at the center of an intense erosional segment of shoreline, this site has documented enormous sediment budget fluxes over a 19-year period of surveying. Prior to the 1992 Corps of Engineers (ACOE) project, the low tide shoreline position was landward of the boardwalk and wave run-up frequently overtopped the bulkhead presently near the street-end reference position for the profile line. The shoreline continues to have problems retaining sand even during periods of very calm seas. The losses have been continuous over the long-term study and indicate no substantial change in the erosion rate seen at 6th Street beaches for the last twenty years. Structural damage from storm waves to the boardwalk, which occurred frequently prior to the 1992 project, has been prevented by the additional beach width provided by the beach nourishment project.

A small dune had been established seaward of the boardwalk after the initial ACOE beach nourishment project was completed but it had nearly eroded away completely by November 1999. The small sliver that remained of the dune was cut away prior to the April 2000 survey as the beach retreated towards the boardwalk. Although the fall 2000 renourishment maintenance project had not yet reached 6th Street by the survey date of October 25, 2000 some sand had accumulated on line from the nearby placement area several blocks north. The sand formed a small nearshore bar and increased the beach and beachface elevations.

The final survey in the report interval completed May 2, 2001 showed that 122.43 yds^3/ft of sand remained from the beach maintenance renourishment project completed during the fall of 2000. The shoreline had advanced seaward 151 feet and a berm ridge at elevation 10 feet NGVD extended 180 feet seaward of the boardwalk. A five-foot, near-vertical berm scarp indicates that the beachface had eroded and retreated since the recent project was completed. The net shoreline change for the report interval was a 138-foot seaward advance with 94.50 yds^3/ft of sand added to the profile volume.

- **Profile #124 – 20th Street, Ocean City, Cape May County** (fig. 85)

Profile #124 is located at the seaward end of 20th Street. The profile includes the street end wooden bulkhead and boardwalk located landward of the dune. A substantial dune system 130 feet wide with a crest elevation of 17 feet NGVD continues to expand seaward. The dune is covered by an abundance of dune grass mixed with sporadic Goldenrod and other early colonizing species such as Sea Rocket on the foredune. This dune started to develop after the completion of the initial ACOE beach nourishment project in 1992.

This location is near the southern end of the initial phase of the ACOE beachfill project completed October 1992 when 2.6 million cubic yards of sand were added to the Ocean City beaches. Prior to this project the street end wooden bulkhead provided the only shore protection for the oceanfront property and public infrastructure. This hard structure was repeatedly overtopped by storm waves as water surged under the boardwalk during small northeast events. The boardwalk frequently suffered significant damage from storm waves that reflected off the bulkhead, impacted the next incoming wave, which forced the water to shoot up through the boardwalk, lifting the decking boards from support timbers. Since completion of the project and subsequent dune development there has been no storm wave damage to any of the oceanfront property or infrastructure within the project area, including the boardwalk. The storm protection value of this enhanced beach and dune system was dramatically demonstrated immediately after the project was completed when a significant northeast storm struck the New Jersey shore in early December 1992. This storm caused widespread damage along much of the New Jersey coast but there was no storm wave damage to properties or public infrastructure along the project area in Ocean City, including the boardwalk. By contrast, a similar less intense storm struck the southern New Jersey coast on October 31, 1991 and caused $4,000,000 in damage to public property and infrastructure.

The ACOE program has a commitment for 50 years of beach maintenance in Ocean City to ensure this wide beach and dune system continues to provide both storm protection and recreational use. During the recent study period the upper beach, berm and beachface changed in a typical seasonal pattern, losing sand during the winter and accreting over the summer. These changes caused up to three feet of berm elevation fluctuation and 58 feet of shoreline variation. On the seafloor an offshore bar moved landward by October 2000, partially filling the deep trough present during the previous surveys. By May 2000, the trough redeveloped and the offshore bar reformed near its previous location. The net shoreline and volume changes for the report period reflect the winter seasonal loses with 33 feet of shoreline retreat and 40.30 yds^3/ft of sand lost from the profile limits.

- **Profile #123 – 34th Street, Ocean City, Cape May County** (fig. 86)

This site is located at the seaward end of 34th Street adjacent to the local lifeguard headquarters'. Because of the building and vehicle beach access path there is a break in the dune system at this site. Consequently, the large dune system present north and south of the profile site is not documented on the profile plots. The landward "dune" toe is located just seaward of a partially buried wooden bulkhead adjacent to the oceanfront properties. The hill of sand has a width of approximately 100 to 140 feet with about 6 feet of elevation relief from the beach grade to the crest. The feature is covered by an abundance of dune grass mixed with goldenrod. Since completion of the second phase of the initial project March 1993 (2.7 million cubic yards of sand was placed on the Ocean City shoreline from 20th to 36th Street), this dune has continued to accumulate sand and grow in width and elevation to its current levels. The current dune height has been a point of contention between some oceanfront property owners who fear a loss of "beach view" and the City and State that value the storm protection provided by the enhanced dune.

The site is located near the southern end of ACOE responsibility but the beach from 36th Street south to 59th Street has received sand from a 100 percent local-NJ State funded project with ACOE support completed in 1995 (360,000 cy). The beach has remained relatively stable with seasonal variations in the berm development. A typical a pronounced "summer" berm ridge developed during the summer and fall but was reduced during the winter by wave run up, creating a flatter beach slope. The shoreline position fluctuated about 45 feet during the report interval with ridge and runnel development near shore. On the seafloor a deep trough separated the beach from an offshore bar. The bar position migrated seaward and then landward but never completely filled the trough during the report period. Some sand did accumulate along the nearshore slope. During recent monitoring here the net sand transfer has been minor. The net volume change was minimal with 9.56 yds^3/ft of sand gained while the shoreline advanced 32 feet.

- **Profile #122 – 56th Street, Ocean City, Cape May County** (fig. 87)

The site is located at the seaward end of 56th Street. The profile includes the street end, a wooden bulkhead with rocks partially buried below the sand along the seaward side that forms a significant storm protection revetment for oceanfront property. Efforts to establish a dune have been limited by a minimal beach width that allows storm wave run up high on the upper beach. Consequently, the dune accumulation has been minimal along this section of the Ocean City beachfront. The State and local project completed in 1995 enhanced the beach width to allow some minor dune development. A small dune was pushed in place and subsequently planted and fence installed around the perimeter. After the most recent renourishment of this portion of the non-Federal project was completed during the late fall of 2000 the dune width advanced to nearly 40 feet at the toe with a ridge crest elevation of 12 feet NGVD.

This section of shoreline has been subject to slow, steady erosion that brought the crest of the dry beach back to the dune toe by October 2000. Fortunately the State and City co-sponsored another cycle of beach nourishment for the southern end of Ocean City during the fall of 2000. The US Army Corps of Engineers (ACOE) supported this effort by allowing their contractor to sequentially move to working the southern shoreline as their project was finished. The May 2001 survey shows the enhanced project beach configuration retained after the winter storm season. From October 2000 to May 2001 the beach volume increased 46.01 yds^3/ft with a 100-foot shoreline advance. The dry recreational beach extended seaward of the dune toe over 80 feet. The final net volume change was an increase of 51.44 yds^3/ft with 96 feet of shoreline advance. South of 59th Street the island is part of Corson's Inlet State Park. The Corson's Inlet shoreline has received large volumes of sand from the Ocean City beaches over the past five years. Aerial photographs show large shoal accretion around the inlet on its northern ebb-tidal delta. Southerly sand migration is evident in the large volume of sand added to this offshore bar system each season.

