



2021 Beach Monitoring Survey

TOWN OF SULLIVAN'S ISLAND, SC

Elko Coastal Consulting, Inc. | July 2021



Technical Report

2021 Beach Monitoring Survey:
Town of Sullivan's Island, SC

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Cover Photo: June 2021 Ground photo near Station 24, looking southwest

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1. Executive Summary

Annual beach monitoring began on Sullivan's Island in 2016 to better understand the beach performance on the island. In addition to data collected in this study effort, beach profile data collected by the state in 2014 and 2015 were also used. Over the last eight years (since 2014), the beach has been relatively stable with some erosion along the northeast end of the island and accretion along the central and southwest end.

The healthy sand supply along Isle of Palms and net longshore transport into the Charleston Entrance Bight have produced frequent, large-scale, shoal bypassing across Breach Inlet. These sand bar attachment events, which are common on Sullivan's Island, were documented by this monitoring in 2014 and 2019. In general, the updrift spit at Breach Inlet overextends the channel entrance and periodically breaches, triggering a shoal-bypassing event¹.

Sediment from the 2019 attachment has supplied sand to the center of the and in 2021 the sand was transported in both directions alongshore. Erosion between Sta. 28 1/2 and Sta. 30 was alleviated this year thanks to this sediment. Continued monitoring of the beach, and in particular, the erosional conditions on the east end is important.

On average, the shoreline advanced 31.1 ft between 2020 and 2021 (seaward movement) along the island. Similar to the last monitoring period, the average volume change was only -1.6 cy/ft, indicating that the island was stable during the last year.

2. Introduction

The purpose of this work is to provide an annual condition survey to monitor the Sullivan's Island beach. The intention is to survey the beach annually at the beginning of hurricane season in order to monitor changes to the beach from normal and/or storm conditions. Annual monitoring not only provides baseline conditions for each storm season, but also a comparison of past year's monitoring data that yields change rates important for understanding beach performance over time.

The beach on Sullivan's Island has generally been accretional due to its location on the updrift side of the Charleston Harbor jetties (Figure 1). As a result, little data had been collected to quantify and understand the physical coastal processes as is common on barrier islands with erosion problems. The Town's Local Comprehensive Beach Management Plan² provides an overview of the studies to date.

¹ Timothy W. Kana, Steven B. Traynum, Dan Gaudio, Haiqing L. Kaczowski, and Trey Hair, 2013. *The Physical Condition of South Carolina Beaches 1980–2010*, *Journal of Coastal Research*, sp iss 69.

² ATM, 1992. *Local Comprehensive Beach Management Plan, Town of Sullivan's Island, May 1992*, 233 p.

This effort continues an annual data collection and analysis plan for the Town of Sullivan's Island that started in 2016. In early 2018, a beach nourishment project placed about 1.7 million cubic yards of sand on the neighboring Isle of Palms. This influx of sediment to the barrier island system updrift of Charleston Harbor will likely have an impact on Sullivan's Island but thus far, it is unclear what the effect will be.

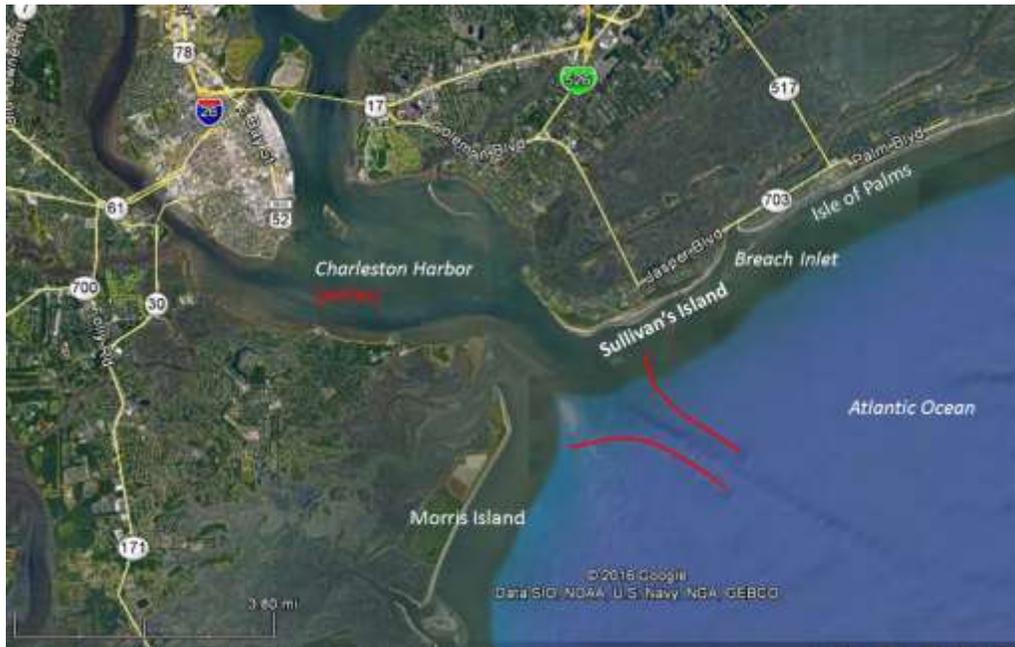


Figure 1. Location map of Sullivan's Island (image modified from Google Earth).

3. Survey Methodology

Topographic and hydrographic data collection (beach profile surveys) occurred on June 17 and 18, 2021. A total of 11 profile surveys were measured at existing Coastal Council/OCRM Monuments (Figure 2). On Sullivan's Island, the OCRM Monument spacing ranges from approximately 500 to 2,000 ft.

The monuments are survey benchmarks, which are permanent metal disks in the ground with information stamped on the face that mark a specific point that can be consistently reoccupied. On Sullivan's Island, these survey benchmarks begin with Monument 3010 at the southwest end of the island adjacent to the Entrance to Charleston Harbor and end at Monument 3095 at Breach Inlet. The lines illustrated in Figure 2 extending offshore from the monuments are the profile lines along which surveyors collect elevation measurements. These measured beach profiles describe a cross-section of the topography and bathymetry of the sand surface along the dry beach and nearshore/sand bar regions (e.g., Figure 7). By surveying the same line routinely, scientists can measure the change in sand volume or shoreline position, for example.



Figure 2. 2015 aerial photo illustrating the eleven (11) beach profile lines and corresponding SCDHEC-OCRM Monuments on Sullivan's Island. The solid black line running parallel to the shoreline through the dunes is the OCRM Baseline.

Surveys out to the “depth of closure” were collected in order to appropriately calculate volume changes along the beach. The depth of closure represents the offshore location where measurable sediment transport ceases. Here, closure depth is roughly -12 ft NAVD88.

Each profile extended from the OCRM Monument to either -14 NAVD88 or 1,400 feet from the toe of the dune, whichever was more landward. In some cases, this meant extending the profile lines up to 4,000 ft offshore to capture the nearshore sand bar feature and reach the depth of closure (e.g., Figure 3 and Figure 4).

The upland portion of the profiles was conducted by RTK GPS standard land surveying techniques and extended seaward to a wading depth deep enough to overlap with the offshore portion of the profile survey. Profile data points were collected at a maximum interval of 25 feet and at all significant elevation changes such as dunes, berms, scarp lines, seawalls, or sand bars.

