DNREC Shoreline Management Economic Study Public Meeting

BEN BLACHLY (IEC), KIRK BOSMA (WHG), MAURA FLIGHT (IEC)

September 26, 2024

Overview

- Study objective and scope
- Guiding research questions
- Coastal processes findings
- Review of cost share framework
- Economic benefits findings
- Cost share recommendations

IEc

Study Objective and Scope

Provide data and analysis to support recommendations regarding equitable State and local cost-share ratios for nourishment projects at bay and ocean beaches.

Scope overview:

- Analysis of 11 beach nourishment project sites.
- Develop cost share recommendations that reflect the distribution of benefits.
- Assess all significant benefits over 30-year time frame.

Eleven Project Sites

Bay Shore

1. Pickering
2. Kitts Hummock
3. Bowers
4. South Bowers
5. Slaughter
6. Broadkill
7. Lewes
8. Cape Shores

Atlantic Coast

9. Rehoboth & Dewey
10. Bethany & South Bethany
11. Fenwick Island

IEc

Research Questions

- How do beach nourishment projects perform across the sites?
- Who benefits from beach nourishment?
- By how much do different groups benefit?
- How do the relative benefits vary across sites?
- How do regional economies depend upon intact beaches?
- What influences the relative social vulnerability of communities affected by these projects?

How do beach nourishment projects perform?

Beach Nourishment Design Alternatives

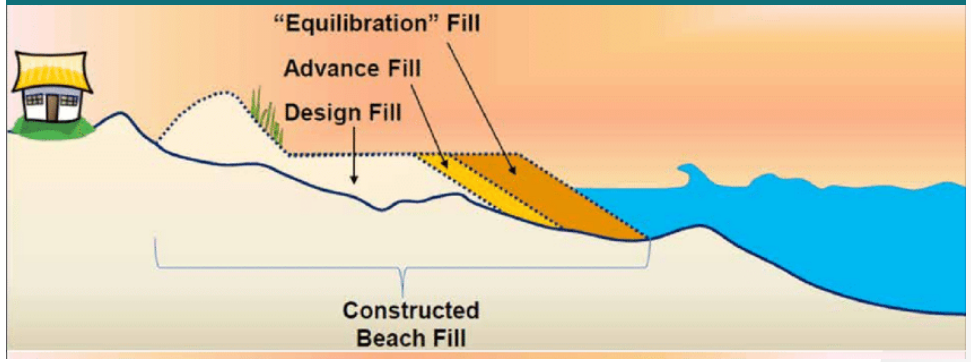
ALTERNATIVES

No Action Alternative

Beach Nourishment Alternatives

1. Previously constructed nourishment template
2. Permitted nourishment template
3. Potential alternative nourishment or approach
4. Larger alternative nourishment sometimes based on dredged material re-use

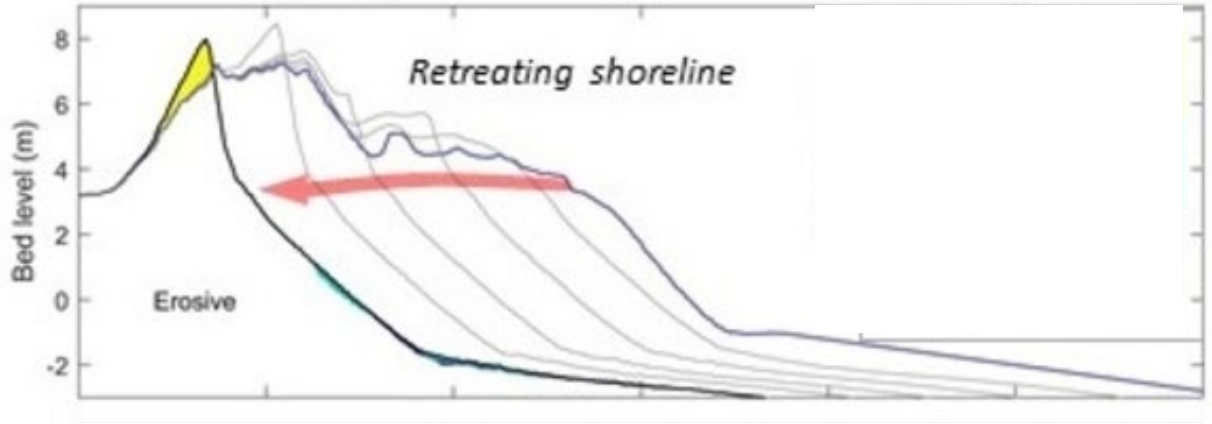
NOURISHMENT TEMPLATE



Physical Scenarios

- Ongoing coastal erosion and nourishment performance

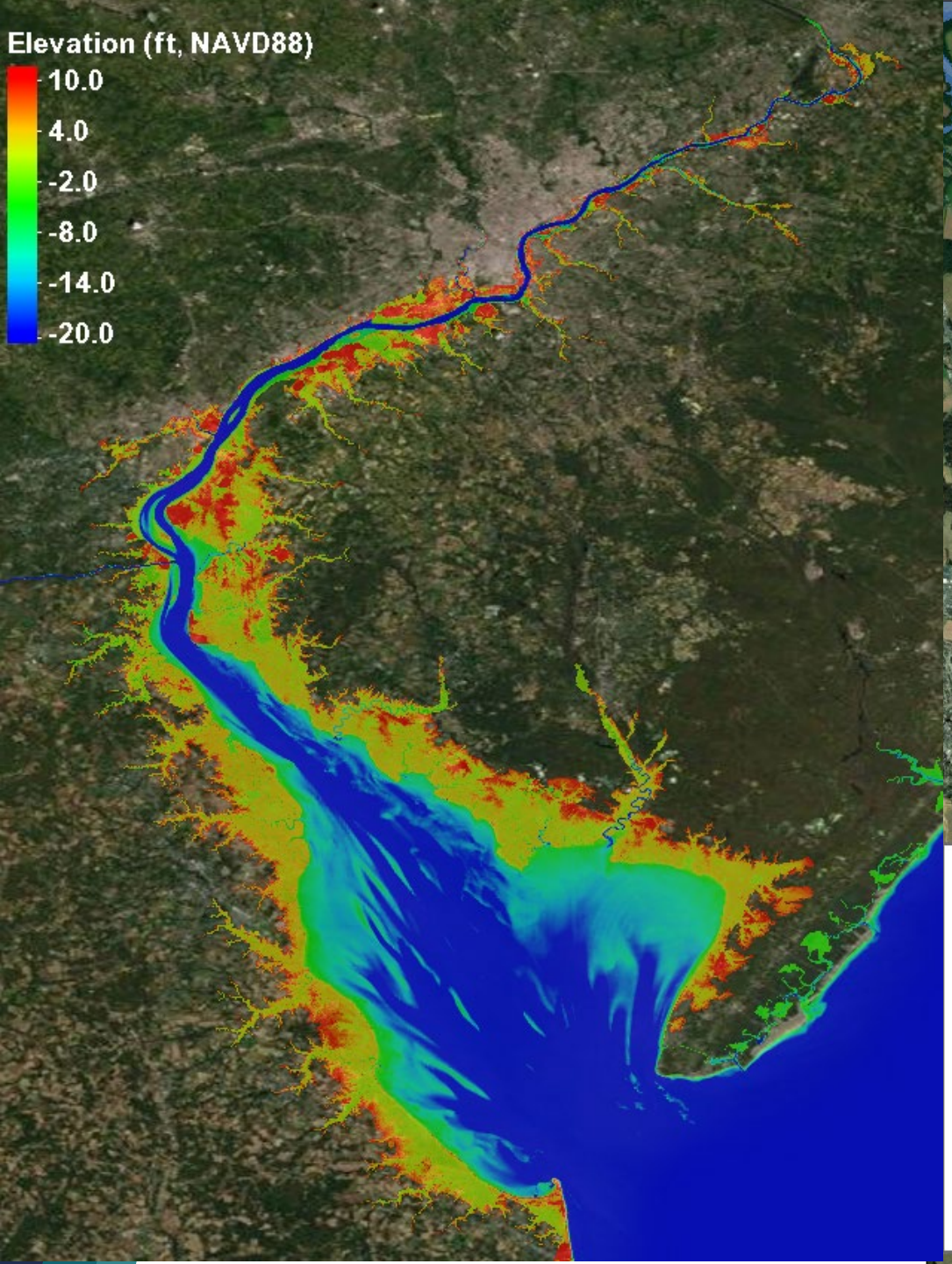
Longer-term

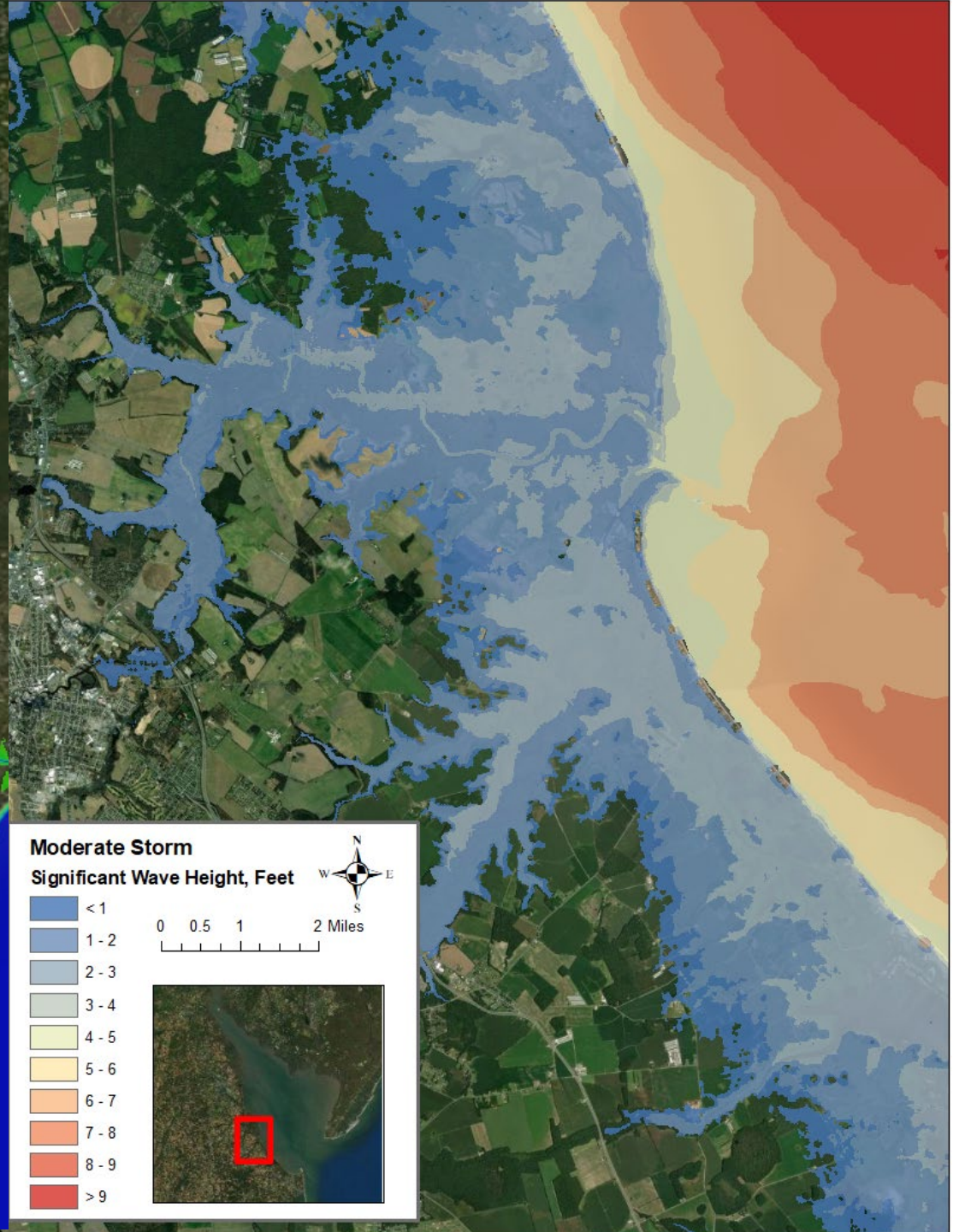


30-year time horizon

- Impacts of various storm events (e.g., 2% to 20% Annual Exceedance Probability)

