

# THE RICHARD STOCKTON COLLEGE OF NEW JERSEY COASTAL RESEARCH CENTER



*This photo of northern Ocean City was taken during the November 11-15, 2009 northeaster shows extensive damage to the beach and dunes along East Atlantic Blvd. along the northern Ocean City, Cape May County shoreline.*

## New Jersey Beach Profile Network 2009 Annual Report on Shoreline Changes in New Jersey Coastal Reaches One Through Fifteen Raritan Bay to Delaware Bay

Prepared for:

New Jersey Department of Environmental Protection  
Division of Construction and Engineering  
1510 Hooper Avenue, Toms River, New Jersey 08753

Prepared by:

The Richard Stockton Coastal Research Center  
Richard Stockton College of New Jersey  
30 Wilson Avenue, Port Republic, NJ 08241

June 30, 2010

# The Richard Stockton College of New Jersey Coastal Research Center



## New Jersey Beach Profile Network 2009 Annual Report On Shoreline Changes In New Jersey Coastal Reaches One Through Fifteen Raritan Bay to Delaware Bay

Prepared for:  
New Jersey Department of Environmental Protection  
Division of Construction and Engineering  
1510 Hooper Avenue

Prepared by:  
Dr. Stewart C. Farrell  
Steven Hafner  
Steven Howard  
Dan Barone, Kim McKenna  
Crist Robine, Robert Koch  
Brad Smith, Marcus Gruver  
Mike Flynn, Eileen Linzner  
June 30, 2010

## TABLE OF CONTENTS

• <b>Executive Summary</b>	<b>1</b>
• <b>Acknowledgements</b>	<b>3</b>
• <b>Introduction</b>	<b>3</b>
• <b>The New Jersey Coastal Zone</b>	<b>3</b>
• <b>Monmouth County</b>	<b>5</b>
Figure 1. Monmouth County Station Locations	<b>6</b>
Monmouth County Summary 2008 – 2009	<b>7</b>
Figure 2, 23-Year Sand Volume Change at Site 187, Cliffwood Beach, Aberdeen	<b>9</b>
Figure 3, 23-Year Sand Volume Change at Site 181, Municipal Lot, Sea Bright	<b>10</b>
Figure 4, 23-Year Sand Volume Change at Site 178, Cottage Road, Monmouth Beach	<b>11</b>
Figure 5, 23-Year Sand Volume Change at Site 167, 3 <sup>rd</sup> Avenue, Asbury Park	<b>12</b>
Figure 6, 23-Year Sand Volume Change at Site 160, Salem Ave., Spring Lake	<b>13</b>
Figure 7, 23-Year Average Sand Volume Changes for the 35 Monmouth Co. sites	<b>14</b>
Site Information – Cliffwood Beach to Pompano Avenue (Figs 8 – 42)	<b>16</b>
• <b>Ocean County</b>	<b>86</b>
Figure 43. Ocean County Station Locations	<b>87</b>
Ocean County Summary 2008 – 2009	<b>88</b>
Figure 44, 23-Year Sand Volume Change at Site 154, 1117 Ocean Avenue, Mantoloking	<b>90</b>
Figure 45, 23-Year Sand Volume Change at Site 145, 26 <sup>th</sup> St., Barnegat Light	<b>91</b>
Figure 46, 23-Year Sand Volume Change at Site 138, Old Whaling Road, LBI	<b>92</b>
Figure 47, 23-Year Average Sand Volume Changes for the 27 Ocean Co. sites	<b>93</b>
Site Information – Water Street to Beach Haven (Figs 48 - 76)	<b>95</b>
• <b>Atlantic County</b>	<b>150</b>
Figure 77. Atlantic County Station Locations	<b>151</b>
Atlantic County Summary 2008 – 2009	<b>152</b>
Figure 78, 23-Year Sand Volume Change at Site 132, 15 <sup>th</sup> Street Brigantine	<b>153</b>
Figure 79, 23-Year Sand Volume Change at Site 130, No. Carolina Ave., Atlantic City	<b>154</b>
Figure 80, 23-Year Sand Volume Change at Site 129, Raleigh Avenue, Ventnor City	<b>155</b>
Figure 81, 23-Year Sand Volume Change at Site 126, 17 <sup>th</sup> St., Longport	<b>156</b>
Figure 82, 23-Year Average Sand Volume Changes for the 9 Atlantic Co. sites	<b>157</b>
Site Information – Brigantine Natural Area to Longport (Figs 83 – 91)	<b>159</b>
• <b>Cape May County</b>	<b>178</b>
Figure 92. Cape May County Station Locations	<b>179</b>
Cape May County Summary 2008 – 2009	<b>180</b>
Figure 93, 23-Year Sand Volume Change at Site 124, 20 <sup>th</sup> Street, Ocean City	<b>182</b>
Figure 94, 23-Year Sand Volume Change at Site 116, 23 <sup>rd</sup> St., Avalon	<b>183</b>
Figure 95, 23-Year Sand Volume Change at Site 111, 15 <sup>th</sup> Ave., North Wildwood	<b>184</b>
Figure 96, 23-Year Sand Volume Change at Site 107, Baltimore Ave., Cape May City	<b>185</b>
Figure 97, 23-Year Sand Volume Change at Site 103, Higbee Beach, Delaware Bay	<b>186</b>
Figure 98, 23-Year Average Sand Volume Changes for the 29 Cape May Co. sites	<b>187</b>
Site Information – Gardens Road to Reeds Beach (Figs 99 – 127)	<b>189</b>
• <b>Monmouth County Sand Volume &amp; Shoreline Change Values</b>	<b>249</b>
• <b>Ocean County Sand Volume &amp; Shoreline Change Values</b>	<b>253</b>
• <b>Atlantic County Sand Volume &amp; Shoreline Change Values</b>	<b>257</b>

• Cape May County Sand Volume & Shoreline Change Values	259
• Typical New Jersey Beach Profile Terminology	263
• Glossary of Coastal Terms	264
• USDA Dune Fencing Plan	266
• USDA Dune Grass Planting Design	267
• Bibliography	268



## EXECUTIVE SUMMARY

The New Jersey Beach Profile Network (NJBPN) was authorized by the New Jersey Department of Environmental Protection (NJDEP) in 1986. Each county's section starts with a summary of beach changes, an examination of the performance of major projects, and a discussion of issues and pending project work in the county. These observations on beach changes along the New Jersey coastline provide a means to determine both rapid seasonal changes and follow long-term trends in shoreline position or beach volume. The advent of major shore protection projects resulting in the addition of millions of cubic yards of new sand has given a performance monitoring aspect to the report. The 100 sites extend from the lower Raritan Bay, along the four oceanfront county shorelines and into Delaware Bay along the western shore of Cape May Co.

The photographs, graphics and text focus on the seasonal and year to year changes observed since the previous report. This pattern of data presentation is followed on the website as well [www.stockton.edu/crc](http://www.stockton.edu/crc). Past reports are linked to the site so comparisons can be made to the present observations along the New Jersey coastline. These reports are designed to show the following:

- The enormous positive impact of beach nourishment over the past 23 years.
- The enhanced shoreline protection benefits of 23 years of dune growth in height and width.
- The importance of the inlet processes and their relationship to change on adjacent beaches.
- The ability to analyze causes of extreme variations at specific sites on the coast.
- The pattern of sand distribution along barrier islands as determined by that island's profiles.
- The beneficial results of the low incidence of serious storm events impacting the NJ coast.

The last bullet point had been true for 12 years until the fall of 2009 and an active El Nino year in the Pacific Ocean. While hurricane impacts were very minimal along the Atlantic Ocean shoreline in 2009, the northeast storm frequency took a major jump over the 2008 – 2009 winter season. Starting in early September, two minor storms flattened the beaches, removing most of the summer berm accumulation. The first significant storm occurred in mid-October. This cut a minor scarp in the toe of the dunes along narrow beaches, but did no serious damage. The next event November 11 – 15, 2009, while not extreme in wind velocity, did continue for four days and seven high tide cycles. Storm damage triggered a Presidential Disaster Declaration DR-NJ 1867 for Cape May, Atlantic and Ocean Counties. All dunes received some scarp damage except for the widest beaches and parts of the two NJ State/local beach projects completed in 2009. The worst damage was seen along the beaches just south of each tidal inlet especially Ocean City, Avalon and Atlantic City. Both beach projects (Upper Township and North Wildwood) also experienced losses exceeding 150,000 cy from the northeast corner at each inlet. Snow storms in December and January continued the process of attrition. Mid-February and mid-March 2010 saw the last two significant storms, each of which also produced Disaster Declarations DR-NJ 1889 and DR-NJ 1897 mostly due to flooding and excessive snow removal costs. Mild events continued into late May 2010 slowing the recovery of the oceanfront beaches.

This reporting interval covers the time between the spring of 2008 and the fall of 2009. The average beach in New Jersey gained 0.06 cubic yards of sand per foot of shoreline as the zero-elevation shoreline position retreated -5.74 feet landward between the fall of 2008 and fall of 2009 as taken from the master site tables of shoreline positions and sand volumes for each profile. Many coastal communities resorted to trucking in thousands of cubic yards of quarry sand to bolster damaged dunes to preclude breaching in potential future events. The Borough of Avalon hauled 30,000 cubic yards to the dunes between 17<sup>th</sup> and 21<sup>st</sup> Streets where 125 feet of landward retreat had occurred. Long Beach Township likewise hauled sand to multiple sites where the dunes had been all but erased leaving properties with wave swash under them at high tide.

The survey data was analyzed and evaluated to show changes in the four county shorelines and sand volume changes for the 18-month study interval. The three seasonal average sand volume changes for each county plus the 18-month summary are shown below. Monmouth County's fall 2008 to spring 2009 gain was driven by a maintenance fill in Long Branch where 175 yds<sup>3</sup>/ft. were placed along 1,500 feet of shoreline to restore the southern end of the northern Monmouth County ACOE project. Ocean and Atlantic had no sand pumping projects, but Cape May County had a fills in Strathmere, Sea Isle City and North Wildwood while surveying was underway.

	<b>S 08 – F 08</b> <b>Cu. yds/ft.</b>	<b>F 08 – S 09</b> <b>Cu. yds/ft.</b>	<b>S 09 – F 09</b> <b>Cu. yds/ft.</b>	<b>S 08 – F 09</b> <b>Cu. yds/ft.</b>
<b>Monmouth County</b>	-2.61	7.00	-2.84	1.24
<b>Ocean County</b>	6.25	-4.42	5.58	7.45
<b>Atlantic County</b>	4.22	0.19	-6.95	-2.63
<b>Cape May County</b>	4.89	0.50	2.73	7.22

The values for Cape May County reflect the beach nourishment activity in 2009. Many of the sites were surveyed prior to the November northeast storm and do not show the damage from the fall 2009 northeast storms.

The shoreline change data is derived from the change in the position where the profile cross section crosses the NAVD88 datum elevation of zero as measured as differences between surveys in the distance between the reference location for each profile and that crossing point. Advances seaward are positive and retreats landward are negative. Each number is the average change for all the sites in each county.

	<b>S 07 – F 07</b> <b>Feet</b>	<b>F 07 – S 08</b> <b>Feet</b>	<b>S 08 – F 08</b> <b>Feet</b>	<b>S 07 – F 08</b> <b>Feet</b>
<b>Monmouth County</b>	2.30	5.34	-6.90	0.42
<b>Ocean County</b>	9.49	-0.68	-10.76	-0.59
<b>Atlantic County</b>	-0.17	0.94	-8.14	-7.36
<b>Cape May County</b>	22.95	-11.92	6.62	17.65

## ACKNOWLEDGEMENTS

*This research was funded by the State of New Jersey Department of Environmental Protection, Division of Construction and Engineering under the Shore Protection legislation authorizing the stable funding of coastal projects (NJ PL 93 Chap 155). This is the final report under contract #4231-09.*

### INTRODUCTION:

The New Jersey Beach Profile Network (NJBPN) provides local and regional information on coastal zone changes and is designed to document storm-related damage assessments to the New Jersey shoreline. The report is focused on long-term trends at sites to develop statistically meaningful information for State and local coastal zone managers. The database covers 23 years at 100 locations between Raritan Bay (three sites in the lower bay), the Atlantic Ocean coastline, and Delaware Bay (four sites on the western shoreline of Cape May County). Each site has been visited annually in the fall since 1986. Semiannual visits, each spring and fall, began in 1994 following the passage of Public Law 155. The program was expanded to take surveys every spring following the winter northeasters and in the fall following the summer beach accretion. In addition, new sites were established in the gaps of coverage and adjacent tidal inlet shorelines. Information collected consists of photographs of the beach/dune system at each site, a topographic profile of the dune, beach and seafloor to a minimum depth of 14 feet, and field notes on significant geologic change in progress. Any construction activity is noted and necessary information regarding quantity and duration of such activity is gathered. The field data is used to generate graphical cross section plots, which compare profiles across the width of the active coastal zone. The cross section is also used to calculate sand volume and shoreline position changes. This report is the latest in a series of annual reports prepared for the New Jersey Department of Environmental Protection (NJDEP) that began in 1987. The information is grouped by profile site location so that the survey cross section, the site photographs, and the description of significant change for each site is together in sequential pages for each site grouped by county. The tables of data are found at the end of the county site descriptions for Cape May County. A summary of each county's coastal zone activities precedes selected site descriptions following the county profile site location diagram.

### THE NEW JERSEY COASTAL ZONE:

The northern coast in Monmouth County is carved into older geologic sedimentary units that created a sandy beach backed by a bluff of the older sediments, which eroded during serious storm events. The erosion provided new sand supplies and some gravel to the beach system, but the repeated bluff retreat produced by storms quickly became a serious problem following extensive human development during the last third of the 19<sup>th</sup> Century. Centuries of erosion had created two major sand spits, one to the north from Long Branch (Sandy Hook), and the other to the south from Bay Head (Mantoloking to Barnegat Inlet). The barrier island segmented shoreline covers the remainder of the NJ coastline where individual islands are separated from the mainland by a series of bays and tidal lagoons. These islands have no local sand supply to add to the beach forcing the island to follow any rise in sea level by moving landward. These islands continue to be in on-going equilibrium between storms, waves, sea level and tidal currents in spite of all human efforts to enforce stability and bring permanence for man-made development.

The Monmouth County shoreline benefited from growth that was made possible as the rail system spread from the metropolitan centers. Businessmen in New York City created the New York & Long Branch Railroad in the 1870's following the Camden & Atlantic City Railroad's construction to Atlantic City on Absecon Island in the late 1850's. This growth accelerated during the last 20 years of the 19<sup>th</sup> Century. Previously, visitors had been coming to the NJ shore by boat or overland to small "resorts" in Cape May City, Tucker's Beach and points along the Monmouth County shoreline. Every major conflict and/or financial crisis curtailed the rate of development. World War I halted growth, but after the peace major new hotels were built at all the, then

developed sites. The Great Depression followed by World War II nearly eliminated growth until the late 1940's. Between 1950 and 2000 the rush to the shore was on. Multi-lane highways replaced the railroads to give the public access and the purchase of a second home became the way to vacation at the beach. Today visitors generate \$27.7 billion in tourism revenue; create 500,000 jobs at local businesses, which pay \$5.5 billion in taxes to the NJ treasury making the Jersey shore and its tourism the second largest state industry.

Naturally, defending this investment against storms, tidal currents, and sea level rise has also become a highly advanced industry. Early efforts relied on local products primarily the Eastern White Cedar to create bulkheads, jetties and groins along the coast. Big errors made during the early years were:

- 1) Not reserving the dry beach and dune system as publicly held real estate.
- 2) In many cases plowing large dune systems flat to make more room for development.
- 3) Building on tidal inlet channel margins and failing to recognize the rapid rates of channel migration.

The arrival of the railroad meant that other products could be brought in to hold back the sea. Concrete, stone and steel made their impact as all structures facing the ocean got higher, longer, and tougher. Better roads and the heavy truck brought all these commodities directly to any coastal site in crisis. As a result many segments of the coast have continuous bulkheads, groins spaced about every 750 feet and all but 3 of the 11 inlets are confined within jetties.

The earliest attempt at sand supplies came in the form of trucking sand from Belmar beaches across the Shark River Inlet and dumping it on the Avon side to effectively "by-pass" the inlet. In 1952 the Corps of Engineers conducted a 2.54 million cubic yard beach fill in Ocean City in Cape May County. Beach restoration followed the devastating March 1962 northeast storm as many sources of sand were employed to replace the beaches torn away by the event. Beach nourishment got a boost in the 1970's as the State passed two multi-million dollar bond issues to finance projects at a variety of places. Congressman William Hughes guided an initial Federal project in Ocean City at the same time the restoration was advancing to construction in Cape May City. These successes generated interest in undertaking the restoration of the entire Monmouth County oceanfront shoreline. Five years, 25 million cubic yards of sand and \$250 million dollars later, the largest beach restoration project ever in Monmouth County was completed by 2000. Additional Federal beach projects were approved and constructed in Surf City, Brigantine, Atlantic City, Ventnor City, Ocean City, Avalon, Stone Harbor, Cape May City and Cape May Point. Federal projects are pending for the Northern Ocean County shoreline (hampered by real estate issues), Ludlam Island and North Wildwood, but lack sufficient funding to go to construction. State and local sponsorship carried this effort to other sites as well. Today, this effort has moved the State of New Jersey to number one in the nation in terms of the percentage of the shoreline under nourishment contracts and in terms of obtaining Federal dollars for beach restoration.

The legacy of having private ownership of the beach has proved to be a thorn in the side of future beach nourishment in areas pending because private ownership frequently extends to the Mean High Tide Line in New Jersey. The original private developers held thousands of feet of coastal property, but with subdivisions to create 50 to 100-foot wide lots for individual homes, the number of properties within a prospective beach restoration project makes obtaining signed easement documents nearly impossible. Owner resistance varies from reluctant to militantly opposed to allowing the project to proceed on their piece of the beach. Experience has shown that a few militant property owners can sabotage a major project in spite of the enormous economic benefit to the municipality as a whole. Litigation takes time and money and the Federal agency (ACOE) insists that real estate problems are the responsibility of the local sponsor of a project. Recent court decisions have reduced pending road blocks due to NJDEP requirements for restrooms and higher levels of public access in sections of the NJ coast primarily devoted to private single family homes at the shoreline. The advocates of not spending public funds on beach restoration where private interests dominate the shoreline fail to focus on the potential impact to the public's utilization of such coastal zone segments from serious storms without any maintenance of the beach. The State and local governing bodies do not allocate highway repair funds based on the income level of those using the road in any particular part of the State. The health of the NJ beach economy depends on making investments in all of it over time if the State desires to maximize the benefits to, utilization by, and revenue stream from this part of the State's environment provides to its citizens.

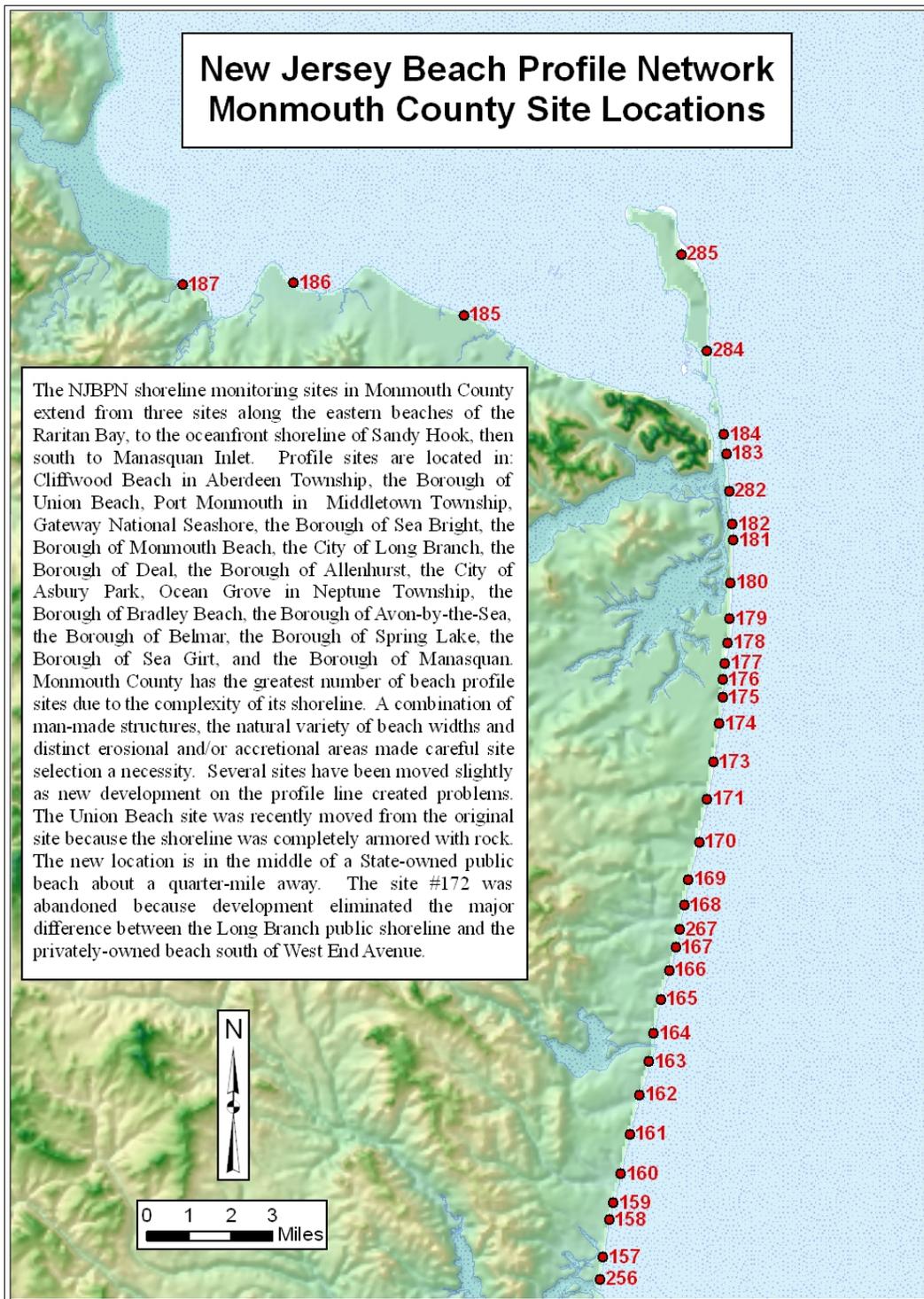


# New Jersey Beach Profile Network

## Monmouth County

Raritan Bay and Sandy Hook  
to Manasquan Inlet

**NJBPN Profile #'s  
187 - 256**



**Figure 1. Location map for the 35 NJBPN profiles in Monmouth County, NJ**

## MONMOUTH COUNTY SPRING 2008 to FALL 2009

Monmouth County contains 35 profile stations for two reasons, first there are three sites along the Raritan Bay shoreline in the county and second, the complexity of coastal construction demanded a denser array of profile stations to cover the variety of coastal shoreline features present in Monmouth County. The 35 sites are covered with 2 photographs each plus four survey plots showing changes since the spring of 2008 to the fall of 2009.

Monmouth County received the benefit of the largest, most expensive and most comprehensive beach nourishment project ever in the United States beginning in 1994. Completed by the New York District Army Corps of Engineers (ACOE) for \$210,000,000, this project continued in three phases until the year 2000. In all, 21 miles of the county shoreline were restored with a 100-foot wider berm and a dune system built in all locations where practical. 6.1 million cubic yards of sand were applied to the 21 miles of beach. The only gaps in the entire project were the communities of Loch Arbor, Allenhurst, Deal and Elberon because these communities would not provide the necessary real estate easements from owners. This fact divides the restored shoreline into two filled segments from the Sandy Hook National Seashore, south to the Long Branch/Elberon boundary, then no fill to the Asbury Park boundary, and the second segment complete to the Manasquan Inlet. The National Park Service also piggybacked onto the Federal project operations to pump sand onto the erosional zone within the Sandy Hook Park boundary, thus adding to the length of the fill.

Maintenance fills have been completed following two strong storms in 1998, hot-spot erosion in Monmouth Beach in 1997 and 2002, and finally a modest fill project proposed to go to construction using FY 2008 money in southern Long Branch that was completed in March 2009. The southern Long Branch project extended south of West End Avenue and north toward Broadway Avenue. Funds in the amount of \$2,961,000, \$3,305,000 and \$1,316,000 were appropriated for Fiscal Years 2006, 2007 and 2008, respectively. This funding was used to design and construct approximately 2400 linear feet of beach re-nourishment in South Long Branch. Since completion in 2001, the southern segment (Asbury to Manasquan) has not required maintenance.

The extremely benign weather seen during the winter of 2008 to 2009 continued into the summer. Then on September 5-6, 2009 a series of northeast storms commenced that numbered 9 with two events causing significant damage to the shoreline. The worst occurred November 11-15, 2009 and lead to a Presidential Disaster Declaration (DR-NJ 1867) by the Federal Emergency Management Agency (FEMA). The effects became worse further south along the coast. Events continued in February and March 2010 as El Nino effects kept the northern Pacific Ocean in storm mode all winter. The beaches became narrower as sand moved offshore. Storm-generated littoral currents moved material south especially eroding the beaches on the south side of each tidal inlet. Dunes lost sand to erosion with some scarps reaching the crest of the existing dune. Several homes on Long Beach Island were left standing on the wet beach at low tide requiring emergency authorization of funding replacement sand supplies. Quarry sand was hauled to the Borough of Avalon to restore the dune between 17<sup>th</sup> and 21<sup>st</sup> Streets. Two large NJ State/local beach projects suffered multi-hundred thousand cubic yard sand losses in The Township of Upper and North Wildwood. Both of these projects were completed in 2009, with the contractor forced off the site prior to finishing the last 40,000 cy of the contract in the City of North Wildwood. Fortunately detailed monitoring allowed FEMA disaster assistance teams to quantify these losses for 75% funding at some point in the future.

Two additional sites were added to the general trends for Monmouth County to show the relative differences among the sites within the massive Federal beach nourishment project along the county shoreline. The first site is located on the Raritan Bay in a small coastal county park in Aberdeen, NJ. The field work spans the entire period of the park's existence and shows a relatively stable beach subject to northeast storm effects due

to waves generated within Raritan Bay. The impacts are focused on the beach and dune toe since the wave period and amplitude restricts the depth of water where sand can be moved around to the immediate shoreline. The northeast storms carved into the dune toe and moved sand lower on the beach advancing the shoreline 15 feet. The sand volume change was small at  $-1.54 \text{ yds}^3/\text{ft}$ . The annual loss of sand was  $3.26 \text{ yds}^3/\text{ft}$ ., as shown on the graph below.

