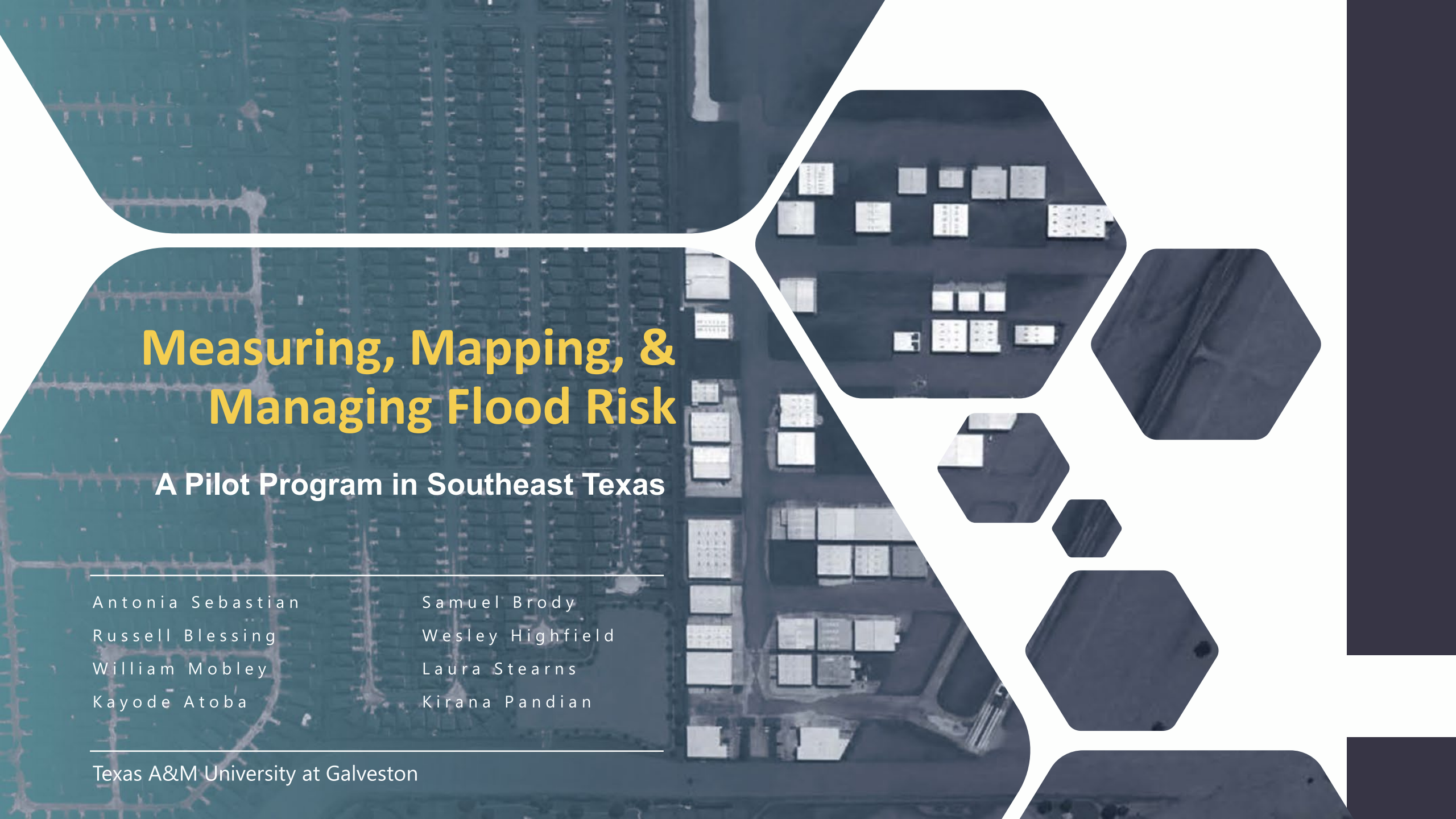


Measuring, Mapping, & Managing Flood Risk

A Pilot Program in Southeast Texas

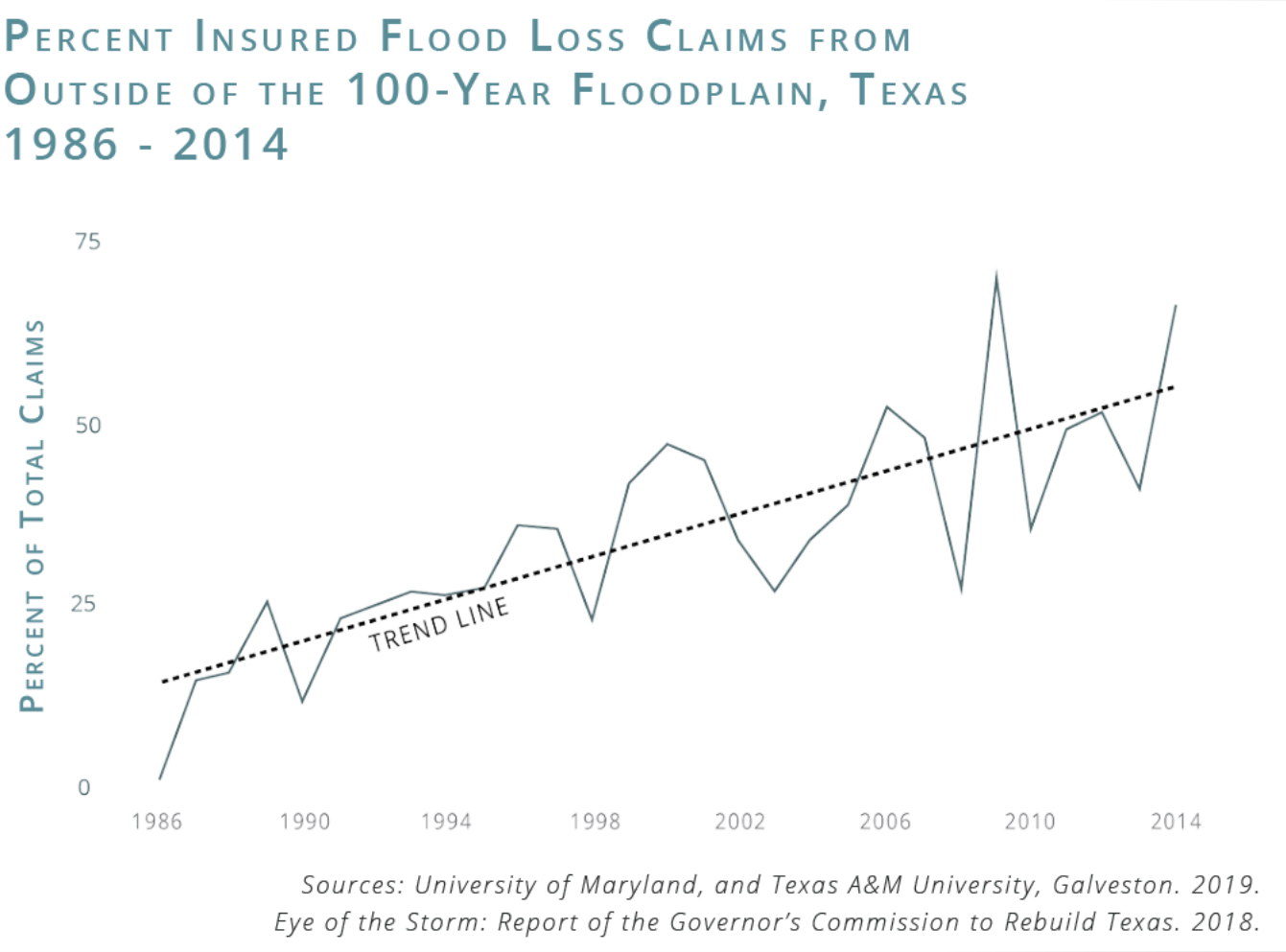
Antonia Sebastian
Russell Blessing
William Mobley
Kayode Atoba
Samuel Brody
Wesley Highfield
Laura Stearns
Kirana Pandian

Texas A&M University at Galveston

CHALLENGES

Inadequate risk communication undermines preparedness.

