Protecting the Urbanized Areas of the Texas Coast

The Ike Dike Example

The Texas Coast

- Much of it is relatively unsettled so ‘soft’ solutions are desirable
- But it has urban and industrial concentrations
- These existing human settlements need coastal barriers as part of an comprehensive surge suppression strategy

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- Largest coastal settlement is around Galveston Bay
- Use the Ike Dike example to discuss what a structural solution might look like

Professorial Digression

- Resistance (Structures) is but a component of resilience
- But a critical component in that it prevents or lessens initial damage
- “Dark” side of the “we can bounce back” theory of resiliency is that some things and some people don’t

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- Small business
- Poor and the elderly


PARKING

- But I digress - so sum up with
- Barriers give us certain protections in urbanized areas that no other resilience strategy can

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- How might we use barriers better in the Houston/Galveston area to help protect the region against Hurricane surge

The Ike Dike

A Coastal Barrier

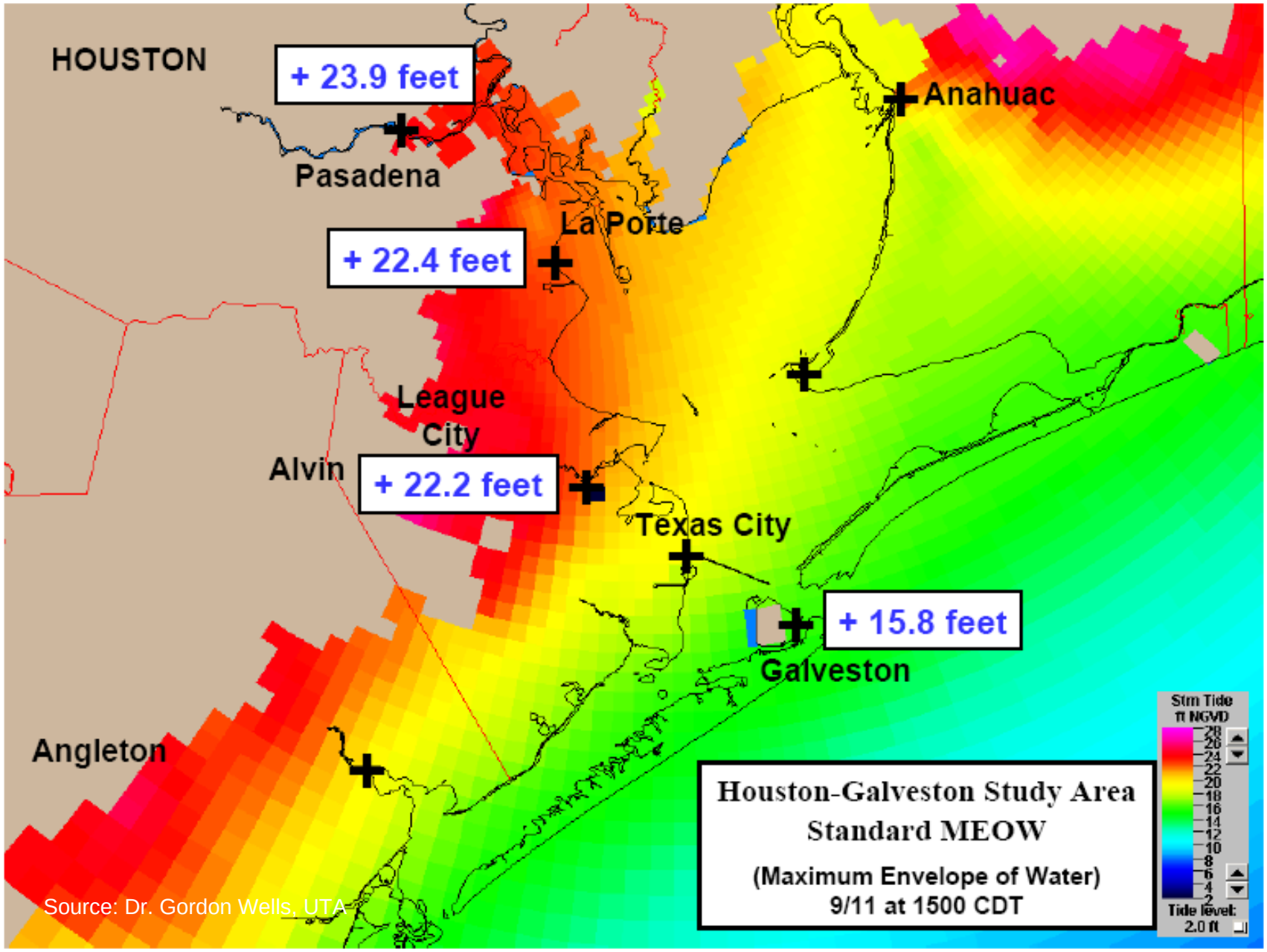
Protecting the

Houston/Galveston Region

from Hurricane Storm Surge

Longer version at

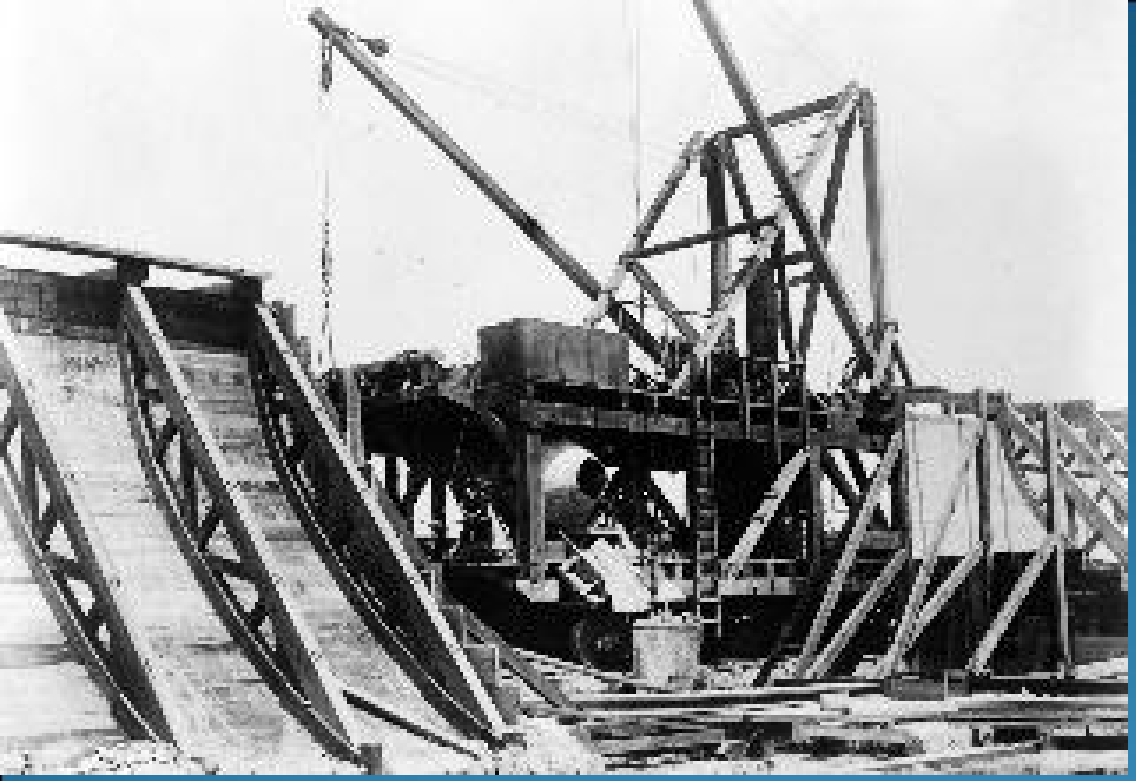
www.tamug.edu/ikedike



Possible Cat 4 Surge


The overall strategy is to keep the ocean surge out of Galveston Bay using a coastal barrier (the Ike Dike) similar to the Dutch Delta Works
Houston Ship Channel
High Island
Bolivar Peninsula
Bolivar Roads
Existing Seawall
Galveston Island
Intracoastal Waterway
Coastal Spine
San Luis Pass

The first component of the Ike Dike already exists – the Galveston Seawall



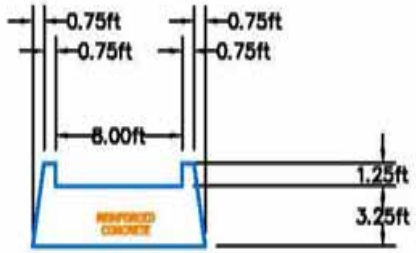
Galveston Seawall -17 foot tall fixed barrier