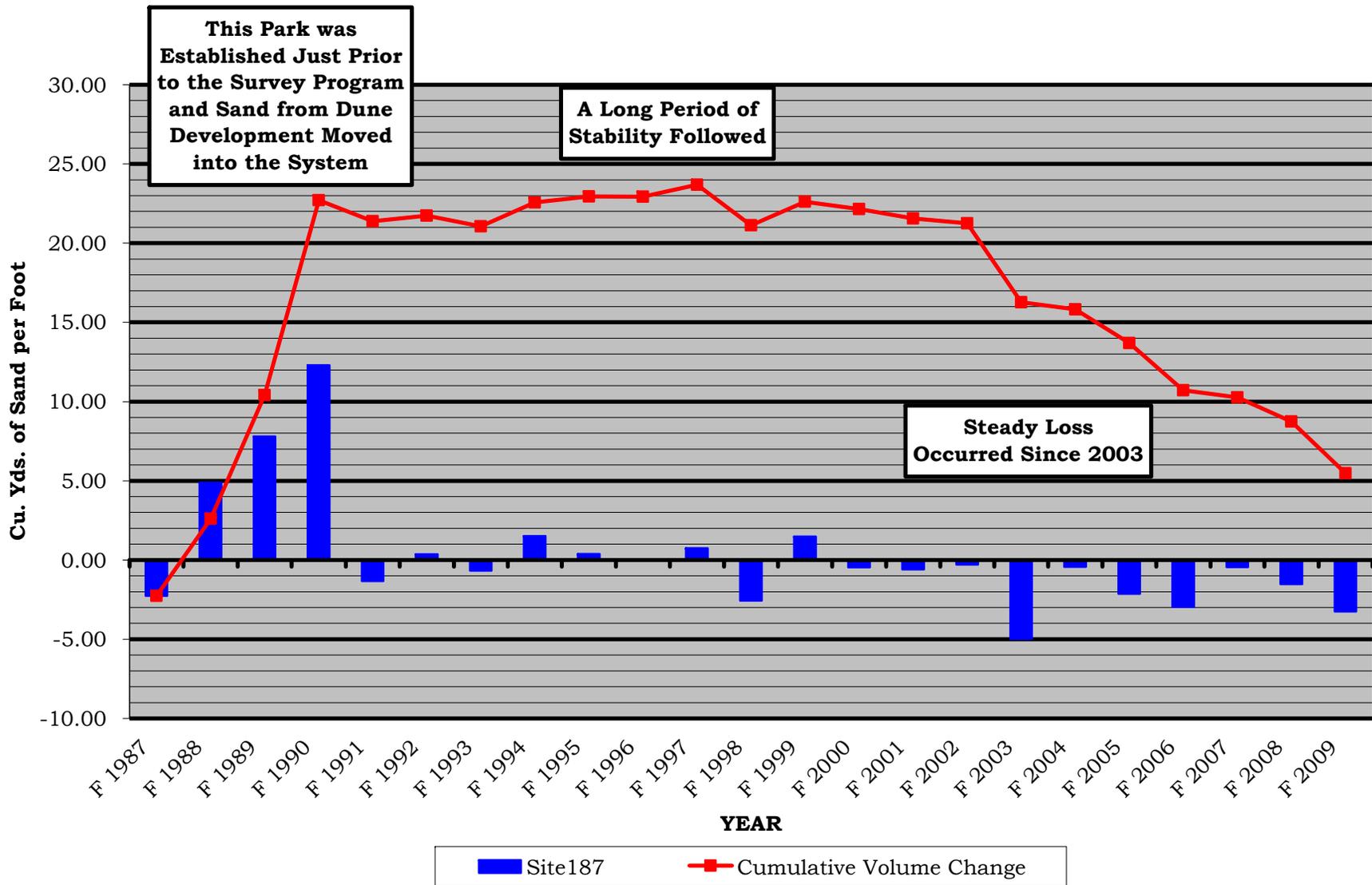
The Monmouth County oceanfront is represented by the municipal beach in Sea Bright, NJ where the initial fill volume was in place by 1995. All losses were restored in 2002 bringing the net increase in sand volume just over  $200 \text{ yds}^3/\text{ft}$ . Since 2002 there have been steady losses of sand taking about  $90 \text{ yds}^3/\text{ft}$ . from the placement volume over the past 8 years. The fall 2009 survey took place prior to the majority of the storms and losses were definitely larger later in the fall.

Cottage Road in Monmouth Beach has been an enigma due to persistent, rapid loss of sand deposits. Observations made this year may lead to possible reasons. There is a massive stone groin protecting the Monmouth Beach Club property positioned about 500 feet south of this site. During non-storm periods of time the dominant littoral currents are directed to the north, so the sand moves north away from the groin and site not being replaced by significant material coming north around the groin. By the fall 2009 survey the site was devoid of sand, the dune was gone and the beach was wet at low tide, not far from the conditions existing here prior to the beach fill. Then the northeast storms started and by the winter of 2010 sand had reappeared as a dry beach fronting the rocks of minimal, but significant dimensions compared to the fall 2009 survey situation. The littoral currents were reversed by the storms and were of increased magnitude during the storms. However, the groin served to impound the sand and not let it pass further south so the beach accumulated sand during the period of severe weather.

The southern segment of the ACOE project has weathered the erosional events very well. The Asbury Park beach gained sand volume in 4 of 10 years which allowed the beach to maintain its appearance and storm resistance for a decade without need for maintenance.

The second new site selected is Salem Avenue in Spring Lake. This site gained sand volume over the decade following the initial sand volume placement. There were three years of continuous loss that dragged the total volume below that placed, but the site continues to maintain a healthy profile 12 years after the project was completed at this location. This trend is true from Asbury Park south to Manasquan, NJ. Loss to the north has benefited Loch Arbor and the Borough of Allenhurst as sand slowly moved north around the northern Asbury Park groin into the cell containing these two municipalities. Extensive groin construction prevents sand movement into the Borough of Deal or south into Elberon from Long Branch as the three sites in these municipalities show.

## 23-Year Sand Volume Changes at Site 187, Cliffwood Beach, Aberdeen



**Figure 2.** There are three sites along the eastern Raritan Bay shoreline in Monmouth County where Cliffwood Beach is the westernmost of the three. Located in a park created just before the establishment of the NJBPN program, the sand available in the system added to the beach/dune system during the three years following the initial pair of surveys. During the next 12 years the shoreline was stable in spite of northeast storms and other events. In 2003 a slow sand loss commenced that has reduced the net gain by three-quarters by 2009.

### 23- Year Sand Volume Changes at Site 181, Municipal Lot, Sea Bright

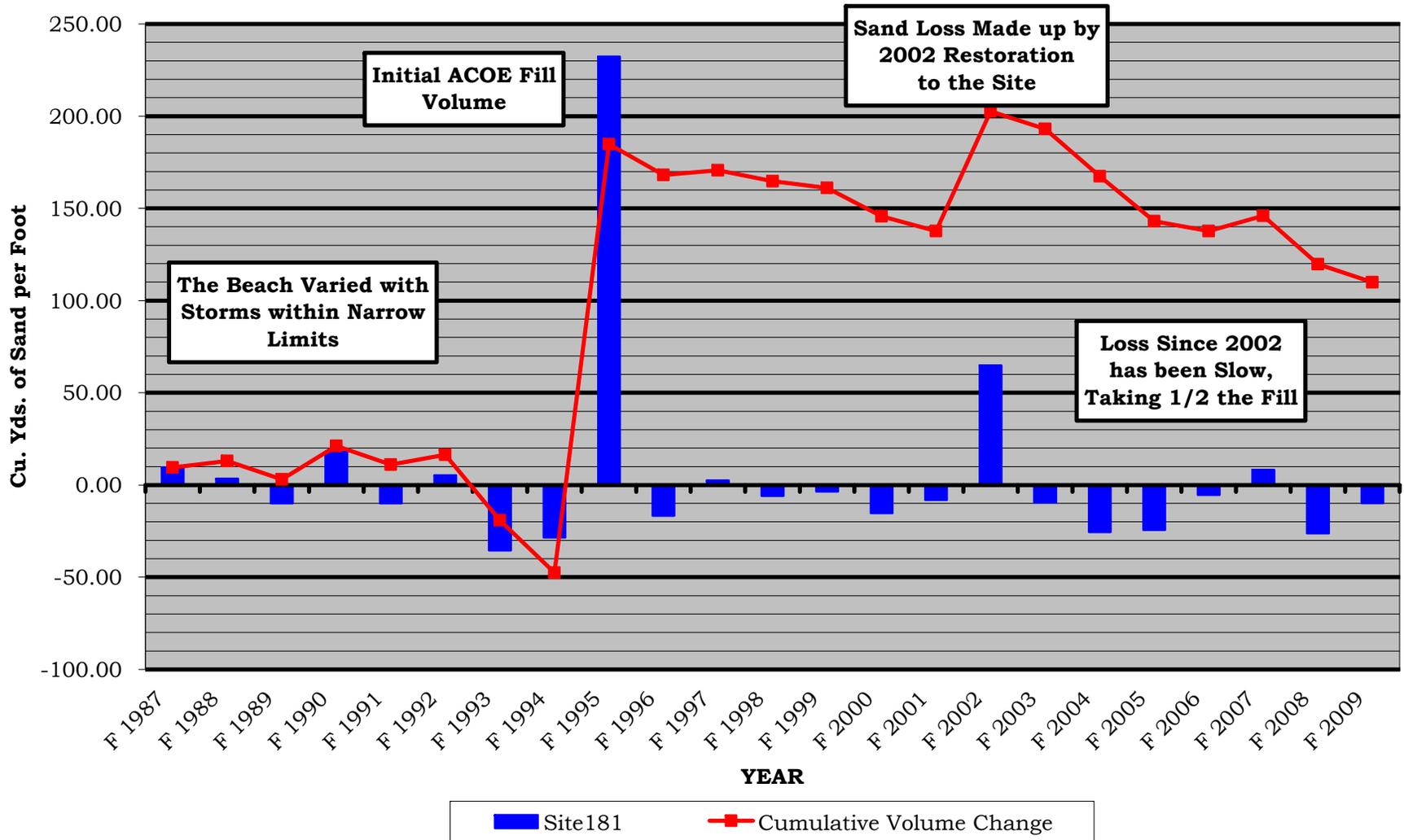


Figure 3. This site was added for 2009 to show the retention rates of the northern Sea Bright beaches for the ACOE project sand deposits. Placed in 1995, the shoreline lost material, but was restored in 2002 to levels exceeding the initial deposit. Six of the past seven years saw loss rates that have nearly reduced the 200 yds<sup>3</sup>/ft. to half that amount. Sand lost from Sea Bright ends up in Sandy Hook adding to the National Seashore beach.

### 23- Year Sand Volume Changes at Site 179, Cottage Road, Monmouth Beach

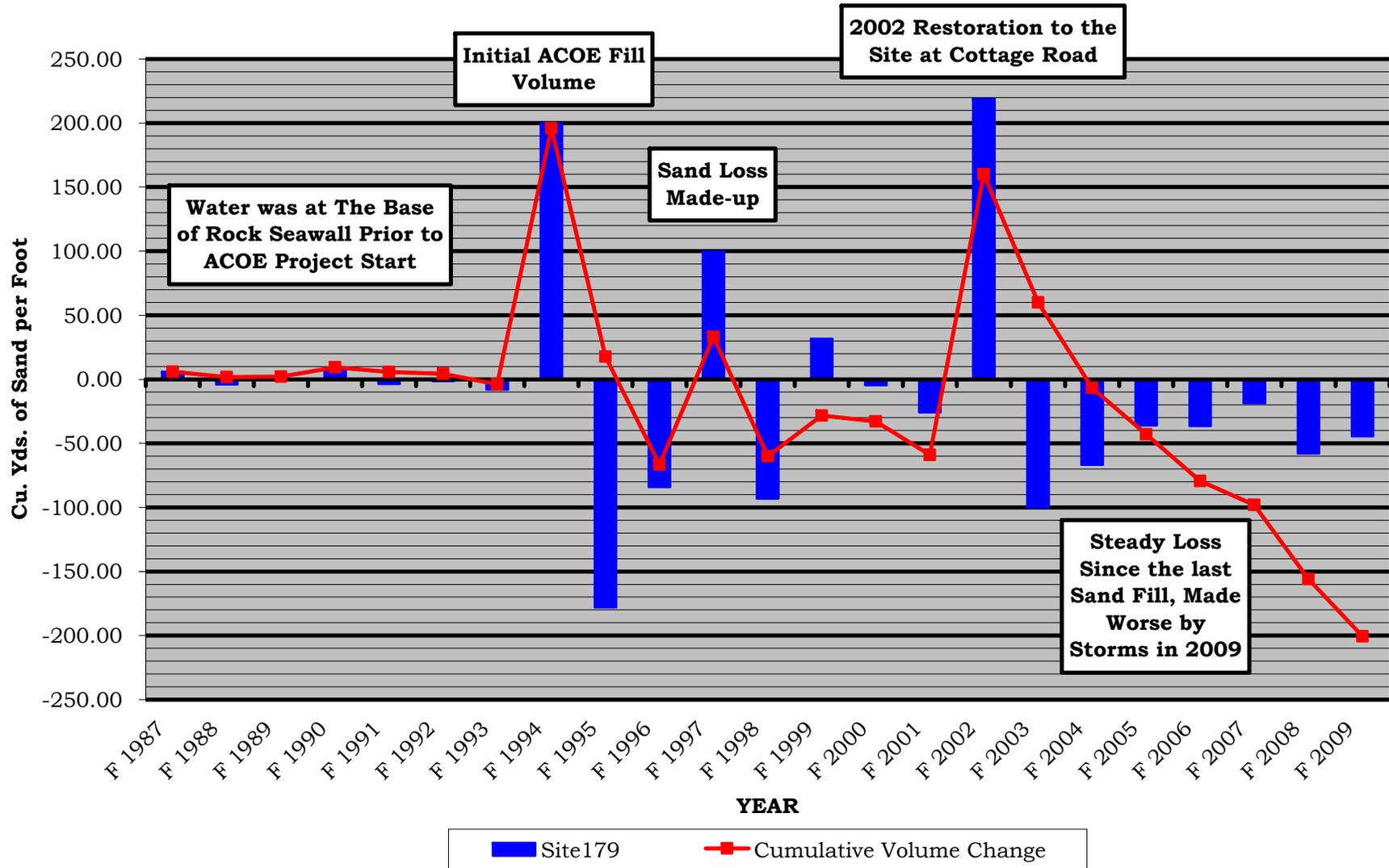


Figure 4. Site #179 at Cottage Road in Monmouth Beach initially had several feet of water at the seaward base of the seawall rocks prior to the ACOE project starting in 1994. Storm losses were made up in 1997 followed by maintenance work in 2002. Chronic losses have piled up because the groins once the sole protection for the Monmouth Beach Club now prevent sand from reaching this site from the south. Storms continuing through the winter reversed this trend and the beach has recovered significantly as NE storms moved sand south to the groins.

### 23- Year Sand Volume Changes at Site 167, 3rd Avenue, Asbury Park

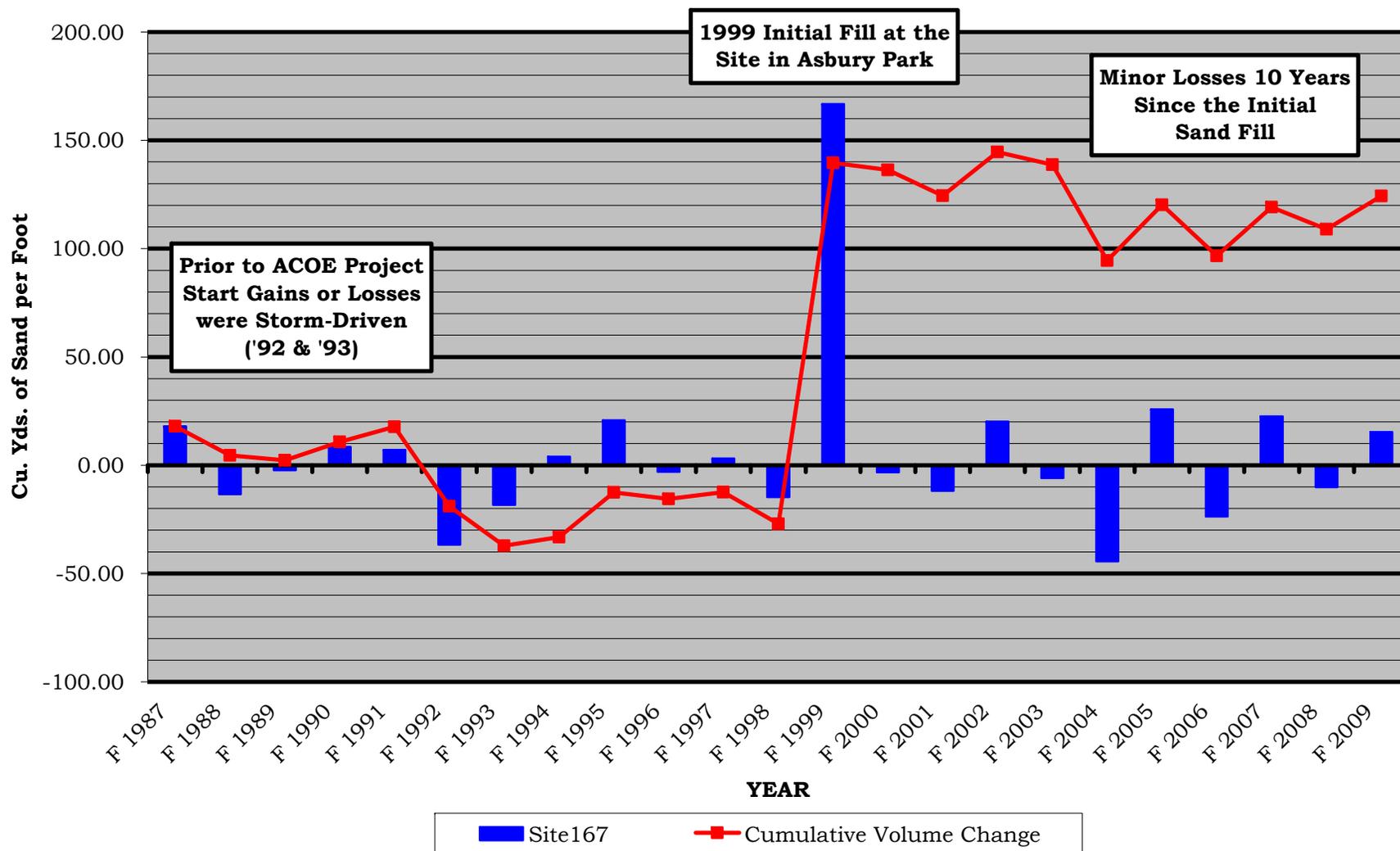


Figure 5. The Third Avenue location in Asbury Park received the Federal beach nourishment in 1999. No additional work has been required since. Four of the ten years since saw additional natural accretion that helped keep the beach near the ACOE sand placement volume seen in 1999. The fall 2009 survey preceded the majority of the northeast events so loss may be greater in 2010.

### 23- Year Sand Volume Changes at Site 160, Salem Avenue, Spring Lake

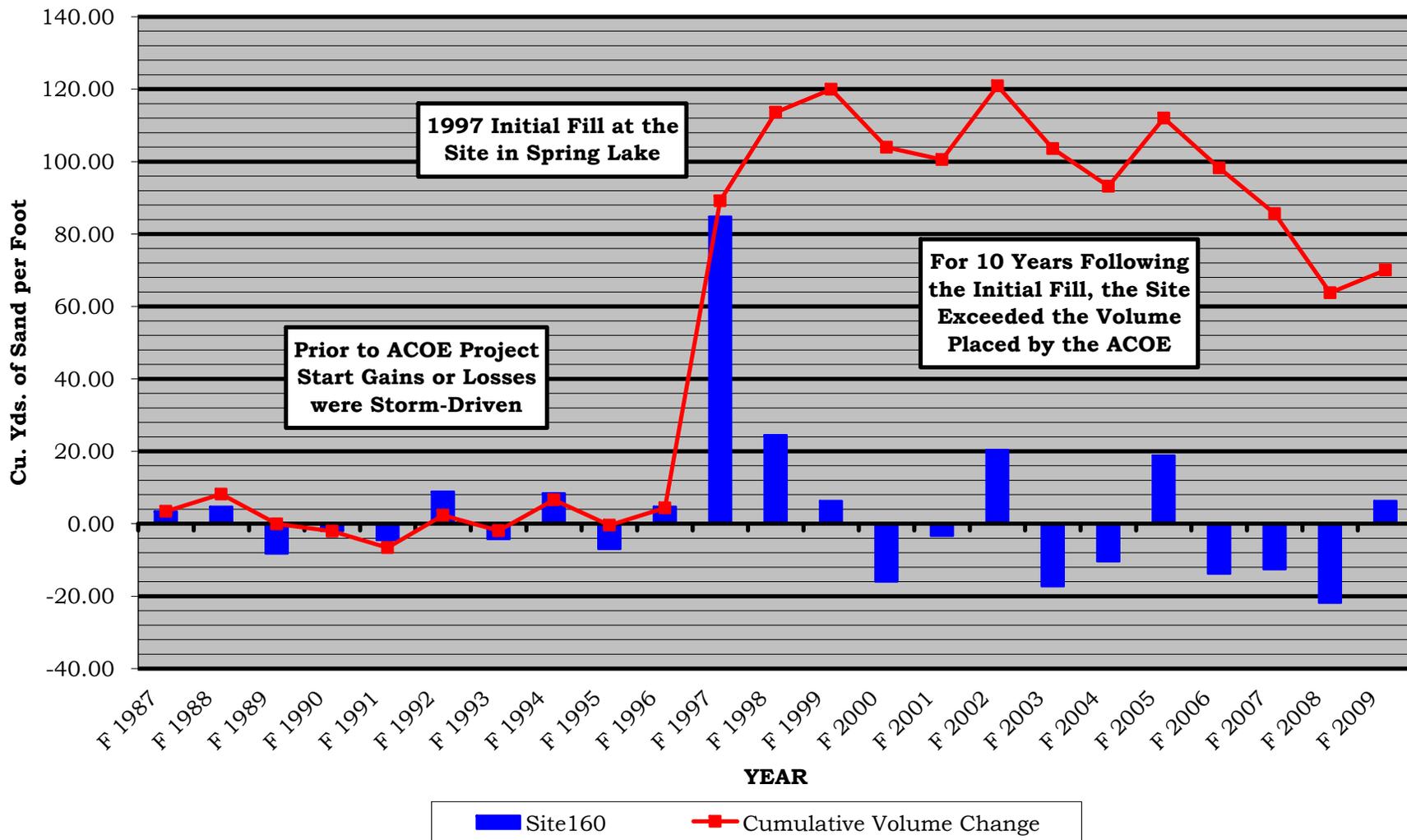
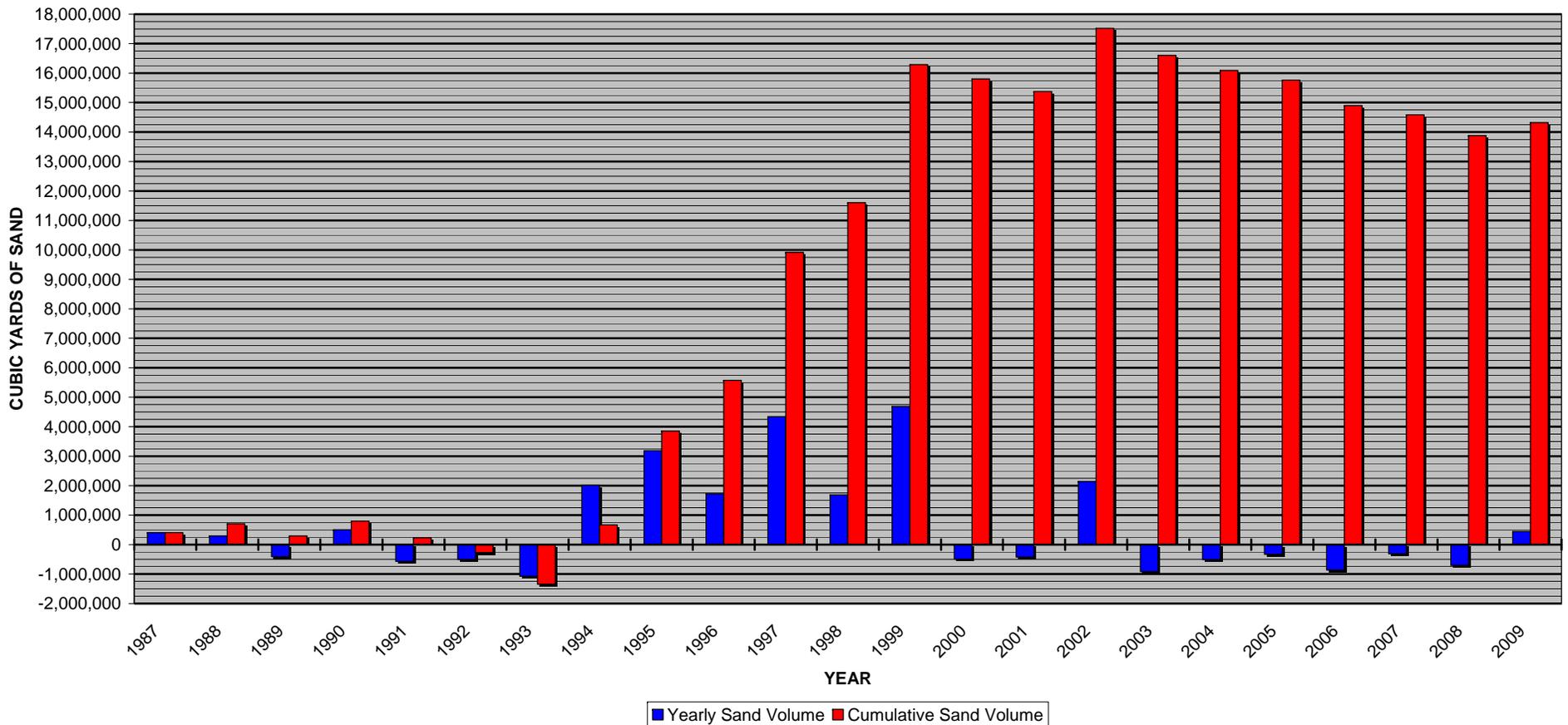


Figure 6. This is the second new site selected to show the relative stability of the southern fill sector in Monmouth County. The fill volume of 85 yds<sup>3</sup>/ft. completed in 1997 was followed by 5 of 12 years with sand added to that placed in 1997. For a decade the site maintained an excess volume of sand over that placed by the ACOE. 2008 took the biggest bite out of the sand supply with a partial recovery in 2009. That survey in 2009 preceded most of the northeast storms.

