

TABLE OF CONTENTS

Annual Report for 2019
On the
Mantoloking
Oceanfront Municipal Shoreline

Executive Summary:

The Stockton University Coastal Research Center (CRC) resumed a 26-year monitoring effort along the municipal shoreline in Mantoloking with a fall 2019 survey of the five municipal profile sites within the Borough. This annual report provides a direct comparison of the beach conditions prior to the federal Northern Ocean County Shore Protection Project, the US Army Corps “as built” condition surveys, and a series conducted on November 4, 2019 by the CRC. The last pre-construction survey by the CRC was conducted in December 2017, but with the beach at Princeton Avenue renourished with 188.74 yds³/ft., which produced a shoreline advance of 255 feet at that site. This was the only location where the project had been completed by the end of 2017. Sand had been added at MANT-3 by 2017, but work was interrupted with the dredge moved south to Ortlely Beach and Seaside to put sand in the most vulnerable locations first.

The US Army contractors surveyed their completed Mantoloking project July 25, 2019 and graciously provided the CRC with their data for “as-built” conditions. These USACE surveys were done at closer intervals and did not exactly align with the much older CRC locations. All but the site at 1117 Ocean Avenue were within a few feet of the Army Corps transects and with the extremely uniform and linear dune built for the project there is relative confidence that both surveys represent real differences in both shoreline and sand volume calculations.

The CRC was asked to return in the fall of 2019 and survey the five locations which resulted in the table 2 below showing the past 4 months of beach changes impacting the project.

2019 Storm Activity:

There were 3 minor storms during the spring of 2019 while the project was under construction. Any losses were compensated for during the final months of work. Since July 25, 2019, storm activity has been of a minor nature with northeast winds under 35 MPH in all cases. The massive amount of new sand is adjusting and has benefitted the Borough of Mantoloking particularly in the northern half of the borough oceanfront (Table 2).

USACE Northern Ocean County Storm Damage Reduction Project:

USACE’s Philadelphia District Commander Lt. Col. Michael Bliss summed the project’s goals as stated, *“The engineered dune and berm system will serve the vital purposes of reducing risk and helping to protect people and property.”* The project cost is approximately \$128 million the U.S. Army Corps of Engineers in partnership with NJDEP awarded the project to build beaches and dunes in northern Ocean County. Contractor Weeks Marine Inc. began pumping sand in Ortlely Beach in summer 2017 initially working south towards Seaside. Work in Mantoloking commenced in fall 2017 and the impact at Princeton Avenue was previously presented in the CRC 2017 annual report.

The identified National Economic Development (NED) plan, which is the plan that maximizes beneficial contributions to the nation while meeting planning objectives, provides a degree of storm damage protection, which is greater than the cost of implementation. For Mantoloking that plan calls for a dune crest with elevation of 22ft NAVD88 with a crest width of 25 feet, dune slope is 1V:5H. The beach berm in front of the dune is 75 feet wide at elevation 8.5 feet NAVD88, beachface slope design is 1V:10H. This 75-foot distance is not the constructed berm width as the constructed berm width includes advanced nourishment to compensate for the offshore portion of the profile template. The constructed berm width will vary with existing conditions but will likely be more than double the design width. Example, the constructed berm width at Princeton Avenue extended approximately 150 feet from the seaward dune toe to the berm crest at elevation 8.5 feet NAVD88.

This method of construction known as “overbuilding method,” places the required design quantity at the proposed berm elevation, but with additional berm width added. The seaward slope of the construction berm is often equal to or steeper than the natural slope. The constructed berm is “overbuilt” so coastal processes can readjust the profile to a natural equilibrium state. This adjustment between slopes, known as compensating slopes, uses excess sand to achieve the desired beach and nearshore template. In this case, much of the overbuilt berm sand moves offshore to form the intended design profile nearshore while still achieving the 75-foot designed beach berm width that will support the expanded dune footprint.

This effect can be clearly seen in the three cross sections at Princeton Avenue (MANT-4). The retreat in the berm was significant, but nearly balanced by the deposition of sand offshore creating a shallower terrace seaward than existed previously.

Post-project monitoring captured this process as the constructed beach profile template adjusts over time to the local wave climate. Beach profile monitoring will help the officials assess short and long-term project performance, quantify shoreline and sand volume losses throughout the Borough and help guide planning of periodic nourishment intervals to maintain adequate storm protection for the community. Monitoring will allow the community to assess storm damages to the beach and dune to advocate for possible emergency nourishment to maintain community storm preparedness between regular scheduled maintenance cycles. However, the USACE seldom surveys its projects more

CRC monitoring was halted during the USACE construction phase because changes were entirely based on project construction progress. The recent survey was conducted on November 4, 2019 to document changes in beach topography since the “as-built” surveys were completed.

