NOTE: We would like to record this meeting and make it available to others that were not able to attend or if you would like to review its content later. Please raise concerns or objections.

Southeast Texas Hurricane Evacuation Study

Evacuation Zone Workshop for Jackson, Matagorda, and Brazoria Counties

April 15, 2024

NATIONAL HURRICANE PROGRAM

Texas A&M Transportation Institute

HAZARD REDUCTION & RECOVERY CENTER

TEXAS DIVISION OF EMERGENCY MANAGEMENT

TDEM

THE TEXAS A&M UNIVERSITY SYSTEM

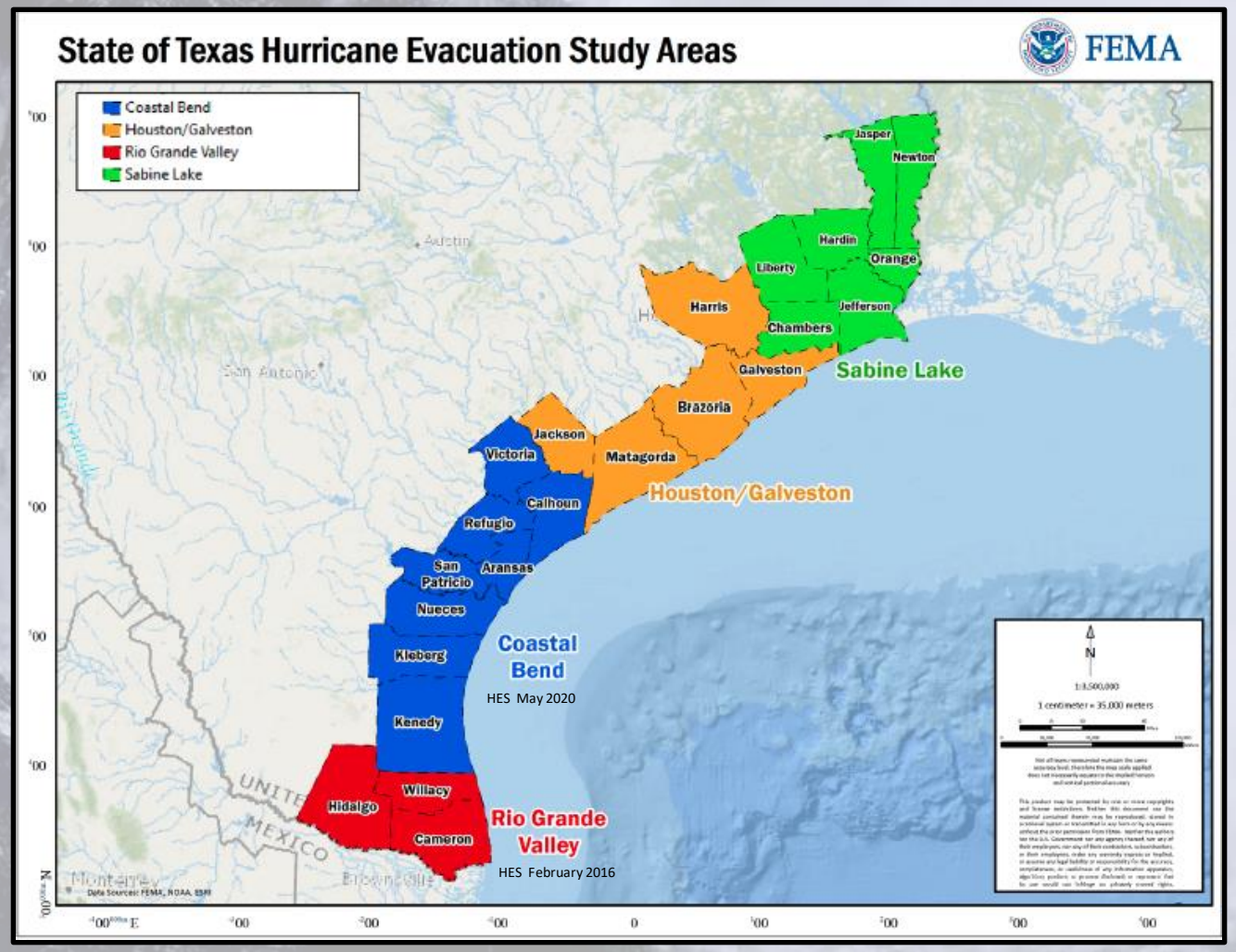
Welcome and Introductions:

- US Army Corps of Engineers: Galveston District
  - Kyle Donlevy
- FEMA, Region 6
  - Arianne Thomas
- Texas Department of Emergency Management
  - Blake White & Carman Apple
- Texas A&M Hazard Reduction and Recovery Center & Texas A&M Transportation Institute
  - Walt Peacock, David Bierling, Doug Wunneburger, Darrell Borchardt, & Alexander Abuabara
- Local government and stakeholder
  - **Please make sure you sign in to register you and your organization's attendance.**

AGENDA: Southeast Texas HES Evacuation Zone Workshop for Jefferson, Hardin, Orange, Newton, and Jasper Counties

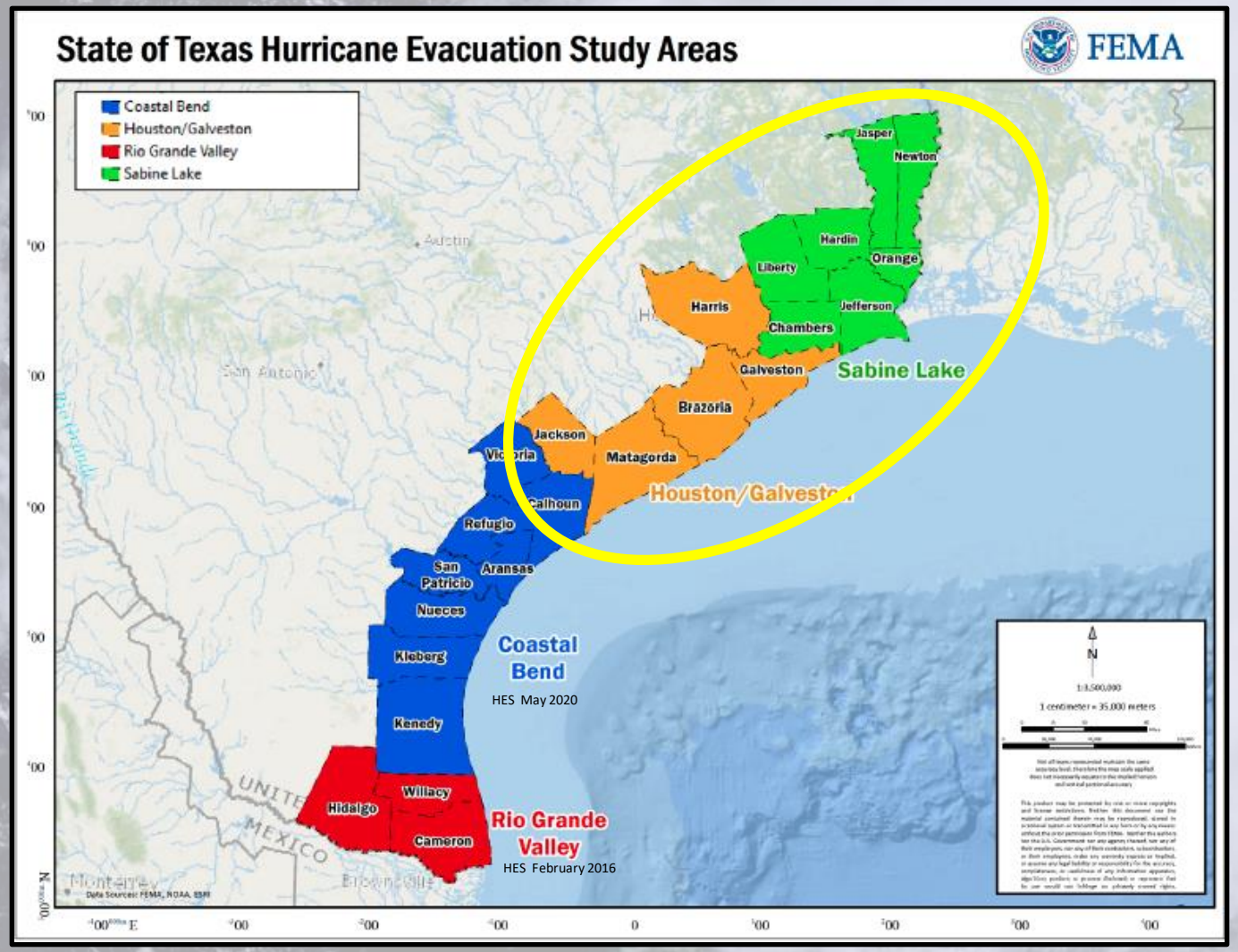
1. Introductions
   - USACE, FEMA, TDEM, TAMU
   - Participants
2. Overview of the Hurricane Evacuation Study (HES) Process
3. Goals for the Day
   - General agreement on guidelines and naming conventions
   - Getting as close as can to a set of evacuation/risk zones
   - Some degree of consistency among county zones.
4. Review workshop Materials
   - HES planning Atlas
   - Maps and County Packets
5. Decide on number of working groups
6. Lunch (~11:30am-1:00pm)
7. Working group or groups
   - If more than one: Elect or decide on a spokesperson/scribe
   - Review data, maps, make recommendations
   - Seek consistency with adjacent counties
8. working group reports
   - Summary of findings and zone changes/modifications or development
   - Issues yet to be resolved
9. Discuss plans for moving forward

