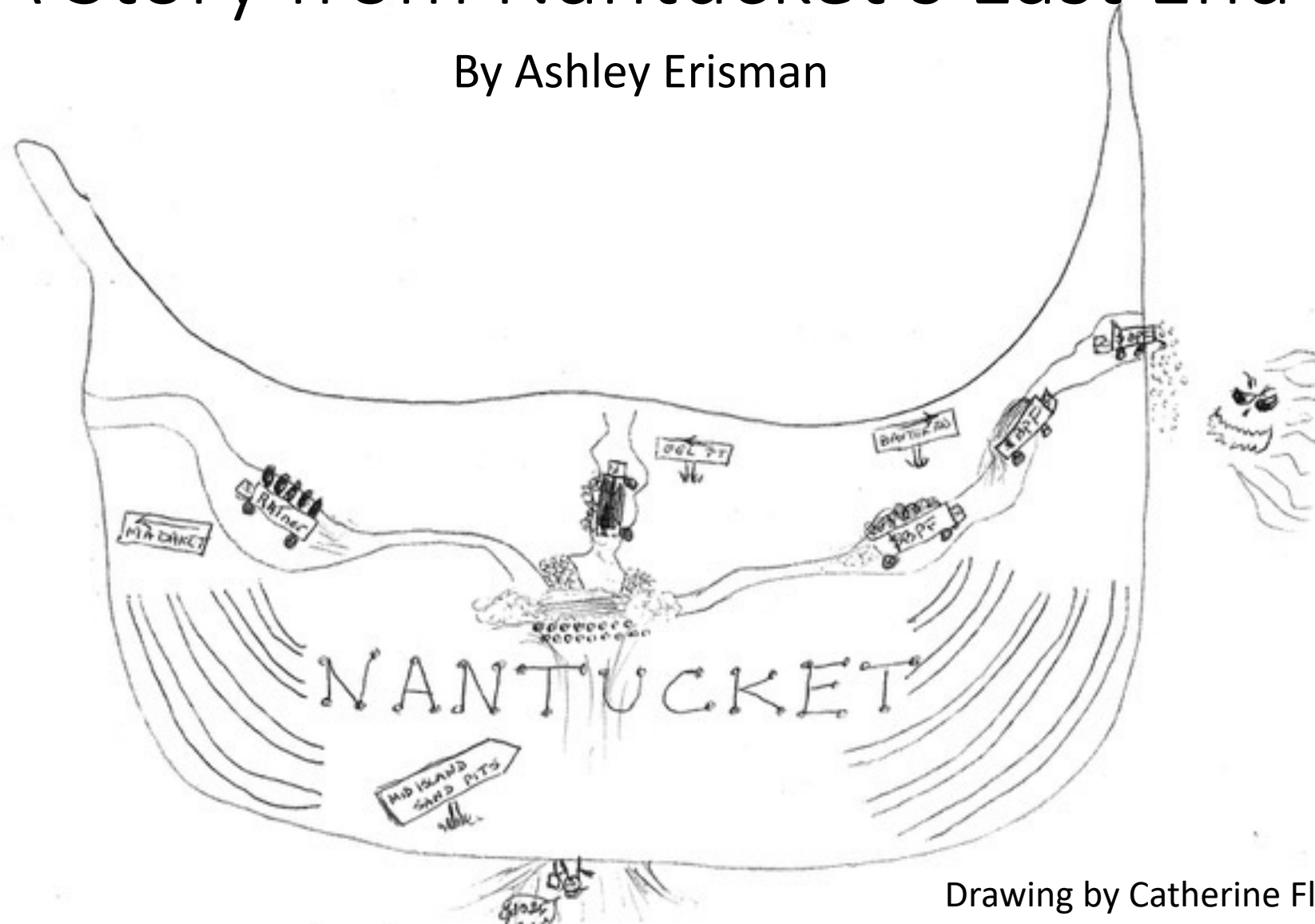


Sacrificial Sand and Bluff Protection: A Story from Nantucket's East End

By Ashley Erisman

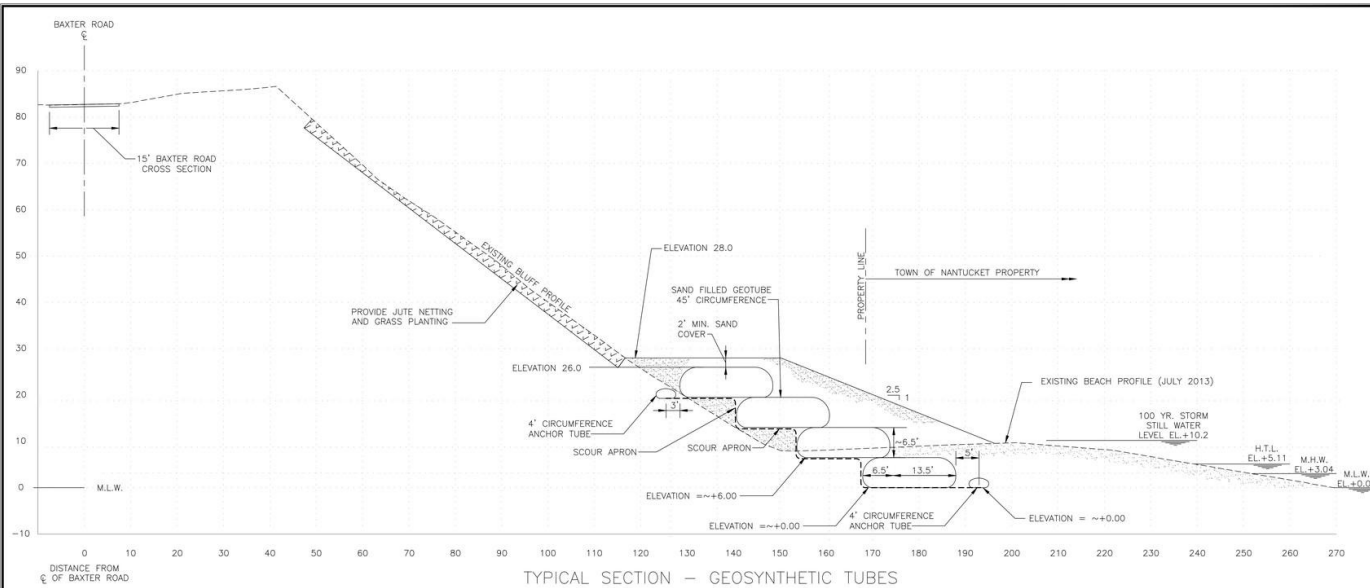


Drawing by Catherine Flanagan Stover 2014

Erosion and Emergencies in 2013

- The Siasconset Bluff is located on the east end of Nantucket. Heights average around 80 feet, and erosion is about one to four feet per year.
- A variety of efforts spanning decades have taken place attempting to slow erosion.
- In the spring of 2013 after a particularly aggressive storm season the Town of Nantucket agreed to partner with the Siasconset Beach Preservation Fund (SBPF) to fight erosion. The groups eventually agreed to submit a proposal for a geotextile tube array (Memorandum of Understanding Amendments 2).
- On November 26, 2013 SBPF filed for an Emergency Certification to protect the most critical 900 feet of bluff with a four tiered geotextile tube structure (Weiss 1). Ultimately a three tiered structure was permitted through Emergency Certification processes.

Geotextile Tube Cross Section and As-built