USACE	Survey #100	July 25, 2019
Fall	Survey #101	November 4, 2019

Table 1 below shows the shoreline and sand volume changes at the five monitoring locations during the interval between fall 2017 and July 2019 following project completion.

Table 2 shows shoreline and sand volume changes that occurred between July 25, 2019 (Survey #100) and November 4, 2019 (Survey #101). The shoreline and volume changes represent an assessment of changes to the Mantoloking shoreline in the four months since the USACE finished work.

Table 2
Shoreline & Sand Volumes Changes
July 25, 2019 to November 4, 2019

Profile Number	Shoreline Change (feet)	Volume Change (yds ³ /ft)	Avg. Volume Change (yds ³ /ft)	Distance Between (feet)	Net Volume Change (yds ³)
<i>Northern Municipal Boundary</i>					
			38.539	294	11,330
Mant-1	-2	38.54			
			32.584	3,033	98,827
Mant-2	-4	26.63			
			23.611	2,584	61,010
Mant-3	9	20.59			
			6.593	2,789	18,388
Mant-4	1	-7.41			
			-3.887	2,164	-8,411
Mant-51	0	-0.37			
			-0.368	495	-182
<i>Southern Municipal Boundary</i>					
			Total Volume Change =		180,962

section includes the road and beach access path on the landward dune toe between the oceanfront homes.

Following Sandy, work commenced to extend the rock revetment south from Bayhead to include this location. South of Lyman Street installation of a steel wall provided enhanced shore protection for properties and infrastructure in the absence of a wider beach and dune system. This all changed during 2018 into 2019 as the project reached this site. Today, the dune buries the rock revetment and the residents are building new dune walk-over paths and various crest of dune decks.