The Galveston Seawall has done it’s job preventing catastrophic Gulf overflow

But does not prevent back surge from the Bay

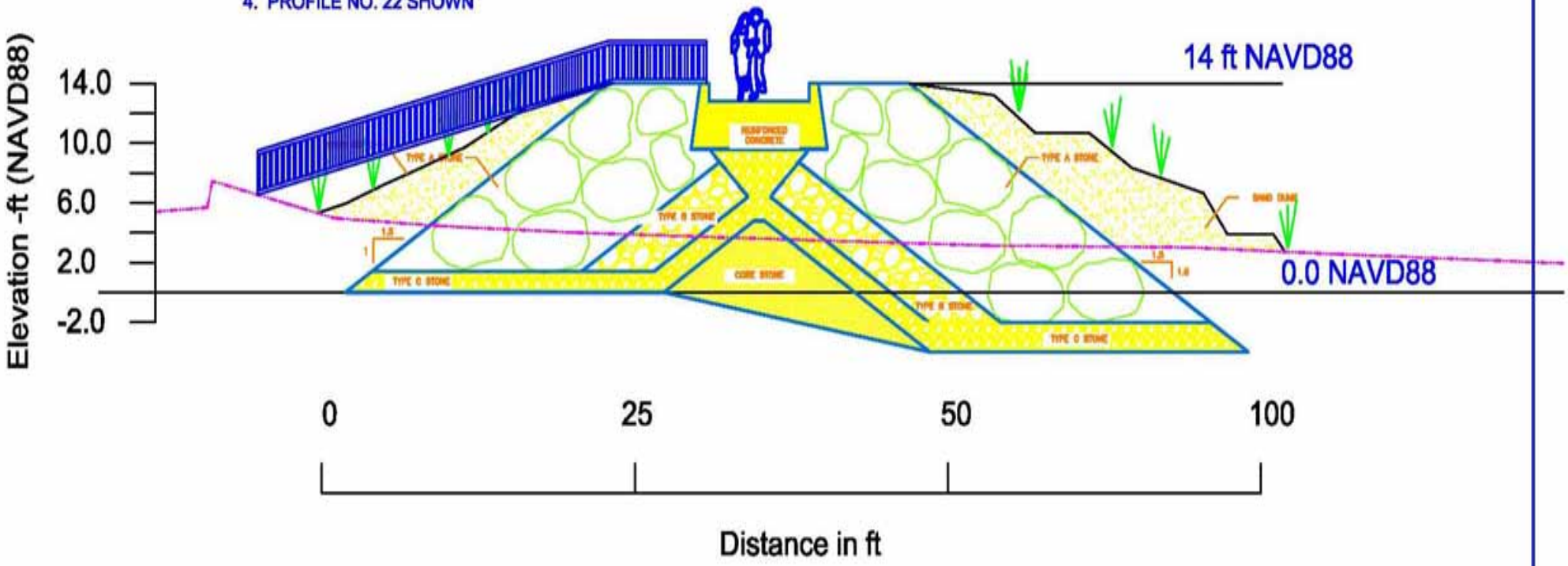

The second component - Land Extensions of the protection afforded by the Seawall
Houston Ship Channel
Bolivar Peninsula
High Island
Bolivar Roads
Existing Seawall
Galveston Island
Intracoastal Waterway
San Luis Pass

Revetment Shown on Pre-Ike Topography



NOTES:

1. TYPE A STONE - 4 TONS
2. TYPE B STONE - 0.4 TONS
3. TYPE C STONE - 25 TO 100 LB
4. PROFILE NO. 22 SHOWN



Design by Marie Garrett, Coastal Solutions Inc and Dr. Billy Edge. Texas A&M University

