# THE RICHARD STOCKTON COLLEGE OF NEW JERSEY
# COASTAL RESEARCH CENTER

**Photograph taken March 2007 as the Philadelphia District Corps of Engineers was Completing the Surf City portion of the Long Beach Island Shore Protection Project.**
(photo courtesy of the ACOE)

## New Jersey Beach Profile Network Annual Report on Shoreline Changes Along Monmouth, Ocean, Atlantic, & Cape May Counties; Raritan Bay to Delaware Bay Spring of 2006 Through Fall of 2007

Prepared for:
New Jersey Department of Environmental Protection
Division of Construction and Engineering
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November 15, 2008

# The Richard Stockton College of New Jersey
# Coastal Research Center


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## Annual Report
## On
## Shoreline Changes In New Jersey
## Monmouth, Ocean, Atlantic & Cape May Counties
## Raritan Bay to Delaware Bay
## Spring of 2006 Through Fall of 2007

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## EXECUTIVE SUMMARY

The New Jersey Beach Profile Network (NJBPN) was authorized by the New Jersey Department of Environmental Protection (NJDEP) in 1986. This report breaks with prior presentation styles in that the individual site data are pulled together so that on three pages the reader will find photographs, explanation text and the summary cross section plots for each location. The goal is to morph the presentation to one easily and effectively presented on the website. As previously, the sites are arranged from north to south numerically and by county. Each county's section starts with a summary of beach changes, performance of major projects, and a discussion of issues and pending project work in the county. The tables of data for shoreline position and sand volume changes are found at the end of the Cape May County section. 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 100 sites extend from the lower Raritan Bay, along the four-oceanfront county shorelines and into Delaware Bay along the western shoreline of Cape May County.

The photographs, graphics and text display and discuss 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 . Past reports are linked to the site so comparisons can be made to the present observations along the New Jersey coastline. The focus of these report is designed to show the following:

- The enormous positive impact of beach nourishment over the past 19 years.
- The beneficial results of the low incidence of serious storm events impacting the NJ coast.
- The enhanced shoreline protection benefits of 20 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.

This reporting interval covers the time between the spring of 2006 and the fall of 2007. The average beach in New Jersey gained 9.07 cubic yards of sand per foot of shoreline. The winter of 2005 to 2006 did not produce significant storms so that by March, April and May the beaches were showing considerable accretion of sand between the dune toe slope and the water line. The fall of 2006 did generate several minor northeast events starting just after Labor Day and continuing into October. The result was that the fall 2006 survey series shows eroded berm and dry beach areas, not the end of summer accretion. The following winter produced multiple northeast events concentrated later in the spring than expected. They concluded with a solid annual northeaster on May 12, 2008 (Mother's Day Storm) that cut deeply into the seaward slope of many dune systems, especially those beaches that did not have recent nourishment projects. The impact on the Borough of Mantoloking was to force a community-wide bulldozing effort to restore the dune toe slope after sand partially returned to the berm

area. The State's assessment was to combine the impacts of these events into a declaration that a 5-year intensity "storm" event had affected the shoreline, so bulldozing was a permitted restoration activity.

The summer that followed did produce the most extensive, State-wide accumulation of sand on the beach, derived from the bars or seabed offshore that has been documented in many years. The New Jersey beaches gained and average of 8.08 cubic yards of sand per foot of shoreline during that summer as material was moved onto the survey envelope from points further seaward than the -16 feet of water depth achieved during these surveys. This value was 89% of the total gain for the average NJ beach. Most of this accumulation was due to the offshore passage of tropical systems (Hurricane Kyle) and several non-tropical events in September that passed well seaward of the coast. The average values for the three seasonal sand volume change comparisons for all the sites in each county and the 18-month interval are as follows:

| | **S 06 – F 06 Cu. yds/ft.** | **F 06 – S 07 Cu. yds/ft.** | **S 07 – F 07 Cu. yds/ft.** | **S 06 – F 07 Cu. yds/ft.** |
|---|---|---|---|---|
| **Monmouth County** | -2.28 | -2.37 | -0.67 | -5.15 |
| **Ocean County** | 16.44 | -5.37 | 21.70 | 32.77 |
| **Atlantic County** | 7.57 | -3.83 | 5.45 | 8.20 |
| **Cape May County** | -2.82 | -4.71 | 15.06 | 7.53 |

Clearly the winner was Ocean County and that was without benefit of other than Surf City's Federally-sponsored beach nourishment to enhance the numbers. No new sand was added to either Monmouth County or Atlantic County sites. Minor additions were made to Ocean City's (660,000 cy) and Avalon's (250,000) cy) erosional areas that improved the numbers for the summer of 2008. The final assessment is that the New Jersey shoreline did extremely well over the past 18 months in terms of sand volume on the beach and with shoreline positions providing benefit to the stability of the dune toe. Special evaluations of dunes showed that where studied, the coastal dunes added both volume and height in detectable amounts. The numbers while not large were at least in the right direction.

## 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 #4190-07.*

## 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 consists of 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 the bill establishing the New Jersey shore protection funding through the NJ real estate transfer tax. 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 12 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. Analysis may be performed for any selection of survey dates at any site across a specifically defined section of the profile. 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. This year, 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 separate 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 the individual site descriptions following the county location diagram.

## THE NEW JERSEY COASTAL ZONE:

All of the New Jersey ocean-facing shoreline is built upon older, unconsolidated terrestrial sediments composed of gravel, sand, silt or clay. The northern coast in Monmouth County has a beach carved into these sedimentary units originally generating a sandy beach backed by a bluff of the older sediments that eroded during serious storm events. The erosion provided new sand and some gravel to the beach system, but the bluff retreat produced by the storm quickly became a serious problem following extensive human development along the coastal bluff during the last third of the 19$^{th}$ Century. Two major sand spits developed, one to the north from Long Branch (Sandy Hook), and the other to the south from Bay Head (Mantoloking to Barnegat Inlet). Continuation of the barrier island segmented shoreline covers the remainder of the coastline where individual islands, separated from the mainland and any sand sediment source developed as sea level rose to its present elevation. These islands continue to be an on-going equilibrium between storms, waves, sea level and tidal currents in spite of all human efforts to enforce stability and continuity for man-made development.

Historically, development first focused on the widest, most vegetated segments of the NJ shoreline driven by the quest for safety from storms and a search for shallow fresh water wells best located in

these parts of the sand coast environment. The Monmouth County shoreline benefited from growth made possible as the rail system spread from the metropolitan centers where interest in New York City created the New York & Long Branch Railroad in the 1870's following the Camden & Atlantic City Railroad to Atlantic City on Absecon Island in the late 1850's. None of this growth really moved rapidly until the last 20 years of the 19th 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. Each major conflict and financial crisis curtailed the rate of development. First it was World War I, then a burst of development where 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 2006 the rush to the shore was on. Multi-lane highways replaced the railroads to give public the access and second home purchase became the way to go to the beach to vacation. All types of visitors generate 13 billion in tourist revenue; create 400,000 jobs at small to moderate businesses, all which pay 2.2 billion in taxes to the NJ treasury making the Jersey shore the number two business after manufacturing.
( www.marloweco.com/value_of_beaches.php )

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 in the public ownership and 2) in many cases plowing large dune systems flat to make more room for development. 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 any source of sand was 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. In the late 1980's one of New Jersey's congressmen took personal interest in large scale Federally-sponsored beach restoration projects. Congressman William Hughes steered the initial 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 in 2000. Projects were approved and constructed in Surf City, Brigantine, Atlantic City, Ventnor, Ocean City, Avalon, Stone Harbor, and Cape May City. 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 taking the vast majority of all Federal dollars spent on beach restoration.

New Jersey Beach Profile Network

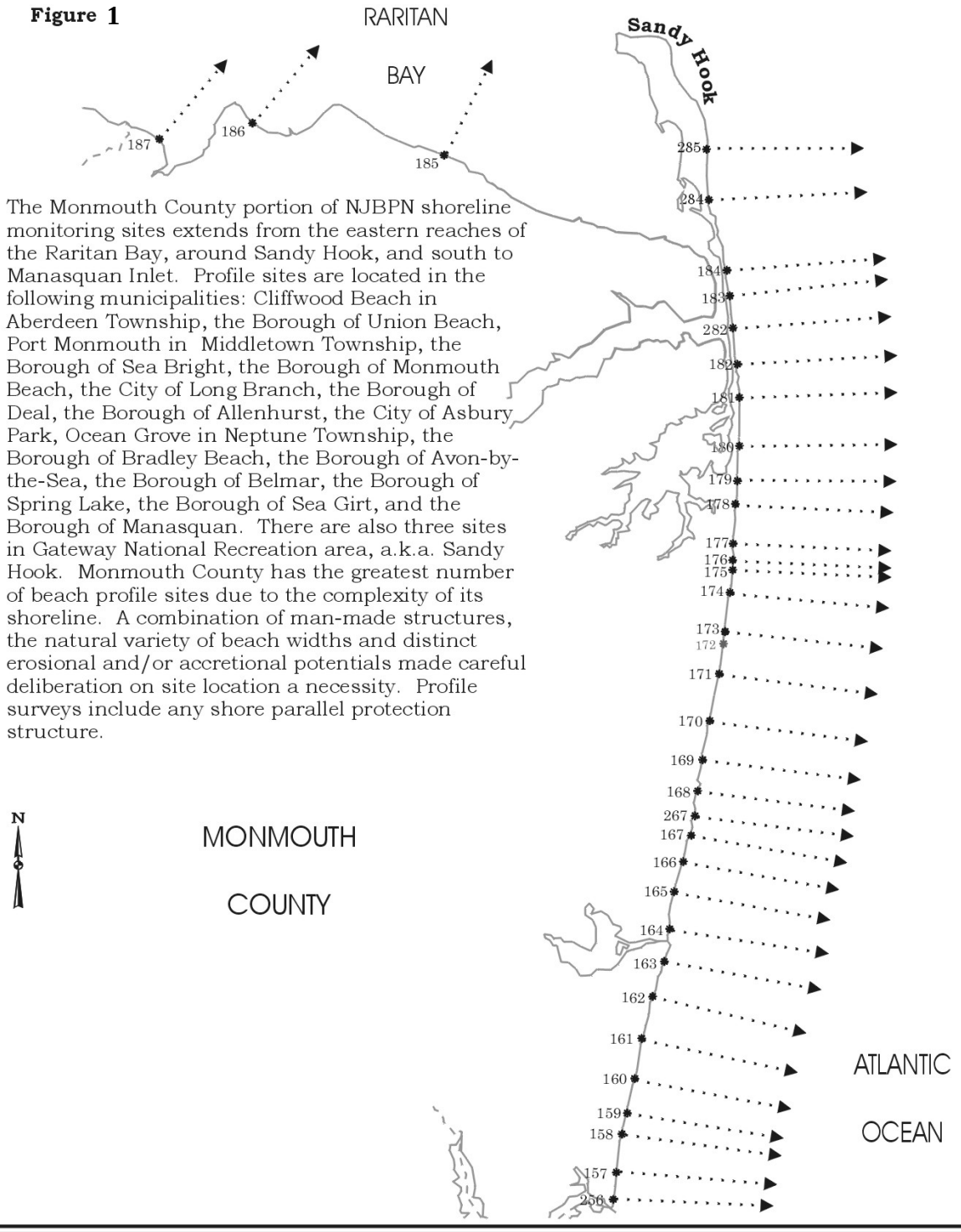
# Monmouth County

## Raritan Bay and Sandy Hook to Manasquan Inlet

## NJBPN Profile #'s 187 - 256

# New Jersey Beach Profile Network
## Monmouth County Profile Site Locations

**Figure 1**




The Monmouth County portion of NJBPN shoreline monitoring sites extends from the eastern reaches of the Raritan Bay, around Sandy Hook, and south to Manasquan Inlet. Profile sites are located in the following municipalities: Cliffwood Beach in Aberdeen Township, the Borough of Union Beach, Port Monmouth in Middletown Township, the Borough of Sea Bright, the Borough of Monmouth Beach, the City of Long Branch, the Borough of Deal, the Borough of Allenhurst, the City of Asbury Park, Ocean Grove in Neptune Township, the Borough of Bradley Beach, the Borough of Avon-by-the-Sea, the Borough of Belmar, the Borough of Spring Lake, the Borough of Sea Girt, and the Borough of Manasquan. There are also three sites in Gateway National Recreation area, a.k.a. Sandy Hook. Monmouth County has the greatest number of beach profile sites due to the complexity of its shoreline. A combination of man-made structures, the natural variety of beach widths and distinct erosional and/or accretional potentials made careful deliberation on site location a necessity. Profile surveys include any shore parallel protection structure.

Monmouth County contains the most 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 2006 to the fall of 2007.

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 in all locations where one was 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 and permissions 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 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 in 2008/9. Since completion in 2001, the southern segment (Asbury to Manasquan) has not been maintained.

Congressional failure to appropriate funding for 2007 and 2008 for maintenance and new construction of beach nourishment projects did not allow the planned maintenance work to proceed. The NY District has 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. A number of towns have commenced designing and building dune systems to augment the level of storm protection and prevent sand from blowing into Ocean Avenue or other infrastructure.

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 for 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 oceanfront shoreline has retreated as sand moved seaward at some locations and toward the north in places such as Sea Bright. At the southern end of the northern segment in Long Branch, end-effect losses have promoted the need for the maintenance effort mentioned above.

Figure 2. View looking west, taken June 1, 2006 looking parallel to the high tide line and the toe of the dune. This beach is used for passive recreation, some fishing and occasional swimming. The park was created in the late 1980's for the citizens of Monmouth County. Its selection as a profile location was based on its potential to represent a true natural area along the Raritan Bay shoreline.

# CLIFFWOOD BEACH - SITE 187

Figure 3. By the fall of 2007 (Nov. 20, 2007) the beach had become slightly wider. The scarp in the dunes occurred following the June 2006 survey then the dunes remained essentially the same through the fall of 2007. The profile once again shows that no changes occur more than 2 feet below the zero elevation datum. The net change in sand volume was -1.93 $yds^3$/ft with a 0.42-foot shoreline retreat.

# New Jersey Beach Profile Network

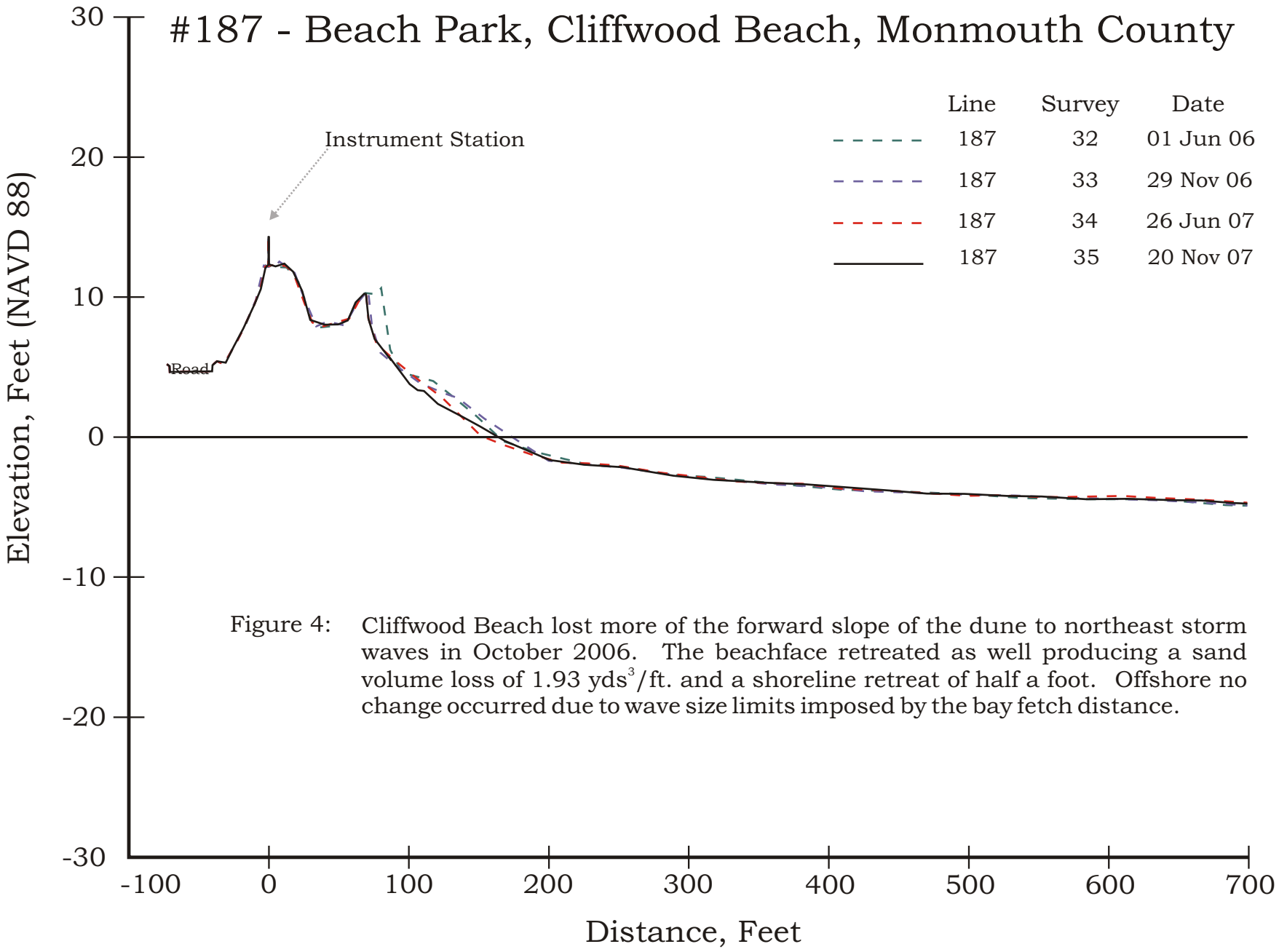



Figure 4: Cliffwood Beach lost more of the forward slope of the dune to northeast storm waves in October 2006. The beachface retreated as well producing a sand volume loss of 1.93 $yds^3/ft.$ and a shoreline retreat of half a foot. Offshore no change occurred due to wave size limits imposed by the bay fetch distance.

Figure 5. This June 1, 2006 photograph shows the Union Beach site as an armored shoreline with little recreational potential other than fishing or crabbing. The redevelopment was done over a decade ago that completely eliminated the dry beach and bluff along this segment of the Raritan Bay shoreline.

## UNION BEACH - SITE 186

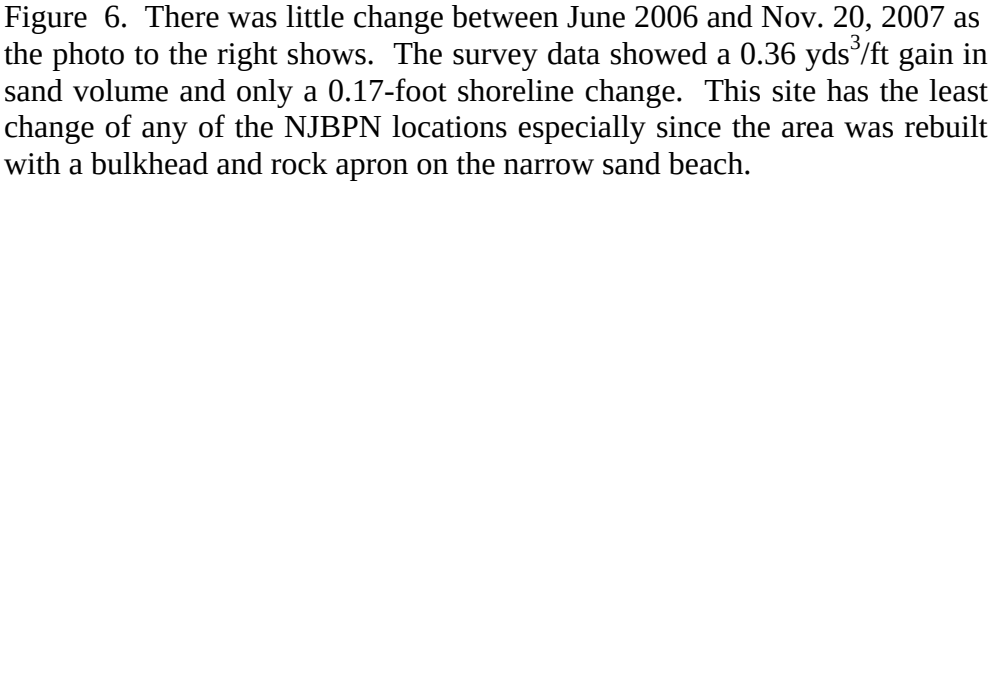


Figure 6. There was little change between June 2006 and Nov. 20, 2007 as the photo to the right shows. The survey data showed a 0.36 $yds^3$/ft gain in sand volume and only a 0.17-foot shoreline change. This site has the least change of any of the NJBPN locations especially since the area was rebuilt with a bulkhead and rock apron on the narrow sand beach.

# New Jersey Beach Profile Network

## #186 - Union Avenue, Union Beach, Monmouth County

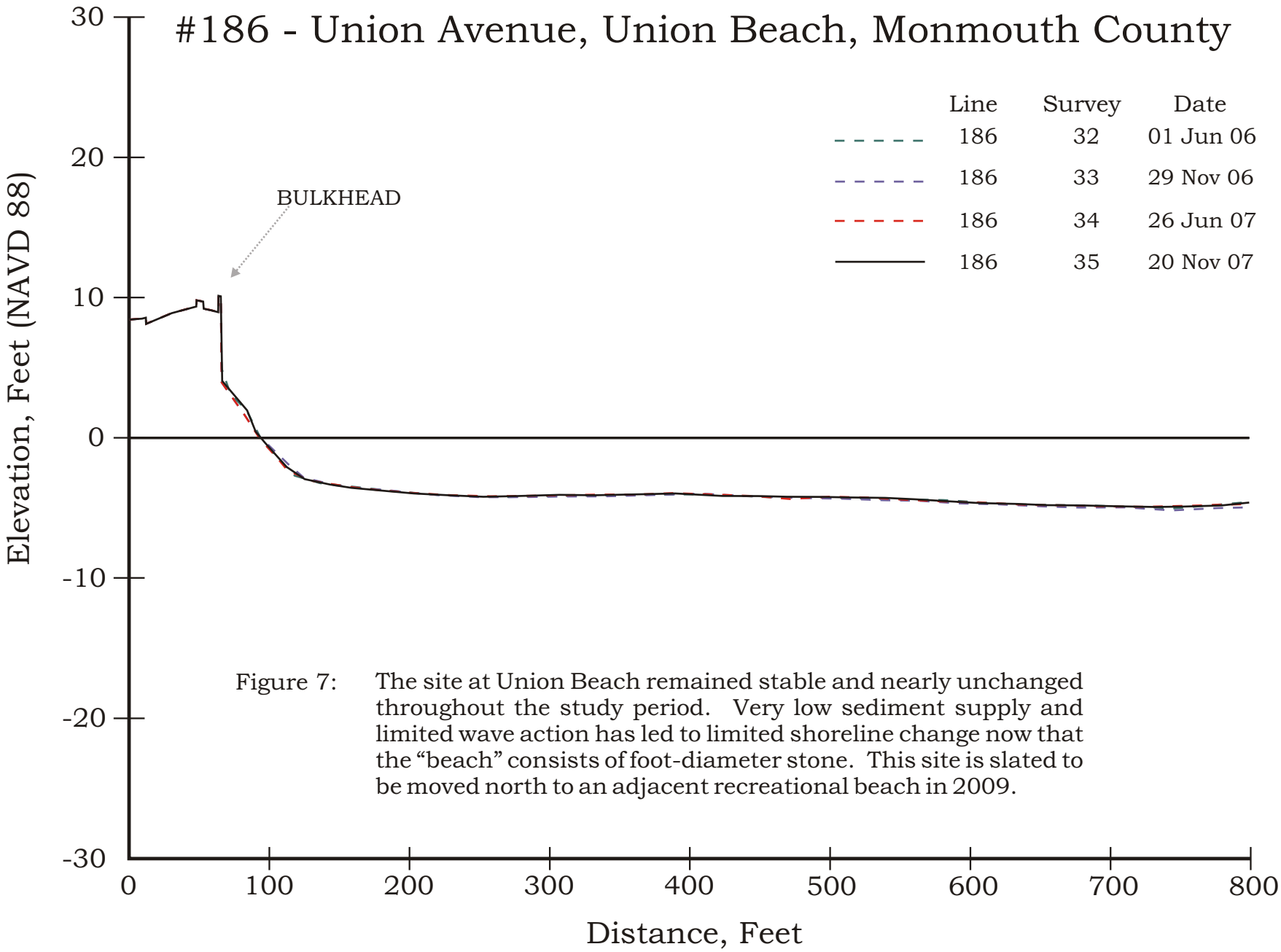



Figure 7: The site at Union Beach remained stable and nearly unchanged throughout the study period. Very low sediment supply and limited wave action has led to limited shoreline change now that the "beach" consists of foot-diameter stone. This site is slated to be moved north to an adjacent recreational beach in 2009.

