Trial by Tide:

Lessons Learned from Planning to Implementation of Nature-based Strategies

Presented by:

Lisa Vickers, Senior Coastal Professional

GEI Consultants

PROJECT APPROACH

Phase One: Planning and Scoping

- Project goals and expectations
- Background Data Collection
- Site Assessments

Phase Two: Design

- System-Scale Approach
- Translating Phase One Findings

Phase Three: Stakeholder and Permitting

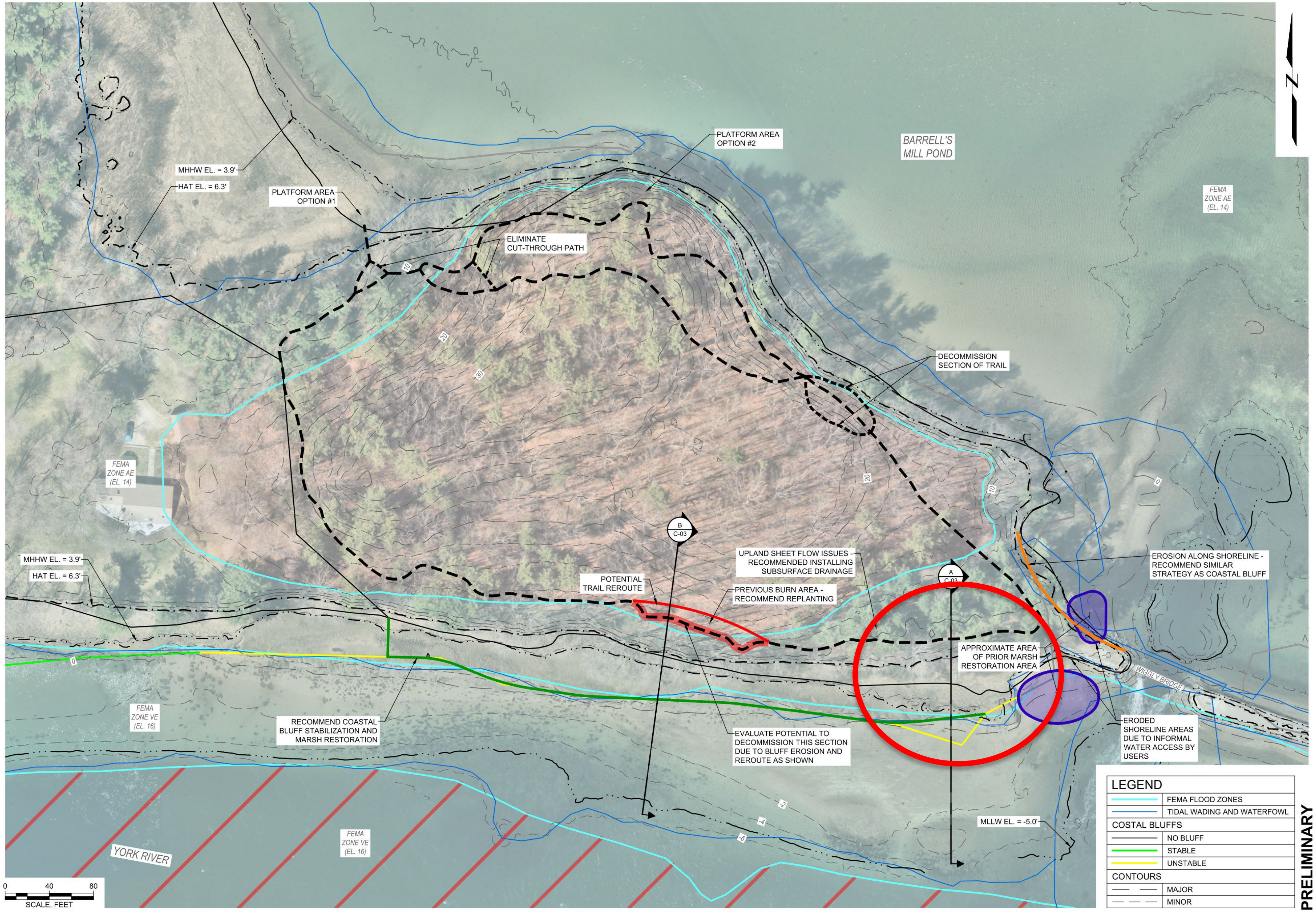
- Local Knowledge and Expectations
- Permitting Feasibility

Phase Four: Construction and Implementation

- Timing, Materials, Compliance

Project Location – Steedman Woods

Source: Nearmap (2025)



PRELIMINARY

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WELLS NATIONAL ESTUARINE RESEARCH RESERVE

NATURE-BASED APPROACH CONCEPTUAL DESIGN

YORK, MAINE

DRAFT

P.E. No.:	
Approved:	
Checked:	DJB
Drawn:	JLD
Designed:	LCV
GEI Project	2502903

Attention:
0 1"
If this scale bar does not measure 1" then drawing is not original scale.

