City Council Special Meeting
Saturday, October 27, 2018
11:00 AM

This facility is wheelchair accessible and accessible parking spaces are available. Requests for accommodations or interpretive services must be made 48 hours prior to this meeting. Please contact the City Secretary's Office at (979) 265-2082 or FAX (979) 265-7345 for further information.

AGENDA

BE IT KNOWN that the **CITY COUNCIL** of the City of Richwood will meet in **City Council Special Meeting** on **Saturday, October 27, 2018** at **11:00 AM** at 1800 N. Brazosport Blvd., Richwood, TX 77531 at the Richwood City Hall in the Council Chambers with the following agenda:

I. CALL TO ORDER

II. INVOCATION

III. PLEDGES OF ALLEGIANCE
Pledge of Allegiance & Texas Pledge

IV. ROLL CALL OF COUNCIL MEMBERS

V. PUBLIC COMMENTS
All public comments will be subject to the following rules: all speakers will be permitted to speak no longer than 3 minutes; all speakers will only be permitted to speak once; speakers cannot defer their 3 minutes to another speaker; the first five individuals who sign up for the public comment section will be permitted to speak

VI. CONSENT AGENDA

A. A resolution approving the 2017 Brazoria County Hazard Mitigation Action Plan 4

B. Approval of interlocal agreement to continue Richwood's participation in the regional stormwater management program 442

VII. DISCUSSION AND ACTION ITEMS

VIII. EXECUTIVE SESSION in accordance with Subchapter D of the Open Meetings Act, Texas Government code Section 551.001, et. Seq., to review and consider the following:

A. Under authority of Section 551.074 to deliberate the appointment, employment, evaluation, reassignment, duties, discipline, or dismissal of a public officer or employee; or to hear a complaint or a charge against an officer or employee: Lindsay Koskiniemi as Finance Director 451

IX. RECONVENE FROM EXECUTIVE SESSION and take action on the following:

A. To deliberate the appointment, employment, evaluation, reassignment, duties, discipline, or dismissal of a public officer or employee; or to hear a complaint or a charge against an officer or employee: Lindsay Koskiniemi as Finance Director

X. WORKSHOP - CITY ZONING REGULATIONS 452

XI. CITY MANAGER’S REPORT

XII. FUTURE AGENDA ITEMS

XIII. COUNCIL MEMBER COMMENTS & REPORTS

XIV. MAYOR'S REPORT

XV. ADJOURNMENT

The City Council may go into Executive Session on any item listed on the Agenda in accordance with Section 551.071 of the Government Code (attorney-client privilege).

I, Giani B. Cantu, do hereby certify that I did, on 10/22/2018 at _____ p.m., post this notice of meeting on the bulletin board at 1800 N. Brazosport Blvd., Richwood, TX, in compliance with the Texas Open Meetings Law.

_____

Giani Cantu, City Secretary
City of Richwood

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MEMORANDUM

To: The Honorable Mark Guthrie, Mayor and Members of the Richwood City Council

From: Michael Coon, City Manager

Date: October 22, 2018

Subject: Discuss and consider a resolution approving the 2017 Brazoria County Hazard Mitigation Action Plan

To receive grant funding for hazard mitigation projects, the federal government requires local governments to have a hazard mitigation plan. Due to the large expense to create a hazard mitigation plan, all the local cities have historically worked with Brazoria County to create a county-wide hazard mitigation plan. Even though the plan covers the entire county, the plan provides details for each city on the potential hazards that they may encounter.

Approval of this plan is required for the City of Richwood to be eligible for any FEMA hazard mitigation grants. The City is currently applying for one such grant to fund a diversion channel that could potentially elevate flooding like what was experienced from Hurricane Harvey.

2017

Brazoria County
Hazard Mitigation Plan

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Acronym List

RHMP	Regional Hazard Mitigation Plan
HMAP	Hazard Mitigation Plan
H-GAC	Houston-Galveston Area Council
FEMA	Federal Emergency Management Agency
TDEM	Texas Division of Emergency Management
TX	Texas
CRS	Community Rating System
NFIP	National Flood Insurance Program
HGMP	Hazard Mitigation Grant Program
CHARM	Community Health and Resource Management
mph	miles per hour
NOAA	National Oceanic and Atmospheric Administration
NSSL	National Severe Storm Laboratory
OEM	Office of Emergency Management
ArcGIS	Geographic Information System
RL	repetitive loss
KBDI	Keetch-Byram Drought Index
WUI	Wildland Urban Interface
FM	Farm to Market road
PHDI	Palmers Hydrological Severity Index
USDA	United States Department of Agriculture
LAL	Lightning Activity Levels
NCDC	National Climate Data Center
CDC	Centers for Disease Control and Prevention
NCEI	National Centers for Environmental Information
SPIA	Sperry-Piltz Iace Accumulation
NWS	National Weather Service
LEP	Linear Extensibility Percent
COLE	Coefficient of Linear Extent

Part 1: INTRODUCTION

Brazoria County's previous Hazard Mitigation Plan was adopted in 2006 and updated in 2011 as part of a seven-county Regional Hazard Mitigation Plan (RHMP). Due to new regulation and planning recommendations, Brazoria County prepared a new countywide multi-jurisdictional Hazard Mitigation Plan (HMAP). Brazoria County partnered with the Houston-Galveston Area Council (H-GAC) for both the 2006 and 2011 plans and continued this partnership during the development and adoption of the HMAP.



Image source: https://www.wikipedia.org/

History

On April 28, 2006, the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM) approved the first RHMP. H-GAC prepared the regional plan in coordination with FEMA and TDEM to ensure it met all applicable state and federal requirements. H-GAC updated the RHMP in 2011 to re-assess vulnerabilities and increase the number and diversity of mitigation action items. The plan includes a more robust assessment of natural hazards, newly uncovered vulnerabilities, more advanced analysis techniques, and a more effective and informed mitigation strategy.

Purpose of Plan

The purpose of Brazoria County's HMAP is to reduce the loss of life and property within the county and lessen the negative impacts of natural disasters. Vulnerability to several natural hazards has been identified through research, analysis, and public input. These hazards threaten the safety of residents and have the potential to damage or destroy both public and private property, disrupt the local economy, and impact the overall quality of life of individuals who live, work, and play in the county. While natural hazards cannot be eliminated, the effective reduction of a hazard's impact can be accomplished through thoughtful planning and action.

The concept and practice of reducing risks to people and property from known hazards is generally referred to as hazard mitigation. One of the most effective tools a community can use to reduce hazard vulnerability is developing, adopting, and updating a hazard mitigation plan as needed. A hazard mitigation plan establishes the broad community vision and guiding principles for reducing hazard risk, including the development of specific mitigation actions designed to eliminate or reduce identified vulnerabilities.

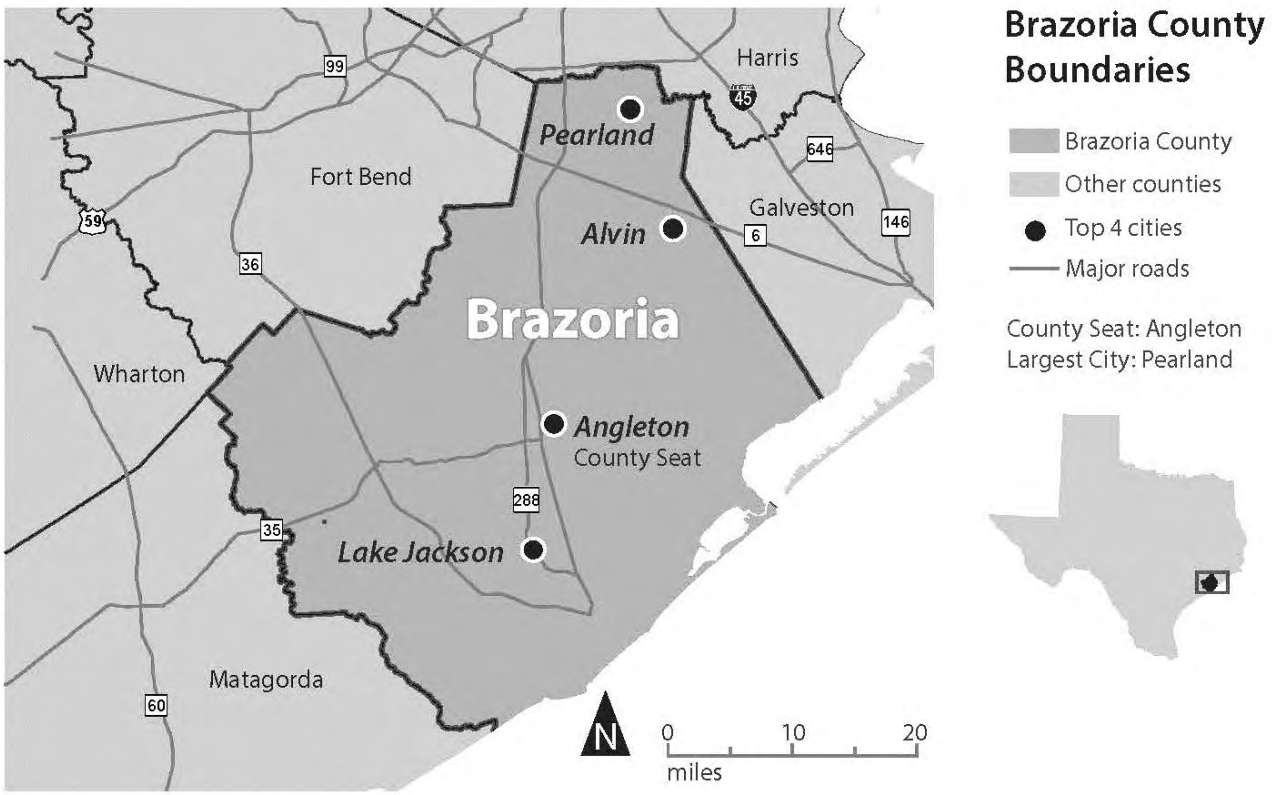
Scope of Plan

Brazoria County is in the east-central region of Texas along the coast, and scope of the HMAP includes the following participating jurisdictions:

- Brazoria County
- Alvin
- Angleton
- Baileys Prairie
- Bonney
- Brazoria
- Brookside Village
- Clute
- Danbury
- Iowa Colony
- Hillcrest Village
- Holiday Lakes
- Jones Creek
- Lake Jackson

- Liverpool
- Manvel
- Oyster Creek
- Quintana
- Richwood
- Surfside Village
- Sweeny
- West Columbia
- Brazosport ISD
- Alvin ISD
- Velasco Drainage District
- Freeport
- Port Freeport

Planning Area Map



The plan, developed in accordance with state and federal rules and regulations governing local hazard mitigation plans, was adopted by the participating jurisdictions and shall be routinely monitored and revised to maintain compliance with all state and federal regulations.

The HMAP profiles the following hazards:

- Flooding
- Hurricanes and Tropical Storms
- Wildfire
- Drought
- Lightning
- Heat
- Hail
- Winter Weather
- Tornado
- Dam/Levee Failure
- Coastal Erosion
- Expansive Soils

Presidential Declared Disasters

Brazoria County has persevered through many natural disasters. The table below lists the presidential declared disasters that the County has experienced since 1973. Each disaster is costly and challenging. The goal of this HMAP is mitigation and reduce the impact of future disasters.

Year	Declaration Type	Title
1973	Major Disaster Declaration	Flood
1979	Major Disaster Declaration	Flood
1979	Major Disaster Declaration	Flood
1983	Major Disaster Declaration	Hurricane
1991	Major Disaster Declaration	Severe Storm
1991	Major Disaster Declaration	Flood
1994	Major Disaster Declaration	Flood
1998	Major Disaster Declaration	Severe Storm
1998	Major Disaster Declaration	Severe Storm
1998	Major Disaster Declaration	Flood
1999	Emergency Declaration	Fire
2001	Major Disaster Declaration	Coastal Storm
2002	Major Disaster Declaration	Coastal Storm
2002	Major Disaster Declaration	Severe Storm
2003	Major Disaster Declaration	Hurricane
2005	Major Disaster Declaration	Hurricane
2005	Emergency Declaration	Hurricane
2005	Emergency Declaration	Hurricane
2006	Major Disaster Declaration	Fire
2007	Emergency Declaration	Hurricane
2008	Major Disaster Declaration	Hurricane
2008	Emergency Declaration	Hurricane
2008	Emergency Declaration	Hurricane
2015	Major Disaster Declaration	Severe Storm
2015	Major Disaster Declaration	Severe Storm
2016	Major Disaster Declaration	Flood
2017	Major Disaster Declaration	Hurricane

Source: Presidential Declared Disasters List (1953-2017), FEMA

Part 2: Planning Process

Part 2: PLANNING PROCESS

This section includes a description of the process used by H-GAC, the County, and participating jurisdictions to develop the 2017 HMAP.

Overview

Hazard mitigation planning can be described as the means to break the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that pre-disaster investments will significantly reduce the demand for post-disaster assistance by alleviating the need for emergency response, repair, recovery, and reconstruction.

Hazard mitigation planning is the process of identifying natural hazards, understanding community capabilities and resources, identifying and assessing hazard vulnerability and risk, and determining how to minimize or manage those risks. In partnership with Brazoria County, H-GAC approached the hazard mitigation planning process by establishing a Planning Team. The next step of the planning process was the assessment of hazards and how they can impact specific assets. H-GAC conducted a hazard analysis that was provided to the Planning Team and presented at a public meeting on October 25, 2017.

After hazard identification and analysis, communities considered their vulnerability to the identified threats. Crucial input from the participating jurisdictions and members of the public helped inform a vulnerability and risk assessment for the entire county. H-GAC used information gathered from meetings with the Planning Team, online participation and input from the participating jurisdictions, and natural hazard modeling techniques to produce a comprehensive vulnerability assessment.

The planning process culminated in a Mitigation Strategy, i.e. identification of specific mitigation actions, which when viewed, represents a comprehensive strategy to reduce the impact of hazards. The Planning Team met on December 18, 2017, to begin the process of developing an overarching Mitigation Strategy, and a long-term approach to update and maintain the HMAP. Specific mitigation actions are identified in this plan and included in the Appendix E. Responsibility for each mitigation action is assigned to a specific individual, department or agency along with a schedule for its implementation. Plan maintenance procedures (Part 8 of this plan) establish procedures to monitor progress, including the regular evaluation and enhancement of the Plan. Multijurisdictional coordination and integration of the HMAP into local planning mechanisms was also addressed. The established maintenance procedures ensure that the plan remains a dynamic and functional document over time.

Plan Development Resources

The Brazoria County HMAP was developed using existing plans, studies, reports, and technical information. Materials and historic data were used to inform participants throughout the planning process, evaluate and analyze hazards, and develop the mitigation strategy.

Plan Development Resources: Existing Documents and Data	
FEMA Disaster Declarations	FEMA Flood Map Services
H-GAC Land Use & Demography Database	Houston-Galveston Area Regional Plan
2011 Regional Hazard Mitigation Plan	NOAA Storm Event Database
State of Texas Hazard Mitigation Plan	Texas A&M Forest Service Wildfire Reports
US Census American Fact Finder	USDA Census of Agriculture Reports
USGS Homeland Infrastructure Foundation-Level Data	Brazoria County Disaster Recovery Plan
Brazoria County Emergency Operations Plan	

Planning Team

Brazoria County and H-GAC established the Planning Team in Fall 2017 in preparation for the first public meeting and hazard mitigation planning workshop held on October 25, 2017. Members were asked to attend all public meetings in person but were provided an online alternative if they were unable to do so. Online materials, surveys, forms, and documentation are provided in Appendix A. Representatives from the County Office of Emergency Management served as liaisons between H-GAC and stakeholders, staff, and members of the public who were unable to attend the meetings, the County's Emergency Coordinator sent out a series of emails to the planning team to invite them to the meeting and to participate in the online forms. In addition to the list below the Senior Regional Planner and a Regional Planner at H-GAC were a part of the planning team.

Jurisdiction	Title	Contact Method
Velasco Drainage District	Superintendent	Email
Freeport	Fire Chief / EMC	Email
Port Freeport	Director of Protective Services	Email
Sweeny	City Manager	Email
Bailey's Prairie	Mayor	Email
Angleton	Emergency Management Coordinator	Email
Alvin	Emergency Management Coordinator	Email
Lake Jackson	City Manager	Email
Iowa Colony	Mayor	Email
Brazoria	City Manager	Email
Holiday Lakes	Mayor	Email
Surfside Beach	City Secretary	Email
Liverpool	Mayor	Email
Alvin ISD	Superintendent	Email
West Columbia	City Manager	Email
Brazoria County	Deputy Emergency Management Coordinator	Email
Clute	Fire Marshal/EMC	Email
Richwood	Chief of Police	Email
Hillcrest Village	Mayor	Email
Danbury	Mayor	Email
Bonney	Mayor	Email
Brookside Village	Mayor	Email
Oyster Creek	Mayor	Email
Quintana	Mayor	Email
Jones Creek	Mayor	Email
Manvel	Mayor	Email
Brazosport ISD	Superintendent	Email

Stakeholders

There were a variety of stakeholders throughout the community and neighboring jurisdictions that were a part of the planning process; these stakeholders either attended meetings, contacted the planning team with their input or both. The chart below shows these stakeholders and their titles. Their input was utilized throughout the plan and specifically in the Hazard Analysis and Mitigation Strategy sections of this plan.

National, Regional, and Local Agencies		
Stakeholder	Title	Contact Method
Texas A&M AgriLife	Extension Program Specialist	Email/ Hosted CHARM Meeting
The Trust for Public Land	Senior Vice President and Director of Conservation Strategies	Email/ Phone
U.S Army Corps of Engineers	Civil Engineer	Email/ Attended CHARM Meeting
Neighboring Communities and Regulatory Authorities		
Stakeholder	**Title**	Contact Method
Harris County	County Engineer	Email/ Attended CHARM Meeting
Brazoria Drainage District #4	District Engineer	Email/ Attended CHARM Meeting
Chambers County	Emergency Management Coordinator	Email/ Phone Call

Meeting Dates & Details

October 25, 2017: Hazard Mitigation Kickoff Meeting

H-GAC and the Planning Team hosted a public meeting at the Nolan Ryan Center 2925 TX-35 Alvin, TX 77511 on October 25, 2017. The purpose of the meeting was for H-GAC staff to gather feedback and input on the draft Hazard Analysis and discuss local vulnerabilities. The Planning Team and members of the community were given a presentation and provided large maps displaying the analysis of various hazards. Participants worked with H-GAC staff to improve the accuracy of the analysis and pinpoint the vulnerabilities of each hazard within their communities. Meeting participants also discussed their current ability to mitigate these threats and how to draft a mitigation action to address them. Prior to the meeting, community members and stakeholders were invited through press releases, public service announcements, and other advertisements in newspapers and on the radio. See Appendix A for meeting agenda, attendees list, and press release.

