NOTE: Please make sure you have checked in…

Southeast Texas Hurricane Evacuation Study

Transportation Analysis Scenario Development Workshops for the Middle and Lower Planning Zones
League City and Lake Jackson

November 18, 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

Agenda:

- Team and Participant Introductions
- Brief Overview of HES progress
  - Hazard Analysis
  - Evacuation Zone Development
    - Handouts
  - Atlas Updates and vulnerability layers
- Transportation Analysis
  - Overview
  - Scenario development
- Contacts

Project website:

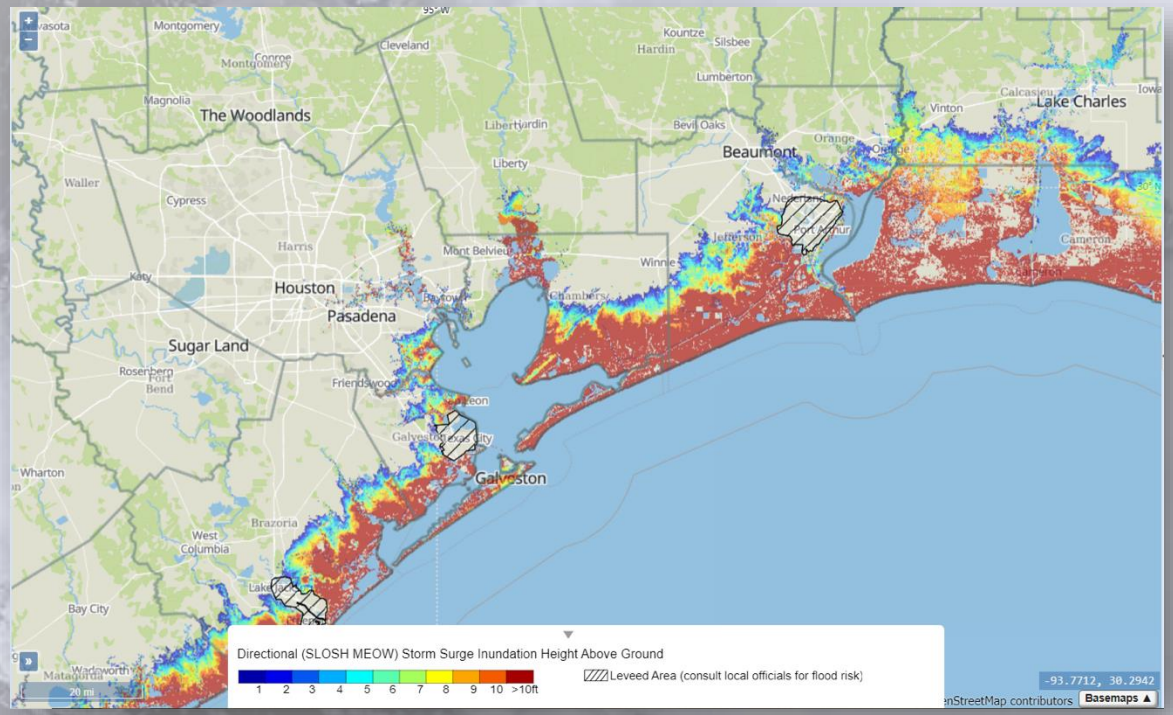
Atlas website:

Team Members and Introductions:

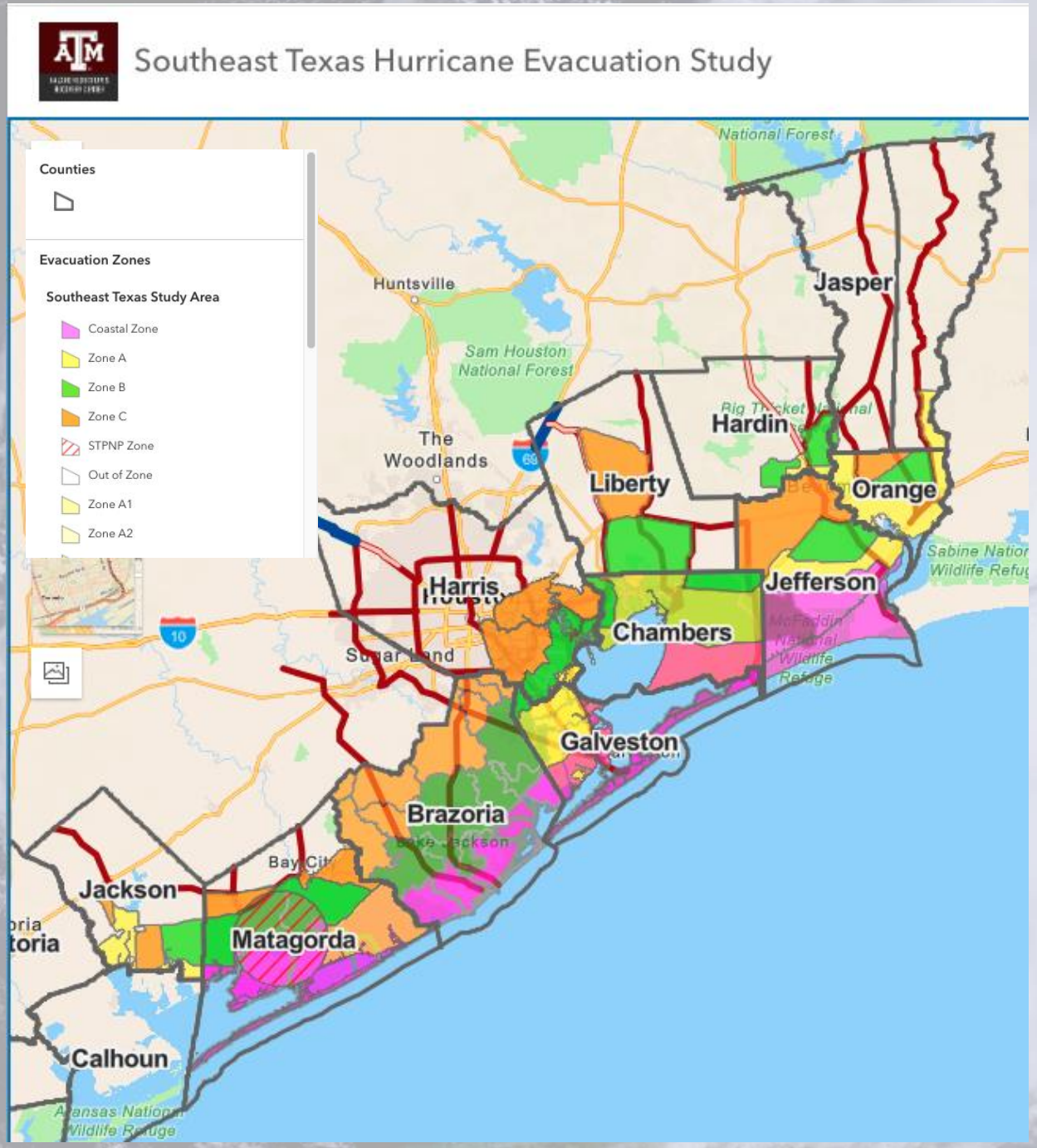
- US Army Corps of Engineers: Galveston District
  - Kyle Donlevy & Gerald Gaines
- FEMA, Region 6
  - Arianne Thomas
- Texas Department of Emergency Management
  - Blake White & Carman Apple
- Texas A&M Hazard Reduction and Recovery Center & Texas A&M Transportation Institute
  - Walt Peacock, David Bierling, Doug Wunneburger, Darrell Borchardt, & Alexander Abuabara
- Local government and stakeholder participants
  - **Again, please make sure you have signed into the workshop**

