

North Nantasket Beach Resilience

Dune Restoration Project Adjacent to 27-53 Beach Avenue
Town of Hull, MA



Tonight's Action Plan



1. Presentation re: Nantasket Beach dune resilience at 6:30 on 4/28/2022 at the Select Board Room, Town Hall

- The path so far
- Project Overview
- North Nantasket Beach Flood Risk
- Benefits of a Resilient Continuous Dune

3. Open Discussion; Feedback and Questions

4. Next Steps

- MEPA ENF Filed 4/27/2022
- Notice in Hull Times
- NOI filing & Hearing – attendance & comments encouraged

Project Partners



Massachusetts Office of
Coastal Zone Management



WOODS HOLE 
GROUP
A CLS COMPANY

Thank you to the **Massachusetts Office of Coastal Zone Management** for funding this important project!

FEMA Insurance & Community Rating System

Hull has the **3rd highest number of repetitive loss** claims in the state.

Over **1/3 of Hull's claims are along Nantasket Beach** and on the nearby streets from Phipps to X Street.

These claims are **concentrated in low-lying areas where flood and rain water accumulates** adjacent to where the dune is not well established.



Improving the dune helps the Town **maintain credit points** it receives towards a 15% savings on increasing flood insurance rates

Progress on Dune Management and Resiliency

The Path So Far...

2015

Climate Change Vulnerability Assessment & Adaptation Plan;
Selectmen vote to close non-permitted openings when they are reported

2019

Municipal Vulnerability Preparedness (MVP) Workshop

2019

Beach Access Plan accepted by the Conservation Commission

2021

Completed dune restorations and pedestrian access paths at 133-143 Beach Ave. and A Street

2021-2022

Design and permitting for proposed dune restoration and new Town-maintained pedestrian access paths adjacent to 27-53 Beach Ave.

2018

Beach Management Plan accepted by Board of Selectmen

2019

Dune restoration and beach nourishment study

2019-2020

Design and permitting for dune restorations and Town-maintained pedestrian access paths at 133-143 Beach Ave. and A Street

2021

Hazard Mitigation Plan Update

Future Actions

- Construct proposed dune restoration and access paths
- Permitting and sand source identification for beach nourishment

Dangers of a Non-Continuous Dune System

1. Flooding is a danger to life and property
2. Flood damage is costly to private property owners and to the Town
3. Non-permitted dune crossings violate the Wetlands Protection Act
4. Weakening the dune at crossings impacts the entire beach system, its function, sediment supply, and ecological systems.

“Simply walking on dunes can also lead to sand-landslides that can destabilize the area,... reduce their natural resistance to erosion and decrease their value as a buffer to storms.”

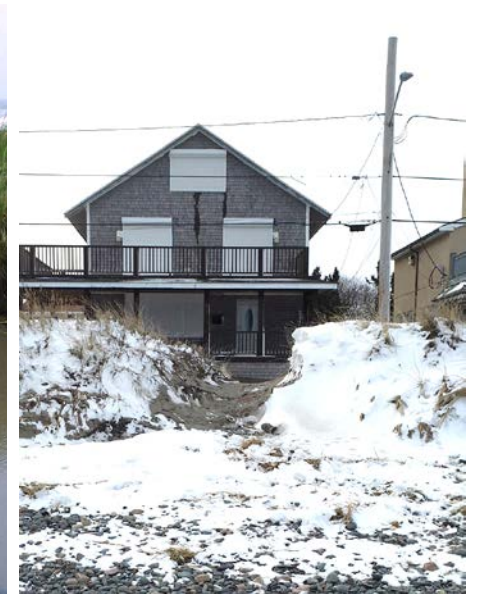
<https://www.mass.gov/service-details/cz-tip-basics-of-building-beach-access-structures-that-protect-dunes-and-banks>

