

**ANNUAL REVIEW FOR 2016
OF THE CAPE MAY POINT, NJ MUNICIPAL BEACHES**



The Photo above taken on April 19, 2016 shows the existing offset conditions at the western end of the municipality between the beaches at Alexander Avenue in the foreground and Sunset Beach on the updrift side of the terminal rock groin. In the background the concrete shipwreck is visible that rests nearshore off Sunset Beach. Although the beach at Alexander Ave has benefited tremendously from sand influx shed from the updrift USACE project beaches, none of the material appears to continue west past the terminal groin at Alexander Avenue.

PREPARED FOR: THE BOROUGH OF CAPE MAY POINT
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Introduction:

The annual survey of the nine cross section stations on the municipal beach was completed by the Stockton University Coastal Research Center (CRC) on April 19, 20 and 21, 2016. These were compared to previous surveys that were conducted April 2014 and March 2015. The findings included in this report complete the annual review of the municipal beaches prior to the 2016 tourist season.

The US Army Corps of Engineers (USACE) has nourished the Cape May Point Borough and Lower Cape May Meadows beaches twice with initial construction completed by June 2007. A second periodic nourishment cycle was completed January 2013 following Hurricane Sandy. The USACE was able to use FY12 funds to complete the second nourishment cycle of the Lower Cape May Meadows - Cape May Point shore protection project. The second cycle of nourishment placed a reported 345,000 cubic yards of sand onto the Lower Cape May Meadows – Cape May Point project beaches with approximately 108,697 placed on the Borough’s beaches (Dwight Pakan, personal communication, USACE). The April 2014 and March 2015 surveys included on the plots in this report allow for a one and two-year assessment of the project’s readjustment.

The fall of 2015 started another El Nino episode. The longest and strongest El Niño recorded was produced in 2016. A global heat wave with superheated ocean temperatures had worldwide implications and affected weather patterns across the US. In New Jersey, the impact was an increase in storm occurrence with the first northeast event occurring in early October 2015. Storm occurrence increased in January through March of 2016, the largest single event was winter storm Jonas, January 22-24, 2016. These northeast storms caused significant beach and dune erosion on New Jersey’s Atlantic Ocean coastline. Cape May Point was largely spared from serious beach erosion because of the shoreline’s orientation and approach angle of the storms. Erosional impacts along the Borough’s shoreline from these winter storms were minor limited to the beachface and nearshore slopes with no significant loss to the recreational beach and dune. Several of the eastern and western beaches in the Borough actually gained significant volumes of sand, added to the beach profile both onshore and offshore resulting in shoreline and berm width advancements, elevation increases and continued dune growth.

Beach Monitoring Program:

The CRC established the Borough’s beach monitoring program in 1991 to address the changes observed along the shoreline. Nine permanent monitoring survey lines are located at the following sites along the Borough’s ocean and bay shorelines. Each profile starts at a fixed reference position behind the dunes, crosses the dunes, beach and extends over 600 feet into the water, ending at a depth of 12-16 feet. Each cross section is located midway between the rock groins that define each of the beach cells. Below is a list of the monitoring site locations and the survey number and dates included in this report:

CMP-0: Lighthouse Avenue	Survey 42	April 8 & 10, 2014
CMP-1: Lehigh Ave	Survey 43	March 23 & 24, 2015
CMP-2: Whilldin Ave	Survey 44	April 19, 20 & 21, 2016
CMP-3: Coral Ave		
CMP-4: Lake Drive		
CMP-5: Cape Avenue		
CMP-6: Pearl Avenue		
CMP-7: Stites Avenue		
CMP-8: Alexander Avenue		

The summary table below compiles the annual shoreline and beach volume change information between 2015 and 2016. The shoreline changes are based on the advance (seaward) or the retreat (landward) of the zero elevation datum position on each cross section. This elevation represents the “shoreline” position; it approximates the proper change horizontally for any shoreline point selected on the beachface subject to daily wave run-up. The unit sand volume computed for the cross section in cubic yards of sand per foot of shoreline is multiplied by the distance between the groins in Cape May Point to arrive at the net volume in the right column for each cell.

Table 1.
Profile Shoreline and Sand Volume Changes
March 2015 to April 2016

Profile Number	Shoreline Change (feet)	Volume Change (yds ³ /ft)	Cell Distance (feet)	Net Volume Change (yds ³)
CMP-0	80	66.08	420	27,754
CMP-1	21	1.79	445	797
CMP-2	3	-9.24	460	-4,250
CMP-3	-14	-12.18	450	-5,481
CMP-4	-12	-11.08	675	-7,479
CMP-5	3	13.44	690	9,274
CMP-6	-30	-16.77	710	-11,907
CMP-7	-5	10.54	680	7,167
CMP-8	64	55.77	660	36,808

Total Volume Change for Cape May Point = 52,682

From March 2015 to April 2016, the Borough’s beaches recorded a modest net gain of 52,682 cubic yards of sand focused on the eastern and western ends of the Borough’s shoreline. The beaches from the State Park through the Lehigh Avenue beach cell gained 28,551 cubic yards of sand while from Pearl through Alexander Avenue the beach gained 43,975 cubic yards of sand. Beaches along the mid-section of the Borough lost sand with the exception of the beach cell from the Lake Avenue groin to Cape Avenue the beach accumulated 9,274 cubic yards of sand. Shoreline changes mirrored the volume changes with the Stites to Alexander cell advancing seaward 64 feet and the State Park through Lehigh Avenue cell advancing seaward 80 feet. The largest shoreline retreat of -30 feet occurred in the Cape to Pearl Avenue beach cell where the greatest sand volume loss (-11,907 cubic yards) also occurred.

The summary table below compiles the shoreline and beach volume change information from April 2014 to beach conditions in April, 2016. The shoreline changes are again based on the advance (seaward) or

the retreat (landward) of the zero elevation datum position on each cross section. Sand volume changes are computed for individual cross section in cubic yards of sand per foot of shoreline multiplied by the distance between the groins in Cape May Point to arrive at the net volume in the right column for each cell.

Table 2
Profile Shoreline and Sand Volume Changes
April 2014 to April 2016

Profile Number	Shoreline Change (feet)	Volume Change (yds ³ /ft)	Cell Distance (feet)	Net Volume Change (yds ³)
CMP-0	72	64.50	420	27,090
CMP-1	34	21.55	445	9,590
CMP-2	-21	-20.55	460	-9,453
CMP-3	-24	-30.82	450	-13,869
CMP-4	-25	-28.41	675	-19,177
CMP-5	8	8.45	690	5,831
CMP-6	-18	-6.55	710	-4,651
CMP-7	9	12.84	680	8,731
CMP-8	54	57.46	660	37,924

Total Volume Change for Cape May Point = 42,016

In 2014 and 2015 following the 2013 USACE project, the Borough’s beaches showed minor net sand volume loss of approximately -28,000 and -18,000 cubic yards of sand respectively. This year’s sand volume gain of over 52,000 cubic yards of sand recovered the lost sand and reversed this recent trend for a modest net gain of approximately 6,000 cubic yards of sand over three years. During the two year time frame from April 2014 to April 2016, the Borough’s beaches recorded a modest net sand volume gain of 42,016 cubic yards of sand. Sand accumulated on the eastern beaches between the State Park and Lehigh Avenue and along the western beaches from Pearl to Alexander Avenue. Sand volume gains on these end beaches again offset losses on the mid-section of the community focused between Whilldin and Lake Drive.

Review of Each of the Beach Cells in Cape May Point:

This section describes the changes documented at each profile location to show general trends in sediment movement along the municipal beaches for 2014-2016. Beach volume and shoreline changes were calculated from March 2015 to April 2016 and from April 2014 to April 2016 as shown in the tables above. The individual site review includes photos taken during the surveys and annual comparison plots

for the past three years to document changes to the beach at each location. Individual site descriptions are included for each profile.

Lighthouse Avenue



The photo taken in March 2015 shows the dune and beach CMP-0. There are no visible indications of scarping or erosion to the beach or dune system. Dune grass and pine have colonized the dune.



The photo taken in April 2016 shows the dune and beach remained remarkably stable this year. There were no visible changes to the beach or dune system other than continued plant growth.

