Transforming Flood Resilience in Harris County

CEC Environmental Summit
October 24th, 2026



HARRIS COUNTY
FLOOD RESILIENCE

Flooding is Harris County's number one natural disaster.

How do we help Harris County prepare for the next flood event?

Harris County Flood Resilience Plan

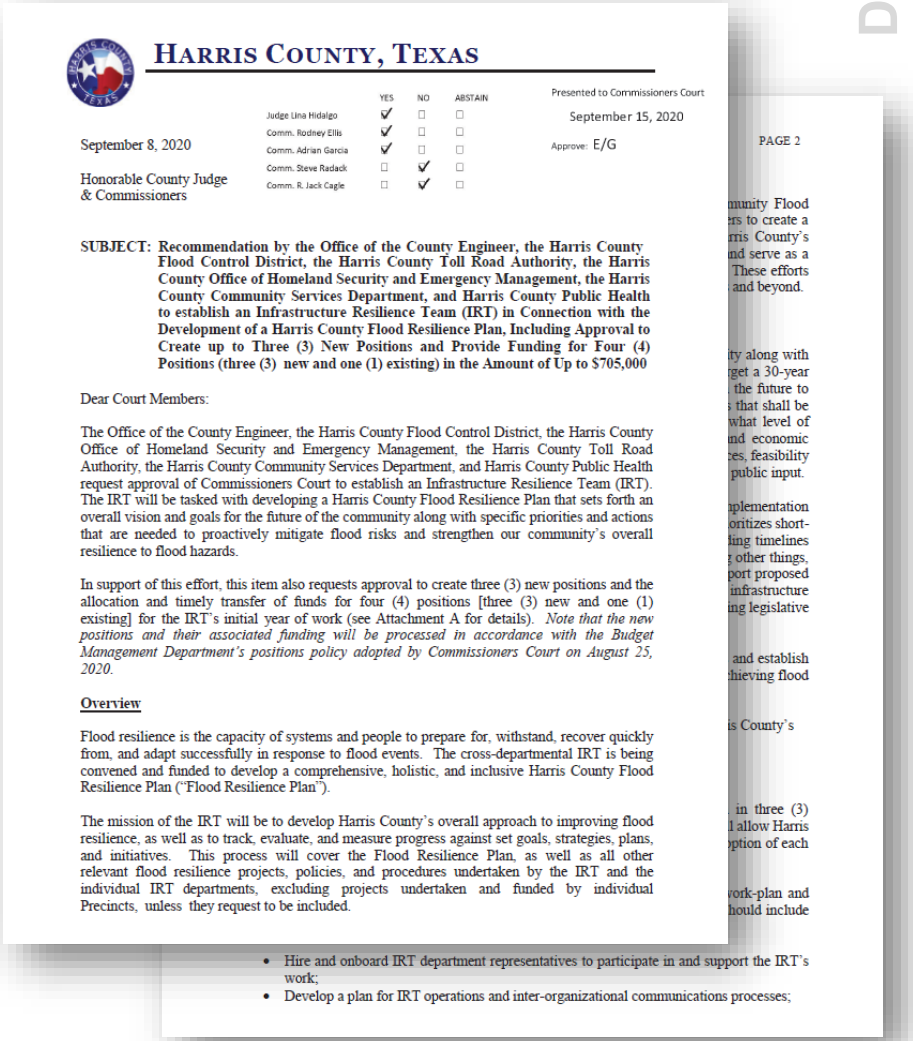
Comprehensive & Collaborative

Harris County's first Flood Resilience Plan will develop a **comprehensive framework** to establish clear, actionable and measurable strategies for flood resilience in the region through a **collaborative process** guided by the **Harris County Flood Control District** and the **Infrastructure Resilience Team** (IRT), with input/ advice from the **Community Flood Resilience Task Force** (CFRTF), and key local and regional partners.

Phase III – Harris County Flood Resilience Plan
Building on past work

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HARRIS COUNTY, TEXAS

	YES	NO	ABSTAIN
Judge Lina Hidalgo	✓		
Comm. Rodney Ellis	✓		
Comm. Adrian Garcia	✓		
Comm. Steve Radack		✓	
Comm. R. Jack Cagle		✓	

Presented to Commissioners Court
September 15, 2020
Approve: E/G

September 8, 2020

Honorable County Judge & Commissioners

SUBJECT: Recommendation by the Office of the County Engineer, the Harris County Flood Control District, the Harris County Toll Road Authority, the Harris County Office of Homeland Security and Emergency Management, the Harris County Community Services Department, and Harris County Public Health to establish an Infrastructure Resilience Team (IRT) in Connection with the Development of a Harris County Flood Resilience Plan, Including Approval to Create up to Three (3) New Positions and Provide Funding for Four (4) Positions (three (3) new and one (1) existing) in the Amount of Up to $705,000

Dear Court Members:

The Office of the County Engineer, the Harris County Flood Control District, the Harris County Office of Homeland Security and Emergency Management, the Harris County Toll Road Authority, the Harris County Community Services Department, and Harris County Public Health request approval of Commissioners Court to establish an Infrastructure Resilience Team (IRT). The IRT will be tasked with developing a Harris County Flood Resilience Plan that sets forth an overall vision and goals for the future of the community along with specific priorities and actions that are needed to proactively mitigate flood risks and strengthen our community's overall resilience to flood hazards.

In support of this effort, this item also requests approval to create three (3) new positions and the allocation and timely transfer of funds for four (4) positions [three (3) new and one (1) existing] for the IRT's initial year of work (see Attachment A for details). *Note that the new positions and their associated funding will be processed in accordance with the Budget Management Department's positions policy adopted by Commissioners Court on August 25, 2020.*

Overview

Flood resilience is the capacity of systems and people to prepare for, withstand, recover quickly from, and adapt successfully in response to flood events. The cross-departmental IRT is being convened and funded to develop a comprehensive, holistic, and inclusive Harris County Flood Resilience Plan ("Flood Resilience Plan").

The mission of the IRT will be to develop Harris County's overall approach to improving flood resilience, as well as to track, evaluate, and measure progress against set goals, strategies, plans, and initiatives. This process will cover the Flood Resilience Plan, as well as all other relevant flood resilience projects, policies, and procedures undertaken by the IRT and the individual IRT departments, excluding projects undertaken and funded by individual Precincts, unless they request to be included.

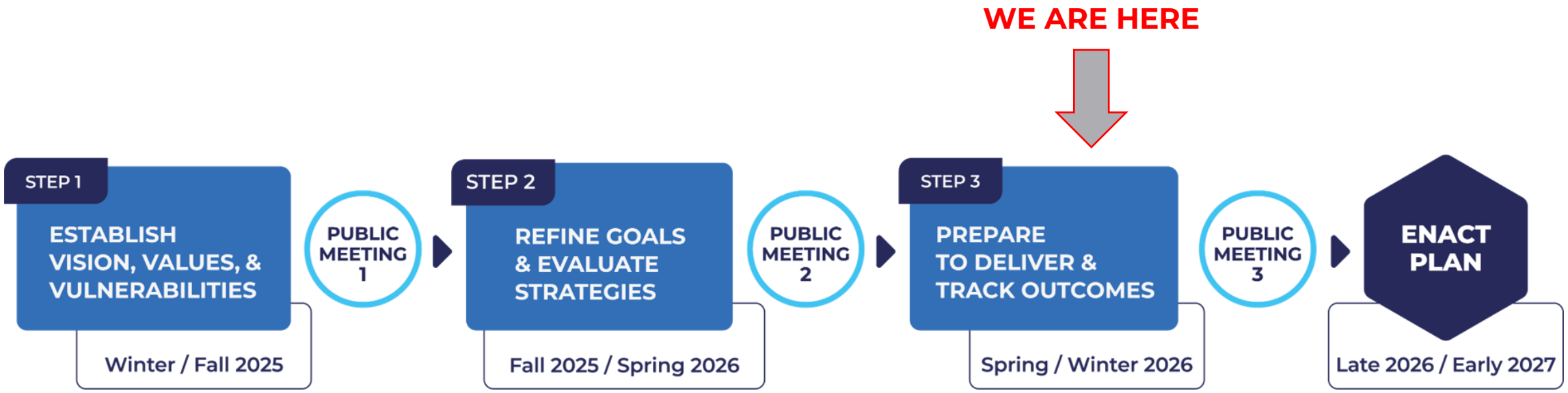
PAGE 2

- Hire and onboard IRT department representatives to participate in and support the IRT's work;
- Develop a plan for IRT operations and inter-organizational communications processes;

