ANNUAL REVIEW FOR 2021
OF THE CAPE MAY POINT, NJ MUNICIPAL BEACHES

The photo above taken on April 9, 2021 from the survey reference location between Stites and Brainard Avenues in Cell CMP-7. This dune is the highest in Cape May Point exceeding 30 feet in elevation. The lower zone of sparcer dune grass vegetation between the old growth and the beach has been transformed into a dune field by northwest winds since the initial USACE beach restoration in 2005. The dry beach is all new sand derived from this project.

PREPARED FOR: THE BOROUGH OF CAPE MAY POINT
215 LIGHTHOUSE AVENUE
CAPE MAY POINT, NJ 08212

PREPARED BY: STOCKTON UNIVERSITY COASTAL RESEARCH CENTER
30 WILSON AVENUE
PORT REPUBLIC, NJ 08241

May 12, 2021

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Introduction:

The Stockton University Coastal Research Center (CRC) completed the annual survey of the beaches on the Cape May Point shoreline between Lighthouse and Alexander Avenues on April 8 and 9, 2021. These were compared to previous surveys that were conducted April 2019 and April 2020. The findings included in this report complete the annual review of the municipal beaches prior to the 2021 beach bathing season. Hopefully, 2021 will see a marked improvement in citizen and visitor enjoyment of the public beaches as the pandemic subsides.

US Army Corps of Engineers (USACE) completed work in early 2017 directly placing sand on the eastern beaches of Cape May Point. In February and March 2021, a periodic maintenance beachfill in the Lower Cape May Meadows extracted berm sand from the NJ State Park and The Nature Conservancy lands to truck haul to the "cove" in Cape May City. In addition, trucks hauled some of this sand to the Lake Drive Cell (CMP-4) creating a spot beach fill in that cell. Regular maintenance work will follow the planned maintenance cycle for both Cape May Point and the Nature Conservancy this coming fall/winter (Dwight Pakam, USACE project manager, personal communication).

Figure 1. Site plan for the USACE beach maintenance completed at Lake Drive, Cape May Point as of February 2021 adding 50,000 cubic yards of sand derived from the NJ State Park beach and truck hauled to Lake Drive.

The 2020 hurricane season saw Tropical Storm Isaias pass by the Jersey shore on August 4th with minor wind damage and some beach erosion. In spite of emergency management's best efforts, the damage was insufficient to produce even a limited disaster declaration. Some places received US Army Corps sand placement mostly due to a project already underway that was impacted by the tropical storm. The winter season saw a number of mild northeasters with the worst occurring February 1 and 2, 2021 accompanied by 55 MPH wind gusts from the northeast. Most storms tracked to the northwest of the Jersey shore this year limiting the sand volume losses from the beaches during the remainder of the winter storm season.

Beach access points remain open and accessible with those along Harvard Avenue the easiest to navigate, along with Alexander, Brainard and Stites Avenues toward the western shoreline. The Pearl Avenue pathway remains a challenge for those with lower mobility and might be a candidate for the installation of some form of pedestrian walkway matting to ease access. This would depend on just how many folks use this beach pathway for beach access. If people generally enter from Cape Avenue and walk on the beach to the northwest, then those who enjoy the trek through the dunes will be fine with it as is. The Surf Avenue access point is relatively longer, but the Surf Ave. roadway and ascent up to the dune crest is half the distance as a hard walking surface.

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 were established 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	Surveys 47, 48 & 49 ending April 9, 2021
CMP-1: Lehigh Ave	Surveys 47, 48 & 49 ending April 8, 2021
CMP-2: Whilden Ave	Surveys 47, 48 & 49 ending April 8, 2021
CMP-3: Coral Ave	Surveys 47, 48 & 49 ending April 8, 2021
CMP-4: Lake Drive	Surveys 47, 48 & 49 ending April 8, 2021
CMP-5: Cape Avenue	Surveys 47, 48 & 49 ending April 9, 2021
CMP-6: Pearl Avenue	Surveys 47, 48 & 49 ending April 9, 2021
CMP-7: Stites Avenue	Surveys 47, 48 & 49 ending April 9, 2021
CMP-8: Alexander Avenue	Surveys 47, 48 & 49 ending April 9, 2021

The summary table (page 3) compiles the annual shoreline and beach volume change information between 2020 and 2021. 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 & Sand Volume Changes
April 2020 to April 2021

Profile Number	Shoreline Change (feet)	Volume Change (yds^3/ft)	Cell Distance (feet)	Net Volume Change (yds^3)
CMP-0	-2.8	-3.30	420	-1,386
CMP-1	-17.5	-14.51	445	-6,456
CMP-2	29.0	12.72	460	5,851
CMP-3	44.5	22.23	450	10,004
CMP-4	108.7	62.53	675	42,210
CMP-5	32.7	13.36	690	9,218
CMP-6	5.7	7.15	710	5,074
CMP-7	8.3	8.64	680	5,872
CMP-8	-27.8	-4.63	660	-3,058
		Total Volume Change for Cape May Point =		**67,331**

This is the third year in a row where natural processes have provided moderate sand volume gains in Cape May Point. The exception is the 42,210 cubic yards that appeared in CMP-4, Lake Drive. This material was brought in from the TNC and NJ State Park beaches in February under the USACE project maintenance program. In 2019, the Borough's beaches recorded a gain of 29,848 cubic yards of sand focused largely on the eastern ends of the Borough's shoreline. In 2020, the gain was less at 17,825 cubic yards, but there were only three cells were sand was lost (CMP-0, CMP-4 and CMP-6). In 2021 the April 2021 survey found that 6 of 9 sites gained sand with the winner by far being CMP-4 at Lake Avenue. The total of 67,331 cubic yards exceeds the sum of the past two years and yields a three-year accretion of 115,004 cubic yards of sand. None of the loss compartments saw serious declines in sand volume or major shoreline position retreats landward. There were two cells were the shoreline (zero-elevation) position did retreat with the maximum value at -27.8 feet in Cell 8 at the Alexander Avenue groin.

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

This section describes the changes documented at each profile location. Individual site descriptions are included for each profile. The spring 2021 photographs provide an update on each site's environmental conditions and the cross sections show where change has occurred and the approximate magnitude of the changes in sand volume and shoreline position.

Lighthouse Avenue:

CMP-0 is the northeastern-most cell that borders the State Park and is bounded to the southwest by a rock groin. This location has benefited tremendously from the USACE Lower Cape May Meadows – Cape

May Point restoration project, where 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. There is no public access from Lighthouse Avenue to the beach.

Figure 2. The view was taken April 9, 2021 showing the transition into the NJ State Park and with Cape May City in the far distance. This view is from the seaward toe of the dunes where grass has grown seaward beyond the fence. Prior to this project the concrete WW II control bunker was entirely in the ocean.

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 63.13yds^3/ft. of sand added per foot of shoreline seaward of the dune toe. In 2016, USACE activity added 78,184 cubic yards of new material to this site and the Lehigh Avenue beach immediately to the southwest. The cross sections show that the beach grew wider following the 2016 survey and remained stable since.

The Lighthouse Avenue beach is currently 400 feet wide from the dune toe to the water's edge. There has been minimal change in the profile configuration. Sand is beginning to accumulate as a small foredune at the fence line. Offshore, the slope has remained constant, if rather steep. Actually, this stability is relatively unique because the site faces the northeast storms at an angle, but the waves still reach the site with intensity. The minor loss in sand volume was seen on the beachface slope and offshore.

