



# New Jersey Beach Profile Network

## Cape May County

Great Egg Harbor Inlet  
to Stow Creek

NJBPN Profile #'s  
225 - 100

## New Jersey Beach Profile Network Cape May County Site Locations

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

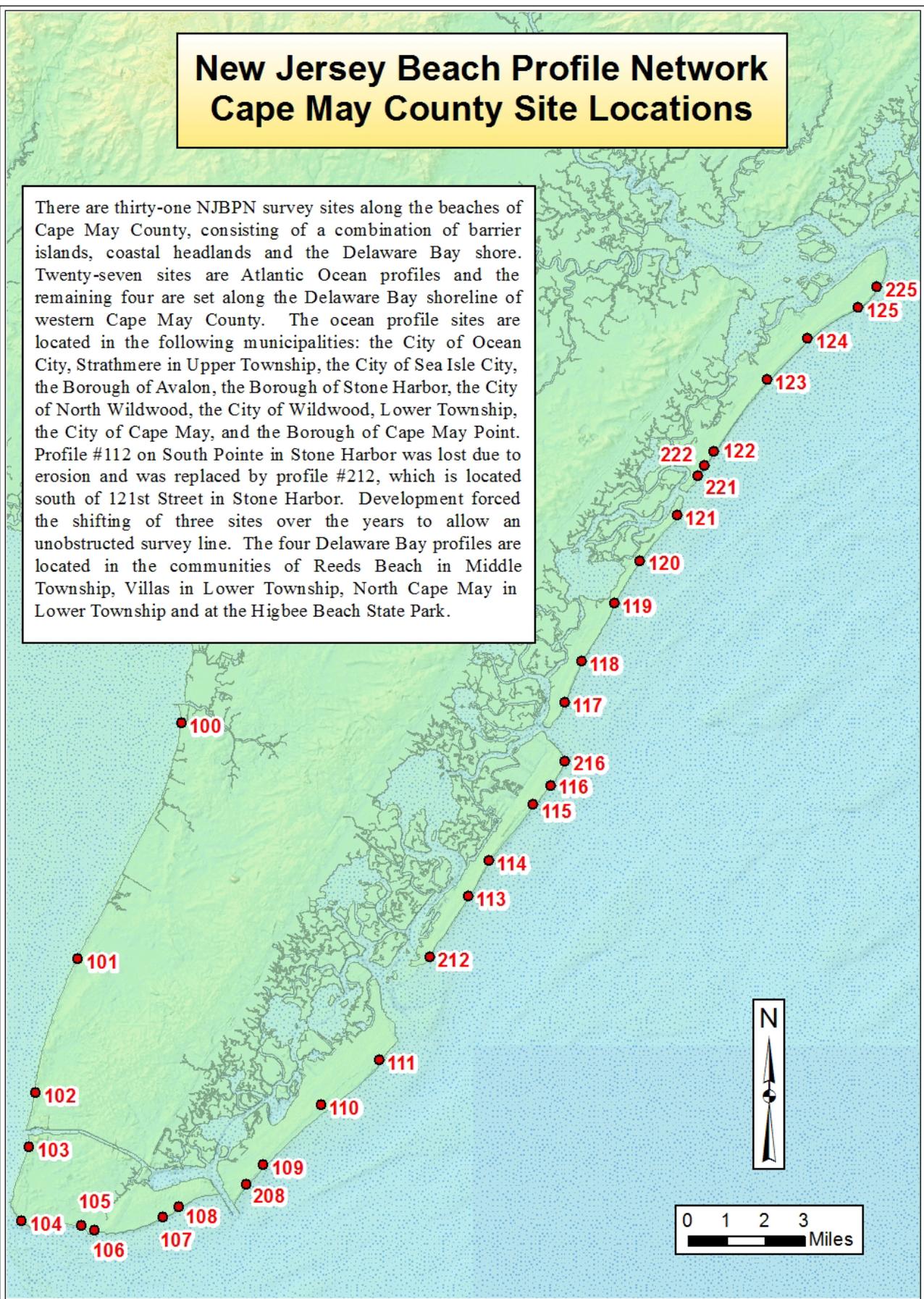


Figure 147. Map of Cape May County showing the locations of the 31 profile sites in the county.

## **Cape May County Oceanfront and Delaware Bay:**

There are 31 NJBPN survey stations in Cape May County between Reeds Beach on the Western Cape May County Delaware Bay shoreline, around Cape May Point and up the ocean coastline to Great Egg Inlet in Ocean City. This county has five tidal inlets separating four barrier islands and a coastal geomorphic compartment that is the site of Cape May City, a US Coast Guard base and Cape May Point. This southernmost shoreline in New Jersey consists of barrier beaches, a low-relief bluff of older sediments at the shoreline plus the possible presence of a relict barrier beach (called Cape Island on old maps) from an earlier high stand in sea level prior to the Wisconsin ice sheet advance (~32,000 years ago).

Each inlet has near identical geomorphic conditions with a narrow, rapidly changing southern spit that curves deep into the inlet, a large ebb-tidal delta offshore and a distinct offset in the seaward position of the southern inlet shoreline due to wave refraction around the ebb-tidal delta. This makes the northeast corner of each island vulnerable to northeast wave conditions especially when the main tidal channel lies close to the southern shoreline of the inlet. The general northeast to southwest coastal orientation in Cape May County exacerbates the impact of northeast storms on each island's northeast-facing beaches particularly the northernmost oceanfront. This impact includes all three Atlantic County barrier islands as well, where maintaining the beach/dune system in each of the affected communities is a difficult battle with the elements.

Each island has at least one profile location where the 33-year surveying history is one of repetitive erosion cycles following each restoration attempt going back to 1983 in Ocean City and 1984 at Strathmere (NJ State/local projects followed later by Federal shore protection work). Avalon conducted a State/local project in 1987, followed 22 years later by the State and North Wildwood in 2009. Episodic deposition has occurred in the mid-section of the four barrier islands yielding generous dunes and wide beaches (20<sup>th</sup> Street in Ocean City, Williams Road in Strathmere, 35<sup>th</sup> to 56<sup>th</sup> Streets in Avalon, and Cresse Avenue in Wildwood Crest). Sand moves eventually to the southern tip of each island creating a rapidly changing environment at the northern side of each tidal inlet (Corson's Inlet state park, Townsend's Inlet, South Point in Stone Harbor, and the Cape May Nature Conservancy). During an extended period of sand starvation along the Stone Harbor shoreline in the late 1980's, the entire South Point spit eroded away and became an array of shallow sub-tidal shoals in Hereford Inlet. A state/local project in 1997 built a base sand supply for rapid spit growth following the 2003 initial federal project in Stone Harbor eventually to recreate South Point (in 2016) as a 7,500-foot long supra-tidal platform for shore birds. This spit remains as a reconstituted feature, the direct result of beach nourishment.

The large scale federal shore protection projects did guarantee the acceleration of these two processes evidenced by the expansion of the Corson's Inlet State Park, the growth of beach width at the south end of Sea Isle City and the spectacular growth in South Point on Seven-Mile Island since 1995 are all entirely due to beach nourishment in Cape May County coastal communities. The expansion of The Nature Conservancy beach south of Cape May City since 1989 beach nourishment commencement in Cape May City is due to sand migration via longshore transport. In winter 2017, the USACE completed the third periodic nourishment in the area from Lower Cape May Meadows to Cape May Point (345,000 cubic yards). 2017 also saw sand placement in both Avalon and Stone Harbor derived from Townsends Inlet. Avalon Borough received about 650,000 cubic yards as of November 2019, with work completed in Ocean City and Strathmere as well. Work is anticipated in North Wildwood as soon as permits can be renewed for sand placement.

## **Delaware Bay Shoreline of Western Cape May County;**

During 2013 and 2014 habitat restoration work commenced through an umbrella of conservation groups funded with National Fish & Wildlife Foundation Hurricane Sandy recovery money. Sandy destroyed or severely damaged 70 percent of known horseshoe crab spawning habitat on the New Jersey Delaware Bay shoreline. These marsh edge beaches consist of thin veneers of coarse sand supporting spawning activity each May of the largest population of horseshoe crabs worldwide. Sandy's storm surge and waves inundated and over-washed

these low elevation beaches removing the thin veneer of sand exposing the salt marsh below, leaving an inhospitable shoreline for horseshoe crab spawning and successful egg production. Attention initially focused on restoring the western shoreline of Cape May County (Pierces Point – Reeds Beach) and included Moore’s Beach in eastern Cumberland County. This stretch of post Sandy degraded shoreline was determined as critical habitat and targeted for immediate restoration based on documented reliance on the region for spawning and subsequent migratory shorebird foraging. Red Knots and other northbound migratory shorebirds depend on the horseshoe crab eggs as a major source of nutrients during their stopover along the Delaware Bay, adding critical weight needed to complete their long flight from South America to the Arctic breeding grounds each spring. Sand for restoration was supplied from Cape May County quarries and the beaches engineered to have a steeper sloping beachface with a beach berm elevation just above normal mean higher high water. Restoration work expanded during 2015 westward along the Delaware Bay shoreline into Cumberland County (Fortescue, Thompson Beach and Dyer Cove (2016)) restoring additional sandy beach habitats suitable for horseshoe crab spawning damaged by Hurricane Sandy.

Other efforts focused on sediment distribution budgets and documentation of wave energy flux (heights, periods and direction of travel) along the lower Delaware Bay NJ shoreline. Installation of various structure types supporting oyster growth and development is providing interesting data on wave energy reduction at the sand beach. The structures act as nearshore oyster reefs to attenuate wave energy, reduce erosion rates and prolong the stability of the rebuilt beaches. Local oystermen are interested in this and similar approaches to oyster propagation as aquaculture opportunities especially viable along the bay front in Cape May County. Structures range from natural shell to “oyster castle” concrete shapes and timber and rebar platforms. Placed nearshore in water depths that expose the structures at low tide, but covers them completely during the higher tide cycle. Wave measurements have shown a reduction in incident wave energy at the beach landward of the structures versus open approach sections of the coastline. The combined efforts and methodologies helped restore the degraded shoreline and assist the migratory shorebirds including the Red Knot that depends on nutrients from horseshoe crab eggs to gain weight to complete their migration and for successful breeding.

Marsh restoration is being incorporated into the Maurice River delta area to convert extensive mud flats back into viable marsh habitat. In addition, the USACE completed a feasibility study to use dredged sands from Delaware Bay to reduce coastal storm risks in three bayshore communities. Potential sources of sand are from maintenance of the Delaware River Main Channel-Lower Reach E or from the Buoy 10 open water disposal site located one mile east of the Delaware Main Channel. In March 2018, the Township of Lower submitted a proposal to the US Army Corps of Engineers (Section 1122 of the Water Resources Development Act) for the use of this source of dredged material to improve shore protection.

### **Cape May City;**

Cape May City beaches continue to shed sand into the “Cove” beach belonging to The Nature Conservancy. These losses are remedied during the US Army Corps of Engineers work between Cold Spring Inlet and Cape May Point. Added studies were approved by the City in 2016 to better understand the beach configuration and seaward slope data following a number of injury complaints alleged to be the result of a too steep a beach and enhanced wave breaking at the beach. However, an administration change in the fall of 2016 election resulted in suspending this municipal study.

### **The Wildwoods;**

The North Wildwood beaches continue to lose sand primarily at the northeastern end of the island at Hereford Inlet. Sand back-passing from Wildwood City has been quite successful in holding the shoreline without returning to the ebb-tidal delta deposit in Hereford Inlet.

Work by the Philadelphia District USACE continues toward an approved design document for the Wildwoods that includes sand harvesting from Wildwood and Wildwood Crest and passing it back north to the erosion zone

in North Wildwood instead of pumping in new sand from offshore or from the Hereford Inlet tidal shoals. The City of North Wildwood conducted sand harvesting work as well transferring 200,000 cy of Wildwood sand north in early 2017 and again by May 24, 2018. Interactions with the Dept. of the Interior regarding use of Hereford Inlet's ebb-tidal delta as a sand source produced agreement from the Dept. Secretary to allow access to the authorized borrow zone for hydraulic dredging for beach nourishment. This use was allowed under the exceptions to employing federal funding within the NJ Coastal Barrier Resource Unit #9 (Hereford Inlet).

### **Avalon & Stone Harbor;**

These two communities have been leaders in shore protection by having successfully managed to have Federal shore protection projects constructed and, for years, have promoted wider, higher dunes with coordinated development of pedestrian access pathways that do not make a breach easier at street end access points. The US Army Corps of Engineers completed a project restoration from the 8<sup>th</sup> Street jetty to 31<sup>st</sup> Street in Avalon and from 70<sup>th</sup> Street in Avalon south to the terminal groin south of 123<sup>rd</sup> Street in Stone Harbor. This work was completed under PL 113-2 Emergency Restoration funds for Hurricane Sandy damage to the federal project. Since that was completed in early 2013, erosion claimed the sand to the revetment rocks at 12<sup>th</sup> Street in Avalon. The Borough conducted its individual beach project in 2015 adding 740,000 cy between 9<sup>th</sup> and 25<sup>th</sup> Streets. The USACE returned in 2017 adding over 900,000 cy to the Avalon beach. Currently a sand back-passing operation is underway to move sand from the mid-island borrow zone beaches to the erosional part of the island. Stone Harbor's southern oceanfront has suffered severe loss rates culminating in NE storm damage in early 2016 that were addressed in 2017 with some Hereford Inlet sand. Sand was also pumped from Townsend's Inlet ebb-tidal delta to Stone Harbor due to issues related to Hereford Inlet being located within a unit of the Coastal Barrier Resource System (CBRS) that prohibits federal funds for use to promote "development" within or for extraction of sediment out of the CBRS unit. This prohibition was lifted by the Dept. of the Interior Secretary in the fall of 2019.

### **Sea Isle City & Strathmere;**

A 2009 NJ State and locally sponsored shore protection project saved these two communities substantial damage from Hurricane Sandy with about 230,000 cubic yards of sand lost that was replaced starting April 17, 2015 in Ocean City under a federal responsibility for Ludlam Island. This project covered from 42<sup>nd</sup> Street to 59<sup>th</sup> Street in Ocean City and extended from Seaspray Avenue south to 93<sup>rd</sup> Street in Stone Harbor and was accomplished using sand from offshore borrow sites previously defined. Sand was added first in Ocean City, then starting in Strathmere and working south finishing at 93<sup>rd</sup> Street in Sea Isle City. Over 3.4 million cubic yards of new sand was pumped onto this island from offshore borrow sites by 2016.

The Corson's Inlet State Park shoreline south of development in Ocean City suffered dune loss of considerable magnitude during Hurricane Sandy. Since sand moves south naturally under wave dominance from the northeast, this shoreline should benefit from any sand losses in Ocean City's part of the new project. The dune will need fencing to encourage reconstruction as the beach widens. The position of the main tidal channel in Corson's Inlet has been monitored because it's position vis-à-vis the Strathmere inlet shoreline is critical to the rates of erosion observed on the southern shoreline. Restoration work is proceeding at both the Strathmere side and north of the State Park on the Ocean City side of Corson's Inlet using ebb-tidal delta sand.

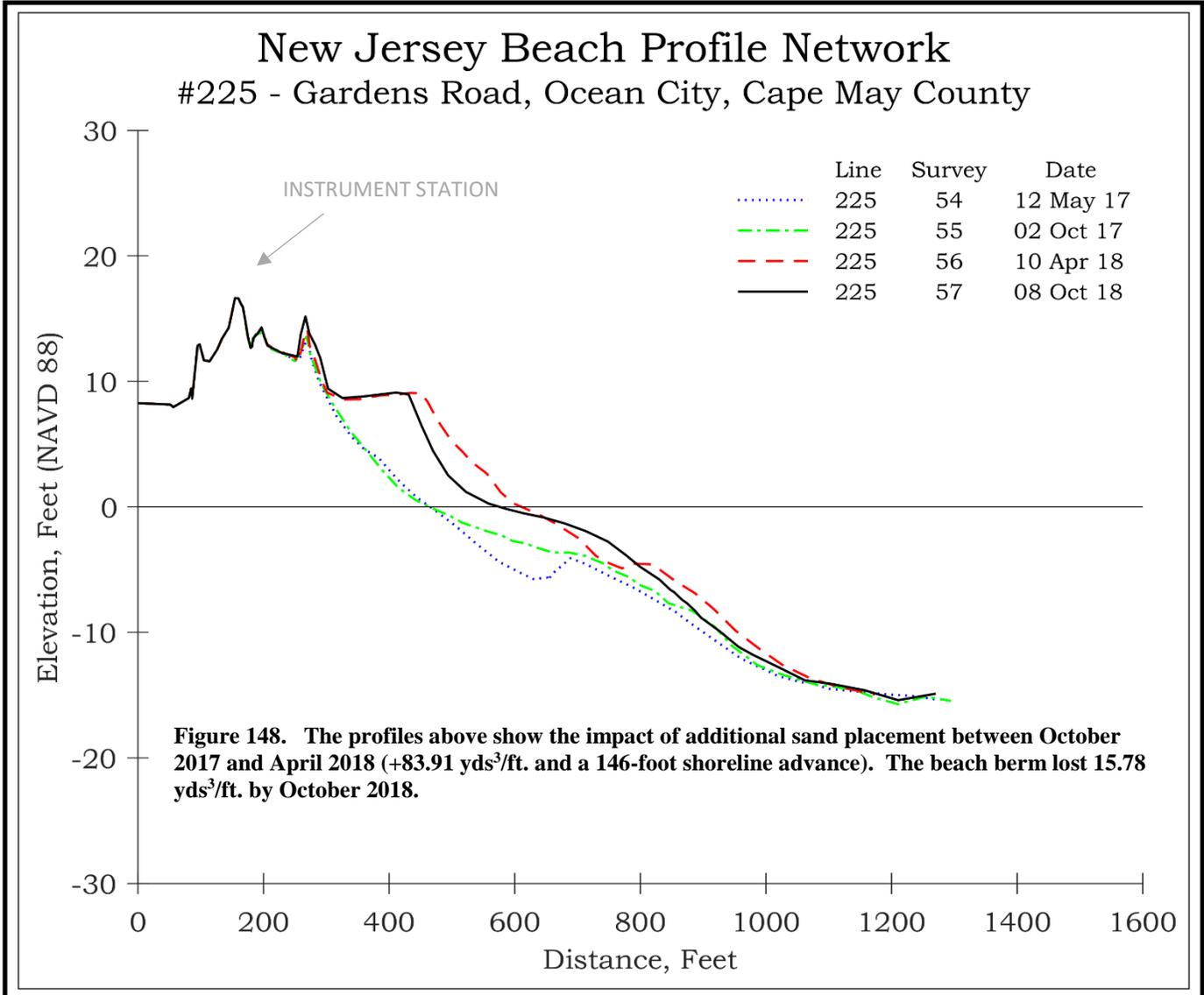
### **Ocean City;**

The Ludlam island project also included 1.5 million cubic yards of sand for the southern shoreline of Ocean City that was damaged by Hurricane Sandy due to low, narrow dunes. This places the shoreline between Great Egg Inlet in Ocean City and Hereford Inlet in Stone Harbor under USACE project jurisdiction with a 3 to 5-year expectancy of maintenance work on restoring these beaches to the design specifications.

**NJBPN 225 - Gardens Road, Ocean City**



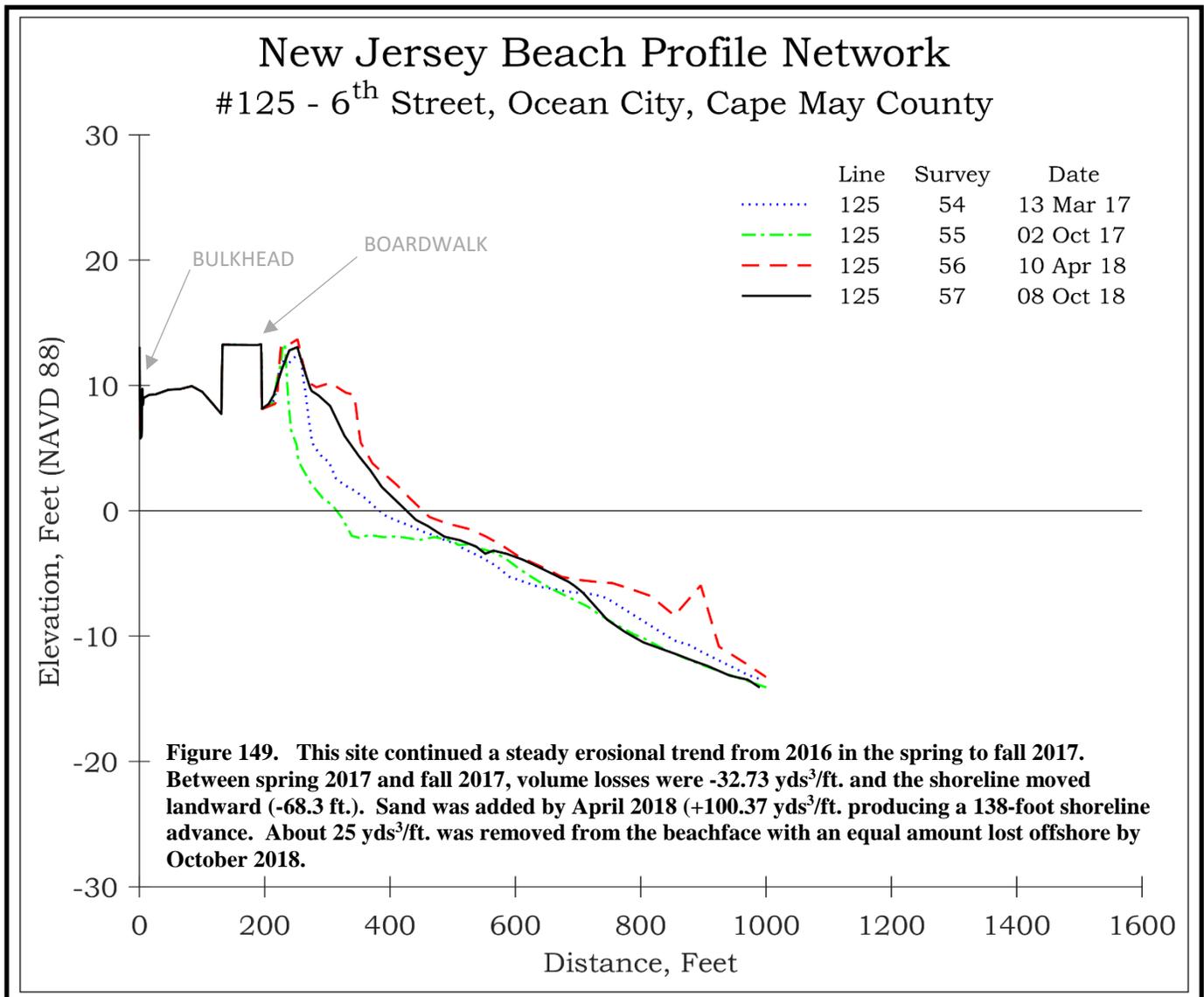
The Gardens Road site is the northernmost profile in Ocean City and located near Great Egg Harbor Inlet. (Left photo is from October 2, 2017. Right photo is from October 8, 2018). The dune and a sloping beach that was created by the 2013 Federal emergency beach fill remained to the fall of 2017. Sand was added by April 2018. The dune fencing has been buried by dune growth.



**NJBPN 125 - 6<sup>th</sup> Street, Ocean City**



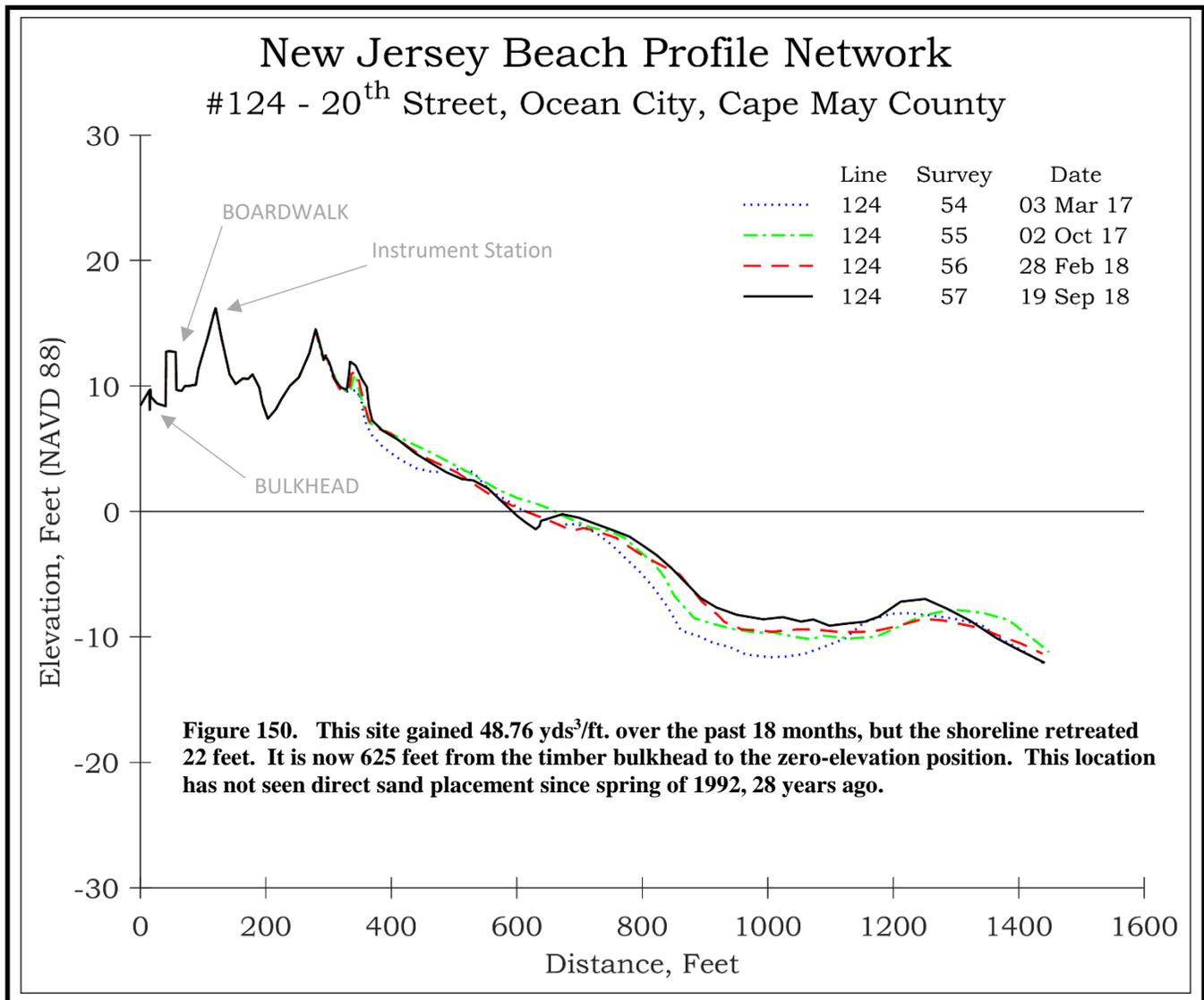
The left photo (taken October 2, 2017) shows a beach still present from the USACE (2013) beach fill, but with high tide at the eroding dune toe. The right photo (taken October 8, 2018) shows sand placed up to the scarped dune vegetation line.