- **Profile #121 – Williams Road, Strathmere, Cape May County** (fig. 88)

Profile #121 is located at the seaward end of Williams Road adjacent to a beach access path and a lifeguard shack erected several years after the site was established. As a result of the beach access path and alterations to the dune area from the lifeguard staging area that surrounds the shack the dune configuration is not typical of the region. The dune configuration is marginally wider north of the profile line while the crest elevation is several feet higher than on the line. Dune grass and goldenrod with a few bayberry plants provide ground cover for the dune off of the profile line.

The upper dry beach is relatively stable to accretional, providing ample recreational area and storm protection for oceanfront property and infrastructure. However, the site lies within the influence of Corson's Inlet, which can cause significant changes along the shoreline and seafloor. There is a site several hundred feet further north used for municipal studies, which shows even more dramatic inlet-induced changes. There erosion had removed the entire dune system, which exposed the street end and adjacent ocean front property to potentially severe storm damage if action was not taken. The local government trucked in an emergency dike as temporary storm protection but this sand was also quickly removed. Accelerated erosion rates several hundred feet north of this site along the Corson's inlet shoreline at the north end of Ludlam Island provided sand to the shoal but further exacerbated this condition. No sand has been artificially added to this shoreline since 1984 when a local-State project was completed. There was an attempt to provide new material from the inlet's ebb-tidal delta during the fall of 2000, but real estate and potential submerged shipwreck locations scuttled the program because the contractor refused to stand by while these issues were solved. This project was eventually completed during the fall of 2001 but is not included in this report's time interval.

Variations on the berm, beachface and seafloor were dramatic at Williams Road during the report period. The berm position fluctuated nearly 100 feet with up to 211 feet of shoreline variation. This variation was not a typical seasonal pattern but related to inlet dynamics and bar or shoal migration. Consequently, the cycle of change was initially erosional but then became accretional through the last two surveys. By June 2001, the beach elevation increased 3 feet at the berm and the net shoreline advance was 45 feet. A huge wedge of sand moved onto the profile offshore forming a wide shallow bar over 300 feet in width. The combination of onshore and offshore gains increased the net volume by 71.38 yds^3/ft for the report interval.

- **Profile #120 – 1st Street, Sea Isle City, Cape May County** (fig. 89)

This site consists of a narrow, low elevation beach fronting an artificial dune with Commonwealth Avenue located immediately landward of the dune's rear toe. Dune grass is abundant on the landward slope and crest with a dune fence installed at the landward toe to prevent foot traffic across the dune. Minor to moderate storms have destroyed the dune four times since 1984. A pair of northeast storms in late January and early February 1998 removed a 2000-foot section of the original dune and washed the sand across the highway onto the salt marsh in some cases. The dune was restored in 1998 with a core composed of 10-foot diameter geo-textile tubes and covered with sand. The seaward face of the geo-tube is presently exposed south of this site. The beach elevation is so low that wave run-up during normal astronomical high tide cycles frequently reach the dune toe causing erosion on the seaward slope. During the report interval 10 feet was lost from the dune toe leaving an overall dune width of approximately 40 feet remaining. The crest of the dune reached an elevation of 15 feet NGVD and was relatively stable.

The beach and beachface slope were extremely stable but depleted of sand. On the beach a thin veneer of sand lies over salt marsh outcrop, which is often exposed especially where sand was excavated to fill the geo-tube during construction of the dune core. The maximum beach elevation at the dune toe is about 6 feet NGVD and quickly slopes down to approximately 3 feet NGVD within 60 feet of the toe seaward. A relatively flat beachface slope continues for another 180 feet to the zero datum line. More dramatic changes were generated by shifts in the offshore bar

position. On December 23, 1999, a shallow shelf extended under water for 175 feet and a small bar was located offshore with a shallow trough in between. By June 2000, the trough was scoured 3 feet deeper and expanded landward over 100 feet eliminating the shelf. The offshore bar accumulated sand as eroded material was transferred offshore. Prior to the December 2000 survey the offshore bar sand was transported landward filling in most of the trough, which reduced the near shore seafloor 7-foot depth to minus 4 feet NGVD. During the winter and spring of 2001 a smaller nearshore trough redeveloped. The net volume change for the period was 11.92 yds^3/ft of sand added to the profile with 52 feet of shoreline advance. This site is located near the border of Upper Township and Sea Isle City but did not receive sand directly from the recent Strathmere beach nourishment project completed during the fall of 2001. However, this site may begin to see an accumulation of sand derived from losses in the project area 1,500 feet north and transported south by littoral currents to this beach. Future monitoring here will indicate the amount and rate of sediment transport to this site from the project area.

- **Profile #119 – 25th Street, Sea Isle City, Cape May County** (fig. 90)

Profile #119 starts at the landward dune toe located less than fifty feet from the oceanfront property. The landward slope is relatively stable and supports a thick stand of bayberry plants mixed with a few small pine trees. Dune grass is thick on the crest but bayberry shrubs are rapidly colonizing large portions of the region. Dune grasses continue over the seaward crest and onto the seaward slope mixed with goldenrod then tapering to a few rhizomes and early colonizing species lower on the slope. The dune width is about 100 feet at the base with a crest elevation of approximately 17 feet NGVD.

In general the beach configuration is similar to the beach described at 1st Street, relatively flat with a low elevation. However, there is enough elevation relief and transferable sand here to promote the formation of a small dry berm. The configuration of this feature varied during the report interval but approximately 100 feet of dry beach above elevation 5 feet NGVD was retained throughout the study period. At the shoreline a shallow scour trough developed prior to May 2000 with the sand deposited on the nearshore slope. This material was transferred back onshore by October 2000 filling the trough and restoring the previous shoreline position recorded on October 8, 1999. Further offshore a deep trough over 200 feet in width separated an offshore bar from the shoreline. The bar position fluctuated by about 100 feet from season to season adding some sand to the seaward trough slope in October 2000 but sand transfer onshore was limited. Some sand accumulated on the nearshore slope by May 2001. The net result for the report interval was a minor volume increase of 1.04 yds^3/ft of sand with 19 feet of shoreline advance. The minor sand volume change and shoreline advance indicated cross-shore sand movement between the beach and nearshore was the dominate beach process affecting this beach with very little lateral sand movement from other sections of shoreline.

- **Profile #118 – 57th Street, Sea Isle City, Cape May County** (fig. 91)

The site was established at the southern end of the Sea Isle City promenade that is located in the middle of Sea Isle City's municipal beachfront. The profile includes the street end and asphalt promenade located adjacent to the landward dune toe. A dune fence along the landward toe inhibits significant quantities of sand from spilling onto the promenade and prevents foot traffic across the dune. An opening through the dune allows vehicles and foot traffic to access the beach directly from 57th Street. The dune is relatively narrow, about 50 feet wide between the seaward and landward toes. The crest of the dune was approximately 17 feet NGVD and continued to accumulate sand on the seaward edge throughout the report interval. Sand also accumulated along the lower portion of the seaward slope along dune fence installed around the dune perimeter. Although relatively narrow, the landward slope and crest of the dune support a diverse number of native species including pitch pine, bayberry, goldenrod and beach pea all intertwined with a thick stand of dune grass. The density and diversity of plants is dramatically reduced over the seaward crest with a sparse number of dune grass stalks and rhizomes mix with a few early colonizing plants such as Sea Rocket on the seaward slope.