oceanfront homes

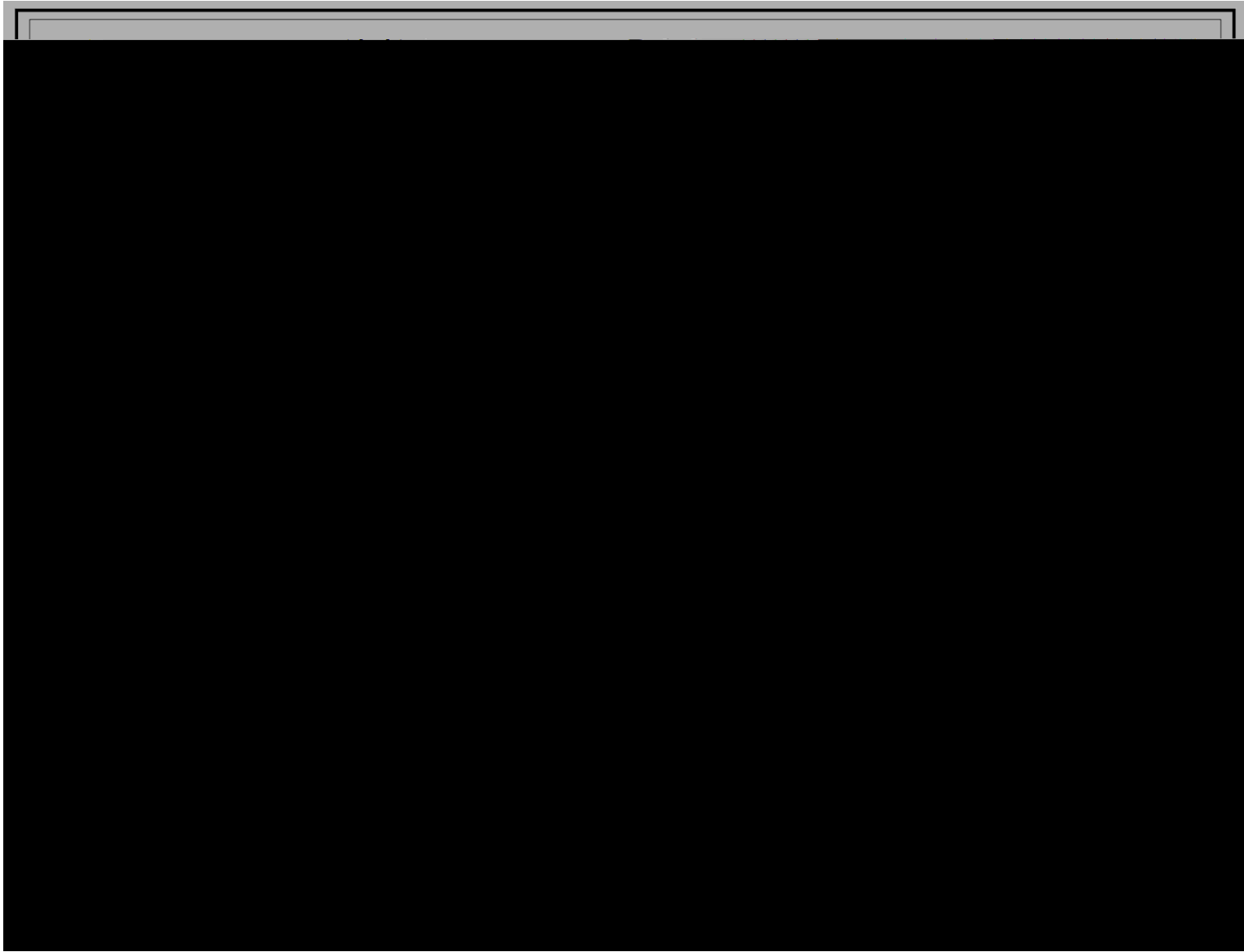