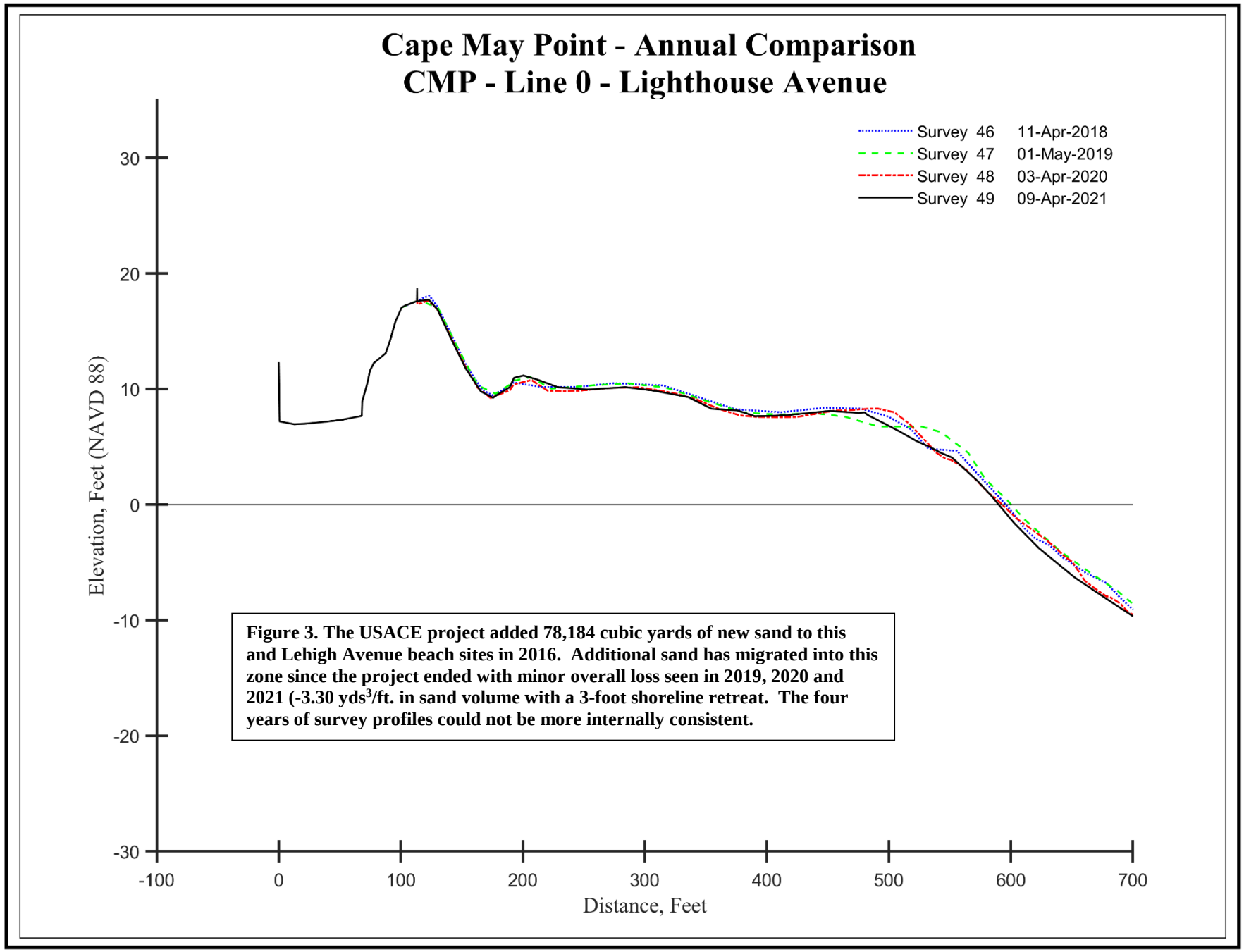


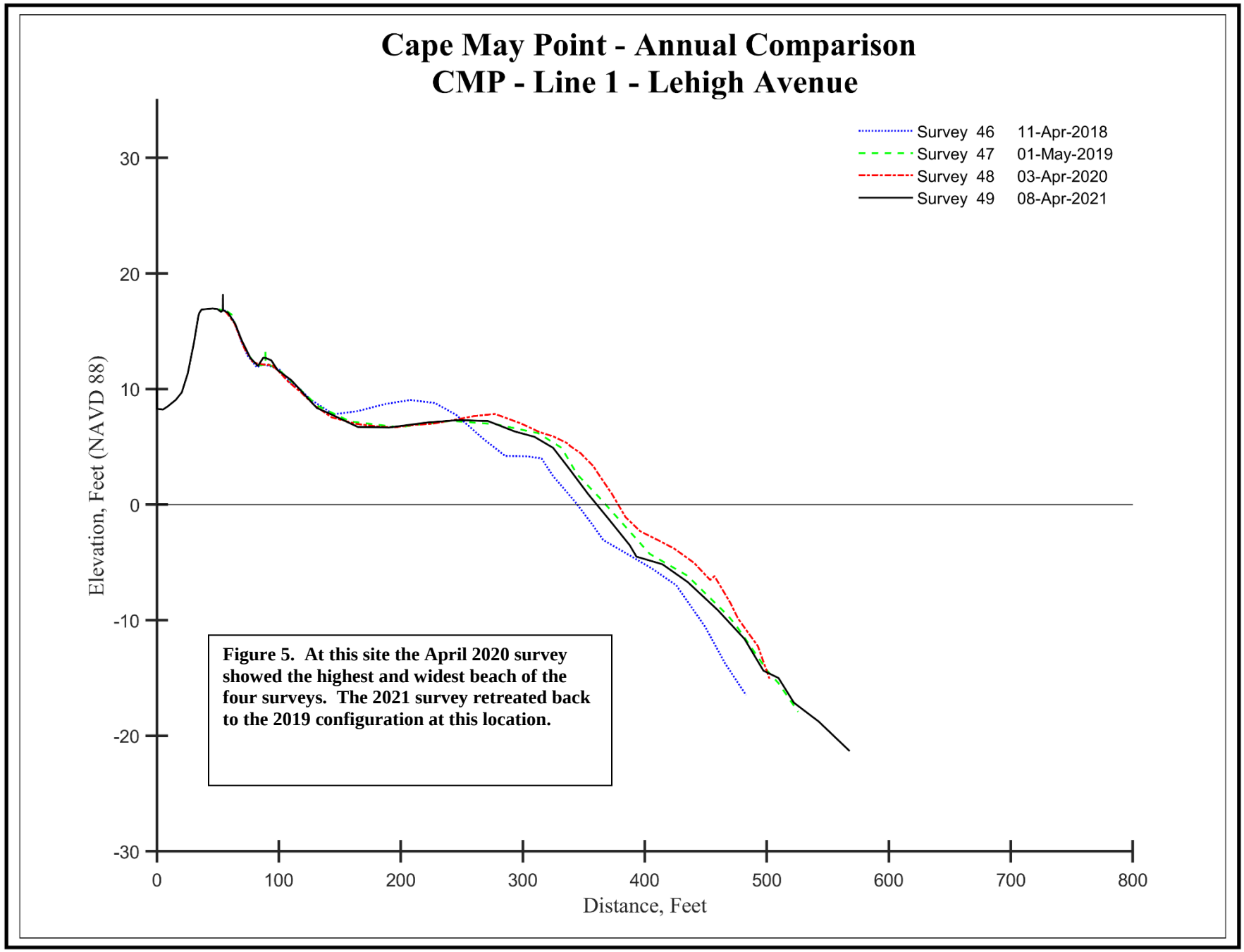
Figure 3. The USACE project added 78,184 cubic yards of new sand to this and Lehigh Avenue beach sites in 2016. Additional sand has migrated into this zone since the project ended with minor overall loss seen in 2019, 2020 and 2021 (-3.30 yds^3/ft. in sand volume with a 3-foot shoreline retreat. The four years of survey profiles could not be more internally consistent.