Department of Civil Engineering, Texas A&M University

Revetments can be hidden to look natural

Coastal highways could be raised 12 feet

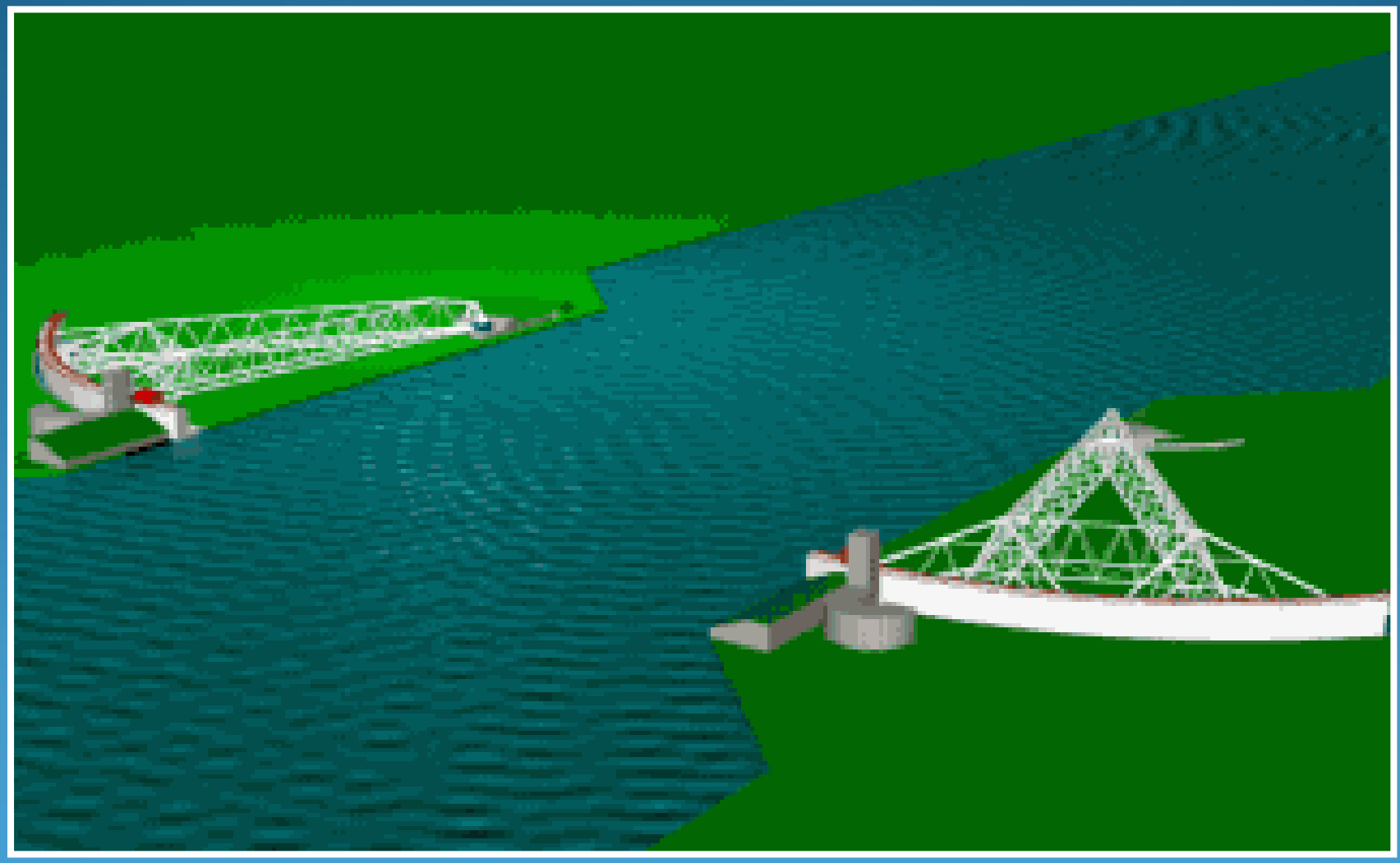

Houston Ship Channel
High Island
Bolivar Peninsula
The third component - Sea Barriers
Bolivar Roads
Galveston Island
Existing Seawall
Intracoastal Waterway
San Luis Pass

The Bolivar Roads Gates

- Must not impede navigation
- Must allow water circulation in and out the Bay under normal conditions
- But close quickly when a hurricane approaches to provide a 17ft higher-than-sea-level barrier across Bolivar Roads
- Can we use existing technology?