HAZARDS ANALYSIS
SLOSH Data- Review

Cat 3, NW, 15 mph

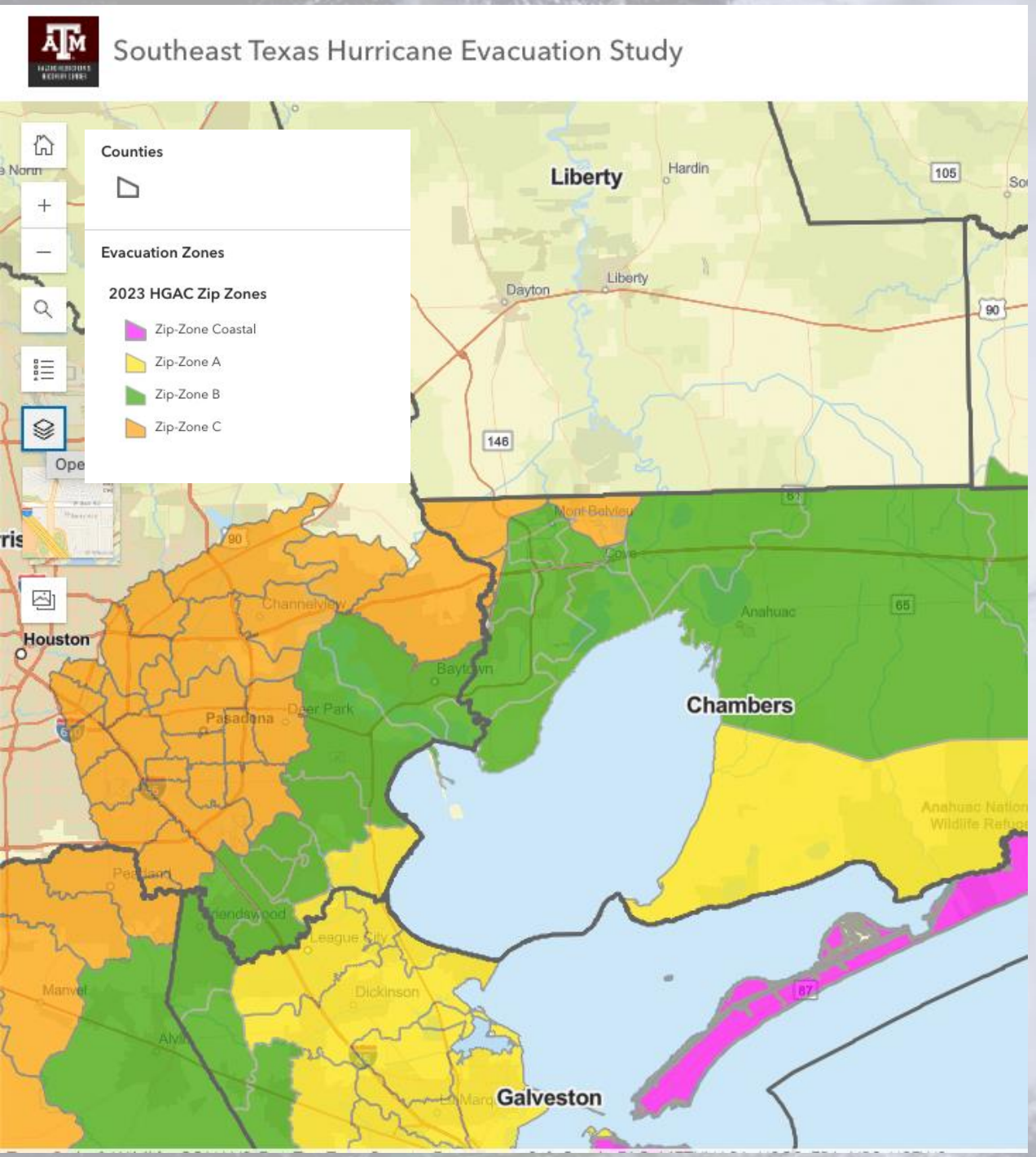


- ***Total of <u>216 MEOWS</u>***
  - 9 Directions (WNW through Parallel)
  - 6 Intensities: TS-5
  - 4 Forward Speeds
  - One tide (high)
- ***Total of 6 MOMs***
  - 6 Intensities: TS-5