GENERAL NOTES

- THIS GEOTEXTILE TUBE SLOPE PROTECTION IS SUBMITTED FOR TEMPORARY SHORT-TERM STABILIZATION OF THE BLUFF ENVIRONMENT AND IS NOT INTENDED TO BE INSTALLED AS A PERMANENT STRUCTURE.
- ALL ELEVATIONS ARE BASED ON MEAN LOW WATER DATUM (M.L.W.=0.0').
- GEOTEXTILE TUBES SHALL OVERLAP IN STEPPED LAYERS WITH THE WIDTH OVERLAPPED TO PROVIDE AN EFFECTIVE SLOPE OF 2:1.
- SLOPE OF GEOTEXTILE TUBE STACK SHALL NOT BE STEEPER THAN 1:2.
- GEOTEXTILE TUBE FABRIC SHALL BE MACCAFERRI MACTUBE OS 500, OR APPROVED EQUAL, WITH EITHER A COMPOSITE OR SHOULD ATTACHED TO THE TOP OF THE GEOTEXTILE TUBE WHERE EXPOSED TO ELEMENTS.
- SCOUR APRON SHALL BE APPROXIMATELY 60' WIDE SO AS TO EXTEND ALONG THE BOTTOM CONTOUR OF STACKED GEOTEXTILE TUBE CONFIGURATION.
- SAND BACKFILL SHALL BE PLACED IN 12" LIFTS AND COMPACTED PRIOR TO PLACEMENT OF UPPER GEOTEXTILE TUBE LAYER, SO AS TO PROVIDE A FLAT STABLE BENCH FOUNDATION FOR THE GEOTEXTILE TUBE INSTALLATION.
- CONTRACTOR SHALL UTILIZE CONSTRUCTION TECHNIQUES WHICH ELIMINATE THE POSSIBILITY OF RIPPING/PUNCTURING GEOTEXTILE TUBE SYSTEM.