The offshore portion of the survey was conducted by hydrographic techniques using a vessel mounted fathometer along with kinematic GPS. The survey equipment and methodology complied with USACE standards for hydrographic surveying.

OTHER DATA UTILIZED IN THIS STUDY

Beach profile data was also collected during the summer of 2014 and 2015 by SCDHEC OCRM and served to the general public through the S.C. Beach Erosion and Monitoring ([BERM Explorer](#)) application. The combination of these data and the survey data collected for this work provides eight years of data over a study period of 2014 to 2021.

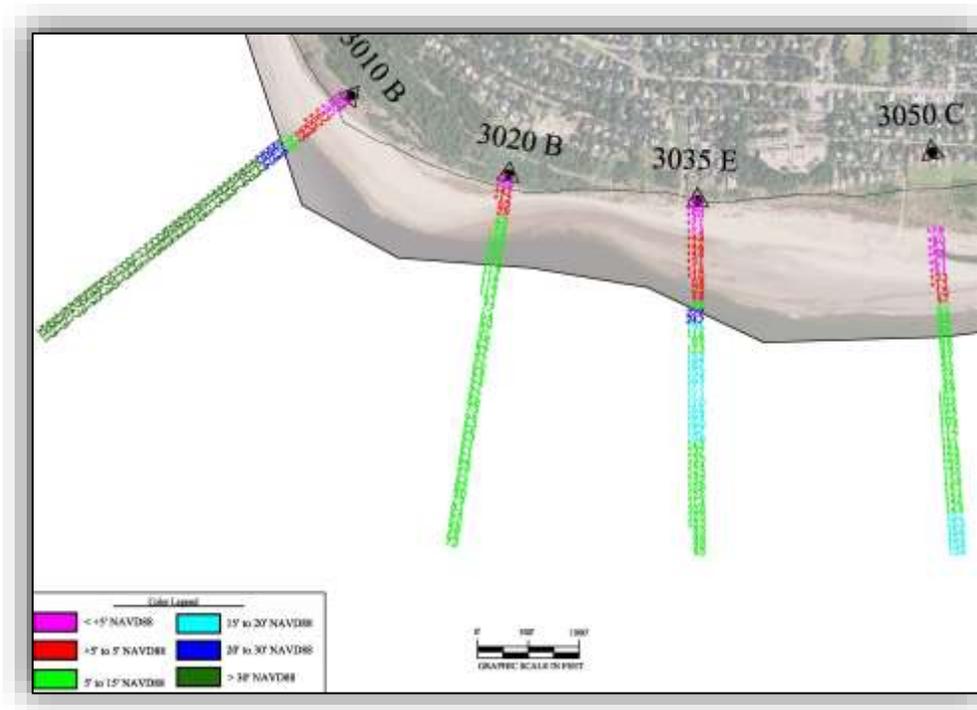


Figure 3. Topographic and bathymetric 2021 survey data illustrating the measured elevation along each line for the southwest end of Sullivan's Island.

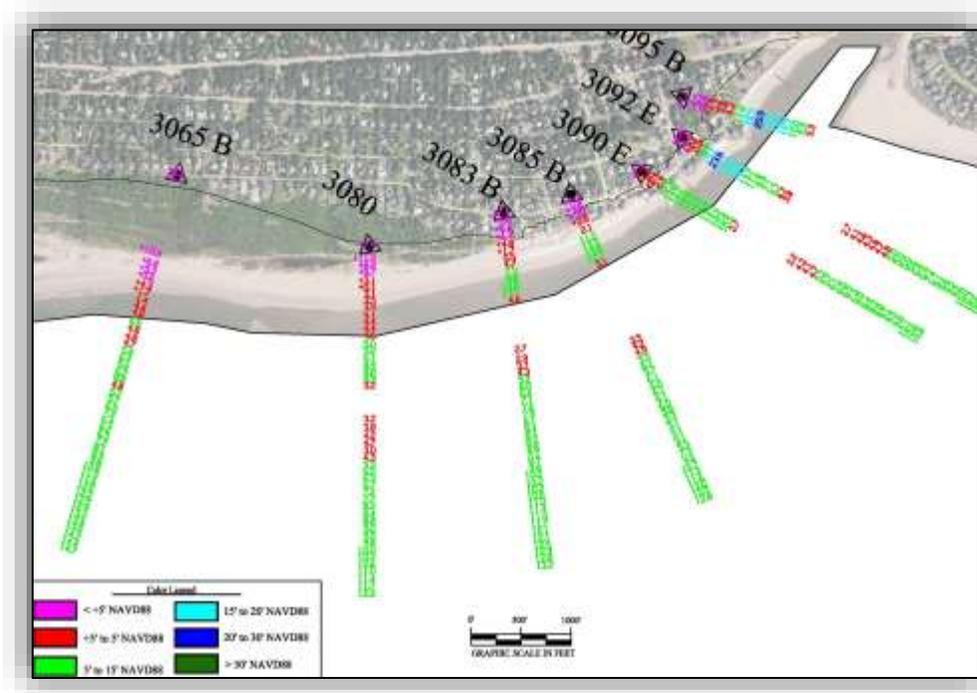


Figure 4. Topographic and bathymetric 2021 survey data illustrating the measured elevation along each line for the northeast end of Sullivan's Island.

4. Shoreline and Volume Change Analysis

The shoreline change analysis was conducted by measuring the position of the Mean High Water (MHW) contour (2.03 ft NAVD88) relative to the OCRM baseline. The volume change analysis was conducted by measuring the volume of sand on the profile from the seawardmost dune crest to the depth of closure (-12ft NAVD88) when possible.

3.1 MHW POSITION RELATIVE TO THE OCRM BASELINE: 2014-2021

The position of MHW relative to the baseline is a useful measurement (Figure 5) because it illustrates both the change in shoreline position from year to year, as well as the distance between the shoreline and baseline – an indicator of the level of storm damage protection provided by the beach/dune system at each monument.

During the study period, the Sullivan's Island shoreline changed dramatically between 2014 and 2015. Between 2015 and 2019, the shoreline gradually recovered back to near the 2014 position in most cases (Figure 5). In the recent past, the shoreline along the northeastern 2/3 of the island retreated again to near 2015 conditions. In the last year, shoreline recovery was measured along this section with the exception of Monument 3080 (Sta. 28), which displayed the highest erosion rate on the island of -92.6 ft between 2020 and 2021.

Average shoreline change between 2020 and 2021 was 31.1 ft of seaward movement (accretion). Several areas were flagged in previous monitoring reports and are discussed below.

The northeast end of the island, between Monuments 3090 and 3095 and adjacent to Breach Inlet, was flagged in the 2016 report. It is under continual erosional pressure due to the southwesterly migration of Breach Inlet, but has been stabilized by erosion control structures. Minor shoreline change has occurred along this northeastern end between 2015 and 2019 (i.e., stability). This area eroded during the previous monitoring period, but recovered in the last year between 2020 and 2021 (Figure 5). The small distance between the shoreline and the OCRM baseline suggests erosional pressure and the need for continued monitoring. There is little storm damage protection at this location.