Between October 1999 and February 2000, the upper beach and beachface eroded significantly. The beach lost up to 3 feet of elevation and the shoreline retreated 111 feet. The very gentle beach gradient means that a 3-foot drop in elevation will produce over 30 times as much horizontal displacement in the point where the zero datum crosses the survey line. Some of this eroded sand was transferred to the nearshore slope of the offshore trough or to the outer profile limits of the offshore seafloor and beyond. Subsequent surveys indicate some sand was transported onshore partially restoring the beach and nearshore slope configuration seen prior to the erosion. Offshore the small bar shifted landward approximately 100 feet but the seafloor remained relatively stable in the trough between the beach and bar during the remainder of the report interval. This indicates very little sand transfer occurred between the offshore and beach but instead suggest the sand that accumulated onshore was derived from the nearshore or adjacent beaches then transported laterally by littoral currents to this site. Consequently, despite 70 feet of net shoreline retreat the net volume change was only a loss of 2.33 yds^3/ft of sand.

- **Profile #117 – 80th Street, Sea Isle City, Cape May County** (fig. 92)

This site is set at the seaward end of 80th Street along the centerline of the road. The profile includes the street end and continues along a dune path through the dune. This path was established at the seaward end of the street perpendicular to the shoreline and at the same elevation as the street. Consequently, the cross-section does not represent the true configuration of the dune system that is on either side of the path. The dune north and south of the profile is approximately 50 feet wide at the base and about three feet higher than shown on the cross-section. Dune grass with some goldenrod flourishes on the landward crest and continues over the seaward crest where it becomes sparse on the seaward slope.

As is typical of the area this beach is low and flat. There was no significant berm development during the surveys conducted for this report. The dry beach above elevation 5 feet NGVD is limited to within about 50 feet of the dune toe while the remainder of the 160-foot wide beach is subject to wave run up during higher tide cycles, which prevented any significant sand accumulation on the beachface. Consequently, there were only small seasonal beach changes recorded onshore with minor shoreline changes. The offshore changes were more significant but were limited to a transfer of sand from the nearshore bar seaward to the offshore seafloor. As a result of these relatively minor changes the net volume changed was small with 7.20 yds^3/ft of sand added to the profile while the shoreline position retreated 25 feet.

- **Profile #216 – 9th Street, Avalon, Cape May County** (fig. 93)

The site was originally established at the seaward end of 9th Street as part of a municipally sponsored erosion study and was added to the New Jersey Beach Profile Network when the program was expanded in 1994. This site is located about 700 feet south of the Eighth Street jetty along Townsends Inlet. This section of shoreline is subject to inlet tidal currents and exposed to direct northeast wave approach because of the inlet configuration. Consequently, this stretch of shoreline has been very erosional. The profile begins at the landward toe of the dune and includes a small aluminum bulkhead set near the street end to prevent street flooding. The landward slope and crest of this artificially constructed dune are stable with an abundance of dune grasses mixed with goldenrod. The crest has accumulated sand during the report interval but the seaward crest and slope are vulnerable to severe erosion. In the fall of 1999, the dune width at the base was approximately 225 feet with a crest elevation of nearly 20 feet. From December 1999 to November 2000, erosion removed 50 feet from the seaward toe but an accumulation on the crest increased the elevation to 21 feet.

The dune erosion followed from severe beach erosion that cut the shoreline back 110 feet, removing any remaining dry recreational beach. This erosion impacted the offshore segment along the seafloor scouring away 7.05 yds^3/ft of sand from the nearshore slope. The cross-section indicates the eroded sand was transported further offshore to the seafloor where a deposit of sand

appeared between December 1999 and November 2000 (27.29 yds^3/ft). Consequently, Great Lakes Dredge and Dock was authorized by the Borough of Avalon to perform an emergency beachfill completed on February 22, 2001 with 306,000 cubic yards of sand placed from this site south to 17th Street. As a result the shoreline advanced 158 feet between November 2000 and June 2001 with 79.53 yds^3/ft of sand added to the net profile volume. A dry recreational beach above elevation 6 feet NGVD extended 100 feet seaward of the dune toe and sand was pushed up the dune slope to repair the dune scarp damage. However, offshore the accumulation of sand observed in June 2000 steadily eroded until June 2001 when the offshore slope was nearly the same as it was in December 1999. The net profile volume change for the report period was 28.07 yds^3/ft of sand gained with a shoreline advance of 48 feet.

- **Profile #116 – 23rd Street, Avalon, Cape May County** (fig. 94)

This profile was established at the seaward end of 23rd Street and includes the street end and boardwalk located over the landward dune toe. The dune was constructed as part of the initial 1987 beach nourishment project and continued to grow to a width of approximately 140 feet with a 15- foot NGVD crest elevation. Sand accumulated to form a new foredune along the seaward slope around dune fence installed at the base of a remnant dune scarp. Dune grasses mixed with sporadic goldenrod flourish from the boardwalk base to the seaward crest. A few dune grass rhizomes and sea rocket, an early colonizing species, are established on the foredune.

Sand was placed here in 1987 after several years of severe erosion had pushed the high tide shoreline landward to a point between the boardwalk and the oceanfront properties, which were exposed to direct wave assault. A maintenance renourishment project in 1990 was the last time sand was placed directly at this location. Sand shed from a series of subsequent projects in the area between the inlet and 17th Street has been transported south through this site helping to maintain a sufficiently wide beach to support both dune growth and recreational needs. A period of erosion between December 1999 and June 2000 cut the shoreline back 119 feet and removed 30.21 yds^3/ft of sand from the nearshore slope. Prior to November 2000, sand moved onshore, which bolstered the beach configuration until June 2001 when the beach configuration was nearly identical to the December 1999 survey. Offshore losses increased the seafloor depth from minus 7 feet NGVD to minus 9 feet NGVD, which diminished further offshore until the elevation change tapered to nearly zero near the profile limit. For the study interval the shoreline retreated 21 feet with 33.80 yds^3/ft of sand lost from the profile, all of which was from the seafloor.