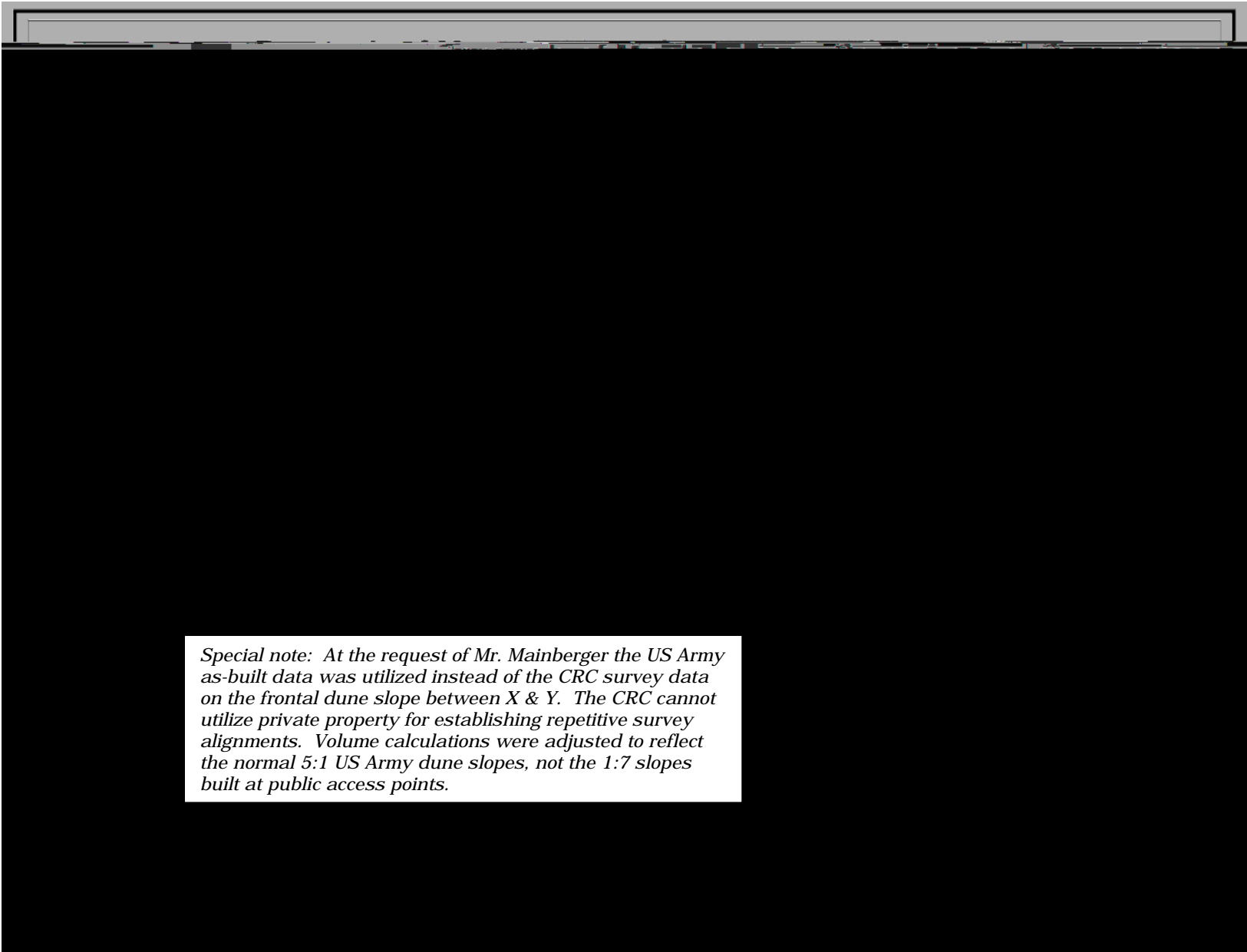
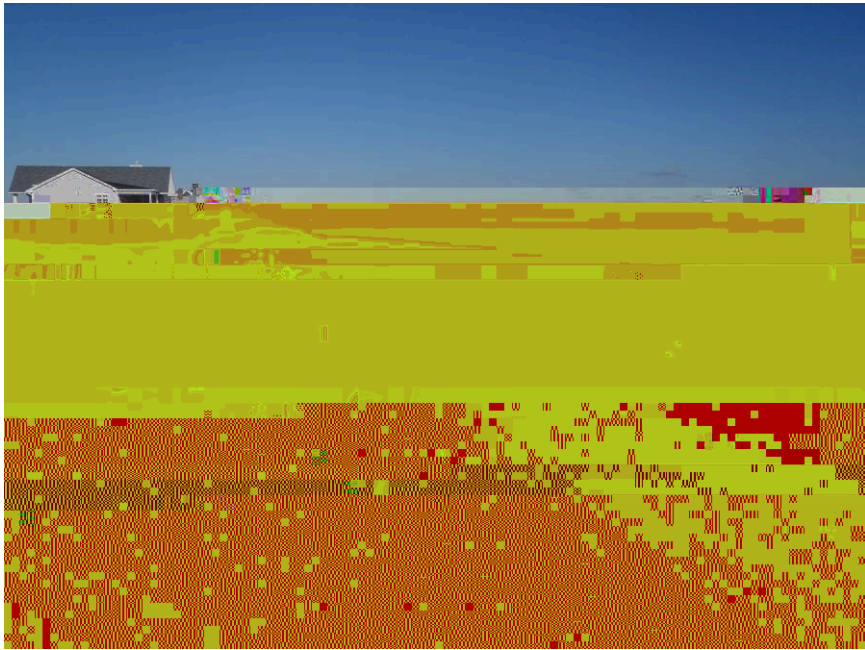