Figure 8. The Spy House park site is a reasonably natural shoreline setting with an artificial dune, which contains many undesirable items of waste concrete, iron, and brick.

## SPY HOUSE MUSEUM - SITE 185

Figure 9. By November 20, 2007 the bluff had retreated an additional 2 feet and a program was initiated by the Monmouth County park system to completely restore a natural dune and remove the accumulated debris from the existing berm and bluff edge. Northeast storms impact this shoreline and result in bluff erosion and some beach retreat. The sand volume increased by 4.62 $yds^3/ft$ with an advance of 3-feet in the shoreline position. No change occurred offshore.

# New Jersey Beach Profile Network

## #185 - Spy House, Port Monmouth, Monmouth County

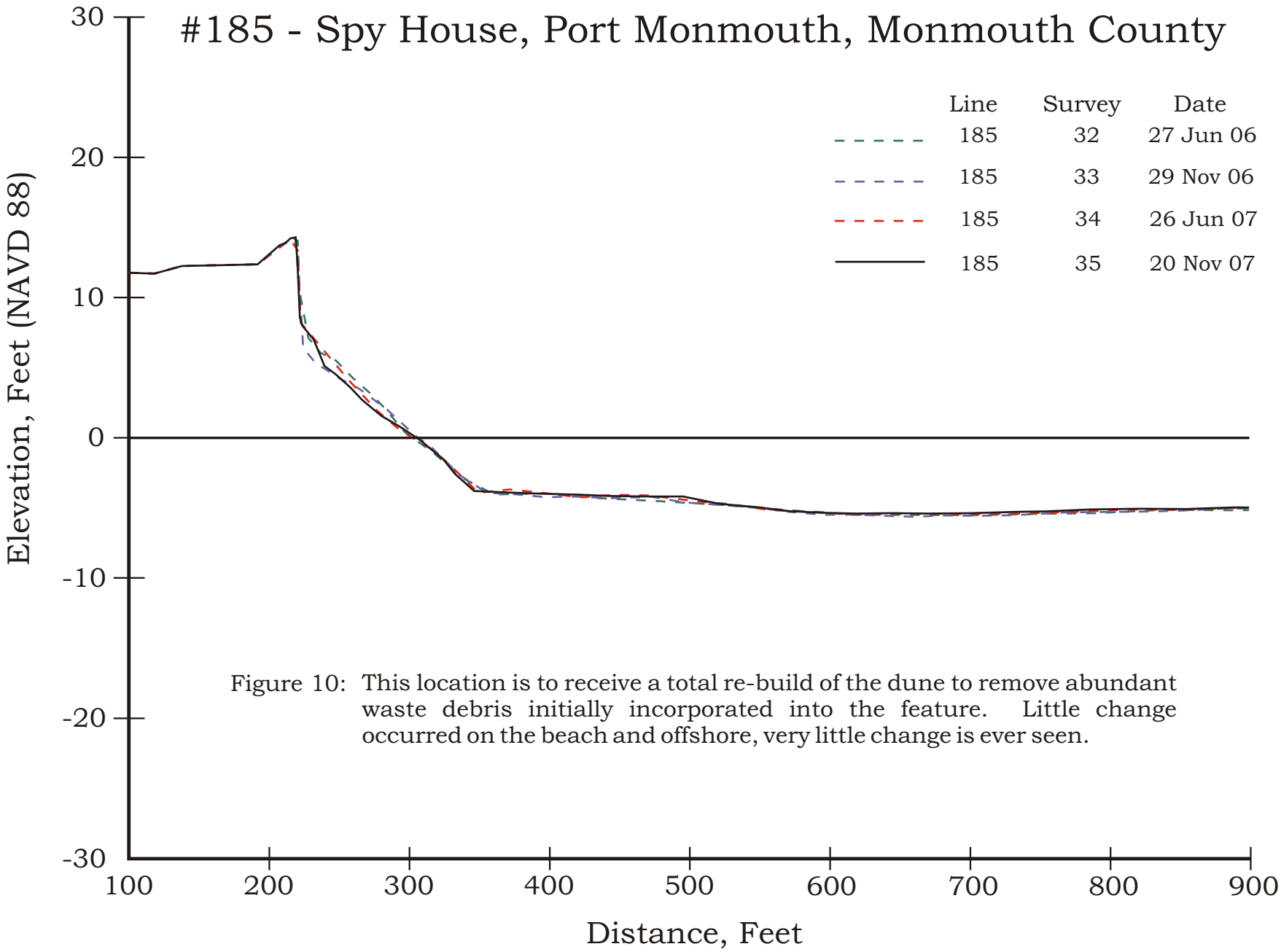



Figure 10: This location is to receive a total re-build of the dune to remove abundant waste debris initially incorporated into the feature. Little change occurred on the beach and offshore, very little change is ever seen.

Figure 11. June 28, 2006 showing the vast plain between the dune crest and the shoreline. Located at the north end of the peninsula that has been the national seashore for decades.

# SANDY HOOK NATIONAL SEA SHORE
# SITE 285

Figure 12. September 17, 2007 shows a similar panorama of 2,000-foot wide beach area. The differences show up better in the plots and focus on the additions to the beach. Sand added to the berm without extending the shoreline seaward this series of surveys. The beach gained 9.39 $yds^3$/ft with nineteen small volume cuts or fills across the wide, back beach area. The largest fill was at the beach and amounted to 9.74 $yds^3$/ft., by itself. The shoreline advanced 7 feet.

# New Jersey Beach Profile Network

## #285 - Gunnison Beach, Sandy Hook, Monmouth County

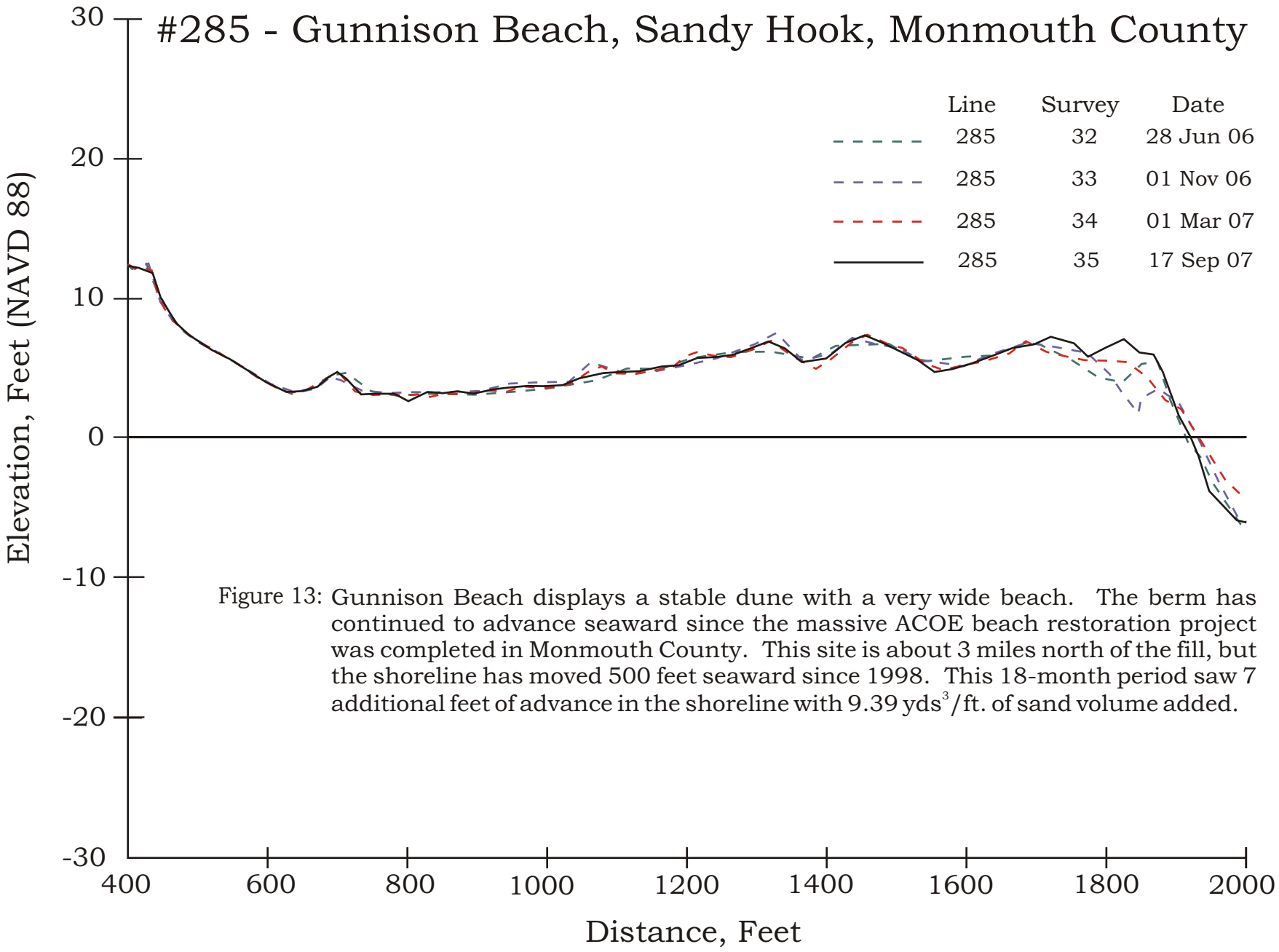



Figure 13: Gunnison Beach displays a stable dune with a very wide beach. The berm has continued to advance seaward since the massive ACOE beach restoration project was completed in Monmouth County. This site is about 3 miles north of the fill, but the shoreline has moved 500 feet seaward since 1998. This 18-month period saw 7 additional feet of advance in the shoreline with 9.39 $yds^3$/ft. of sand volume added.

Figure 14. Photograph taken May 16, 2005 showing the dune, beach and the hills of Atlantic Highlands in the distance.

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

Figure 15. The similar view taken September 17, 2007 shows the removal of the pathway fencing and better vegetation growth on the foredune area, but little other detail on the volume or shoreline position. This shoreline is impressive and contains many grand views of the New Jersey coast. The sand volume decreased by 12.63 $yds^3/ft$, but the shoreline advanced 1 foot.

# New Jersey Beach Profile Network

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

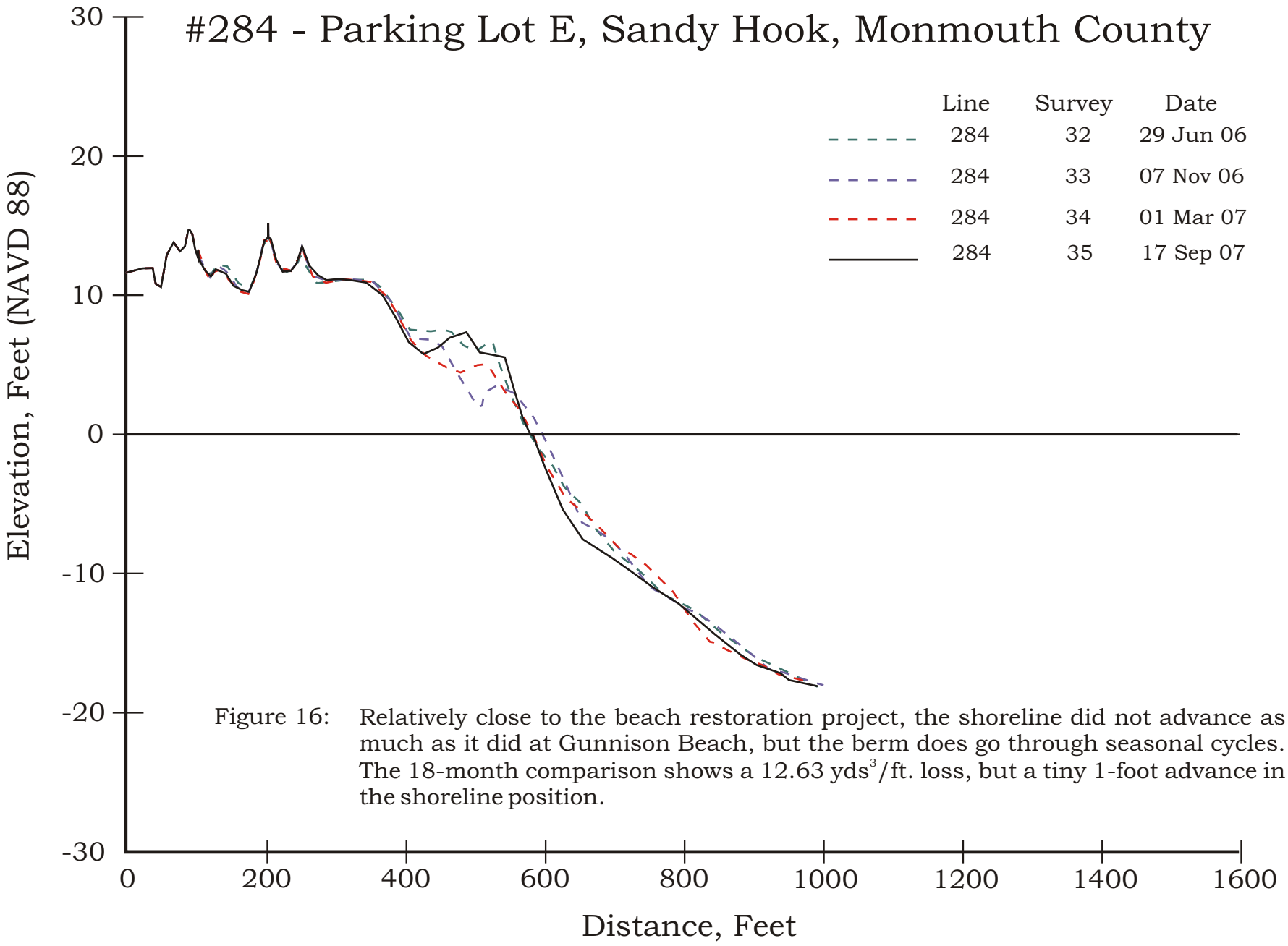



Figure 16: Relatively close to the beach restoration project, the shoreline did not advance as much as it did at Gunnison Beach, but the berm does go through seasonal cycles. The 18-month comparison shows a 12.63 $yds^3$/ft. loss, but a tiny 1-foot advance in the shoreline position.

Figure 17. On June 27, 2006 the beach width was 150 feet. Substantial erosion took 13.62 $yds^3$/ft. from the berm and reduced its width by 100 feet. Some accumulation took place by the March 2007 survey.

# SANDY HOOK, HIGHLANDS BEACH
# SITE 184

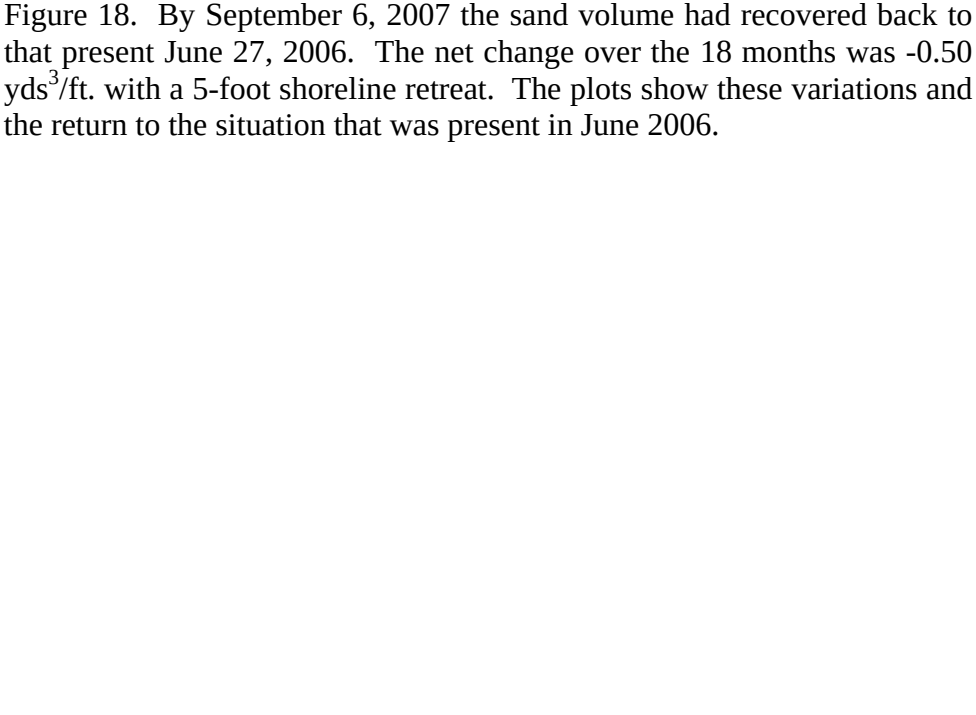


Figure 18. By September 6, 2007 the sand volume had recovered back to that present June 27, 2006. The net change over the 18 months was -0.50 $yds^3$/ft. with a 5-foot shoreline retreat. The plots show these variations and the return to the situation that was present in June 2006.

# New Jersey Beach Profile Network

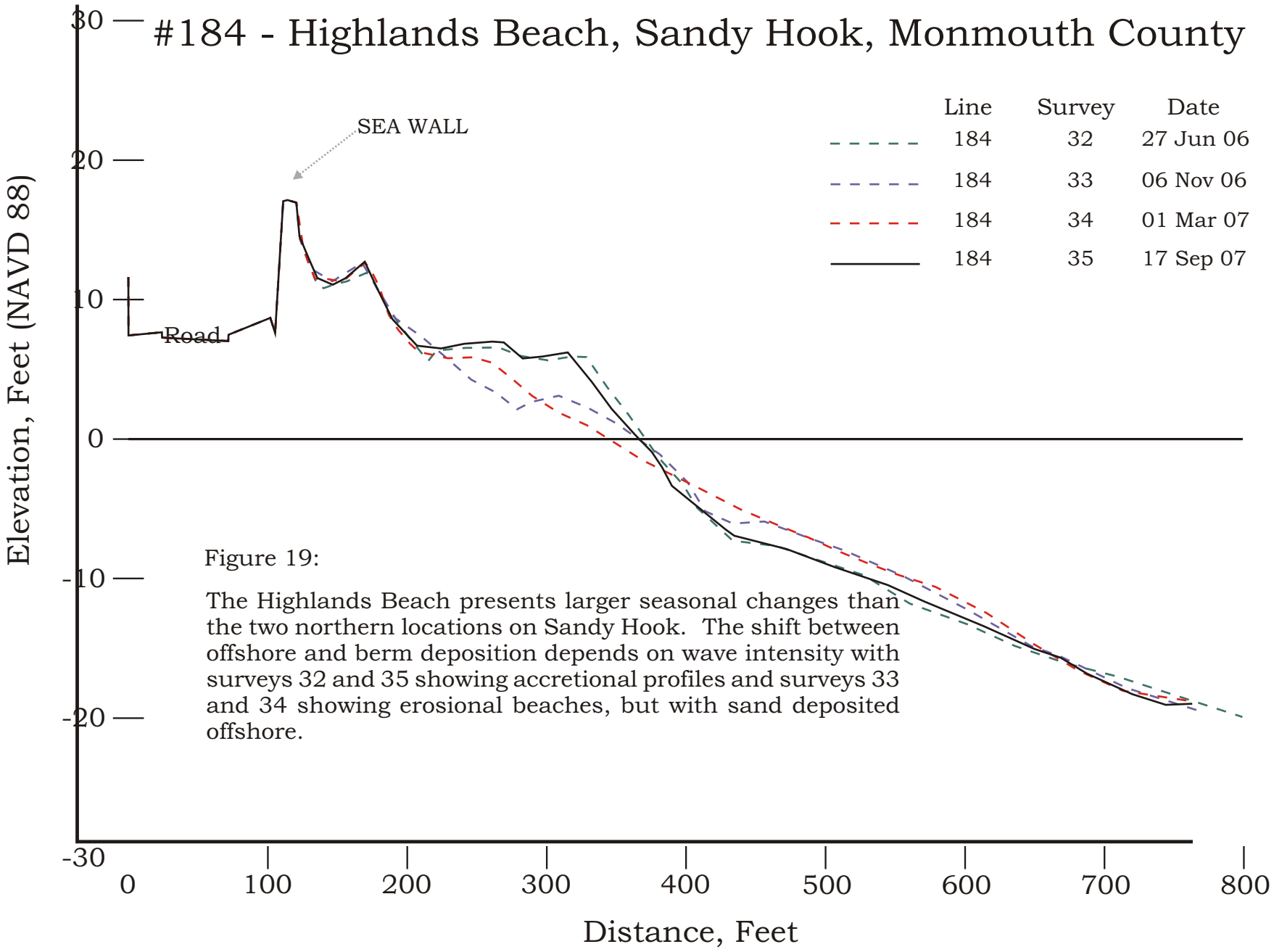



Figure 19:

The Highlands Beach presents larger seasonal changes than the two northern locations on Sandy Hook. The shift between offshore and berm deposition depends on wave intensity with surveys 32 and 35 showing accretional profiles and surveys 33 and 34 showing erosional beaches, but with sand deposited offshore.

Figure 20. View to the south on June 27, 2006 showing the naturally accumulating dunes. The beach underwent a cyclic seasonal accretion during the summer and erosion during the winter.

# VIA RIPA STREET, SEA BRIGHT
# SITE - 183



Figure 21. View of the dune toe on September 6, 2007 showing the beach width. Remember that prior to the beach nourishment project this beach view and all features seaward of the rock seawall would have been part of the Atlantic Ocean, which beat on the rocks at any stage of the tide. The net sediment volume change was a loss of 7.76 $yds^3$/ft. with a 23-foot shoreline retreat. The major differences were in the sand volume present in the berm each season (see plots).

# New Jersey Beach Profile Network

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

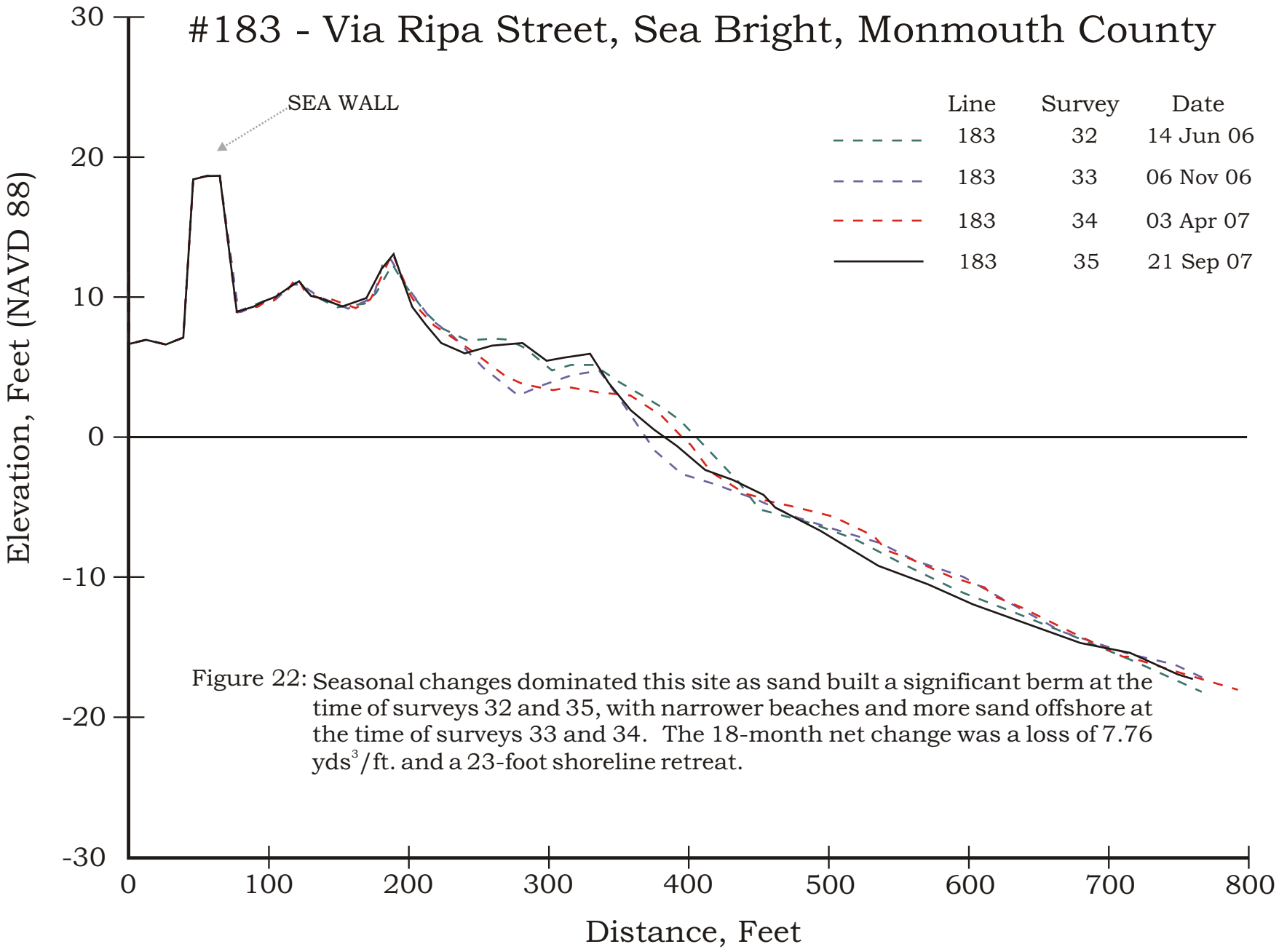



Figure 22: Seasonal changes dominated this site as sand built a significant berm at the time of surveys 32 and 35, with narrower beaches and more sand offshore at the time of surveys 33 and 34. The 18-month net change was a loss of 7.76 $yds^3/ft.$ and a 23-foot shoreline retreat.