Lehigh Avenue:

CMP-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.

Figure 4. This view is to the northeast showing the beach width present as of April 8, 2021. The dune to the left side sits on top of the stone revetment and the beach is many times the pre-beach nourishment width creating an excellent storm barrier as well as a recreational resource enjoyed by the Borough citizens.

This site also received sand during the USACE authorized second maintenance project conducted between November 2012 and January 2013. The most recent project counted both Lighthouse and Lehigh sites as one placement volume at 78,174 cubic yards. The winter of 2020 to 2021 produced the single largest sand volume loss at CMP-1 with a 17.5-foot shoreline retreat and a 14.51 yds^3/ft. sand volume decline. The April 2020 survey in Figure 5 shows a wider beach and similar slope into the ocean but pulled back landward by sand loss. The 2021 configuration is still more advanced over that seen in April 2018.


Cape May Point - Annual Comparison
CMP - Line 1 - Lehigh Avenue
Survey 46 11-Apr-2018
Survey 47 01-May-2019
Survey 48 03-Apr-2020
Survey 49 08-Apr-2021
Elevation, Feet (NAVD 88)
30
20
10
0
-10
-20
-30
0
100
200
300
400
500
600
700
800
Distance, Feet
Figure 5. At this site the April 2020 survey showed the highest and widest beach of the four surveys. The 2021 survey retreated back to the 2019 configuration at this location.

Lehigh to Whilden Avenues:

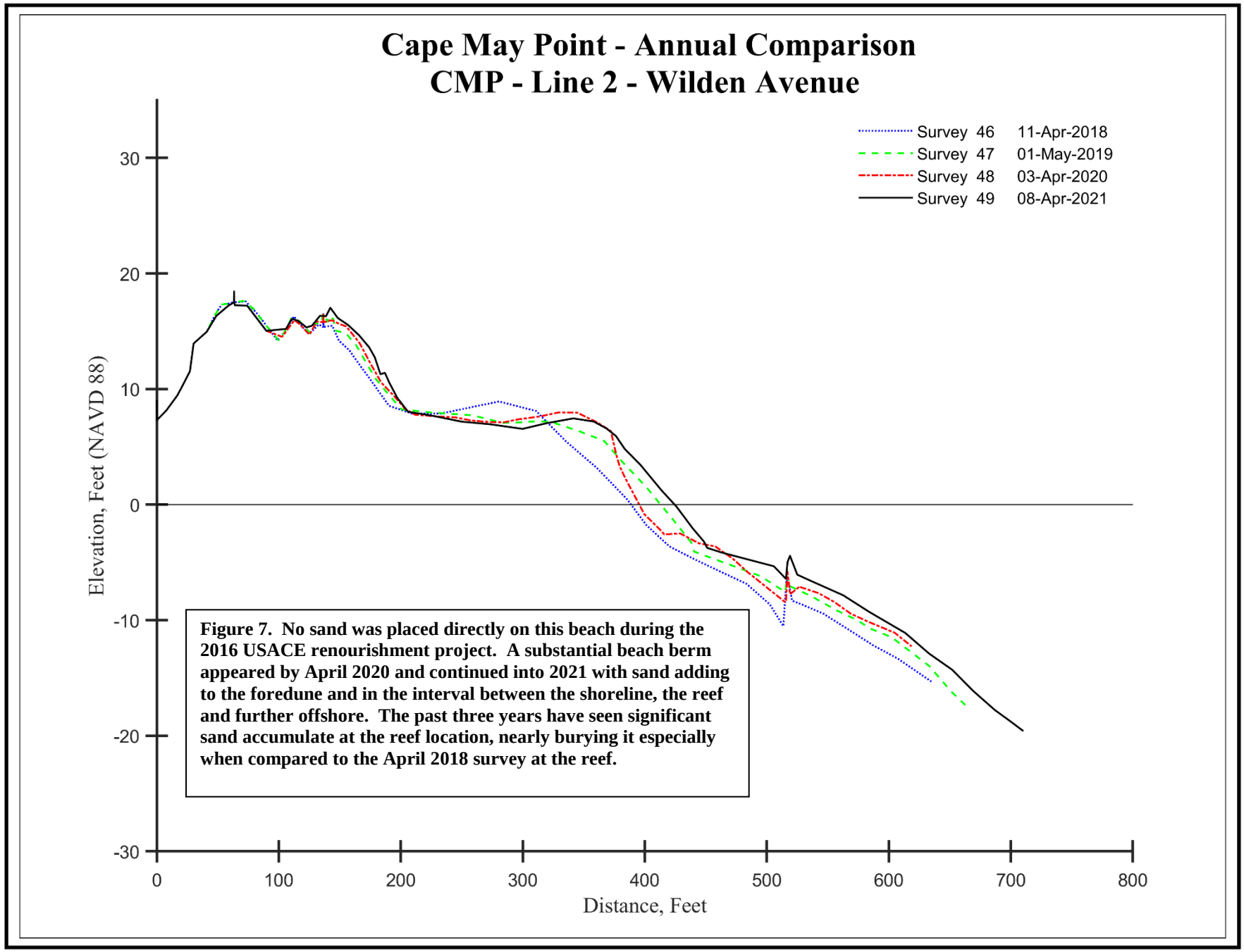
The CMP-2 beach is southeastern-most of the groin cells with an early installation of the "Beachsaver" units from 1993, which still are functioning and show on the profile cross-section at the 520-foot distance from the reference point and remain stable. Sand added to the system during the initial USACE project 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.

The "Beachsaver" units have been incrementally buried by sand reducing its crest exposure above the seabed from 6 to almost even with the sand bottom surface by 2021. Landward of the units, a very minor trough remains with even shallower sand slopes further seaward as material was added offshore. The distance from the zero-elevation position on the beach to the barriers declined by 20 feet by April 2021 as sand added to the beachface. There is limited bathing use area between the low tide shoreline and the beachsavers. The depth at the base of the beachsaver on the profile line is -6.15 feet NAVD 1988.

Figure 6. The April 8, 2021 view to the southwest shows an expanding foredune zone with large mounds of wind deposition around clumps of grass plants indicating continued dune enhancement. The beach width is recreationally sufficient and serves as an effective wave barrier too. The beach gained 29.0 yds^3/ft. as the shoreline advanced 13 feet.

The recent cycle of USACE sand placement also did not directly put sand into this cell. However, sand added to this cell by natural processes with a wider berm and continued the gradual burial of the 1993 "Beachsaver" reef system.