Dune Crossings Affect Coastal Flooding & Damage

Continuous dune with permitted, Town-maintained crossings



Altered dunes, non-permitted crossings



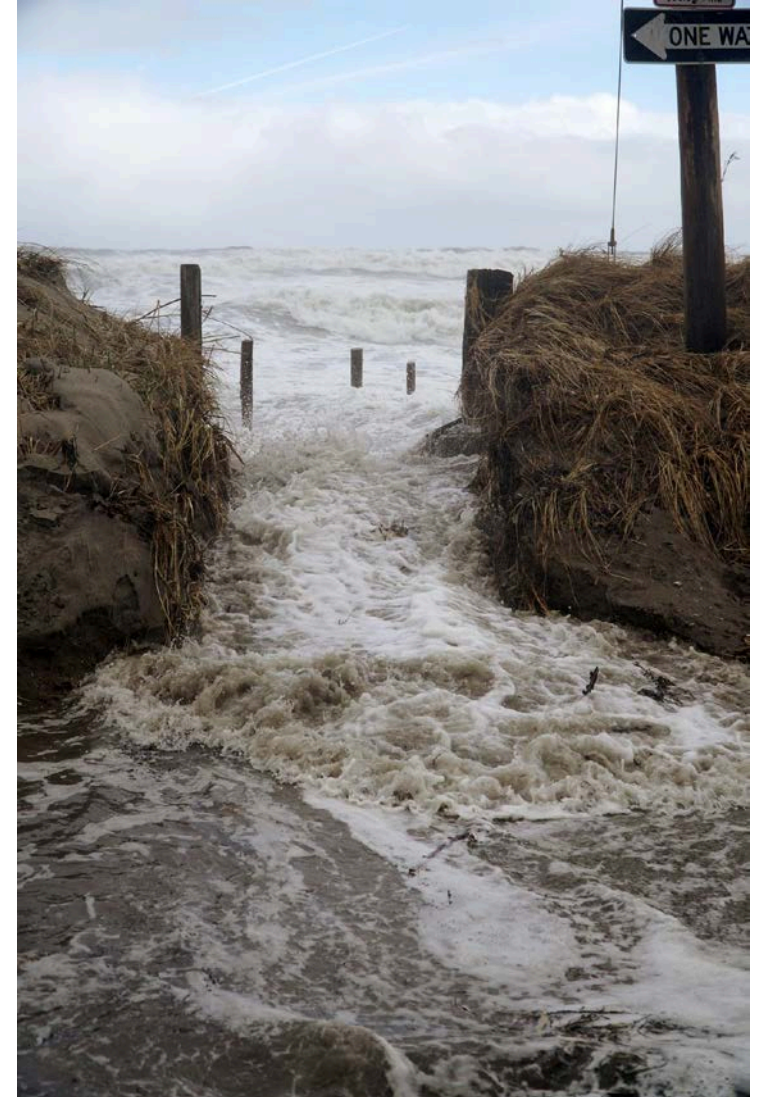
Dune Crossings Affect Coastal Flooding & Damage

Altered dunes, non-permitted crossings



Video of altered dune overtopping

Every crossing is a vulnerability



Post-October 27th Nor'easter

- Note the sand, stones, and seaweed (wrack) in the street



Benefits of a Resilient Continuous Dune System

- 1. Safeguards an environment that is a beautiful recreational area for our residents to enjoy**
- 2. Is a necessary component of a healthy beach**
- 3. Serves as our primary line of defense against increasingly destructive storms**
- 4. Provides flood protection for many families including those who live inland and at lower elevations**

Dune Volume & Protection

The volume of the dune directly impacts the level of protection from coastal storms the dune provides.

Approximate Volume of Dune (cubic yard/linear foot)	Level of Storm Protection (return period)
5	< 5-yr
10	5- to 10-yr
15	10- to 20-yr
20	20- to 25-yr
25	25- to 30-yr
30	30- to 35-yr
35	35- to 40-yr
40	45- to 50-yr
45	> 50-yr

Dune at U Street: 10-yr level of storm protection



Dune at Lewis Street: 50-yr level of storm protection



Dune Restoration at A Street and Beach Avenue

Before Restoration



After Restoration



Dune Restoration at 133-143 Beach Avenue

Before Restoration



After Restoration



Project Goals and Design Approach

- 1. Restore degraded Coastal Dune habitat along the entire ~800 ft length of frontal dune along 27-53 Beach Ave to provide additional flood protection and enhance the resource.**
 - Match the height, width, and slopes of adjacent established sections of dunes.
 - Remove hard structures and features.
 - Avoid changing or encroaching on other habitats (Coastal Beach) or private beach lots.
 - Match nourishment material grain size to the native material.
 - Plant with native salt-tolerant vegetation, primarily Cape American Beach Grass.
- 2. Improve beach access via Town-maintained paths, while discouraging the creation of new unpermitted access paths**
 - Maintain existing permitted beach access path at Malta St.
 - Install two additional paths, one north and one south of Malta St.