FOR PERMITTING PURPOSES ONLY

MILONE & MACBROOM
 Civil Engineers and Surveyors
 One Front Street, Suite 100
 Nantucket, Massachusetts 01903
 Phone: 508-548-1111
 www.miloneandmacbroom.com

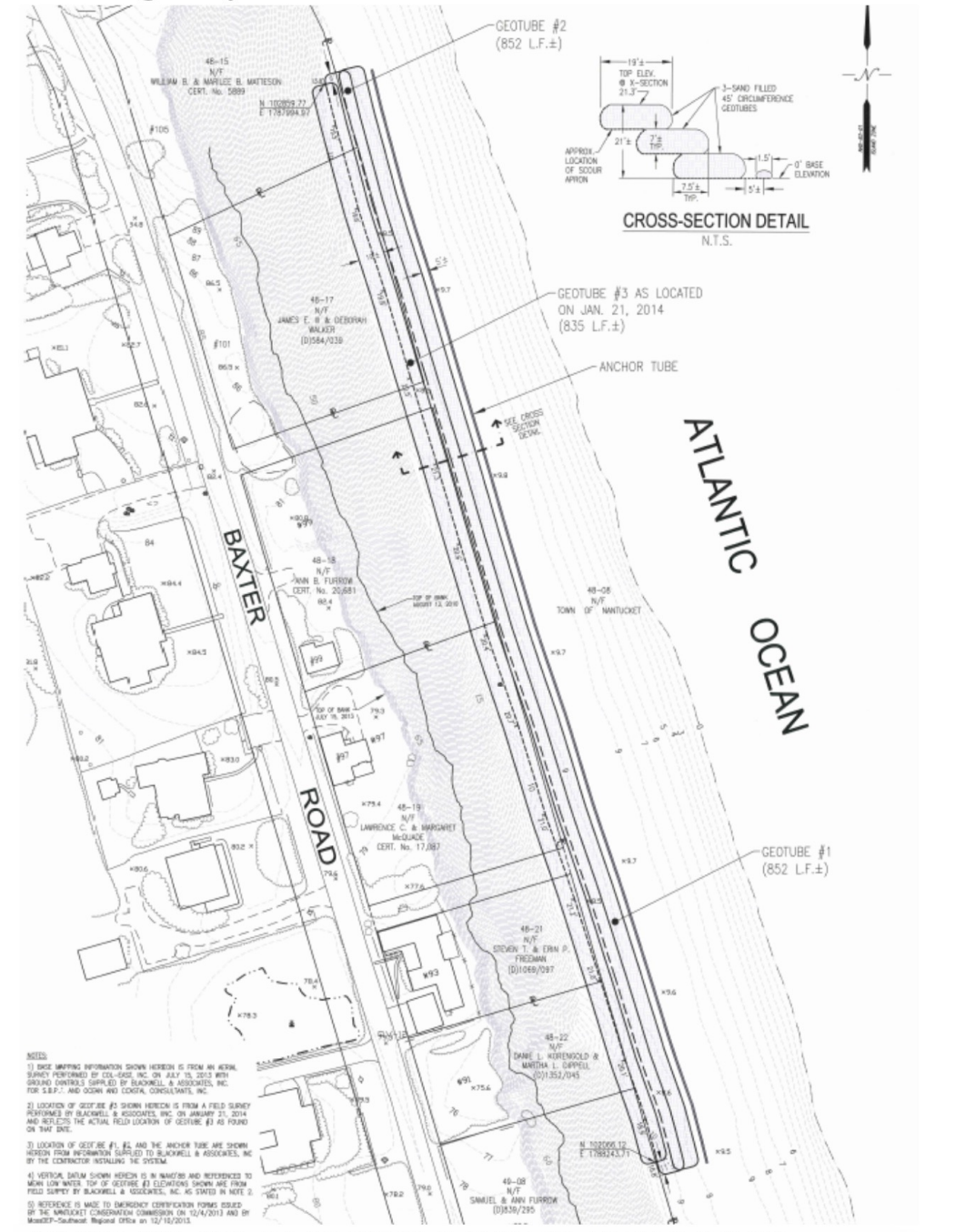
DESCRIPTION	DATE

TYPICAL CROSS SECTION - TEMPORARY SLOPE STABILIZATION
BAXTER ROAD SLOPE STABILIZATION
 NANTUCKET, MASSACHUSETTS

RSD: SMW
 HOR: 1" = 20'
 VERT: 1" = 20'
 OCT. 25, 2013

2987-11
 4 OF 9
TYP

Emergency Installation of Sand Filled Geotubes



As-built provided by Blackwell & Associates, January 27, 2014. Drawn By: Leo C. Asadoorian.