However, the concrete barriers are still exposed on the seabed and have become more of a tripping hazard and risk of cut feet on the marine growth on the structure than the previous potential for wave rush or the back wash of swimmers into the structures. In-water bathing beyond 3-foot depths is not recommended.


Cape May Point - Annual Comparison
CMP - Line 2 - Wilden Avenue
Survey 46 11-Apr-2018
Survey 47 01-May-2019
Survey 48 03-Apr-2020
Survey 49 08-Apr-2021
Elevation, Feet (NAVD 88)
30
20
10
0
-10
-20
-30
0
100
200
300
400
500
600
700
800
Distance, Feet
Figure 7. No sand was placed directly on this beach during the 2016 USACE renourishment project. A substantial beach berm appeared by April 2020 and continued into 2021 with sand adding to the foredune and in the interval between the shoreline, the reef and further offshore. The past three years have seen significant sand accumulate at the reef location, nearly burying it especially when compared to the April 2018 survey at the reef.

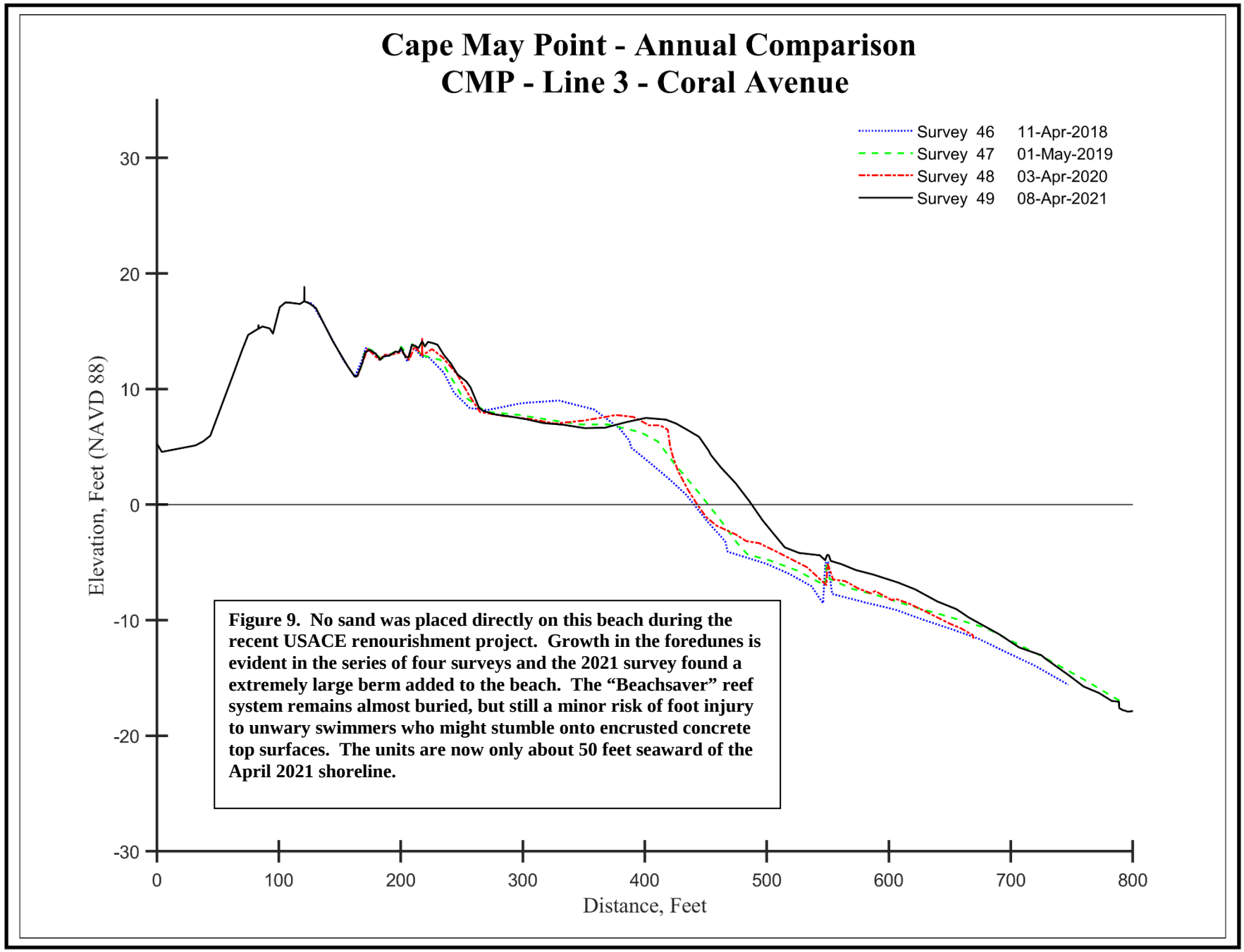
Whilden to Coral Avenues;

CMP-3 is bounded by rock groins at Whilden 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). No new sand was added here during the 2016 USACE project either. Sand accumulated on the dunes, and in a relatively large volume on the beach berm extending offshore.

Figure 8. The view to the northeast along the foredune toe shows the grass creating the mounding of the added sand where root extensions have generated tufts of new growth expanding the dune's width. The beach view is back toward CMP-2 with a wider beach present as of April 8, 2021.

This site has seen virtual burial of the "beachsaver" reefs where the elevation relief on the concrete structures has been reduced from 5.0 feet showing above the seabed in 2016 to 0.5 feet showing April 8, 2021. Sand continued to accumulate on the distal offshore slope as well.

Given the 44.5-foot advance in the shoreline by April 2021 and the near burial of the reef units, the risk of serious injury to swimmers is gone, but the barnacle encrusted top concrete surfaces remain a hazard for foot cuts to unaware swimmers, few of which even know the structures are present.


Cape May Point - Annual Comparison
CMP - Line 3 - Coral Avenue
Survey 46 11-Apr-2018
Survey 47 01-May-2019
Survey 48 03-Apr-2020
Survey 49 08-Apr-2021
Elevation, Feet (NAVD 88)
30
20
10
0
-10
-20
-30
0
100
200
300
400
500
600
700
800
Distance, Feet
Figure 9. No sand was placed directly on this beach during the recent USACE renourishment project. Growth in the foredunes is evident in the series of four surveys and the 2021 survey found a extremely large berm added to the beach. The "Beachsaver" reef system remains almost buried, but still a minor risk of foot injury to unwary swimmers who might stumble onto encrusted concrete top surfaces. The units are now only about 50 feet seaward of the April 2021 shoreline.

Coral Avenue to Lake Drive

The Lake Drive (CMP-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 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). This site also received modest sand placement in 2016 (42,300 cubic yards, Dwight Pakam, personal communication).

Figure 10. This April 8, 2021 view to the southwest shows the extensive foredune and a wider beach practically filling the rock groin cell extents.

The past two years of successive retreat in the position of the beachface shifted dramatically by April 2021 with a 62.53 yds^3/ft. sand volume increase and a shoreline advance of 109 feet seaward at the zero-elevation position. After reaching out to the US Army Corps of Engineers project manager (Dwight Packam) the response was presented that the Corps had transferred 50,000 cubic yards of beach sand derived from both the Nature Conservancy lands as well as from the NJ State park beach. Sand was truck-hauled to Lake Avenue as well as moved north to the "Cove" in Cape May City. Mr. Packam provided the map of the Cape May Point placement (Figure 1).