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Timeline

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Who Is Involved

- **Commissioners Court & Precinct Teams**
- **Community Flood Resilience Task Force** (CFRTF)
- **Infrastructure Resilience Team** (IRT)
  - Harris County Flood Control District (HCFCD) Lead Agency
  - Harris County Office of Homeland Security & Emergency Management
  - Office of the County Engineer
  - Housing & Community Development
  - Harris County Public Health
  - Harris County Toll Road Authority

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Incorporating Resilience Definition into Strategies

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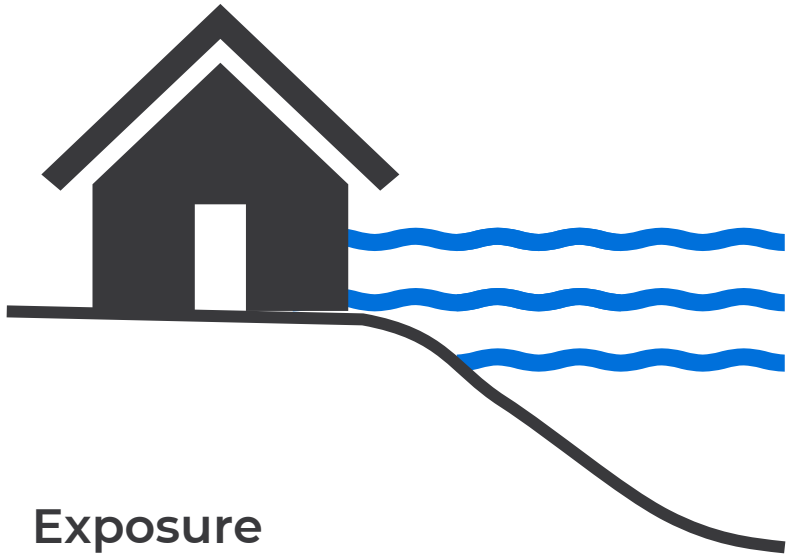
The ability of communities, infrastructure, and the natural environment to prepare for, respond during, and recover after a flood. Resilience is built through an ongoing process of planning and response that takes place before, during, and after and between flood events. Flood resilience requires the collaboration of governments, local organizations, and community members working together to make sure everyone has the resources and support they need.

Assessing Flood Vulnerabilities

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Strategy Development

Focused on Vulnerabilities



Exposure

How much and how long the asset experiences flooding.



Sensitivity

Physical characteristics that make the asset more likely to be harmed.



Consequence

Scale of impact on the community.

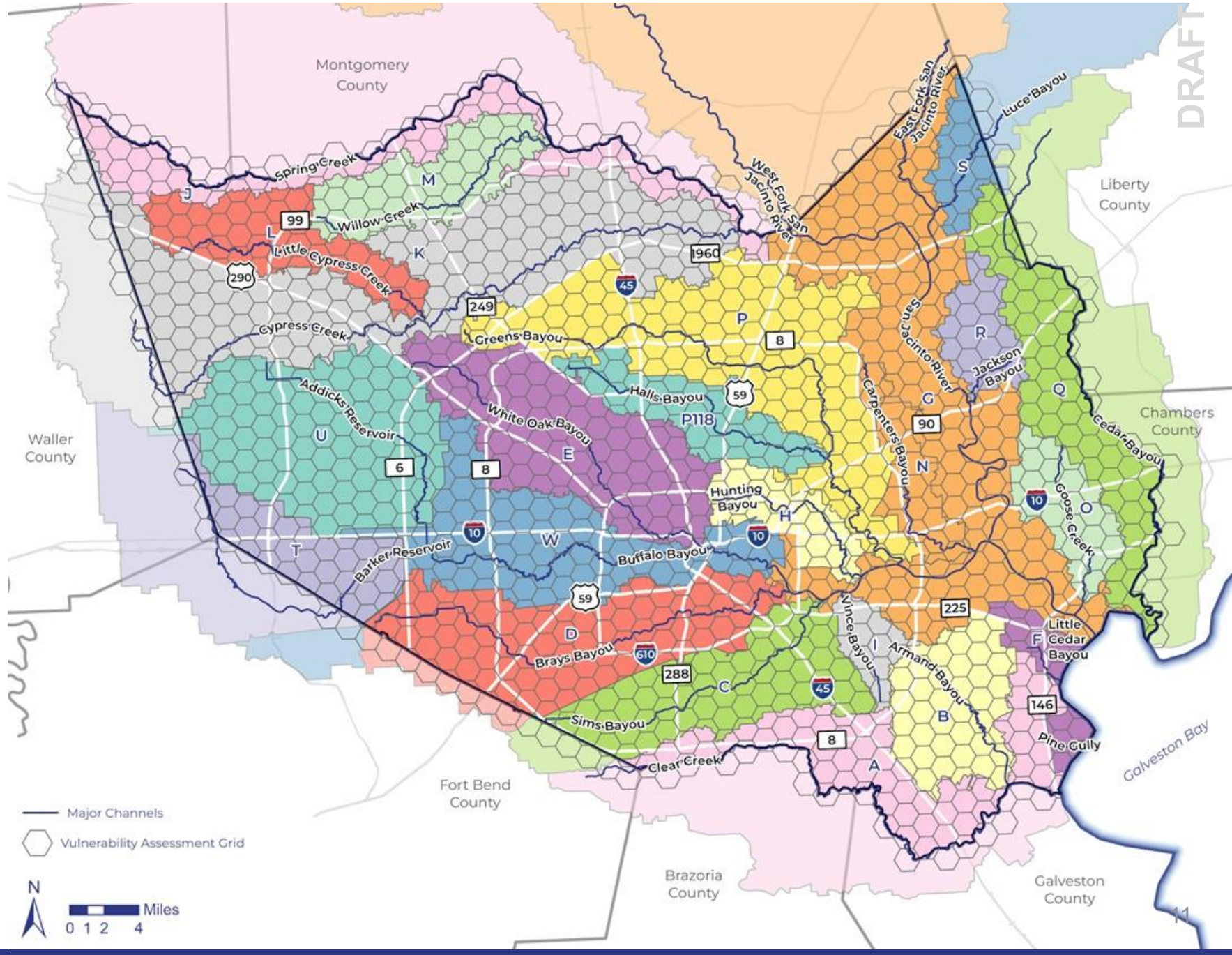
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Establishing Vulnerability

Harris County's 23 watersheds form a complex hydrologic and hydraulic network, with 2,500 miles of channels, including natural waterways and manmade conveyance. These watersheds expand into seven adjacent counties, creating a truly regional system. Within the county, there are many local communities, including 34 cities with their own floodplain administrators.