Figure 23. June 14, 2006 shows a view across the vegetated plain that is the back beach of this location. It is 440 feet to the zero elevation position from the seaward base of the seawall.

## SHREWSBURY WAY, SEA BRIGHT
## SITE - 282

Figure 24. View taken September 21, 2007 shows a similar situation with increased vegetation. The beach changed seasonally with the best profile situation observed June 14, 2006, but with the Sept 2007 survey only a few feet landward with the same aspect berm size. The net change was an 11.39 cu. yds/ft. decrease in sand volume with a 27-foot shoreline retreat.

# New Jersey Beach Profile Network

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

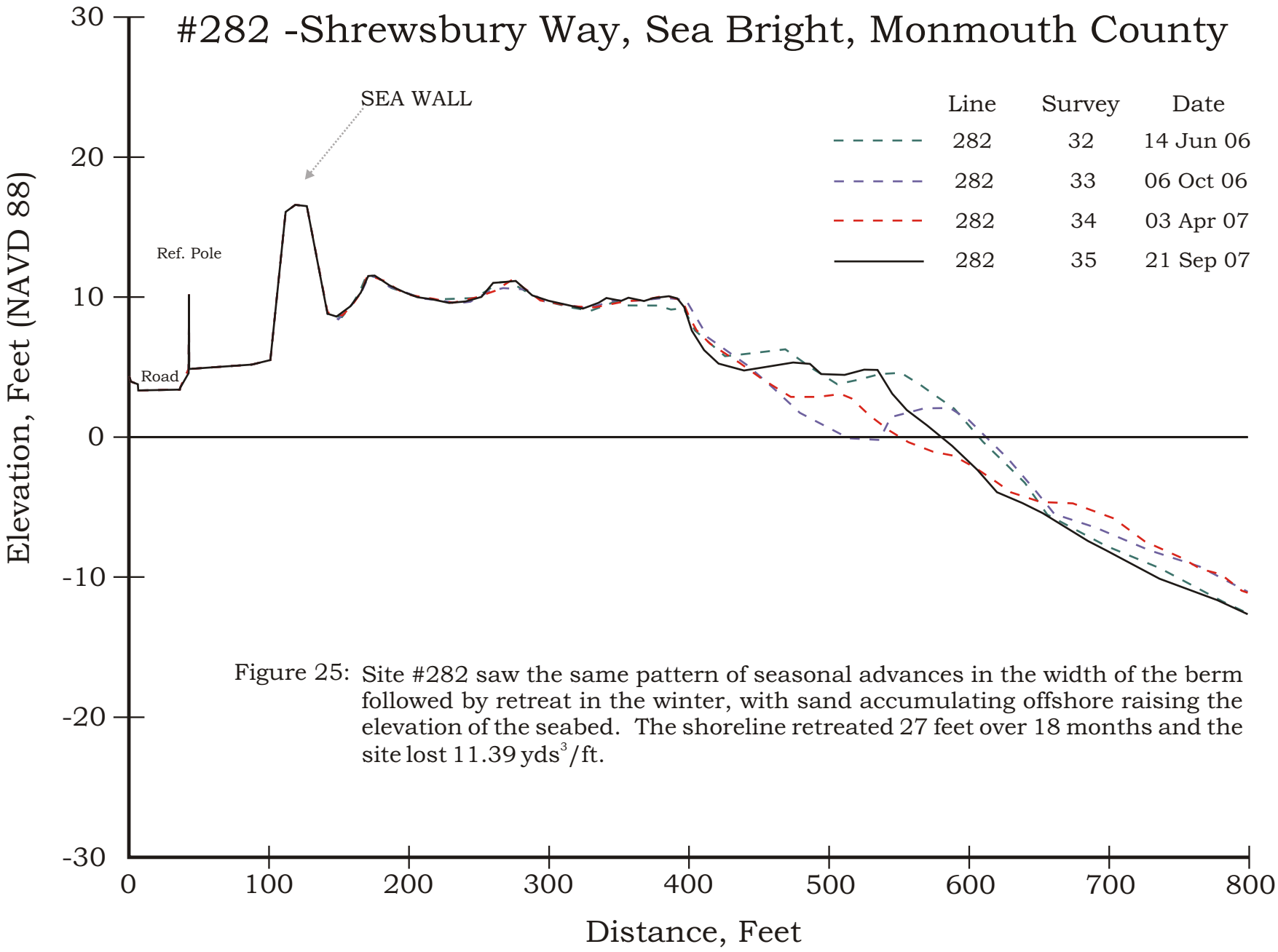



Figure 25: Site #282 saw the same pattern of seasonal advances in the width of the berm followed by retreat in the winter, with sand accumulating offshore raising the elevation of the seabed. The shoreline retreated 27 feet over 18 months and the site lost 11.39 $yds^3/ft$.

Figure 26. June 14, 2006 shows a view of this public beach in Sea Bright where the beach width remained constant over the 18-month interval of this study.

# PUBLIC BEACH, SEA BRIGHT
# SITE - 182



Figure 27. View taken September 21, 2007 shows the dunes that make up the forward segment of the back beach. The berm developed and eroded as seasons changed. The most variation occurred at the berm, with a net change of -1.10 $yds^3$/ft. and a 9-foot shoreline retreat. This indicates that stability has been consistent over the past 18 months.

# New Jersey Beach Profile Network

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

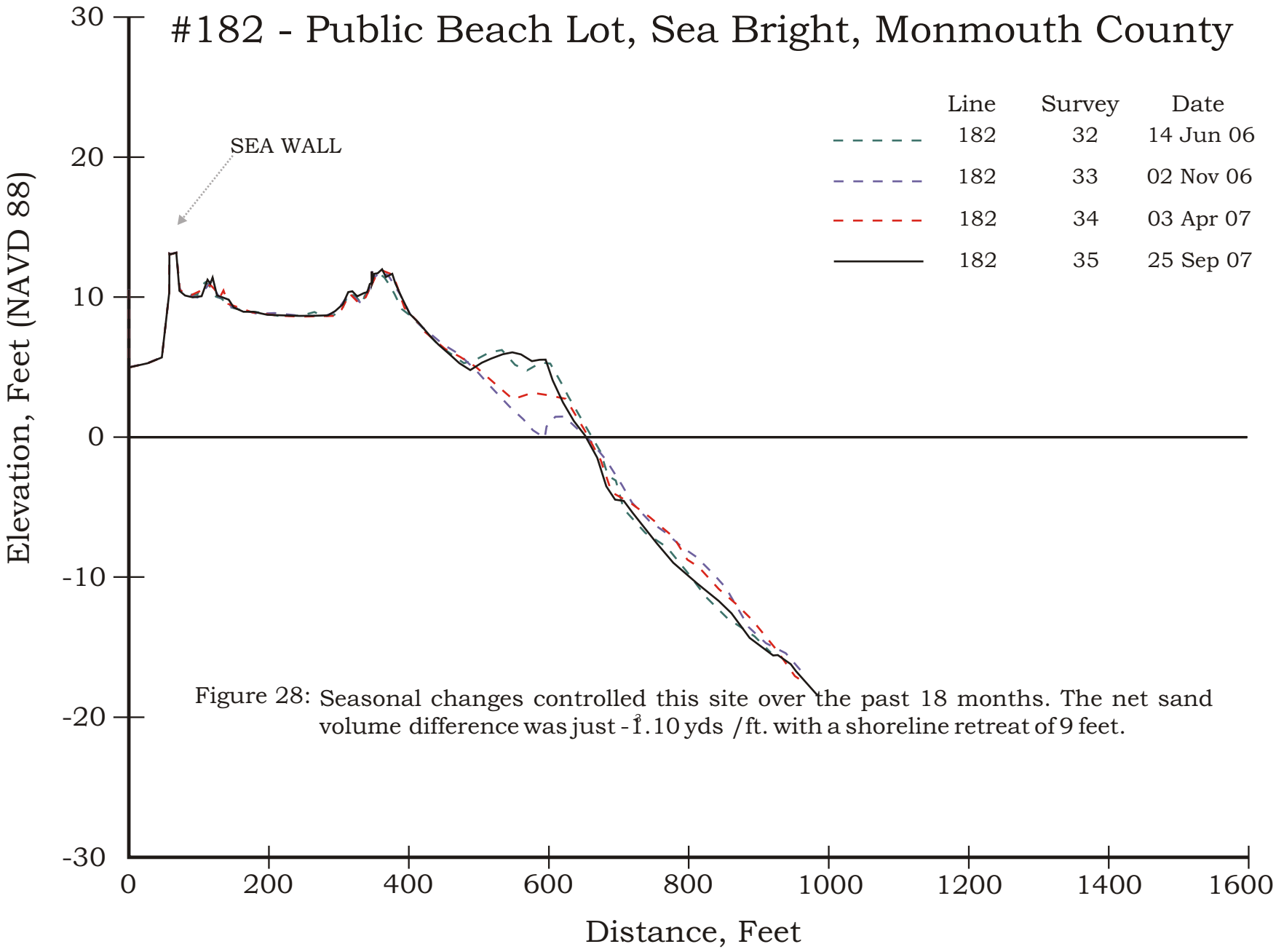



Figure 28: Seasonal changes controlled this site over the past 18 months. The net sand volume difference was just -1.10 yds /ft. with a shoreline retreat of 9 feet.

Figure 29. June 13, 2006 view of the municipal beach in Sea Bright. There was a substantial summer to winter shift in the berm. The maximum change occurred between surveys 32 and 33 where 20.13 $yds^3/ft$ moved away from the berm.

# MUNICIPAL BEACH, SEA BRIGHT
# SITE - 181

Figure 30. The view to the right was taken September 25, 2007 at essentially the same location on the profile and shows that the rocks are about a foot higher 18 months later where the beachface meets the rock groin on the beach. The net change was a small gain of 2.67 $yds^3/ft$. The shoreline retreated just under one foot.

# New Jersey Beach Profile Network

## #181 - Municipal Lot, Sea Bright, Monmouth County

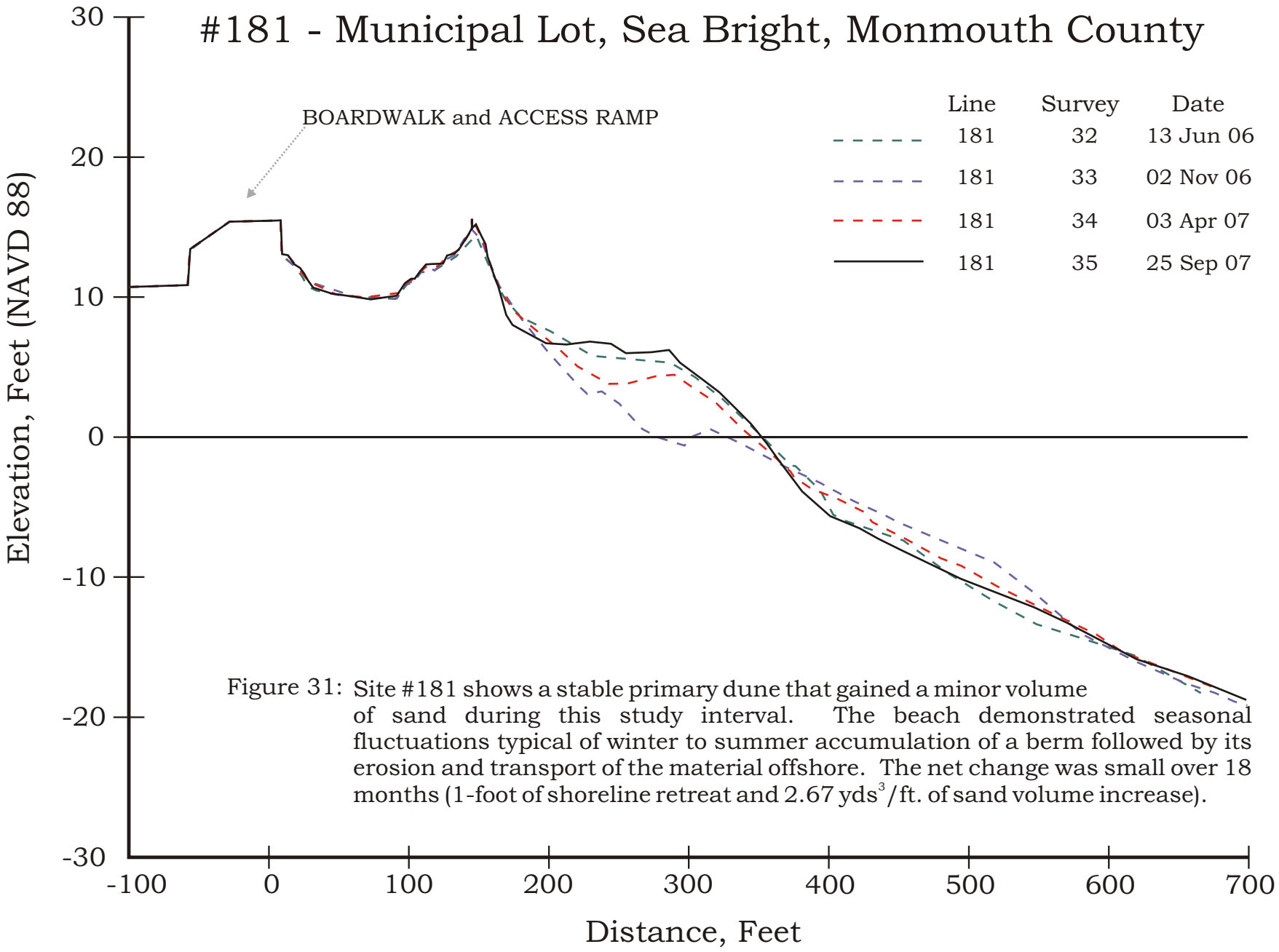



Figure 31: Site #181 shows a stable primary dune that gained a minor volume of sand during this study interval. The beach demonstrated seasonal fluctuations typical of winter to summer accumulation of a berm followed by its erosion and transport of the material offshore. The net change was small over 18 months (1-foot of shoreline retreat and 2.67 $yds^3$/ft. of sand volume increase).

Figure 33. View taken September 25, 2007 was taken at the toe of the dune grass. The beach produced seasonal changes between a flat gradient beach seaward and a sizable berm following each summer. The net change was a loss of 7.26 $yds^3$/ft with a 9-foot shoreline retreat.

Figure 32. June 13, 2006 shows a view from the seawall of the vegetated back beach area south of the municipal center in Sea Bright. The dune has no central ridge, except for the small mound that lies just seaward of the wall.

## SUNSET COURT, SEA BRIGHT
## SITE - 180

# New Jersey Beach Profile Network

## #180 - Sunset Court, Sea Bright, Monmouth County

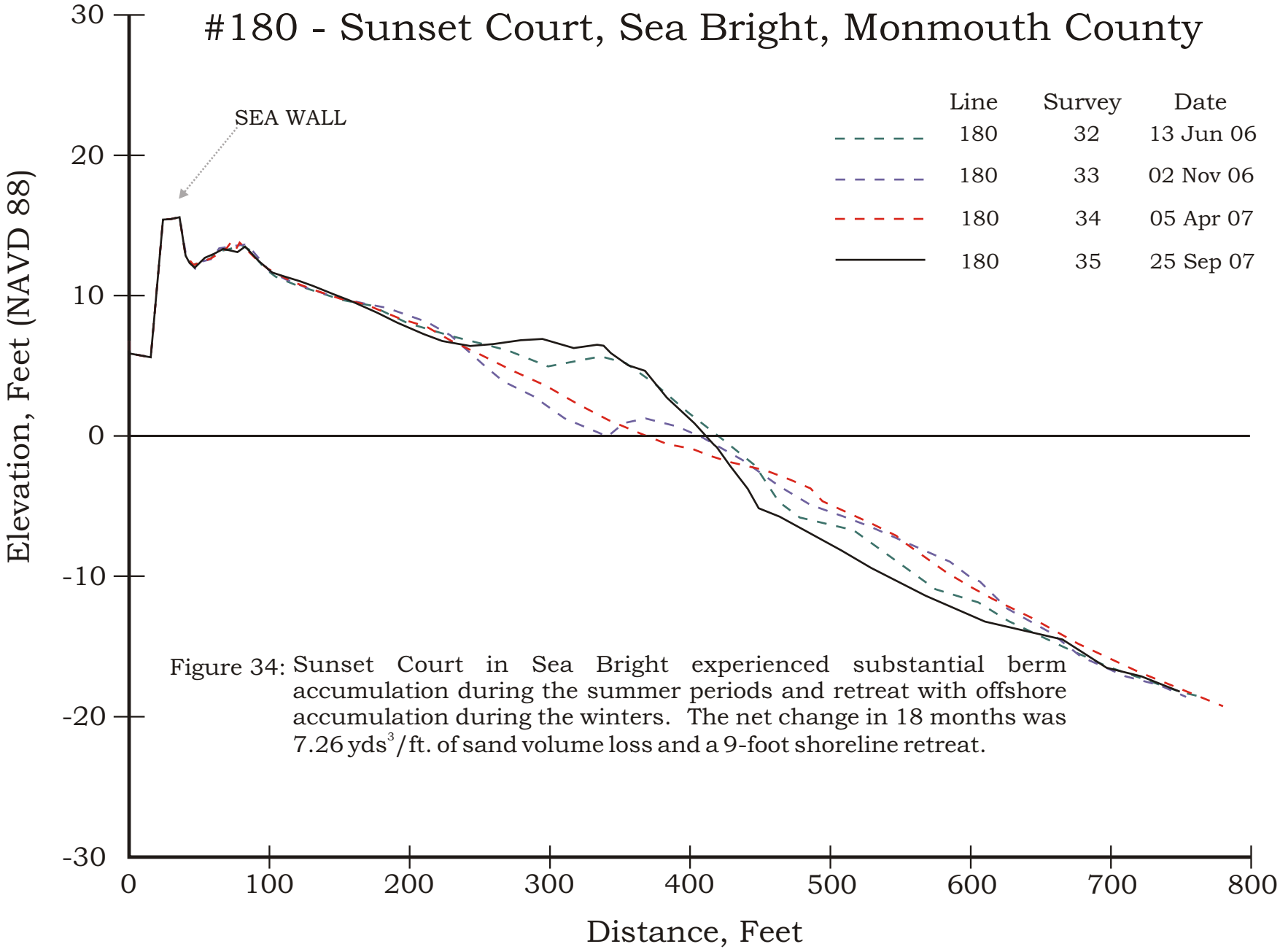



Figure 34: Sunset Court in Sea Bright experienced substantial berm accumulation during the summer periods and retreat with offshore accumulation during the winters. The net change in 18 months was 7.26 $yds^3$/ft. of sand volume loss and a 9-foot shoreline retreat.

Figure 35. June 13, 2006 view of the rock groin that defends the northern edge of the Monmouth Beach Club property. This site has retreated more readily than other Sea Bright or southern community sites on the beach fill project shoreline. The plot shows the continued pace of retreat.

## COTTAGE ROAD, MONMOUTH BEACH
## SITE - 179

Figure 36. View taken September 25, 2007 and shows the rock seawall fronting the Monmouth Beach Club property just south of the profile line. This site has been the only significant erosion problem in the Monmouth County project. These rocks offset seaward by several hundred feet so the ocean waves find them rapidly following any maintenance fill effort. The wave reflection and turbulence move the sand away from the club property exposing the site to storm damage. The serial volume changes were -27.07 $yds^3/ft$; -18.75 $yds^3/ft$; and -40.46 $yds^3/ft$ and the shoreline retreated 79, 54 and 7 feet each survey between survey # 32 and # 35. The net change was a loss of 86.44 $yds^3/ft$ and a 141-foot shoreline retreat. This site continues as an erosional hot spot.

# New Jersey Beach Profile Network

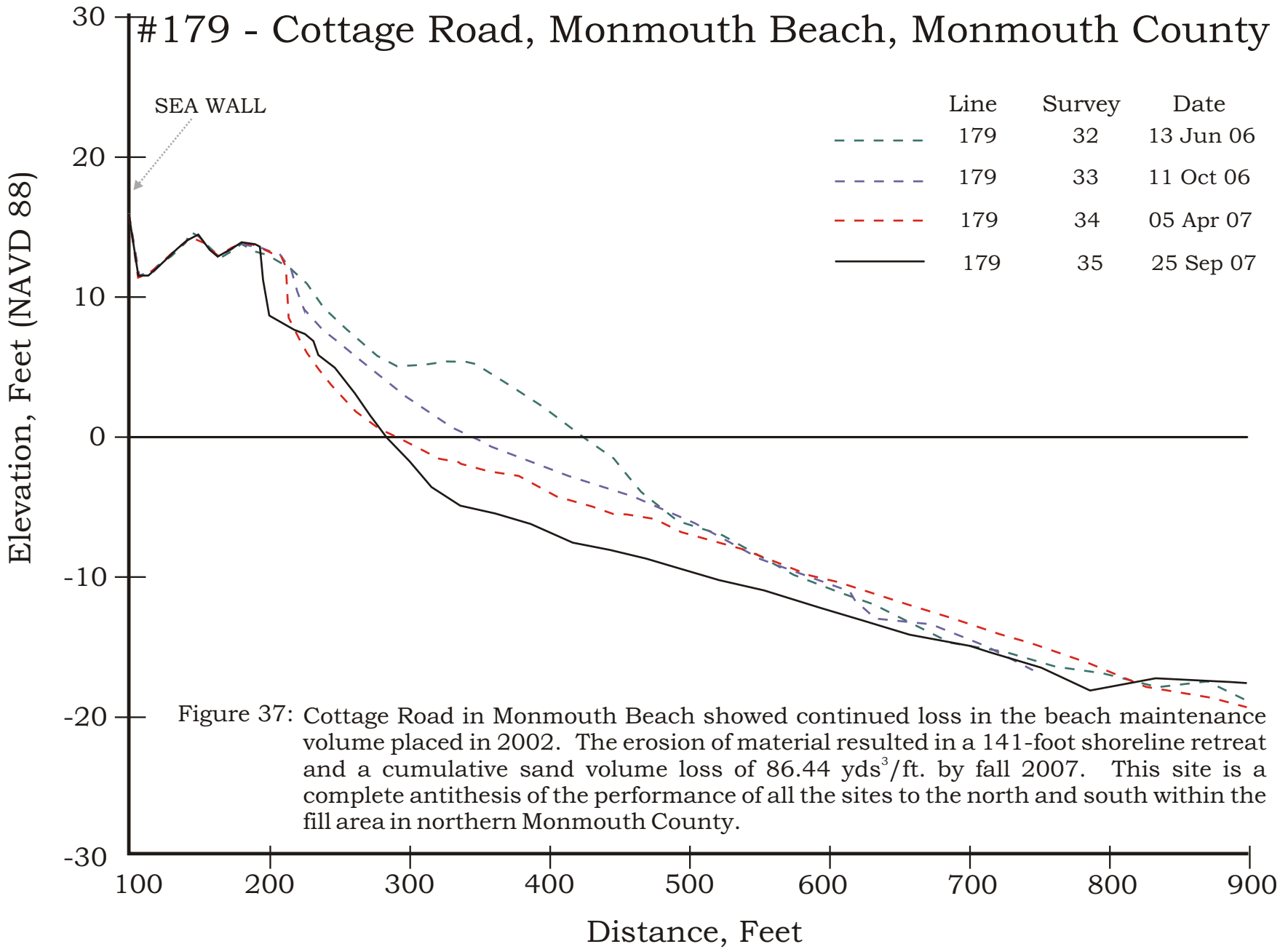



Figure 37: Cottage Road in Monmouth Beach showed continued loss in the beach maintenance volume placed in 2002. The erosion of material resulted in a 141-foot shoreline retreat and a cumulative sand volume loss of 86.44 $yds^3$/ft. by fall 2007. This site is a complete antithesis of the performance of all the sites to the north and south within the fill area in northern Monmouth County.