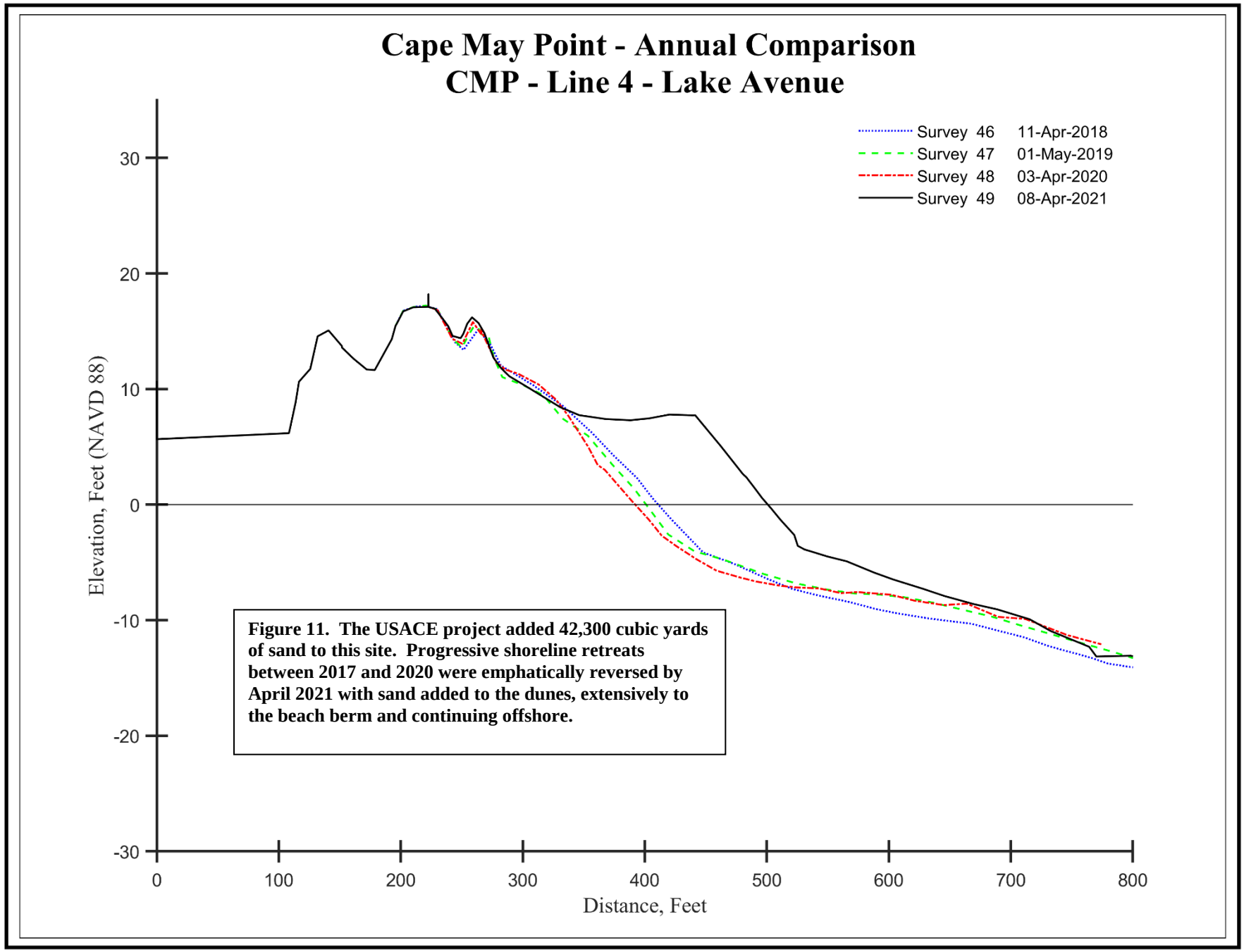


Figure 11. The USACE project added 42,300 cubic yards of sand to this site. Progressive shoreline retreats between 2017 and 2020 were emphatically reversed by April 2021 with sand added to the dunes, extensively to the beach berm and continuing offshore.

Surf to Cape Avenues:

CMP-5 contains the nearshore "beachsaver" units installed in 2002 during the USACE CMP-227 experimental project. The breakwater units are still present, located just over 240-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 or during the recent 2016 effort, but natural processes have moved sand from east to west along the Borough's shoreline over time.

Figure 12. The April 9. 2021 view to the southwest shows the expanding dune toe plant growth and continued accumulation of additional dune sand. This site has experienced exceptional dune accumulation of new sand.

The wider beaches have provided a source of sand for the wind to move sand onto the seaward slope and crest of the dune. Since 2018 the primary dune and a foredune on the upper beach have grown considerably adding to the sand held in reserve putting more storm protection in place. The beach is wider by 33 feet. The "Beachsaver" reef system was detected, but with a higher sand elevation on the inside than offshore of the structures. Swimming areas are 210 feet wide from the zero-elevation position out to the reef alignment. The water would be over swimmers' heads at the reef.

