View to the north of the Borough of Stone Harbor on Seven Mile Island. The photo shows the condition of the municipal shoreline nearly 16 months following the Federal emergency re-nourishment project that restored the Borough’s beaches and dunes to the original federal project design template. (Photo by Ted Kingston, October 30, 2014)

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April 30, 2015
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Introduction:

This annual report presents the status of the beaches within the Borough of Stone Harbor from May 2013 to October 2014. This time frame allowed for a one-year assessment of the emergency beach nourishment project that was authorized by Congress in January 2013. The 100% Federally-funded project commenced within six months following Hurricane Sandy (which made landfall in Atlantic County on October 29, 2012) and was completed by August 2013.

Prior to Hurricane Sandy, four severe storms that included northeasters on November 2009, March 2010 and December 2010 and Hurricane Irene 2011 impacted the Borough’s 2003 Federal shore protection project and each of the severe storms resulted in a Presidential Disaster Declaration. This left the Borough’s shoreline susceptible to further erosion. Even though Hurricane Sandy made landfall nearly 35 miles north of the Borough, its storm surge and waves dramatically eroded the beaches and dunes totaling 380,800 cubic yards (CY) of sand. Following the storm, the focus in 2013 was to help the shore communities recover and rebuild, and in January 2013, Congress passed Public Law 113-2 (Disaster Relief Appropriations Act of 2013) to restore all Federal shore protection projects (including beaches and dunes) within the impacted area. In Stone Harbor those efforts included a major beach nourishment project to restore the municipal shoreline to the original full design template with the placement of 674,224 CY (USACE reported pay volume) of sand on the beaches and dunes between 80th Street and 123rd Street.

The Stockton University Coastal Research Center (CRC) 2013 Annual Report on the Condition of the Stone Harbor Beaches noted erosion of the Borough’s beaches following the completion of the emergency repair project in August 2013 to the Fall (October) 2013 survey (-22,287 CY). Much of the sand was stripped from the beachface and berm and carried cross-shore where it accumulated as a large shore parallel sand bar that continued well offshore beyond the survey limits.

Data presented herein show volume trends and changes in shoreline position during a relatively mild 2013-2014 winter season and subsequent summer. Annual shoreline and sand volume changes between Surveys #41 and #43 are presented in Table 1 and semi-annual changes (Surveys #41 to #42 and #42 to #43) are presented in Table 2 and Table 3.

2014 Weather Events;

The 2013-2014 fall/winter was generally quiet though there were ten strong wind events (>40 knots) that impacted eastern Cape May County and resulted in property damages (NOAA, 2015). The event that occurred on and around October 10, 2013 lasted 72 hours and generated 40+ knot onshore winds. Its waves cut into the recently completed emergency beach fill and was responsible for the initial losses recorded in the CRC’s 2013 annual report. This was the initial event on the list of storms that occurred between October 2013 and April 2014. The fall/winter volume losses are shown in Table 2. As calmer weather returned in late spring/summer 2014, the natural recovery processes allowed some of the sand that was moved offshore to move back onshore during the summer months (Table 3).

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 on a quarterly basis. 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 of the groin compartments or cells along the Borough beachfront contains one profile line. Work continued on a semi-annual monitoring schedule.
The following is a list of the profile locations:

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

**Surveys Completed**

The CRC completed five surveys between May 2013 and October 2014.

- **Survey 39** represents a dune, beach and nearshore survey to a depth of approximately eight feet. This survey was conducted to acquire topography/bathymetry prior to the federal emergency beach replenishment project that took place from April to June 2014. Survey location 123 was omitted because there was no beach access due to staging, piping, and pumping of the beach replenishment project.
- **Survey 40** represents a full dune, beach, and nearshore survey at all sites and is considered the Spring 2013 survey for measuring annual changes.
- **Survey 41** represents a full dune, beach, and nearshore survey at all sites and is considered the Fall 2013 survey for measuring annual changes.
- **Survey 42** represents a full dune, beach, and nearshore survey at all sites and is considered the Spring 2014 survey for measuring annual changes.
- **Survey 43** represents a full dune, beach, and nearshore survey at all sites and is considered the Fall 2014 survey for measuring annual changes.

The CRC’s 2013 annual report presents changes from the October 2012 to October 2013. This 2014 report presents the changes from the pre-emergency fill profile in May 2013 (Survey 39), the spring survey of August 6, 2013 (Survey 40 - post emergency fill) fall survey in October 2013 (Survey 41) spring survey in May 2014 (Survey 42) and fall survey in October 2014 (Survey 43).

**Stone Harbor Engineered Beach Performance**

Initial construction of the Federal shore protection project began in 2002 and was completed in the Borough in 2003. Since placement, the USACE engineered beach sustained several significant storm events but maintained its storm protection value to the community during Hurricanes Irene and Sandy by preventing major flooding from storm waves and dune breaches.

Hurricane Sandy (landfall on October 29, 2012) severely eroded the Borough’s beaches and the dunes scarped but maintained their stability and were able to protect oceanfront properties from storm surge. Damage to beach access crossovers, ramps and pavilions was extensive but the public infrastructure inland was largely protected from storm waves.

In April 2013, the emergency beach fill commenced and added 674,224 CY (USACE reported pay volume) of sand to the Borough’s 13,077 feet of oceanfront shoreline. This was an average gain of 54.70 yds$^3$/ft. Fill volumes tapered to the south as net sand transport along the Borough’s shoreline is to the south and required less sand to restore the template. The total net sand volume change over late summer and early fall of 2013 was a modest loss of 22,287 CY of sand from across the entire Stone Harbor oceanfront including the dunes, beaches and offshore seafloor (CRC, 2014). The effects of the remaining nine storm events continued the trend of volume losses from the early fall and the greatest volume losses over the 2013-2014 winter occurred at site
For the 2013-2014 year, only SH-82 (northermost profile location) and SH-123 (southernmost profile location) showed any volumetric gains though neither showed a net shoreline position advance for the year (Table 1).

Tables 1 through 3 provide shoreline and volume change information for each of the ocean beach profile locations within the Borough of Stone Harbor. Shoreline changes were calculated by comparing the zero datum positions for the 2013-2014 monitoring period. Sand volume changes across the length of the survey line were calculated for each individual profile site by computing the cut and fill cell changes in the profile with the previous survey or, were calculated from the annual surveys. 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 computed by multiplying each cross section volume change by its corresponding groin cell width.

Table 1 represents the annual changes in shoreline position and across profile volume changes (from Fall 2013 [Survey 41] to Fall 2014 [Survey 43]).