Project Location

Primary frontal dune adjacent to 27-53 Beach Ave

- ~800 linear ft
- Within Town owned layout of Beach Ave
- Two large unpermitted concrete patios
- Several unpermitted paths
- Existing dune has more volume and elevation north of Malta St



Lower Beach Ave Patio

- ~60-ft wide gap in dune consists of a concrete patio built seaward of the road and into the coastal dune on Town land (Beach Ave road layout).
- Intent is to remove hard structures (concrete pad & kneewalls) and restore dune volumes, grades, elevations.
- Dune will be planted with native vegetation (e.g. American beach grass).
- Additional pedestrian access path to be established.



Malta St Patio

- ~60 ft wide gap consists of a concrete patio built off of the road and into the coastal dune on Town land.
- Intent is to remove hard structures (firepits & bollards) and restore dune volumes, grades, elevations.
- Dune will be planted with native vegetation (e.g. American beach grass).
- Town will also explore restoring the degraded dune between the two openings.
- Malta St pedestrian access path to be maintained.



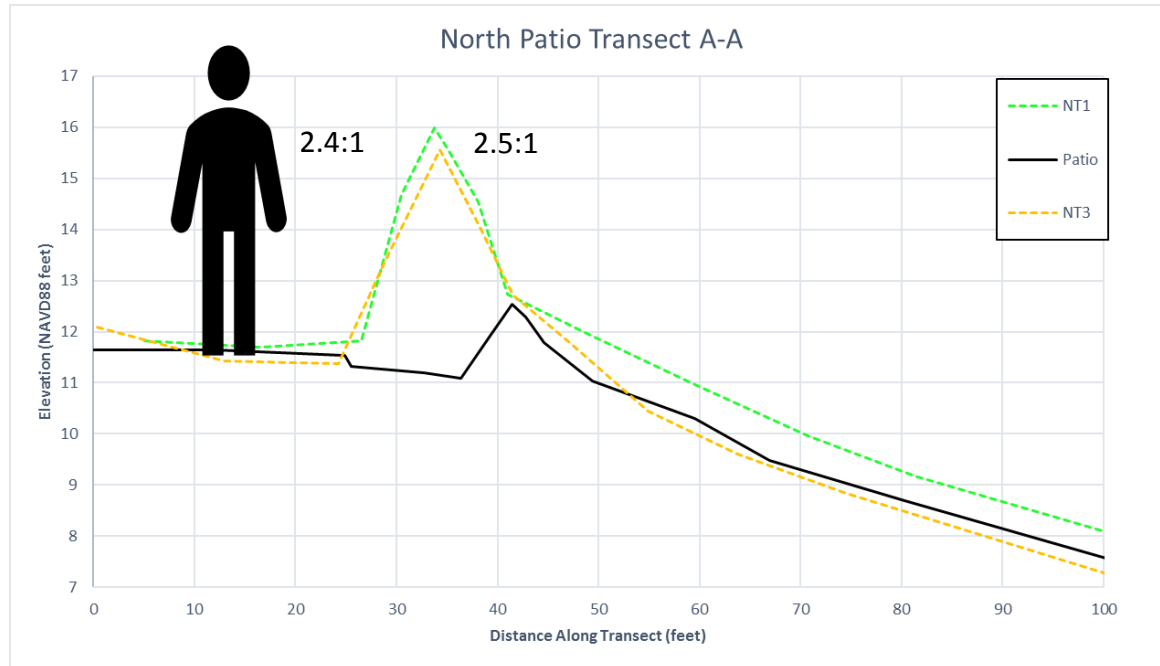
North of Malta St

- 5+ unauthorized footpaths through the dune will be filled
- Dune will be planted with native vegetation (e.g. American beach grass).
- Additional pedestrian access path to be established.