Overview of HES Re-Study for Southeast Texas



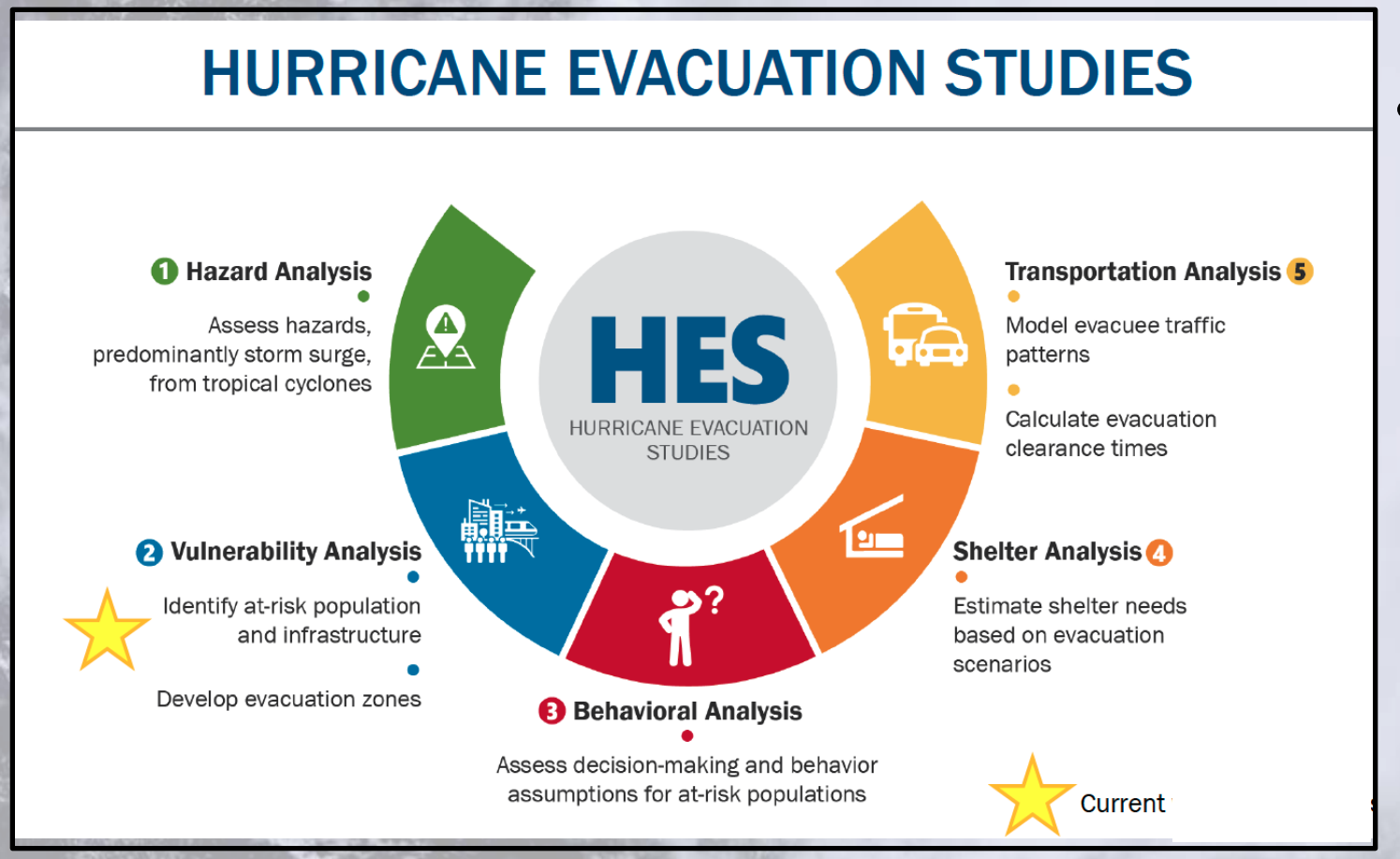
- Texas traditionally had 4 HES areas
  - Sabine Lake, Houston/Galveston, Coastal Bend, and Rio Grande Valley
- Coastal Bend HES 2020
- Rio Grande Valley HES 2016
- Lake Sabine: HES 2011
- Houston/Galveston HES 2004
  - HGAC 2011 Zip-Code based evac zones and transportation analysis
  - Matagorda and Brazoria included

Overview of HES Re-Study for Southeast Texas



- The NHP has combine the Houston/Galveston and Sabine Lake study areas into the **Southeast Texas HES – Re-study area**.
  - 12 highly diverse counties:
    - Population Size: 4.8 million to 12,052
    - Sq. Miles: 1,707 to 334
    - Density: 2,772 to 18.1 per mile
    - Socio-economic, demographic, economic characteristic
    - Extent and nature of hurricane hazard exposure
    - Established Hurricane risk/evacuation zones

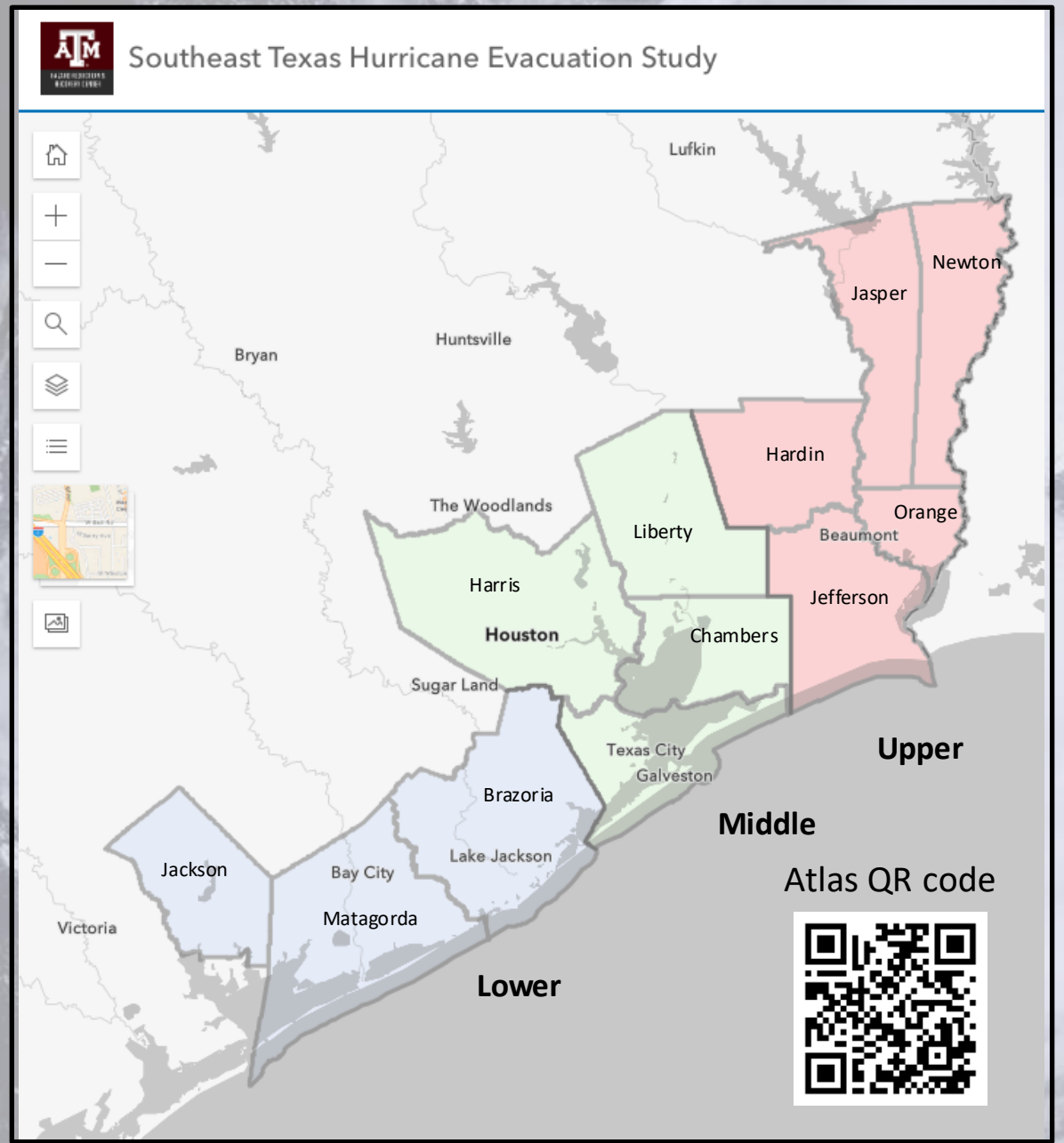
Overview of HES Re-Study for Southeast Texas