- **Profile #115 – 35th Street, Avalon, Cape May County** (fig. 95)

The profile begins at the seaward end of 35th Street. Thirty-fifth Street is located at the northern end of an undeveloped segment of the Avalon shoreline where the oceanfront homes are over 500 feet from the seaward dune toe. Called the “high dune area”, the beach is backed up with a prominent foredune ridge shown on this cross section. This dune lies at the seaward edge of a wide vegetated sand plain that grades into old dunes up to 50 feet above sea level between 40th Street and 55th Street in Avalon. These “high dunes” are covered with a climax forest of cherry trees. At 35th Street the crest elevation is only 15 feet NGVD and the back dune area is covered with bayberry and pitch pine. The profile follows along the beach access path for the initial 300 feet of the plot, which is in the area of dense bayberry and pine growth. The original instrument station for this site in 1987 was located on the first ridge approximately 300 feet seaward of the street end. As a result of extraordinary dune growth during the last decade the instrument station was moved seaward to what has developed into the primary ridge 440 feet seaward of the street end. This region between the old instrument station on the rear ridge and the primary ridge is covered with dune grasses mixed with several other native species including goldenrod and some sporadic bayberry plants. Seaward of the primary dune ridge a foredune has continued to accumulate sand, further expanding the dune system seaward. Dune grasses mixed with goldenrod inhabit the swale and landward slope of the foredune up to the crest. Aeolian sand accretion on the seaward foredune slope limited the vegetation growth to a few dune grass

rhizomes and early colonizers such as sea rocket. During this study interval the seaward slope advanced about 10 feet.

The upper beach was remarkably stable within 75 feet of the dune toe but significant seasonal variations occurred with the beach berm position and configuration. Typical "summer" berms were located about 180 feet seaward of the dune toe during both fall surveys. But the berm was flattened by wave run up between the fall 1999 and spring 2000 surveys and the eroded sand was transferred to the lower beachface slope to create a flat beach configuration. After the berm reformed at a higher elevation during the summer and fall some winter storm wave activity notched a cut in this large berm and transported the sand to the beachface and nearshore slope forming a smaller berm lower on the beachface. After an initial period of scour between fall 1999 and spring 2000 when a deep nearshore trough developed, sand migrated landward from the seafloor between June 2000 and June 2001. This onshore movement filled in most of the trough and formed a shallower nearshore slope providing sand to the beachface. The net volume change for the report interval was 4.82 yds^3/ft sand lost but this loss occurred at the profile limit. The zero elevation shoreline retreated 12 feet but the dry recreational beach width advanced 30 feet at the +6-foot elevation. These changes indicate that the sand budget was relatively stable here with cross-shore sediment transfer the dominant process. Any lateral shoreline transport was in equilibrium.

- **Profile #114 – 70th Street, Avalon, Cape May County** (fig. 96)

This site is located at the seaward end of 70th Street. The profile includes the street end then continues along the beach access path through the back dune. Continued dune growth along this stretch of beach has been documented with the addition of the seaward ridge during the last decade. During this study interval an accumulation of sand continued on the seaward slope of the growing foredune. Bayberry and pitch pine inhabit the back dune area seaward of the ocean front property. Grasses flourish on the landward slope of the primary dune ridge and are mixed with sporadic bayberry plants. Seaward of the primary crest an abundance of dune grass provides dense ground cover through the swale to the developing foredune. Recently deposited aeolian sand on the foredune crest and seaward slope extended the dune system seaward 25 feet. The overall dune system width is 180 feet from toe to toe with a primary crest elevation of 18 feet NGVD.

After a period of minor beachface erosion associated with the development of a seafloor scour trough from December 1999 to December 2000, the trend shifted towards onshore transport and accretion during the remainder of the report interval. The offshore bar migrated landward filling the trough that separated the offshore and nearshore regions. At the same time sand moved back onto the beach and eventually produced the berm seen by July 2001. Over 18 months the profile sand volume lost 3.17 yds^3/ft combined with 7 feet of shoreline retreat indicates relative stability, typical of cross-shore sediment transport between the bar and beach. Sand lost from the north end of Avalon and transported south by littoral currents has helped to maintain a balanced sand budget on Avalon beaches between 32nd Street and 78th Street. This beach stability is also the cause of the expansion of the dune system along this stretch of shoreline over the past decade.

- **Profile #113 – 90th Street, Stone Harbor, Cape May County** (fig. 97)

Profile #113 is located at the seaward end of 90th Street. The plot includes the street end and a wooden bulkhead buried along the landward dune toe at the street end. A primary dune ridge 40 feet wide with a crest elevation of 17 feet NGVD is adjacent to the bulkhead. This feature survived several storm episodes of erosion when the dune just south of the profile line was breached. The seaward crest of the primary dune ridge was the location of the storm scarp line. Currently dune grasses mixed with seaside goldenrod flourish over this ridge and onto the seaward slope. At the seaward toe of the primary dune a foredune ridge developed during the study interval leaving a small swale between the two ridges. Dune grass and goldenrod are sparse through the swale and onto the foredune but efforts to establish denser coverage have been made by planting new grass

plugs on this developing feature. In addition to the grass planting dune fence installation along the seaward toe will help stabilize the seaward slope and collect aeolian sand and encourage continued growth. On January 3, 2000 the foredune ridge was approximately 10 feet wide with about one foot of elevation relief and by June 2001 the width was 30 feet with 3.5 feet of relief for a crest elevation of 14 feet NGVD. This new feature enhances significantly the storm protection value of this dune system for the oceanfront properties and street end.

The primary reason for this dune growth was a relatively stable beach during the study interval. During this study the upper beach continued to accumulate sand from the dune toe seaward for nearly 150 feet to the berm ridge. Some minor winter erosion between January 2000 and June 2000 generated a small ridge and runnel at the toe of the beachface and a deep trough further offshore. After June 2000, conditions allowed the sand to migrate landward partially filling the offshore trough while the nearshore sand moved onshore to form a pronounced "summer" berm by June 2001. The final beach configuration showed a berm ridge about 125 feet seaward of the dune toe at elevation 7 feet NGVD. The 18-month profile volume change was a small gain of 1.48 yds^3/ft of sand with less than a foot of shoreline advance. These minor changes demonstrate the remarkable stability of this beach in spite of extensive cross-shore sediment transport between the seafloor and beach.

- **Profile #212 – South End, Stone Harbor, Cape May County** (fig. 98)

Site #212 was established to replace site #112 lost when the entire length of South Pointe vanished into Hereford Inlet between 1989 and 1992. The current profile location is just north of the terminal groin, which keeps the beach in place. The profile begins on the western edge of a vehicle access path to the groin and is included on the plot. Along the western edge of the path a thick stand of bayberry shrubs are flourishing. A dune fence along the eastern edge of the path confines the landward dune toe preventing sand from spilling onto the path. On the seaward slope a wooden bulkhead and revetment is buried below the current sand surface but a few pilings and stretches of the bulkhead emerge north and south of the profile site. The dune width is approximately 75 feet at the base with a crest elevation of about 15 feet NGVD. Dune grasses mixed with goldenrod inhabit the landward slope through the seaward crest. The seaward slope is devoid of vegetation below the bulkhead. The dune prevents breaches into the natural area west of this site with the closest developed property located over 500 feet north of the profile.

The beach profile is located adjacent to Hereford Inlet about 550 feet north of the terminal groin. Consequently, the site is subject to tidal currents and shoal migration because of its proximity to the inlet. The beach is low and relatively narrow about 200 wide from the dune toe to the shoreline position but less than 100 feet of width is above elevation 4 feet NGVD, which means a large portion of the beach is awash at high tide. Both the January 2000 and June 2000 surveys showed a flat beach configuration with a small bar located near shore. Prior to November 2000 sand from nearshore moved onshore and a small berm developed on the beachface at elevation 3 feet NGVD. Additional sand was transferred onshore from the seafloor nearshore prior to June 2001, which enlarged this developing berm ridge, building it higher on the beachface at elevation 5 feet NGVD. This feature extended the dry recreational beach area above 4 feet NGVD seaward another 40 to 50 feet. Sand also accumulated on the offshore seafloor during the June 2001 survey. Despite the berm growth the shoreline position retreated 26 feet, as a result of the nearshore transfer of sand higher onto the beachface creating a steeper slope. The net profile change for the study period was a minor loss of 2.76 yds^3/ft of sand indicating a conservation of sediment within the region of shoreline subject to the surveys.