<table>
<thead>
<tr>
<th>Profile Number</th>
<th>Shoreline Change (feet)</th>
<th>Volume Change (yds³/ft)</th>
<th>Cell Distance (feet)</th>
<th>Cell Volume Change (yds³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-82</td>
<td>-26</td>
<td>12.08</td>
<td>1,381</td>
<td>16,682</td>
</tr>
<tr>
<td>SH-90</td>
<td>-11</td>
<td>-29.75</td>
<td>2,240</td>
<td>-66,640</td>
</tr>
<tr>
<td>SH-95</td>
<td>-15</td>
<td>-22.65</td>
<td>1,680</td>
<td>-38,052</td>
</tr>
<tr>
<td>SH-103</td>
<td>-19</td>
<td>-22.60</td>
<td>2,208</td>
<td>-49,901</td>
</tr>
<tr>
<td>SH-108</td>
<td>16</td>
<td>-10.20</td>
<td>1,433</td>
<td>-14,617</td>
</tr>
<tr>
<td>SH-112</td>
<td>1</td>
<td>-20.70</td>
<td>804</td>
<td>-16,643</td>
</tr>
<tr>
<td>SH-116</td>
<td>-33</td>
<td>-9.54</td>
<td>2,273</td>
<td>-21,684</td>
</tr>
<tr>
<td>SH-123</td>
<td>-28</td>
<td>1.86</td>
<td>1,058</td>
<td>1,968</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13,077</td>
<td></td>
</tr>
<tr>
<td>Total Volume Change =</td>
<td></td>
<td></td>
<td></td>
<td>-188,886</td>
</tr>
</tbody>
</table>

For the annual comparison (Fall 2013 to Fall 2014, Table 1), the shoreline position retreated at most of the Borough’s profile locations except at 108th Street and 112th Street; though volume losses occurred at these sites. The greatest annual volume losses were recorded at SH-90 and the overall volume change was -188.886 CY for the Borough’s ocean beaches and nearshore.
Onshore (from above the zero datum elevation) changes ranged from losses (– 9.8 yds$^3$/ft.) at SH-112 to gains (2.9 yds$^3$/ft) at SH-123. Offshore (below datum elevation), only SH-82 gained sand volume (12 yds$^3$/ft.) while all others recorded losses indicating that the sand was either carried further offshore or downdrift toward South Pointe.

Table 2 shows the changes in shoreline position and total sand volumes (across the entire profile) at each of the Borough’s eight sites between October 2013 (Survey 41) and May 2014 (Survey 42).

<table>
<thead>
<tr>
<th>Profile Number</th>
<th>Shoreline Change (feet)</th>
<th>Volume Change (yds$^3$/ft)</th>
<th>Cell Distance (feet)</th>
<th>Cell Volume Change (yds$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-82</td>
<td>-1</td>
<td>-11.70</td>
<td>1,381</td>
<td>-16,158</td>
</tr>
<tr>
<td>SH-90</td>
<td>-1</td>
<td>-19.81</td>
<td>2,240</td>
<td>-44,374</td>
</tr>
<tr>
<td>SH-95</td>
<td>-38</td>
<td>-22.00</td>
<td>1,680</td>
<td>-36,960</td>
</tr>
<tr>
<td>SH-103</td>
<td>-34</td>
<td>-24.21</td>
<td>2,208</td>
<td>-53,456</td>
</tr>
<tr>
<td>SH-108</td>
<td>-6</td>
<td>-11.50</td>
<td>1,433</td>
<td>-16,480</td>
</tr>
<tr>
<td>SH-112</td>
<td>-26</td>
<td>-15.08</td>
<td>804</td>
<td>-12,121</td>
</tr>
<tr>
<td>SH-116</td>
<td>-38</td>
<td>-14.86</td>
<td>2,273</td>
<td>-33,777</td>
</tr>
<tr>
<td>SH-123</td>
<td>-13</td>
<td>-21.05</td>
<td>1,058</td>
<td>-22,271</td>
</tr>
<tr>
<td><strong>Total Volume Change</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>-235,596</strong></td>
</tr>
</tbody>
</table>

The semi-annual comparison (Table 2) shows that the shoreline retreated at all of the Borough’s profile locations though only modestly at SH-82 and SH-90. All continued the volume loss trend that had begun immediately following completion of the emergency nourishment project. The greatest fall/winter volume losses were recorded at SH-103 and the overall volume change was -235,596 CY for the Borough’s ocean beaches and nearshore.
Table 3 shows the changes that took place during the summer months of 2014 (Survey 42 to Survey 43); usually a period of shoreline rebuilding due to the calmer wave climate.

<table>
<thead>
<tr>
<th>Profile Number</th>
<th>Shoreline Change (feet)</th>
<th>Volume Change (yds³/ft)</th>
<th>Cell Distance (feet)</th>
<th>Cell Volume Change (yds³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-82</td>
<td>-25</td>
<td>21.09</td>
<td>1,381</td>
<td>29,125</td>
</tr>
<tr>
<td>SH-90</td>
<td>-10</td>
<td>-10.00</td>
<td>2,240</td>
<td>-22,400</td>
</tr>
<tr>
<td>SH-95</td>
<td>23</td>
<td>-0.42</td>
<td>1,680</td>
<td>-709</td>
</tr>
<tr>
<td>SH-103</td>
<td>14</td>
<td>1.61</td>
<td>2,208</td>
<td>3,544</td>
</tr>
<tr>
<td>SH-108</td>
<td>22</td>
<td>1.55</td>
<td>1,433</td>
<td>2,224</td>
</tr>
<tr>
<td>SH-112</td>
<td>27</td>
<td>-6.02</td>
<td>804</td>
<td>-4,842</td>
</tr>
<tr>
<td>SH-116</td>
<td>5</td>
<td>6.68</td>
<td>2,273</td>
<td>15,193</td>
</tr>
<tr>
<td>SH-123</td>
<td>-16</td>
<td>22.50</td>
<td>1,058</td>
<td>23,805</td>
</tr>
</tbody>
</table>

Total Volume Change = 45,939

The 2014 summer season was one of admirable sand accumulation recovering some of the volume losses that occurred during the 2013-2014 winter season. The semi-annual comparison for the summer months (Table 3) shows seaward shoreline movement at the Borough’s central profile locations (SH-95 to SH-116). Of these, only SH-103, SH-108 and SH-116 showed modest volumetric gains for the summer. The greatest spring/summer onshore (above the zero datum) volume gains were recorded at SH-108 (8.3 yds³/ft) and overall volume change was 45,939 CY for the Borough’s ocean beaches and nearshore.

Individual Site Descriptions

This section describes the changes documented at each of the beach profile locations from May 2013 to October 2014. All of the sites are located within the Federal shore protection project limits and all received sand to return the sites to the 2002-2003 original design template. The spring 2013 post-Hurricane Sandy restoration project commenced in April and worked from south to north to repair storm damages. The project finished its northern section in late July.