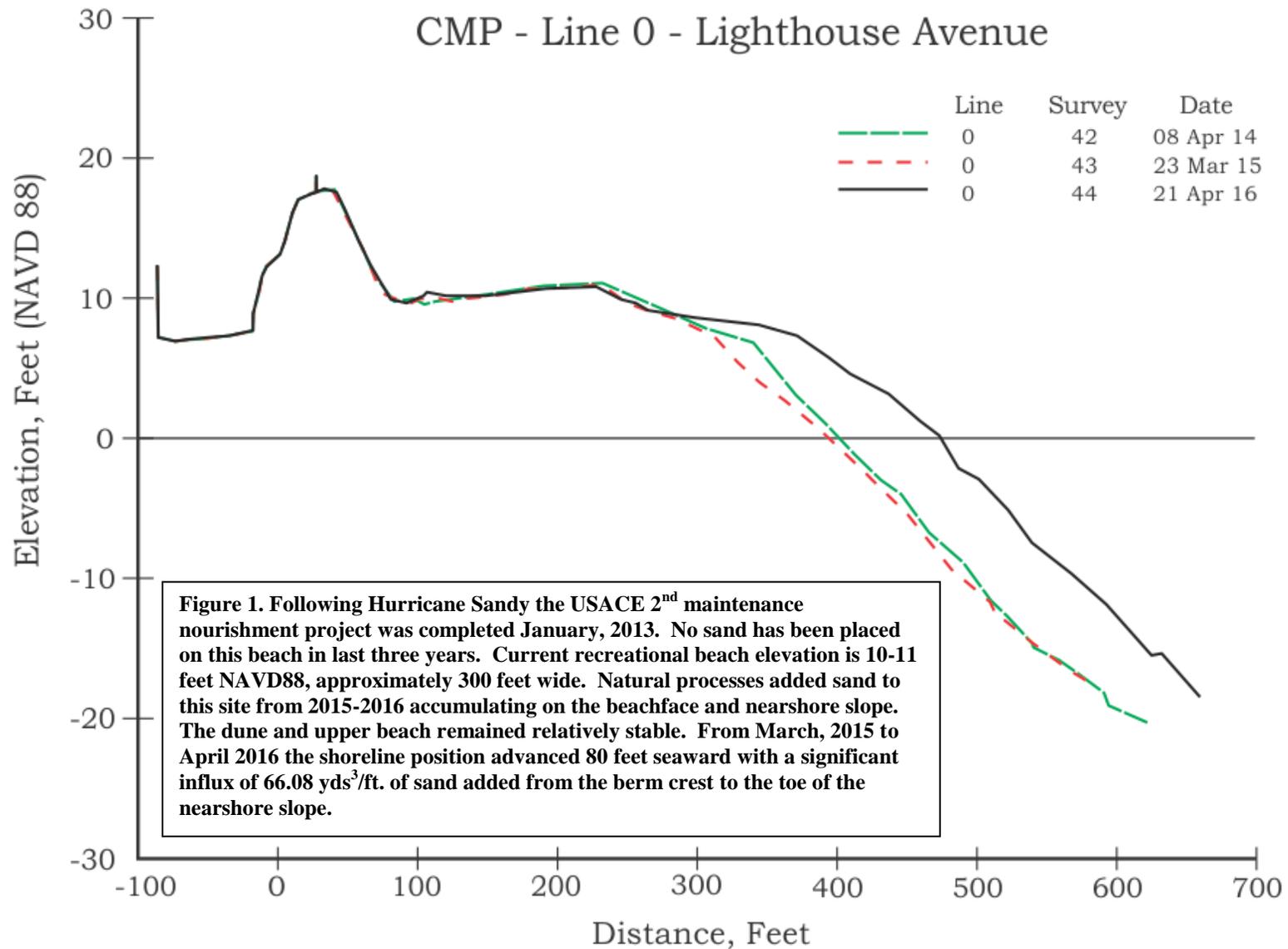
CMP-0 (Cell 0) is the northeastern-most cell that borders the State Park and is bounded to the west by a rock groin. This location has benefited tremendously from the USACE Lower Cape May Meadows – Cape May Point restoration project, initial construction was completed June 2007. The project added over 250 feet of recreational beach berm and established a stable dune system 100 feet wide at the toe with a crest elevation of 18 feet NAVD88. Prior to the initial project the beach was narrow; a small dune armored with tensor mats on the seaward slope protected the exposed dune system from severe erosion.

The USACE authorized a second maintenance project with construction from November 2012 to January 2013. The project restored the design beach width and elevation. The beach width increased by 58 feet with 63.13yds³/ft. of sand added to each foot of shoreline seaward from the dune toe. Following the project the beach elevation ranged from 10-12 feet NAVD 88 and extended 275 feet seaward of the seaward dune toe.

The beach and dune system remained remarkably stable to accretive through April 2016. A massive wedge of sand moved onto the beachface and nearshore slope that continued seaward to the profile limit. This sand was likely shed from Cape May Meadows and Cape May City beaches following recent nourishment efforts in those locations. The sand added to the beachface at this location advanced the shoreline position seaward 80 feet. Onshore 23.12 yds³/ft of sand accumulated on the beachface slope between the beach berm crest and zero datum shoreline position. An additional 42.96 yds³/ft. of sand accumulated on the nearshore and offshore slope for a net sand volume gain of 66.08 yds³/ft of sand. This beach berm width now extends over 300 feet seaward of the dune toe and provides ample storm protection to prevent significant storm damage to the dune system and oceanfront properties. Aeolian sand from the beach continues to feed sand to the seaward dune toe and accumulates along the foredune around installed dune fences. The beachface slope remains relatively steep at a rate of approximately 10 to 1 so that within 200 feet the seafloor goes from 0 to -20 feet NAVD 88. Proximity to the nearshore tidal channel cause stronger longshore currents along this shoreline moving sand in the down drift direction.

Cape May Point - Annual Comparisons

CMP - Line 0 - Lighthouse Avenue



Lehigh Avenue



Taken on March 23, 2015, this photo shows a wide beach seaward of the dune toe. Note the position of the old bunker(background) on the beach and rock groin partially submerged.



Taken on April 21, 2016, photo shows stable to slightly accretive beach. The berm is noticeably wider and higher a year later, sand has accumulated along the beach berm and beachface slope advancing the shoreline position.

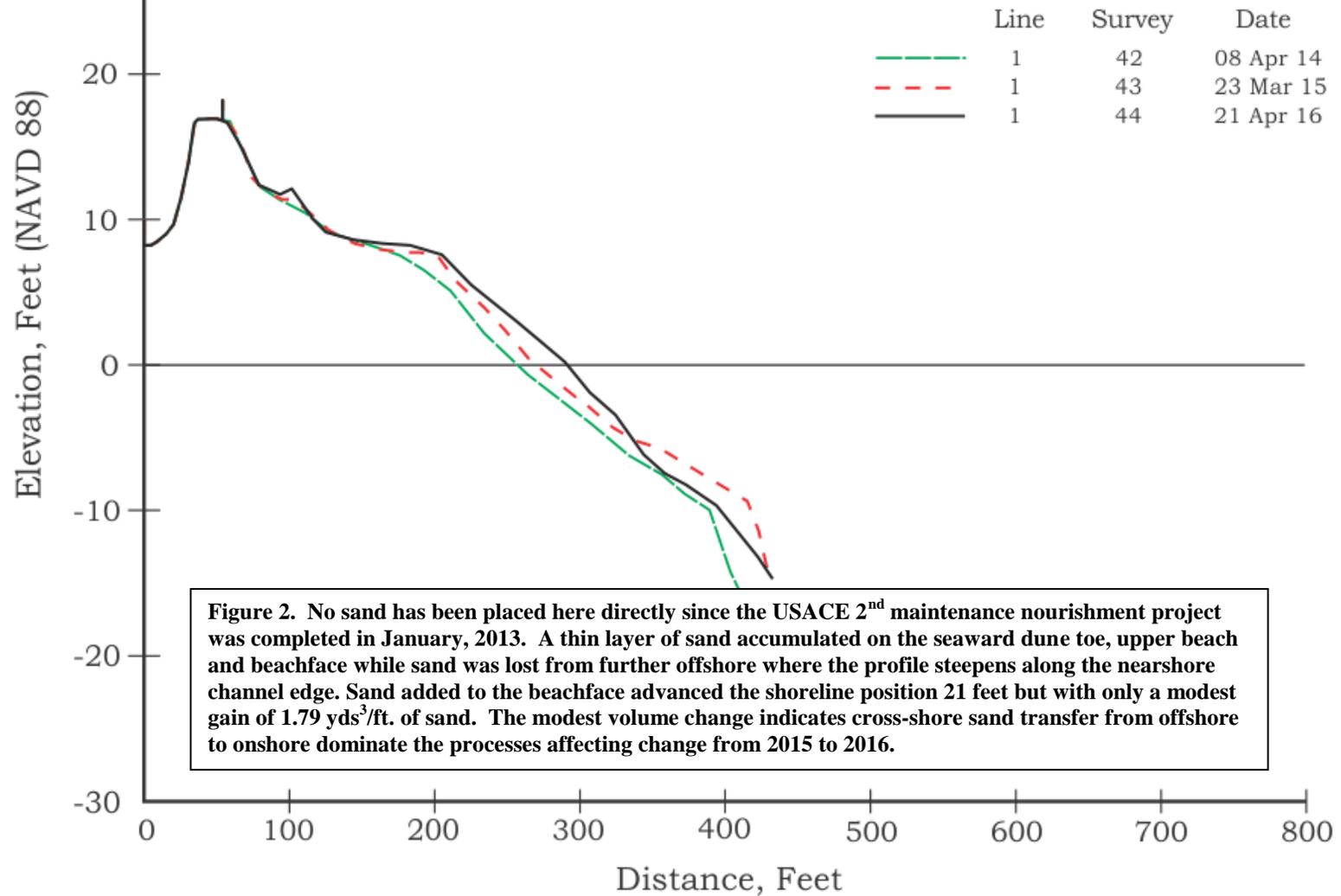
CMP-1 (Cell 1) stretches from the Lighthouse Avenue groin to Lehigh Avenue. Prior to the initial USACE project no dry beach was present between the rock groins. Shore protection was provided by a rock seawall that armored the seaward dune slope. Beyond the groins the seafloor steeply dropped into the adjacent tidal channel. The initial USACE project re-established a dry recreational berm and covered the seawall with sand to restore the dune.