Geotextile Tube Installation







Project Statistics



- Mitigated with 22 cubic yards of sand per linear foot
- Upon completion 39,204.24 cubic yards of sand had been delivered
- At \$27 per cubic yard* that cost roughly \$1,058,514.48 (Cohen 42-43)
- 1,782 dump truck loads (an average load is 22 cubic yards)
- The project was privately funded by SBPF and cost roughly \$3 million (Patel 3)

*2013 Pricing

Upgrades, Returns, and Continued Construction







“A LOT OF PEOPLE THINK I’M CRAZY” – NANTUCKET HOUSE JUST FEET FROM SCONSET BLUFF SELLS FOR \$899,000

by Jason Graziadei



2018 Geotextile Tube Statistics

- Length 947 linear feet
- Roughly 20, 834 cubic yards of sand per year
- Over 1,000 truck loads required each year
- Increasing sand costs of \$30* per cubic yard
- Total sand mitigation costs \$625,000 per year (Bund 2018)

*2018 Pricing





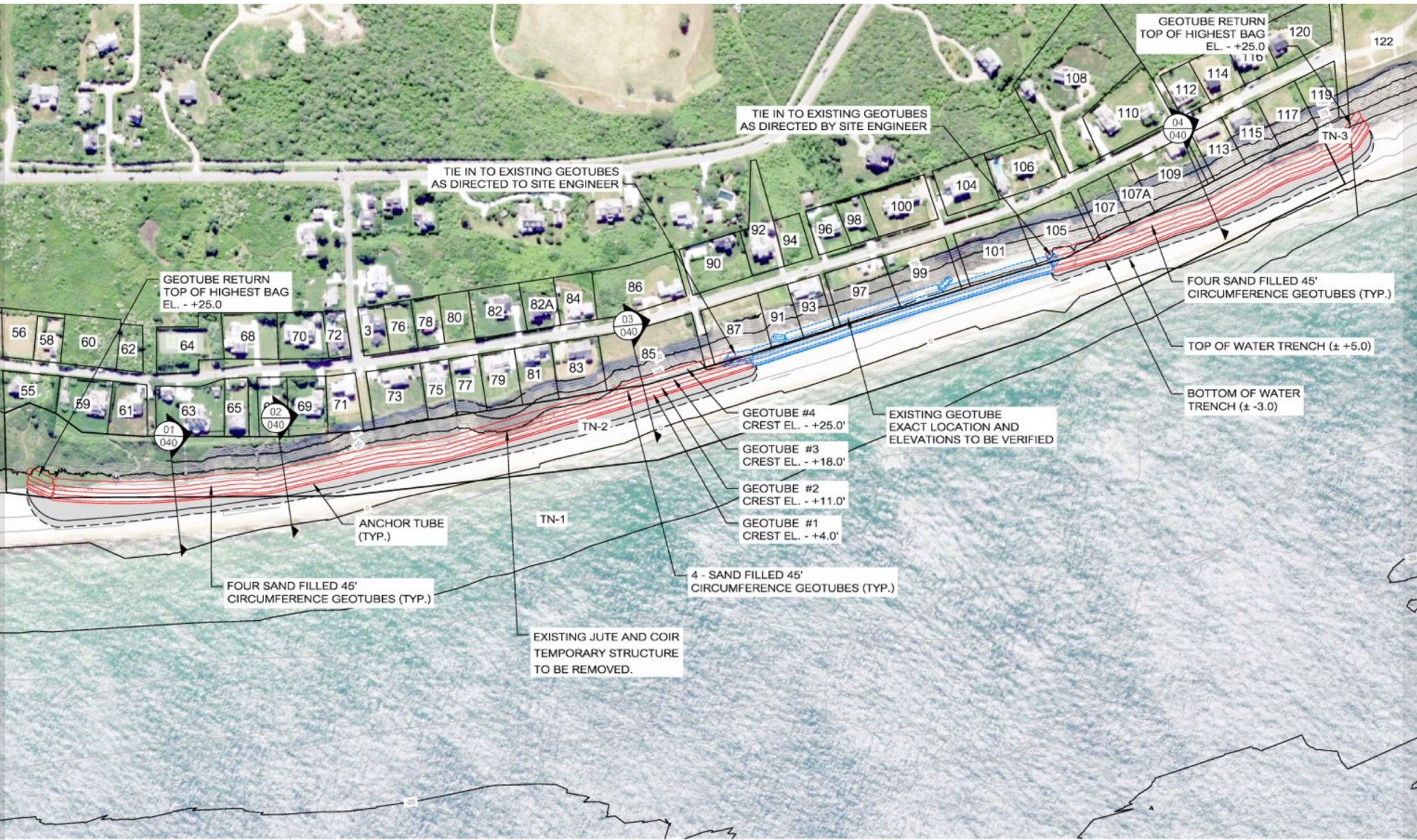
Sacrificial Sand







The Geotextile Tube Expansion Project of 2018



- The proposed project expansion would require at least 83,600 cubic yards of sand per year.
- At the time of this submission the islands two sand pits contained an estimated 400,000-700,000 cubic yards of sand.