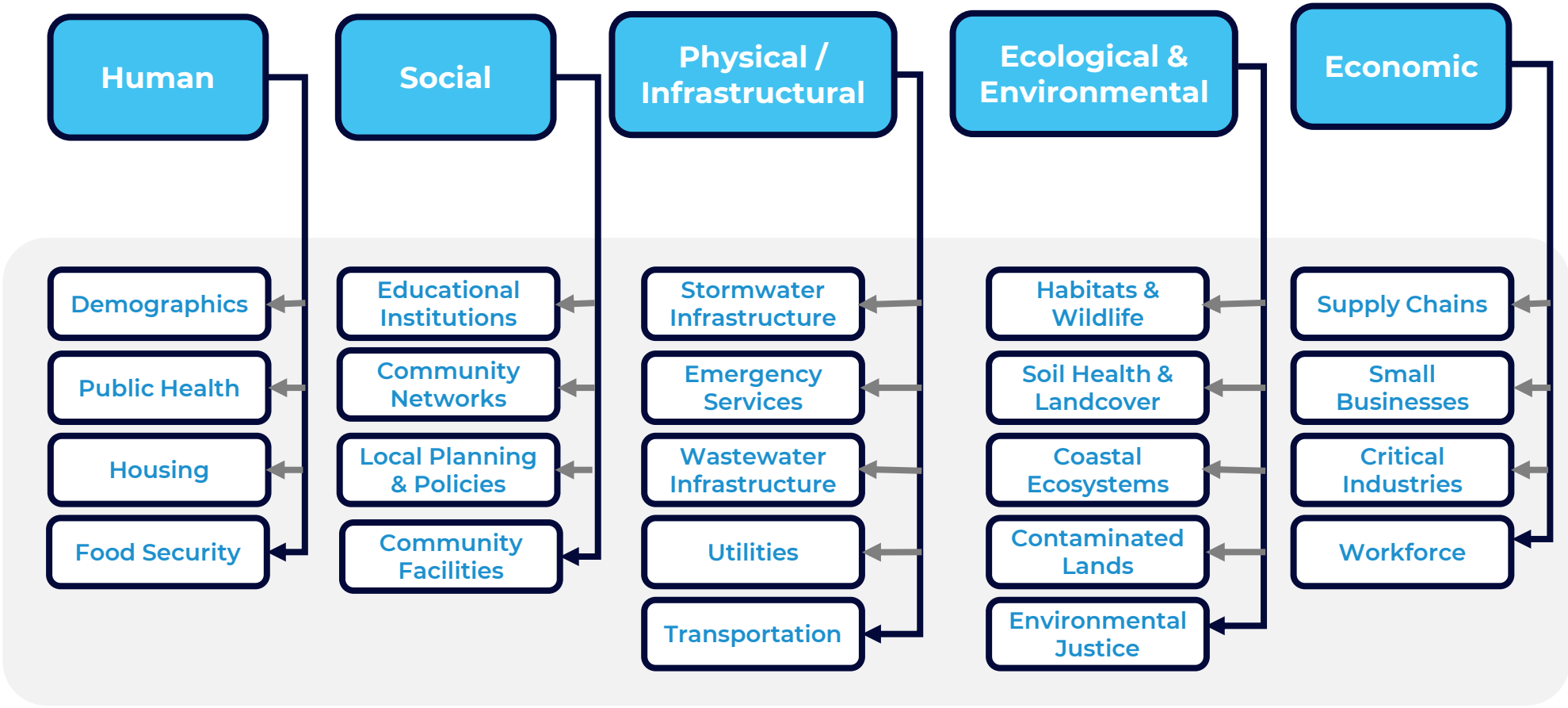
The aim of the vulnerability assessment is to identify unique challenges faced by specific locations across the county, which will inform the resilience strategies developed in the next phase of the planning process.

A countywide hex grid is used to represent vulnerability in a manner to allow for high-level findings.



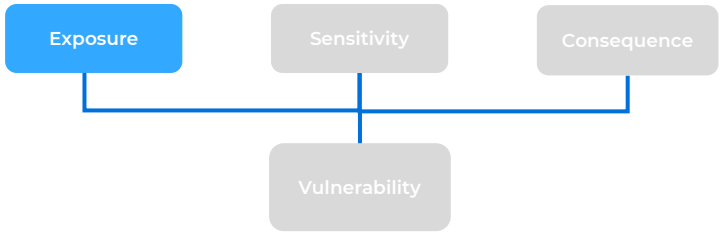
A vulnerability assessment that includes flood risk and community data was conducted across all Harris County watersheds across five primary system components

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Vulnerability Assessment Results

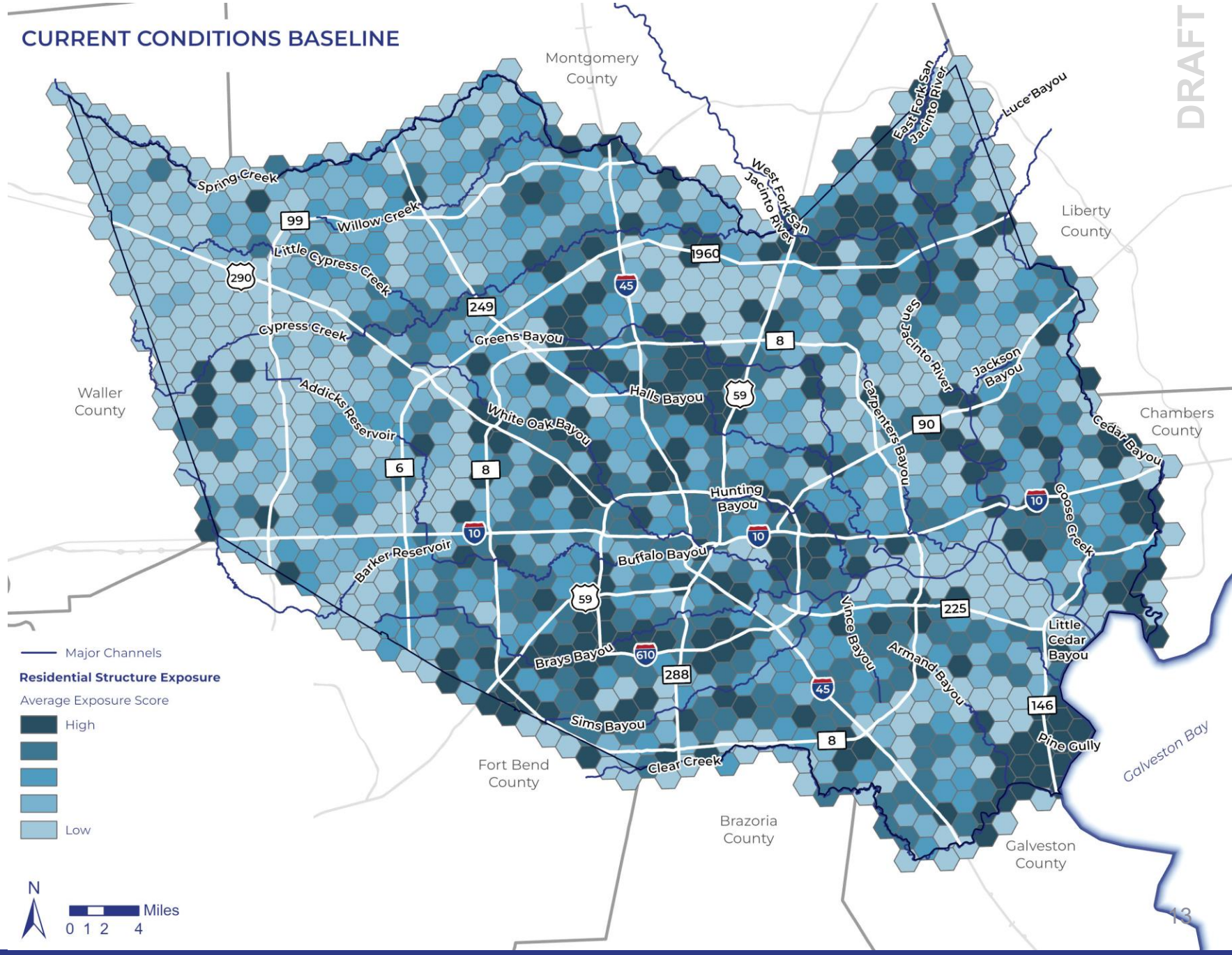
Human – All Residential



Exposure

The **current baseline** maps highlight a key pattern in Harris County's watersheds regarding channel capacity. Currently, the highest exposure occurs in the most flood-prone watersheds, including Brays, Hunting, White Oak, Halls, Greens, and San Jacinto, effectively mirroring high-frequency flood patterns. These watersheds are most reliant on built infrastructure to convey water to major channels, resulting in higher susceptibility to flood hazards across all storm frequencies, combining both urban and riverine flood hazards.