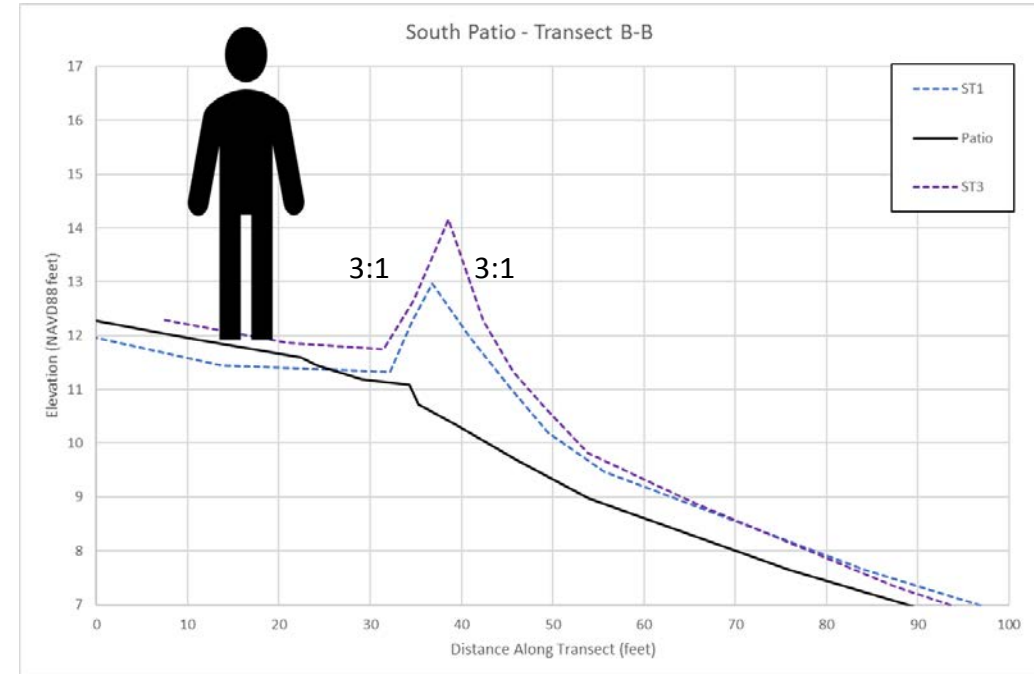
Existing Profile Comparison at Each Patio

Malta St Patio



- Dune Crest of adjacent unaltered dune is el. 15-16' NAVD
- Narrow crest
- Steep slopes ~2.5:1

