

**2021 ANNUAL REPORT ON
THE CONDITION OF THE MUNICIPAL BEACHES FOR
THE BOROUGH OF STONE HARBOR, CAPE MAY COUNTY, NEW JERSEY**

This view to the south along the 82rd Street dune crest from the survey line as of October 5, 2021 provides a broad view of the north Stone Harbor dune field. While the pedestrian access pathway is lower in total elevation than the dune crest, the width of dunes helps this issue. Additional path elevation would improve storm defences at this location.

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Introduction:

It has been four years since the US Army Corps of Engineers (USACE) conducted the placement of sand on the Borough's beaches between 105th and 123rd Streets. By March 7, 2017 the total amount placed in the southerly section of the Borough oceanfront was 394,000 cubic yards, under the sponsorship of the Division of Coastal Engineering within the NJDEP. This was because of the continuing issue regarding the Coastal Barrier Resources Act prohibition on expending federal funds to remove sand from a CBRS for adjacent municipal beach nourishment.

In May, repairs commenced in Stone Harbor's north end beaches (80th Street to 105th Street) using Federal Flood Control Coastal Emergency Act (FCCE) funding under the direction of the US Army Corps, because Townsend's Inlet is not a CBRS area. Townsends Inlet was the sand source for approximately 320,000 cubic yards that was placed on the Borough's north end beaches (80th to 105th Streets). Adding these two sand volume totals, the Borough oceanfront received 714,000 cubic yards of additional sand during 2017.

In 2019, Stone Harbor determined that the USACE proposal to extract sand from the Stone Harbor dunes that have expanded seaward onto the federal dry beach template creating their design beach and push that sand onto the beachface to widen the beach and add protection was too fraught with cost per cubic yard, extraction of the buried dune fencing and the general loss of storm protection that the existing dunes provide the Borough.

The continuing effort to arrive at a consensus with the US Fish & Wildlife Service, the Dept. of the Interior, and the three affected communities where sand from Herford Inlet's authorized sand borrow areas could again, be utilized for beach nourishment from the ebb-tidal shoals of the inlet is moving toward a Washington DC meeting with the Director of the US F&WS at some point in the near future.

2021 Weather Events;

The winter of 2020 to 2021 produced multiple mild to moderate northeast storms none of which generated severe conditions. The tropical systems were represented by Hurricane Ida which made Louisiana landfall in late August 2021 as a category four storm and then tracked northeast, crossing NJ inland generating tornado and rainfall flooding damages along its track. The ocean waves were significant but did not produce damages on the shoreline sufficient to generate a disaster declaration for beach damage. The last northeast event was a three-day low wind velocity event October 10 to 12, 2021. The 2021 summer seasonal sand accretion was relatively extensive this year generating wider beaches as sand from bar systems offshore moved landward to add to the beach berm.

Beach Monitoring Program Methodology

The CRC established the Borough's beach monitoring program in June of 1996 to address the shoreline changes along the 13,077 feet of municipal oceanfront beaches. Eight permanent beach profile-monitoring sites were established to gather data initially on a quarterly basis but shifted to a semi-annual survey in 2007. 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 14-16 feet. Each of the groin compartments or cells along the Borough beachfront contains one profile line. Work continues with a semi-annual monitoring schedule. More recently, the Borough requested monitoring services following the 2016 to 2017 dredging of the municipal bayside lagoons to improve navigation for all lagoon frontage owners and other users. This work involved repeating some of the lagoon traverse transects used by the contractor after dredging was complete to prove quantities of sediment removed for payment. The CRC has repeated these transects for the past five years to determine where and if sedimentation is affecting overall navigability.