Figure 38. April 17, 2006 saw a relatively sparsely vegetated dune in this view to the north up the beach.

# MONMOUTH BEACH CLUB, MONMOUTH BEACH SITE - 178



Figure 39. View taken September 26, 2007 for the beach and dune toe looking north. This beach is somewhat narrower than it is along the Sea Bright shoreline because of the development that preceded erection of the rock seawall decades ago. Seasonal changes dominated this beach, just 5,000 feet south of the problem area at Cottage Avenue. The erosional zone is confined to that site. The net change was a very minor gain of 2.90 $yds^3$/ft., with a 3-foot shoreline advance. This information provides substantial evidence that the changes are seasonal and the beach is stable.

# New Jersey Beach Profile Network

## #178 - Monmouth Beach Club, Monmouth County

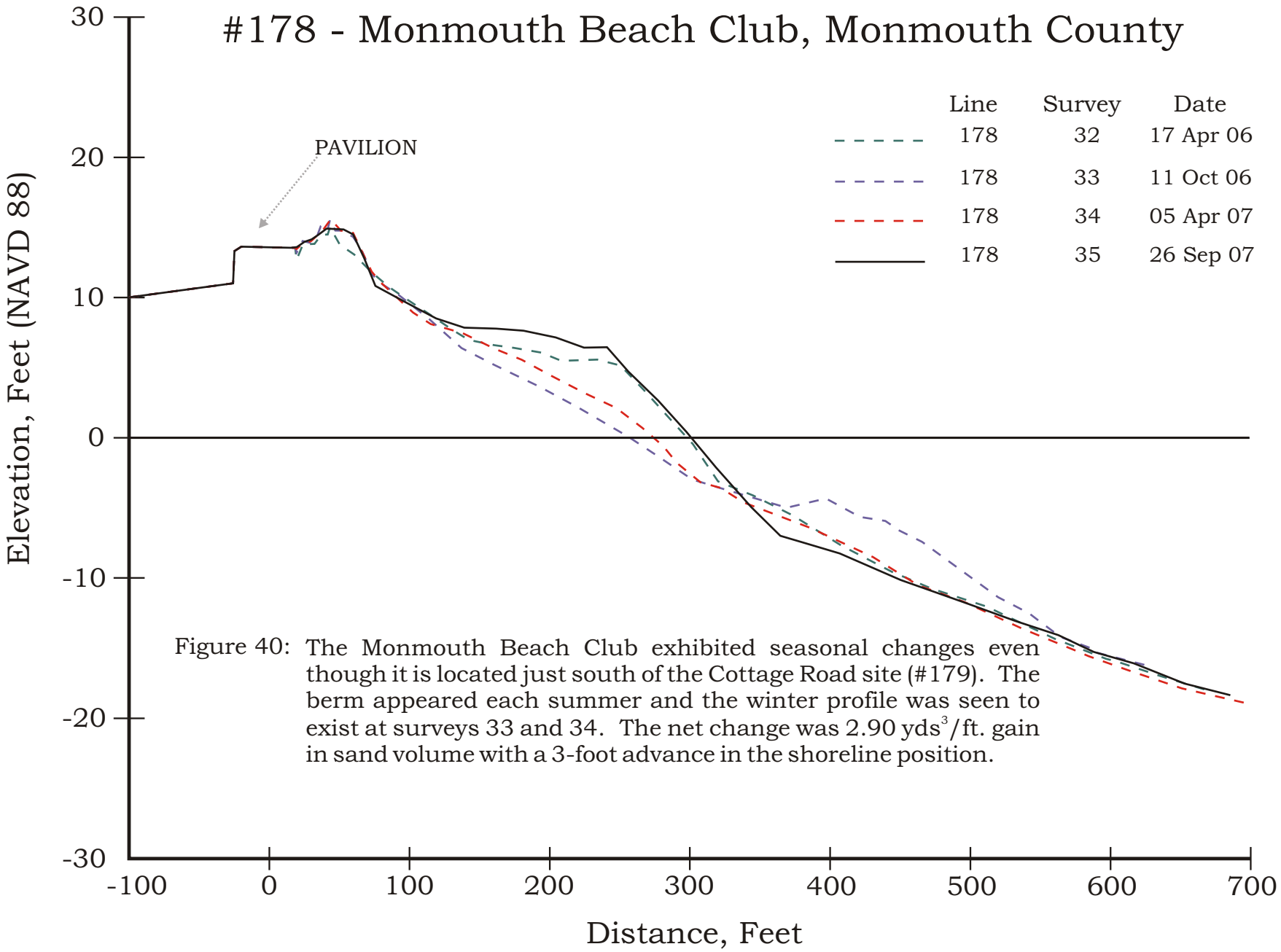



Figure 40: The Monmouth Beach Club exhibited seasonal changes even though it is located just south of the Cottage Road site (#179). The berm appeared each summer and the winter profile was seen to exist at surveys 33 and 34. The net change was 2.90 $yds^3$/ft. gain in sand volume with a 3-foot advance in the shoreline position.

Figure 41. April 17, 2006 photograph shows a view to the south from Ocean Avenue. The bare area is an access zone to the beach. The dune is relatively modest in height, but the extra width of the beach provides substantial protection.

# 404 OCEAN AVENUE, LONG BRANCH
# SITE - 177

Figure 42. View taken September 26, 2007 at the toe of the dune on the beach. The berm underwent seasonal changes each summer with sand moving onto the beach each summer and off to the bar each winter. The net change was a loss of 19.99 $yds^3$/ft. with a 41-foot shoreline retreat. The berm in April 2006 was larger than that present in September 2007.

# New Jersey Beach Profile Network

## #177 - Ocean Avenue, Long Branch, Monmouth County

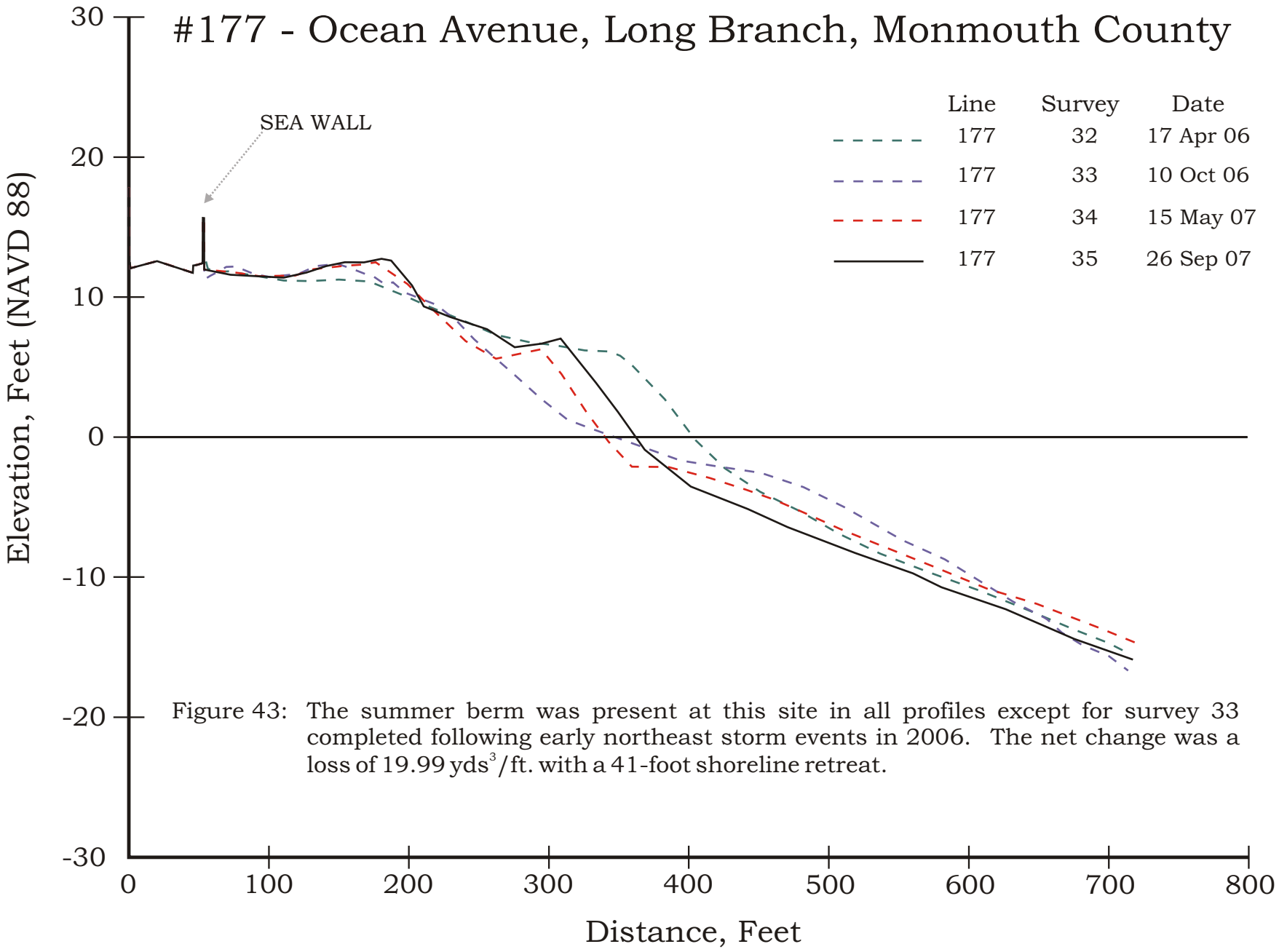



Figure 43: The summer berm was present at this site in all profiles except for survey 33 completed following early northeast storm events in 2006. The net change was a loss of 19.99 $yds^3$/ft. with a 41-foot shoreline retreat.

Figure 44. This April 12, 2006 view was taken from the beach looking south. Changes were confined to the berm as sand moved to the beach each summer and left the beach for the offshore bar each winter.

## SEVEN PRESIDENTS PARK, MONMOUTH BEACH SITE - 176

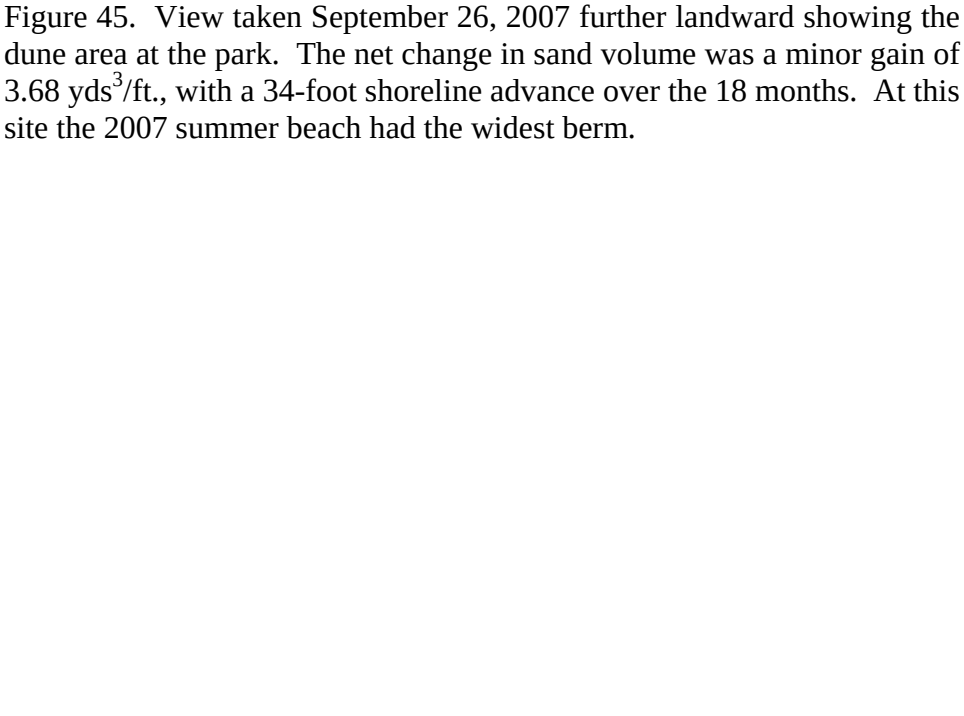


Figure 45. View taken September 26, 2007 further landward showing the dune area at the park. The net change in sand volume was a minor gain of 3.68 $yds^3$/ft., with a 34-foot shoreline advance over the 18 months. At this site the 2007 summer beach had the widest berm.

# New Jersey Beach Profile Network

## #176 - Seven Presidents Park, Monmouth County

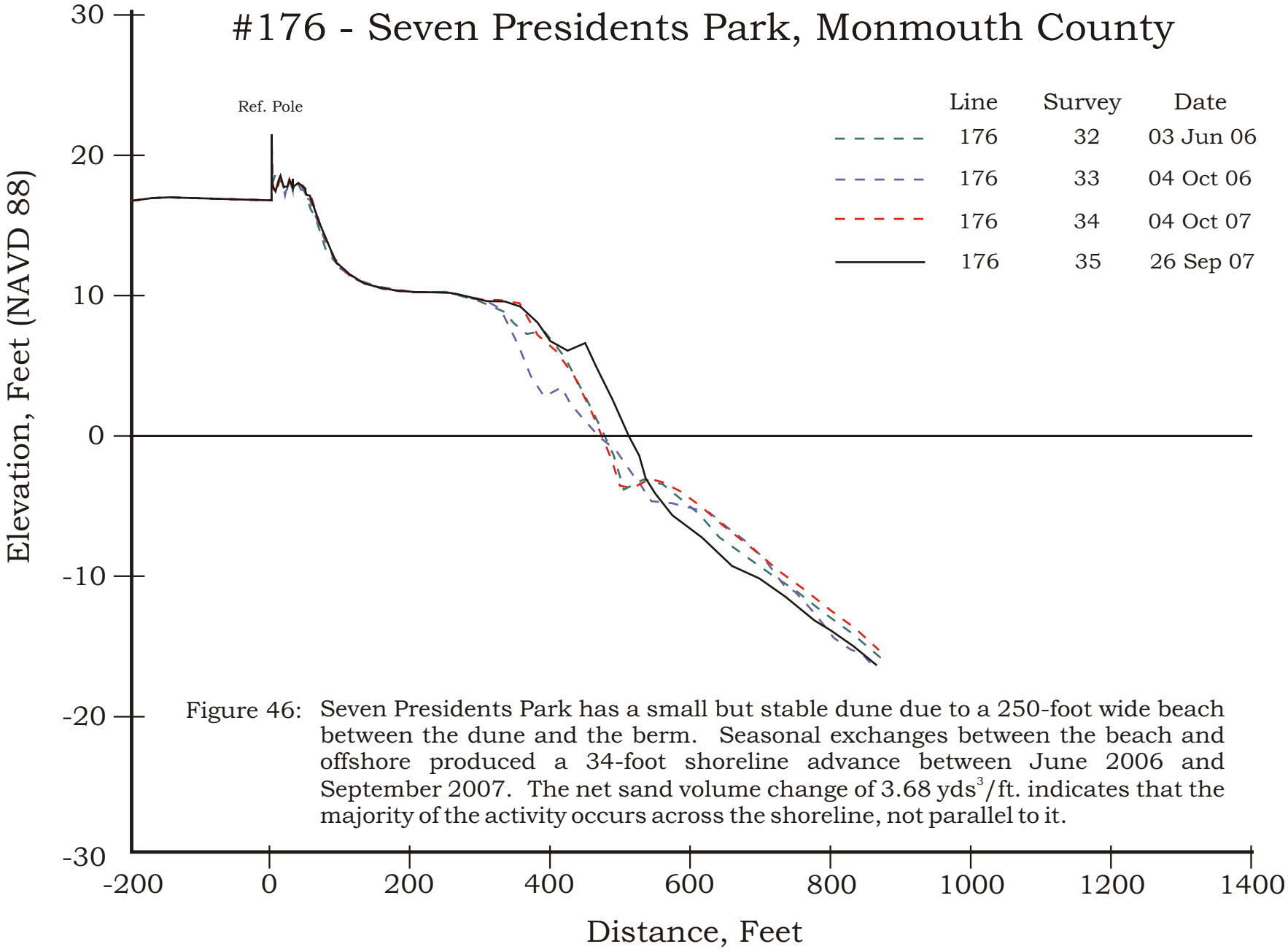



Figure 46: Seven Presidents Park has a small but stable dune due to a 250-foot wide beach between the dune and the berm. Seasonal exchanges between the beach and offshore produced a 34-foot shoreline advance between June 2006 and September 2007. The net sand volume change of 3.68 $yds^3$/ft. indicates that the majority of the activity occurs across the shoreline, not parallel to it.

Figure 47. April 12, 2006 shows a view to the north along the Long Branch steel bulkhead built to protect the upland bluff decades ago. The wind transport has moved sand up to the top edge of the structure in places.

## BROADWAY AVENUE, LONG BRANCH
## SITE - 175



Figure 48. View taken September 26, 2007 shows a beach in excellent condition following a decent summer's accretion from offshore. The October 2006 survey on the plots shows a depleted beach with a substantial bar offshore. This site also exhibited cross shore transport during the study interval. The net change was a 22.50 $yds^3$/ft loss in sand volume with a 10-foot shoreline advance. The loss volume was seen offshore as the sea floor became 18 inches lower across 350 feet of the survey.

# New Jersey Beach Profile Network

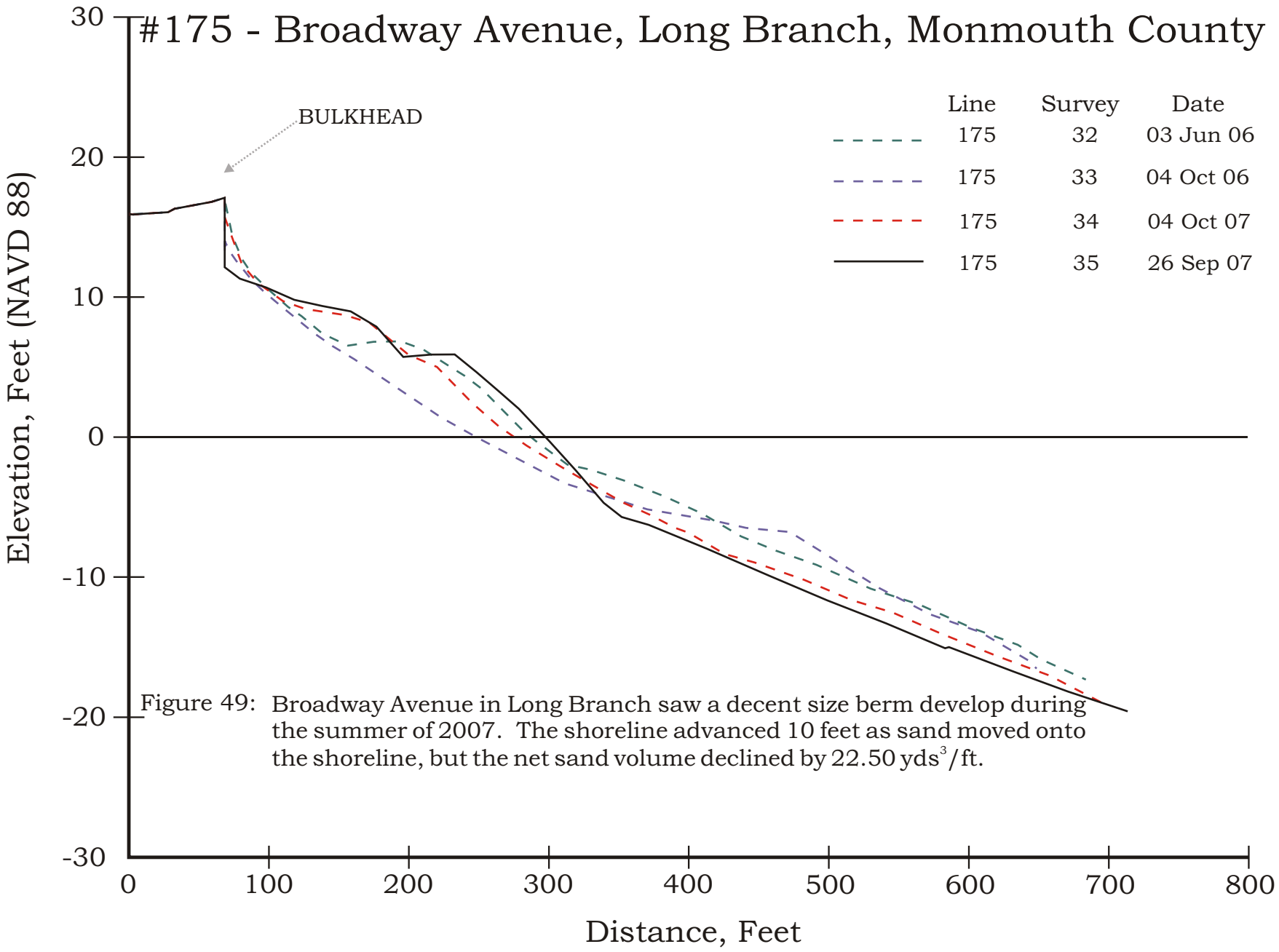



Figure 49: Broadway Avenue in Long Branch saw a decent size berm develop during the summer of 2007. The shoreline advanced 10 feet as sand moved onto the shoreline, but the net sand volume declined by 22.50 $yds^3/ft$.

Figure 50. April 12, 2006 view to the south showing the beach fronting the rock revetment built in the 1960's to protect the bluff from erosion that had breached prior bulkhead structures. This wall occupies the original location of the boardwalk built over the beach at that time.

## MORRIS AVENUE, LONG BRANCH
## SITE - 174

Figure 51. View taken September 27, 2007 showing considerable additional vegetation and a very similar beach. The plots show that the changes were confined to the berm and shallow offshore regions. The best berm was observed in this 2007 survey shown in the photograph to the right. The net sand volume changes were a loss of 20.55 $yds^3$/ft. and a 22-foot shoreline retreat. All the loss volume came from the offshore region as the seabed became lower.