NO.	DATE	ISSUE/REVISION	APP
0	7/14/2025	SITE CONDITIONS REPORT	LCV

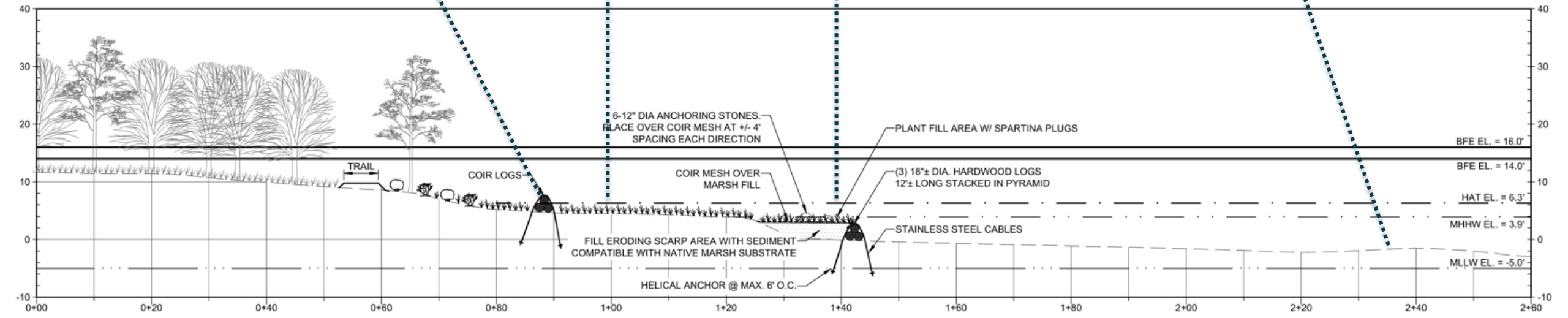
SHEET NAME

RECOMMENDED NBS STRATEGIES PLAN

SHEET NO.

C-02

DOYLE, JESSY \\geiconsultants.com\data\Data_Storage\Working\WELLS NATIONAL ESTUARINE RESEARCH RESERVE\2502903 Nature-Based Approach Conceptual Design\00_CAD\Design\Sheets\2502903_C-02 RECOMMENDED NBS STRATEGIES PLAN.dwg - 10/20/2025