The following is a list of the profile locations:

◆ SH-82	82 nd Street	Border with Avalon – 84 th St. groin
◆ SH-90	90 th Street	84 th St. groin – 92 nd St. groin
◆ SH-95	95 th Street	92 nd St. groin – 98 th St. groin
◆ SH-103	103 rd Street	98 th St. groin – 106 th St. groin
◆ SH-108	108 th Street	106 th St. groin – 111 th St. groin
◆ SH-112	112 th Street (paper street)	111 th St. groin – 114 th St. groin
◆ SH-116	116 th Street	114 th St. groin – 122 nd St. groin
◆ SH-123	123 rd Street (paper street)	122 nd St. groin – terminal groin

Surveys Completed

The CRC completed four surveys between April 2020 and October of 2021:

- ◆ **Survey 56** represents a full dune, beach and nearshore survey at all sites for April 2020
- ◆ **Survey 57** represents a full dune, beach and nearshore survey at all sites for October 2020
- ◆ **Survey 58** represents a full dune, beach and nearshore survey of all sites for April 2021
- ◆ **Survey 59** represents a full dune, beach and nearshore survey of all sites for October 2021

Stone Harbor Engineered Beach Performance

Table 1 is specifically designed to show sand volume changes between the reference position landward of the dunes, across the dry beach and to the zero-elevation position (NAVD 1988). Each sand volume is determined for each individual profile site by computing the sand cut or fill cell changes when the two profiles in comparison are superimposed and the software evaluates the respective gains or losses between them. These values are expressed in cubic yards of sand per linear foot of beachfront (yds³/ft.). The total beach volume change is calculated using this value. The distance (cell width) between groins along the beachfront of Stone Harbor was measured between the centerlines of adjacent groins. Each cell's net sand volume change is determined by multiplying each cross-section volume change by its corresponding groin cell width. Each cross section was positioned in the middle of each groin cell to maximize the single site providing the most reliable cross section data. Additional cross sections could provide more precise information but each added profile in each cell adds significantly to the cost of data collection (three lines per cell would need three times the number of days to survey them plus added office time).

Table 2 represents sand volume and shoreline changes seen during the past summer between the April and October 2021 surveys that includes both the beach and dunes and the offshore region to water depths of 15 to 17 feet.

Table 3 is the annual change across the entire transect length seen between October 2020 and October 2021 where winter to winter storm activity is represented and has shown loss year after year. Last year the annual beachfront sand volume loss amounted to 76,849 cubic yards dominated by higher losses to the north easing somewhat toward the southern terminal rock groin south of the 123rd Street site. During 2020 into 2021, the annual loss rate increased to 131,222 cubic yards, focused this year on the southern beaches with minimal loss between the Avalon boundary and 95th Street. 108th Street was the only southern site with positive annual outcomes. Beach width declined at 5 of 8 sites with no trend in the pattern along the oceanfront. Site SH-112 retreated the most at -36 feet measured at the zero-elevation position. However, site SH-108 to the immediate north had a 20-foot shoreline advance seaward this year. The other two location saw essentially no change in shoreline position.

Table 1
Stone Harbor
April 2021 (#58) to October 2021 (#59)
6 Months of Dune and Beach Sand Volume Changes to the Zero Elevation Point

Profile Number	Shoreline Change (feet)	Volume Change (yds³/ft)	Cell Distance (feet)	Cell Volume Change (yds³)
SH-82				
SH-90				
SH-95				
SH-103				
SH-108				
SH-112				
SH-116				
SH-123				
Total Volume Change =				74,032

Last summer 51,216 cubic yards of sand accumulated on Stone Harbor beaches above the zero-elevation position. This year that value increased to 74,032 cubic yards. Two locations lost sand volume on the beach, but at low volumes (-339 cy at SH-123; and -3,595 cy at SH-112).

Table 2 shows the same data computed for the entire transect survey length offshore. Last year the net change was a loss of 77,229 cubic yards of sand. This year that change reversed to deposition at 76,353 cubic yards across the entire region under study. Therefore, the offshore region gained a modest 2,321 cubic yards of material in addition to that seen accumulating on the beaches and dunes. This is good news given that between 2019 and 2020 the offshore region lost 128,444 cubic yards of sand.

Table 2
Stone Harbor Semi-Annual Survey
April 2020 (#56) to October 2020 (#57)
Shoreline and Total Transect Sand Volume Changes

Profile Number	Shoreline Change (feet)	Volume Change (yds³/ft)	Cell Distance (feet)	Cell Volume Change (yds³)
SH-82				
SH-90				
SH-95				
SH-103				
SH-108				
SH-112				

Table 3
Stone Harbor Annual Survey
October 2020 (#57) to October 2021 (#59)
Shoreline and Total Transect Sand Volume Changes

Annual sand volume losses that include the winter months show loss rates approximating 10 cubic yards of sand per foot of Stone Harbor oceanfront. There is less sand on the beaches within the scope of the surveys with a narrower dry sand area at 5 of 8 sites. The summer beach gains did not offset the winter loss seen offshore.