December 18, 2017: Hazard Mitigation Strategy Meeting

H-GAC hosted a Planning Team meeting at its offices in Houston on December 18, 2017. The purpose of this meeting was to begin the development of a Mitigation Strategy and determine plan maintenance procedures. H-GAC staff gave a presentation on both topics and led a discussion about strategy development. Planning Team members outlined a Mitigation Strategy and refined their mitigation actions. See Appendix A for meeting agenda and sign-in sheet.

April 5 and 6, 2017: Community Health and Resource Management (CHARM) Workshops

The County had the opportunity to partner with Texas A&M's AgriLife to host a set of workshops for all jurisdictions in the county (https://tcwp.tamu.edu/charm/); members of the planning team attended as well as representatives from surrounding jurisdictions that were not directly participating in the HMAP (See Appendix A for a complete sign-in sheet). April 5th was for jurisdictions in the north part of the county. April 6th was for the jurisdictions in the southern part. The workshops utilized GIS to explore current conditions including data such as 100 year-floodplain overlays and social vulnerability throughout the jurisdictions. After current conditions were presented, the workshop participants discussed what they wanted future land use to look like given the current conditions.

TBD 2018: Request for Public Comment

H-GAC hosted a draft of the HMAP on its website, and provided an online method for the public to submit comments and feedback on the draft. The comments and feedback will be discussed at a public meeting when the plan is up for adoption. The jurisdictions' HMAP adoption meeting dates, public hearings, and locations were also provided on the same webpage. Press releases were then sent to all local media outlets to notify the public of the opportunity to comment online, by phone, or in person at each jurisdiction's public meeting. Each jurisdiction also notified the public as described in Part 8 of this plan.

Plan Adoption

To be completed after Plan Adoption.

Participation & Public Input

Public input and participation is a crucial element of hazard mitigation planning. Feedback and input from the public during the October 25th Hazard Mitigation Kick-off meeting was used to identify vulnerabilities in each jurisdiction, identify valuable assets, and develop the risk assessment. Although the public was given the opportunity to attend public meetings in person, the first public meeting followed shortly after Hurricane Harvey. Many residents and local staff were busy with recovery efforts at the time, and attendance was difficult. To ensure the public's ability to participate in the planning process, H-GAC hosted all HMAP-related materials online and advertised both the meetings and the website link (http://www.h-gac.com/community/community/hazard/brazoria-county-hazard-mitigation.aspx). Online surveys, resources, a mitigation action submittal portal, and a place to submit comments on the draft plan were made public on the H-GAC website (see Appendix A). Examples of online participation include submitting mitigation actions, completing the NFIP survey, and conversations over email.

The Brazoria County Office of Emergency Management also distributed hardcopies of the surveys and forms to each participating jurisdiction that was unable to attend the public meeting on October 25th, 2017. These jurisdictions then had the option to either mail in the packet to H-GAC's office for processing, or submit the online surveys. The data from capability assessment survey was used to develop the risk assessment and identify vulnerabilities. The online mitigation action portal allowed jurisdictions to submit their proposed projects, and later used to develop the mitigation strategy. County and City Certified Floodplain Managers (CFMs) also submitted surveys which helped develop the flood hazard analysis and mitigation strategies for flooding.

The chart below demonstrates the method and type of participation by each jurisdiction.

Jurisdiction	Representative attended Hazard Mitigation Meeting(s)	Participated in Mitigation Strategy Development	Online Participation
Brazoria County	x	x	x
Alvin	x	x	x
Angleton	x	x	x
Bailey's Prairie	x	x	x
Bonney	x	x	x
Brazoria	x	x	x
Brookside Village			x
Clute			x
Danbury			x
Iowa Colony	x	x	x
Hillcrest Village	x	x	x
Holiday Lakes	x	x	x
Jones Creek			x
Lake Jackson	x	x	x
Liverpool	x	x	x
Manvel	x	x	x
Oyster Creek			x
Quintana			x
Richwood	x	x	x
Surfside Beach	x		x
Sweeny	x	x	x

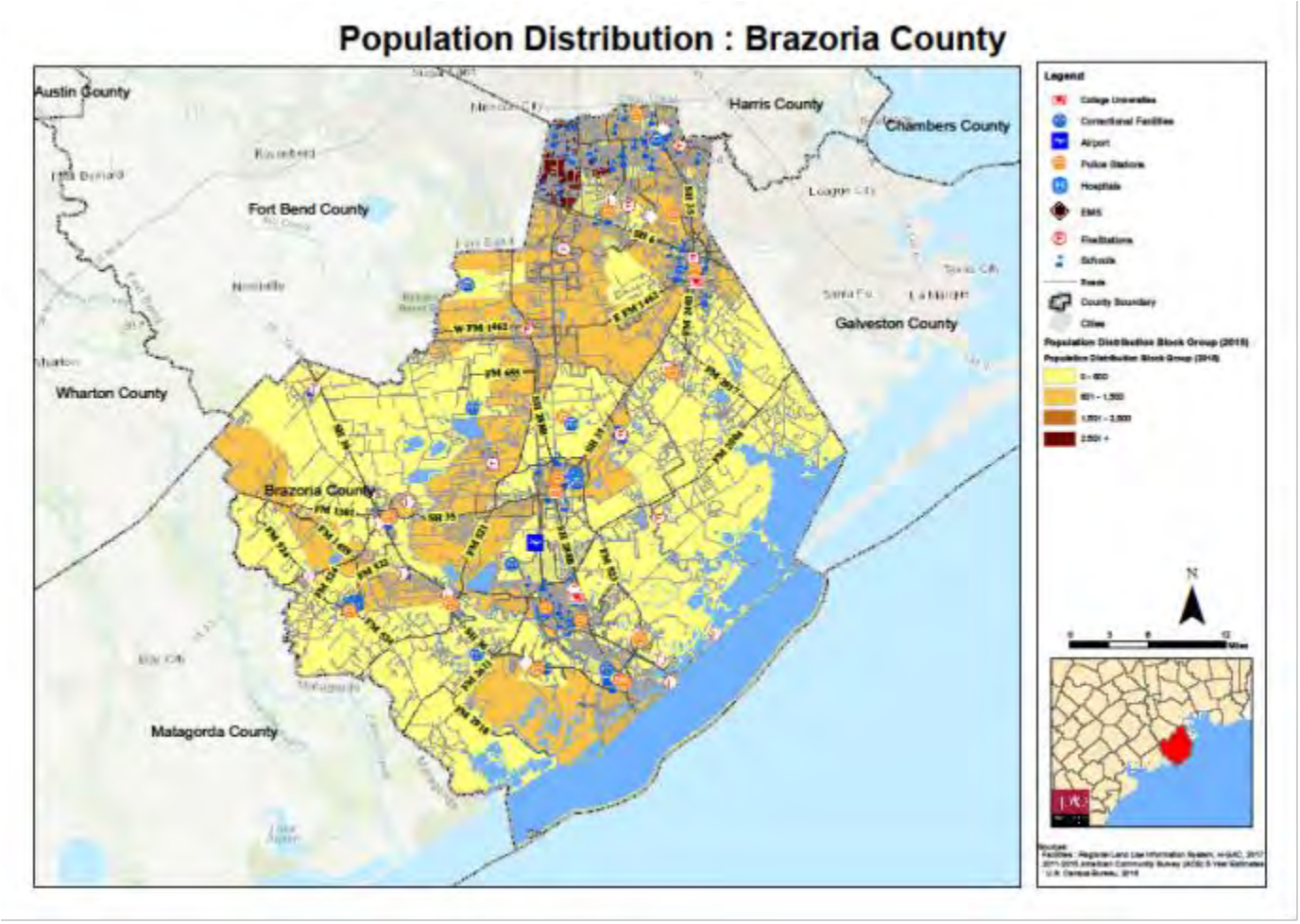
West Columbia	x		x
Brazosport ISD			x
Velasco Drainage District	x	x	x
Port of Freeport	x	x	x
Alvin ISD	x	x	x
Freeport	x	x	

Part 3: County Profile

Part 3: COUNTY PROFILE

Brazoria County is a coastal county located south of Houston, west of Galveston County. The southern portion of the county is home to coastal marshes, the Brazoria National Wildlife Refuge and the San Bernard National Wildlife Refuge. The Brazos River cuts through the western half of the county before it enters the Gulf of Mexico at the Port of Freeport. State Highway 6 runs east-west through the northern end of Brazoria County with State Highways 35, 36, and 288 sweeping generally north-south.

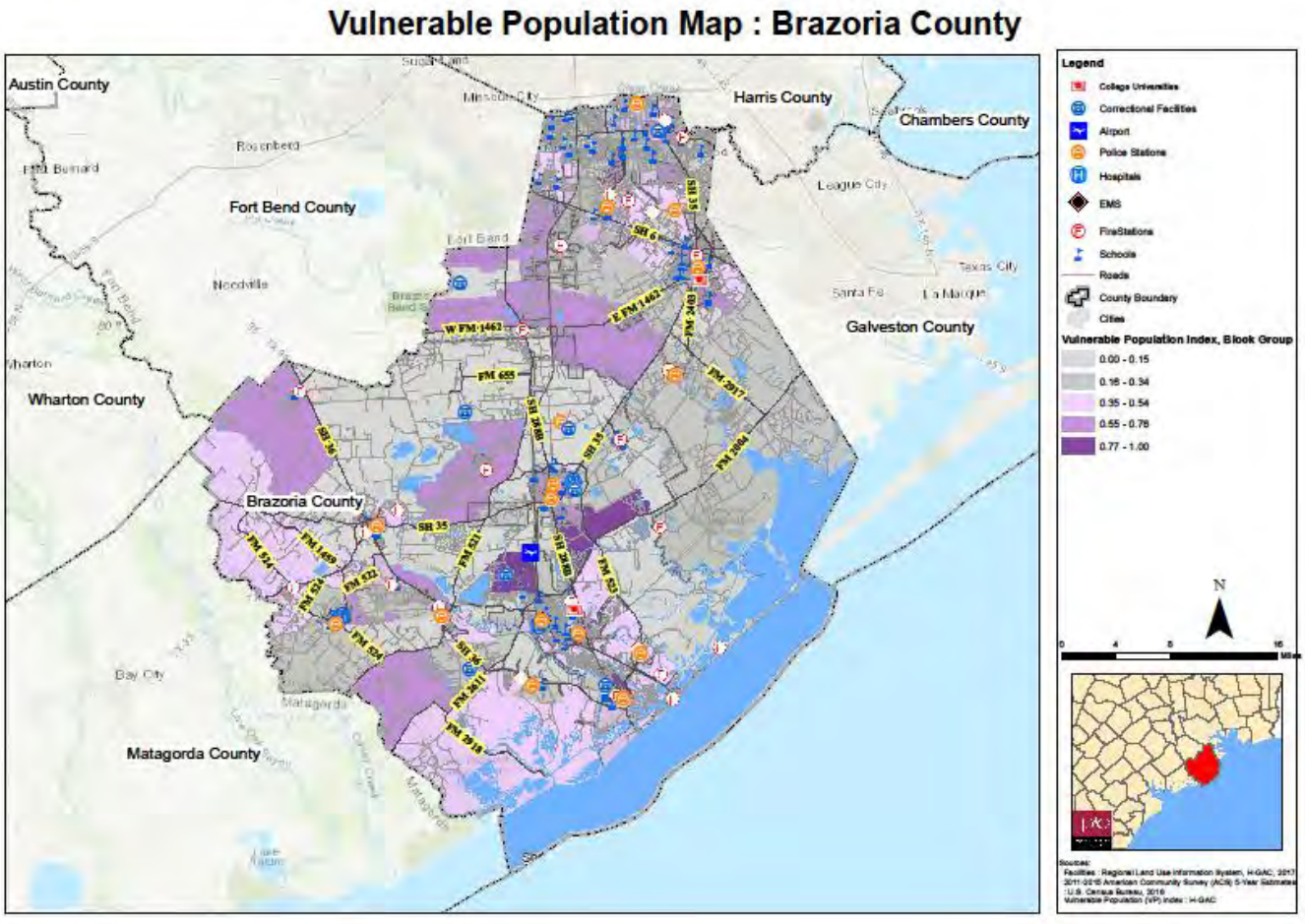
Brazoria County is home to 354,000 residents and is forecast to grow rapidly, reaching 574,000 by 2040. The county is home to six cities boasting more than 10,000 residents: Pearland (107,574), Lake Jackson (27,529), Alvin (26,164), Angleton (19,491), Freeport (12,153), and Clute (11,586).



The county's robust economy is geographically divided between agriculture in the western portion of the county, petrochemical production in the Brazosport area in the southern portion of the county; public services and banking in the mid-county/Angleton area; and burgeoning residential construction, retail, and medical services sectors in the suburban northern portion of the county, including Pearland, part of the Houston metropolitan area. The deepwater Port of Freeport is undergoing an expansion and will be the only terminal capable of receiving Panamax ships on the Texas Coast (Panamax ships are the largest sized ships that are able to pass through the Panama Canal). Agriculture, particularly rice and cattle production has a significant history in the county; this sector continues be a foundation in the county contributing over 118 million dollars to the local economy annually.

Brazoria County's median household income is one of the largest in the region* at $69,700. The county also has a high rate of homeownership (72%) and a median home value of $152,900. Residents of the county spend approximately 54% of their income on costs related to housing and transportation.

Although Brazoria County is largely residential (the majority of Brazoria County residents work in neighboring Harris County), Brazoria County's economy has grown in pace with its residential development.[iv] Business services are the largest employment cluster, with approximately 18,000 employees. Many of these jobs are related to the support activities for oil and gas operations.[v] Retail, healthcare, distribution, and manufacturing are important private sector employers. Retail trade comprised 12 percent of employment in 2014, and retail sales totaled $6.3 billion in 2012.[vi] Several major national retailers have distribution centers in Brazoria County. Healthcare is a growing sector of the economy as many of the institutions based in the Texas Medical Center have opened or are planning to open hospitals in the county. The county has one of the highest median home values in the region at $176,900 and over 40% of its housing units have been built since 2000.



The Vulnerable Population Index identifies areas throughout Brazoria County that may not have the means or the resources to act when a natural disaster occurs in Brazoria County. For the purposes of this plan, vulnerable populations include any households without a car, single female household with child/ children in the home, individuals living below the poverty line, individuals who are disabled, individuals who are Hispanic, individuals who are non-Hispanic, and non-white, and individuals 65 years and older. The areas in the county with the greatest proportion of these individuals is defined as the most vulnerable areas in Brazoria County. On the map, the areas that are deep purple (or black if printed in black and white) are where the greatest proportion of the vulnerable population is located in Brazoria County. Cities that have the largest proportion of the vulnerable population in

Brazoria County include Angleton, West Columbia, and Bailey's Prairie. Defining and mapping vulnerable populations provides the opportunity to demonstrate where perhaps the most need is throughout Brazoria County.

*The region includes Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller and Wharton counties.

[i] Houston-Galveston Area Council

[ii] U.S. Census Bureau

[iii] Texas Association of Counties

[iv] U.S. Census Bureau

[v] U.S. Cluster Mapping

[vi] U.S. Census

[vii] DATA USA, Workforce Solutions

[viii] USDA Census of Agriculture

[ix] Community Impact Newspaper

[x] National Weather Service

[xi] Workforce Solutions

[xii] Federal Reserve Bank of Saint Louis

2017

Part 4: Hazard Identification

Part 4: HAZARD IDENTIFICATION

The State of Texas's Hazard Mitigation Plan has identified 5 major natural hazards that affect the region. These include hurricane, flood, wildfire, drought, and tornado[i]. The local planning team identified 12 natural hazards which could affect the county and local jurisdictions.

Flooding

Flooding is one of the most frequently occurring, destructive, and costly natural hazards facing Texas.[ii] There are two main categories for floods: general and flash flooding. General flooding is typically a long-term event that can last from a couple of days to weeks. This type of flooding is characterized by an overflow of water from an existing waterway, including rivers, streams, and drainage ditches. Flash flooding is an event that typically lasts a few minutes to less than 6 hours. These floods are characterized by heavy rain or water from a dam failure that inundates waterways and infrastructure, such as bridges and roads. Either type of flooding can destroy infrastructure, homes, and other structures, and pulling cars off roads. However, flash flooding typically is considered the most dangerous type of flooding, because of its "speed and the unpredictability"[iii]. Generally, the impact of flooding is intensified in urban areas because of less impervious surfaces and in suburban or rural areas because of building in vulnerable areas. While 100 and 500-year floodplains are identified throughout the county and local jurisdictions, flooding can occur outside of these areas.

Lightning

Lighting can be seen throughout thunderstorms, hurricanes, intense forest fires, and winter storms. Lightning occurs when positive and negative charges build within a cloud leading to a rapid discharge of electricity[iv]. While there are several types, lightning is typically classified as ground flashes or cloud flashes. One of the more common lightning strikes are cloud-to-ground lightning; these strikes are classified as ground flashes. Cloud-to-ground lighting starts as a channel of negative charge, called a stepped leader, zigzagging downward in roughly 50-yard segments in a forked pattern [v]

Lightning often strikes tall structures, such as trees and skyscrapers, but can also strike open fields or other areas depending on where the electrical charges form. Lightning causes an average of 80 deaths and 300 injuries each year in the United States.[7] In 2017, 16 people were killed by lightning in the United States, two of these deaths occurred in Texas, but not in the county. [vi]

Hail

Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into balls of ice. To be considered hail, frozen precipitation needs to be at least .2 inches. Size of hail can range from pea-sized (1/4 inch in diameter) to softball-sized (4 ½ inches in diameter). Quarter sized hail (1 inch in diameter) and above is considered severe by the National Oceanic and Atmospheric Administration's (NOAA) National Severe Storm Laboratory. Hail storms can result in significant damage to vehicles, buildings, and crops. Severe hail and hail swaths can result in an accumulation of hail on roadways and roofs, which may result in car accidents or roofs collapsing.[vii]. As of 2015, Texas had the highest level of hail loss claims throughout the country. According to the National Insurance Crimes Bureau, hail loss claims totaled 400,000 dollars in Texas from 2013 to 2015. However, damage from hail typically occurs in northern Texas rather than southern Texas.

Winter Weather

A winter storm is any event in which the main type of precipitation is snow, sleet, or freezing rain, according to (NOAA), 70 percent of injuries related to winter storms are in automobiles. Winter storms form with cold air, lift, and moisture.[viii] While there are several types of winter storms, ice storms and snow flurries or showers with light accumulation are the most likely in the region. The main concerns with winter weather are road conditions and power outages.