SH-82 is located at 82nd Street along 1st Avenue and seaward of the 82nd Street recreation area. The profile line is set approximately midway between the Avalon border and the groin at 84th Street. This site is included in the Borough’s monitoring program to represent typical beach conditions on the Borough’s only stretch of beach.

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without a groin (in the northern section of the community). The profile is located about 800 feet south of the Avalon border and the USACE federal project taper. This site consists of 200 feet of primary dune width seaward of the asphalt promenade that is set on top of the revetment from its landward offset at 83rd Street to 80th Street.

Between May 2013 and August 2013, the project beach berm extended 220 feet seaward of the dune toe. No sand was placed directly on the dune during the project as the post Sandy conditions exceeded the design configuration. The project added 65.05 yds³/ft. of sand to the profile, advanced the shoreline position 106 feet and raised the beach elevation to 7.5 feet NAVD 88. By the October 2013 survey, the first of ten fall/winter storms impacted the Borough’s shoreline and nearly two thirds of the project berm had eroded and the nearshore scoured. The site lost 34.04 yds³/ft. of sand and 140 feet of berm width while the shoreline position retreated 72 feet. Some sand was transferred cross-shore to the seafloor but most was carried outside the survey limits or swept downdrift on longshore currents.

During the fall/winter 2013-2014 (Survey #41 to #42) the dry berm eroded and losses were recorded across the profile (-11.7 yds³/ft) but the summer gains (21 yds³/ft) were able to compensate for the winter storm losses. Comparing the October 25, 2013 survey with the October 13, 2014 survey (#41 to #43), the site showed only minimal gains (0.4 yds³/ft) above the datum and the shoreline moved landward (-26.14 ft). Most of the profile’s volumetric gains were below the datum (11.7 yds³/ft). The nearshore bar migrated landward during the summer 2014.

Site SH-82 – 82nd Street  (Photoplates 1a-1e)

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**Photoplate 1a** - Photo taken May 14, 2013 (pre-fill survey [39]). View to south along the dune toe from 82nd Street. The dune fence was installed to capture aeolian sand but the beach remained relatively narrow prior to the summer 2013 USACE project.

**Photoplate 1b** - Photo taken August 6, 2013 (spring 2013 survey [40]). View to south along the dune toe from 82nd Street. The beach is wider following the June 2013 completion of the USACE emergency restoration efforts. No sand was added to the dune system but sand continued to naturally accumulate along the fence installed at the dune toe.
Photoplate 1c - Photo taken October 25, 2013 (fall 2013 survey [41]). View to south along the dune toe from 82nd Street. Following the summer season an early October onshore wind event generated waves that eroded the beachface but blew sand to the dune fence and buried half the fence with up to 2 feet of sand.

Photoplate 1d – Photo taken May 19, 2014 (spring 2014 survey [42]). View to the south along the dune toe from 82nd Street. The berm elevation was lowered over the winter and much of the sand was moved to the nearshore forming two sandbars.

Photoplate 1e - Photo taken October 13, 2014 (fall 2014 survey [43]). View to the south along the dune toe from 82nd Street. The beach berm built up over the summer months gaining 21 cy/ft. of sand along the entire profile.
Figure 1a – The semi-annual comparison profiles show the position of the dune, berm, and nearshore bar from May 2013 (pre-Hurricane Sandy emergency beach fill) to October 2014. In Survey 39, the profile consisted of a steep dune scarp and low-elevation berm (approx. 5 feet NAVD88). The August 2013 survey shows the USACE 2013 project beach provided about 250 feet of additional beach berm width and raised the elevation of the beach to 7.5 feet NAVD88. The nearshore also gained sand advancing the shoreline position seaward approximately 100 feet. The profile recorded volume losses between August 2013 and May 2014, but gained back over 29,000 CY over the summer 2014 months (Table 3).
Figure 1b – The annual comparison plot shows the changes in the configuration of the profile at 82nd Street after the completion of the 2013 summer USACE emergency fill project. Over the course of the 2013-2014 year, the dune remained generally in the same position, but the berm was lowered and the shoreline moved landward (-26.14 ft). Volume losses across the entire profile (-11.7 cy/ft) were recorded for the winter 2013-2014 season (Table 2). Volume losses occurred over the winter (between Survey 41 and Survey 42) but the summer recovery period allowed the coastal cell to emerge with an overall annual volume gain of 16,682 CY.
SH-90, is located at 90th Street and was originally established in 1986 as a survey site for the New Jersey Beach Profile Network (NJBPN). The profile line is set north of the public beach access path to provide a typical cross-sectional representation of the dune and beach that is bounded by groins at 84th Street and 92nd Street. The dune system consists of two ridges approximately 150 feet wide extending from the street end revetment to the seaward dune toe.

The 2013 emergency beach nourishment project added 61.10 yds$^3$/ft. of sand to the system, advanced the shoreline position seaward 71 feet and raised the beach berm elevation to 7.5 feet NAVD88 for 200 feet seaward of the dune toe. The nearshore slope elevation also increased up to 3 feet as sand moved offshore during the project. No sand was placed directly on the dune during the project as the post Sandy conditions exceeded the design configuration. A 12-foot deep trough nearly 150 feet wide separated the project beach from an offshore sand bar that had deposited during the previous storm events. By October 2013, the offshore trough was filled with sand derived from the beach fill. During the 2013-2014 winter, the entire profile lost sand (-19.81 yds$^3$/ft). Some of the berm sands were transferred offshore to the nearshore bar. Comparing the October 25, 2013 survey with the October 13, 2014 survey shows the entire profile lost sand (-29.7yds$^3$/ft) and the shoreline position moved 11.13 feet landward.

Site SH-90 – 90th Street  (Photoplates 2a-2e)

Photoplate 2a - Photo taken May 14, 2013 (pre-fill survey [39]). View to south along the newly installed row of dune fence from 90th Street. Aeolian sand had begun to accumulate around the base of the fence that partially restored the modest foredune eroded during H. Sandy.

Photoplate 2b - Photo taken August 6, 2013 (spring 2013 survey [40]). View to south along the dune toe from 90th Street. The 2013 USACE beach maintenance project restored the beach width and elevation to the original design template. No sand was added to the dune at this location.
Following the summer season an early October onshore wind event generated waves that eroded about a third of the project beach berm width.

Sand from the berm was moved to the nearshore over the winter months.