Figure 1 d: The four cross sections display conditions from two 2017 surveys prior to the federal project and two 2019 surveys after project completion. The dune construction is the primary focus in size, if not in height, with the wider beach very evident as well. The beach/dune changes between the two 2017 and the 2019 surveys are about of the same consequence. Sand was added offshore since the project was completed as the as-built profile design adjusted. Sand may have moved south into northernmost Mantoloking as well generating this deposit offshore.



Special note: At the request of Mr. Mainberger the US Army as-built data was utilized instead of the CRC survey data on the frontal dune slope between X & Y. The CRC cannot utilize private property for establishing repetitive survey alignments. Volume calculations were adjusted to reflect the normal 5:1 US Army dune slopes, not the 1:7 slopes built at public access points.

Figure 2d: The two profiles prior to the federal project show a much lower dune elevation with less than half the area at the base of the dune. The beach lies seaward of the dunes, while the beachface slope in 2017 commenced at the toe of the dune. The dune position was adjusted after July 2019, because the CRC profile line is not precisely on the same alignment as the USACE survey. As close as possible, but not exactly the same. Sand accumulated at the dune toe and as an offshore bar at the distal end of the survey.



3a. December 21, 2017



3b. May 15, 2019



3c. November 4, 2019

Mant-3 Photographs 3a & 3c show the view to the north from the seaward dune crest. Photo 3b is along the steel wall.