Hurricanes and Tropical Storms

Tropical cyclones with sustained winds of 74 mph and above are classified as hurricanes. Hurricanes can reach wind speeds of 156 mph or more, which would be considered a category five on the Saffir-Simpson scale with potential for catastrophic damage. Hurricanes generally have a well-defined center, called the eye. Hurricane season is generally June 1st through November 30th each year.[ix]However, hurricanes can and have formed outside of this season. Hurricanes are one of the top natural hazards affecting the region, with high winds and flooding considered two of the main impacts from hurricanes and tropical storms.[x]

Tropical cyclones (rotating low-pressure weather systems that have organized thunderstorms, but no fronts) with sustain winds of at least 39 mph and no higher than 73 mph are classified as tropical storms. Tropical storms generally have ill-defined centers and slower moving winds than hurricanes.[12]

Flooding is also a concern for the county during these events. Hurricane Harvey is a recent example of the impact flooding during hurricanes and tropical storms has on the region, county, and local jurisdictions. Hurricane Harvey made landfall on August 25th, 2017 as a category four hurricane near Rockport, Texas; Hurricane Harvey traveled further inland as a tropical storm over the next few days. The tropical storm triggered general and flash flooding throughout the region with recorded rainfall measuring as high as 60.58 inches in the region. Flooding was seen throughout the county and local jurisdictions.

Windstorms are identified by the State of Texas as a common hazard affecting the region. The plan addresses the concerns of windstorms through the hurricane/ tropical storm and tornado sections.

Tornado

Tornadoes are a violently rotating column of air touching the ground, usually attached to the base of a thunderstorm.[xi] However, tornadoes have formed during hurricanes and tropical storms. Tornadoes form when there is a change in a storm's speed and direction. Tornadoes can have wind speeds that range from 40 mph to 300 mph and move at 10 mph to 20 mph. However, tornadoes typically last a few minutes. The damage seen from a tornado is largely due to the strength of the winds, but strong hail and lighting often accompany tornadoes.[xii]

Wildfire

Wildfires are any non-structure fire, except prescribed fires that occur in wildland areas, including prairies or forest. as many as 90 percent of wildland fires in the United States are cause by humans and the other 10 percent are started by lava or lightning.[xiii] In understanding that most wildfires are started by people, the Texas Forest Service assigns a high priority to year-round wildfire prevention activities that reduce risks to residents and property. Texas Forest Service prevention campaigns use radio, TV, print, and web-based products along with local outreach programs to increase wildfire awareness and deliver fire safety messages. Texas Forest Service works with local and county officials to keep them informed of fire danger and the likelihood of large damaging wildfires. In 2017, five Texans

died due to wildfires in north Texas; Texas faced more than 21 million dollars in damages from wildfires throughout the state.[xiv]

Drought

Drought varies greatly in length and extent. High temperatures, high winds, and low humidity can worsen drought conditions and can make areas more susceptible to wildfire. Human demands and actions, such as farming and animal grazing, can also hasten drought-related impacts. There are typically four types of drought: meteorological, agricultural, hydrological, and socio-economic. Meteorological droughts are typically defined by the level of dryness over a given period. Hydrological droughts are defined by the decline of soil/ground water or stream flow or lake/ river levels. Agricultural droughts refer to the impact of low rainfall and storm water or reduced ground water or reservoir levels needed for agriculture. Socio-economic drought considers the impact of drought conditions on supply and demand of some economic goods such as grains.[18, xv] There are a wide range of effects that can occur from drought, including decreased land prices, loss of wetlands, increased energy demand, and increase of mental health disorders.[xvi] Impacts seen in Texas from drought in the past, include wildfires, loss of agricultural crops including rice and wheat fields, and increase in energy cost and demand. [xvii]

Coastal Erosion

There are several types of erosion including soil and coastal erosion. Soil erosion is comprised of two types: wind erosion and water erosion. Wind erosion is a common occurrence, which typical occurs when winds blow across flat, sparsely vegetated, or disturbed land, lifting soil into the air or displacing soil to a new location. Wind erosion can cause soil deterioration and air pollution.[xviii] Water erosion can occur over land or in streams and channels. Water erosion that takes place over land may result from rain, shallow sheets of water flowing off the land, or surface flow, which is concentrated in areas of lower elevation. Stream channel erosion may occur as the volume and velocity of water flow increases enough to cause movement of the streambed and bank soils.[xix] Major storms, such as hurricanes, may cause significant erosion by combining high winds with heavy surf and storm surge to significantly affect the rate of coastal erosion.[xx]

Coastal erosion in the county is a central concern for communities located along the coast. Coastal erosion is the wearing a way of beaches and bluffs due to storms, wave action, sea level rise, and human activities. Coastal erosion is responsible for an estimated 500 million dollars per year in property loss throughout the U.S. Coastal erosion can impact local economies that depend on tourism and ports, and high property values for beachfront homes and establishments. Additionally, coastal erosion can greatly impact wetlands and destroy natural ecosystem and natural barriers that can help to protect from other natural hazards including hurricanes.

Heat Events

While the National Weather Service defines excessive heat as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks, a Heat Event is more loosely defined. A heat event could be a period where the county experiences high temperatures which could affect residents particularly children and the elderly. According to the National Weather Service, the county particularly in summer months experiences typical daily temperatures more than 90 degrees and humidity more than 75 percent. These high temperatures mixed with high percentage of humidity can affect the elderly and children even though these are not above average temperatures for the county.

Dam/ Levee Failure

Aging infrastructure and increased uncertainty of other natural hazards such as flooding are factors in the rising concern of dam and levee failure. Rising flood levels can create a levee breech or dam failure resulting in flashing flooding within as little as six hours or less. Aging infrastructure and other factors such as debris or melting snow may create a dam failure or levee breach over a greater period, weeks to months. The results of a dam failure or levee failure can result in residential and commercial buildings flooded outside of the identified 100 to 500-year floodplain and increase flood water levels during a flood event.[xxi]

There are 51 known dams and levees in Brazoria County. These dams are maintained by public, state, federal, local, or partnering entities. All dams have been classified as 'Low' in the hazard potential classification. The failure of a dam or levee during a major rain event would cause additional flood damage, but substantial economic, environmental, or lifeline losses are not expected. Only the communities at risk of experiencing impacts from a dam or levee failure are profiled. Those jurisdictions include Unincorporated Brazoria County, Bailey's Prairie, Brazoria, Holiday Lakes, Oyster Creek, West Columbia, Port of Freeport, and Freeport. The remaining jurisdictions participating in this plan are not at risk for dam and failure and will not be profiled.

Expansive Soils

Expansive soils are soils and soft rock that tend to swell or shrink due to changes in moisture content. Expansive soils (bentonite, smectite, or other reactive clays) expand when the soil particles attract water and can shrink when the clay dries. Changes in soil volume present a hazard primarily to structures built on top of expansive soils. In Texas, most expansive soils are in band 200 miles west of the coastline, stretching approximately from Beaumont to Brownsville. These areas receive the most moisture and are also vulnerable to droughts, which can cause the soils to contract. Problems associated with expansive soils are sinking or broken foundations or ruptured pipelines. In the region, the problems associated with expansive soils typically occur during drought periods.[xxii]Drought may also worsen the effects of land subsidence. Land subsidence is identified as a common hazard by the State of Texas. However, land subsidence was not brought up throughout the planning process and there were no recorded events or damage found throughout the county. Consequently, land subsidence is not identified as a natural hazard in this plan.

References

[i] Texas Division of Emergency Management. (2013, October 15). *State of Texas Hazard Mitigation Plan 2013 Update*. Page 74. Retrieved from https://www.dps.texas.gov/dem/Mitigation/txHazMitPlan.pdf.

[ii] Texas Division of Emergency Management. (2013, October 15). *State of Texas Hazard Mitigation Plan 2013 Update*. Page 259. Retrieved from https://www.dps.texas.gov/dem/Mitigation/txHazMitPlan.pdf.

[iii] NOAA National Severe Storms Laboratory, Flood Basics. Retrieved from www.nssl.noaa.gov/education/svrwx101/floods/.

[iv] *NOAA National Severe Storms Laboratory*, Lightning FAQ, Retrieved from: www.nssl.noaa.gov/education/svrwx101/lightning/faq/

[v] *NOAA National Severe Storms Laboratory*, Thunderstorm Basics Retrieved from: www.nssl.noaa.gov/education/svrwx101/thunderstorms/.

[vi] NOAA's National Weather Service (2001, Jan.) Retrieved from www.lightningsafety.noaa.gov/.

[vii] *NOAA National Severe Storms Laboratory*, Hail Basics. Retrieved from: www.nssl.noaa.gov/education/svrwx101/hail/.

[viii] US Department of Commerce, NOAA, National Weather Service. (2017, June 1) Severe Weather Definitions. Retrieved from: www.weather.gov/bgm/severedefinitions.

[ix] US Department of Commerce, National Oceanic and Atmospheric Administration. (2013, June 28) What Is a Hurricane? Retrieved from: oceanservice.noaa.gov/facts/hurricane.html.
US Department of Commerce, NOAA, National Weather Service, and NWS Drought Safety Home.
[x] Texas Division of Emergency Management. (2013, October 15). *State of Texas Hazard Mitigation Plan 2013 Update*. Page 87. Retrieved from https://www.dps.texas.gov/dem/Mitigation/txHazMitPlan.pdf.
[xi] NOAA National Severe Storms Laboratory. Tornado Basics. Retrieved from: www.nssl.noaa.gov/education/svrwx101/tornadoes/.
[xii] National Geographic. (2017, Sept. 2017). Tornadoes. *Tornado Facts and Information*. Retrieved from: www.nationalgeographic.com/environment/natural-disasters/tornadoes/.
[xiii] National Parks Service, U.S. Department of the Interior. Wildland Fire: Wildfire Causes | U.S. National Park Service. Retrieved from: www.nps.gov/fire/wildland-fire/learning-center/fire-in-depth/wildfire-causes.cfm.
[xiv] DTS Wildfire. TxWRAP - Home. Retrieved from: texaswildfirerisk.com/.
[18] US Department of Commerce, NOAA, National Weather Service. (2017, June 1). Severe Weather Definitions. *Retrieved from:* www.weather.gov/bgm/severedefinitions.
[xv] *National Weather Service*, NWS Drought Types Page Retrieved from: www.nws.noaa.gov/om/drought/types.shtml.
[xvi] US Department of Commerce, NOAA, National Weather Service. (2001, January 1) Retrieved from: www.nws.noaa.gov/om/drought/impacts.shtml.
[xvii] NPR, "Everything You Need to Know About the Texas Drought. Retrieved from: stateimpact.npr.org/Texas/tag/drought.
[xviii]Purdue. Wind Erosion, Retrieved from: milford.nserl.purdue.edu/weppdocs/overview/wndersn.html.
[xix] US Department of Commerce, NOAA (2016, Aug.17). "Coastal Hazards." Retrieved from: oceanservice.noaa.gov/hazards/natural-hazards/.
[xx]US Department of Commerce, NOAA. (2013, June 28) "What Is a Hurricane?" Retrieved from: oceanservice.noaa.gov/facts/hurricane.html.
[xxi] FEMA. (2017, November 15). Dam Failure Information. www.fema.gov/dam-failure-information
[xxii] Geology. Expansive Soil and Expansive Clay. Retrieved from: geology.com/articles/expansive-soil.shtml.

Part 5: Risk Assessment

Part 5: RISK ASSESSMENT

A Vulnerability Assessment is the process of identifying threats by natural hazards to the population and infrastructure. By identifying the greatest vulnerabilities within the County, it becomes possible to develop a Mitigation Strategy that effectively allocates resources for addressing the most serious vulnerabilities. For this assessment, the Planning Team conducted three main processes to identify the vulnerabilities within Brazoria County:

- Cataloging critical and valuable assets within the County.
- Conducting a capability assessment.
- Assessing the County's vulnerability to each hazard and ranking these hazards according to degree of risk.

H-GAC maintains a database of critical facilities. During a public meeting on October 25, 2017, Brazoria County officials reviewed and updated this list, including adding additional valuable assets within the community. Following this process, the Planning Team determined 461 facilities are critical or valuable assets. Through a Hazus analysis, the Planning Team also identified residential and commercial units. Appendix B contains a comprehensive list of the facilities. The full Hazus analysis is catalogued in Appendix C. A summary of the facilities is provided below.

Critical Facilities & Valuable Assets

Asset Description	Quantity
Emergency Operation Centers	11
Medical Facilities and Emergency Rooms	21
Fire Station	34
Police Station	50
Utility, Electrical, and Waste Water Facilities	76
Correctional Facilities	8
College University Campus and Buildings	5
Schools	91
Nursing Home	59
Dams	53
Natural Gas Receipt Delivery	5
Brownfields & Superfund Sites	3
Shelters	45
Residential Buildings	95,480
Commercial Units	14,267

Risk Assessment Survey

The Planning Team ranked the hazards by scoring the frequency, impact, and vulnerability of each. Impact and vulnerability ratings were weighted more heavily than frequency scores when determining overall risk. Additionally, communities described the loss or damage, and provided specific data that expand on the descriptions provided below.

Frequency Ratings	Impact Ratings	Vulnerability Ratings
Unlikely: Rare and isolated occurrences; Unlikely to occur within the next 5 years.	**Negligible:** Less than 10 percent of property and population impacted in the planning area.	**Low:** Hazard results in little to no damage, and negligible loss of property, services, and no loss of life. Planning area is not vulnerable to this hazard.
Likely: Frequent and regular occurrences; Likely to occur within the next 5 years.	**Limited:** 10 to 25 percent of property and population impacted in the planning area.	**Moderate:** Hazard results in some damage, and moderate loss of property, services, and potentially loss of life. Planning area is moderately vulnerable to this hazard.
Very Likely: Consistent and predictable occurrences; Likely to occur more than once in the next 5 years.	**Significant:** 25 to 75 percent of property and population impacted in the planning area.	**High:** Hazard results in extensive damage, and extensive loss of property, services, and potentially loss of life. Planning area is highly vulnerable to this hazard.
	Extensive: 75 to 100 percent of property and population impacted in the planning area.	**Extreme:** Hazard results in catastrophic damage, loss of property, services, and loss of life. Planning area is extremely vulnerable to this hazard.

Hazards Ranked by Risk

Each identified hazard poses a risk to Brazoria County. Ranking the hazards from greatest to lowest risk allows the communities to prioritize their resources and focus efforts where they are most needed.

Risk Rating	Ranking	Hazards
High	1	Flooding
	2	Hurricanes and Tropical Storms
	3	Tornadoes
Moderate	4	Drought
	5	Lightning
	6	Heat Events
	7	Hail
Low	8	Expansive Soils
	9	Winter Weather
	12	Coastal Erosion

Capability Assessment

The participating jurisdictions completed a capability assessment survey to collect data on hazards that affect communities, the communities' ability to mitigate damages from these hazards, and current plans or programs in place to help mitigate natural hazards. The Planning Team used this information to assess the risk within each community and to determine a strategy to integrate the HMAP into their current planning mechanisms.

HMP: Hazard Mitigation Plan
DRP: Disaster Recovery Plan
CP: Comprehensive Land Use Plan
FMP: Floodplain Management Plan
SMP: Stormwater Management Plan
EOP: Emergency Operations Plan
COOP: Continuity of Operations Plan
REP: Radiological Emergency Plan
SARA: SARA Title III Emergency Response Plan
TP: Transportation Plan
REG-PL: Regional Planning
SO: Subdivision Ordinance
FDPO: Flood Damage Prevention Ordinance
MA: Mutual Aid Agreements
CRS: Community Rating System
CIP: Capital Improvements Plan (that regulates infrastructure in hazard areas)

Jurisdiction	DRP	CP	FMP	SMP	EOP	COOP	REP	SARA	TP	REG	SO	AB	MA	FDPO	CRS	CIP
Unincorporated Brazoria County					x					x		x	X			
Alvin										x		x	X			
Angleton	x	x	x	x	x	x	x	x	x	x	x	x	X	x		x
Bailey's Prairie	x	x	x		x		x		x	x	x	x		x		
Bonney										x		x				
Brazoria					x					x	x	x	X			
Brookside Village										x		x	X			
Clute	x		x		x					x		x	X			x
Danbury										x		x				
Hillcrest										x		x	X			
Holiday Lakes			x							x		x	X	x		
Iowa Colony		x	x		x		x			x	x	x	X	x		x
Jones Creek					x					x		x	X	x		
Lake Jackson	x	x	x	x	x				x	x	x	x	X		x	x
Liverpool										x		x	X			
Manvel	x	x	x	x	x	x	x	x	x	x	x	x	X	x		x
Oyster Creek										x		x				
Quintana										x		x				
Richwood					x	x		x		x		x	X			x
Surfside Beach	x		x	x	x					x	x	x	X	x	x	x
Sweeny	x		x		x	x	x		x	x		x	X			x
West Columbia	x		x		x	x	x		x	x		x	X			x
Alvin ISD												x				
Freeport				x							x		x	x		
Brazosport ISD																
Port Freeport					x					x		x				
Velasco Drainage District	x		x	x	x					x		x				

Expand and Improve

All participating jurisdiction examined their existing authorities, policies, programs and resources. Each participating jurisdiction then identified ways to improve upon and expand their existing authorities to support the mitigation strategy.

Jurisdiction	Capability Expansion Opportunities
Unincorporated Brazoria County	Identified their local budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. Brazoria County will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. They will also expand their mutual aid agreements and continuity of operations plan to include more jurisdictions in the county.
Alvin	Expand and improve their floodplain regulation practices to reduce the effects of flooding on their community.
Angleton	Identified an inadequate budget as a factor that decreases their capability to implement mitigation actions and reduce future damages. Angleton will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. They also plan to expand their mutual aid agreements to address flood emergency response needs.
Bailey's Prairie	Identified the need to improve their fire protection compliance practices. Bailey's Prairie will also expand their local budget to resolve their shortage of technical and administrative staff needed to more effectively implement the HMAP. Baileys Prairie will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards, send technical staff to continuing education courses, and work with elected officials and the public to increase their budget to meet their administrative staff needs and improve infrastructure.
Bonney	Expand their mutual aid agreement practices, and consider drafting and implementing a disaster recovery plan.
Brazoria	Identified the local budget as a factor that decreases their capability to fund technical staff that can implement the mitigation strategy. Brazoria will apply for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. They will expand their mutual aid to better coordinate emergency response services with neighboring jurisdictions and Brazoria County.
Brookside	Brookside will supplement their local budget by applying for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. The jurisdiction will also expand their mutual aid agreements with neighboring jurisdictions in the county.
Clute	Expand their NFIP compliance practices, send technical staff to continuing education courses, and consider the adoption of mutual aid agreements with neighboring jurisdictions.
Danbury	Expand their floodplain regulation practices to reduce the effects of flooding on their community. The city will also consider drafting and implementing a disaster recovery plan and expanding their mutual aid agreements.
Hillcrest	Expand their mutual aid agreement practices, and consider drafting and implementing a disaster recovery plan, and emergency operations plan.
Holiday Lakes	Expand their NFIP compliance practices, improve their current regulation of development in the floodplain, and will consider adopting stronger fire codes.
Iowa Colony	Expand their mutual aid agreements to better coordinate emergency response services with the neighboring jurisdictions and Brazoria County.
Jones Creek	Expand outreach efforts to enroll more residents in their existing education and notification strategy.
Lake Jackson	Expand their mutual aid agreements to better coordinate emergency response services with the neighboring jurisdictions and Brazoria County, and consider the adoption of continuity of operations plan. Lake Jackson identified their Capital Improvements Plan has a program that could be expanded to better mitigate against the natural hazards in their community. Officials will take steps to allocate their budget toward projects that reduce the impacts of natural hazards.
Liverpool	Craft mutual aid agreements and interlocal agreements with the neighboring jurisdictions and Brazoria County.
Manvel	Consider becoming a CRS community to improve NFIP compliance and strengthen flood mitigation practices.
Oyster Creek	Develop and implement a drainage plan or partner with a drainage district to address flooding damages in Oyster Creek.