Episodic





MODELS

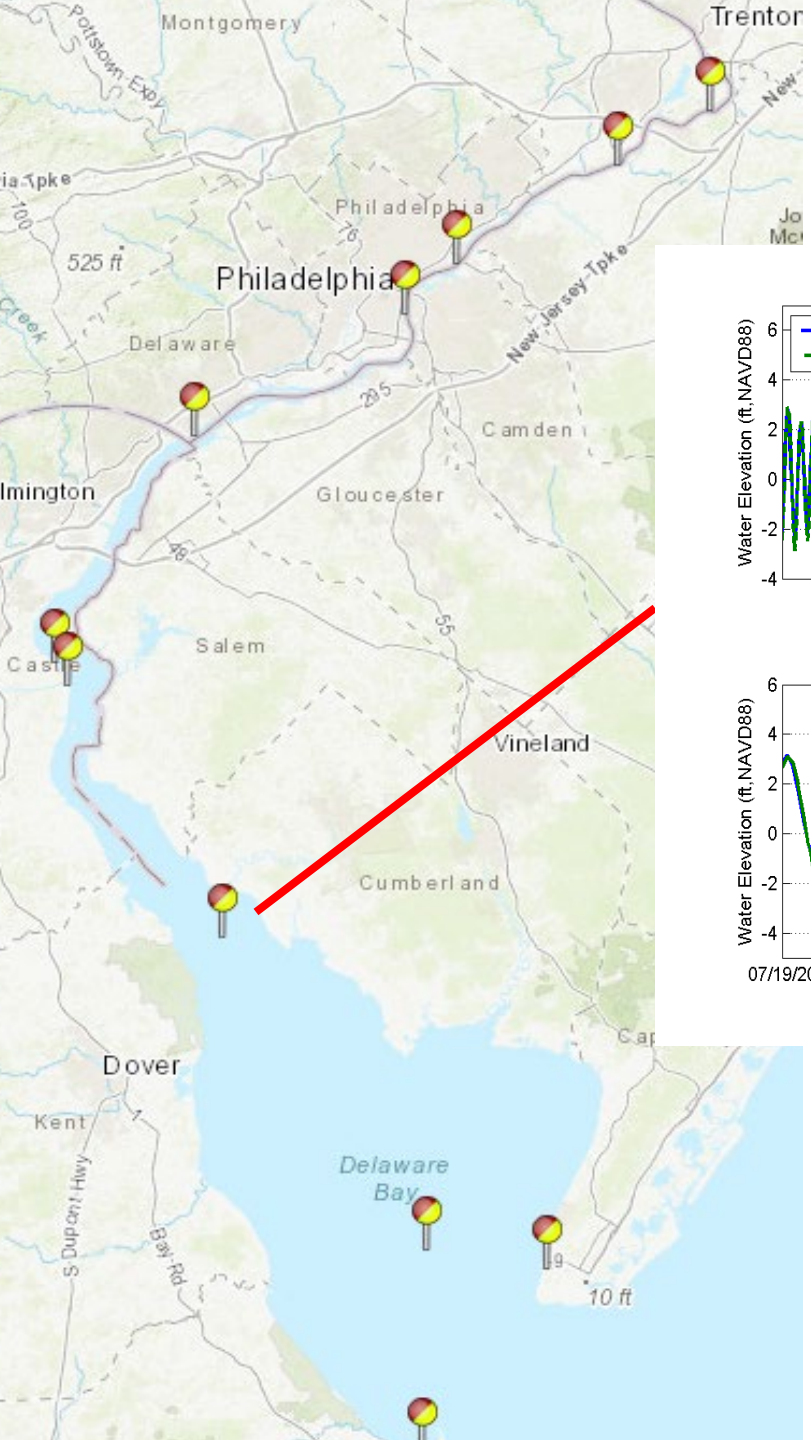
Hydrodynamics

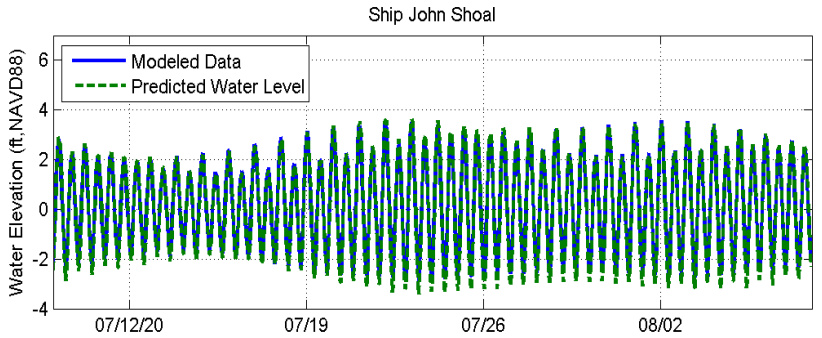
Waves

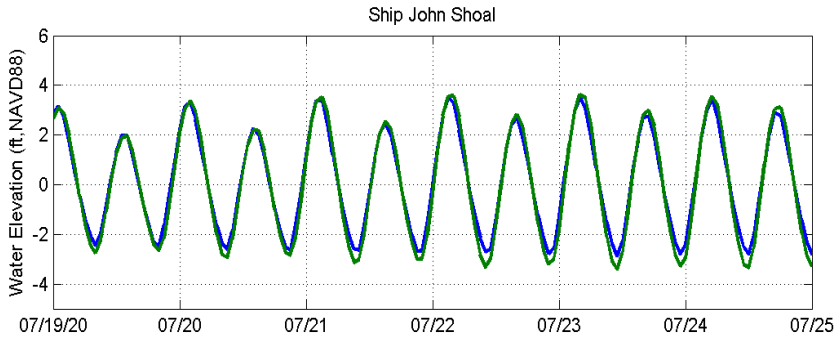
Sediment Movement

Shoreline Erosion

Model Calibration and Validation

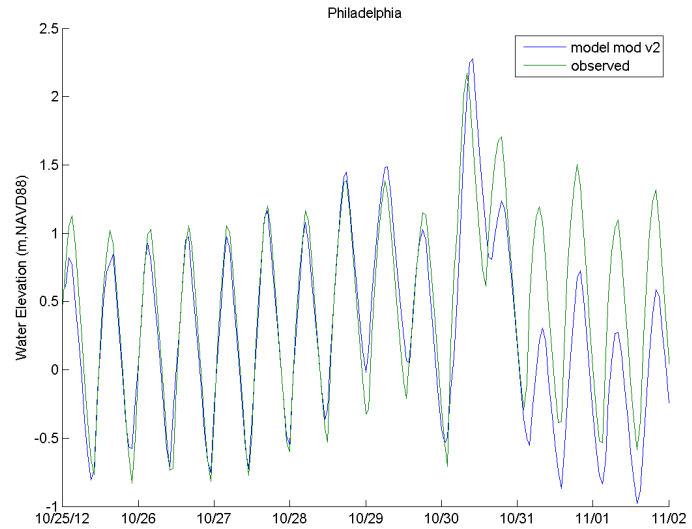






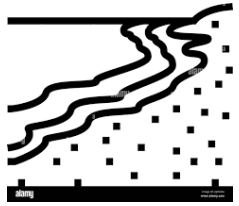
Bias: 0.09 ft
Percent Error: 5.0%

- Validation and calibration of the model the 11 different NOAA stations in Delaware Bay/River
- Calibrated to Hurricane Sandy and Hurricane Isabel