ANNUAL & CUMULATIVE OCEANFRONT SHORELINE SAND VOLUME CHANGES, MONMOUTH COUNTY 1987 to 2009



**Figure 7.** The final bar graph illustrates the trend and each year’s average sand volume change for all 35 of the Monmouth County survey sites. Between 1994 and 1999 the ACOE project was underway along 21 miles of the county shoreline adding 140 yds<sup>3</sup>/ft. in average cumulative sand volume to the county’s beaches. Storm recovery work in 1997 and maintenance work performed in 2002 added sand to portions of the project, but no new sand was placed until 2009’s work in Long Branch. The El Nino year of 2009 and 2010 may show in the spring survey data for 2010, but the surveys in the early fall of 2009 show as an average net accumulation of sand along the project shoreline. This was the only year since 2002 when the Monmouth County average was positive, but the county remains as the graph shows, over 15,000,000 cubic yards of sand ahead of the 1993 situation.

Thus far no significant funding has been appropriated to conduct maintenance beach nourishment projects for Monmouth County. The NY District ACOE pieced together the funding package to maintain the Long Branch segment in 2009. No other beach restoration projects have been authorized by local municipal governments. Sea Girt commenced designing and building a dune system to augment the level of storm protection and prevent sand from blowing into Ocean Avenue. Thus far Belmar has not seen fit to build a dune system along its oceanfront. The Ocean Grove and Bradley Beach dunes have done well with periodic maintenance tailored to reduce excess height development or encroachment into the parcels landward of the dune alignment.

The Raritan Bay shoreline continues to erode slowly at two of the three sites with no impact seen below a depth of 2 feet in the bay due to short-period, low-amplitude waves attacking at the point of breaking on the shoreline depending only on the stage of the tide from where sand gets moved around. Monmouth County parks system is preparing to restore the scrap and rubble cored dune along the park shoreline at site #185. The New York District ACOE has plans in various states of readiness for Port Monmouth, Leonardo (flooding), Union Beach, Highlands (flooding) and Keyport (flooding) shorelines and associated low-lying areas. These projects have been authorized by the WRDA of 2007, but no appropriations have come from Congress to proceed to construction. These five Raritan Bay projects have the majority of the funds slated for flood abatement and storm surge associated with strong northeast storms.

## CLIFFWOOD BEACH - SITE 187



Photo taken September 24th 2008. View to the east.

Shoreline retreat exposed an old timber structure on the beach in 2007 and continued in 2008.

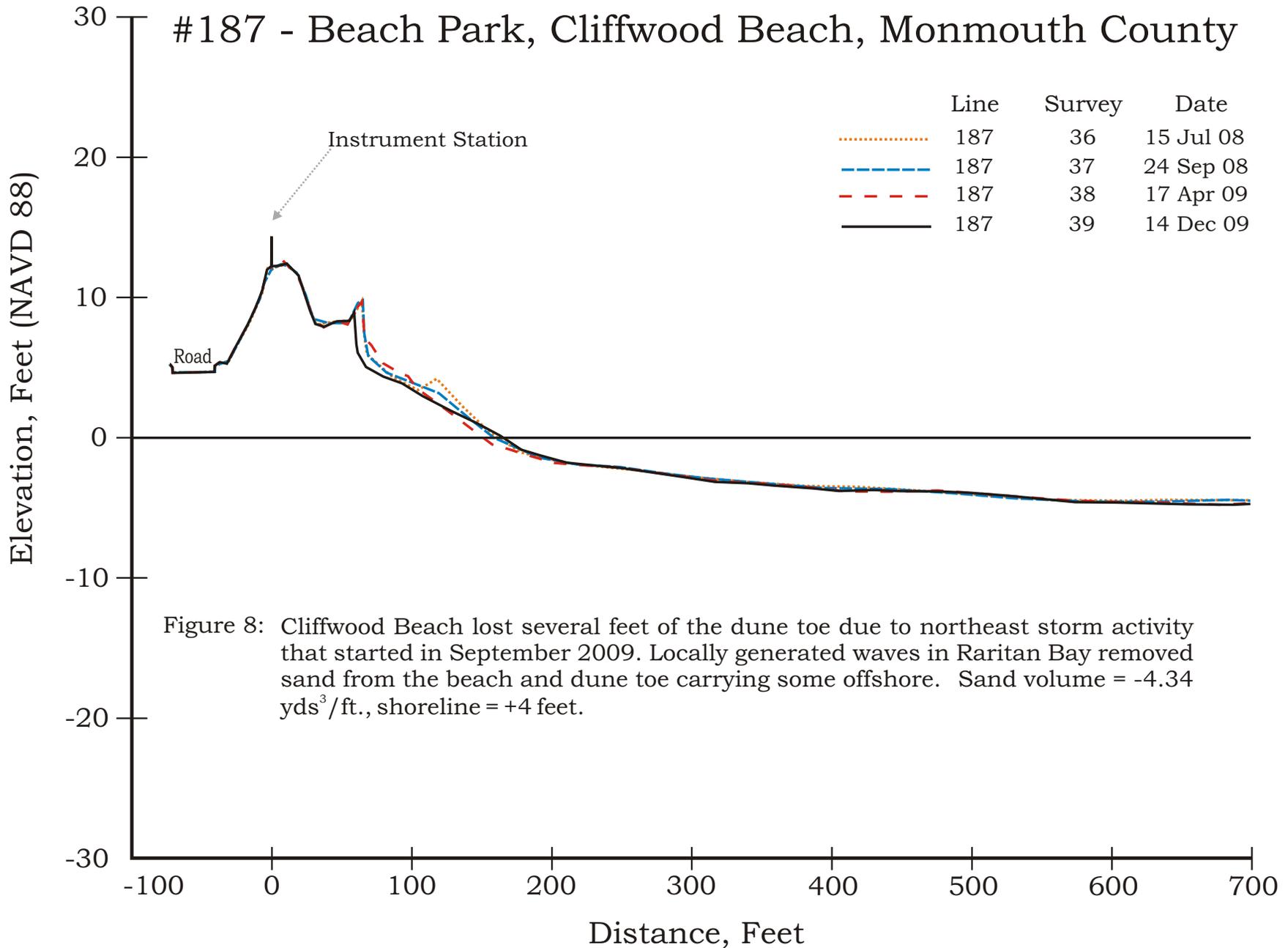


Photo taken December 14, 2009. View to the east.

Comparing the profiles over the 15 month time period, the profile location lost volume (-3.26 cu yd/ft) and the shoreline moved seaward (6.78 ft). Raritan Bay northeast storm waves cut into the dunes and pushed back the beach.

# New Jersey Beach Profile Network

#187 - Beach Park, Cliffwood Beach, Monmouth County



## UNION BEACH - SITE 286 (formerly Site 186)



Photo taken September 9, 2008. View to the east. Photo of Site 186.

This shoreline was upgraded with hard structures about a decade ago. This photograph shows the new bulkhead/railing and pedestrian walkway with an apron of medium stone extending to the low tide line. Since changes rarely occur beyond the low tide line in the 22 years of study, this site has become an exercise in futility to continue surveying. The last comparison was between surveys 36 and 37 (July 15, 2008 and Sept 9, 2008) where the site lost 1.61 cu yd/ft and the shoreline retreated 1.35 feet. After discussions with the NJDEP, the site was moved about a quarter mile to the northwest along the shoreline to a public bathing beach so that more normal shoreline changes could be followed. The new site is near the intersection of Beach and Front Streets in Union Beach.

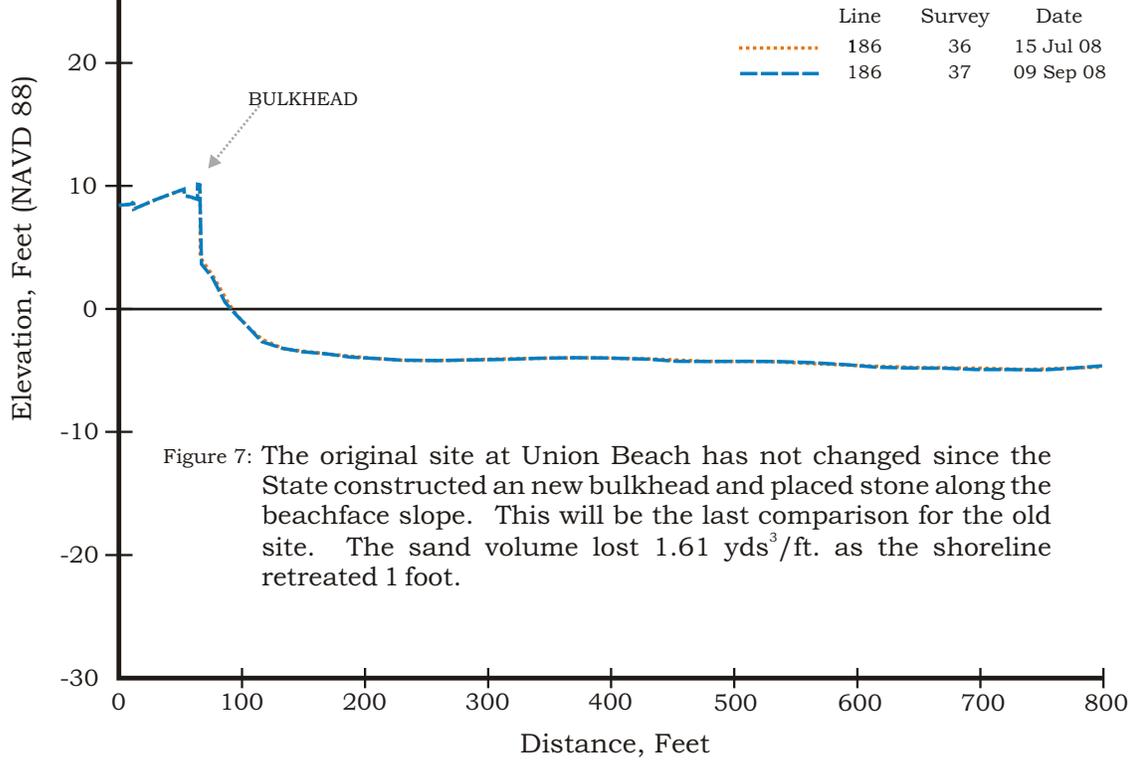


Photo taken December 14, 2009. View to the east. Photo of Site 286.

Comparing the profiles since inception in April 2009, the profile location gained volume (0.69 cu yd/ft) and the shoreline moved seaward (11.94 ft). The orange fencing on the beach appears to be designed to prevent sand from blowing onto the parking/roadway area during the winter.

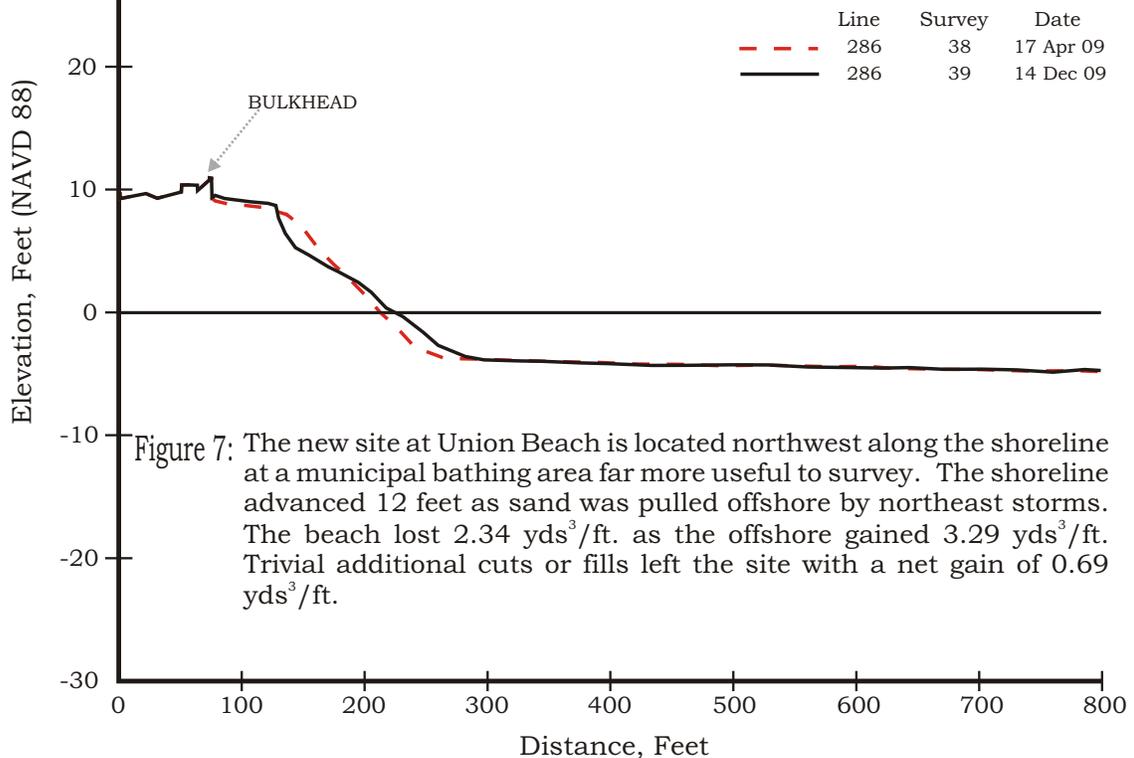
## New Jersey Beach Profile Network

#186 - Union Avenue, Union Beach, Monmouth County



## New Jersey Beach Profile Network

#286 - Beach Street, Union Beach, Monmouth County



## SPY HOUSE MUSEUM - SITE 185



Photo taken September 24, 2008. View to the west.

Fishing pier and an old structure exposed near the low tide line.

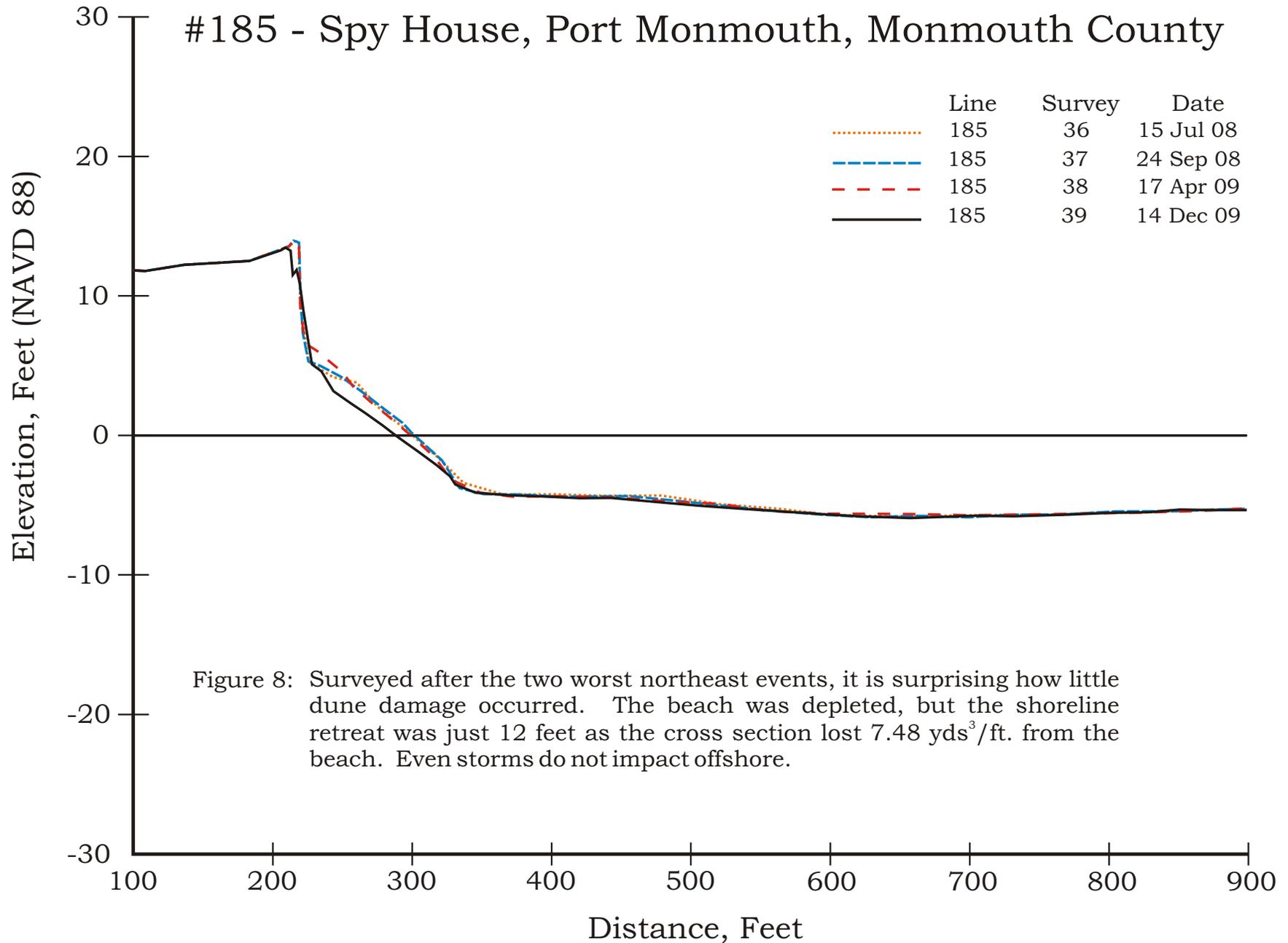


Photo taken December 14, 2009. View to the west.

Comparing the profiles over the 15 month time period, the profile location lost volume (-5.63 cu yd/ft) and the shoreline moved landward (-13.48 ft). Northeast storms cut away at the dune as the beach retreated before the erosion produced by the waves generated on Raritan Bay.

# New Jersey Beach Profile Network

#185 - Spy House, Port Monmouth, Monmouth County



## SANDY HOOK NATIONAL SEASHORE - SITE 285



Photo taken November 3, 2008. View to the north/east.

The beach grows relatively continuously since the Federal project provided abundant material to move north to the end of Sandy Hook.

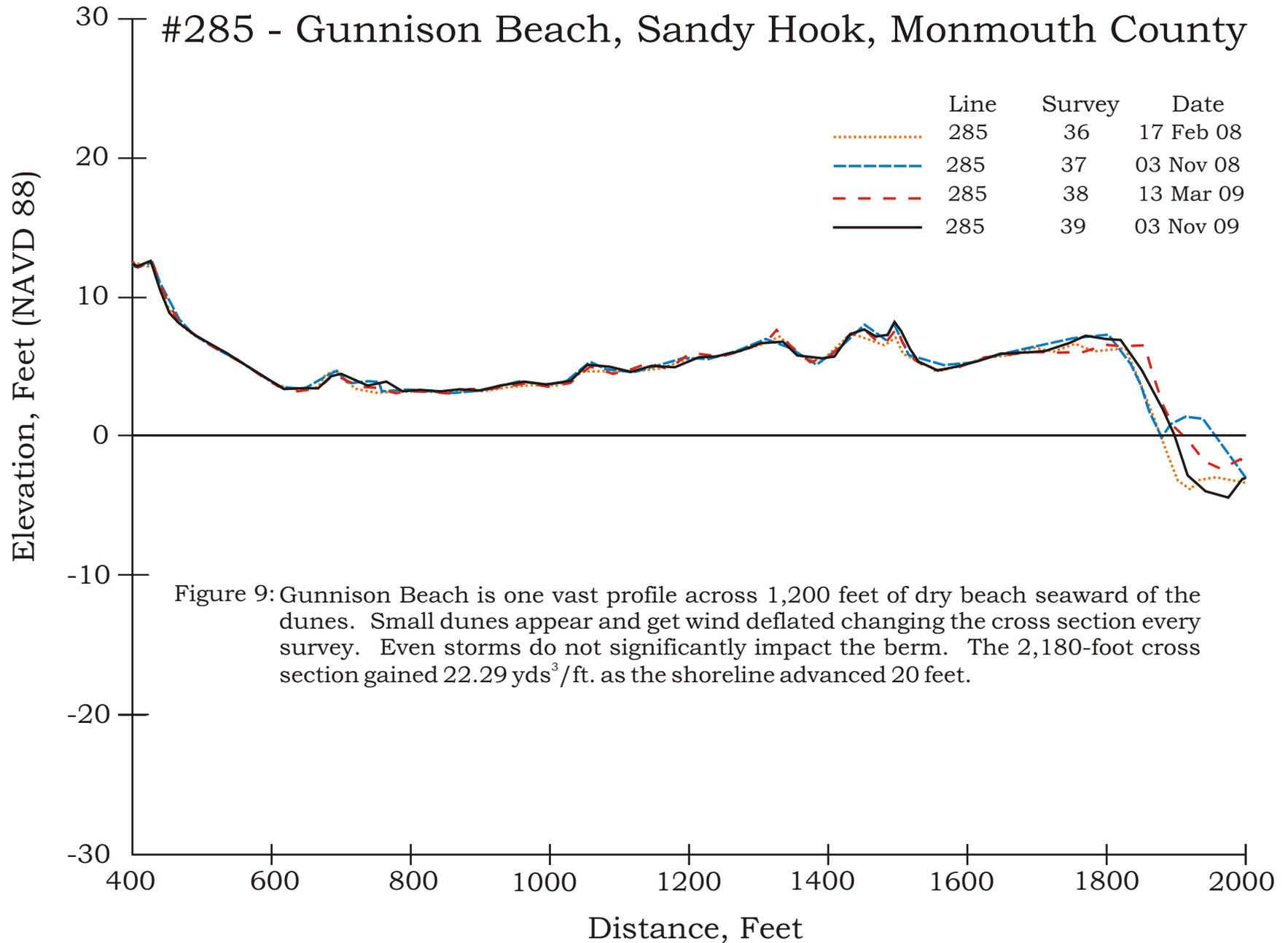


Photo taken November 3, 2009. View to the north/east.

Comparing the profiles over the one year time period, the profile location was relatively stable with a volume change of only (0.32 cu yd/ft) and the shoreline moved seaward (19.71 ft).

# New Jersey Beach Profile Network

#285 - Gunnison Beach, Sandy Hook, Monmouth County



# SANDY HOOK NATIONAL SEASHORE, PARKING LOT E - SITE 284



Photo taken November 3, 2008. View to the south.

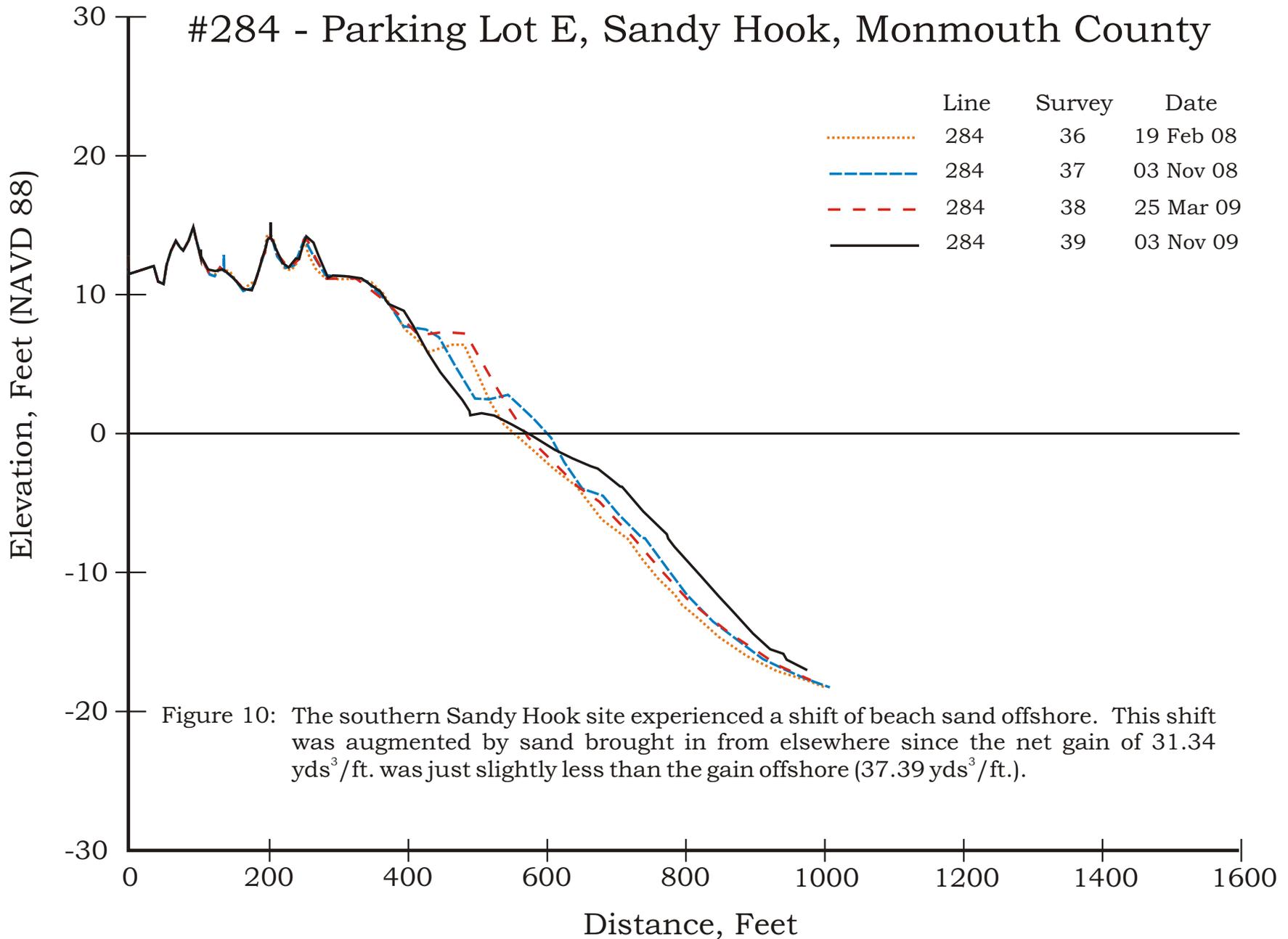


Photo taken November 3, 2009. View to the south.