Although the dune system has remained remarkably stable to accretional since construction the beach has been exposed to several recent severe storm events. This site also received sand during the USACE authorized second maintenance project conducted between November 2012 to January 2013. The project restored the design beach width and elevation. The beach width increased by 60 feet with 56.39yds³/ft. of sand added to each foot of shoreline seaward from the dune toe. Following the project the beach elevation was 10 feet NAVD 88 and extended about 170 feet seaward of the seaward dune toe.

Aeolian process carried sand to the dune slope toe from April 2014 to April 2016 developing a new foredune ridge. Sand accumulated on the beach berm, beachface and nearshore slope while further offshore along the channel margin the slope retreated landward. The beachface slope remains relatively steep within the initial 125 feet the nearshore slope then steepens dramatically to a near angle of repose slope into the adjacent tidal channel. The proximity of this beach to the nearshore tidal channel with strong longshore currents near the end of the groins creates the potential for rapid retreat of the beachface slope as the channel cuts landward into the nearshore slope. This year the shoreline position advanced seaward 21 feet with the addition of 4.69 yds³/ft. of sand onshore while offshore the loss of -2.90 yds³/ft. of sand near the channel margin reduced the net volume gain to a minor 1.79 yds³/ft. of sand.

Cape May Point - Annual Comparisons

CMP - Line 1 - Lehigh Avenue



Lehigh to Whilldin Avenues



The photo taken on March 23, 2015 shows aeolian accumulation and colonization of plants seaward onto the open beach. Wide beach has supported continued growth along the seaward dune slope.



The photo above was taken on April 21, 2016. Seaward dune slope has accumulated sand but the berm lowered and retreated landward, not position of the rock groin in both photos.

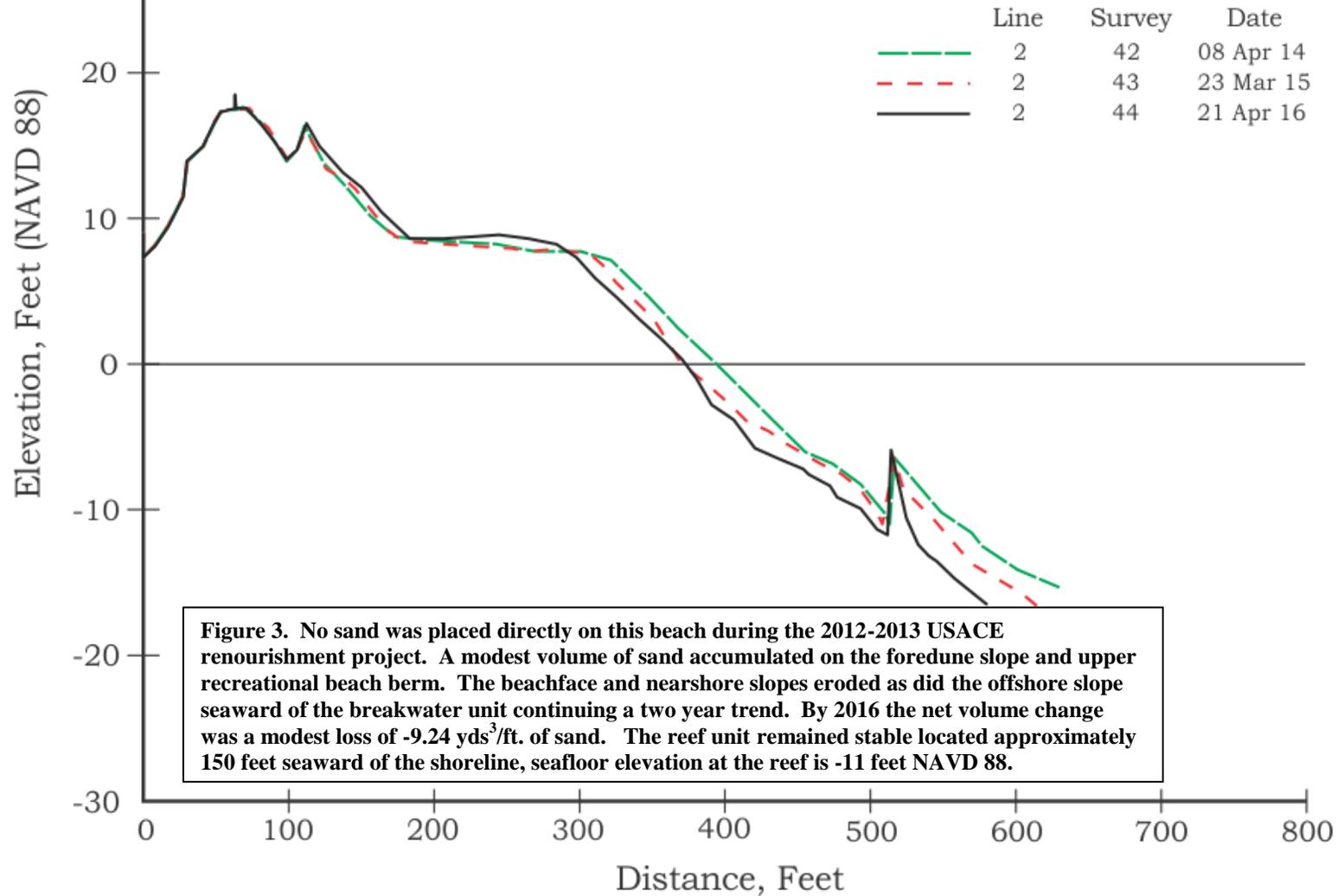
The CMP-2 (Cell 2) beach is the northeastern-most of the groin cells with an early installation of the “Beachsaver” units from 1993, which still are functioning and show on the profile cross-section at the 520-foot distance from the reference point and remain relatively stable. Sand added to the system during the initial USACE project has resulted in the near burial of a rock seawall that served as property protection prior to the project. No additional sand was placed here during the 2013 2nd maintenance cycle.

Sand shed from the recent project beaches accumulated rapidly in this cell during 2013. From April 2014 to April 2016 time frame, sand accumulated on the seaward dune slope and upper beach offset by losses on the beachface and nearshore slope. Sand was also lost from beyond the reef unit to the profile limits for a net sand volume loss of -9.24 yds³/ft. of sand. Scouring around the reef unit has created a deeper trough (-11 feet NAVD88) landward and seaward of the “Beachsaver” units over the last 2 consecutive years.

The “Beachsaver” unit crest now protrudes about six feet above the nearshore slope. Landward of the units a deep trough was scoured that exposed the vertical landward face of the unit. This site has continued to erode both on the beachface, nearshore and offshore slopes. The shoreline position retreated landward 21 feet over the last two years. As of April 2016, the reef crest was 130 feet seaward of the zero elevation shoreline position (about mid-tide position) with the concrete units residing in -11 to -12 feet of water below the NAVD88 zero elevation. The reef crest protrudes up to elevation -6 feet NAVD88. In this position the units are unlikely to be encountered by swimmers this season within the middle of the groin cell. As always caution and restrictions should be in placed closer to the groins where the shoreline sand extends outward toward the concrete reef along each groin.