Data Output Types

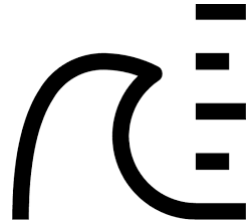
Shoreline Position



Beach Width and Spreading

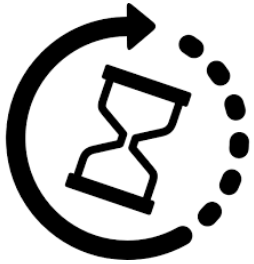
Coastal Flooding Extent

Wave Energy



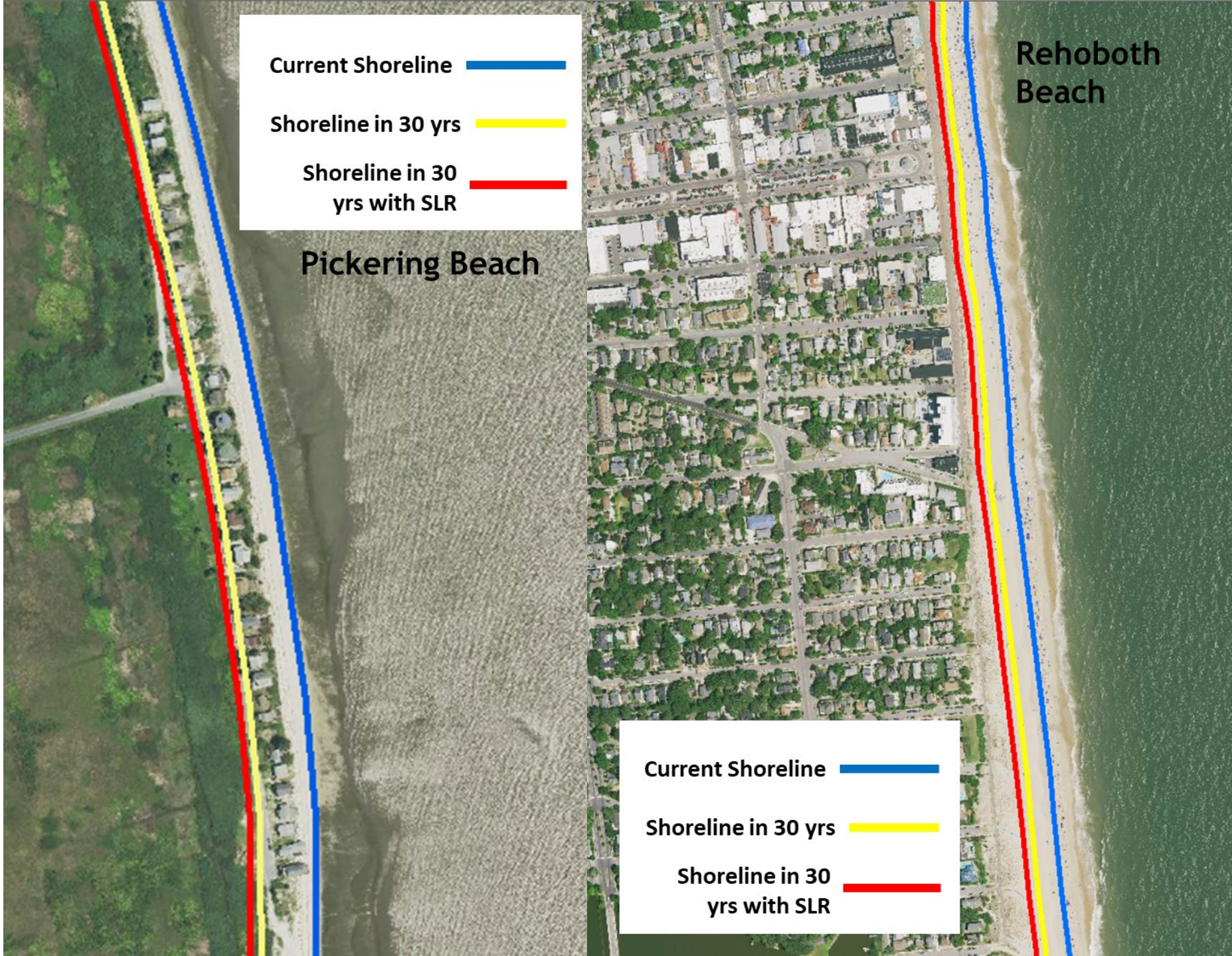
Episodic Coastal Erosion

Beach Nourishment Performance

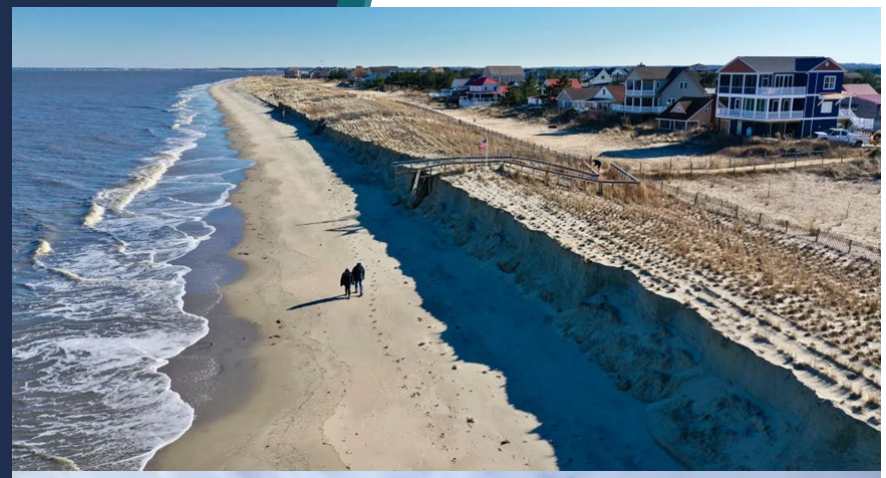


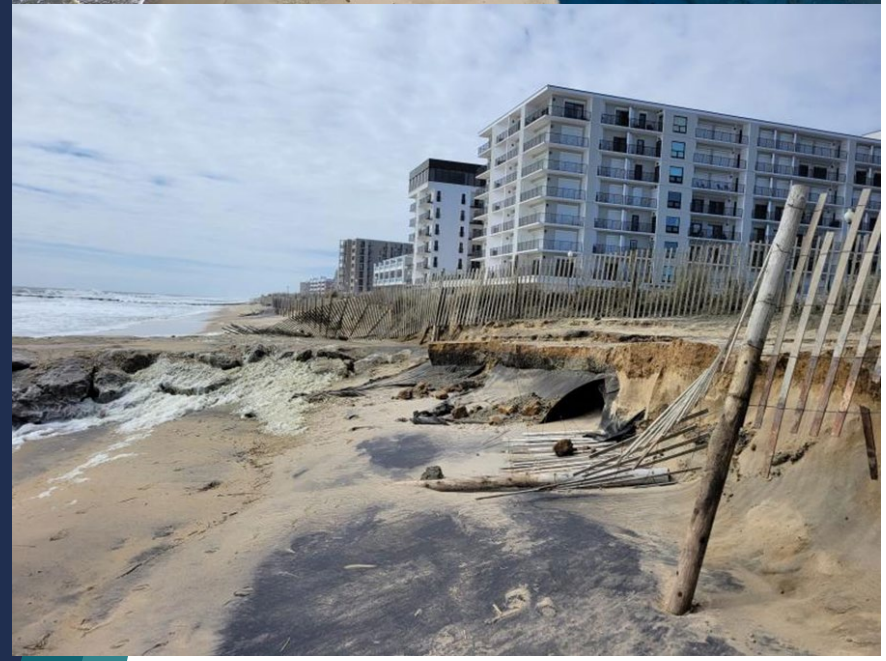
IEc

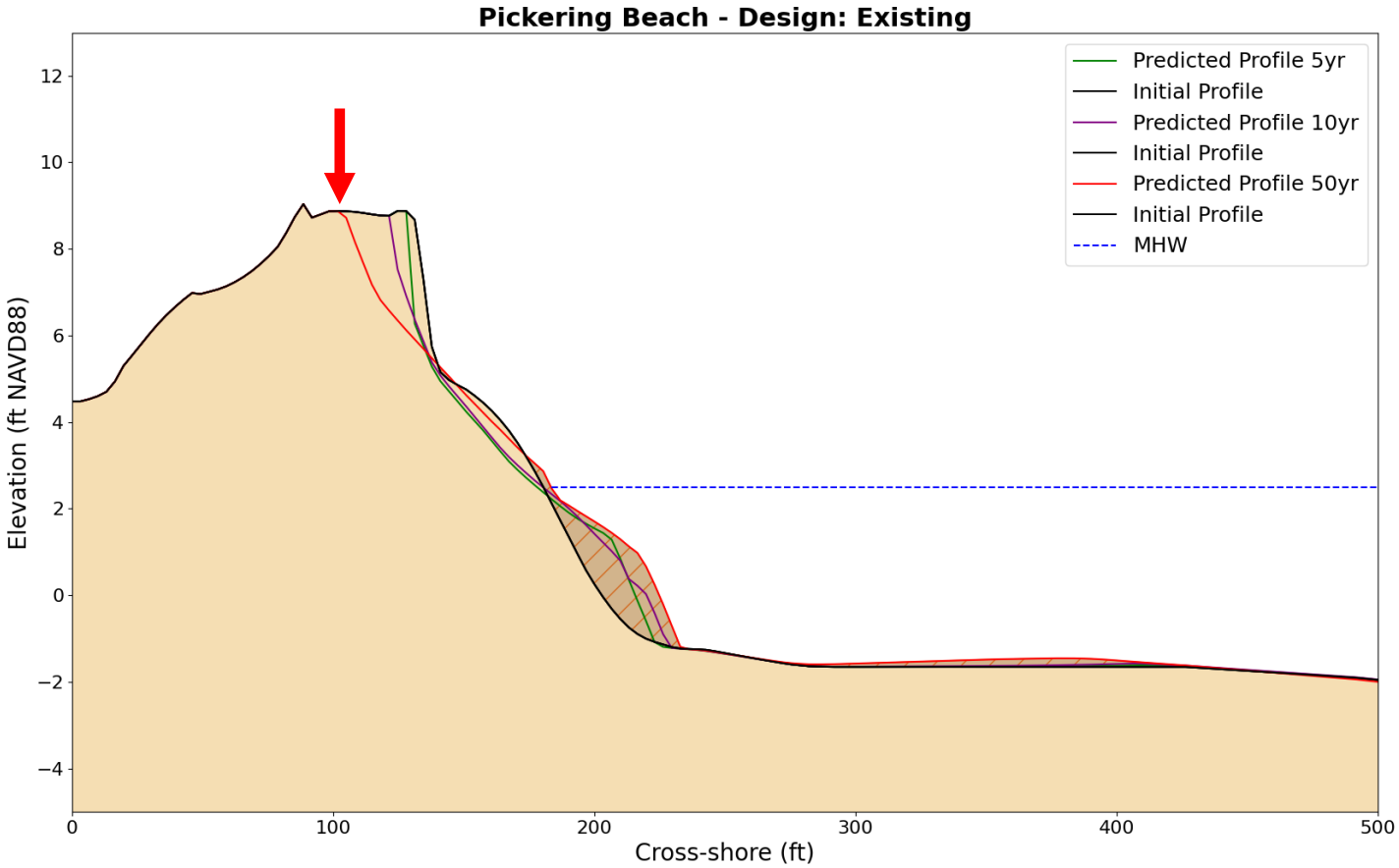
Shoreline Position



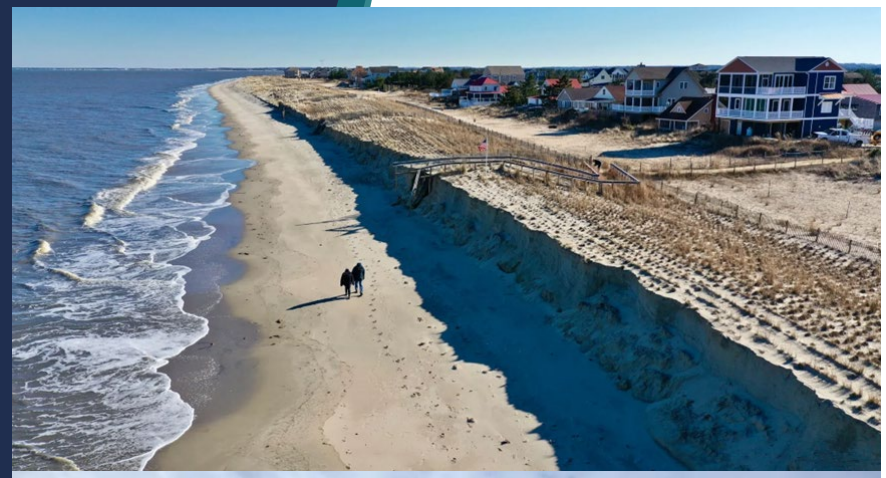
Episodic Coastal Erosion (Storms)