- The 100-year floodplain has become the primary instrument to communicate risk.
- However, the floodplain was only designed to set insurance rates.
- False sense of security, particularly for those just outside the floodplain boundary



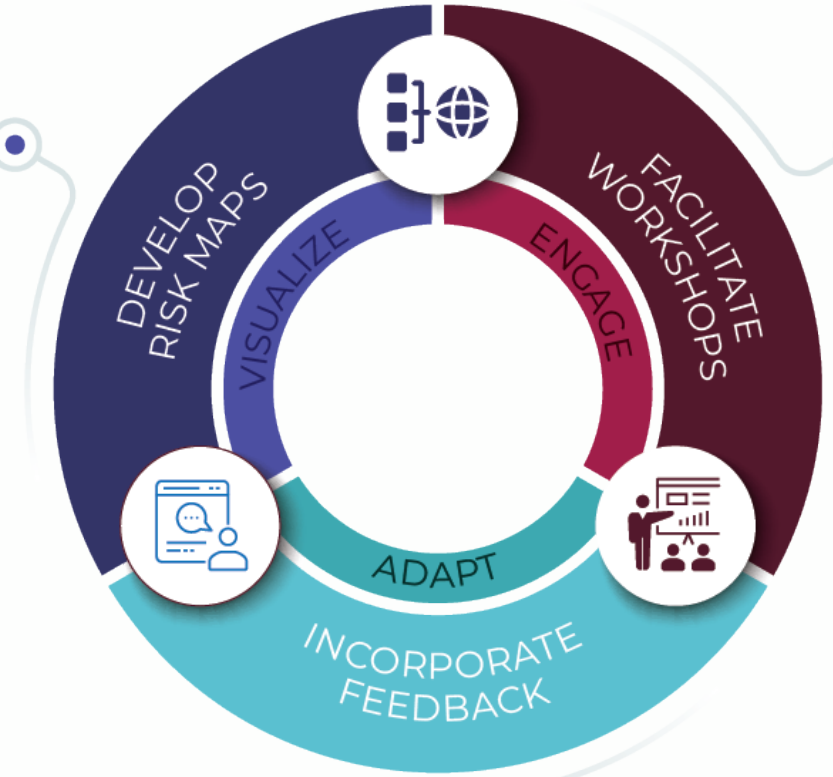
PROJECT IMPACT STATEMENT

This project integrates advanced risk modeling and community engagement to create new mapping tools that expand decision-maker's capacity to mitigate flood risk.

RISK MODELING

Physics-based Models

Machine Learning Models



UNDERSTANDINGS OF RISK & PERCEPTION

Greenspoint

Richwood/Lake Jackson

QUALITATIVE ASSESSMENT & THEME ANALYSIS

PROJECT GOALS & OBJECTIVES

Connecting Goals to Operations

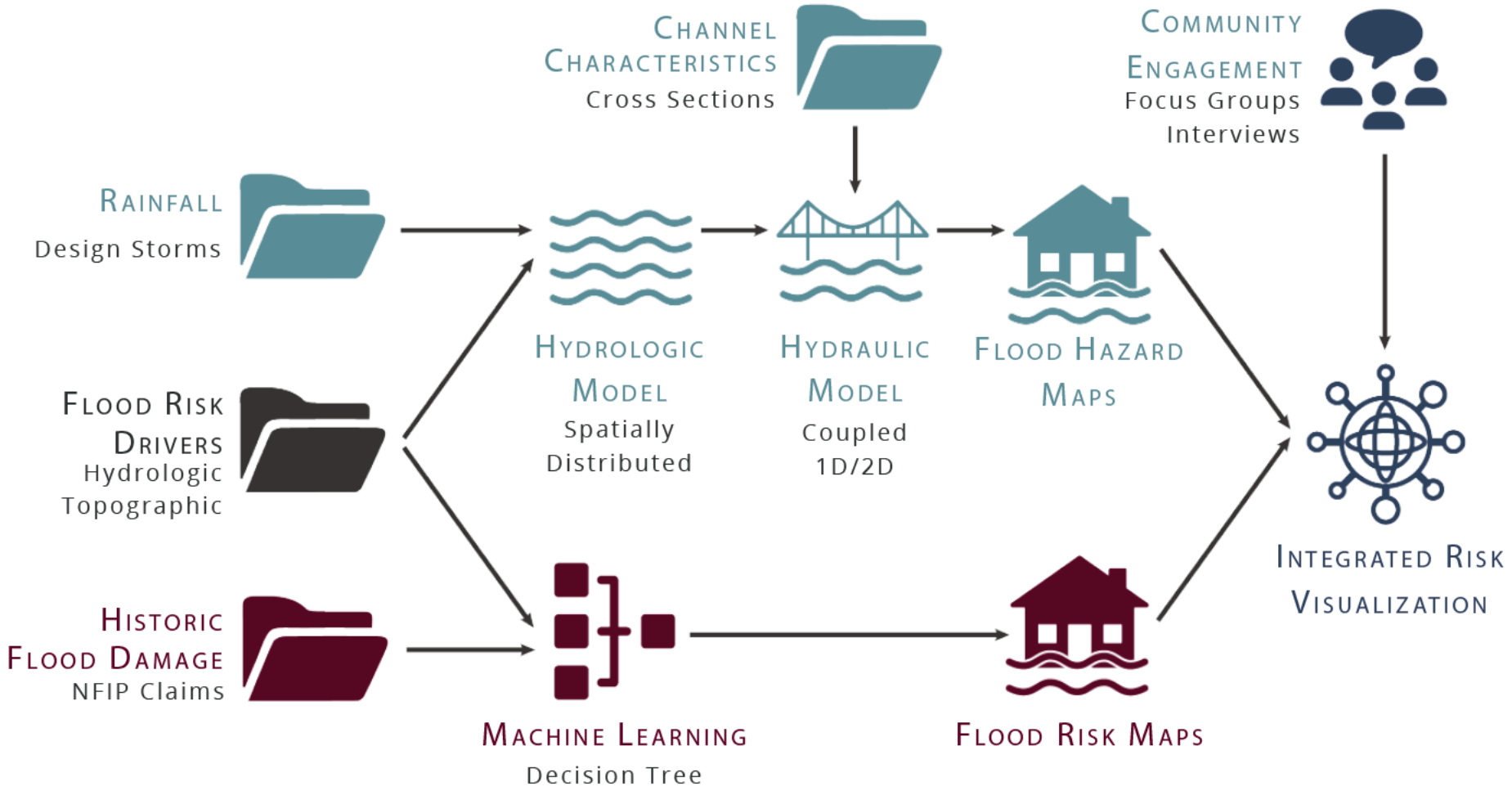
GOAL

Identify and develop visual tools to measure, map, and articulate flood impacts to help communities to prepare for and reduce the adverse effects of future storm events.

OBJECTIVES

1. Improve existing models and develop new methods for predicting flood risk in the built environment.
2. Develop web-based tools individuals can engage with flood risk information.
3. Hold iterative, facilitated workshops focusing on stakeholder perceptions of risk in the creation of interactive flood risk visualizations.
4. Engage a multi-stakeholder community (federal, state, and local).