# New Jersey Beach Profile Network

## #174 - Morris Avenue, Long Branch, Monmouth County

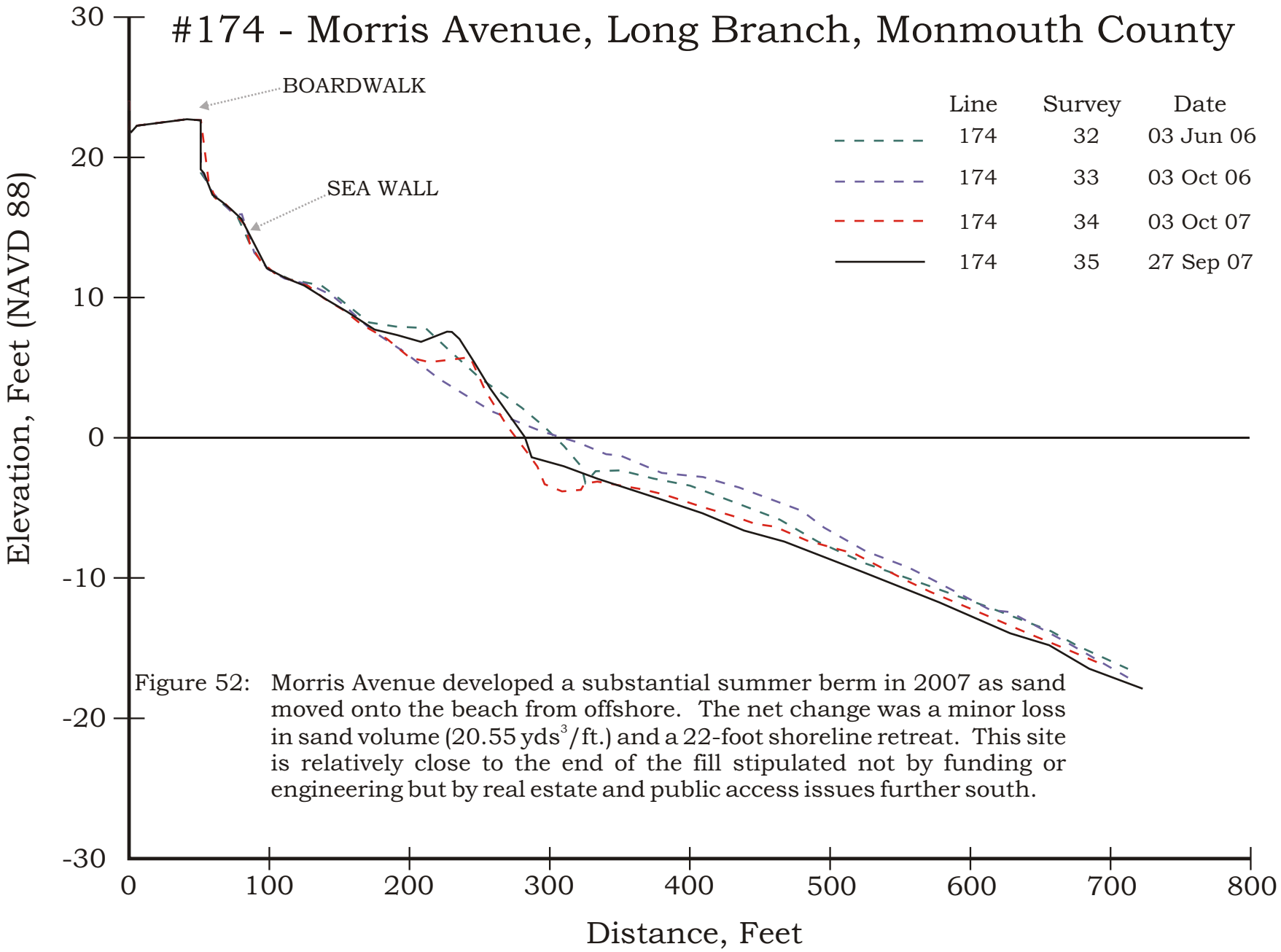



Figure 52: Morris Avenue developed a substantial summer berm in 2007 as sand moved onto the beach from offshore. The net change was a minor loss in sand volume (20.55 $yds^3$/ft.) and a 22-foot shoreline retreat. This site is relatively close to the end of the fill stipulated not by funding or engineering but by real estate and public access issues further south.

Figure 53. April 12, 2006 view of a site located at the southern end of the project fill in Long Branch. The work stopped here due to real estate issues and public access along the entire mid-section of the Monmouth County shoreline between here and Asbury Park.

## WEST END AVENUE, LONG BRANCH
## SITE - 173

Figure 54. View taken September 27, 2007 showing retreat of the beach along the groins. Sand moved south into the un-filled areas, and added to the material offshore. This summer the beach was in the best condition in some time. The net change was a gain of 5.20 $yds^3$/ft., with a 5-foot advance in the shoreline. These results show the benefits of cross shore transport on any particular beach. This site has lost much of the sand deposited during the fill project.

# New Jersey Beach Profile Network

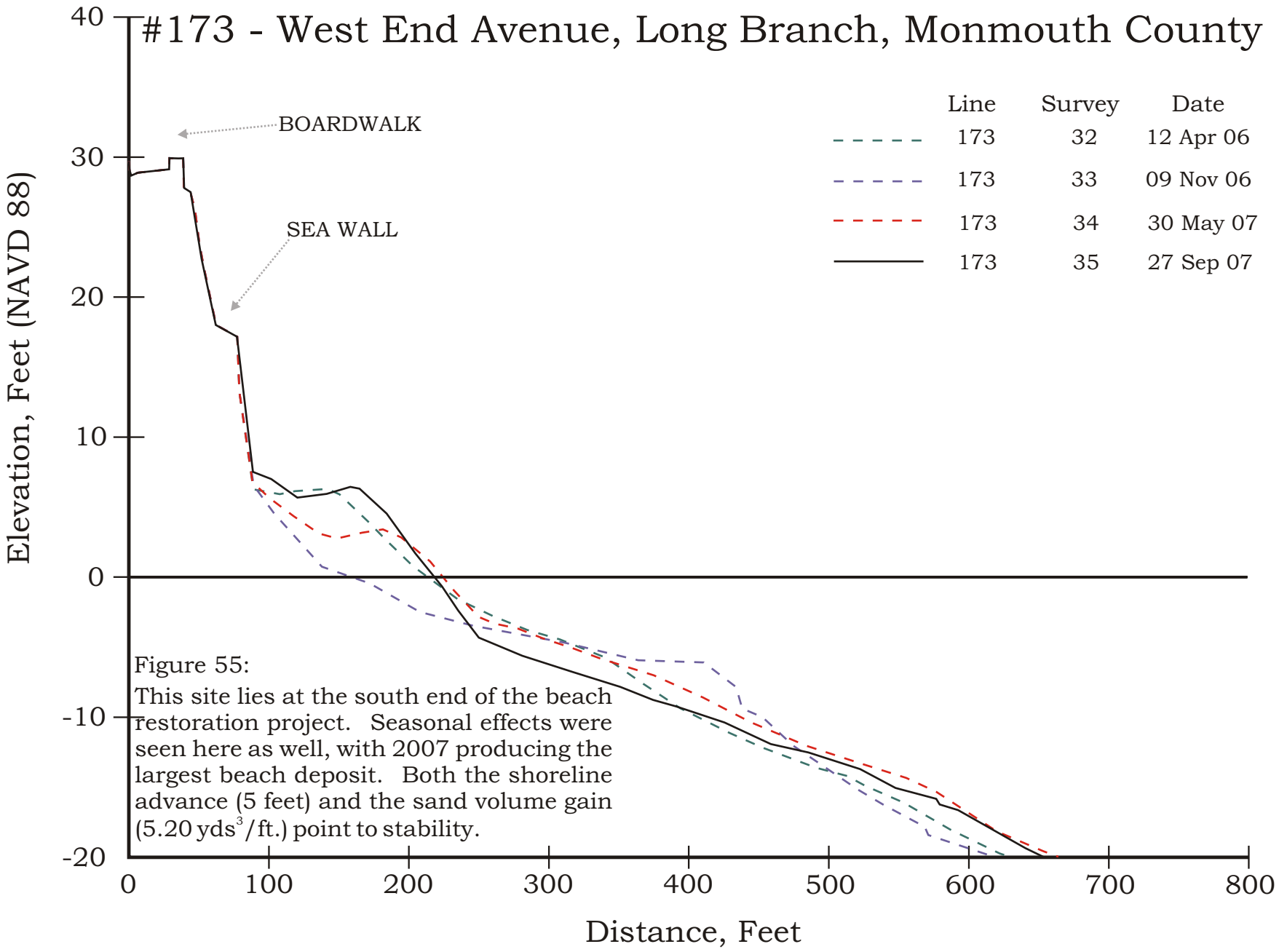



Figure 55:
This site lies at the south end of the beach restoration project. Seasonal effects were seen here as well, with 2007 producing the largest beach deposit. Both the shoreline advance (5 feet) and the sand volume gain (5.20 $yds^3/ft.$) point to stability.

Figure 56. The June 23, 2006 photograph shows a wet sand beach in front of the rocks at Pullman Avenue. This sand has been slowly building up over years since the project.

## PULLMAN AVENUE, ELBERON
## SITE - 171



Figure 57. View taken October 16, 2007 clearly shows more sand deposited at the rocks burying all but the highest elevation boulders. Material also appears to have shifted south from the groin exposing more of the pilings in 2007 than were visible in the summer of 2006. The net change was a tiny loss of 0.10 $yds^3$/ft across the 650 feet of the survey with a 10-foot shoreline advance at the cross section line.

# New Jersey Beach Profile Network

## #171 - Pullman Avenue, Elberon, Monmouth County

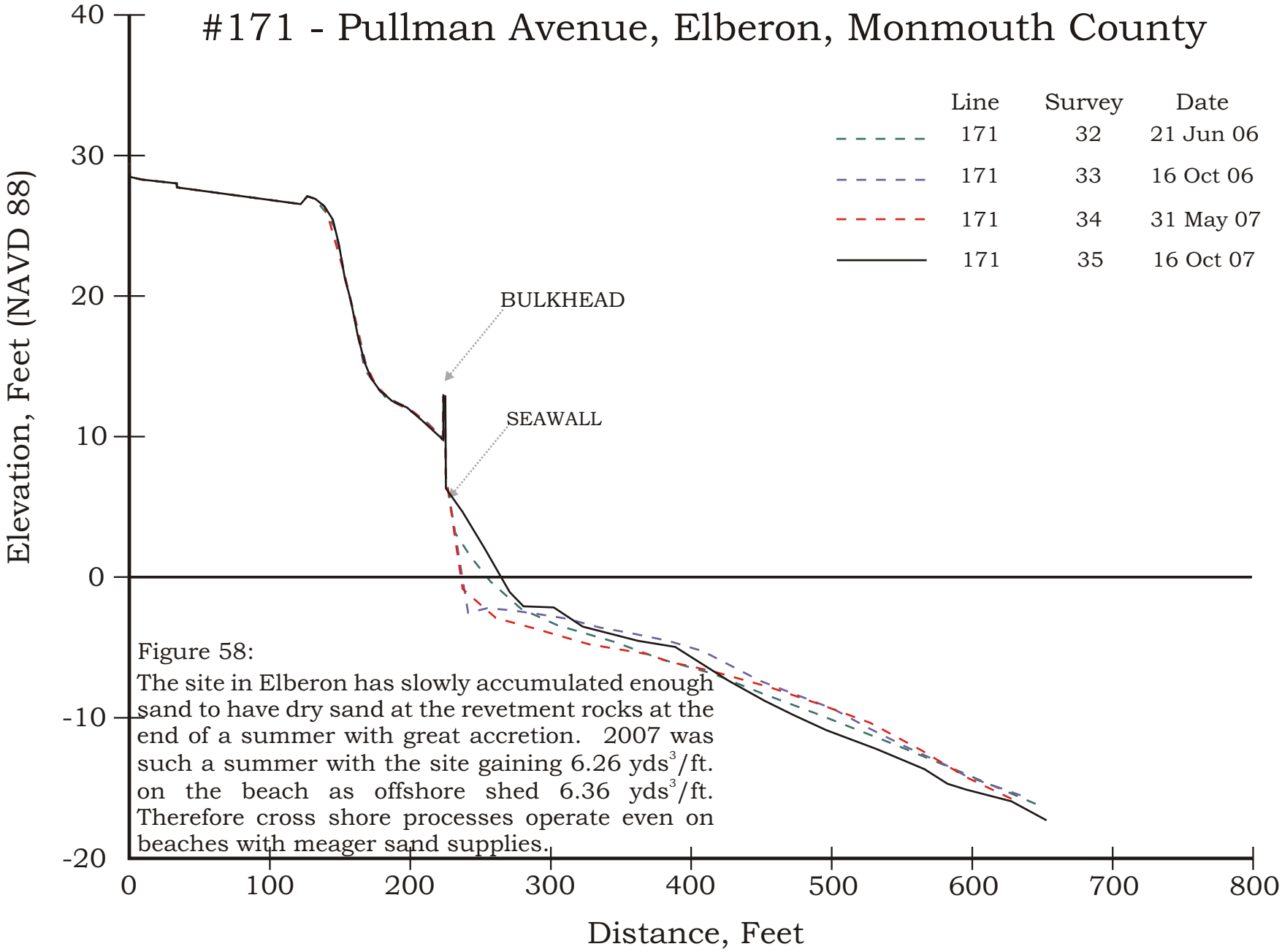



Figure 58:
The site in Elberon has slowly accumulated enough sand to have dry sand at the revetment rocks at the end of a summer with great accretion. 2007 was such a summer with the site gaining 6.26 $yds^3$/ft. on the beach as offshore shed 6.36 $yds^3$/ft. Therefore cross shore processes operate even on beaches with meager sand supplies.

Figure 59. This June 21, 2006 view of the Roosevelt Avenue beach shows an unusual situation where sand had built up to the point were a terrace extended half way out to the groin tip. The plots show a wedge of sand up to 5 feet above the zero elevation line. Loss followed during the next two surveys with some recovery seen following the final survey (#35).

## ROOSEVELT AVENUE, DEAL SITE - 170

Figure 60. View taken October 16, 2007 looking toward the south corner of this groin cell. Located about half way between the two segments of the Monmouth County fill, not much evidence has emerged linking sand supplies to migration north or south from the filled beaches. The 18-month change is dramatic where there is a wet beach graded nearly to high tide with a decent width sand terrace present in June 2006, but by October 2007, there was no beach exposed at a low to mid-tide sea level. The net change was a loss of 16.32 $yds^3$/ft., with a 53-foot retreat in the shoreline position. The final three surveys show a zero elevation where the sand meets the rocks unlike the initial survey (#32).

# New Jersey Beach Profile Network

## #170 - Roosevelt Avenue, Deal, Monmouth County

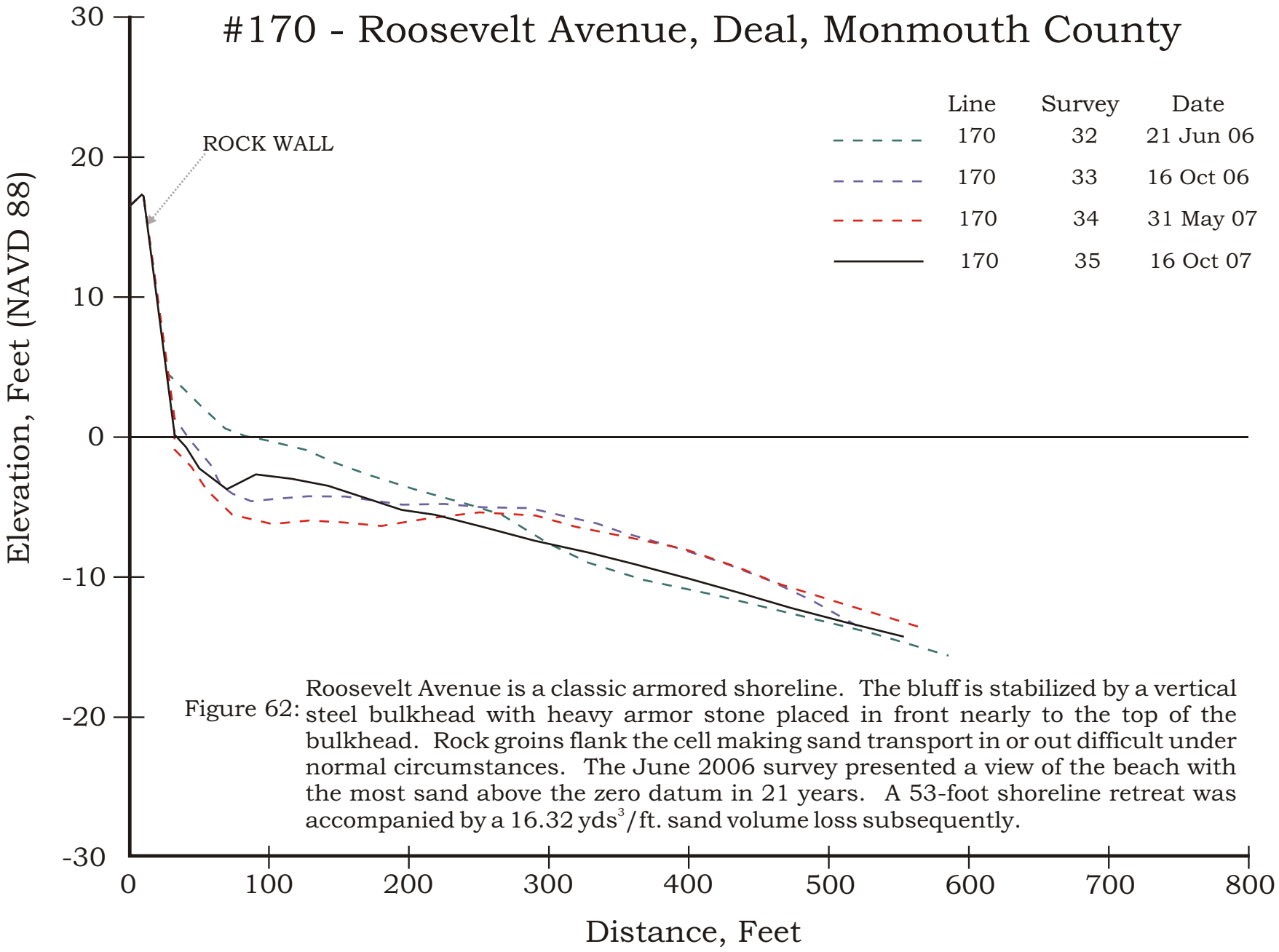



Figure 62: Roosevelt Avenue is a classic armored shoreline. The bluff is stabilized by a vertical steel bulkhead with heavy armor stone placed in front nearly to the top of the bulkhead. Rock groins flank the cell making sand transport in or out difficult under normal circumstances. The June 2006 survey presented a view of the beach with the most sand above the zero datum in 21 years. A 53-foot shoreline retreat was accompanied by a 16.32 $yds^3$/ft. sand volume loss subsequently.

Figure 63. This beach segment remains as one of just two places in the Borough of Deal that still show a berm with a "natural" bluff edge exposed at the landward slope of the berm. The sand is retained by four massive rock groins spaced a few hundred feet apart. The beach varies seasonally as sediment is transferred to the berm from offshore, but no evidence exists since 1998 that beach nourishment sand has been transferred north from Asbury Park to this site. The photograph was taken June 21, 2006.

## DARLINGTON AVENUE, DEAL
## SITE 169

Figure 64. This view taken October 16, 2007, shows the entire width of the beach from the bluff. The pilings on the right support a relatively new section of bluff protection common to this segment of the NJ shoreline. Today, these additions are at the discretion of the property owner not a municipal or State effort. This season the beach was wider than documented with the other three surveys with a higher, more pronounced berm. The sand volume decreased by 1.62 $yds^3$/ft. and the shoreline retreated by 13 feet. Between the spring and fall surveys of 2007 the beach gained 9.31 $yds^3$/ft. as the shoreline advanced 17 feet. The sand came in from the offshore.

# New Jersey Beach Profile Network

## #169 - Darlington Avenue, Deal, Monmouth County

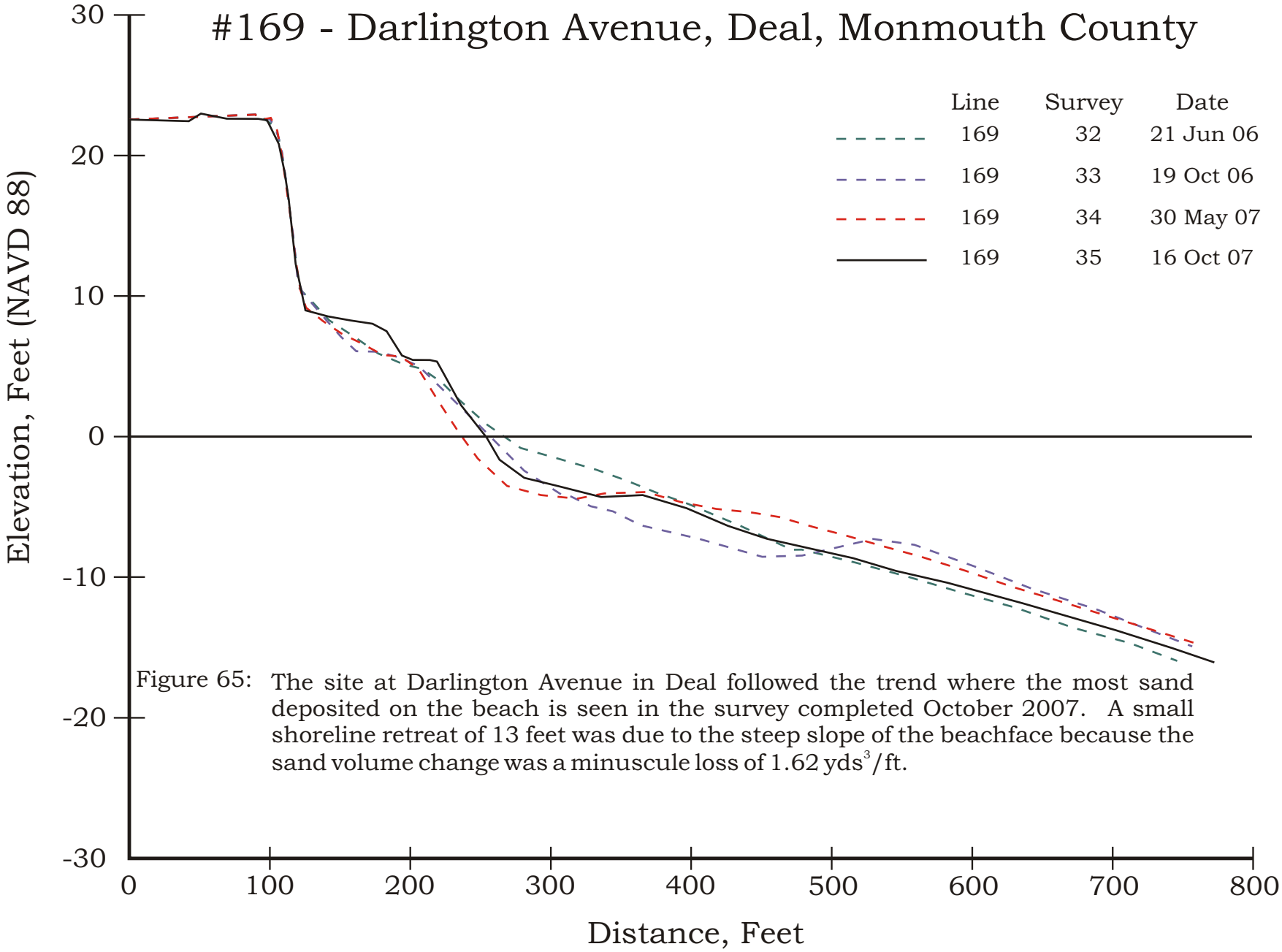



Figure 65: The site at Darlington Avenue in Deal followed the trend where the most sand deposited on the beach is seen in the survey completed October 2007. A small shoreline retreat of 13 feet was due to the steep slope of the beachface because the sand volume change was a minuscule loss of 1.62 $yds^3/ft$.

Figure 66. The Allenhurst site has a bluff that was protected with a concrete seawall many decades ago. Modest volumes of sand have been added to the beach over the years. There has been slow leakage of sand from Asbury Park and the Federal beach restoration project completed in 2001. Slow, almost imperceptible increases in beach volume and width have made a difference at this site. The crane in the distance sits on the groin between the Deal Lake outlet and the Loch Arbor/Allenhurst beach. The lake's outlet was being reconstructed in 2006. The picture was taken June 20, 2006.

## CORLIES AVENUE, ALLENHURST
## SITE 168

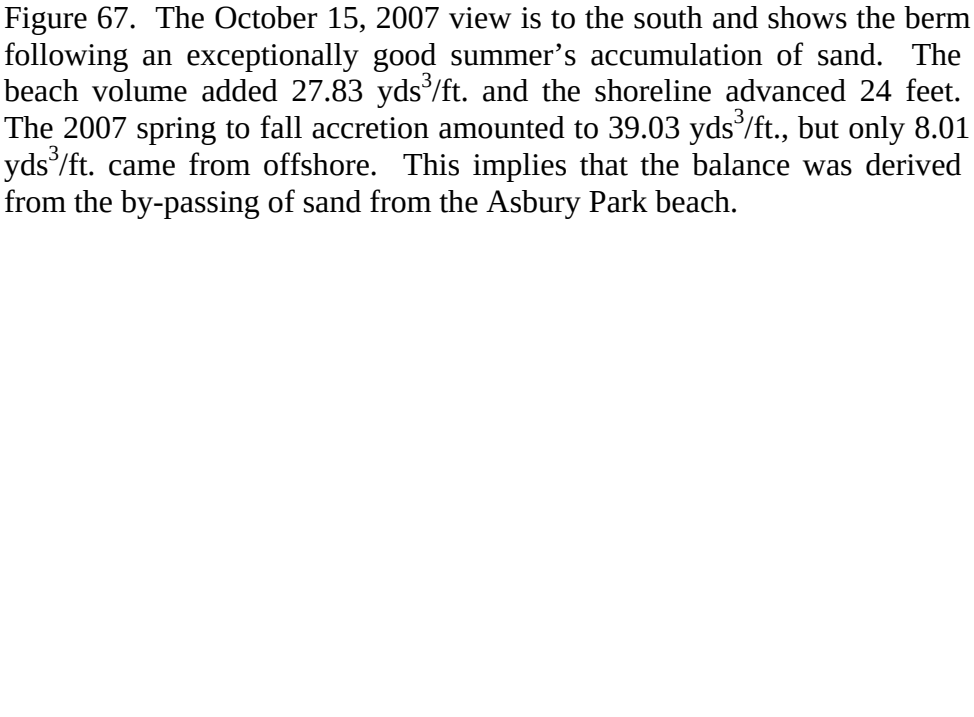


Figure 67. The October 15, 2007 view is to the south and shows the berm following an exceptionally good summer's accumulation of sand. The beach volume added 27.83 $yds^3$/ft. and the shoreline advanced 24 feet. The 2007 spring to fall accretion amounted to 39.03 $yds^3$/ft., but only 8.01 $yds^3$/ft. came from offshore. This implies that the balance was derived from the by-passing of sand from the Asbury Park beach.