Cape May Point - Annual Comparisons

CMP - Line 2 - Willdin Avenue



Whilldin to Coral Avenues;



The 2015 photo taken on March 23 shows the offset in beach width and berm elevation between Coral and Lake Avenue beaches along the Coral Avenue rock groin.



The April 21, 2016 photo shows the beach offset along the Coral Avenue groin continues to widen. By far this offset is the most pronounced in Cape May Point.

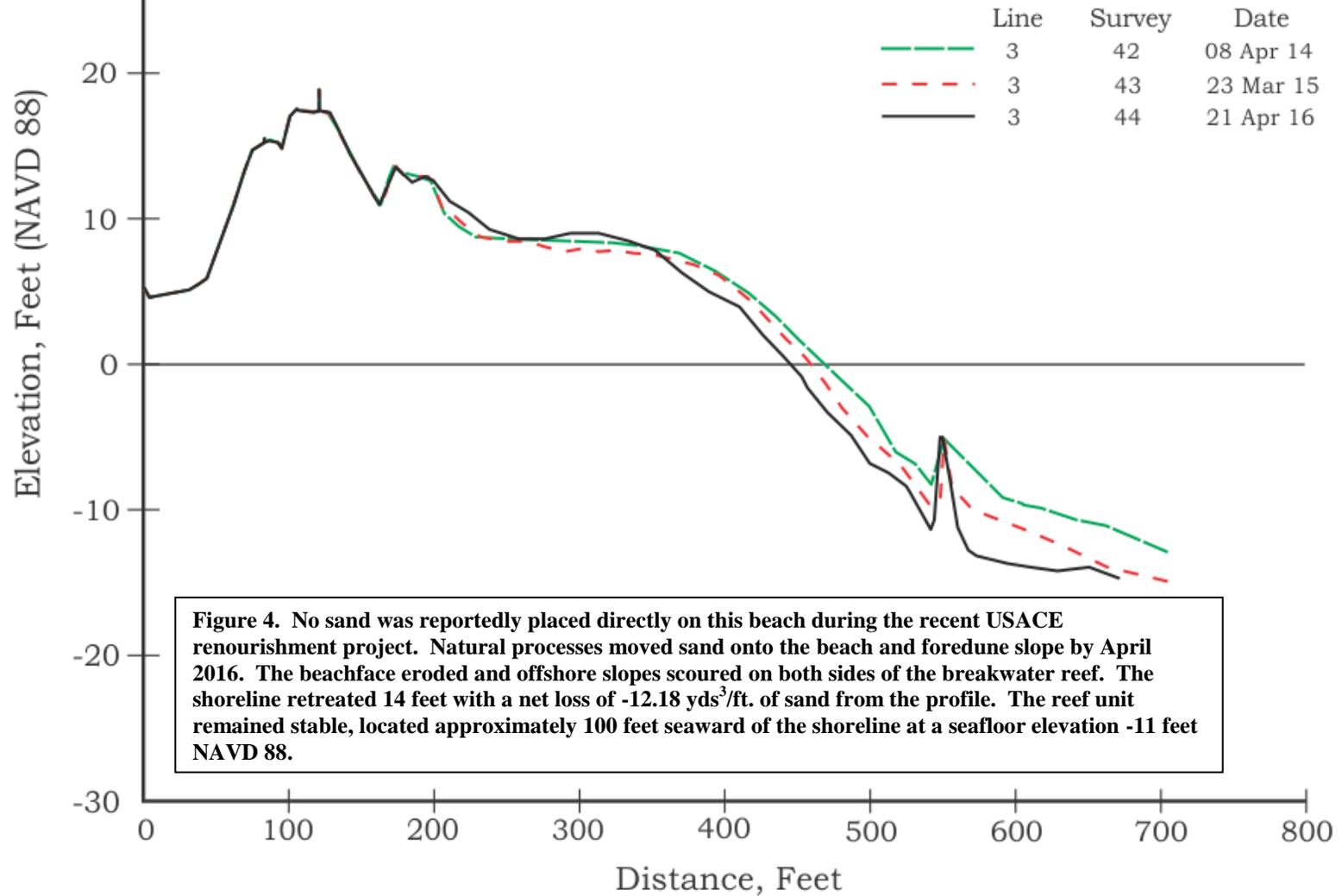
CMP-3 is bounded by rock groins at Whilldin Avenue and Coral Avenue. This beach cell was the second original 1993 “Beachsaver” unit installation in Cape May Point. Sand added to the system during the initial USACE project had resulted in the near burial of the entire beach unit structure. No additional sand was placed here during the 2nd maintenance cycle (2012-2013). Subsequent erosion offshore and inshore of the “Beachsaver” reef resulted in three to six feet of scouring of the seafloor from April, 2014 through April, 2016.

Erosion continued on the nearshore and beachface slope resulting in 14 feet of shoreline retreat from March 2015 to April 2016. Onshore sand accumulated on the beach berm and seaward dune toe further developing the new foredune ridge. The primary dune ridge remained remarkably stable since initial construction.

The modest loss of beach width keeps the “Beachsaver” units within relative close proximity to the shoreline, approximately 100 feet. The concrete crest protrudes to elevation -5.0 feet (NAVD88 zero datum) while the base is at -11 to -13 feet NAVD88. This location remains the most problematic in terms of swimmers encountering the structure while using the beach. There is a deep trough at the landward side of the reef structure but the swimming space has only increased marginally. Again this year the recommendation is to allow swimmers to wade nearshore in shallow water less than 3-4 feet deep regardless of the tide level. Water access could be allowed here in mid-beach but water access near the groins where the units are closer to shore should be prohibited.

Cape May Point - Annual Comparisons

CMP - Line 3 - Coral Avenue



Coral Avenue to Lake Drive



Photo above was taken from the swash on March 23, 2015. The beachface is relatively steep with approximately 75-feet of dry recreational beach.



Photo above was taken on April 20, 2016 looking west at Lake Drive. There was a modest shift in sand from the beachface slope to the upper beach.