**NJBPN 124 - 20<sup>th</sup> Street, Ocean City**



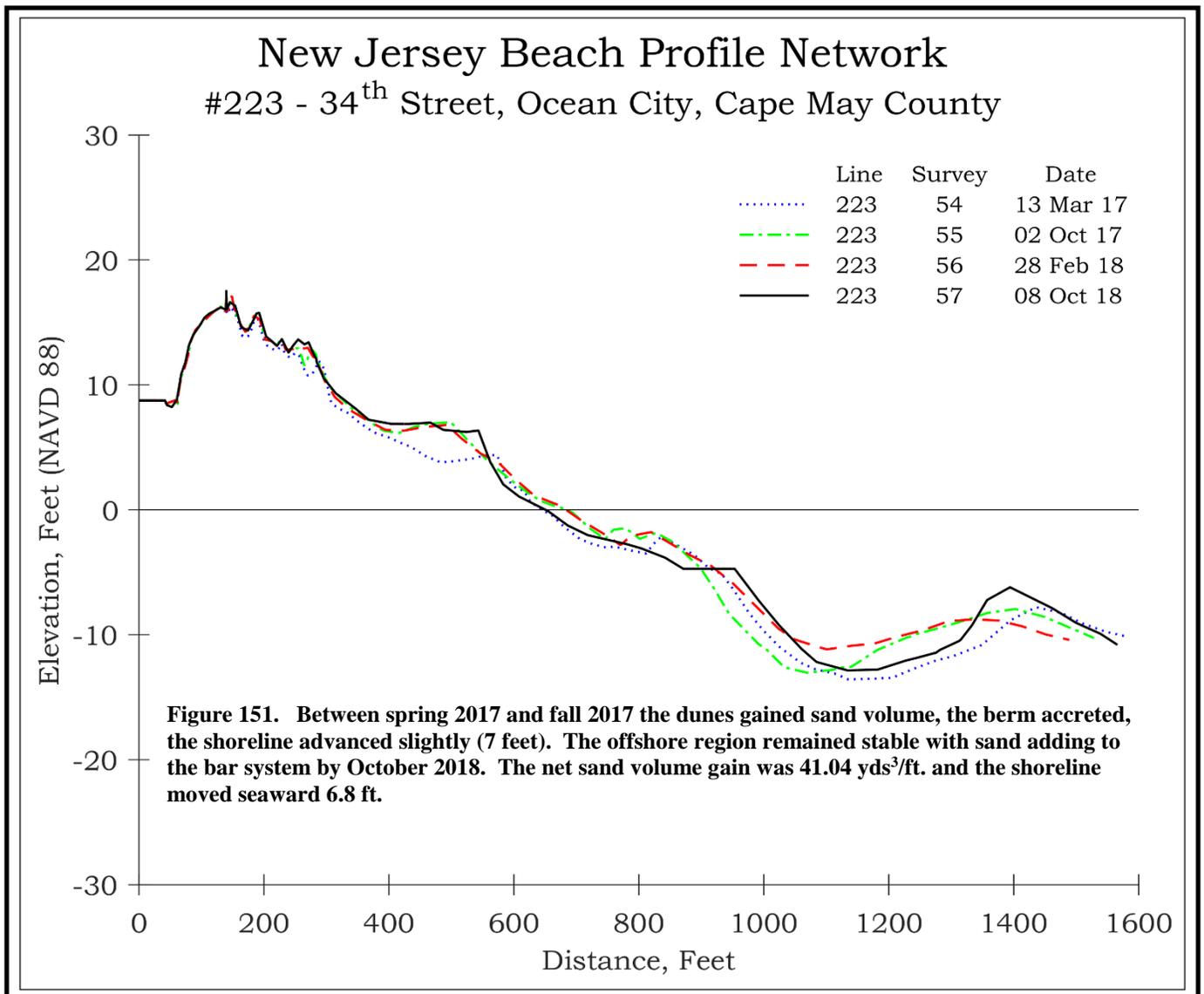
The 20<sup>th</sup> Street profile is located near the center of the island and hosts an extensive dune and wide berm. The area has been stable since the initial beach restoration in 1992. Photo on left taken October 2, 2017. Right photo taken September 19, 2018. The dune continued to move slightly seaward and there were volumetric gains between spring 2017 and fall 2018 (+48.76 yds<sup>3</sup>/ft.). The view from the instrument location provides a panoramic feeling for the expanse of this beach. In 1991, the low tide line was under the boardwalk to the extreme left of the pictures. The photo position would have been 300 feet out to sea and the ocean lies 300 feet further to the east of that position today.



NJBPN 223 - 34<sup>th</sup> Street, Ocean City



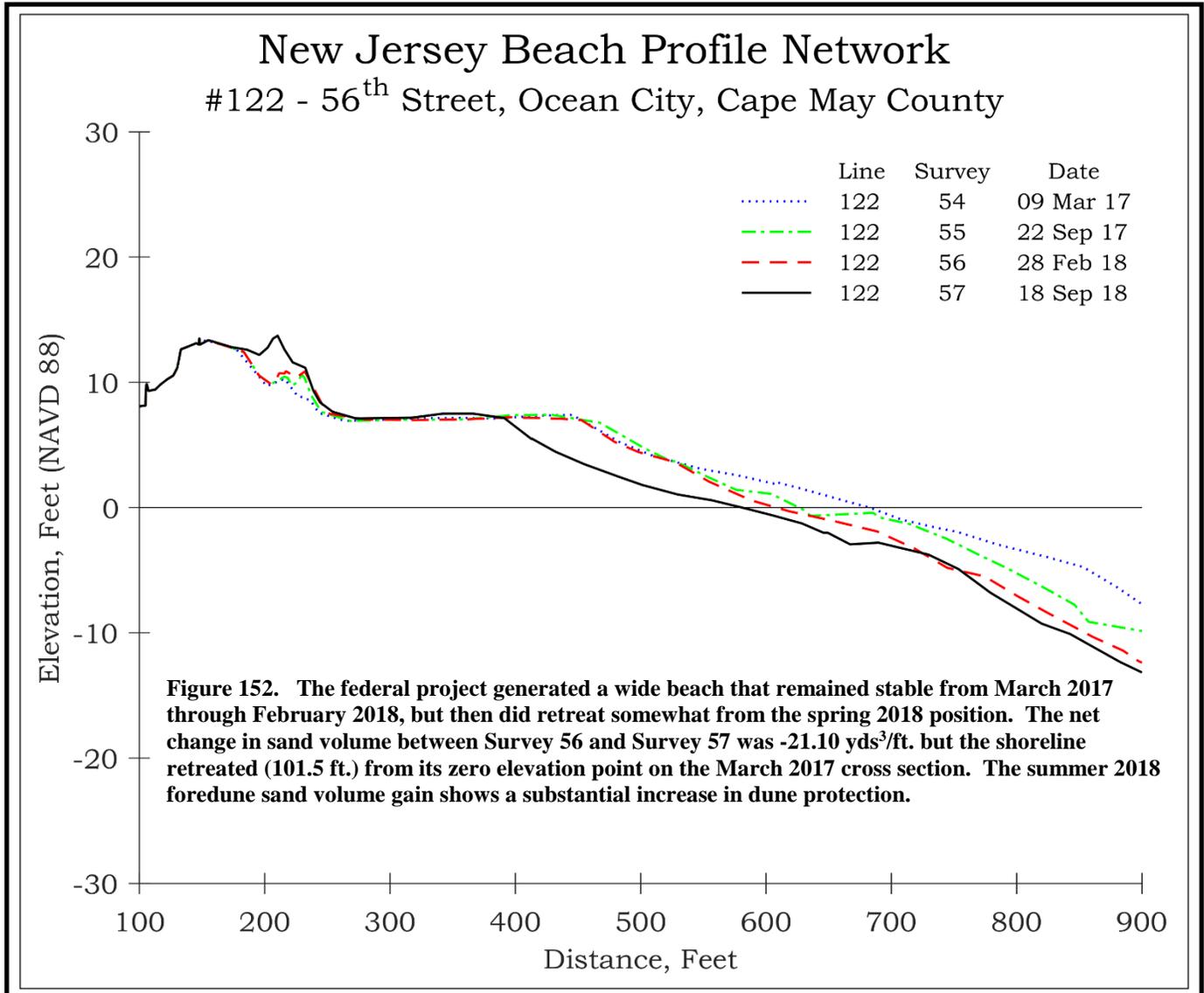
The comparison photos to the south (left taken October 2, 2017 and right photo taken October 8, 2018) show changes in dune growth over the past 18 months. The old fence from 2014 has been buried, with a new fence nearing complete burial between March 2017 and October 2018. Both vegetation and more sand appeared on this foredune area.



**NJBPN 122 - 56<sup>th</sup> Street, Ocean City**



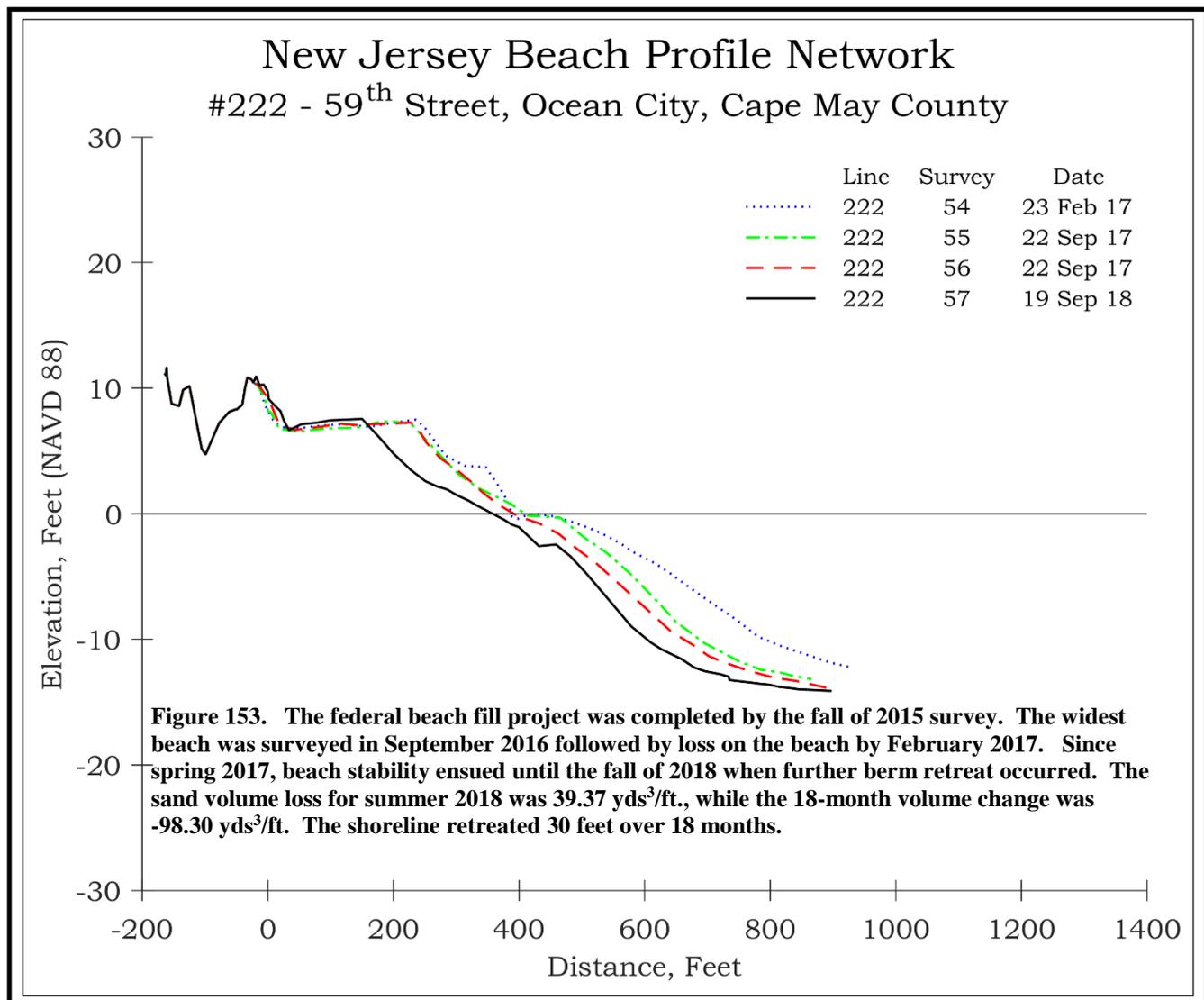
In 2015, the 56<sup>th</sup> Street site received its first sand replenishment since the 1995 state beach fill. The new dune was planted and fenced as shown on the left photograph (September 22, 2017). The right view was taken September 18, 2018 and shows that the newest line of sand fencing has been completely buried by Sept. 2018.



**NJBPN 222 - 59<sup>th</sup> Street, Ocean City**



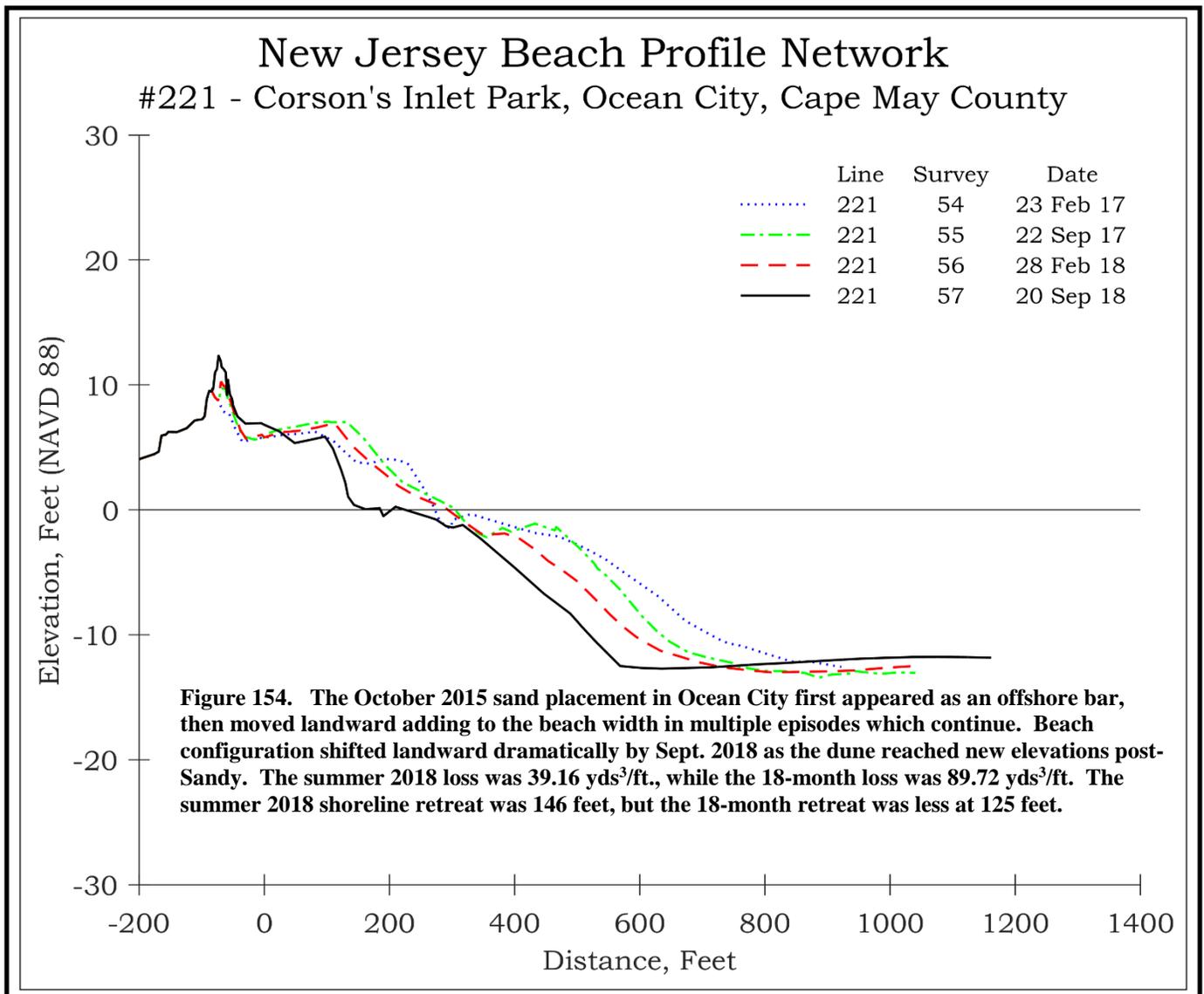
The 59<sup>th</sup> Street site is located at the southern end of the developed section of Ocean City within the Corson's Inlet State Park. This site is also within the 2015 federal beach fill project area. (Left photo taken September 22, 2017. Right photo taken September 19, 2018). Dune growth has continued due to the generous beach width supplying sand. While some retreat occurred at the berm and shoreline.



**NJBPN 221 - Corson's Inlet State Park, Ocean City**



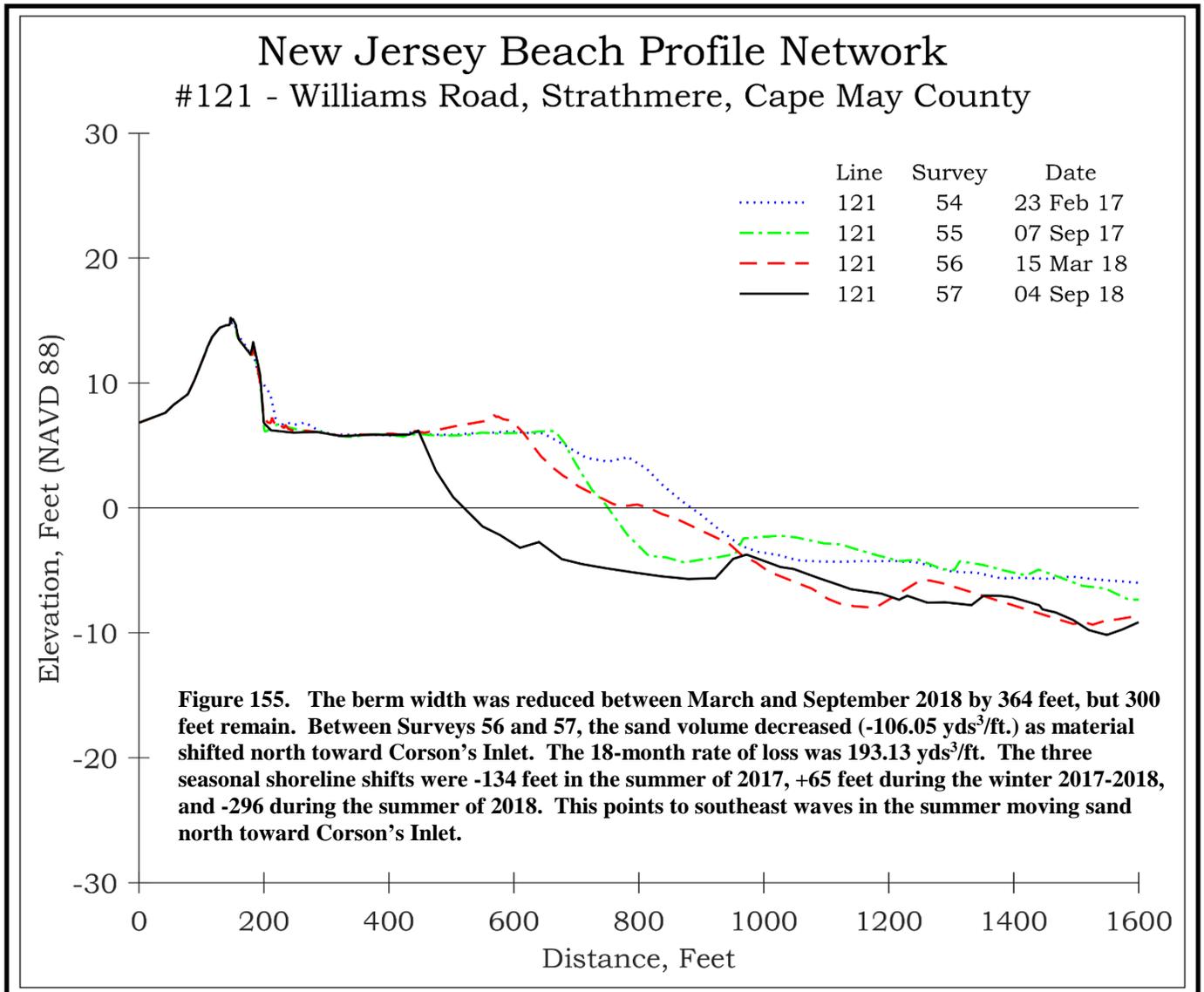
Natural dune recovery has continued following Hurricane Sandy which destroyed the foredune. The left photograph, taken September 22, 2017 shows the beach (view to the south from the toe of the fore dune). By September 20, 2018 (right photo), the beach was considerably narrower, but the dune exceeded 12-foot crest elevation.



**NJBPN 121 - Williams Road, Strathmere**



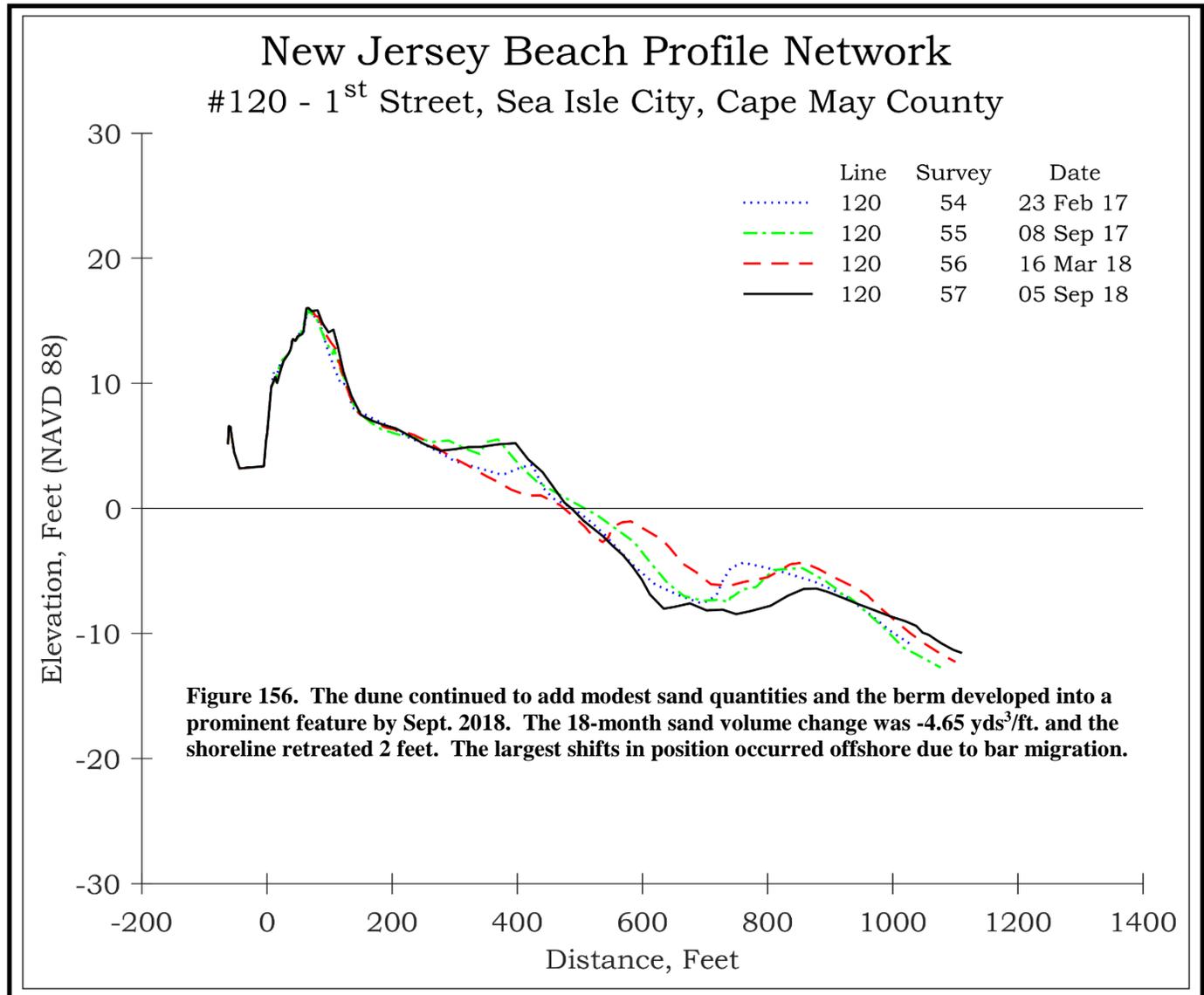
The Williams Road site is dominated by the ebb-tidal delta at Corson’s Inlet. The extensive width of the dry beach serves to protect the dunes from wave damage. The summer beach was still evident as of September 7, 2017 (left photo). The September 4, 2018 view on the right shows the dune and extent of the dry beach.