- The Island sand pits would have between 4.8-8.4 years of sand remaining if they ONLY supplied the SBPF expansion project (Bund 2018)

<p>GENERAL NOTES</p> <p>CONTIGUOUS ARE DERIVED FROM THE 2017 LIDAR SURVEY AND THE FALL 2016 WOODS HOLE TOPO AND BATHYMETRY SURVEY.</p> <p>ELEVATIONS ARE IN FEET AND ARE REFERENCED TO MLLW 10.</p> <p>OBJECTS TO BE FIELD FIT TO MINIMIZE EXCAVATION.</p>		<p>PREPARED FOR:</p>		<p>PREPARED BY:</p> <p>Baird.</p> <p>W.F. Baird & Associates Ltd.</p>		<p>SCONSET BEACH PRESERVATION FUND</p> <p>PROPOSED PLANVIEW</p>																					
<p>0 125 250 500</p> <p>NORTH</p> <p>GRAPHIC SCALE FEET</p>		<table border="1"> <thead> <tr> <th>REV.</th> <th>T.I.</th> <th>DESCRIPTION</th> <th>BY:</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		REV.	T.I.	DESCRIPTION	BY:	DATE						<table border="1"> <thead> <tr> <th>REV.</th> <th>T.I.</th> <th>DESCRIPTION</th> <th>BY:</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		REV.	T.I.	DESCRIPTION	BY:	DATE						<p>10000 0 1000 2018 01 04</p>	
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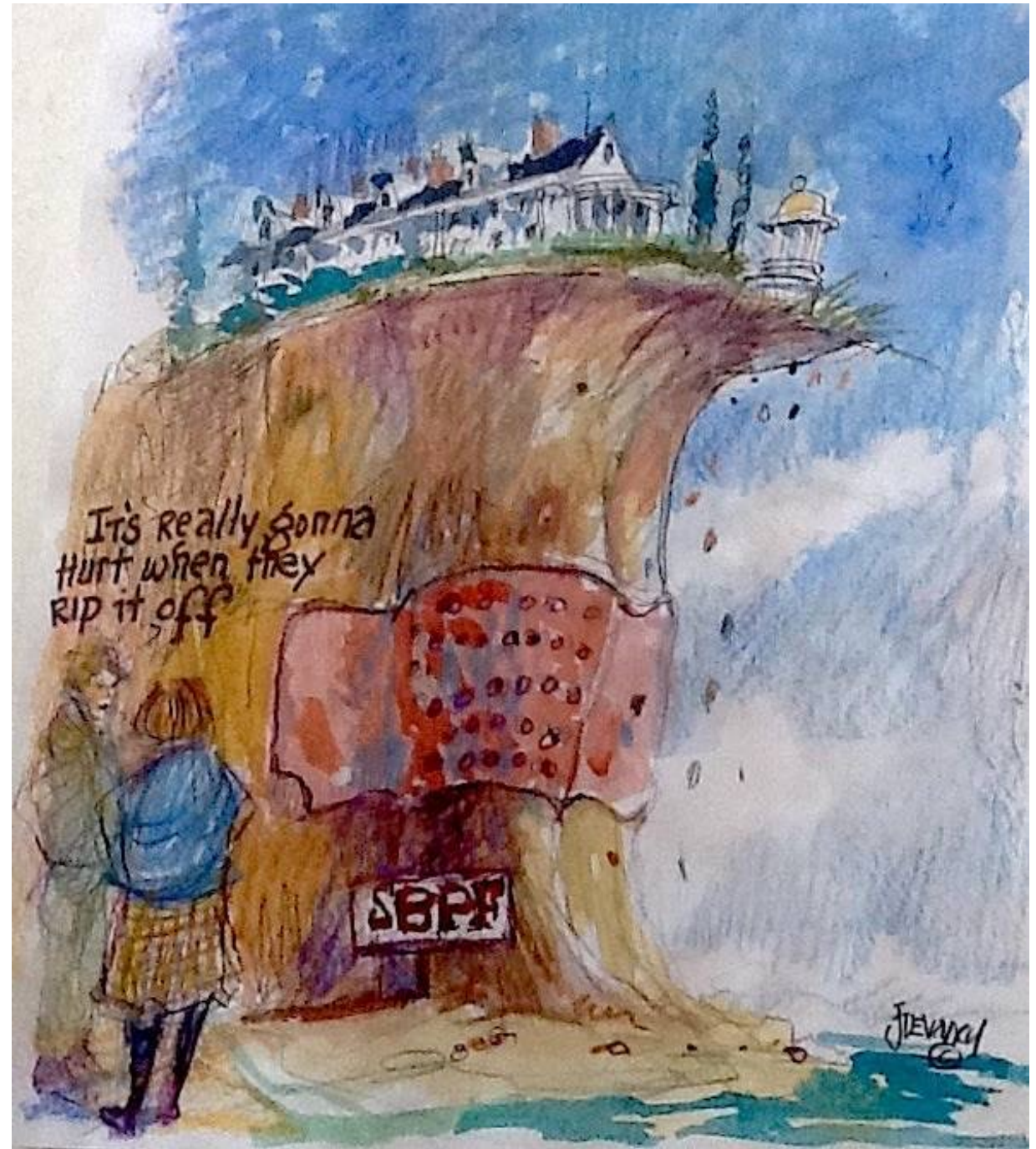
Contaminated Material





