



Sandy Neck Beach Coastal Resiliency Alternatives Analysis

Sandy Neck Board Mtg. August 8, 2022

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Endangered Species



Meeting Agenda

Summary 2016 Project

- › Long-Term Coastal Resiliency Alternatives

Overview Current Project

- › Surveys (topographic; T&E species)
- › Review and Update 2016 Alternatives
- › Alternative Designs for 3 Alternatives
- › Regulatory Agency Meetings
- › Public Meetings

Preliminary Findings

Next Steps



2016 Project Long-Term Coastal Resiliency Alternatives for Sandy Neck Beach

2016 Project Goals & Objectives

“LONG-TERM COASTAL RESILIENCY”

Defined as an alternative that is demonstrated to be:

- ✓ **Sustainable for a minimum of 50 years**
- ✓ **Economically viable**
- ✓ **Permittable under current environmental regulations**
- ✓ **Supports current parking capacity & public access**

Performed by:

- CLE Engineering
- Applied Coastal

Funded by:

- FY16 MA CZM Coastal Resiliency Grant

Long-Term Resiliency Alternatives Considered:

Evaluated Alternatives using data on:

- Shoreline change analysis and modeling



ALT. NO.	ALTERNATIVE TYPE	DESCRIPTION	TOTAL EST. COST	Benefit/Cost (B/C) Ratio
			(Capital + Maint. Costs Over 50 Years)	
1	Conventional ("hard") Engineering Structure	BULKHEAD WITH VEGETATED SAND COVER	\$10.7 mil	1.17
2		STONE REVETMENT WITH VEGETATED SAND COVER	\$14.1 mil	0.89
3	"Soft" Engineering Structure	BIO-ENGINEERED SAND-FILLED COIR BAGS WITH VEGETATED SAND COVER	\$18.9 mil	0.66
4A		SAND NOURISHMENT 530 LF (±35,600 CY)	\$40.6 mil	0.31
4B		SAND NOURISHMENT 750 LF (±47,780 CY)	\$37.2 mil	0.34
4C		SAND NOURISHMENT 1,000 LF (±61,830 CY)	\$27.2 mil	0.46
4D		SAND NOURISHMENT 1,500 LF (±90,880 CY)	\$18.9 mil	0.66
5A	Managed Site Reconfiguration	MANAGED SITE RECONFIGURATION Relocate/Reconfigure Parking Lot	\$6.1 mil	2.03
5B		MANAGED SITE RECONFIGURATION Relocate Parking lot and ORV Access (Trail #1)/Reconfigure existing air-down area	\$6.5 mil	1.92
5C		MANAGED SITE RECONFIGURATION Relocate/Reconfigure Parking lot & ORV Access (Trail #1) with screening trees; Relocate existing air-up/air-down areas	\$6.5 mil	1.91
5D		MANAGED SITE RECONFIGURATION Relocate/Reconfigure Parking lot & ORV Access (Trail #1) with screening dune; Relocate existing air-up/air-down areas	\$6.6 mil	1.88



RATING PARAMETERS & VALUES					TOTAL RATING VALUE (TRV)
B/C Ratio	Permit Rating	Protection Rating	Enhance Coastal Wetland Resources	Enhance Wildlife Habitat	
<i>Calculated Value</i>	0 = no 1 = yes	0 = low 1 = high	0 = no; 0.5 = limited; 1 = yes	0 = no 1 = yes	



Alternative Type	Description	TRV Score (Range)
★ Managed Site Reconfiguration	Alternative 5 (A through D)	5.00 to 5.91 ★
Conventional ("hard") Engineering Structures	Alternative 1: Bulkhead with vegetated sand cover Alternative 2: Stone Revetment with vegetated sand cover	2.39 to 2.67
"Soft" Engineering Structures	Alternative 3: Bio-engineered sand-filled coir bags with vegetated sand cover Alternative 4 (A through D): Sand Nourishment	2.31 to 2.66



Current Project

Sandy Neck Beach Coastal Resiliency Alternatives Analysis

Overview of Current Project

Project Team

- › The Woods Hole Group
- › Tighe & Bond
- › Goddard Consulting

Contract Signed May 2022

Scope of Services

- › Review and Update 2016 Alternatives – 1.2
- › Alternate Designs for 3 Alternatives – 1.3
- › Regulatory Agency Meetings – 1.4
- › Public Meetings – 1.5
- › Final Project Alternatives Analysis – 1.6
- › Surveys (topographic; T&E species) – 2.1



Surveys

Topographic Survey

Existing Infrastructure & Utilities

Wetland Delineations

Endangered Species Habitat Surveys

Eastern Spadefoot

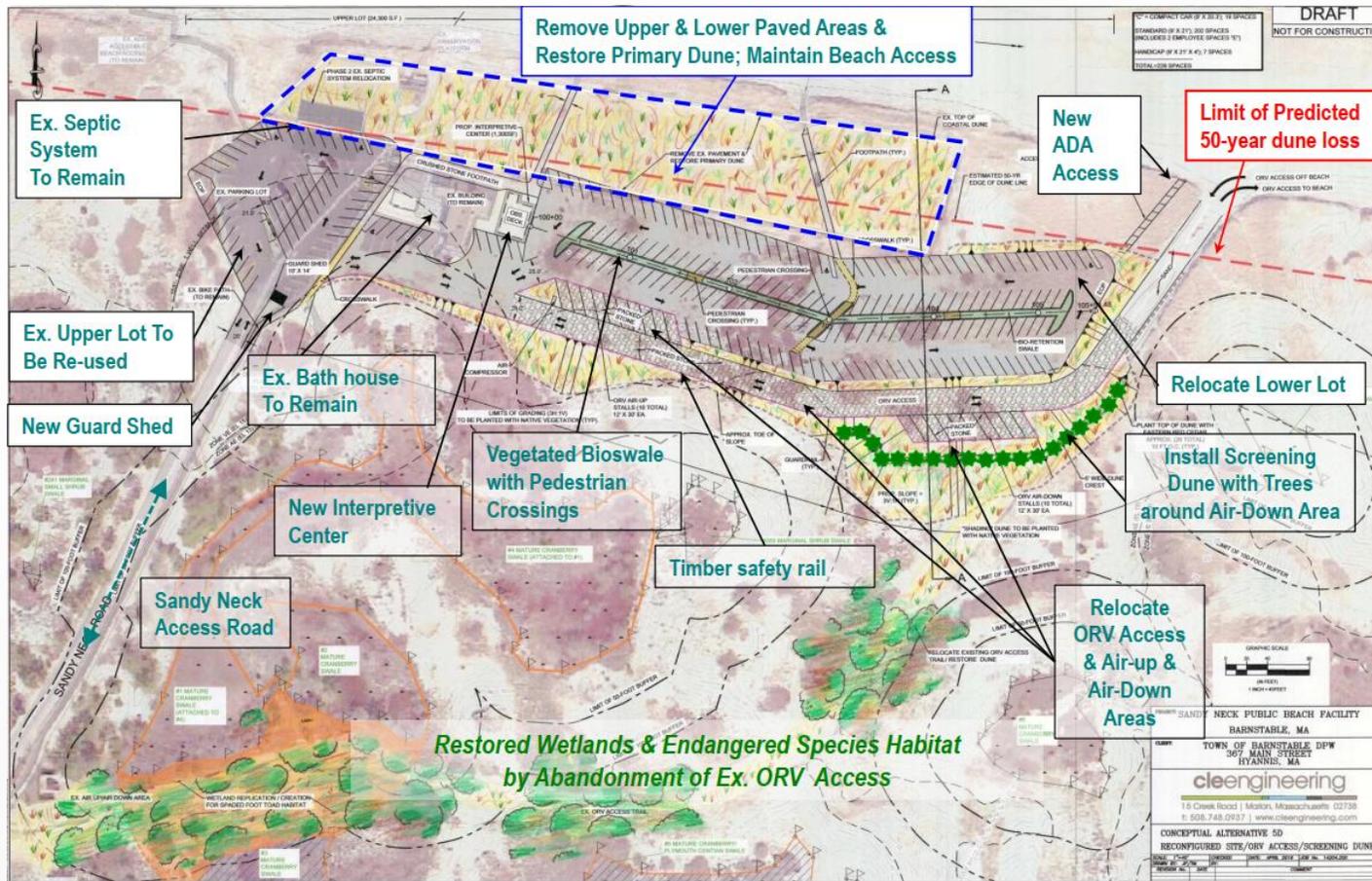
Least Tern

Piping Plover

Plymouth Gentian



Review and Update 2016 Alternatives



Conventional (Hard) Shoreline Protection

- › Alternative 1: Cantilever Bulkhead
- › Alternative 2: Stone Revetment

Engineered (Soft) Shoreline Protection

- › Alternative 3: Bioengineered Slope Stabilization
- › Alternative 4: Beach Nourishment (4 options)