The beach and nearshore here lost volume over the summer months (-10.11 cy/ft.).
Figure 2a – The semi-annual comparison profiles show the position of the dune, berm, and nearshore bar from May 2013 (pre-Hurricane Sandy emergency beach fill) to October 2014. In Survey 39, the profile consisted of a steep dune scarp and low-elevation berm (approx. 5 feet NAVD88). The August 2013 [40] survey shows the USACE 2013 project profile showing a gain of 61 cy/ft. of sand. Over the winter, the profile recorded volume losses above the datum, but sand filled the deep trough that was present in the August 2013 survey and was captured in the nearshore bar (August 2013 to May 2014). The site continued a volume loss trend over the summer (-10 cy/ft.) and the shoreline moved landward (-10 ft.) (Table 3).
Figure 2b – The annual comparison plot shows the changes in the configuration of the profile at 90th Street after the completion of the 2013 summer USACE emergency fill project. Over the course of the 2013-2014 year, the foredune gained elevation due in part to the placement of sand fencing at the base of the dunes. The berm lowered and the shoreline moved landward (-11 ft.). Volume losses across the entire profile (-29.75 cy/ft) were recorded for the winter 2013-2014 season (Table 2). Volume losses continued over the summer (-10 cy/ft).
SH-95, is located at 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. Hurricane Sandy caused significant erosion at 95th Street lowering the beach elevation up to 4 feet destroying the foredune and causing the shoreline position to retreat 75 feet.

In spring 2013 the USACE maintenance project commenced and worked south to north and reached this location by summer. By the August post construction survey the project restored this beach to its original design template. The project added 79.14 yds$^3$/ft. of sand to the system, advanced the shoreline position seaward 135 feet and raised the beach berm elevation to 7.5 feet NAVD88 220 feet seaward of the dune toe. The fill project also raised the nearshore slope elevation up to 3 feet as the beach pushed seaward and sand moved offshore during the project. No sand was placed directly on the dune during the project as the post Sandy conditions exceeded the design configuration. A 13-foot deep trough nearly 150 feet wide separated the project beach from an offshore sand bar deposited during the earlier storm events.

During the 2013-2014 winter, volume losses were recorded across the profile (-22 yds$^3$/ft.) as berm sand filled the nearshore trough and further offshore. The dry beach and dunes gained sand during the summer months and the shoreline moved seaward (22.5 ft).

Comparing the October 25, 2013 survey with the October 13, 2014 survey, the dry beach volume decreased a modest amount (-1.0 yds$^3$/ft.) of sand while the portion below the datum lost the majority of sand (-22.64 yds$^3$/ft.) offshore or was moved south to South Pointe.

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

Photoplate 3a - Photo taken May 14, 2013 (pre-fill survey [39]). View to south along the dune toe from 95th Street. The 2013 winter resulted in a narrow but higher beach as sand moved onshore. Wind-blown sand accumulated on the seaward dune slope as a thin veneer that reduced the steep scarp and restored a gentler slope.

Photoplate 3b - Photo taken August 6, 2013 (spring 2013 survey [40]). View to south along the dune toe from 95th Street. The 2013 USACE beach maintenance project restored the beach width and elevation to the original design template. A row of dune fence was installed but no sand was added directly to the dune during the project.
Photoplate 3c - Photo taken October 25, 2013 (fall 2013 survey [41]). View to south along the dune toe from 95th Street. An early October onshore wind event generated waves that eroded about half of the project beach berm width (Figure 3a). Wind-blown sand had started to accumulate around the recently installed fence.

Photoplate 3d - Photo taken May 19, 2014 (spring 2014 survey [42]). View to south at top of dune from 95th Street. This location lost sand (~22 cy/ft) over the whole profile during the 2013-2014 winter.

Photoplate 3e - Photo taken October 13, 2014 (fall 2014 survey [43]). The view to the south along the dune toe from 95th Street shows a wide early fall dry beach. The profile gained 5 cy/ft of sand during the summer.
Figure 3a – The semi-annual comparison profiles show the position of the dune, berm, and nearshore bar from May 2013 (pre-Hurricane Sandy emergency beach fill) to October 2014. In Survey 39, the profile consisted of a steep dune scarp and low-elevation berm. The August 2013 [40] survey shows the USACE 2013 project profile showing a gain of 79.14 cy/ft. of sand across the profile, but a deep trench separating the nearshore bar and the shoreline. Over the 2013-2014 winter, the profile recorded volume losses across the profile (-22 cy/ft.). Though the overall profile recorded modest volume loss during summer 2014, the beach gained volume (5 cy/ft.) and the shoreline moved seaward (22.51 ft.) (Table 3).
Figure 3b – The annual comparison plot shows the changes in the configuration of the profile at 95th Street two months after the completion of the USACE 2013 project. Over the course of the year, the dune remained its general location and elevation, but the restored berm was lowered and volume losses were recorded across the profile (-22 cy/ft.) and the shoreline moved landward (-38 ft.).
SH-103, is located at 103rd Street and was established for the Borough’s beach monitoring program at the seaward end of 103rd Street along the north sidewalk. When the site was originally established in 1996, the profile crossed the bulkhead and dropped to the rock revetment at the toe of the bulkhead. An extremely narrow beach just seaward of the rocks provided limited recreational area for beach patrons. Storm waves and surge would overtop the revetment and cause local flooding. This beach continued to erode until by 1998 no dry beach existed seaward of the rock revetment. Sand was placed here during the 1998 municipal beach fill re-establishing a dry beach berm and dune ridge. In 2003 the initial Federal project enhanced the width of both the dune and beach. Several subsequent projects have been required to provide periodic beach maintenance that included the 2009 state/municipal project, the spring/summer 2011 federal project, and the summer 2013 H. Sandy emergency beach fill.

The 2013 USACE emergency nourishment project reached this location by summer. The August post construction survey showed the project had restored this beach to its original design template. The project placed 65.84 yds³/ft. of sand to the system, advanced the shoreline position seaward 95 feet and raised the beach berm elevation to 7.5 feet NAVD88 that extended seaward 140 feet seaward of the dune toe. Sand was placed directly on the seaward dune slope during the project to restore the pre-Sandy dune configuration. A 12-foot deep trough nearly 150 feet wide separated the project beach from an offshore sand bar. By the time of the October 2013 survey, much of the project berm eroded and the nearshore was scoured. Despite the 2013 USACE project the beach and nearshore by October 25, 2013 was narrower and lower than the 2012 pre-Sandy configuration. Winter 2013-2014 produced more volume losses, predominantly below the datum (-22.04 yds³/ft.) and the shoreline moved landward (33.71 ft). Modest volume gains occurred above the datum (4.93 yds³/ft.) during the summer months, much from the sand that accumulated behind the fencing that was installed following the beach nourishment project.

Comparing the October 25, 2013 and October 14, 2014 surveys, volume losses (-25.3 yds³/ft.) were recorded below the datum as the beach fill sands either were moved further offshore or downdrift toward South Pointe. Figure 4b shows the lowering of the nearshore profile elevation.