Quintana	Develop new mutual aid agreements to better coordinate emergency response services with the neighboring jurisdictions and Brazoria County, and consider the adoption of continuity of operations plan.
Richwood	Identified their Capital Improvements Plan has a program that could be expanded to better mitigate against the natural hazards in their community. Richwood will take steps to allocate their budget toward projects that reduce the impacts of natural hazards.
Surfside Beach	Expand their mutual aid agreements to better coordinate emergency response services with the neighboring jurisdictions and Brazoria County.
Sweeny	Sweeny will supplement their local budget by applying for state and federal funding to help fund mitigation actions that reduce the impact of natural hazards. They will also expand their mutual aid agreements and emergency operations plan to include more jurisdictions in the county.
Alvin ISD	Further relationship with County and local emergency coordinators to expand outreach and mitigation efforts across the district
Freeport	Expand outreach efforts to enroll more residents in their existing education and notification strategy.
West Columbia	Expand and improve their Capital Improvements Plan strategy to better mitigate against the natural hazards in their community. West Columbia will take steps to allocate their budget toward projects that reduce the impacts of natural hazards.
Port of Freeport	Improve the Emergency Operations Plan to ensure that communication and utilities are not at risk in the event of a natural disaster.
Velasco Drainage District	Expand their NFIP compliance practices, improve their current regulation of development in the floodplain, and will consider expanding their emergency operations plan.
Brazosport ISD	Collaborate with local and County emergency management officials to implement projects that help to reduce the impacts of natural hazards.

2017

Part 6: Hazard Analysis & Vulnerability Assessment

Part 6: HAZARD & VULNERABILITY ANALYSIS

Introduction

After the potential hazards in the county were identified, the Planning Team reviewed historic data and conducted an analysis in ArcGIS for each hazard. This analysis was presented at the October 16, 2017, public meeting. At this meeting, stakeholders provided many firsthand accounts of damage caused by natural disasters. These reports were taken into consideration and included in the hazard analysis when possible. The result of that process has determined 12 different natural hazards require mitigation efforts. The maps and the discussion that follow are a compilation of data analysis, historic information, and public feedback.

6.1 Flooding

6.2 Wildfire

6.3 Hurricanes and Tropical Storms

6.4 Drought

6.5 Lightning

6.6 Heat Events

6.7 Winter Weather

6.8 Hail

6.9 Tornado

6.10 Dam and Levee Failure

6.11 Expansive Soils

6.12 Coastal Erosion

Part 6.1: Flooding

6.1 Flooding

Floodplains are the primary tool used by FEMA to determine areas at risk of flooding. The periodic flooding of lands adjacent to rivers, streams, and shorelines is a natural and inevitable occurrence that can be expected based upon established recurrence intervals. The recurrence interval of a flood is the average time interval, in years, that can be anticipated between flood events of a certain magnitude. Using the recurrence interval with land and precipitation modeling, forecasters can estimate the probability and likely location of flooding. These are expressed as floodplains. The most commonly used floodplain measurements are the 100-year floodplain and the 500-year floodplain. The 100-year floodplain has a 1 in 100 chances of flooding each year. The 500-year floodplain is estimated to have a 1 in 500 chances of occurring each year.

Flooding causes widespread and varying degrees of damage. The magnitude or extent of flood damage is expressed by using the maximum depth of flood water during a specific flood event. Structures inundated by 4-feet or more of flood water are considered an absolute loss. Other forms of loss, such as roads, bridges, agriculture, services, or death or injury are also summarized by jurisdiction in this plan.

Historic Occurrences

The National Oceanic and Atmospheric Administration (NOAA) collects historic climate data for the entire nation. NOAA's storm event data can be accessed on the National Climatic Data Center (NCDC) storm events database. A condensed version of the Brazoria County flood events data from 2000 - present is provided in the table below. No deaths, injuries, or crop damages were reported in the last 17 years in the county.

Jurisdiction	Date	Property Damage	Notes
Unincorporated	9/13/2000	$150,000	Several roads and railroad underpass impassable in Freeport and Clute. Water inside a house in Clute. Cars flooded and high water in streets in Clute, Freeport, and Danbury. Total of 7.7 inches of rainfall in Angleton.
Unincorporated	6/5/2001	$0	Flooding from T.S. Allison.
Freeport	6/7/2001	$0	Flooding from the remnants of T.S. Allison
Unincorporated	6/8/2001	$0	Flooding from the remnants of T.S. Allison
Unincorporated	6/8/2001	$0	Flooding from the remnants of T.S. Allison
Countywide	6/9/2001	$0	Flooding from the remnants of T.S. Allison
Countywide	6/9/2001	$0	Flooding from the remnants of T.S. Allison
Unincorporated	8/30/2001	$30,000	Highway 35 underpass, South Johnson Street and surrounding streets underwater in Alvin; street flooding in Angleton.
Unincorporated	8/31/2001	$500,000	High water in Alvin, Manvel, and Danbury.
Unincorporated	9/2/2001	$80,000	Homes flooded in the Shadow Bend subdivision on Austin Bayou in Danbury. Numerous streets flooded, including Highway 6 between Manvel and Alvin and Highway 36 in Damon.
Angleton	8/15/2002	$50,000	Street flooding in Angleton and Lake Jackson.
Alvin	8/15/2002	$90,000	Several roads in and around Alvin have high water; water is in homes in Alvin.
Freeport	9/6/2002	$25,000	Numerous roads flooded and impassable from Freeport to Lake Jackson.
Sweeny	9/7/2002	$250,000	Waist deep water and flooding in Sweeny.
Freeport	9/9/2002	$30,000	Two feet of water on streets in Freeport.
Countywide	9/10/2002	$30,000	Countywide flooding due to training cells.
Countywide	11/5/2002	$35,000	Numerous roads closed due to high water on extremely saturated grounds.
Unincorporated	12/4/2002	$2,000	Flooding in extreme northeast portion of county.
Lake Jackson	9/4/2003	$10,000	Bumper-high street flooding. Water threatening homes in the Winding Woods subdivision.

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Manvel	10/9/2003	$15,000	Flooding over County Road 190, west of Highway 146, forced its closure. Subdivision along Highway 6 in Manvel experienced flooding.
Sweeny	6/23/2004	$5,000	Roads flooded in and around Sweeny.
Brazoria	10/16/2006	$500,000	Approximately 115 homes flooded in several locations. Several roads flooded including County Road 5995 near Bastrop Bayou, Highway 36 and County Road 304 near Jones Creek, and near County Road 769B.
Freeport	4/25/2007	$15,000	Water reported in a couple of homes in and around the old Velasco District.
Angleton	5/28/2007	$110,000	Three flooded homes with over a foot of water in them off Henderson Road. Reports of 50 more flooded homes, or homes with water damage, in Angleton.
Angleton	5/28/2007	0	Flooding across Highway 288 near the intersections of FM 523 and County Roads 340 and 341. Flooding also reported on Highway 35 between Angleton and West Columbia.
Unincorporated	7/1/2010	0	Numerous roads were closed due to high water in Sweeny and West Columbia.
Sweeny	7/1/2010	$500,000	Heavy rainfall caused flooding of 30 to 35 homes in the town of Sweeny.
West Columbia	7/1/2010	$1,250,000	Flooding of 40 to 45 homes and businesses in the town of West Columbia.
Brazoria	1/22/2015	$1,000	The intersection of CR 353 and CR 354 between West Columbia and Brazoria was barricaded.
Lake Jackson	4/14/2015	$0	Heavy rain caused residential street flooding that left some roadways impassable across northern Lake Jackson.
Unincorporated	4/17/2015	$5,000	Street flooding in the town of Richwood.
Angleton	5/12/2015	$75,000	Widespread flooding was reported with water in homes in Angleton.
Unincorporated	8/28/2016	$12,000	Nearly 6 inches over a relatively short period of time caused flood waters to be reported entering a few homes in northern Freeport. There were reports of water in at least 5 homes in Velasco along 800 north Avenue F. There were numerous reports of flooded roadways and standing water in the Dow Chemical plant.
Danbury	4/18/2017	$450,000	Over 60 homes had a couple of inches of water in the town of Danbury. The worst flooding occurred in the eastern and western side of town, or near the sloughs. Sections of County Roads 208, 201 and 211 were impassable due to the flooding.
Unincorporated	4/18/2017	$0	Flood waters from Halls Bayou came over sections of FM 2004, from FM 2917 to near the Galveston County line, forcing road closures.
Iowa Colony	8/26/2017	$0	There were numerous water rescues within the county; from Pearland down to the Angleton-Lake Jackson area. Flash flood waters, from sheet flooding and bayous/creeks coming out of banks, completely inundated hundreds to thousands of homes and businesses. Roads and highways in and along the Highway 288 corridor were flooded and therefore closed for long time periods. Major record flooding of the Brazos, San Bernard and Oyster Creek caused the flooding of hundreds to thousands of vicinity homes, vehicles and businesses. Numerous roads and homes were inundated with flood waters on east side of Oyster Creek including the Columbia Lakes, Mallard Lakes, Great Lakes, Riverside Estates and Bar X subdivisions as well as homes along CR 39. Other county roads that became impassable due to high flood waters include FM 1462, Highways 35 and 90, FM 950, CR 25, 380A, CR 42 and FM 521. The Phillips refinery outside of the town of Sweeny took on water from the west near Little Linville Bayou. Hanson Riverside County Park along the San Bernard River southwest of West Columbia was inundated and water over-topped the Phillips Terminal.
Unincorporated	8/28/2017	$0	Sections of FM 523 near Highway 288 north of Angleton was closed due to flooding. Major record flooding of the Brazos, San Bernard and Oyster Creek caused the flooding of hundreds to thousands of vicinity homes, vehicles and businesses. Numerous Roads and homes were inundated with flood waters on east side of Oyster Creek including the Columbia Lakes, Mallard Lakes, Great Lakes, Riverside Estates and Bar X subdivisions as well as homes along CR 39. Other county roads that became impassable due to high flood waters include, but are not limited to, FM 1462, Highways 35 and 90, FM 950, CR 25, 380A, CR 42 and FM 521. The Phillips refinery outside of the town of Sweeny took on water from the west near Little Linville Bayou. Hanson Riverside County Park along the San Bernard River southwest of West Columbia was inundated and water over-topped the Phillips Terminal.
Iowa Colony	8/28/2017	$0	Sections of FM 521 near FM 1462 in the Rosharon area were closed due to flooding. Major record flooding of the Brazos, San Bernard and Oyster Creek caused the flooding of hundreds to thousands of vicinity homes, vehicles and businesses. Numerous Roads and homes were inundated with flood waters on east

			side of Oyster Creek including the Columbia Lakes, Mallard Lakes, Great Lakes, Riverside Estates and Bar X subdivisions as well as homes along CR 39. Other county roads that became impassable due to high flood waters include, but are not limited to, FM 1462, Highways 35 and 90, FM 950, CR 25, 380A, CR 42 and FM 521. The Phillips refinery outside of the town of Sweeny took on water from the west near Little Linville Bayou. Hanson Riverside County Park along the San Bernard River southwest of West Columbia was inundated and water over-topped the Phillips Terminal.
Brazoria	8/28/2017	$0	Parts of SH 36 and FM 521 around the town of Brazoria were closed due to flooding. Major record flooding of the Brazos, San Bernard and Oyster Creek caused the flooding of hundreds to thousands of vicinity homes, vehicles and businesses. Numerous Roads and homes were inundated with flood waters on east side of Oyster Creek including the Columbia Lakes, Mallard Lakes, Great Lakes, Riverside Estates and Bar X subdivisions as well as homes along CR 39. Other county roads that became impassable due to high flood waters include, but are not limited to, FM 1462, Highways 35 and 90, FM 950, CR 25, 380A, CR 42 and FM 521. The Phillips refinery outside of the town of Sweeny took on water from the west near Little Linville Bayou. Hanson Riverside County Park along the San Bernard River southwest of West Columbia was inundated and water over-topped the Phillips Terminal.

Source: https://www.ncdc.noaa.gov/stormevents/

Brazoria County Disaster Declarations

There have been twenty-four federally declared flood disasters in Brazoria County since 1973. These events are considered the most significant flood events in Brazoria County's recent history.

Date	Disaster Number	Title	Date (Cont.)	Disaster Number	Title
7/11/1973	398	Severe Storms & Flooding	**7/17/2003**	1479	Hurricane Claudette
7/28/1979	595	Storms & Flash Floods	**9/2/2005**	3216	Hurricane Katrina Evacuation
9/25/1979	603	Severe Storms & Flooding	**9/21/2005**	3261	Hurricane Rita
8/19/1983	689	Hurricane Alicia	**9/24/2005**	1606	Hurricane Rita
4/12/1991	900	Severe Storms & Tornadoes	**8/18/2007**	3277	Hurricane Dean
12/26/1991	930	Severe Thunderstorms & Flood	**8/29/2008**	3290	Hurricane Gustav
10/18/1994	1041	Severe Thunderstorms & Flood	**9/10/2008**	3294	Hurricane Ike
8/26/1998	1239	Tropical Storm Charlie	**9/13/2008**	1791	Hurricane Ike
9/23/1998	1245	Hurricane Georges- Texas	**5/29/2015**	4223	Severe Storms & Tornadoes & Flooding & Straight-line Winds
10/21/1998	1257	Texas Flooding	**11/25/2015**	4245	Severe Storms & Tornadoes & Flooding & Straight-line Winds
9/26/2002	1434	Tropical Storm Fay	**6/11/2016**	4272	Severe Storms & Flooding
11/5/2002	1439	Severe Storms & Tornadoes & Flooding	**8/25/2017**	4332	Hurricane Harvey

Source: https://www.FEMA.gov

NFIP Participation

The National Flood Insurance Program (NFIP) is a voluntary program that aims to reduce the impacts of flooding by incentivizing communities to adopt and enforce floodplain management regulations. The NFIP provides affordable flood insurance for property owners, renters, and businesses in participating communities. This reduces the socio-economic impacts of flooding on communities through risk reduction via flood insurance, and reduces the physical impacts of flooding through beneficial floodplain regulation.

NFIP Participants in Brazoria County:

- City of Alvin
- City of Angleton
- Village of Bailey's Prairie
- Town of Bonney
- Brazoria County
- City of Brazoria
- City of Brookside Village
- City of Clute
- City of Manvel
- Town of Quintana
- City of Sweeny
- City West Columbia
- City of Hillcrest Village
- Town of Holiday Lakes
- City of Iowa Colony
- Village of Jones Creek
- City of Lake Jackson
- City of Danbury
- City of Liverpool
- City of Oyster Creek
- City of Richwood
- City of Surfside Beach
- City of Freeport

Each of the participating jurisdictions has a certified floodplain manager on staff, and/or function under the regulatory umbrella of Brazoria County. To remain NFIP compliant, the CFM's office conducts jurisdiction wide permitting of new development, permit review, flood code enforcement, document flood zones using GIS, educate the public, and provide public assistance. The County CFM regulates new development by determining if the property in question is in a flood hazard area designated by FEMA by the legal description. The next step is to determine the flood elevation for new structures based on the FEMA data.

In May 2005, Commissioners' Court required the elevation to be set at 2-feet above the FEMA elevation based on the large amount of development in the County and to comply with the Countywide Drainage Criteria for new subdivisions. If the property is not located in a flood hazard area, the requirement will be recommended to be 24-inches above existing grade.

To improve flood mitigation efforts and enhance their NFIP program, the participating jurisdictions will adopt and enforce stronger floodplain management regulations for new construction in Special Flood Hazard Areas (SFHAs).

The Port of Freeport, Alvin ISD, Brazoria ISD, and the Drainage District do not participate in the NFIP, because they do not regulate the floodplain in their planning area and are therefore not considered communities under the NFIP.

Repetitive Loss Properties
Repetitive loss properties (RL) are properties that have received a minimum of two insurance payments of $1,000 or more from the NFIP within the last 10 years. Brazoria County has a total of 1,356 RL properties, and 376 severe repetitive loss properties totaling $177,892,291.82 in insurance payouts.

An exhaustive and comprehensive list of all RL properties are listed in Appendix D.

Jurisdiction	Residential RLPs	Non-residential RLPs	SRL Properties	Total RLPs
Unincorporated Brazoria County	738	24	76	762
Alvin	106	6	19	112
Angleton	83	9	22	92
Bailey's Point	9	0	0	9
Brazoria	24	0	2	24
Brookside	35	0	5	35
Clute	16	5	2	21
Danbury	9	0	0	9
Freeport	37	7	2	44
Hillcrest Village	6	0	1	6
Holiday Lakes	1	0	0	1
Iowa Colony	6	0	1	6
Jones Creek	16	0	2	16
Lake Jackson	15	3	0	18
Liverpool	4	0	0	4
Manvel	27	1	4	28
Oyster Creek	6	2	0	8
Quintana	1	0	0	1
Richwood	11	0	3	11
Surfside	123	16	8	139
Sweeny	6	1	3	7
West Columbia	14	0	2	14

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year. The analysis calculates the average number of events in each jurisdiction annually and then calculates the chance of the event occurring in a year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history and an estimate of what the jurisdiction could experience in the future. Information from stakeholders, FEMA, NOAA, and the Department of Homeland Security (DHS) are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- FEMA's Hazus analysis software
- GIS analysis of critical facilities in the floodplain; and
- Stakeholder identified vulnerabilities.

Hazus was used to determine the economic loss and calculate the buildings stock that's at risk of flooding in Brazoria County. Shelter needs were also projected using this method. The complete HAZUS report is in Appendix C. H-GAC maintains a database of critical facilities in Brazoria County. Using GIS, this plan identifies any critical assets located within the 100-year and 500-year floodplain. Stakeholders then provided valuable insight into additional vulnerabilities within their communities. These findings are provided in condensed charts for each jurisdiction.