Managed Site Reconfiguration

- › Alternatives 5A-5D: Relocation/Reconfiguration of Existing Infrastructure (4 options)

Review & Update 2016 Alternatives 2, 3, 5A thru 5D

2016 Study

- conceptual alternatives sustainable for 50 years
- based on wave and sediment transport/shoreline modeling
- looked at longevity of dune given annualized sediment transport rates
- predicted dune location in 50-yrs assuming no nourishment



2016 Study

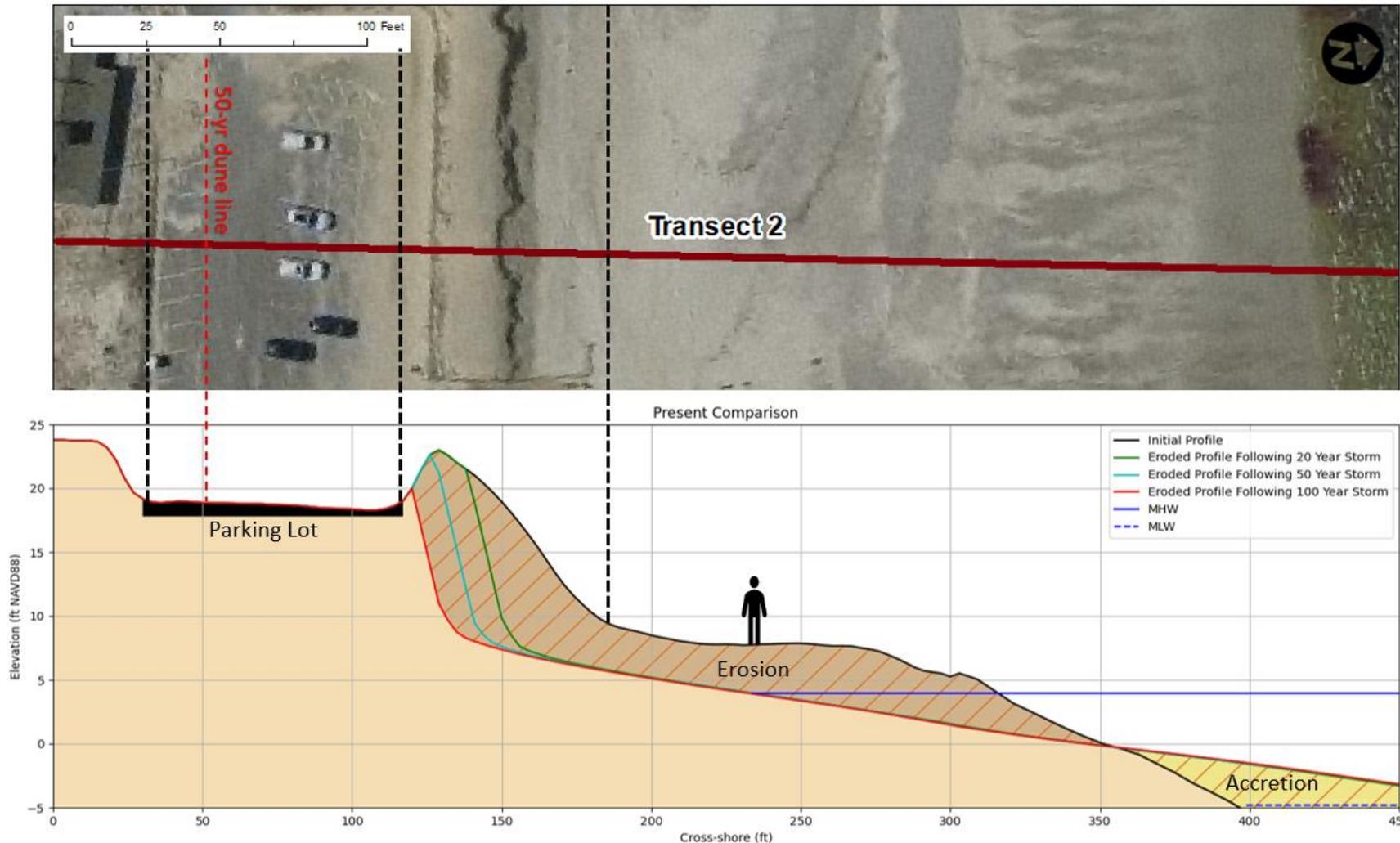
2022 Study

- storm driven erosion of dune (20-, 50-, and 100-yr storms) – incl. SLR
- ability of alternatives to provide protection for parking lot
- probability of flooding from Barnstable Harbor – incl. SLR
- parking lot and stormwater design elements
- designs for Alt. 2, 3, 5A thru 5D
- offsite parking alternatives