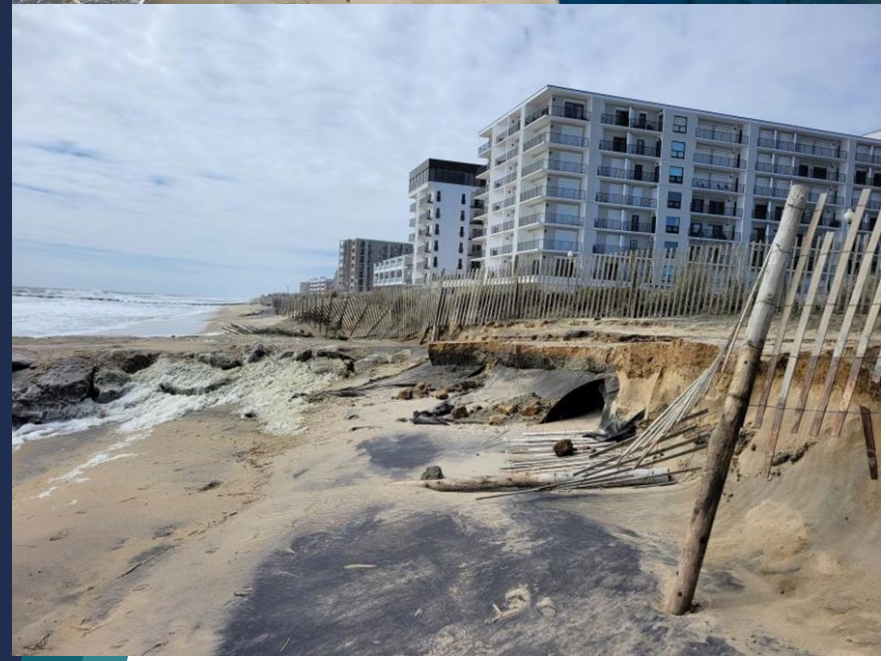


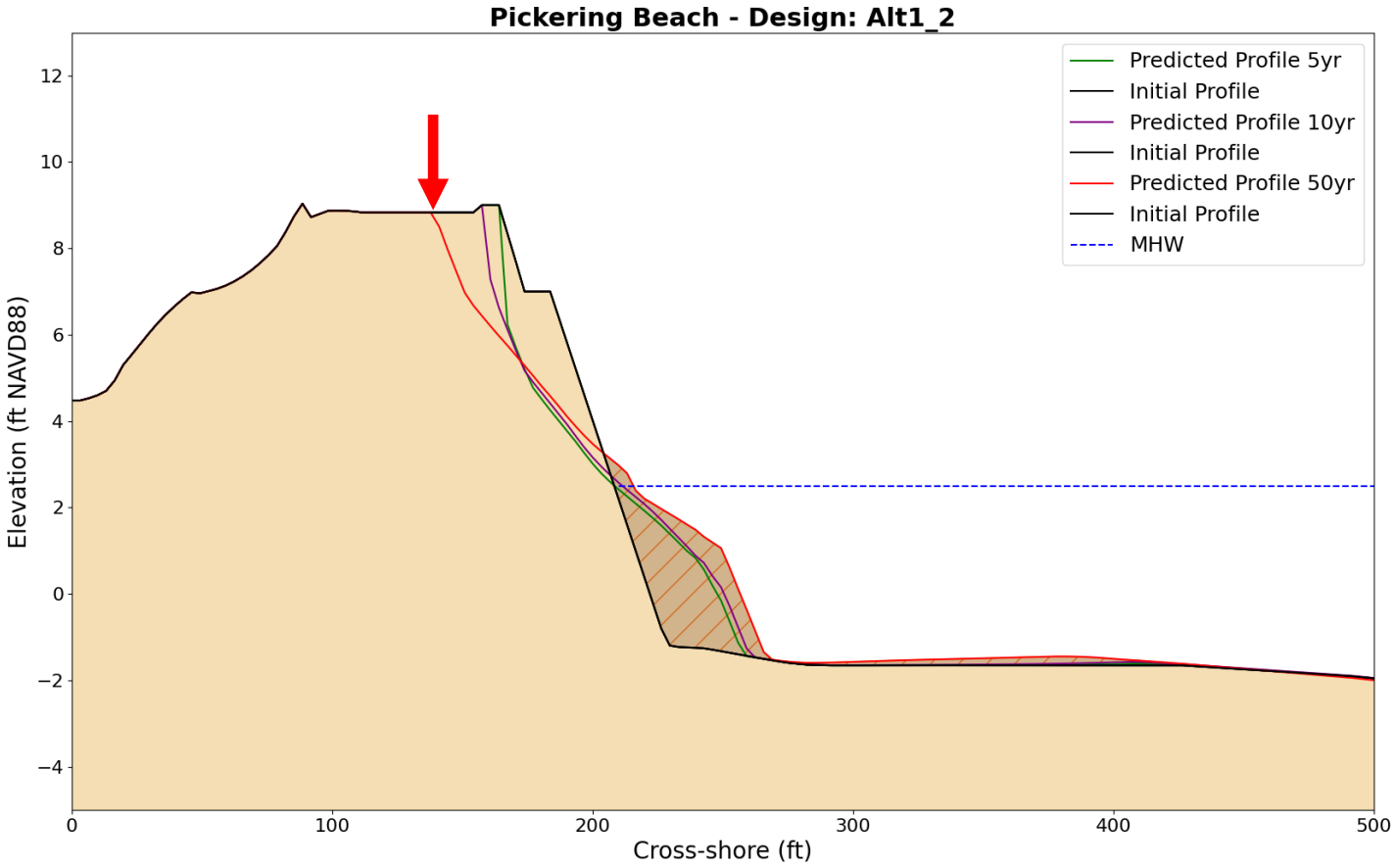




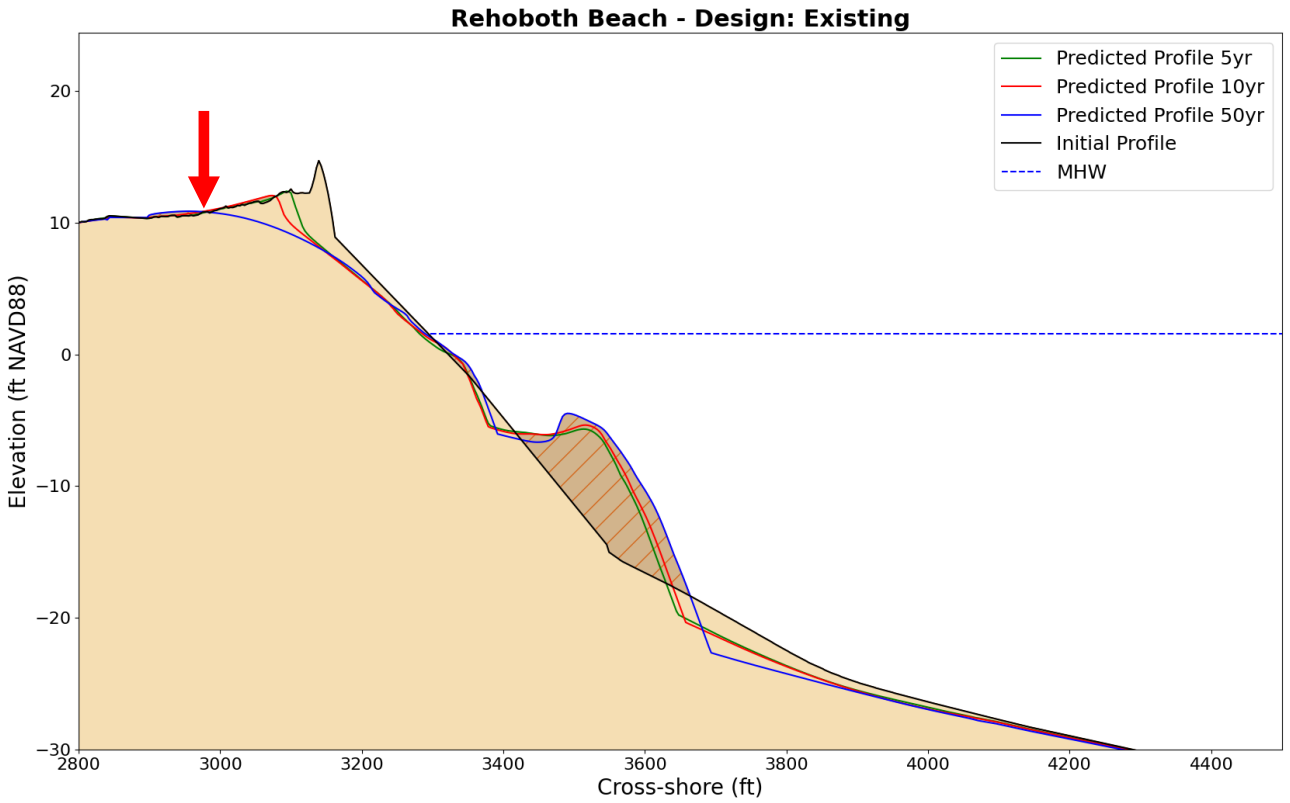
Episodic Coastal Erosion (Storms)



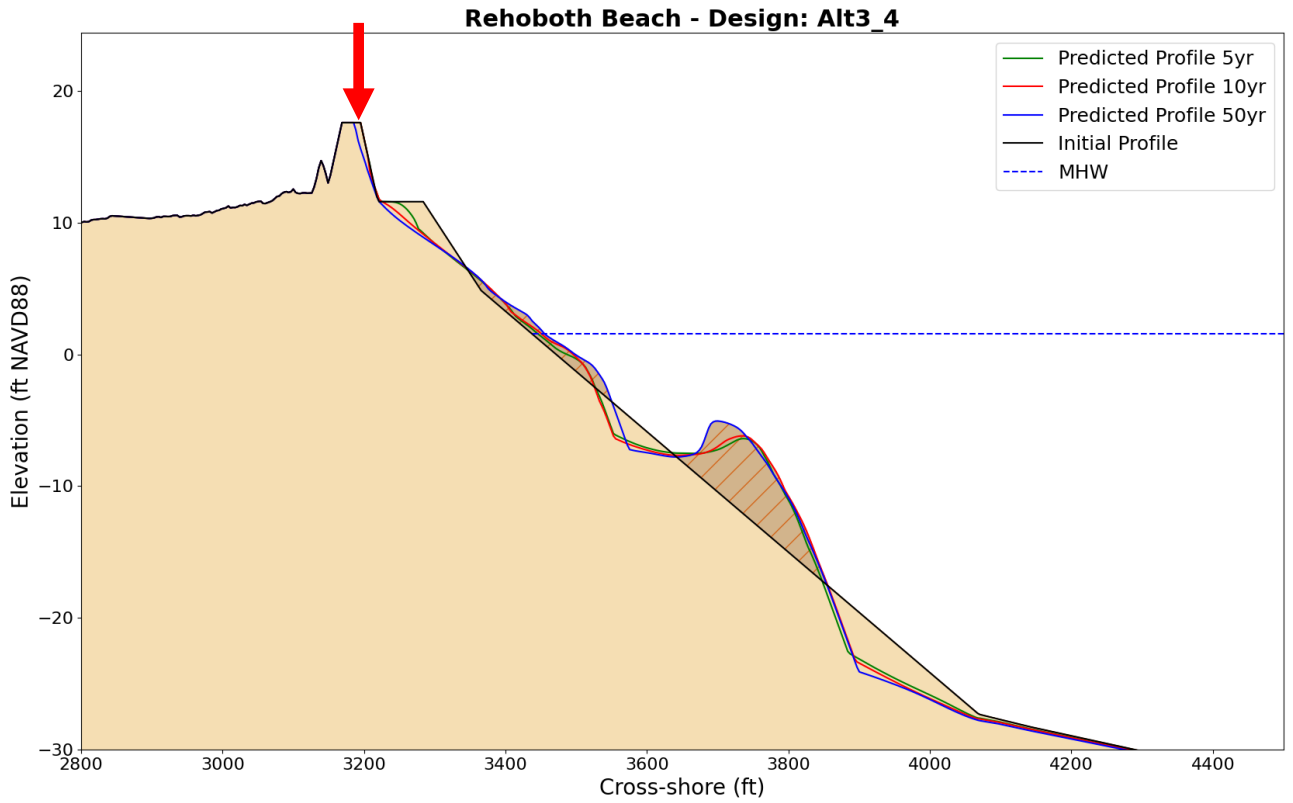




Episodic Coastal Erosion (Storms)