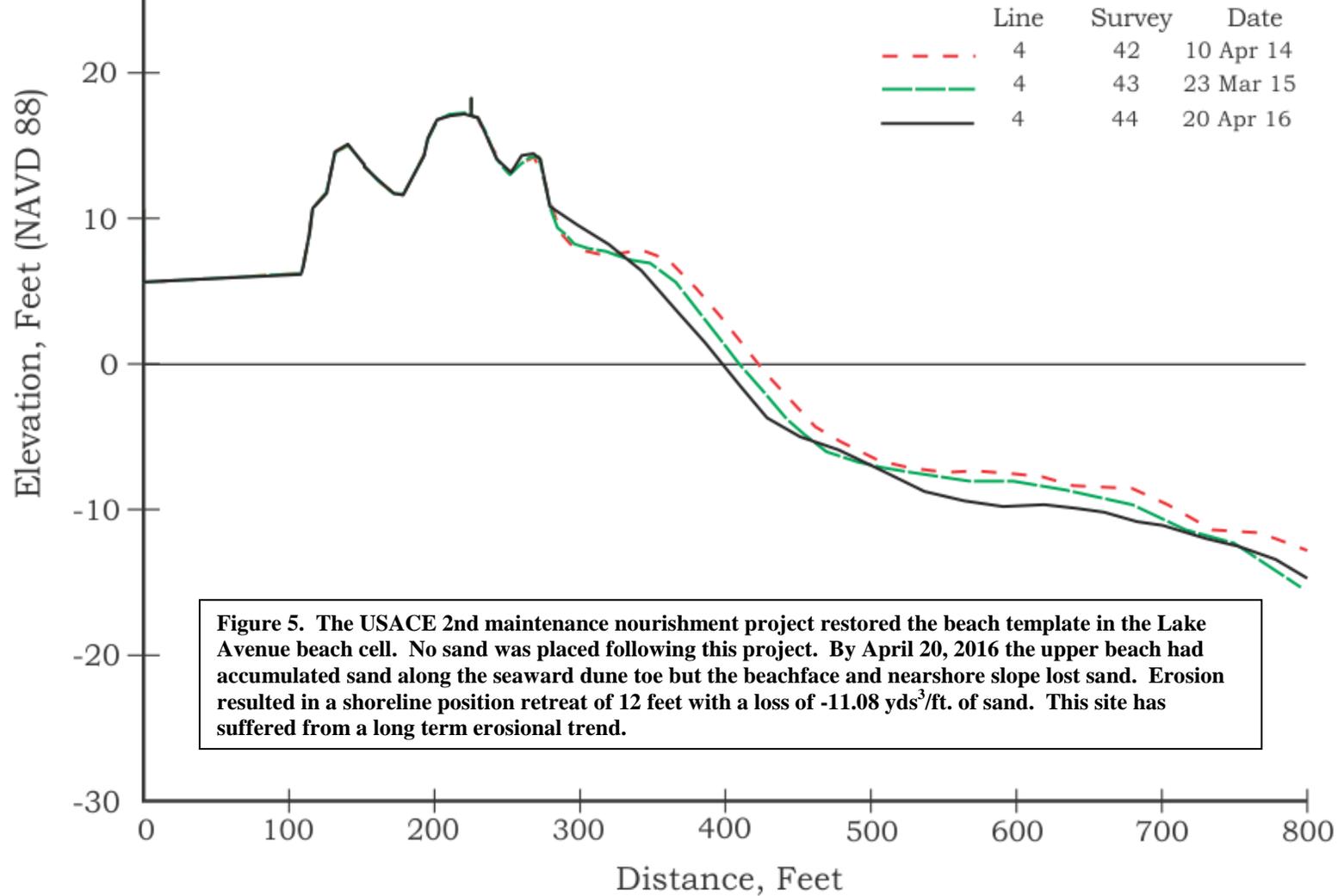
The Lake Drive (CMP-4, Cell 4) beach cell is bounded by the rock groins at Coral Avenue and south of Lake Drive (closer to Surf Avenue). This cell does not contain any nearshore “Beachsaver” structures but it has received sand both during the initial project and in the recent 2nd maintenance cycle nourishment project. Over the 2012/2013 winter the USACE reported sand placement of 37,000 cubic yards in the Lake Drive beach cell (Dwight Pakan, USACE). The beach berm width advanced to approximately 125 feet seaward of the dune toe at elevation 10 feet NAVD 88 with 43.63 yds³/ft. of sand added, the shoreline position advanced seaward 60 feet. This sand rapidly eroded and by April 2014 approximately half the beach width added during the recent project was removed.

The dune has remained relatively stable to slightly accretive through the recent monitoring time interval of April 2014 to April 2016. Aeolian processes accumulated sand along the foredune crest and slope. Natural processes also pushed sand higher onto the recreational beach berm. Over the last two years the beachface and nearshore slope has steadily eroded resulting in 25 feet of shoreline retreat from April 2014 to April 2016. Further offshore the platform lost sand as a thin layer of sand from the beachface slope to the profile limits. The net result was a loss -28.41 yds³/ft. of sand over the last two years.

From March 2015 to April 2016 the shoreline retreated 12 feet with a loss of -11.08 yds³/ft. of sand. This loss rate mimicked the erosion rate from April 2014 to March 2015. The dry beach width has been reduced from just over 80 feet to extending 50 feet seaward of the seaward dune toe. Despite the loss of dry recreational beach width this location remains one of the more desirable bathing beaches in the Borough. Approximately 50 feet of dry recreational beach extends seaward to a gradual descent into deeper water and a relatively large, shallow offshore platform area for recreational swimming within this groin compartment.

Cape May Point - Annual Comparisons

CMP - Line 4 - Lake Avenue



Surf to Cape Avenues



The photo taken on March 24, 2015 shows a wider recreational beach berm than Lake Avenue with a well-developed wide dune system.



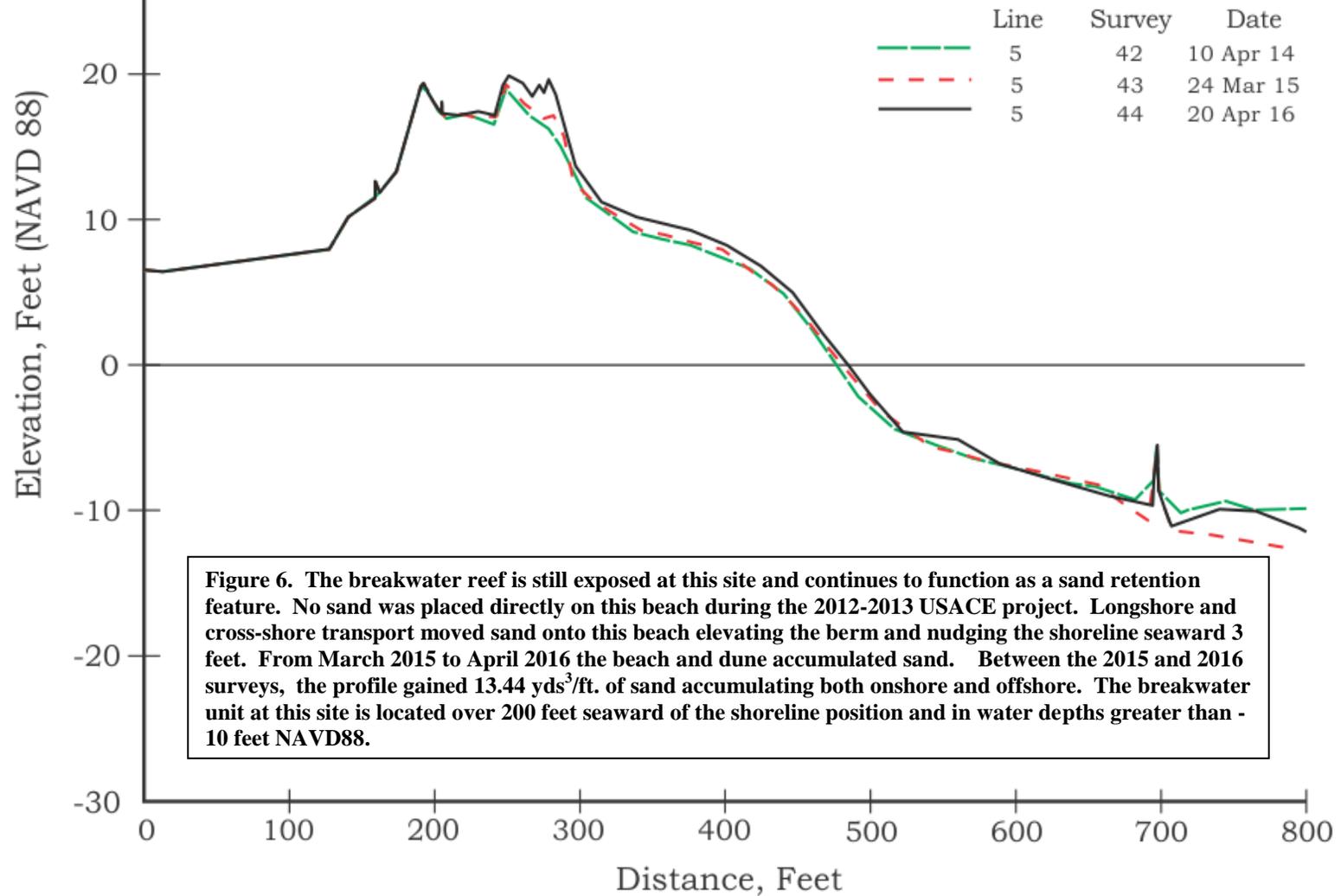
The Photo above was taken on April 20, 2016 shows sand accumulation on the seaward dune slope and upper beach berm that partially buried early colonizing plants but enhanced storm resiliency.

CMP-5 (Cell 5) contains the nearshore breakwater unit installed in 2002 during the USACE CMP-227 experimental project. The breakwater units are still present, located nearly 200-feet seaward of the zero elevation shoreline position. These units are furthest from the shoreline and lowest in elevation in the cell's mid-section where swimming is allowed. That prevents individuals from encountering the units. In this cell the units pose little threat to recreational swimming but swimming along the rock groins should be restricted where the units are closer to shore due to sand accumulation at the rocks.