The southwest end of the island, in the vicinity of the Charleston Harbor jetty, eroded over the last year. Monument 3010, closest to the channel, lost 72.7 ft of shoreline between 2020 and 2021.

At the sandbar attachment point, near Station 26 (OCRM Monument 3065), the shoreline moved nearly 200 ft seaward between 2020 and 2021. This location is represented by the bottom of the curve of the lines near 8,000 ft alongshore (Figure 5). This suggests that the sandbar continues to attach and provide sand to this area.

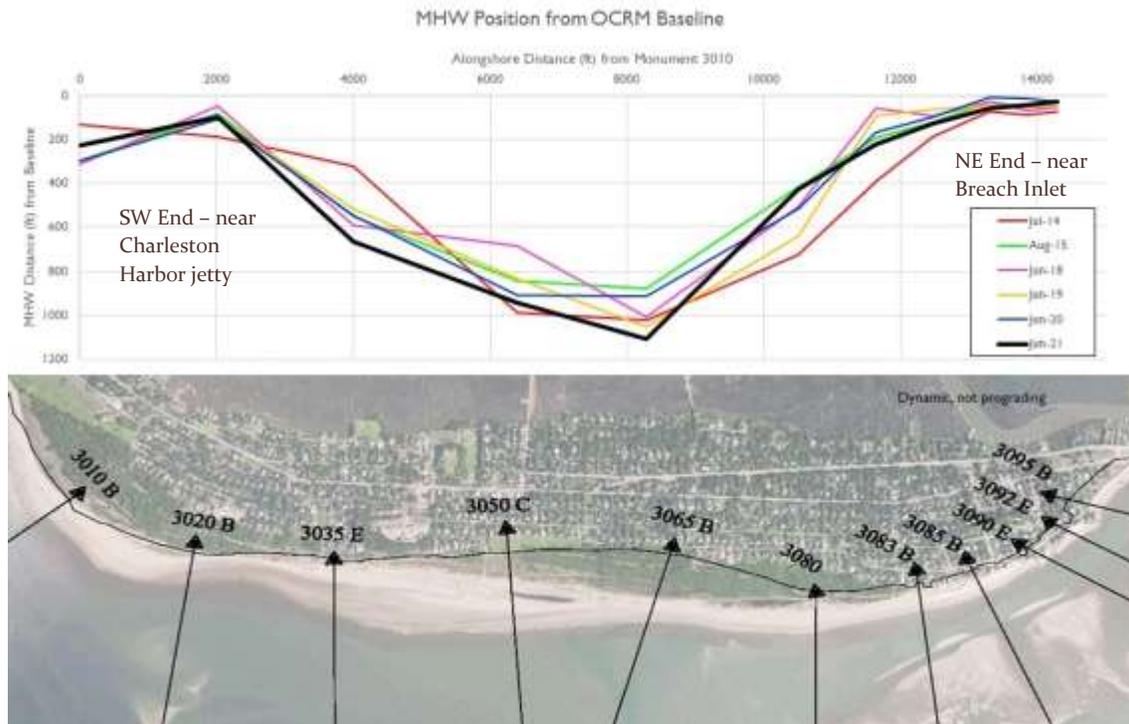


Figure 5. Annotated MHW Position graph aligned with the aerial photo from Figure 2, illustrating the change in shoreline position from 2014 to 2021, as well as the distance between the shoreline and baseline. Note the scale shows wider (larger) shoreline widths toward the bottom to correspond with the map.

Perhaps most interesting observation is that the average shoreline change between 2014 and 2021 is -22.1 ft/yr (compare red and black line on Figure 5). Thus, the Sullivan’s Island shoreline has not been advancing seaward since 2014. In other words, the island is not endlessly growing seaward. As noted in the last monitoring report, the shoreline may have reached a dynamic equilibrium.

3.2 VOLUMETRIC ANALYSIS

As noted above, the volume change analysis was conducted by measuring the volume of sand on the profile from the seawardmost dune crest to the depth of closure (-12ft NAVD88) when possible. These two locations were selected to approximate the limits of measurable sand movement across the beach portion of the profile. The nearshore sand bar was intentionally left out of the calculations when possible because the bar often complicates beach profile volume calculations. When the profile does not “close” at or before -12 ft, volume is calculated out to the location where the lines intersect (i.e., the visible depth of closure).

There is no doubt that the nearshore sand bar and the beach exchange sediment, but in order to understand the beach volume change, an effort was made to separate the beach profile from the nearshore sand bar when the bar was separated by a deep channel and

not welding to the beach face. The volume of the nearshore bar can be approximated in the future if necessary.

3.2.1 Unit volume to DOC by Monument: 2014-2021

As suggested in the MHW analysis, northeastern Sullivan’s Island has less storm protection in place than the rest of the island. Despite the narrowing beach, the average unit volume to the depth of closure (DOC) has been stable at near 130 cubic yards per foot (cy/ft) from 2016 to 2021. The rest of the island has at least 200 cy/ft of volume along each measured profile (Figure 6).

The other end of the island, near Charleston Harbor, has exhibited relatively stable unit volume measurements over the last three years. Between monuments 3020 and 3050 (Sta. 19 west to Sta. 22.5), very little volume change has been measured. As is expected adjacent to inlets, monument 3010, closest to the channel is more dynamic.

During this monitoring period, the profile line to the east of the sandbar attachment point (Monument 3080) lost volume as sediment from the previous sand bar attachment event spread out. Most profiles in the vicinity of the sandbar attachment point lost volume in the offshore portion as the sandbar attached and gained volume in the sand dunes, backbeach, and berm. These measurements are detailed by monument in the next section.