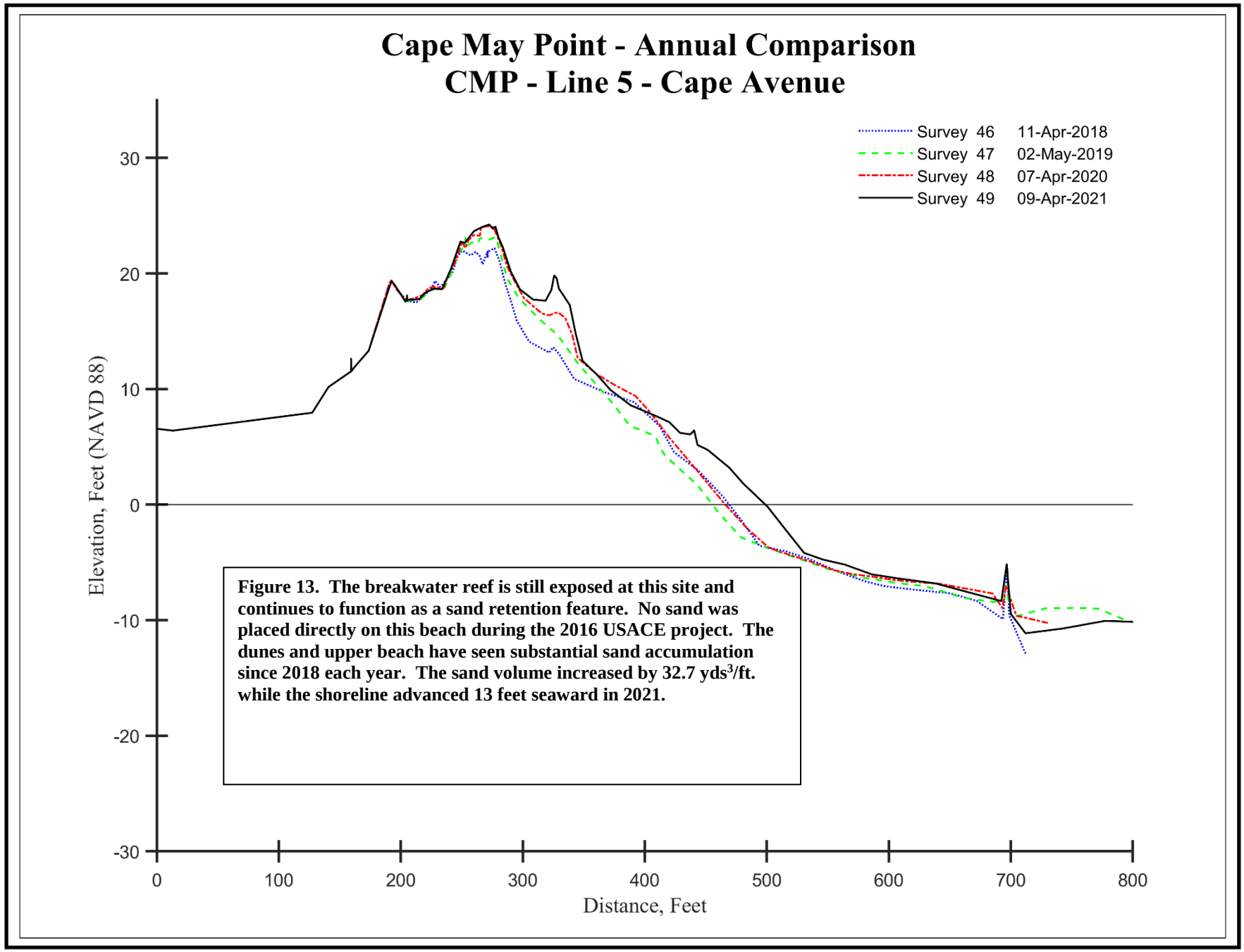


Figure 13. The breakwater reef is still exposed at this site and continues to function as a sand retention feature. No sand was placed directly on this beach during the 2016 USACE project. The dunes and upper beach have seen substantial sand accumulation since 2018 each year. The sand volume increased by 32.7 yds^3/ft. while the shoreline advanced 13 feet seaward in 2021.

Cape to Pearl Avenues;

CMP-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 dozen annual surveys. Consequently, they have limited ability to influence additional sand retention.

Figure 14. This view was taken April 9, 2021 at the instrument position in the dunes looking southwest into Delaware Bay. The dune toe defines the extent of dune growth leaving a modest dry beach widening toward the groin.

Sand shed from the initial up drift federal project beaches moves into this site seasonally by predominant longshore drift. The barrier 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 is already prohibited.

No sand was placed this far west during the USACE nourishment project, so beach building has been a result of natural processes. This past year has seen added material to the berm, the foredune slope including small gains offshore.

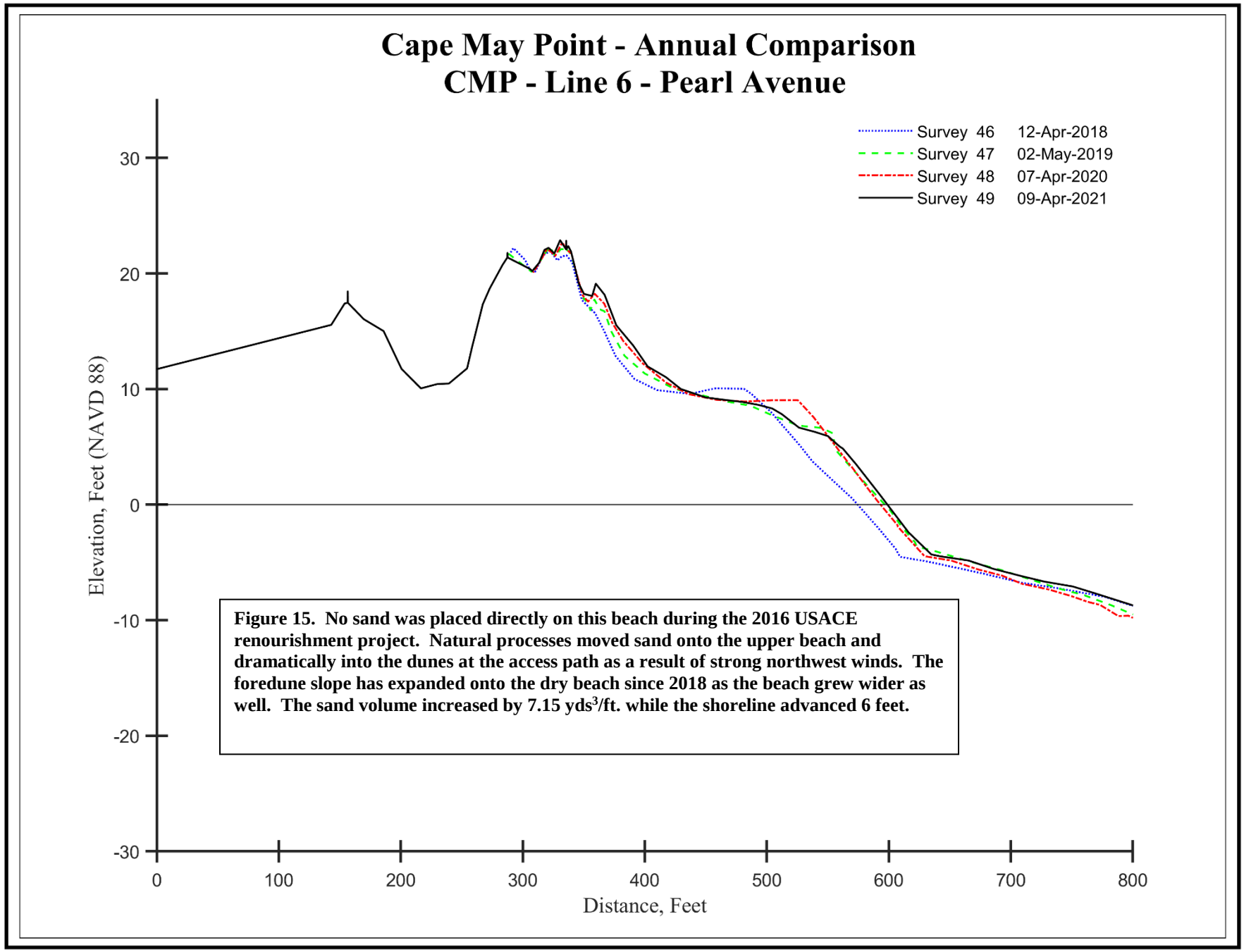


Figure 15. No sand was placed directly on this beach during the 2016 USACE renourishment project. Natural processes moved sand onto the upper beach and dramatically into the dunes at the access path as a result of strong northwest winds. The foredune slope has expanded onto the dry beach since 2018 as the beach grew wider as well. The sand volume increased by 7.15 yds^3/ft. while the shoreline advanced 6 feet.

Pearl to Stites Avenues;

Profile CMP-7, located southeast of Brainard Avenue, 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. With no submerged offshore 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.

Figure 16. The April 9, 2021 view to the southwest on CMP-7 shows the expanse of foredune slope and its vegetation. The mass of accumulated dune sand remains the largest among the Cape May beach segments in both total elevation and width of the dunes. The beach provides excellent protection as well.

Dune crest elevations in excess of 30 feet NAVD 1988 provide excellent storm protection, especially since the beach faces southwest where major events do not directly impact the shoreline. The beach, the dunes and the nearshore regions all gained minor quantities of sand since 2020. The entire foredune slope has become a low elevation dune field since 2018. The volume totals were moderate (8.64 yds^3/ft.) added by 2021. The shoreline also advanced 8.3 feet since 2020.