Individual Site Descriptions:

This section describes the changes documented at each of the beach profile locations from late October 2020 to October 2021. All the sites are located within the Federal shore protection project limits that received sand during the February-March 2017 (105th to 123rd Streets [federal \$]) or May-June 2017 (80th to 105th Streets [NJ State \$]) fill activities. No fill was provided to Stone Harbor during the 2019 maintenance work which was completed in Avalon. Octb-2 (on.)TJ 8.64 0 Td (.01 -1.1C1 (v .5 ()T(as)TJ 0 Tc 0 Tw(m)-6 (9.hw(mH.04 507.36

Site SH-82 – 82nd Street (Photos 1a-1c)



Photo 1a – Photo taken April 16, 2020 showing a wide, dry beach and sand accumulation at the dune fencing.



Photo 1b - Photo taken on October 6, 2020, looking north along the dune crest where sand has been transported into the dunes and the sand fence is essentially buried by what could become a new foredune line.



Photo 1c – Photo taken October 5, 2021 from the primary dune crest looking north. The buried sand fence continues to collect sand adding to the dune mass.

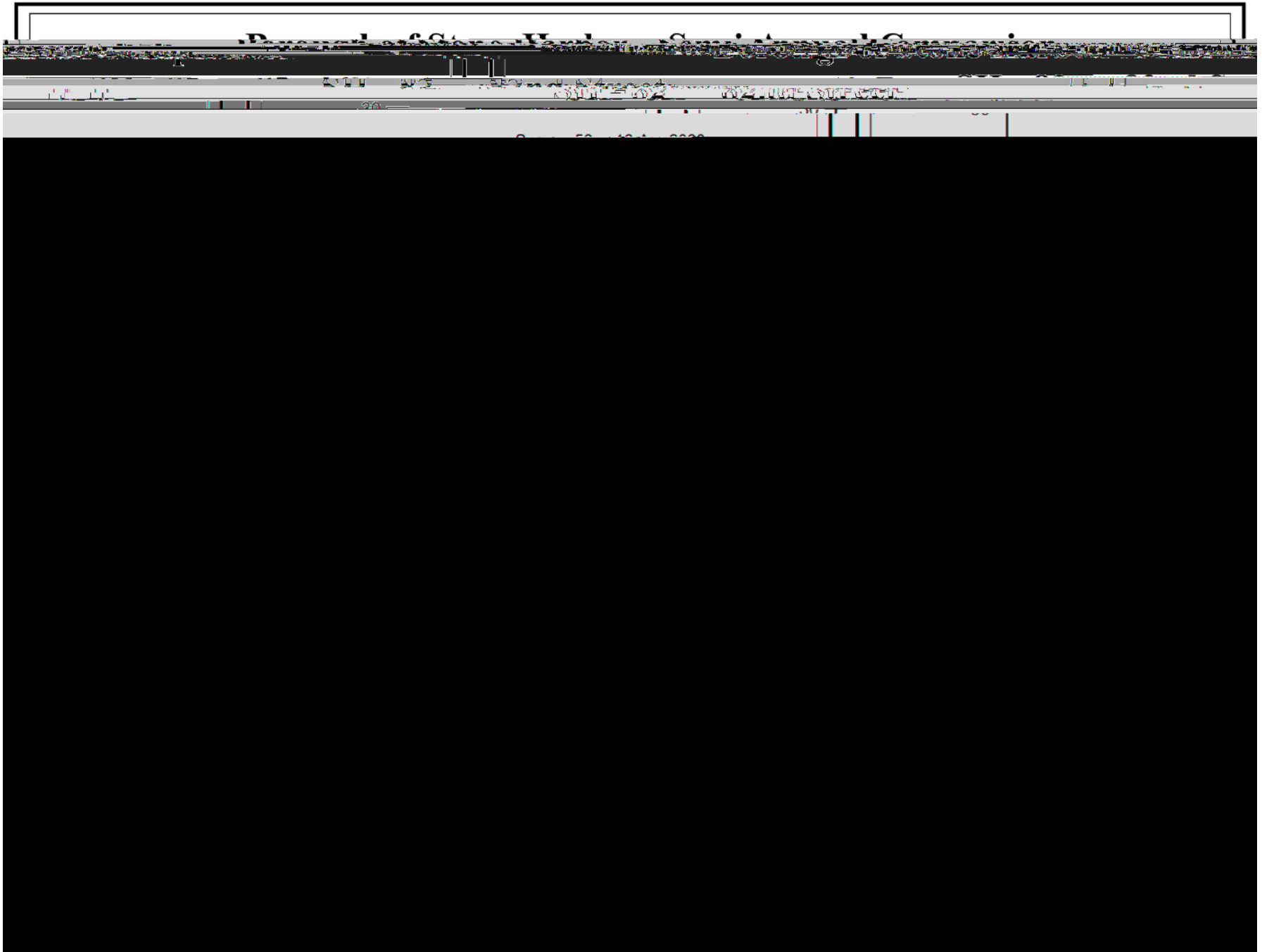


Figure 1d. Between April and October 2021 sand dramatically moved landward and deposited across the transect from the seaward dune toe offshore filling the existing bar trough. The beach did nominally retreat from the October 2020 position.