2022 Study

Storm Driven Erosion – Existing Beach & Dune Configuration



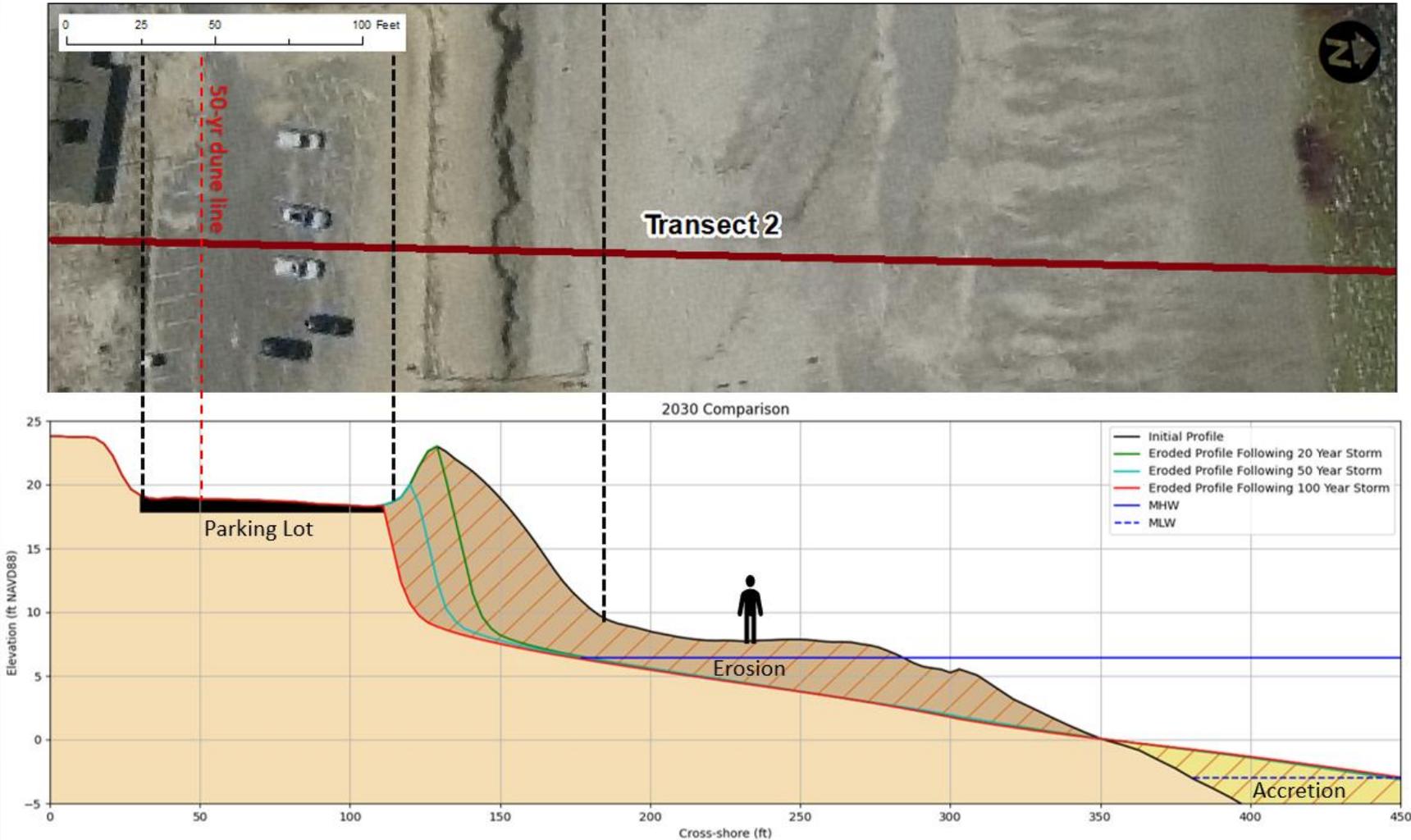
Present Day Water Levels

Erosion with:

- › 5% storm
- › 2% storm
- › 1% storm

2016 50-yr dune erosion line
based on annualized rates
of erosion

Storm Driven Erosion – Existing Beach & Dune Configuration



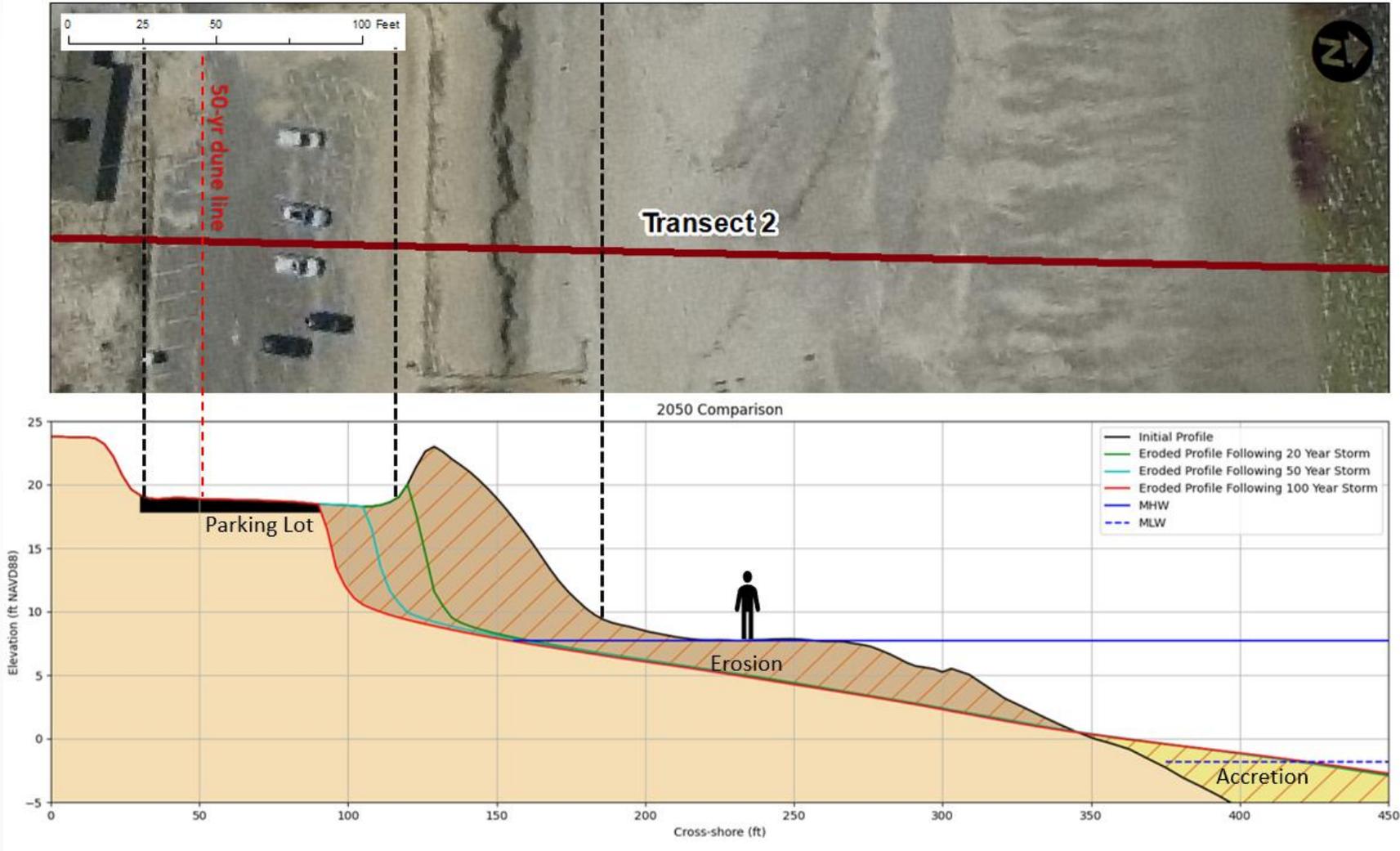
Water Levels During:

- › 2030

Erosion with:

- › 5% storm
- › 2% storm
- › 1% storm

Storm Driven Erosion – Existing Beach & Dune Configuration



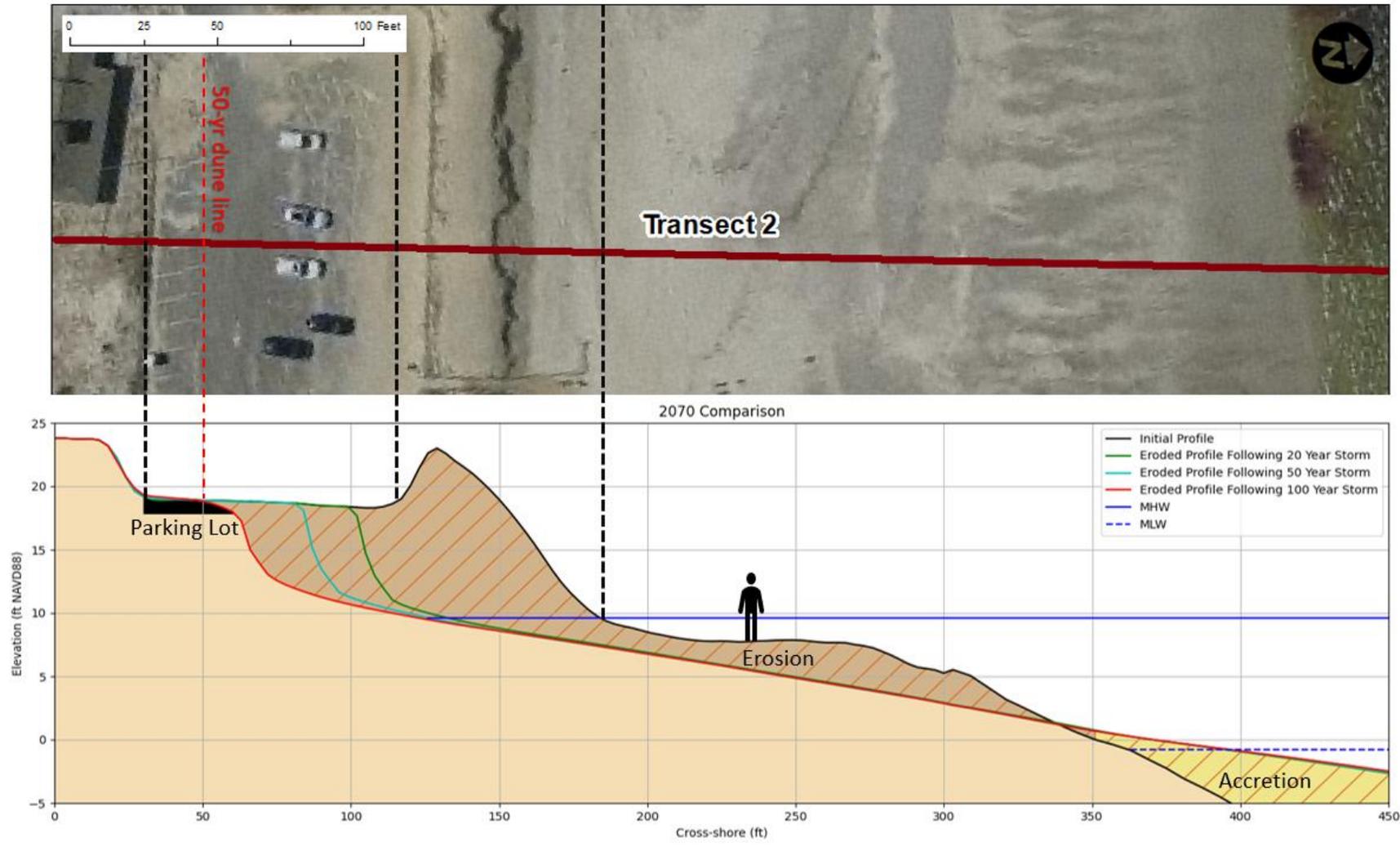
Water Levels During:

- › 2050

Erosion with:

- › 5% storm
- › 2% storm
- › 1% storm

Storm Driven Erosion – Existing Beach & Dune Configuration



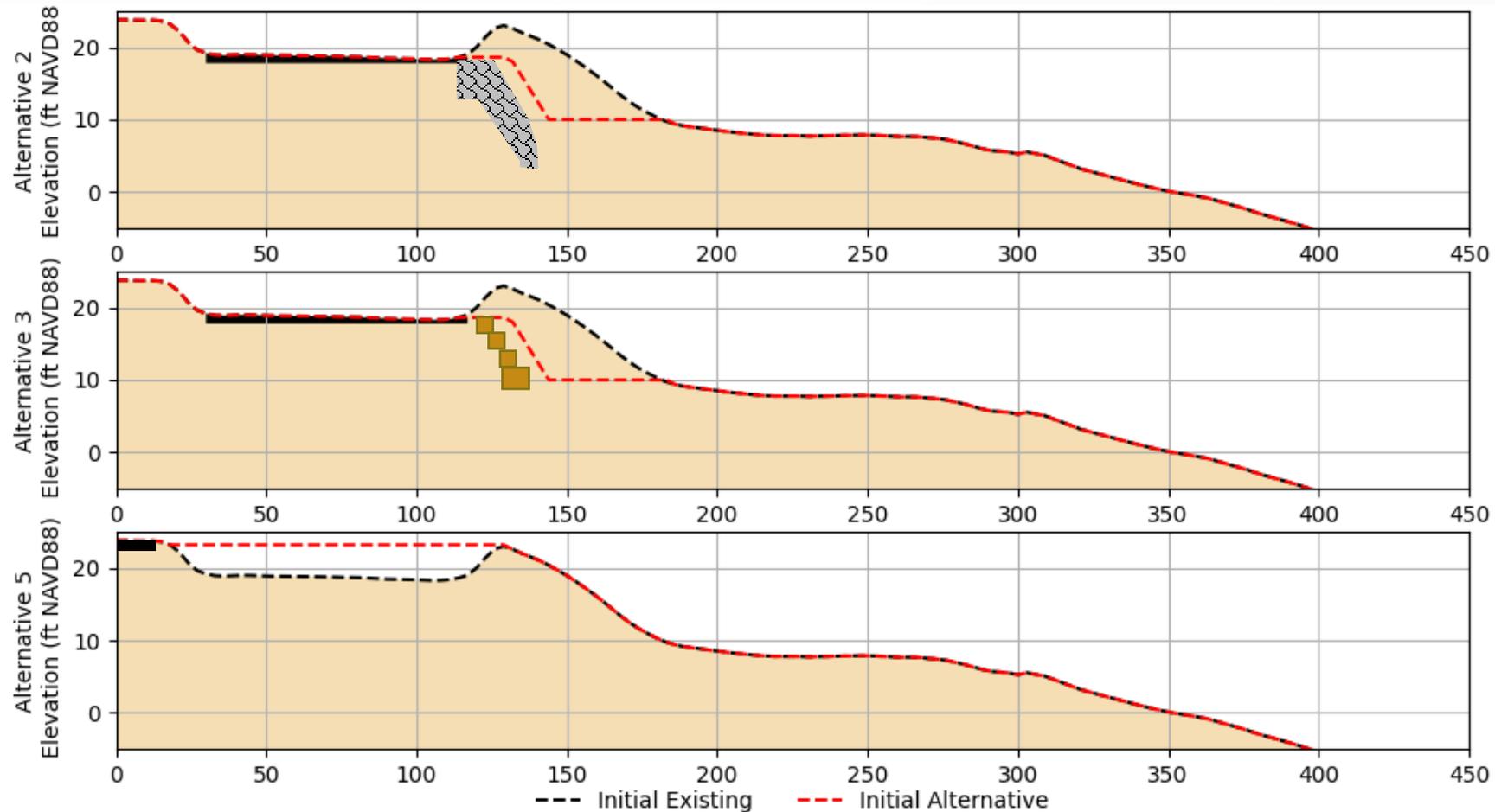
Water Levels During:

- › 2070

Erosion with:

- › 5% storm
- › 2% storm
- › 1% storm

Performance of Alternatives 2, 3, and 5

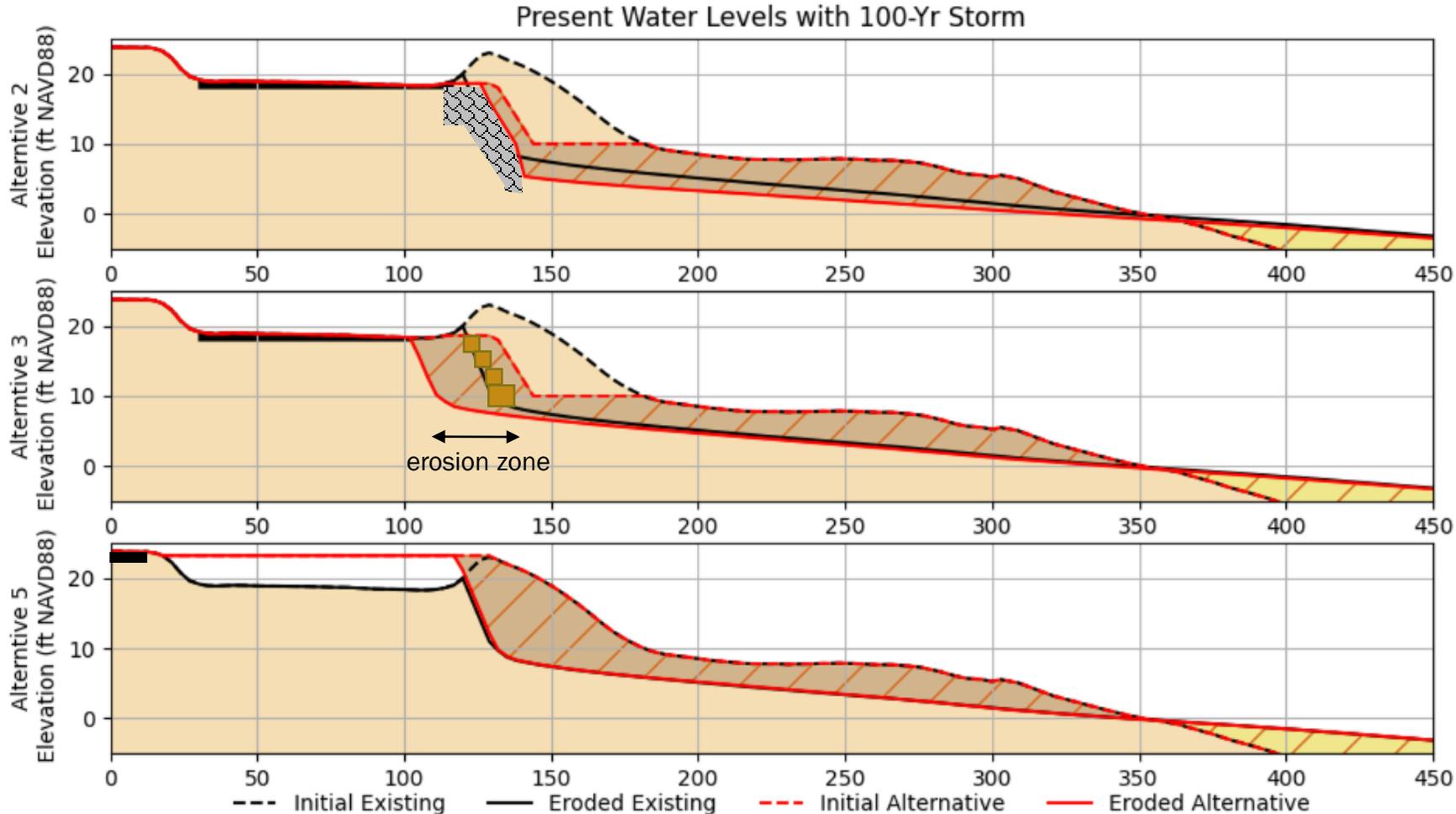


Present Day Water Levels

1% Storm with:

- › Alt. 2 – stone revetment
- › Alt. 3 – bioengineered solution
- › Alt 5 – managed site reconfiguration

Performance of Alternatives 2, 3, and 5

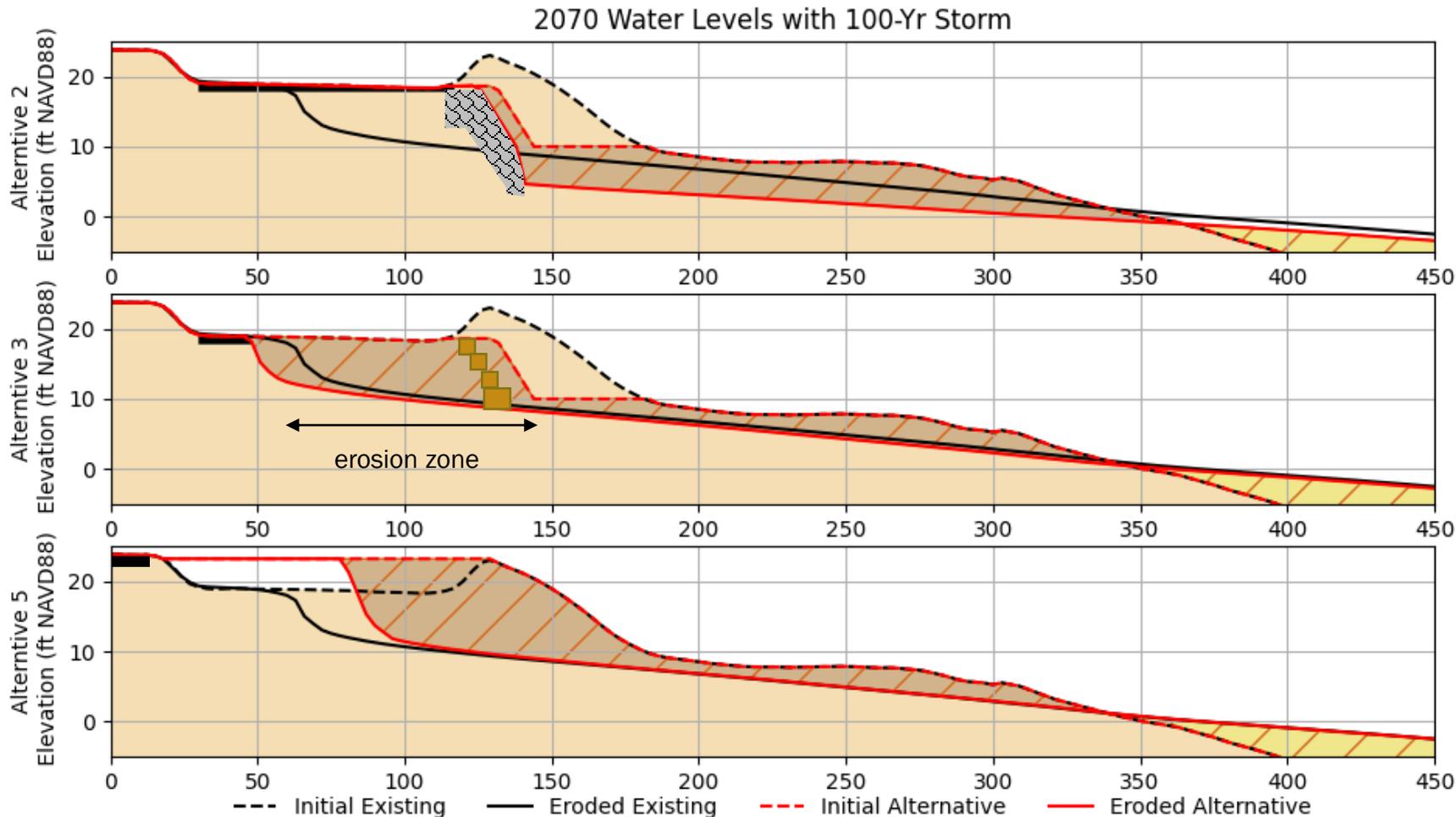


Present Day Water Levels

1% Storm with:

- › Alt. 2 – stone revetment
- › Alt. 3 – bioengineered solution
- › Alt 5 – managed site reconfiguration