Update on Evacuation Zone reassessment and development

- The process is nearly complete
  - Few more tweaks are underway
  - Please, continue to review, share, and discuss with County Judges, and get with us if there are additional modifications.
- Atlas includes
  - Earlier evacuation zones
    - Layer name: ***2023 HGAC Zip Zone***
  - The new draft zones
    - Layer name: ***Southeast Texas Study Zones***
  - Change layers for areas increased, decreased, or remained unchanged
    - Layer name: ***Change in Zone from 2023 HGAC Study***



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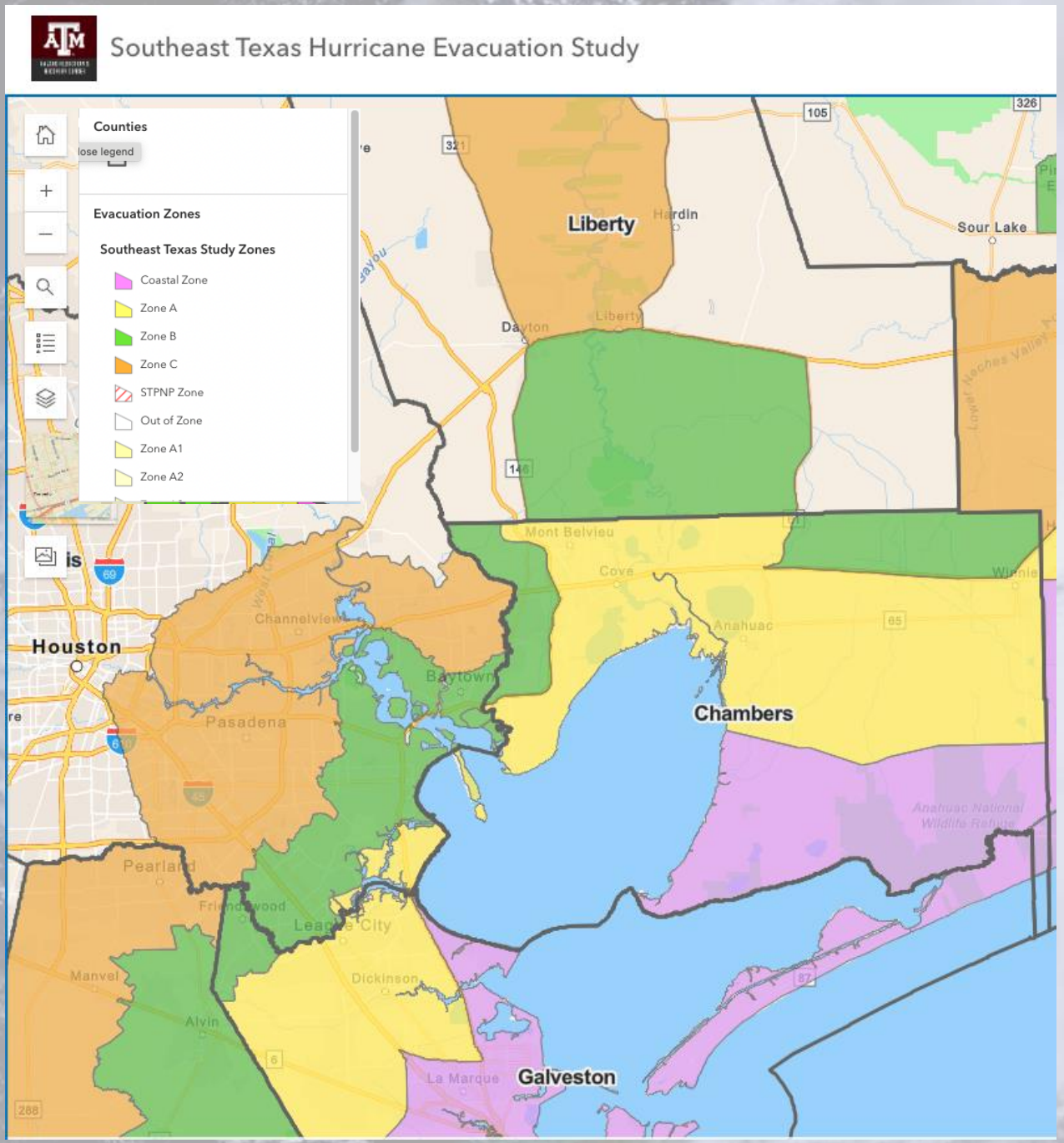