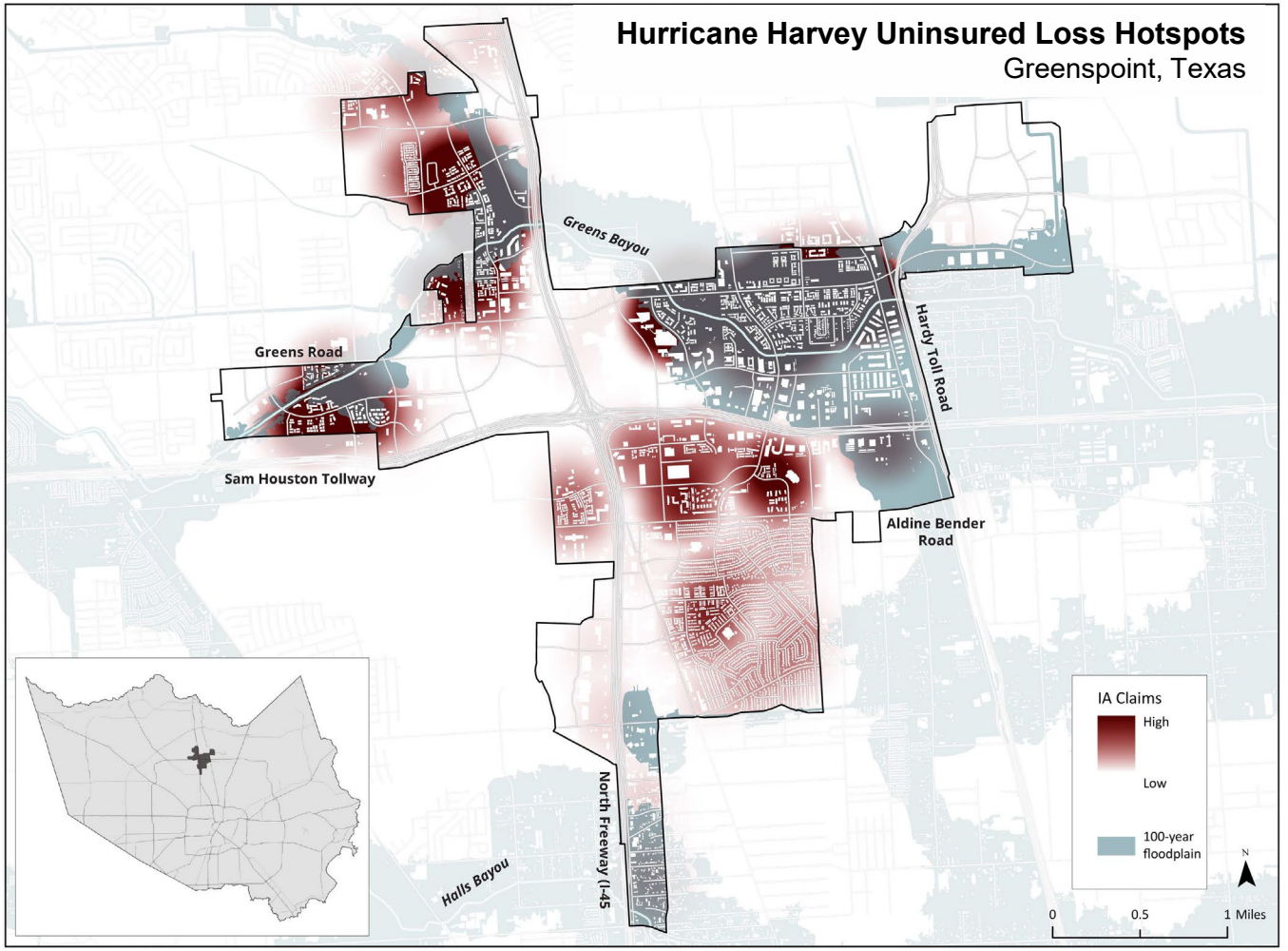
PROCESS INTEGRATION OF MULTIDISCIPLINARY APPROACHES



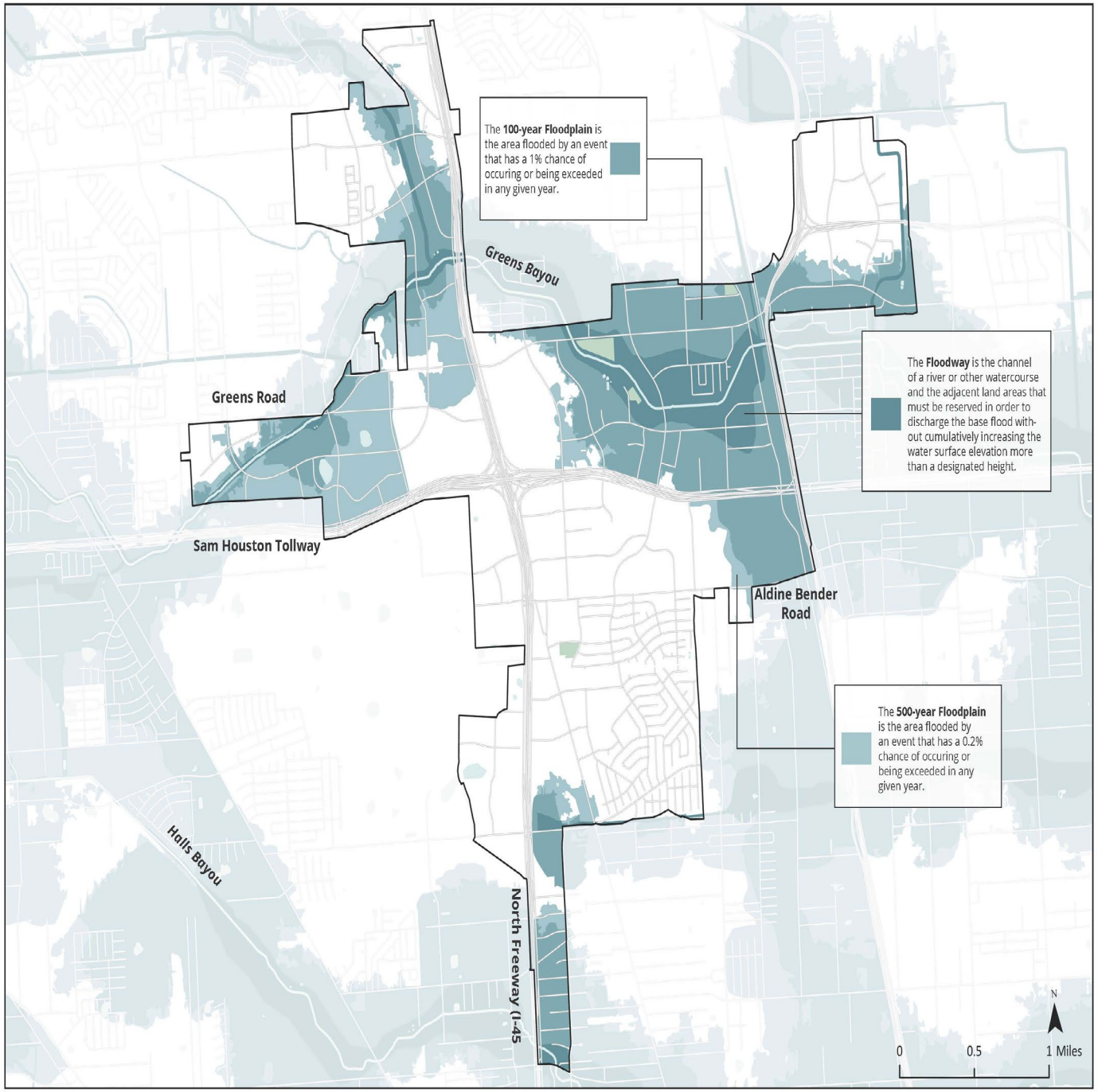
ILLUSTRATIVE EXAMPLE

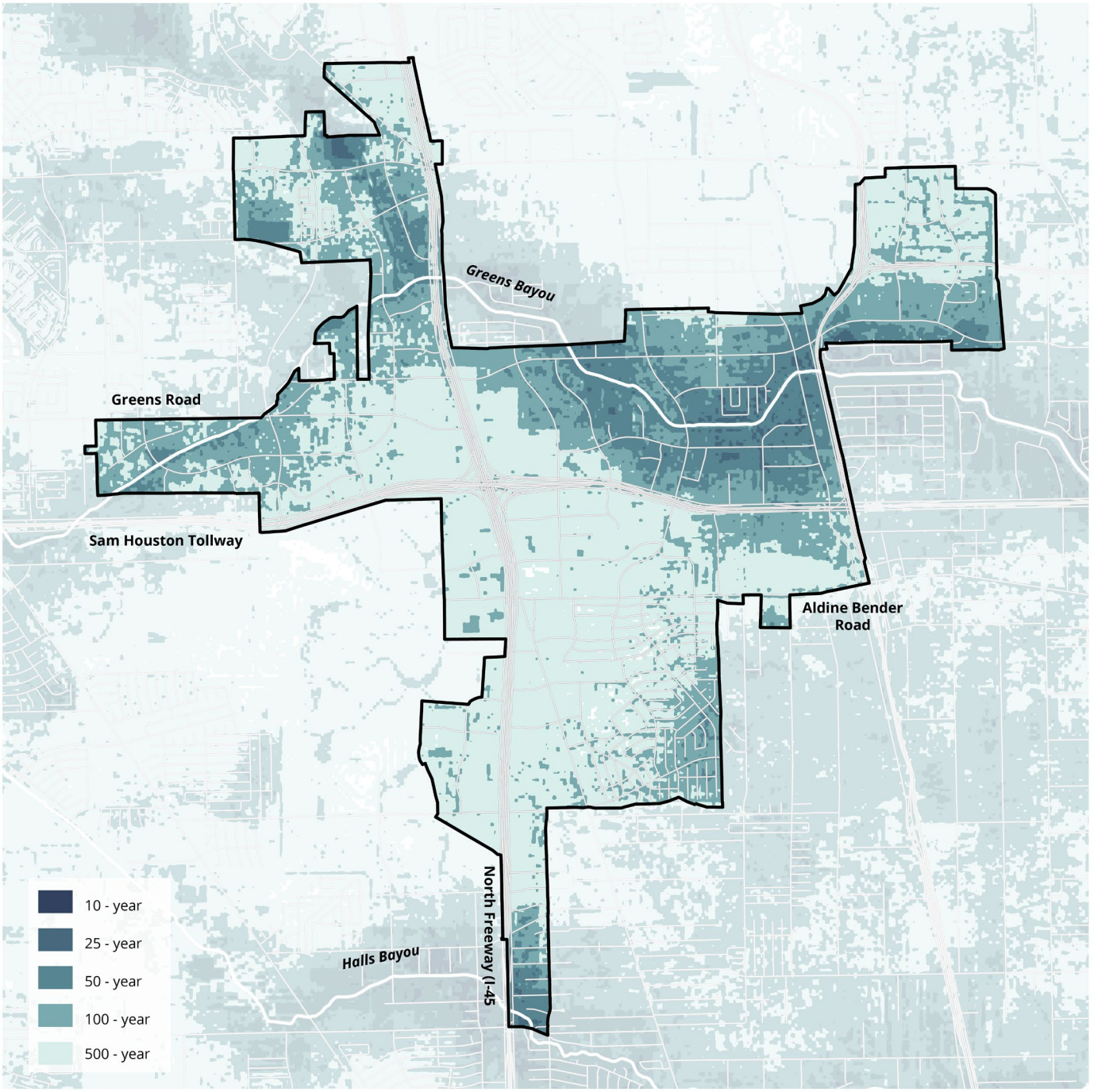
Greenspoint was impacted by both 2016 floods and Harvey.