- Steps in HES process:
  1. Hazard Analysis: Hazard data for surge and wind has been generated, report forthcoming
  2. Vulnerability Analysis: The focus of this phase
  3. Behavioral Analysis
  4. Shelter Analysis
  5. Transportation Analysis

Funding has been allocated

Overview of Vulnerability Analysis Phase



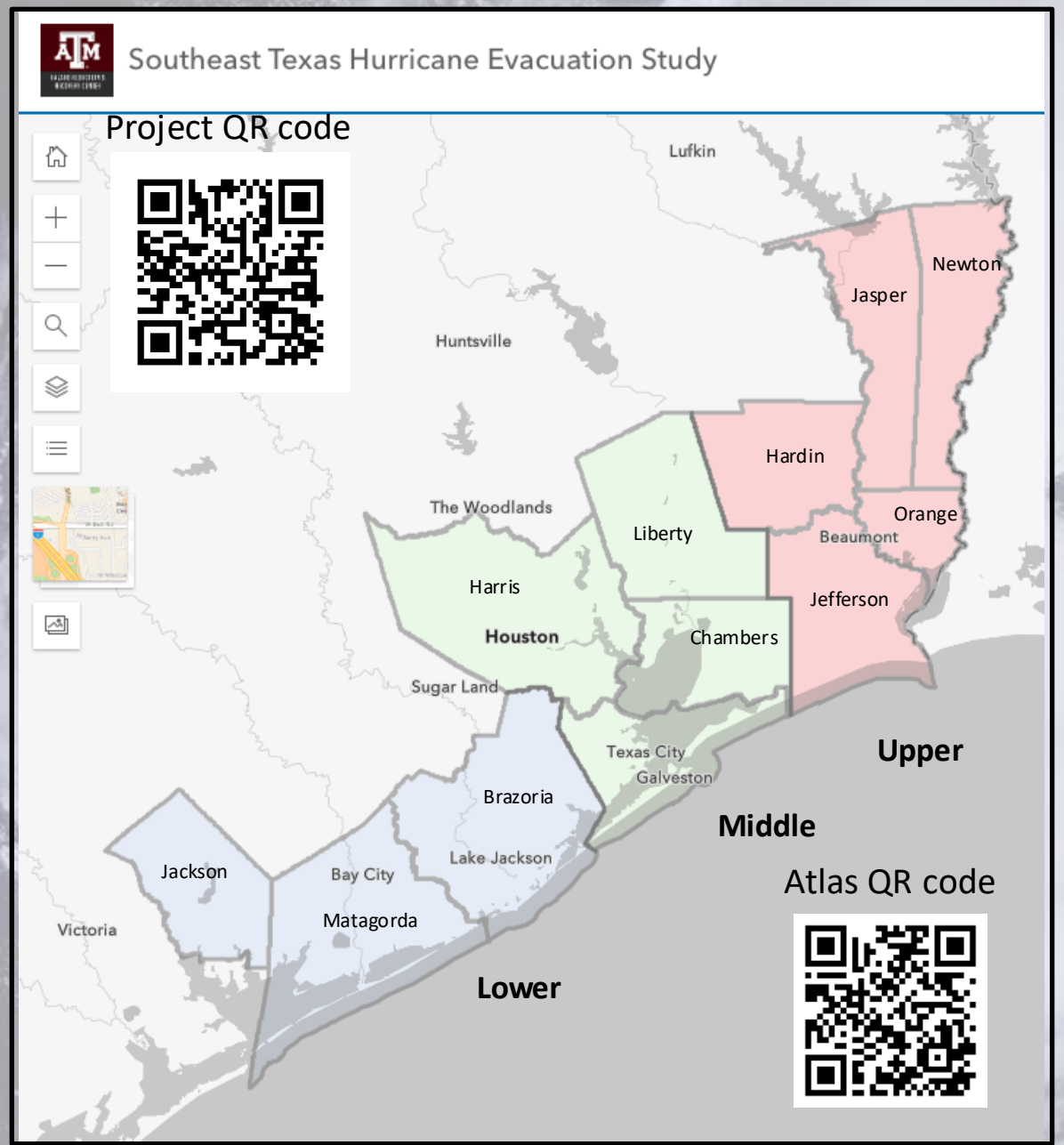
Atlas QR code

Project QR code

Two key components:

1. Evacuation zone assessment, modification, and development
   - Driven by new hazard analysis, updated population and other data, and existing evacuation zones.
   - To facilitate this process and enhance meeting participation we will identify three planning zones
     - Project front Page:
       - https://texasatlas.arch.tamu.edu
     - "Working" GIS Website:
       - https://texasatlas.arch.tamu.edu/hes:
2. Vulnerability Analysis
   - Predicated on modified evacuation zones and hazard data.