SH-90 is



Figure 2d. Sand was added to the dune's seaward slope and as a uniform layer across the beach into the offshore region. The berm was larger than it had been the previous summer. The offshore bar crest moved into the trough that existed in April 2021.

SH-95, the 95th Street site was established along the north side of 95th Street and the beach access path. The profile line crosses the municipal parking lot, a wooden bulkhead, access ramp and dune located just north of the municipal beach observation platform. The dune system is essentially a single ridge that extends seaward 140 feet from the street end revetment to the seaward dune toe with a crest elevation of 15 feet NAVD88.

Minor Sand quantities moved onto the beach building a small berm. There was no significant annual change in the shoreline position (+3.0 feet seaward). Offshore the bar crest in April moved landward filling the trough.

Site SH-95 – 95th Street (Photoplates 3a-3c)

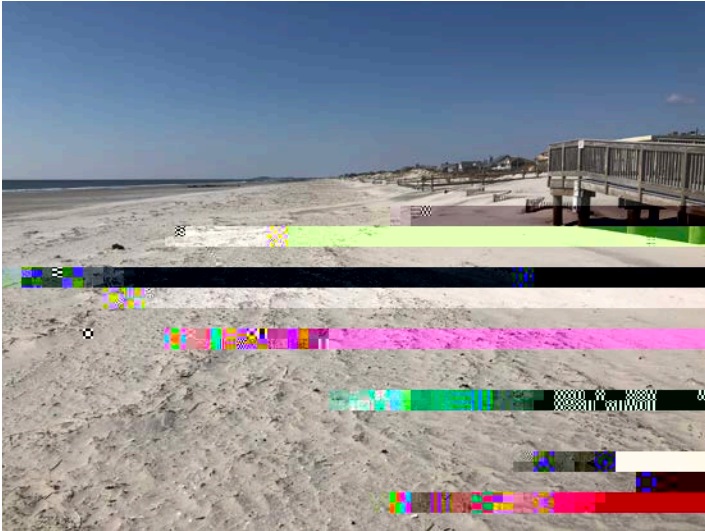


Photo 3a - The April 16, 2020 photo presents a wider dry beach with sand added to the nearly buried sand fencing at the toe of the seaward dune