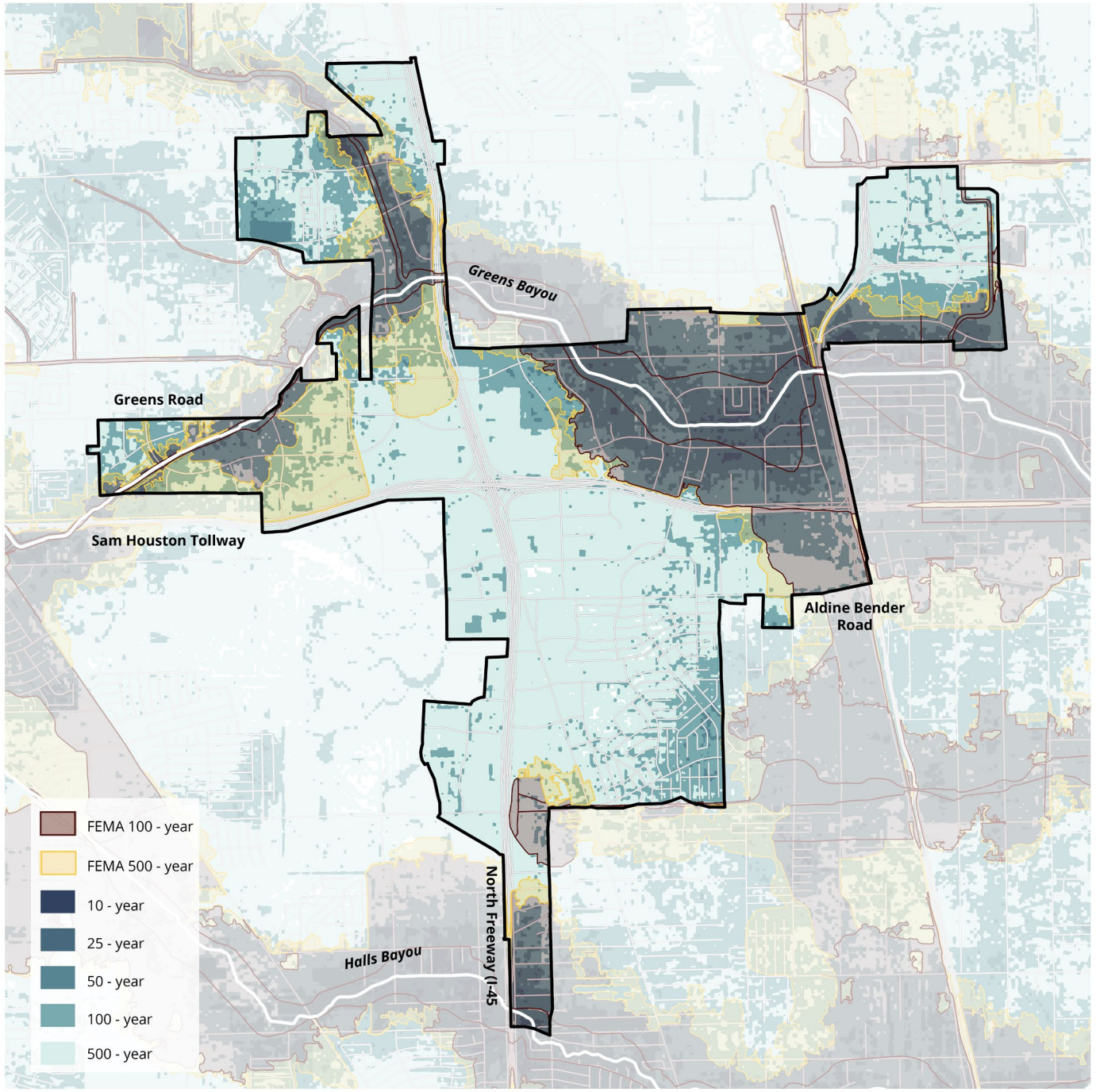
- Located in North Houston on Greens Bayou
- One third of the population is below the poverty line
- High concentration of multi-family housing in the floodplain
- 18% of parcels outside the floodplain had an IA claim during Harvey