Brazoria County (All participating jurisdictions)

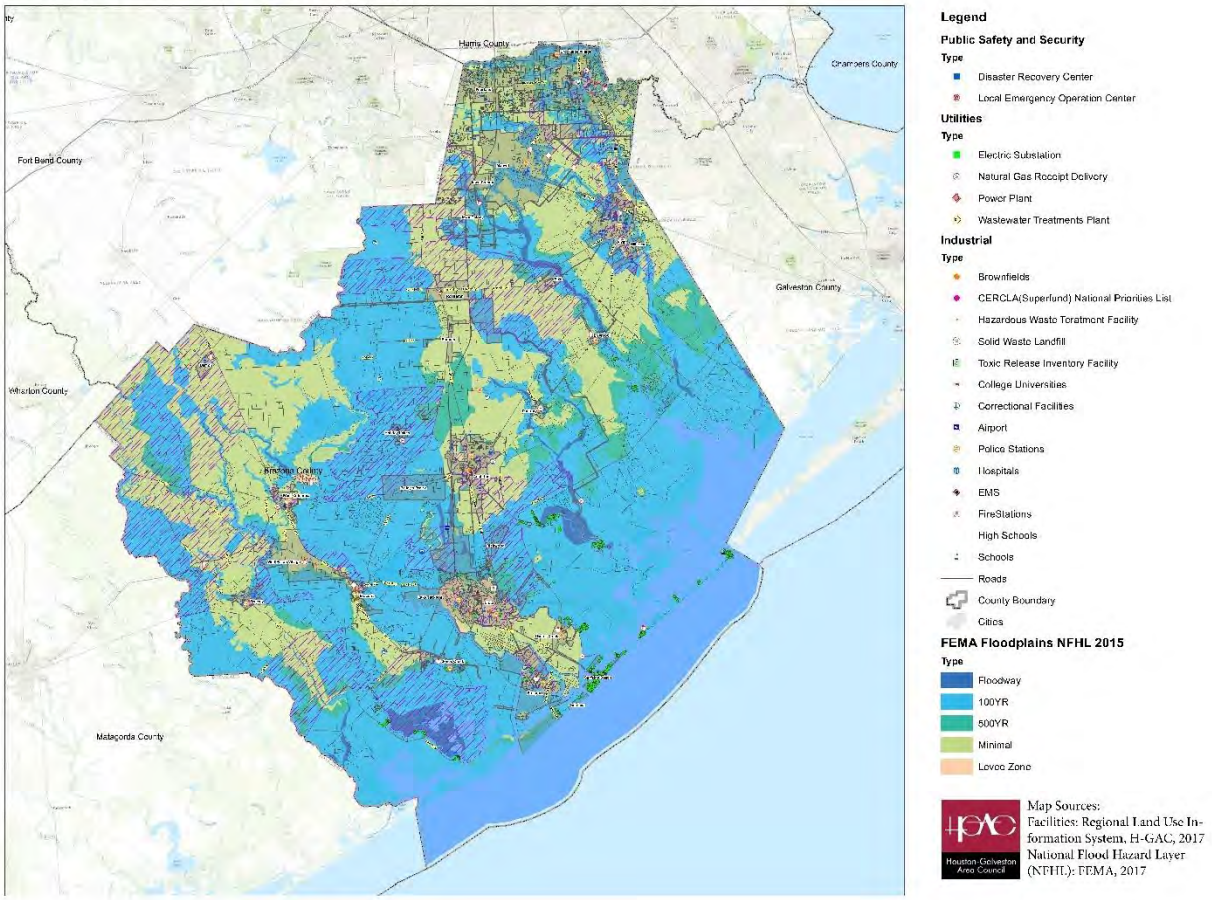
Identified Vulnerabilities:

- Community members and city staff expressed the concern of major infrastructure, roads and bridges, acting as physical barriers throughout the county, in past major flood events this:
    - Prevented water from certain areas, but also allowed for increased floodwaters in other areas
    - Led to rescuers not being able to reach communities where the main highway was the only way for first responders to reach people in need
- Individuals who reside or work within the 100 year or 500 year floodplain
- Communities without emergency shelters, local hospitals, or fire stations- relying on the county or larger jurisdiction for emergency services/ response
- Local farmers and other business owners whose shops or farmland flood
- Industrial sites located throughout the county particularly along the coast

Identified Impacts:

- Major roadways blocked by floodwaters may create an increase of serious injuries or loss of life due to responders not being able to reach those injured or in danger
- Lack of shelters and emergency responders throughout the county may lead to an increase in response time which may lead to a loss of life or serious injury
- Economic and financial loss for cities and individuals including property loss and loss of economic activity from loss of major employers including industrial and farming activities

Floodplains: Brazoria County



Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	12
Area Affected:	61 %	**Annual Event Average:**	1.42

Probability: Very Likely; 100 percent chance the event will occur in a year

Extent: According to past events the county has experienced 5 feet of water; the county can experience 6 to 7 feet of water.

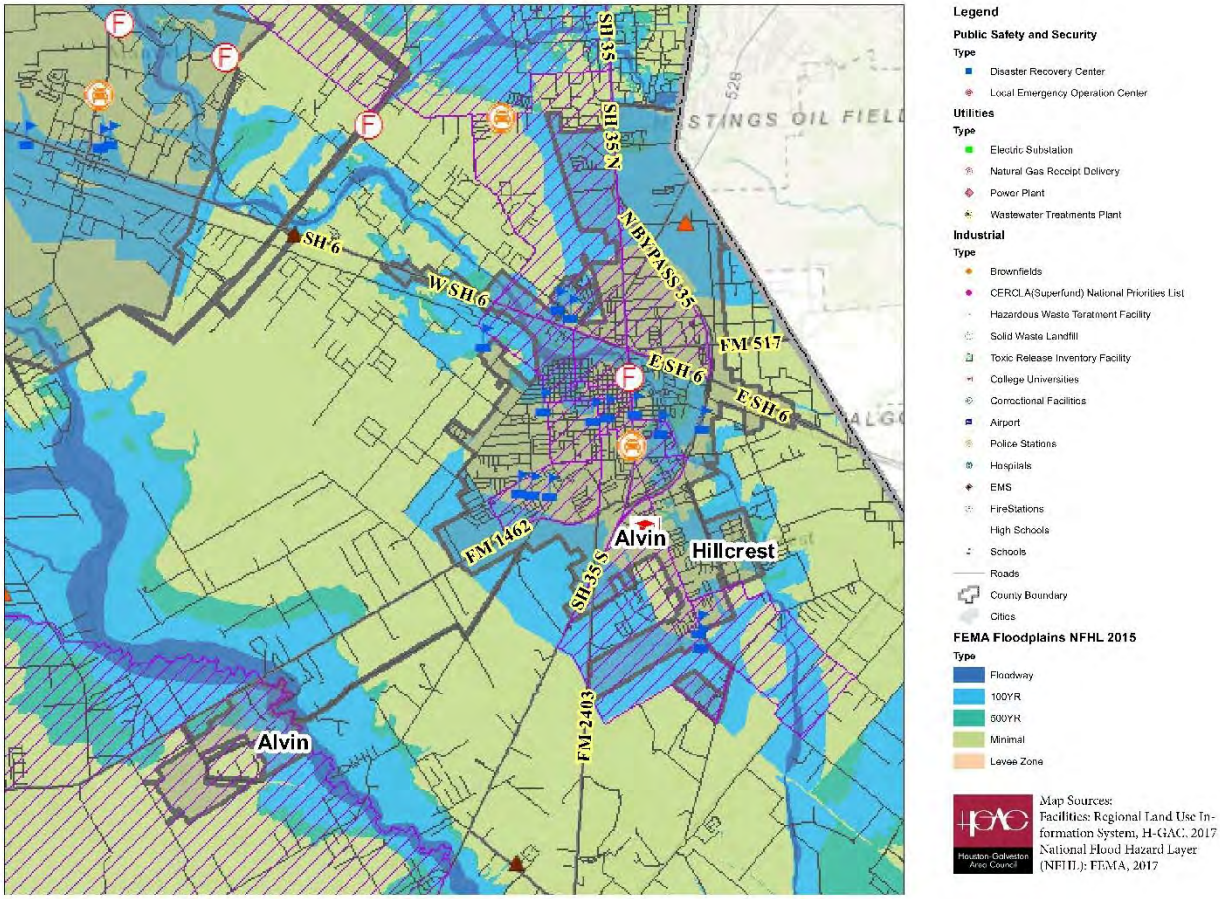
Identified Vulnerabilities:

- Critical facilities including: 3 fire station, 5 schools, 1 shelter, and 2 correctional facilities
- Vulnerable populations concentrated near Brazoria National Wildlife Refuge

Identified Impacts:

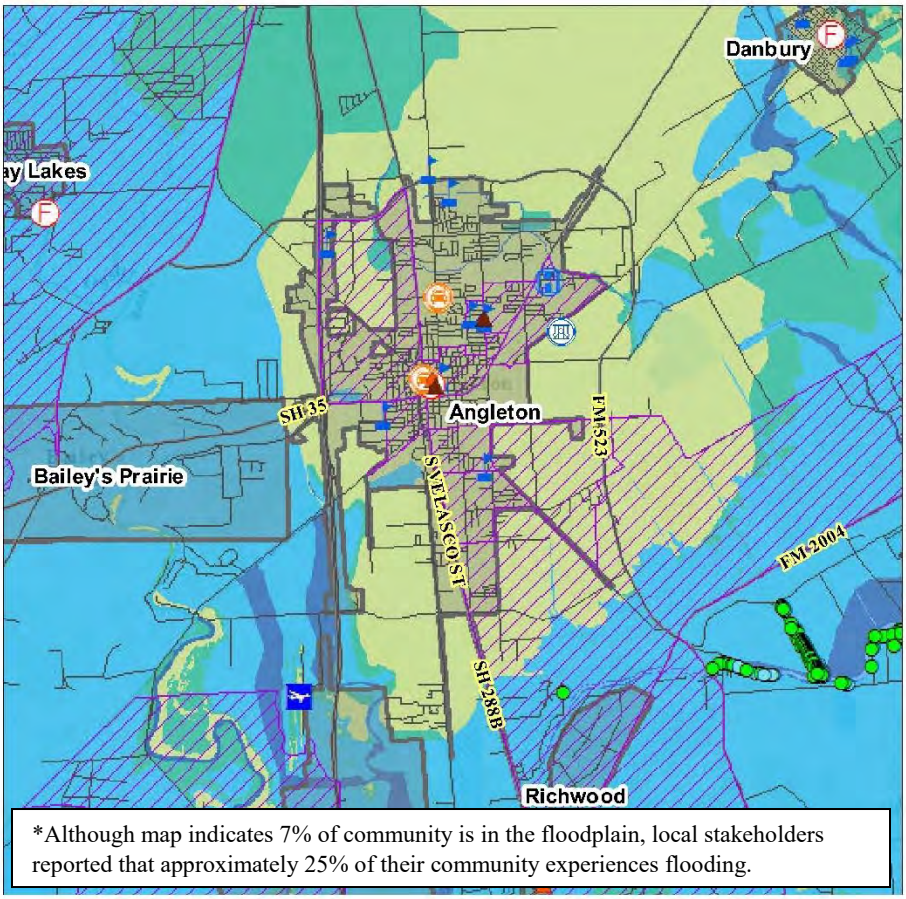
- Vulnerable populations (defined in the Community Profile Section) include residents without cars, funds or other resources to evacuate in case of a flood event; significant injury, loss of life could occur because of the inability evacuate to dry land
- Roadways during future events may become impassable throughout the county due to high flood waters making it difficult or impossible to reach critical facilities or those most in need.
- More than 500 homes throughout the unincorporated areas and commercial establishments may see damage or complete destruction during future events

Floodplains: Alvin



Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	6
Planning Area Affected:	69 %	**Annual Event Average:**	.35
Probability: Likely; 35 percent chance the event will occur in a year			
Extent: According to past events the county has experienced 5 feet of water; the jurisdiction can experience 7 to 8 feet of water.			
Identified Vulnerabilities: • Mustang Bayou runs along the edge of the city; several residential areas are within the 100-year floodplain along the Bayou particularly along W. Talmage Rd. and Bellaire Blvd. **Identified Impacts:** • Injury and loss of life due to flooded homes or traveling on impassable roadways • Residential and commercial property loss. Loss of homes and residents who may have to move due to damage to their home or business			

Floodplains: Angleton



*Although map indicates 7% of community is in the floodplain, local stakeholders reported that approximately 25% of their community experiences flooding.

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2000:**	8
Planning Area Affected:	25 %	**Annual Event Average:**	.47
Probability: Likely; 47 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water.			

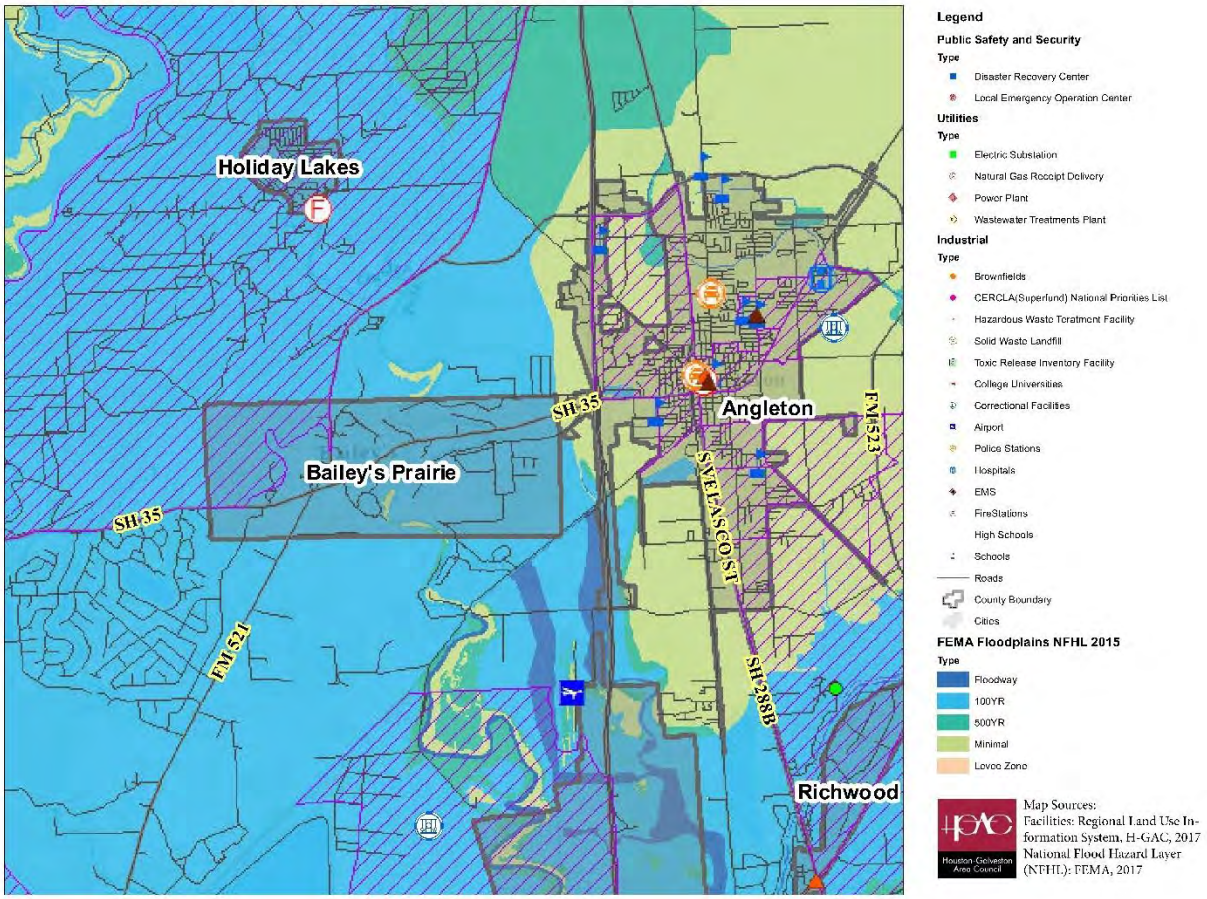
Identified Vulnerabilities:

- Residential neighborhoods in the north of the city are within the 100-year floodplain along North Valderas Street and North Plantation Drive
- Sheet flooding occurs throughout the center of the city with the up to 3 feet of water potentially accumulating near Cannan Drive and North Valderas Street. Sheet flooding could potentially affect the police departments, fire station, shelters, EOC and theater within the city

Identified Impacts:

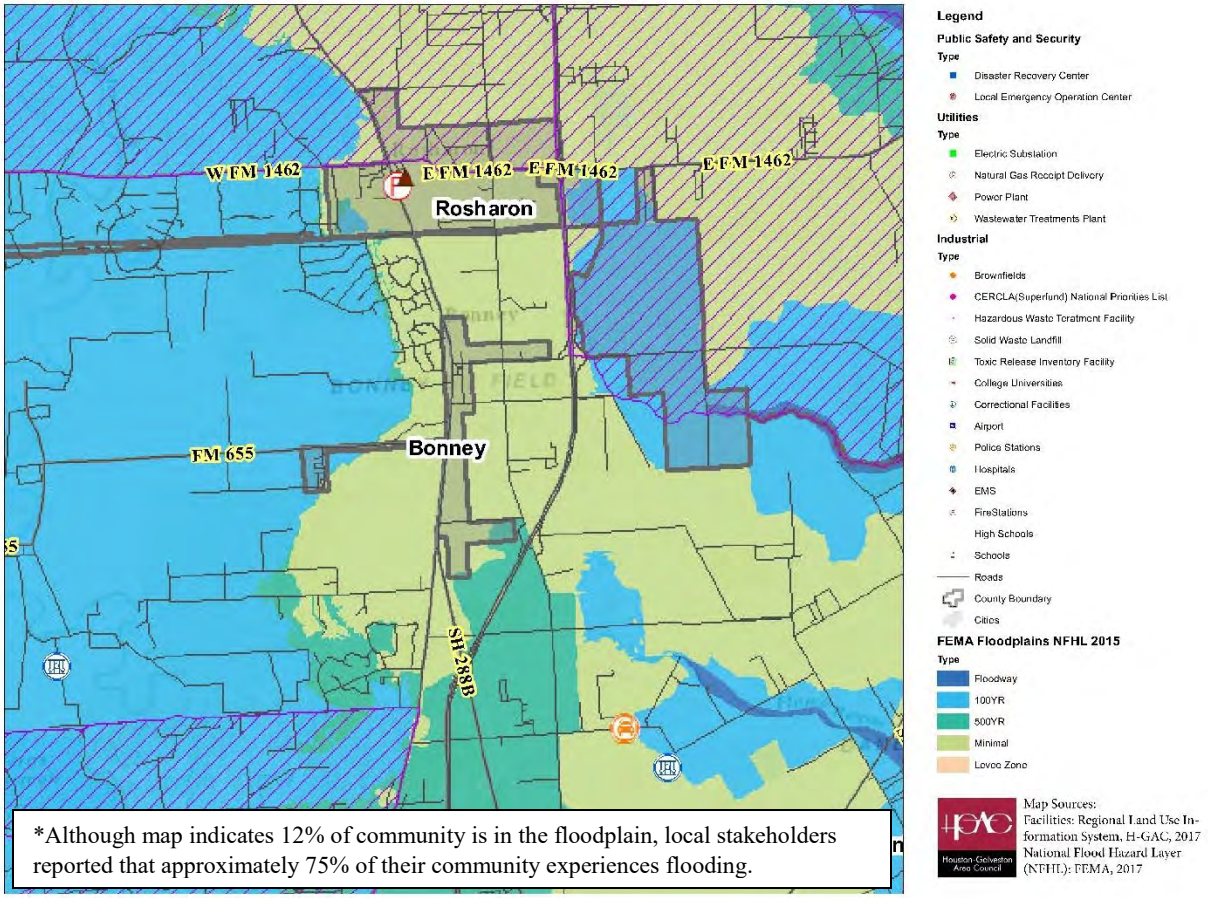
- Potential flooding within critical facilities may lead to first responders not being able to respond to the community's needs such as rescues or calls for help, because of damage sustained to communication systems or equipment within these facilities
- Residential and commercial property loss. Residents with property within or just outside of the 100 to 500-year floodplain may be more likely to see significant damage from flood events
- Significant damage to commercial and residential property may lead to residents moving away and a loss of economic activity throughout the jurisdiction

Floodplains: Bailey's Prairie



Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water.			
Identified Vulnerabilities: • The entire city is within the 100-year floodplain; residential areas in the north along Highway 35 and the south towards 521 are most vulnerable to 3 feet of water • 170 residential structures at risk **Identified Impacts:** • With the entire city within the 100 year-floodplain there is potentially a greater chance that commercial and residential structures throughout the city will flood leading to loss of life, significant injury, and cost of home and business repair • With no police station EMS or fire station, the jurisdiction relies on Angleton's and Brazoria's first responders. If Highway 35 and 521 are impassable due to floodwaters first responders needing to come into the city will have a difficult time reaching residents or visitors within the city. Potentially leading to first responders, residents, and visitors sustaining injuries or a loss of life.			