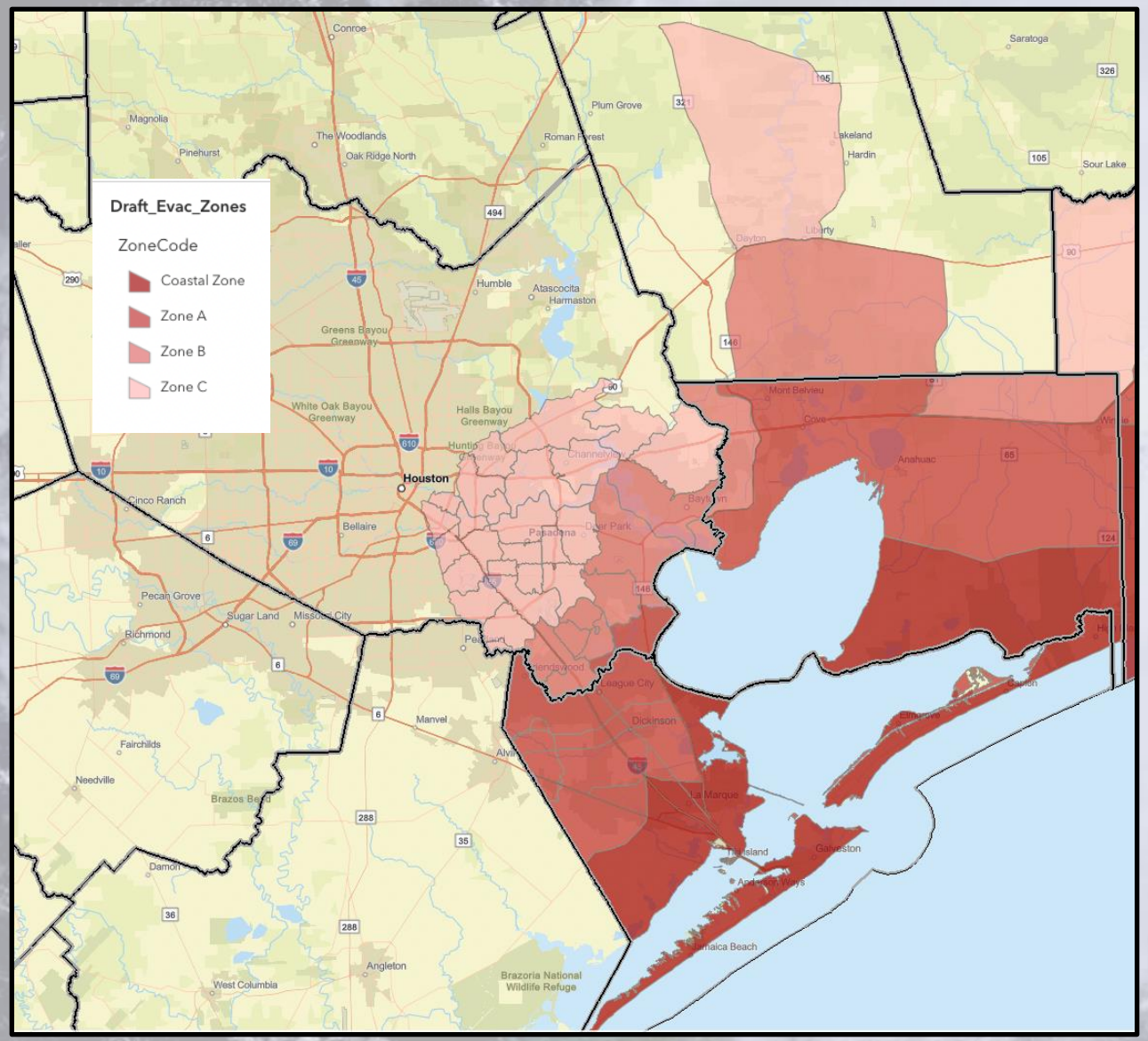
The Purpose of this workshop…



… is to potentially develop hurricane evacuation/risk zones for 2025

- Our focus today is on the three counties in the lower planning area:
  - 3 diverse counties:
    - Population Size (est. July 1, 2022)
      - Brazoria: 388,181; Matagorda: 36,125; & Jackson: 15,142
    - Density (per sq. mile)
      - Brazoria: 272.9; Matagorda: 33.2; & Jackson: 18.1
    - Variations in the extent and nature of hurricane hazard exposure
    - Some variations in evacuation routes and susceptibility to surge
    - Brazoria and Matagorda have zip-code bases evacuation zones, but Jackson does not have designated evacuation zones

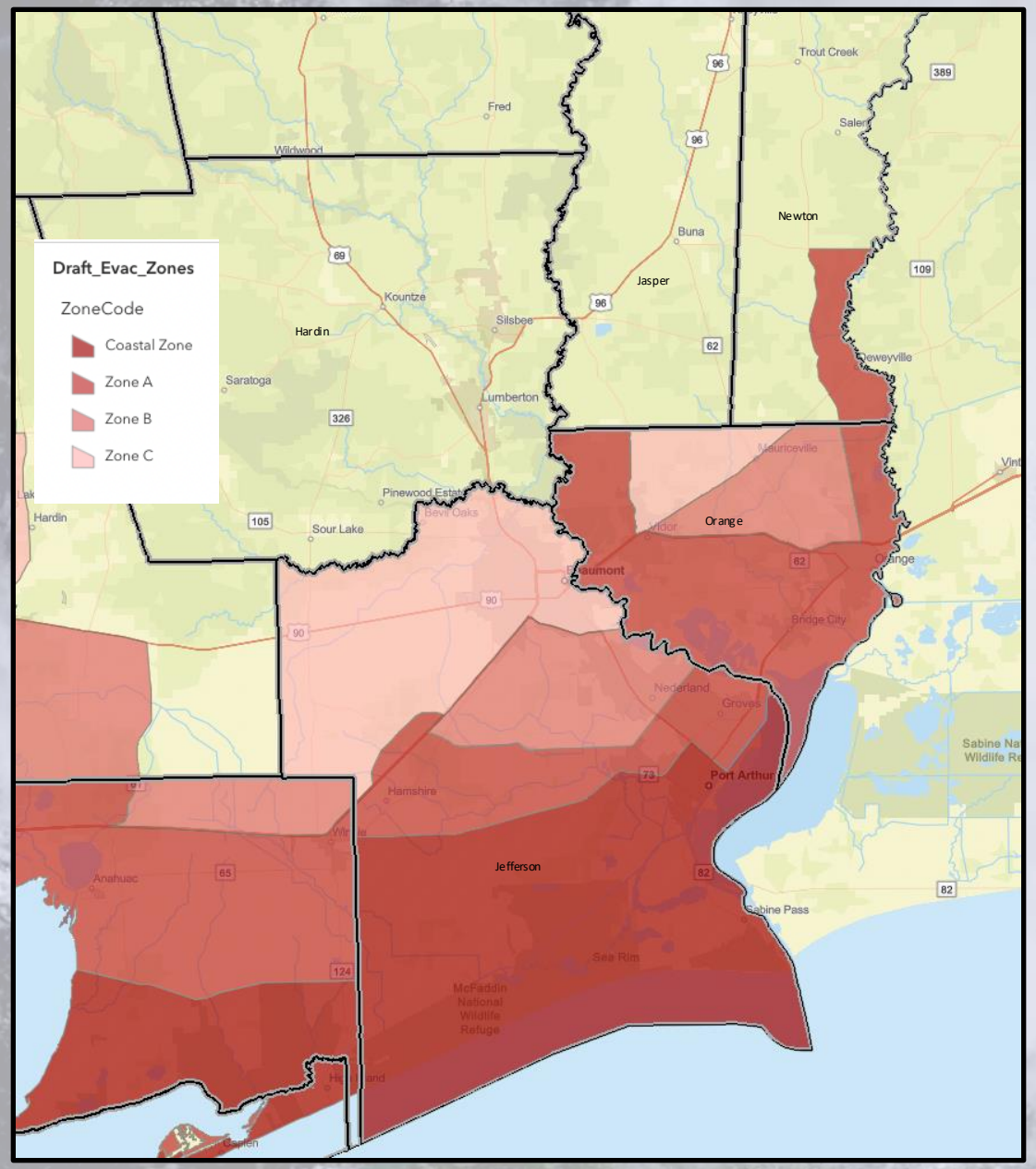
Updated Situation



Central planning area:

- Harris County: stayed with current zip-code areas but split one and added a new zip-code area near downtown.
- Chambers County: abandoned the zip-zone approach and modified zones using roadways.
- Liberty County: developed new evacuation zones but used roadways to designate boundaries.
- Galveston County: still a work in progress but have extended coastal zone, followed by A zones.
- Names: Coastal, Zones A, B, and C
  - In general, successive zones from Coastal to C have declining risk
    - But this pattern does not hold in some areas where phased evacuation is an important issue.
    - Also, some places only have lettered zones, no coastal.