- **Profile #111 – 15th Avenue, North Wildwood, Cape May County** (fig. 99)

This site is located at the seaward end of 15th Avenue set along the south side of the lifeguard headquarters and beach access path. The elevated boardwalk ends at this site just south of the profile line. North of 15th Avenue a densely vegetated dune line is established along the seaward side of the ground level path parallel to the beach that continues north from the boardwalk

position. South of the site a wide, flat back beach area separates the boardwalk from dune hummocks established several hundred feet seaward of the boardwalk. These dune "islands" continue in a broken chain from the pier several blocks south of the site, north towards Hereford Inlet. The hummocks were established on beach raking debris piles covered with sand. The municipality installed dune fence around the perimeter of each pile. These piles were planted with dune grasses mixed with goldenrod to complete the process. The hummock that developed on this line during the last decade was destroyed by erosion between October 1997 and June 1998. However, several "islands" survive north and south of the site and are between 6 to 8 feet high in some locations but most are scarped on the seaward slope.

The site has become the subject of erosion after 5 years of relative stability. The beach has retreated 740 feet since 1986, when the dry beach width extended about 1200 feet seaward of the lifeguard headquarters. Its location on May 4, 2001 has been reduced to just less than 400 feet of beach seaward of the headquarters building. The shoreline (zero datum) has retreated from a 1400-foot distance to a position 675 feet from the reference monument located adjacent to the lifeguard headquarters. The sand volume lost amounts to 375 yds^3/ft since 1986.

This significant loss would have devastating consequences if duplicated in any other New Jersey beachfront municipality. The driving force behind this erosion appears to be related to changes in Hereford Inlet tidal dynamics. This site is located thirteen blocks south of Hereford Inlet and the erosion problem intensifies as you approach the inlet. However, because of the remarkable initial width of the beach this erosion did not cause significant alarm among municipal officials until recently. The sand volume lost from the oceanfront beach has been relocated along the Hereford Inlet shoreline of North Wildwood. A long-term review of inlet changes completed in 1988 for the New Jersey Department of Environmental Protection (NJDEP) indicated that this is the third such transition in the inlet configuration since 1900. The last one captured on a map dated 1962, shows a huge sand spit positioned northeast of the seawall with at least two city blocks of lots superimposed on it. A photograph taken in 1960 by a resident who owned a property on Second and Surf Avenues shows an old wooden bulkhead with a small boat tied to the pilings. The boat is sitting on the beach at low tide. Today this ancient bulkhead is a block inland from the modern rock revetment parallel to First Avenue at Surf Avenue. The conclusion being that major sand re-deposition is common and possible within a two-year interval. In the present case, a sand spit was observed for the first time in December 1999 and has grown larger relatively slowly this time.

During this study interval the beach continued to erode steadily with an additional 113 feet of shoreline retreat and 63.32 yds^3/ft of sand lost. The berm retreated 100 feet from 480 feet to 380 feet at elevation 8.5 NGVD. Similar losses continued on the seafloor from the shoreline to the nearshore slope toe 300 to 400 feet offshore. Further offshore the seafloor was stable indicating the sand was not transferred offshore to where a bar would form. Instead the sand was transported away from the site by littoral currents. During the 1990's the tidal channel hugged the south inlet shoreline revetment. A significant portion also appears to have been transported south to Wildwood where the beach width has increased.

- **Profile #110 – Cresse Avenue, Wildwood, Cape May County** (fig. 100)

The Cresse Avenue site is located at the southern end of the Wildwood boardwalk. This profile begins at the street end barricade adjacent to the base of the boardwalk. The profile continues across a wide flat expanse of open dry beach that extends approximately 1000 feet to the berm ridge. There is no dune along the profile line but a well-developed dune begins less than 100 feet south of the profile site and continues south along the Wildwood Crest shoreline, past the fishing pier located several blocks further south. This feature is approximately 75 feet wide at the base with about 6 feet of elevation relief and planted with dune grass mixed with goldenrod. North of the site up to the new convention pier the dune is absent.

The upper beach is extremely stable and provides abundant opportunity for public recreational activities. Unlike many communities in Monmouth and Ocean Counties where public beach

access is quite restricted, in Cape May County the municipal governments encourage tourism and public beach access. Consequently, wide beaches such as this site support an abundance of seasonal public activity and economic prosperity. The upper beach elevation is above 6 feet NGVD, which prevents normal tidal overwash but berm top ponds do occur frequently on the 1000-foot width beach. The water in these ponds is less than a foot deep, heats up rapidly in the summer sun with the resulting explosive growth of fecal bacteria. Testing revealed this potential health hazard for beach patrons; especially young children who are enjoy playing in these calm beach pools. The Philadelphia District Army Corps of Engineers has begun a study that includes alternatives to alleviate this condition.

Sand has continued to accrete here since 1986 when NJBPN monitoring began. The shoreline position has advanced 435 feet from fall 1986 to spring 2001 with 148.86 yds^3/ft of sand added to the profile volume. In 1986 the shoreline position was located 752 feet seaward of the boardwalk and advanced to 1187 feet by spring 2001. The shoreline advance during this report interval was just 18 feet but the berm ridge advanced nearly 80 feet. Sand accumulated on the nearshore slope forming a bar system then moved onshore where it was added to the berm and beachface. A trough separated the nearshore bar system from a second offshore bar located approximately 450 feet seaward of the shoreline. This offshore feature varied in position and configuration during the study interval. Initially the bar location moved seaward by 100 feet then as sand advanced landward the trough width decreased. By October 2000 this bar was adding its volume to the beach. The trough and bar reformed in the previous locations by May 2001. During this recent study interval the net profile sand volume increased 20.37 yds^3/ft. The source of this material appears to originate in North Wildwood.

- **Profile #109 – Raleigh Avenue, Lower Township, Cape May County** (fig. 101)

This site is located at the seaward end of Raleigh Avenue. The profile was established along the south side of a beach access path between large beachfront condominiums. A wooden bulkhead adjacent to the seaward edge of the buildings is partially buried but separates the dune and beach from the densely developed area west of the beach. A low elevation dune extends from the bulkhead seaward approximately 150 feet. The crest elevation of the dune along the profile line is just 11.5 feet NGVD but is slightly higher along the north side of the beach access path. Dune grasses mixed with some non-grass species provide moderate ground cover on the landward dune region but the plant density is diminished seaward where sand continued to accumulate forming a foredune ridge during the study interval.