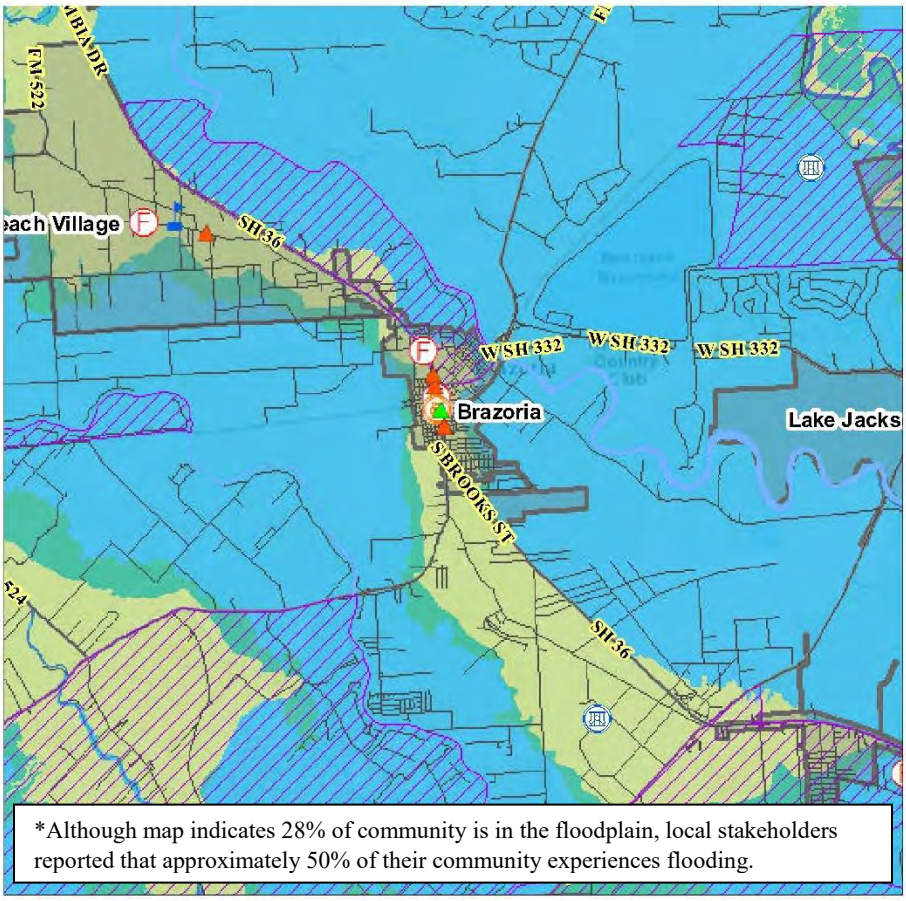
Floodplains: Bonney



*Although map indicates 12% of community is in the floodplain, local stakeholders reported that approximately 75% of their community experiences flooding.

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2000:**	5
Area Affected:	75 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water.			
Identified Vulnerabilities: • In the past, Highway 288 acted as a divider. Everything west of the highway was flooded with up to 3 feet of water; the jurisdiction is west of Highway 288. **Identified Impacts:** • Residential and commercial property loss can occur throughout the city • Reliance on neighboring jurisdictions and county first responders may lead to increased response time which may create a potential for serious injury or loss of life			

Floodplains: Brazoria

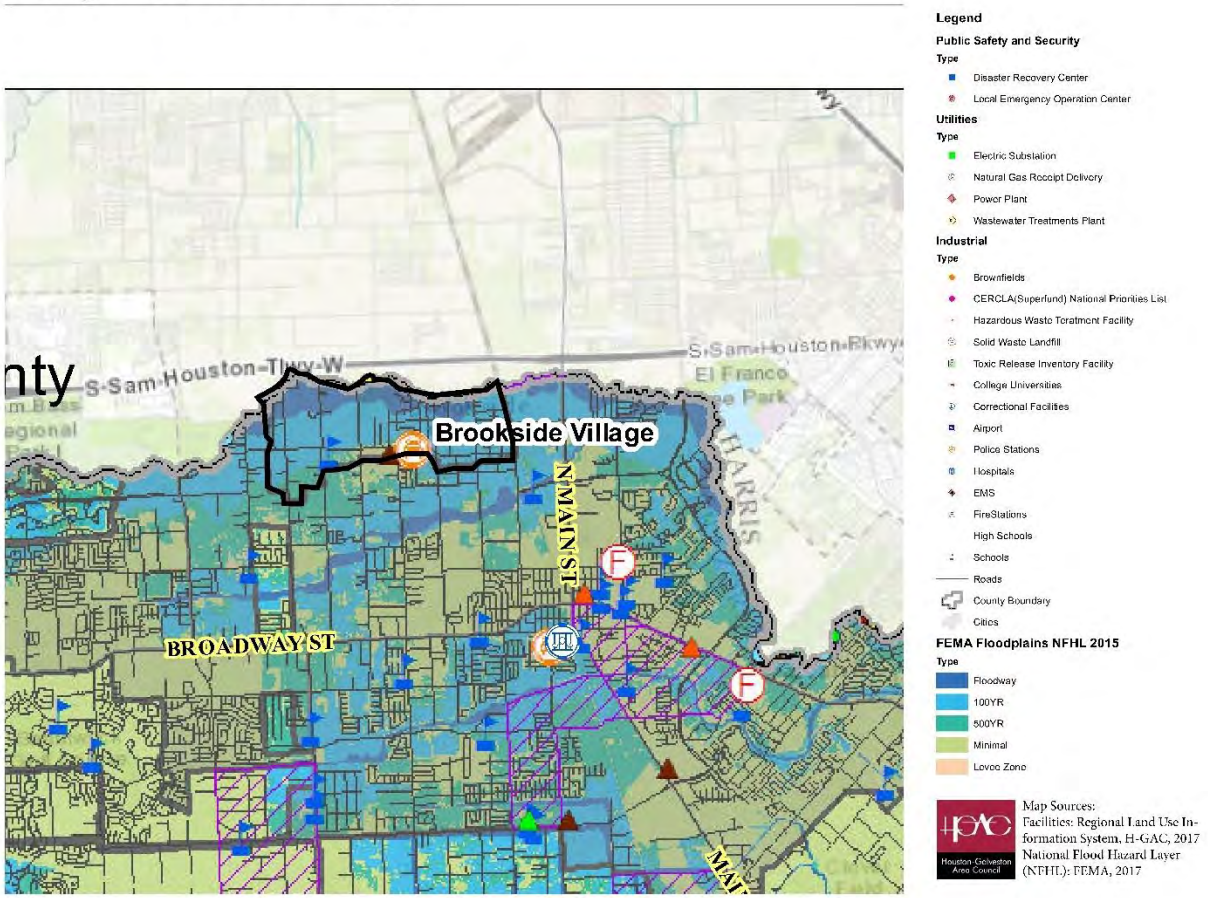


*Although map indicates 28% of community is in the floodplain, local stakeholders reported that approximately 50% of their community experiences flooding.



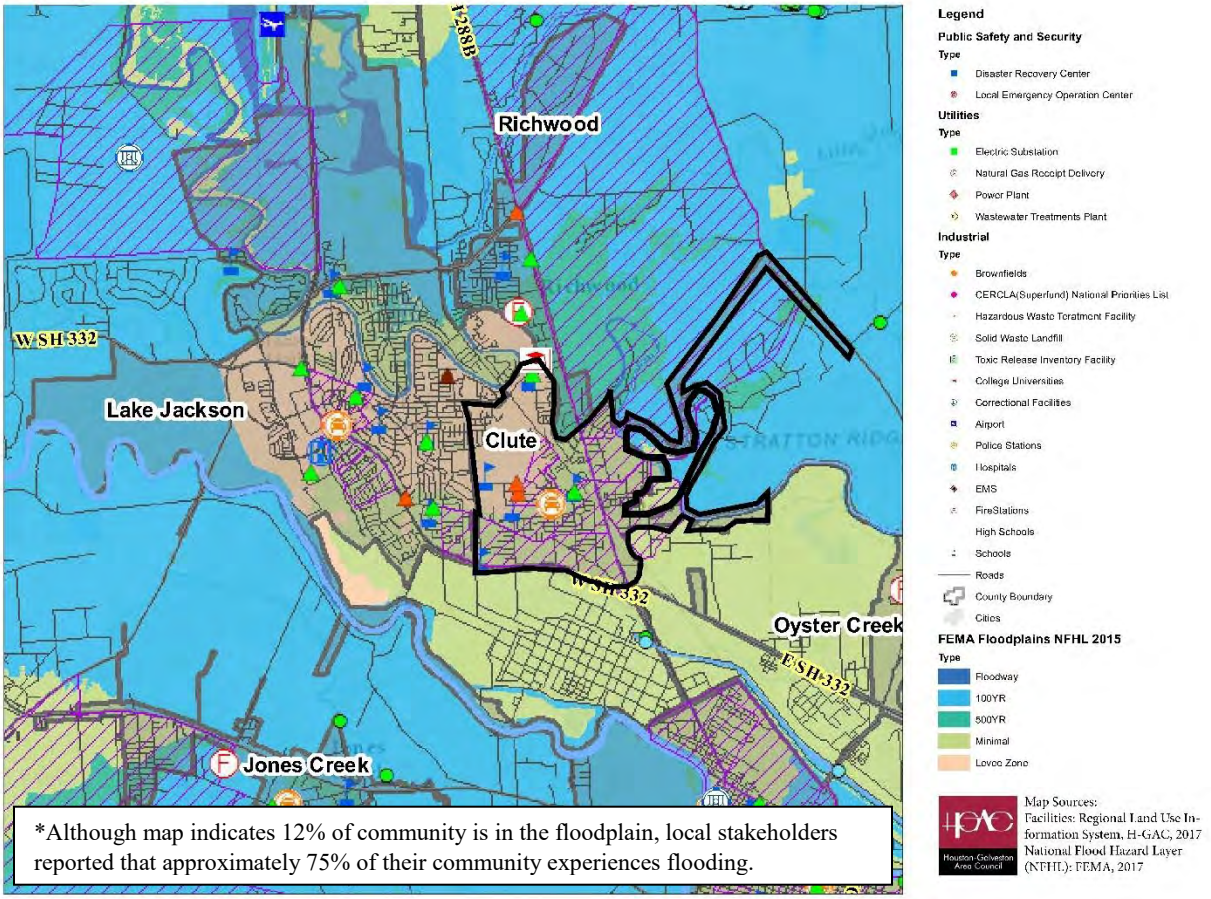
Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	8
Area Affected:	50 %	**Annual Event Average:**	.47
Probability: Likely; 47 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 4 feet of water; the jurisdiction can experience 6 to 7 feet of water.			
Identified Vulnerabilities: • Past flooding along the Brazos River in the north east of the city near Old Brazoria, potential for homes and businesses to be damaged near this area • Wastewater treatment plant flooded due to the San Bernard **Identified Impacts:** • Commercial and residential property loss due to flooding • Financial loss for residents who lost their homes or sustained damage to their homes • Financial loss for the city in terms of losing commercial/ retail areas • A loss of the wastewater treatment plant may lead to a lack of clean water throughout city or sewer-water impacting water quality in local rivers and bayous			

Floodplains: Brookside Village



Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	5
Area Affected:	99 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water.			
Identified Vulnerabilities: • Past flooding has occurred in the north west of the city near Elen Lane and Rice Road, residential and commercial areas are the most vulnerable in these areas. **Identified Impacts:** • Potential loss of life or serious injury could occur for those trapped on flooded roadways, or in homes and commercial areas • Loss of commercial and residential property due to damage from floodwaters; this could lead to individuals displaced from their homes and a financial loss for the city due to the loss in taxes and/ or businesses throughout the jurisdiction			

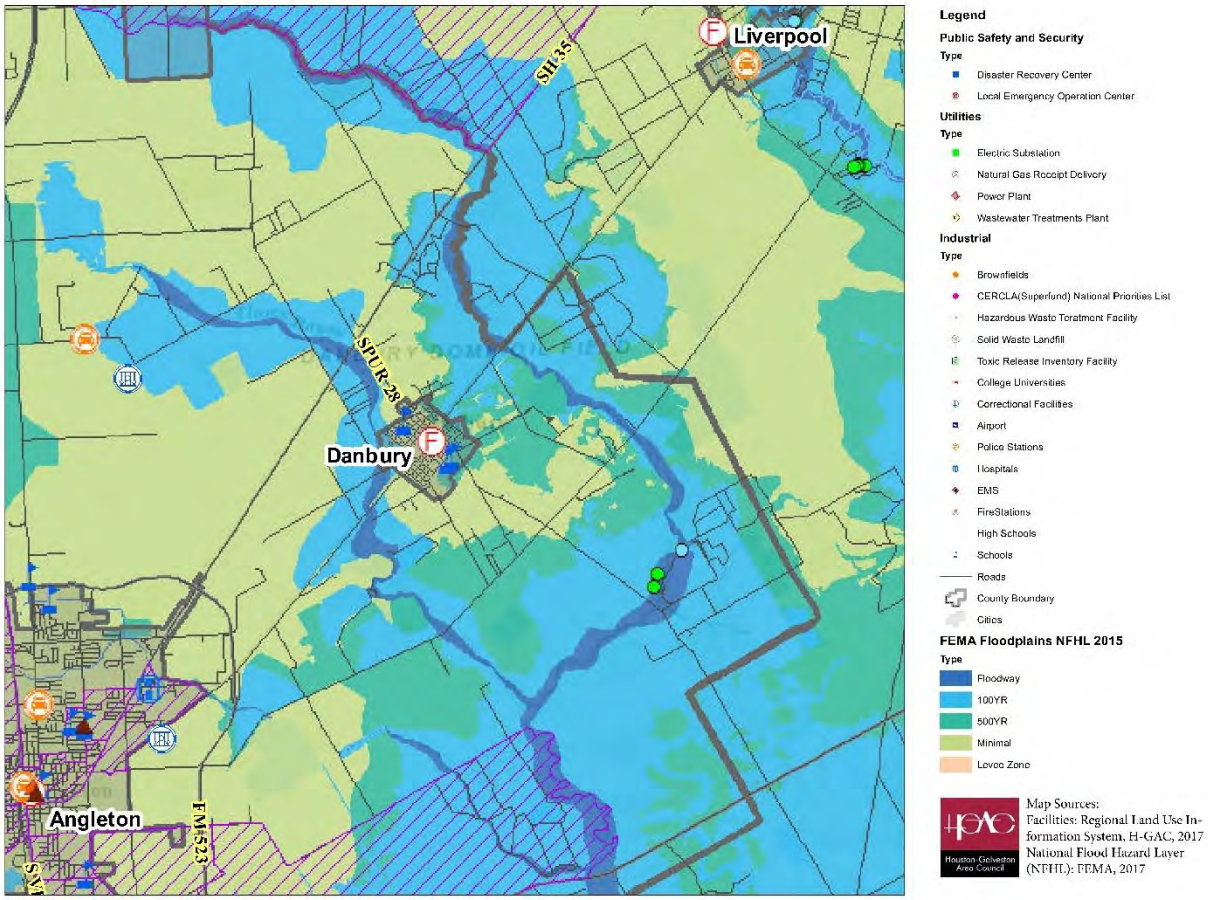
Floodplains: Clute



*Although map indicates 12% of community is in the floodplain, local stakeholders reported that approximately 75% of their community experiences flooding.

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	5
Area Affected:	75 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 6 feet of water			
Identified Vulnerabilities: • Vulnerable populations are concentrated to the northeast and southwest of the city • The vulnerable population to the north east of the city is on the edge of oyster creek which has overflowed in the past. **Identified Impacts:** • Vulnerable populations may have a significantly harder time trying to evacuate during flood events; they may also not have the resources to move away from the floodplain or obtain flood insurance. This may lead to an increase in serious injury or loss of life during events and a loss of residential and commercial property.			