2021 Removal Order

- Due to lack of mitigation sand the system was ordered removed in 2021.
- A judge upheld the Conservation Commission removal order in 2022.
- The geotubes remain in place to this day.



Mitigation Volume of Sediment Placed By SBPF

Sand Year	Dates	Required Volume of Mitigation (CY)	Volumes of mitigation sediment provided by SBPF according to 2020 Annual Report (CY)							Total Mitigation Provided (CY)	Annual Surplus/Defecit (CY)	Cumulative Surplus/Defecit (CY)
2014	December 13 - March 14	18,744	23,951							23,951	5,207	5,207
2015	April 14 -March 15	18,744	6,015	4,477	3,936			-2,138		12,290	-6,454	-1,247
2016	April 15 -March 16	20,834	15,085					-2,138		12,947	-7,887	-9,134
2017	April 16 -March 17	20,834	1,230							1,230	-19,604	-28,738
2018	April 17 -March 18	20,834	9,320	2,090	2,499	40		5,506		19,455	-1,379	-30,117
2019	April 18 -March 19	20,834	2,606	2,204	3,156	4,120		2,683		14,769	-6,065	-36,182
2020	April 19 -March 20	20,834	5,400	4,266	1,506					11,172	-9,662	-45,844
2021	April 20 -March 21	20,834	1,350	1,800	5,454	2,052				10,656	-10,178	-56,022
2022	April 21 -March 22	20,834	0							0	-20,834	-76,856
2023	April 22 -March 23	20,834	0							0	-20,834	-97,690
2024	April 23 -March 24*	20,834	0							0	-20,834	-118,524
2025	April 24 -March 25**	0	0							0	0	-118,524
									Total	106,470	CY	-118,524

* volume of sediment placed has not been submitted to the Conservation Commission

** Partial Sand Year

CY=Cubic Yard(s)

Chart by RJ Turcotte

WHAT THE DATA TELLS US...