**NJBPN 120 - 1<sup>st</sup> Street, Sea Isle City**



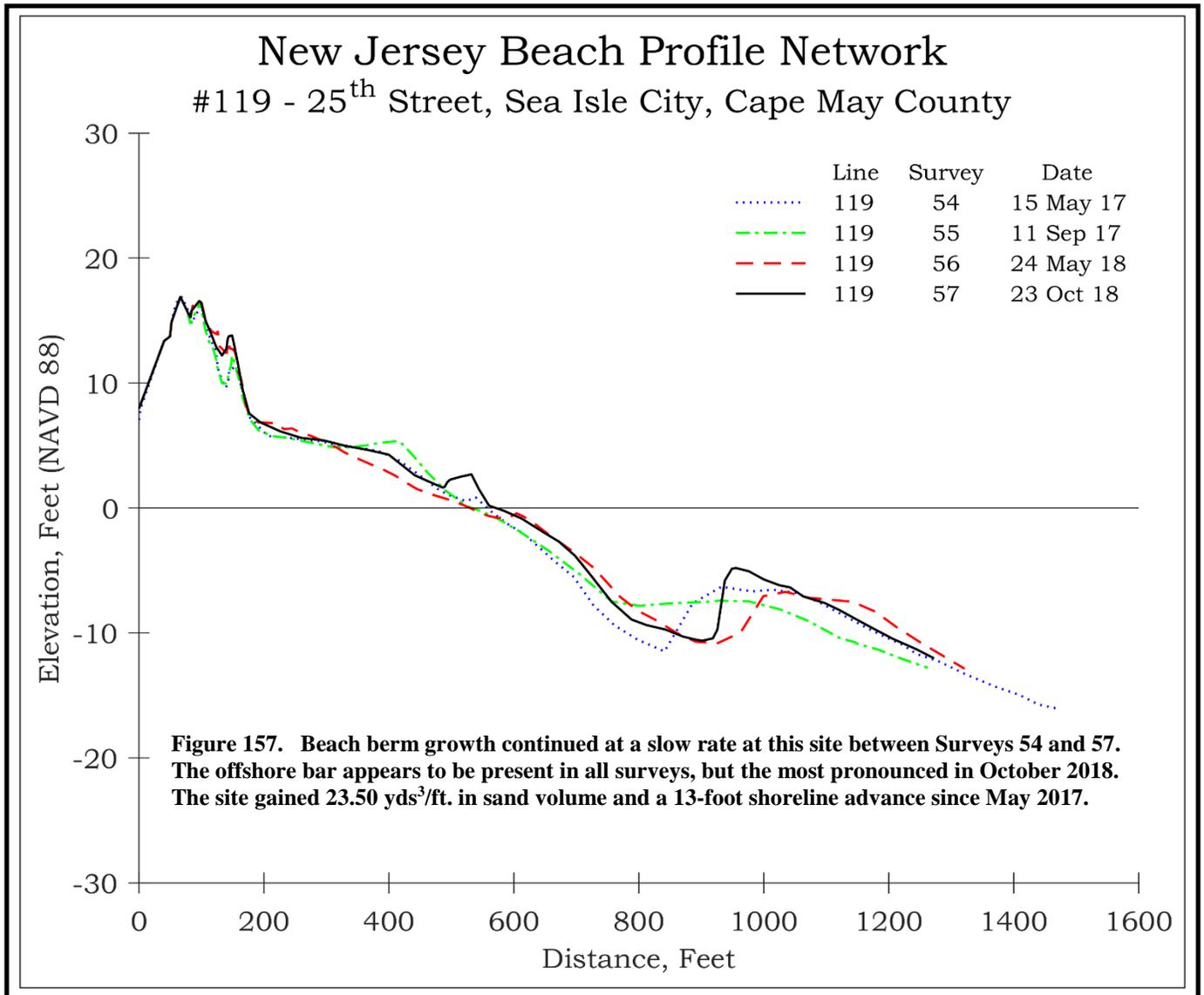
The dune here at the 1<sup>st</sup> Street location consists of a geotextile core covered by sand. The core has been in place for 26 years without failure, so worked better than an I-5 gravel core. However, more extensive beach maintenance has occurred since 2001 leading to the federal project in summer 2015. The left photograph was taken September 8, 2017 showing young dune plants getting started while the right view was taken September 5, 2018 and shows more mature dune grass with extensive foredune development at the buried fencing installed in 2015.



**NJBPN 119 - 25<sup>th</sup> Street, Sea Isle City**



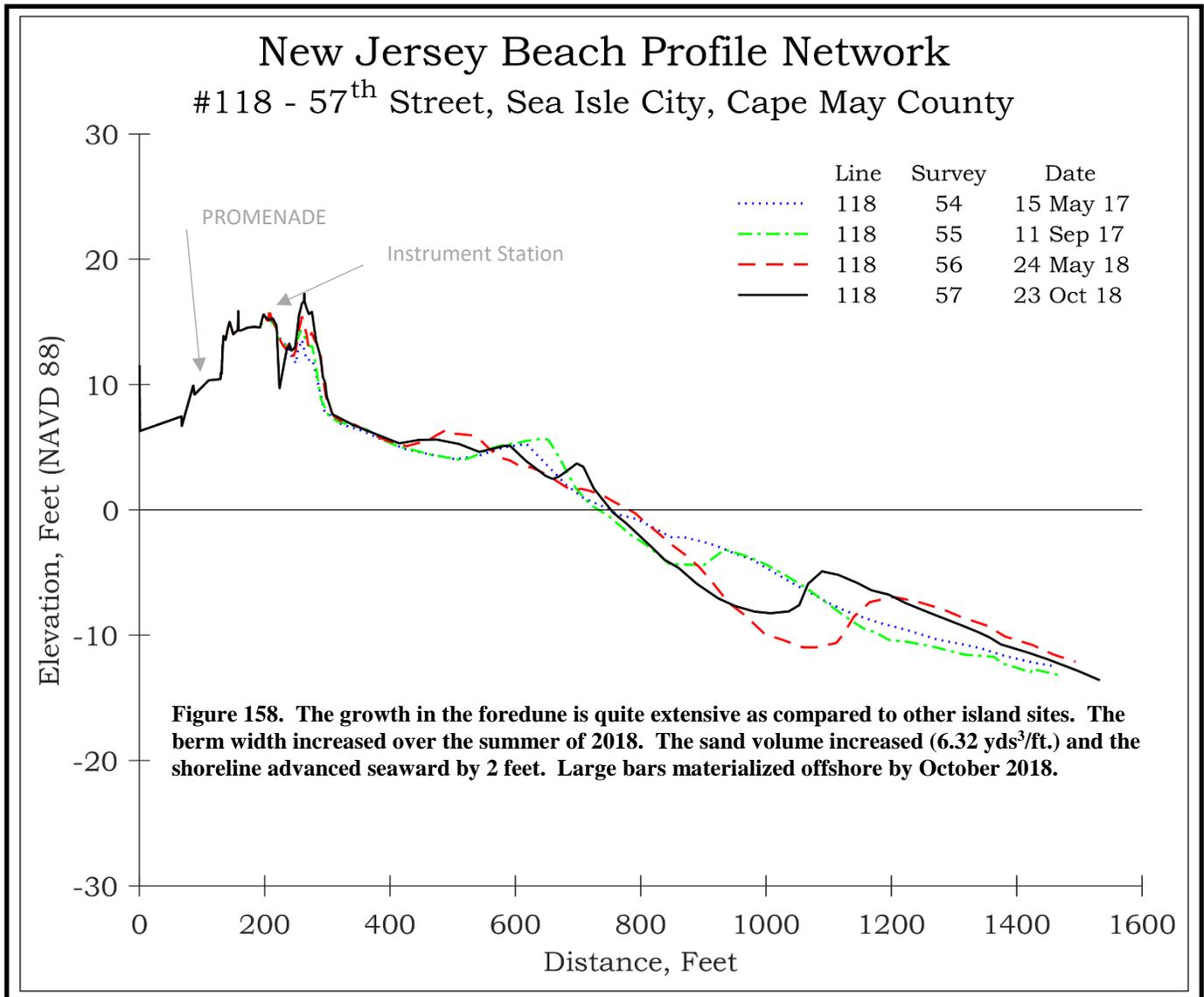
The 25<sup>th</sup> Street site is reasonably stable and was enhanced in 2009 under the NJ State project. The 2015 federal project greatly widened the beach and added to the dune. The left photograph from September 11, 2017 shows the dune with new grass plants and a deposit of sand at the fencing near the dune toe. The right photo taken on October 23, 2018 shows the foredune development with growing vegetation having buried the 4-foot fencing.



**NJBPN 118 - 57<sup>th</sup> Street, Sea Isle City**



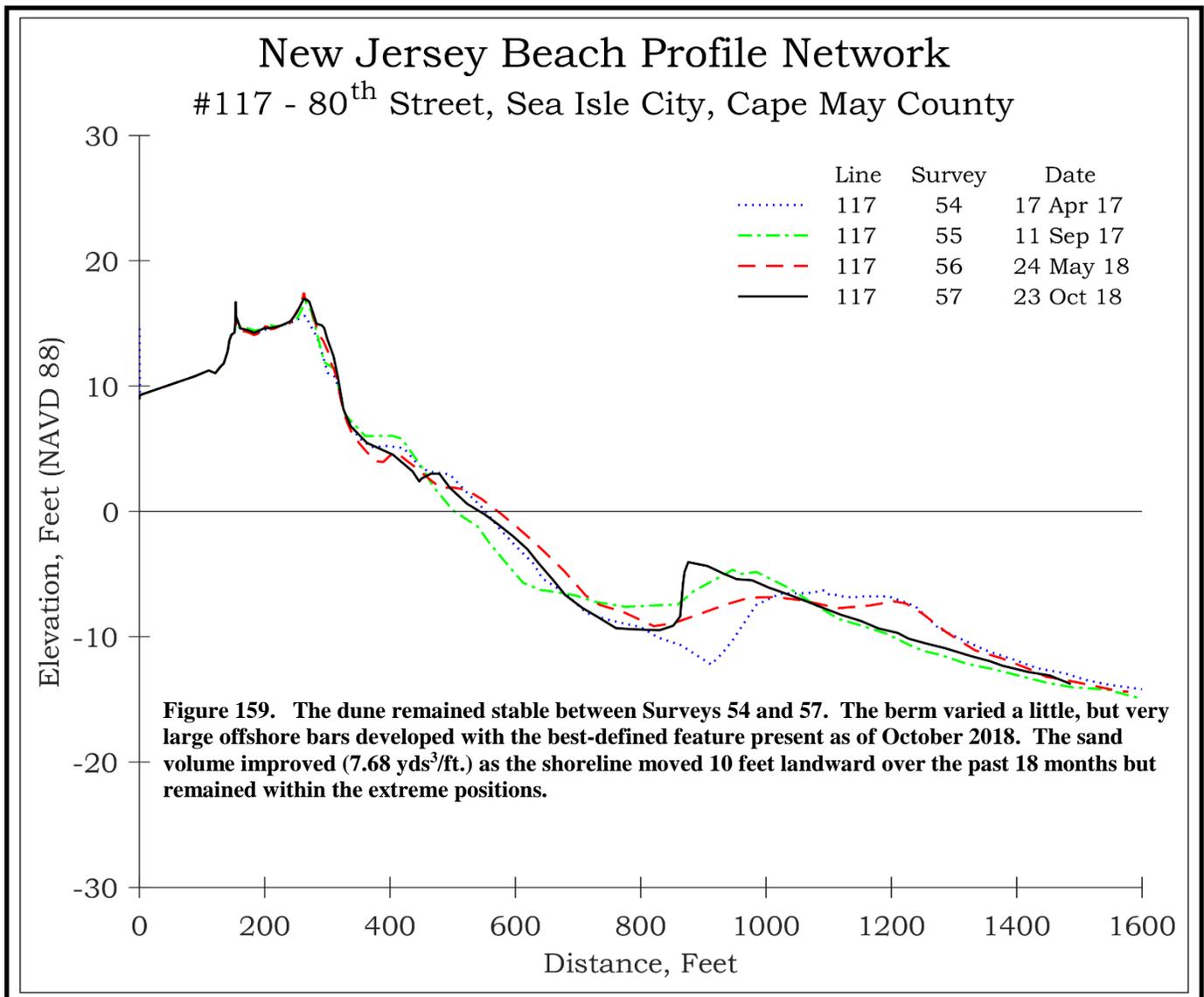
The left photo (taken September 11, 2017) shows the wide beach and dune toe fencing nearly buried with sand. The right photo (taken on October 23, 2018) shows some dune grass growth over the two summers and a beach in very good shape.



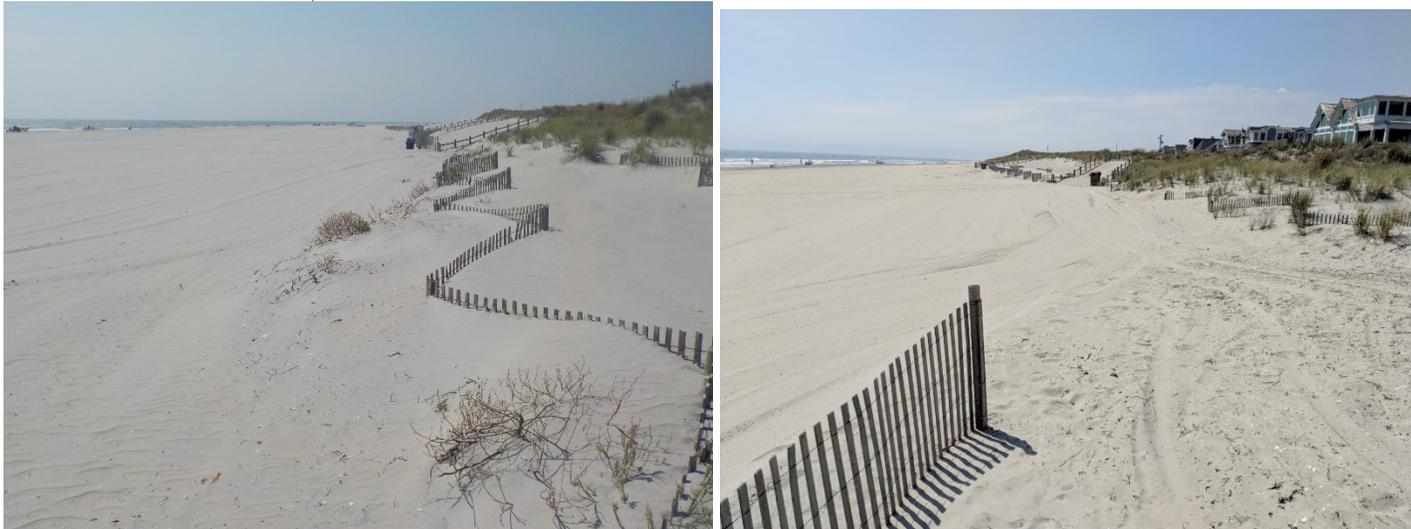
NJBPN 117 - 80<sup>th</sup> Street, Sea Isle City



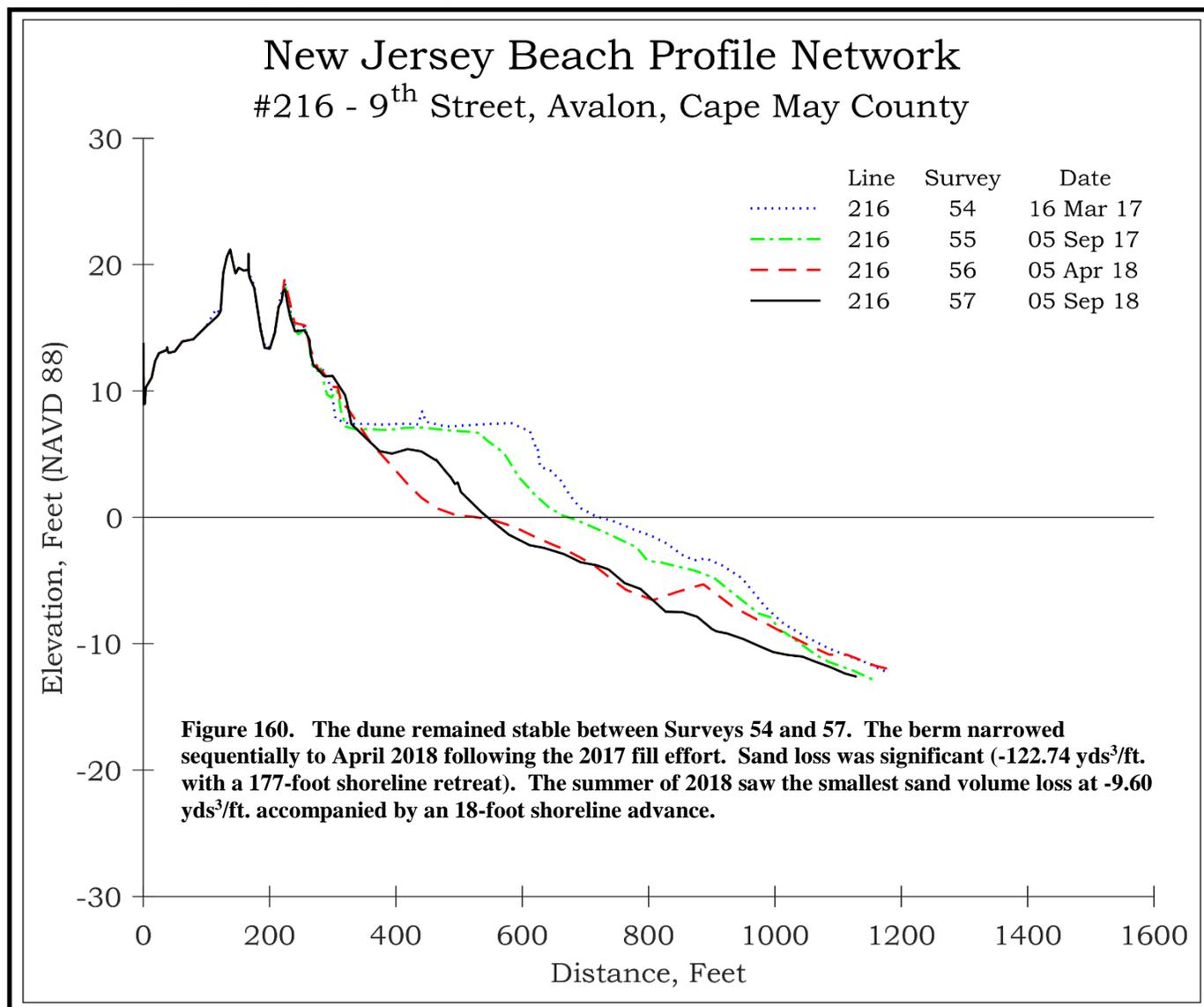
The left photo was taken September 11, 2017 and shows the southern Sea Isle City beach and dunes with the dune fencing buried and grass growth underway. The right photo (taken on October 23, 2018) shows the buried fence, installed 4 years earlier as the federal project was completed.



## NJBPN 216 - 9<sup>th</sup> Street, Avalon



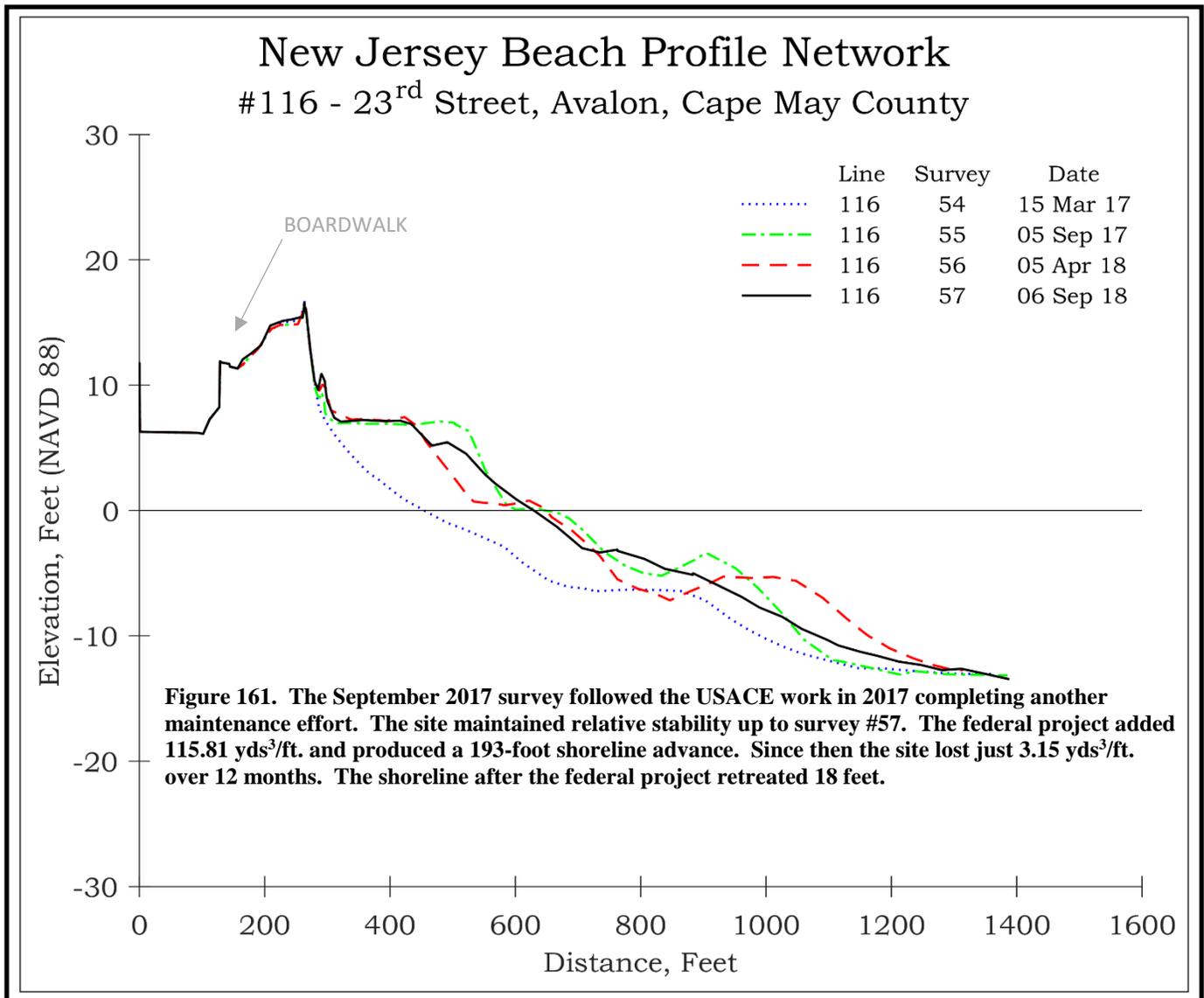
The 9<sup>th</sup> Street site is located near the Townsend's Inlet south jetty. The spring of 2017 survey (left photo taken September 5, 2017) immediately followed a federal maintenance effort on the Avalon shoreline that restored a rapid loss of berm width created by a municipally-funded effort in 2015. The dune here was not affected by the erosion because restoration occurred prior to such damage. (Right photo taken September 10, 2018.)



**NJBPN 116 - 23<sup>rd</sup> Street, Avalon**



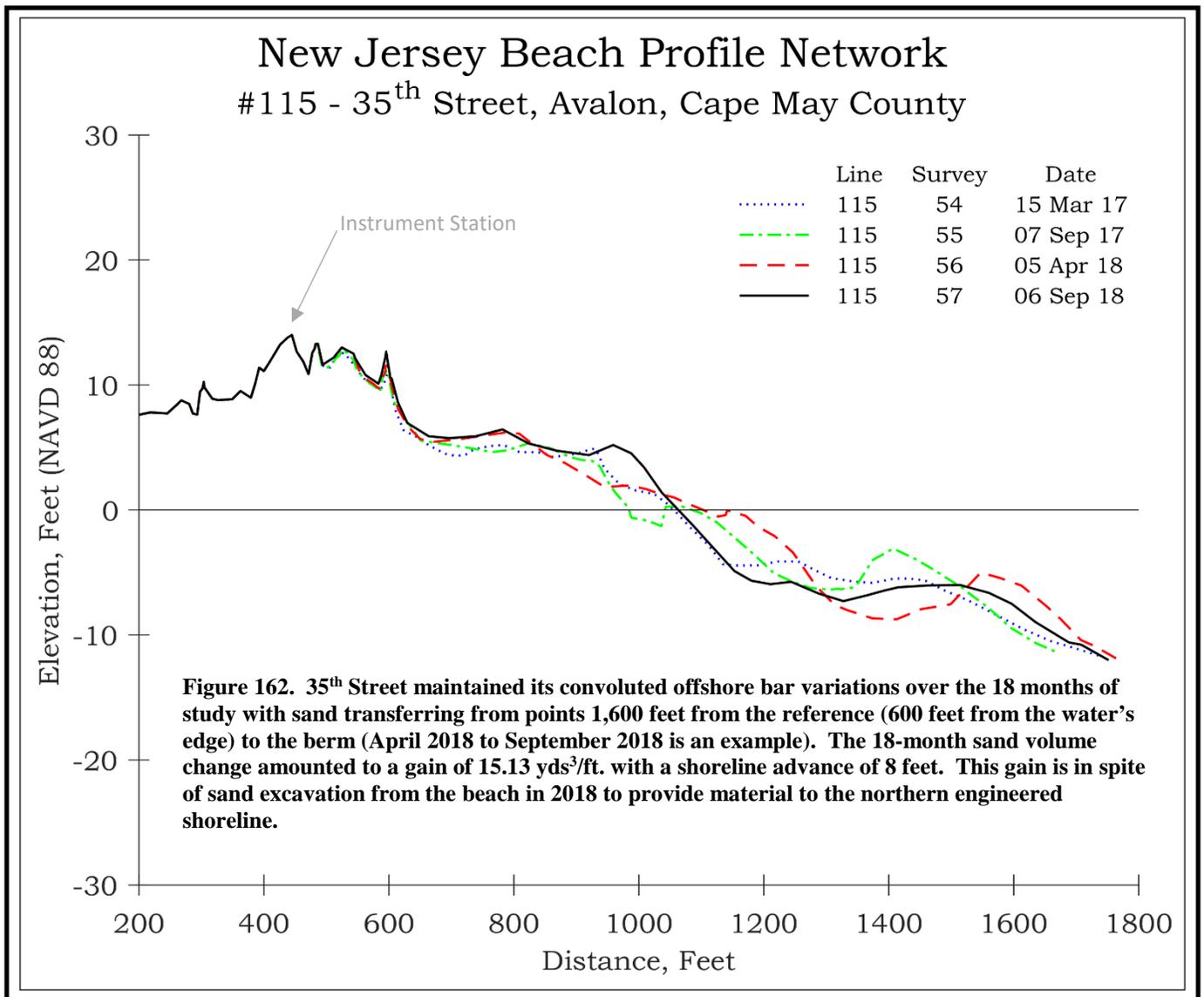
The left photo (September 5, 2017) shows a wide, dry beach following the 2017 federal maintenance effort. The right photo taken on September 6, 2018 follows the 2017 federal maintenance. The project fencing is now over half buried by the fore dune accumulation.