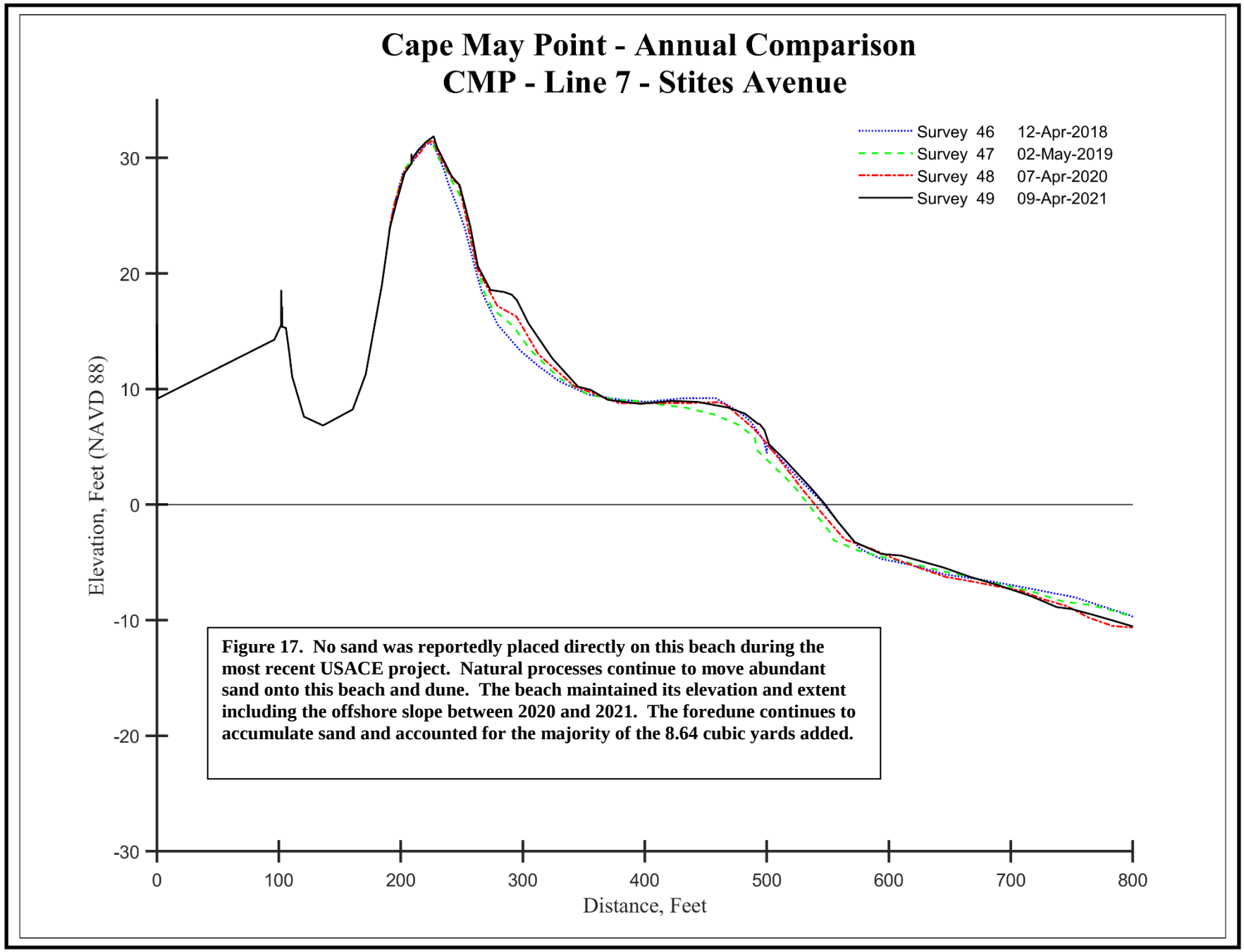


Figure 17. No sand was reportedly placed directly on this beach during the most recent USACE project. Natural processes continue to move abundant sand onto this beach and dune. The beach maintained its elevation and extent including the offshore slope between 2020 and 2021. The foredune continues to accumulate sand and accounted for the majority of the 8.64 cubic yards added.

Stites to Alexander Avenues;

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 moves onto the western Delaware Bay shoreline and shoals locally known as the "Cape May Rips". The offset landward in the beach west of the Alexander Avenue groin occurs because the dominance of the tidal currents over the minimal wave transport landward for sand allows the currents to distribute sand on the shallow bay floor in the vicinity, instead of waves moving the majority of the material passing the groin to the Sunset Beach shoreline.

Figure 18. This westernmost cell ends at the groin in the distance. The view toward Delaware Bay was taken April 9, 2021. Lower Township is immediately adjacent to the structure. The hummocky dunes in the foreground all have appeared in the past 5-6 years as this beach has expanded.

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, sand accumulation resumed with a large wedge of sand appearing from the seaward dune crest seaward to the profile limits. The dune has provided the most dramatic volume gain of any along the Cape May coastline. It accounts for about 40% of the entire site's sand accumulation since 2017. Sediment continued to move into the wide, low-elevation foredune area (adding 2.93 yds^3/ft.). The beachface eroded back somewhat losing 7.40 yds^3/ft. The shoreline retreated 28 feet making this the greatest retreat value of the 9 sites this year.

Swimming is not permitted at this beach, reserving it for fishing and beach sitting only.