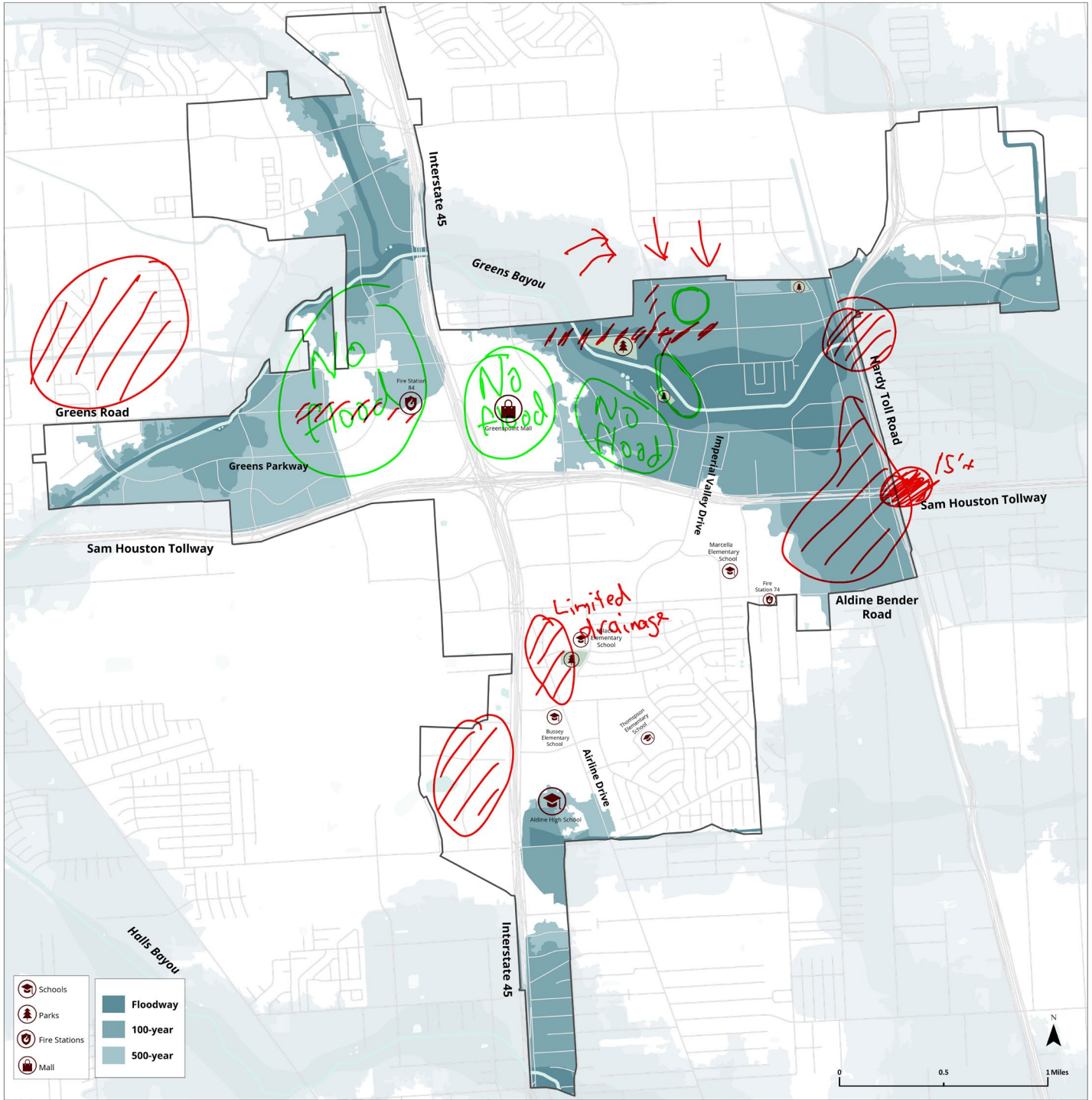


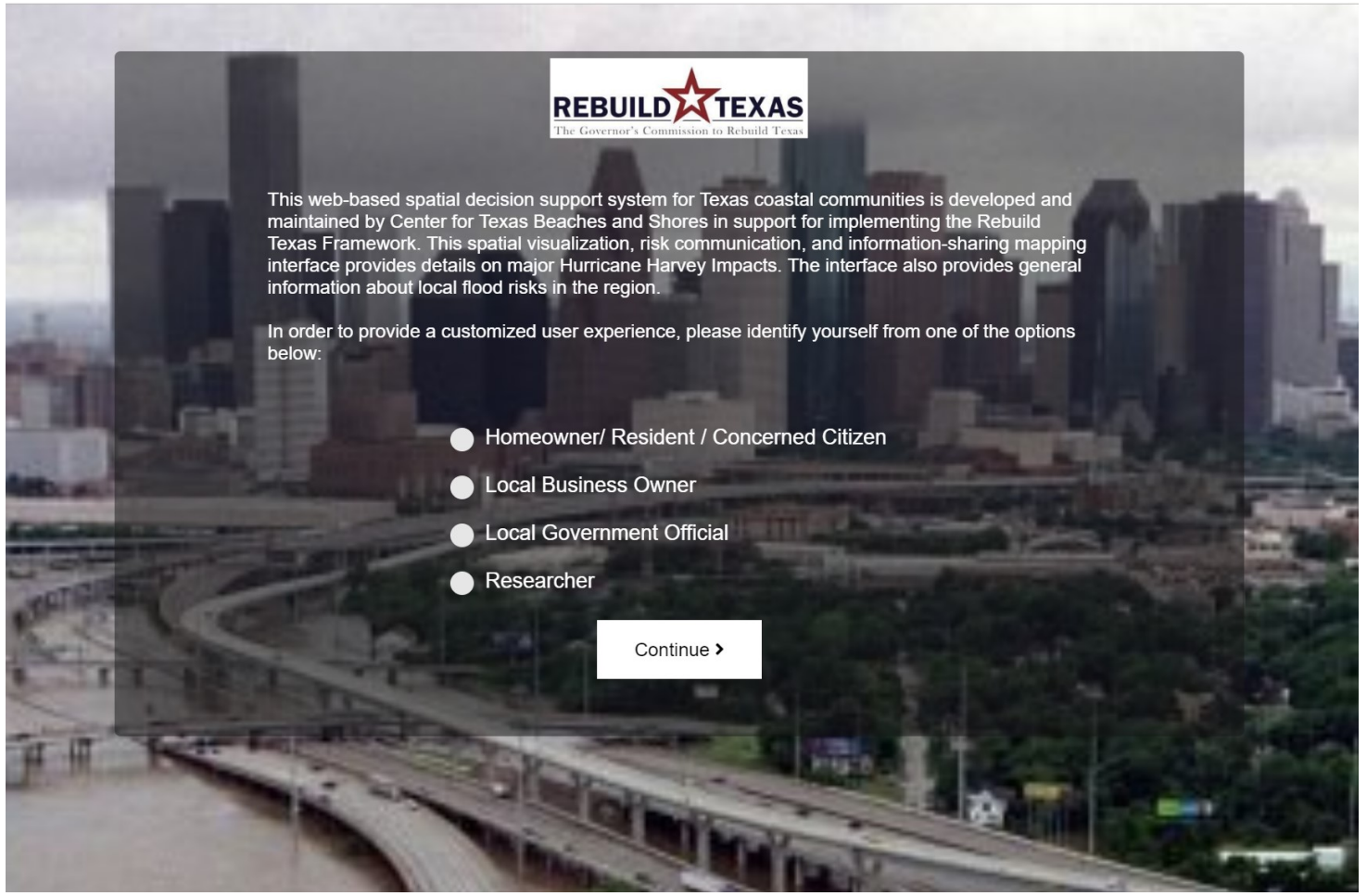
Source: Texas A&M University (2019)


The 100-year Floodplain is the area flooded by an event that has a 1% chance of occuring or being exceeded in any given year.
Greens Bayou
Greens Road
The Floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
Sam Houston Tollway
Aldine Bender Road
The 500-year Floodplain is the area flooded by an event that has a 0.2% chance of occuring or being exceeded in any given year.
Halls Bayou
North Freeway (I-45
N
0
0.5
1 Miles


Greens Bayou
Greens Road
Sam Houston Tollway
Aldine Bender Road
North Freeway (I-45
Halls Bayou
10 - year
25 - year
50 - year
100 - year
500 - year