A navigation solution

Animation of the flood gates closing



Bolivar Roads

A Bay circulation solution

The Netherlands
Storm Surge Barrier in Action

Possible New York Barrier

http://www.arcadis-us.com/

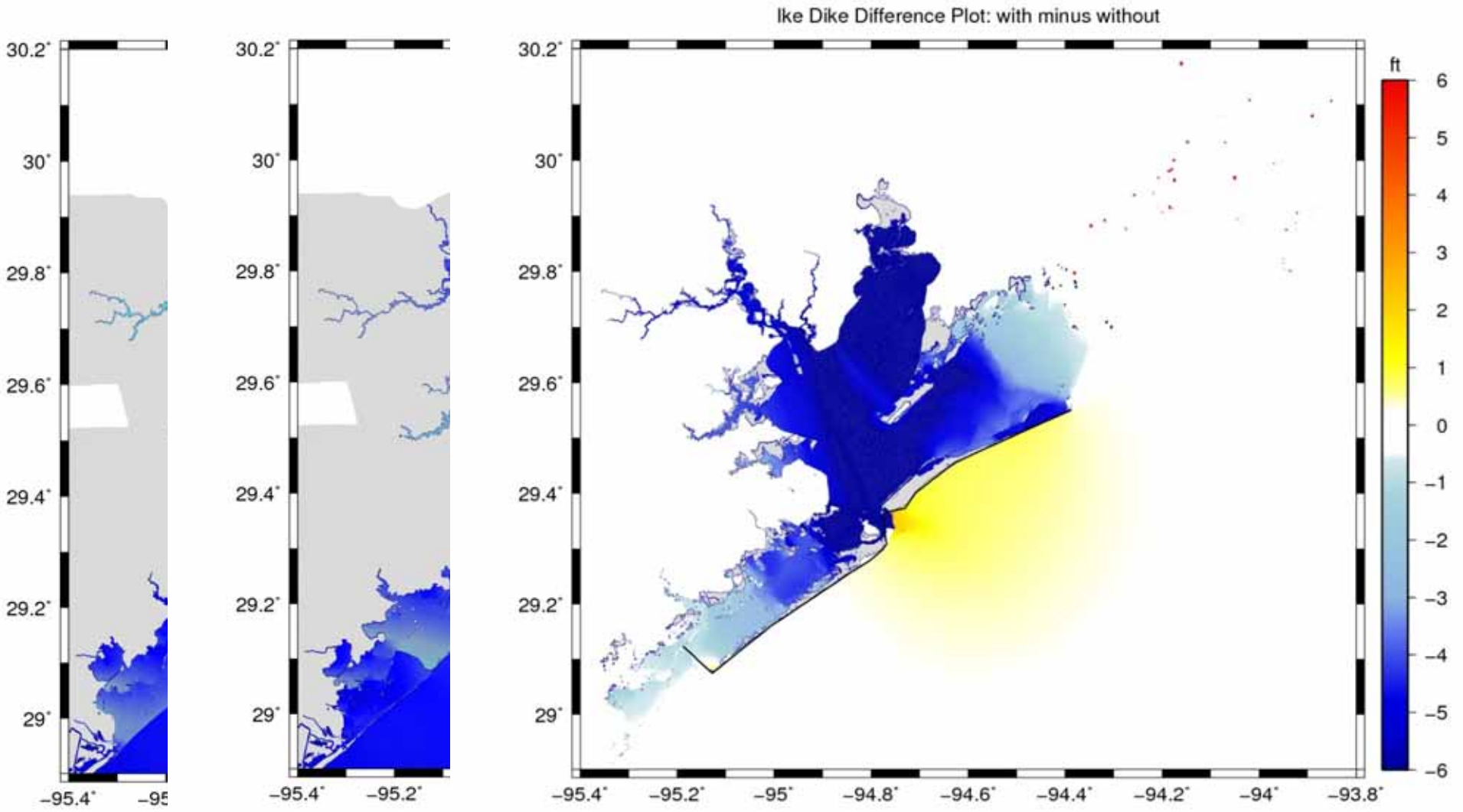
ARCADIS
Infrastructure, environment, facilities

Combining Gate designs, the Bolivar Roads portion of the Barrier can:

- allow navigation in the Ship Channels
- allow for circulation in Galveston Bay


All together it forms a coastal spine
But will “the Ike Dike”, suppress massive surges?
Houston Ship Channel
High Island
Bolivar Peninsula
Bolivar Roads
Existing Seawall
Galveston Island
Intracoastal Waterway
San Luis Pass