Floodplains: Danbury



Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2000:**	6
Area Affected:	62 %	**Annual Event Average:**	.35

Probability: Likely; 35 percent chance the event will occur in a year

Extent: According to past events the jurisdiction has experienced 2 feet of water; the jurisdiction can experience 3 to 4 feet of water

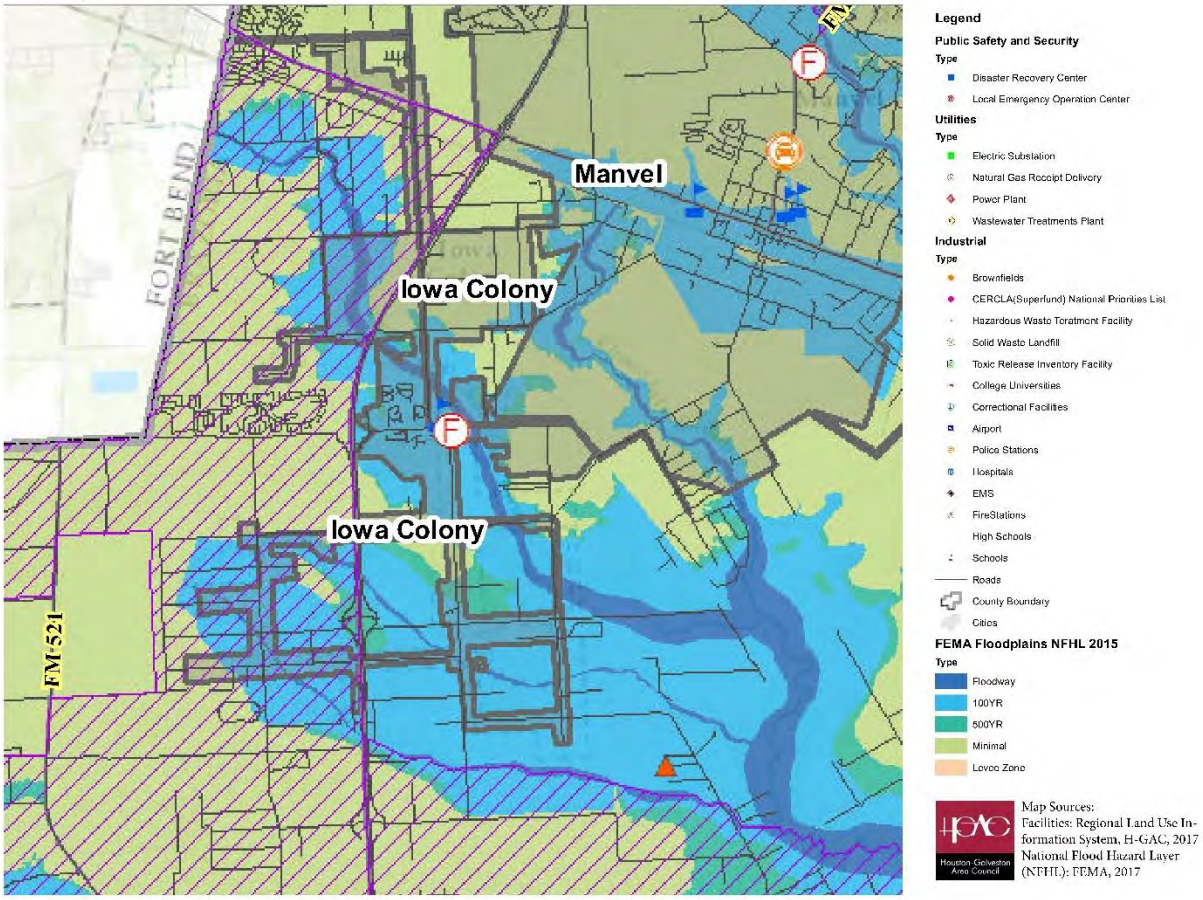
Identified Vulnerabilities:

- The southeast of the city is within the 100-year flood plan and has a concentration of industry and residential areas
- In the north of the city the Danbury oil field and Fish Farms are also located in the 100-year floodplain

Identified Impacts:

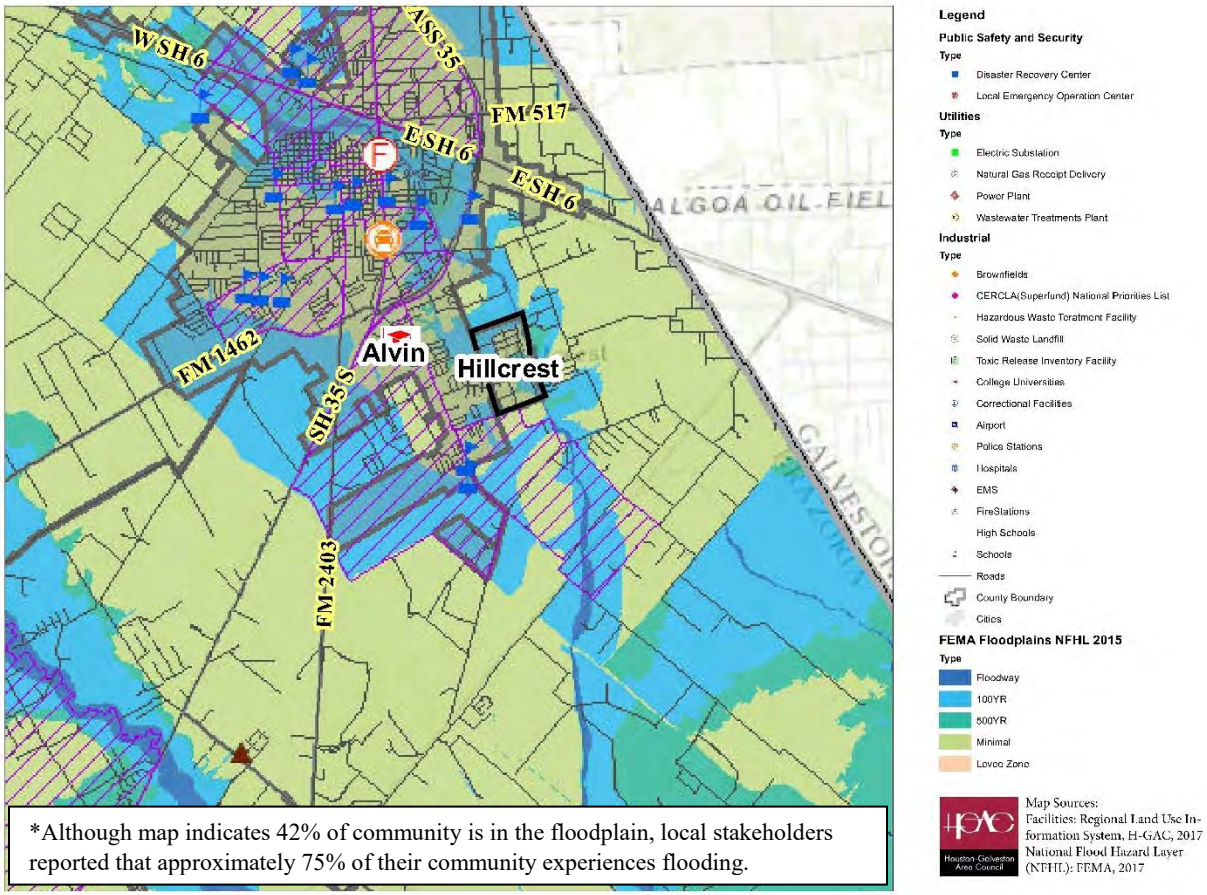
- Residential and commercial property loss due to floodwaters
- A potential for a domino effect; flooding could create a technical hazard because of the location of the oil and industrial sites leading to potential serious injury or loss of life
- Economic loss for the city if main industry and employment centers are flooded and damaged

Floodplains: Iowa Colony



Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2000:**	7
Area Affected:	87 %	**Annual Event Average:**	.41
Probability: Likely; 41 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water			
Identified Vulnerabilities: • 30 homes flooded throughout the city and City Hall flooded with 1.5 feet to 3 feet of water • City Hall currently located within the 100-year floodplain. **Identified Impacts:** • Residential and commercial property loss • Residents displaced from their homes • Delay in city services, because of the loss of City Hall			

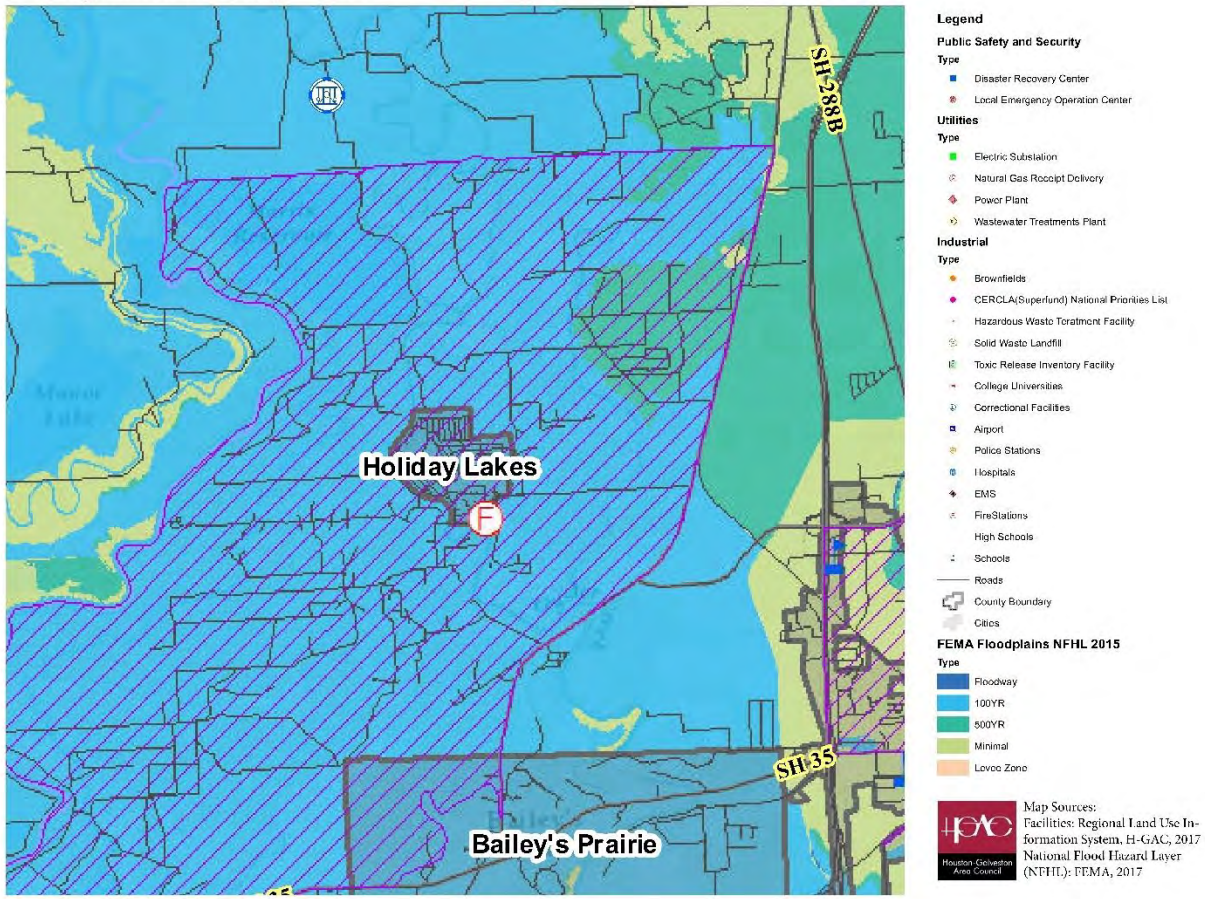
Floodplains: Hillcrest Village



*Although map indicates 42% of community is in the floodplain, local stakeholders reported that approximately 75% of their community experiences flooding.

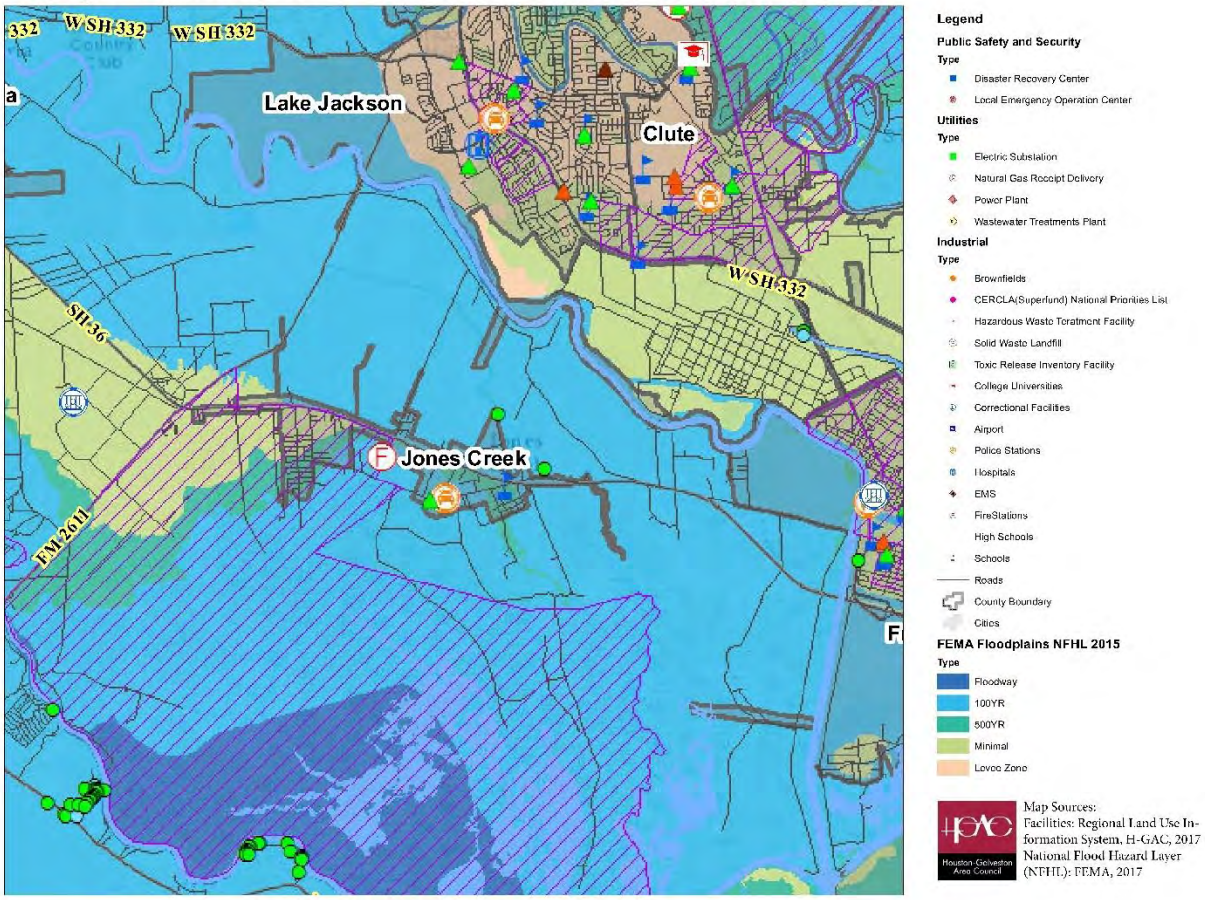
Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2000:**	5
Area Affected:	75 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 5 feet of water; the jurisdiction can experience 6 to 8 feet of water			
Identified Vulnerabilities: • The most vulnerable population in the city is in the northeast. This population is within and just out of the 100-year floodplain in the city. **Identified Impacts:** • Vulnerable populations may have a harder time evacuating during flooding events, potentially leading to an increase loss of life or serious injury • Vulnerable populations may not have the resources to move away from the floodplain; this may lead to reoccurring injuries, property loss, and damage			

Floodplains: Holiday Lakes



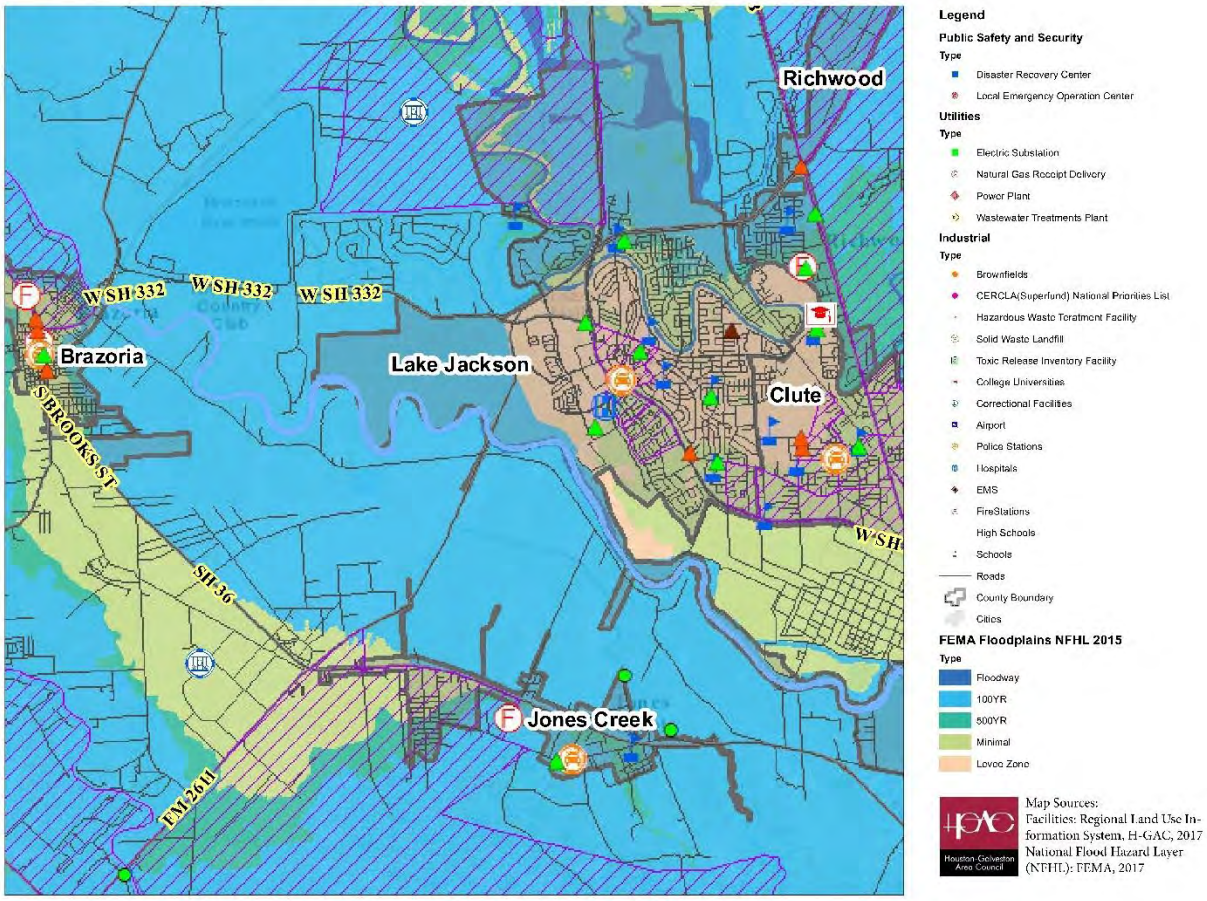
Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 6 feet of water			
Identified Vulnerabilities: • Approximately 60 percent of the city's residential areas are within the 100-year floodplain • The city is surrounded by the 100-year floodplain **Identified Impacts:** • Loss of or significant damage to commercial and residential property due to flood damage • With the city surrounded by the 100-year flood plain and the city depending on the Angleton fire department there may be loss of life or serious injury due to a potential delay in response during large scale events			

