COASTAL TEXAS STUDY SEDIMENT NEEDS

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WEDA Dredging Summit (Virtual)

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COASTAL TEXAS STUDY

US Army Corps of Engineers®
Galveston District

The U.S. Army Corps of Engineers has partnered with the Texas General Land Office to identify and recommend feasible projects to reduce risks to public health and the economy, restore critical ecosystems, and to make the Texas coastline more resilient.

US Army Corps Of Engineers

STUDY SUMMARY

http://CoastalStudy.Texas.gov
CoastalTXStudy

Study Name: Coastal Texas Protection & Restoration Feasibility Study

Authorization: Sec. 4091, Water Resources Development Act (WRDA) of 2007 Public Law 110-114

Appropriation: 2014-2019 yr increments thru public law
2020-2021 thru Bipartisan Budget Act of 2018

Budget: $20.18 Million ($12.282 Federal: $7.898 Cost-shared)

Non-Federal Sponsor: Texas General Land Office

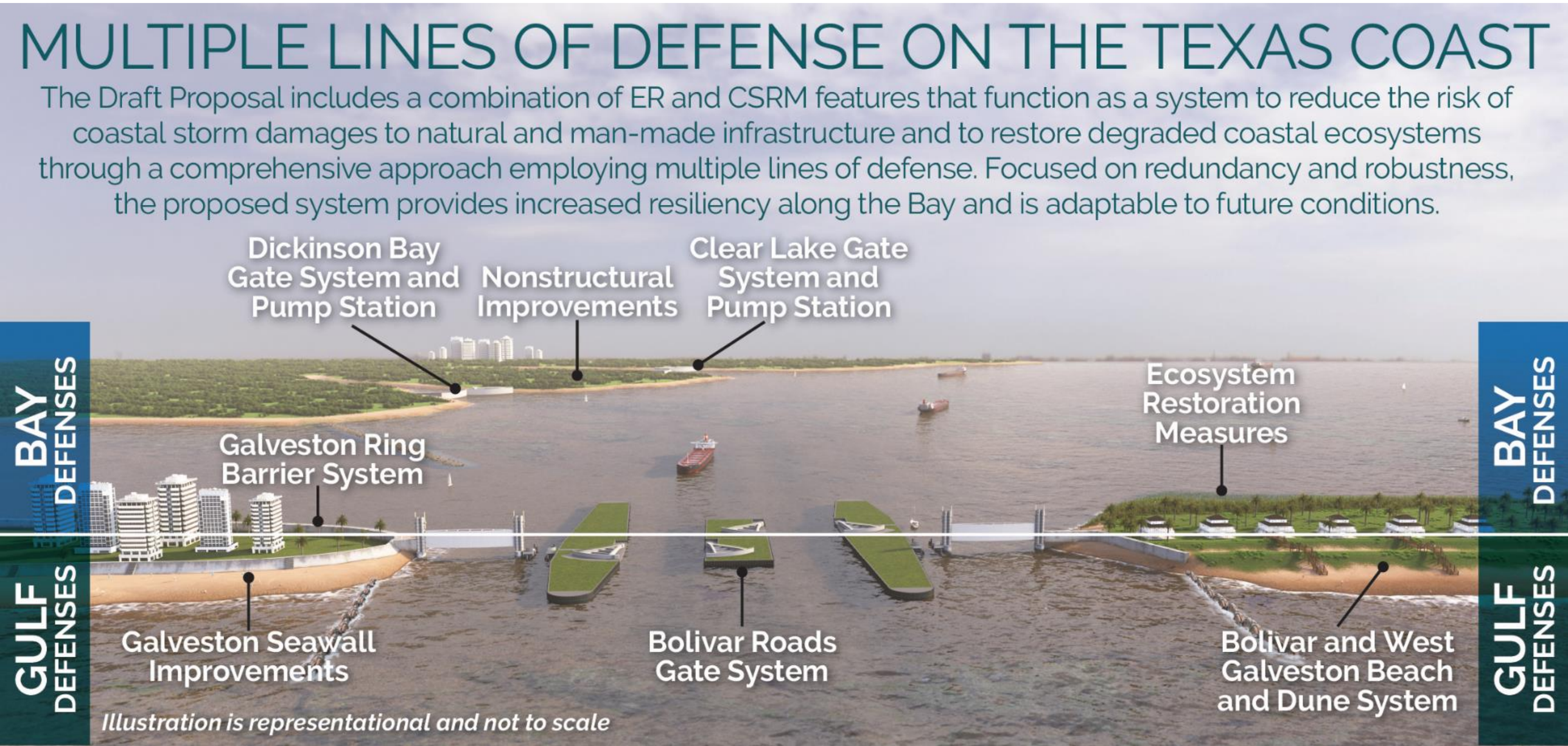
Schedule: Recon: 2014-2015
Feasibility Study Start: Oct 2016
Scheduled Completion: May 2021

Multi-Purpose: Coastal Storm Risk Management and Ecosystem Restoration

Scope:
Develop a ***comprehensive plan*** to determine the feasibility of carrying out projects for flood damage reduction, ***hurricane*** and ***storm damage reduction***, and ***ecosystem restoration*** in the coastal areas of the State of Texas.

The comprehensive plan shall provide for the ***protection***, ***conservation***, and ***restoration*** of wetlands, barrier islands, shorelines, and related lands and features that ***protect critical resources, habitat, and infrastructure*** from the impacts of coastal storms, hurricanes, erosion, and subsidence

Recommended Plan



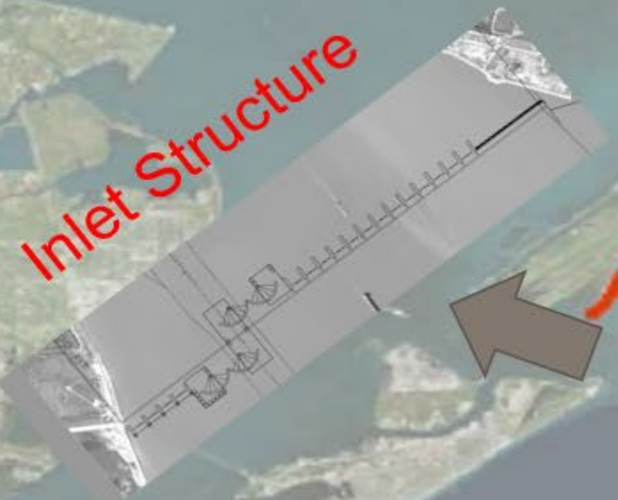
Sediment Needs: Beach and Dune System

Design & Analyses

Design of Beach and Dune System

Design Questions

- How much material do we need ?
- Sediment Source ?
- Will it perform at the design level and sustain over RSLC?
- Beach access ?
- Project Cost (Initial ,O&M) ?



Bolivar
~26 mile

Galveston
~19 mile

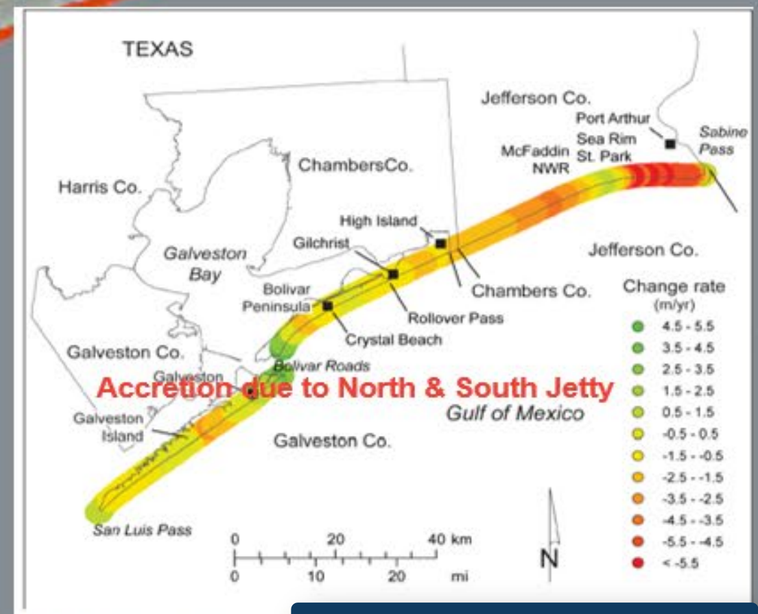
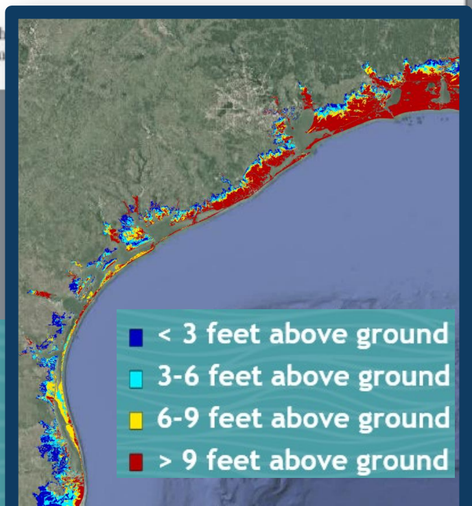


Figure 17. Net rates of long-term ch
and San Luis Pass (Jefferson, Cham
tions through 2007 (table 3).