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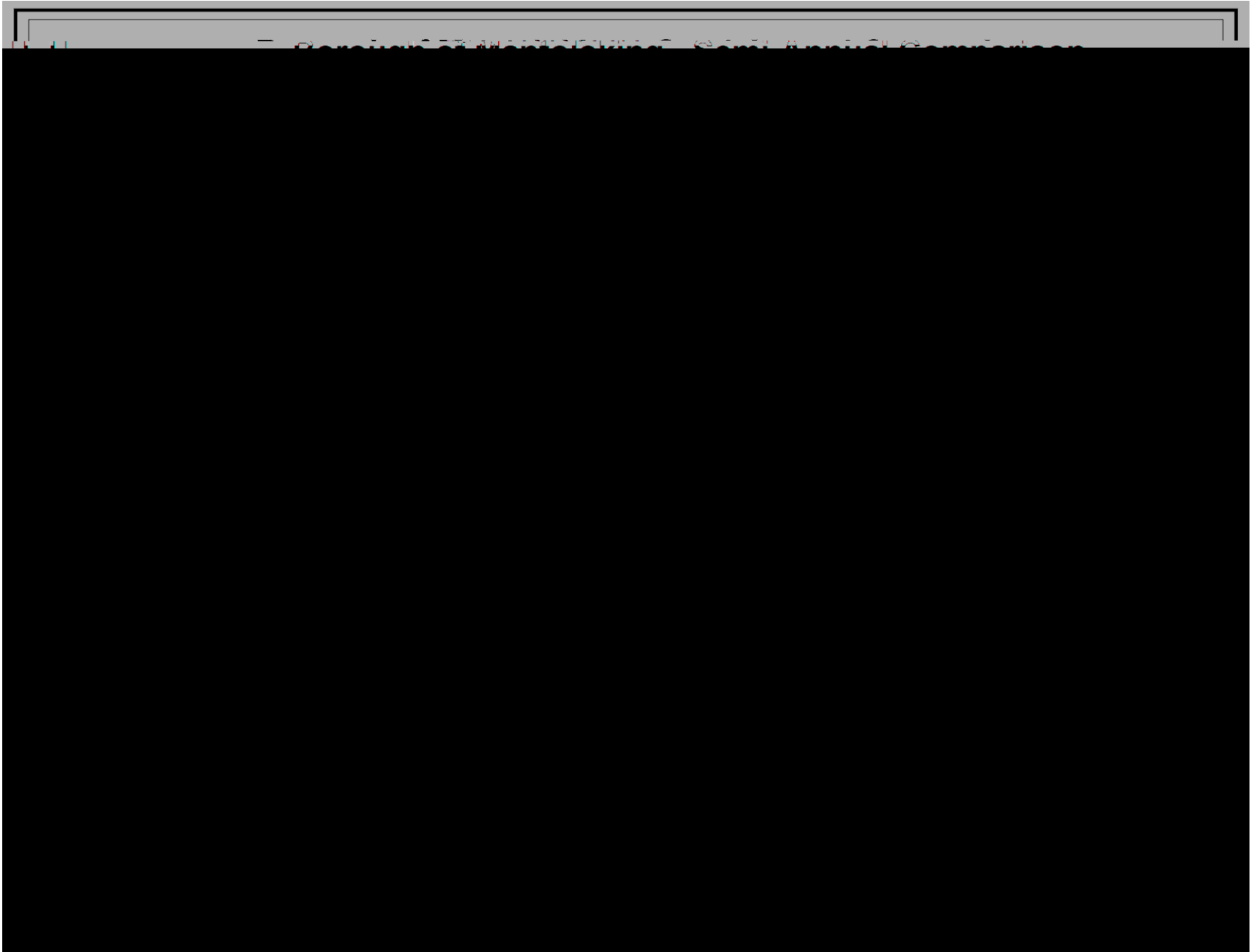
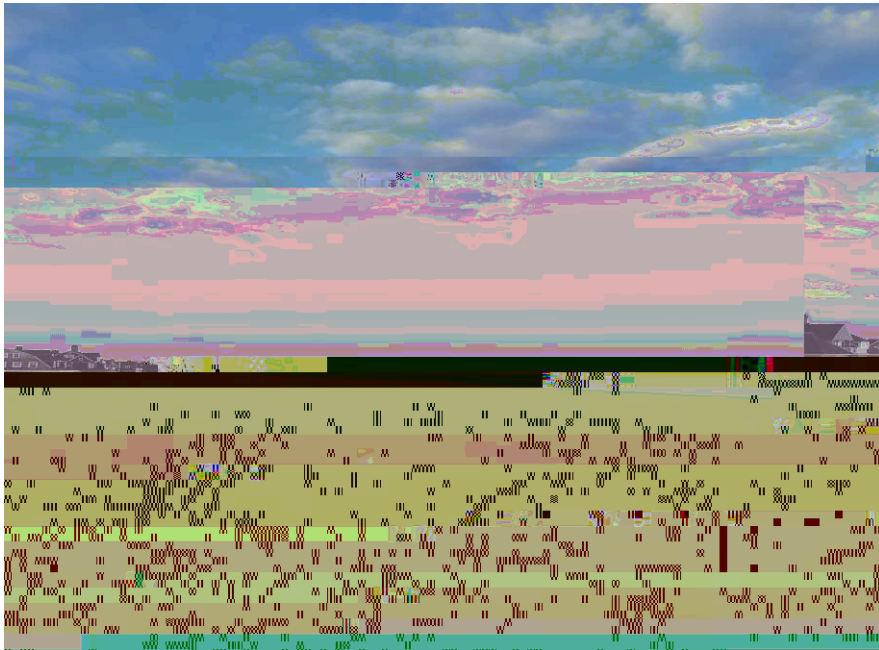
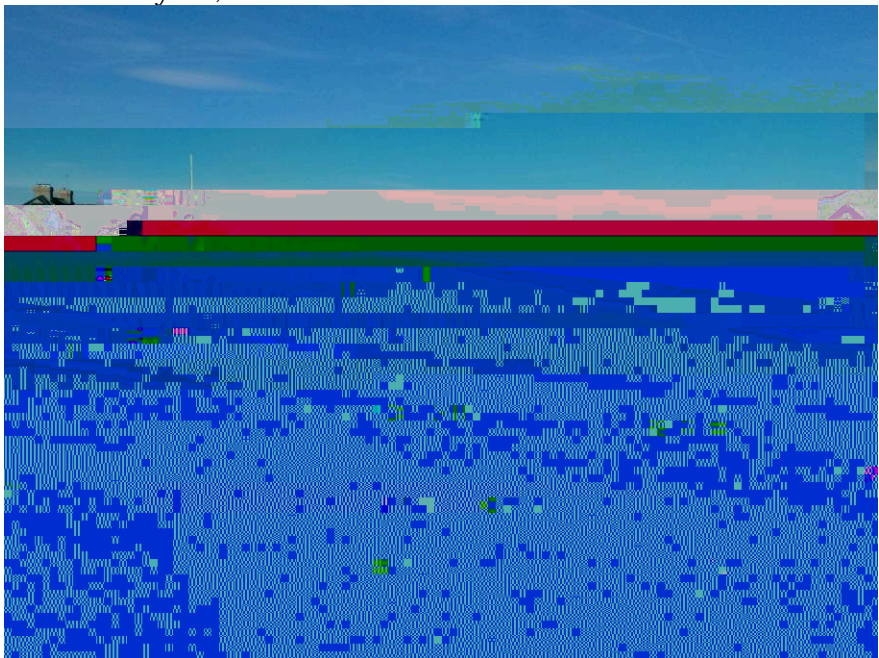