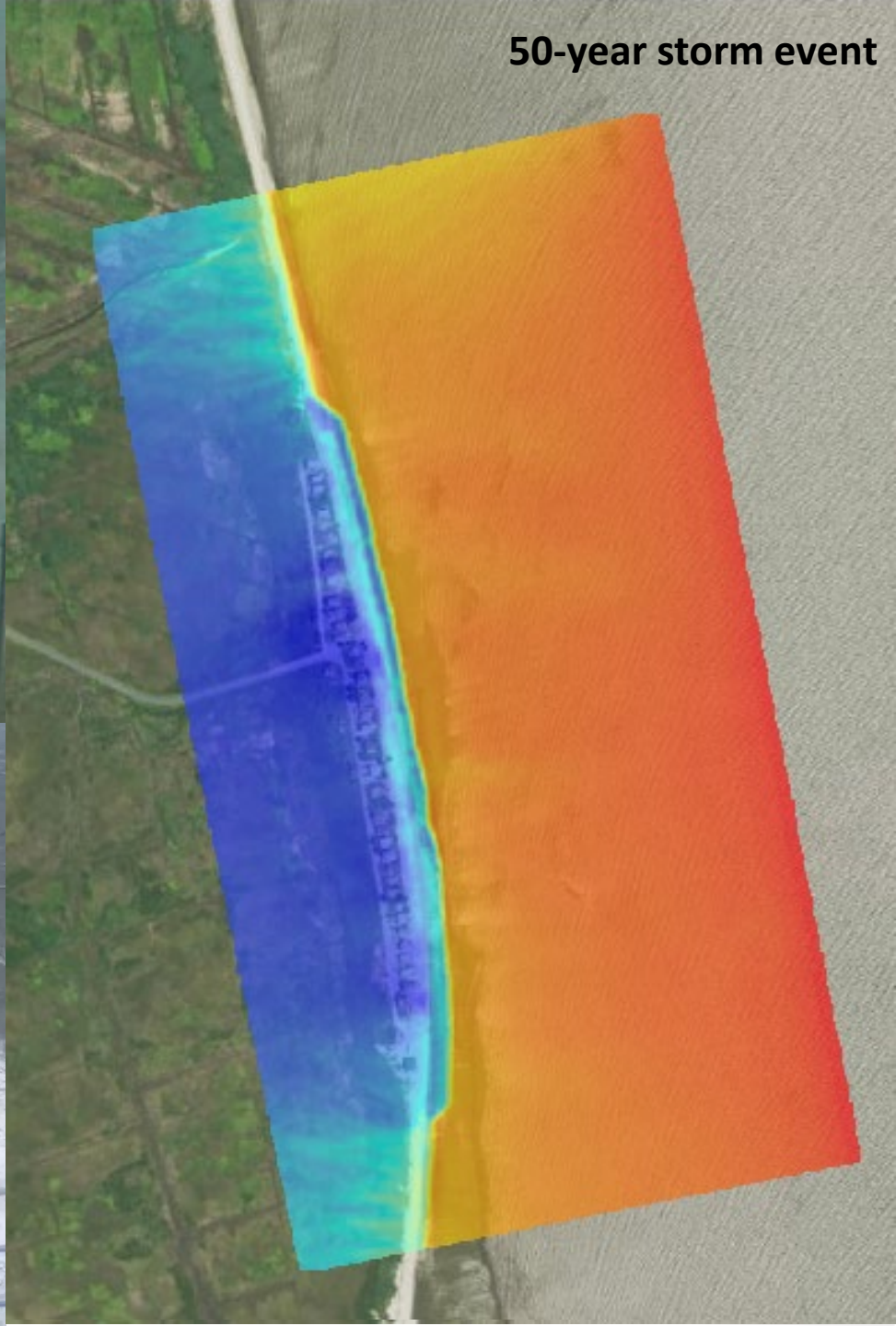


Episodic Coastal Erosion (Storms)



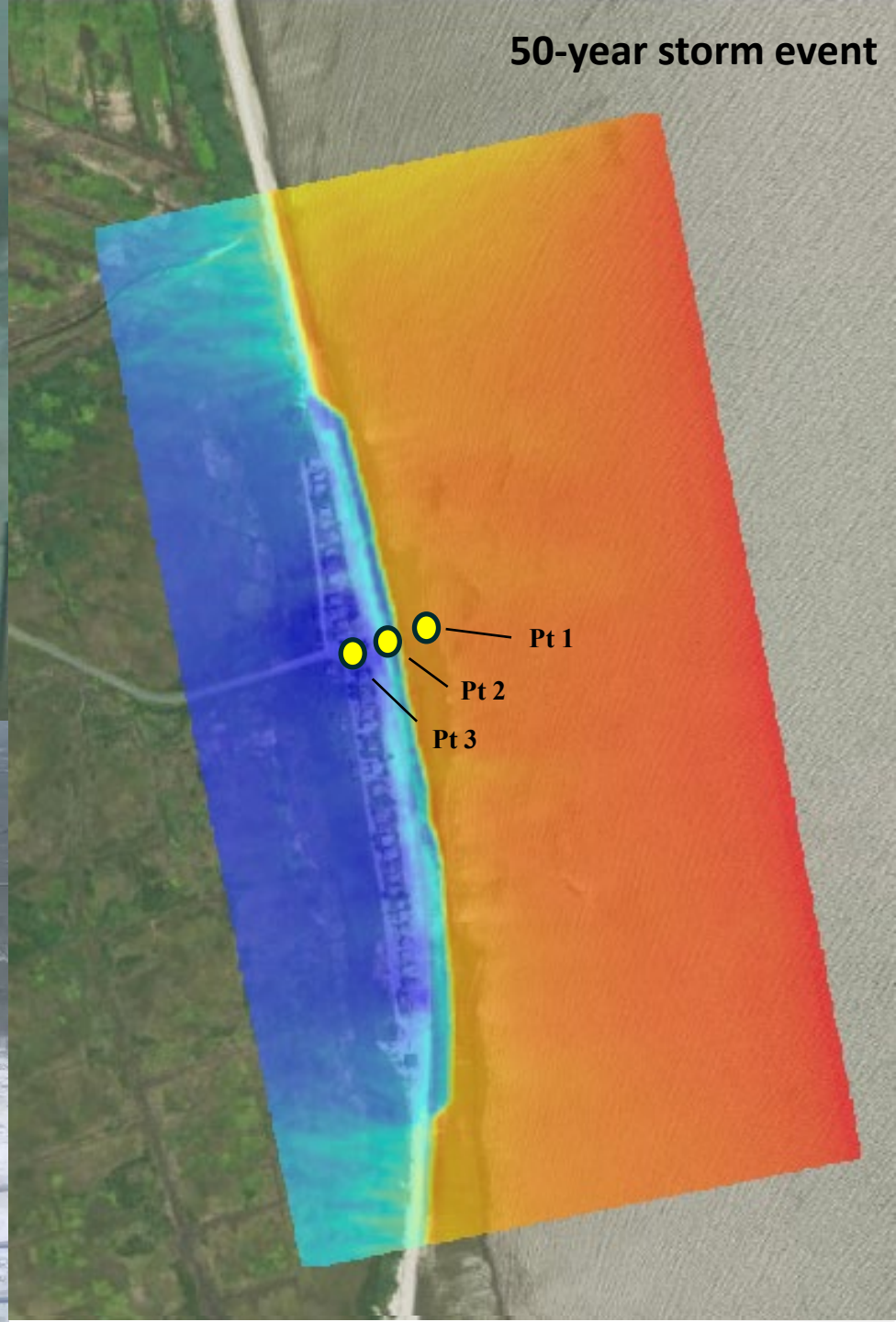
Wave Heights and Energy

Wave Heights and Energy



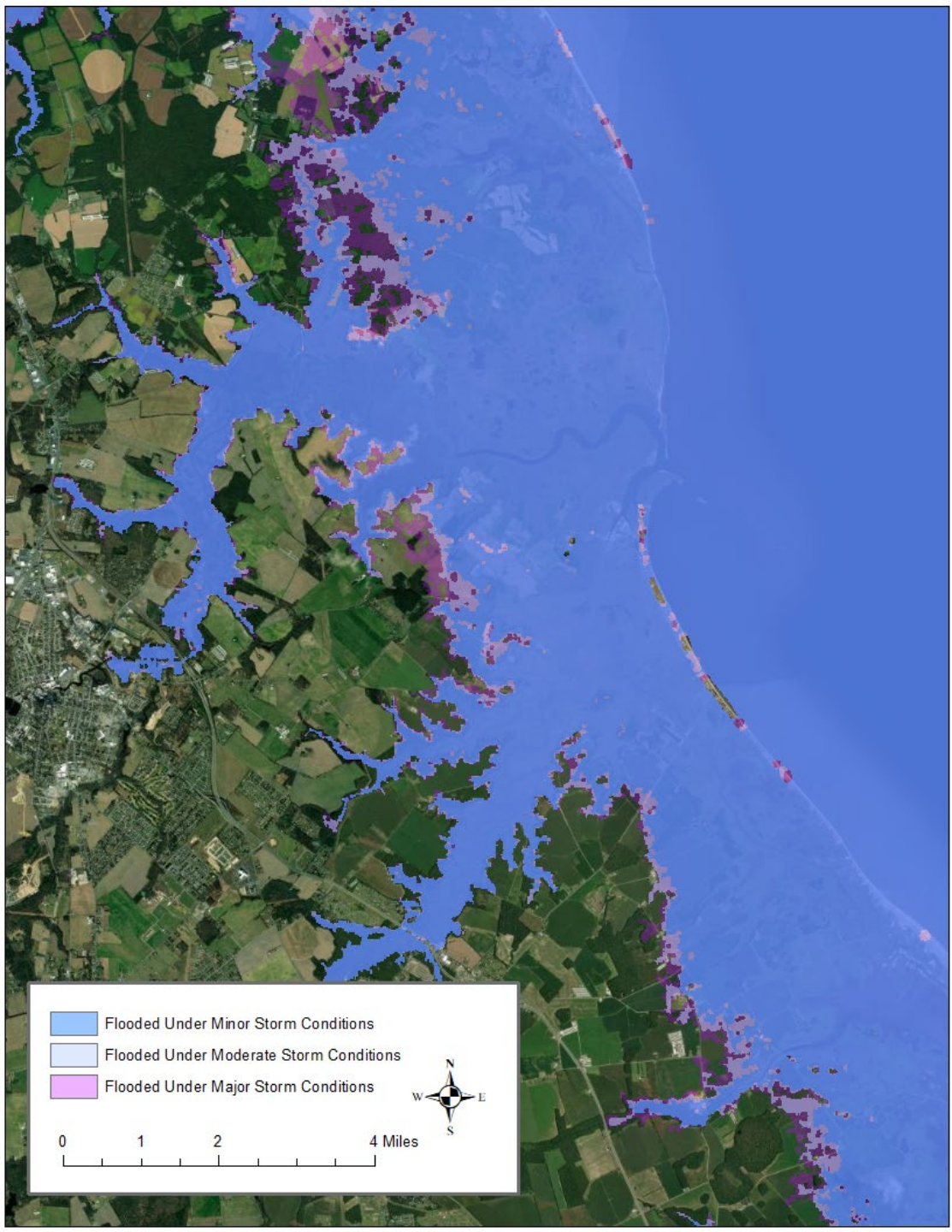
Wave Heights and Energy

Alternative	Wave Heights (ft)								
	5-year event (20% AEP)			10-year event (10% AEP)			50-year event (2% AEP)		
	Pt 1	Pt 2	Pt 3	Pt 1	Pt 2	Pt 3	Pt 1	Pt 2	Pt 3
Existing Conditions	4.0	1.7	0.0	4.2	2.1	0.0	5.3	3.8	0.78
Alternative 4	3.8	0.0	0.0	4.0	0.1	0.0	5.3	2.6	0.70