Challenge:

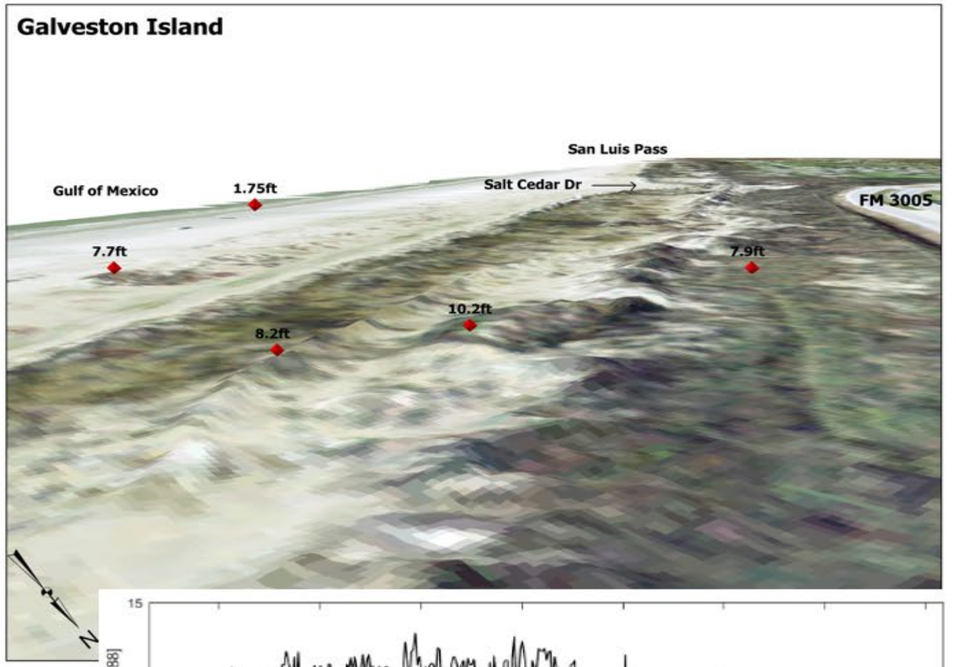
Over 45 miles of coastal spine (beach & dune system) design, Performance & Resiliency check against forcing (Storm, Erosion, RSLC)

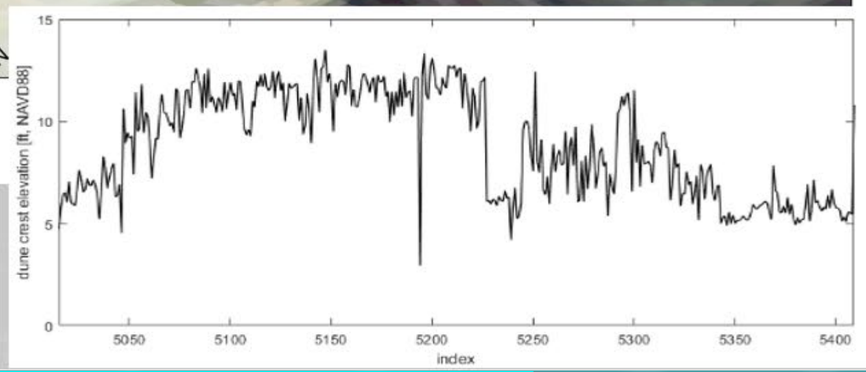


We stepped back from 17 ft Levee to Nature Based Solution

Design Philosophy : Mimic Natural Condition

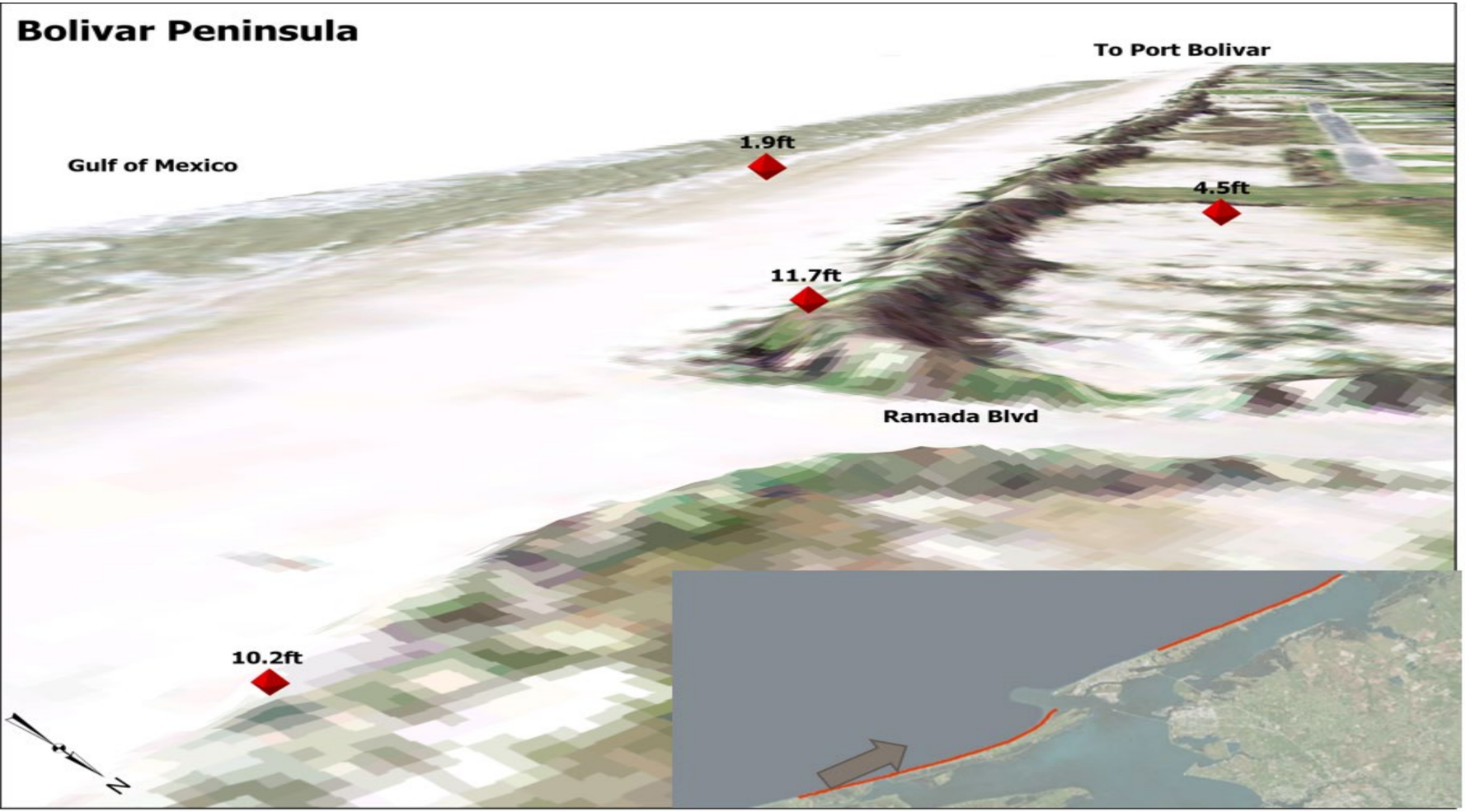
Topography (2018 LIDAR)

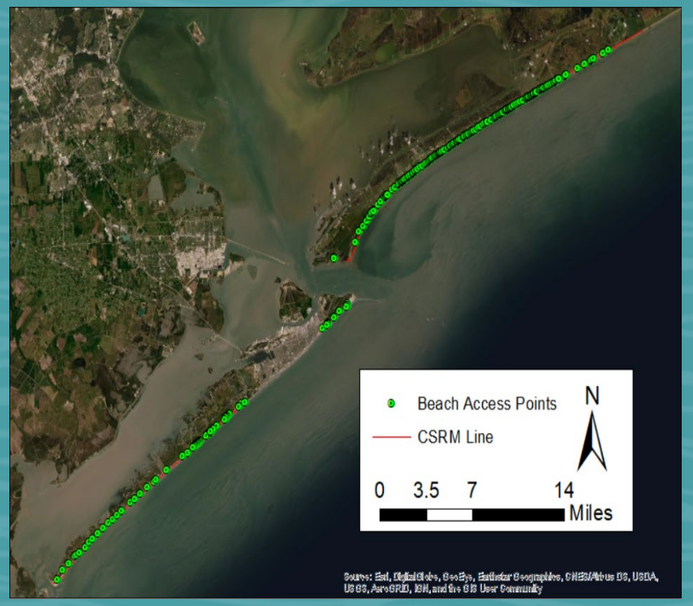




Galveston Island Dune Line (5 to 12 ft)

Design Philosophy : Mimic Natural Condition





State & Federal Regulation on Beach Access

Bolivar Peninsula Dune Line (~10 ft)

Design & Evaluation Method

1. CEDAS: BMAP, S-Beach

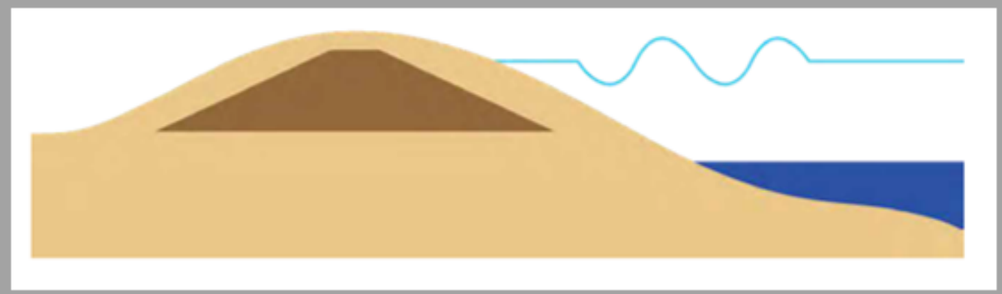
Storm Condition : Event Based
(Ike, Rita, Frances, Allison)

2. CSHORE

MonteCarlo Probabilistic Simulations
(170 Tropical Storms,
RSLC)