Greens Bayou
Greens Road
Sam Houston Tollway
Aldine Bender Road
North Freeway (I-45
Halls Bayou
FEMA 100 - year
FEMA 500 - year
10 - year
25 - year
50 - year
100 - year
500 - year


Interstate 45
Greens Bayou
Greens Road
Greens Parkway
Sam Houston Tollway
Hardy Toll Road
Imperial Valley Drive
Sam Houston Tollway
Aldine Bender Road
Airline Drive
Interstate 45
Halls Bayou
Fire Station 84
Greenspoint Mall
Marcella Elementary School
Fire Station 74
Bussey Elementary School
Thompson Elementary School
Aldine High School
No Flood
No Flood
No Flood
Limited drainage
15'+
Schools
Parks
Fire Stations
Mall
Floodway
100-year
500-year
N
0
0.5
1 Miles

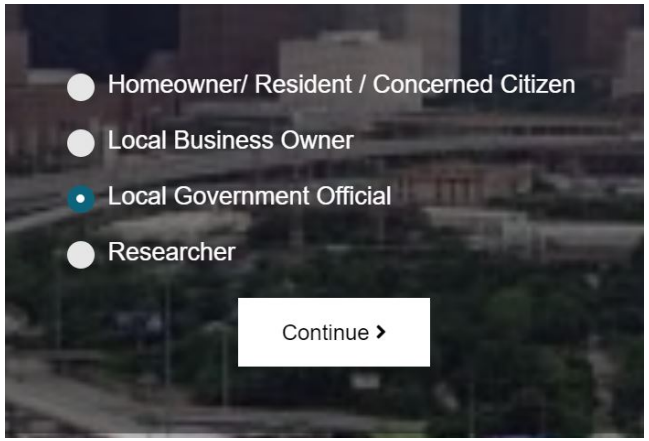


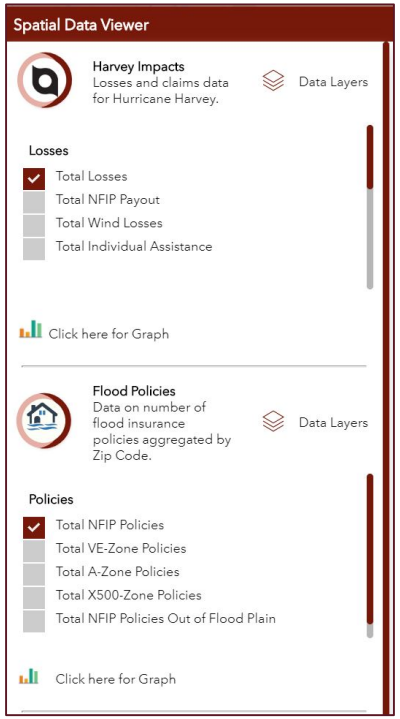
Dashboard 1

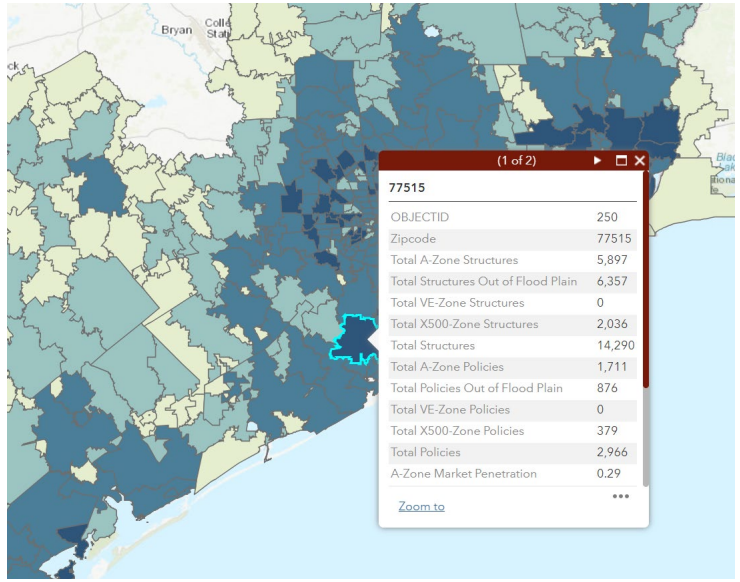
Resilient-Texas.com

- Developed in support of the Governor's Commission to Rebuild Texas following Hurricane Harvey
- Highlights key impacts of Hurricane Harvey, as well as general information on local flood risks
- Customized experience based on the user's role within the community