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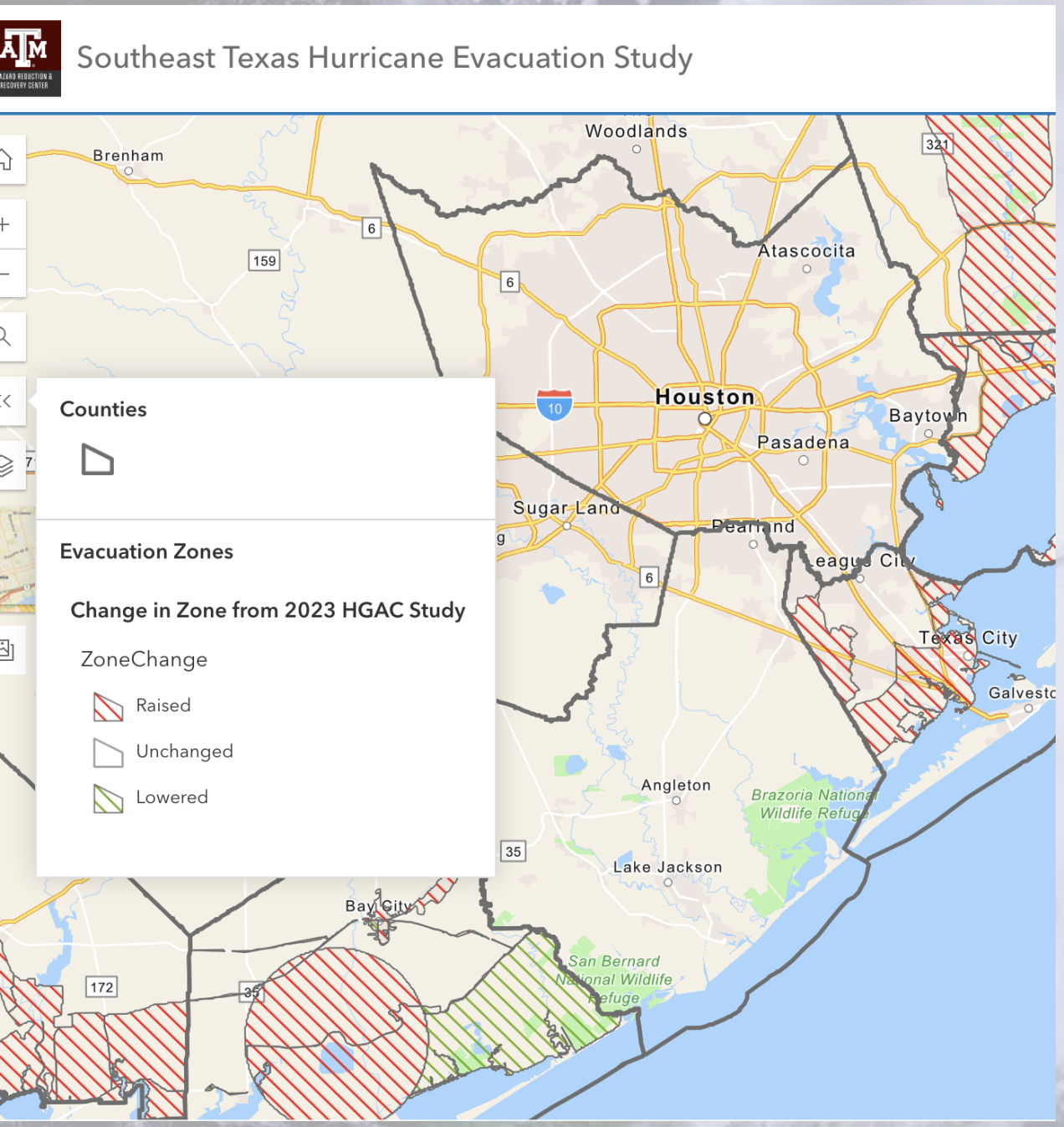

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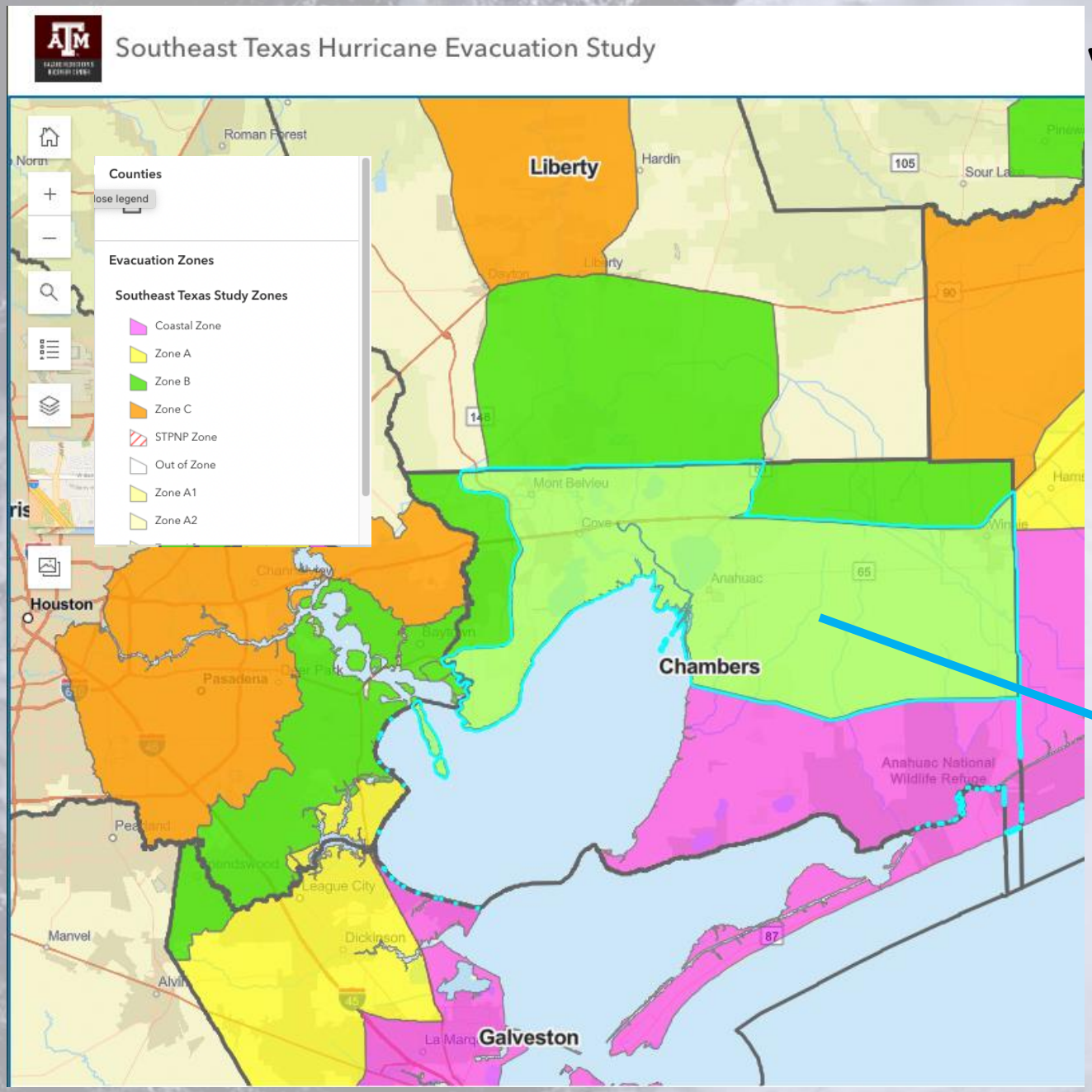