# New Jersey Beach Profile Network

## #168 - Corlies Avenue, Allenhurst, Monmouth County

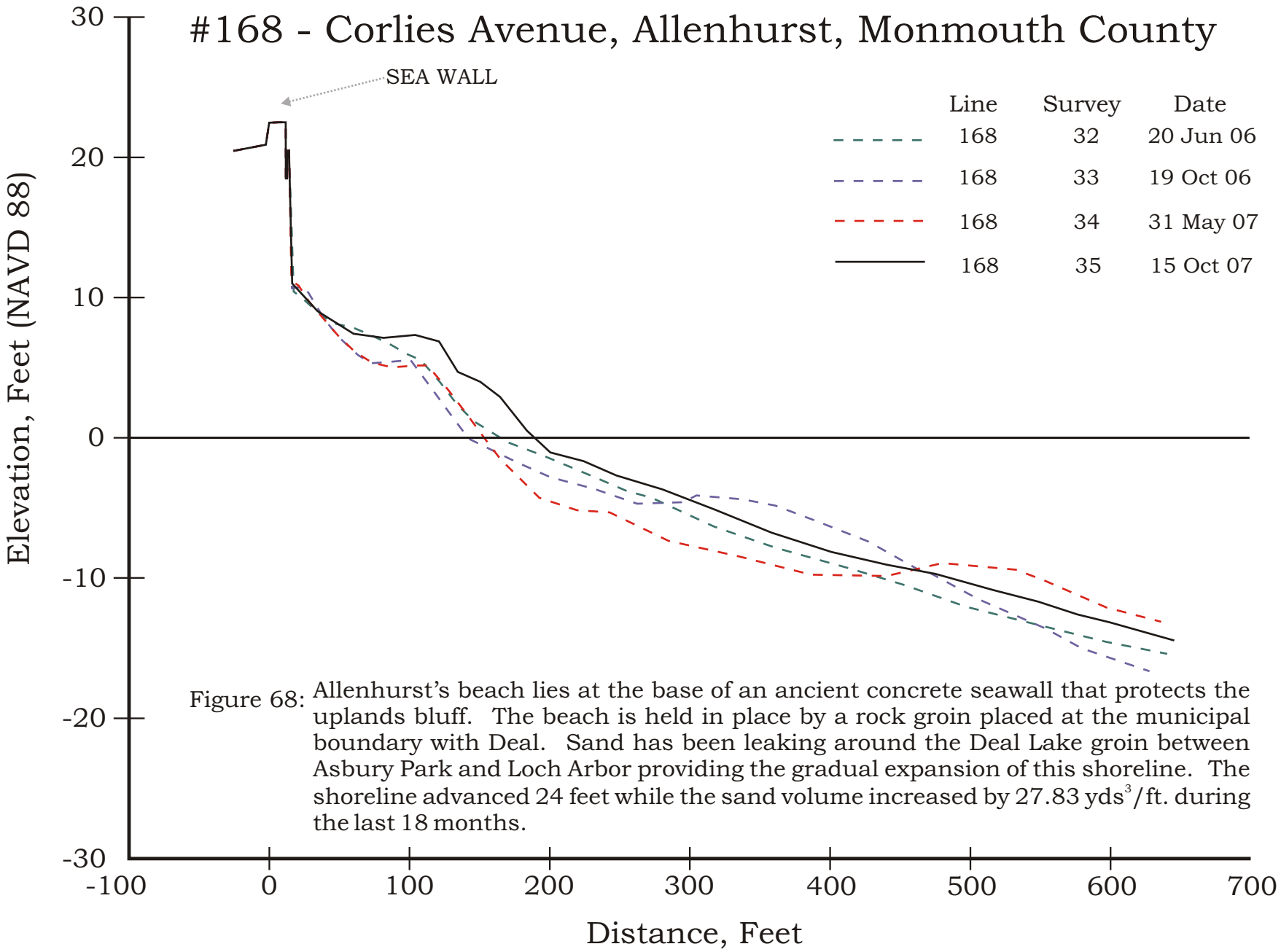



Figure 68: Allenhurst's beach lies at the base of an ancient concrete seawall that protects the uplands bluff. The beach is held in place by a rock groin placed at the municipal boundary with Deal. Sand has been leaking around the Deal Lake groin between Asbury Park and Loch Arbor providing the gradual expansion of this shoreline. The shoreline advanced 24 feet while the sand volume increased by 27.83 $yds^3$/ft. during the last 18 months.

Figure 69. This view of the northern Asbury Park beach was taken June 20, 2006 and shows the terminal groin with the cranes on it rebuilding the Deal Lake outlet. The beach width has maintained a relatively constant value, which corresponds with the very slow rate that the Allenhurst beach grew due to limited sand by-passing of the groin.

## 7th AVENUE, ASBURY PARK - SITE 267

Figure 70. The picture to the right was taken October 1, 2007 and shows the beach with a substantial berm as sand moved onto the beach during the 2007 season. The sand volume decreased by 3.52 $yds^3$/ft. with an 11-foot advance in the shoreline position. The seasonal change pattern dominates this beach in spite of its location at the northern end of the project where end-losses would be expected.

# New Jersey Beach Profile Network

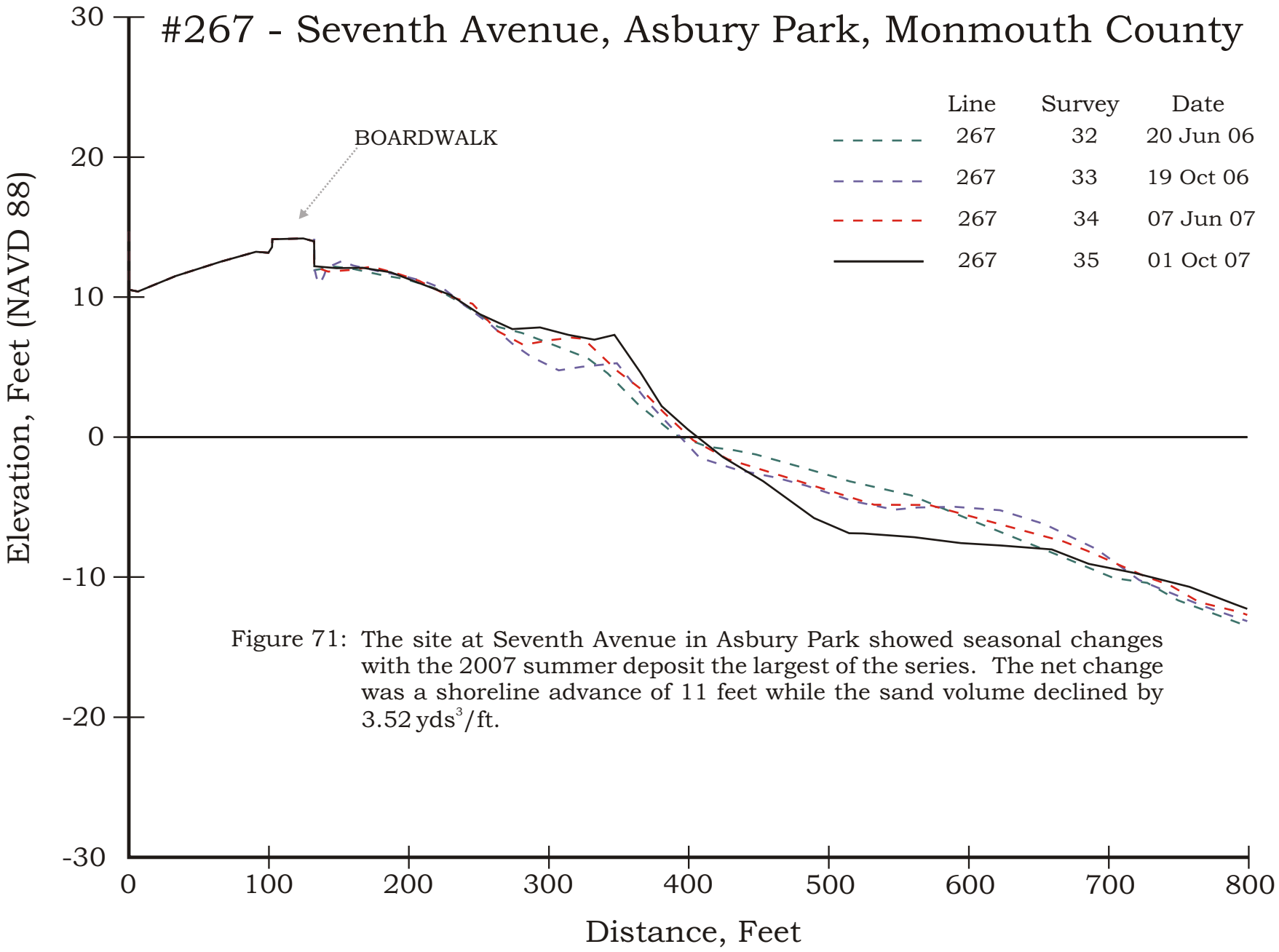



Figure 71: The site at Seventh Avenue in Asbury Park showed seasonal changes with the 2007 summer deposit the largest of the series. The net change was a shoreline advance of 11 feet while the sand volume declined by 3.52 $yds^3/ft$.

Figure 72. The beach on June 20, 2006 shows the outer third of the rock groins as the shoreline consolidated. The berm is still 200 feet wide in the summer seasons and no storm impacts have been seen at the boardwalk since 1992.

# 3rd AVENUE, ASBURY PARK
# SITE 167

Figure 72. The Asbury Park beach has a huge tourist component that meant no dunes along the boardwalk. The picture taken October 1, 2007 shows a beach without any recreational activity, but with a wide berm and an excellent summer accretion beyond the other three surveys. The 2007 seasonal transfer of sand placed 18.54 $yds^3$/ft. of sand on the berm with 16.15 $yds^3$/ft. obtained from offshore. This points to a cross shore sediment movement typical of stable sections of shoreline. The seasonal shoreline advanced 35 feet. The 18-month net change was a sand volume increase of 13.62 $yds^3$/ft. and a 21-foot advance in the shoreline position.

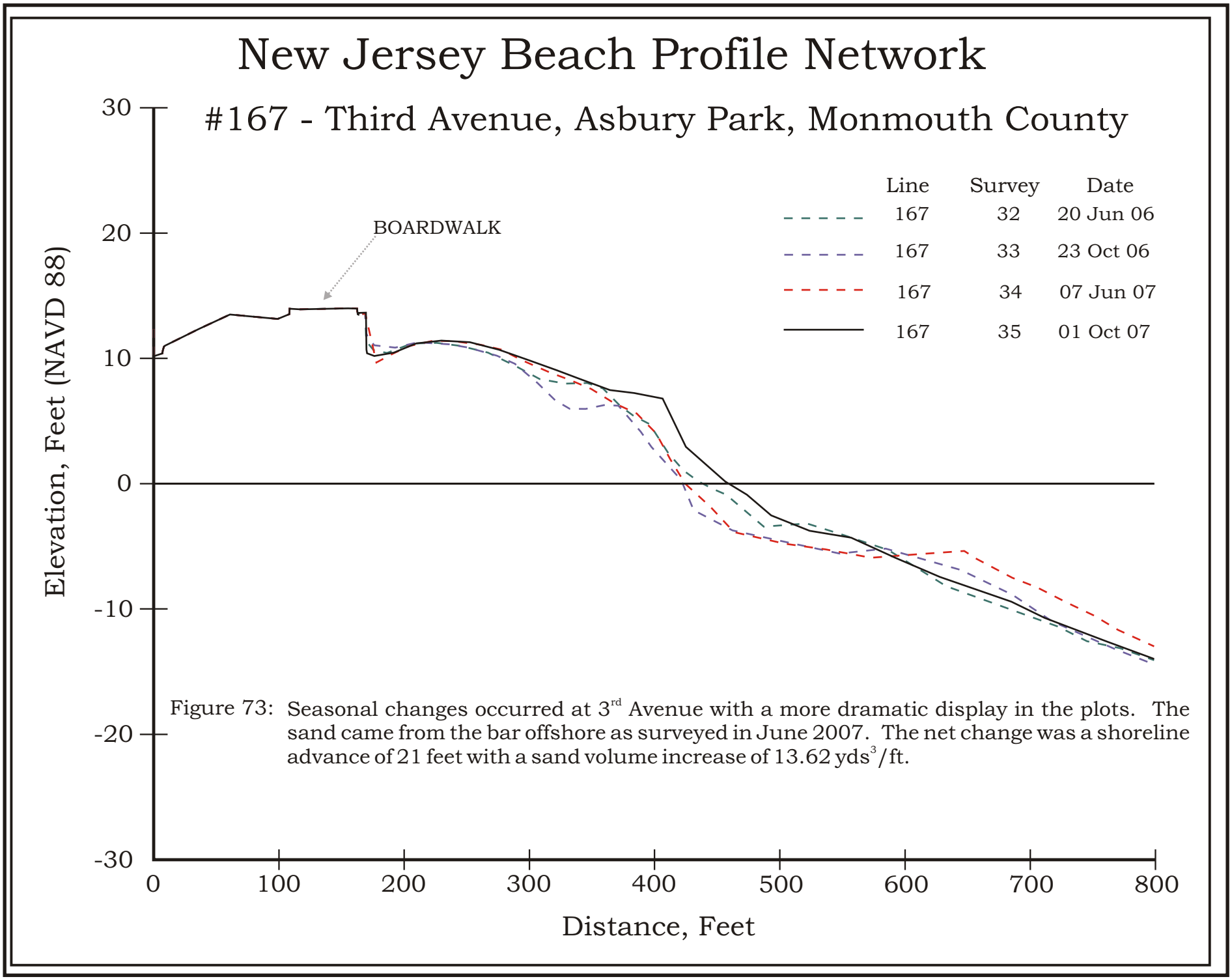



Figure 73: Seasonal changes occurred at 3rd Avenue with a more dramatic display in the plots. The sand came from the bar offshore as surveyed in June 2007. The net change was a shoreline advance of 21 feet with a sand volume increase of 13.62 $yds^3/ft$.

Figure 74. This view of the beach was taken looking across the dune on June 23, 2006. In Ocean Grove there have been dunes developed since the Federal project was completed without a great deal of planning for the eventual dune configuration.

# OCEAN PATHWAY, OCEAN GROVE
# SITE 166

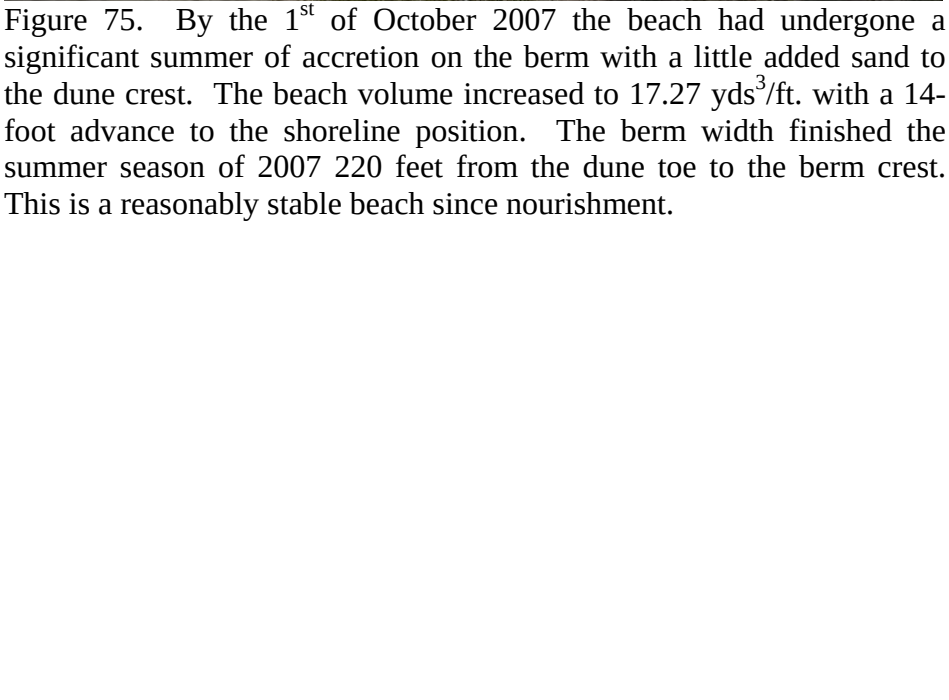


Figure 75. By the 1st of October 2007 the beach had undergone a significant summer of accretion on the berm with a little added sand to the dune crest. The beach volume increased to 17.27 $yds^3$/ft. with a 14-foot advance to the shoreline position. The berm width finished the summer season of 2007 220 feet from the dune toe to the berm crest. This is a reasonably stable beach since nourishment.

# New Jersey Beach Profile Network

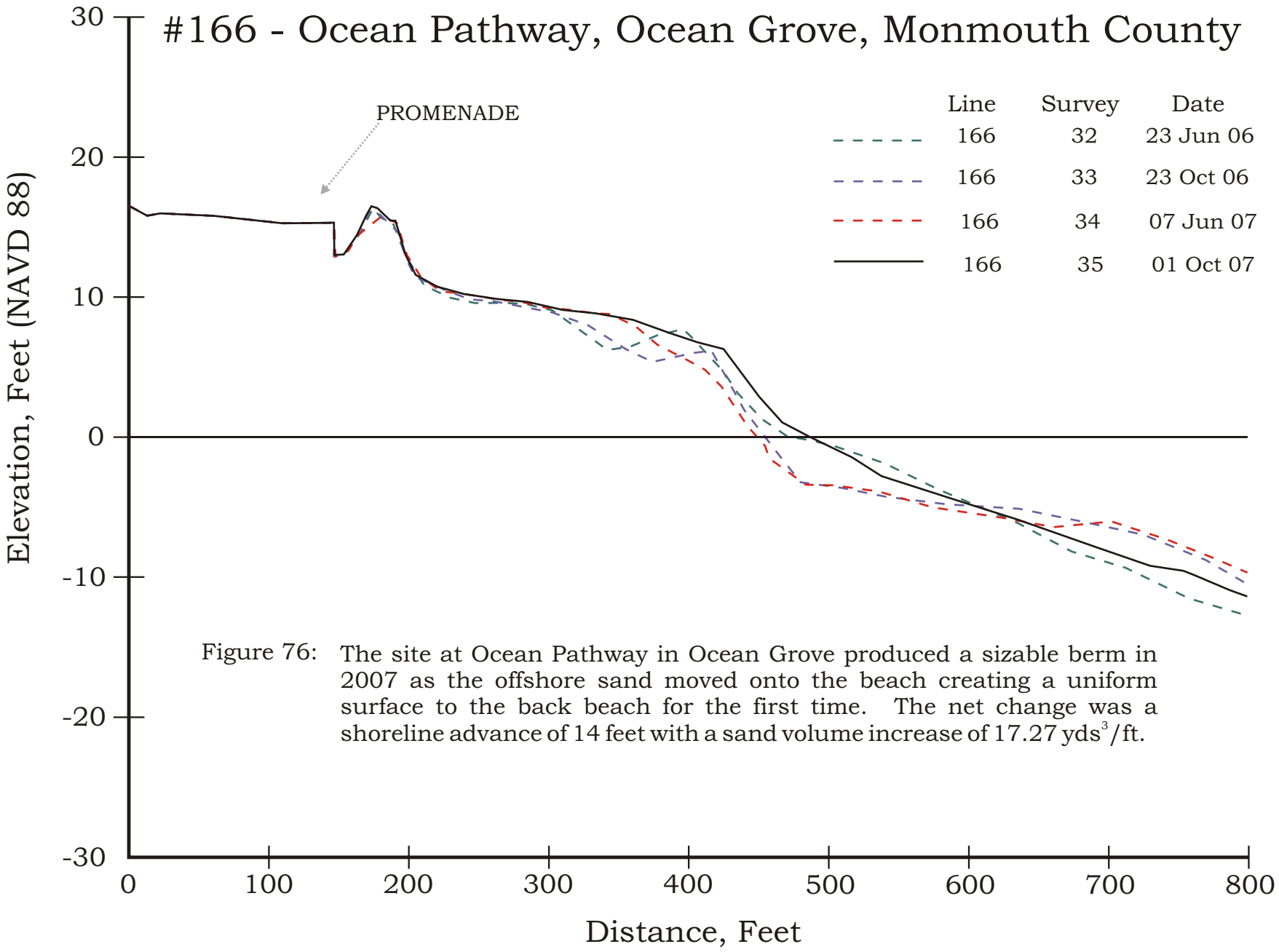



Figure 76: The site at Ocean Pathway in Ocean Grove produced a sizable berm in 2007 as the offshore sand moved onto the beach creating a uniform surface to the back beach for the first time. The net change was a shoreline advance of 14 feet with a sand volume increase of 17.27 $yds^3/ft$.

Figure 77. Dunes were incorporated into the beach project in Bradley Beach creating a totally new look for the oceanfront. The high tide came under the boardwalk in 1992 damaging most of it. The boardwalk was removed from the beach and rebuilt as a promenade on the seaward edge of the bluff. The western half of the dune field occupies the former position of the boardwalk. This photograph was taken June 26, 2006.

# McCABE AVENUE, BRADLEY BEACH
# SITE 165

Figure 78. The same view taken October 10, 2007 shows the dune fencing having trapped a sizable wedge of sand at the toe. The profiles show some growth in both height and width of the dunes. The berm was also well developed as a result of extensive cross shore sand movement during the 2007 summer. The net change was a sand volume increase of 1.09 $yds^3$/ft. with a 21-foot retreat in the shoreline position. The June 26$^{th}$ berm was slightly wider in 2006, so the higher feature in 2007 had a steeper seaward slope to the beachface, but the shoreline maintained a constant sand volume over 18-months.