How it Works



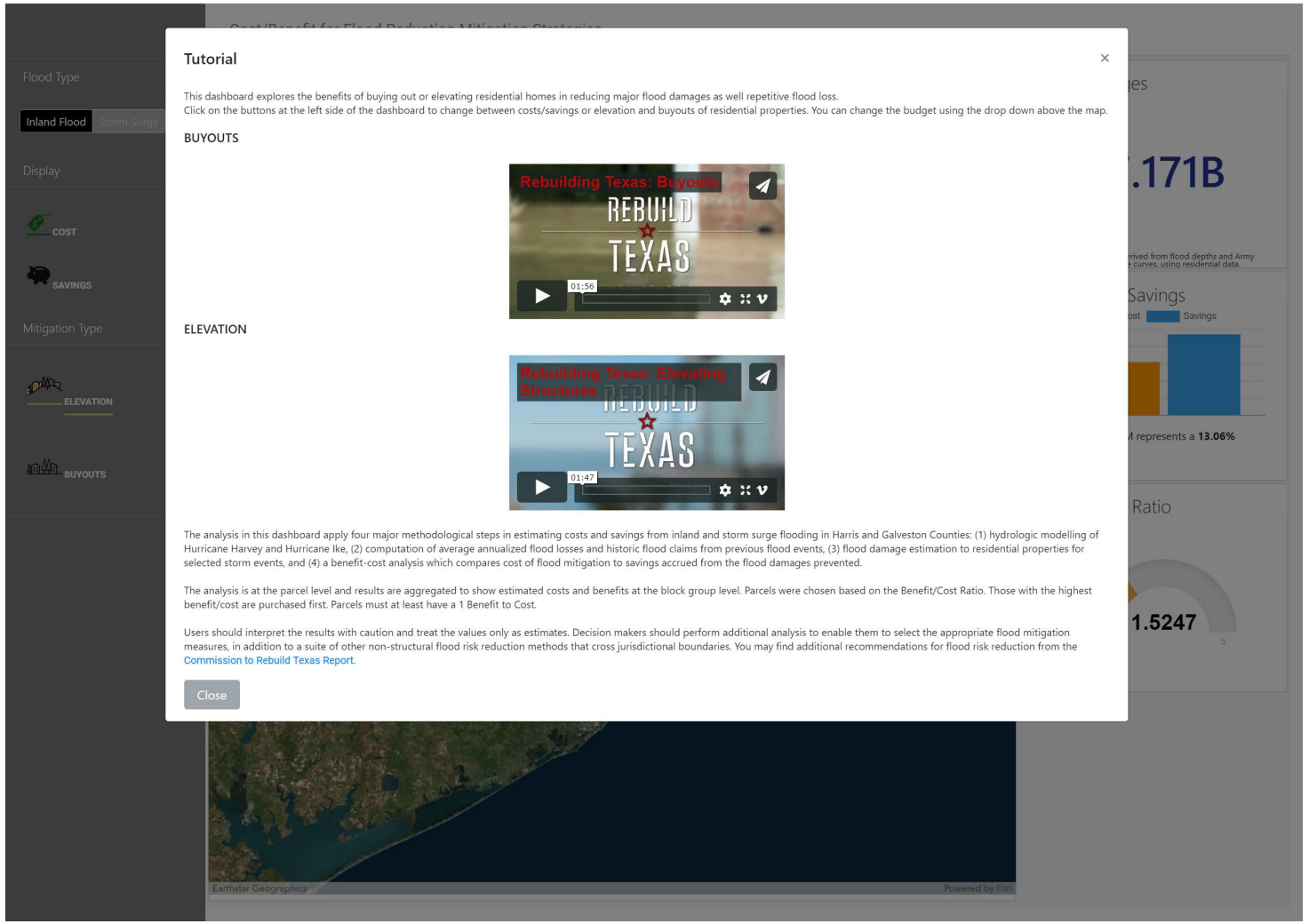




Select Role

Choose Layers

Explore Data

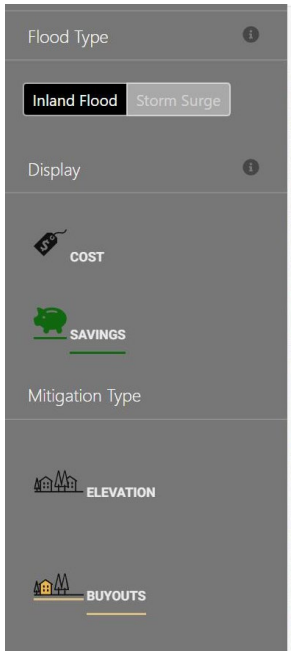


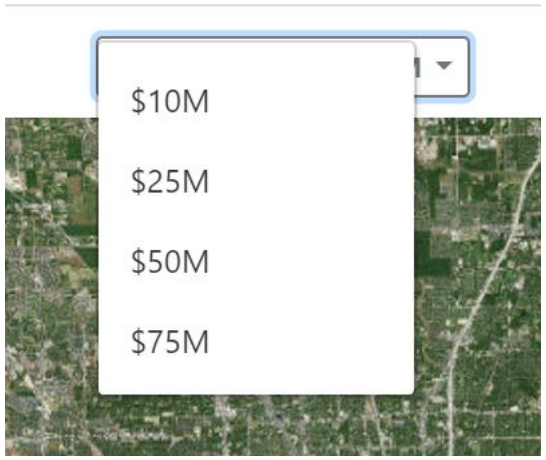
Dashboard 2

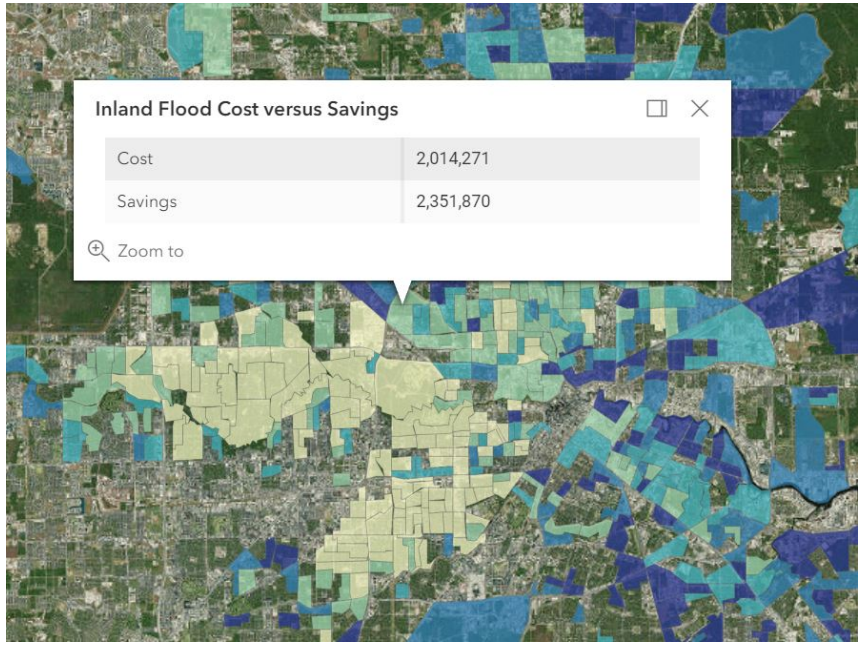
TexasCoastalAtlas.com/dashboard2

- Developed following the Governor's Commission to Rebuild Texas following Hurricane Harvey
- Explores benefits of mitigation efforts compared to flood losses
- Customize analysis based on type of flooding, mitigation method, and budget