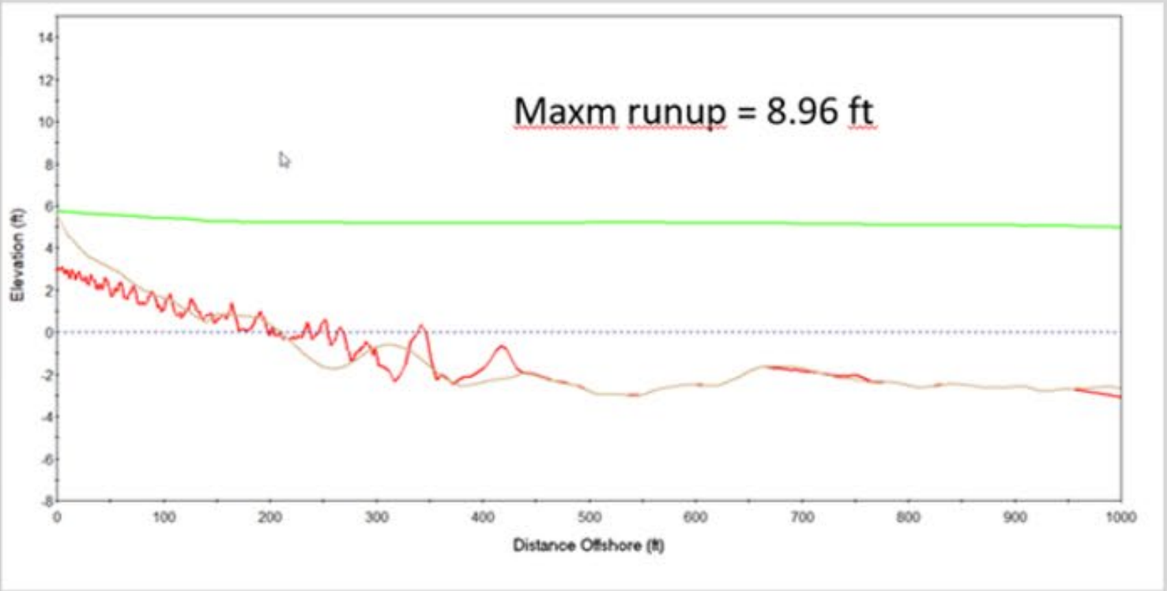
Design Cross Section : Many Cases

- Existing Condition
- Dune: Sand Only Option (12 ft, 14 ft Dune Height)
- Dune Field: Sand Only Option (12 ft, 14 ft Dune Height)
- Fortified Dune - Hard Core Inside (8 ft, 10 ft, 12 ft)

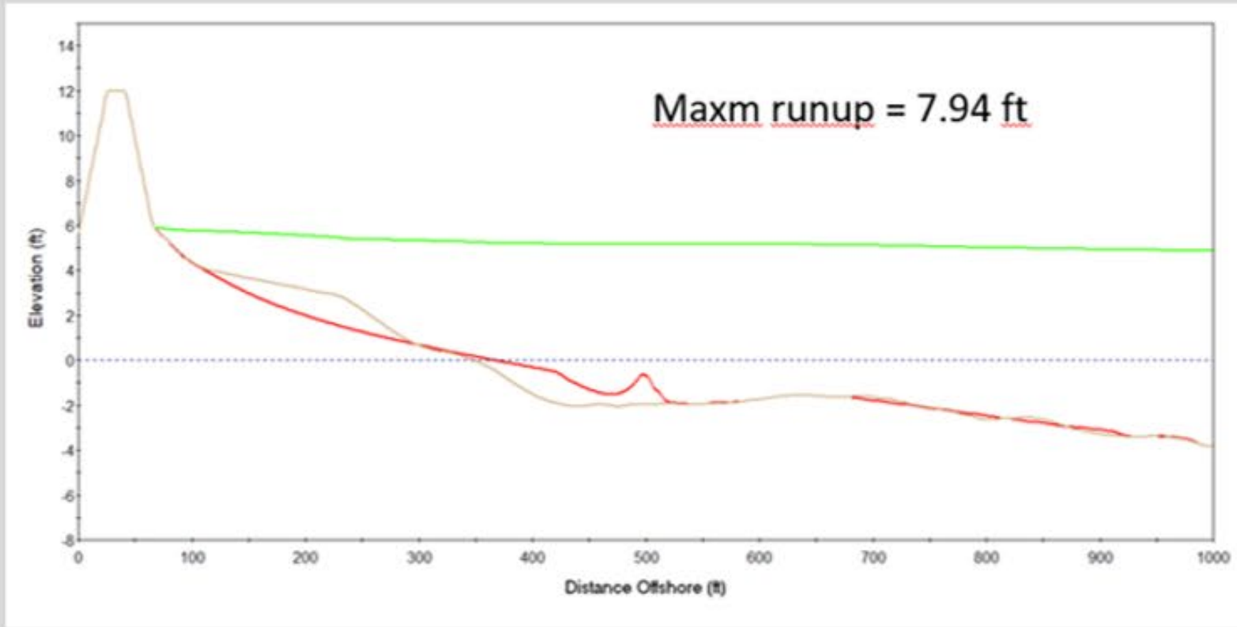


Question to Answer
(a) Initial Quantity (Construction Cost)
(b) Regular re-nourishment cycle (O&M)

Example Case:10 year Storm (~Reta)



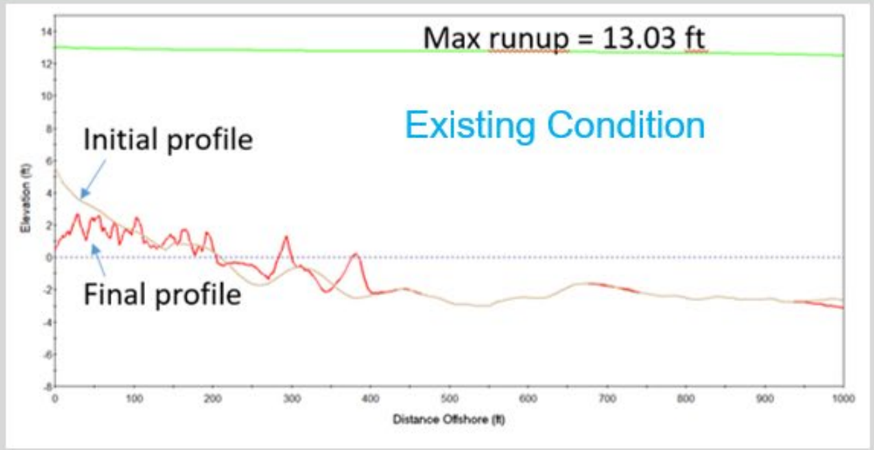
Existing Condition

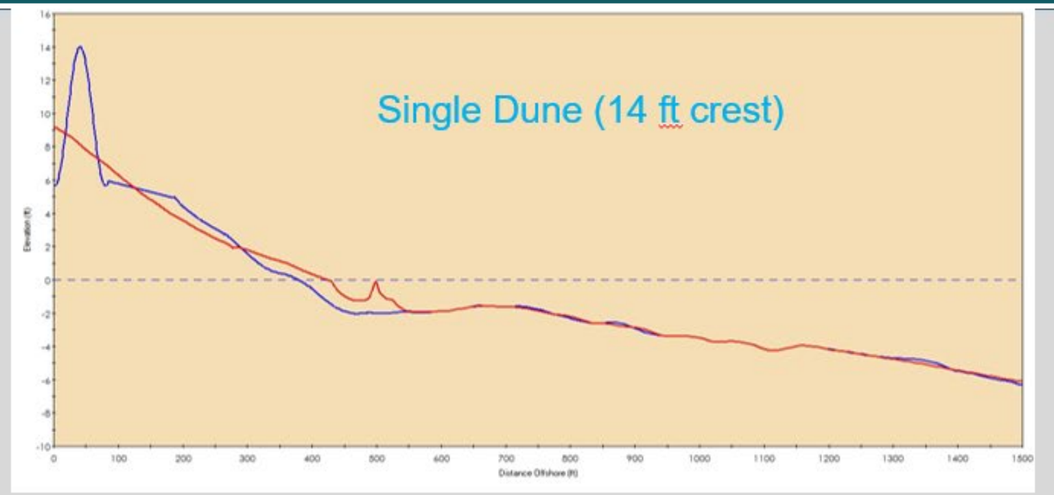


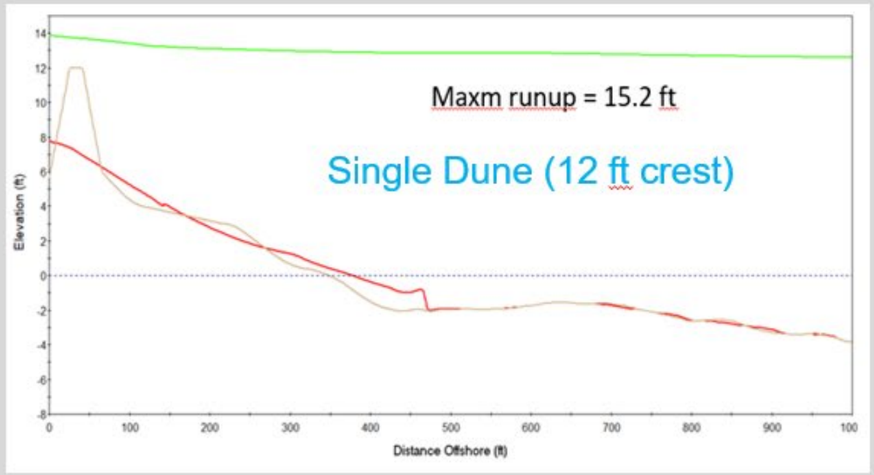
Single Dune (Sand Only Option)

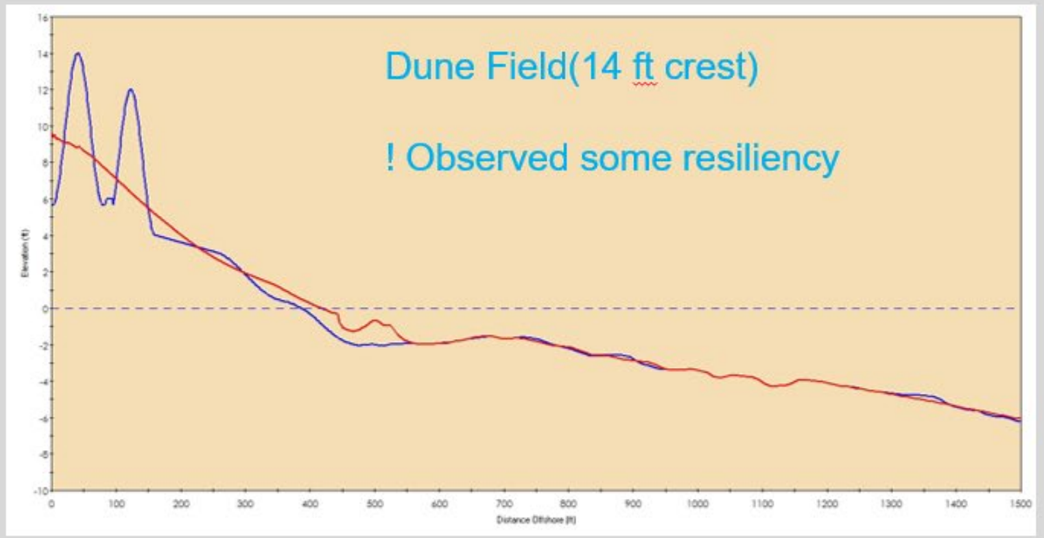
Dunes appears to be intact

Example Case:100 year Storm (> Ike)