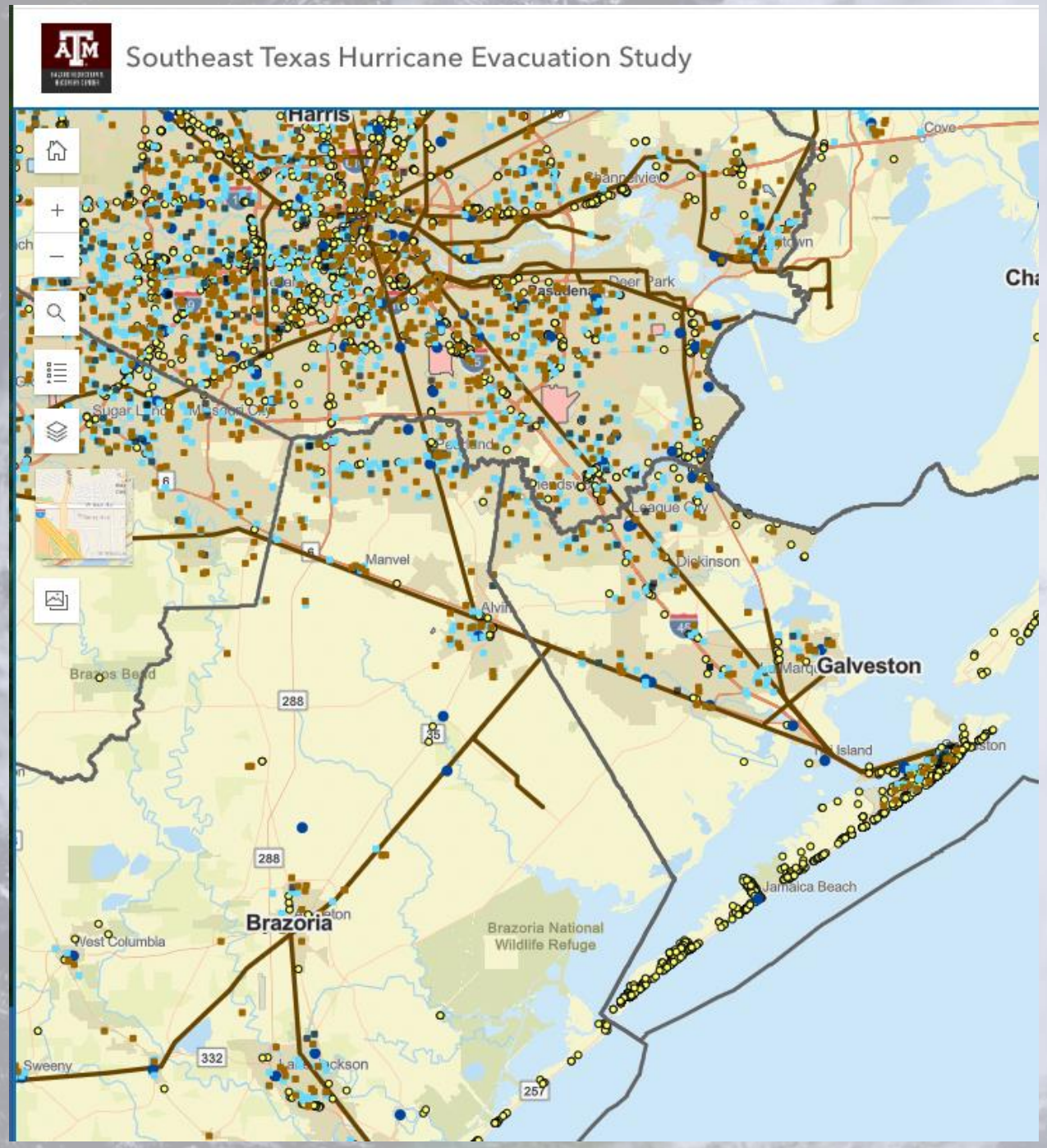
Vulnerability data has been added and much more to come

- Click on any County's evacuation zone and the following data will appear:
  - Population
  - Households
  - Vehicles
  - Zone's Boundary description