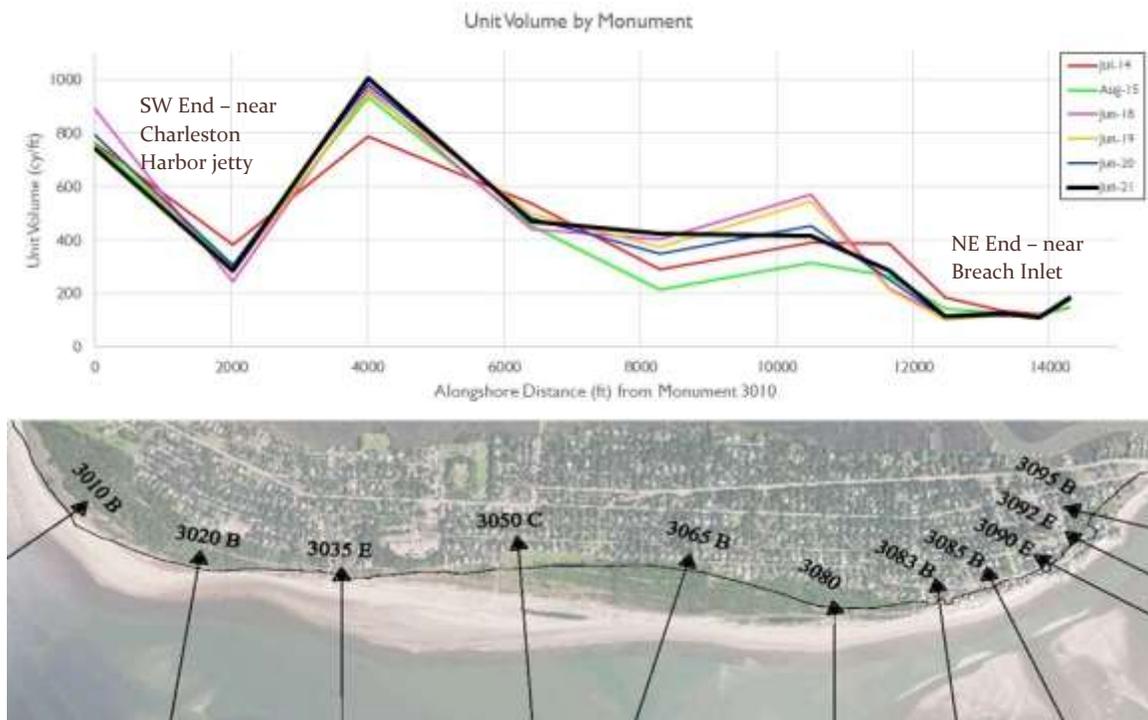


Figure 6. Annotated Unit Volume graph illustrating the change in unit volume at each profile from 2014 to 2021. Note the scale shows larger volumes toward the top of the plot.

3.2.2 Island-wide Volume Change Estimates

Due to the large distance between OCRM Monuments on Sullivan's Island, it is difficult to calculate total volume statistics for the island using data from only 11 profiles. Small fluctuations in volume at a single beach profile translate to relatively large volume change statistics when applied over long distances. Thus, the volume change estimates provided in Table 1 should be treated as approximations.

From 2016 to 2021, the total volume change was a gain of 281,287 cy (Table 1). Generally speaking, the center of the island has been gaining significant volume while the ends of the island have been somewhat erosional. During this monitoring period, from 2020 to 2021 the total volume change on the island was a gain of 54,914 cy (Table 1). Volume loss was measured near Charleston Harbor while the rest of the island gained sand volume.

Table 1. Volume change estimate for Sullivan's Island from 2016 to 2021 and for 2020 to 2021.

Monument	2016-2021		2020-2021	
	Avg. Change Between Profiles (cy/ft)	Total Between Profiles (cy)	Avg. Change Between Profiles (cy/ft)	Total Between Profiles (cy)
3010 B	-19		-50	
		-31,880		-93,860
3020 B	-4		-19	
		44,877		5,581
3035 E	48		25	
		141,290		18,177
3050 C	68		-10	
		136,733		58,567
3065 B	88		77	
		39,441		48,135
3080	-54		-35	
		-33,430		-1,851
3083 B	8		33	
		-2,759		17,849
3085 B	-14		3	
		-5,354		4,511
3090 E	3		7	
		-3,565		614
3092 E	-16		-5	
		-4,068		-2,809
3095 B	-1		-7	
Total Volume Change (cy)		281,287		54,914

3.3 BEACH CONDITIONS BY MONUMENT

In addition to survey data collection, this study also conducted a beach condition assessment by taking ground photographs at each OCRM Monument and noting the condition of the beach. This section includes the condition assessment information and a beach profile data plot for each OCRM Monument.

3010

This is the southwesternmost OCRM Monument on Sullivan’s Island, located along the long beach access path at Station 16 with the nature trail. The beach is located on the Charleston Harbor side (“inside”) of the jetty. This profile has experienced significant beach and dune erosion during the last year (Figure 7). Observations indicated that the rack line was at the dune toe, suggesting erosional conditions (Figure 8). Incipient dunes and a wide primary dune that had been growing at this location since 2015 eroded between 2020 and 2021 (Figure 9). According to the 2021 volume calculation, this profile has a unit volume of 743 cy/ft. This is about 50 cy less than the 2020 unit volume.

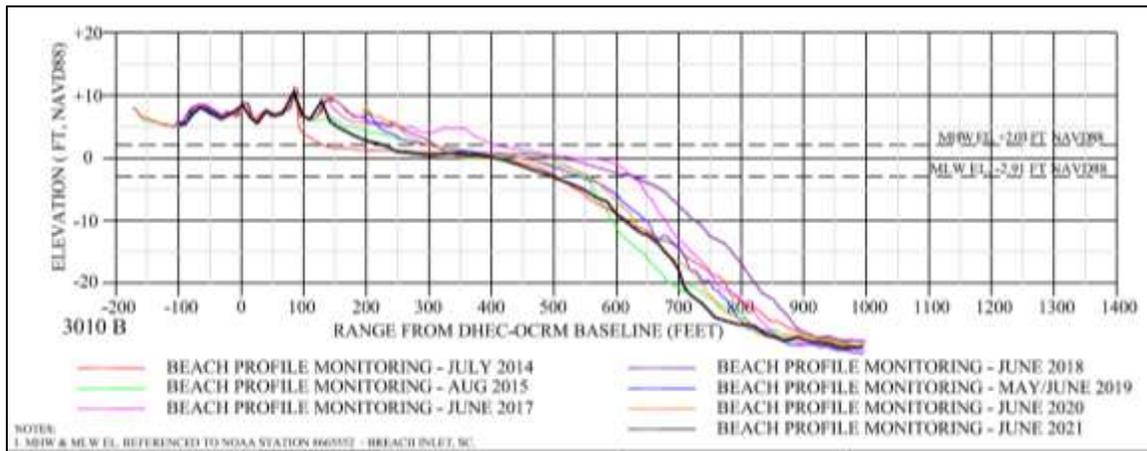


Figure 7. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3010.



Figure 8. Ground photo taken at Monument 3010 looking east on June 2, 2020 (top) and June 17, 2021 (bottom). Note the incipient dunes that developed in 2020 had been eroded by 2021.



Figure 9. Ground photo taken at Monument 3010 looking west on June 2, 2020 (top) and June 17, 2021 (bottom).

3020

Monument 3020 is located along the long beach access path at the Sand Dunes Club. Significant erosion had taken place here since 2014 that included loss of a large dune and submerged nearshore sand body (Figure 10). Little change occurred during this monitoring interval (2020-2021). A dune has been reestablished farther landward of the eroded 2014 dune.

Beach observations confirmed that the recovery that began in 2019 continued in 2021 with vegetation growth and dunes advancing seaward. Dead trees along the dune line were buried with sand. The beach was accreting with at least 100 ft of dry beach at high tide. A sand bar had attached to the updrift beach and the beach berm accreted (Figure 11). Dune recovery continued (Figure 12).

According to the 2021 volume calculation, this profile has a unit volume of about 305 cy/ft, which is in stark contrast to the surrounding accretional areas. This monument is influenced by its location downdrift of the Charleston Harbor jetty.