**NJBPN 115 - 35<sup>th</sup> Street, Avalon**



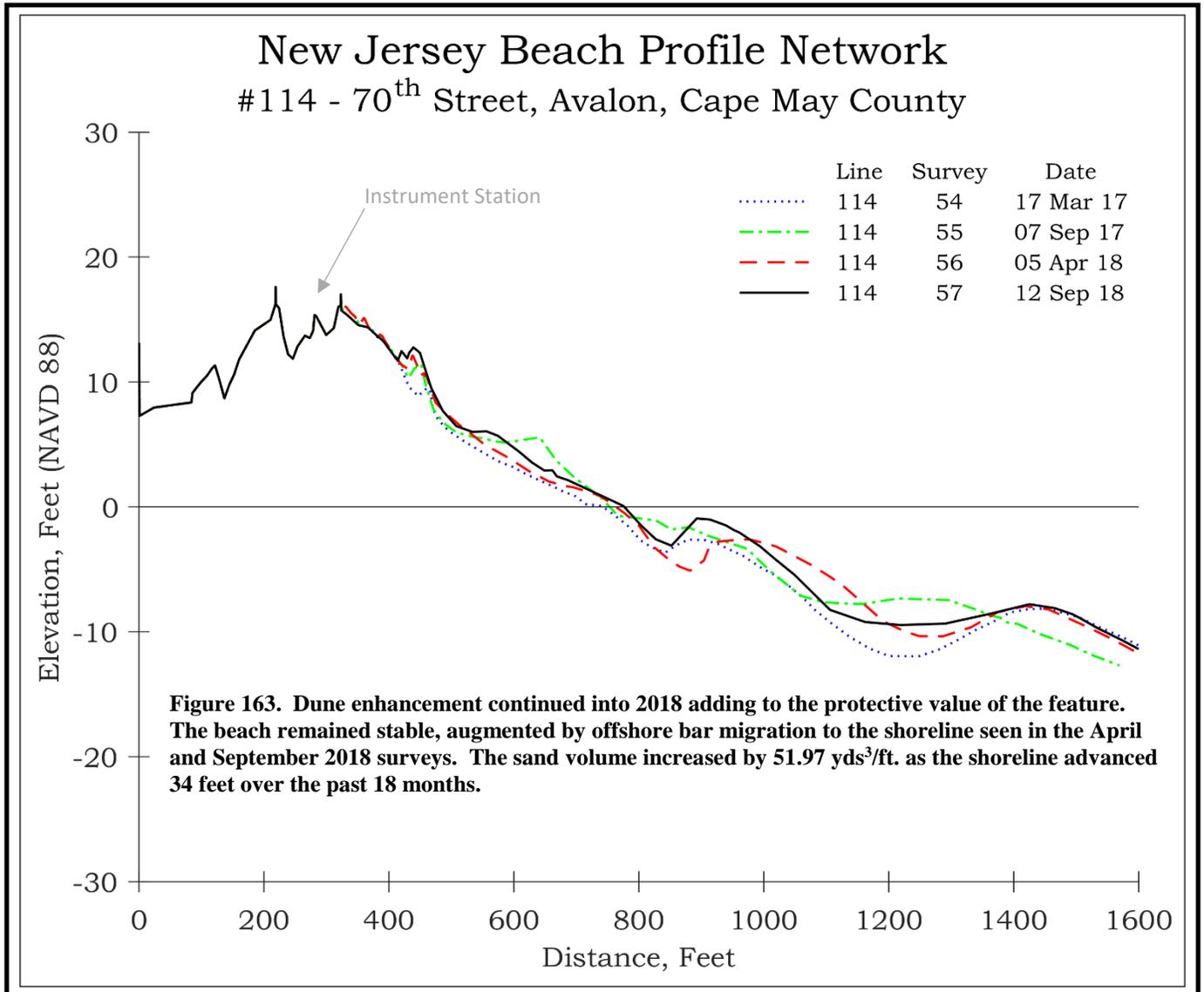
This site lies south of the Avalon beach nourishment segment and is located in an accretion zone within the municipality. The left photo, (view to the south) taken September 7, 2017 shows the wide dry beach and dunes. Note the new line of dune fencing. The right photo, taken on September 6, 2018, shows more sand added at the base and landward side of the fencing.



**NJBPN 114 - 70<sup>th</sup> Street, Avalon**



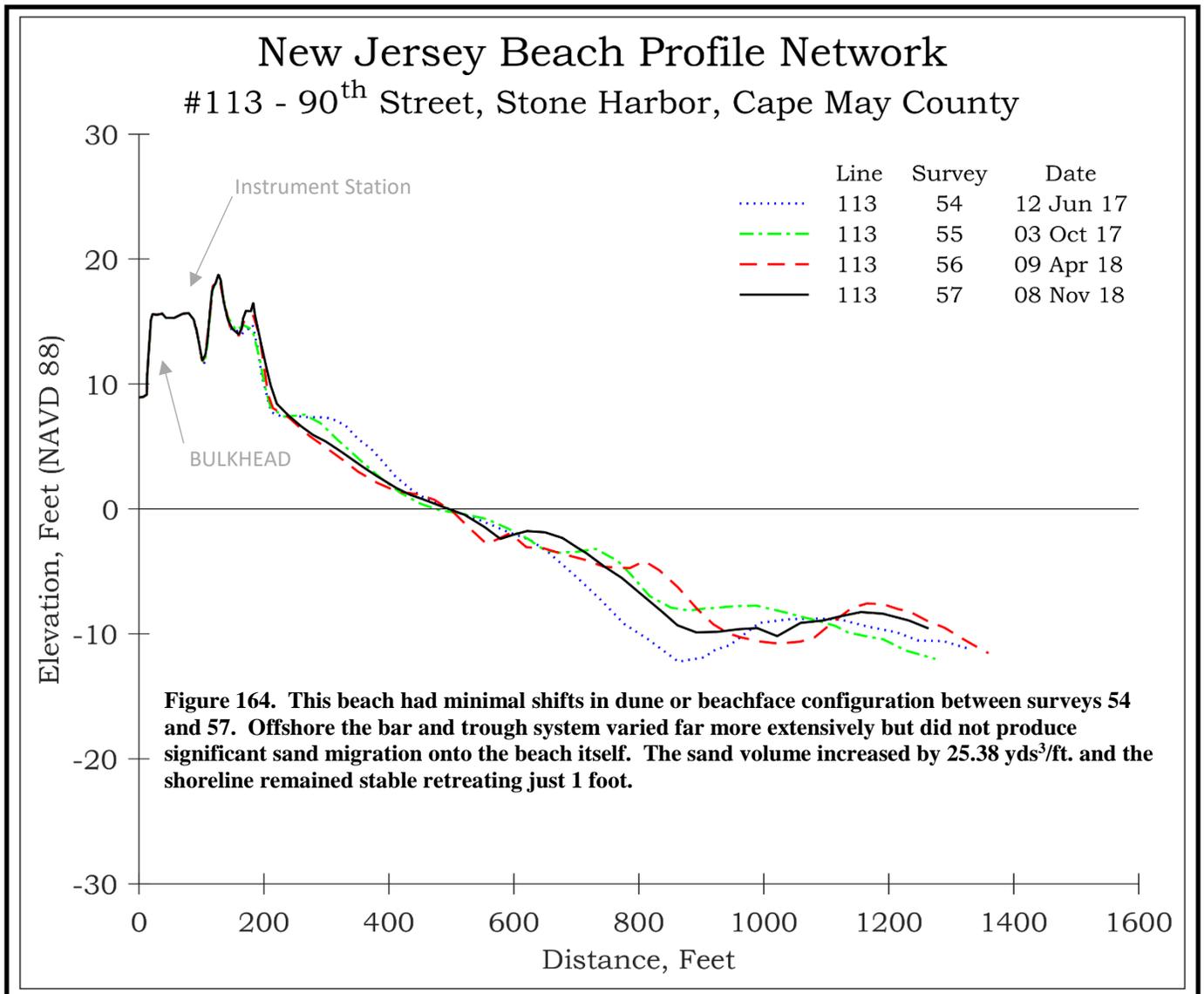
The 70<sup>th</sup> Street location has been a stable area for decades and lies at the very north limit of the Stone Harbor segment of the USACE Seven-Mile Island shore protection project, which breaks between 31<sup>st</sup> Street and 70<sup>th</sup> Street due to that shoreline not requiring maintenance. The left photo was taken September 7, 2017 and shows the wide seaward dune slope including a new line of fencing. The right photo, taken September 12, 2018, shows the buried fence.



**NJBPN 113 - 90<sup>th</sup> Street, Stone Harbor**



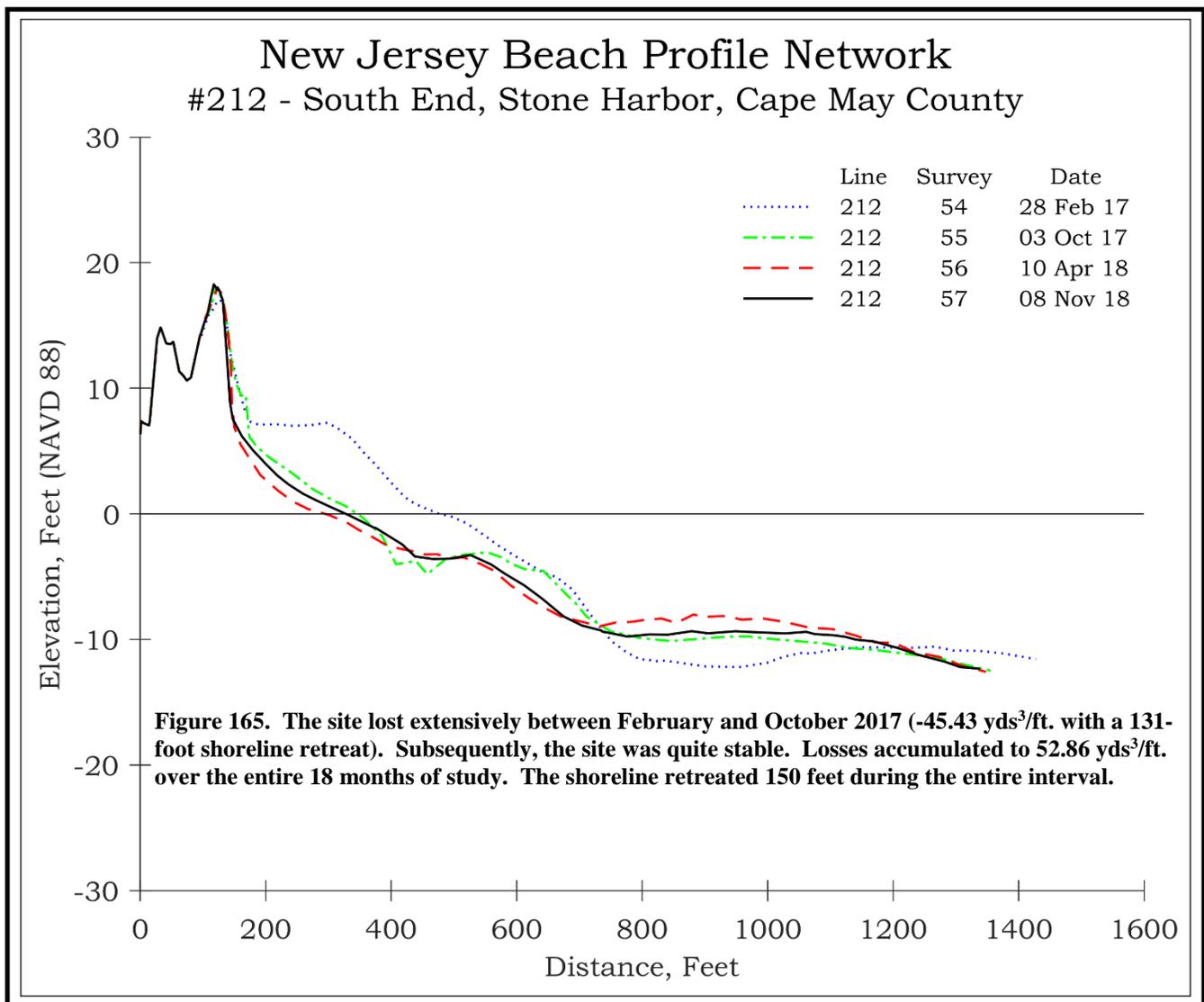
The 90<sup>th</sup> Street location been quite stable not needing maintenance as frequently as sites further south. The left photo, taken October 3, 2017, includes the berm and seaward dune toe. The right photo, taken on November 8, 2018, shows a slightly narrower beach.



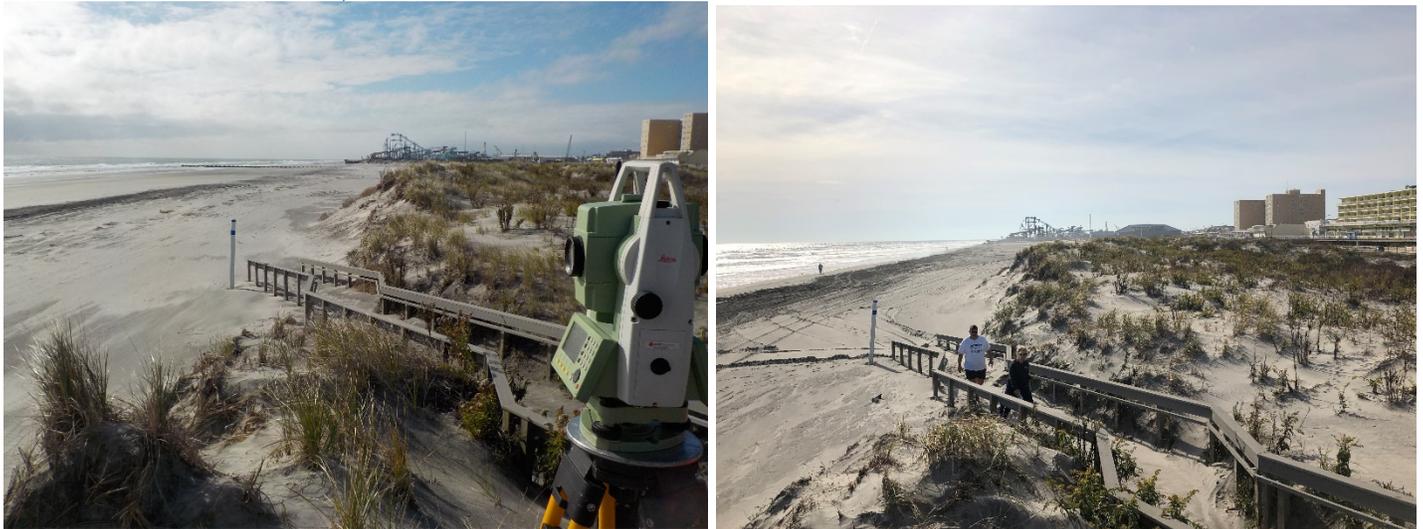
**NJBPN 212 - 121<sup>st</sup> Street, Stone Harbor**



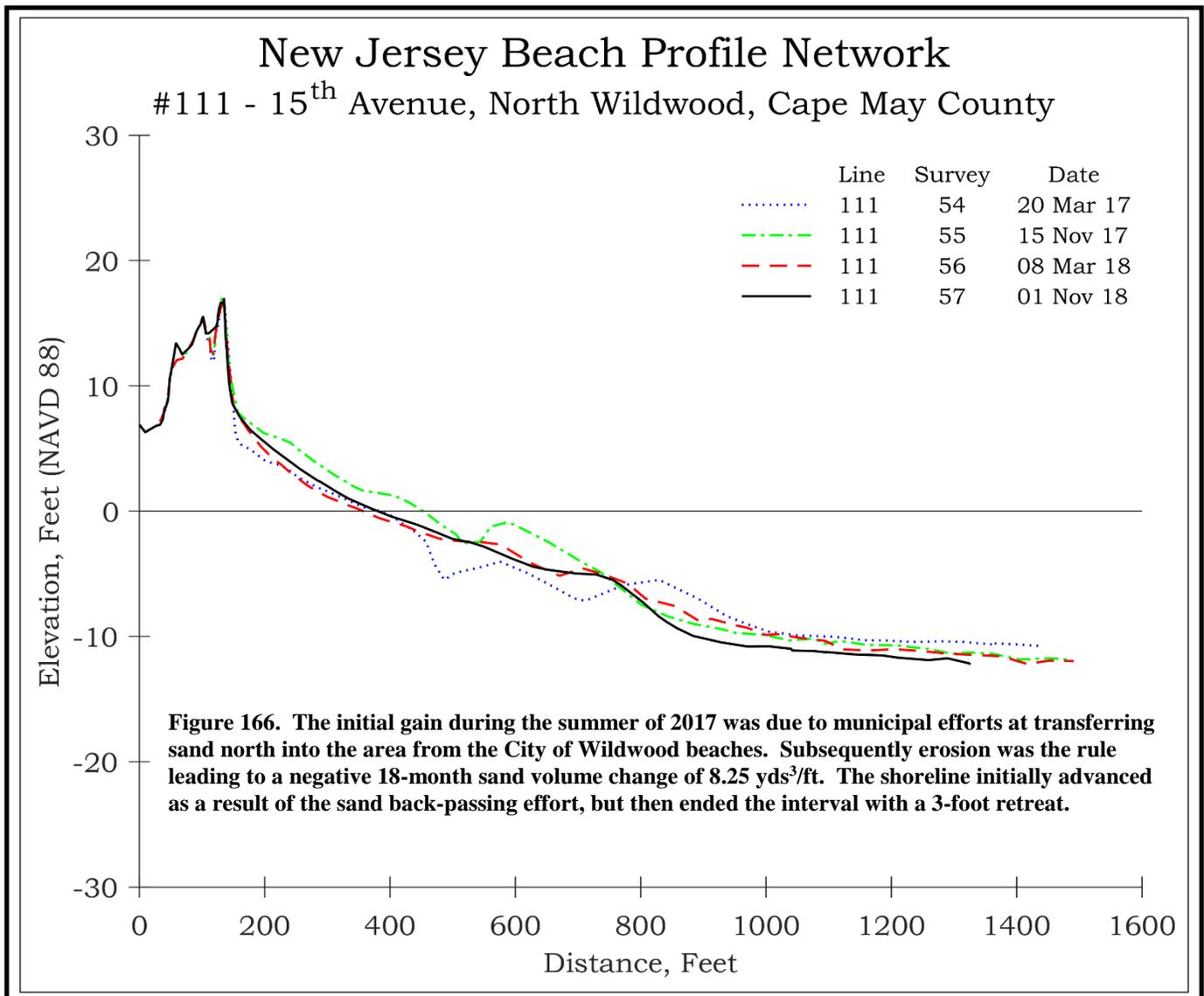
The south end Stone Harbor site has shown a long-term erosional trend that may be influenced by changes surrounding Hereford Inlet. The site has been the recipient of numerous beach nourishment projects including municipal and Federal efforts. Most recent was spring 2017 in a regular maintenance effort. October 3, 2017 (left photo) shows the southern beach flat to the dune toe with a very linear slope from the crest to the dune toe. The right photo, taken on November 8, 2018, shows a new fence line on the beach, a profusion of seaside goldenrod plants at the dune crest and a slightly wider beach.



## NJBPN 111 - 15<sup>th</sup> Avenue, North Wildwood



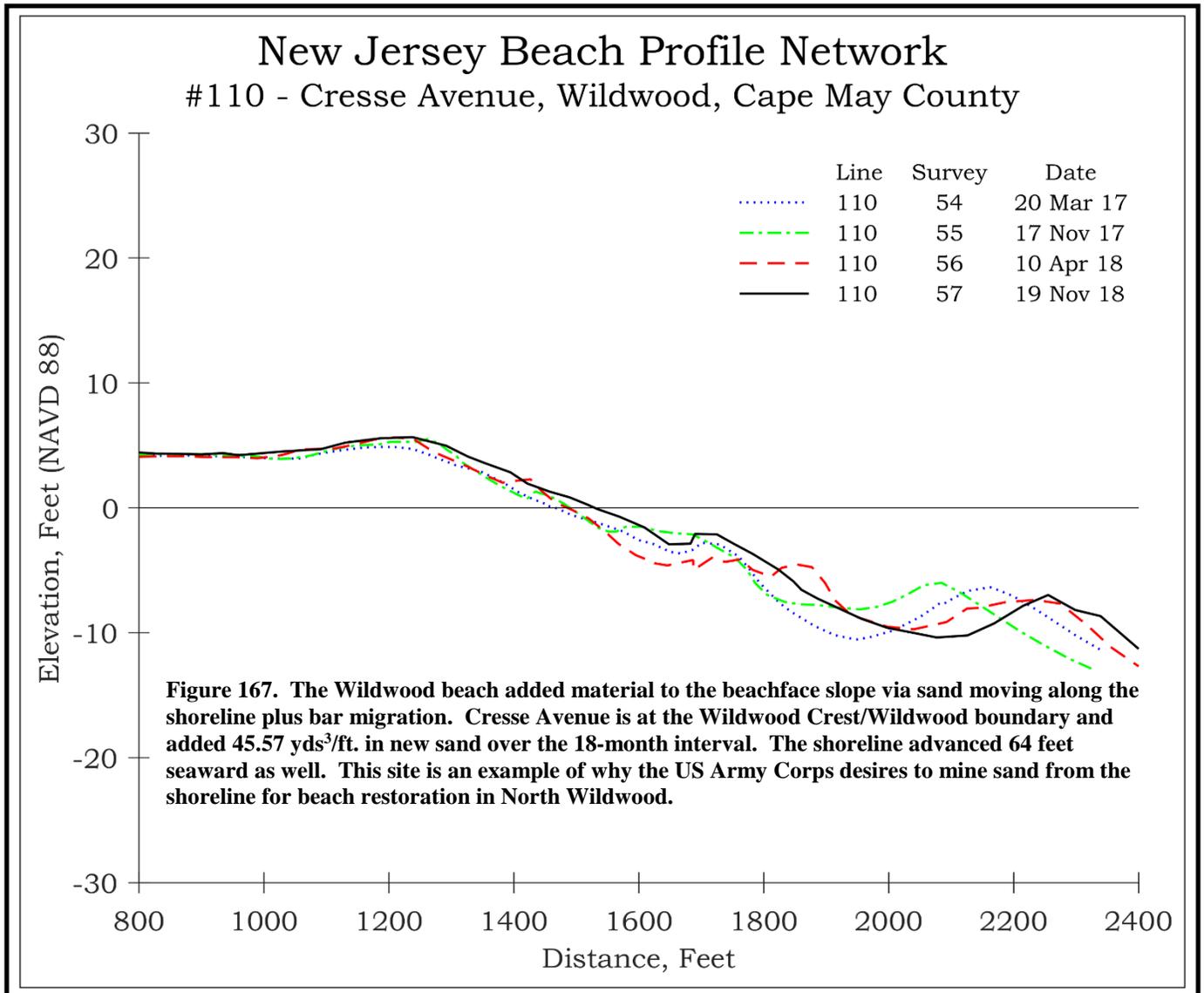
The 15<sup>th</sup> Avenue site is just south of the locus of major erosion problems in North Wildwood. The November 15, 2017 view to the left shows storm debris deposited at the toe of the dune with a dry beach pocket remaining near 20<sup>th</sup> Avenue to the south. By November 1, 2018 the situation had improved a bit with a wider beach, but note that some dune retreat had occurred (distance from the white pole to the dune slope).