Chambers County Zone A

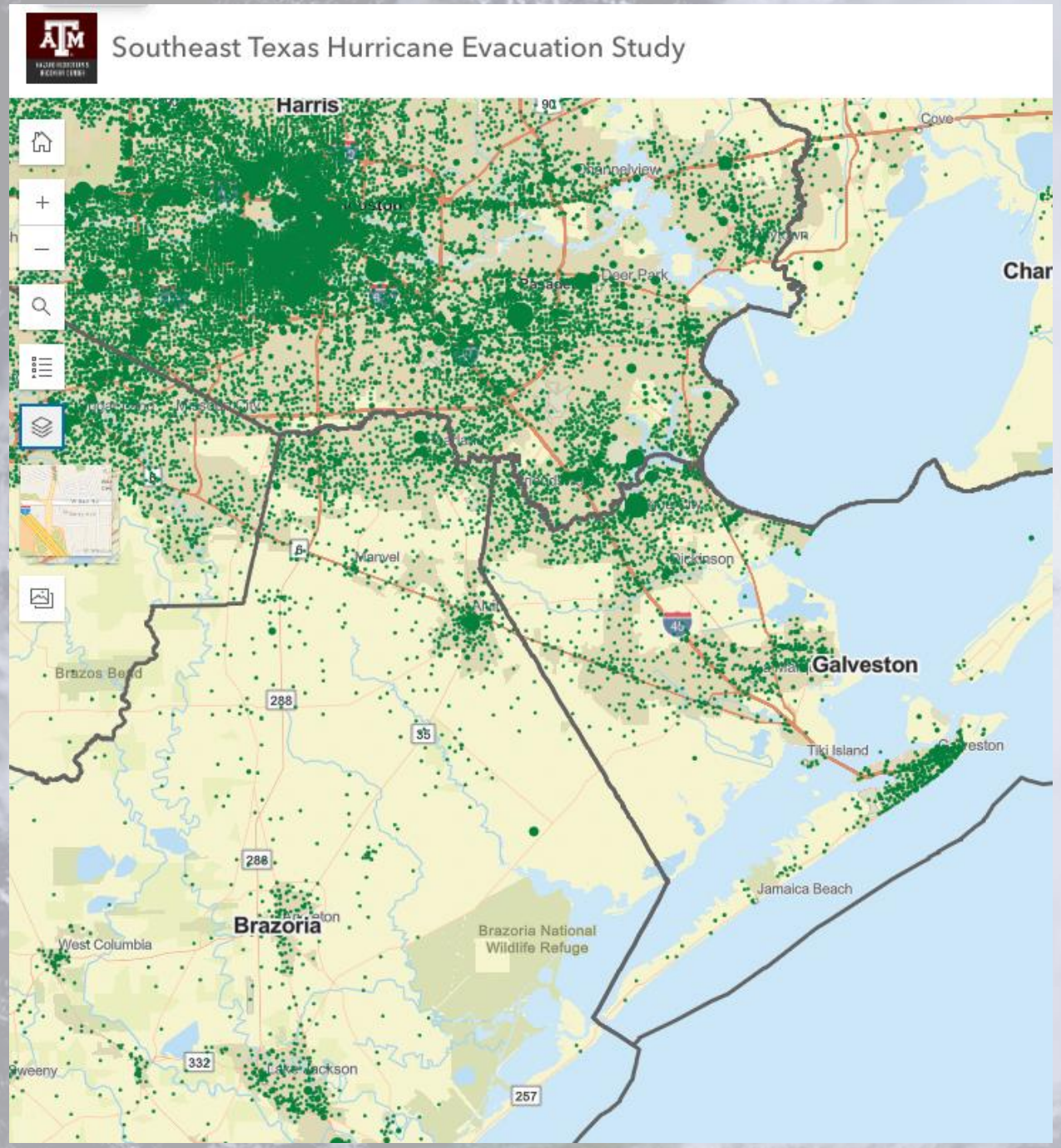
Zoom to

Boundary Description:	All areas east of Grand Pkwy to SH 61. South of IH 10.
Population (night)	33,194
Households (est)	11,284
Vehicles (est)	25,222
Hotel Capacity	500
Vehicles (hotel)	500
Mobile Home Population	4,502
Mobile Home Vehicles	3,423



Vulnerability data has been added and much more to come

- Built environment data
  - Hotels/motels/B&Bs
  - Childcare Centers
  - Schools (private and public)
  - Evacuation routes
  - Etc.
- Population concentrations and characteristics
  - Population concentrations
  - Social vulnerability indicators
    - Low to moderate income, etc.
    - Block group, tract, and ZCTAs
- Additional hazard layers
  - Surge, flood, levee areas,



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SETX HES Transportation Analysis

The primary purpose of the transportation analysis is to estimate the clearance times needed to complete a safe and timely evacuation of the population for a range of hurricane threats and scenarios.

- Identify Evacuation Network
- ***Determine Evacuation Scenarios***
- *Estimate Clearance Times*

What is the END GAME?

State: Texas County: Nueces Use Base Location

HURREVAC makes recommendations for evacuation start times based on how long it takes to evacuate a vulnerable population ahead of the arrival of tropical-storm-force winds (34kt/39mph). To utilize this capability of the program, you must first select one or more evacuation scenarios from a region's Hurricane Evacuation Study. Refer to the Study's technical data report, or ask your state's Hurricane Program Manager for guidance on making selections appropriate to a particular storm situation.