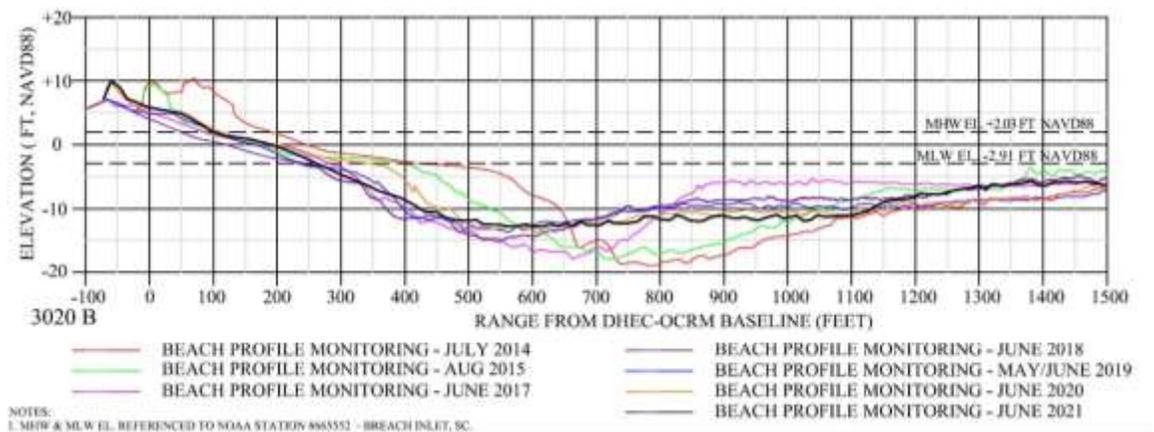


Figure 10. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3020.



Figure 11. Ground photo taken at Monument 3020 looking northeast on June 2, 2020 (top) and June 17, 2021 (bottom). Notice the evolution of the sand bar attachment on the beach to the northeast.



Figure 12. Ground photo taken at Monument 3020 looking southwest June 2, 2020 (top) and June 17, 2021 (bottom).

3035

Monument 3035 is located along the long beach access path at Station 19. This area has been the beneficiary of recent sandbar attachment events (Figure 13). The beach has been wide and accreting for the last several years. A new primary dune has formed since 2014. In 2021, beach observations confirmed that a wide backbeach and a wide, high berm (Figure 14 and Figure 15). Evidence of past ponding landward of the berm was observed, which is common at this location.

According to the 2021 volume calculation, this profile has a unit volume of 1,004 cy/ft. The beach profile at this monument is influenced by the sediment trapping effect of the Charleston Harbor jetty.

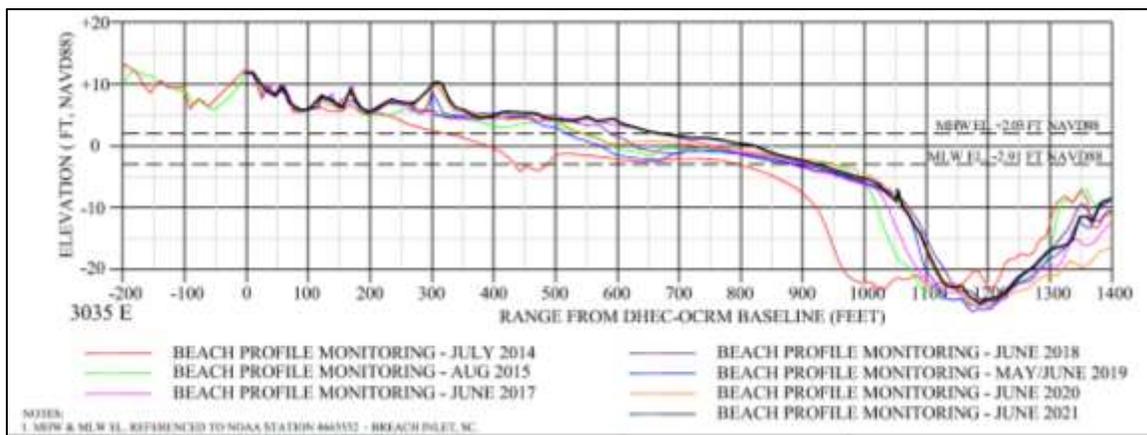


Figure 13. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3035.



Figure 14. Ground photo taken at Monument 3035 looking northeast on June 2, 2020 (top) and June 17, 2021 (bottom). Note increased elevation of the berm.



Figure 15. Ground photo taken at Monument 3035 looking southwest on June 2, 2020 (top) and June 17, 2021 (bottom). Note the higher berm elevation.

3050

Monument 3050 is located along the long beach access path at Station 22.5 in the center of the island. Beach profile data indicate the onshore transport of the recent sand bar attachment events that occurred here in 2014 and 2018-19 (Figure 16). Over the last five years, sediment from these attachment events have welded to the shoreface and resulted in the 2021 beach which includes a wide berm and new, tall primary dune.

The beach observations confirm that the 2021 beach was over 100 ft wide and accretional. The dunes were healthy with new growth and as with the nearby beach profiles, coppice mounds and incipient dunes that had formed in 2020 had been overtopped and replaced with a sandy berm. Evidence of past backbeach ponding was observed. This is likely a result of King tide events and may be helping to slow seaward aggradation.

According to the 2021 volume calculation, this profile has a unit volume of 471 cy/ft. The beach profile at this monument benefits from its location updrift of the Charleston Harbor jetty. Sand volume has been relatively stable at this profile fluctuating between 400 and 500 cy/ft but the shoreline position has fluctuated considerably. The data indicate stability rather than uninhibited accretion and progradation.

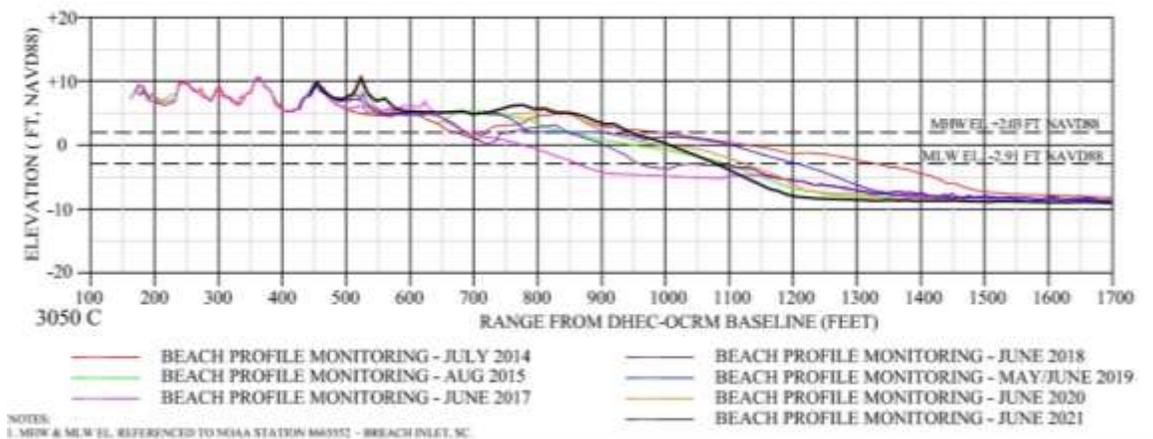


Figure 16. Beach profile monitoring data from 2014-2020 in cross-section view at Monument 3050.



Figure 17. Ground photo taken at Monument 3050 looking northeast on June 2, 2020 (top) and June 17, 2021 (bottom).



Figure 18. Ground photo taken at Monument 3050 looking southwest on June 2, 2020 (top) and June 17, 2021 (bottom).

3065

Monument 3065 is located along the long beach access path at Station 26, which traverses a beachfront marsh environment containing significant standing water. Shoreline and beach profile data indicate that this is the widest maritime forest, beachfront marsh, dune and beach system on the island.