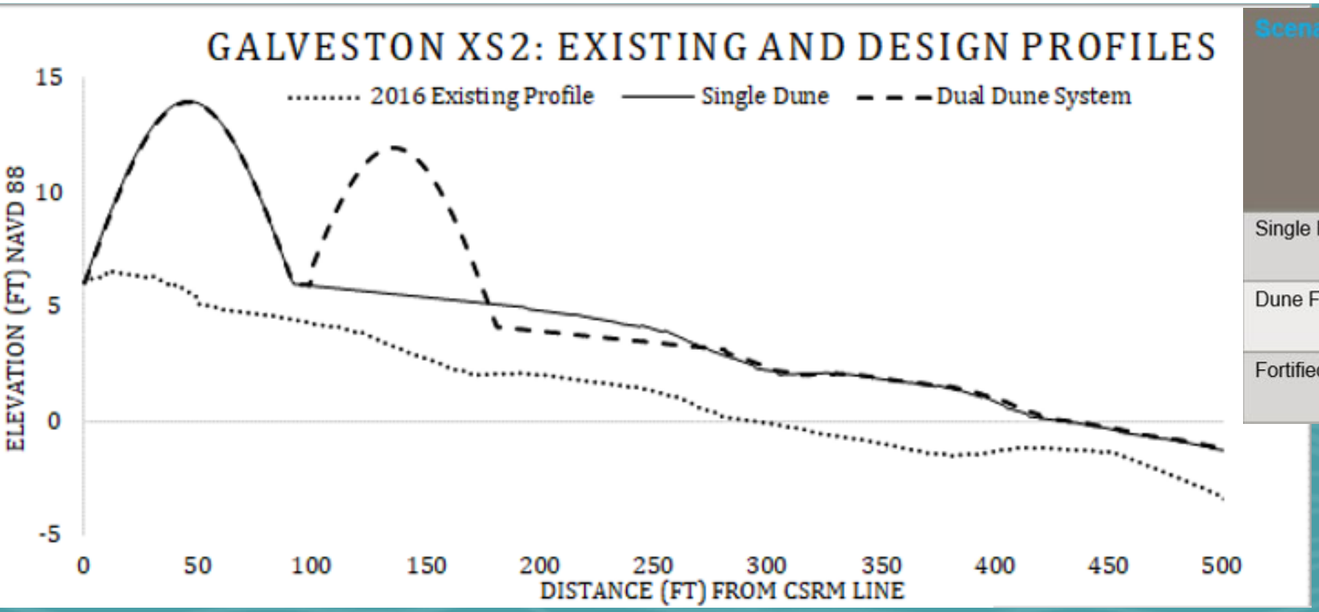






Dunes appear to be compromised in such events

Evaluation Matrix



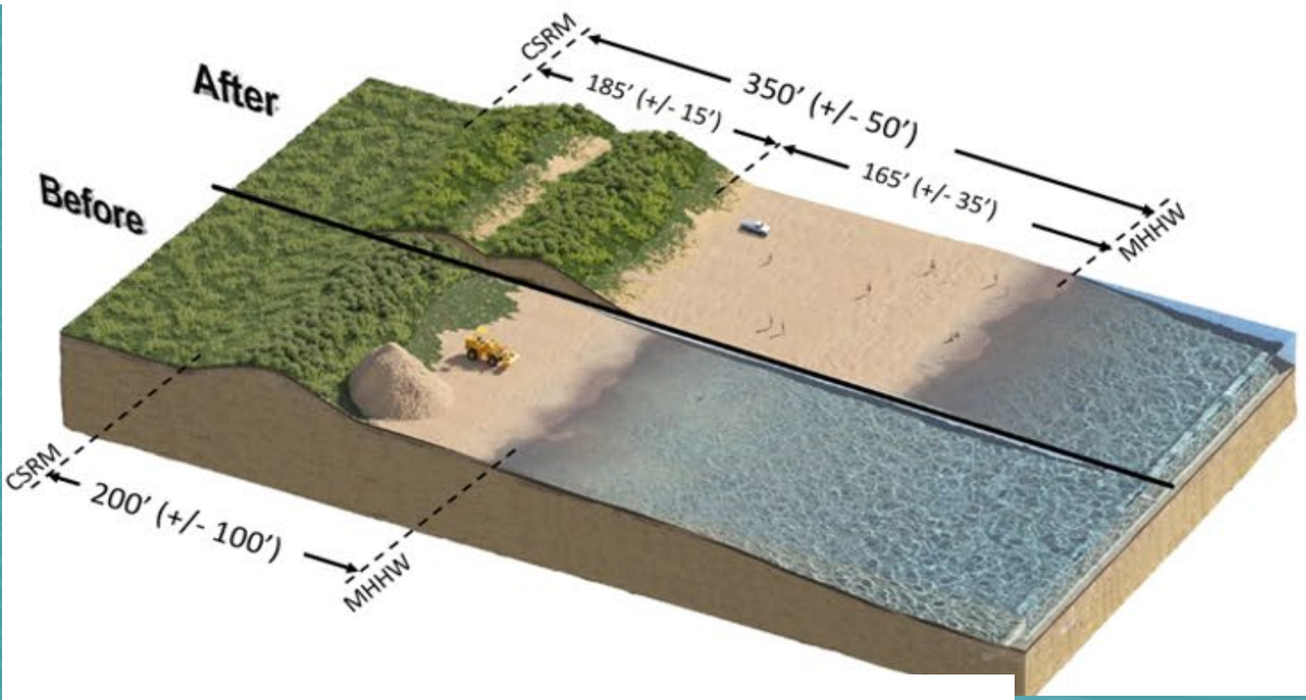
Scenario	Approximate Initial Cost (in Million)	Maintenance Sand Volume (10 yr int.)	Breaching, Overtopping (100 Yr AEP)	Resiliency	Acceptability/Environmental Compliance
Single Dune	$ 1,197	Range between 10 and 14 cyd/ft average	Very High	Medium	High
Dune Field	$ 1,425		High	High	Very High
Fortified Dune	$ 1,533		Very Low	Very High	Medium

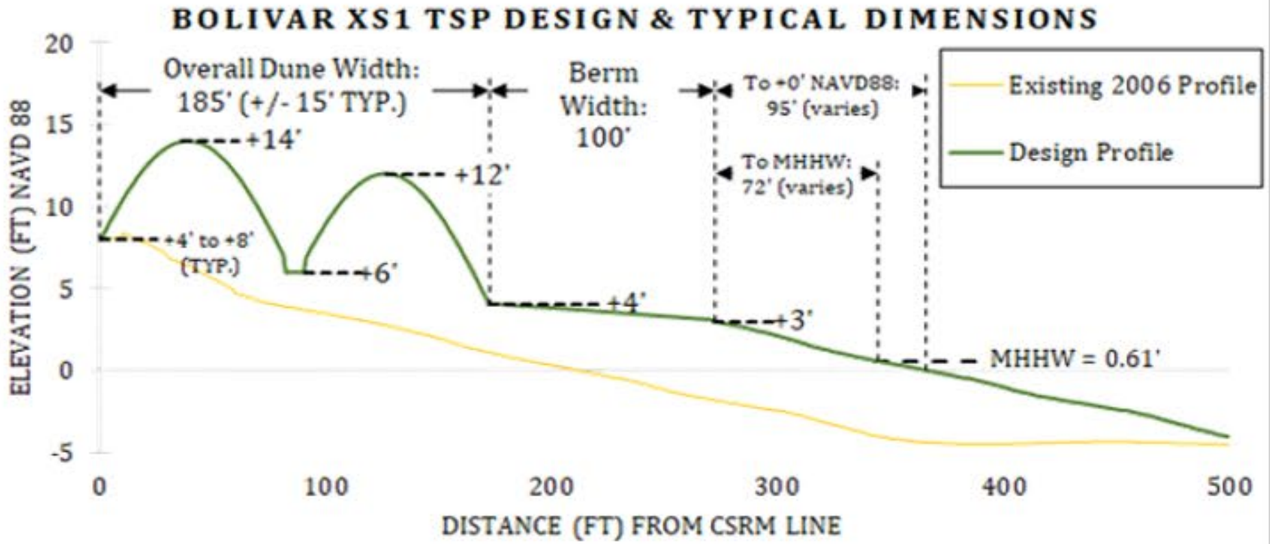
Cost, Performance, Resiliency, Compliance

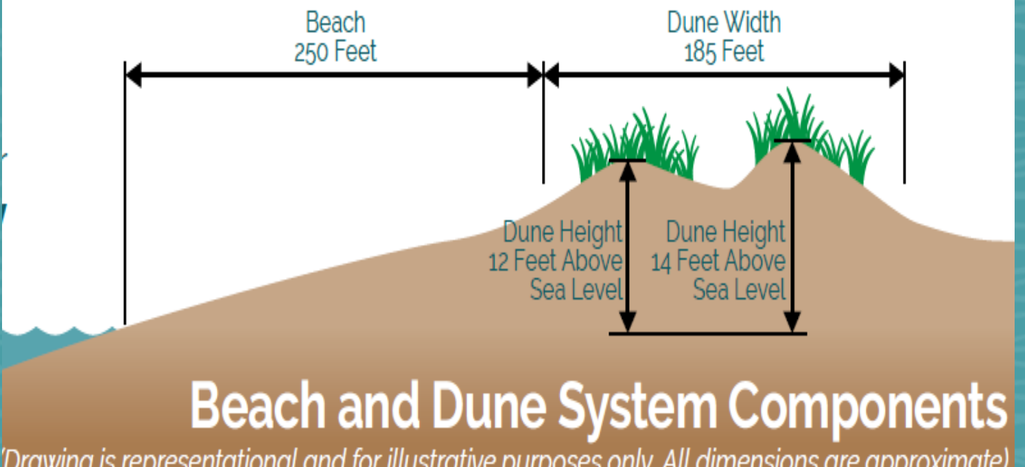
Profile Configuration		Duration of Inundation (hours)	Max Water Depth at CSRM (feet)	Max Wave Height at CSRM (feet)
Existing Profile	**Average**	**51.75**	**9.66**	**4.73**
	Minimum	47.25	8.72	4.07
	Maximum	61.5	11.61	5.81
Single Dune Profile	**Average**	**9.56**	**2.46**	**1.15**
	Minimum	8.25	1.69	0.97
	Maximum	10.5	3.34	1.43
Dual Dune Profile	**Average**	**2.44**	**1.26**	**0.82**
	Minimum	1.5	0.64	0.45
	Maximum	3.75	2.00	1.08