This beach has remained relatively stable since 1986 with just 7.69 yds^3/ft of sand added to the profile volume. The dune grew to a peek crest elevation of nearly 15 feet NGVD by October 1996 but was disturbed prior to the June 1997 survey. Subsequent dune recovery has allowed the dune width to advance seaward nearly 80 feet further than its previous position but the dune elevation remained diminished. The upper beach also gained sand during the monitoring history causing an increase in the elevation between the dune and berm. During this recent report interval the berm position advanced nearly 40 feet and the shoreline position moved seaward 49 feet. Sand moved onshore to the beachface from the nearshore slope. Further offshore a bar developed prior to May 2000 then moved landward during the summer filling a seafloor trough between the nearshore and offshore bar systems. The bar reformed offshore over the winter of 2001 restoring the previous trough and bar positions by May 2001. During the recent interval 33.68 yds^3/ft of sand accumulated on line, probably originating from offshore beyond the profile limit.

- **Profile #208 – Coast Guard Base, Lower Township, Cape May County** (fig. 102)

This site is located in Lower Township at the south end of Five-Mile Beach along the boundary between the US Coast Guard Electronics Engineering Center and the recently established U.S. Fish, Game and Wildlife Service wildlife management area on land previously owned by the US Coast Guard. The beach is only several hundred feet north of the Cold Springs Inlet jetty on an

undeveloped section of beach. An extensive natural dune is present, which is only partially, documented on the profile plots. Landward of the reference position, located on the back ridge, the vegetation is too extensive, approaching a maritime forest, to allow access for surveying. Consequently, the cross-section includes the back ridge crest, swale and large front dune. The seaward slope of the back ridge is a covered by flourishing bayberry plants and dune grasses. Abundant dune grasses and native non-grass species inhabit the swale and landward primary dune slope including occasional bayberry shrubs. From the crest seaward dune grasses flourish and rhizomes extend seaward to the dune toe. Early colonizing plants are appearing over the upper beach near the dune toe where a foredune is in the early stage of development.

This region has remained relatively stable during the recent report interval in the absence of significant storm activity. The lack of storm wave run up onto the upper beach allowed sand to accumulate along the seaward dune toe and vegetation to colonize the zone. The maximum beach elevation maintained is relatively low at 7 feet NGVD making this beach susceptible to overwash from storm surge. Dune breaching has occurred along sections of this beach during moderate storm events over the 15-year monitoring history. The berm position fluctuated seasonally within a region 100 to 180 feet seaward of the dune toe. The shoreline position advanced 30 feet with 14.80 yds^3/ft of sand added to the profile volume in the past 18 months. A series of nearshore and offshore bars formed prior to March 2000 then moved landward and onshore by October 2000. The offshore bar reformed after the winter, but prior to the March 2001 survey. This site continues to be very stable with steady dune growth adding sand to the primary ridge and beginning the formation of a small foredune. The Cold Springs Inlet jetty helps hold sand in place along this shoreline.

- **Profile #108 – Cape May Beach Club, Cape May County** (fig. 103)

The site is located directly seaward of the Cape May Beach Club. There is a low dune seaward of the beach club security fence, which is slowly accumulating sand. The dune has modest ground cover consisting of a variety of dune grass species that help collect and stabilize the sand. No efforts have been made to establish a dune fence, which would increase the rate of sand accumulation along this section of the dune toe. The dune width extends nearly 200 feet seaward of the club fence with a crest elevation of 12.5 feet NGVD. This beach was restored by the ACOE starting in 1989 as part of the initial phase of a 50-year commitment to maintain the beaches in the City of Cape May. This initial phase placed sand along the US Coast Guard Training Center in Cape May from the Cold Springs Inlet west jetty to Patrol Ave.

Since restoration, periodic maintenance projects nourished the city beaches that resulted in remarkable stability since 1997. The upper dry beach is relatively flat and uniform over approximately 250 feet seaward of the dune toe, at an elevation of 10 feet NGVD. The beachface slope was only slightly more variable with minor shifts in the shoreline and berm positions fluctuating within a 40-foot zone. Beyond the beachface toe the seafloor was stable. The net shoreline change for the report was a 15-foot advance with 9.32 yds^3/ft of sand added to the net profile volume.

- **Profile #107 – Baltimore Avenue, Cape May City, Cape May County** (fig. 104)

This profile is located at the seaward end of Baltimore Avenue along the north side of Beach Avenue. The profile includes the road, an old wooden bulkhead adjacent to the south side of Beach Avenue, continues over a rock seawall and onto a developing dune system. Prior to restoration in 1991 by the ACOE project, low tide reached the base of the now partially buried seawall, only the tops of the cap rocks and a portion of the landward edge are currently exposed. The nourishment project extended the dry berm approximately 300 feet seaward. Dune fencing was installed on the wide, dry beach seaward of the buried seawall and aeolian sand accumulated forming a small low dune 150 feet wide with a crest elevation of 13 feet NGVD. Dune grass was planted and flourished providing stability and collecting additional sand. Rhizomes extended

seaward from the dune toe helping the dune advance onto the beach nearly 30 feet during this study interval.

The dry upper beach is flat and currently extends nearly 380 feet to the berm ridge. The upper beach elevation is 10 feet NGVD and is an ideal platform for continued dune growth. This wide beach provides a substantial area for recreational activities and provides a significant buffer to damage from moderate storms, although major events could potentially overwash this beach and low dune causing street flooding. During the past 18 months the berm and shoreline positions advanced approximately 40 and 33 feet respectively with 20.57 yds^3/ft of sand added to the net profile volume. Sand also accumulated on the seafloor along the nearshore slope during this current study forming a small bar feature. Offshore a thin veneer of sand accumulated on the seafloor prior to the May 2001 survey.

- **Profile #106 – Broadway Avenue, Cape May City, Cape May County** (fig. 105)

The site is located near the end of the promenade at Broadway Avenue in the final groin cell before entering the natural beach area along the Cape May Meadows Nature Conservancy property. The profile includes the asphalt promenade and wooden bulkhead located along the seaward edge of the promenade. This profile line is set along the eastern edge of a comfort station built after the profile was established. Consequently, a small dune system that has developed over the past few years along the seaward base of the promenade is not included on this cross-section because the area around the building is maintained clear of significant sand accumulation. The dune system that has developed east and west of the comfort station is approximately 60 feet wide with about 2 to 3 feet of elevation relief. Dune grasses mixed with some goldenrod flourish over the dune crest and are colonizing the beach near the dune toe.

This site is at the end of the current ACOE beach commitment to Cape May City and receives periodic re-nourishment. The beach along the Cape May City promenade is a popular recreational area with easy public access and abundant nearby parking available. The last renourishment maintenance project occurred during the fall of 1999. The September 1999 survey was completed prior to this project but the April 2000 study taken nearly seven months after the completion shows the beneficial impact of the project at this site. The berm advanced approximately 50 feet with 8.33 yds^3/ft of sand added to the recreational beach. Littoral drift and onshore cross-shore transport combined to bring another 10.34 yds^3/ft of sand to the beachface prior to September 2000 causing the shoreline position to advance 41 feet and the berm another 25 feet. The final survey for the report completed in May 2001 shows more sand shed from the eastern project beaches transported west by littoral currents where it accumulated along this beach extending the berm another 30 feet to a position 150 feet seaward of the bulkhead at elevation 9.5 feet NGVD. Offshore an additional thin veneer of sand accumulated on the seafloor from shallow water out to near the profile limit. This final accumulation brought another 19.15 yds^3/ft of sand to the profile, which created a net profile volume increase of 32.63 yds^3/ft of sand for the report interval with a net shoreline advance of 29 feet.