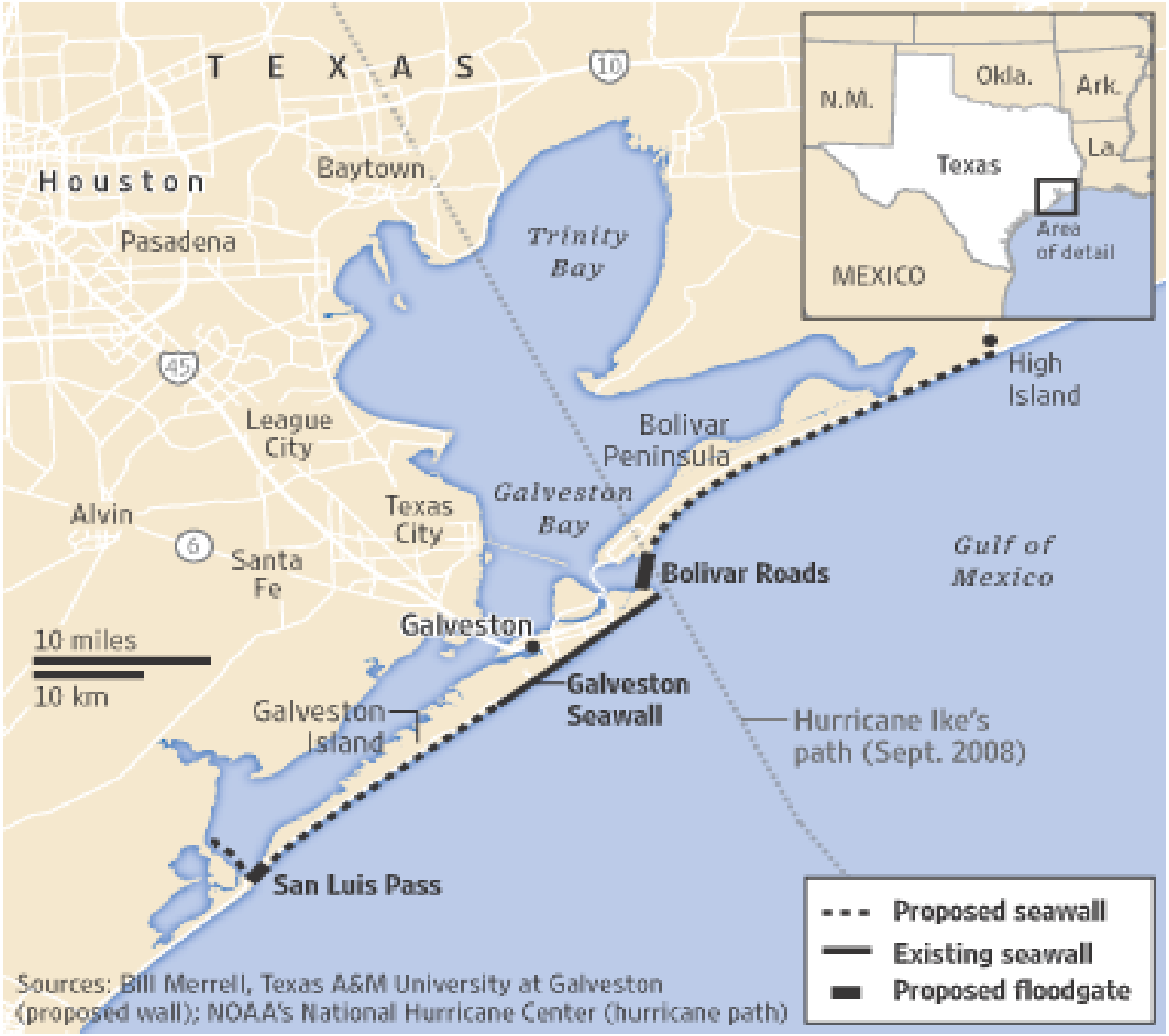
Simulations: Ike's Surge without and with The Dike - The University of Texas



Gordon Wells, Jennifer Profit, Clint Dawson http://users.ices.utexas.edu/~jennifer/Ike_Dike/

Additional Characteristics

- Allows Bay shores to be natural
- System can be leaky - unlike New Orleans
- Only needs to hold maximum surge for a few hours
- Designed for a 10,000 yr storm
- Most Hurricane surges much smaller



The Ike Dike

- Provides Comprehensive Protection from Storm Surge
- Protects People, Properties and Industrial Base for a Nationally Important Region
- Reduces Vulnerability – Will Encourage Investment in and Commitment to the Region

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- Costs Much Less than a Single Hurricane Recovery
- Probably Costs Less Than Individually Armoring the Entire Bay Complex

The Ike Dike (continued)

- Prevents Surge Damage to the Bay's Natural Resources
- Is More Environmentally Sound than Armoring the Entire Bay Complex

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- Best (and Perhaps Only) Way to Protect Our Less Resilient Populations
- Protects Lives – Especially During Difficult Evacuations from Hurricanes that Quickly Change Path or Intensity

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Hurricane Ike
Chinese FY1-D MVISR
September 12, 2008 at 6:18 PM CDT