How it Works







Choose Mitigation

Change Budget

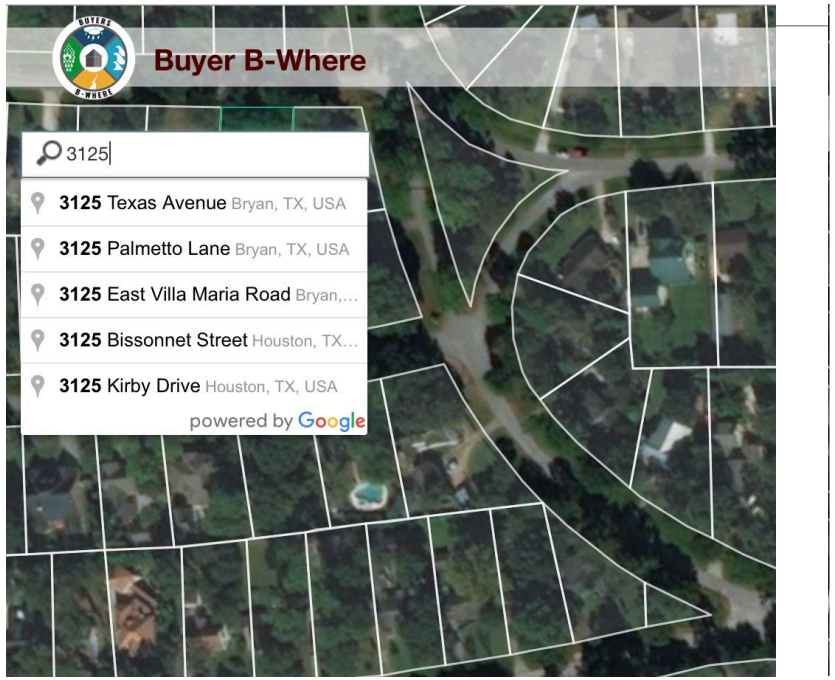
Compare Cost vs. Savings

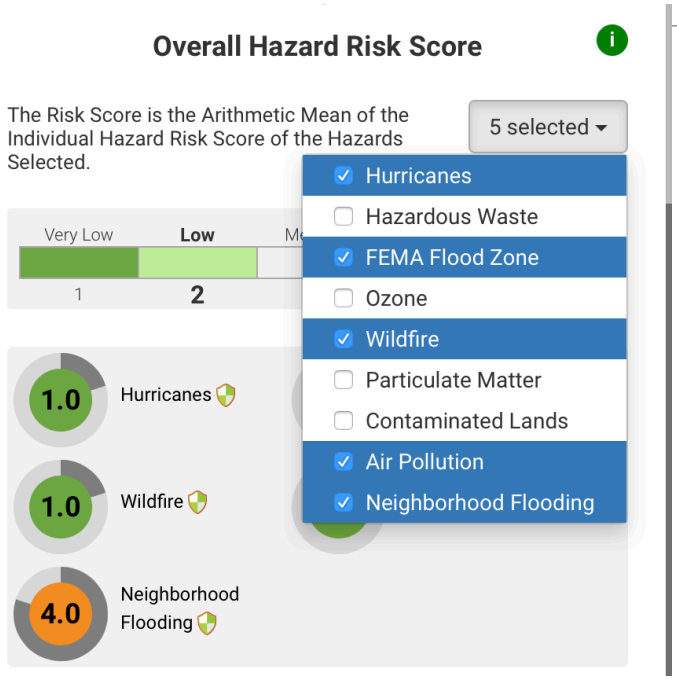
Buyers Be-Where

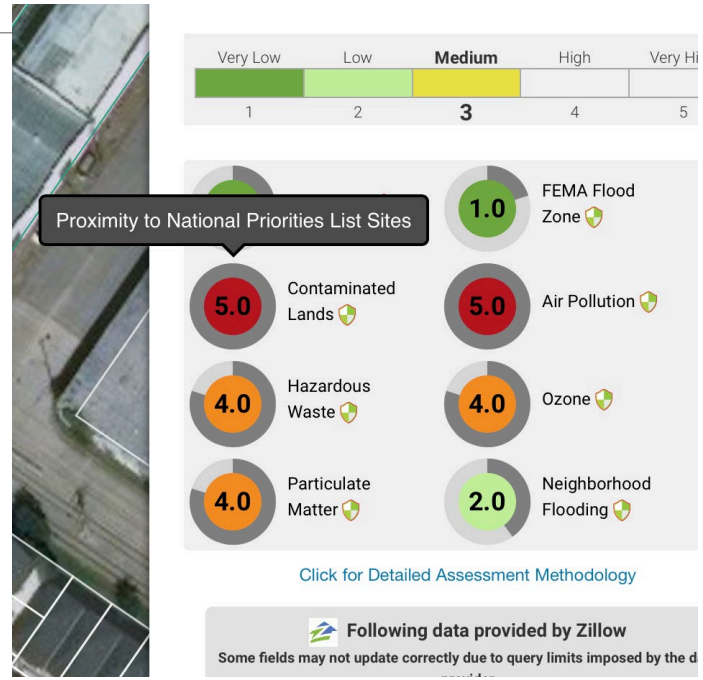
Buyers-BeWhere.com

- Offers on-demand and easy to understand information on a range of hazards
- Allows for customizable risk score for individual parcels relative to surround properties
- Provides solutions to mitigate risks and increase potential long-term value

How it Works







Search an Address

Select the Hazards

Understand the Indicators

Flooding

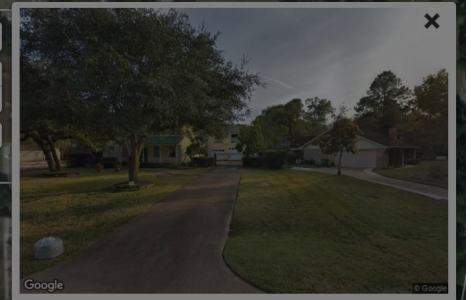
https://www.ready.gov/floods
https://www.fema.gov/media-library-data/1443014398612-a4dfc0f86711bc72434b82c4b100a677/revFEMA_HMA_Grants_4pg_2015_508.pdf

Structural:

- Elevate structures
- Wet proof by installing flood openings or using flood proof materials in foundation or ground level floor
- Dry proof by installing sewer backflow valves, using flood impervious coating on exterior walls, and placing floodgates or shields at all openings
- Install french drains and on site retention

Behavioral:

- Clean and maintain gutters and drains
- Move valuables to higher level
- Be aware where neighbors' properties drain
- Purchase flood insurance
- Check whether there is a high risk classified dam nearby



Houston, Texas, 77018

Overall Hazard Risk Score

The Risk Score is the Arithmetic Mean of the Individual Hazard Risk Score of the Hazards Selected.

7 selected

Very Low | Low | Medium | High | Very High

1 | 2 | 3 | 4 | 5

1.0 Hurricanes
3.0 FEMA Flood Zone
1.0 Air Pollution
1.0 Hazardous Waste
5.0 Particulate Matter
1.0 Sea Level Rise
3.0 Neighborhood Flooding

Click for Detailed Assessment Methodology

Following data provided by Zillow

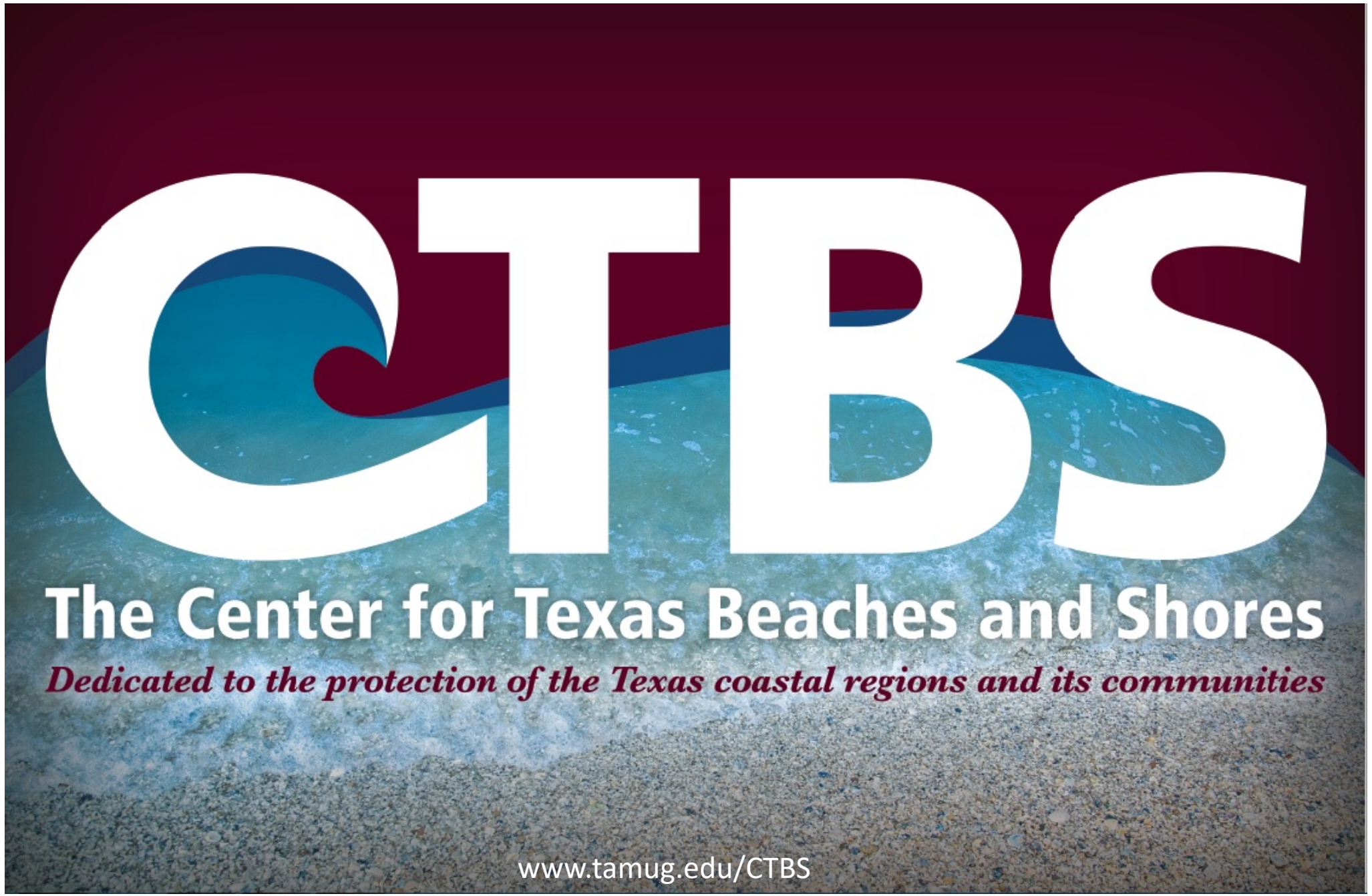
Some fields may not update correctly due to query limits imposed by the data provider

Zestimate: Data not available
Facts: Data not available
Features: Data not available
Description: Data not available.

Texas Disaster Information System

An interactive, web-based spatial data system designed to support Preparedness, Response, Recovery and Mitigation for the State of Texas.

- Statewide system will employ cutting-edge data analytics and mapping technologies.
- Provide residents, policy makers, local jurisdictions, and other stakeholders with the most current and accurate information available to assess related disaster risks, impacts, and mitigation strategies.


CTBS
The Center for Texas Beaches and Shores
Dedicated to the protection of the Texas coastal regions and its communities
www.tamug.edu/CTBS