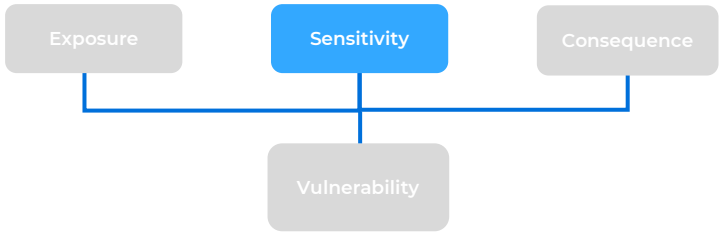
Additionally, the results highlight the coastal flood risk in the southeastern portion of the county, where flood events can expose communities to deeper flood hazards.



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Vulnerability Assessment Results

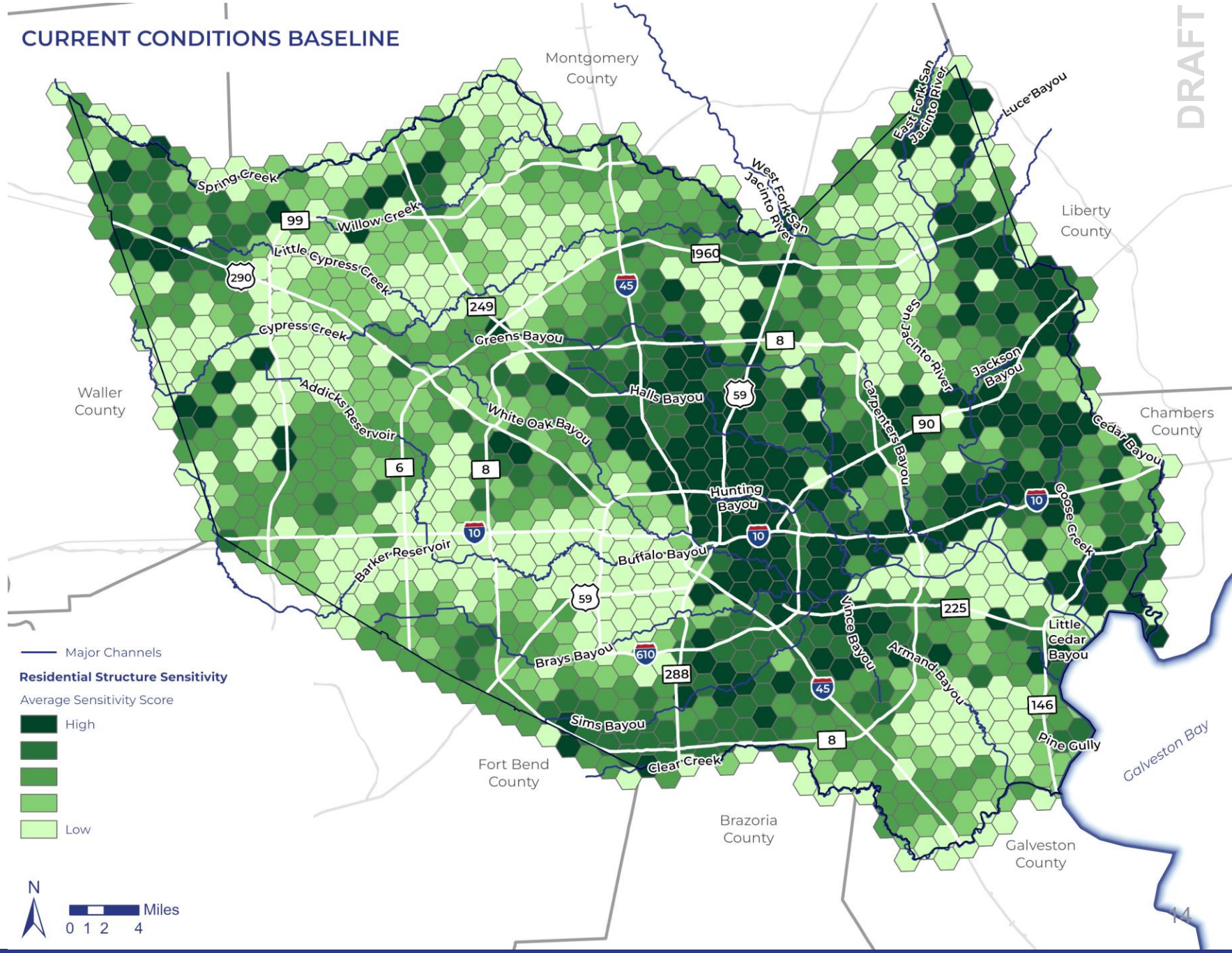
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Sensitivity

While residential home sensitivity varies throughout the county, there is a clear cluster of more sensitive residential development north of Highway 225, within Beltway 8, and east of I-45, as well as along corridors east of Beltway 8 along I-10 and Highway 90. On the contrary, residential development along I-10 west of downtown and in the southwestern area of Loop 610 appears to be less sensitive.

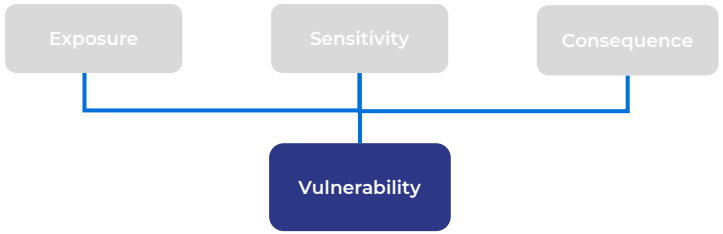
This data strongly correlates with the social vulnerability data used in the consequence for many areas, so both are not included independently in the provided summary maps.