Total Evacuation hours: 47

Evacuation Participation Rate: Normal participation based on recent experience

Response: Moderate (24 hour) response

Roadway Modification: No change to transportation system

Total Evacuation hours: 41

Evacuation Participation Rate: Normal participation based on recent experience

Response: Moderate (24 hour) response

Roadway Modification: Additional capacity by utilizing breakdown lane on I

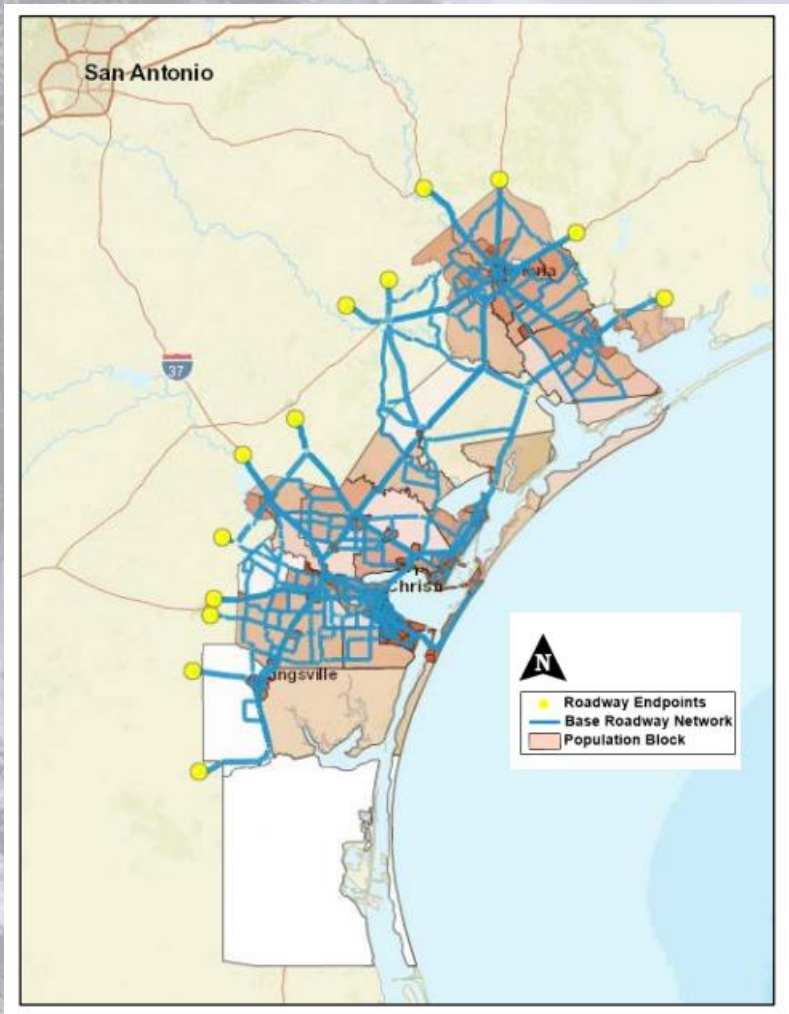
Total Evacuation hours: 36

Evacuation Participation Rate: Normal participation based on recent experience

Response: Moderate (24 hour) response

Roadway Modification: Lane reversal implemented on IH-37

How do we get there?
Through the magic of RtePM!!



RtePM → Real time evacuation Planning Model

- Model includes the existing street network
  - *Allows for modifications, closures, shoulder lanes, contraflow
- Population totals from latest census data
  - Daytime & Nighttime
  - Seasonal populations can be added
- Start time of evacuation can be staggered amongst zones
- Behavioral analysis used to help define evacuating traffic
- RtePM result = estimated time for the last car to reach endpoint
  - NOT all the way to Dallas
  - Reasonable safe location

Scenario Development

Scenario Inputs

- Resident Behavior
  - Response Rate
  - Response Time
  - Destinations
- Seasonal Population
- Roadway Operations
  - Evaculane
  - Contraflow
  - Incidents
  - Background Traffic
- “All Scenario” Inputs
  - Percent private vehicles
  - Percent using other means
  - Average Vehicle Occupancy
  - Vehicles Towing

Scenario Development

Resident Behavior

- Storm impact and timing
- Behavior study
- Rely on local knowledge/expertise
- Possible vs. Practical # of scenarios

Response Time

- Fast (5 hours)
- Medium(24 hours)
- Slow (2-day)
- Custom

Scenario Development

Roadway Operations

- **Road Closures**
- **Contraflow**
- **Evaculane**
- Traffic incidents
- Background traffic

Scenario Development

NOTE: Charts showcasing scenarios used for Coastal Bend study for illustrative purposes only. NEW scenarios will be developed specifically for the 2024 Southeast Texas study.

Scenario Group	Population	Evacuation Zone/Area				Persons Evacuating
		A	B	C	Outside Evacuation Zone	
Recent Experience	% Resident Pop	75%	51%	40%	44%	
	% Seasonal Pop	75%	51%	40%	44%	377,000
Recent Experience Plus	% Resident Pop	90%	66%	55%	59%	
	% Seasonal Pop	90%	66%	55%	59%	479,200
Maximum Evacuation	% Resident Pop	100%	100%	100%	100%	
	% Seasonal Pop	100%	100%	100%	100%	681,400

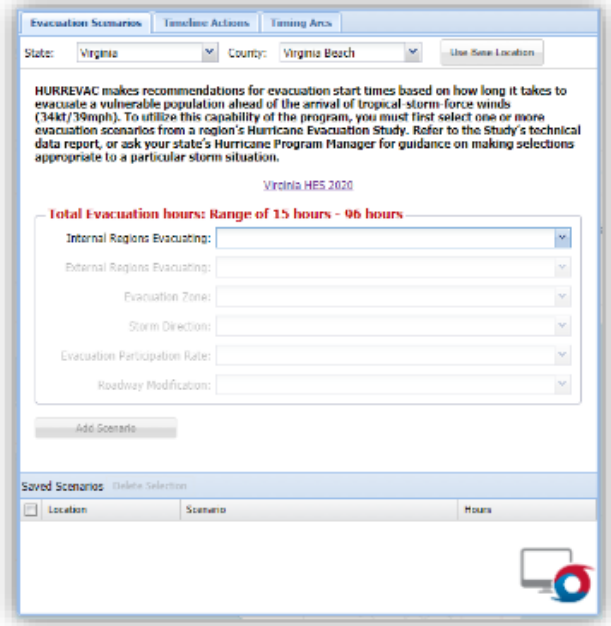
Scenario Group	Evaculane	Contraflow	Response Time
Recent Experience			2 days
Recent Experienc Plus			
Maximum Evacuation	No	No	2 days 24 hours 5 hours
	Yes	No	2 days 24 hours 5 hours
	Yes	Yes	2 days 24 hours 5 hours

TRANSPORTATION ANALYSIS

Outcomes

- **Develop Evacuation Scenarios** through close coordination with local & state emergency managers
- **Transportation modeling to get Clearance Times** using the Real Time Evacuation Planning Model (RtePM)
- **HURREVAC Integration**