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

Photoplate 4a - Photo taken May 14, 2013 (pre-fill survey [39]). View to the south along the dune toe from 103rd Street. The beach remained narrow from the previous fall survey but the elevation increased as sand started to move onshore. Wind-blown sand accumulated on the seaward dune slope that reduced the steep scarp and restored a gentler uniform slope.

Photoplate 4b - Photo taken August 6, 2013 (spring 2013 survey [40]). View to the south along the dune toe from 103rd Street. The 2013 USACE beach maintenance project restored the beach width and elevation to the original design template. Sand was placed on the seaward dune slope and a row of dune fence was installed to trap windblown sand.
Following the summer season an early October onshore wind event generated waves that eroded about half of the project beach berm width. Wind-blown sand had started to accumulate around the recently installed fence.

View to the south along the newly planted dune toe from 103rd Street. The profile lost volume (-24.2 cy/ft) over the 2013-2014 winter.

The foredune gained in elevation and volume from wind-blown sand that was trapped by the sand fence.
**Borough of Stone Harbor - Semi-Annual Comparison**

**SH - 103  103rd Street**

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<td>103</td>
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Figure 4a – The semi-annual comparison profiles show the position of the dune, berm, and nearshore bar from May 2013 (pre-Hurricane Sandy emergency beach fill) to October 2014. In Survey 39, the profile consisted of a steep dune scarp and low-elevation berm. The August 2013 [40] survey shows the USACE 2013 project beach provided about 180 feet of additional beach berm width and raised the elevation of the beach to 7.5 feet NAVD88. Sand was also added to the seaward dune slope to restore to the original project design configuration. Between August 2013 and May 2014, the entire profile recorded a volume loss of -23.4 cy/ft. and the shoreline moved landward (-35.35 ft.).
Figure 4b – The annual comparison plot shows the changes in the configuration of the profile at 103rd Street. The sand transfer beyond the profile limits demonstrates the impact of cross-shore transport at this location. Even though during the summer the profile gained volume, the net volume change for the year was -22.6 cy/ft. and the shoreline moved landward (-19.48 ft.) (Table 1).
SH-108, is located at the end of 108th Street and was placed near the middle of this groin cell. The history here is similar to site SH-103. When the site was originally established in 1996, the profile crossed the bulkhead and dropped to the rock revetment at the toe of the bulkhead. An extremely narrow beach just seaward of the rocks provided limited recreational area for beach patrons. Exposure of the rocks accelerated the beach erosion as waves refracted off the hard structure and scoured the sandy beach. Larger storm waves and surge would overtop the revetment and cause local flooding. Sand was also placed here during the 1998 municipal beach fill re-establishing a dry beach berm and dune ridge. In 2003 the initial Federal project enhanced the width of both the dune and beach. Several severe storms have impacted the Stone Harbor beaches since 2009 including Hurricanes Irene in 2011 and Sandy in 2012. Storm erosion has required subsequent periodic beach maintenance that included the 2009 State/municipal project, the 2011 Federal project and the 2013 USACE emergency project.

The 2013 USACE maintenance project was finished in this region by June 12, 2013. The June post construction survey showed the project had restored this beach to its original design template. The project placed 69.33 yds$^3$/ft. of sand into the system, advanced the shoreline position seaward 93 feet and raised the beach berm elevation to 7.5 feet NAVD88 that extended 180 feet seaward of the dune toe. The fill project also raised the nearshore slope elevation up to 3 feet as the beach pushed seaward and sand moved offshore during the project. Sand was placed directly on the seaward dune slope during the project to restore the pre-Sandy dune configuration. A 13-foot deep trough over 150 feet wide separated the project beach from an offshore sand bar deposited during the earlier storm events. By October 28, 2013 nearly two-thirds of the project berm eroded (125 feet) and the nearshore scoured. Sand was transferred cross-shore to the offshore seafloor partially offsetting some of the onshore losses. The net result was a loss of 11.79 yds$^3$/ft. of sand with a shoreline position retreat of 59 feet as the beachface slope and nearshore were scoured by the fall wave climate.

Comparing the October 28, 2013 and the October 14, 2014 surveys show that there was sand volume losses below the datum (-10.17 yds$^3$/ft.) while the shoreline position moved 16.23 feet seaward. Despite the 2013 USACE project the beach and nearshore by October 28, 2013 was narrower and lower than the 2012 pre-Sandy configuration and the trend continued throughout the year. Only modest volume gains occurred during the spring-summer of 2014.

**Site SH-108 – 108th Street**

**Photoplate 5a - Photo taken May 13, 2013 (pre-fill survey [39]).** View to north along the dune toe from 108th Street. The beach was narrowed during the 2012-2013 winter but the elevation increased as sand moved onshore. Wind-blown sand accumulated on the seaward dune slope.

**Photoplate 5b - Photo taken June 12, 2013 (spring 2013 survey [40]).** View to north from 108th Street. The 2013 USACE beach maintenance project restored the beach width and elevation to the original design template. Sand was added directly to the dune during the project to restore the seaward dune slope but no fence had yet been installed.
Photoplate 5c - Photo taken October 28, 2013 (fall 2013 survey [41]). View to the north along the dune toe from 108th Street. The early October 10, 2013 onshore wind event generated waves that eroded about two thirds of the 2013 USACE project beach berm width. Wind-blown sand had started to accumulate around the recently installed fence.

Photoplate 5d - Photo taken May 20, 2014 (spring 2014 survey [42]). View to north from 108th Street. Over the winter, the profile lost volume (-11.5 cy/ft) and the shoreline moved landward (-5.8 ft.).

Photoplate 5e - Photo taken October 14, 2014 (fall 2014 survey [43]). View to the north from 108th Street. Sand accumulated on the berm (above the datum) over the summer months and the shoreline moved seaward (1.5 ft.).
Figure 5a – The semi-annual comparison profiles show the position of the dune, berm, and nearshore bar from May 2013 (pre-Hurricane Sandy emergency beach fill) to October 2014. In Survey 39, the profile consisted of a steep dune scarp and low-elevation berm. The August 2013 [40] survey shows the USACE 2013 project beach provided about 200 feet of additional beach berm width and raised the elevation of the beach to 7.5 feet NAVD88. Sand was also added to the seaward dune slope to restore to the original project design configuration. Between August 2013 and May 2014 the trough between the beach and nearshore bar filled with sand displaying a volume gain (9.9 cy/ft) below the 0.0 datum. The sand was probably relocated from the berm but some may have been moved from offshore.
Figure 5b – The annual comparison plot shows the changes in the configuration of the profile at 108th Street. The sand transfer beyond the profile limits demonstrates the impact of cross-shore transport at this location. The net volume change for the year was -10.2 cy/ft. and a moderate seaward movement of the shoreline (16 ft.) (Table 1). Volume losses occurred over the 2013-2014 winter and the summer gains (1.55 cy/ft.) could not balance the losses.
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. Hurricane Sandy’s storm surge and waves tore into the beach and dune system and completely removed the well-developed foredune ridge. Despite a complete loss of the foredune at 112th Street the well-developed primary dune system maintained significant volume, width and height to protect oceanfront property