Woods Hole Group (WHG) monitoring data shows some significant changes that correlate with the presence of the geotubes. Whether these are *caused* by the geotubes, or are purely coincidental, the following changes are clearly evident:

1 ACCELERATED EROSION AT & NORTH OF THE GEOTUBES



*In front of and to the north of the geotubes, the long term net erosion rate has **tripled** from the pre-geotube rate.**

2 NARROWING BEACH IN FRONT OF THE GEOTUBES



*In front of the geotubes, the walkable beach has narrowed by approximately **-57%** in the 7 years after they were installed.**

3 BLUFF BASE EROSION JUST NORTH OF THE GEOTUBES



*The toe of the bluff at the north end of the geotubes has **receded roughly -24'** since the geotubes were installed.**

Graphic by Doug Rose

As Town & SBPF Pursue Expansion Of Geotubes, Tons Of Sand Barged To Island For Existing Project

Jason Graziadei • Feb 12, 2024



Graphic from Nantucket Current



Photo by Kit Noble

According to the Nantucket Current:

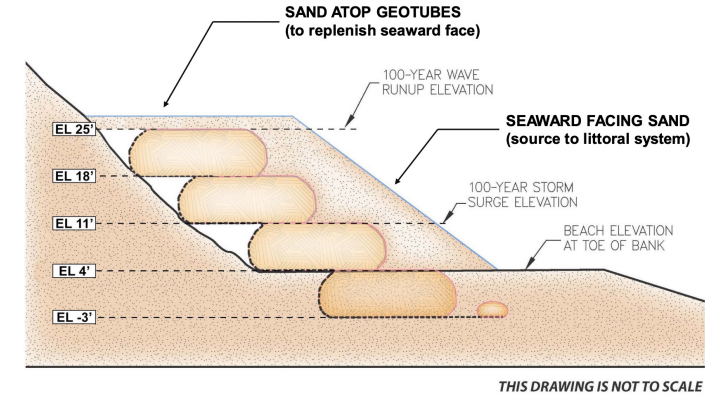
- *3,300 tons (6.6 million pounds) of sand was delivered via barges in early February 2024.
- *The template material originated from Plymouth, MA.
- *The sand was loaded into trucks and driven to New Bedford where it was loaded onto three barges and towed to Nantucket. (Graziadei 2024)