Updated Situation

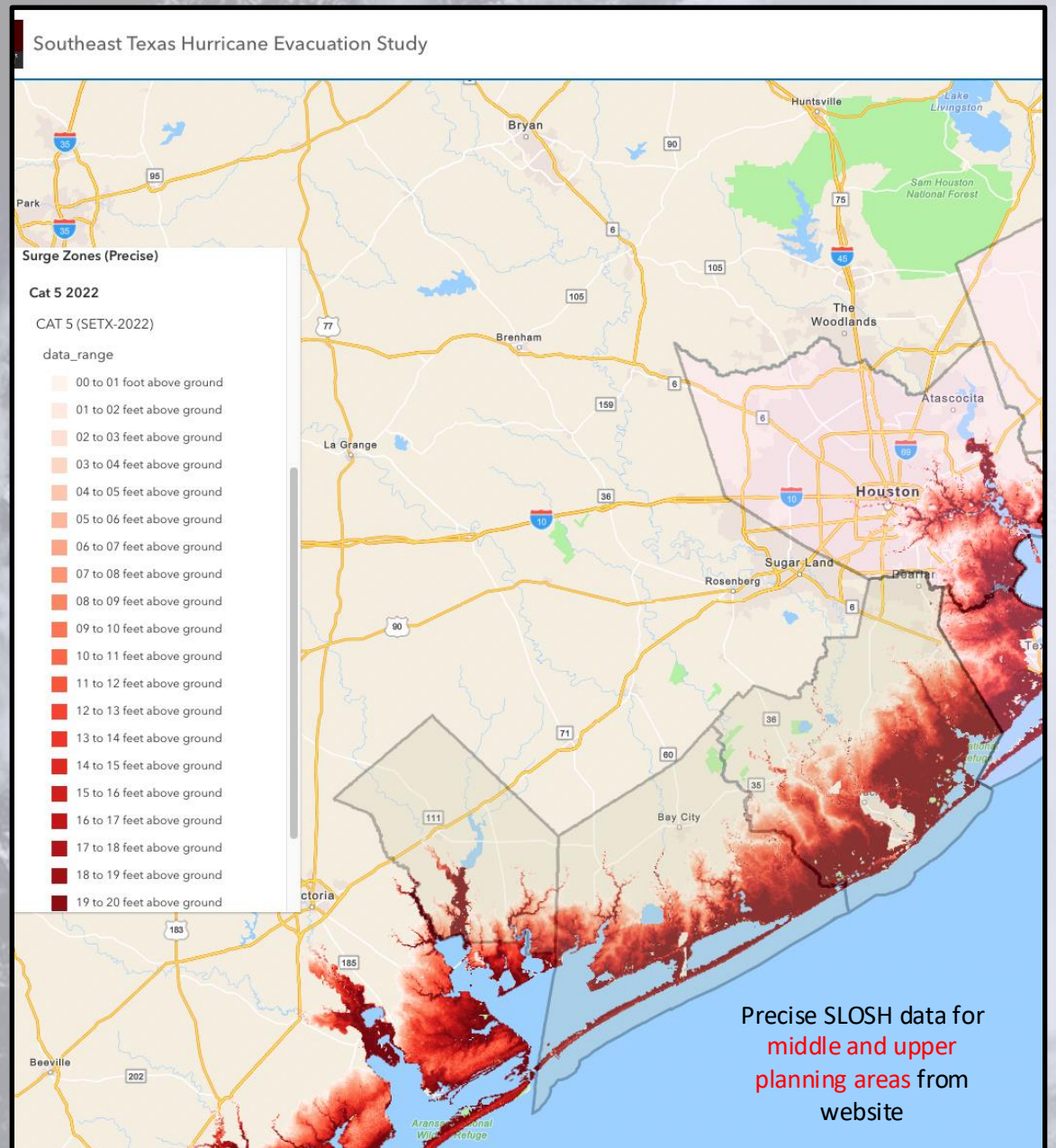


Upper planning area:

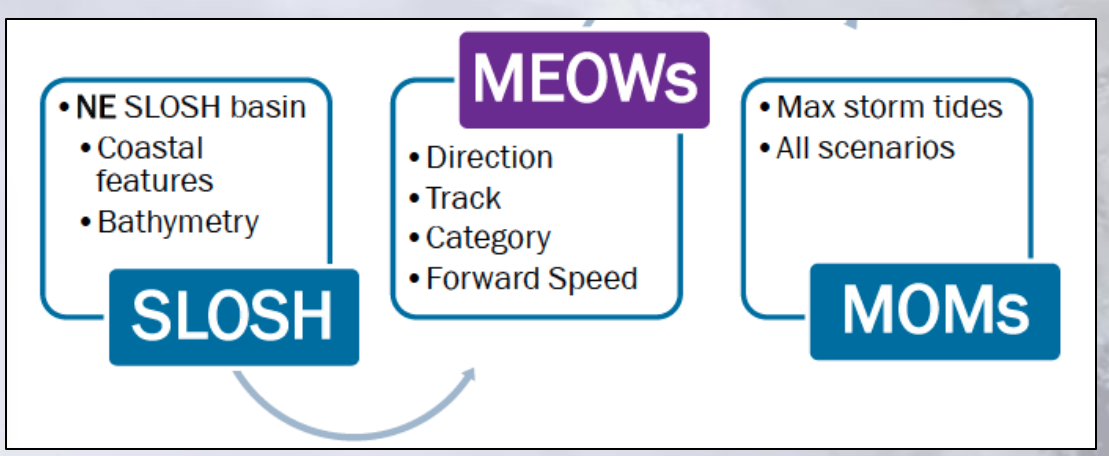
- Jefferson and Orange counties: Have developed evacuation zones that include all areas in their counties given their surge risk.
- Newton County: Has evacuation zones on its lower eastside, along the boundary with Louisiana due to surge up the Sabine River.
- Jasper County: Did not designate evacuation zones. Their surge risk is limited to its lower westside, with slight potential for Cat 5 surge up the Neches river.
- Hardin County: No update.
- Naming: Coastal, Zones A, B, and C
  - In general, successive zones from Coastal to C has declining risk
  - Not all counties have each zone

Hazard Data: Storm Surge Modeling

Produced by NOAA and USACE



Precise SLOSH data for middle and upper planning areas from website

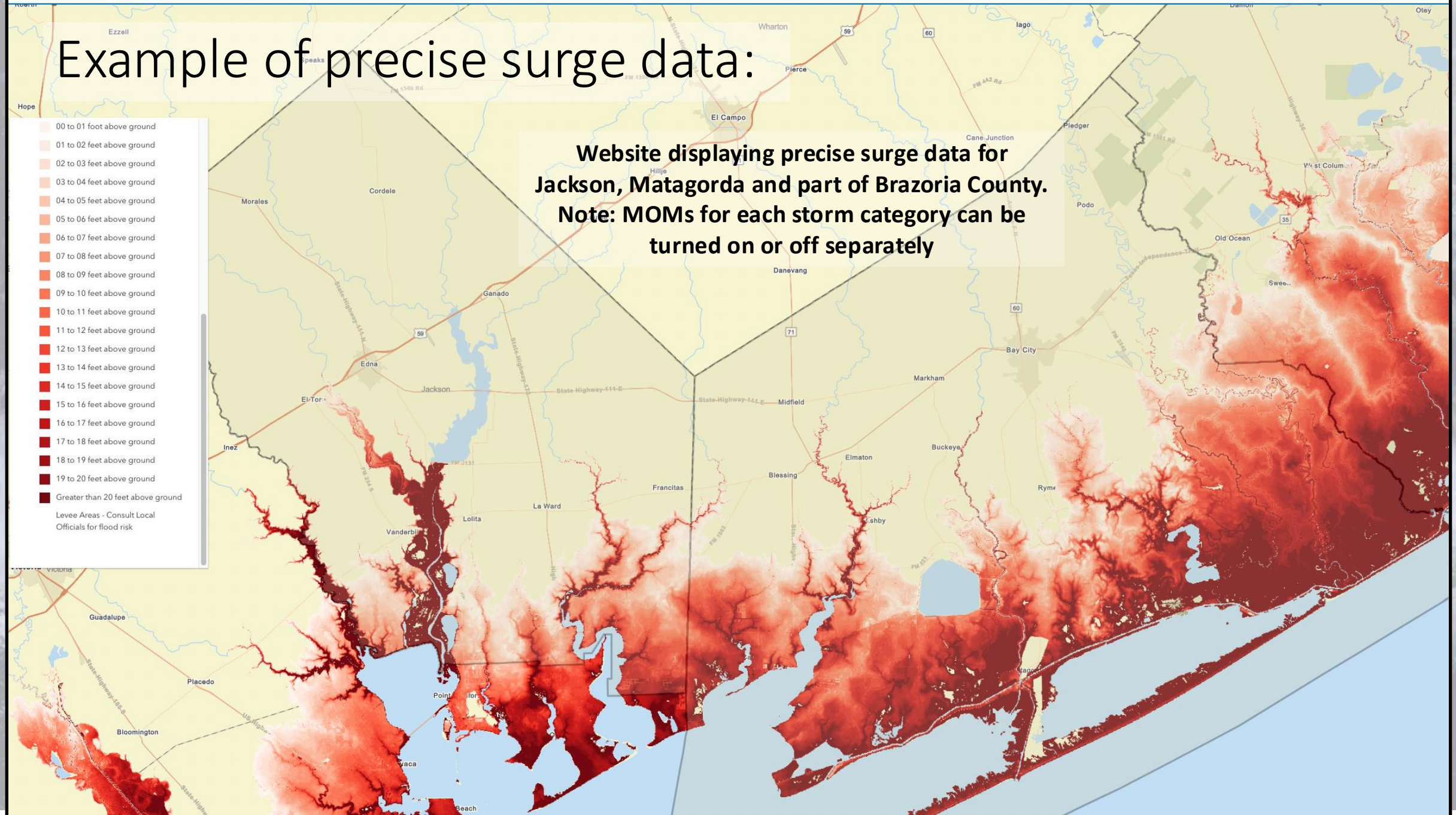


SLOSH = Sea, Lake, and Overland Surges from Hurricanes
MEOW = Maximum Envelope of Water
MOM = Maximum of Maximums