- **Profile #105 – Beach Avenue, Lower Township, Cape May County** (fig. 106)

This site is located over 500 feet west of the terminus of Beach Avenue along the natural beach area within the Cape May Meadows Nature Conservancy property. The profile begins at the landward dune toe along the edge of the back dune wetland area. The high primary “dune” seen at the rear of the cross section plot was built by the State in 1985 to protect the marsh habitat from overwash. Currently this feature has bayberry and pine established along the landward slope and dune grasses have propagated over the crest and extend onto the foredune. The beachface slope began at the toe of the artificial ridge in 1987. Since 1987 this beach has grown tremendously. The sand responsible for this growth has been derived from losses from the Cape May City project and has resulted in beach accretion all the way to the State Park in the Borough of Cape May Point. The lower elevation dunes presently extend approximately 400 feet seaward of the tall dune and have accumulated from wind-deposited sand blown in across the widening

beach. Dune grass rhizomes, goldenrod and other early colonizing plants have spread across this region stabilizing the features and contributing to further growth.

Sand that had accumulated on the seafloor near the beach prior to September 1999 began to move onshore by March 2000 and continued to add sand to the beachface through September 2000. This addition of 30.95 yds^3/ft of sand to the beachface extended the berm and shoreline position seaward 100 feet and 174 feet respectively. However, after September 2000 the seafloor source of sand was depleted and the shoreline began to erode. The berm position retreated nearly 80 feet by March 2001 to almost the same location documented during the September 1999 survey and the shoreline retreated 90 feet. For the report period the net shoreline advance was 84 feet with a net profile volume loss of 33.64 yds^3/ft of sand, lost mostly from the seafloor. The shoreline advance reflects the shift of sand from the ridge to the beach between 1999 and 2001. Sand shed from the recently completed renourishment project area in Cape May City should eventually be transported to this site and accumulate along the nearshore seafloor as it has done since the initial project was completed.

- **Profile #104 – Lake Drive, Cape May Point, Cape May County** (fig. 107)

This profile site is located at the seaward end of Lake Drive. The profile plot includes the street end then continues over a wide dune feature that is the primary shore protection feature along this stretch of beach. This feature is approximately 150 feet wide at the base and reaches a crest elevation of 15.5 feet NGVD. From the landward crest the profile slopes downward to cross a 50-foot wide flat area at elevation 13 feet NGVD where a volleyball field was present in 1987. The seaward crest rises above this flat area to form a peek with a crest elevation of 15 feet NGVD. The region between the landward and seaward crest is densely vegetated with bayberry plants and pitch pine trees mixed with dune grass, goldenrod and poison ivy. Dune grass continued to spread over the seaward crest down the seaward slope. The seaward slope has stabilized after several years of periodic dune scarping caused significant retreat. During this recent study interval the seaward slope and dune toe advanced slightly.

The Cape May Point beaches are part of a Philadelphia Corps of Engineers demonstration project to focus on the effectiveness of submerged breakwater units and a submerged sill to retain sand in two additional groin cells. Beach nourishment will accompany the breakwater project. This particular cell will not receive the breakwater protection. However, the site will receive sand as part of a control beach study associated with the installation of the breakwater protection at the two groin cells immediately east of this site. Past cross section information here has shown a chronic loss in sand quantity on the beachface. This pattern continued through December 2000 but sand placement prior to May 2001 reversed this trend. A berm was formed at elevation 9 feet NGVD that extended 30 feet seaward of the dune toe and the shoreline position advanced 23 feet. Offshore the sharp drop-off into deeper water received some sand prior to December 2000 along the steeper slope for the first time in over 10 years of study. The low wave energy seen along the shoreline may be the reason the sand appeared, but it may also relate to the arrival of sediment derived from the Cape May City ACOE project described at sites 108 to 106. This phenomenon was observed at all eastern municipal survey stations at the time of the fall 2000 survey conducted for the Borough of Cape May Point. During this report interval the net profile volume increased by 19.42 yds^3/ft of sand.

- **Profile #103 – Higbee Beach, Cape May County** (fig. 108)

This site is located at the Higbee Beach State Park wildlife management area. The profile is located a few hundred feet south of the beach access path that leads to the bay from the main parking lot. The cross-section begins on the dune bluff, which is densely vegetated with bayberry, pitch pine, poison ivy and dune grasses that blend into an upland forest landward of the reference position. The seaward slope has been scarped by periodic episodes of erosion during the last decade but has been relatively stable during recent surveys. The beach is subject to wave approach generated by any westerly wind fetch across Delaware Bay. This site has eroded

occasionally since monitoring began in 1986 with 32 feet of shoreline retreat through May 2001. The erosion extended uniformly from the top of the bluff down to the base of the beach. The bluff retreated approximately 45 feet and the seafloor depth increased several feet during the monitoring history.

More recently a steep berm scarp developed prior to the December 2000 survey with 2.44 yds^3/ft of sand eroded from the beach. Sand was lost from the nearshore seafloor between December 2000 and May 2001 but the offshore was stable. The net profile changes were a volume loss of 11.19 yds^3/ft of sand and a shoreline retreat of 17 feet.

- **Profile #102 – Whittier Avenue, North Cape May, Cape May County** (fig. 109)

This site is located along Beach Drive between Roslyn and Whittier Avenues. The profile starts along the landward side of Beach Avenue and includes the road. It then continues across a small open grass lot adjacent to the seaward edge of the road, which blends into typical dune vegetation at the landward crest of the dune system about 20 feet from the road edge. For all practical purposes the landward dune toe is essentially the seaward edge of the road. This dune system is approximately 60 feet wide from the road edge to the seaward toe with a crest elevation of 15 feet NGVD. Along this stretch of the Delaware Bay the dune is well established with a dense ground cover of dune grasses mixed with goldenrod and poison ivy adding stability to the sand. This feature has continued to grow during the NJBPN monitoring history forming the substantial foredune crest seen on the plot. This accretion continued over the seaward slope to the upper beach. However, the beachface and seafloor are more variable. A small berm developed between May 2000 and September 2000 but quickly eroded prior to May 2001 when the beachface returned to its previous configuration. Near shore a small wedge of sand moved onshore during May 2000 then eroded prior to September 2000 and continued to erode through May 2001 forming a nearshore scour trough on the seafloor at the beachface toe. Offshore a series of small sand bars shifted position at a rate far more rapid than the 6-month survey interval. The net changes for the report interval were minor with 8.41 yds^3/ft of sand lost form the profile and 6 feet of shoreline retreat.