Scenario	Subregion					Dir		Cat			Zones				Part Rate			LR		NC		Likely		
	SS	P	MP	NN	ES	NW	NE	1/2	3	4	A	B	C	D	L	M	H	W	WO	W	WO	ML	CAT	REGIONAL CLEARANCE TIME
ES-1																								28
ES-2																								28
ES-3																								45
ES-4																								38
ES-5																								58
ES-6																								50
ES-7																								34
ES-8																								45
ES-9																								38
ES-10																								58
ES-11																								58
ES-12																								50
ES-13																								67
ES-14																								67
ES-15																								58



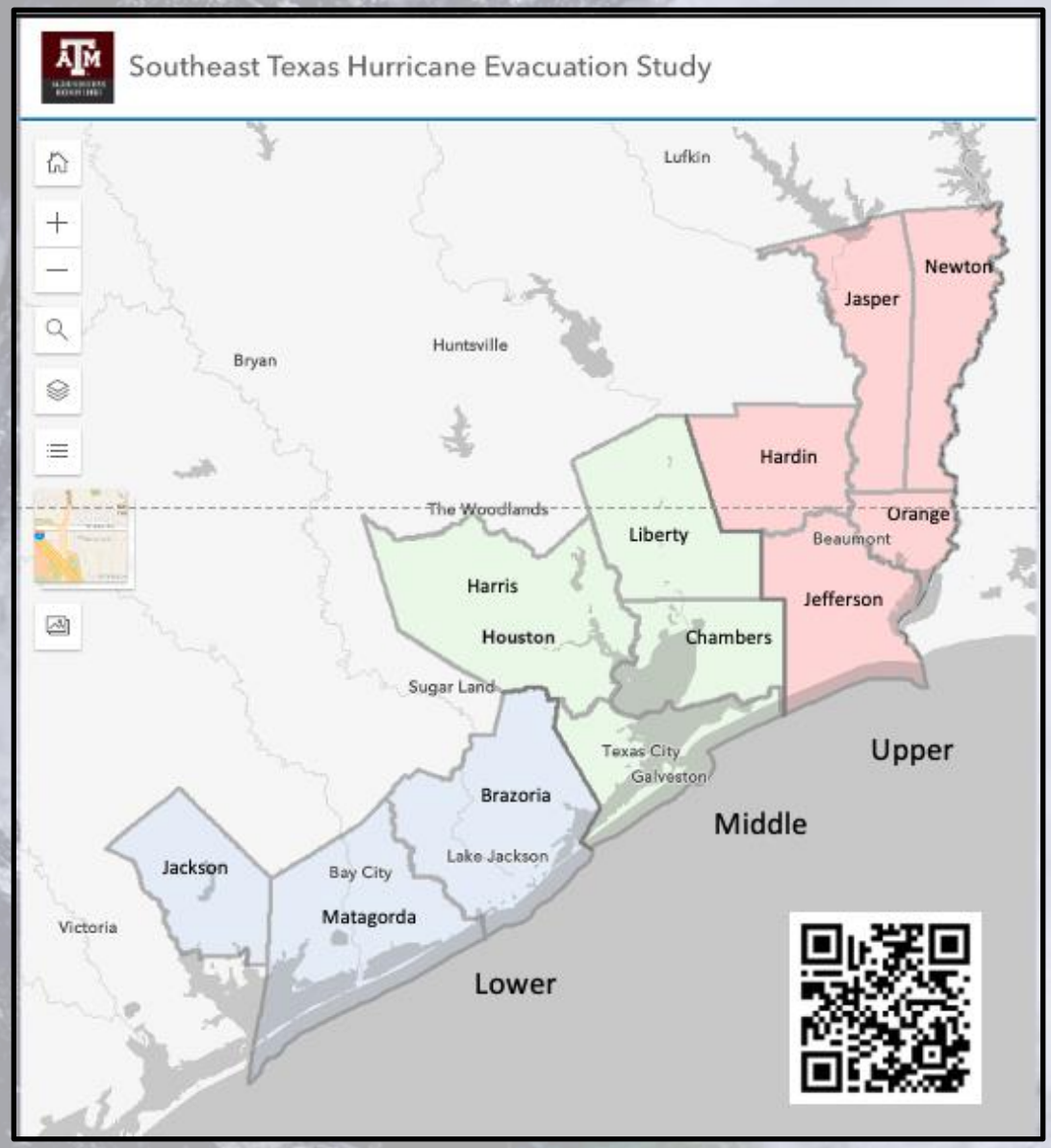
Slide Credit: USACE + Sea Island Software

Transportation Analysis / Scenario Development

Scenarios "drive" the transportation analysis

- ✓ **Need your input to develop scenarios [each region can be different]**
  - **Staggered zone start times**
  - **Road Closures**
  - **Evaculane/Contraflow options**
  - **Seasonal population**
  - **Special needs population not in private vehicles**
  - **Population to shelters**
- ✓ **Resident behavior**
  - **Response time**
  - **Likely destinations**
- ✓ **RtePM variables to consider**
  - **Persons per vehicle**
  - **% vehicles towing**
  - **Background traffic / roadway incidents**

HES Southeast Texas: Future Activities and Meetings…



- **Evacuation Zone Development**
  - Formal report is begin developed and will be posted
  - Work on template maps
- **Vulnerability Analysis**
  - Updates on Atlas will be continuous
  - Draft reports are in preparation and will be posted
    - Including recommendations to consider for evacuation plans
  - Virtual or in person meetings are possible to review Atlas and reports
- **Transportation Analysis**
  - Scenario Matrix will be sent for review
  - Upper, Lower, Middle process order
  - Might need some individual follow-ups
  - Additional summary meeting after complete

Atlas website:

Project website:

Additional Questions & Discussion

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 Wunneburger:** 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