The 2013 USACE emergency project was finished in this region prior to the June 12, 2013 survey. This project placed 54.95 yds³/ft. of sand into the system, advanced the shoreline position seaward 69 feet and raised the beach berm elevation to 7.5 feet NAVD88 that extended 200 feet seaward of the dune toe. The fill project raised the nearshore slope elevation up to 3 feet as the beach pushed seaward and sand moved offshore during the project. Sand was placed directly on the seaward dune slope during the project to restore the pre-Sandy dune configuration. A 13-foot deep trough over 150 feet wide separated the project beach from an offshore sand bar deposited during the earlier storm events. By October 28, 2013 nearly half of the project berm had eroded (100 feet) and the nearshore was scoured. Sand was transferred to the offshore seafloor and partially offset some of the onshore losses. Volume losses were recorded over the 2013-2014 winter months (-15.07 yds³/ft.), though the beach above datum gained a modest 2.06 yds³/ft. over the 2014 spring-summer.

Comparing the October 28, 2013 survey and the October 14, 2014 survey shows that the whole profile lost sand (-20.69 yds³/ft.) while the shoreline position remained relatively in the same position (moved seaward 0.91 ft). Much of the sand appears to have moved offshore or downdrift toward South Pointe.

Site SH-112 – 112th Street (Photoplates 6a-6e)

Photoplate 6a - Photo taken May 13, 2013 (pre-fill survey [39]). View to south along the dune toe from 112th Street. The beach was narrow but the elevation increased over the winter as sand moved onshore and wind-blown sand accumulated on the seaward dune slope.

Photoplate 6b - Photo taken June 12, 2013 (spring 2013-and post-fill survey [40]). View to the south along the dune toe from 112th Street. The 2013 USACE beach maintenance project restored the beach width and elevation to the original design template (note position of beach along groin in distance). Sand was added directly to the seaward dune slope during the project to restore the original design configuration.
Photoplate 6c - Photo taken October 28, 2013 (fall 2013 survey [41]). View to south along the dune toe from 112th Street. The early October 10, 2013 onshore wind event generated waves that eroded about half of the 2013 USACE project beach berm width. Wind-blown sand had started to accumulate around the recently installed fence.

Photoplate 6d - Photo taken May 20, 2014 (spring 2014 survey [42]). View to south along the dune toe from 112th Street. The berm elevation was lowered from the previous fall survey. Fencing helped capture sand to add to the dune volume.

Photoplate 6e - Photo taken October 14, 2014 (fall 2014 survey [43]). View to south along the dune toe from 112th Street. There was some volume gain above the datum over the summer months (2.0 cy/ft) but volume losses offshore.
Figure 6a – The May 2013 profile shows the impacts of Hurricane Sandy and the 2012-2013 winter. This site was renourished by the USACE in June 2013 providing about 180 feet of additional beach berm width and raising the elevation of the beach by up to 5 feet to about elevation 7.5 feet NAVD88. Much of the berm sand was transferred cross-shore to the nearshore bar by the fall 2014 survey. The May 2014 profile is similar to the May 2013 shape, though the dune gained volume from the federal project.
Figure 6b – The annual comparison plot shows that the dune remained in the same position (restored to its approximate Hurricane Sandy position) in the summer before the October 2013 survey. One year later, the profiles show that the berm lowered though the position of the shoreline remained relatively the same. Volume losses occurred across the profile (-20.7 cy/ft.). Only the area above the datum recorded gains during the summer recovery period (2.0 cy/ft.).
**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.

Hurricane Sandy cut significantly into the beach width and elevation but the beach was sufficiently wider prior to Sandy to absorb and dissipate most of the wave energy and prevent any loss in the dune width. This was the only site to show no evidence of dune losses during Hurricane Sandy. During the storm the shoreline position retreated landward 77 feet with 20.22yds$^3$/ft. of sand eroded from onshore while the beach elevation was lowered up to 4 feet along the old berm ridge. The 2013 USACE emergency project was finished in this region prior to the June 12, 2013 survey. The project placed 17.57 yds$^3$/ft. of sand into the system, advanced the shoreline position seaward 13 feet and raised the beach berm elevation to 7.5 feet NAVD88 that extended just 60 feet seaward of the dune toe. The limited fill placed here had little impact on the nearshore seafloor as the project raised the beach elevation but did not extend the overall width. No sand was placed directly on the seaward dune slope during the project as the post-Sandy dune configuration exceeded the design template. An 11-foot deep trough over 200 feet wide separated the project beach from an offshore sand bar deposited during the earlier storm events.

During the 2013-2014 winter, volume losses across the profile were recorded (~14.86 yds$^3$/ft) though there were modest volume gains across the profile (6.68 yds$^3$/ft) during the summer months. Comparing the October 28, 2013 survey and the October 14, 2014 survey shows beach volume losses of -9.53 yds$^3$/ft and the shoreline position retreated 33.3 feet landward.

**Site SH-116 – 116th Street** (Photoplate 7a-7e)

*Photoplate 7a - Photo taken May 13, 2013 (pre-fill survey [39]). View to north along the dune toe from 116th Street. The beach remained narrow from the impacts of H. Sandy and the 2012-2013 winter, but the elevation increased as sand moved onshore. Wind-blown sand accumulated on the seaward dune slope and plants began to colonize the new slope.*

*Photoplate 7b - Photo taken June 12, 2013 (spring 2013 survey [40]). View to north along the dune toe from 116th Street. The 2013 USACE beach maintenance project added a modest volume of sand here and restored the beach width and elevation to the original design template (note project pipe still on beach). Dune fence had not yet been installed.*
Photoplate 7c - Photo taken October 28, 2013 (fall 2013 survey [41]). View to north along the dune toe from 116th Street. This beach has remained relatively stable following the 2013 USACI project. Wind-blown sand slowly accumulated around the recently installed fence.

Photoplate 7d – Photo taken May 20, 2014 (spring 2014 survey [42]). View to the north along the dune toe from 116th Street. The entire profile recorded volume losses over the 2013-2014 winter (-14.8 cy/ft).