40
30
20
10
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-10
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0+20
0+40
0+60
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1+40
1+60
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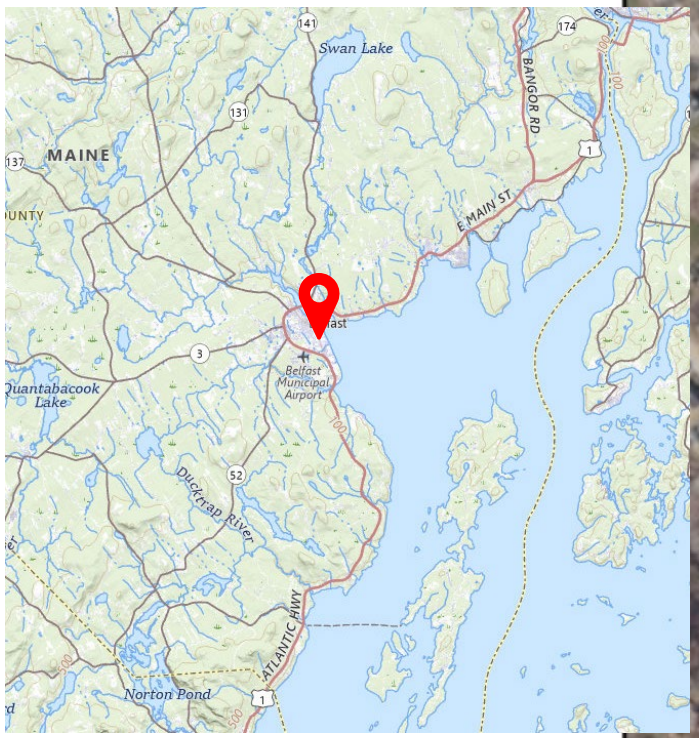
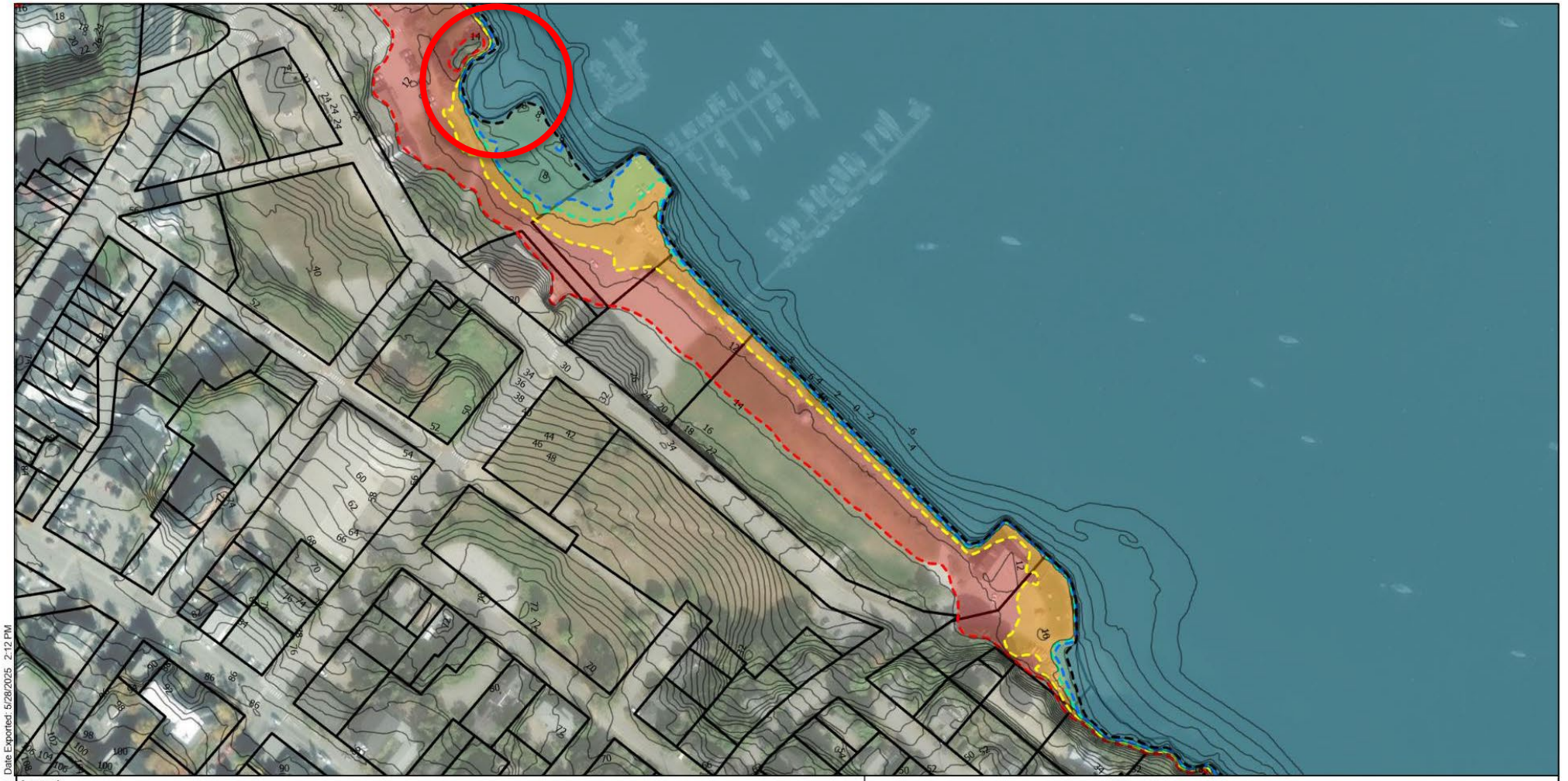
2+00
2+20
2+40
2+60
TRAIL
COIR LOGS
6-12" DIA ANCHORING STONES. PLACE OVER COIR MESH AT +/- 4' SPACING EACH DIRECTION
COIR MESH OVER MARSH FILL
PLANT FILL AREA W/ SPARTINA PLUGS
(3) 18"± DIA. HARDWOOD LOGS 12'± LONG STACKED IN PYRAMID
STAINLESS STEEL CABLES
FILL ERODING SCARP AREA WITH SEDIMENT COMPATIBLE WITH NATIVE MARSH SUBSTRATE
HELICAL ANCHOR @ MAX. 6' O.C.
BFE EL. = 16.0'
BFE EL. = 14.0'
HAT EL. = 6.3'
MHHW EL. = 3.9'
MLLW EL. = -5.0'