This monument is near the sandbar attachment point, which fluctuates but in 2019 was located near Sta. 27.5. The bar comes onshore and then begins to spread in both directions alongshore.

The profile goes through cycles of erosion and accretion as new sand bars attach and the sand is dispersed alongshore. Note the stability in the dune and high shoreline and berm position variability in the beach profile survey (Figure 19). Between 2020 and 2021, beach width increased.

Beach observations confirm that the beach width increased to over 100 ft wide at high tide (Figure 20 and Figure 21). The primary dune was building seaward with new growth and some evidence of overtopping which as suggested previously may be helping to reduce uninhibited seaward growth. According to the 2021 volume calculation, this profile has a unit volume of 425 cy/ft.

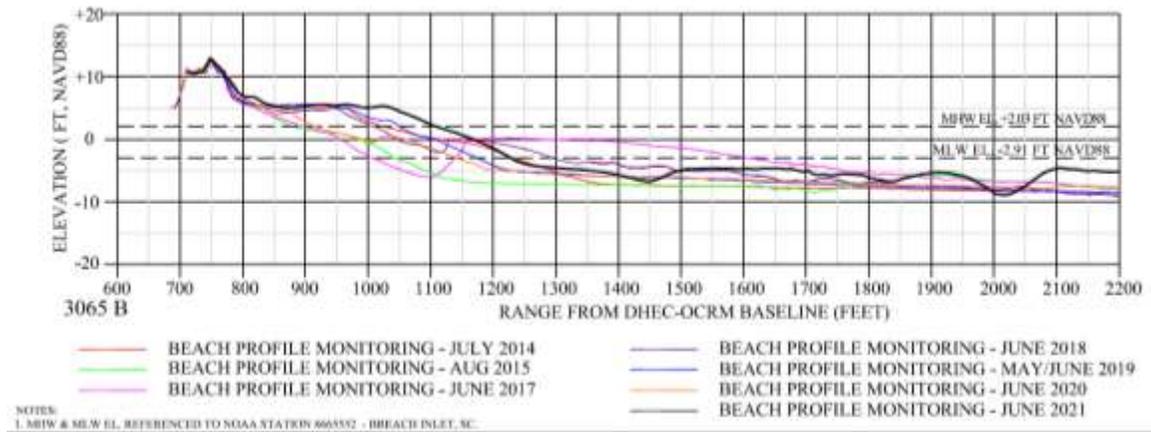


Figure 19. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3065.



Figure 20. Ground photo taken at Monument 3065 looking northeast on June 2, 2020 (top) and June 17, 2021 (bottom). Note the sandbar attachment point in 2020.



Figure 21. Ground photo taken at Monument 3065 looking southwest on June 2, 2020 (top) and June 17, 2021 (bottom). Note the wide beach in 2021.

3080

Monument 3080 is located along the long beach access path at Station 28.

The sand bar attachment point was located just to the west of this monument in 2019 and 2020. In 2020, the sand bar had attached to the shoreface and was spreading out (Figure 22). The primary dune and the beach berm both accumulated sand and advanced seaward in 2021 then reduced in width in 2021 as the sand spread.

Beach observations confirm that the beach at this location had lost beach width due to sand spreading (Figure 23 and Figure 24). Conditions were erosional with only about 10 feet of dry beach at high tide.

According to the 2021 volume calculation, this profile has a unit volume of 417 cy/ft. This profile continues to display relatively large volume loss due to sand from the attachment event spreading out alongshore. The beach condition now resembles the 2015 condition. More erosion is possible before the next sandbar attachment event; however, the dunes are very wide, offering more than sufficient storm protection.

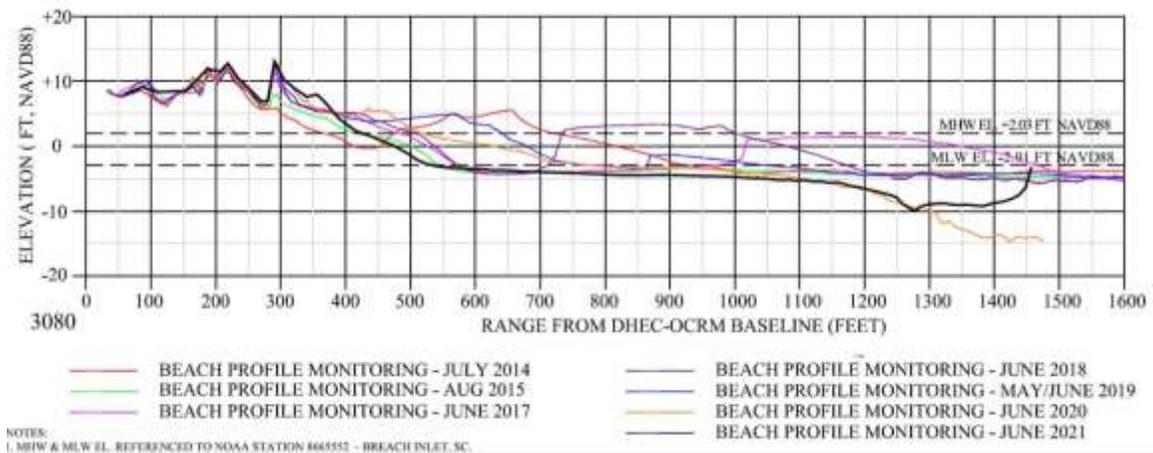


Figure 22. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3080.



Figure 23. Ground photo taken at Monument 3080 looking northeast on June 2, 2020 (top) and June 17, 2021 (bottom). Note the narrower beach in 2021.



Figure 24. Ground photo taken at Monument 3080 looking southwest on June 2, 2020 (top) and June 17, 2021 (bottom).

3083

Monument 3083 is located near Station 29 which had been flagged in previous monitoring reports as an area of critical erosion. This profile represents the southwest end of the groin field along northeastern Sullivan's Island.

Prior to this monitoring event, the shoreline here had retreated nearly 300 ft since the last sand bar attachment event in 2014 (Figure 25), including the loss of three rows of low sand dunes. In 2021, fairly significant beach recovery was measured. The shoreline advanced 50 ft seaward between 2020 and 2021 due to sand from the most recent attachment event migrating to this area. Another sand bar was beginning to migrate onshore as well (Figure 25).

The backbeach accumulated a significant amount of sand covering the previously exposed seawall and sand bags that had been placed and/or exposed at the toe of the dune scarp (Figure 26). Groins and seawalls continue to dominate this portion of the island, but recovery was observed.

This location marks the transition between the northeast end of the island, which has been stabilized with erosion control structures and the wide, fluctuating beach of the central portion of the island to the southwest (Figure 27).

According to the 2021 volume calculation, this profile has a unit volume of 285 cy/ft, about 80 cy/ft larger than in 2019.