# New Jersey Beach Profile Network

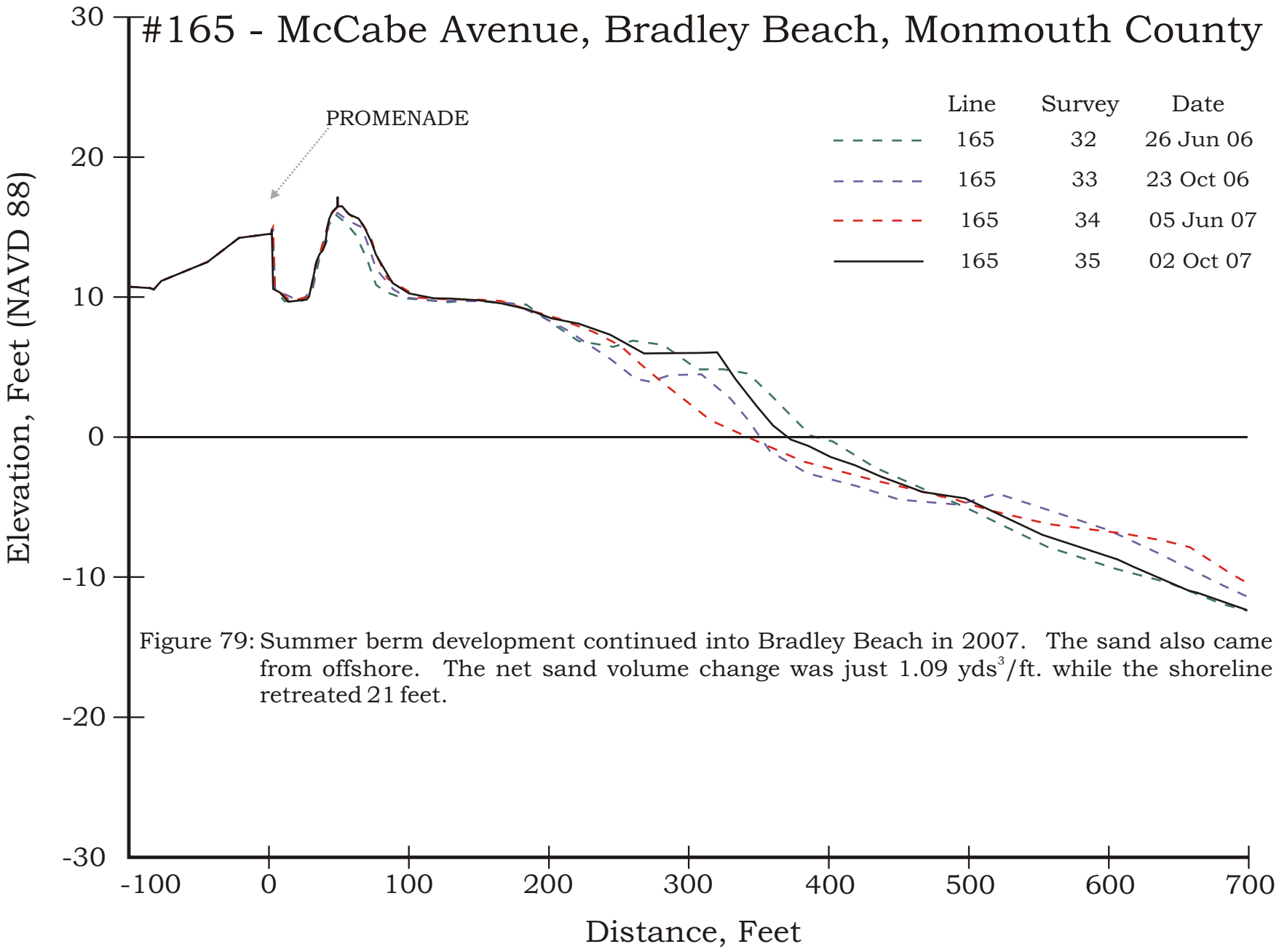



Figure 79: Summer berm development continued into Bradley Beach in 2007. The sand also came from offshore. The net sand volume change was just 1.09 $yds^3/ft.$ while the shoreline retreated 21 feet.

Figure 80. The Avon beach remains with a 200-foot wide berm and a pattern of cross shore sand transport recreating the summer beach profile from 2006 with that deposited on the beach during the summer of 2007. The picture to the left was taken June 26, 2006.

# SYLVANIA AVENUE, AVON BY THE SEA
# SITE 164

Figure 81. By October 2, 2007 the beach, now absent the tourists, remained in excellent condition. The seasonal shift in sand position in 2007 saw 6.21 $yds^3$/ft. added to the berm between June 5$^{th}$ and October 2$^{nd}$ while 27.28 $yds^3$/ft. was removed from the offshore slope. The shoreline position only changed by 1.5 feet. The 18-month change was a loss of 23.26 $yds^3$/ft. with a 21-foot shoreline retreat. This segment of the Federal project is quite stable.

# New Jersey Beach Profile Network

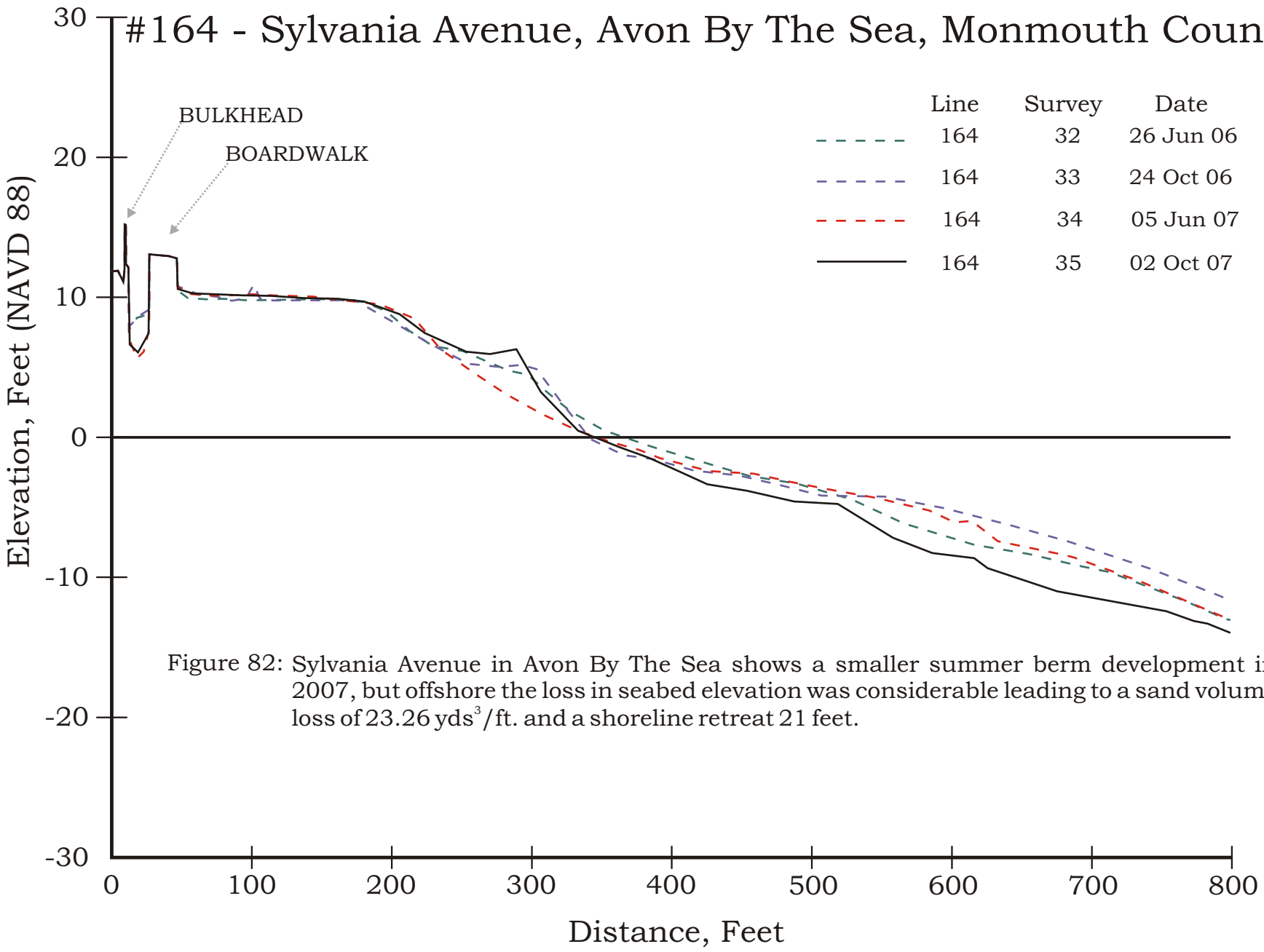



Figure 82: Sylvania Avenue in Avon By The Sea shows a smaller summer berm development in 2007, but offshore the loss in seabed elevation was considerable leading to a sand volume loss of 23.26 $yds^3$/ft. and a shoreline retreat 21 feet.

Figure 83. Located just south of Shark River Inlet, this beach has been at least 250 feet wide for decades due to the sand-trapping effect of the Shark River jetties. No nourishment sand was put here for that reason, but sand movement has added to the width over the past 7 years. The photograph was taken June 19, 2006.

## 5th AVENUE, BELMAR - SITE 163



Figure 84. The October 2, 2007 view is to the north and was taken in the middle of the beach between the boardwalk and the berm. The Belmar fishing pier located at the inlet shows in the distance. The last 18 months has seen an 8.95 $yds^3$/ft. addition to the sand volume with a 3-foot retreat in the shoreline position. This represents nearly no change on a beach this wide.

# New Jersey Beach Profile Network

## #163 - 5th Avenue, Belmar, Monmouth County

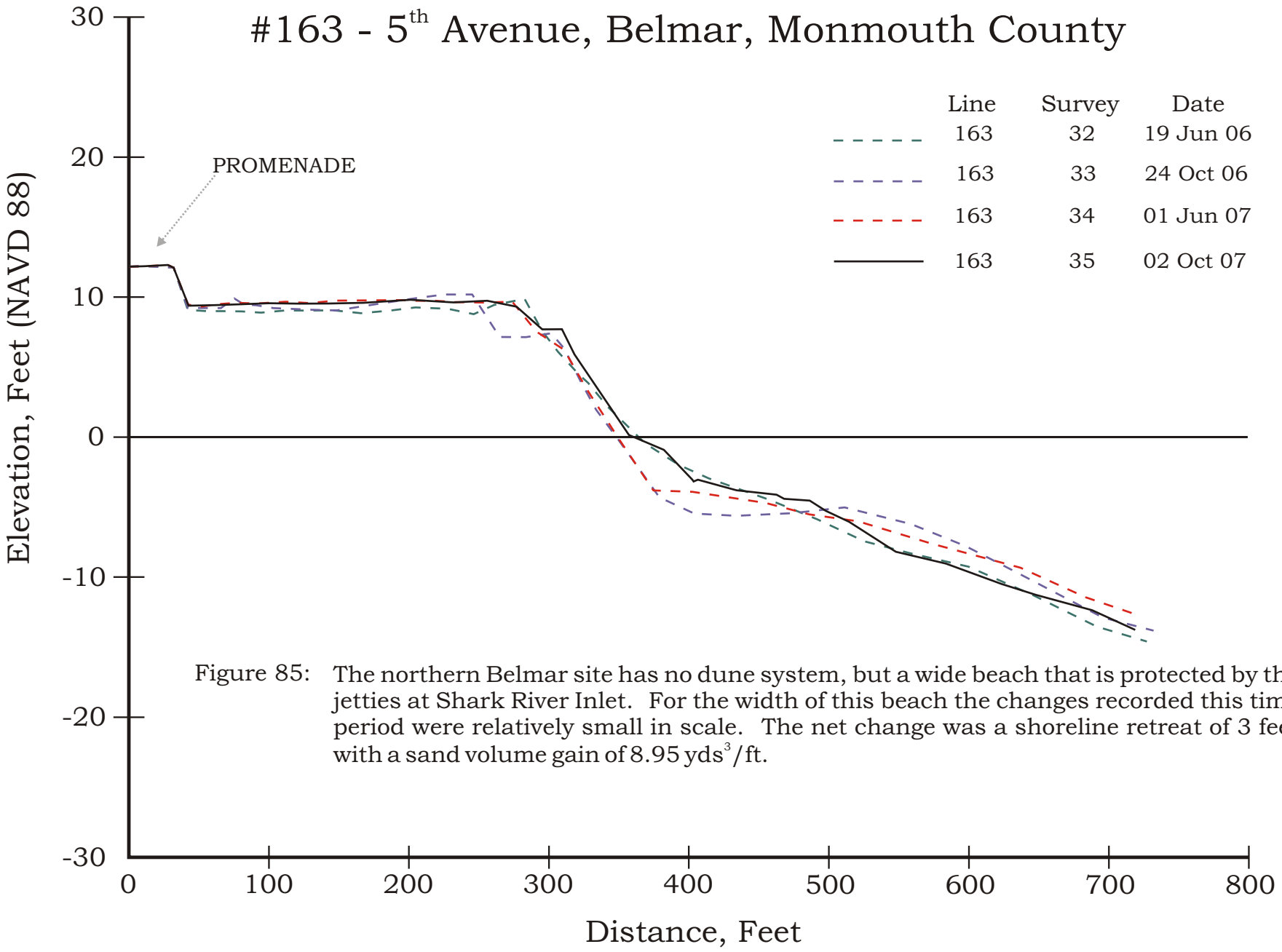



Figure 85: The northern Belmar site has no dune system, but a wide beach that is protected by the jetties at Shark River Inlet. For the width of this beach the changes recorded this time period were relatively small in scale. The net change was a shoreline retreat of 3 feet with a sand volume gain of 8.95 $yds^3/ft$.

Figure 86. The southern Belmar beach expands and retreats each year by a larger percentage. The new boardwalk has a well maintained dune with minimal storm resistance, but it looks great while walking along the "walk". This picture was taken June 19, 2006

## 18th AVENUE, BELMAR – SITE 162

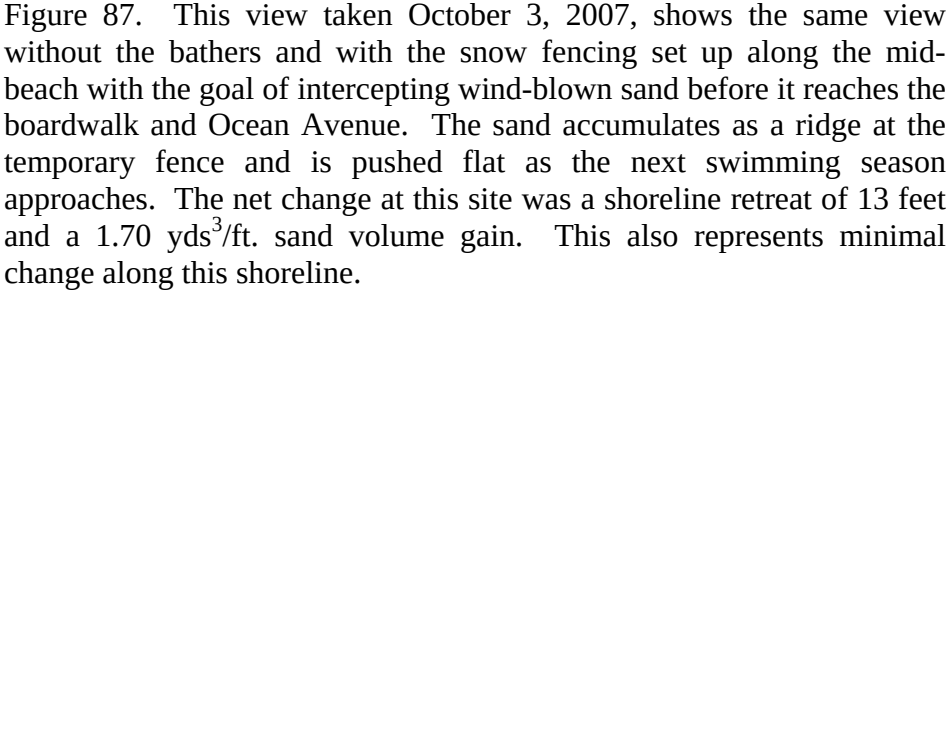


Figure 87. This view taken October 3, 2007, shows the same view without the bathers and with the snow fencing set up along the mid-beach with the goal of intercepting wind-blown sand before it reaches the boardwalk and Ocean Avenue. The sand accumulates as a ridge at the temporary fence and is pushed flat as the next swimming season approaches. The net change at this site was a shoreline retreat of 13 feet and a 1.70 $yds^3$/ft. sand volume gain. This also represents minimal change along this shoreline.

# New Jersey Beach Profile Network

## #162 - 18th Avenue, Belmar, Monmouth County

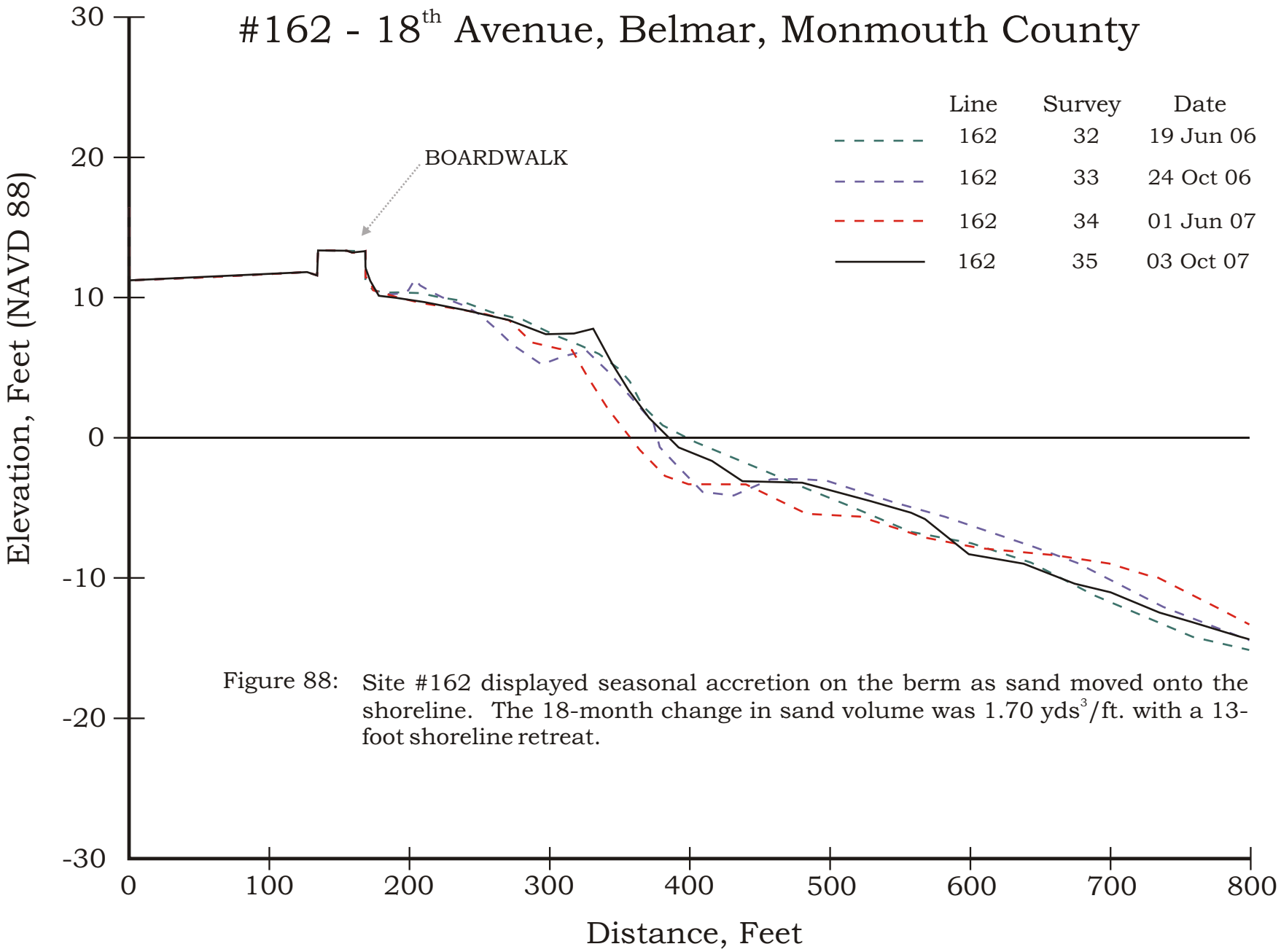



Figure 88: Site #162 displayed seasonal accretion on the berm as sand moved onto the shoreline. The 18-month change in sand volume was 1.70 $yds^3$/ft. with a 13-foot shoreline retreat.

Figure 89. The Spring Lake beach has a dune positioned between the boardwalk and Ocean Avenue that has been present for decades prior to the Federal Project. The impact here has been the gradual filling in of the space between the western edge of the boardwalk and the dune effectively widening it. The negative aspect is that should waves reach the boardwalk in force, they will impact the dune's seaward edge and smash the boardwalk deck as the water goes vertical. Photograph date was June 19, 2006

# BRIGHTON AVENUE, SPRING LAKE
# SITE 161



Figure 90. The October 3, 2007 situation shows the beach looking north from the middle of the dry berm. This past 18 months the shifts were very minimal between June 16th and October 25th 2006, but much more dramatic between June 1st and October 3rd 2007. The 2007 season saw a gain of 19.32 $yds^3$/ft. as the offshore lost 12.51 $yds^3$/ft. with a 42-foot shoreline advance. The 18-month statistics were 6.15 $yds^3$/ft. sand volume gain with a 0.42-foot shoreline advance. This amounted to little change over this study interval.

# New Jersey Beach Profile Network

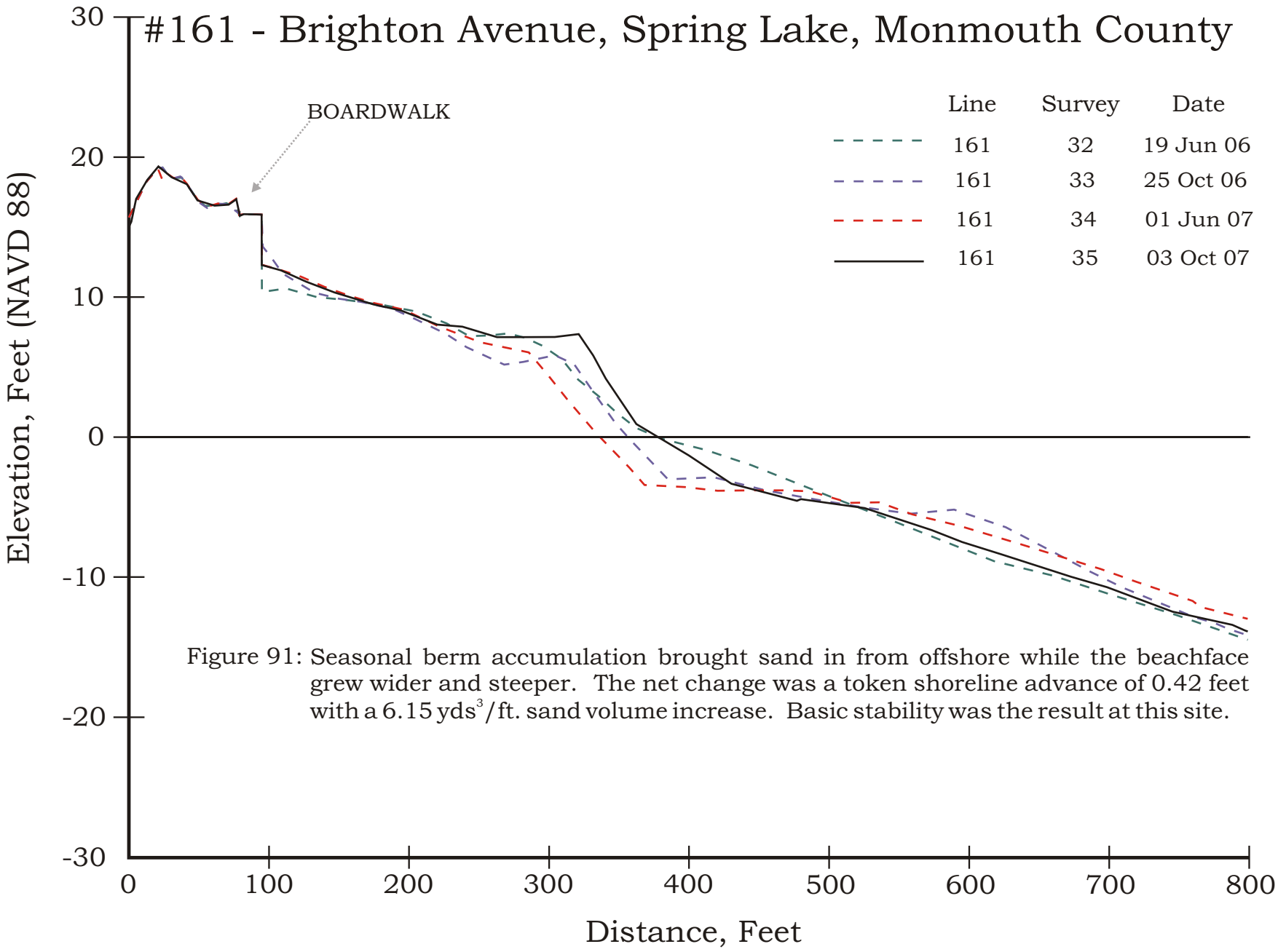



Figure 91: Seasonal berm accumulation brought sand in from offshore while the beachface grew wider and steeper. The net change was a token shoreline advance of 0.42 feet with a 6.15 $yds^3$/ft. sand volume increase. Basic stability was the result at this site.

Figure 92. On June 12, 2006, the beach was graded off for the coming swimming season. The structure on the left has been a central municipal bathing area for at least 75 years. It houses changing rooms, showers, restrooms, snack shops and a salt water pool all for public use. The beach is always available for the daily or seasonal tag fee in the summer.