Project Location – City of Belfast



Floo


Legend
Existing HAT (7.5 ft NAVD88)
Existing 100-YR (9.7 ft NAVD88)
2100 100-YR (13.7 ft NAVD88)
Contours
2050 HAT (9.0 ft NAVD88)
2050 100-YR (11.2 ft NAVD88)
Parcel Boundaries
Source:
Aerial Imagery from ESRI Worldmap
Inundation Extents Based on USGS 1M ME MidCoast 2021 B21 LiDAR
Notes:
0 ft NAVD88 = 5.8 ft MLLW
Created by: IYG 5/6/25
Checked by: LCV 5/28/25
Coordinate System: NAD 1983 (2011) StatePlane Maine East FIPS 1801 (US Feet)
N
0 75 150
Feet
City of Belfast Vulnerability Assessment
Belfast, Maine
City of Belfast
Belfast, Maine
GEI Consultants
BELFAST INUNDATION MAP
3 OF 3
Project 2407807
May 2025
Fig. 3
Date Exported: 5/28/2025 2:12 PM
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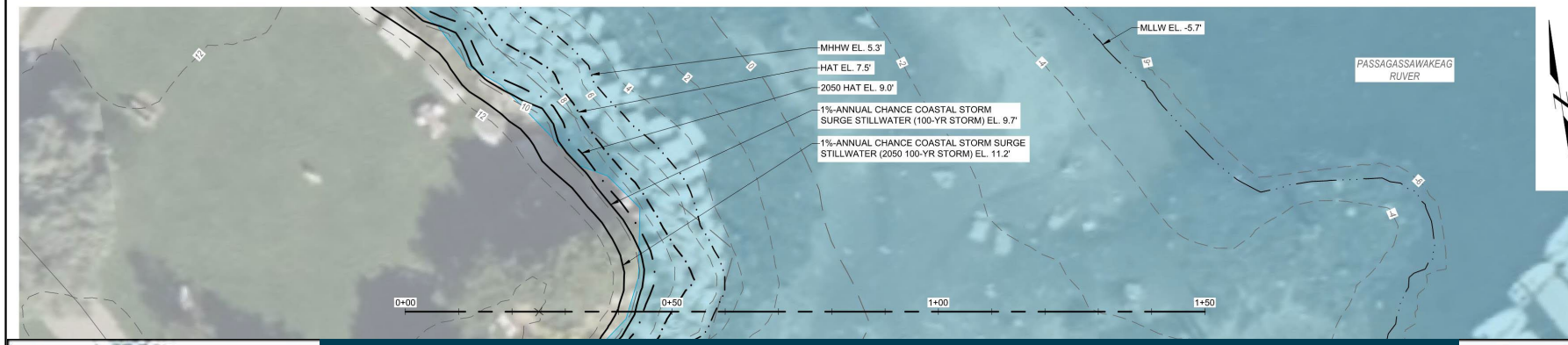
llagas4413
B:\Working\BELFAST ME, CITY OF\2407807 City of Belfast Vulnerability Assessment\05_GIS\BaseMap\BaseMap.aprx
World Imagery: Maxar, Microsoft



Hempstead Harbor Shoreline Trail and Cove Wetland Restoration

0 4 8 16
SCALE, FEET

2 C-01 PROFILE
AREA 2: INLET
SCALE: 1" = 8'

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CITY OF BELFAST
BELFAST, MAINE

RABILITY
RFRONT
SSMENT
BELFAST
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AREA 2 INLET MARSH RESTORATION

PRELIMINARY

SHEET NO.
C-03

DOYLE, JESSY \\geiconsultants.com\data\Data_Storage\Working\BELFAST ME, CITY OF\24078\07 City of Belfast Vulnerability Assessment\05_CAD\Design\Sheets\24078\07_C-03 AREA 2 - INLET.dwg - 6/2/2026