Photoplate 7e – Photo October 14, 2014 (fall 2014 survey [43]). View to the north along the dune toe from 116th Street. Over the summer, the whole profile gained volume (6.7 cy/ft).
Figure 7a – The semi-annual comparison profiles show the position of the dune, berm, and nearshore bar from May 2013 (pre-Hurricane Sandy emergency beach fill) to October 2014. The post-construction survey [40] shows the influence of the USACE 2013 project from the pre-project survey [39]. The project provided about 50 feet of additional beach berm width at elevation 7.5 feet NAVD88 and raised the elevation of the beach by up to 2.5 feet. No sand was directly added to the seaward dune slope at this site but sand trapped by fencing added to the volume gains above the datum (11.75 cy/ft.) between May 2013 and October 2014.
Figure 7b – The annual comparison plot shows the changes in the configuration of the profile at 116th Street. Over the course of the 2013-2014 year, the dune remained in the same position, though sand trapped by sand fencing added to the seaward dune slope. The October 2014 survey [43] shows the movement of the nearshore bar and the welding of a former sand bar onto the beach. Despite these gains the profile recorded a volume loss (-9.5 cy/ft.) (Table 1). It is suspected that most of the sand was either transported offshore beyond the limits of the profiles or moved south toward South Pointe.
SH-123 is located at 123rd Street south of the developed part of town and just north of the terminal groin originally constructed by the Philadelphia District of the U.S. Army Corps of Engineers (USACE). In 1994, the site was added to the NJBPN as part of an expansion of the State’s monitoring project and as a replacement cross section for former site #112 that was erased from South Pointe by weather events in 1990 where the entire natural zone south of the terminal groin was eroded to a shoal below low tide. Because of this prior history of data collection and its proximity to Hereford Inlet, this site was included in the Borough’s beach monitoring project. 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 region 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 Pointe. The result has been a larger dune system that now completely buries the revetment once exposed along this beach and the formation of an expansive point that stretches over a mile from the terminal groin into Hereford Inlet. However, like the other Borough project beaches this location suffered significant erosion of the dry beach berm and dune during Hurricanes Irene and Sandy and several northeasters.

The 2013 USACE emergency project was finished in late May as the project progressed from south to north. The project placed 25.38 yds$^3$/ft. of sand into the system, advanced the shoreline position seaward 148 feet and raised the upper beach elevation to 7.5 feet NAVD88 that extended 200 feet seaward of the dune toe. Sand was placed directly on the seaward dune slope during the project to restore the dune configuration to the design template. A pre-project survey [39] was not conducted at this site because the profile line was located within the emergency fill staging area.

Through the summer and early fall the project beach berm and dune eroded extremely rapidly. A shallow platform 1-2 feet above the datum remained near the project shoreline position and later gained elevation (Figure 8a) as sand moved onshore during the 2013-2014 winter and volume gains were recorded across the profile during the summer (22.5 yds$^3$/ft.). Comparing the October 28, 2013 survey and the October 14, 2014 survey shows modest volume gains across the profile (1.85 yds$^3$/ft.) while the shoreline position retreated 28.3 feet landward.

Site SH-123 – 123rd Street (Photoplate 8a-8e)
Photoplate 8c - Photo taken October 28, 2013 (fall 2013 survey [41]). View to north along the dry beach from 123rd Street. This beach eroded quickly following the 2013 USACE project. The shallow platform visible in the photo above delineates the project beach extents. Nearly 150 feet of the project beach berm was lost from the previous survey. Wind-blown sand has slowly accumulated around the recently installed fence.

Photoplate 8d – Photo taken May 20, 2014 (spring 2014 survey [42]). View to the north along the dune toe from 123rd Street. Volume gains above the datum (1.8 cy/ft) were attributed to the sand fencing and planted vegetation that captured windblown sand.

Photoplate 8e – Photo taken October 14, 2014 (fall 2014 survey [43]). View to the north along the dune toe from 123rd Street. A summer volume gain was recorded across the profile (22.5 cy/ft.) though most was below the datum.
Figure 8a – The semi-annual comparison profiles show the position of the dune, berm, and nearshore bar. In the June 2013 (post-project) survey, the berm elevation was at 7.5 feet NAVD88. By the fall 2013 survey the entire profile lost volume (-36.3 cy/ft.). Much of the sand was transferred either offshore or downdrift toward South Pointe or captured in the ebb tidal delta of Hereford Inlet. The offshore losses dominated this profile line through the winter (2013-2014) (-22.9 cy/ft.) but the profile regained that volume (22.5 cy/ft.) over the 2014 summer (Table 3).
Figure 8b – The annual comparison plot shows a gain in elevation of the seaward dune. Despite the 2013 USACE project the shoreline retreated (-28.37 ft.). The nearshore was scoured during the early fall and sand was transferred offshore. A volume gain occurred above the datum that kept in balance what was lost offshore or downdrift of the profile line (overall gain of 1.8 cy/ft.) (Table 1).
Summary

This monitoring report documents the changes to the Stone Harbor municipal beaches from May 2013 to October 2014. Storms such as Hurricane Irene (August 2011), the October 2011 northeaster, and Hurricane Sandy (October 2012) combined to remove 121% of the sand placed on the Borough’s beaches from the 2011 USACE project; nearly 702,000 cubic yards of sand from the beaches and dunes. Hurricane Sandy accounted for the removal of 380,859 cubic yards of sand from just the dune and beach not including nearshore losses. Much of the eroded sand has moved south to Hereford Inlet extending the South Pointe beaches into the inlet over 500 feet just this past year and additional sand was carried offshore beyond the profile extent using current methods. Sand was also transferred further offshore to deeper water to form massive shore parallel bars. Hurricane Sandy scoured a deep, wide trough in the seafloor that separated the offshore deposit from the beach and hampered natural landward cross-shore transport. Most of the eroded sand was transferred south towards South Pointe or offshore to deeper water limiting natural recovery of the municipal beaches.

The emergency re-nourishment effort by the USACE for Stone Harbor was initially authorized following Irene then expanded to include damages suffered during Hurricane Sandy. Work to restore the project to its original template design commenced within six months of Sandy. During late spring and summer 2013, Norfolk Dredging Company contracted by the USACE completed work on the municipal beaches. Surveys conducted by the CRC before and after the project show a placement volume of 715,346 CY of sand (211,850 CY of sand above the pre-Sandy conditions). Beach berm elevations were raised to 7.5 feet NAVD88 and extended seaward from the dune toe by up to 220 feet. Public Law 113-2 (June 2013) allowed the USACE to fully fund the re-nourishment with federal dollars saving the state and local governments from covering the project cost. The emergency funding also financed planting dune grass, installing sand fencing, and beach crossover work in the project area.