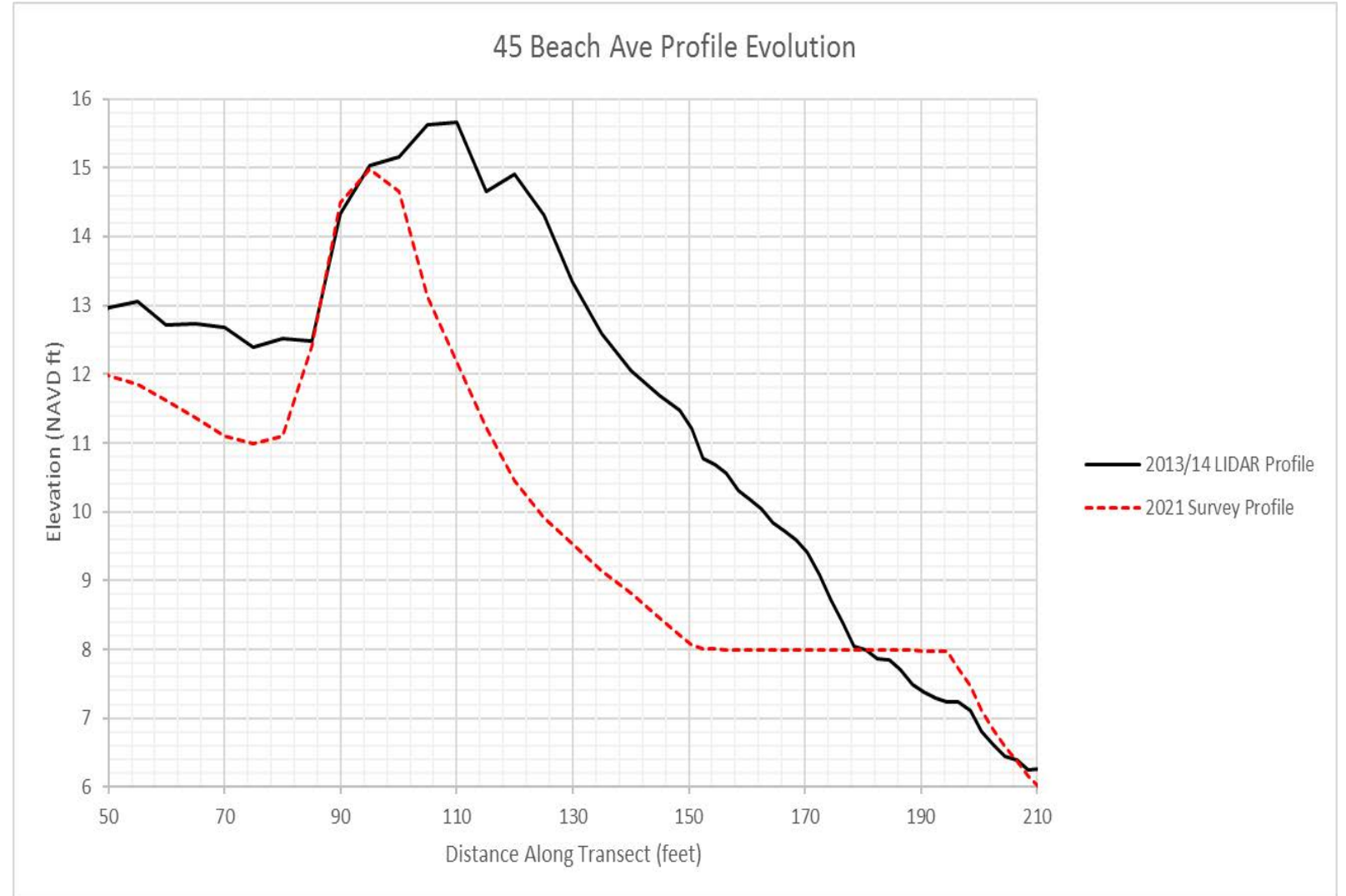
Lower Beach Ave Patio



- Dune Crest of adjacent unaltered dune is el. 13-14' NAVD
- Narrow Crest
- Steep slopes ~3:1; although the crest is 1-3 feet lower in elevation than Malta St

Ongoing Erosion has Reduced Flood Protection

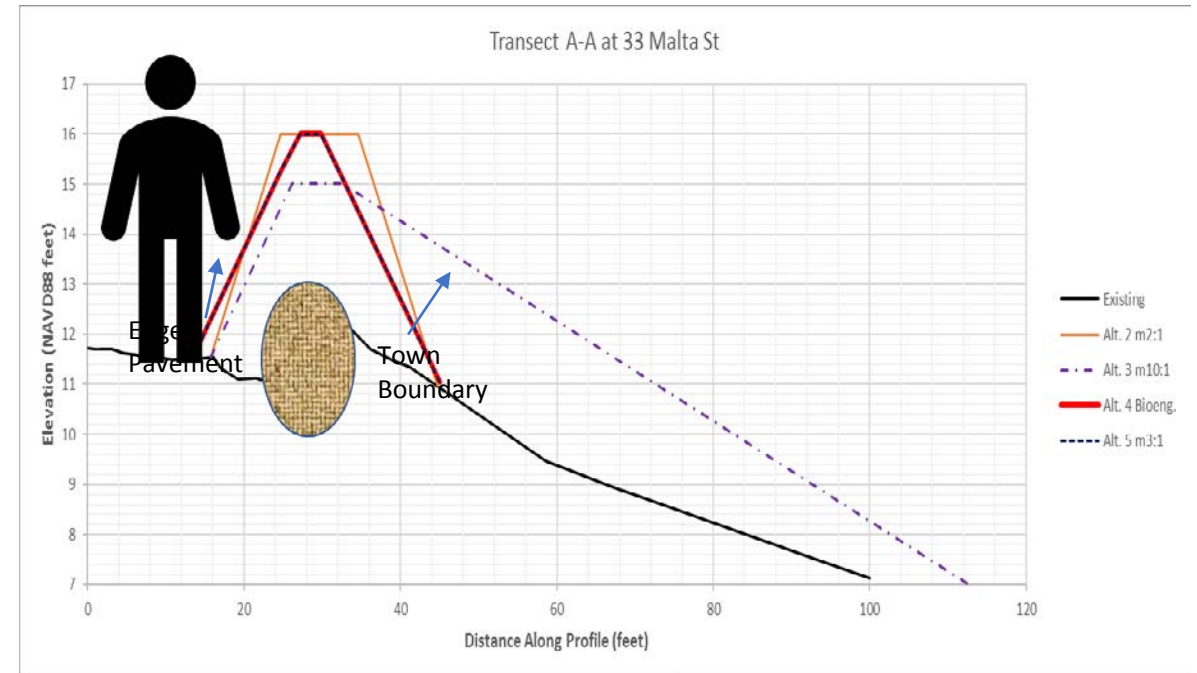
- Comparison of the dune profile at 45 Beach Ave using 2013/14 LiDAR and recent 2021 survey data.
- Note significant beach and dune erosion have occurred in the last 8-9 years that has reduced the 25-yr storm level of protection previously afforded by the dune.



Alternatives Analysis for Dune Design

- Alternatives analysis was conducted looking at a range of dune heights, widths, lengths, and slopes.
- In all, a total of five (5) alternatives were evaluated as part of this analysis including:
 - **Alternative 1 – No Action**
 - **Alternative 2 – Dune Restoration Using 2:1 Slopes within Town Property**
 - **Alternative 3 – Dune Restoration Consistent with NHESP Guidance**
 - **Alternative 4 – Bioengineered Dune within Town Property**
 - **Alternative 5 – Dune Restoration Using 3H:1V Slopes within Town Property and Establishing Additional Pedestrian Access Paths (Preferred Alternative)**
- Note: The base width of the dune is confined to the edge of pavement/NHESP boundary and the Beach Ave Road corridor/seaward (Town) boundary (except for the 10H:1V slope alternative).