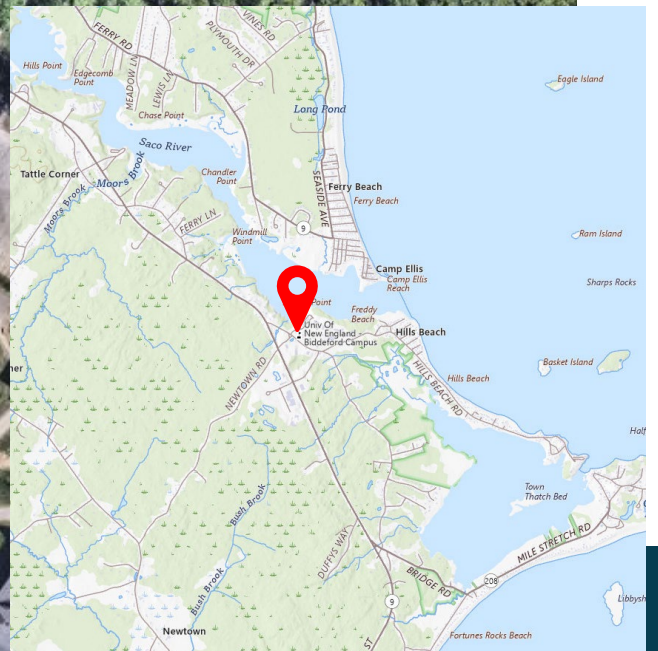
Project Location - UNE

Saco River

Jordan Point

PROJECT LOCATION

UNE Campus



2024 Aerial Photo, Source: Nearmap

Erosion and Accretion at UNE's Fringing Salt Marsh

Ella Livengood
Faculty Advisor: Dr. Pam Morgan
School of Marine and Environmental Programs, University of New England, Biddeford Maine 04005

Introduction

The fringing salt marsh in front of UNE's Ripich Commons lawn is currently eroding. This is important because the marsh provides ecosystem services for people at and near the university. The marsh provides habitat for rare species, water quality enhancement, protection from storms, educational benefits, and recreation for fisherman (Purcell et al. 2020). In order to protect and restore this valuable ecosystem, we have been researching which areas of the marsh are most vulnerable, which will then give us important information to make our restoration attempt as successful as possible.

The objective of this study was to determine which areas of the marsh are most vulnerable to erosion.

Figure 1 & 2. The eroding shoreline at UNE and a student installing a rebar erosion pin into the marsh edge.

Methods

- Erosion pin data were collected over four years and the mean change in length of the pins protruding from the marsh was calculated (Garbisch et al. 1994) (Fig 2).
- Sediment discs were deployed in the fall of 2020-2024, and we calculated how much sediment was deposited at each meter along eight transects (Fig 3, 4).
- A site map was created to show where the erosion rate at the edge of the marsh was the greatest and where the sedimentation rates on the marsh surface were the lowest.

Figure 3. Map of the site featuring each transect and rebar erosion pin location.

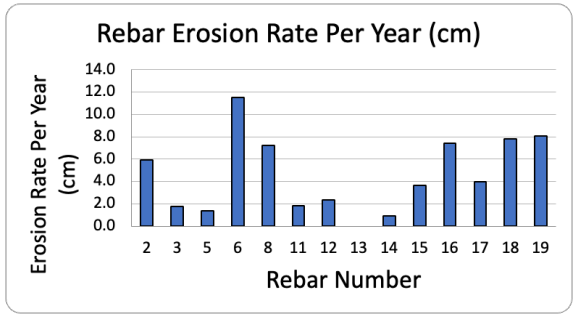


Figure 5. Rebar pin erosion rates per year from 2020-2024.

Figure 6. Sediment collected (g/m2/day) compared to location along the transects.

Table 1. How much sediment was collected per disc each day. The lowest rates are highlighted in red, as compared with studies in New England marshes using similar methods (Morgan et al. 2009).

Results

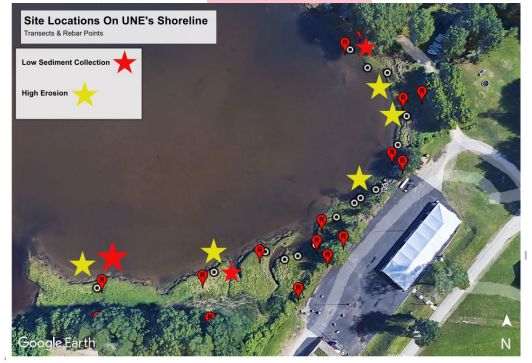


Figure 7. Map featuring all the areas on the marsh with high erosion rates and low sediment collection.

Conclusions

- Transect 8 is experiencing the least amount of sediment accumulation, leading us to the decision that the southwest portion of the marsh is most vulnerable to sea level rise (Table 1).
- Note that in most cases, the closer to the marsh edge, the more sediment is deposited on the marsh surface (Fig. 6).
- There was no one area of the marsh edge that eroded faster, implying that the salt marsh as a whole is eroding at dangerous rates (Figs. 5&6).
- A solution to this involves the implementation of a **living shoreline**, which protects the marsh edge from erosion by using plants and other natural materials to stabilize the shoreline (NOAA 2024).