Data are generated from multiple SLOSH model runs

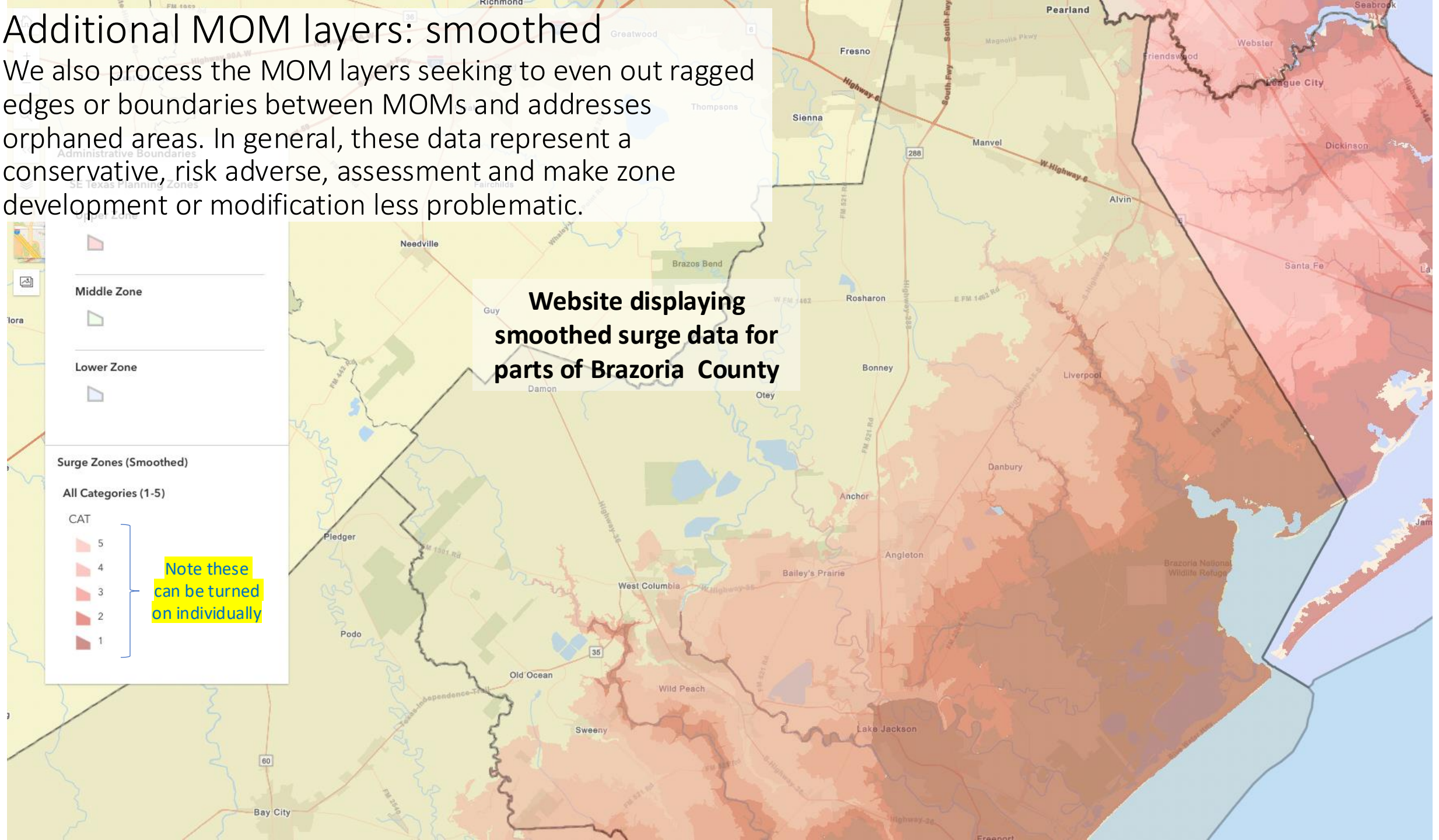
- Total of 216 MEOWs
  - 9 directions WNW, 6 intensities & 4 forward speeds
  - Assuming High-tide
- Total of 6 MOMs generated
  - Category 1 – Category 5 storms on website
  - Note MEOWs are are classified according to predominant storm categories generating similar surge levels, not necessarily specific wind speeds.

Example of precise surge data:



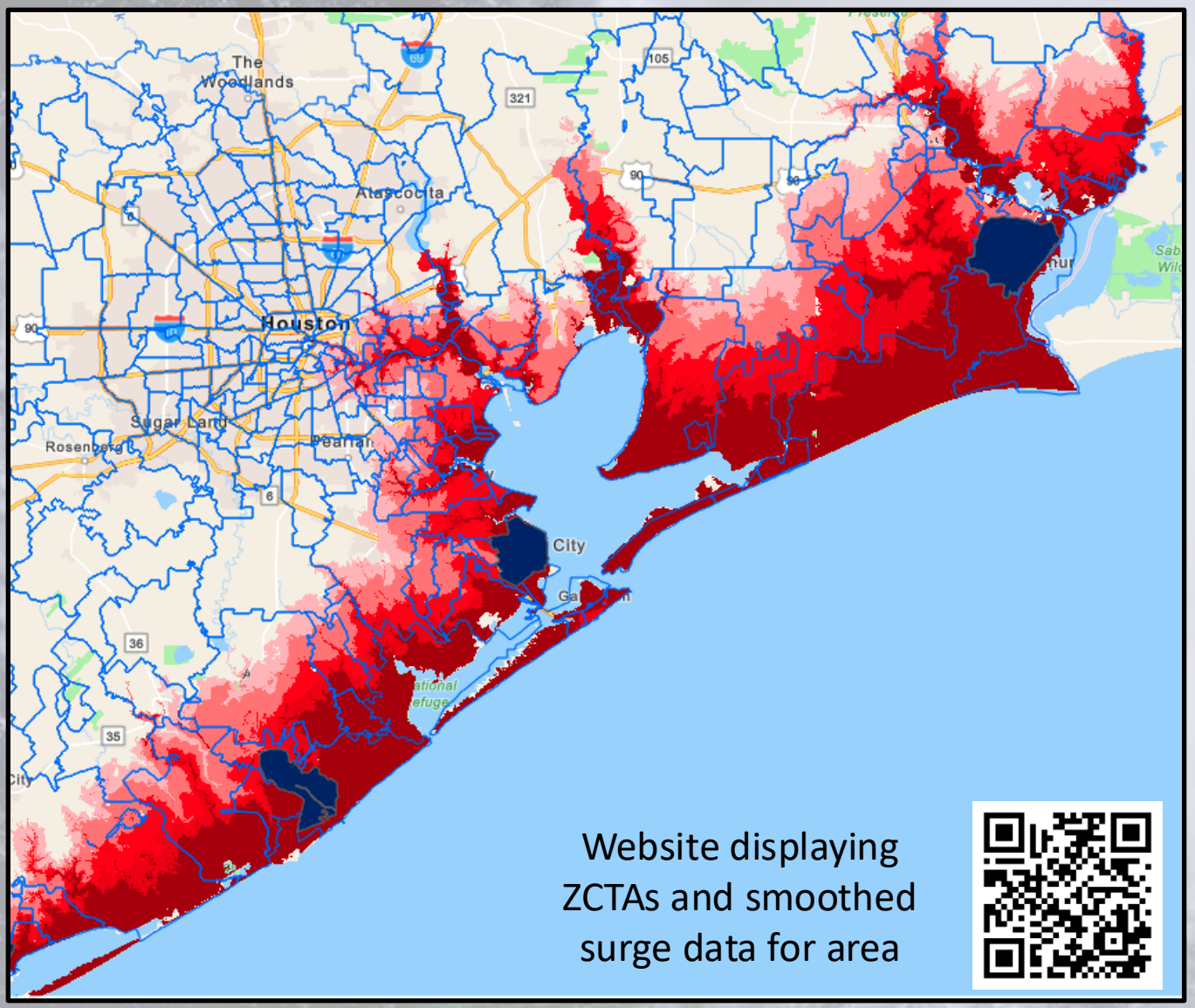
Additional MOM layers: smoothed

We also process the MOM layers seeking to even out ragged edges or boundaries between MOMs and addresses orphaned areas. In general, these data represent a conservative, risk adverse, assessment and make zone development or modification less problematic.