Comparing the profiles over the thirteen month time period, the profile location gained volume (13.42 cu yd/ft) but the shoreline moved landward (-27.56 ft).

# New Jersey Beach Profile Network

#284 - Parking Lot E, Sandy Hook, Monmouth County



## SANDY HOOK, HIGHLANDS BEACH - SITE 184



Photo taken November 3, 2008. View to the south.

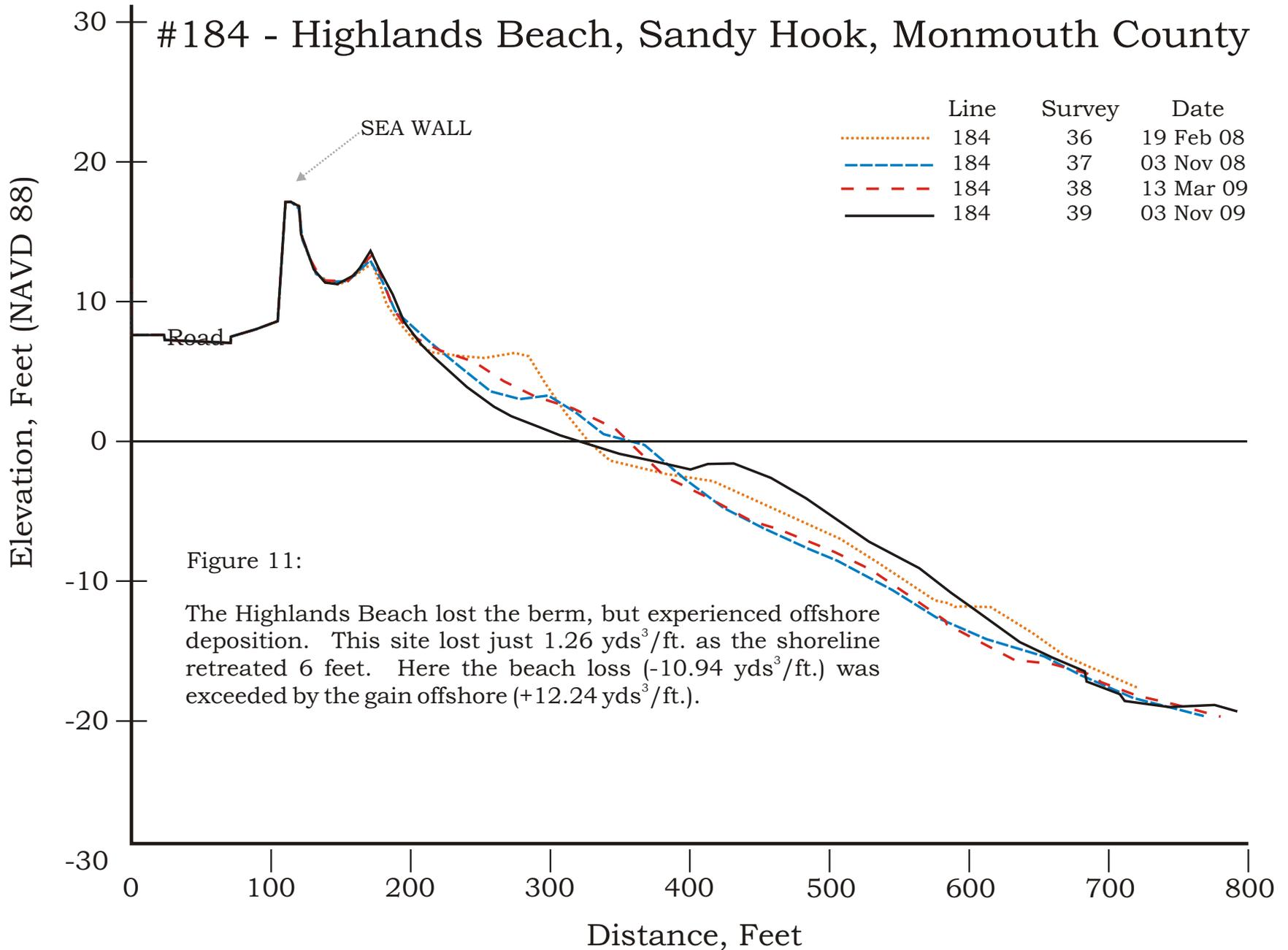


Photo taken November 3, 2009. View to the south.

Comparing the profiles over the thirteen month time period, the profile location gained volume (16.05 cu yd/ft) and the shoreline moved landward (-36.68 ft). This landward movement is demonstrated by examining the number and height of the timber pilings showing in 2009 as compared to 2008.

# New Jersey Beach Profile Network

#184 - Highlands Beach, Sandy Hook, Monmouth County



## VIA RIPA STREET, SEA BRIGHT - SITE 183



Photo taken November 4, 2008. View to the north.

This site has a natural dune that has been growing since 1998. A single line of fence was all that was established following the Federal project.

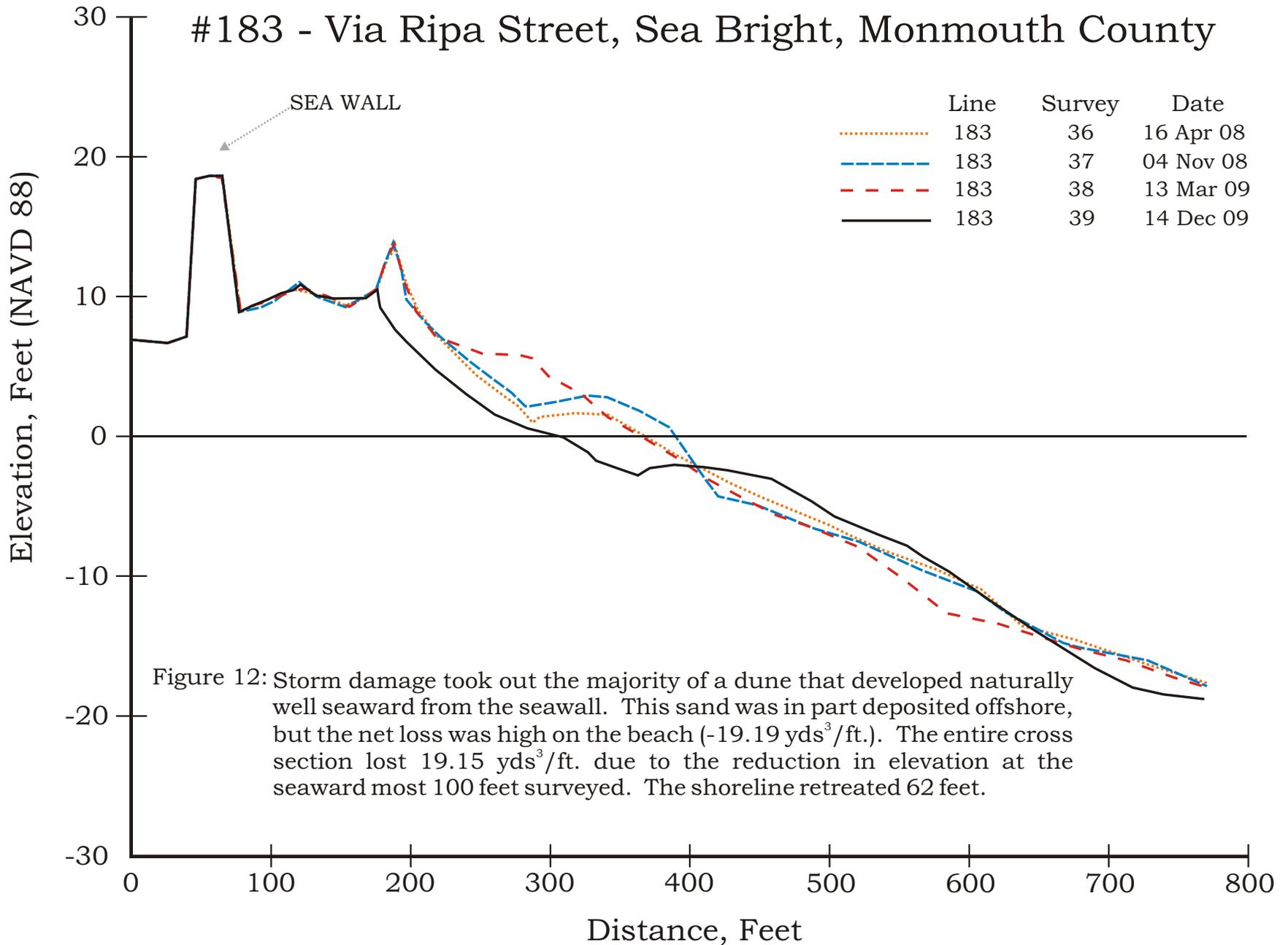


Photo taken December 14, 2009. View to the north.

Comparing the profiles over the thirteen month time period, the profile location lost volume (-20.39 cu yd/ft) and the shoreline moved landward (-83.20 ft). Some loss occurred in the dunes due to the fall 2009 storms.

# New Jersey Beach Profile Network

#183 - Via Ripa Street, Sea Bright, Monmouth County



## SHREWSBURY WAY, SEA BRIGHT - SITE 282



Photo taken November 4, 2008.. View to the north. Remember that prior to the 1996 fill at this site, the beach walkers in the picture would have been swimming in 16 to 20 feet of water 350 feet east of the seawall.

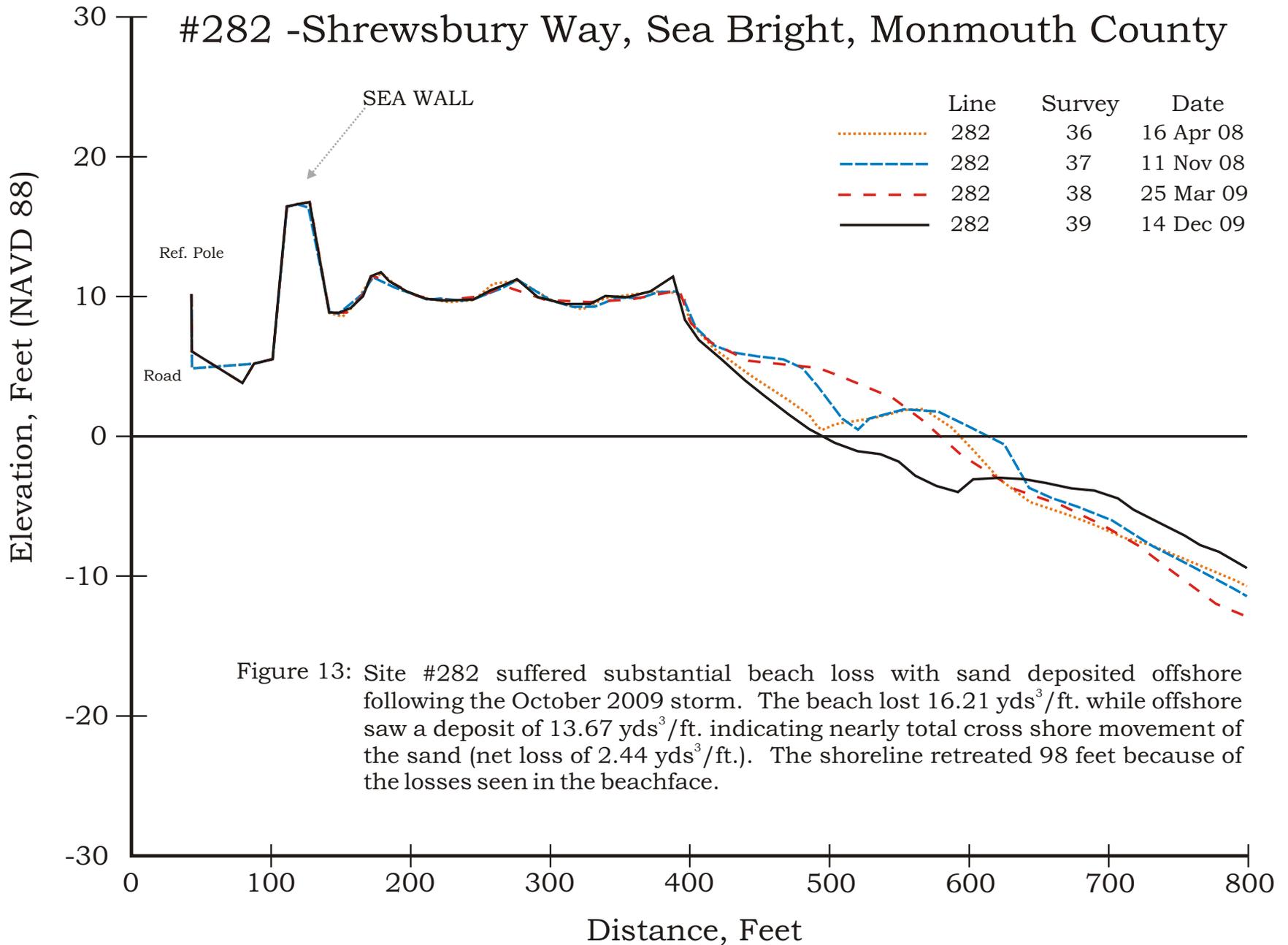


Photo taken December 14, 2009. View to the north.

Comparing the profiles over the thirteen-month time period, the profile location lost volume (-11.71 cu yd/ft) and the shoreline moved landward (-118.74 ft). Note the sizable bar moving onto the beach following partial recovery following the November northeast storm.

# New Jersey Beach Profile Network

## #282 -Shrewsbury Way, Sea Bright, Monmouth County



## PUBLIC BEACH, SEA BRIGHT - SITE 182



Photo taken December 1, 2008. View to the south. This small segment of public shoreline has maintained its general condition since the fill was completed over a decade ago.

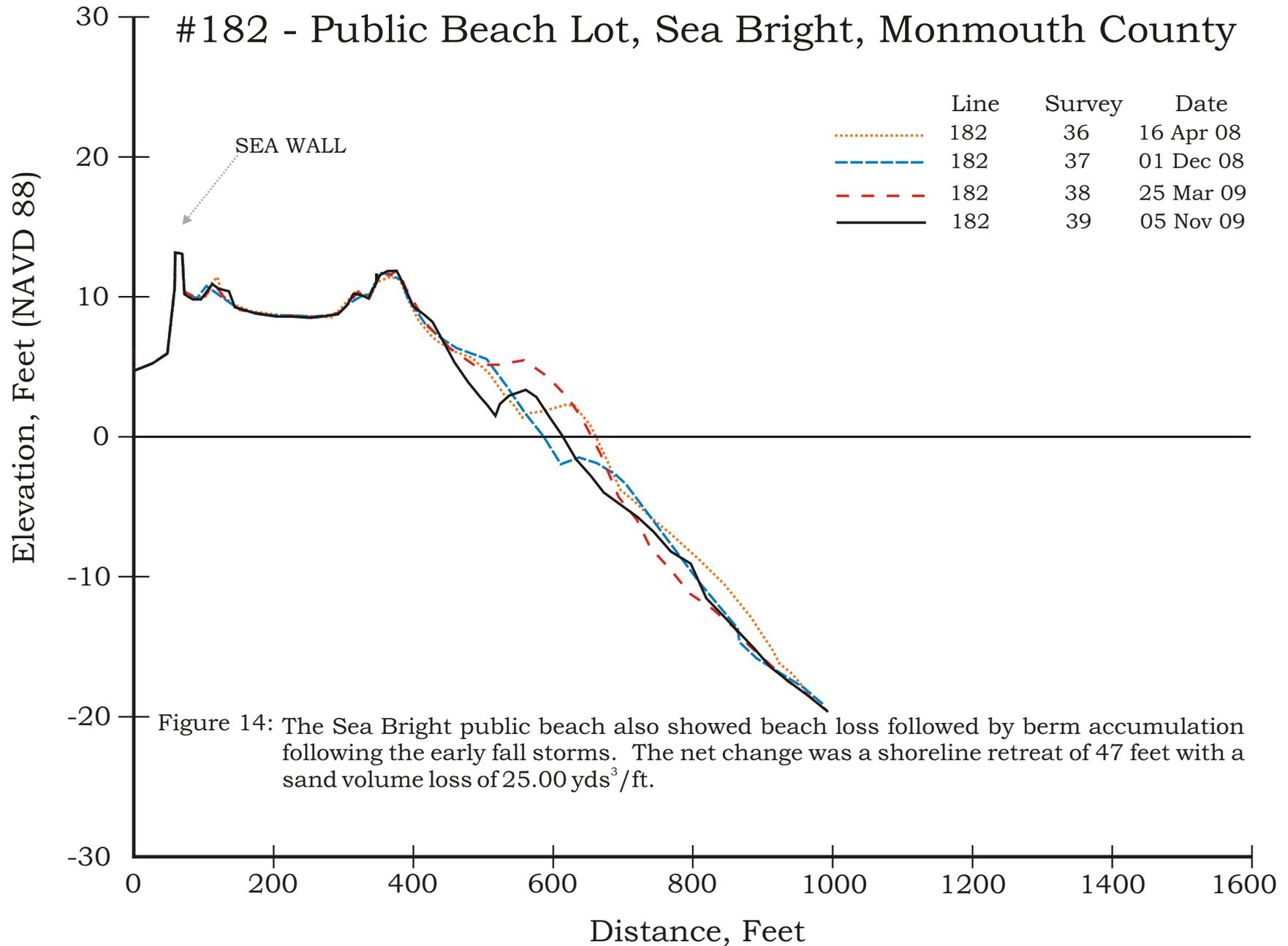


Photo taken November 5, 2009. View to the south.

Comparing the profiles over the eleven month time period, the profile location lost volume (-7.24 cu yd/ft) and the shoreline moved seaward (27.14 ft).

# New Jersey Beach Profile Network

#182 - Public Beach Lot, Sea Bright, Monmouth County



## MUNICIPAL BEACH, SEA BRIGHT - SITE 181



Photo taken December 1, 2008. View to the north. The entrance for bathers cuts through the dune system at this location. The beach has slowly retreated since 1996.

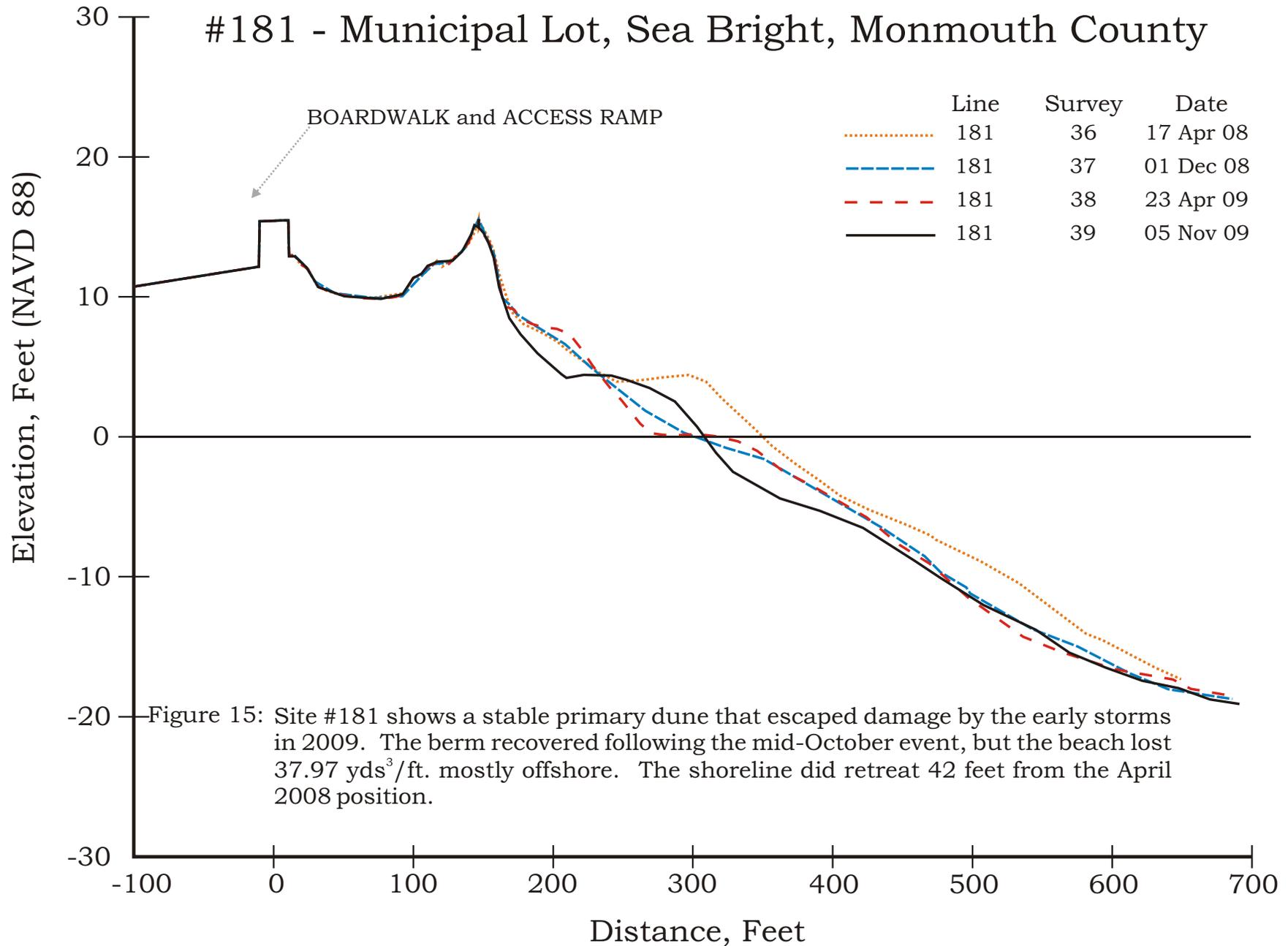


Photo taken November 5, 2009. View to the north.

Comparing the profiles over the one year time period, the profile location lost volume (-9.83 cu yd/ft) and the shoreline moved seaward (6.56 ft).

# New Jersey Beach Profile Network

#181 - Municipal Lot, Sea Bright, Monmouth County



## SUNSET COURT, SEA BRIGHT - SITE 180



Photo taken November 21, 2008. View to the north. Here, in contrast to Site 179 a short distance away, there is a decent beach and healthy dune system. There is a need for a maintenance fill or modification to the privately-owned structure causing the problem.

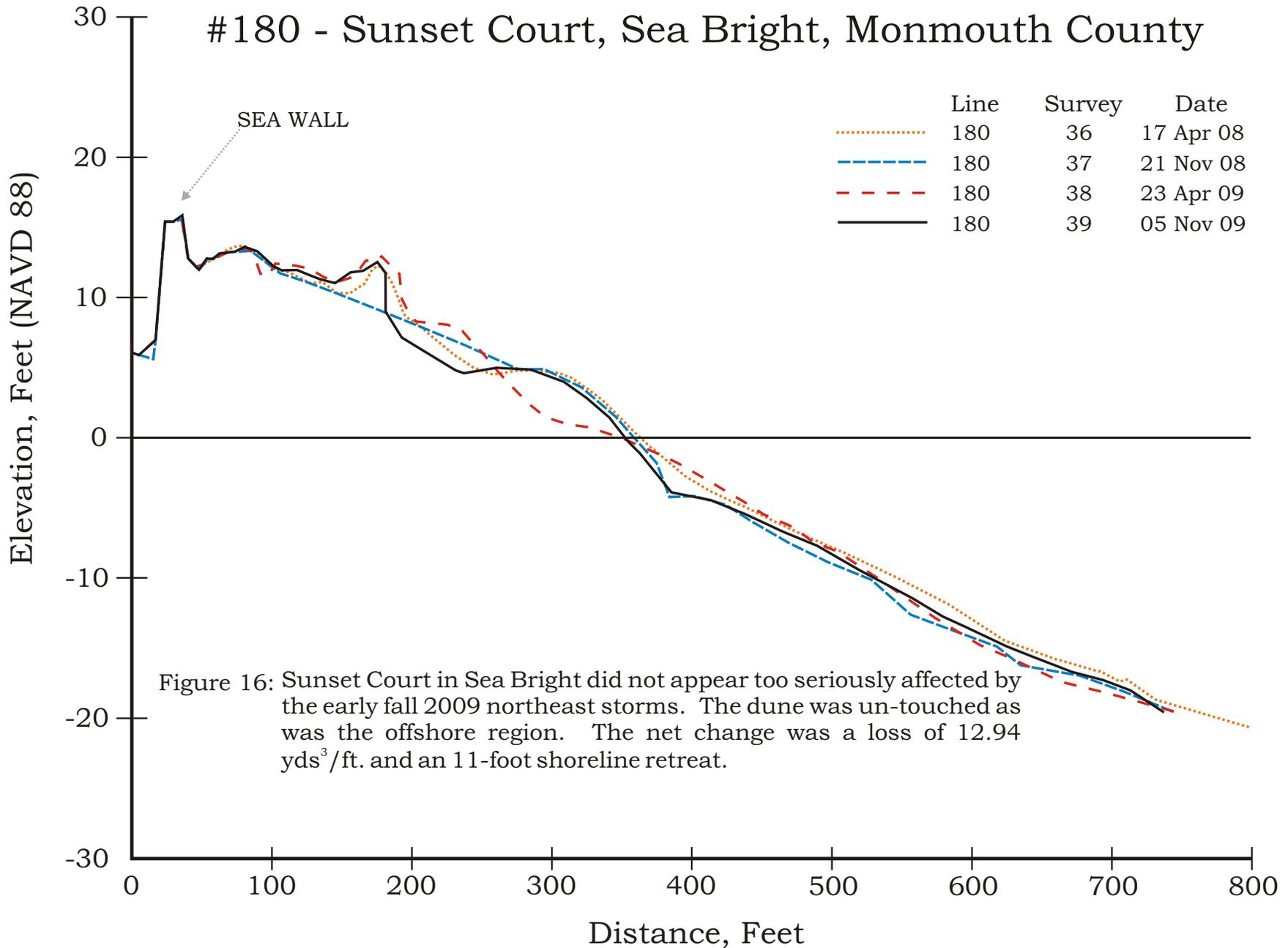


Photo taken November 5, 2009. View to the north.