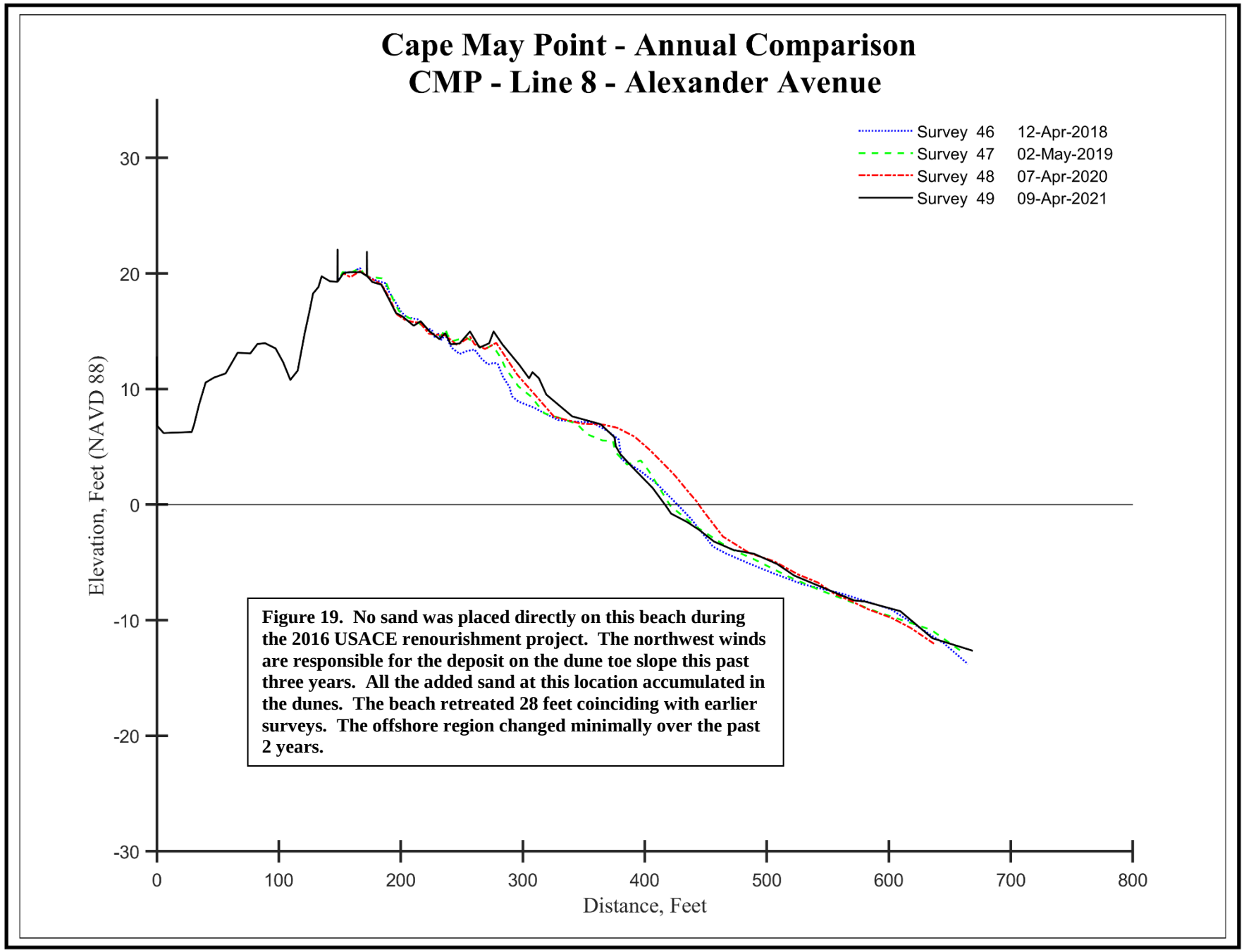


Figure 19. No sand was placed directly on this beach during the 2016 USACE renourishment project. The northwest winds are responsible for the deposit on the dune toe slope this past three years. All the added sand at this location accumulated in the dunes. The beach retreated 28 feet coinciding with earlier surveys. The offshore region changed minimally over the past 2 years.

Summary:

The USACE commenced sand placement in Cape May City in 1989 and have conducted maintenance or storm restoration efforts 12 times including restoring beaches following Hurricane Sandy in 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. In 2016, an additional 951,893 cubic yards were placed along the entire region's shoreline. Altogether, the beach restoration south of Cold Springs Inlet jetties has added 7,723,385 cubic yards of new material never previously within the local regional sand supply. In 2021 the USACE trucked NJ State Park and TNC beach sand into Cape May Point to augment the Lake Drive beach cell with 50,000 cubic yards of sand. The local wave approach to the regional shoreline guarantees that most of that sand will eventually pass into Cape May Point minus the volume which moves out to sea or onto the Delaware Bay bottom directly or remains in place as part of the beaches and dunes.

This sand supply has resulted in an influx of material for all the Cape May Point beaches even those western beaches not directly filled. Approximately 108,697 cubic yards (cy) of sand were placed directly on the Borough's beaches during the 2013 project limited to CMP 0, CMP 1 (71,697 cy) and CMP 4 (37,000 cy) cells. Sand has accumulated in the western cells and especially along the eastern shoreline. In 2016, 110,484 cubic yards were added to Cape May Point beaches at Lighthouse, Lehigh and Lake Avenues (CMP 0, 1 and 4). In addition, sand continues to be 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 2021, recently augmented with truck placement of 50,000 cubic yards at Lake Drive in February 2021. In 2019 and 2021, large additions appeared along the eastern Borough beaches offshore, to the point of near burial of the 1993 "beachsaver" reef system installed at sites CMP-2 and CMP-3. These reef systems remain in place, but practically buried in sand. The 2019, 2020 and 2021 cross sections at these two sites do show the most sand ever seen at the reef system. This sand accumulation continued with deposition further seaward from the reef systems creating a gentler slope into the bay. Strong northwest winds have produced dramatic additions to the western site dunes enhancing both the crest elevations and generating a wider foredune slope that now occupies the entire pre-beachfill project work width of the beaches originally in each cell.

The net sand volume change for 2021 was an excellent gain of 67,461 cubic yards of sand. At most sites aeolian processes have moved sand from the wider beaches to the seaward dune toe and slope. The most dramatic addition in 2020 was the USACE sand placement at Lake Drive (CMP-4).

Observations & Recommendations

1. Cells 0 (Lighthouse Ave.) and 1 (Lehigh Ave.) do not have reef structures; the beaches at Lighthouse and Lehigh Avenue lost modest sand volumes on the beachface and offshore. Both beaches have steep slopes into deep water with strong tidal currents into and out of Delaware Bay.
2. Cell 2 at Whilden Avenues, the shoreline position (zero datum) is approximately 90 feet distance from the breakwater structure. Depth of the scour trough landward of the units has decreased from 2020, but with 0.5 feet of the reef structure now exposed above the sea floor around the units. The swimming area width has decreased by 30 feet, but there is a risk of injury to unwary visitors if they step on the reef structure by accident. Wave surge is far less than when 6-7 feet of height existed between the reef crest and the landward seafloor. The CRC again recommends not allowing swimming in this cell except for wading into 3 feet of water and installing a line of floats

indicating the maximum distance into the water which should be about 20 feet from the breakwater reef.

3. Cell 3 at Coral Avenue, the shoreline position advanced 45 feet seaward reducing the distance to the breakwater units to approximately 65 feet from the shoreline position (zero datum). The space between the water's edge and the reefs filled in dramatically to allow bathers to walk into the water to the reef itself. Wave turbulence over the structures should be minimal this season because about just the top surface of the reef structure is exposed at the seafloor. The reduction in exposed reef structure above the sand surface reduces the wave turbulence over the reef and makes for safer swimming. Markers or floats should be used if swimming is allowed. Perhaps both CMP 2 & 3 could be used this season as a way to space out summer visitors to continue social distancing and allow chest deep water access in both of these beach cells.
4. Cell 4 (Lake Ave.) has no structures offshore and a relatively flatter nearshore slope. This site is the beneficiary of the 50,000 cy in new sand added by the US Army Corps and remains a good option for a swimming beach in Cape May Point this season. The relatively shallow slope platform in the water between groins make wading and swimming much safer for beach patrons.
5. Cells 5 (Cape Ave.) and 6 (Pearl Ave.) contain the newer submerged breakwater units but they pose minimal risk for swimming in 2021. Both reef structures lie in greater than -8 feet of water approximately 180 feet from the shoreline at low tide. The landward trough filled in at Cell 5 as well, generating a flat area between the reef and the shoreline. The "Double Tee" structure in Cell 6 is 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. Cell 7 at Stites Avenue benefited from a stable berm area enhancing the recreational value of the beach, this paired with the shallow offshore platform will offer a relatively safe option for swimming. The beach is wider in 2021, but only by 8 feet.
7. Cell 8 at Alexander Avenue has seen a large sand gain in the dunes as the foredune dramatically accumulated sand. The berm eroded landward by 28 feet with sand loss from the beachface and offshore. This beach has traditionally been closed to swimming. Allowing water access would entail additional life guards be hired to protect it.

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 issues. Please contact the CRC with any questions or concerns.