Observed Resiliency with Dune Field (Ike Simulation)

Recommended Plan







Wide Beach (200 – 250 ft)

Dune Field (12, 14 ft)

Vegetated

Beach Access: Open Beaches Act

Initial Construction Quantity

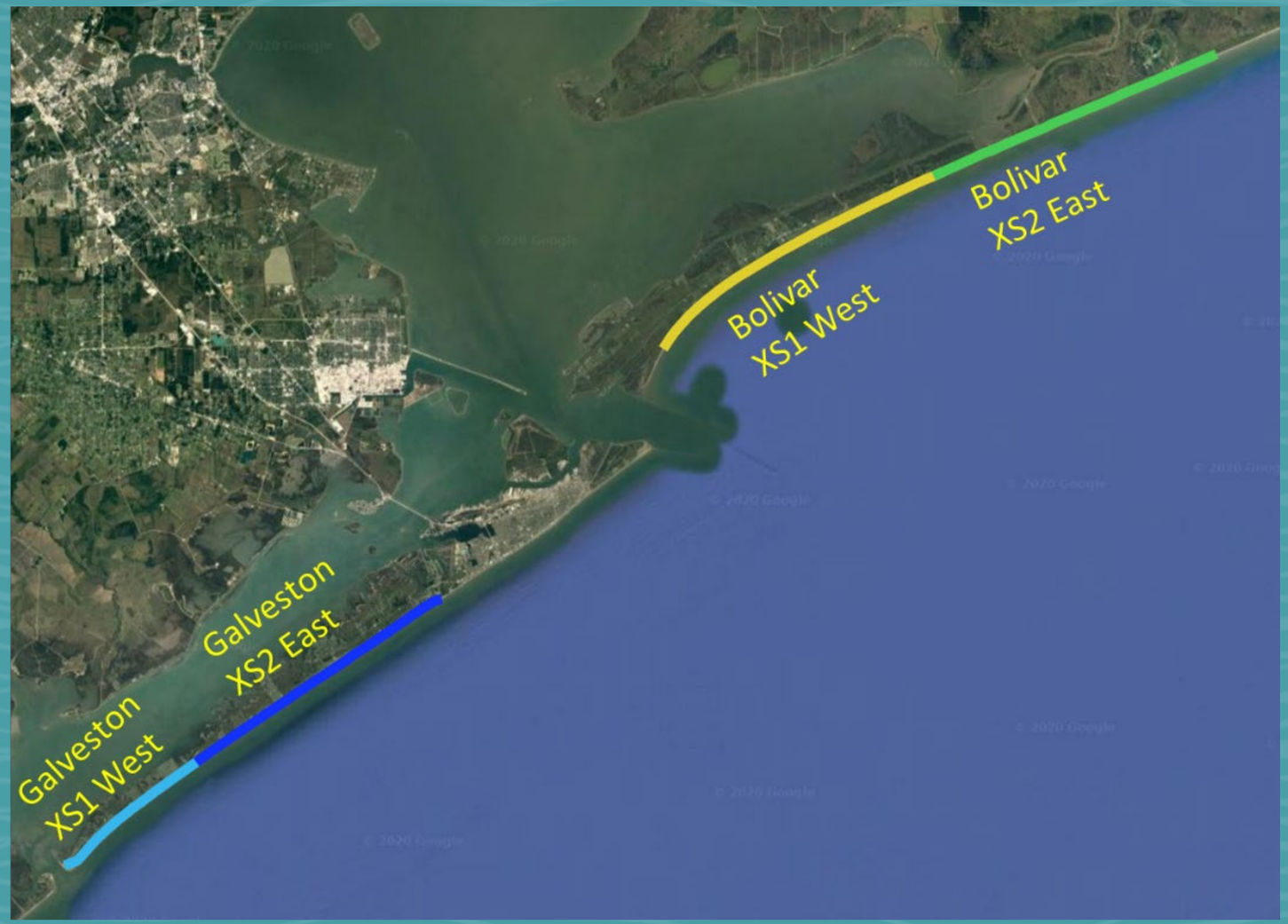
- Galveston Length: 18.35 mile
- Bolivar Length : 25.09 mile

- Galveston initial construction volume including advanced nourishment
  17.19 MCYD (Avg. 177.43 CYD/ft)

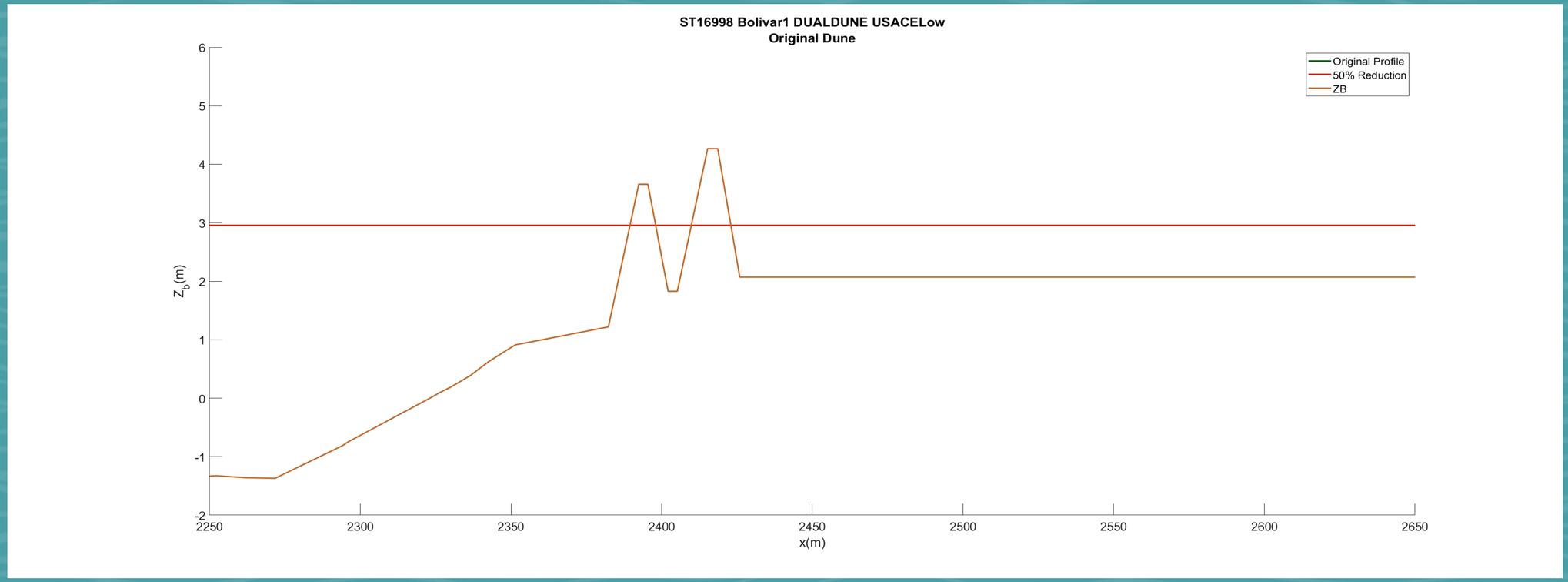
- Bolivar Initial Construction Volume including advanced nourishment
  22.14 MCYD (Avg. 167.12 CYD/ft)

- Total initial construction volume with advanced nourishment
  39.33 MCYD

- Volume includes contingency due to bulking factor to voids



Life Cycle Cost (O&M)