Comparing the profiles over the one year time period, the profile location gained volume (4.29 cu yd/ft) and the shoreline moved landward (-6.41 ft).

# New Jersey Beach Profile Network

#180 - Sunset Court, Sea Bright, Monmouth County



## COTTAGE ROAD, MONMOUTH BEACH - SITE 179



Photo taken November 21, 2008. View to the north.

Cottage Road is the southern source area for sand when littoral currents are moving north toward Sandy Hook. This is because of a massive rock groin built decades ago to protect a private beach club in Monmouth Beach located immediately to the south. The last of the dune plants were left clinging to the rocks in 2008.



Photo taken November 4, 2009. View to the north.

Comparing the profiles over the one year time period, the profile location lost volume (-44.57 cu yd/ft) and the shoreline moved landward (-67.63 ft). Only a meager quantity of sand remains because the heavy reversal in the direction of longshore transport had yet to occur in sufficient magnitude. The November 2009 northeast storm lasted 5 days and produced abundant sand transport back to this area where the groin trapped it.

# New Jersey Beach Profile Network

#179 - Cottage Road, Monmouth Beach, Monmouth County

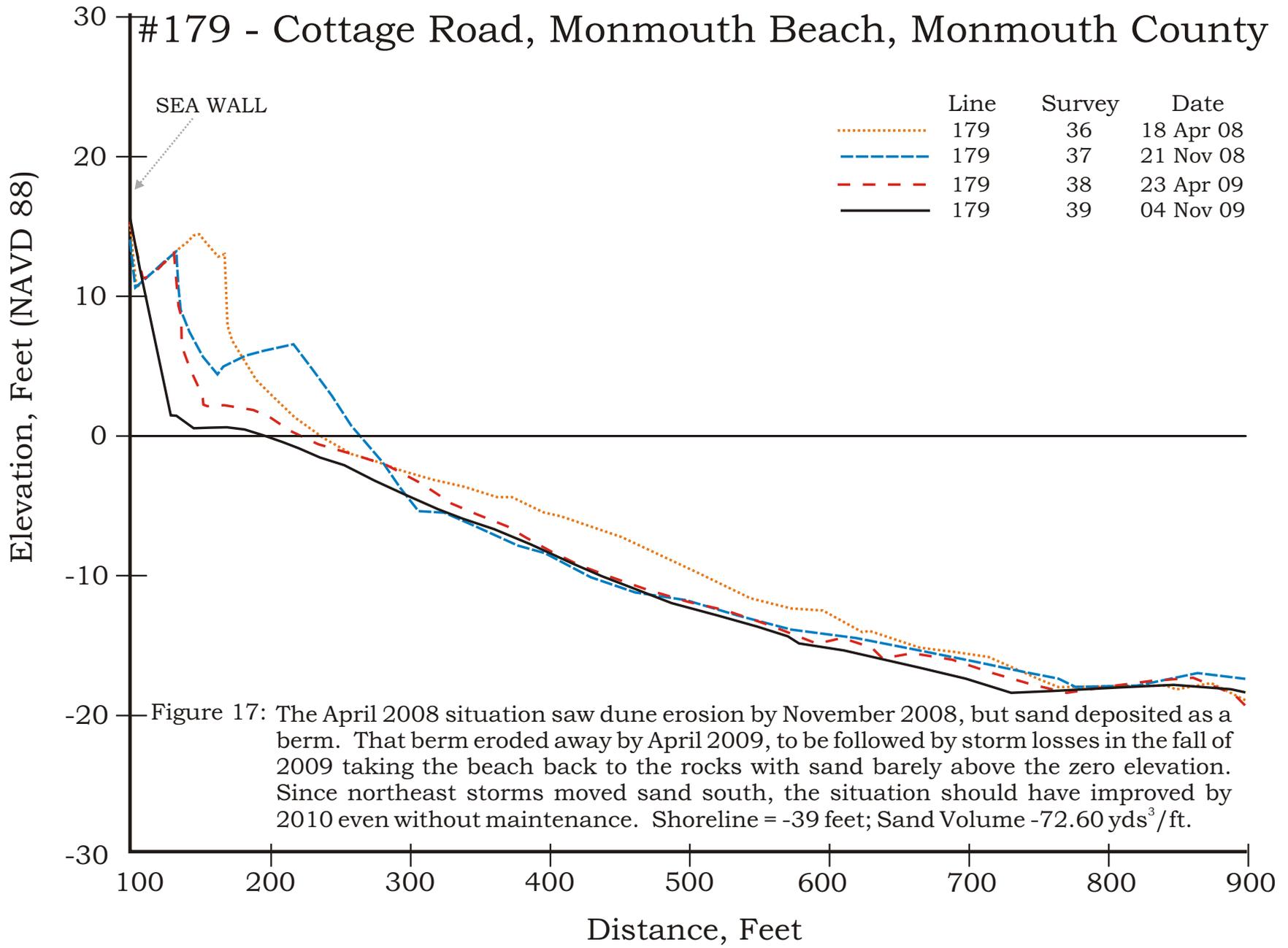


Figure 17: The April 2008 situation saw dune erosion by November 2008, but sand deposited as a berm. That berm eroded away by April 2009, to be followed by storm losses in the fall of 2009 taking the beach back to the rocks with sand barely above the zero elevation. Since northeast storms moved sand south, the situation should have improved by 2010 even without maintenance. Shoreline = -39 feet; Sand Volume -72.60 yds<sup>3</sup>/ft.

## MONMOUTH BEACH CLUB, MONMOUTH BEACH - SITE 178



Photo taken November 20, 2008. View to the north.

The Monmouth Beach Club shoreline lies south of the big groin complex just south of Cottage Road. Sand transport around the Monmouth Beach Club area has been continuously difficult since the ACOE project was built.

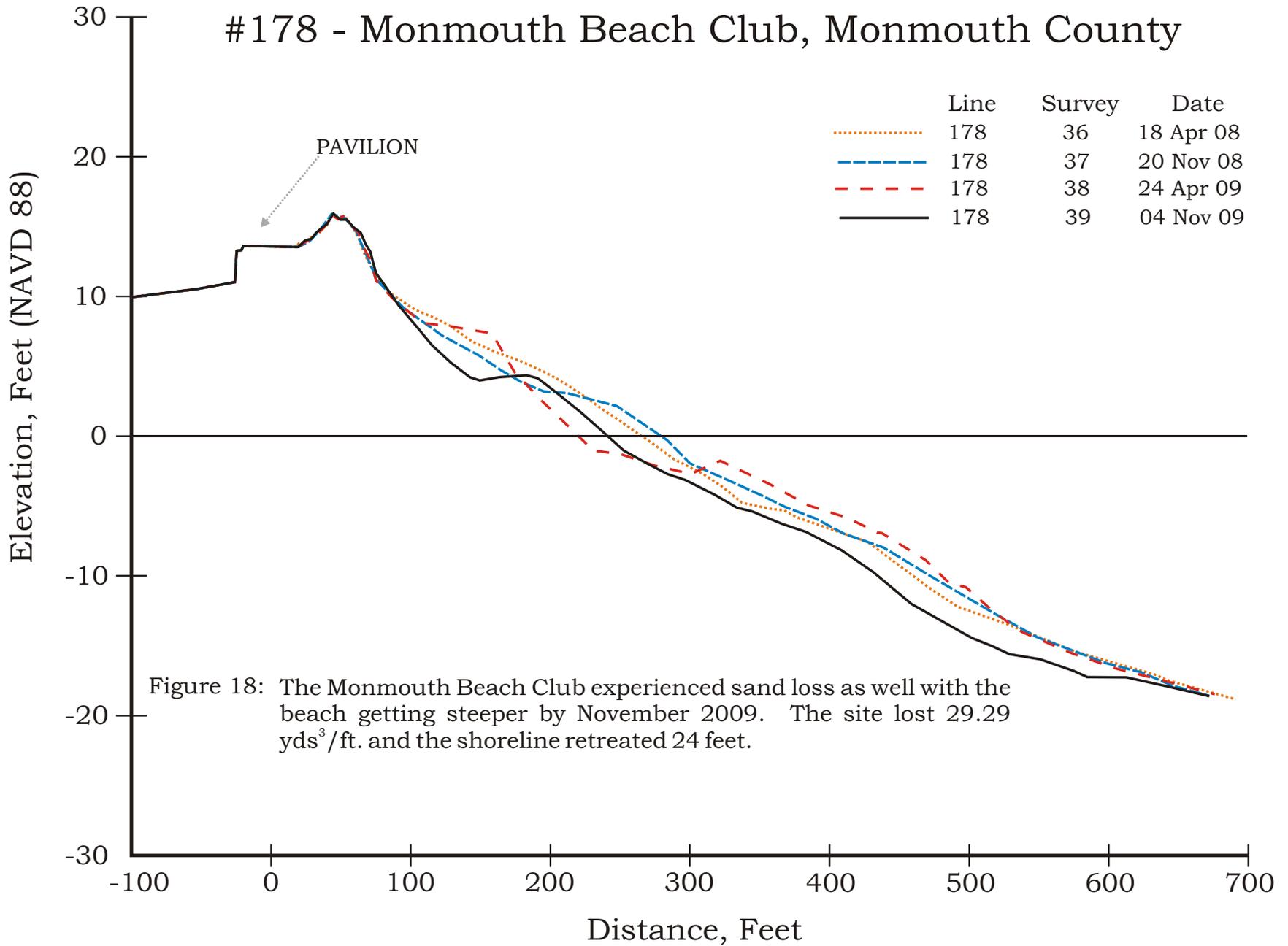


Photo taken November 4, 2009. View to the north.

Comparing the profiles over the one year time period, the profile location lost volume (-30.75 cu yd/ft) and the shoreline moved landward (-38.29 ft).

# New Jersey Beach Profile Network

## #178 - Monmouth Beach Club, Monmouth County



## 404 OCEAN AVENUE, LONG BRANCH - SITE 177



Photo taken November 20, 2008. View to the south.

The site was essentially stable over the 2008-9 study interval.

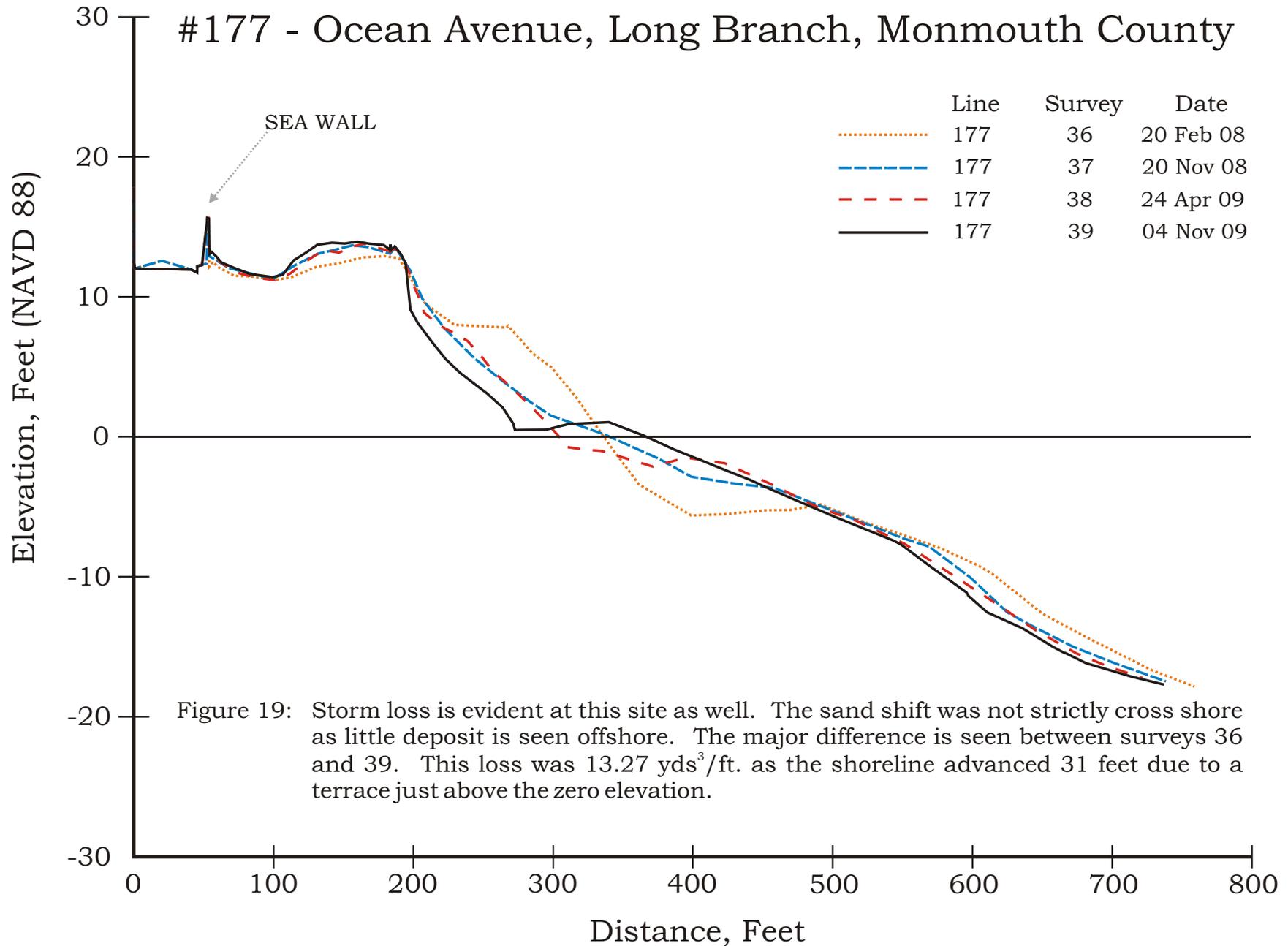


Photo taken November 4, 2009. View to the south.

Comparing the profiles over the eleven month time period, the profile location lost volume (-9.21 cu yd/ft) and the shoreline moved seaward (26.59 ft). Waves had reached the dune toe in mid-October.

# New Jersey Beach Profile Network

#177 - Ocean Avenue, Long Branch, Monmouth County



## SEVEN PRESIDENTS PARK, MONMOUTH BEACH - SITE 176



Photo taken November 17, 2008. View to the south.

At the Seven Presidents Park the beach had a broad flat slope to the water from a narrow segment of flat dry beach.

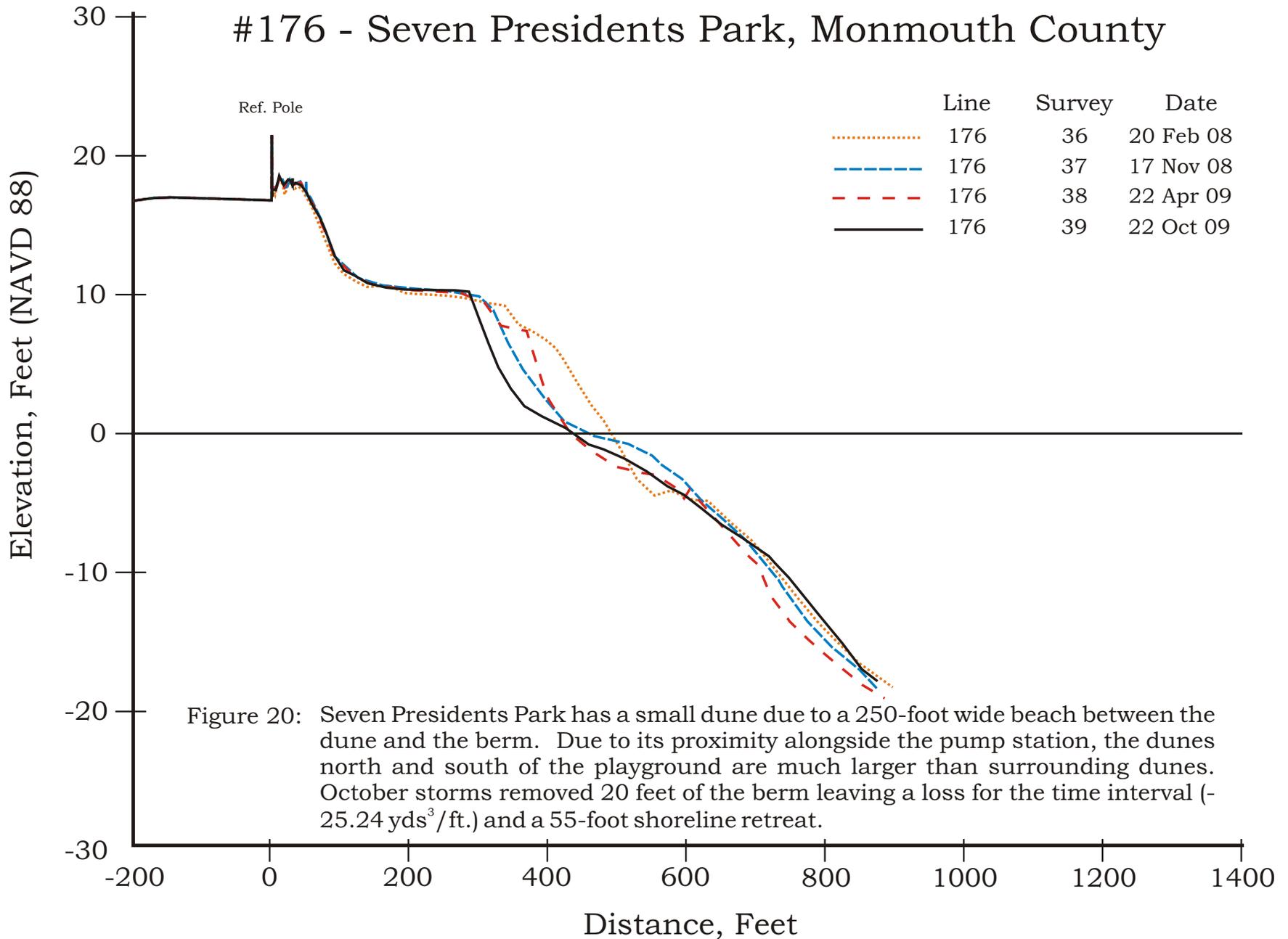


Photo taken October 22, 2009. View to the south.

Comparing the profiles over the eleven month time period, the profile location lost volume (-12.83 cu yd/ft) and the shoreline moved landward (-22.84 ft).

# New Jersey Beach Profile Network

## #176 - Seven Presidents Park, Monmouth County



## BROADWAY AVENUE, LONG BRANCH - SITE 175



Photo taken November 17, 2008. View to the north.

The old rusted steel showing in both photographs is the top of the 70-year old vertical steel bulkhead used to defend the uplands bluff.

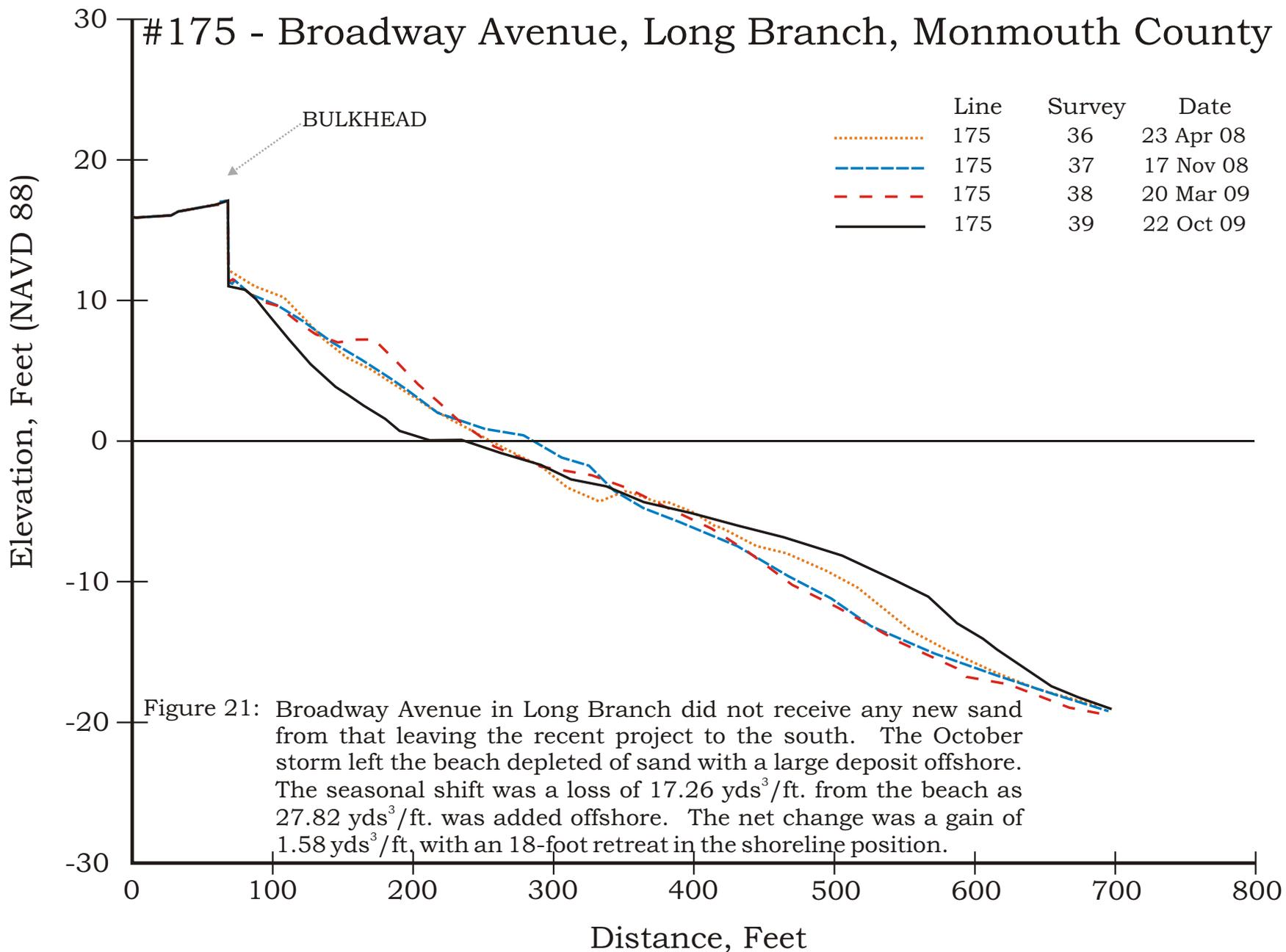


Photo taken October 22, 2009. View to the north

Comparing the profiles over the eleven month time period, the profile location gained volume (7.33 cu yd/ft) and the shoreline moved landward (-48.58 ft). Storm-generated loss is obvious in the 4-foot vertical segment of the steel wall now showing in 2009. This is the first year since the fill in 1996 that you could not just walk off the wall onto the beach.

# New Jersey Beach Profile Network

#175 - Broadway Avenue, Long Branch, Monmouth County



## MORRIS AVENUE, LONG BRANCH - SITE 174



Photo taken November 17, 2008. View to the south.

This central area of the Long Branch municipal beach is defended by both groins and a rock sea wall at the bluff. Some retreat has occurred here since the artificial end of the project is but one additional survey site away to the south. This November 17, 2008 view shows the rocks and stray grass plants that have established up the slope toward the pedestrian walk. This area received sand indirectly in 2009 as the ACOE performed a maintenance on the southern end of the Long Branch beaches.

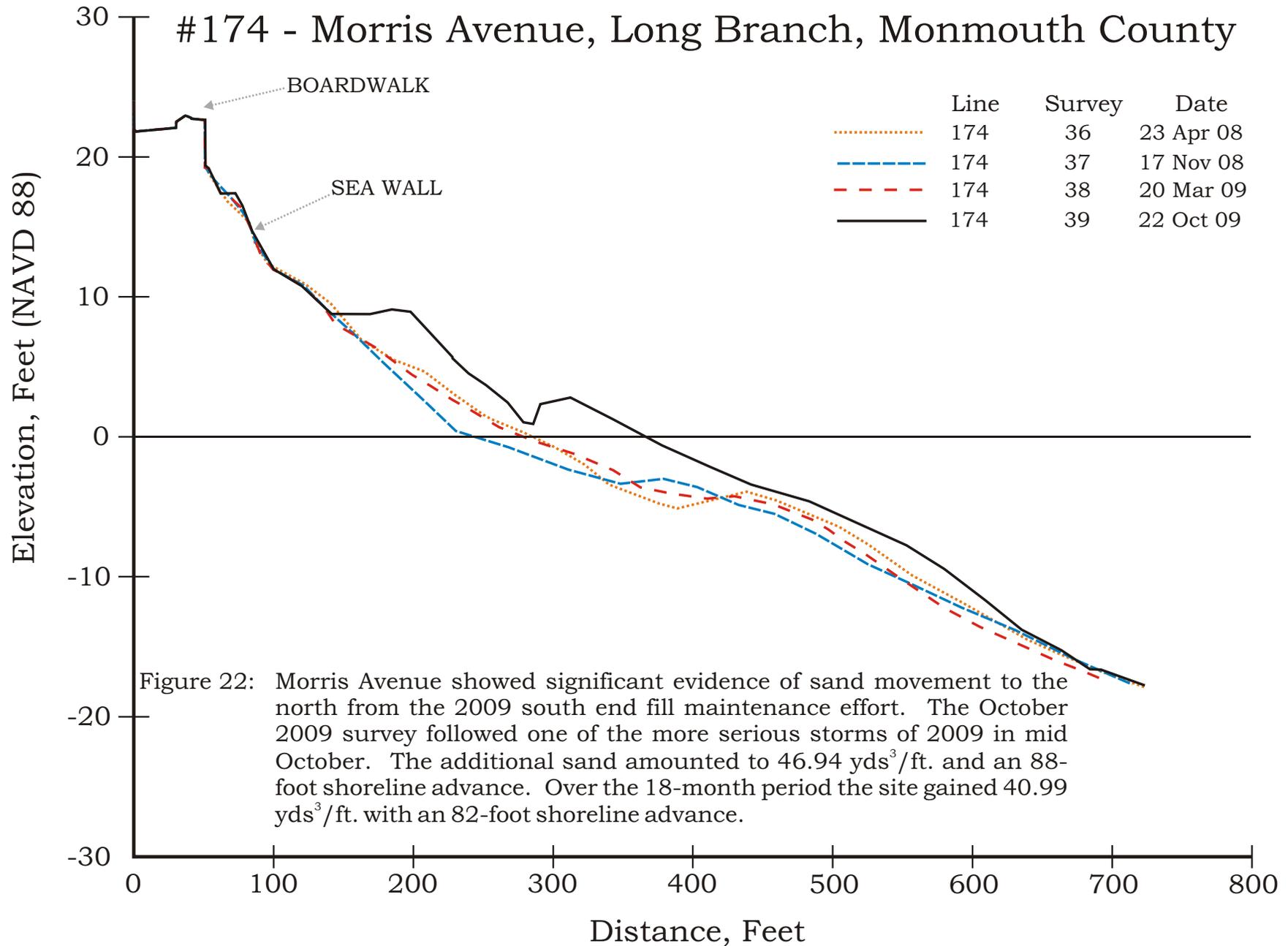


Photo taken October 22, 2009. View to the south.