Figure 4. Sediment discs used to measure surface sedimentation rates.

References

Andrew DP, Puskar N, Thomas JS, David BW. 2020. Valuing Ecosystem Services of Coastal Marshes and Wetlands. Land Grant Press by Clemson Extension. [accessed 2025 April 16]; https://repository.library.noaa.gov/view/noaa/38545.

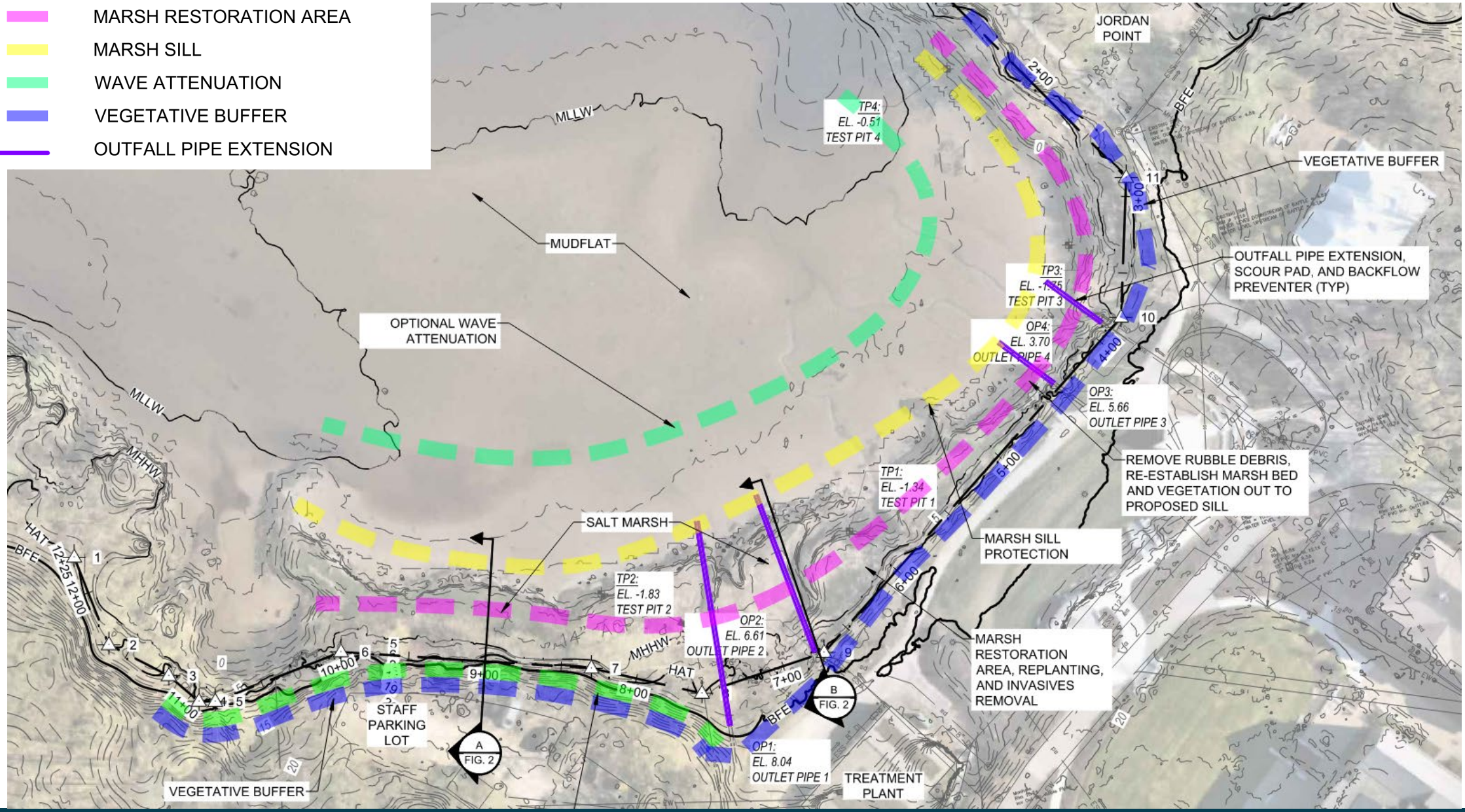
Garbisch E, Garbisch JL. 1994. Control of plant bank erosion through tidal marsh construction on restored shores: Application in the Maryland portion of Chesapeake Bay. Environmental Management. [accessed 2025 April 16]; 75(4):677-691. https://doi.org/10.1007/BF02394633.