**NJBPN 110 - Cresse Avenue, Wildwood**



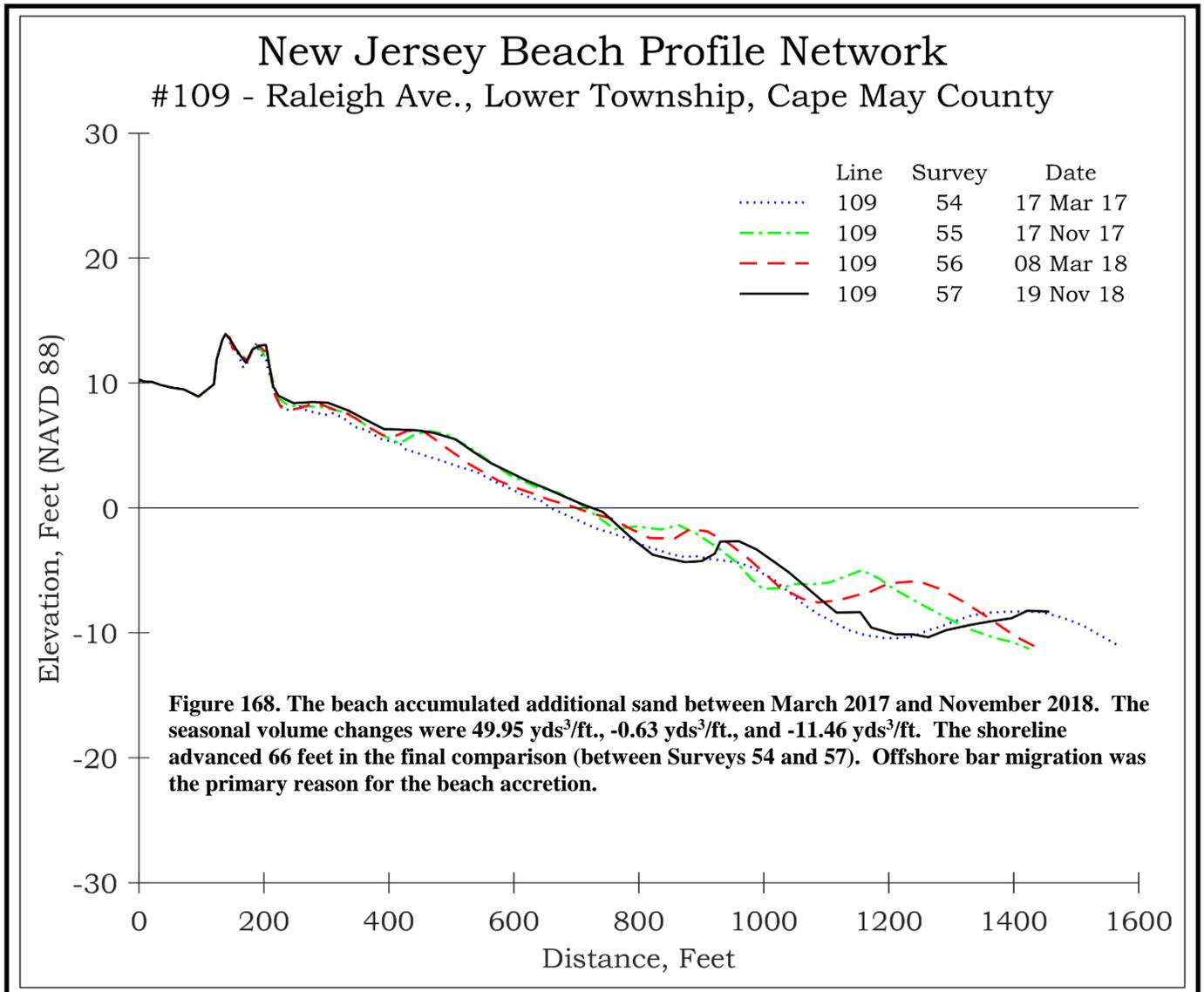
The Cresse Avenue site has been accumulating sand volume since 1992. Sand lost from North Wildwood migrates south adding to the beach width each year. The left photo, taken November 17, 2017, shows the beach width accompanied by the migration of the offshore bar onto the beachface. The right photo, taken on November 19, 2018, repeats the expansive view with another bar moving ashore, but now the beach is wider by 7 feet after 18 months.



**NJBPN 109 - Raleigh Avenue, Lower Township**



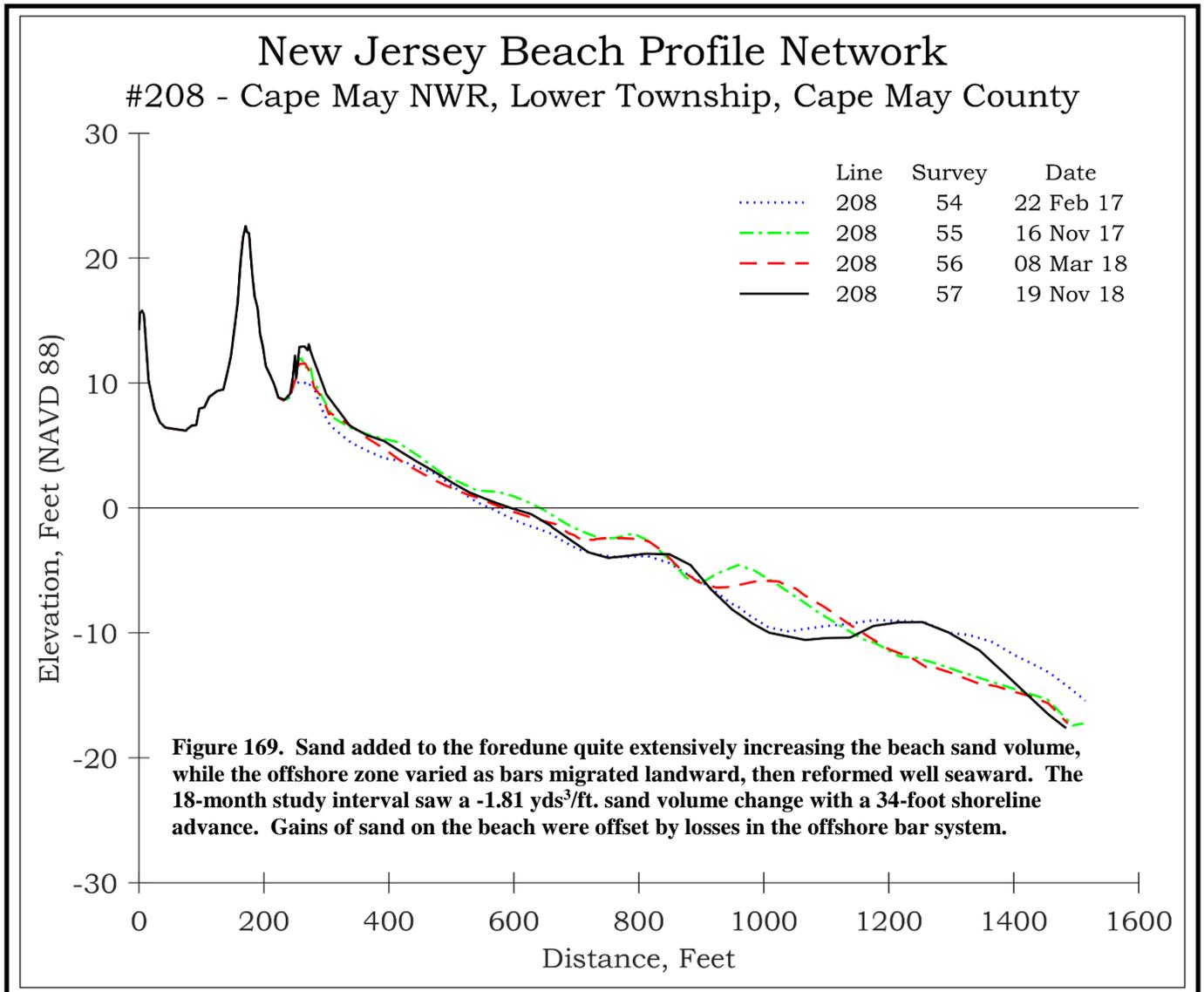
The left photo (taken on November 17, 2017) shows the wide beach present in Lower Township. The right photo, taken on November 19, 2018, shows the central zone of the beach and gives a good view of the width which increased again by 43 feet.



**NJBPN 208 – Cape May National Wildlife Refuge, Lower Township**



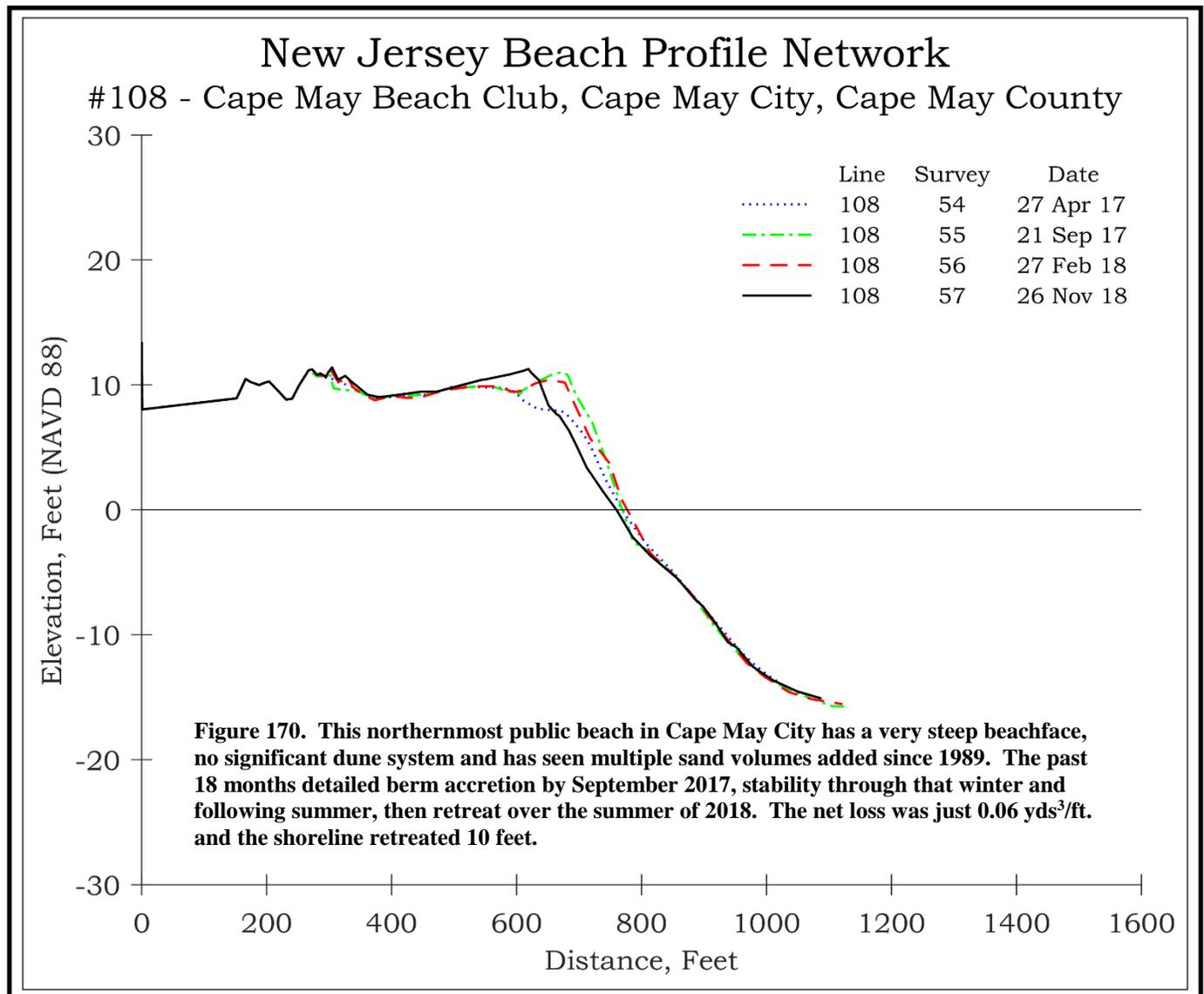
The left photo was taken November 16, 2017 and is a view along the dune toe to the north and gentle shoreward gradient developed on the wide beach. The right photo was taken on November 5, 2018 and shows improvement in the seaward dune slope sand and grass coverage, but little else new.



**NJBPN 108 - Cape May Beach Club, Cape May City**



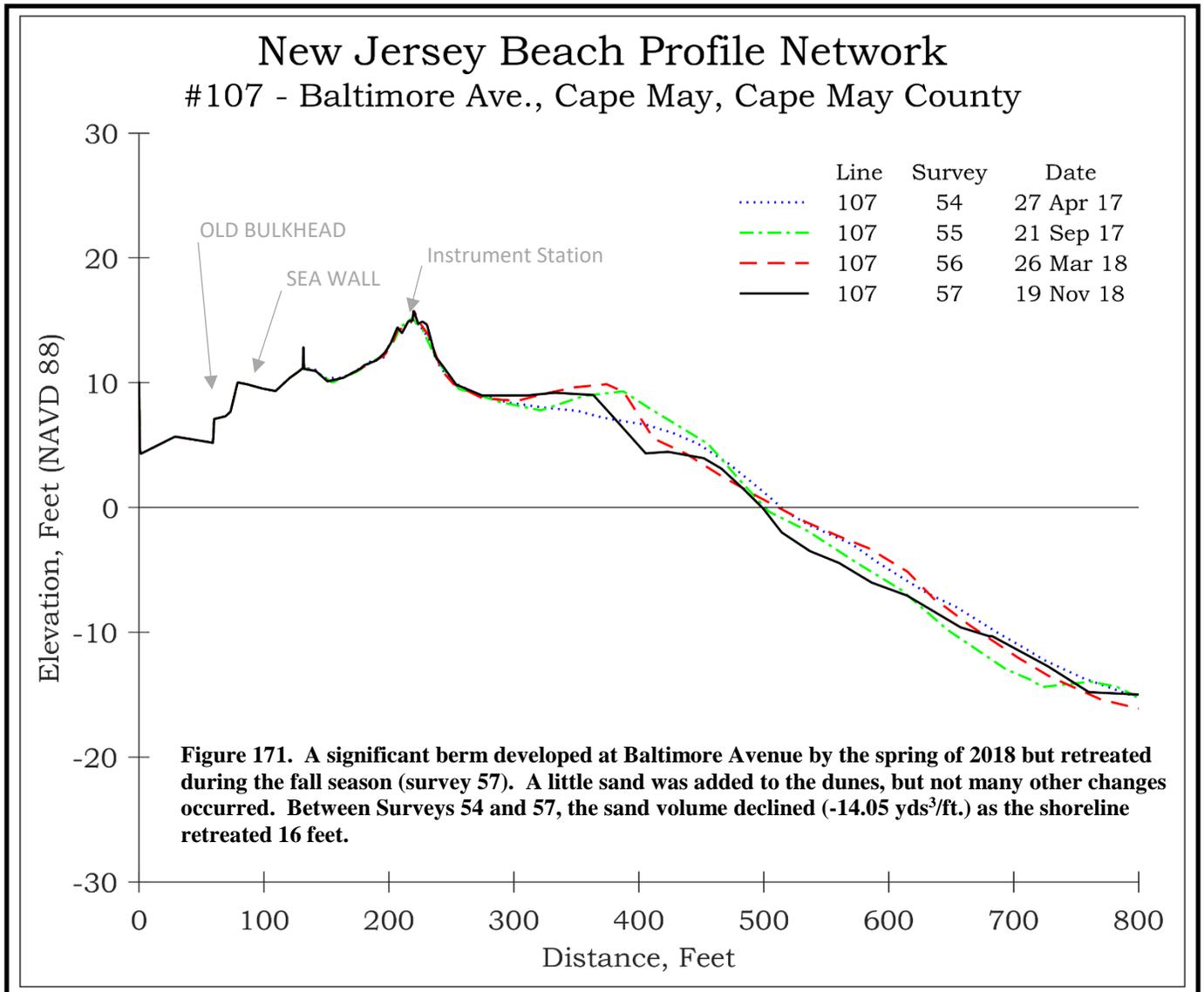
The left photo was taken September 21, 2017. The right photo was taken on November 26, 2018 and in comparison shows relative consistency in configuration and beach elevation.



**NJBPN 107 - Baltimore Avenue, Cape May City**



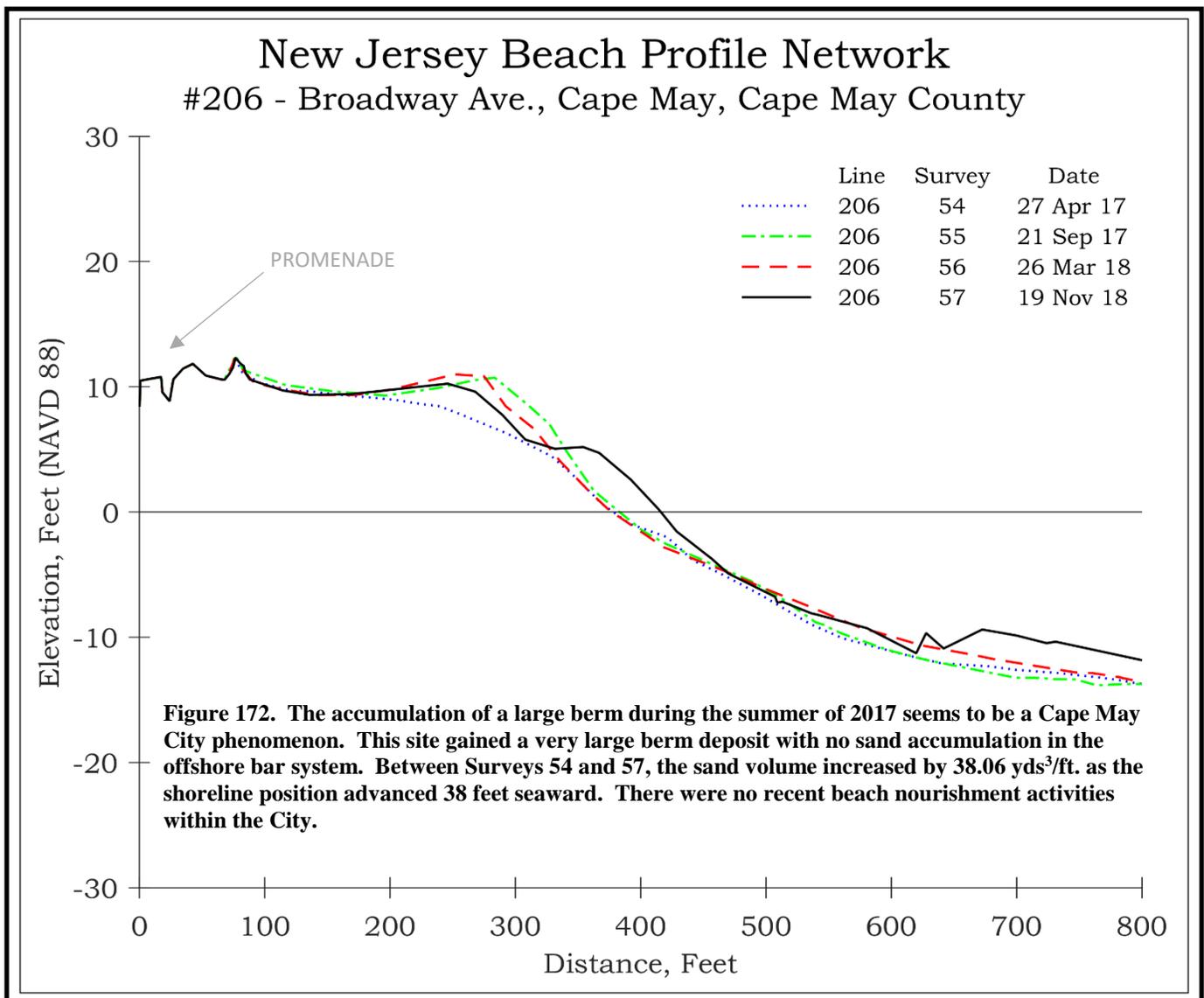
The left photo was taken on September 21, 2017. The right photo was taken on November 19, 2018. The post-beach restoration situation at this location is astounding given that in 1989, the waves broke on the rock seawall at low tide at Baltimore Avenue.



**NJBPN 206 - Broadway Avenue, Cape May City**



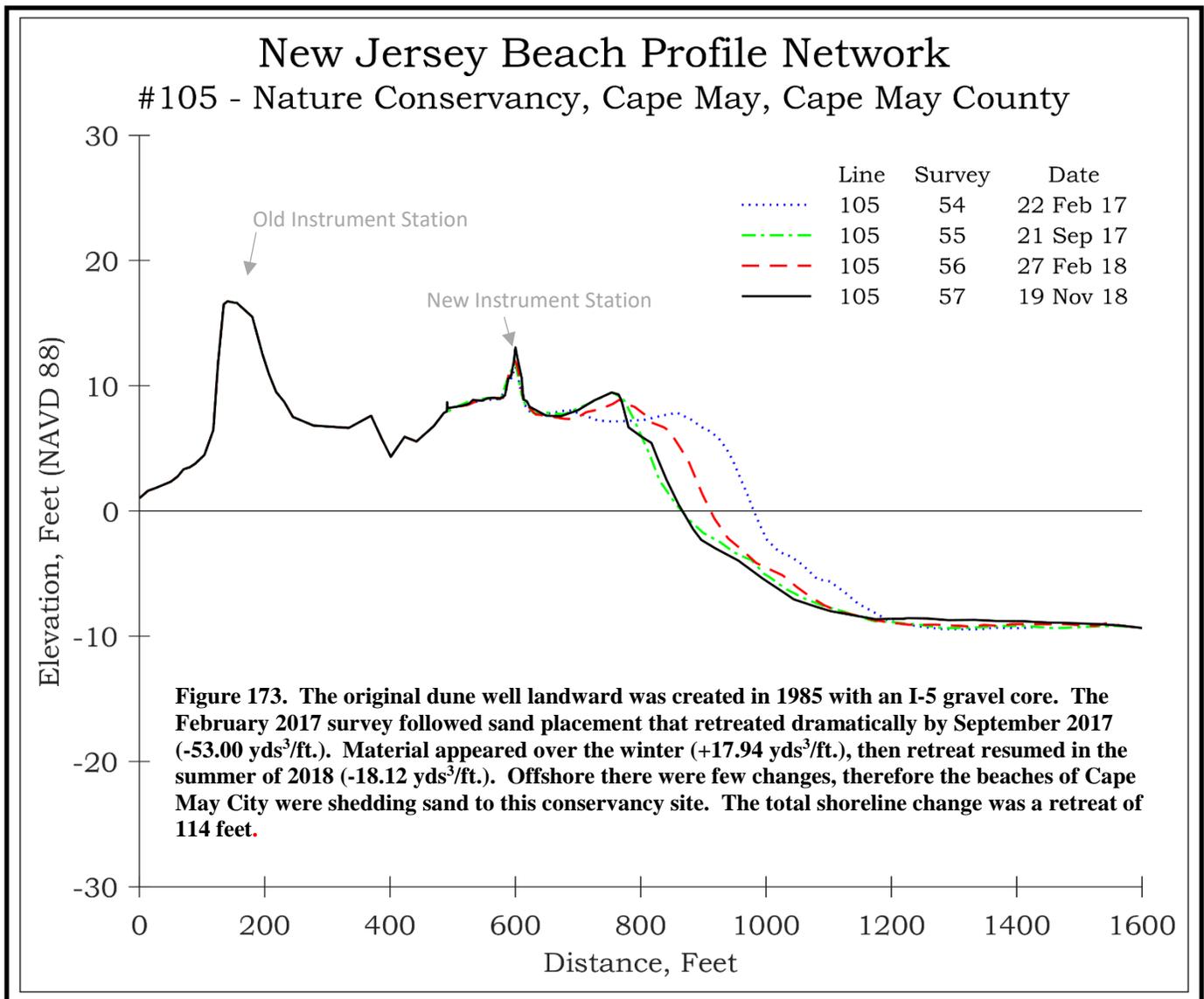
The left photo was taken on September 21, 2017. The right photo (206) was taken on November 19, 2018 and shows similar conditions on the large scale. The cross sections below display changes in the berm elevation.



**NJBPN 105 - Nature Conservancy, Cape May**



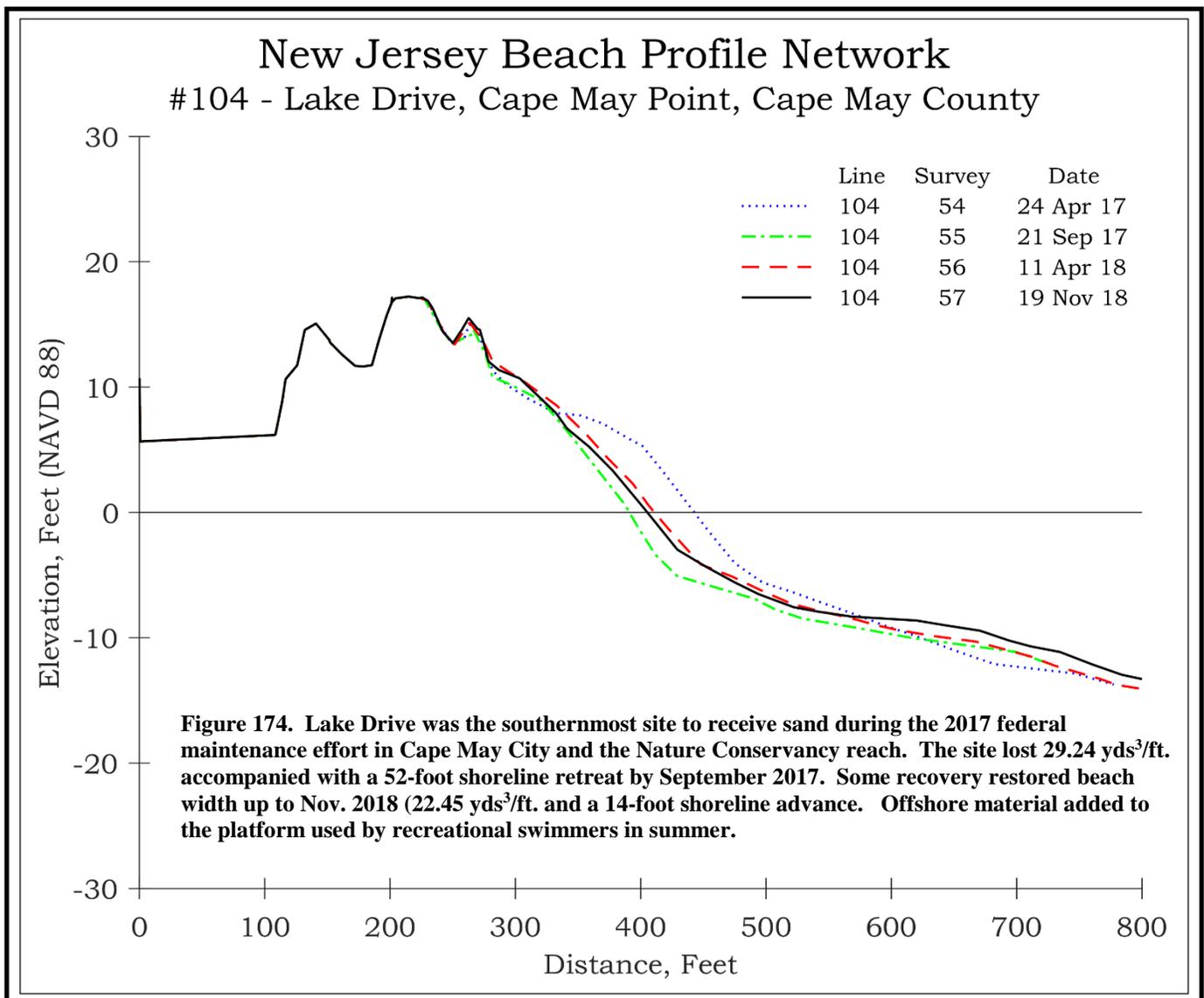
The left photo was taken September 21, 2017. The right photo taken on November 19, 2018, and shows a wider beach 18 months later. Berm development continued south into the Conservancy area in spite of considerable shoreline retreat from the February 2017 position.