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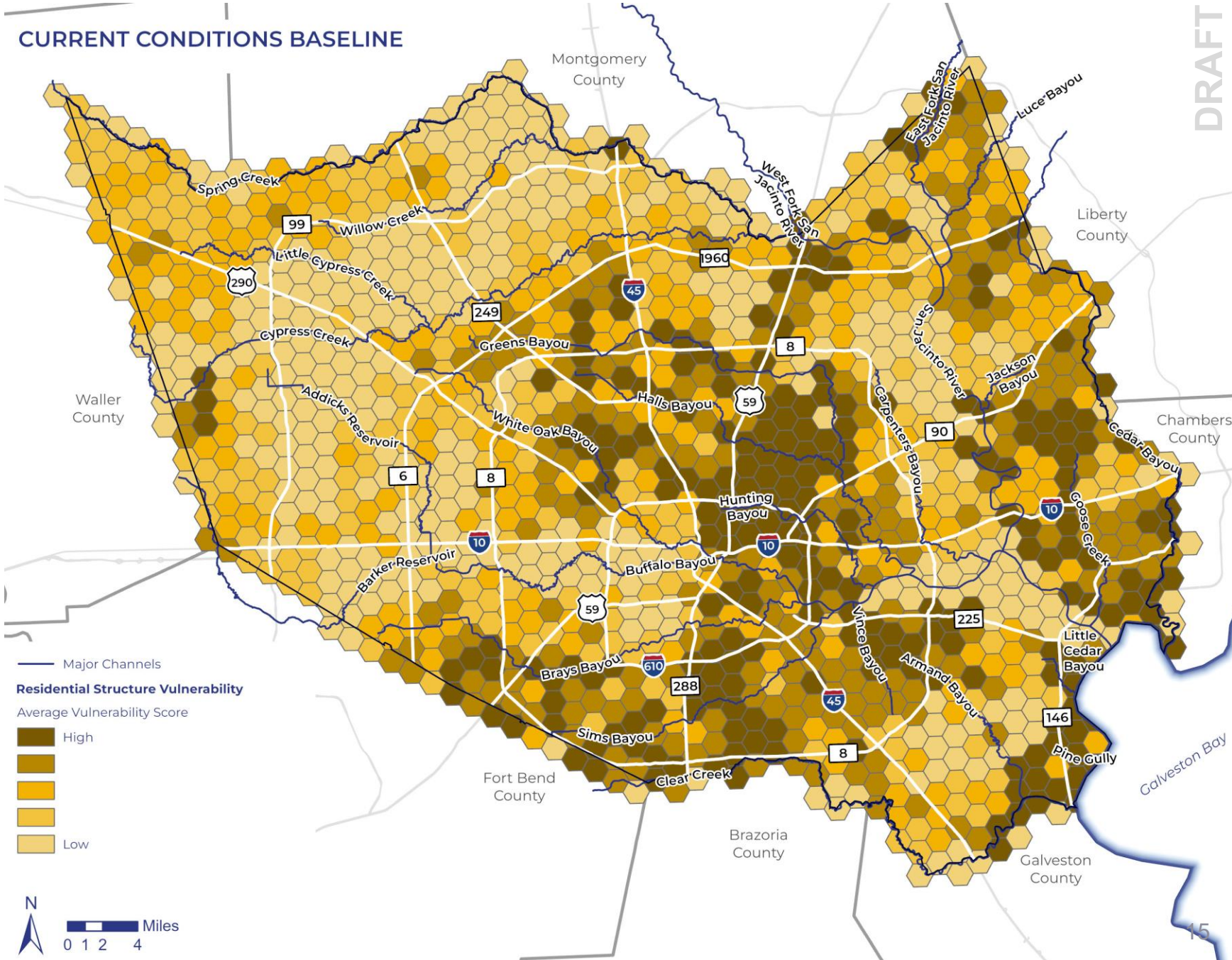
Vulnerability Assessment Results

Human – All Residential



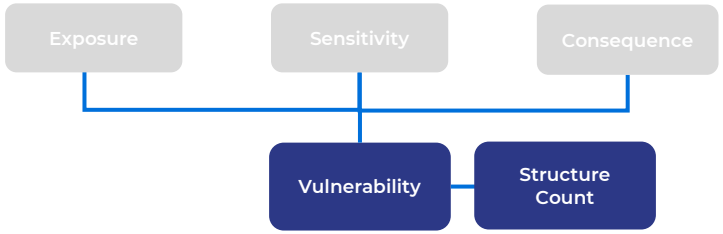
Vulnerability

Under current conditions, the most vulnerable residential homes are in the ring around downtown Houston, with the highest vulnerability along Halls and Hunting Bayous to the northeast. Areas with higher vulnerability also occur in small pockets east of the San Jacinto River, along the West Fork San Jacinto River, and along Galveston Bay. On the contrary, residential homes on the western side of the ring centered on I-10 have lower vulnerability. Although there are watersheds with large clusters of high risk, it is important to note that areas of medium and high vulnerability are present across all watersheds.



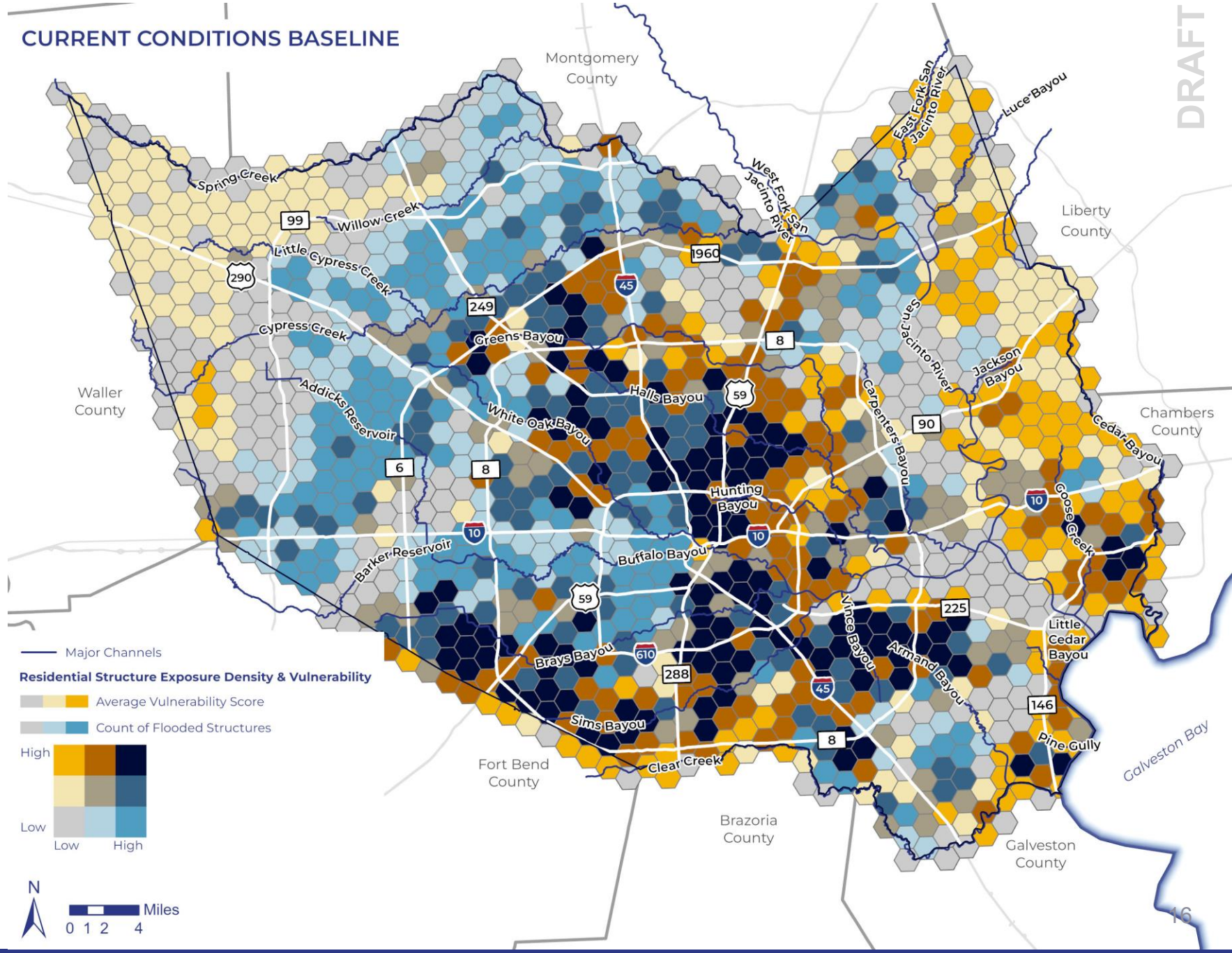
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Vulnerability Assessment Output