Alternatives 1-5 Shown for Transect A-A

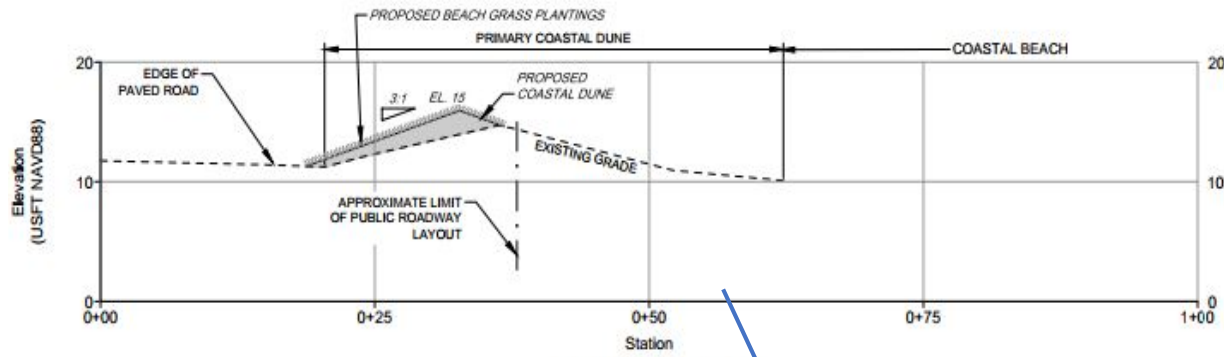


Preferred Dune Design

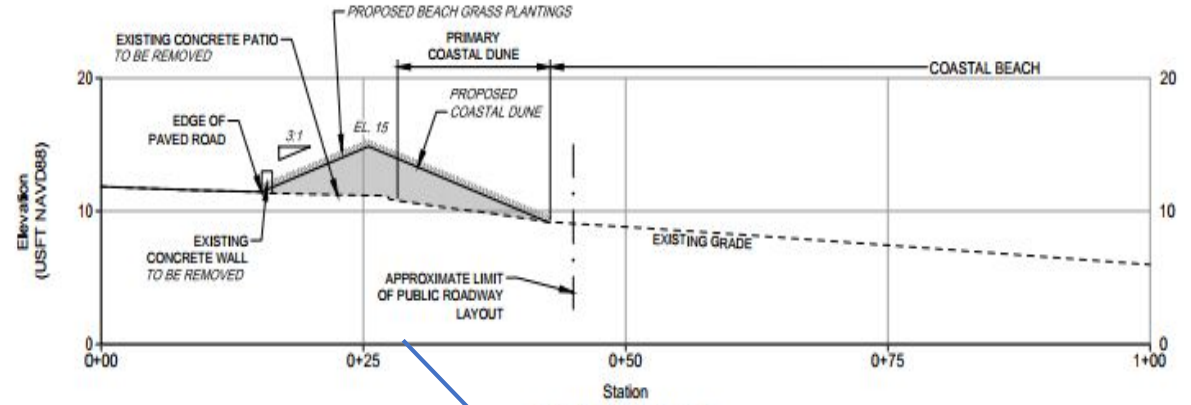
- Dune crest elevation of 15' NAVD at lower Beach Ave and 16' throughout rest of dune.
- Dune crest width 1-4.5 ft with 3H:1V side slopes.
- Project length and area is 828 ft and 20,922 S.F., which will require 830 cubic yards of sand.
- Dune to be planted with native beach grass
- Re-establish the Malta St pedestrian access paths and establish 2 additional ones at 31 and 47 Beach Ave.
- Construction to take place over 1-2 weeks in Fall 2023
- Construction will take place entirely on Town property and the roadway.