**NJBPN 104 - Lake Drive, Cape May Point**



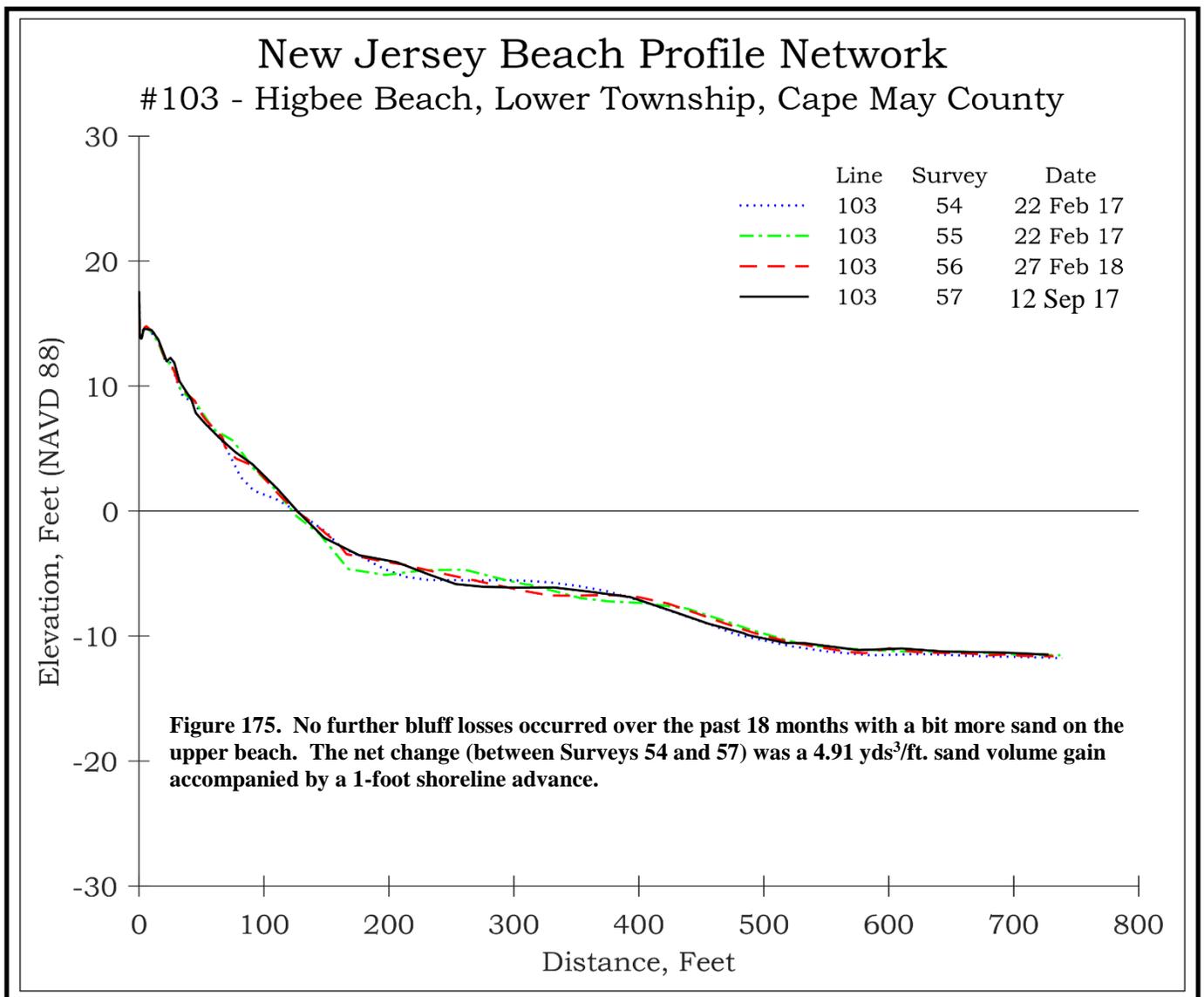
The left photo was taken on September 21, 2017. The right photo was taken on November 19, 2018. Sand was added by the USACE as far west as this groin cell in Cape May Point by spring 2017 with loss in beach width subsequently.



**NJBPN 103 - Higbee Beach State Park, Lower Township**



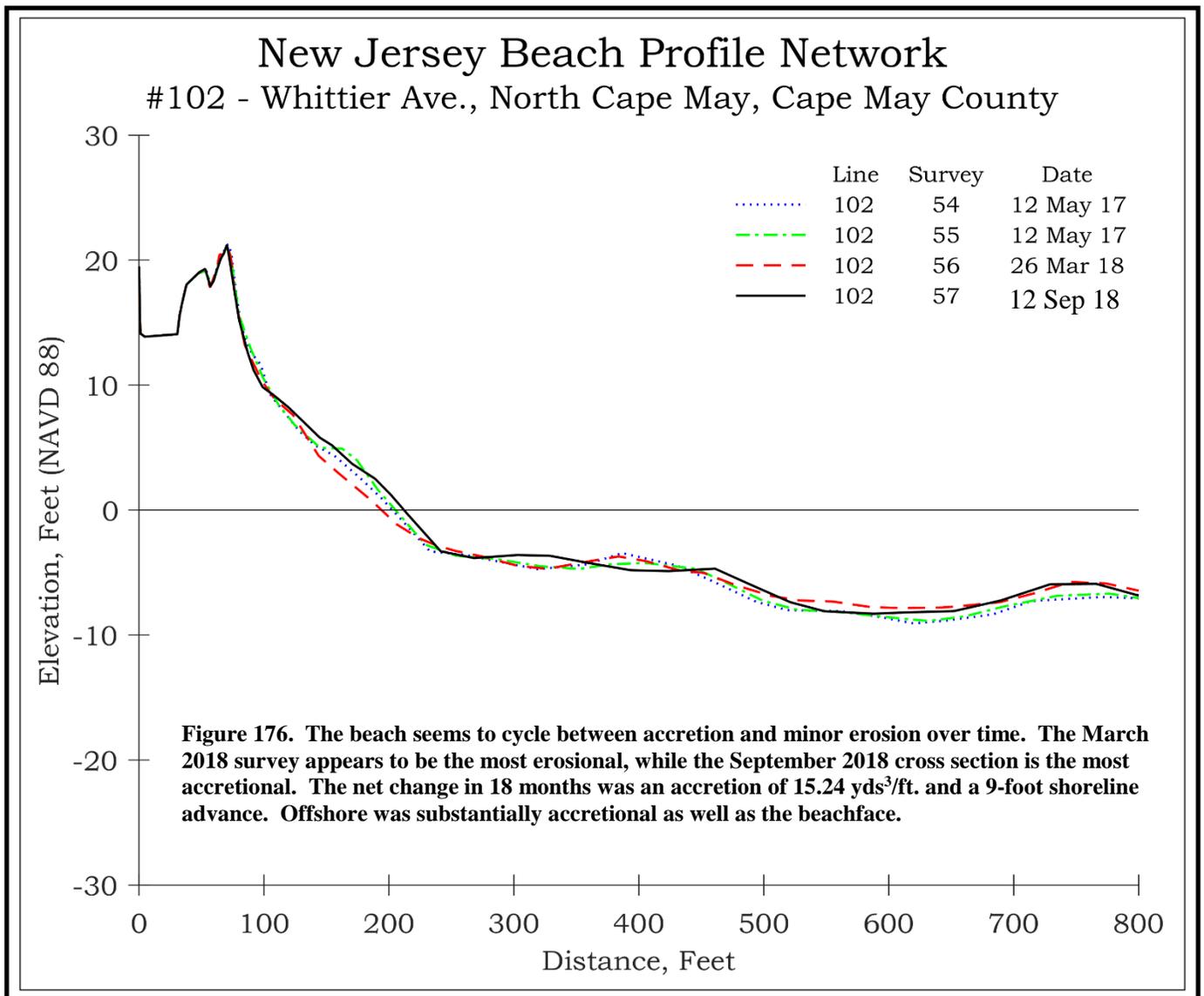
The left photo was taken September 12, 2017. The right photo taken November 6, 2018, shows minimal changes and the same piece of driftwood is still present near the edge of the grass.



**NJBPN 102 - Whittier Avenue, North Cape May**



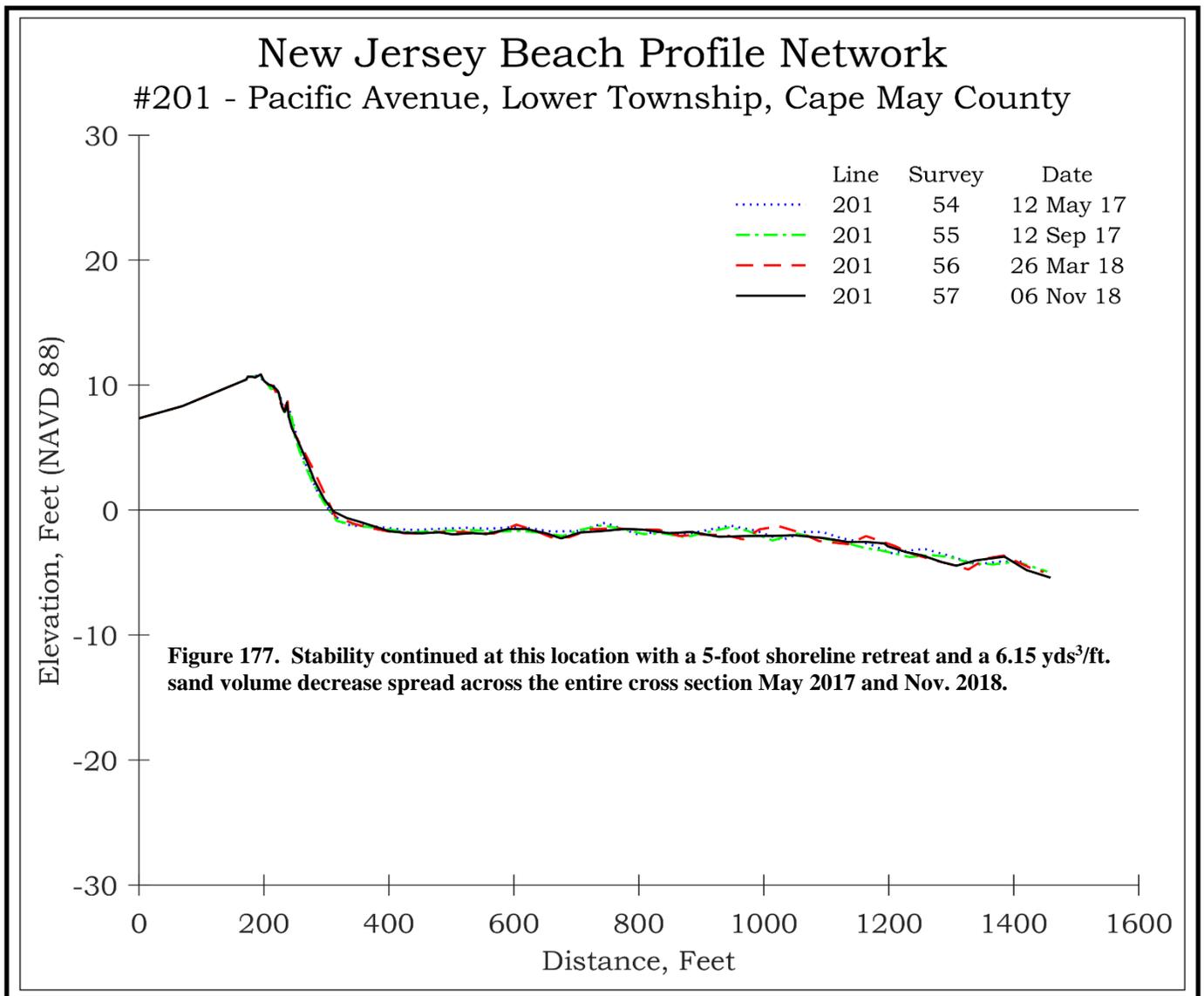
The left photo was taken on September 12, 2017. The right photo, taken on November 6, 2018, shows a dramatic growth in seaward dune slope grass after a substantial loss in dune sand after Sept. 2016.



**NJBPN 201 - Pacific Avenue, Villas**



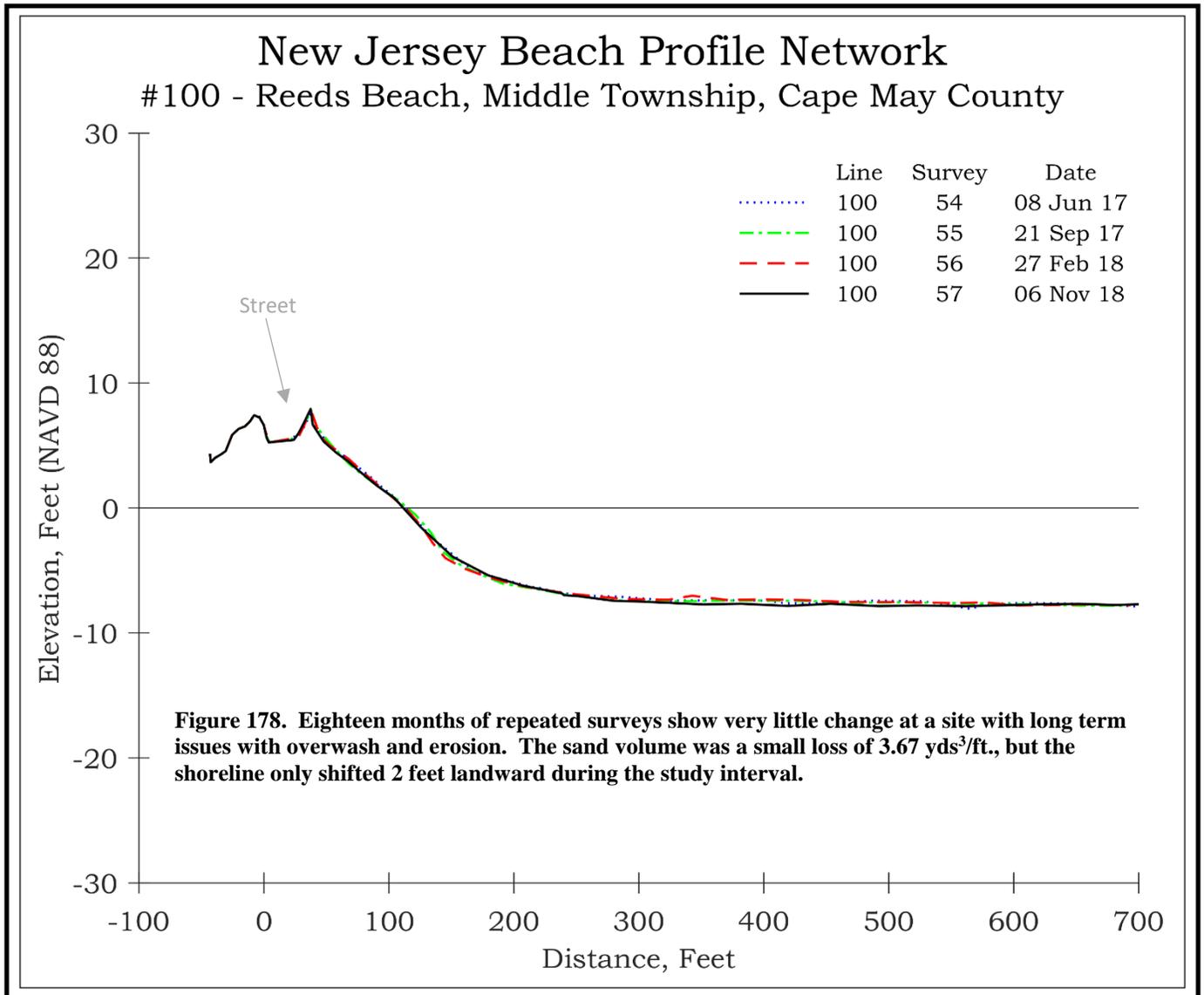
The left view was taken September 12, 2017. Right photo (201) was taken on November 6, 2018. Minimal change occurred at Pacific Avenue with some dune grass growth toward the bay.



**NJBPN 100 - Reeds Beach, Middle Township**



The left photograph was taken on September 21, 2017. The right photo was taken on November 6, 2018. The two views show the road and dune landward of the road and the new ridge of sand placed on the upper beach. The only remarkable thing is the growth of dune grass that could have been planted, but does not have any rows indicating human installation. The heap of sand might have contained many naturally included seeds. One larger plant in the foreground was there in 2016.



## **Summary and Conclusions for Cape May County:**

During the fall of 2017, the USACE continued maintenance of its projects in Cape May County. Recently completed work in southern Ocean City (completed by December 2017) and all of Ludlam Island (completed by spring 2016) continued to adjust. Sediment moved into the Corson's Inlet State Park along the northern shoreline adding to the badly damaged dune and beach system present there. Avalon and Stone Harbor received almost a million cubic yards of material by spring 2017 from Townsend's and Hereford Inlets with the NJ Div. of Coastal Engineering funding the Hereford Inlet work because the CBRS rules prohibited the USACE from funding such activities in the CBRS NJ-09 unit. The municipalities of Stone Harbor, Avalon and North Wildwood continued to seek a policy change on using CBRS unit sand for beach nourishment using federal funding, back to those in existence in 1996 when the USACE was allowed to commence the Seven-Mile Island shore protection project for Stone Harbor in 2003.

The Wildwoods shore protection project continues on its projected pathway to construction as a massive back-passing operation to restore the North Wildwood oceanfront beach using excess beach sand from Wildwood and Wildwood Crest. In 2016, maintenance work occurred in The Nature Conservancy and Cape May Point with sand placement on the berm. Recent review by the City of North Wildwood is reexamining the 2009 hydraulic dredging project that placed over a million cubic yards of sand on the municipal beach with efforts made to urge the Army Corps to reconsider use of Hereford Inlet ebb-tidal shoals as the sand source in spite of the fear of augmenting the littoral transport of that material to Wildwood and Wildwood Crest.

Erosion continued to plague the northeast segment of Ocean City, Strathmere, Avalon and North Wildwood. Northern Ocean City received maintenance, while Strathmere is maintaining a sufficient margin of protection at the moment. Avalon received federal maintenance during 2017 and North Wildwood succeeded in moving 154,000 cy of Wildwood beach sediment by truck to enhance the beach and dunes between 3<sup>rd</sup> and 15<sup>th</sup> Avenues. North Wildwood's northernmost oceanfront suffers from sand starvation due to ebb channels adjacent to the inlet shoreline directing sand to the northeast and not depositing any quantity offshore of the northern beaches where wave action could move it landward and add it to the beach. Cape May City remained stable with a significant addition of major berm sand over the summer of 2017. The beach in the Nature Conservancy into the eastern few groin cells of Cape May Point received federal maintenance in 2016.

The Delaware Bay shoreline remained relatively stable with no significant sediment additions. A USACE environmental restoration in Lower Township using Delaware Bay Main Navigation Channel dredged material remains in the planning phase.

A Delaware Bayshore, Downe Township, NJ feasibility study under Section 103 of the River and Harbor Act of 1962 (PL 87-874), to design and construct small beach erosion and flood damage reduction projects is in progress. Signed in May 2015, the project's estimated cost is \$740,000 at a 65 – 35 percent federal, non-federal sponsor share. The objective is to design projects to mitigate against future damages similar to Hurricane Sandy's damages seen to impact the region (Fortescue and Gandys Beach within Downe Township).

Appendix Tables 8 and 9 provide the seasonal and annual profile volume and shoreline changes for Cape May County.

**APPENDIX – COUNTY ANNUAL BEACH VOLUME AND SHORELINE CHANGES**

TABLE 4						
MOMOUTH COUNTY						
SEASONAL; OVERALL; ANNUAL SPRING & FALL BEACH VOLUME CHANGES						
	Survey & Time Period					
	Seasonal			Overall	Annual Spring & Fall	
	54 - 55	55 - 56	56 - 57	54 - 57	54 - 56	55 - 57
<b>PROFILE SITE LOCATION</b>	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
	Volume Change (cubic yards per foot)					
187: Cliffwood Beach, Beach Park	1.52	-2.16	-0.42	-1.26	-0.73	-2.79
286: Union Beach, Beach Street	-1.36	-0.03	-0.61	-2.20	-1.54	-0.74
185: Port Monmouth, Spy House	-2.05	2.75	-1.05	-1.16	0.73	1.06
385: Sandy Hook, North Beach	34.17	-3.23	17.83	42.67	30.61	14.40
285: Sandy Hook, Gunnison Beach	-16.92	6.60	-1.34	-11.74	-10.26	5.31
28401: Sandy Hook, Area F Rd.		6.74	-11.86			-5.83
284: Sandy Hook, Parking Lot E	13.69	0.92	25.54	39.89	14.62	25.77
18401: Sandy Hook, Parking Lot C		-2.24	-26.47			-27.97
184: Sandy Hook, Highlands Beach	12.08	-10.25	23.39	22.59	0.40	10.50
183: Sea Bright, Via Ripa Street	0.99	3.11	-0.97	1.49	4.10	0.47
28202: Sea Bright, 300 Ocean Ave.		4.53	-37.50			-32.56
28201: Sea Bright, 436 Ocean Ave.		-18.73	11.59			-7.15
282: Sea Bright, Shrewsbury Way	3.82	18.14	-35.03	-12.38	22.41	-16.84
18202: Sea Bright, 678 Ocean Ave.		18.48	-25.12			-6.64
18201: Sea Bright, 801 Ocean Ave.		-25.32	16.75			-7.76
182: Sea Bright, Public Beach Lot	15.61	-3.52	-22.30	-10.63	11.42	-26.31
181: Sea Bright, Municipal Lot	16.85	6.37	-26.25	-2.42	23.87	-19.81
18003: Sea Bright, 1201 Ocean Ave		-8.50	-6.25			-14.76
18002: Sea Bright, 15 Tradewinds Ln.		-5.82	-13.94			-19.96
18001: Sea Bright, 1485 Ocean Ave.		-7.58	-7.19			-14.76
180: Sea Bright, Sunset Court	0.66	-10.80	-2.62	-12.65	-10.08	-13.42
17901: Monmouth Beach, 122 Ocean Ave.		-21.42	16.39			-4.90
179: Monmouth Beach, Cottage Road	-24.59	18.63	-43.59	-42.13	5.53	-17.66
17801: Monmouth Beach, 65 Ocean Ave.		-3.42	-0.60			-3.89
178: Monmouth Beach, Monmouth Beach Club	37.41	-26.15	-1.15	10.28	10.99	5.05
17701: Monmouth Beach, 9 Ocean Ave.		-14.35	-8.37			-23.87
177: Long Branch, Ocean Avenue	9.80	3.82	-30.99	-15.82	14.64	-27.19
17601: Long Branch, 300 Ocean Ave North		36.55	-58.14			-22.41
176: Long Branch, Seven Presidents Park	-32.50	-12.83	5.40	-38.91	-45.57	-9.16
17501: Long Branch, Ocean Terr.		-5.51	-1.77			-6.96
175: Long Branch, Broadway Avenue	13.32	8.06	-24.88	-3.70	21.17	-17.01
17402: Long Branch, 45 Ocean Ave.		0.92	-1.23			-2.11
17401: Long Branch, N. Morris Ave.		-18.68	-1.54			-20.49
174: Long Branch, S. Morris Avenue	8.74	-15.83	-2.90	-9.83	-6.95	-18.58
17303: Long Branch, 276 Ocean Ave.		-2.27	-0.53			-2.09
17302: Long Branch, 378 Ocean Ave.		10.49	-13.06			-1.85
17301: Long Branch, Wooley Ct.		-16.04	29.06			13.31
173: Long Branch, West End Avenue	18.35	3.52	-0.29	20.44	20.21	2.09
27201: Long Branch, 717 Ocean Ave.		-15.78	10.20			-8.35
272: Long Branch, 805 Ocean Avenue	-5.27	-19.56	-1.51	-25.41	-25.32	-19.93
17101: Long Branch, Plaza Ct.		-12.54	-24.38			-39.20
171: Elberon, Pullman Avenue	-40.66	-17.09	-38.33	-98.02	-59.68	-56.84
17005: Long Branch, 981 Ocean Ave.		-22.37	-33.18			-56.17
17004: Long Branch, 1115 Ocean Ave.		-13.31	-20.12			-33.92
17003: Long Branch, Ocean Ct.		-11.76	-5.93			-16.06
17002: Long Branch, Garfield Rd.		-11.09	-0.33			-11.38
17001: Deal, Jerome Ave.		7.43	-23.77			-14.53
170: Deal, N. Roosevelt Avenue	-16.03	21.06	-28.08	-21.28	7.69	-8.75
16905: Deal, S. Roosevelt Ave.		0.40	13.21			14.95
16904: Deal, 71 Ocean Ave.		-17.30	1.79			-15.72
16903: Deal, Ocean Ln.		-33.22	-24.04			-57.56
16902: Deal, Brighton Ave.		-9.55	-17.98			-26.97
16901: Deal, Wallace Rd.		-30.35	1.15			-29.72
169: Deal, Darlington Avenue	-10.48	-2.19	10.44	-3.99	-14.17	8.17
16802: Deal, Monmouth Dr.		-11.31	-19.45			-30.11
16801: Deal, Neptune Ave.		13.10	-25.36			-12.27