Figure 3d: The pre-federal project dune and b



4a. January 19, 2018



4c. January 19, 2018



4b. April 12, 2017

Mant-4 Photographs 4a to 4c. All views are to the north from essentially the same location at Princeton Avenue.

Photograph 4a The Federal shore protection project, completed here by January 19, 2018, added a massive quantity of sand to this site that extended seaward to the profile limits. The dune more than doubled in size and beach width expanded seaward several hundred feet.

Photograph 4b By July 25, 2019 the grass had been planted and fencing installed. The situation did adjust considerably between the two dates 18 months apart in spite of the project reaching this location first.

Photograph 4c The public access pathway was complete by November 4, 2019 with fencing and handicap access rebuilt.

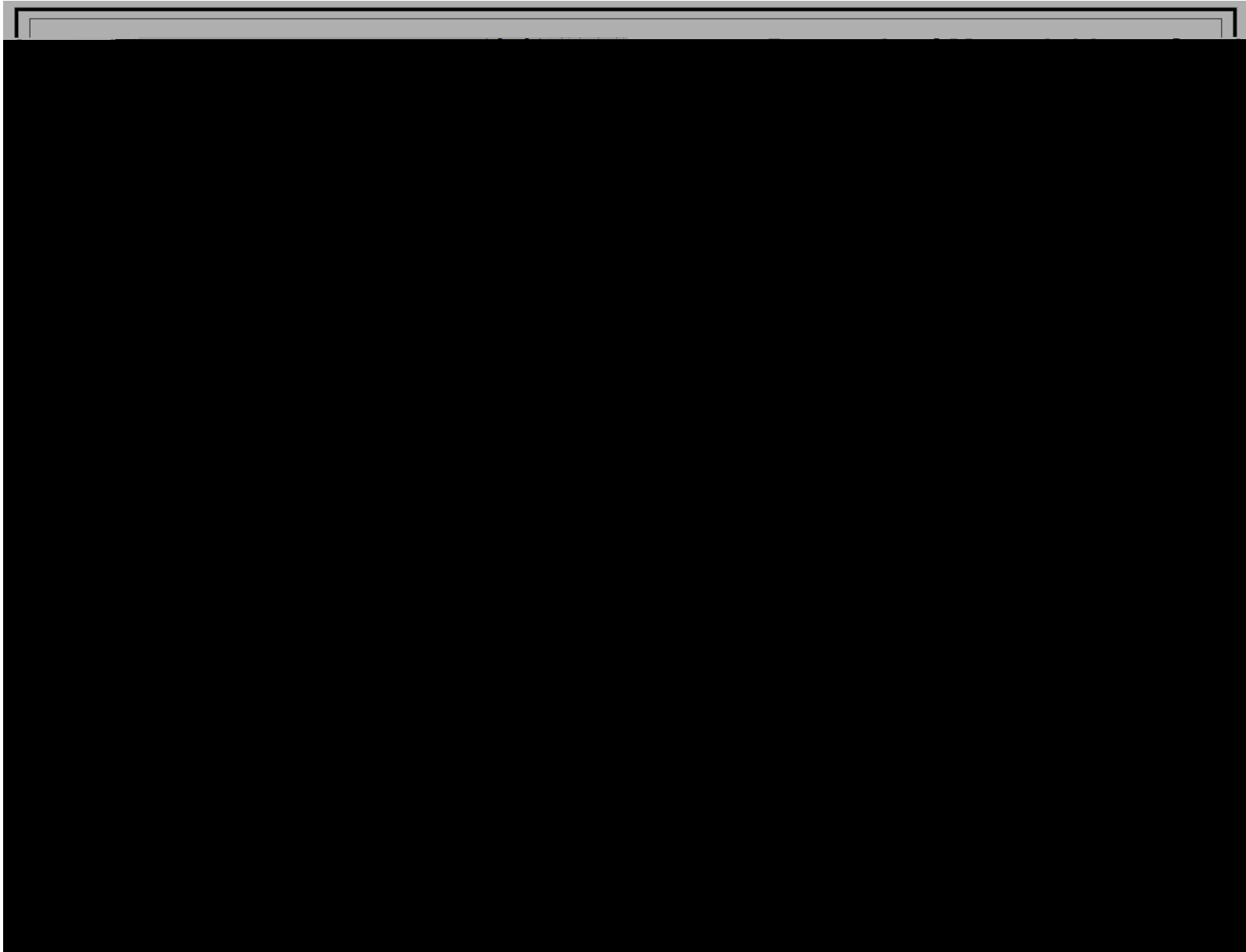


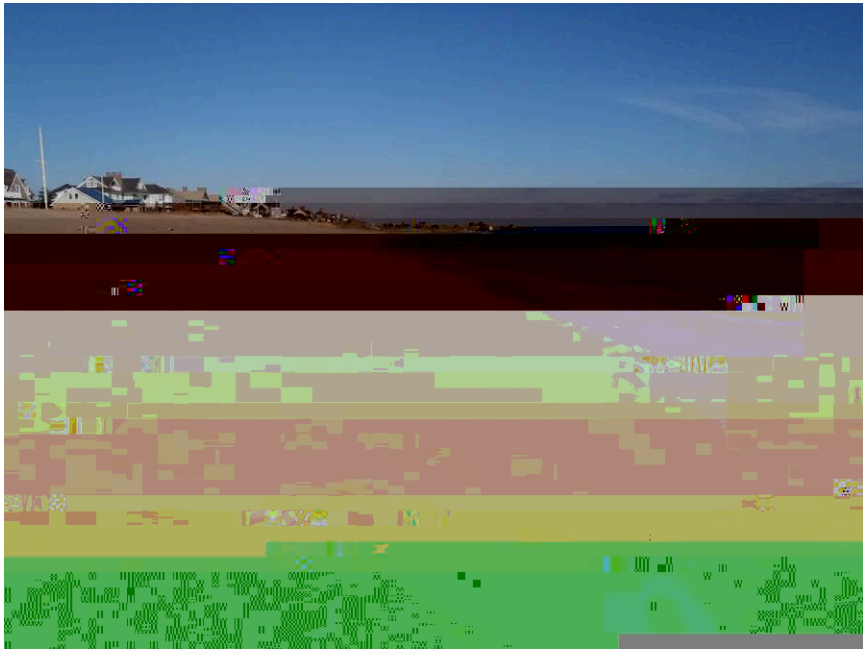
Figure 4d: The April 2017 survey shows the original Princeton Avenue dune with the January 2018 survey providing an early as-built condition view. Since then the dune has been planted and fenced. The beach accumulated sand at the dune toe and a significant bar formed offshore. The January 2018 beach extent diminished as the

- Mant-51 #1543 Ocean Avenue

This monitoring site was initially located on private property between the homes at #1547 and #1549 Ocean Avenue. Because of its proximity to the border with Brick Township, this location became the southernmost site for the Borough monitoring program. During 2005, new property owners limited accessibility to the private property and site resulting in the site relocation to the public access pathway between #1543 and #1539 Ocean Avenue. The shift in the line's location was 202 feet to the north.

Prior to the USACE project, the dune system along the southern 1,500 feet of Mantoloking is the widest and highest in the municipality. Homes are set back to the natural toe of the back slope of the dune. In November 2010, the dune was 180 feet wide at the toe and 90 feet along the crest with an elevation of 23 feet NAVD 88. Super storm Sandy's surge and waves rapidly eroded the narrow beach and cut away over half the dune but the dune elevation at the landward erosional scarp remained above 20 feet and prevented overwash, breaching and oceanfront property damage.