Vulnerability + Structure Count Bi-Variate

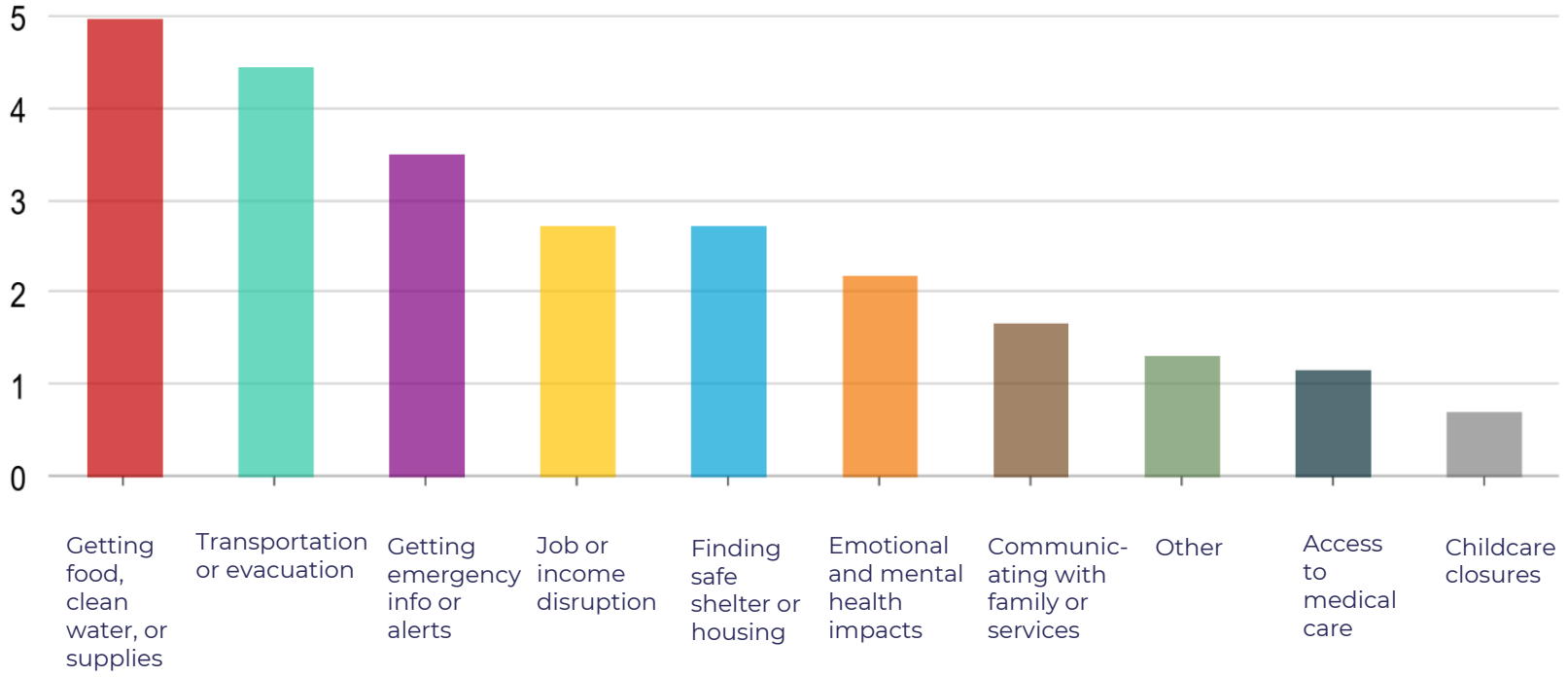
Introducing structure count alongside vulnerability data helps clarify the magnitude of vulnerabilities based on density. The darkest blue areas represent the highest density and most significant vulnerabilities, which are primarily found in urban regions within Beltway 8. Additionally, we can identify high vulnerability areas with medium and low structure counts in the northeastern and eastern parts of the county. This information can guide the implementation of various flood resilience strategies, including considerations of cost-effectiveness, as higher structure counts may affect the calculations of project benefits.



HARRIS COUNTY FLOOD RESILIENCE

Engagement Insights - Survey

Please select the top 3 challenges your household or community faces during or after a flood



Rank	Answers	Average score
1	Getting food, clean water, or supplies	4.98
2	Transportation or evacuation	4.45
3	Getting emergency information or alerts	3.50
4	Job or income disruption	2.73
5	Finding safe shelter or housing	2.73
6	Emotional / mental health impacts	2.19

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Engagement Insights – Survey and Public Meetings

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Strategy Types

Brackets indicate slight differences in wording between the community survey (bracketed) and public meeting prompts.

	Community Survey (as of 10/20) n = 1004	Public Meetings n = 242
Better flood warnings and emergency alerts	9.4%	4.5%
More information about flood risk in my area	5.9%	6.6%
Flood education workshops	5.1%	2.5%
Information [*Info*] in various languages and accessible formats	2.3%	2.1%
Household financial support	4.8%	2.1%
Stronger partnerships with local government	4.1%	6.2%
Major regional flood mitigation infrastructure	12.9%	15.3%
Local improved infrastructure [*Improved infrastructure*] (e.g., drainage, roads, utilities)	17.7%	15.7%
Access to emergency supplies (e.g., food, water) [*(food, water, etc.)*]	7.1%	2.1%
Food access programs before, during, and after emergencies [*disasters*]	4.0%	1.2%
Help with evacuation planning or transportation	4.7%	7.4%
Community emergency hubs or resilience hubs	6.7%	7.4%
Nature-based solutions or habitat restoration	8.4%	13.2%
Health care and mental health support	2.1%	5.0%
Support for renters and mobile home residents	1.5%	2.1%
Stronger mutual aid networks	1.9%	1.2%
Other (please explain)	1.6%	5.4%

Engagement Insights – Technical Workshops

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*Historically affordable developments were built on cheaper land **in areas with higher flood risk**, therefore when these areas experience flooding there are often existing disadvantages that lead to **generational impacts**.*

*Structure improvements that use state or federal funding require **proven title**, which **complicates disaster funding** available for their properties.*

*The unhoused population and **those in poor quality housing** situations with unstable utilities and infrastructure are more likely to experience challenges or need shelter during disasters.*

***Renters** depend on property owners to provide timely repairs, have less options to relocate, and often do not plan the same way as homeowners (e.g., unlikely to purchase a generator).*

Vulnerability Assessment Engagement

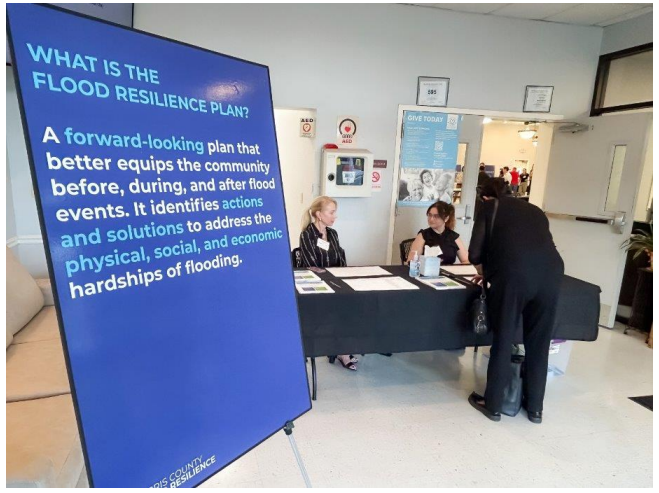
Public Open Houses













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HARRIS COUNTY FLOOD RESILIENCE