168: Allenhurst, Corlies Avenue	9.19	-37.71	25.37	-3.97	-28.56	-12.34
26703: Loch Arbour, Euclid Ave.		-44.05	58.24			15.21
26702: Loch Arbour, Edgemont Ave.		-70.73	-39.35			-105.20
26701: Asbury Park, 1740 Ocean Ave.		-20.26	4.99			-14.28
267: Asbury Park, Seventh Avenue	13.46	23.92	-21.86	14.45	38.24	0.42
16701: Asbury Park, Sunset Ave.		8.58	-37.94			-17.15
167: Asbury Park, Third Avenue	9.81	0.64	0.61	11.23	10.38	1.48
16602: Asbury Park, Asbury Ave.		-7.05	-0.77			-5.30
16601: Ocean Grove, Spray Ave.		4.03	-9.91			-6.33
166: Ocean Grove, Ocean Pathway	31.13	-11.31	10.78	29.97	18.87	-0.40
16502: Ocean Grove, Broadway		-9.80	10.28			-0.64
16501: Bradley Beach, Cliff Ave.		-38.68	33.03			-1.32
165: Bradley Beach, McCabe Avenue	-4.72	9.83	3.46	9.58	6.71	14.17
16402: Bradley Beach, 4th Ave.		-4.14	0.20			-4.37
16401: Bradley Beach, 2nd Ave.		1.07	2.96			3.67
164: Avon-By-The-Sea, Sylvania Avenue	24.42	-33.03	2.33	-9.97	-5.92	-38.42
16303: Avon-By-The-Sea, Garfield Ave.		-25.62	-7.13			-34.36
16302: Avon-By-The-Sea, Washington Ave.		17.73	-49.31			-11.06
16301: Belmar, 2nd Ave.		-57.36	40.33			-16.36
163: Belmar, 5 th Avenue	-11.63	1.27	3.94	-6.37	-10.25	5.40
16202: Belmar, 8th Ave.		-68.16	-11.35			-76.16
16201: Belmar, 14th Ave.		37.43	-15.45			20.63
162: Belmar, 18 th Avenue	-14.76	11.31	6.55	3.15	-3.47	17.87
16104: Belmar, North Blvd.		-16.68	37.62			17.42
16103: Spring Lake, Remsen Ave.		15.45	-1.39			13.38
16102: Spring Lake, Lorraine Ave.		-19.13	14.90			-1.62
16101: Spring Lake, Tuttle Ave.		18.71	-9.91			9.38
161: Spring Lake, Brighton Avenue	-11.23	17.42	13.61	19.58	5.60	30.98
16004: Spring Lake, Madison Ave.		26.86	-21.44			5.47
16003: Spring Lake, Morris Ave.		-26.79	-5.01			-31.96
16002: Spring Lake, Mercer Ave.		-18.97	15.04			-4.08
16001: Spring Lake, Essex Ave.		1.82	-11.55			-11.65
160: Spring Lake, Salem Avenue	-7.06	-2.67	1.47	-6.27	-8.01	0.03
15902: Spring Lake, Union Ave.		-13.54	-15.64			-32.40
15901: Spring Lake, Brown Ave.		8.19	-13.42			-2.24
159: Sea Girt, New York Avenue	17.14	-0.83	-6.38	14.51	20.88	-3.24
15801: Sea Girt , Crescent Park		-23.10	15.05			-7.91
158: Sea Girt, Trenton Avenue	16.75	-18.68	0.00	-1.30	-0.49	-18.16
15703: Sea Girt, Seaside Pl.		-4.32	-25.42			-31.69
15702: Sea Girt, NGTC - North		4.52	-13.35			-9.14
15701: Sea Girt, NGTC - South		3.98	19.77			22.76
157: Manasquan, Riddle Way	10.41	-18.10	30.08	16.62	-8.59	9.77
25602: Manasquan, Main St.		-23.10	-4.59			-27.40
25601: Manasquan, Brielle Rd.		-20.87	14.92			-4.23
256: Manasquan, Pompano Avenue	-23.21	21.32	-3.05	-6.70	-4.33	14.90
15601: Manasquan, Riverside Dr.		90.54	-71.07			17.48
	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
Seabright sites	3.63	-2.85	-10.18	-8.02	8.24	-12.77
Long Branch sites	-4.03	-6.57	-10.72	-24.46	-11.64	-17.72
New Deal sites	-13.26	-6.19	-11.21	-12.64	-3.24	-17.25
<b>AVERAGE for ALL SITES</b>	<b>2.62</b>	<b>-5.69</b>	<b>-5.07</b>	<b>-2.48</b>	<b>1.22</b>	<b>-10.20</b>
Average for the oceanfront beaches	2.90	-5.87	-5.21	-2.56	1.37	-10.49
Phase II sites	4.26	-6.74	-0.65	6.04	2.22	-6.72

TABLE 5						
MOMOUTH COUNTY						
SEASONAL; OVERALL; ANNUAL SPRING & FALL SHORELINE CHANGES						
	Survey & Time Period					
	Seasonal			Overall	Annual Spring & Fall	
	54 - 55	55 - 56	56 - 57	54 - 57	54 - 56	55 - 57
PROFILE SITE LOCATION	S17-F17	F17-S18	S18-F18	S17-F18	S17-S18	F17-F18
	Shoreline Change (feet)					
187: Cliffwood Beach, Beach Park	4.8	-2.8	-10.0	-8.0	2.0	-12.8
286: Union Beach, Beach Street	0.5	-1.3	-4.3	-5.0	-0.8	-5.5
185: Port Monmouth, Spy House	-2.3	-3.0	-1.8	-7.1	-5.3	-4.8
385: Sandy Hook, North Beach	107.5	-18.8	26.3	115.0	88.8	7.5
285: Sandy Hook, Gunnison Beach	-14.3	4.0	-43.8	-54.0	-10.3	-39.8
28401: Sandy Hook, Area F Rd.		-24.2	-32.3			-56.5
284: Sandy Hook, Parking Lot E	43.0	14.0	-6.3	50.8	57.0	7.8
18401: Sandy Hook, Parking Lot C		0.0	-14.5			-14.5
184: Sandy Hook, Highlands Beach	38.3	0.0	-5.3	33.0	38.3	-5.3
183: Sea Bright, Via Ripa Street	-30.3	-1.8	-42.8	-74.8	-32.0	-44.5
28202: Sea Bright, 300 Ocean Ave.		-16.3	-38.3			-54.5
28201: Sea Bright, 436 Ocean Ave.		-24.0	32.0			8.0
282: Sea Bright, Shrewsbury Way	-23.0	82.5	-75.3	-15.8	59.5	7.3
18202: Sea Bright, 678 Ocean Ave.		22.8	-31.5			-8.8
18201: Sea Bright, 801 Ocean Ave.		-45.5	3.3			-42.3
182: Sea Bright, Public Beach Lot	67.0	-31.3	10.8	46.5	35.8	-20.5
181: Sea Bright, Municipal Lot	60.8	-13.0	-43.8	4.0	47.8	-56.8
18003: Sea Bright, 1201 Ocean Ave		-10.0	-30.0			-40.0
18002: Sea Bright, 15 Tradewinds Ln.		-14.0	-35.5			-49.5
18001: Sea Bright, 1485 Ocean Ave.		-21.8	-9.5			-31.3
180: Sea Bright, Sunset Court	5.5	-33.4	-14.5	-42.4	-27.9	-47.9
17901: Monmouth Beach, 122 Ocean Ave.		-57.5	26.3			-31.3
179: Monmouth Beach, Cottage Road	-31.8	-11.3	-35.3	-78.3	-43.0	-46.5
17801: Monmouth Beach, 65 Ocean Ave.		-5.3	10.8			5.5
178: Monmouth Beach, Monmouth Beach Club	32.5	-13.3	-18.0	1.3	19.3	-31.3
17701: Monmouth Beach, 9 Ocean Ave.		-29.0	-26.3			-55.3
177: Long Branch, Ocean Avenue	-3.3	-11.0	-25.3	-39.5	-14.3	-36.3
17601: Long Branch, 300 Ocean Ave North		35.0	-60.3			-25.3
176: Long Branch, Seven Presidents Park	-40.3	-29.0	24.0	-45.3	-69.3	-5.0
17501: Long Branch, Ocean Terr.		-19.8	6.8			-13.0
175: Long Branch, Broadway Avenue	54.3	-17.3	-22.0	15.0	37.0	-39.3
17402: Long Branch, 45 Ocean Ave.		-13.5	1.3			-12.3
17401: Long Branch, N. Morris Ave.		-55.3	12.3			-43.0
174: Long Branch, S. Morris Avenue	19.0	-36.5	3.0	-14.5	-17.5	-33.5
17303: Long Branch, 276 Ocean Ave.		-8.5	-7.8			-16.3
17302: Long Branch, 378 Ocean Ave.		0.8	-9.8			-9.0
17301: Long Branch, Wooley Ct.		-31.0	34.3			3.3
173: Long Branch, West End Avenue	20.5	11.0	-17.5	14.0	31.5	-6.5
27201: Long Branch, 717 Ocean Ave.		-17.0	-18.3			-35.3
272: Long Branch, 805 Ocean Avenue	-7.8	-44.3	-14.5	-66.5	-52.0	-58.8
17101: Long Branch, Plaza Ct.		-8.6	-18.8			-27.3
171: Elberon, Pullman Avenue	-56.8	-46.0	-47.8	-150.5	-102.8	-93.8
17005: Long Branch, 981 Ocean Ave.		-3.4	-52.5			-55.9
17004: Long Branch, 1115 Ocean Ave.		-10.3	2.3			-8.0
17003: Long Branch, Ocean Ct.		-10.0	-7.3			-17.3
17002: Long Branch, Garfield Rd.		-22.0	5.3			-16.8
17001: Deal, Jerome Ave.		-9.5	-20.5			-30.0
170: Deal, N. Roosevelt Avenue	-4.3	17.3	-34.5	-21.5	13.0	-17.3
16905: Deal, S. Roosevelt Ave.		-12.0	-0.3			-12.3
16904: Deal, 71 Ocean Ave.		-31.0	-8.0			-39.0
16903: Deal, Ocean Ln.		-45.3	2.5			-42.8
16902: Deal, Brighton Ave.		-20.3	3.3			-17.0
16901: Deal, Wallace Rd.		-5.5	3.5			-2.0
169: Deal, Darlington Avenue	-11.8	-19.0	7.8	-23.0	-30.8	-11.3
16802: Deal, Monmouth Dr.		-18.8	-12.5			-31.3
16801: Deal, Neptune Ave.		11.8	-29.8			-18.0

168: Allenhurst, Corlies Avenue	3.3	-42.3	31.8	-7.3	-39.0	-10.5
26703: Loch Arbour, Euclid Ave.		-9.5	42.5			33.0
26702: Loch Arbour, Edgemont Ave.		-51.0	0.8			-50.3
26701: Asbury Park, 1740 Ocean Ave.		-34.3	55.3			21.0
267: Asbury Park, Seventh Avenue	3.3	24.8	-11.0	17.0	28.0	13.8
16701: Asbury Park, Sunset Ave.		29.0	-61.8			-32.8
167: Asbury Park, Third Avenue	8.0	0.3	19.3	27.5	8.3	19.5
16602: Asbury Park, Asbury Ave.		-2.8	-26.8			-29.5
16601: Ocean Grove, Spray Ave.		26.0	-22.8			3.3
166: Ocean Grove, Ocean Pathway	21.3	-16.5	0.0	4.8	4.8	-16.5
16502: Ocean Grove, Broadway		-6.5	-14.5			-21.0
16501: Bradley Beach, Cliff Ave.		-19.0	7.0			-12.0
165: Bradley Beach, McCabe Avenue	4.0	6.0	4.0	14.0	10.0	10.0
16402: Bradley Beach, 4th Ave.		-7.0	14.0			7.0
16401: Bradley Beach, 2nd Ave.		44.5	-21.3			23.3
164: Avon-By-The-Sea, Sylvania Avenue	34.5	-17.3	2.3	19.5	17.3	-15.0
16303: Avon-By-The-Sea, Garfield Ave.		-20.3	6.0			-14.3
16302: Avon-By-The-Sea, Washington Ave.		59.5	-71.5			-12.0
16301: Belmar, 2nd Ave.		-43.8	34.8			-9.0
163: Belmar, 5 th Avenue	-13.3	11.8	-0.8	-2.3	-1.5	11.0
16202: Belmar, 8th Ave.		-1.5	-1.0			-2.5
16201: Belmar, 14th Ave.		12.5	-15.5			-3.0
162: Belmar, 18 th Avenue	-26.8	24.5	-5.3	-7.5	-2.3	19.3
16104: Belmar, North Blvd.		-34.5	49.3			14.8
16103: Spring Lake, Remsen Ave.		13.0	2.3			15.3
16102: Spring Lake, Lorraine Ave.		-18.8	16.8			-2.0
16101: Spring Lake, Tuttle Ave.		-9.8	10.5			0.8
161: Spring Lake, Brighton Avenue	-10.3	3.3	36.5	29.5	-7.0	39.8
16004: Spring Lake, Madison Ave.		17.3	2.5			19.8
16003: Spring Lake, Morris Ave.		-9.5	4.8			-4.8
16002: Spring Lake, Mercer Ave.		-29.0	31.8			2.8
16001: Spring Lake, Essex Ave.		-3.0	2.3			-0.8
160: Spring Lake, Salem Avenue	-14.8	21.8	6.3	13.3	7.0	28.0
15902: Spring Lake, Union Ave.		18.8	-15.0			3.8
15901: Spring Lake, Brown Ave.		2.5	-18.0			-15.5
159: Sea Girt, New York Avenue	17.8	1.3	-6.3	12.8	19.0	-5.0
15801: Sea Girt , Crescent Park		-31.9	17.3			-14.6
158: Sea Girt, Trenton Avenue	-6.0	3.0	-0.5	-3.5	-3.0	2.5
15703: Sea Girt, Seaside Pl.		-6.3	-14.3			-20.5
15702: Sea Girt, NGTC - North		-16.0	-22.0			-38.0
15701: Sea Girt, NGTC - South		-5.4	12.1			6.7
157: Manasquan, Riddle Way	73.8	-74.0	13.0	12.8	-0.3	-61.0
25602: Manasquan, Main St.		-73.0	-14.5			-87.5
25601: Manasquan, Brielle Rd.		-67.5	2.3			-65.3
256: Manasquan, Pompano Avenue	38.8	-30.3	-19.5	-11.0	8.5	-49.8
15601: Manasquan, Riverside Dr.		61.2	-74.8			-13.5
	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
Seabright sites	12.4	-11.6	-19.3	-18.2	11.2	-30.9
Long Branch sites	-2.0	-16.8	-10.6	-41.0	-26.8	-27.4
New Deal sites	-8.0	-13.2	-8.9	-22.3	-8.9	-22.1
<b>AVERAGE for ALL SITES</b>	<b>9.8</b>	<b>-10.0</b>	<b>-7.1</b>	<b>-6.7</b>	<b>2.0</b>	<b>-17.1</b>
Average for the oceanfront beaches	10.5	-10.3	-7.1	-6.7	2.3	-17.4
Phase II sites	9.5	-6.5	-0.3	8.5	3.6	-6.8

<b>TABLE 6</b>						
<b>OCEAN COUNTY</b>						
<b>SEASONAL; OVERALL; ANNUAL SPRING &amp; FALL BEACH VOLUME CHANGES</b>						
	Survey & Time Period					
	Seasonal			Overall	Annual Spring & Fall	
	54 - 55	55 - 56	56 - 57	54 - 57	54 - 56	55 - 57
<b>PROFILE SITE LOCATION</b>	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
	Volume Change (cubic yards per foot)					
156: Point Pleasant, Water Street	80.71	-38.67	-14.78	26.19	40.08	-54.53
155: Point Pleasant, Maryland Avenue	3.19	1.82	32.04	37.66	5.39	34.65
154: Bay Head, Johnson Avenue	21.67	-12.71	1.84	10.68	9.04	-10.26
153: Mantoloking, 1117 Ocean Avenue	80.04	136.63	-4.08	201.31	218.38	119.38
152: Brick Township, Public Beach #3	20.85	-5.89	181.12	173.64	8.13	165.73
151: Normandy Beach, 1 st Avenue	-23.58	-19.33	208.03	171.40	-42.70	183.54
150: Lavallette, White Avenue	15.92	-20.40	22.61	17.44	-5.30	0.11
149: Ortley Beach, 8 th Avenue	39.50	-13.41	225.49	227.30	23.66	193.92
248: Seaside Heights, Franklin Avenue	52.27	-12.20	25.57	66.12	40.58	13.40
148: Seaside Park, 4 th Avenue	20.45	22.90	25.21	68.44	43.86	47.84
347: Midway Beach, 6 th Lane	-2.89	24.33	-1.77	19.64	21.40	22.31
247: Island Beach State Park, Gillikin Access	24.86	-44.63	32.34	11.77	-21.38	-12.36
246: Island Beach State Park, Parking Lot A7	38.28	-19.26	30.66	49.55	18.81	13.27
146: Island Beach State Park, South End	-5.63	-10.31	-6.77	-22.63	-14.57	-17.00
245: Barnegat Light, 10 th Street	3.77	-60.12	45.39	-14.88	-54.44	-19.54
145: Barnegat Light, 26 th Street	22.62	5.58	1.52	29.95	28.24	6.87
144: Loveladies, La Baia Street	-20.16	-9.75	-8.69	-38.14	-30.06	-19.40
143: Harvey Cedars, 73 rd Street	-19.28	38.68	86.95	105.83	19.04	125.45
142: Harvey Cedars, Tranquility Drive	49.28	-30.25	49.81	65.72	21.92	17.83
241: Surf City, 20 th Street	14.49	-27.08	80.92	67.52	-12.69	53.84
141: Ship Bottom, 8 th Street	2.28	55.25	14.87	72.75	51.04	69.20
140: Long Beach Township, 32 nd Street	-10.79	11.92	61.70	61.43	0.95	73.51
139: Long Beach Township, 81 st Street	6.27	0.57	-13.33	-8.52	7.46	-12.80
138: Long Beach Township, Old Whaling Rd.	-24.53	6.87	7.58	-4.92	-17.17	16.22
137: Beach Haven, Taylor Avenue	-1.52	-1.71	-1.52	-1.43	-3.61	-2.65
136: Beach Haven, Dolphin Avenue	-32.90	72.43	-58.62	-19.05	39.56	13.76
135: Long Beach Township, Webster Ave.	-23.13	41.11	-2.87	18.36	18.24	38.91
234: Long Beach Township, Natural Area	-102.29	85.10	-74.33	-89.48	-17.14	10.67
	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
AVERAGE COUNTY SURVEY	8.21	6.34	33.82	46.56	14.17	38.28

<b>TABLE 7</b>						
<b>OCEAN COUNTY</b>						
<b>SEASONAL; OVERALL; ANNUAL SPRING &amp; FALL SHORELINE CHANGES</b>						
	Survey & Time Period					
	Seasonal			Overall	Annual Spring & Fall	
	54 - 55	55 - 56	56 - 57	54 - 57	54 - 56	55 - 57
<b>PROFILE SITE LOCATION</b>	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
	Shoreline Change (feet)					
156: Point Pleasant, Water Street	61.3	-41.0	2.0	22.3	20.3	-39.0
155: Point Pleasant, Maryland Avenue	1.0	35.5	25.3	61.8	36.5	60.8
154: Bay Head, Johnson Avenue	9.8	-3.5	-29.5	-23.3	6.3	-33.0
153: Mantoloking, 1117 Ocean Avenue	212.0	43.8	10.8	266.5	255.8	54.5
152: Brick Township, Public Beach #3	33.3	-21.5	193.3	205.0	11.8	171.8
151: Normandy Beach, 1 st Avenue	8.5	-32.8	213.3	189.0	-24.3	180.5
150: Lavallette, White Avenue	39.8	-36.3	4.8	8.3	3.5	-31.5
149: Ortlely Beach, 8 th Avenue	76.5	-39.3	211.0	248.3	37.3	171.8
248: Seaside Heights, Franklin Avenue	83.8	-33.0	-12.3	38.5	50.8	-45.3
148: Seaside Park, 4 th Avenue	40.5	-8.3	43.0	75.3	32.3	34.8
347: Midway Beach, 6 th Lane	-3.3	23.0	-8.3	11.5	19.8	14.8
247: Island Beach State Park, Gillikin Access	88.0	-95.5	51.5	44.0	-7.5	-44.0
246: Island Beach State Park, Parking Lot A7	46.0	-19.8	26.8	53.0	26.3	7.0
146: Island Beach State Park, South End	42.3	-63.3	24.0	3.0	-21.0	-39.3
245: Barnegat Light, 10 th Street	-6.0	-82.0	17.8	-70.3	-88.0	-64.3
145: Barnegat Light, 26 th Street	46.0	16.3	-40.5	21.8	62.3	-24.3
144: Loveladies, La Baia Street	44.8	-58.8	-4.0	-18.0	-14.0	-62.8
143: Harvey Cedars, 73 rd Street	14.0	19.5	206.8	240.3	33.5	226.3
142: Harvey Cedars, Tranquility Drive	98.8	-43.0	127.3	183.0	55.8	84.3
241: Surf City, 20 th Street	17.8	-46.8	129.3	100.3	-29.0	82.5
141: Ship Bottom, 8 th Street	-8.3	43.0	-9.8	25.0	34.8	33.3
140: Long Beach Township, 32 nd Street	-16.0	21.8	74.0	79.8	5.8	95.8
139: Long Beach Township, 81 st Street	22.5	-1.3	-21.5	-0.3	21.3	-22.8
138: Long Beach Township, Old Whaling Rd.	14.3	-2.3	-15.3	-3.3	12.0	-17.5
137: Beach Haven, Taylor Avenue	32.0	-4.8	-12.3	15.0	27.3	-17.0
136: Beach Haven, Dolphin Avenue	8.3	83.3	-94.0	-2.5	91.5	-10.8
135: Long Beach Township, Webster Ave.	7.8	32.3	-22.0	18.0	40.0	10.3
234: Long Beach Township, Natural Area	-110.3	114.0	-118.8	-115.0	3.8	-4.8
	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
AVERAGE COUNTY SURVEY	32.3	-7.2	34.7	59.9	25.2	27.6