## SALEM AVENUE, SPRING LAKE
## SITE 160

Figure 93. On October 5, 2007 the beach was at a seasonal high point in terms of berm width and sand present on the beach. In the profile plot for this date there even was a sizable bar migrating toward the beach. The net change in 18 months was 5.72 $yds^3$/ft. with a 7-foot shoreline advance. In spite of a substantial seasonal accretion in 2007 (35.13 $yds^3$/ft. added to the berm from offshore together with a 43-foot shoreline advance, the site finished the study period essentially the same as it started.

# New Jersey Beach Profile Network

## #160 - Salem Avenue, Spring Lake, Monmouth County

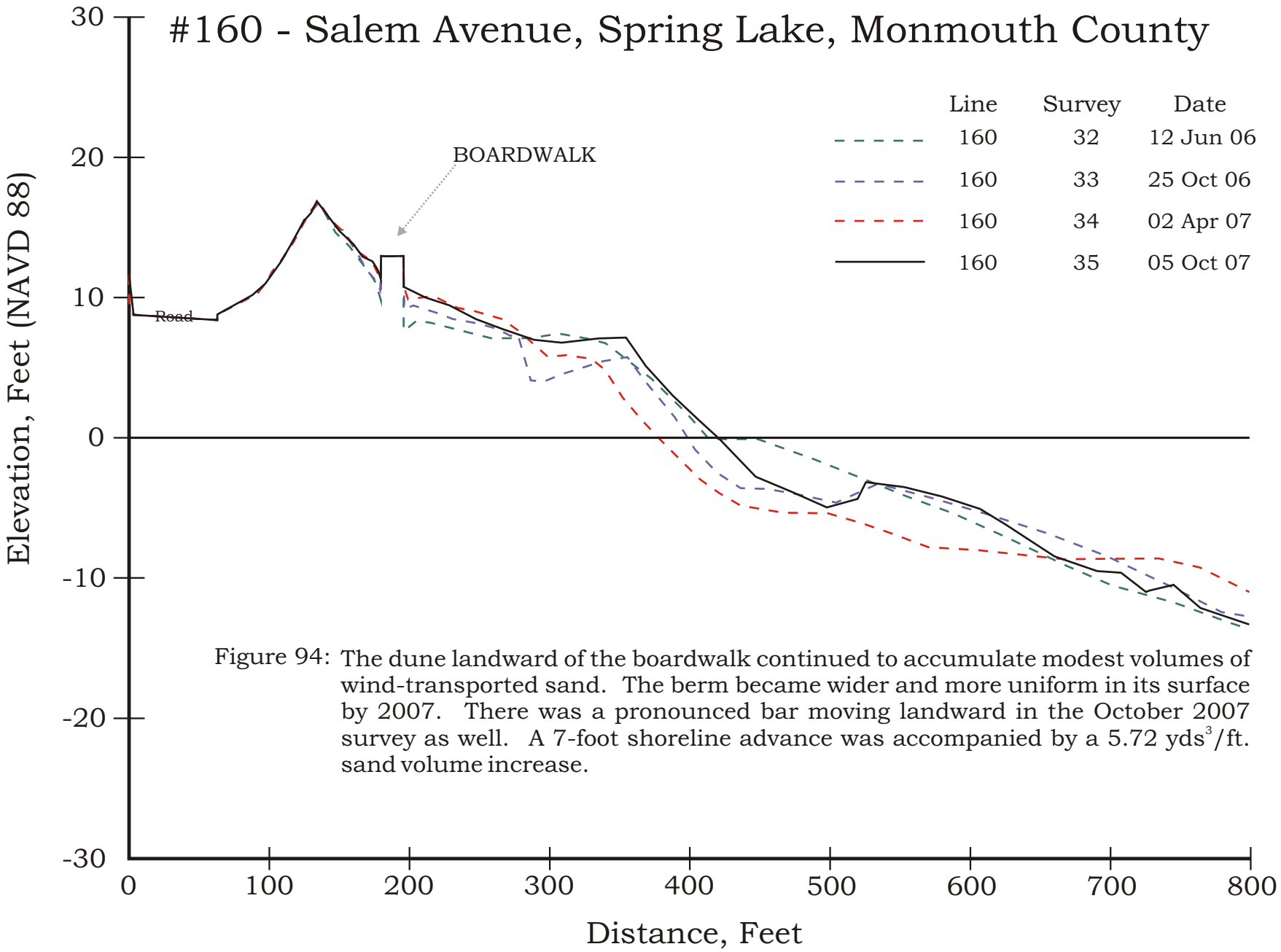



Figure 94: The dune landward of the boardwalk continued to accumulate modest volumes of wind-transported sand. The berm became wider and more uniform in its surface by 2007. There was a pronounced bar moving landward in the October 2007 survey as well. A 7-foot shoreline advance was accompanied by a 5.72 $yds^3/ft.$ sand volume increase.

Figure 95. The June 12th 2006 view of the beach shows the dune, boardwalk and the beach with about a third of the rock groins now showing.

# NEW YORK AVENUE, SEA GIRT
# SITE 159



Figure 96. The October 5, 2007 view to the right shows the same south view, but from the boardwalk. There is no dune at this cross section location because of high beach use traffic. The ridge in the photograph is another temporary storm barrier pushed up and flattened out each year. The net change was 9.19 $yds^3$/ft. in beach volume increase with a 23-foot shoreline advance.

# New Jersey Beach Profile Network

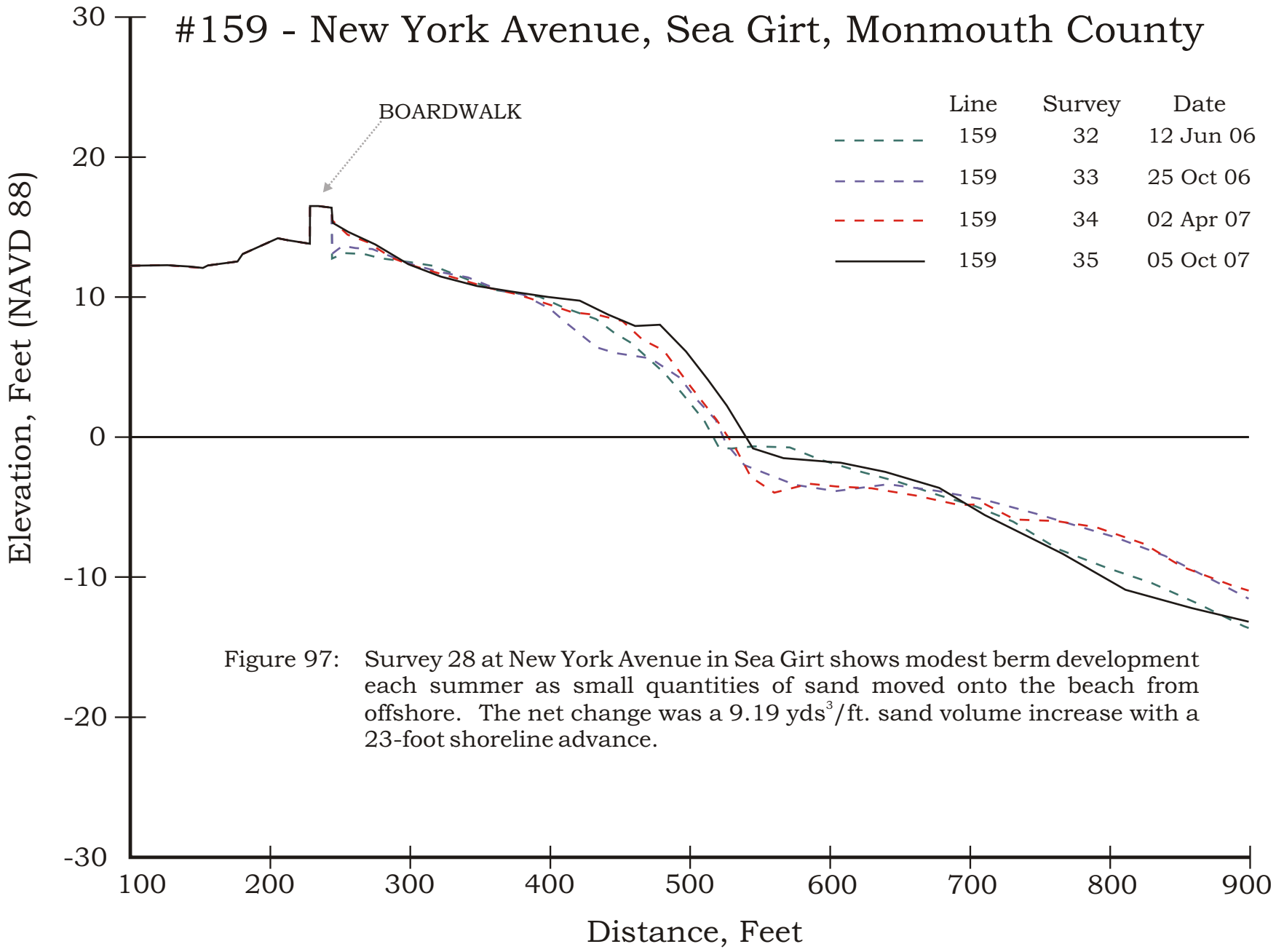



Figure 97: Survey 28 at New York Avenue in Sea Girt shows modest berm development each summer as small quantities of sand moved onto the beach from offshore. The net change was a 9.19 $yds^3/ft.$ sand volume increase with a 23-foot shoreline advance.

Figure 98. The May 5, 2006 photograph is of the beach between the boardwalk and the shoreline in southern Sea Girt. The slope up to the boardwalk has been filling in since the Federal project was completed. Keep in mind that in 1995 the high tide line was west of this boardwalk and it was about 10 feet down from its surface to the sand.

# TRENTON AVENUE, SEA GIRT
# SITE 158

Figure 99. The dune scarp was once at the ends of the fencing between properties about 50 feet landward of the boardwalk prior to the beach nourishment. All the material between the boardwalk and the old scarp has accumulated from the beach nourishment project. The seasonal shift in beach position in 2007 was the most impressive along this shoreline. The beach gained 53.99 $yds^3$/ft. as the shoreline advanced 36 feet seaward (see plot). 18.71 $yds^3$/ft. came from offshore to 968 feet from the reference location. The net change over 18 months was loss of 16.54 $yds^3$/ft. and a 25-foot shoreline retreat from the May 2006 position. This loss shows as a beachface retreat, but sand was poised to move onto the shoreline as late at the October 5th 2007 survey.

# New Jersey Beach Profile Network

## #158 - Trenton Avenue, Sea Girt, Monmouth County

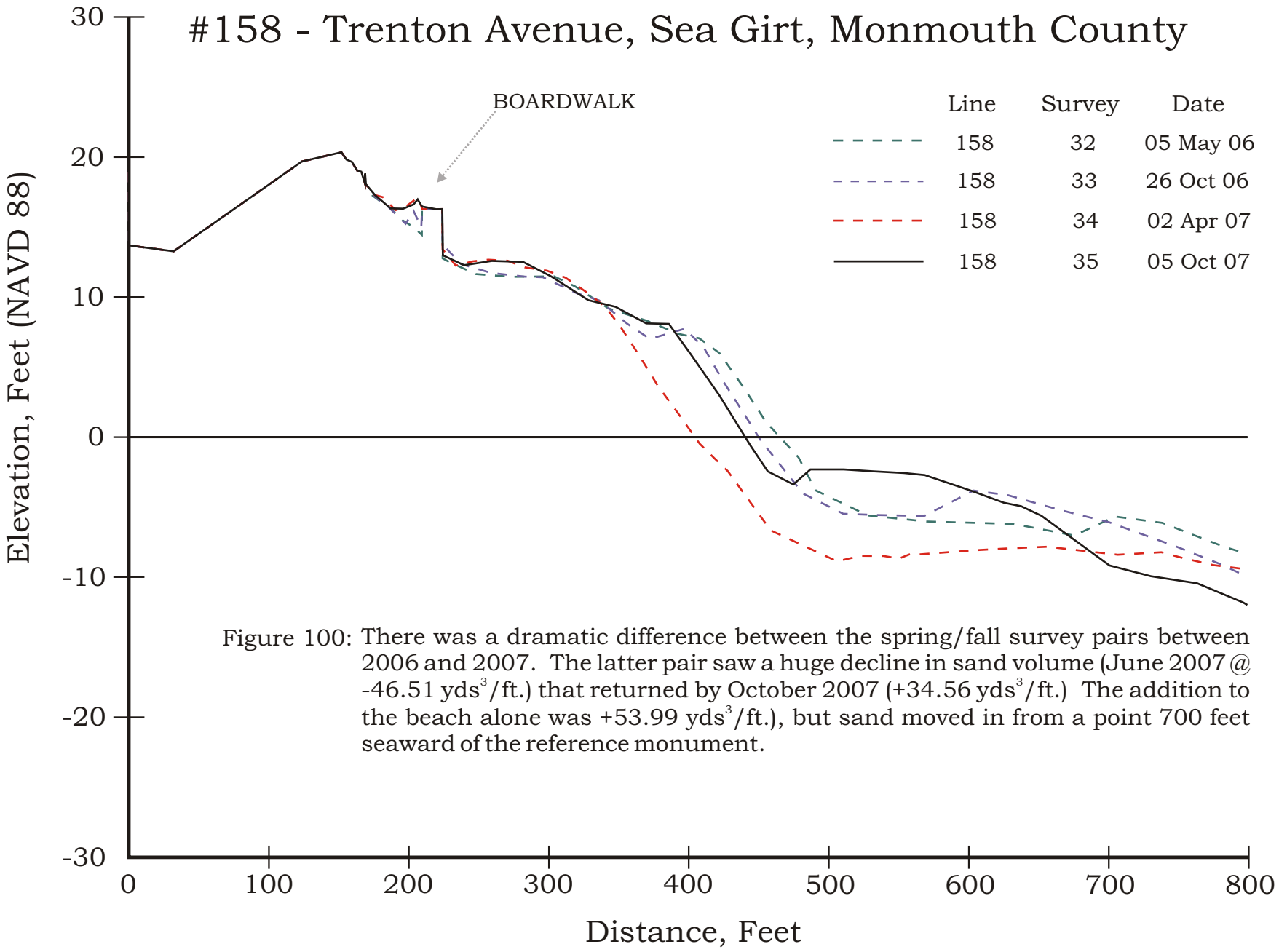



Figure 100: There was a dramatic difference between the spring/fall survey pairs between 2006 and 2007. The latter pair saw a huge decline in sand volume (June 2007 @ -46.51 $yds^3$/ft.) that returned by October 2007 (+34.56 $yds^3$/ft.) The addition to the beach alone was +53.99 $yds^3$/ft.), but sand moved in from a point 700 feet seaward of the reference monument.

Figure 101. Riddle Way is about in the center of the Manasquan municipal shoreline. The beach seaward of the dunes is entirely Federal nourishment sand. The dunes have developed substantially since the project was completed. This picture was taken May 3, 2006.

# RIDDLE WAY, MANASQUAN
# SITE 157

Figure 102. The summer to fall 2007 sediment exchange was relatively small compared to the change between the summer of 2006 and 2007. In 2006 the offshore bar contained 18.23 $yds^3$/ft. that appears from the plots to have vanished by 2007. The net change was -11.49 $yds^3$/ft. with a 9-foot shoreline advance over 18 months.

# New Jersey Beach Profile Network

## #157 - Riddle Way, Manasquan, Monmouth County

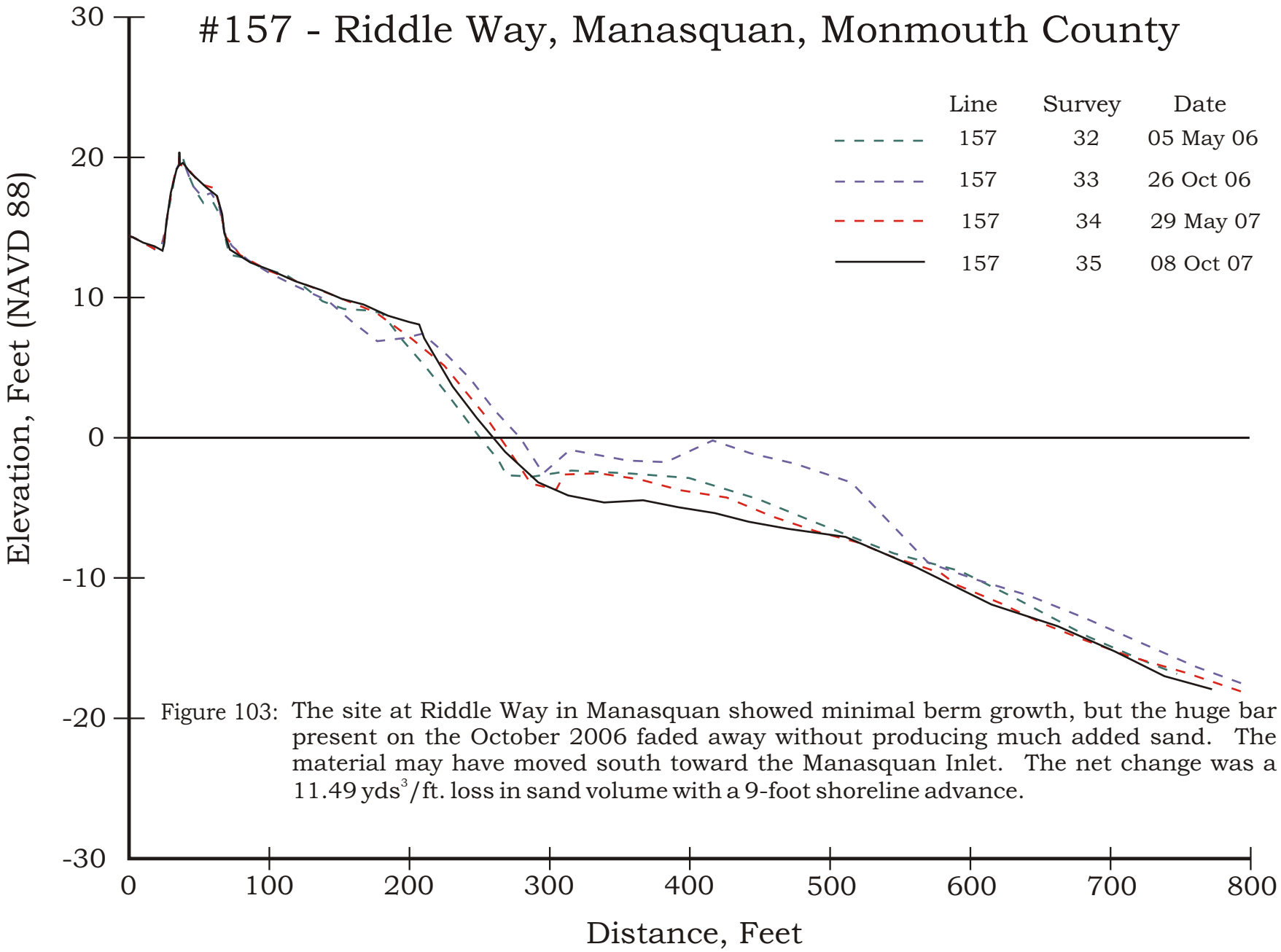



Figure 103: The site at Riddle Way in Manasquan showed minimal berm growth, but the huge bar present on the October 2006 faded away without producing much added sand. The material may have moved south toward the Manasquan Inlet. The net change was a 11.49 $yds^3$/ft. loss in sand volume with a 9-foot shoreline advance.

Figure 104. This May 5, 2006 view to the north along the Manasquan shoreline shows the beach near the Manasquan Inlet. The dune has enlarged greatly since it was established in the early 1990's just prior to the December 1992 storm.

# POMPANO AVENUE, MANASQUAN
# SITE 256

Figure 105. The October 8, 2007 shot shows the development and promenade landward of the dunes in Manasquan. There has been some strife over the years as owners of the homes adjusted to the dune field. As homes turn over the new owner accepts the conditions present at the time of purchase as "the way it is", since they are unaware of the change. The beach by October 8th was slightly more sand-rich than it was at other times. The gain on the beach was 6.11 $yds^3$/ft., but the offshore lost 24.13 $yds^3$/ft. During the study interval the entire cross section lost 35.76 $yds^3$/ft and the shoreline advanced 5 feet. The lost material most likely was transferred to the Manasquan Inlet ebb-tidal shoals.

# New Jersey Beach Profile Network

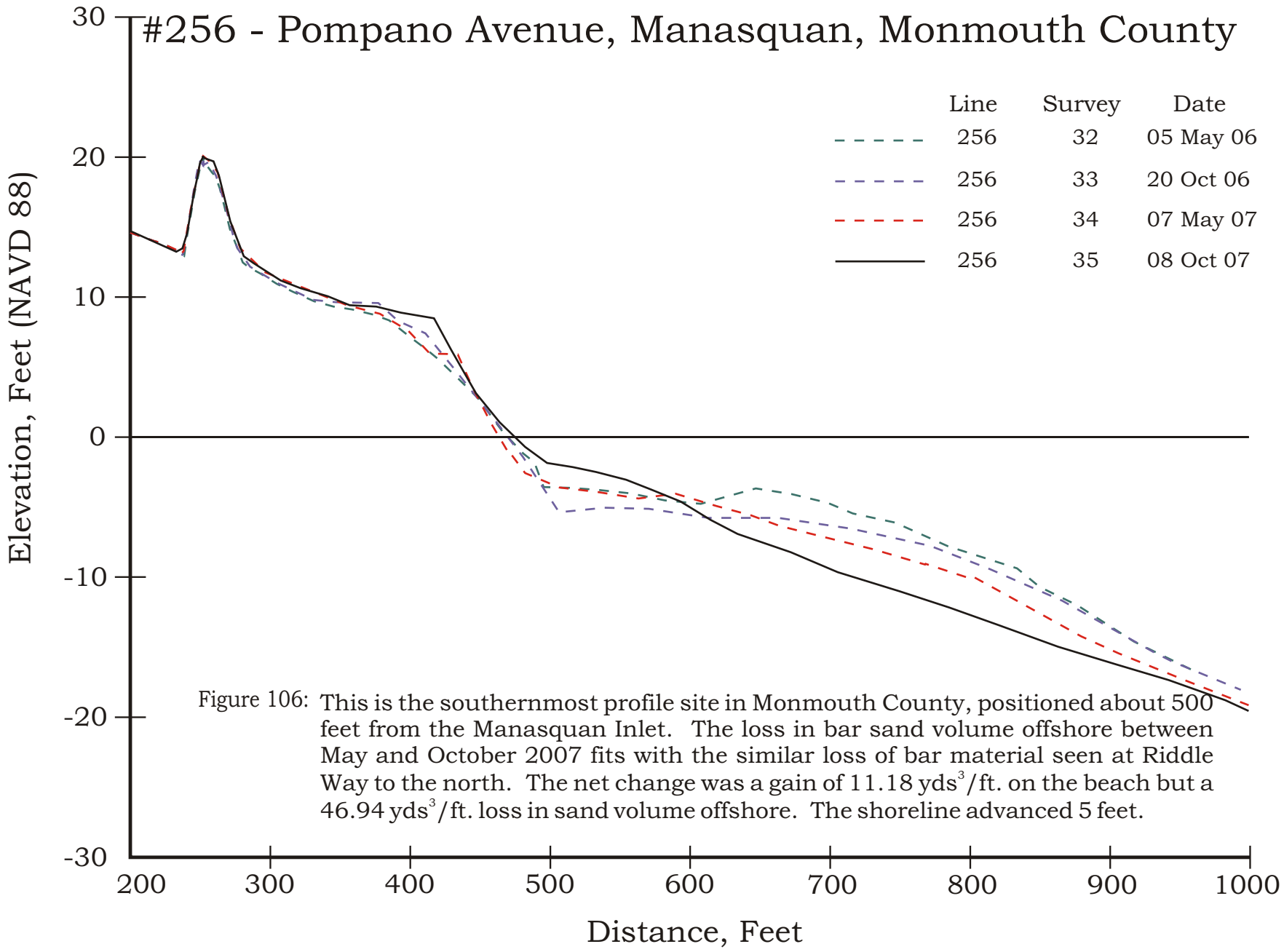



Figure 106: This is the southernmost profile site in Monmouth County, positioned about 500 feet from the Manasquan Inlet. The loss in bar sand volume offshore between May and October 2007 fits with the similar loss of bar material seen at Riddle Way to the north. The net change was a gain of 11.18 $yds^3/ft.$ on the beach but a 46.94 $yds^3/ft.$ loss in sand volume offshore. The shoreline advanced 5 feet.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