No sand was placed west of Lake Drive during the 2012-2013 USACE renourishment project, but natural processes has moved sand from east to west along the Borough's shoreline over time. The wider beaches have provided a source of sand for Aeolian to move sand onto the seaward slope and crest of the dune. This process continued from April 2014 through April 2016. A thin layer of sand accumulated across the recreational beach berm onto the beachface slope. The seafloor was relatively stable during this timeframe with modest variations occurring landward of the "Beachsaver" units. Offshore beyond the reef units the seafloor elevation was more variable initially losing sand with nearly full recovery this year to the profile limits. Onshore the beach width remained relatively stable with 13.44 yds³/ft. of sand added to the profile distributed fairly evenly between above and below the datum. The shoreline position was relatively stable advancing 3 feet seaward from spring 2015 to spring 2016. Shore protection continues to be enhanced at this site through natural processes adding height and width to the dune and beach. Current configuration has a nearly 200-foot wide dune from toe to toe with a maximum crest elevation of 20 feet NAVD 88. The dry recreational beach berm extends seaward of the dune toe approximately 100 feet at elevation 10 feet NAVD 88.

Cape May Point - Annual Comparisons

CMP - Line 5 - Cape Avenue



Cape to Pearl Avenues



This photo taken on March 24, 2015 looking east shows the seaward dune crest and slope with plants colonizing the seaward slope. Dry recreational beach berm width is approximately 150-feet and supports dune growth.



This photo taken on April 20, 2016 shows accumulation of sand along the seaward dune slope and upper beach. Beach cusp formation in the beachface on the downdrift side of the groin resulted in modest shoreline retreat.

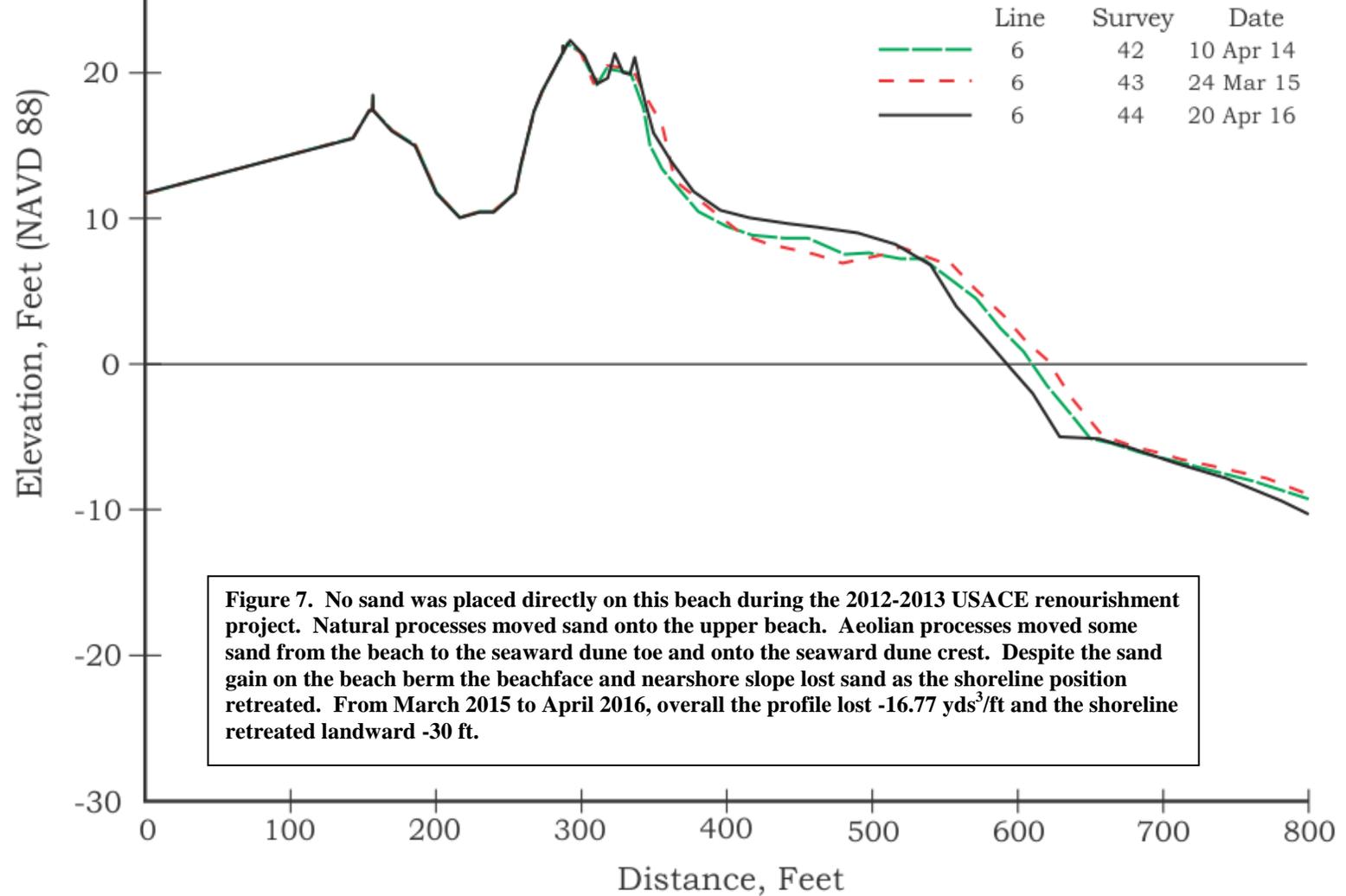
CMP-6 (Cell 6) is bounded by the rock groins at Cape Avenue and Pearl Avenue. The nearshore bay floor contains the “Double Tee” structures that were installed as part of the USACE CMP-227 experimental project. These units were quickly buried and have remained buried by sand in the past seven annual surveys. Consequently, they have limited ability to influence additional sand retention.

Sand shed from the initial up drift federal project beaches moves into this site seasonally by predominant longshore drift. As a result it is unlikely erosion will expose these units in the near future provided the USACE continues to remain committed to regular project maintenance by adding sand to the system. These units are located on the seafloor 11 feet below the 0.0 ft. NAVD88 datum and buried by 4 feet of sand nearly 100 feet offshore. The units however might be accessible adjacent to the rock groins, and any recreational activity in the water close to the rock groins should already be prohibited.

No sand was placed this far west during the USACE nourishment project, so beach building has been a result of natural processes. By April 2016 sand had accumulated on the dry recreational beach berm and seaward dune slope and crest through aeolian processes and wave runup. On the beachface the waves cut into the slope resulting in 30 feet of shoreline retreat. Offshore there was a loss of sand near the profile limits. The net change in sand volume was a loss of -16.77 yds³/ft. of sand. Despite the overall modest loss of sand from the profile the dunes continued to accumulate sand on the seaward slope and crest into 2016.

Cape May Point - Annual Comparisons

CMP - Line 6 - Pearl Avenue



Pearl to Stites Avenues



This photo taken on March 24, 2015 shows the accretion dune that occurs from natural aeolian conditions. The beach berm width provides an ample source of sand.