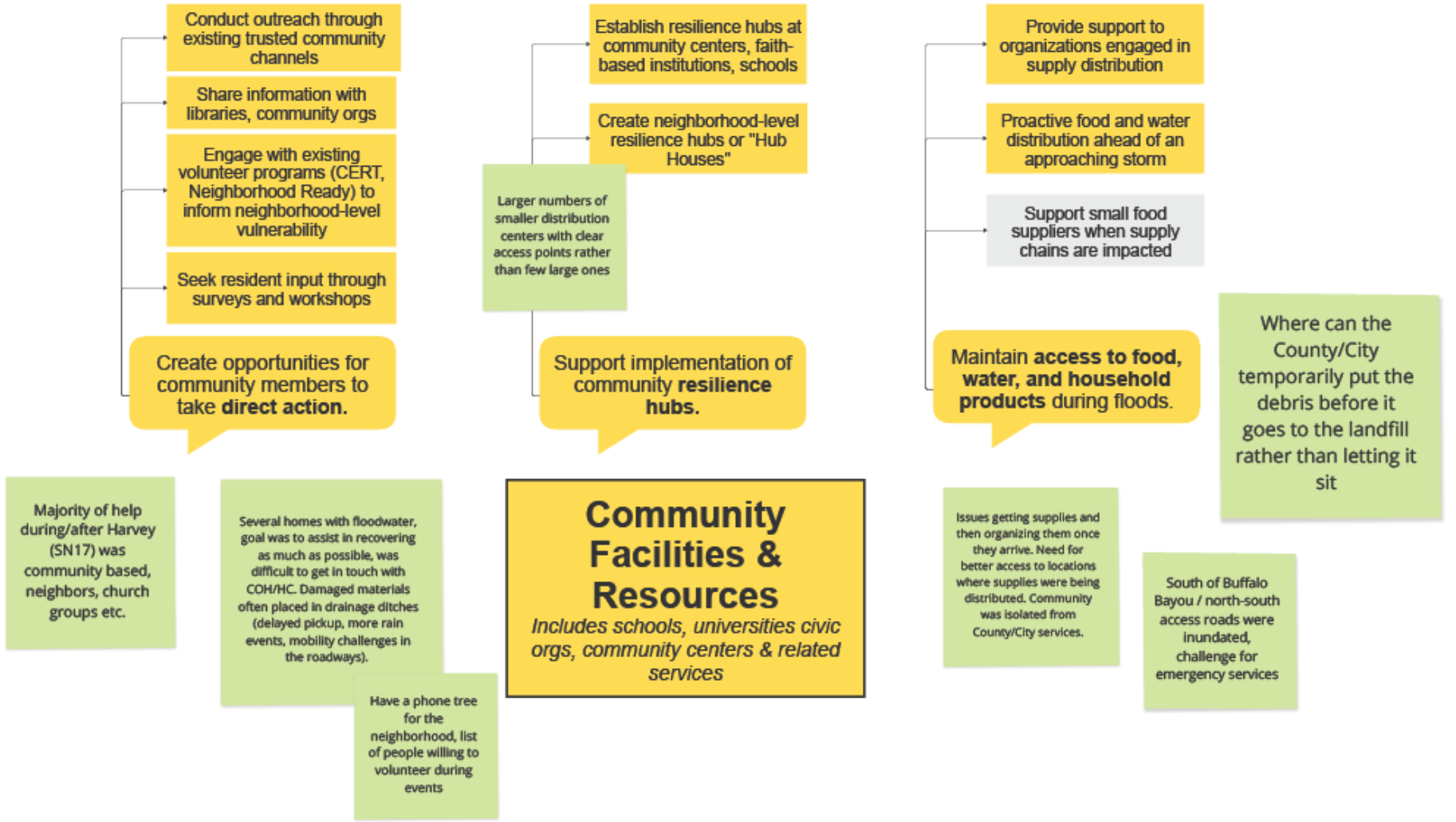
The Strategy Development Process

Strategy Development (County Process)



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Strategy Development (Public Process)



- Incorporated more community-suggested actions following the **four virtual small group workshops** in May
- Conducted **four technical discussions with County Precincts** to further develop strategies and actions
- Conducted **working meetings with IRT** to understand IRT priorities

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What We Heard

12 Topics | **40 Strategies** | **419 Resident Votes**

Participants reviewed proposed flood resilience strategies & placed dots beside the approaches they supported.

Housing & Shelter

Improve voluntary buyout & relocation programs.	9
Encourage & enable residents to take individual steps to improve the flood resilience of their homes.	9
Expand programs & resources to support populations disproportionately affected by flooding & improve access to safe, resilient housing.	22

Healthcare & Social Safety Net

Expand access to social services for vulnerable populations by improving outreach, accessibility, & coordination.	8
Strengthen access to healthcare services by improving facility resilience, coordination, & multimodal connectivity during flood events.	3
Ensure reliable access to essential goods & services across all neighborhoods during flood events.	11

Economic Continuity

Provide short-term assistance to accelerate recovery for businesses, workers, & households following flood events.	7
Support pre-disaster business continuity planning & resilience upgrades to reduce disruption during flood events.	3
Integrate flood resilience into regional economic development & workforce programs to support long-term stability & growth.	15

Resilient Development & Strategic Growth

Provide incentives & technical guidance to promote resilient design in new development & redevelopment.	4
Strengthen, enforce, & update regulations & design standards to ensure consistent & effective flood resilience across development & County facilities.	11
Development coordinated regional initiatives for stormwater management, land preservation, & growth.	11

Ecological Health & Natural Resources

Integrate green stormwater infrastructure & nature-based solutions to reduce flood risk while delivering community & environmental benefits.	17
Maintain natural systems to preserve their flood mitigation function, improve system performance during storms, & reduce secondary hazards.	14
Preserve, restore, & reconnect habitats to enhance natural flood mitigation, improve ecosystem function, & strengthen resilience.	22

Collaborative Governance

Strengthen interdepartmental coordination & scale of programs	10
Strengthen coordination with regional, state, & federal partners to advance shared flood resilience goals.	14
Expand, coordinate, & diversify funding sources to support implementation, long-term maintenance, & equitable investments.	8
Provide tools & data, shared objectives, & guidance to align flood resilience planning & decision-making across County departments.	8

Community Facilities & Resources

Improve residents' flood preparedness & disaster literacy through consistent education & communication.	9
Create opportunities for residents & community organizations to take direct action to improve local flood resilience.	5
Support countywide coverage & operational needs of community resilience hubs.	13
Expand community engagement & outreach to empower residents & leverage trusted local networks.	11

Emergency Services

Expand & enhance flood monitoring & early warning systems to improve coverage, reliability, & accessibility.	10
Strengthen public communication to provide clear, consistent, & coordinated information before & during flood events.	6
Ensure residents can access emergency services before, during, & after floods, with priority support for those with limited mobility/resources.	10
Harden & retrofit critical emergency facilities to maintain operations during flood events.	3
Strengthen cross-jurisdictional coordination through unified communication systems, shared protocols, & joint training.	9

Stormwater Management & Maintenance

Expand regional stormwater storage capacity through multi-benefit solutions.	17
Continuously update flood data, models, & plans using the best available information to support decision-making.	8
Enhance & maintain watershed function & primary channel conveyance to improve flow, reduce risk, & support long-term system performance.	11
Strengthen & maintain neighborhood drainage systems to improve local stormwater management & reduce flood impacts.	14
Advance innovation & resilient design practices by developing guidance, piloting new approaches, & scaling successful solutions across the county.	10