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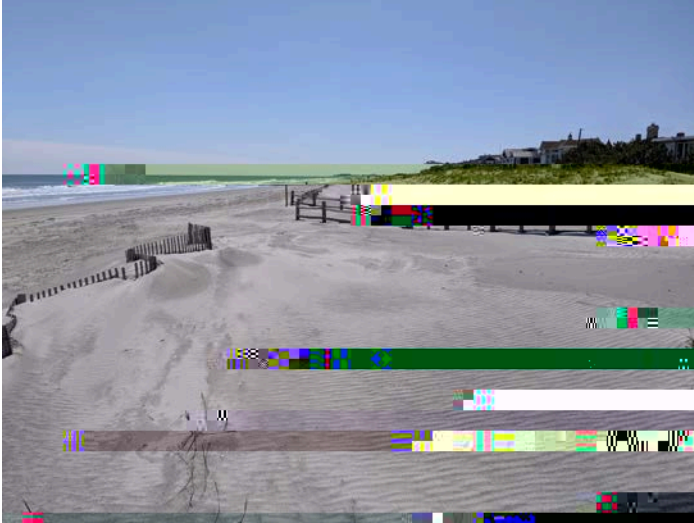


Figure 3d. Sand deposited on the beach in modest quantities this past summer (2.14 yds³/ft.)

SH-103 was established for the Borough's beach monitoring program at the seaward end of 103rd Street along the north sidewalk. In 2003 the initial Federal project enhanced the width of both the dune and beach that had vanished by 1998 as a result of long-term erosion. Several subsequent projects have been required to provide periodic beach maintenance that included the 2009 state/municipal project, the spring/summer 2011 federal project, the summer 2013 Hurricane Sandy emergency beach fill, and the recent state/federal work in 2017.

Behaving in similar fashion to SH-95, the beach configuration was augmented modestly across the dune, beach and nearby offshore. Offshore a significant gradient change moved bar crest sand into two nearshore troughs creating a uniform slope seaward by summer's end.

Site SH-103 – 103rd Street (Photoplates 4a-4c)



Photoplate 4a - Photo taken October 14, 2019 showing sand continuing to fill the 4-foot high snow fencing creating a new foredune. The beach width was sufficient to provide the supply.

Photoplate 4b - Photo taken April 15, 2020 shows sand filling in the lower section of the access pathway burying the fencing.



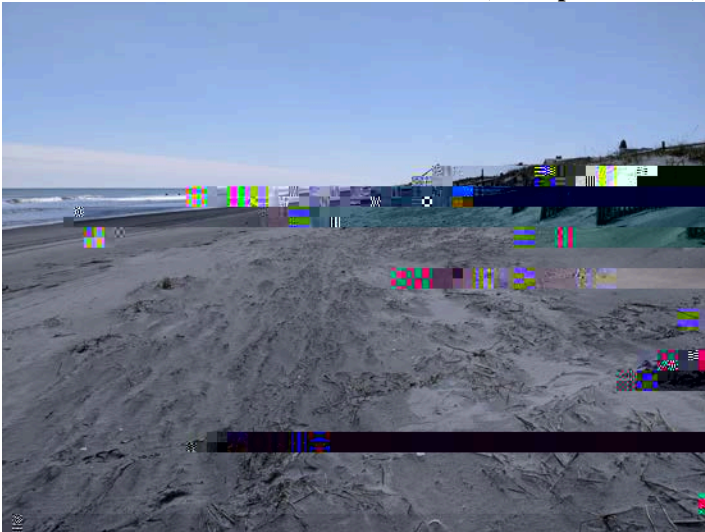
Photoplate 4c – Photo taken October 5, 2021 on the beach just seaward of the dune's seaward slope.

Figure 4d. The cross sections at 103rd Street show a similar pattern to that seen at 95th Street where neither the annual shoreline change (-25 feet) or the summer

SH-108 is located at the end of 108th Street and was placed near the middle of the groin cell. This site shares a pre-beach restoration history similar to site SH-103. Sand was placed here during the 1998 municipal beach fill that re-established a dry beach and dune ridge. In 2003, the initial Federal project enhanced the width of both the dune and beach.

A somewhat larger sand volume was added to this beach over the summer (28.20 yds³/ft.) with most of it added offshore (17.35 yds³/ft.). Annually, there was a 2.99 yds³/ft. sand volume gain.

Site SH-108 – 108th Street (Photoplates 5a-5c)



Photoplate 5a – The photo taken April 15, 2020 shows minor additions of sand near the dune toe, but a similar width beach to the water line.