At the time of the August 2013 survey, all of the municipal beaches displayed a deep trough (> -10 ft. NAVD88) approximately 400 feet from the shoreline, though it was not as pronounced in the southern survey locations (SH-116 and SH-123). Following completion of the USACE project in summer 2013 the beach berm began to erode and by October 28, 2013 at most of the sites (with the exception of 116th Street) the shoreline position retreated. Shoreline changes were highly variable and ranged from a moderate advance of 46 feet at 116th Street to 72 feet of retreat at 82nd Street. During the 2013-2014 winter season, all of the municipal beaches experienced significant erosion (-11.5 yds$^3$/ft to -24.2 yds$^3$/ft.) with volume losses exceeding 235,500 CY and all of the shorelines retreated landward (Table 2). The greatest losses occurred at SH-95 to SH-103. This was during a time of rather quiet wind and wave conditions. Much of these losses were likely due to the accelerated transport of sand alongshore to the beach/nearshore at South Pointe and into the Hereford Inlet ebb tidal delta, though filling the deep nearshore trough may have had some influence on the cross-shore transfer of sand from the beaches to offshore. Mild spring and summer conditions allowed sand to accumulate on the municipal beaches except at SH-90, SH-95, and SH-112 (Table 3).

The net result for 2013-2014 along the Borough’s shoreline was an annual sand volume loss of -188,886 CY (Table 1). Only SH-82 and SH-123 accumulated sand during that time period though the shoreline retreated at both sites. Net volume losses mainly occurred below the 0.0 ft datum elevation (-178,230 CY) and it is suspected that the sand was transferred to fill the trough or downdrift to the South Pointe beaches and Hereford Inlet. Some sand may have been carried further offshore, though there were no large wave events to have moved that great amount of sand. It is unlikely that this sand will return to the municipal beaches.

Conclusions & Recommendations

Although the area of South Pointe is a valued natural area and shore bird habitat, the region represents a vast source of potential sand to harvest in a sustainable manner to mitigate the annual losses within the developed section of Stone Harbor. As more sand is placed into the system on the northern beaches, erosion and littoral currents combine to transport the sand shed from these beaches south toward the South Pointe spit resulting in
its continued growth. The municipality should consider a sand backpassing program to harvest excess sand from the South Pointe beaches and transport it back to the erosional shoreline between 93rd Street and 110th Street in an effort to recycle sand and extend the duration required between the federal maintenance re-nourishment cycles. A sand backpassing project was recently completed at South Pointe to enhance bird nesting habitat in the area and could be a viable sand source for the future without threatening nesting areas if the program is properly managed and executed prior to March 1st of any given year.

The continued erosion of the federal project experienced in this past year demonstrates the need to provide regular maintenance between major beach nourishment projects to maintain a higher level of storm preparedness. The recommendation from previous years to recycle the sand from South Pointe remains valid and is the best alternative to continued reliance on large scale nourishment projects triggered only after the beaches degrade to a critical level to warrant federal (USACE) maintenance projects. Reliance on this traditional method of periodic nourishment places the community at potential additional risk to storm damages as the dune and beach system degrades between nourishment cycles. A sand backpassing program would make the community more resilient through regular maintenance of the beach that would diminish the rate of degradation to the design template and ensure that the beach/ dune system is sufficient to provide protection during the next storm. The burden is on the coastal community to remain diligent and be prepared by maintaining their shoreline and increasing their storm protection by learning the lessons that the past storms provided.

The CRC conducts annual surveys of Hereford Inlet and the surrounding shoreline as part of an ongoing monitoring program for the State of NJDEP BCE (Bureau of Coastal Engineering). These surveys have revealed that the South Pointe spit continues to grow in width, elevation and length as additional sand shed from project beaches in the north moves south carried by the dominant direction of littoral currents. The point has continued to grow at a rate of about 500 feet a year accumulating in an advance of 7,200 feet since 2006, and is now well over a mile long stretching from the terminal groin south of 123rd Street to the tip of the point. Considering the rate of spit growth and the need for Congressional authorization for funding to allow a continued commitment by the USACE to replenish the Stone Harbor beaches this depositional shoreline should be considered as a source of sand to harvest annually (as a maximum frequency in doing it). By harvesting sand outside the shorebird nesting season their use of this sensitive habitat is protected.

Reducing the frequency of expensive hydraulic beach nourishment projects will save all three partners (municipality, state and federal government) money in project costs. Similar backpassing programs have been completed twice each in the neighboring communities of Avalon and North Wildwood to help establish a more cost effective approach to managing regional sediment budgets and beach management issues. The initial North Wildwood project was subject to FEMA reimbursement under the disaster declaration for Hurricane Irene. The two Avalon projects (2006 & 2012) were municipally funded as was the current North Wildwood work using sand from clearing the storm water outfall lines in the beach in the City of Wildwood. The USACE is investigating a similar project in the Wildwoods to regionally manage the island’s sediment budget through a sand backpassing program with potential benefits for all three island communities’ beach management concerns.

Recommendations as result of recent events have not changed significantly from previous reports.

- No further addition needs to be made to the existing dunes in the form of direct construction of wider or higher dunes. The sand fencing that was installed after the emergency beach nourishment project slowed wind transport and added to dune growth in the municipality.
- The zigzag pattern of the installed fence forced deposition of the wind-transported sand seaward and lower in elevation on the upper seaward toe slope of the dunes. This pattern prevents excessive elevation to the primary dune. Fence installation should follow recommendations summarized in past CRC reports as obtained from the USDA circular defining the installation of fence and planting of American beach grass. CRC could provide additional copies if needed.
New regular interval maintenance efforts including sand harvesting and transfer from South Pointe to the project area should be considered to maintain the beach near its full design template through recycling longshore erosional losses to reduce the frequency of large scale beach nourishment projects and increase the resiliency of Stone Harbor’s dune and beaches in future storm events.

- Issues would be: Determining the regions on South Point least likely to impact the habitat.
- Depths of excavation into the beachface allowed.
- Sand volume extracted from each excavation zone on the beach.
- Extent along the beachface for each excavation zone.
- Timing of the work to allow natural shoreline adjustment to erase the impacts before March 1st.
- Designing a project palatable to both the NJ Endangered Species Program and the US Fish & Wildlife Service.

It is recommended to deposit all maintenance sand on the northern portion of groin cells because sand tends to move south between the cells fairly quickly.

References


National Atmospheric and Oceanic Administration, National Climatic Data Center, Storm Events Database, results for Cape May County, New Jersey, accessed 2015, https://www.ncdc.noaa.gov/stormevents/listevents.jsp?eventType=%28Z%29+Strong+Wind&beginDate_mm=10&beginDate_dd=01&beginDate_yyyy=2013&endDate_mm=06&endDate_dd=30&endDate_yyyy=2014&co unty=CAPE%2BMAY%3A9&hailfilter=0.00&tornfilter=0&windfilter=000&sort=DT&submitbutton=Search& statefips=34%2CNEW+JERSEY.