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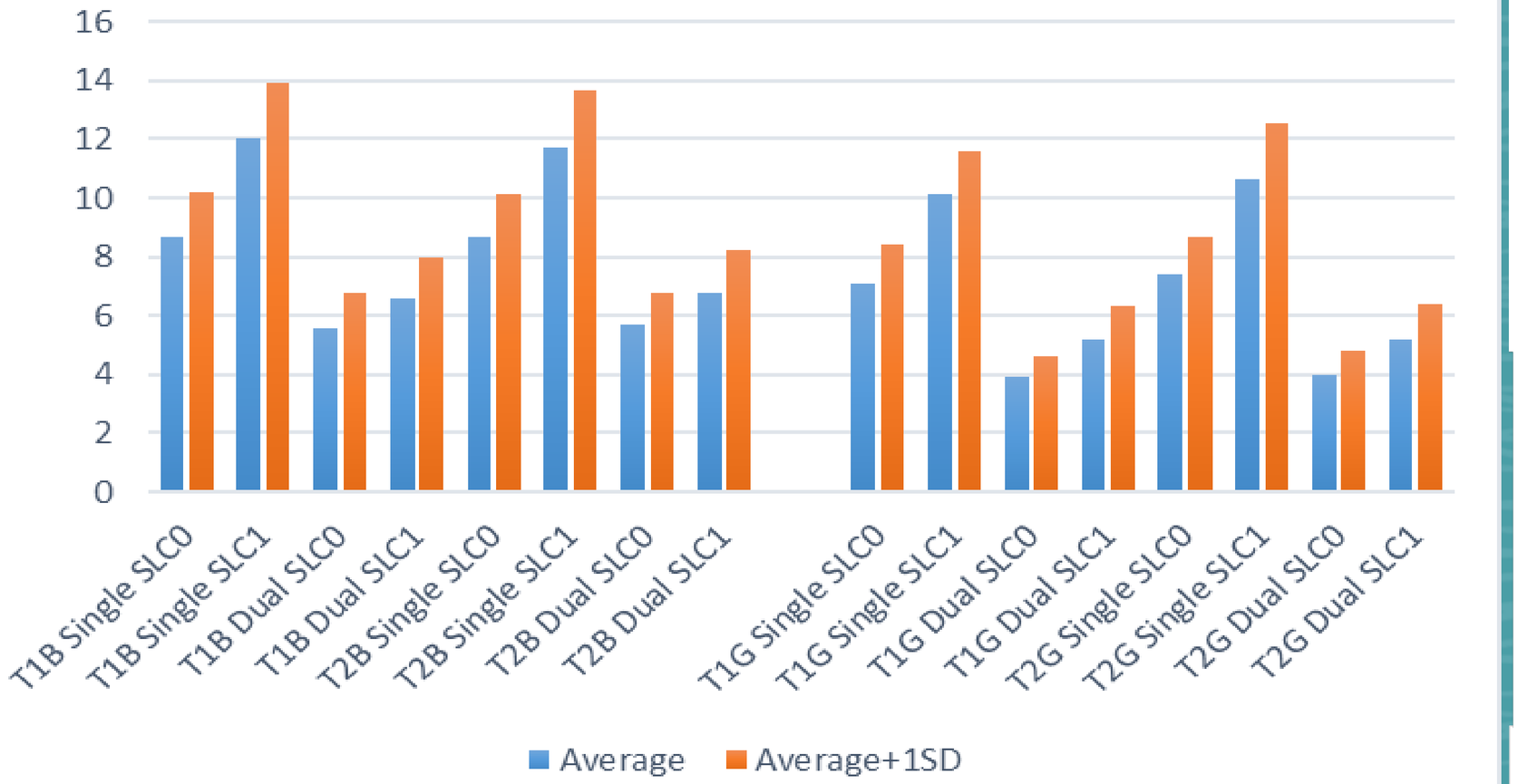
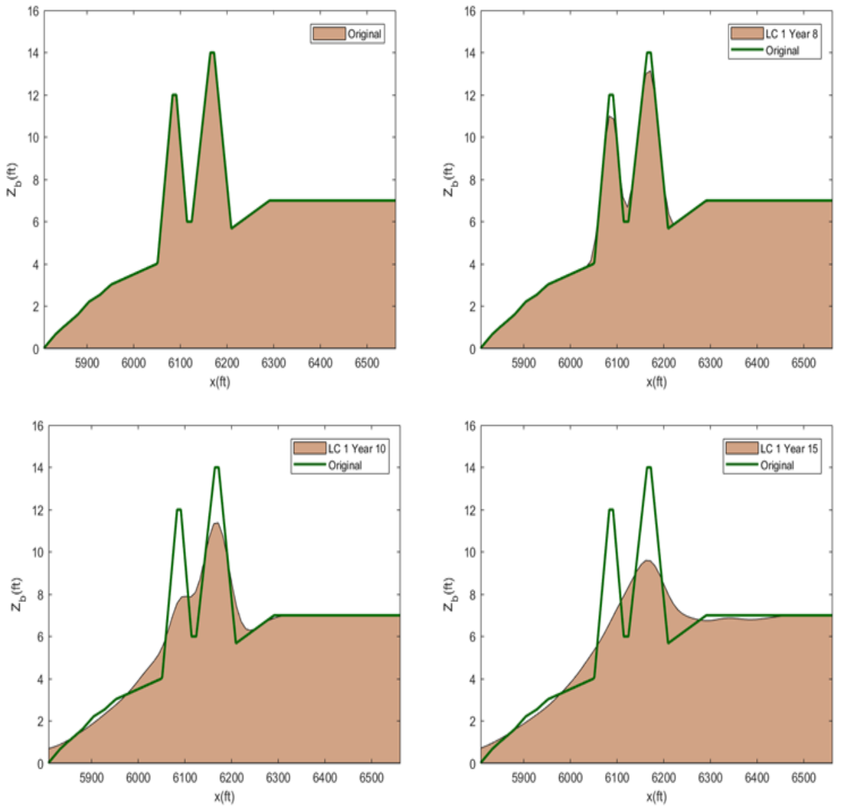
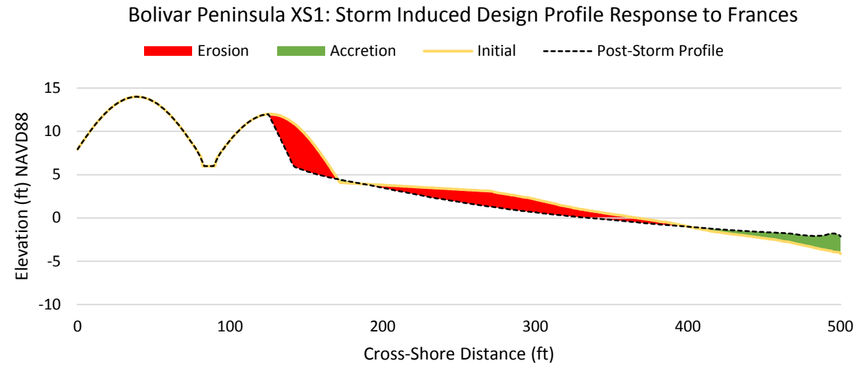






Rebuild Cycle : Single Dune @ 5 years
Dune Field @ 7 years

Life Cycle Cost (Renourish Volume)

Total maintenance volume over 50 year life cycle

<u>Low RSLC</u>
Bolivar: 12.751 MCYD
Galveston: 6.569 MCYD
Total : 19.32 MCYD

<u>High RSLC (including Std. dev)</u>
Bolivar: 15.813 MCYD
Galveston: 9.135 MCYD
Total : 24.948 MCYD

<u>Int. RSLC (including Std. dev)</u>
Bolivar: 14.28 MCYD
Galveston: 7.85 MCYD
Total : 22.13 MCYD

Bolivar: re-nourish cycle every 6 years @ 1.785 MCYD per rebuild

West Galveston: re-nourish cycle every 7 years @ 1.04 MCYD per rebuild

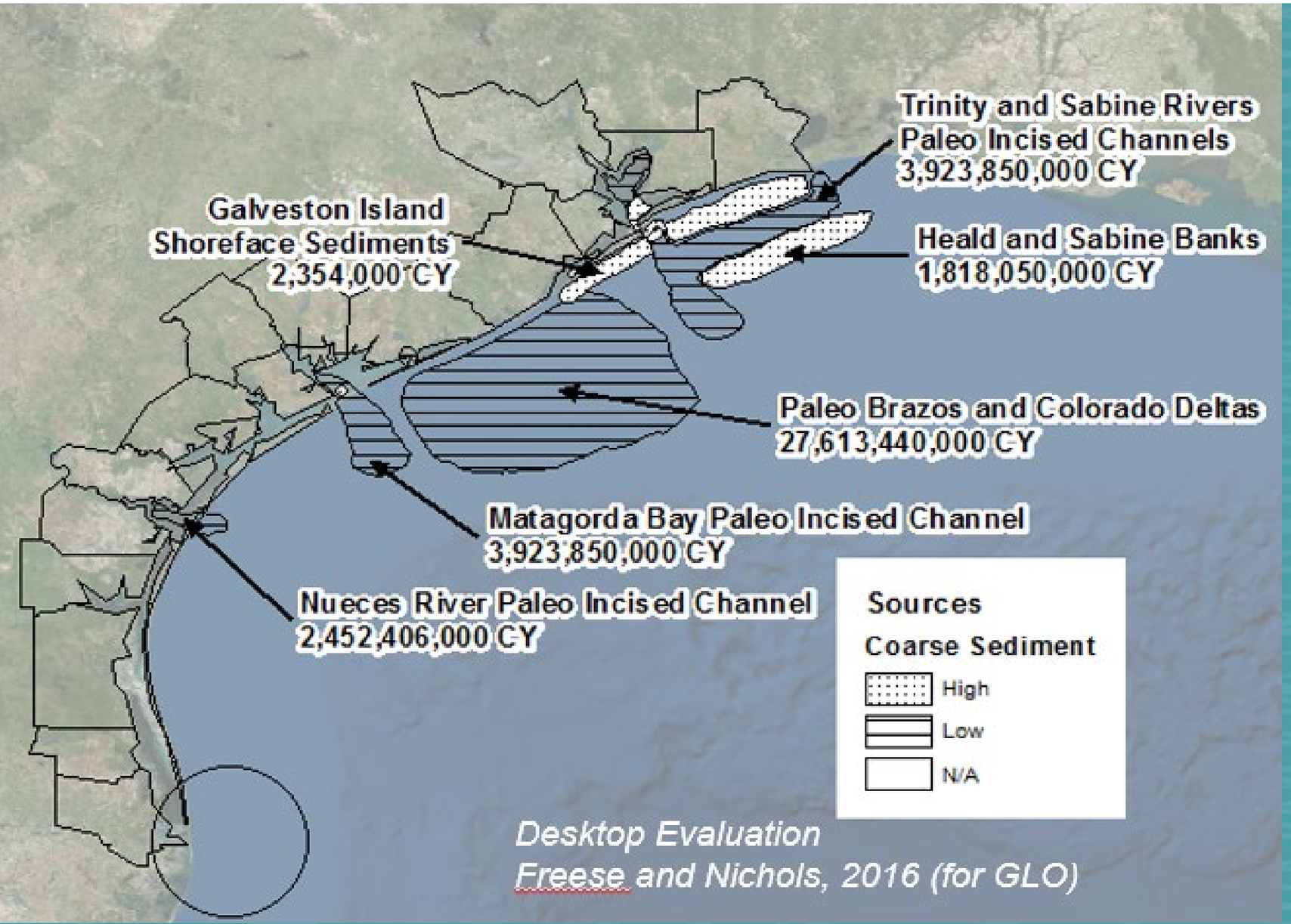
Sediment Source (>60 MCY for CSRM)