Transect	Crest width	Crest Elev.	Side Slopes	Bottom Width	Stable (Y/N)
	ft	ft-NAVD	h:v	ft	
A-A	<1	16	3:1	27.5	Yes
B-B	2.7	14.9		31.7	
C-C	4.5	16		26.6	
D-D	<1	16		18.0	
131-145 Beach Ave (SE35-1485)	8	16	3:1	29	Yes

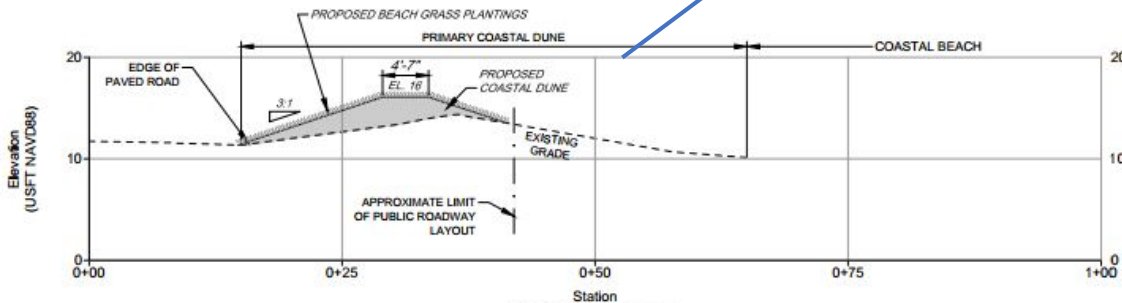
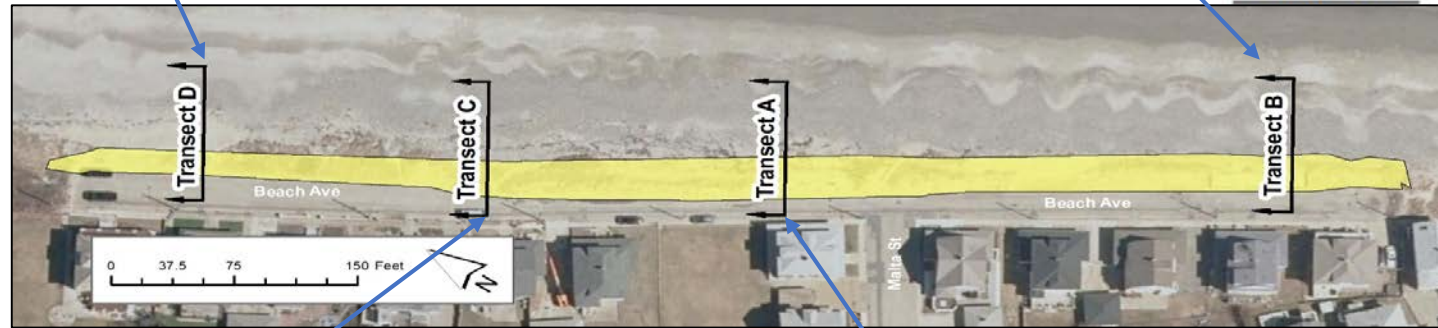
Proposed Dune Restoration Design Cross Sections



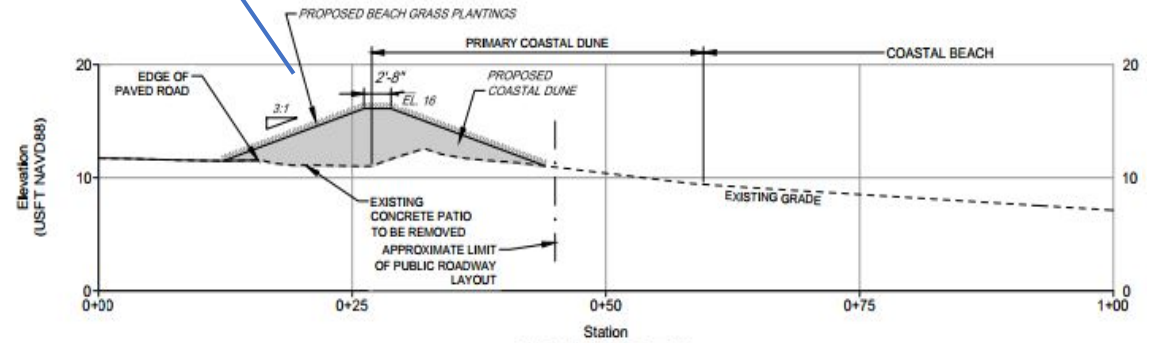
TRANSECT D
SCALE: 1" = 10' HORIZ. & VERT.