The 2011 SUD-13 approximately the same main



5a. December 21, 2017

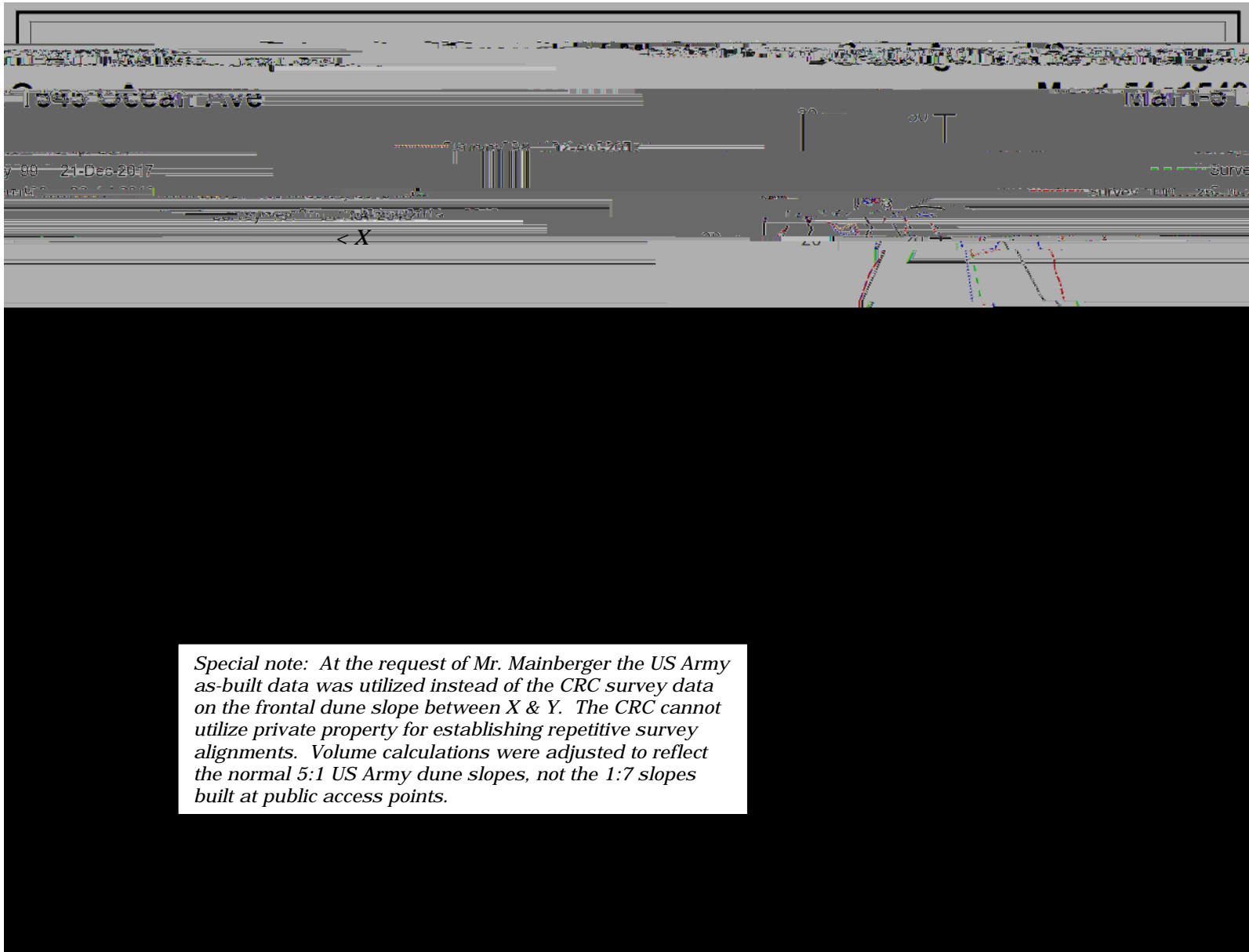


Figure 5d: The southern site did not see dune breaching during Sandy because of the greater width of the feature. The new federal dune expanded that profile substantially seaward. The beach accumulated an elevated berm by November 2019, with very few changes offshore.

Conclusions:

The 2017 Mantoloking annual report showed an initial gain in the municipal sand supply between April 2017 and December 2017 with the addition of 595,206 cubic yards of sand, derived from the USACE project start up. Sand placement started near Princeton Avenue and worked north including 1117 Ocean Avenue (Mant-3). The placement venue moved south and commenced in more vulnerable areas of Northern Ocean County, working north until again reaching Mantoloking in late 2018. The 3 sites not influenced by the project as of December 2017 (Mant-1, Mant-2 and Mant-51) showed typical long-term pre-construction patterns with modest sand volume and shoreline position changes.

By July of 2019, with everything in place the entire CRC post December 2017 comparisons yielded 1,558,043 cubic yards of new material. However, that volume should be added to the 595,206 cubic yards the CRC reported having been placed as of late 2017. The final placement sand volume thus amounts to 2,153,249 cubic yards based on the five CRC Mantoloking Borough cross sections. The USACE as-built data yields a larger number*2,571,591cy (+418,342 cy more than determined from the 5 Mantoloking survey locations). The CRC numbers cannot include the multiple months between work completed as of the CRC December 2017 fall survey, the winter of 2018 erosion, followed by USACE return to pump the remainder of the Borough beachfront and continue into Bay Head, finishing in 2019. The pending fall 2020 survey data would directly compare to the fall 2019 information yielding changes to the existing oceanfront conditions between 2019 and 2020.

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southern two. Sand will affect both Manasquan and Barnegat Inlet navigation, requiring more frequent dredging, but that material has been transferred back to the