Flood Extent and Depths

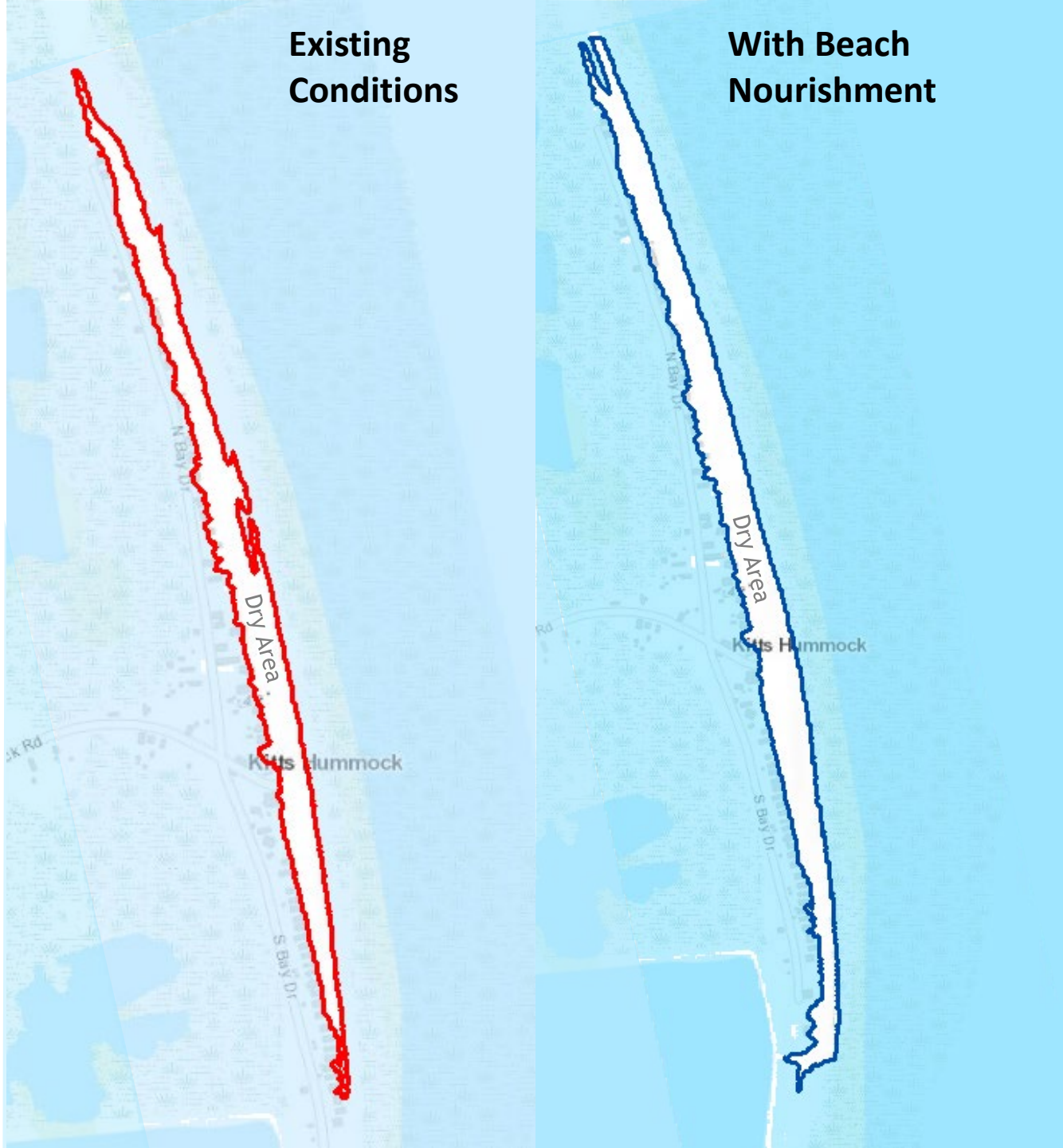
Slaughter Beach storm damage – 1962



IEc

Flood Depths and Extent

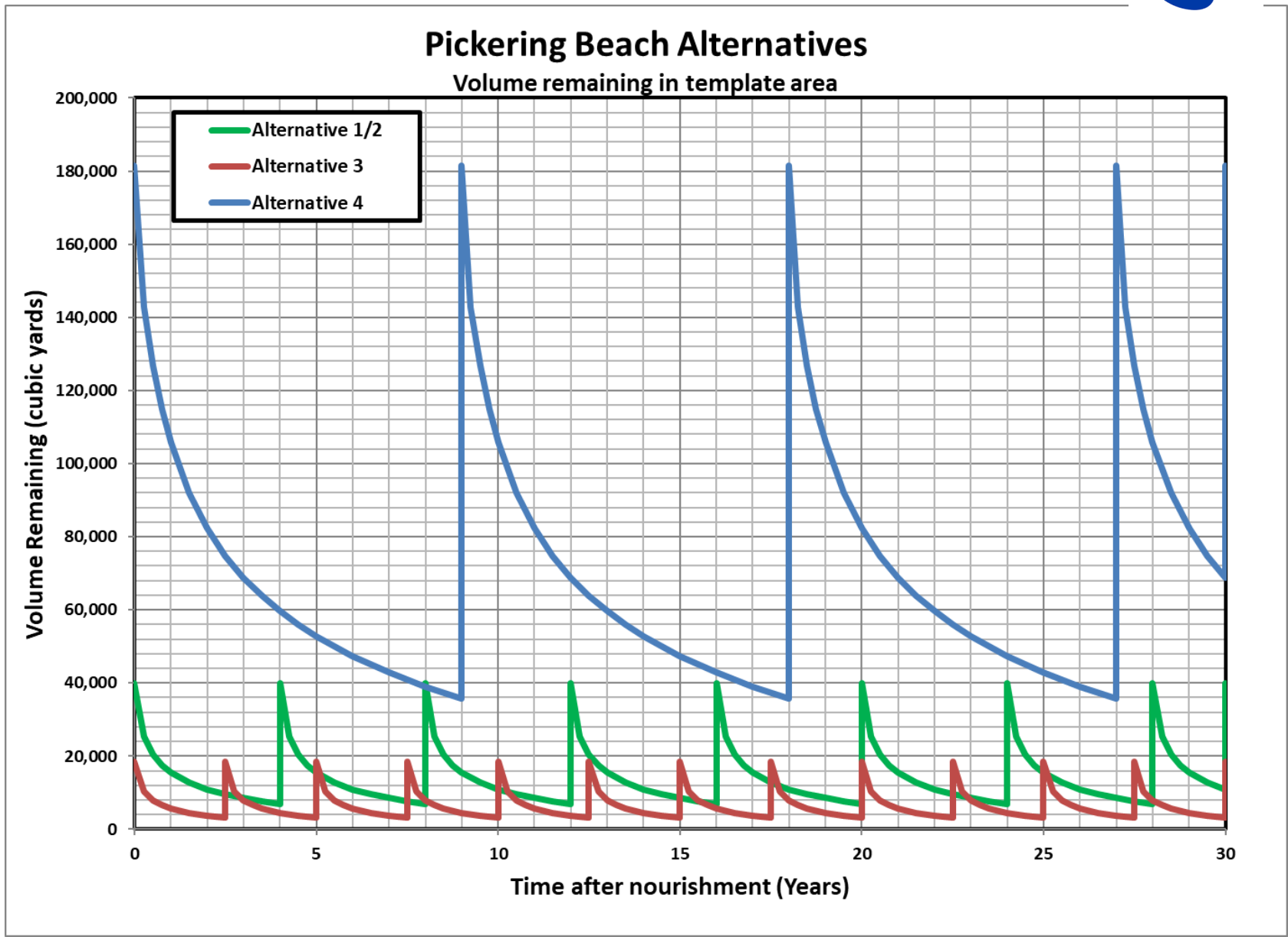
- Evaluates all level storm events
- Includes Backbay flooding processes during a coastal storm event
- Provides not only where the flooding occurs, but also the depth of the water



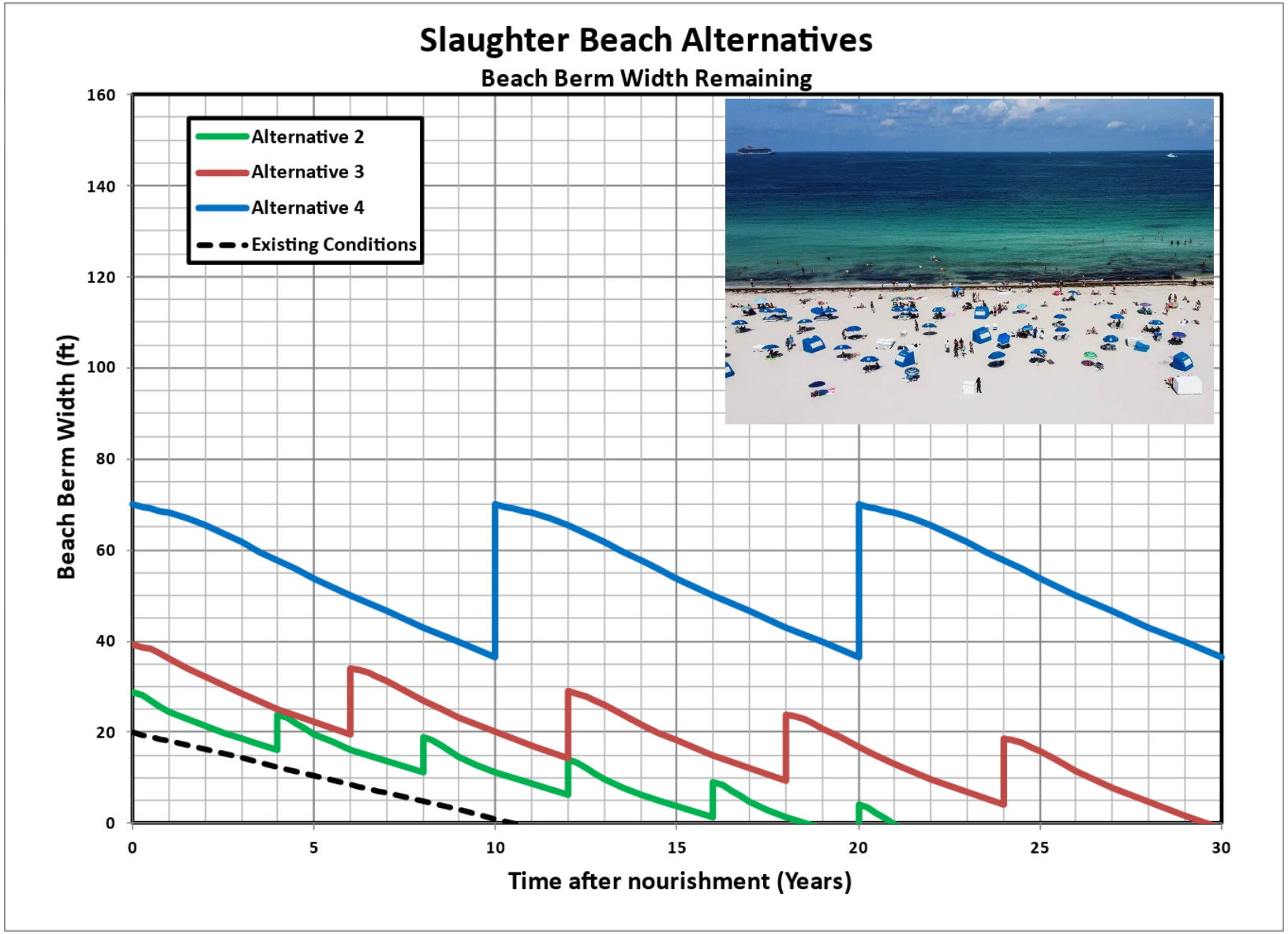
Beach Nourishment Performance

Renourishment triggers with approximately 20% of initial volume remaining in project area