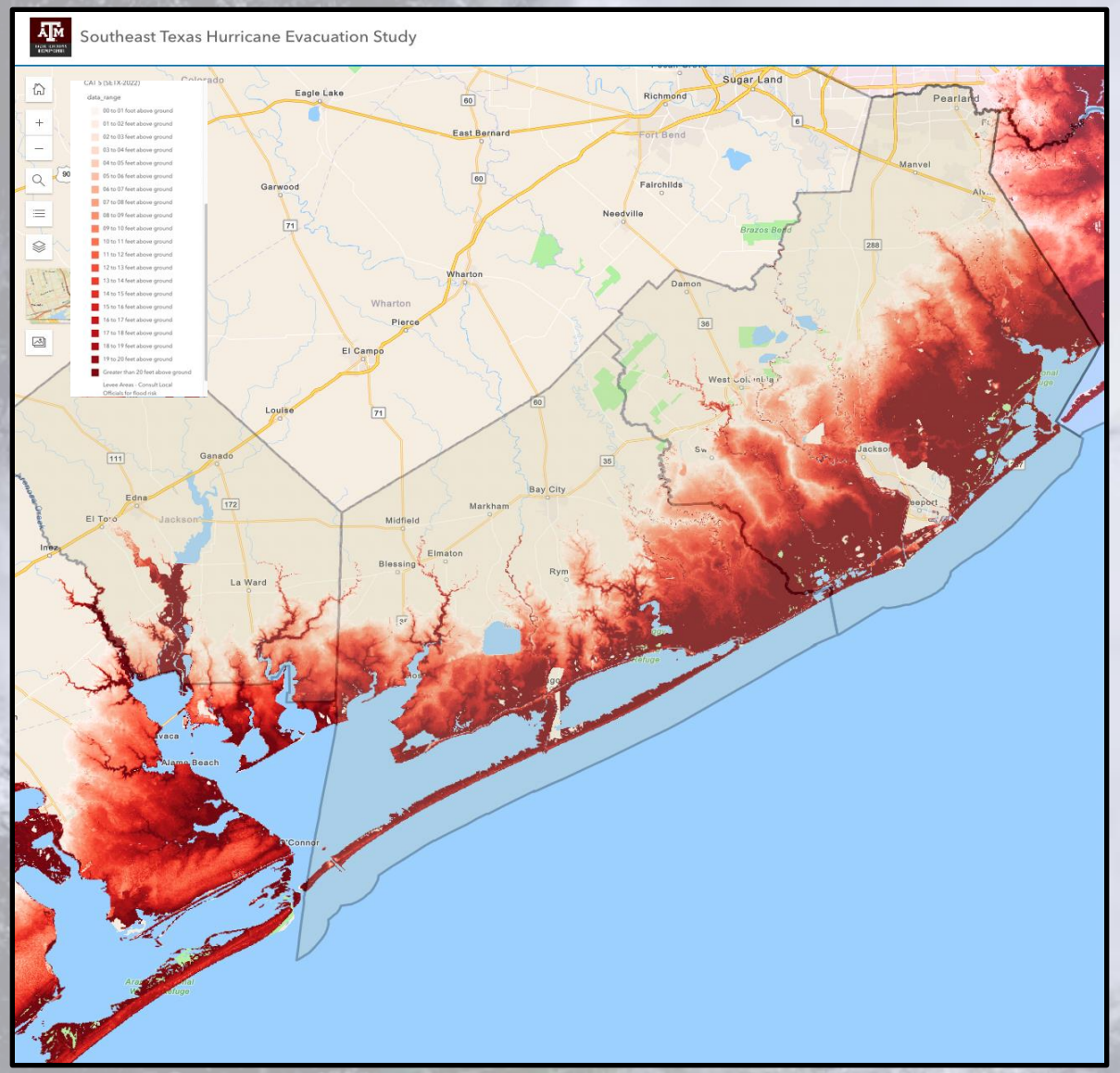
Additional data:

Project QR code



- Population and infrastructure data
  - Population:
    - Landscan 90-meter (2021)
    - Census's LEHD Origin-Destination Employment Statistical (LODES) data on job and residential locations by Census Blocks (2022)
  - Building foot-print data
  - Transportation road network data
  - Zip code tabulation areas (ZCTAs)
  - FEMA's Flood Zones
  - Other data:
    - Critical facilities
      - Mass shelters and/or evacuation centers
      - vulnerable populations
  - We will review these and other data shortly.

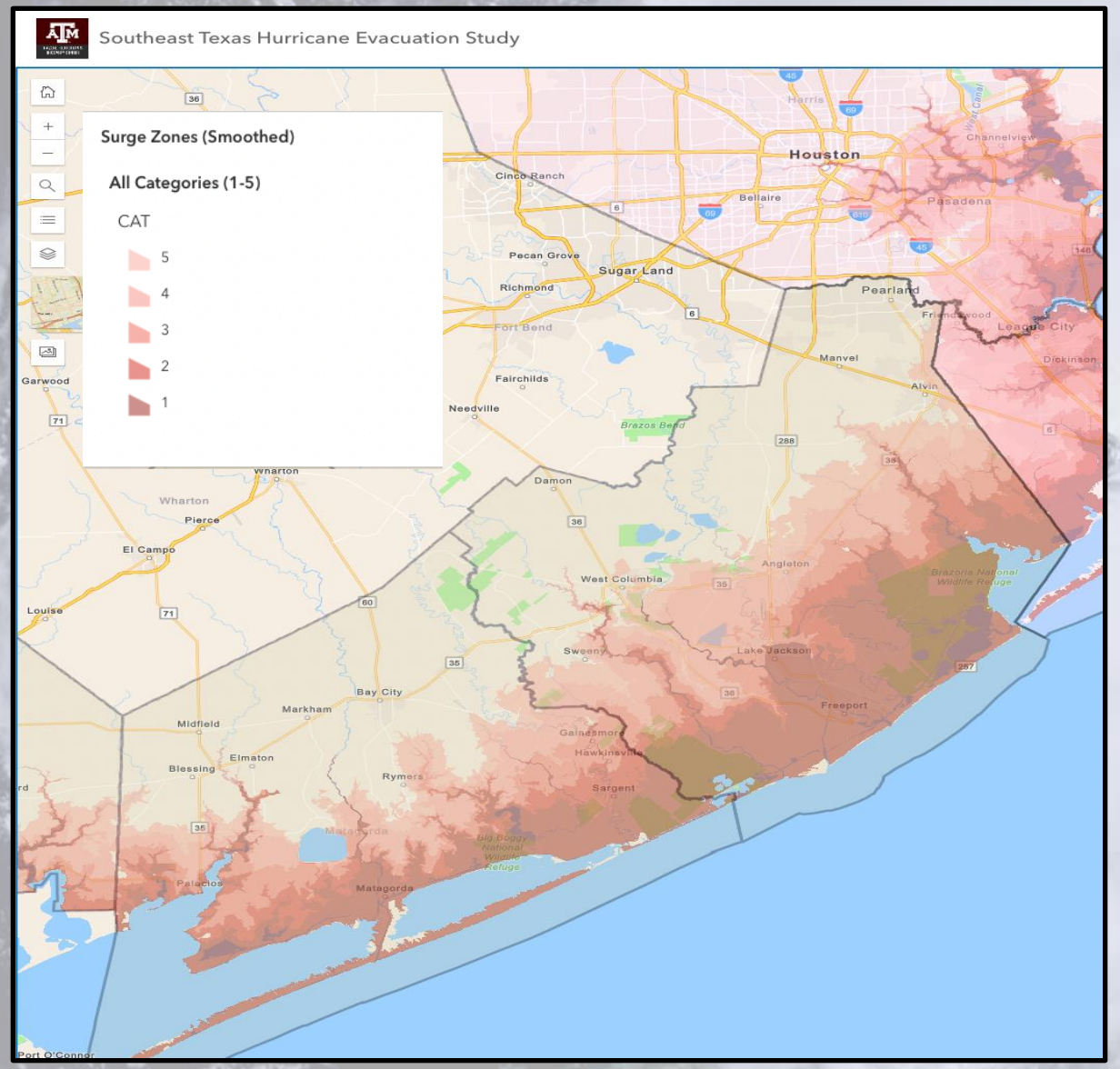
Evacuation Zone assessment and modification



Guiding principles in evacuation zone development and/or modification:

1. **Life safety –** getting the public out of potential harms way
2. **Storm Surge hazard** is the key hazard driving evacuation/risk zone development & modifications
3. **Facilitating risk/warning communication** – zones should be easily identifiable, communicable, and interpretable by public
4. **Facilitating emergency management decision making** – getting people out of harms way but in manner facilitating transportation flow
5. **Avoiding zone identification based on storm categories** – variations in storms and conditions can demand modifications in evacuation calls
6. **Regional Consistency:** naming and, where possible, adjacency in zones.