Photoplate 5b – The photo taken October 6, 2020 shows improvement in beach width as sand was added to the upper part of the dry beach.



Photoplate 5c – By October 6, 2021 the beach width had increased by 20 feet annually. A flatter gradient meant

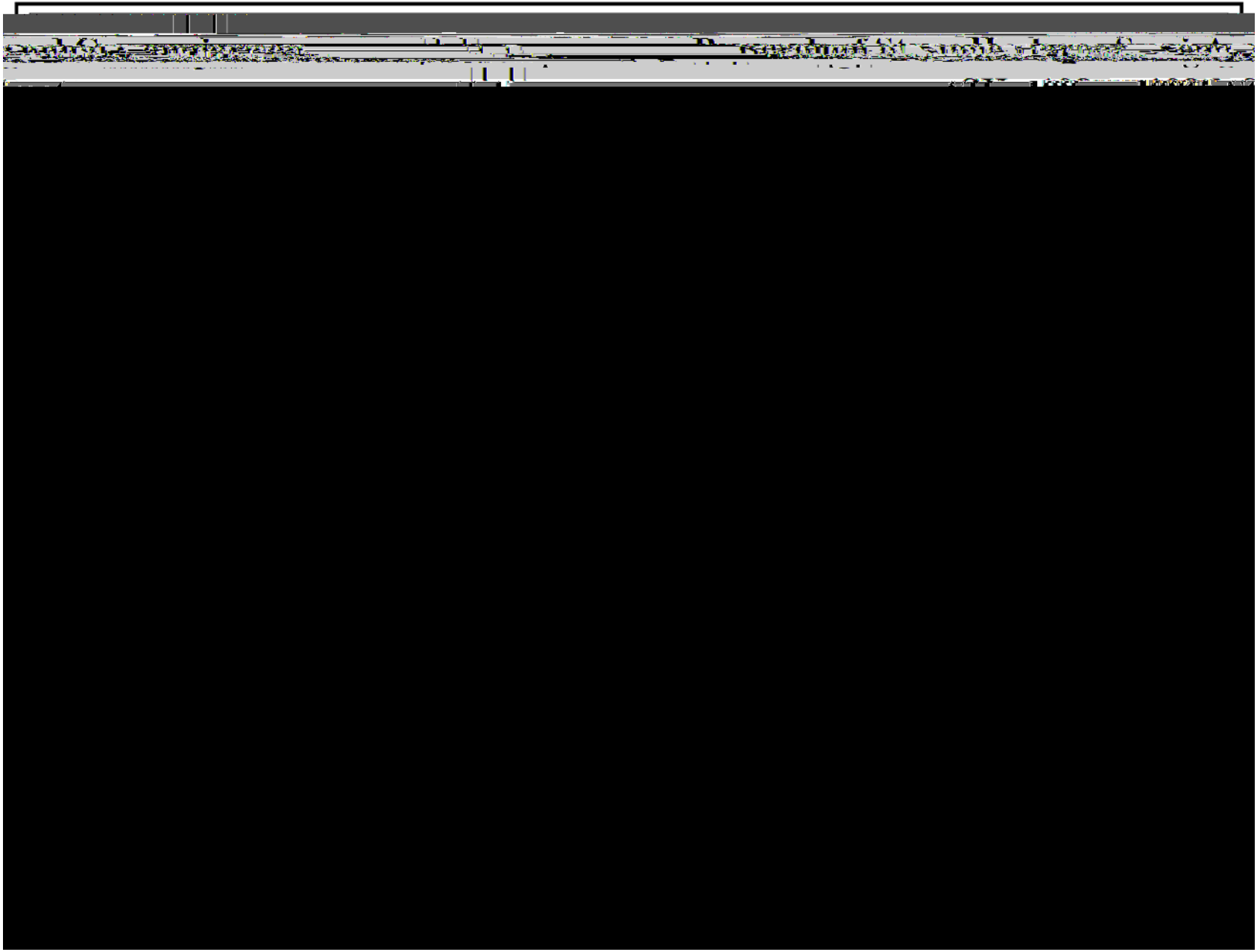
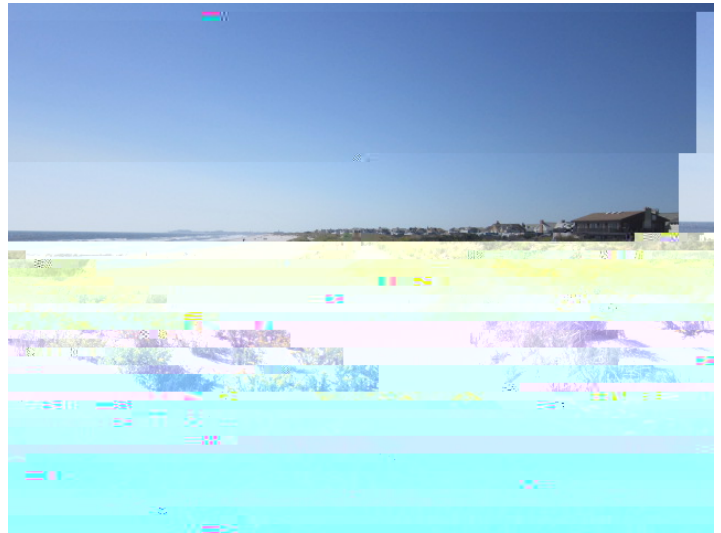
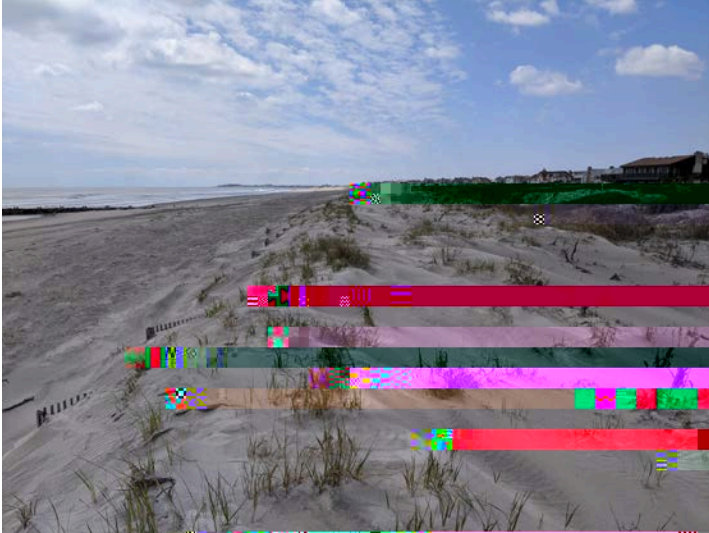