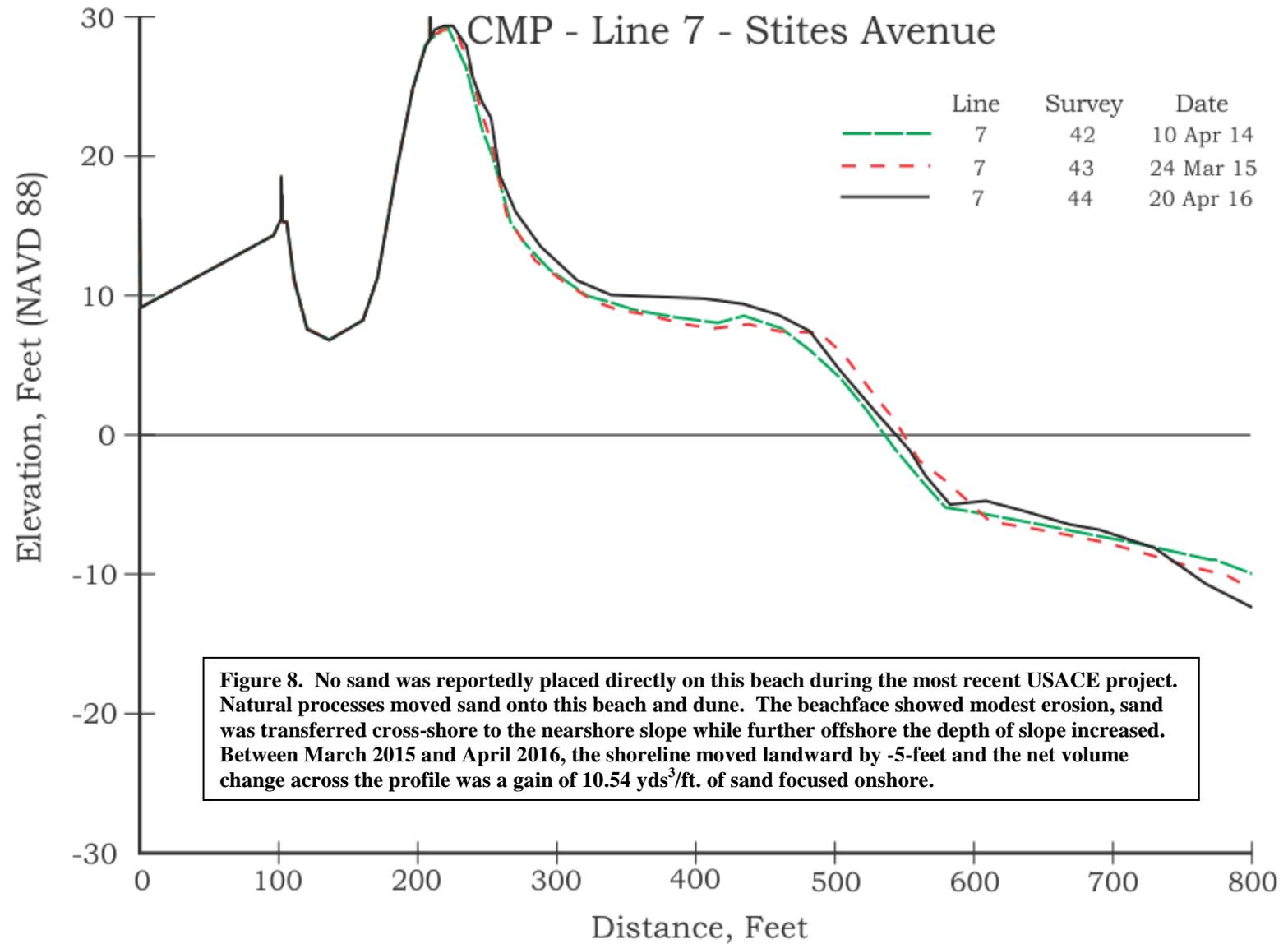
The photo above was taken on June 1, 2016 from a similar perspective. Dune grass has colonized the seaward slope to the toe. The wider beach berm provides sufficient storm protection for continued dune growth.

Profile CMP-7, located southeast of Brainard Avenue, (Cell 7) is bounded by the rock groins near Pearl Avenue and Stites Avenue. The cell has not received any sand directly from the past USACE beach restoration or maintenance projects. Natural processes dominated by longshore drift continue to transfer sand from east to west along the Borough's shoreline. This process has benefited the western beaches as sand has accumulated across the entire profile length from the dune crest to the offshore seafloor limits this process continued through April 2016. With no structures present at this location the wide dry beach should provide beach patrons with abundant recreational area and good nearshore swimming conditions for the summer season.

In 2016 the annual net volume gain was 10.54 yds³/ft. of sand but with 5 feet of landward shoreline position retreat as the beachface slope was cut back by wave energy. The elevation of the recreational beach berm increased by nearly 2 feet as sand accumulated onshore. Aeolian transport moved sand to the seaward dune slope and up to the crest. Sand accumulation was nearly continuous across the entire profile length except the beachface slope and offshore profile limits. The wind transport effect has been evident on the Stites Avenue beach access pathway where sand deposition has repeatedly buried the pathway and seating area at the dune crest.

Following a site visit this June 18th it was observed that once again public works was forced to dig out the beach entrance pathway at Stites Avenue due to wind deposition of sand. This pathway also has a picnic table and platform at the dune crest making raising the walkway difficult, but that is impacted with wind-deposited sand as well. Two solutions are suggested; 1) place 40-50 feet of snow fencing more or less parallel with the cut at the crest, but 30 feet toward the west from the cut; or 2) abundantly plant the 30 feet of dune crest toward the west with beach roses or dune grass between the existing dense vegetation and partly down the upper seaward dune slope. Either solution will reduce the deposition of sand in the Stites Avenue dune walk over. Each winter add another row of fencing at the toe of material trapped by the initial fence row or add more plants at the sand toe.

Cape May Point - Annual Comparisons



Stites to Alexander Avenues



This photo taken on March 24, 2015 shows the dune and berm conditions similar to the 2014 survey. This site experienced negligible changes between 2014 and 2015.



This photo taken on April 19, 2016 shows continued dune growth and seaward expansion of the beach berm and shoreline position.

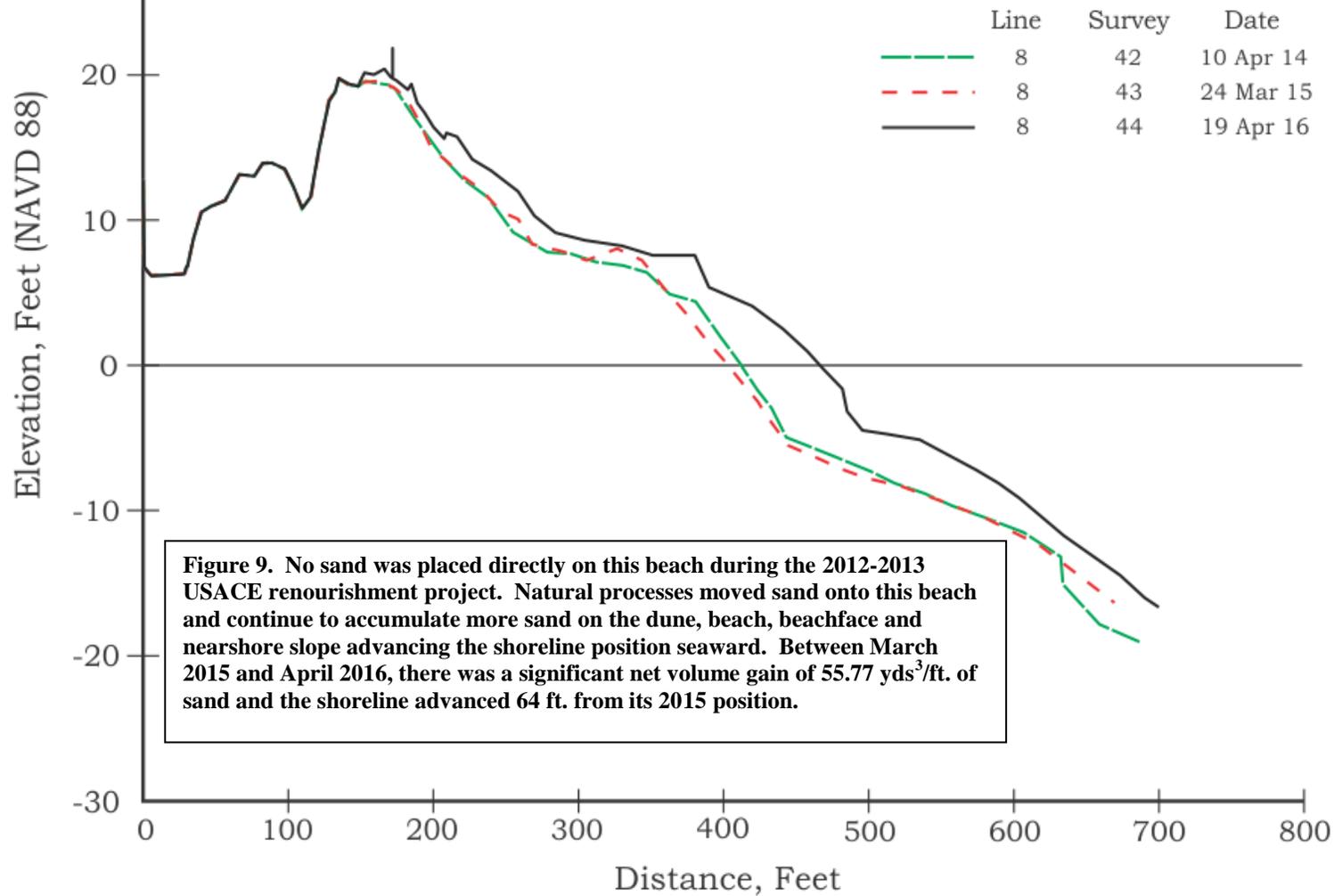
The Alexander Avenue location, CMP-8 is the western most beach cell in the Borough. Sand placement was never included for this location during the USACE projects. Natural processes have moved sand from the project beaches to this location. The beach extends seaward nearly to the tip of the western groin. Sediment loss from this cell is to the western Delaware Bay shoreline and shoals locally known as the “Cape May Rips”. The offset in the beach west of the Alexander Avenue groin means that most of the sand is transported to the nearby bay floor and does not appear on the Sunset Beach shoreline.