Performance of Alternatives 2, 3, and 5

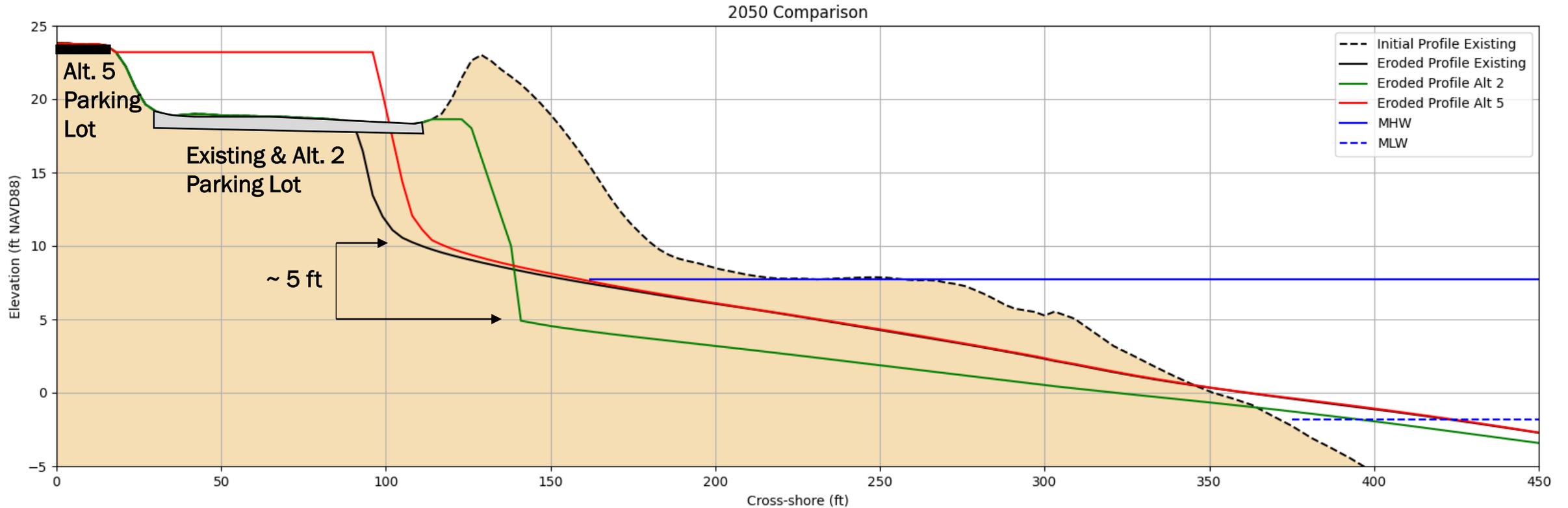


2070 Water Levels

1% Storm with:

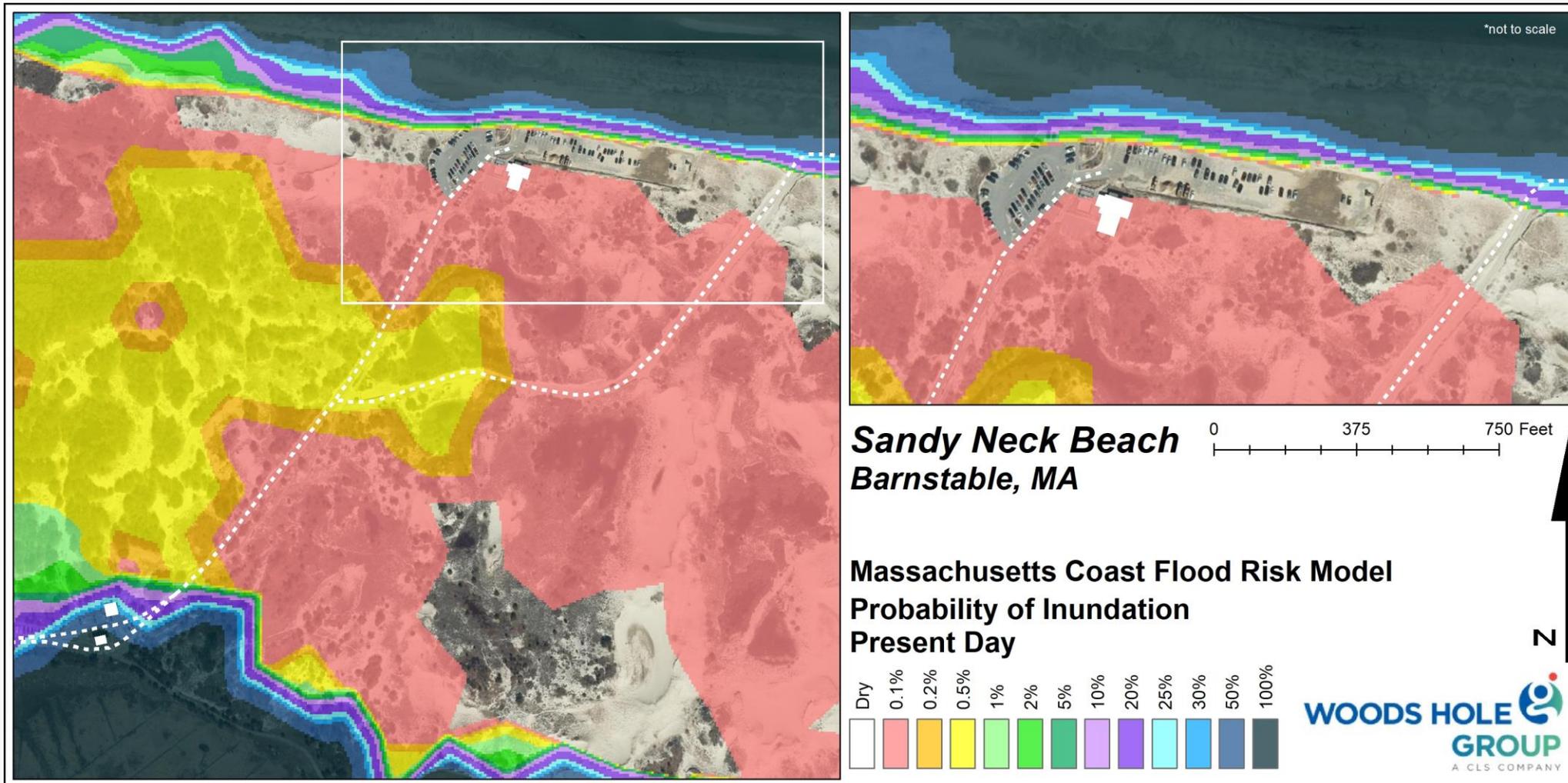
- › Alt. 2 – stone revetment
- › Alt. 3 – bioengineered solution
- › Alt 5 – managed site reconfiguration