Evacuation Zone assessment and modification

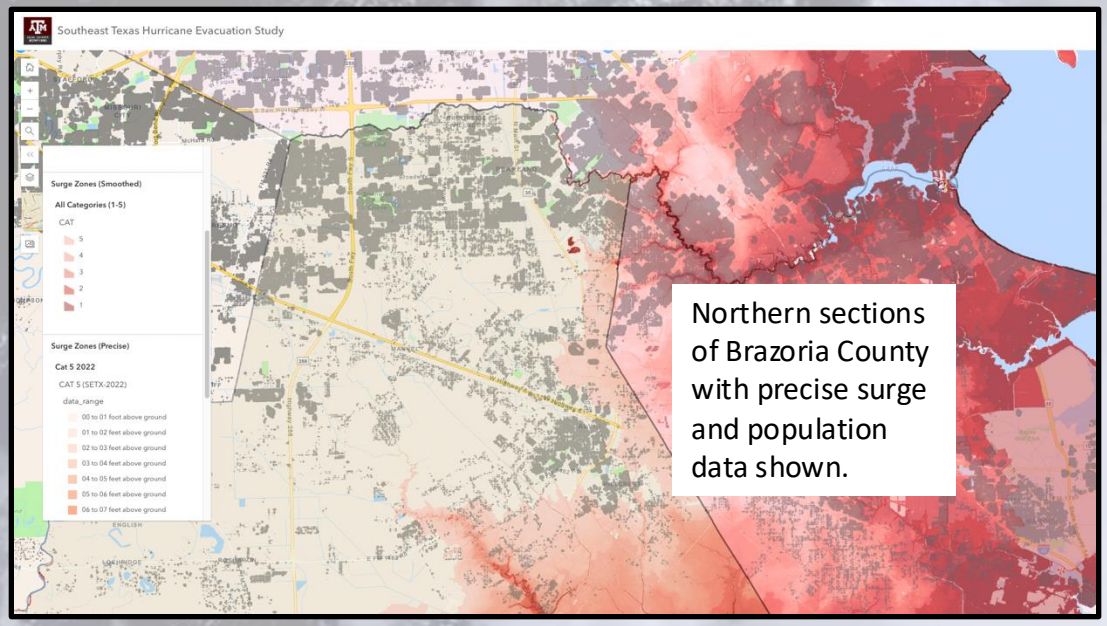


Evacuation Zone Naming Convention:

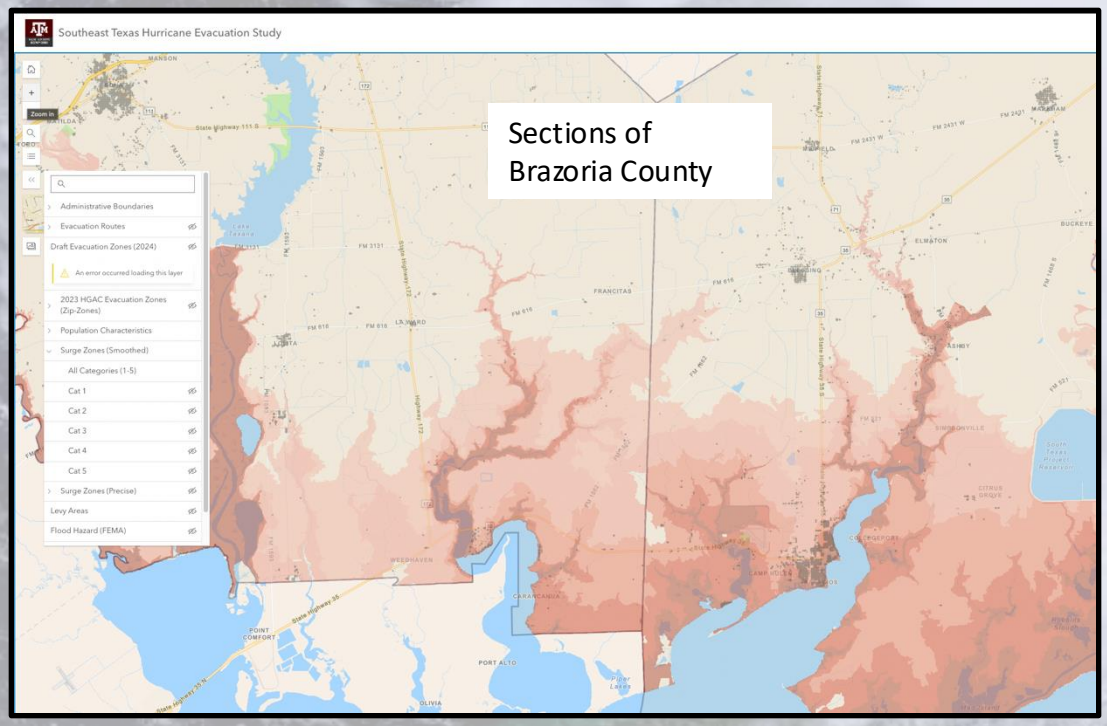
Current:

- Coastal and Zones A-C
- Generally, successive zones reflect declining surge risk probability
- But evacuation timing/phasing may be important to consider
- Not all counties must have each zone

Review of Workshop Materials



Northern sections of Brazoria County with precise surge and population data shown.



Sections of Brazoria County

Example of Working Group Activities:

1. Elect spokesperson/reporter
2. Review map packets, problems/issues highlighted, and proposed changes or new zones
3. Work with maps and the Atlas data to develop a better understanding of the issues
4. Propose, consider, and reconsider problem areas, other issues, and produce solutions.
5. Develop consensus where possible
   - Strive for consensus within work groups
   - Help our team members to accurately record changes, modifications, or new solutions
   - Identify problems and issues that will need additional data or unique solutions
   - Meet with adjacent county groups to assess consistency problems or issues – seek solutions.
6. Develop a county report to entire group
   - make sure that HES team member has clear understanding (preferably written and recorded on printed maps) of changes, modifications, problems to be addressed, and steps forward.

HES Team Contacts

- USACE Galveston District
  - **Kyle Donlevy:** kyle.a.donlevy@usace.army.mil
    - Overall, HES Re-Study Manager and coordination
- FEMA Region 6
  - **Arianne Thomas:** arianne.deruise@fema.dhs.gov
    - HES input and technical support
- Texas Department of Emergency Management
  - **Blake White:** blake.white@tdem.texas.gov
  - **Carman Apple:** carman.apple@tdem.texas.gov
    - HES oversight, input and technical support, coordination with county, local, & regional government, agencies, and stakeholders.

- Texas A&M HRRC and TTI
  - Conducting vulnerability, behavioral, shelter, and transportation analysis and providing technical assistance.
    - **Walt Peacock:** peacock@tamu.edu
      - Overall team management, coordination, and data analysis
    - **David Bierling:** d-bierling@tti.tamu.edu
      - Overall team management, coordination, and data analysis
    - **Doug Wunneberger:** dwunneburger@arch.tamu.edu
      - GIS and data development and analysis, website development
    - **Darrell Borchardt:** d-borchardt@tti.tamu.edu
      - Transportation scenario development and analysis
    - **Alexander Abuabara:** aabuabara@arch.tamu.edu
      - GIS & data development and analysis and website development and maintenance