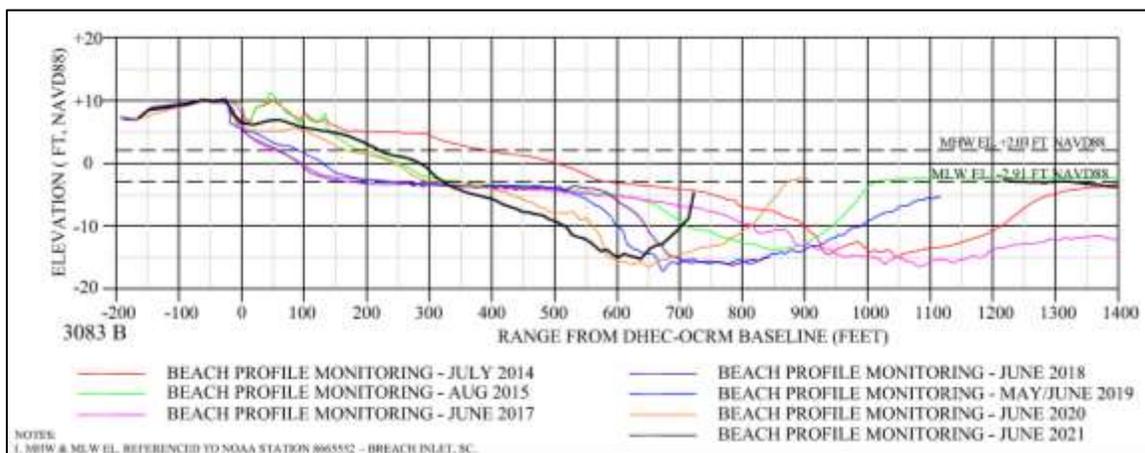


Figure 25. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3083.



Figure 26. Ground photo taken at Monument 3083 looking northwest on June 2, 2020 (top) and June 17, 2021 (bottom). Note the increased beach width in 2021.



Figure 27. Ground photo taken at Monument 3083 looking southwest on June 2, 2020 (top) and June 17, 2021 (bottom). Note the exposed sand bags in 2020.

3085

Monument 3085 is located near Station 30. While this area had been eroding since the sand bar attachment event in 2014, accretion was measured during the last two monitoring periods. Beach profile data indicates evidence of fairly stable conditions with some dune recovery between 2020 and 2021 (Figure 28).

Beach observations indicate some recovery with 40 ft of beach at high tide, as opposed to high water reaching under the decks of the homes in this area in years past. No dune vegetation has developed but sand fencing is helping with some recovery (Figure 29). A historic cannon structure which had been exposed in 2019 was covered with sand in 2021 (Figure 30).

According to the 2021 volume calculation, this profile has a unit volume of 114 cy/ft, a slight increase from the 2020 volume.

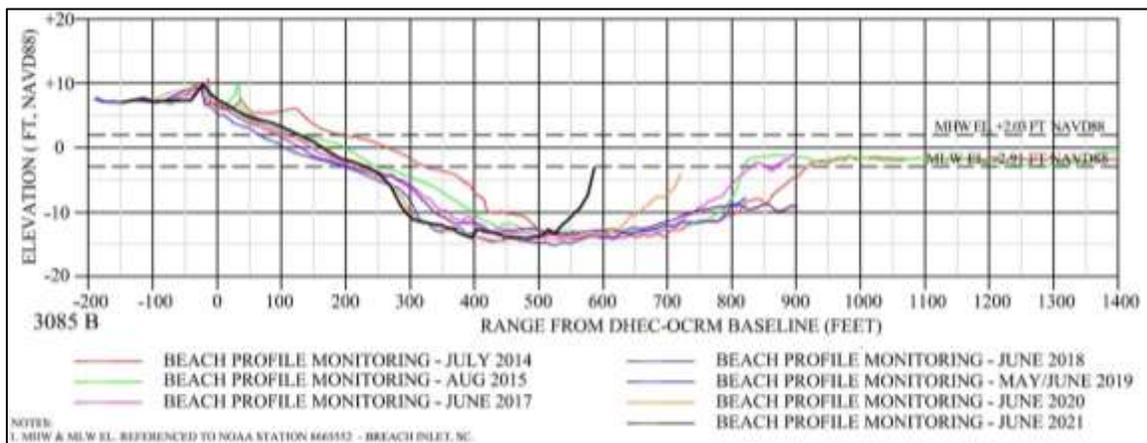


Figure 28. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3085.



Figure 29. Ground photo taken at Monument 3085 looking northwest on June 2, 2020 (top) and June 17, 2021 (bottom). Notice increased downdrift erosion in 2021.



Figure 30. Ground photo taken at Monument 3085 looking southwest on June 2, 2020 (top) and June 17, 2021 (bottom). Note the exposed cannon structure in 2020

3090

Monument 3090 is located just south of Station 31 on northeastern Sullivan’s Island near Breach Inlet. It represents a small (<250 ft long) pocket beach between two groins. The beach is nearly completely armored. The beach profile has exhibited erosion despite the stabilization structures (Figure 31). No dry beach is exposed at high tide and no dunes are present (Figure 32 and Figure 33).

Beach observations in 2021 confirm these measurements. While some dry sand was present between the road and access path, at the time of the observations there was no dry beach in front of the seawalls.

According to the 2021 volume calculation, this profile has a unit volume of 124 cy/ft, the same as 2019 and 2020.

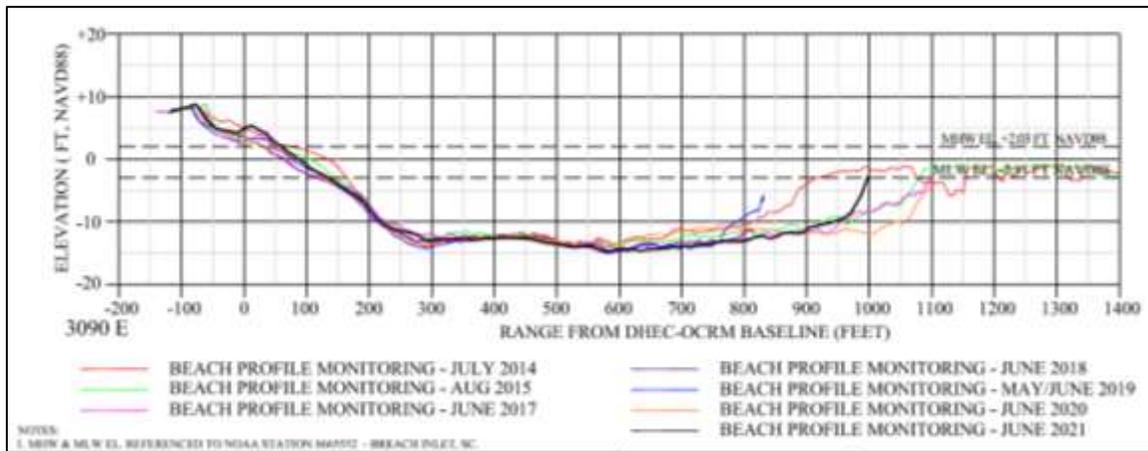


Figure 31. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3090.



Figure 32. Ground photo taken at Monument 3090 looking north on June 2, 2020 (top) and June 17, 2021 (bottom). Note increased erosion in 2021.



Figure 33. Ground photo taken at Monument 3090 looking southwest on June 2, 2020 (top) and June 17, 2021 (bottom). Note the total lack of dry beach in 2021.

3092

Monument 3092 is located south of Station 32 on northeastern Sullivan’s Island near Breach Inlet. This profile line represents a section of the island that has been armored with erosion control structures. During this monitoring interval, the profile was fairly stable and a private dune restoration project was in place (Figure 34). The recent sand bar attachment event has not resulted in sediment being transported to this area.