Feasibility costs are based on sediments at Sabine Heald Banks

West Galveston

Bolivar Peninsula

Sediment Source (>60 MCY for CSRM)

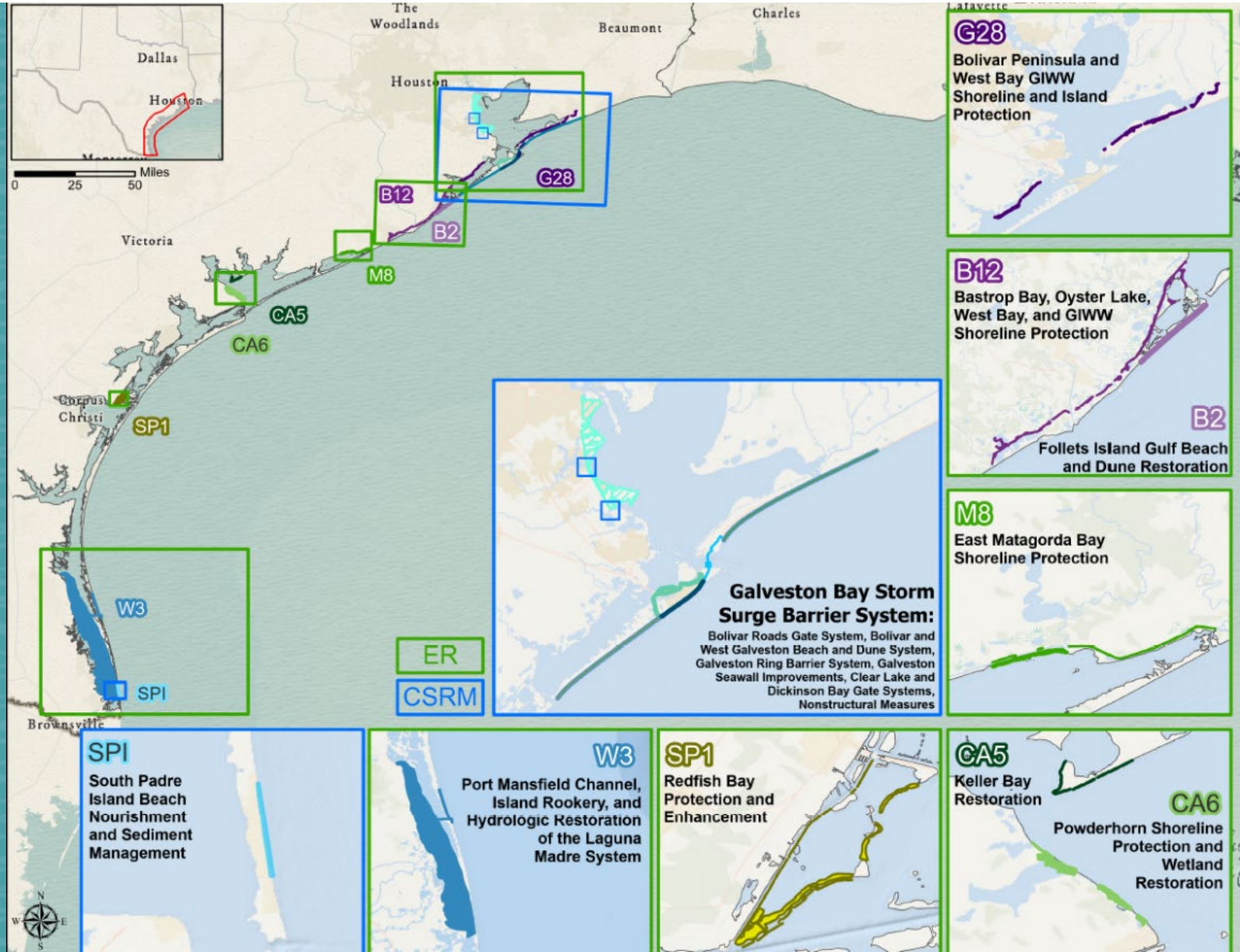


Current costs are based on Sabine Heald Banks.

Cost effective near shore source needs to be explored

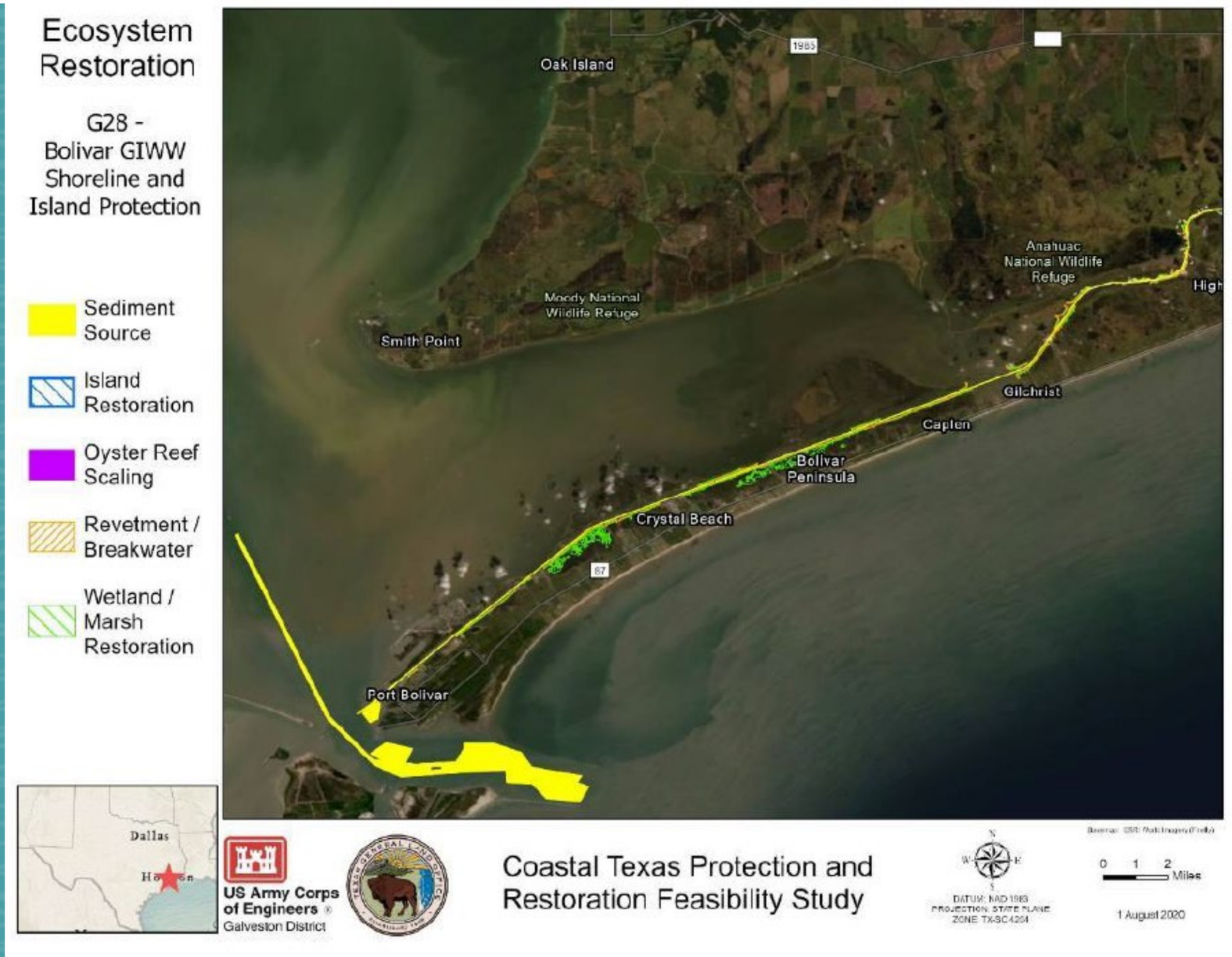
Other Sediment Needs (ER)

- **Coastwide Ecosystem Restoration**
- **8 Separate sites totaling 6600 acres of habitat restoration**