Trucked and Delivered



Photo by Peter Sutters

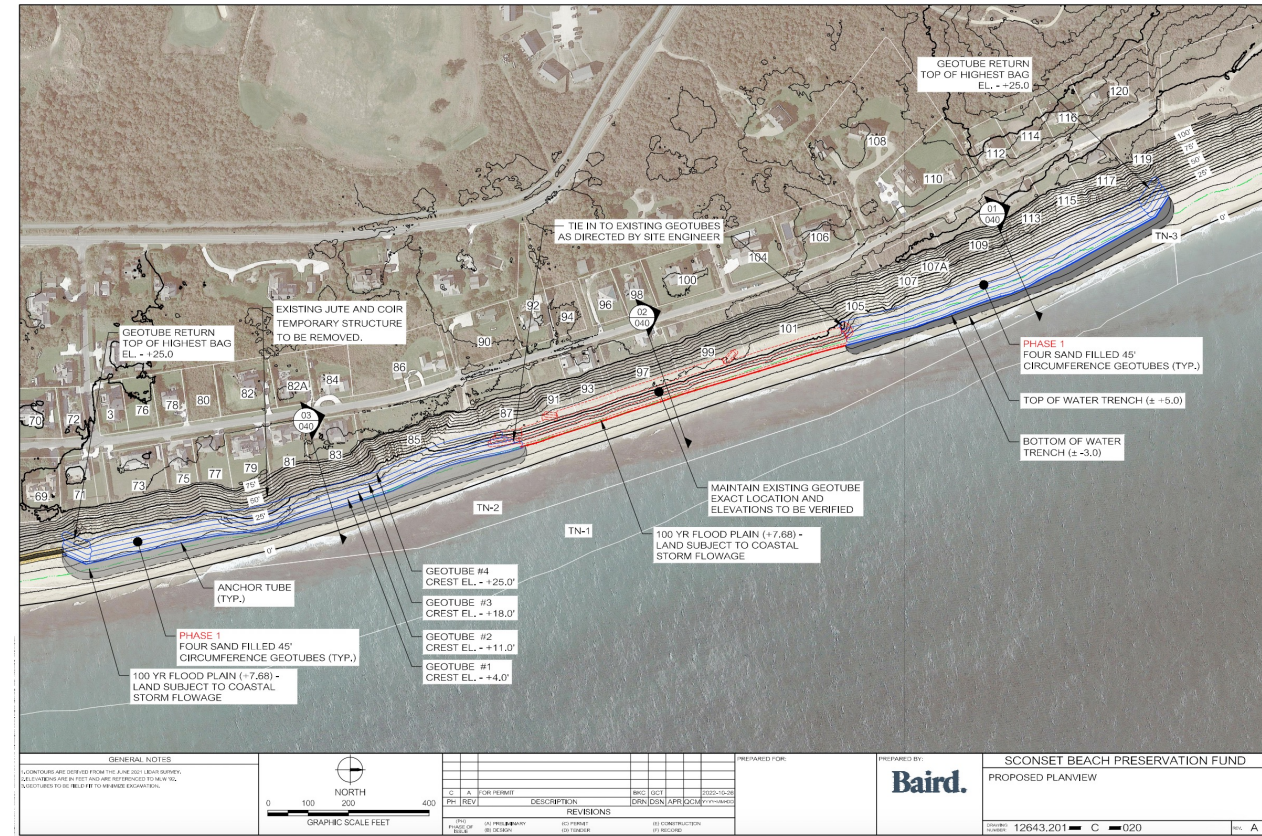
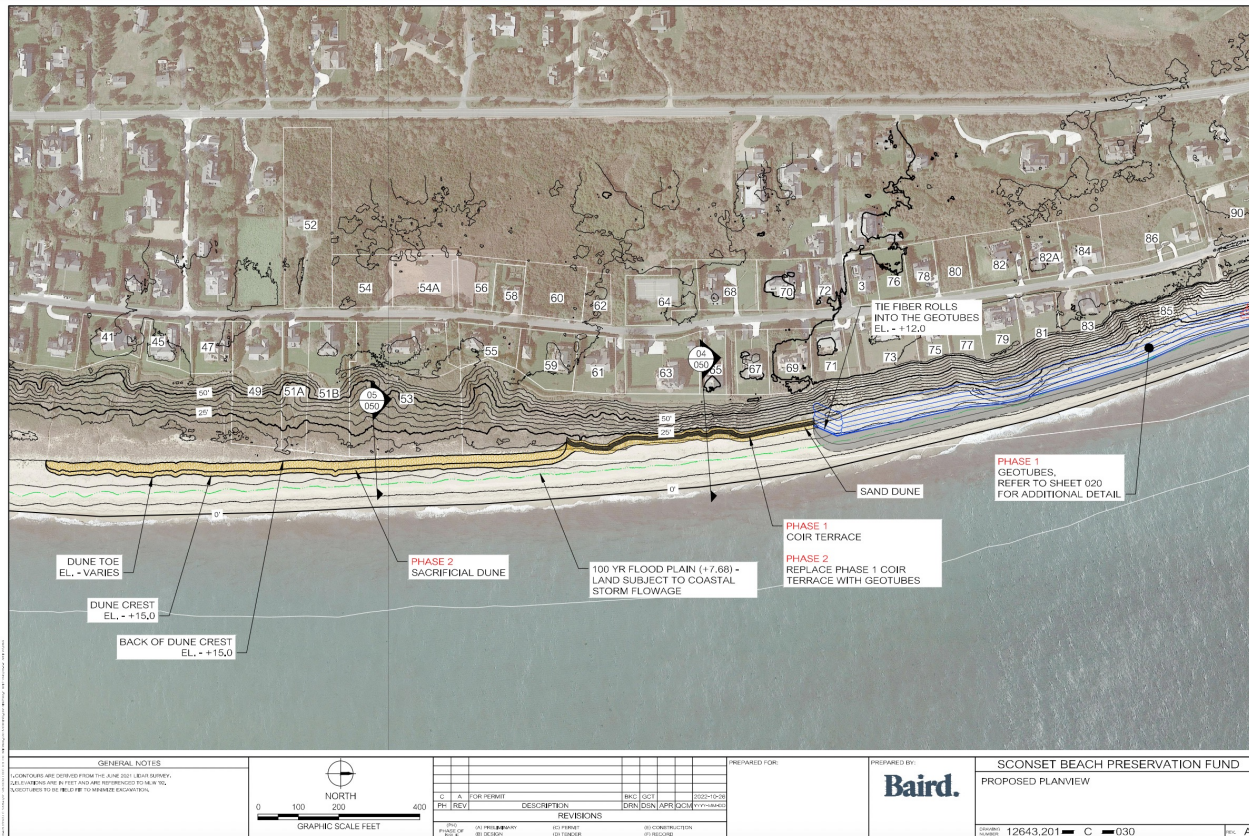
Geotextile Tube Expansion (continued...)



Baxter Road & Sconset Bluff Stabilization and Coastal Resiliency Project Nantucket, MA



Figure 14
Basis of Coastal Engineering Design



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