Comparing the profiles over the eleven month time period, the profile location gained volume (52.98 cu yd/ft) and the shoreline moved seaward (122.89 ft). This was all due to the northerly transport of maintenance fill sand applied to the southern end of the Long Branch segment of the Monmouth County fill in 2009.

# New Jersey Beach Profile Network

#174 - Morris Avenue, Long Branch, Monmouth County



## WEST END AVENUE, LONG BRANCH - SITE 173



Photo taken November 12, 2008. View to the south.

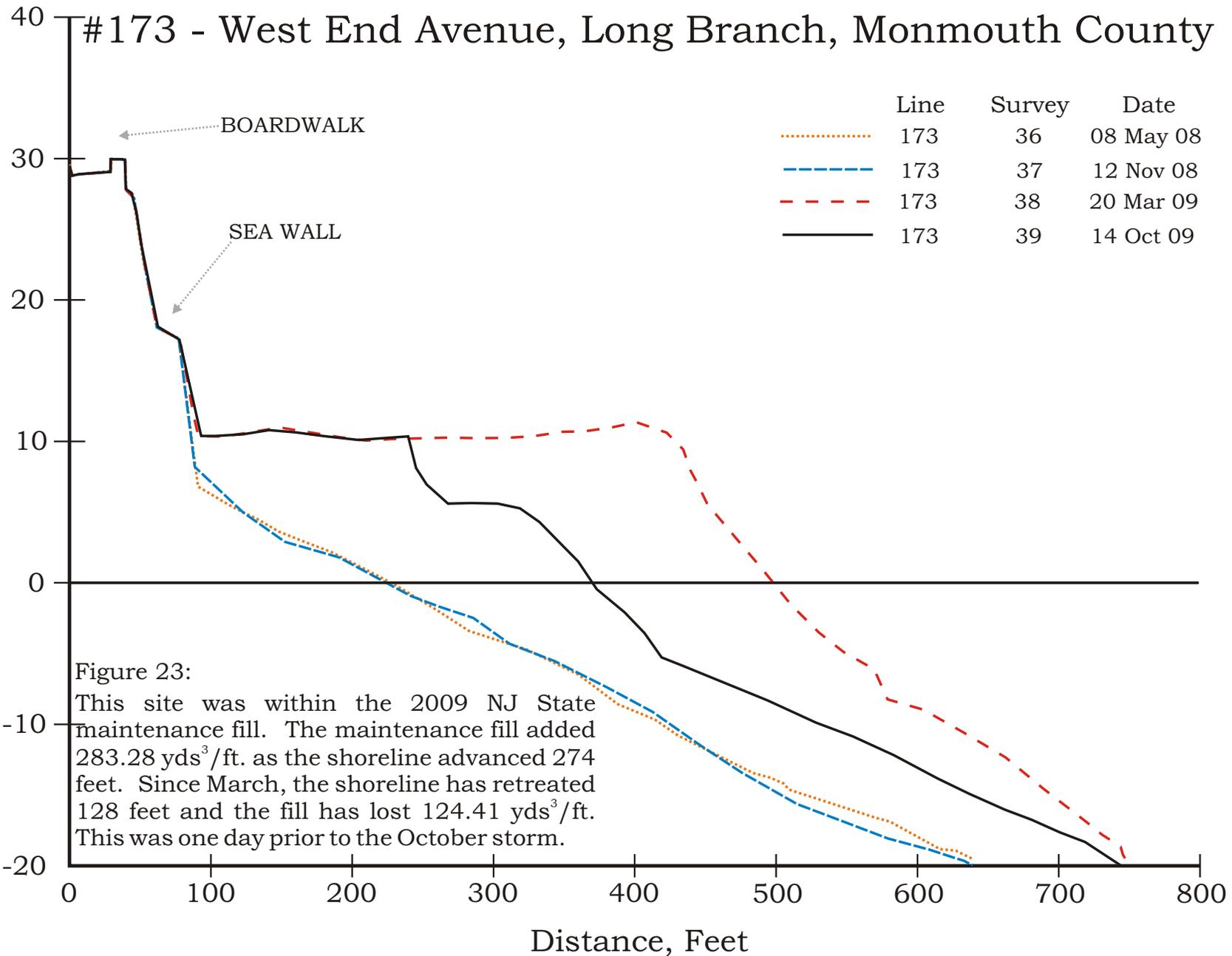
This is the southernmost survey site within the Long Branch to Sandy Hook segment of the Monmouth County beach fill. The deposition stopped just south of here due to real estate issues along privately owned oceanfront tracts in Elberon and Deal into Allenhurst. This view shows the top of the bluff, the rock sea wall and the remaining beach between the groins. The 2009 beach restoration maintenance fill augmented this site substantially by March 2009.



Photo taken October 14, 2009. View to the south.

Comparing the profiles over the eleven month time period, the profile location gained volume (158.86 cu yd/ft) and the shoreline moved seaward (146.14 ft). Some berm retreat has occurred as this maintenance fill adjusted to the shoreline conditions. Northeast storms would have acted to move material south into Elberon.

# New Jersey Beach Profile Network



## PULLMAN AVENUE, ELBERON - SITE 171



Photo taken November 10, 2008. View to the north.

Located on the highest elevation (+36 feet) along the Monmouth County bluff, this site lies about a mile south of the southern end of the beach fill in Long Branch. This view shows the entire bluff, the flat terrace between the steel bulkhead and the bluff and a relative distant view of the shoreline.

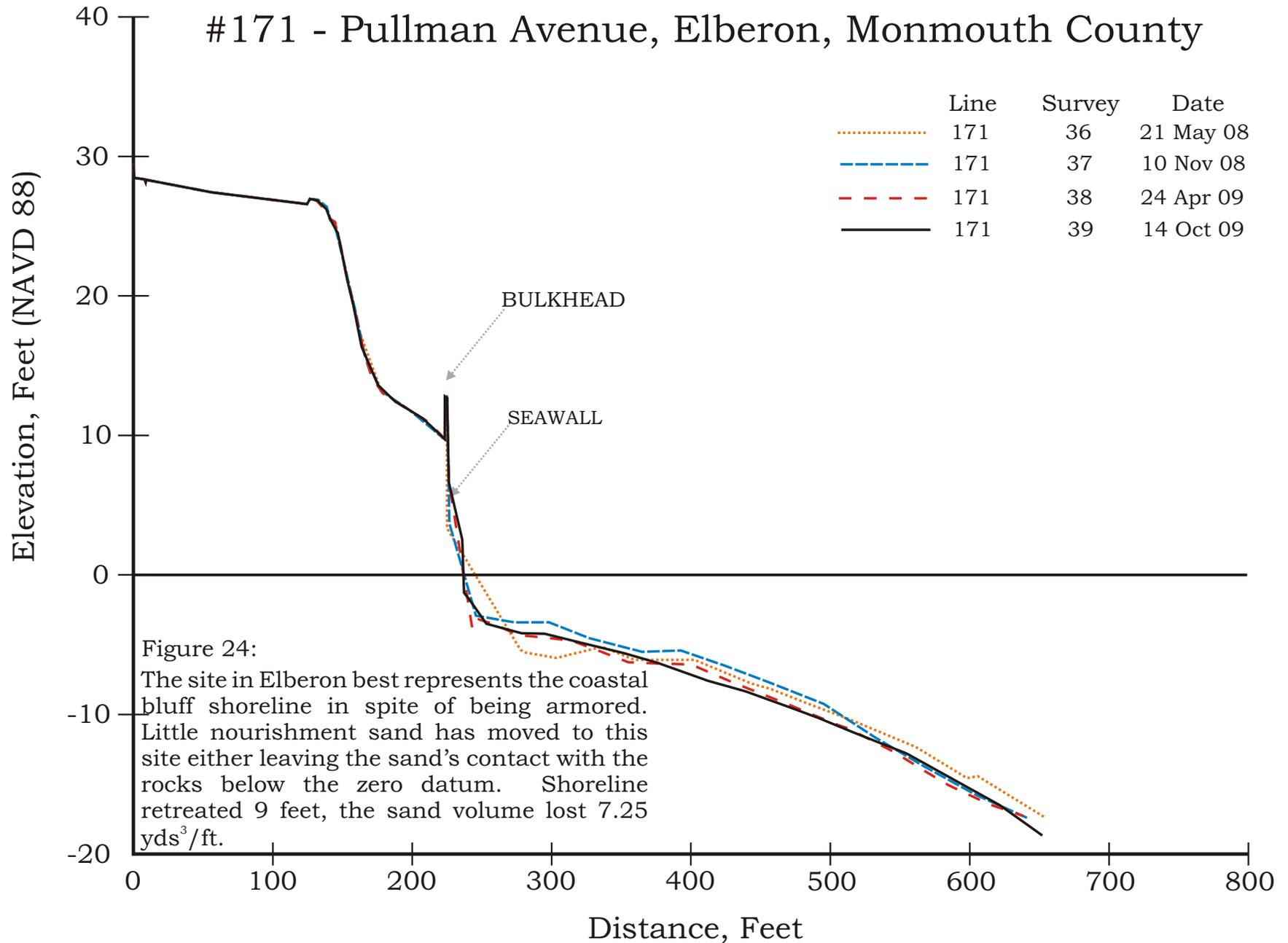


Photo taken October 14, 2009. View to the north at the bulkhead/revetment. There was no dry beach in 2009, in fact none has existed since the May 2008 survey.

Comparing the profiles over the eleven month time period, the profile location lost volume (-8.67 cu yd/ft) and the shoreline moved landward (-0.60 ft).

# New Jersey Beach Profile Network

#171 - Pullman Avenue, Elberon, Monmouth County



## ROOSEVELT AVENUE, DEAL - SITE 170



Photo taken November 10, 2008. View to the north.

This view to the north along the rock-armored shoreline of Deal shows a small sand pocket trapped against the northern groin in the cell. Sand shifts north to south within the cell, but little new material can move laterally along the shoreline. Groins every 700 to 1,000 feet make that impossible.

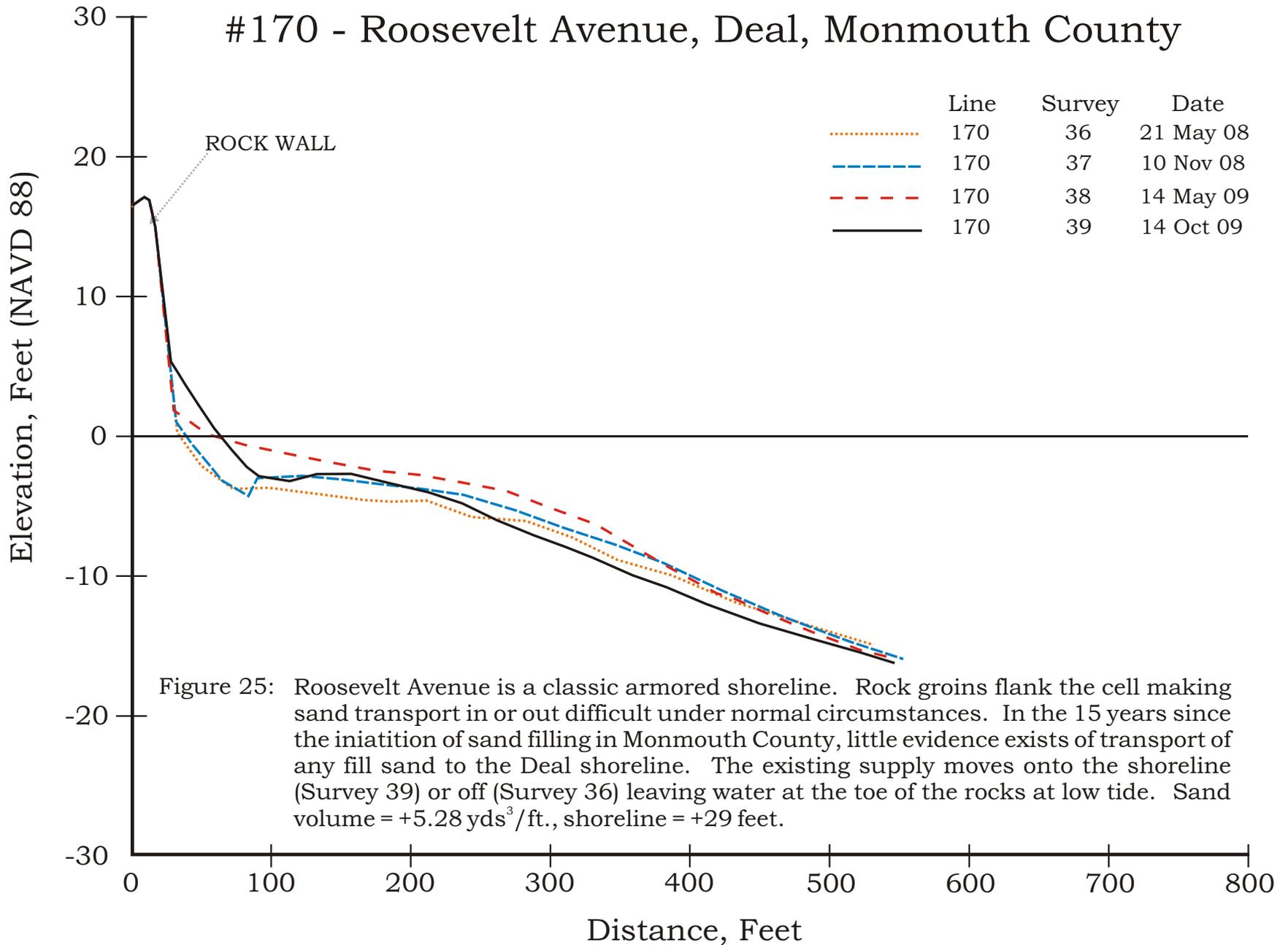


Photo taken October 14, 2009. View to the north.

Comparing the profiles over the eleven month time period, the profile location lost volume (-6.77 cu yd/ft) and the shoreline moved seaward (24.65 ft). The shoreline advanced seaward, but the sand volume declined because the losses offshore exceeded the deposition on the beach.

# New Jersey Beach Profile Network

#170 - Roosevelt Avenue, Deal, Monmouth County



## DARLINGTON AVENUE, DEAL - SITE 169



Photo taken November 12, 2008. View to the south.

Darlington Avenue in Deal has the best preserved bluff shoreline anywhere along the Monmouth County coast. The beach berm protects the toe of the bluff. The sand had ramped up the slope and was vegetated. Recently, owners have placed rock along the toe of the bluff to the south of the line at Darlington Avenue.

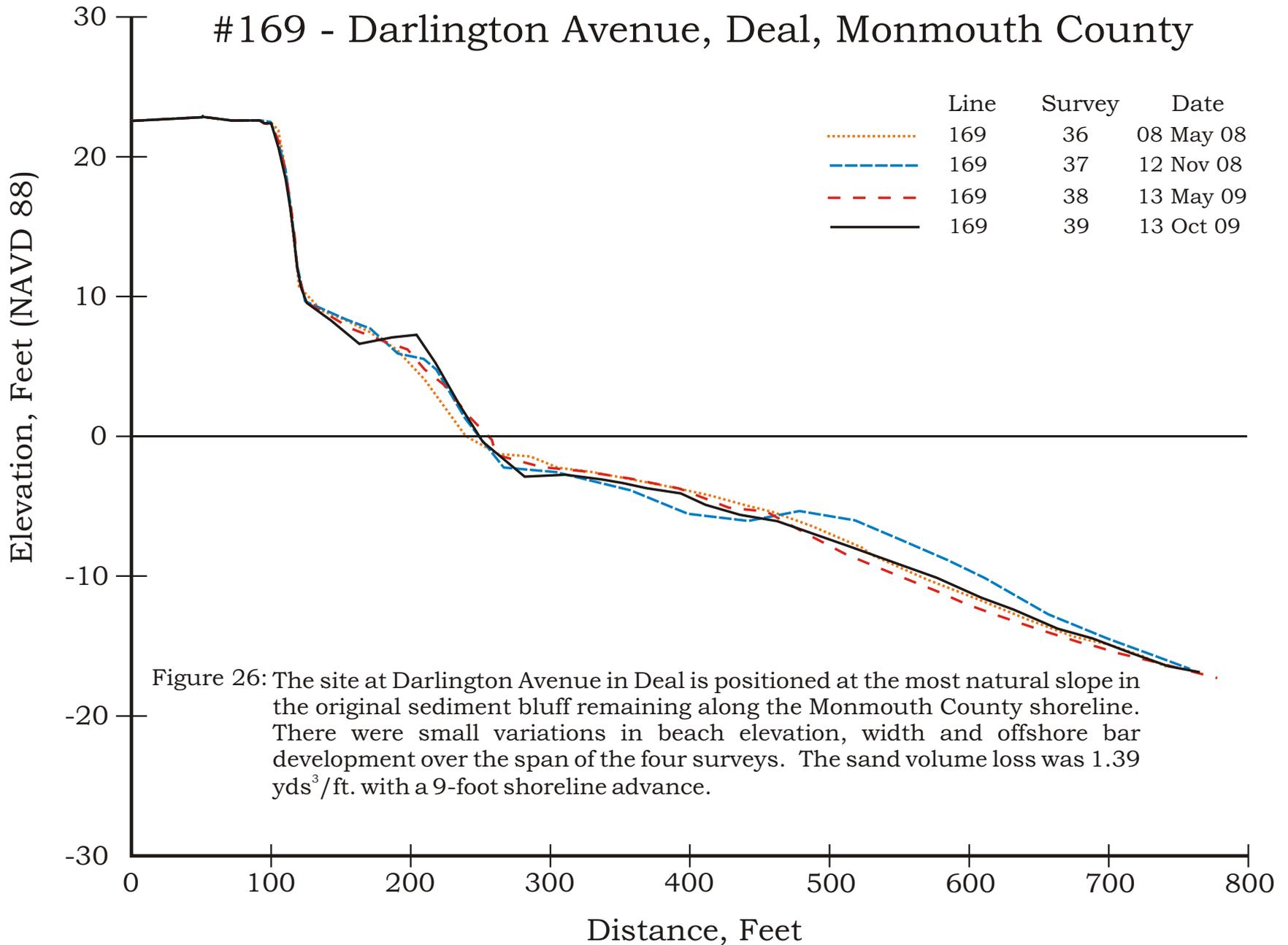


Photo taken October 13, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location lost volume (-9.68 cu yd/ft) and the shoreline moved seaward (0.26 ft).

# New Jersey Beach Profile Network

#169 - Darlington Avenue, Deal, Monmouth County



## CORLIES AVENUE, ALLENHURST - SITE 168



Photo taken October 31, 2008. View to the south.

The Allenhurst beach is located in front of an old concrete seawall built to protect the easily eroded bluff years ago. It has survived many storms. The beach was wider than it had been in decades due to sand escape from the groin seen to the south that retains the Asbury Park section of the Federal fill. For some reason neither Loch Arbor (a one-block wide oceanfront community) nor Allenhurst chose to participate in the US Army Corps Monmouth County project. However, the tendency for sand to move north along this part of the NJ coastline has provided a boost to both community beaches.



Photo taken October 13, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location gained volume (14.01 cu yd/ft) and the shoreline moved seaward (34.39 ft).

# New Jersey Beach Profile Network

#168 - Corlies Avenue, Allenhurst, Monmouth County

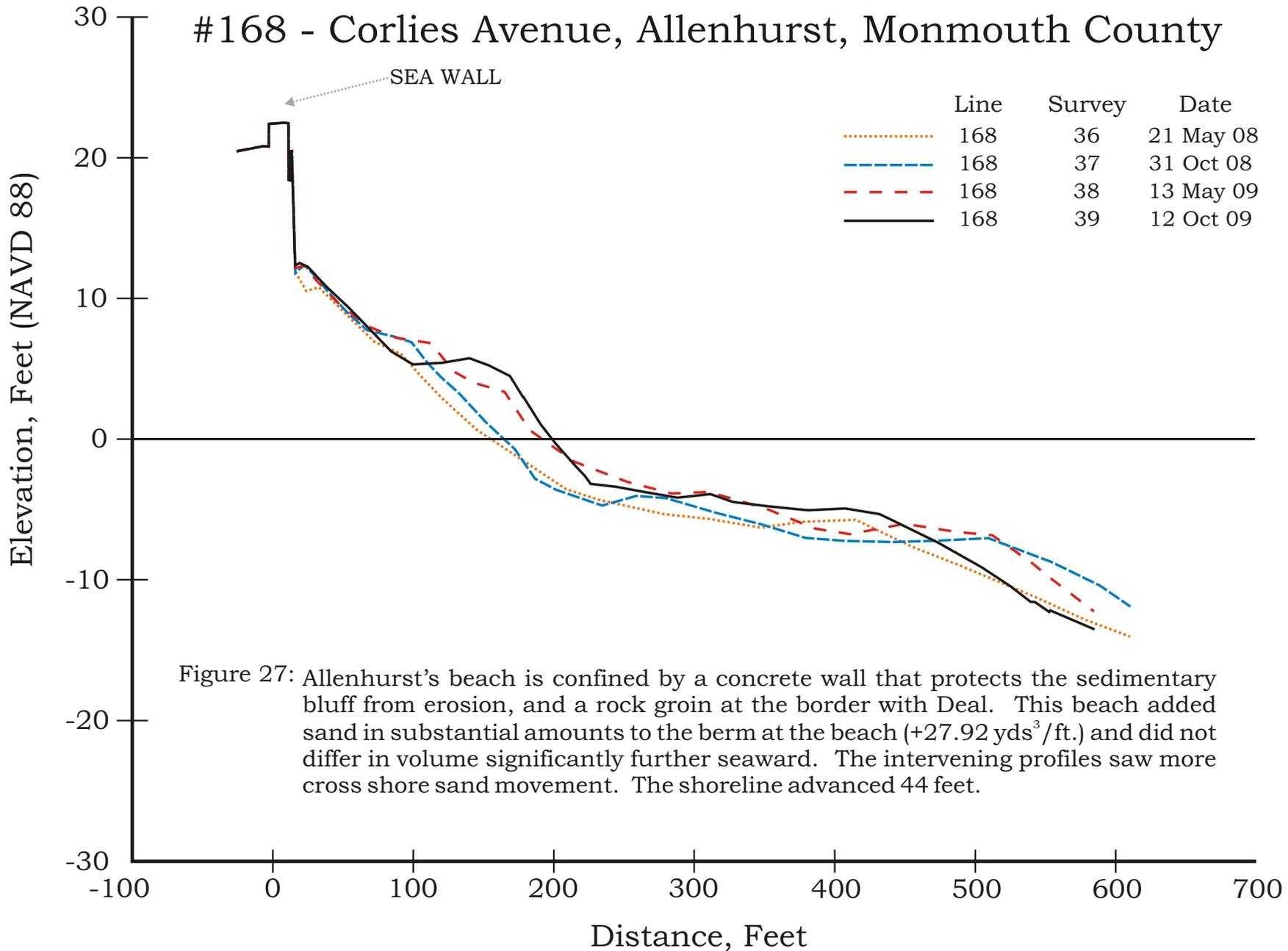


Figure 27: Allenhurst's beach is confined by a concrete wall that protects the sedimentary bluff from erosion, and a rock groin at the border with Deal. This beach added sand in substantial amounts to the berm at the beach (+27.92 yds<sup>3</sup>/ft.) and did not differ in volume significantly further seaward. The intervening profiles saw more cross shore sand movement. The shoreline advanced 44 feet.

## 7th AVENUE, ASBURY PARK - SITE 267



Photo taken October 31, 2008. View to the north.

Located at the northern end of the south segment of the Monmouth County project, this Asbury Park beach has retained most of the initial deposit of sand. No maintenance has been done since completion in 1999. There is a large terminal groin between Asbury Park and Loch Arbor that some sand has moved around in the last decade, but not enough to be any detriment to the Asbury Park beach.