The 2021 beach observations confirmed that the private dune restoration installed in 2020 is doing well with flourishing vegetation; however, only about 10 ft of high tide beach existed. The structures have somewhat stabilized this portion of the beach, but erosion continues (Figure 35 and Figure 36).

According to the 2021 volume calculation, this profile has a unit volume of 108 cy/ft, nearly the same as in 2019 and 2020.

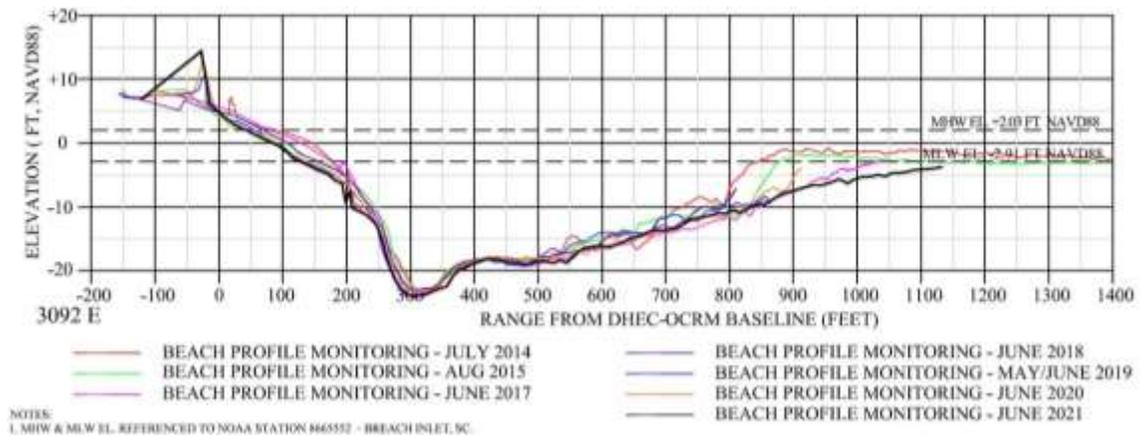


Figure 34. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3092.



Figure 35. Ground photo taken at Monument 3092 looking north on June 2, 2020 (top) and June 17, 2021 (bottom).



Figure 36. Ground photo taken at Monument 3092 looking south on June 2, 2020 (top) and June 17, 2021 (bottom). Note the dune vegetation in 2021.

3095

Monument 3095 is located on Station 32 at the northeastern tip of Sullivan’s Island on Breach Inlet. It represents a cusped beach anchored by groins. The beach profile has exhibited little change over time due to the stabilization structures (Figure 37).

The June 2021 beach observations indicate nearly identical conditions as 2020. Spring high tides were reaching the toe of vegetation and about 10 ft of dry beach existed at high tide (Figure 38 and Figure 39).

According to the 2021 volume calculation, this profile has a unit volume of 180 cy/ft slightly less than in 2020.

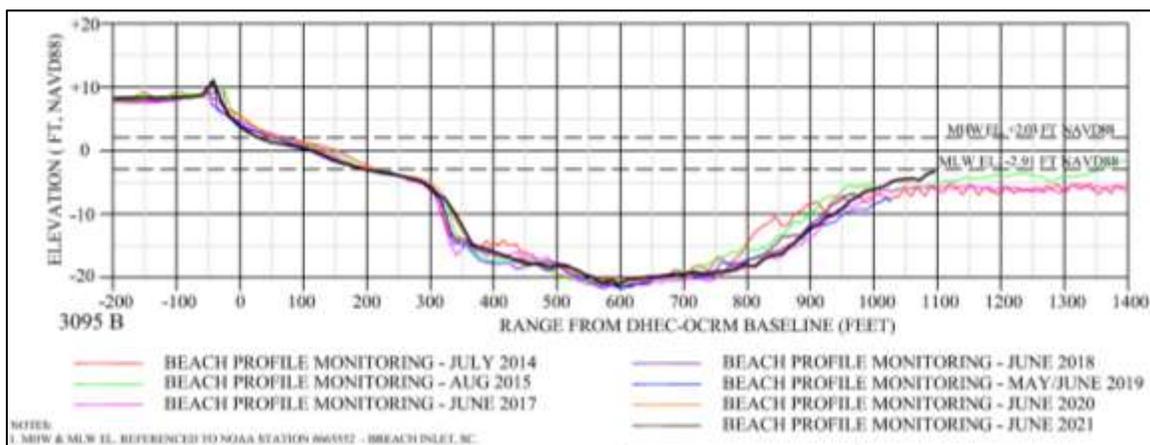


Figure 37. Beach profile monitoring data from 2014-2021 in cross-section view at Monument 3095.



Figure 38. Ground photo taken at Monument 3095 looking north on June 2, 2020 (top) and June 17, 2021 (bottom).



Figure 39. Ground photo taken at Monument 3095 looking south on June 2, 2020 (top) and June 17, 2021 (bottom). Note continued erosion of the clay bluff in 2021.

5. Summary of 2020 Beach Monitoring Survey

This report provides an annual condition survey to monitor the Sullivan's Island beach. Beach profile data collected during August 2016, June 2017, June 2018, June 2019, June 2020, and June 2021 were compared to beach profile data collected by SCDHEC-OCRM in the summers of 2014 and 2015.

Analyses of the mean high water (MHW) position relative to the SCDHEC-OCRM Baseline and unit volume by monument were conducted. These analyses documented that in general, the island gained sand volume in the center and eroded slightly on both ends between 2020 and 2021. The beach has gained about 280,000 cy of sand since 2016. Between 2020 and 2021, a volume gain of about 55,000 cy was measured.

The northeast end of the island, between Monuments 3083 and 3095, has little protective beach and dune system in place. Despite armoring with erosion control structures, erosion continues along this stretch of Sullivan's Island. Here, beachfront homes are located either on or seaward of the primary dune in vulnerable positions. Fortunately, sand volume gain was measured at Monuments 3085 and 3090 (Sta. 30-31) during this monitoring interval.

The data documented a sandbar attachment event in 2014 and another in 2019. Most of the sediment from the 2014 attachment event has been transported downdrift, toward southwestern Sullivan's Island and the Charleston Harbor jetty. Data from 2021 confirm that sand bar attachment events result in a pattern of accretion and erosion along the central portion of the island.

The beach at Station 19 is extraordinarily wide with a unit volume of over 1,000 cy/ft and growing due sand trapping by the Charleston Harbor jetty. The shoreline has advanced over 340 ft seaward since 2014. Sand volume continues to increase as the primary dune and backbeach prograde and increase in elevation.

If the present management strategy is maintained, additional dune, beachfront marsh, and maritime forest progradation (seaward movement) may continue in the central portion of the island. It seems that the more frequent occurrence of king tides (specifically the higher than predicted high tides) may be controlling additional dune progradation somewhat. Continued annual monitoring is recommended. By better understanding the beach performance following sandbar attachment events, improved management strategies may become obvious.

In addition to the wide, accreting beaches in the central portion of the island, Sullivan's Island also has beach management challenges on the northeast end related to narrow beach widths and minimal storm protection. Several hot spots are being closely scrutinized.