TRANSECT B



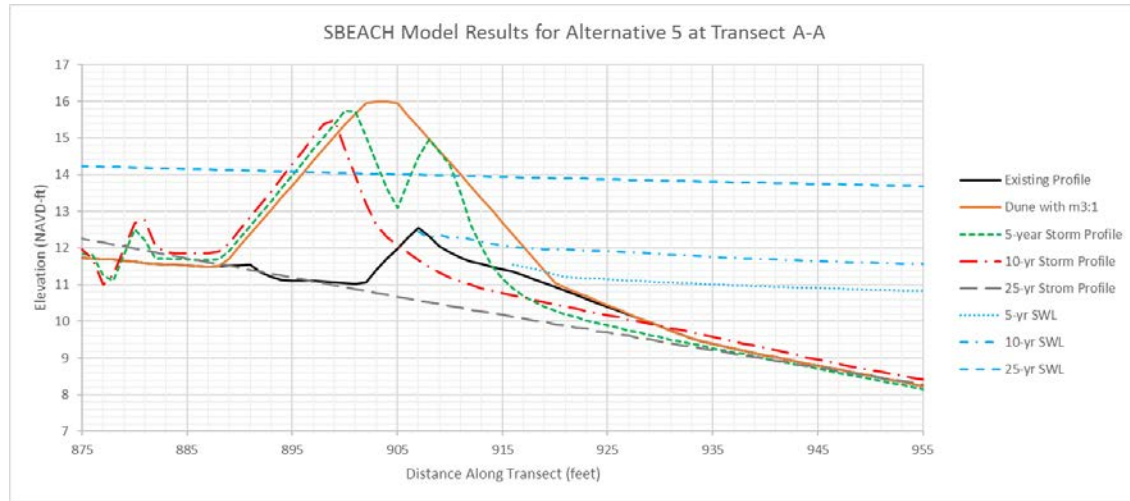
TRANSECT C
SCALE: 1" = 10' HORIZ. & VERT.



TRANSECT A
SCALE: 1" = 10' HORIZ. & VERT.

Proposed Dune Level of Protection

Dune morphological response to simulated storms.



- Transect A-A (Malta St) and B-B (Lower Beach Ave) were simulated versus the 5-yr, 10-yr, and 25-yr storms.
- North of Malta St, the proposed dune at Transect A-A provides storm protection against the 10-yr storm, but is destroyed during the 25-yr storm.
- At lower Beach Ave, the same dune configuration has less height (1-ft) and width (3-ft) than A-A. While it survives the 5-year storm, it is destroyed by the 10-yr storm.
- Alternative provides a 5-10-yr level of storm protection, which is less than the 25-yr storm level that was presented for this section of dune under a prior 2020 Study with Kleinfelder. However, this is still an improvement over existing conditions.

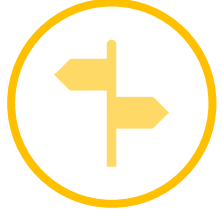
Discussion

- Restoration goal is to match adjacent dune sections of dune using a crest elevation of 15-16' NAVD and 3H:1V side slopes. This will be similar to the dune constructed at 131-145 Beach Ave in 2020, but the crest width will be much less (1-4 ft vs 8 ft wide)
- A crest elevation of 15-16' NAVD is 4-5 ft above the road surface, approximately chest to shoulder height.
- The level of storm protection has decreased from a 25-yr storm in ~2014 to less than a 5-yr storm in the southern end. Proposed project will increase flood protection to a 5-10 yr storm in south and 10yr+ storm in north and close flood pathways.
- Construction only on Town owned property and construction access will be from Malta St. No work from the Coastal Beach. Construction to take 1-2 weeks in the Fall 2023.
- Dune fill will consist of compatible sediment (sand) and be planted with native salt tolerant vegetation (Cape American Beach Grass).
- The authorized beach access path to be re-established at Malta St and two additional paths to be created at 31 and 47 Beach Ave.
- ENF filed with MEPA on 4/27/2022 and will be advertised in the next edition of the Hull Times. An NOI will be filed with the Hull ConCom in May 2022. A public hearing will be held with ConCom to review the NOI and attendance & comments are encouraged.

131-145 Beach Ave Dune constructed in 2020



You Can Help



Use designated Town crossings at street endings, follow new signage & respect closures of non-permitted crossings



Volunteer for annual beach grass planting and cleanups



Do not create new crossings or remove vegetation or sediment (sand, gravel, or cobble stones) from the dune



Communicate your support through the Conservation Commission with letters and public hearing comments

Feedback and Questions

Please submit your feedback and questions to:

Christian Krahforst, Conservation Administrator

Email: conservationemail@town.hull.ma.us

Phone: (781) 925-8102

Fax: (781) 925-8509

Mail: Conservation Department, Town of Hull, 253 Atlantic Avenue, Hull, MA 02045

Thank you!