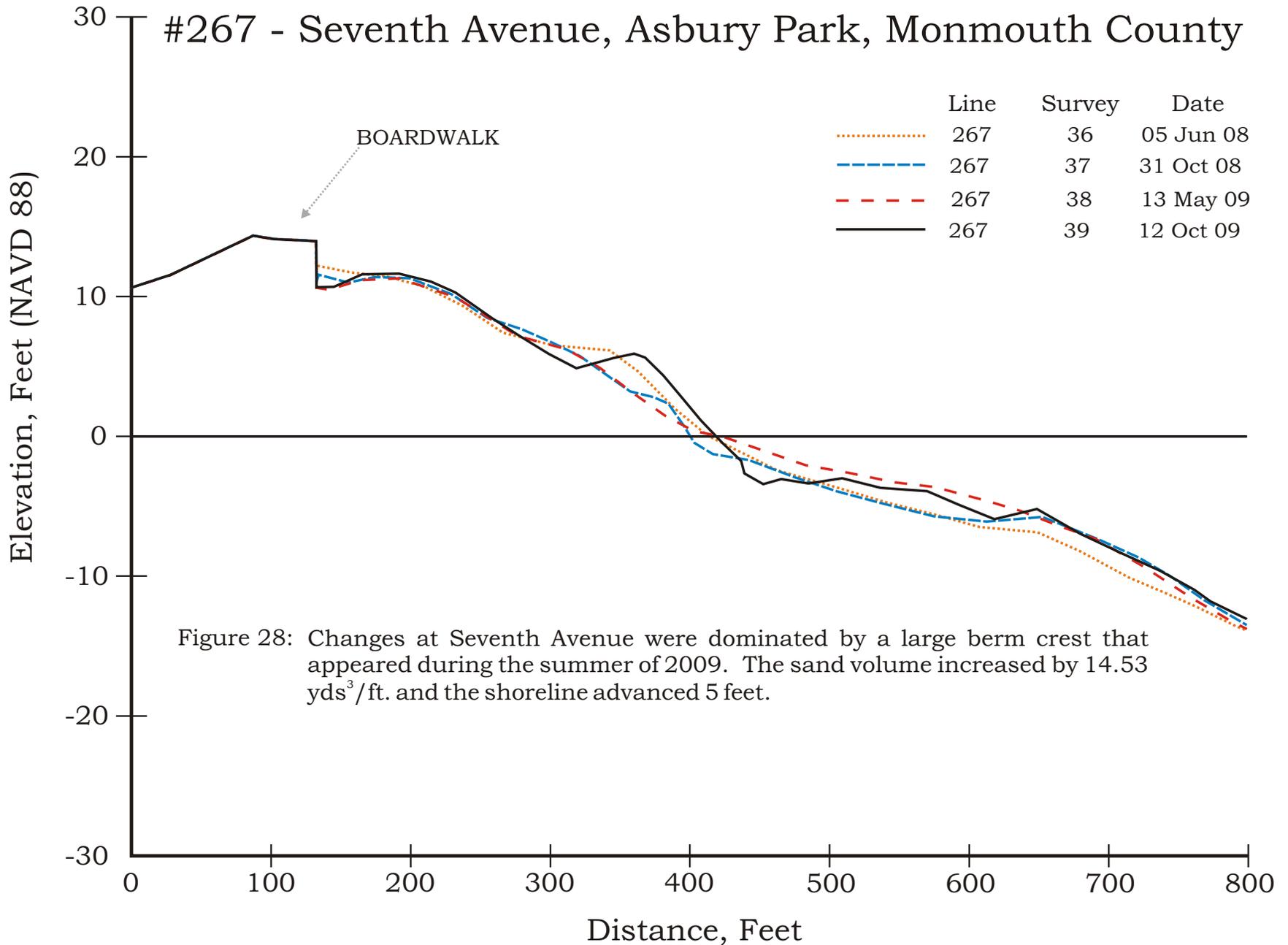


Photo taken October 12, 2009. View to the north.

Comparing the profiles over the one-year time period, the profile location gained volume (11.94 cu yd/ft) and the shoreline moved seaward (18.54 ft).

# New Jersey Beach Profile Network

#267 - Seventh Avenue, Asbury Park, Monmouth County



## 3<sup>rd</sup> AVENUE, ASBURY PARK - SITE 167



Photo taken October 31, 2008. View to the north.

The middle of the Asbury Park beach is wide and very flat with no dune. The recreational use precludes a natural dune from forming and no municipal work was done to force a dune to grow near the boardwalk.



Photo taken October 12, 2009. View to the north.

Comparing the profiles over the one-year time period, the profile location gained volume (15.21 cu yd/ft) and the shoreline moved seaward (8.05 ft).

# New Jersey Beach Profile Network

#167 - Third Avenue, Asbury Park, Monmouth County

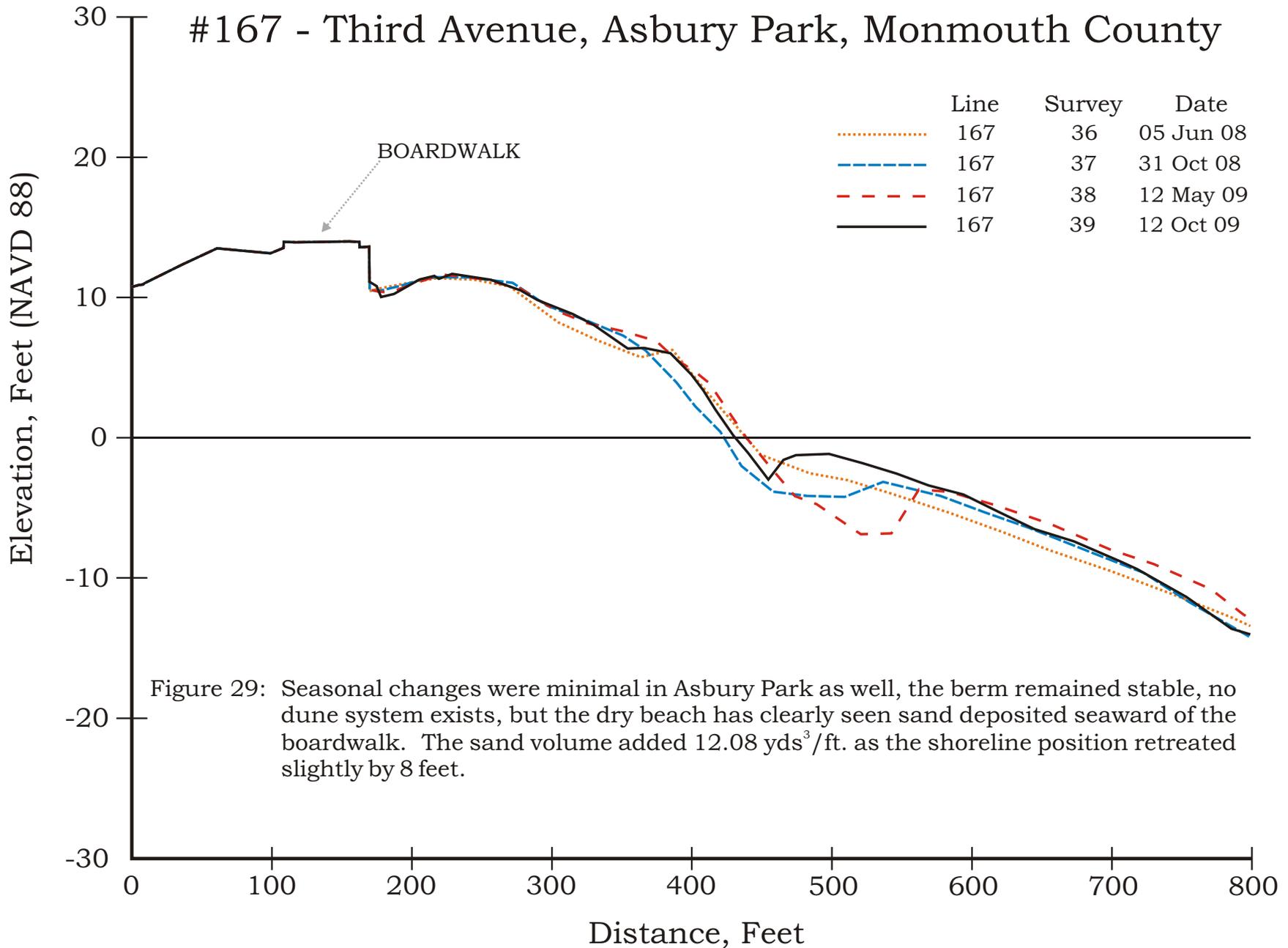


Figure 29: Seasonal changes were minimal in Asbury Park as well, the berm remained stable, no dune system exists, but the dry beach has clearly seen sand deposited seaward of the boardwalk. The sand volume added 12.08 yds<sup>3</sup>/ft. as the shoreline position retreated slightly by 8 feet.

## OCEAN PATHWAY, OCEAN GROVE - SITE 166



Photo taken October 30, 2008. View to the north.

Ocean Grove has an equally wide beach as Asbury Park, but took steps to create a dune between the beach and the boardwalk.

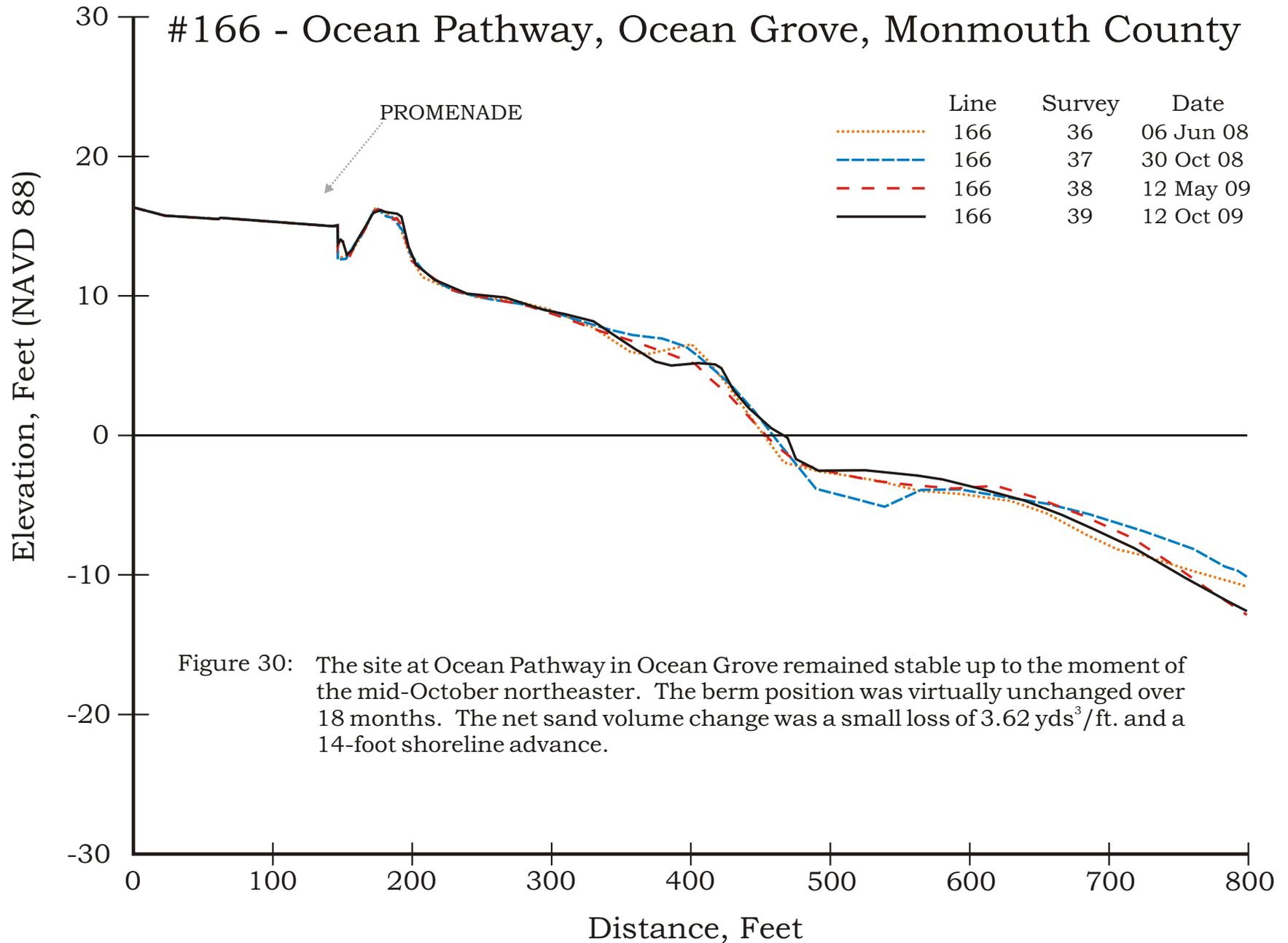


Photo taken October 9, 2009. View to the north.

Comparing the profiles over the one-year time period, the profile location lost volume (-9.16 cu yd/ft) but the shoreline moved seaward (7.54 ft).

# New Jersey Beach Profile Network

#166 - Ocean Pathway, Ocean Grove, Monmouth County



## McCABE AVENUE, BRADLEY BEACH - SITE 165



Photo taken October 30, 2008. View to the south.

This location is far different from what it was in 1996 before the beach fill. The first step the community made was to pull the boardwalk back off the beach and replace it with a paver promenade on the top of the bluff between Ocean Avenue and the boardwalk. This provided an additional 40 feet of badly needed beach width. By October 2008, the dune was well developed where the boardwalk once was and the filled beach extended 235 feet further seaward to the berm.

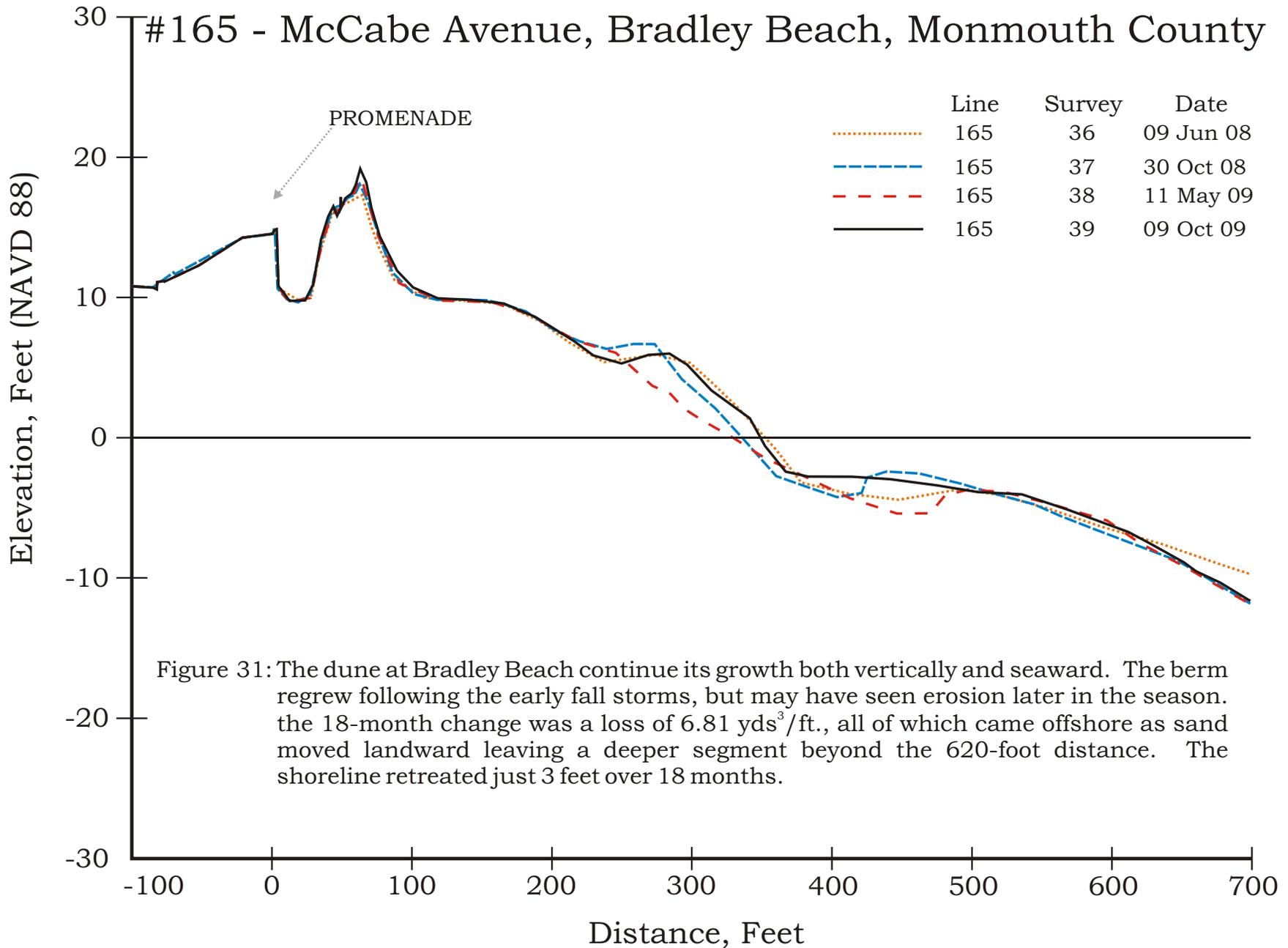


Photo taken October 9, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location gained volume (7.11 cu yd/ft) and the shoreline moved seaward (13.06 ft). The Federal project has provided this community with a new sense of beach resort pride.

# New Jersey Beach Profile Network

#165 - McCabe Avenue, Bradley Beach, Monmouth County



## SYLVANIA AVENUE, AVON BY THE SEA - SITE 164



Photo taken October 30, 2008. View to the south.

This photo shows the beach just north of the Shark River Inlet. This is the most significant barrier to the free movement of sand along this southern Monmouth County fill segment. No dune was built along this community's shoreline so all the fill-widened beach is available for blankets in the summer. The sand fence shown is a winter-only installation designed to avoid developing a permanent dune.

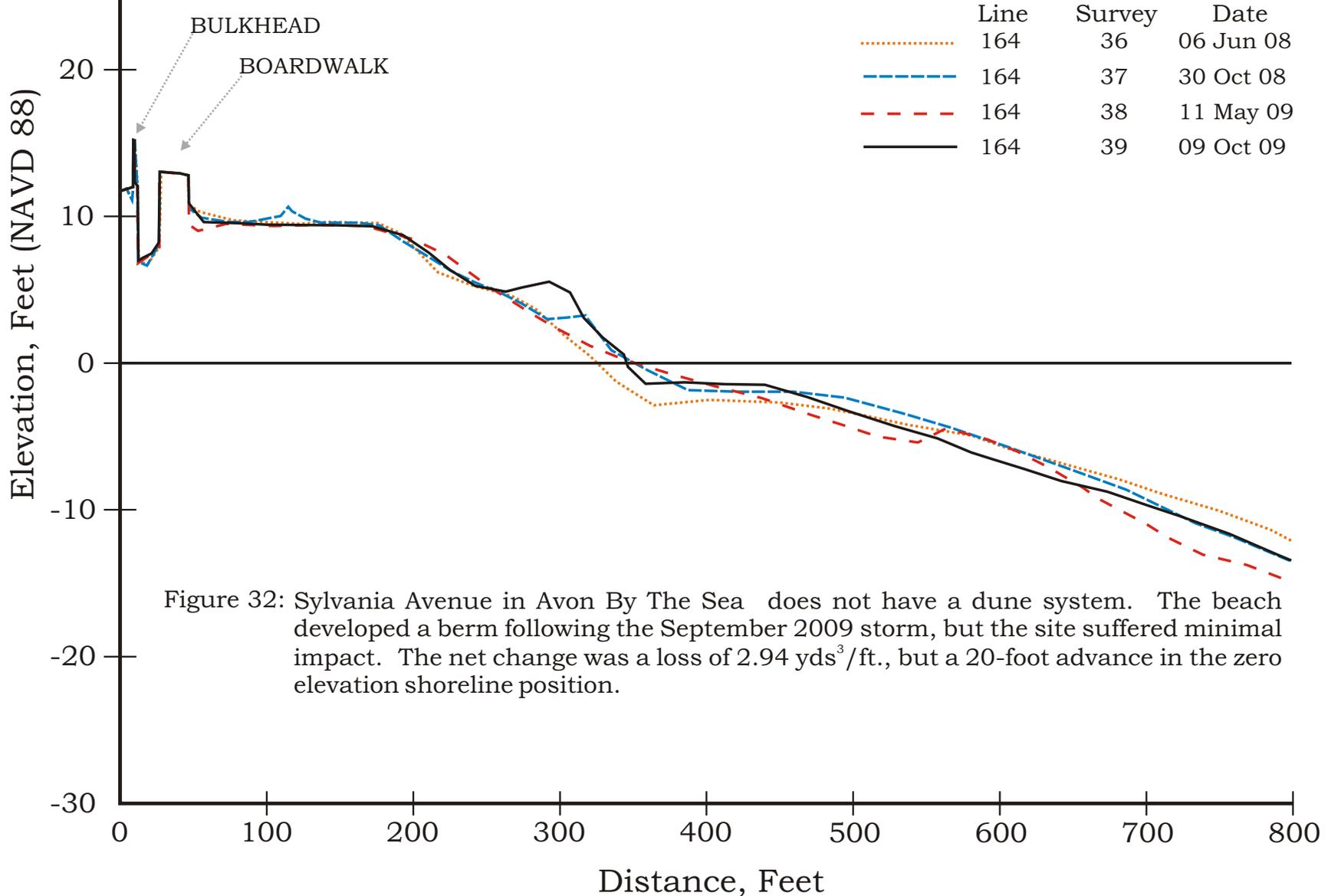


Photo taken October 9, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location lost volume (-6.1 cu yd/ft) and the shoreline moved landward (-5.49 ft).

# New Jersey Beach Profile Network

#164 - Sylvania Avenue, Avon By The Sea, Monmouth County



## 5<sup>th</sup> AVENUE, BELMAR - SITE 163



Photo taken October 21, 2008. View to the north.

The northern Belmar beach lies just south of the Shark River Inlet and has historically trapped sand moving north. This photograph illustrates the 350-foot wide, flat beach with a token dune just east of the boardwalk. The fencing is a winter-only installation designed to capture sand on the beach and not on the boardwalk or Ocean Avenue.

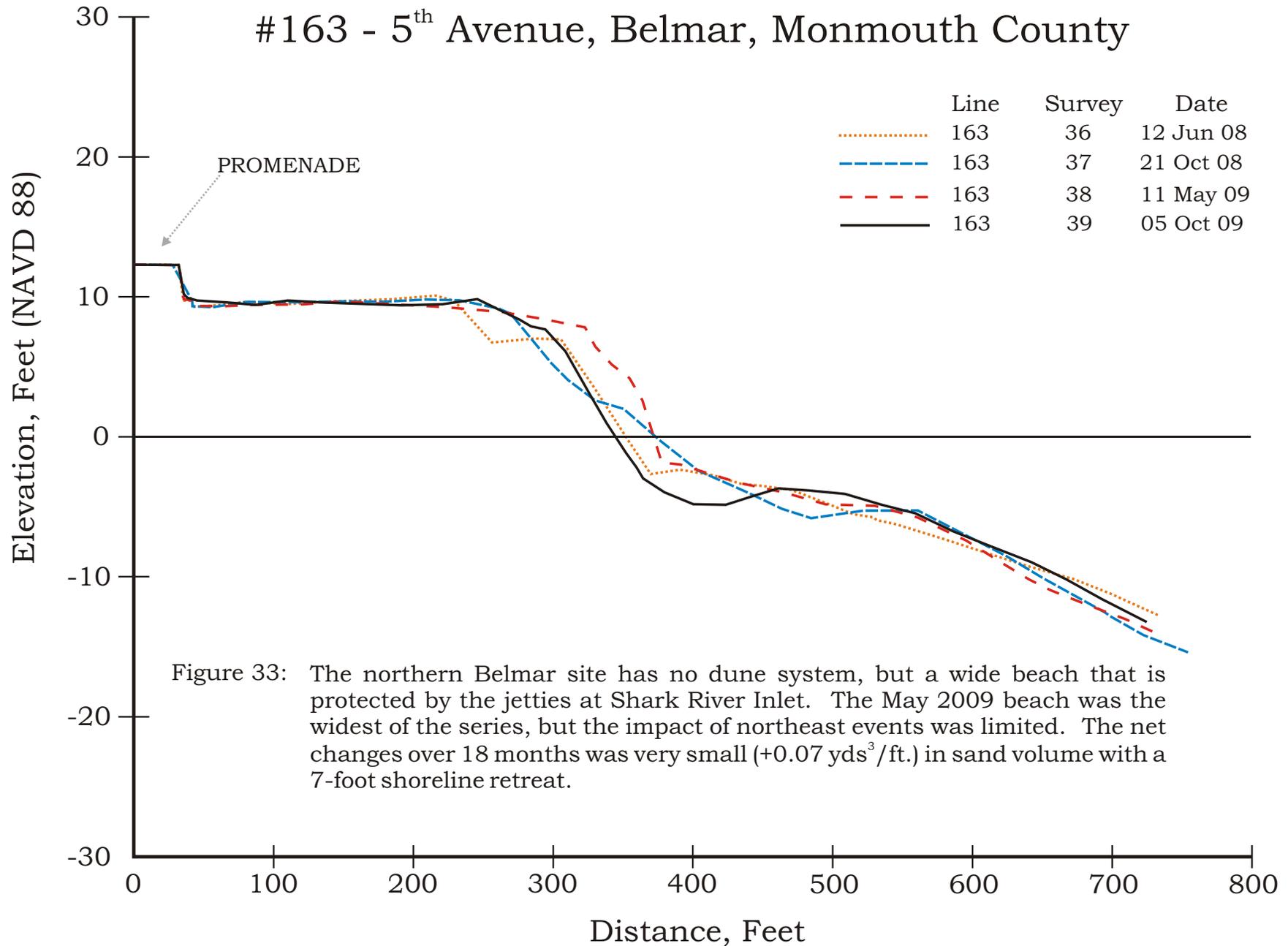


Photo taken October 5, 2009. View to the north.

Comparing the profiles over the one-year time period, the profile location lost volume (-0.75 cu yd/ft) and the shoreline moved landward (-28.86 ft).

# New Jersey Beach Profile Network

#163 - 5<sup>th</sup> Avenue, Belmar, Monmouth County



## 18<sup>th</sup> AVENUE, BELMAR - SITE 162



Photo taken October 21, 2008. View to the north.

In southern Belmar the beach is a little narrower, but the “dune” represents a landscaping endeavor. In 2008 the municipality erected three lines of sand fencing in an effort to reduce sand transport onto Ocean Avenue, the boardwalk and the decorative planting that constitutes the City’s dune system.