Performance of Existing vs. Alternatives 2, 3, and 5



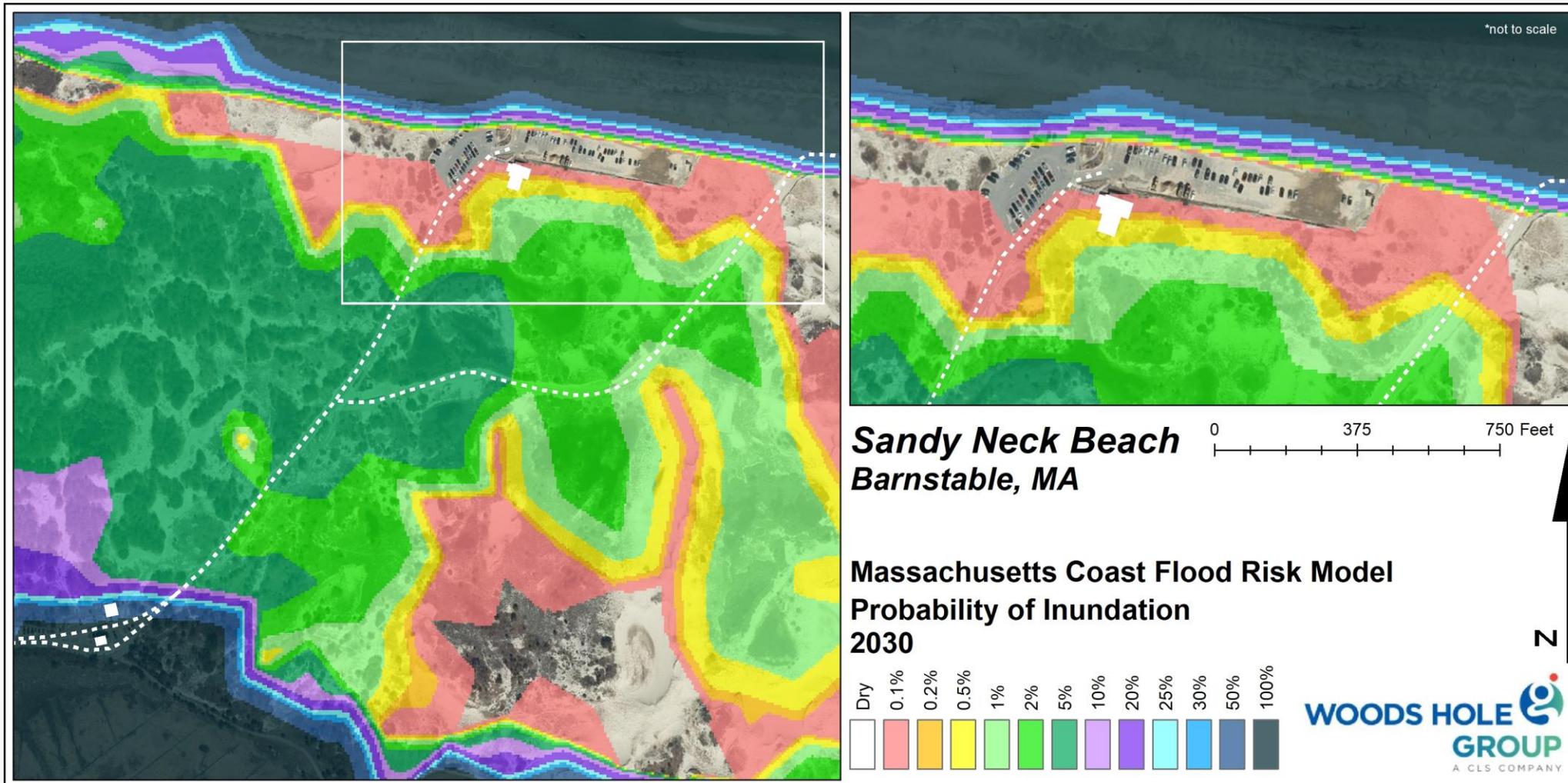
2050 Water Levels & 100-yr Storm

Flooding Impacts



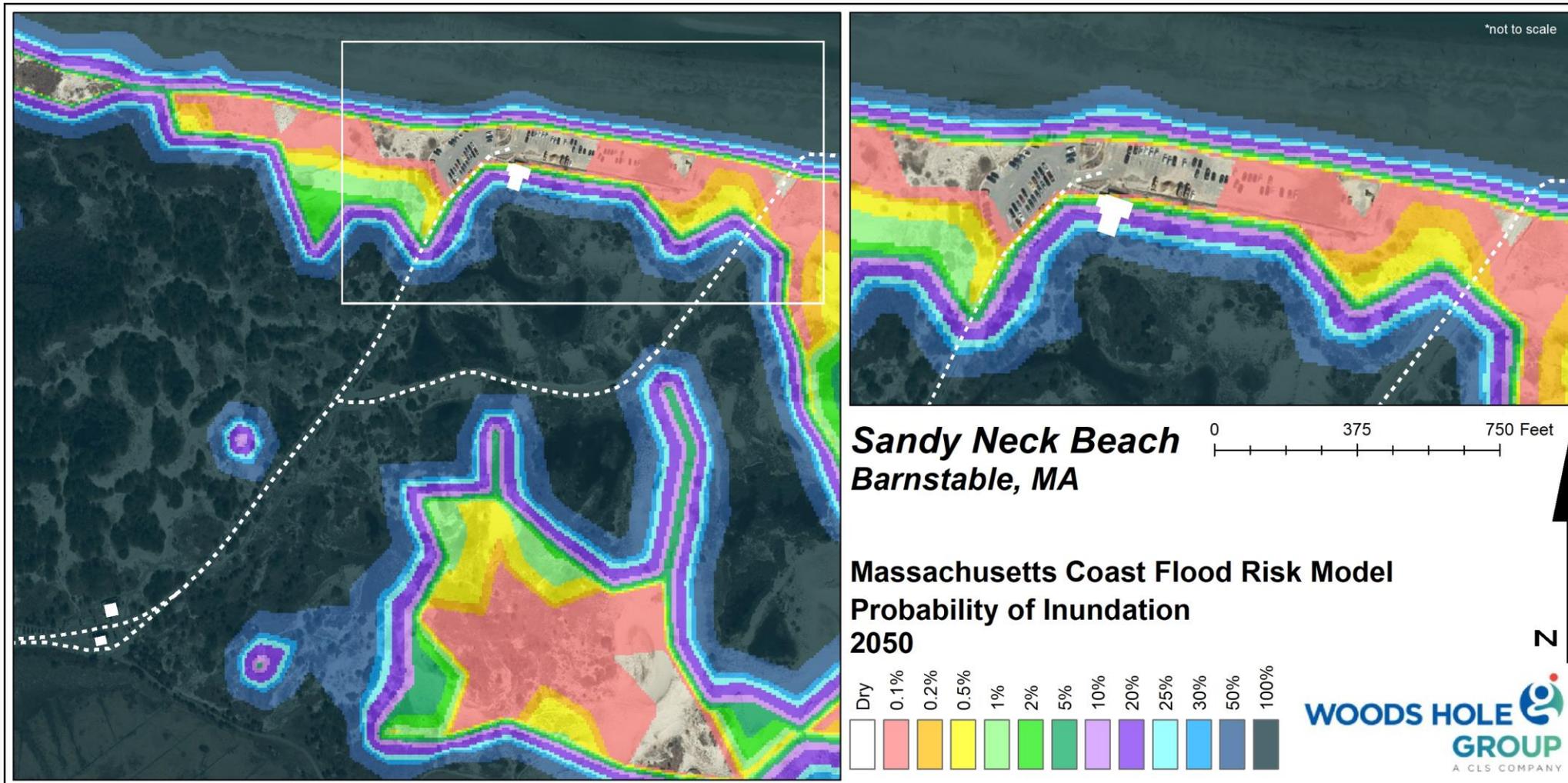
Probability of
Flooding in:
› Present Day