Following completion of the initial USACE project sand began to accumulate in increasing amounts, 2015 was the first year in which this accretive trend stopped. In 2016 the accretive trend continued with a large wedge of sand accumulating from the seaward dune crest seaward to the profile limits. The dune advanced seaward 20 feet as a result of sand accumulation on the seaward slope. Recreational beach berm height increased 2 feet while the width advanced seaward 30 feet. Sand accumulated along the beachface slope advancing the shoreline position seaward 64 feet. The net annual volume change was a significant gain of 55.77 yds³/ft. of sand with onshore gains accounting for nearly one third of the sand volume added to the length of the profile.

The dry beach provides ample area to support summer recreational activity onshore while the nearshore slope is steeper in this cell with water depths of -10 feet NAVD88 within 100 feet of the shoreline. The steeper slope and drop off near the end of the groins along with strong tidal currents in this region should probably limit swimming activity by most to the shallow nearshore region.

Cape May Point - Annual Comparisons

CMP - Line 8 - Alexander Avenue



Summary

The USACE projects over the last several decades have significantly increased the available sand budget from Cape May City through Cape May Point. In Cape May City the USACE has completed 10 nourishment cycles including the post-Sandy effort completed January 2014. In January 2013, the USACE completed its second nourishment cycle of the Lower Cape May Meadows – Cape May Point project with placement of 345,000 cubic yards of sand. All of this sand has resulted in a vast influx of sand for all the Cape May Point beaches even those western beaches not directly filled. Approximately 108,697 cubic yards (cy) of sand was placed directly on the Borough's beaches during the 2013 project limited to CMP 0, CMP 1 (71,697cy) and CMP 4 (37,000cy) cells. Sand has accumulated in the western cells and especially along the eastern shoreline. Sand was largely derived from sand shed from the USACE project beaches and transferred longshore from the State Park natural area into Cape May Point, where the westerly curve of the shoreline into Delaware Bay allowed deposition on the beach. This process has continued through April 2016.

From spring 2015 through spring 2016 the project beach at Lighthouse Avenue accumulated a large wedge of sand from the berm crest seaward to the profile limits. The Lower Meadows natural area and Cape May City supply sand that readily feeds into this location unimpeded by structures from the terminal groin in Cape May City. Lehigh Avenue at CMP 1 saw a more modest influx of sand on the seaward dune toe, recreational beach berm and upper beachface. From CMP 2 to CMP 4 the beaches all lost sand with modest to moderate erosion along the beachface and nearshore slope.

The erosional trend transitioned back to sand accumulation moving west along the Cape May Point shoreline. CMP 5 had a moderate increase in sand volume added from the seaward dune crest through the nearshore. A modest net loss of sand at CMP 6 derived from erosion of the beachface slope was offset by significant sand accumulation at CMP 7 and CMP 8. All three of these sites accumulated sand from the seaward dune crest seaward to the recreational beach berm crest. In addition, CMP 8 showed a massive influx of sand on the beachface and nearshore slopes seaward to the profile limits. The beaches from Pearl Avenue through Alexander Avenue have continued to accumulate sand resulting in an expanding dune system and wider beaches. The primary dune ridge at these sites are now over 150 wide along the toe at each site while the recreational beach berm width extends from 100-150 feet seaward of the dune toe. These dunes and beaches now provide abundant space for recreational activities and substantial shore protection for the landward properties and infrastructure. All of these gains were achieved through natural processes and derived from sand shed from the project beaches transferred west by prevailing longshore currents.

The net sand volume change for 2016 was a gain of 52,682 cubic yards of sand. At all sites aeolian processes have moved sand from the wider beaches to the seaward dune toe and slope. Each site also showed an accumulation of sand on the recreational beach berm adding from a thin layer of sand up to two-feet thick of additional elevation. At each end of the Borough sand was added from the dune seaward to the profile limits raising the elevations and expanded the overall width of the system. The individual cross sections that showed uniform deposition of sand from the dune crest through offshore require large volumes of new sand being introduced to the system from adjacent beaches and outside the Borough.

Observations & Recommendations

The impact of erosional changes to beachface and nearshore slopes in cells CMP 2 and CMP 3 has increased the degree of safety for recreational use by reducing the risk of collisions of bathers with the

submerged breakwater units. The distance between the shoreline and units has increased from erosion of the beachface and the water depths are deeper near the units through scouring of the seafloor, compared to the conditions last year.

1. Cells 0 and 1 do not have structures; the beaches at Lighthouse and Lehigh Avenue remain stable to accretive. Both beaches have steep slopes into deep water with strong tidal currents into and out of Delaware Bay.
2. Cell 2 at Whilldin Avenues, the shoreline position (zero datum) is approximately 150 feet distance from the breakwater structure. Depth of the scour trough landward of the units has increased to nearly -12 feet NAVD88. The swimming area remains limited, especially closer to the groins but may again be manageable in the mid- beach cell this year. The CRC again recommends installing a line of floats indicating the maximum distance for swimming that should be about 30 feet from the breakwater reef.
3. Cell 3 at Coral Avenue, the shoreline position again retreated slightly, the breakwater units in April 2016 were approximately 110 feet from the shoreline position (zero datum). The beachface slope remains fairly steep with further development of a scour trough landward of the units -11 feet NAVD88. In the current beach configuration this location would only allow approximately half the distance between the reef and the mid-tide beach's water edge as safe for water activity. It is the CRC recommendation that entry into the water be limited to no more than 3- to 4-foot depths until such time that excavation removes sufficient sand from this region to draw the shoreline landward and increase the distance between the shoreline and the concrete units.
4. Cell 4 has no structures offshore and a relatively flatter nearshore slope. This site remains overall a good option for a swimming beach in Cape May Point this season although the recreational berm is narrow compared to adjacent beaches. The relatively shallow slope platform in the water between groins make wading and swimmer relatively safer for beach patrons.
5. Cells 5 and 6 contain the newer units but pose minimal risk for swimming in 2016. Both reef structures lie in greater than - 8 feet of water approximately 200 hundred feet from the shoreline at low tide. The "Double Tee" structure in Cell 6 is once again buried with additional sand. Swimming near the groins should always be avoided since the units are slightly closer to the beach adjacent to the rocks.
6. Cells 7 at Stites Avenue benefited from a wider berm area enhancing the recreational value of the beach, this paired with the shallow offshore platform will offer a relatively safe option for swimming.
7. Cell 8 at Alexander Avenue, a massive accumulation of sand this year has elevated and pushed the recreational berm seaward. Available recreational area has been substantially improved at this beach since 2005. Unfortunately, the beach has now expanded to the seaward end of the terminal groin putting the shoreline position in close proximity to strong tidal currents flowing past the terminal groin. These conditions have guided the Borough's decision to close the Alexander Avenue beach to swimming. This condition has not changed and may require extensive sand excavation to alleviate this concern in order for swimmers to utilize this location.
8. Cell 4 at Lake Drive continues to suffer chronic erosion reducing the recreational beach's stability to sustain higher levels of recreational activity and provide enhanced shore protection for the dune system. The last two years CMP 4 has lost 19,000 cubic yards of sand while the beach at CMP 8 has gained nearly 38,000 cubic yards in the same time frame. A program that hauled excess sand accumulating at CMP 8 back to CMP 4 may provide a sustainable management option for the USACE and municipality to explore as an alternative between nourishment cycles to stabilize the Lake Drive beach. Excavation of sand from the beachface at Alexander Avenue may also reduce the risk to swimmers in this cell from exposure to strong tidal currents in this location. An alternative remains to reinstitute a program of sand excavation from the beachface at CMP 3 and

or CMP 2 as a sand source to maintain the beach berm at CMP 4. This would have benefits for all locations increasing the sand supply for the Lake Drive beach while increasing the distance between the shoreline positions and “Beachsaver” reefs, reducing the risk of swimmers encountering the submerged structures.

9. With the increased sand budget entering the Cape May Point beach system from the USACE projects many of the severe erosional concerns the municipality faced in past have been alleviated. Concerns are now focused on moderate erosion at Lake Drive and potential risk to swimmers using the beaches. Sand management practices that sustainably use this new sand resource efficiently can help the municipality alleviate and reduce these concerns.

The Coastal Research Center (CRC) will continue to monitor the conditions on the Cape May Point beaches at the Borough’s request and assist officials with addressing any coastal zone management zone issues. Please contact the CRC with any questions or concerns.