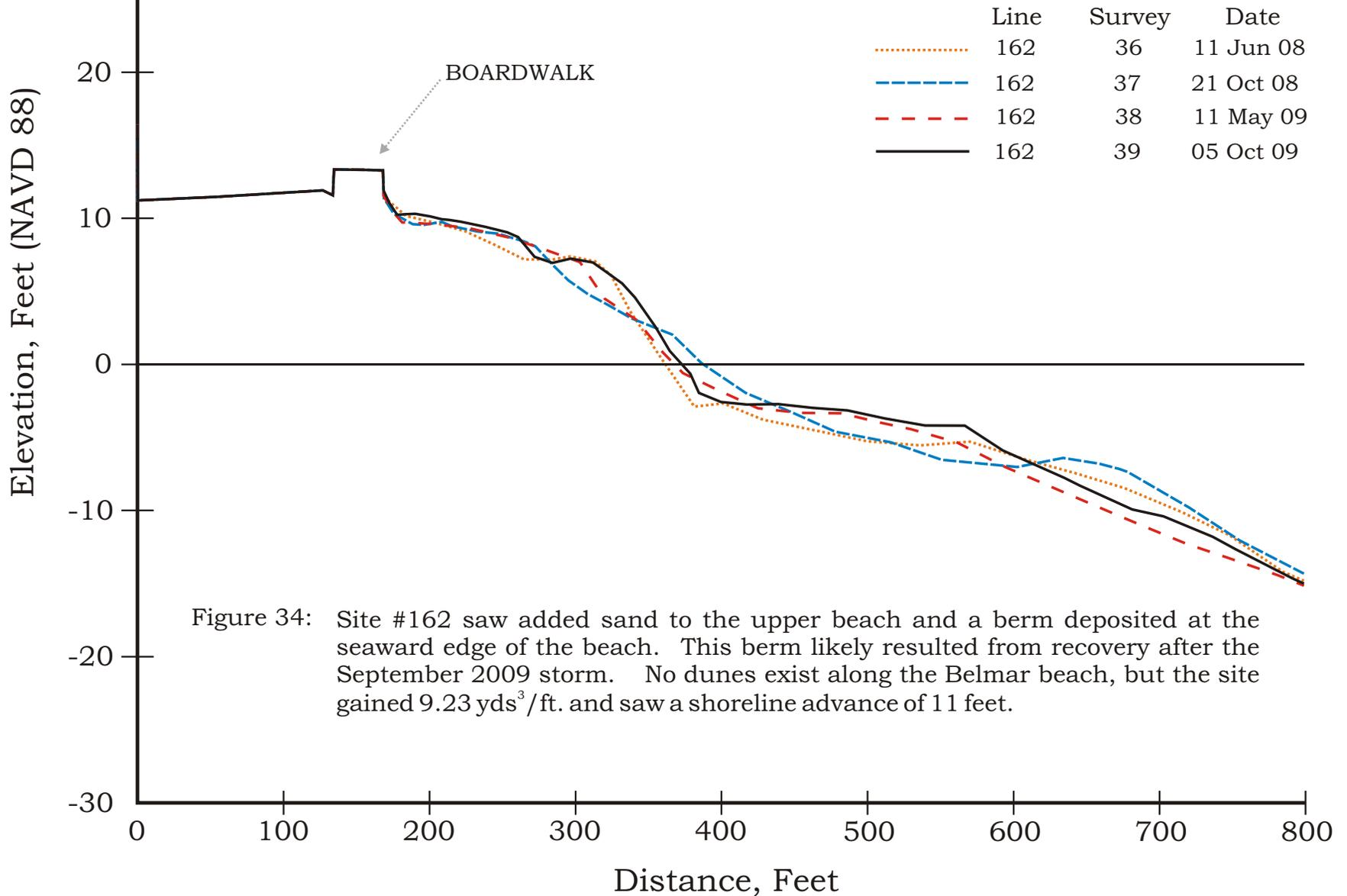


Photo taken October 5, 2009. View to the north.

Comparing the profiles over the one-year time period, the profile location gained volume (1.68 cu yd/ft) but the shoreline moved landward (-14.67 ft). The fencing is back in place for the next winter season.

# New Jersey Beach Profile Network

#162 - 18<sup>th</sup> Avenue, Belmar, Monmouth County



## BRIGHTON AVENUE, SPRING LAKE - SITE 161



Photo taken October 17, 2008. View to the south.

The Spring Lake beach always had a dune located between the boardwalk and Ocean Avenue. This feature has grown larger since the Federal project was completed and a deep trough between the dune and the landward side of the boardwalk filled in with sand.



Photo taken October 5, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location gained volume (4.23 cu yd/ft) and the shoreline moved seaward (7.26 ft).

# New Jersey Beach Profile Network

#161 - Brighton Avenue, Spring Lake, Monmouth County

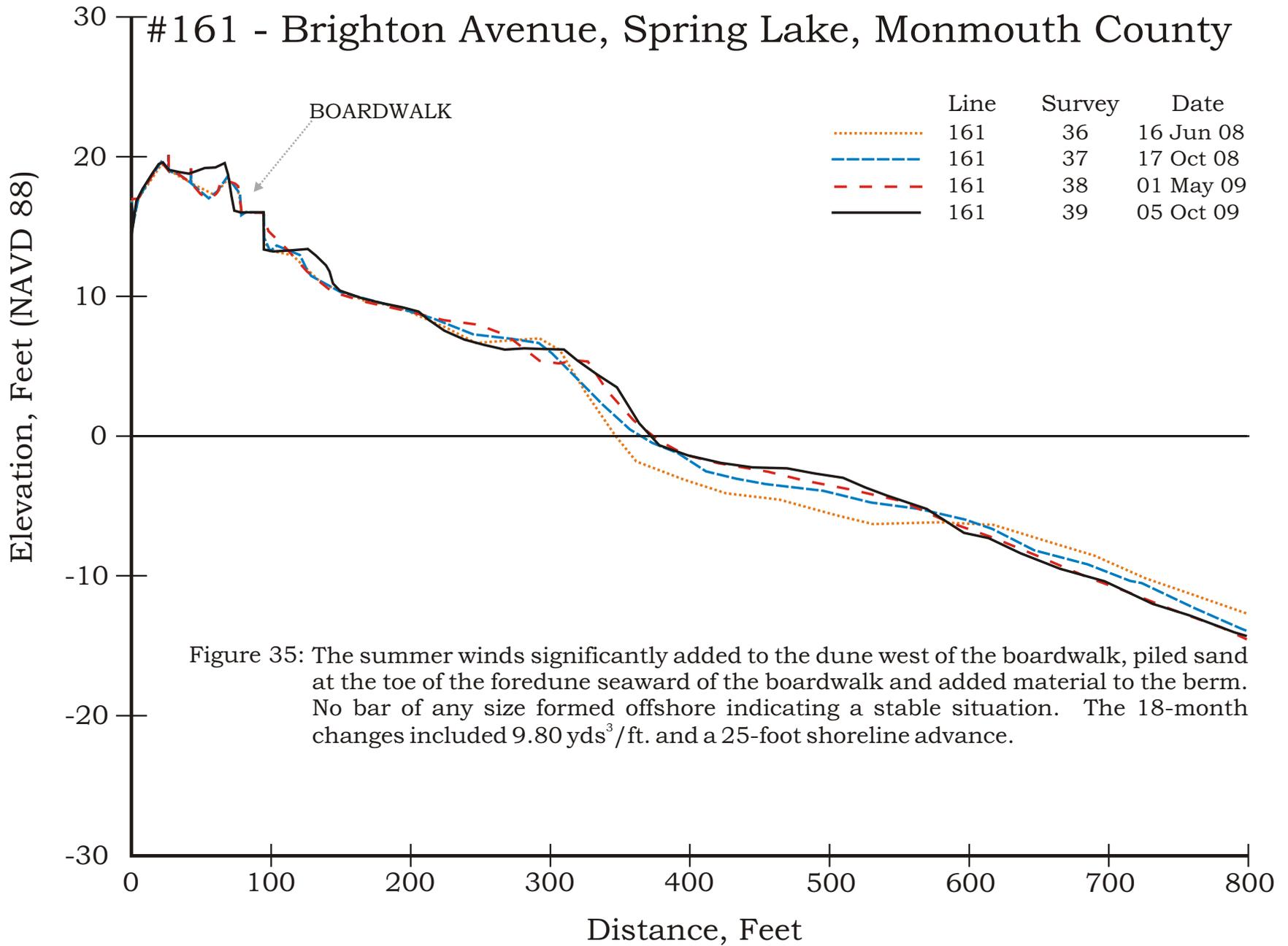


Figure 35: The summer winds significantly added to the dune west of the boardwalk, piled sand at the toe of the foredune seaward of the boardwalk and added material to the berm. No bar of any size formed offshore indicating a stable situation. The 18-month changes included 9.80 yds<sup>3</sup>/ft. and a 25-foot shoreline advance.

## SALEM AVENUE, SPRING LAKE - SITE 160



Photo taken October 17, 2008. View to the south. The beach restoration project dramatically changed the southern Monmouth County beaches by increasing their width by 200%.

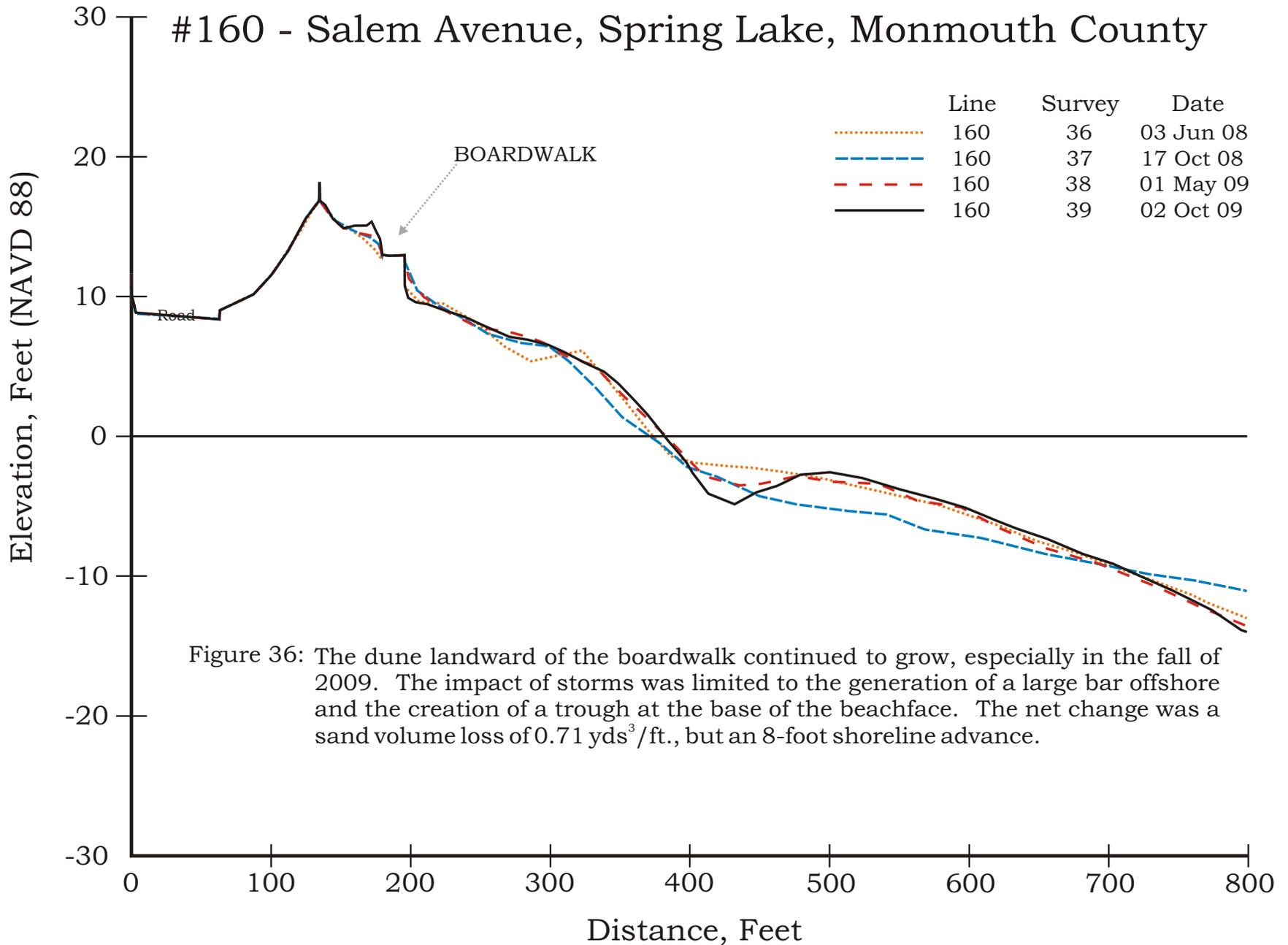


Photo taken October 2, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location gained volume (6.28 cu yd/ft) and the shoreline moved seaward (10.7 ft).

# New Jersey Beach Profile Network

#160 - Salem Avenue, Spring Lake, Monmouth County



## NEW YORK AVENUE, SEA GIRT - SITE 159



Photo taken October 17, 2008. View to the north.

New York Avenue is located in the public recreational section of the Sea Girt shoreline. This view shows the beach and boardwalk. The dune has yet to be constructed due to conflict over design and issues with the NJDEP. These issues continue to block dune establishment.

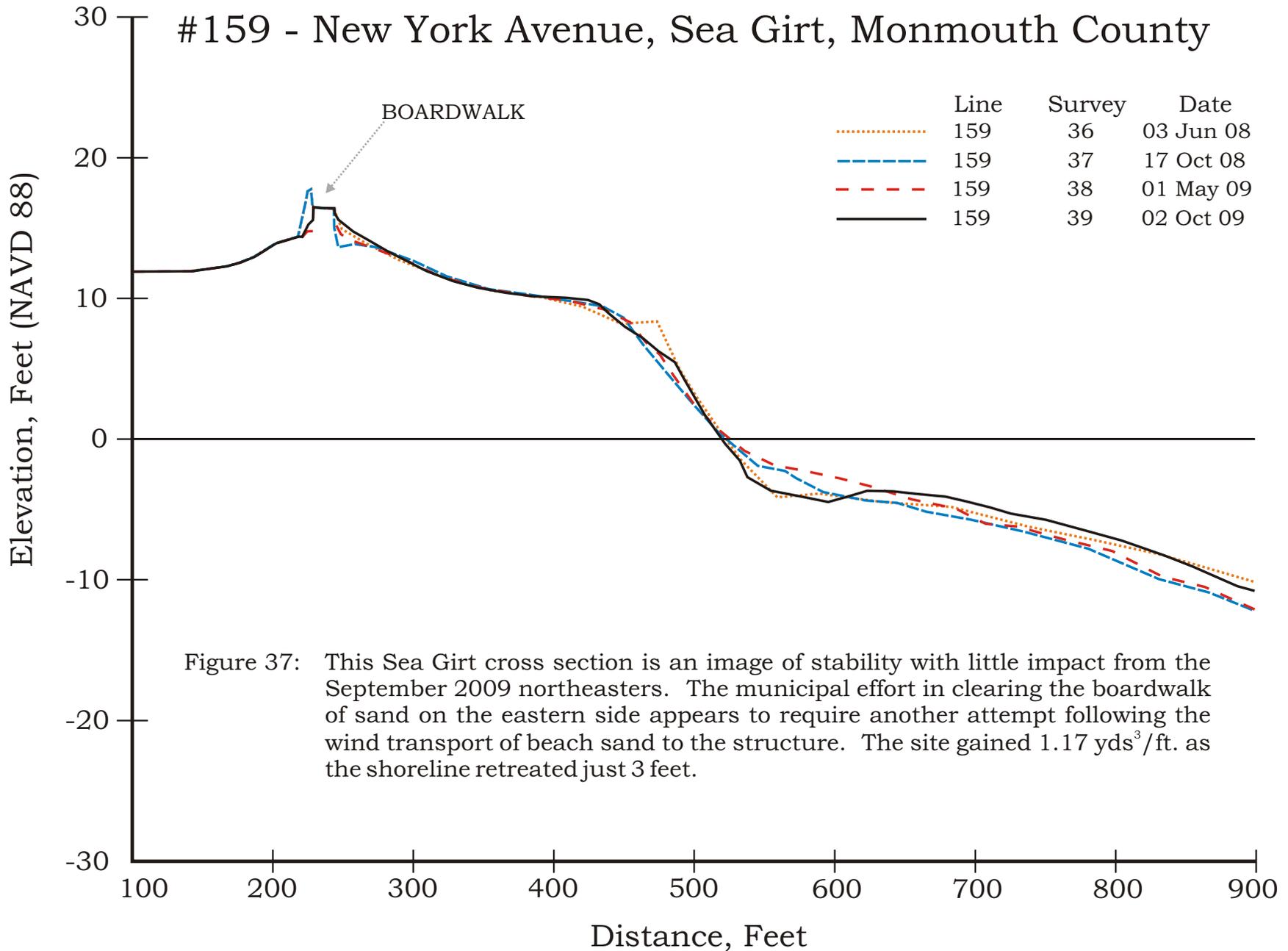


Photo taken October 2, 2009. View to the north.

Comparing the profiles over the one-year time period, the profile location gained volume (13.25 cu yd/ft) but the shoreline moved landward (-3.19 ft).

# New Jersey Beach Profile Network

#159 - New York Avenue, Sea Girt, Monmouth County



## TRENTON AVENUE, SEA GIRT - SITE 158



Photo taken October 16, 2008. View to the south.

The Trenton Avenue site is near the southern boundary of Sea Girt and the NJ State Police training center between Sea Girt and Manasquan. The beach width is substantial as this view shows. The boardwalk has large dunes between it and the uplands bluff that was last touched by storm erosion during the December 1992 event. Since then the Federal beach restoration project has allowed accretion of dunes and the growth of grass reaching seaward of the elevated boardwalk.

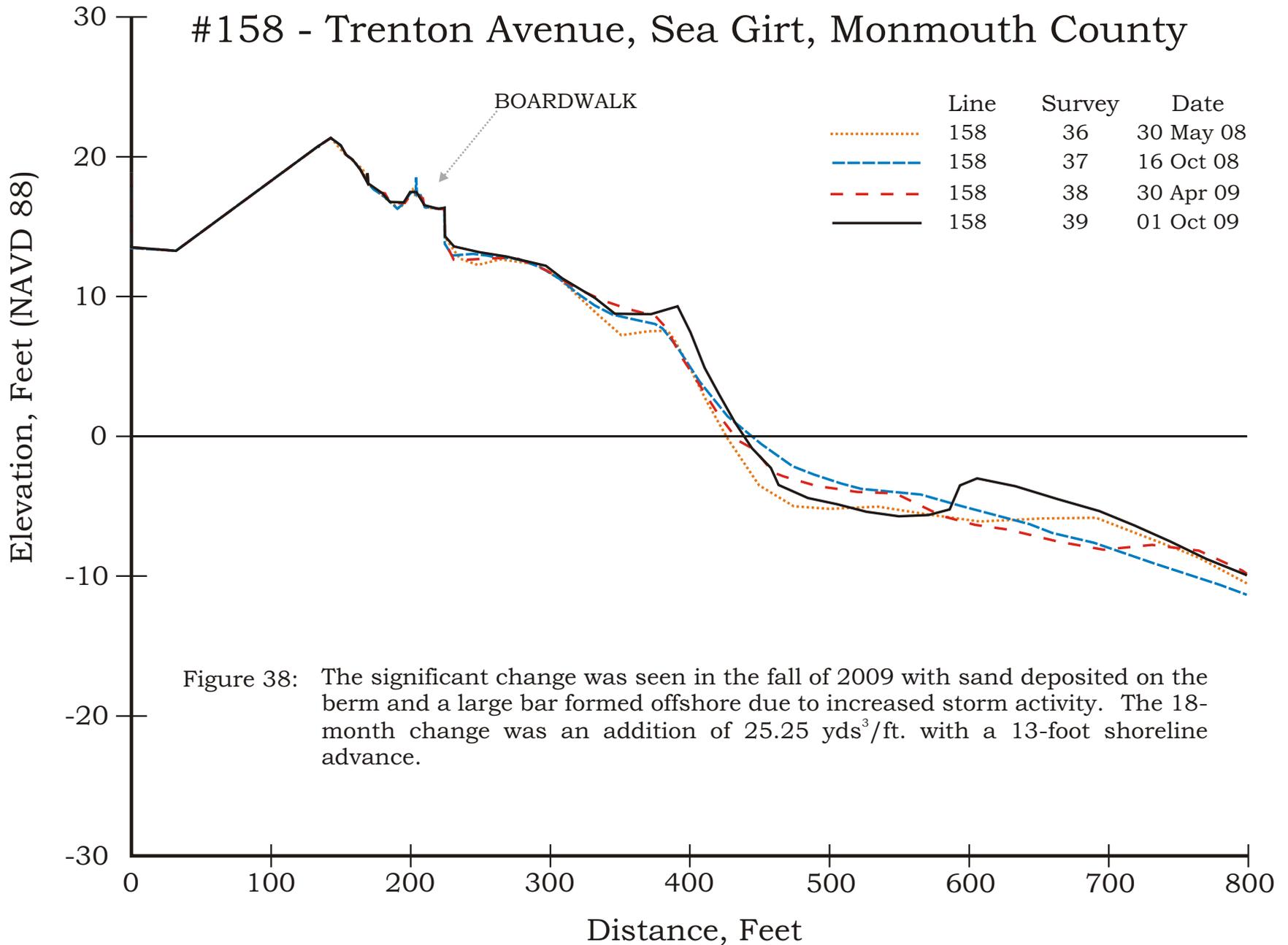


Photo taken October 1, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location gained volume (17.76 cu yd/ft) but the shoreline moved landward (-5.57 ft). The rock groins are more exposed in 2009 than they were a year earlier.

# New Jersey Beach Profile Network

#158 - Trenton Avenue, Sea Girt, Monmouth County



## RIDDLE WAY, MANASQUAN - SITE 157



Photo taken October 26, 2008. View to the south.

Located in the middle of the Manasquan shoreline, Riddle Way has a dune that dates from after the December 1992 storm. The community erected straight line sand fence to capture winter sand transport on the beach rather than in the dunes.

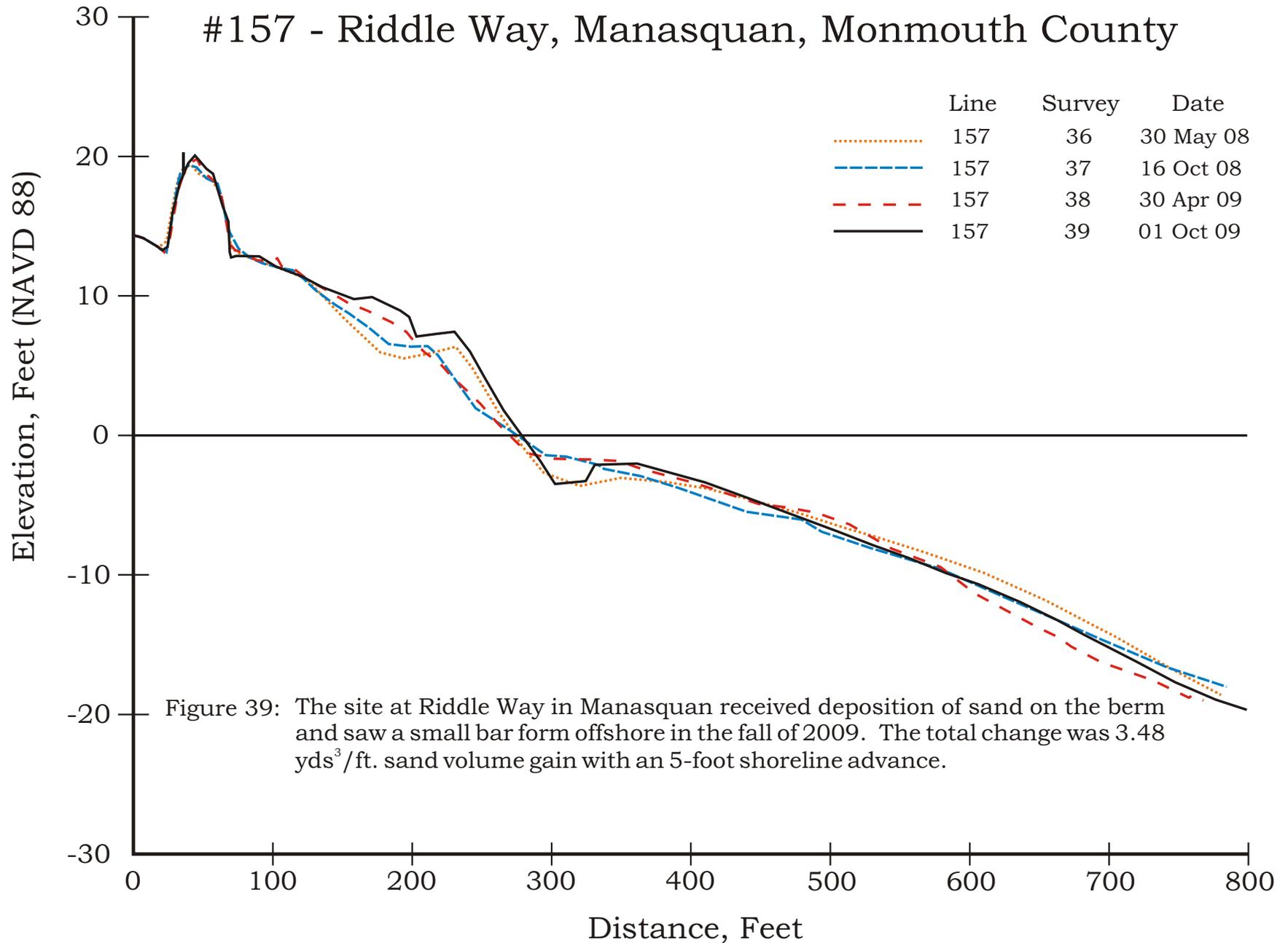


Photo taken October 1, 2009. View to the south.

Comparing the profiles over the one-year time period, the profile location gained volume (10.81 cu yd/ft) and the shoreline moved seaward (3.27 ft).

# New Jersey Beach Profile Network

#157 - Riddle Way, Manasquan, Monmouth County



## POMPANO AVENUE, MANASQUAN - SITE 256



Photo taken October 15, 2008. View to the north.

This site was established following dramatic changes observed after the 1992 northeast storm. Sites near both sides of each inlets were needed to follow the more dynamic changes noted at the 11 NJ inlets. Pompano Avenue is two - three blocks from the north jetty to Manasquan Inlet.



Photo taken October 1, 2009. View to the north.

Comparing the profiles over the one-year time period, the profile location lost volume (-13.74 cu yd/ft) and the shoreline moved landward (-28.33 ft). The new snow fence was designed to trap wind-transported sand before it was added to the dunes particularly raising the crest elevation.

# New Jersey Beach Profile Network