- Alt. 1/2 – Every 4 yrs
- Alt. 3 – Every 2.5 yrs
- Alt. 4 – Every 8 yrs



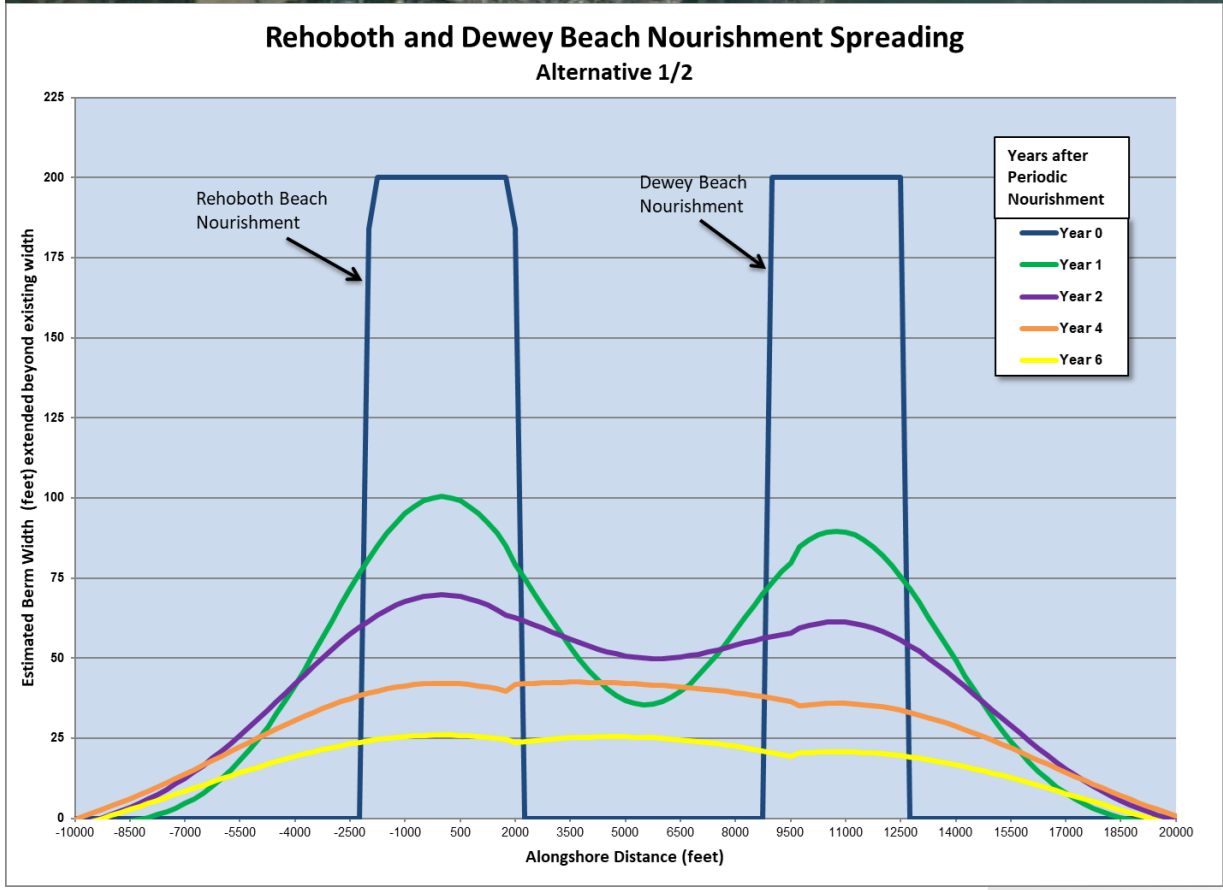
Beach Nourishment Width

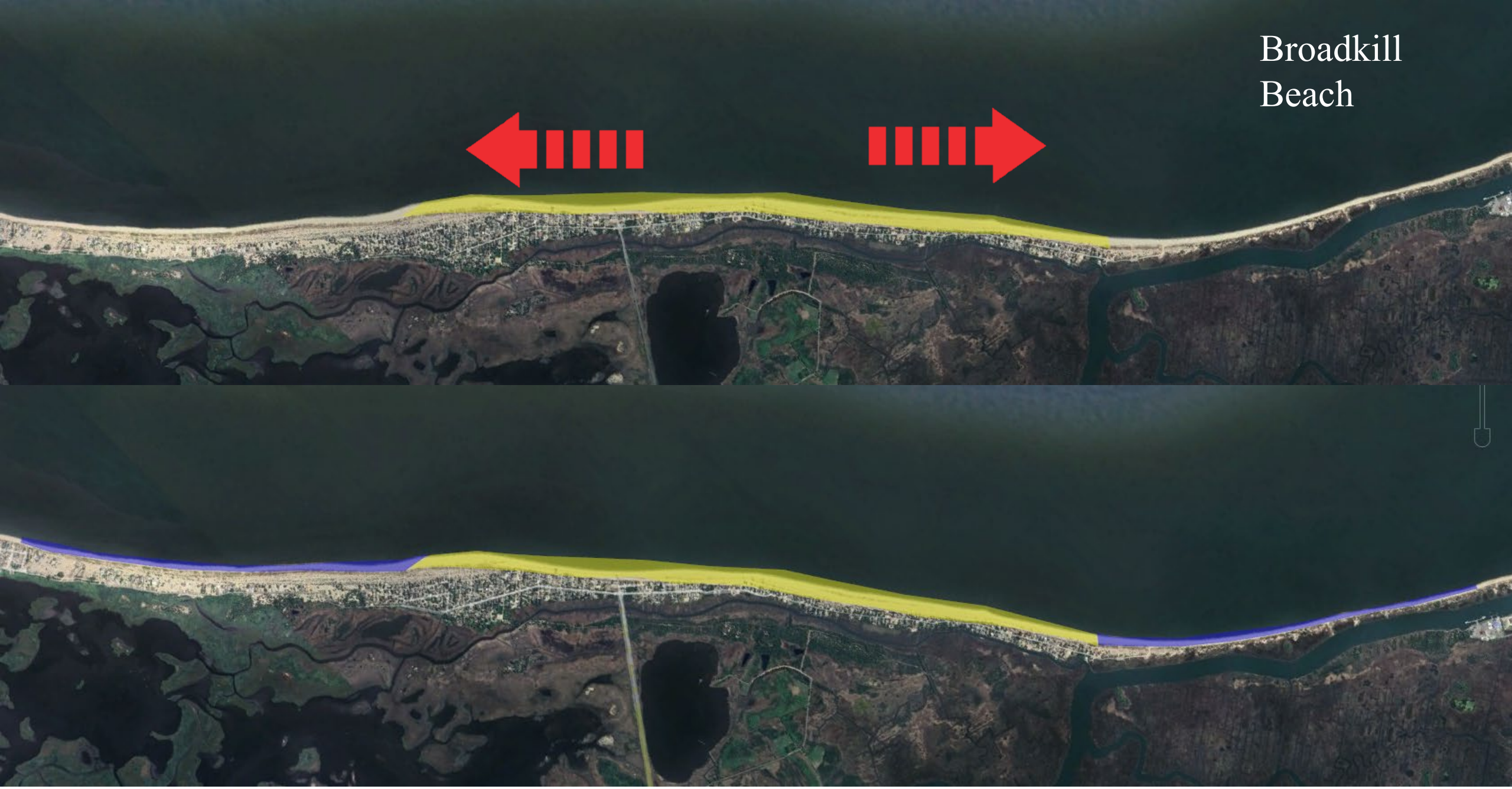


IEc

Beach Nourishment Spreading

- Sediment doesn't disappear, but relocates
- Beach nourishment benefits more than areas than just the initial placement area
- Spreads over time, dependent on energy and storms




Broadkill
Beach

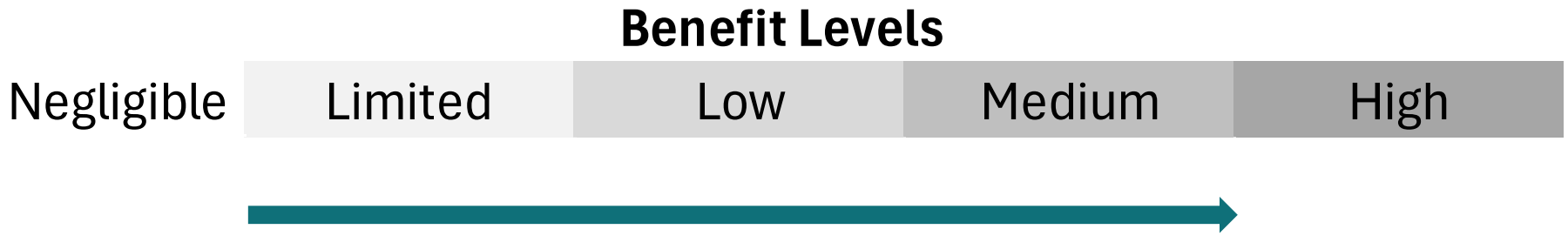
Framework for developing equitable cost share recommendations

IEc

Benefit Category	Recipients of Benefit	Cost Share Groups
Infrastructure Resilience	Private property owners: local	State
	Public property and infrastructure owners: state, county, municipal	County
Recreation Value	Recreators: state, local	Local
Tourism Impacts	Business owners: state, county	
	Governments: state, county	
Ecological Benefits	state	

Framework for the Benefits Analysis

- Utilize best available data
  - Regular workgroup meetings
  - Consultation with local experts
- Utilize well-accepted methods for each benefit
  - Mixture of qualitative and quantitative metrics
- Determine level of each benefit at each site



Who benefits from beach nourishment and by how much?