Flooding Impacts



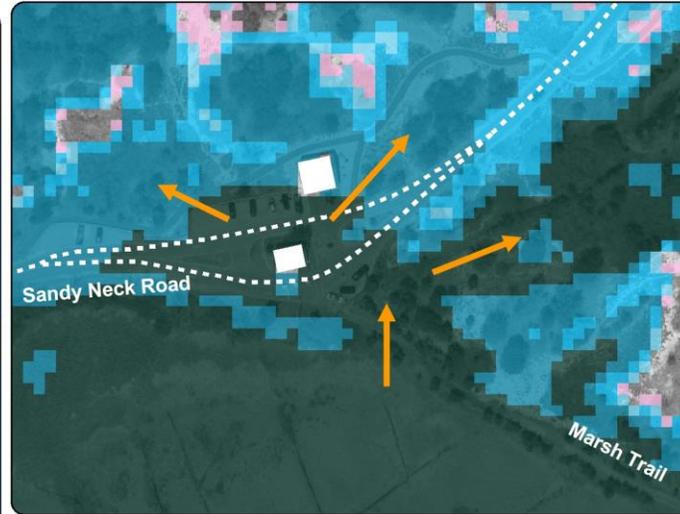
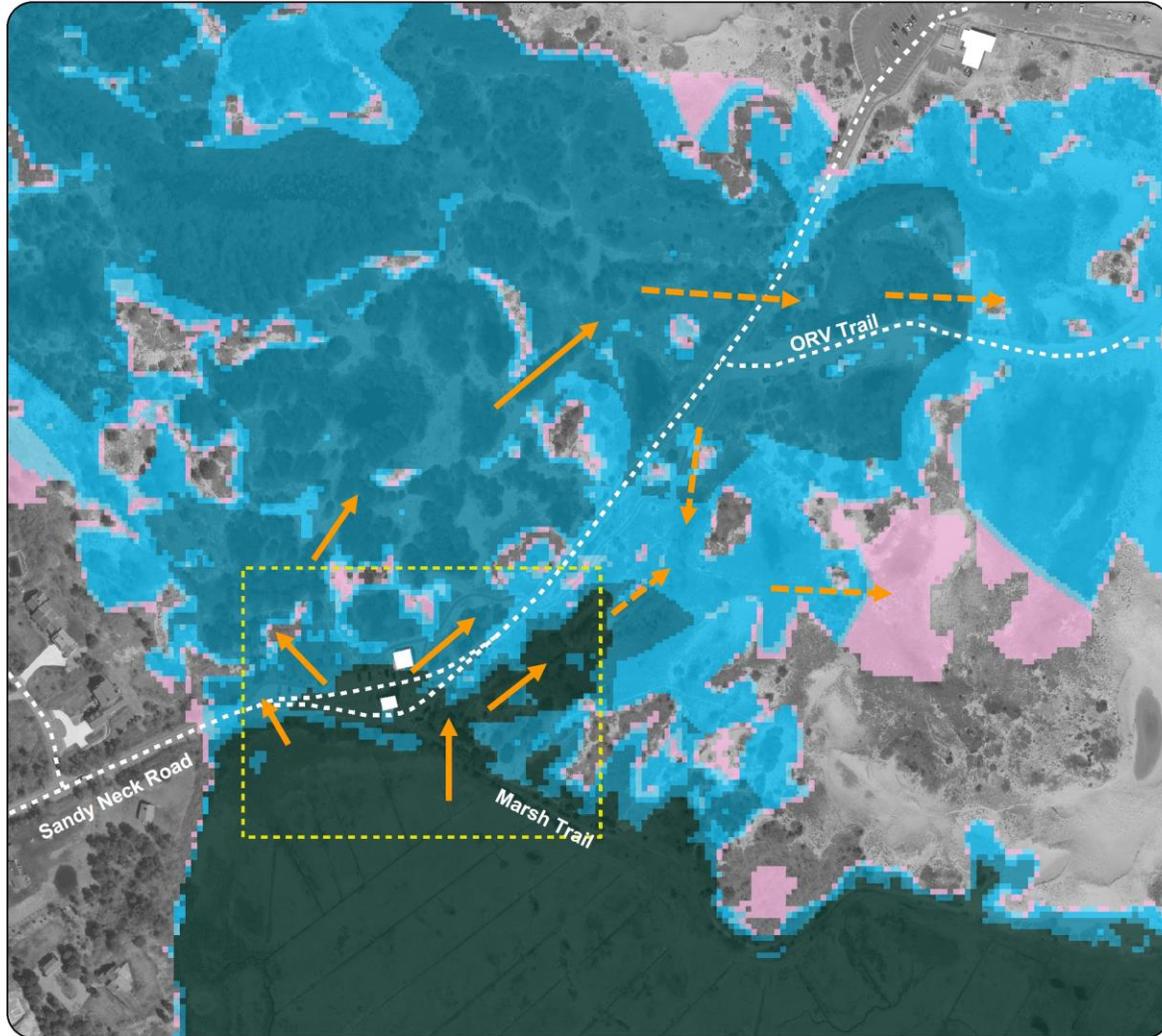
Probability of
Flooding in:
› 2030

Flooding Impacts



Probability of
Flooding in:
› 2050

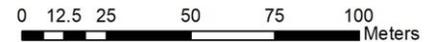
Flood Pathways



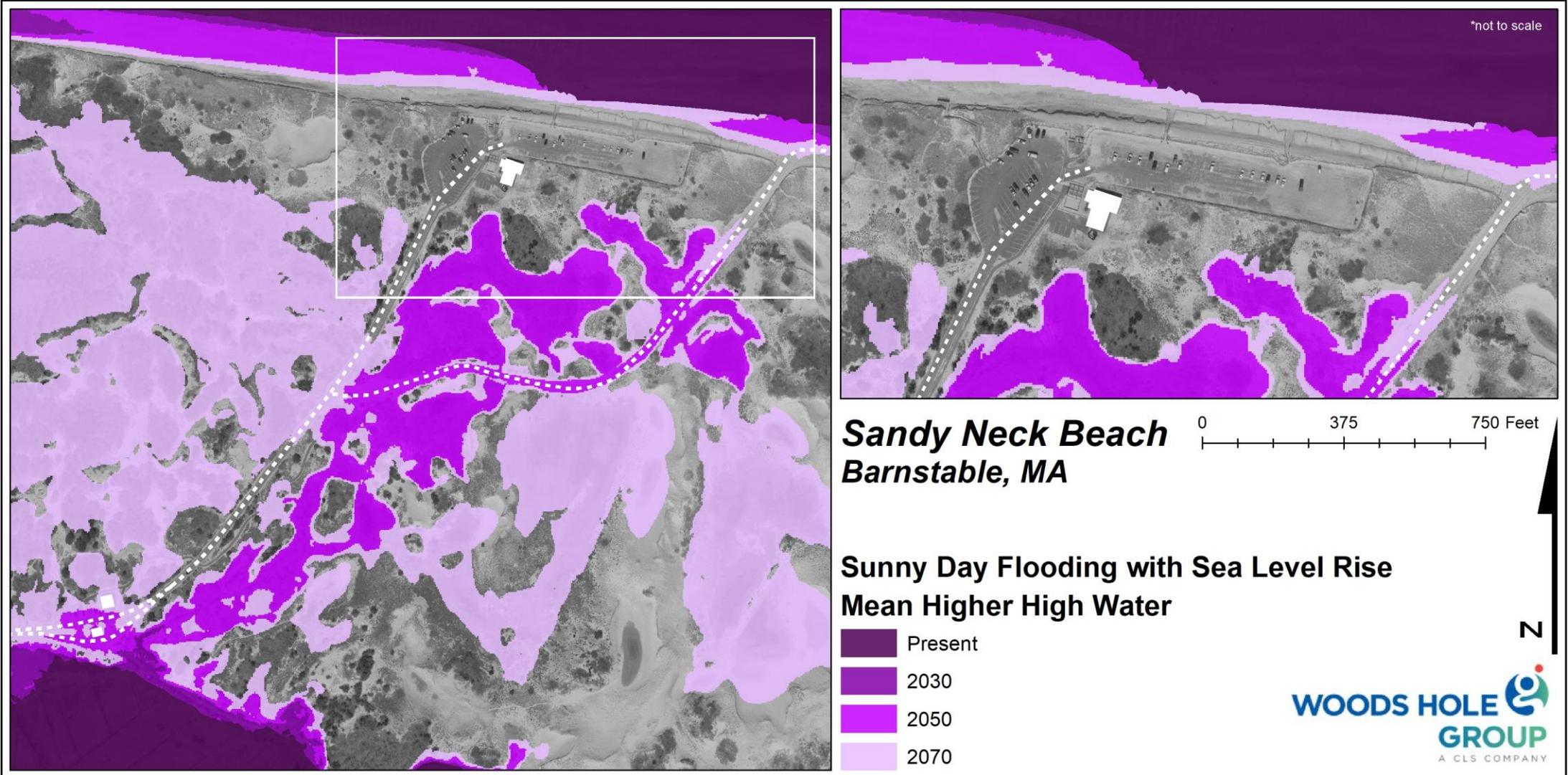
2030



Sandy Neck Beach
Barnstable, MA



Sunny Day Flooding with Sea Level Rise



Next Steps

- Complete Review and Update of 2016 Alternatives – Task 1.2 Tech Memo
- Update Designs for 3 Options – Task 1.3
 - Options selected by Town based on Task 1.2 Tech Memo
- Regulatory Agency Meetings – Task 1.4
- Public Meetings – Task 1.5
- Final Project Alternatives Analysis – Task 1.6 Report

Alternatives	Protection Rating	Permitability	Resource Area Benefits	Abutter Impacts	Cost (capital & maintenance)	Ranking
Alt A						
Alt B						
Alt C						

Schedule

Sandy Neck Beach Facility Reconfiguration