Morgan PA, Burdick DM, Short FT. 2009. The Functions and Values of Fringing Salt Marshes in Northern New England, USA. Estuaries and Coasts. [accessed 2025 April 16]; 32(3):483–495. https://doi.org/10.1007/s12237-009-9145-0.

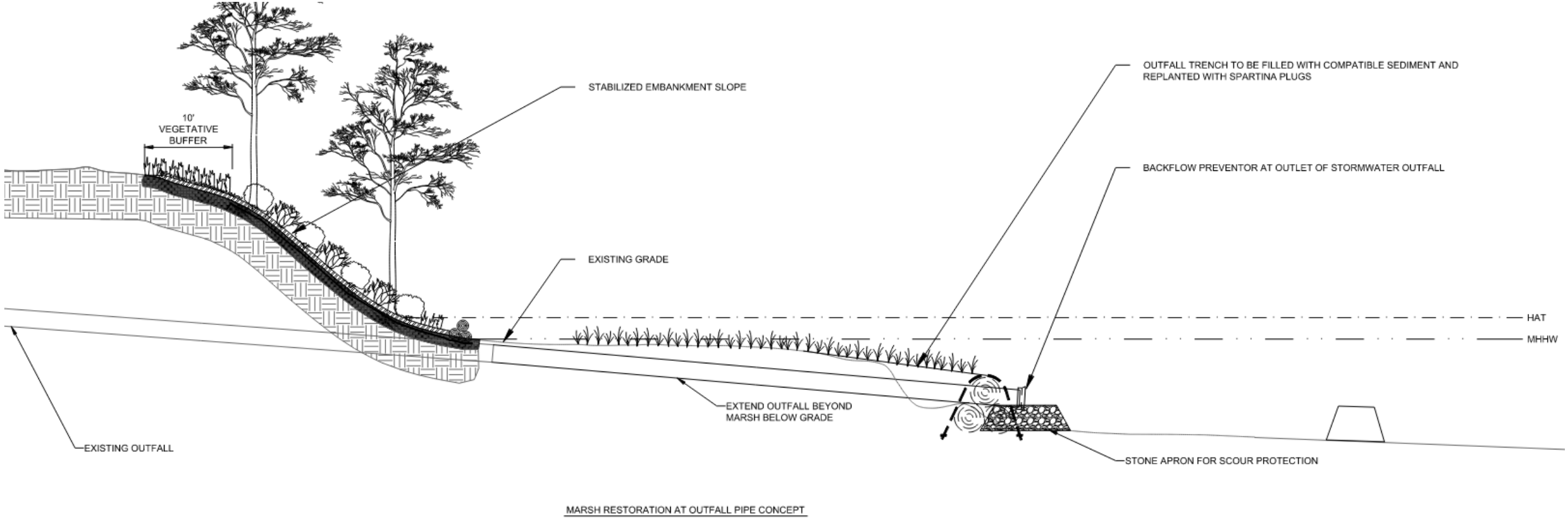
What is a living shoreline? 2024. Washington (DC): NOAA; [accessed 2025 April 16]. https://oceanservice.noaa.gov/facts/living-shoreline.html.

LEGEND:

- UPLAND SLOPE RESTORATION AREA
- MARSH RESTORATION AREA
- MARSH SILL
- WAVE ATTENUATION
- VEGETATIVE BUFFER
- OUTFALL PIPE EXTENSION