How much do property and infrastructure owners benefit from beach nourishment?

Delaware Bay project sites (excluding Lewes):

- $18 million annual expected damages
- Nourishment avoids 7-85%
- Primarily benefits residential property owners

Atlantic Ocean project sites (and Lewes):

- $33 million annual expected damages
- Nourishment avoids 40-100%
- Benefits shared by private property owners, municipalities, state

Image credit: Coastal Point, Mike Smith

Image credit: WRDE.com

IEc

How much do Delaware recreators benefit from nourishment?

Delaware Bay beaches (excluding Lewes):

- 31,000 annual trips by DE residents
- Nourishment avoids the loss of up to 23%

Atlantic Ocean beaches (and Lewes):

- 3.1 million annual trips by DE residents
- Nourishment avoids the loss of up to 36%

Rehoboth Beach before and after nourishment (same date, one year apart)

Image credit: Delaware News Journal

IEc

How much do local and regional economies benefit from beach nourishment?

- $1.1 billion in regional GDP from tourists visiting the beaches in this study.
  - Ocean beaches (and Lewes) account for nearly all (99.6%) of this tourism benefit.
  - The contribution of the bay beaches (excluding Lewes) to this tourism activity is negligible.
- Beach nourishment of the ocean beach sites avoids a loss to the tourism economy of between 1% and 17% (varies by beach).
- While the tourism activity benefits the broader state, the county experiences the majority (up to 97%) of the economic boost.

Image credit: Boardwalk Plaza Hotel

How much ecological benefit does beach nourishment provide?

Image credit: WHYY

- Delaware's coastal ecosystems hold immense ecological value.
- Nourishment provides some protection to certain ecological resources over 30-year timeframe (e.g., species such as horseshoe crabs and some shorebirds, wetlands).
- Ecological benefits of nourishment are greater at bay beaches but low relative to other benefits.
  - Limited influence on wetlands
  - Potential for negative ecological effects
- Ecological benefits assigned to the state cost share.

Benefit Levels at Delaware Bay Coast Project Sites (excluding Lewes)

	Infrastructure Resilience	Recreation Value	Tourism Impacts	Ecological Benefit
Pickering	High	Low	Negligible	Low
Kitts Hummock	High	Low	Negligible	Low
Bowers	Medium	High	Negligible	Low
South Bowers	Medium	Low	Negligible	Low
Slaughter	Medium	High	Negligible	Low
Broadkill	High	High	Negligible	Low
Cape Shores	High	Negligible	Negligible	Low

Benefit Levels at Atlantic Coast Project Sites (and Lewes)

	Infrastructure Resilience	Recreation Value	Tourism Impacts	Ecological Benefit
Lewes	High	Low	Low	Low
Rehoboth - Dewey	High	High	High	Limited
Bethany - South Bethany	High	Low	Low	Limited
Fenwick Island	High	Low	Low	Limited

Cost share recommendations

IEc

Summary of Cost Share Findings

- At all sites, the majority of benefits are experienced locally. The local cost share recommendation is similar for bay and ocean beaches.
- Ocean beach projects include a county-level cost share recommendation element due to benefits to the tourism economy.
- The state cost share recommendation is higher for the bay beach projects mainly due to the greater influence of the nourishment projects to coastal ecosystem protection on the bay.
- At ocean beach sites, sand spreading following nourishment can benefit adjacent communities. These benefits are included in the local cost share recommendation, and assigned to the specific communities benefitting.
- Cost share recommendations are generally not sensitive to design of the nourishment project.

IEc

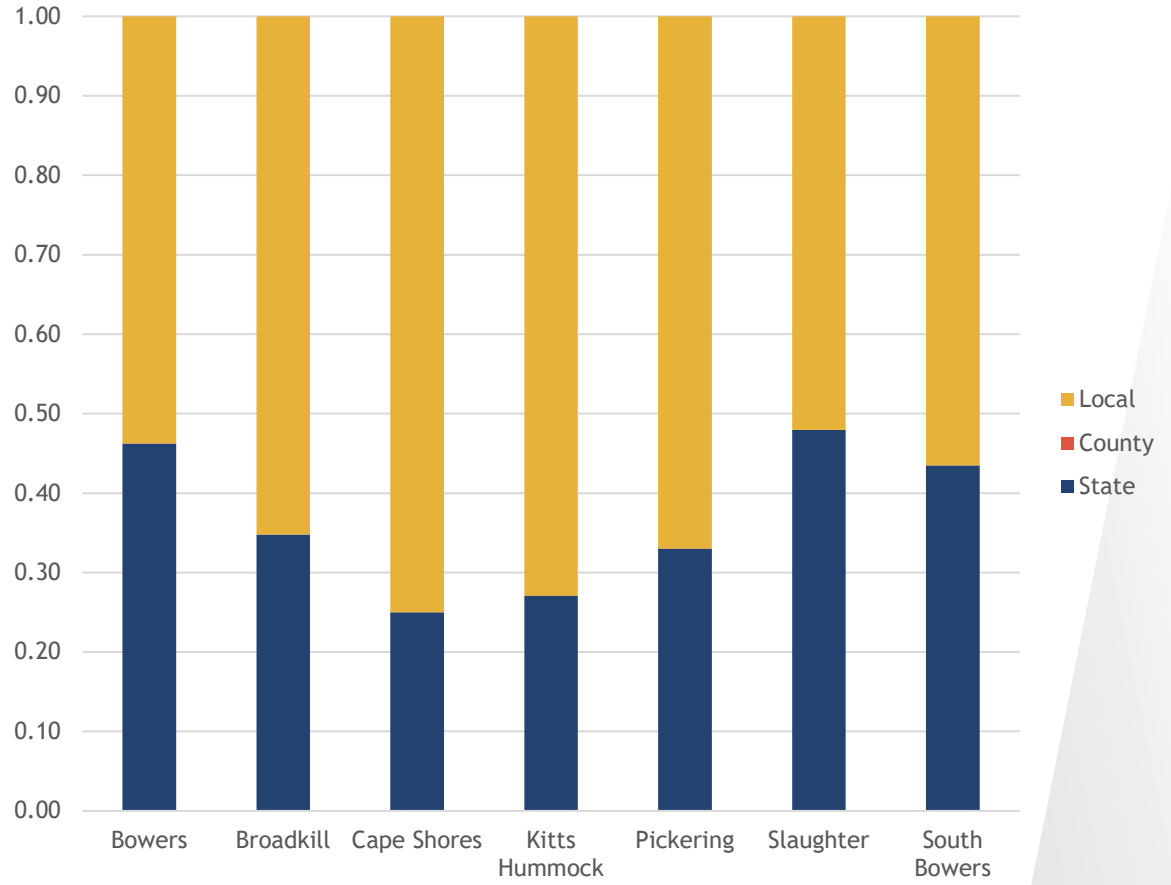
Delaware Bay Cost Share Recommendations (excluding Lewes)

Relevant benefit categories:

- Infrastructure resilience
- Recreation value
- Ecological benefit

Cost share partners:

- State 25-48%
- Local 52-75%



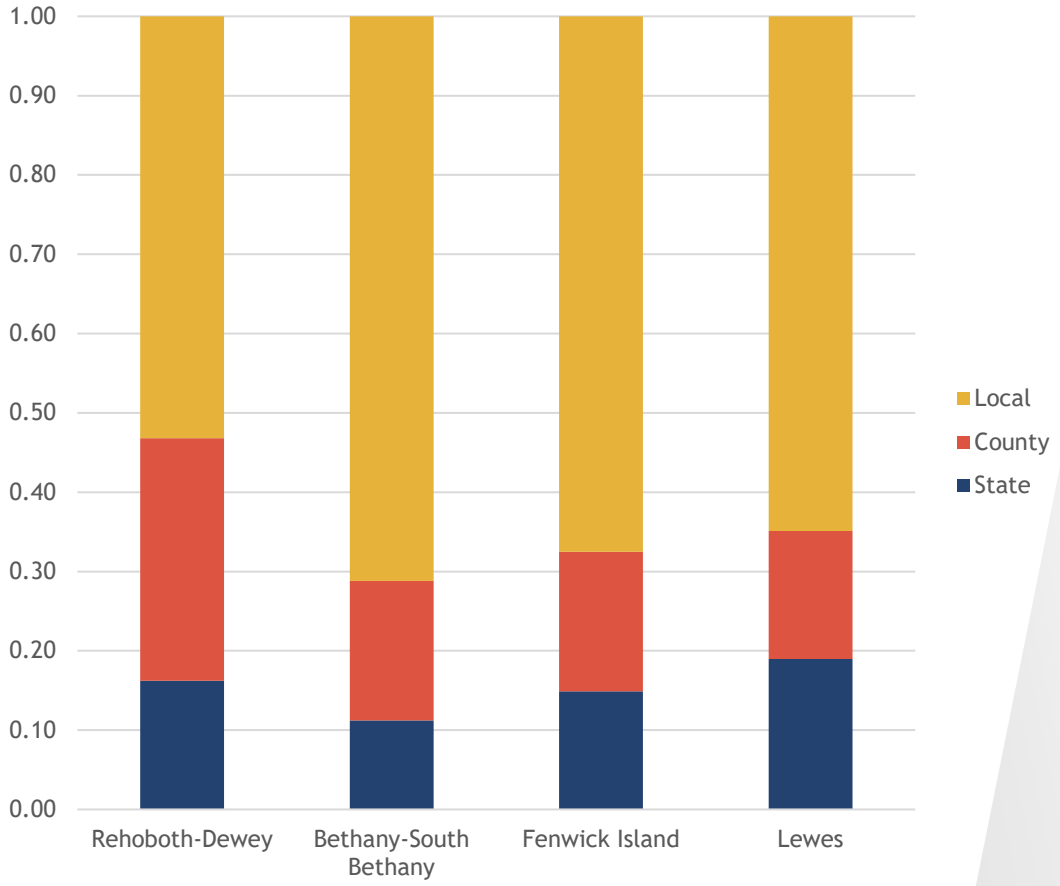
Atlantic Ocean Beach (and Lewes) Cost Share Recommendations

Relevant benefit categories:

- Infrastructure resilience
- Recreation value
- Tourism impacts
- Ecological benefit

Cost share partners:

- State 11-19%
- County 16-31%
- Local 53-71%



IEc

Additional Considerations

- Social vulnerability: susceptibility to harm
  - The report includes an assessment of the relative vulnerability of the populations benefitting from beach nourishment.
  - Finds the primarily factor contributing to the vulnerability of the coastal communities is age, which contributes to health deficits and a more limited ability to respond to or recover from environmental hazards, including storm events.
- Policy mechanism: how cost shares are funded
  - The local, county, and state cost share recommendations are based exclusively on the distribution of benefits. They do not reflect a recommendation regarding the government level at which the cost shares may be collected. Of note, many of the bay beaches are unincorporated.
  - The report does not make recommendations regarding policy options for operationalizing the cost share recommendations (e.g., taxes, fees, levies).
- Consistency with existing research
- Evaluation of nourishment costs

IEc

WOODS HOLE GROUP
FOR EARTH, FROM SPACE
A CLS COMPANY

Ben Blachly, IEc
Kirk Bosma, WHG
Maura Flight, IEc