Figure 5d. Dune growth was confined to the foredune fence line in 2021, but the beach accumulated a consistent layer of sand across the entire offshore region to the point where the earlier bar crest was positioned 1,100 feet from the reference.

SH-112 is located on the open lot adjacent to the Villa Maria Catholic retreat that occupies the paper location of 112th Street. The profile line extends landward to a reference location along 2nd Avenue. An open grass lot occupies the city block between 2nd Avenue and the wooden bulkhead revetment. The wooden revetment runs parallel to the beach the entire length of the Borough along the oceanfront property lines and seaward street ends. The bulkhead is significantly offset landward at 111th Street, providing additional area for dune development to occur naturally. As a result, the width of the primary dune was nearly 200 feet from the bulkhead to the seaward dune toe. This location has a very significant primary dune largely due to the limited oceanfront development on this parcel. Occupied by the Catholic Church as a retreat for over a century, the site has no structures directly at the landward dune toe. The dunes spill over the bulkhead and occupy most of the original dry beach that existed prior to the USACE project in 2004.

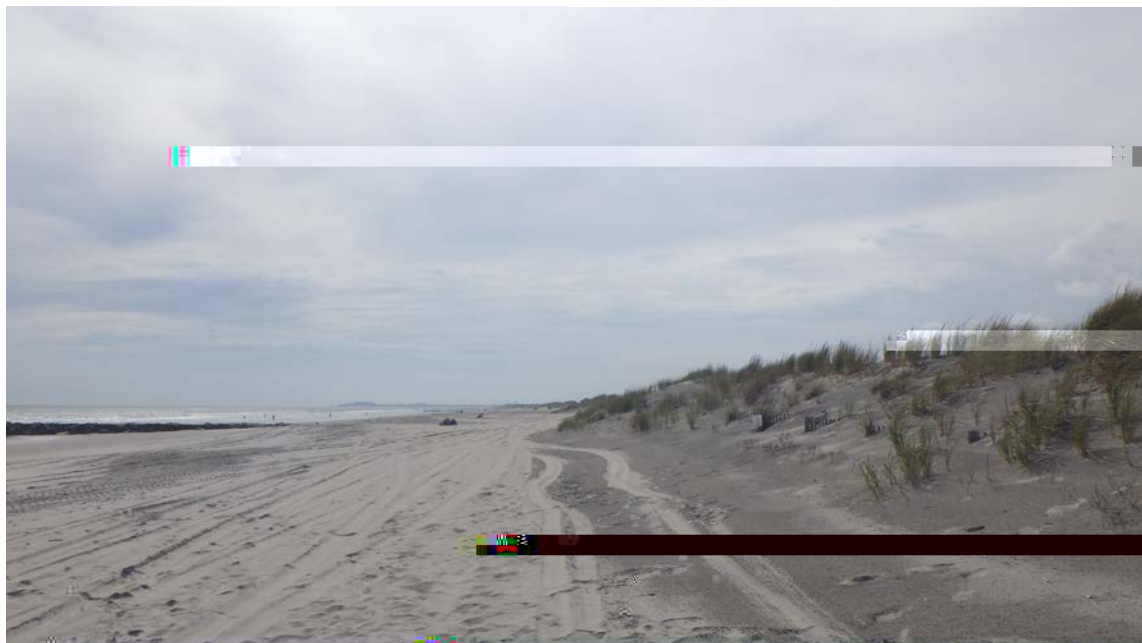
Site SH-112 – 112th Street

(Photoplates 6a-6c)



Photoplate 6a – Photo taken April 15, 2020 and shows large amounts of wind deposition around the existing plants.

Photoplate 6b - Photo taken October 7, 2020 where the seasonal plant growth has taken hold on the new sediment supplied by the wind.



Photoplate 6c – View to the south October 4, 2021 along the seaward dune toe. The sand supply is sufficient to protect the dune slope thus far.

SH-116 is located along the west side of 2nd Avenue and 116th Street. Seaward of the bulkhead at 116th Street is the best-established natural dune system in the Borough. A landward offset in the bulkhead just north of this site produced the area on which this dune developed, sheltered from storm overwash by the 114th Street groin and the bulkhead offset to the west. The dune system consists of two distinct ridges with a combined width of nearly 300 feet from the street end bulkhead to the seaward dune toe with a crest elevation of 16.5 feet NAVD88.

Sand was deposited across the dune and beach part of th

Figure 7

SH-123 is located at 123rd Street south of the developed part of town and just north of the terminal groin. The profile reference marker is located in a dense stand of bayberry west of a vehicle access path to the Hereford Inlet terminal groin. This site has benefited tremendously since the completion of the initial USACE project both from direct sand placement and from longshore currents that have carried a substantial volume of sand shed from the northern project beaches south toward South Point.



Figure 8d. 123rd Street site retained its seaward dune slope position and accumulated a little sand at the base of the toe. Sand from offshore moved landward onto the beach and immediately offshore. The loss seen annually can be ascribed to the sand migration from the bar well offshore, landward between April and October 2021.

Summary

The 2017 joint federal and NJ State project was the most recent effort adding sand to the Stone Harbor oceanfront. The weather conditions have favored beach stability during the sequence of surveys presented in this report. The northern part of the project was funded through the Federal Flood Control Coastal Emergency Act (FCCE) program. Because of the CBRA resource issues with the Hereford Inlet site, the borrow area from Townsends Inlet was selected for the sand supplied to the north end beaches because the US Army Corps was not allowed to spend federal funds within the Hereford Inlet CBRS. The State of NJ, Div. of Coastal Engineering funded the southern segment of Stone Harbor's nourishment cycle because State or local funds may be expended moving sand from a CBRS.

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