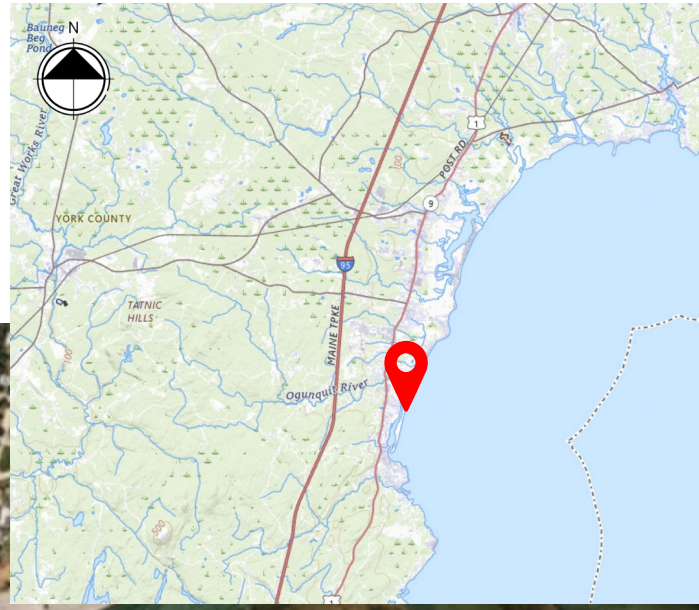


PROPOSED LIVING SHORELINE



MARSH RESTORATION AT OUTFALL PIPE CONCEPT

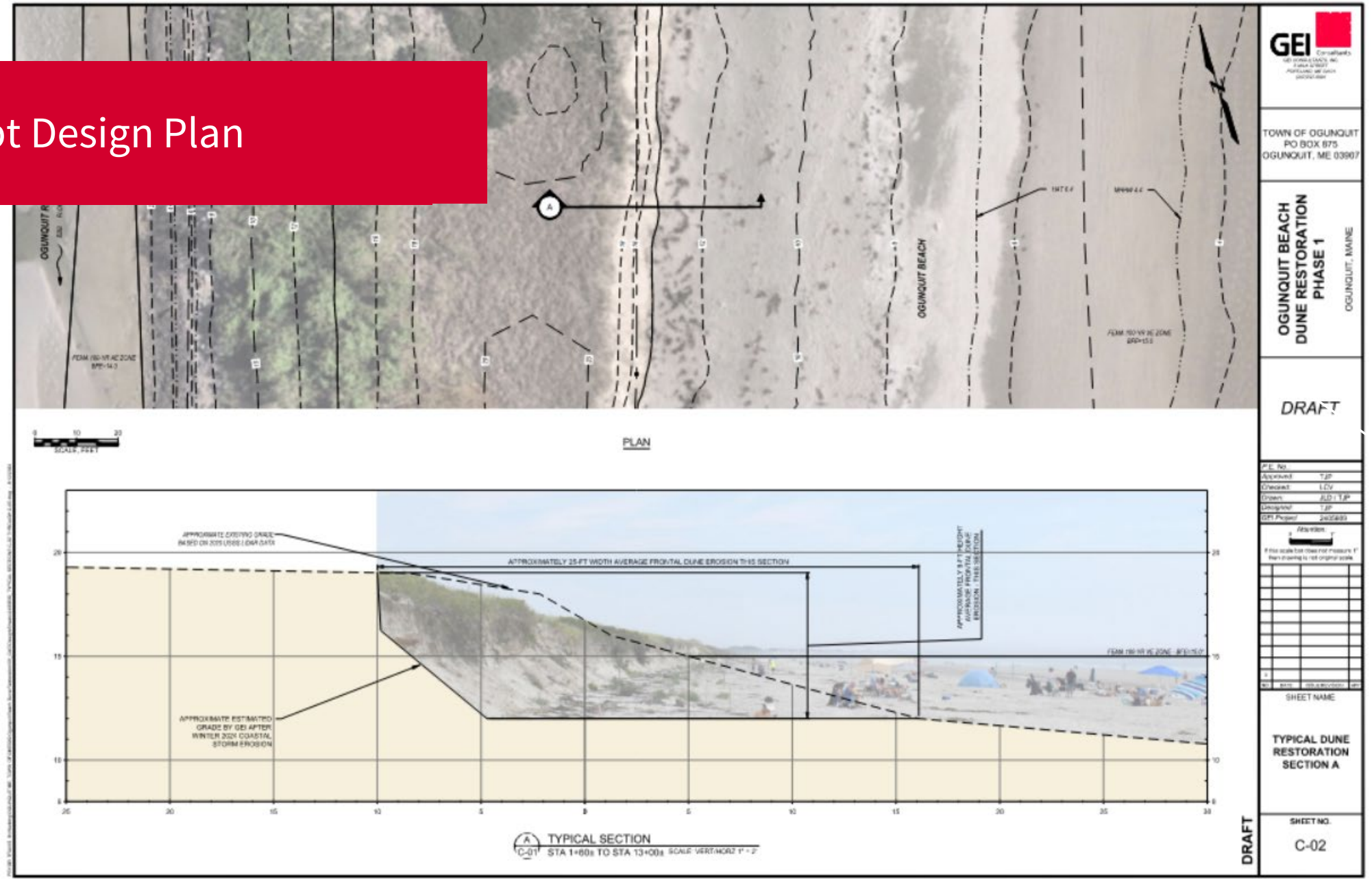
Project Location – Ogunquit Beach



Source: Nearmap (2025)

Evidence of 1974 Dune Project

Concept Design Plan



March 2025 for Restoration Activity: Beach Scraping


Before


Before

Thank you!
Questions?

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GEI Consultants
Consulting Engineers and Scientists