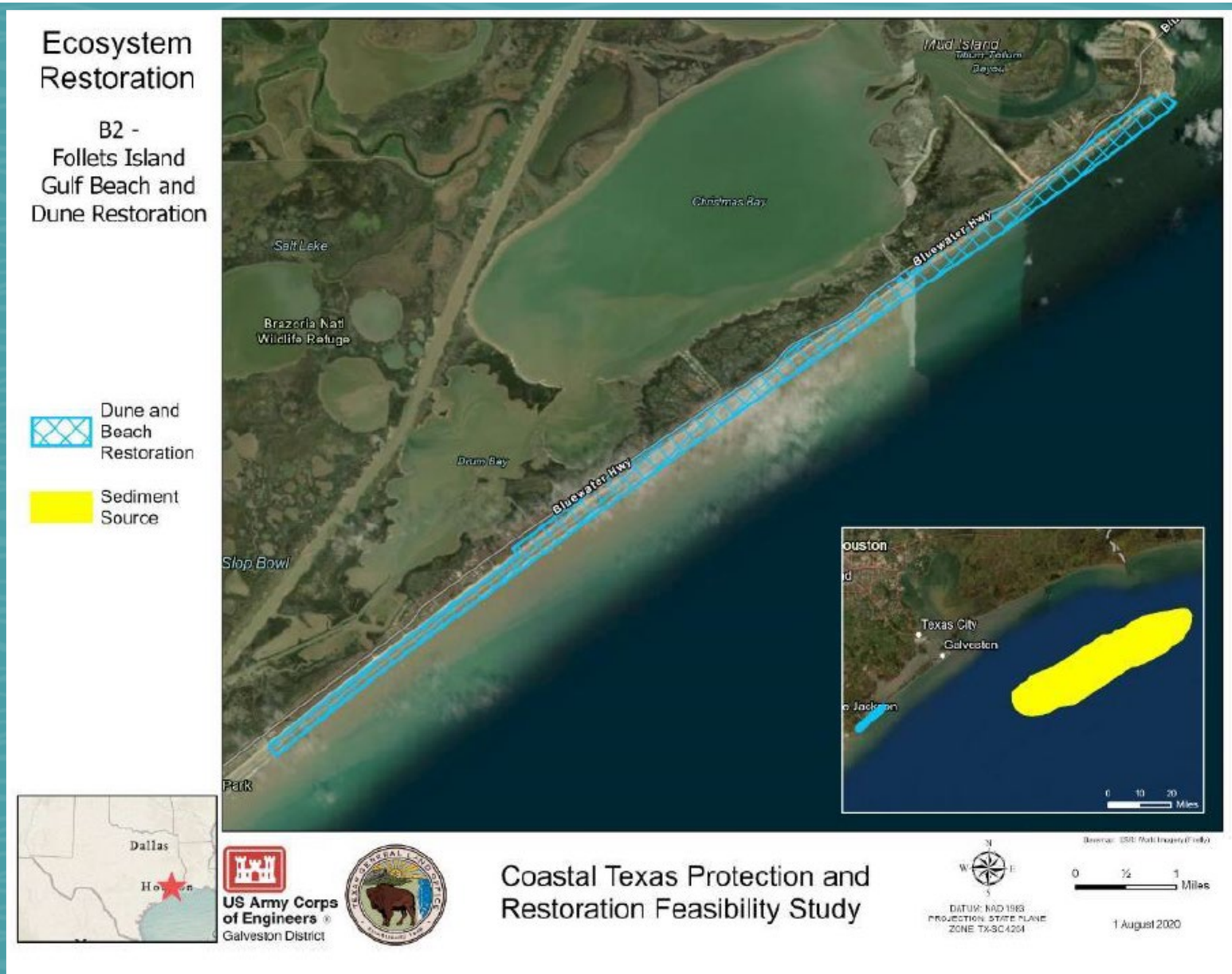
Other Sediment Needs

- **G28(Marsh restoration)**
- **Sediment Volume (6.5 MCY)**
- **HSC, anchorage basin**



Other Sediment Needs

- **B2 (Follets Island, 10 mile)**
- **(0.8 M CY)**
- **SPI (Brazos River)**

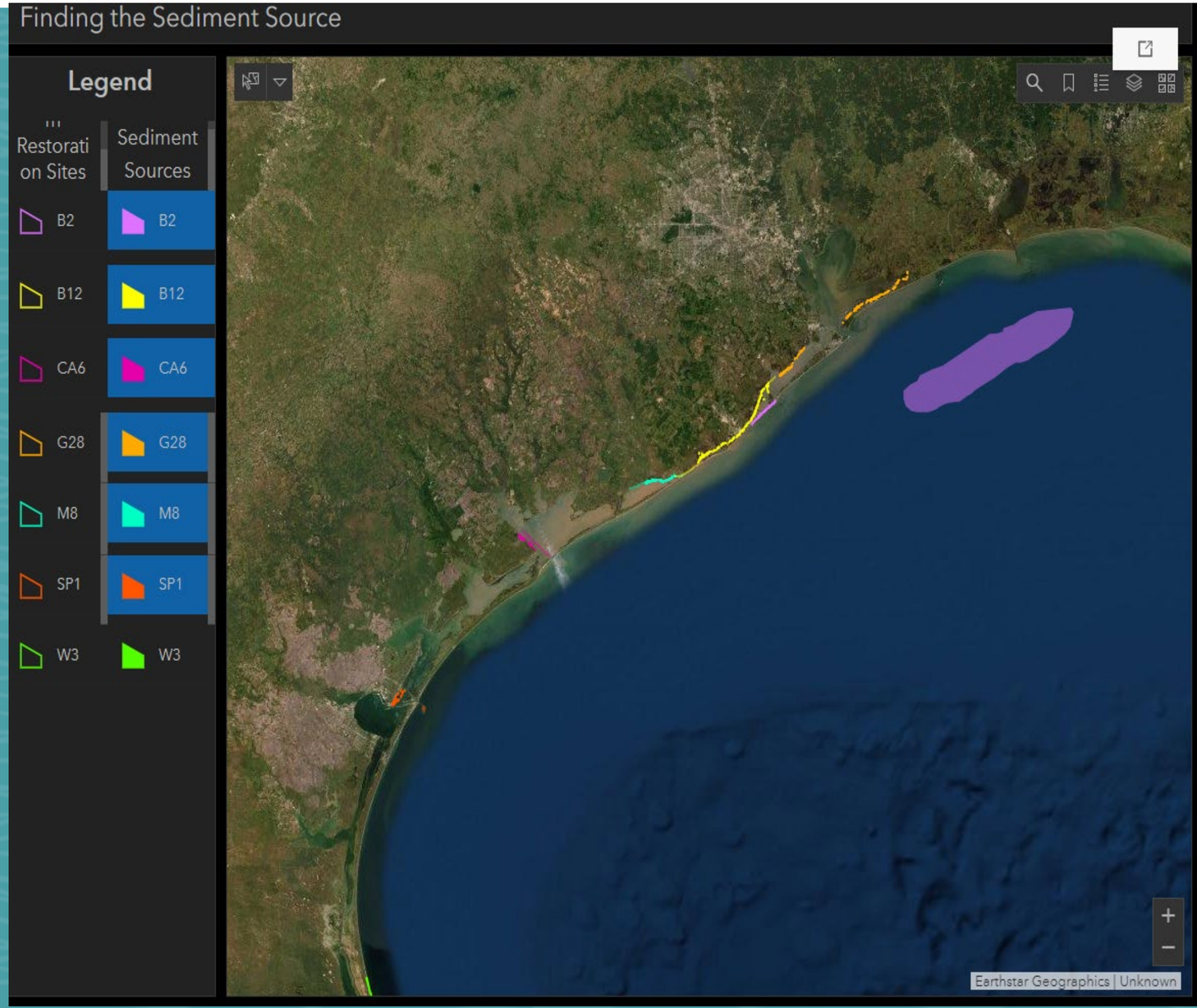


Summary (~70 M CY)

We need lots of sediments.

(This quantity can raise the entire Galveston Island by 1 ft)

https://storymaps.arcgis.com/stories/bd63f11a9ec34d0dbcbdefc5cc5a6a47



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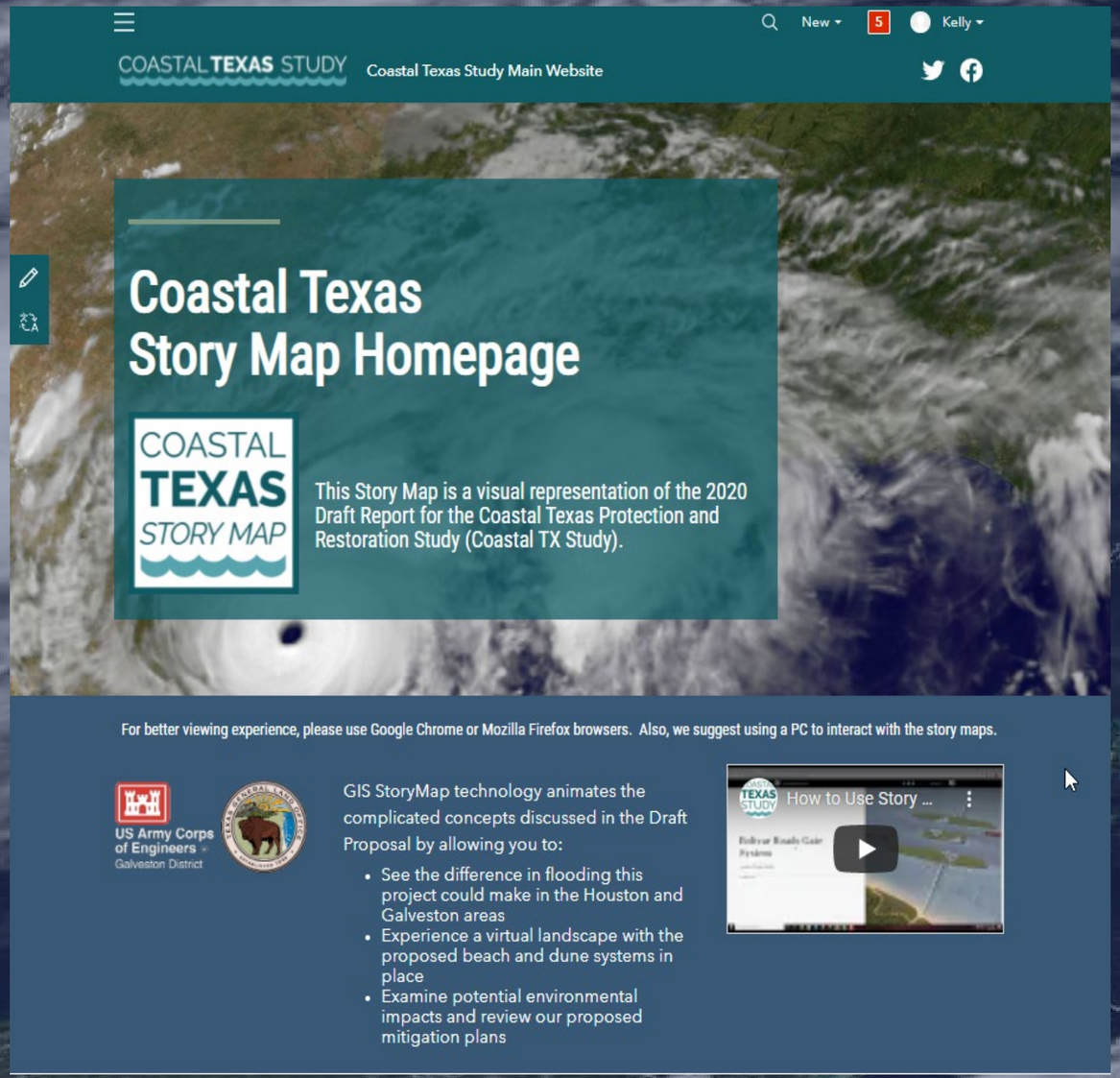
SOCIAL MEDIA

http://CoastalStudy.Texas.gov
CoastalTXStudy
StoryMap: https://coastal-texas-hub-usace-swg.hub.arcgis.com/

Web: http:CoastalStudy.Texas.gov

Coastal TX StoryMaps



Closing Remark by Col. Vail

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