- **Profile #101 – Pacific Avenue, Villas, Cape May County** (fig. 110)

This site is located at the intersection of Millman Lane and Pacific Avenue. The profile reference position is located along the landward edge of Millman Lane, which is included on the profile plot. The profile continues through a private residential yard to the landward edge of a small dune bluff. At this point the vegetation abruptly changes to native dune species with a dense cover of dune grasses mixed with goldenrod continuing to the seaward toe and a dense thicket of wild berries with some sporadic bay berry plants are located along the landward crest. The dune and beach are remarkably stable along this section of shoreline with minimal changes to report on the beach. The net profile volume change for the report interval reflects this stability with 0.91 yds^3/ft of sand lost from the entire profile length. A vast mud flat extends over 400 feet from the beachface toe with minor variations occurring here as well. The only significant variations along this profile line occur on the last 800 feet of this 1600-foot long profile. This section is dominated by sandbars that migrate slowly across the mud flat. The wave-break bars on the seaward edge of the mud flats became enhanced and migrated landward a few feet in response to the greater frequency of northwest winds. The shoreline changes appear larger than this information would indicate because the zero intercept occurs on the uppermost segment of the tidal flats. Here, a seaward gradient of 1:200 feet means tens of feet of horizontal displacement of this zero intercept for each 0.1 feet of elevation difference at the point where zero elevation occurs. The net shoreline retreat for the report interval was 18 feet.

- **Profile #100 – Reeds Beach, Cape May County** (fig. 111)

This site is located along Beach Avenue approximately midway between Bidwell Creek Inlet and Reeds Beach Road. The profile begins on an open lot landward of the road along the edge of the salt marsh. The profile includes the landward lot and road before sloping seaward down the beachface to the water. The narrow nature of this beach means that repeated episodes of wave overwash move sand onto the access road. Road crews clearing the road of sand formed a small dune on the east side of the road. Recently sand also was placed along the seaward edge of the road after past overwash events to form a small bayside dune in an effort to protect the road but this sand was eroded away during an episode of overwash between August 2000 and May 2001. Sand was also lost from the upper dry beach leaving the road extremely vulnerable to continued overwash. The net shoreline position change for the report interval was minimal with just 4 feet of retreat while the seafloor was remarkably stable since the wind fetch generated waves are not large enough to impact the seafloor in water depths above five feet. The amount of sand in the envelope of beach changes is minor with the net volume loss amounting to just 1.23 yds^3/ft.

SUMMARY OF CAPE MAY COUNTY:

All Cape May County beaches showed an advance over the 18-month interval overcoming a winter loss from 1999 to 2000. The average beach's sand volume declined by 4.15 yds^3/ft during the winter of 1999 and the average shoreline position retreated by 28 feet. The following winter saw a gain of 10.25 yds^3/ft and a shoreline advance of 9 feet indicating that conditions were very mild. The 18-month comparison from the fall of 1999 to the spring of 2001 saw an average beach volume gain of 9.25 yds^3/ft and a shoreline advance of 14 feet. The latter part of this time interval was the most benign for the Cape May County shoreline.

The most recent local project was concluded in February 2001 in the Borough of Avalon, (306,000 cubic yards). Upper Township and the State of New Jersey completed 461,000 cubic yard restoration of the northern Strathmere beach on Ludlam Island in late 2001 but this occurred after the spring 2001 survey series. The Borough of Cape May Point is part of the Lower Cape May Meadows to Cape May Point Ecosystem Restoration and Shore Protection Project. Cape May Point will have two beach cells augmented with submerged breakwater sills installed between the outer tips of the adjacent groins with sand supplied to the cells using trucked-in material. The Cape May Meadows portion of this project will commence this coming year.

Beach nourishment activity continued as both major ACOE projects completed maintenance at Ocean City (third cycle in 2000 with 1.35 million cubic yards placed) and at Cape May City (fourth cycle in 1999 with 400,000 cubic yards placed). The Great Egg Harbor and Peck Beach project, developed by the Philadelphia District Corps of Engineers, was set in motion in September 1991 with the signing of the Local Cooperation Agreement with the State and local entity. The initial phase, completed in October 1992, provided 2.6 million cubic yards of sand to the northern Ocean City beaches, which prevented major property and infrastructure damage during the December 1992 northeast storm. Phase II was completed in March 1993, with a post-disaster declaration rehabilitation contract added to phase II for 846,000 cy, completed July 1993.

Maintenance contracts completed:

December 1994	606,000 cubic yards
August 1995	1,400,000 cubic yards
August 1995	360,000 cubic yards (south end) non-Federal effort
October 1997	800,000 cubic yards
December 2000	1,350,000 cubic yards (north end)
November 2000	400,000 cubic yards (south end) non-Federal effort

The Philadelphia District is in the feasibility phase of project development for Great Egg Harbor Inlet to Townsend's Inlet. The reconnaissance report was completed in April 1996. Funds were

added to the Federal FY99 budget to continue the feasibility phase. The Federal 2000 budget contained funds to continue the feasibility work and to begin the Planning and Engineering Design work. The Final Feasibility Report was due in July 2001. On the local side Sea Isle City has taken the initiative to reinforce the dunes along their municipal segment of this beach. The City also completed a groin south of 94th Street and placed 365,000 cubic yards of sand on the southernmost beach on Ludlam Island in 1999.

The Townsend's Inlet to Cape May Inlet shore protection project has moved to the initiation of construction with four million dollars set aside in the FY 01 Federal budget for construction. This is an array of projects including a replacement seawall along the Avalon shoreline at Townsend's Inlet, and placing sand on the oceanfront beach of Seven-Mile Island in Avalon and Stone Harbor. There is an ecosystem restoration of 116 acres planned for Stone Harbor Point. The State of New Jersey and the Borough of Avalon have just completed an extension of the 8th Street inlet jetty at Townsend's Inlet. Plans called for a 400-foot extension, but placement difficulties have seen less than the full length of stone added.

Project work on Five-Mile Island is contemplated on the Hereford Inlet frontage with reconstruction of portions of the inlet shoreline seawall. Beach nourishment on the oceanfront beach is not being considered as the project develops. However, studies at 15th Street in North Wildwood have documented a rapid shoreline retreat as sand has moved north into and along the inlet shoreline since December 1999 (113 feet of retreat during this study period).

The Cape May Inlet to Lower Township project began with an initial fill of 1,400,000 cubic yards in 1991. Periodic nourishment occurred in April 1993 (415,000 cy), a storm-related rehabilitation in September 1993 (300,000 cy), March 1995 (331,000 cy), January 1997 (366,000 cy), and November 1999 (400,000 cy). Another nourishment is scheduled with funds from Federal budget FY 01. The loss rate from this project has been concentrated at the southern end where sand spills over and around the third groin along Broadway Avenue. The Cape May meadows shoreline has seen extensive accretion of beach, dunes and offshore bars. Site #105 documents this shoreline advance over the past 10 years.

The shoreline along western Cape May County has seen shoreline retreat following episodes of strong northwest winds. There are only modest sand volume shifts, but the shoreline exists at a smaller scale so that even ten cubic-yard-per-foot changes have considerable impact. The Philadelphia District ACOE is moving toward an Ecosystem Restoration and Protection project for Reeds Beach to Pierces Point along the Delaware Bay shoreline of Cape May County. The project covers 6,800 feet of shoreline and entails a one-time placement of sand for horseshoe crab and shorebird habitat. The Villas and Vicinity Ecosystem Restoration and Protection project continued with PED funding from FY 00. This is also a one-time sand nourishment of 29,000 feet of shoreline within Middle and Lower Townships, Cape May County. Approximately 12,000 cubic yards of sand were placed on the Schellingers Creek section of the Cape May County shoreline (Township of Middle) by the Cape May County Mosquito Extermination Commission in 2000.