**TABLE 10**  
**CAPE MAY COUNTY**

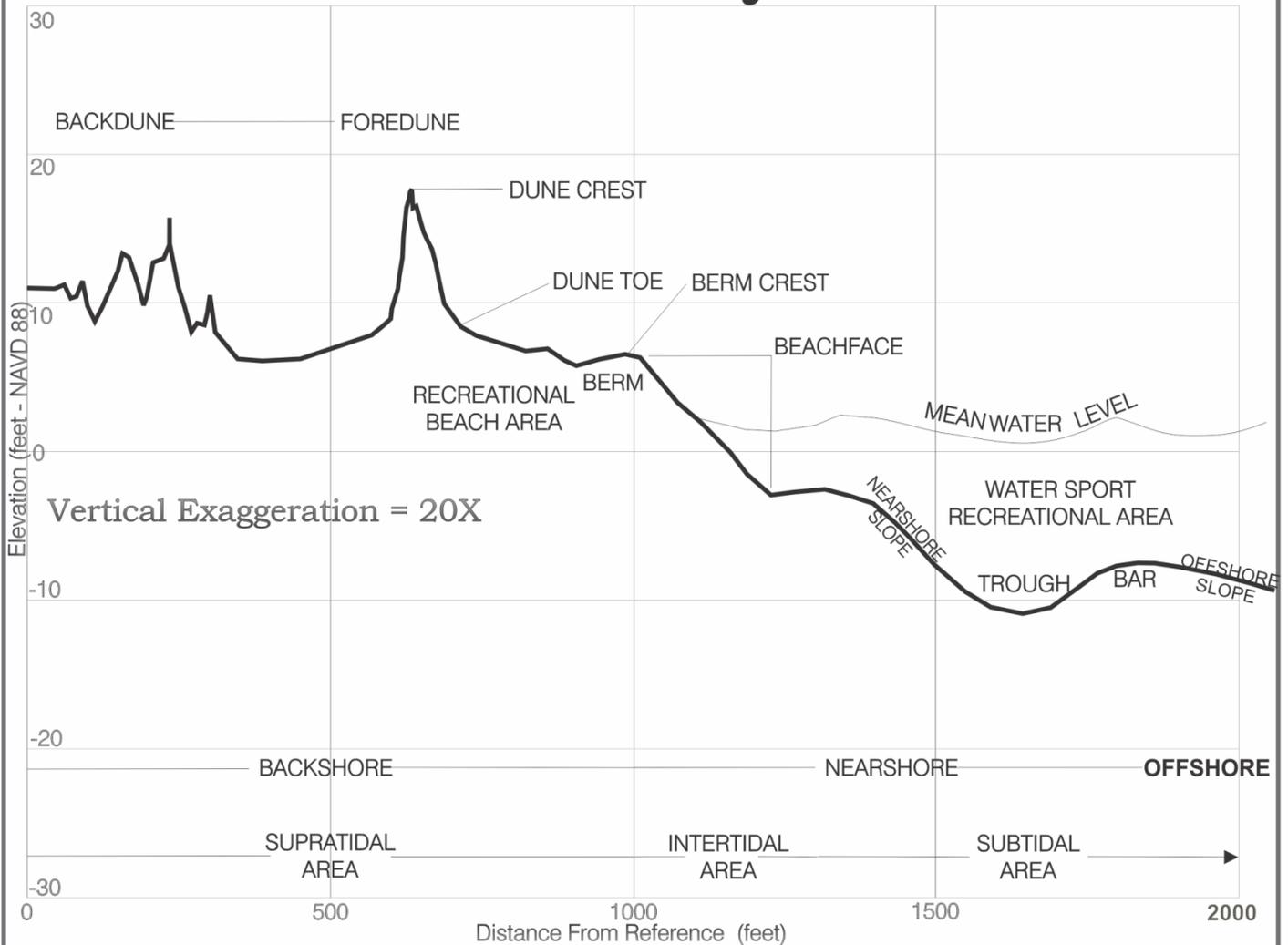
**SEASONAL; OVERALL; ANNUAL SPRING & FALL SAND VOLUME CHANGES**

	Survey & Time Period					
	Seasonal			Overall	Annual Spring & Fall	
	54 - 55	55 - 56	56 - 57	54 - 57	54 - 56	55 - 57
	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
<b>PROFILE SITE LOCATION</b>	<b>Volume Change (cubic yards per foot)</b>					
225: Ocean City, Gardens Road	18.38	83.91	-15.78	87.43	103.50	69.06
125: Ocean City, 6 th Street	-32.73	100.37	-50.02	17.30	67.32	50.02
124: Ocean City, 20 th Street	36.65	-6.31	18.75	48.76	29.99	12.28
223: Ocean City, 34 th Street	34.13	17.14	-10.44	41.04	52.45	7.59
122: Ocean City, 56 th Street	-17.58	-34.84	-21.10	-72.54	-56.45	-54.80
222: Ocean City, 59 th Street	-40.65	-15.76	-39.37	-98.30	-58.58	-54.82
221: Ocean City, Corson's Inlet Park	-17.24	-28.05	-39.16	-89.72	-46.83	-67.31
121: Strathmere, Williams Road	-35.83	-52.40	-106.05	-193.13	-89.73	-158.41
120: Sea Isle City, 1 st Street	11.30	8.26	-19.97	-4.65	17.54	-12.47
119: Sea Isle City, 25 th Street	0.28	11.01	11.91	23.50	12.60	23.17
118: Sea Isle City, 57 th Street	-13.06	6.62	12.46	6.32	-6.98	19.72
117: Sea Isle City, 80 th Street	-4.93	22.43	-11.56	7.68	18.01	10.06
216: Avalon, 9 th Street	-40.01	-73.07	-9.60	-122.74	-112.92	-83.96
116: Avalon, 23 rd Street	115.81	1.84	-5.01	112.99	117.77	-2.96
115: Avalon, 35 th Street	7.21	12.31	-7.78	15.13	22.64	6.98
114: Avalon, 70 th Street	45.60	-5.15	12.26	51.97	39.31	6.69
113: Stone Harbor, 90 th Street	28.49	-2.88	0.36	25.38	27.50	-3.66
212: Stone Harbor, South End	-45.43	-3.08	-5.32	-52.86	-48.10	-8.33
111: North Wildwood, 15 th Avenue	30.87	-31.12	-12.99	-8.25	0.06	-43.03
110: Wildwood, Cresse Avenue	16.70	2.16	29.97	45.57	19.39	27.54
109: Lower Township, Raleigh Ave.	49.95	-0.63	-11.46	36.28	47.66	-13.79
208: Lower Township, Cape May NWR	11.07	-15.47	0.01	-1.81	-2.11	-15.44
108: Cape May City, Cape May Beach Club	8.09	0.32	-7.75	-0.06	8.27	-7.72
107: Cape May, Baltimore Ave.	-9.57	6.51	-11.27	-14.05	-2.93	-4.56
206: Cape May, Broadway Ave.	14.58	5.05	18.51	38.06	19.66	23.02
105: Cape May, Nature Conservancy	-53.00	17.94	-18.12	-51.82	-34.06	0.03
104: Cape May Point, Lake Drive	-29.24	18.34	4.11	-7.79	-10.51	19.07
103: Lower Township, Higbee Beach	4.52	0.45	0.00	4.91	4.93	0.46
102: North Cape May, Whittier Ave.	3.56	6.54	5.57	15.24	10.19	11.45
201: Lower Township, Pacific Avenue	-7.51	3.14	-2.20	-6.15	-4.24	0.85
100: Middle Township, Reeds Beach	-1.30	0.97	-3.38	-3.67	-0.32	-2.42
	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
AVERAGE for EACH SURVEY	2.87	1.82	-9.50	-4.84	4.68	-7.93
Average for oceanfront beaches	4.58	1.04	-11.48	-5.87	5.58	-10.58

<b>TABLE 11</b>						
<b>CAPE MAY COUNTY</b>						
<b>SEASONAL; OVERALL; ANNUAL SPRING &amp; FALL SHORELINE CHANGES</b>						
	Survey & Time Period					
	Seasonal			Overall	Annual Spring & Fall	
	54 - 55	55 - 56	56 - 57	54 - 57	54 - 56	55 - 57
<b>PROFILE SITE LOCATION</b>	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
	Shoreline Change (feet)					
225: Ocean City, Gardens Road	-0.8	146.3	-35.0	110.5	145.5	111.3
125: Ocean City, 6 th Street	-68.3	137.5	-26.0	43.3	69.3	111.5
124: Ocean City, 20 th Street	45.8	-46.5	-21.3	-22.0	-0.8	-67.8
223: Ocean City, 34 th Street	39.8	-0.5	-32.5	6.8	39.3	-33.0
122: Ocean City, 56 th Street	-56.3	-18.0	-27.3	-101.5	-74.3	-45.3
222: Ocean City, 59 th Street	21.8	-17.8	-33.8	-29.8	4.0	-51.5
221: Ocean City, Corson's Inlet Park	32.5	-11.8	-145.8	-125.0	20.8	-119.5
121: Strathmere, Williams Road	-133.8	65.0	-295.5	-364.3	-68.8	-230.5
120: Sea Isle City, 1 st Street	19.8	-33.0	11.8	-1.5	-13.3	-21.3
119: Sea Isle City, 25 th Street	-24.4	-3.8	41.5	13.3	-28.2	37.8
118: Sea Isle City, 57 th Street	-17.5	49.3	-29.5	2.3	31.8	19.8
117: Sea Isle City, 80 th Street	-49.5	69.0	-29.0	-9.5	19.5	40.0
216: Avalon, 9 th Street	-49.5	-145.0	17.5	-177.0	-194.5	-127.5
116: Avalon, 23 rd Street	193.0	2.0	-20.3	174.8	195.0	-18.3
115: Avalon, 35 th Street	-71.5	118.5	-39.5	7.5	47.0	79.0
114: Avalon, 70 th Street	10.8	9.8	13.8	34.3	20.5	23.5
113: Stone Harbor, 90 th Street	-21.0	19.8	0.3	-1.0	-1.3	20.0
212: Stone Harbor, South End	-131.3	-51.5	33.3	-149.5	-182.8	-18.3
111: North Wildwood, 15 th Avenue	69.5	-96.0	23.5	-3.0	-26.5	-72.5
110: Wildwood, Cresse Avenue	24.0	-4.0	43.5	63.5	20.0	39.5
109: Lower Township, Raleigh Ave.	55.5	-15.0	25.5	66.0	40.5	10.5
208: Lower Township, Cape May NWR	80.3	-59.8	13.0	33.5	20.5	-46.8
108: Cape May City, Cape May Beach Club	-0.3	7.8	-17.3	-9.8	7.5	-9.5
107: Cape May, Baltimore Ave.	-13.3	30.8	-33.0	-15.5	17.5	-2.3
206: Cape May, Broadway Ave.	5.0	-6.0	39.0	38.0	-1.0	33.0
105: Cape May, Nature Conservancy	-115.0	46.3	-45.3	-114.0	-68.8	1.0
104: Cape May Point, Lake Drive	-51.8	20.0	-5.8	-37.5	-31.8	14.3
103: Lower Township, Higbee Beach	-3.3	3.8	0.3	0.8	0.5	4.0
102: North Cape May, Whittier Ave.	2.5	-11.3	18.0	9.3	-8.8	6.8
201: Lower Township, Pacific Avenue	0.0	5.0	0.3	5.3	5.0	5.3
100: Middle Township, Reeds Beach	1.5	-2.0	-1.3	-1.8	-0.5	-3.3
	<b>S17-F17</b>	<b>F17-S18</b>	<b>S18-F18</b>	<b>S17-F18</b>	<b>S17-S18</b>	<b>F17-F18</b>
AVERAGE for EACH SURVEY	-6.6	6.7	-18.0	-17.9	0.1	-10.0
Average for oceanfront beaches	▲ -5.9	▲ 7.4	▲ -21.9	▲ -20.4	▲ 1.5	▲ -13.0
Average for bayshore beaches	▲ 0.2	▲ -1.1	▲ 4.3	▲ 3.4	▲ -0.9	▲ 3.2

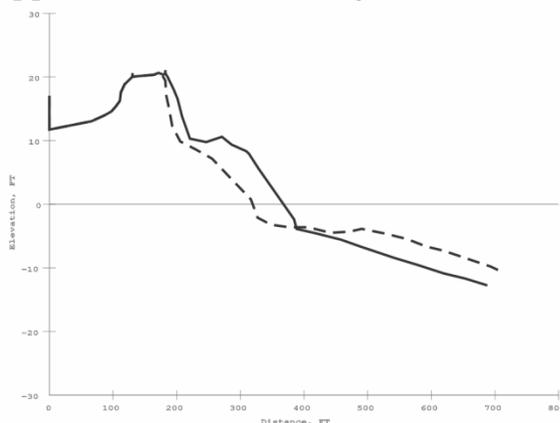


# Typical Beach Profiles in New Jersey



Above is a typical beach profile with major features and zones labeled. No beach will show every aspect of this diagram at all times, but it illustrates all important features that appear on the New Jersey shoreline..

## Seasonal Variations



The pair of profiles to the left show typical seasonal beach profile changes. The dashed line profile develops during a winter season, where wave conditions move material offshore. The solid line profile is generated during a summer season, where wave conditions move sand onshore, building a well developed berm and wider beach and adding to the dune. The winter wave conditions shift this beach material to the offshore region of the profile.



# Coastal Research Center Glossary of Coastal Terms



**Accretion** - The addition of material to the beach cross section by natural processes.

**Aeolian Accretion** - Sand accumulation that results from wind driven processes.

**Backshore** - The area of the beach profile landward of the berm and seaward of upland dunes or bluffs.

**Beachface** - Also known as foreshore. The area of the beach exposed to regular wave action.

**Berm** - The nearly horizontal portion of the beach formed at the high water line as waves deposit material. A beach may have no berm or multiple berms depending on wave conditions.

**Bulkhead** - A structure that is built to retain or prevent the slumping of "earth" at the water's edge due to currents or wave action. Bulkheads are typically made of wood, steel, or plastic.

**Cross-shore Transport** - The transfer of sand perpendicular to the shoreline, or along the profile. A bar migrating onto the beach is an example of cross-shore transport.

**Current** - The flow of water in a channel or at the shoreline.

**Downdrift** - The direction of movement of sediment parallel to the coastline.

**Datum** - A reference level from which elevations are measured.

**Dry Beach** - The area of beach between the water and dune toe that is commonly used for recreation. Also referred to as recreational beach.

**Dune** - Unconsolidated hills or mounds of sand. Dunes are the result of aeolian processes and may have vegetation ranging from sparse to dense. Vegetation greatly stabilizes a dune.

**Eddy** - A circular current developed within or adjacent to the main current.

**Erosion** - The removal of material either vertically or horizontally by natural processes.

**Foredune** - The most seaward of the dune ridges along the profile.

**Geotube** - A geo-textile fabric installation filled with sand, typically used to retain material or to dissipate wave energy.

**Groin** - A shore-perpendicular erosion control structure, usually made of wood or rock. This structure acts to slow the process of littoral transport.

**Hurricane** - A tropical cyclone in the Northern Hemisphere, with sustained winds over 74 mph.

**Jetty** - A shore-perpendicular erosion control structure similar to a groin, however it is used to control the movement of sand at an inlet or channel.

**Littoral Current** - Current that moves parallel to shore, that results from the approach of waves not being perpendicular to the shoreline.

**Littoral Drift** - Also known as longshore transport. Movement of material parallel to the shoreline resulting from waves arriving at the shore at any angle not 90 degrees to the shore.



# Coastal Research Center Glossary of Coastal Terms



**Longshore Transport** - Also known as littoral drift. Movement of sand parallel to the coastline resulting from wave generated littoral currents.

**NAVD** - (the datum of 1988) New elevation reference developed to replace the 1929 engineering datum.

**NGVD** - (the datum of 1929) An elevation reference developed from a specific model of the Earth's surface.

**Onshore** - In the direction of the shoreline; landward.

**Offshore** - In the direction opposite of the shoreline; seaward.

**Neap Tide** - A tide reduced in total elevation ranges due to the orbital positions of the sun and moon. Neap tides occur at first and last quarter moon stages.

**Nearshore** - Region of beach profile extending from the berm seaward in the direction of the offshore.

**Northeaster** - Dominant type of coastal winter storm event experienced in New Jersey, with winds from the northeast that exceed 30 mph.

**Revetment** - Cover of stone placed on or along a shoreline to protect a slope or shore structure.

**Ridge** - A low elevation, shore-parallel continuous mound of sand, generated by wave action.

**Riprap** - Line of rocks placed randomly along a slope or structure for protection.

**Runnel** - A continuous area of lower elevation than, but parallel to and adjacent to, a ridge(s).

**Scarp** - A near vertical feature generated by erosion of material from the lower portion of a slope or bluff.

**Scour** - Underwater removal of material through currents and/or wave action.

**Seawall** - Hard structure that separates the land and water.

**Shoreline** - The narrow area of land in contact with the water. When referring to a profile plot, the point where the profile crosses the line representing the datum.

**Spring Tide** - Tide with the highest elevation ranges due to the orbital positions of the sun and moon. Spring tides occur at new or full moon stages.

**Swale** - A long, narrow, generally shallow depression between ridges.

**Swash** - The area of beachface exposed to breaking wave energy as waves come ashore at the beach.

**Storm Surge** - The abnormal rise in local sea level that accompanies a hurricane or other major storm event.

**Updrift** - In the direction opposite of the dominant direction of movement of sand driven by waves.

**Wrack** - Debris deposited on the beach by wave action.

References: A.G.I., U.S.A.C.O.E., N.O.A.A., F.E.M.A., N.J.D.E.P.

## BIBLIOGRAPHY

- 1981, New Jersey Shore Protection Plan: New Jersey Department of Environmental Protection, Division of Coastal Resources, CN 401, Trenton NJ 08625, vols 1-3
- 1985, Guidelines and Recommendations for Coastal Dune Restoration and Creation Projects. Bureau of Planning and Project Review, NJDEP, CN 401, Trenton, NJ 12p.
- 1986, Final Report for 1986 on New Jersey Beach Profiles Network: A Series of FEMA Monitoring Survey Stations. Contract #23059 NJDEP Coastal Resources Division.
- 1986, Beach Profiles Network for New Jersey, A Station Location Reference. Contract #23059 NJDEP Coastal Resources Division, Trenton, NJ 08625
- 1986, New Jersey Beach Profiles Network. Profile Photograph Reference. Contract #23059 NJDEP Coastal Resources Division, Trenton, NJ 08625
- 1987, New Jersey Beach Profile Network. Profile Photograph Reference. Contract #29059 NJDEP Coastal Resources Division, Trenton, NJ 08625
- 1992, New Jersey Beach Profile Network. Profile Monument Location Reference. Contract #29405 NJDEP, Division of Coastal Planning and Policy, Trenton, NJ 08625
- 1992, The New Jersey Beach Profile Network (NJ BPN), Reach Specific Analysis Following Six Years of Study on the New Jersey Oceanfront Coastline. Contract #29405 NJDEP, Division of Coastal Planning and Policy, Trenton, NJ 08625
- 1992, The New Jersey Beach Profile Network (NJ BPN), Reach Specific Analysis Following Six Years of Study on the New Jersey Oceanfront Coastline. Contract #29405 NJDEP, Division of Coastal Planning and Policy, Trenton, NJ 08625
- 1998, Villas and Vicinity, NJ Interim Feasibility Study – Final Feasibility Report and Environmental Assessment, United States Army Corps of Engineers Philadelphia District, Philadelphia, Pa 19107-3391
- Farrell, S.C., Meggison, A., Lyons, T., Hafner, S., Boyer, S., and Sullivan, B., 1992, The New Jersey Beach Profiles Network; Analysis of the Shoreline Changes in NJ Coastal Reaches 1 through 15, NJ Dept of Environmental Protection (NJ DEP), Trenton, NJ 08625, Contract #29338, 136p.
- Farrell, S.C., Hafner, S., Speer, B., and Lepp, T., 1997, The New Jersey Beach Profiles Network; Analysis of the Shoreline Changes in NJ Coastal Reaches 1 through 15, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 263p.
- Farrell S., 1995, Beach Nourishment at Avalon, New Jersey: A Comparison of Fill Performance with and without Submerged Breakwaters, in, Proceedings of the 8th National Conference on Beach Preservation Technology, Florida Shore and Beach Preservation Association, 864 East Park Ave., Tallahassee, Florida, Lawrence Tait, ed.
- Fisher, J., 1967, Origin of Barrier Chain Shorelines: Middle Atlantic Bight, Geological Society of America Annual Program, P 66-67.

Nordstrom, K., Fisher, S., Burr, M., Frankel, E., Buckalew, T., and Kucma, G., 1977, Coastal Geomorphology of New Jersey, Volumes I and II. Tech Report 77-1, Center for Coastal and Environmental Studies, Rutgers University, New Brunswick, NJ.

Uptegrove, J., Mullikin, L., Waldner, J., Sheridan, R., Hall, D., Gilroy, J., and Farrell, S., 1994, Characterization of Offshore Sediments in Federal Waters as Potential Sources of Beach Replenishment Sand - Phase 1. Technical Report NJ Geological Survey, Trenton NJ. 150p.

Farrell, S.C., Hafner, S., Speer, B., Lepp, T., Ebersold, S., 1998, The New Jersey Beach Network; Analysis of the Shoreline Changes in NJ Coastal Reaches 1 through 15, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 263p

Farrell, S.C., Hafner, S., Speer, B., Lepp, T., Ebersold, S., Constantino, C., 1999, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Fall of 1997 Through Spring of 1998, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 197p

Ciorra, Anthony, Project Manager, U.S. Army Corps of Engineers, New York District, 26 Federal Plaza, New York, NY 10278, web: <http://www.nan.usace.army.mil>

Farrell, S.C., Hafner, S., Constantino, C., Policarpo, J., Bogle, B., and Linzner, E., 2000, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Fall of 1998 Through Spring of 2000, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 178p.

Farrell, S.C., Hafner, S., Constantino, C., Robine, C., Bogle, and, B. Linzner, E., 2001, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Fall of 1999 Through Spring of 2001, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 183p.

Farrell, S.C., Hafner, S., Constantino, C., Robine, C., Lees, B., Finley M. and Linzner, E., 2002, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Fall of 1998 Through Spring of 2000, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 178p.

Farrell, S.C., Hafner, S., Constantino, C., Robine, C., Lees, B., Finley M. and Linzner, E., 2003, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Spring of 2002 Through Fall of 2003, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 218p.

Farrell, S.C., Hafner, S., Constantino, C., Robine, C., Lees, B., Finley M. and Linzner, E., 2004, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Spring 2003 Through Fall of 2004, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 205p.

Farrell, S.C., 2006, Twenty Years of Coastal Monitoring Along the New Jersey Shoreline; 50<sup>th</sup> Annual Meeting of the American Shore & Beach Preservation Association, Long Branch, NJ, October 2006

Farrell, S. C., Hafner, S., Robine, C., Howard, S., Smith. B., Gruver, M. 2007, The New Jersey Beach Network; Twenty Years of Coastal Monitoring Along the New Jersey Shoreline; NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 354p.

Farrell, S. C., Hafner, S., Robine, C., Howard, S., Smith. B., Gruver, M. 2008, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Spring of 2007 Through Fall of 2008, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 243p.

Farrell, S. C., Hafner, S., Robine, C., Howard, S., Smith, B., 2009, Beach Nourishment in New Jersey and the Effectiveness of Shoreline Monitoring over 23 years, North East Beach Preservation Association Conference, Sept. 21 to 23, 2009, Woods Hole Massachusetts.

Farrell, S. C., Hafner, S., Robine, C., Howard, S., Smith, B., Gruver, M., Barone, D., Mc Kenna, K., 2010, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Spring of 2009 Through Fall of 2010, NJ Dept of Environmental Protection (NJDEP), Trenton, NJ 08625, 273p.

Farrell, S.C., Hafner, S., Howard, B.S., Barone, D.A., McKenna, K.K., Robine, C., Koch, R., Smith, B., Gruver, M., Flynn, M.J., and Tracey, C., 2012, Shoreline Changes in New Jersey Coastal Reaches One through Fifteen Raritan Bay to Delaware Bay-A Review of 25 Years-1986 to 2012: New Jersey Beach Profile Network 2011 Annual Report to the New Jersey Department of Environmental Protection, Division of Construction and Engineering, <http://intraweb.stockton.edu/eyos/page.cfm?siteID=149&pageID=151>. 289p.

Coastal Research Center, Impact of Hurricane Sandy on the NJBPN sites along the Coast of New Jersey Following the October 29-30, 2012 Storm, 2012, published in five Regional Reports to the Bureau of Coastal Engineering, NJ Dept of Environmental Protection (NJDEP), Toms River, NJ 08735, 188p. Also available on [www.stockton.edu/crc](http://www.stockton.edu/crc)

Farrell, S. C., Hafner, S., Robine, C., Howard, S., Smith, B., Flynn, M., Barone, D., Mc Kenna, K., 2013, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Spring 2012 Through Fall 2013, NJ Dept. of Environmental Protection (NJDEP), Bureau of Coastal Engineering Toms River, NJ 08753, 169p.

Farrell, S. C., Hafner, S., Robine, C., Howard, S., Smith, B., M., Barone, D., Mc Kenna, K., 2014, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Spring 2013 Through Fall 2014, NJ Dept. of Environmental Protection (NJDEP), Bureau of Coastal Engineering Toms River, NJ 08753, 162p.

Howard, B.S., Barone, D.A., and McKenna, K.K., 2015, State Channel Maintenance Capacity: Evaluation of Dredged Holes, Final Report to the New Jersey Department of Transportation Bureau of Research Project No. 2013-10, Coastal Research Center, Stockton University, Port Republic, NJ. 67p.

Barone, D., McKenna, K.K., Farrell, S., C., 2014, Hurricane Sandy: Beach-Dune Performance at New Jersey Beach Profile Network Sites, Shore and Beach, vol. 82, no. 4, pp. 13-22.

Farrell, S., C., 2016, Managing NJ Coastal Zone Storm Effects as They Alter the Developed Environment We Love; 2016, Society of Ecological Restoration, Mid-Atlantic Chapter Conference, Sea View, Galloway, NJ.

Farrell, S. C., McKenna, K.K., Hafner, S., Robine, C., Smith, B., DiCosmo, N., Gruver, M., Ferencz, A., Tracey, C., Pimpinelli, H., 2016, The New Jersey Beach Network; Annual Report on Monitoring New Jersey Beaches Spring 2014 Through Fall 2015, NJ Dept. of Environmental Protection (NJDEP), Bureau of Coastal Engineering Toms River, NJ 08753, 166p.

McKenna, K.K., Farrell, S.C., and Gebert, J.A., 2016, Hurricane Sandy: Beach-dune recovery at New Jersey Beach Profile Network (NJBPN) sites, Shore & Beach, vol. 84, no. 3, pp. 5-17.

Barone, D.A., McKenna, K.K., Farrell, S.C., 2014, Hurricane Sandy: Beach-dune performance at New Jersey Beach Profile Network sites, Shore and Beach, vol. 82, no. 4, pp. 13-22.

US Army Corps of Engineers, 2016, New Jersey Shore Protection, Manasquan Inlet to Barnegat Inlet Coastal Storm Damage Reduction Project, Philadelphia District Project Fact Sheet,

<http://www.nap.usace.army.mil/Missions/Factsheets/Fact-Sheet-Article-View/Article/490786/new-jersey-shore-protection-manasquan-inlet-to-barnegat-inlet-nj/> (accessed May 2017).

Farrell, S. C., McKenna, K.K., Hafner, S., Smith, B., Robine, C., Pimpinelli, H., DiCosmo, N., Tracey, C., Beal, I., Ferencz, A., Gruver, M., and Suran, M., 2017, The New Jersey Beach Network; Report on Monitoring New Jersey Beaches An Analysis of Thirty Years of Sand Redistribution and Shoreline Changes in New Jersey's Four Coastal Counties, Raritan Bay, the Atlantic Ocean Coast, and Delaware Bay, Fall 1986 Through Fall 2016, NJ Dept. of Environmental Protection (NJDEP), Bureau of Coastal Engineering Toms River, NJ 08753, 689p.