Power & Telecommunications

Improve the reliability/resilience of power & telecommunications networks to reduce outages & accelerate recovery.	19
Expand access to backup power solutions for critical facilities, essential services, & vulnerable populations.	10

Environmental Hazards & Exposures

Integrate environmental monitoring into flood control efforts to improve data collection & inform risk management.	5
Encourage residents to strengthen the flood resilience of their homes & build neighborhood capacity through education, support, & tools.	10
Strengthen pathways for facilities & residents to reduce environmental risks associated with flooding.	7

Mobility & Access

Protect access to critical services & evacuation routes during flood events to maintain mobility & emergency response.	7
Align transportation planning, design, & infrastructure investments with flood control measures to minimize roadway flooding depths & durations.	18

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Stormwater Management

Exposure Reduction Strategies

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What's the big idea? – Addresses local, regional and coastal impacts | comprehensive, strategic long-term planning | multi-purpose / multi-benefit solutions | Retrofit for LID/ GSI, additional storage | better predictive modelling |

Expand regional stormwater **storage** capacity through **multi-benefit solutions**

Improve **watershed function and primary channel conveyance**

Strengthen and **maintain neighborhood drainage systems** to improve local stormwater management

- Multi-benefit storage and conveyance solutions (not single purpose)
- Improve local stormwater capacity within existing development through retrofits/ partnerships (COH, METRO)
- Create a centralized digital inventory of drainage assets, to improve system management across multiple partners
- Underground storage and conveyance in highly built-out watersheds
- Targeted investment to enhance existing infrastructure

Stormwater Management

Exposure Reduction Strategies

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What's the big idea? – Addresses local, regional and coastal impacts | comprehensive, strategic long-term planning | multi-purpose / multi-benefit solutions | Retrofit for LID/ GSI, additional storage | better predictive modelling |

Advance **resilient design practices** by developing guidance, piloting new approaches, and scaling successful solutions across the county. (S047)

Continuously update flood data, models, and plans using the best available information(S020)

Enhance mitigation efforts to **minimize the effects of coastal storms,** such as storm surge and compound flooding, as well as long-term sea-level rise impacts. (SXXX)

- PCPM update
- Alternatives to gravity-based drainage
- Stormwater reuse
- Strategic long term ROW masterplan/ land acquisition policy
- Strategic long-range capital investment plan
- Holistic understanding of vulnerability at the watershed level
- Natural features to attenuate coastal forces

Ecological Health & Natural Resources

Exposure Reduction Strategies

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What's the big idea? – Natural design as baseline | maximize performance of natural features | small-scale repeatable integration in urban areas | look regionally for proactive management of lands |

Integrate NBS and GSI into standard project delivery

Conserve/ enhance natural systems for their flood mitigation functions

Preserve, restore, reconnect habitats to improve ecosystem function

- Incentivize GSI for private development
- Dedicated fees (such as TIF) for NBS development
- Standardized LID design guidance
- Standardize, quantify and community LID benefits
- Develop a community toolkit/ education for community embrace of LID/ GSI
- Long term strategic conservation approach
- Natural Stable Channel design principles adoption
- Preserving and conserving critical natural habitats
- Greening utility and transportation corridors

Community Facilities and Resources

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What's the big idea? – Make flood resilience approachable in all neighborhoods | leverage existing community assets | target existing gaps in basic needs during emergencies |

Improve residents' flood preparedness and disaster literacy through **consistent accessible, multi-lingual, easy to understand** education and communication materials.(S008)

Create opportunities for **residents and community** organizations to **take direct action** to improve local flood resilience. (S016)

Expand community engagement and outreach to empower **hard to reach** residents leveraging trusted local networks. (SXXX) (S052)

Support countywide coverage and operational needs of **community resilience hubs.** (S017)

- Accessible, multi-lingual, easy to understand education to improve flood / preparedness literacy
- Meeting in a Box to disseminate information through a train-the-trainer format.
- Short-form educational content (digital and analog).
- Neighborhood/ Youth Resilience champions - neighborhood level networks. (tied to resilience hubs programming).
- CFRTF as a community implementation partner on education/ outreach activities.
- Flood resilience retrofits for community centers as resilience hubs.

Evaluating Strategies & Actions

- Priority informed/
- strategically phased implementation approach
- Phase 1 : 0 to 2 year (*20 ~30 actions)*
- Identify metrics/ targets to track
- Iterative adaptive management approach

U	V	W	X	Y	Z	AA	AB	AC	AD	AE
Authority & Operations	Existing Precedent	Funding Sources	Feasibility Rating	Economic Disparities	Health Disparities	Housing Disparities	Language Disparities	Vulnerable Age Group Disparities	Additional Hazards	Workforce Development
Partially	Yes	Partially	Medium	Yes	Yes	No	No	Partially	Yes	Partially

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How can you contribute?

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Community Survey/ Plan updates

1. Please take the **survey (QR Code)**
2. Please visit the **website**
3. Please submit **comments**

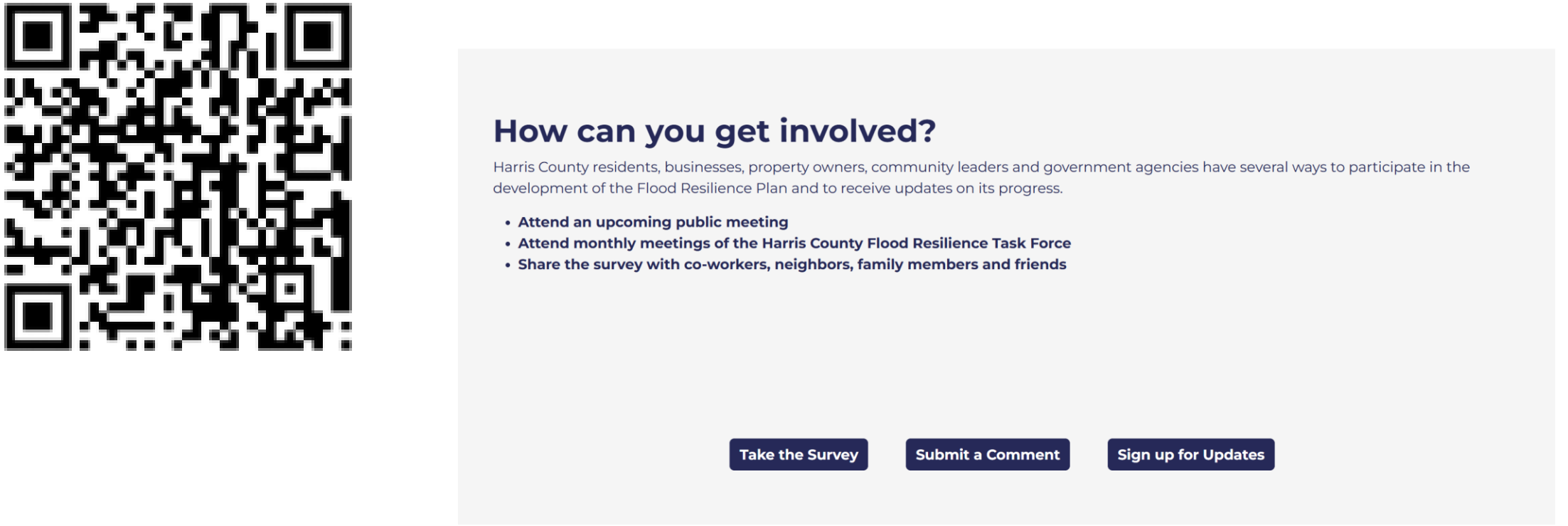
Harris County Flood Resilience Plan > Home

CFRTF Website for previous presentations:

https://cfrtf.harriscountytx.gov/

How can you contribute?

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Thank You

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