Floodplains: Jones Creek



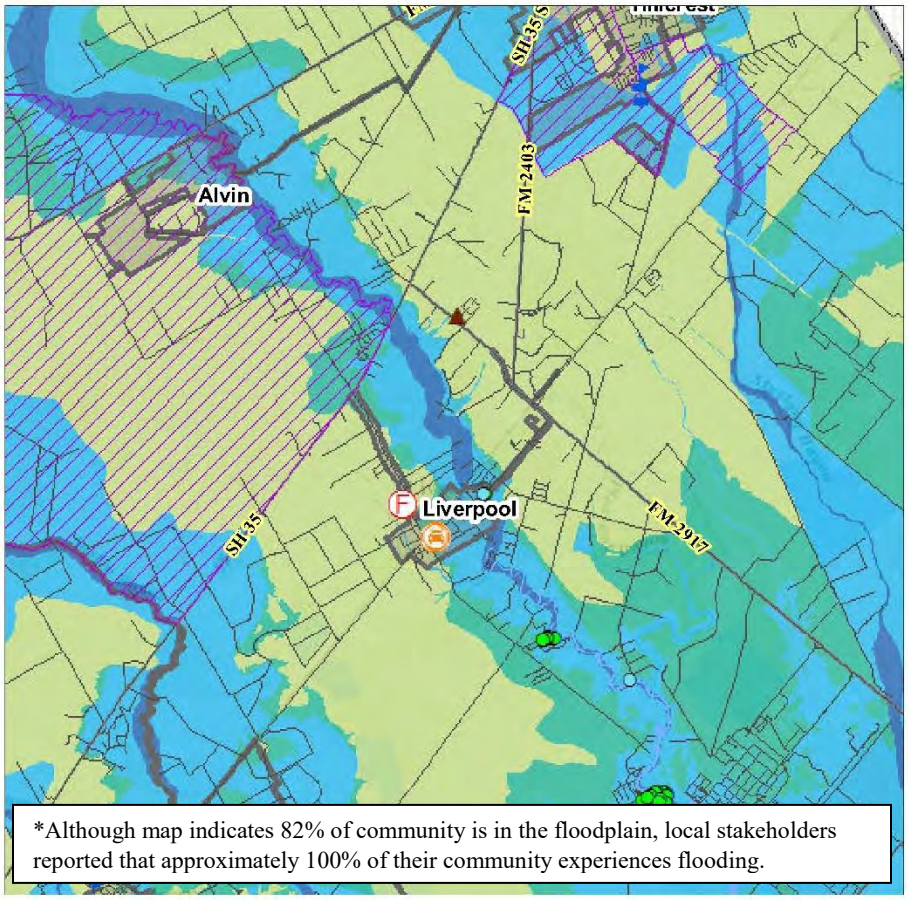
Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	5
Area Affected:	86 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 5 to 7 feet of water			
Identified Vulnerabilities: • Residential areas in the far east of the city are just outside of the 100-year floodplain. • Highway 36, which has flooded in the past, runs directly through the city **Identified Impacts:** • Residential and commercial property loss due to flood damage • If a major roadway becomes impassable, serious injury or loss of life could occur because of residents not being able to evacuate or first responders unable to reach residents in homes			

Floodplains: Lake Jackson



Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	6
Area Affected:	71 %	**Annual Event Average:**	.35
Probability: Likely; 35 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced .5 feet of water; the jurisdiction can experience 1 to 2 feet of water			
Identified Vulnerabilities: • The 100-year floodplain runs just east of the city • Residential areas in the northeast of the city are within the 100-year floodplain **Identified Impacts:** • Serious injury or loss of life with residents or visitors trying to evacuate from flooded homes and or neighborhoods • Residential property loss throughout the east of the city • Economic loss due to residents displaced from their homes			

Floodplains: Liverpool



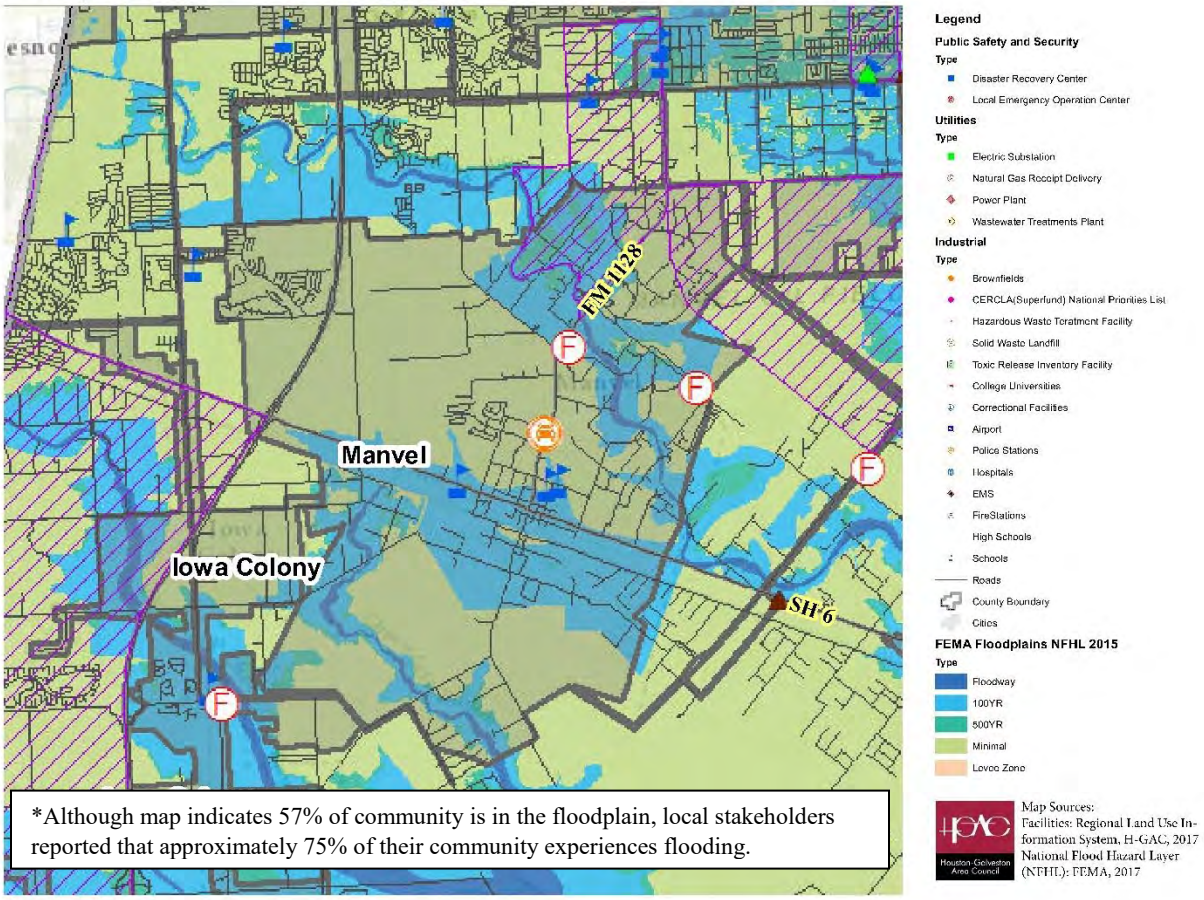
*Although map indicates 82% of community is in the floodplain, local stakeholders reported that approximately 100% of their community experiences flooding.



Map Sources: Facilities: Regional Land Use Information System, H-GAC, 2017 National Flood Hazard Layer (NFHL): FEMA, 2017

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3.5 feet of water; the jurisdiction can experience 5 to 7 feet of water			
Identified Vulnerabilities: • The far east of the city along Chocolate Bayou is within the 100-year floodplain; residential areas are prone to flooding throughout this area **Identified Impacts:** • Residential and commercial property loss throughout the east of the city • Loss of life or serious injury for those trying to evacuate from their homes and neighborhoods			

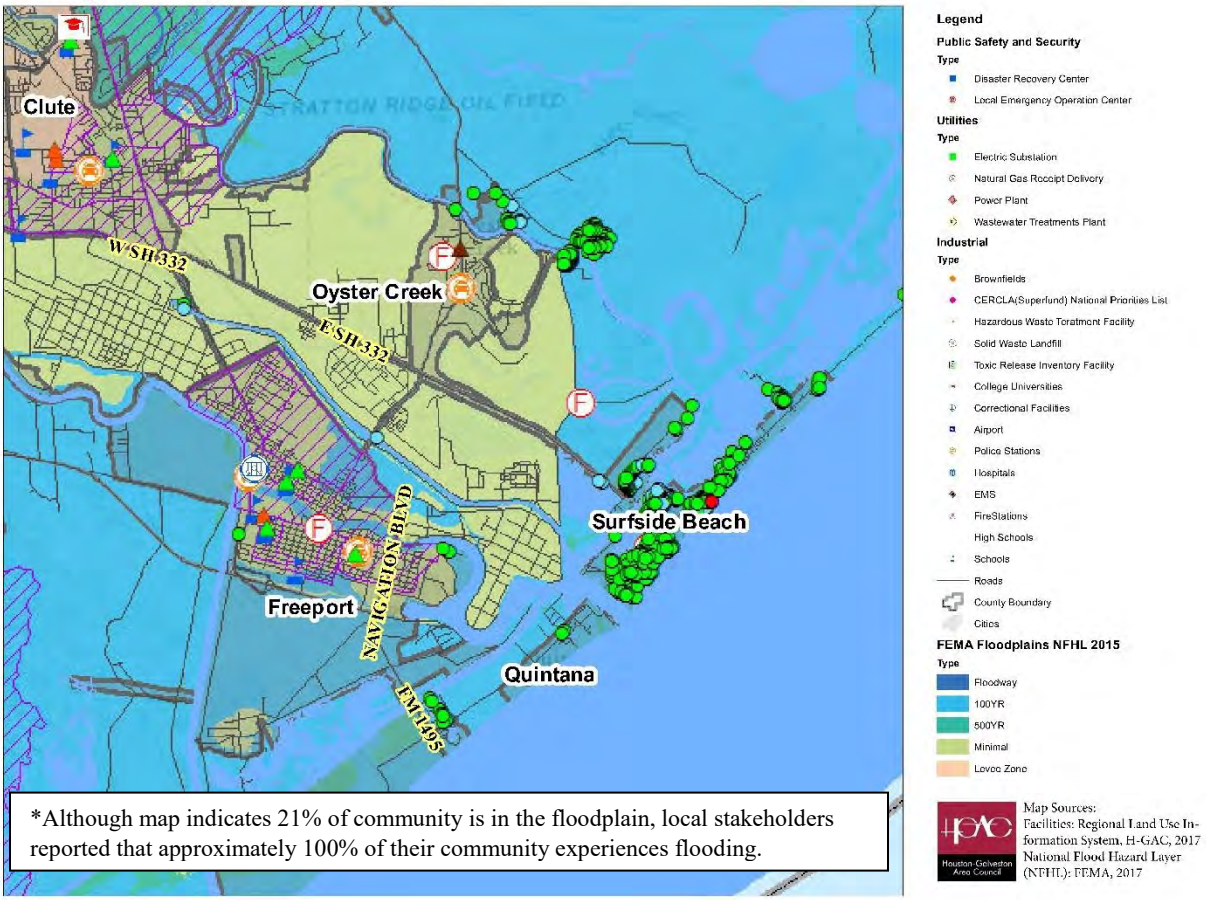
Floodplains: Manvel



*Although map indicates 57% of community is in the floodplain, local stakeholders reported that approximately 75% of their community experiences flooding.

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2000:**	6
Area Affected:	75 %	**Annual Event Average:**	.35
Probability: Likely; 35 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water			
Identified Vulnerabilities: • Mustang Bayou runs through the east of the city; homes near Mustang Bayou are prone to flooding • Commercial and residential areas along Bissell Road toward TX 288 are prone to sheet flooding **Identified Impacts:** • Loss of commercial and residential properties throughout the city • Serious injury or loss of life of those trying to evacuate their neighborhood or commercial areas • Economic loss with residents displaced from their homes and businesses shut down throughout the city			

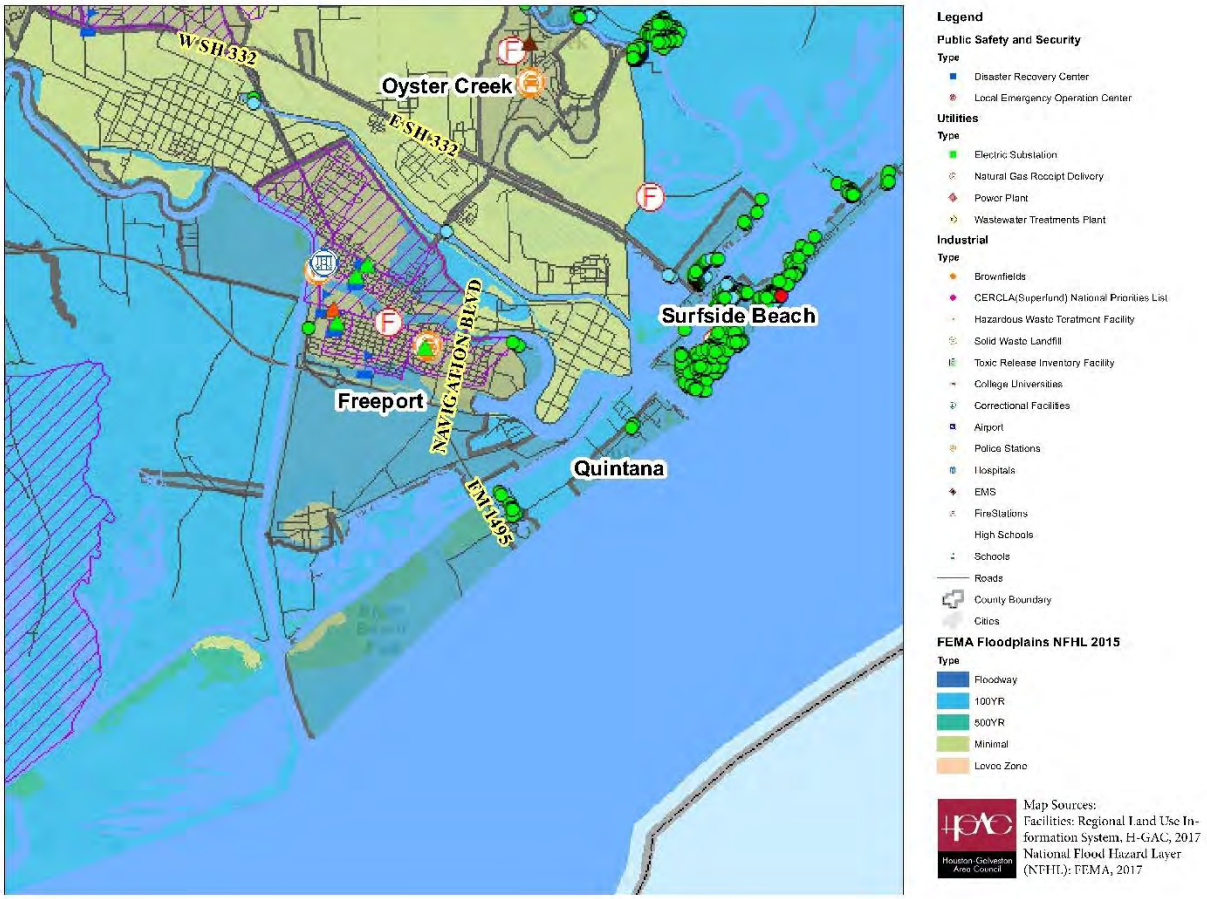
Floodplains: Oyster Creek



*Although map indicates 21% of community is in the floodplain, local stakeholders reported that approximately 100% of their community experiences flooding.

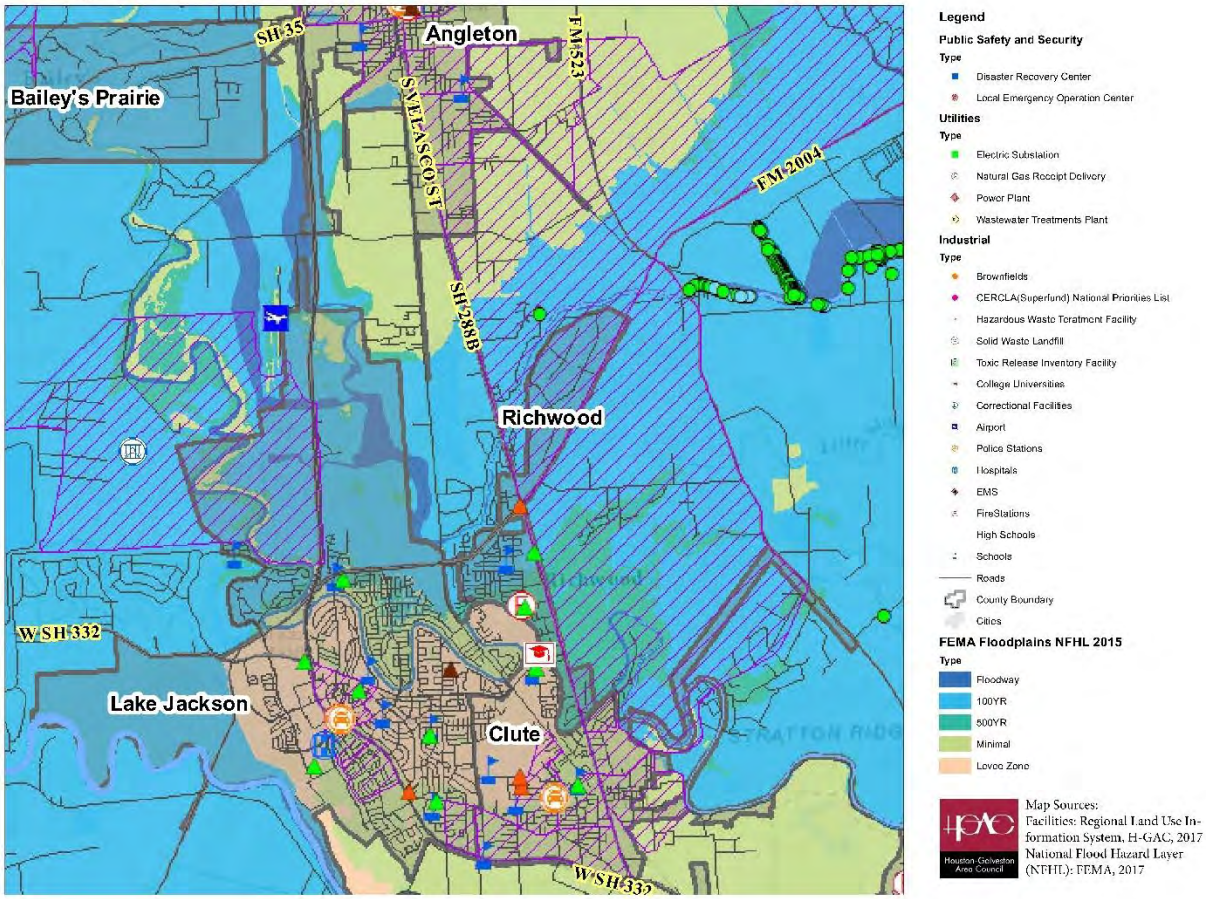
Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water			
Identified Vulnerabilities: • The northeast of the city is adjacent to oyster creek and is within the 100-year floodplain • The city's largest retail center is in this area as well as residential areas; these areas are prone to flooding. **Identified Impacts:** • Commercial and residential property loss throughout the city, particularly in the northeast of the city • Economic loss for the city and local business that could be damaged during flooding • Financial loss for residents who were displaced because of the event and/ or whose homes were destroyed or damaged due to the event.			

Floodplains: Quintana



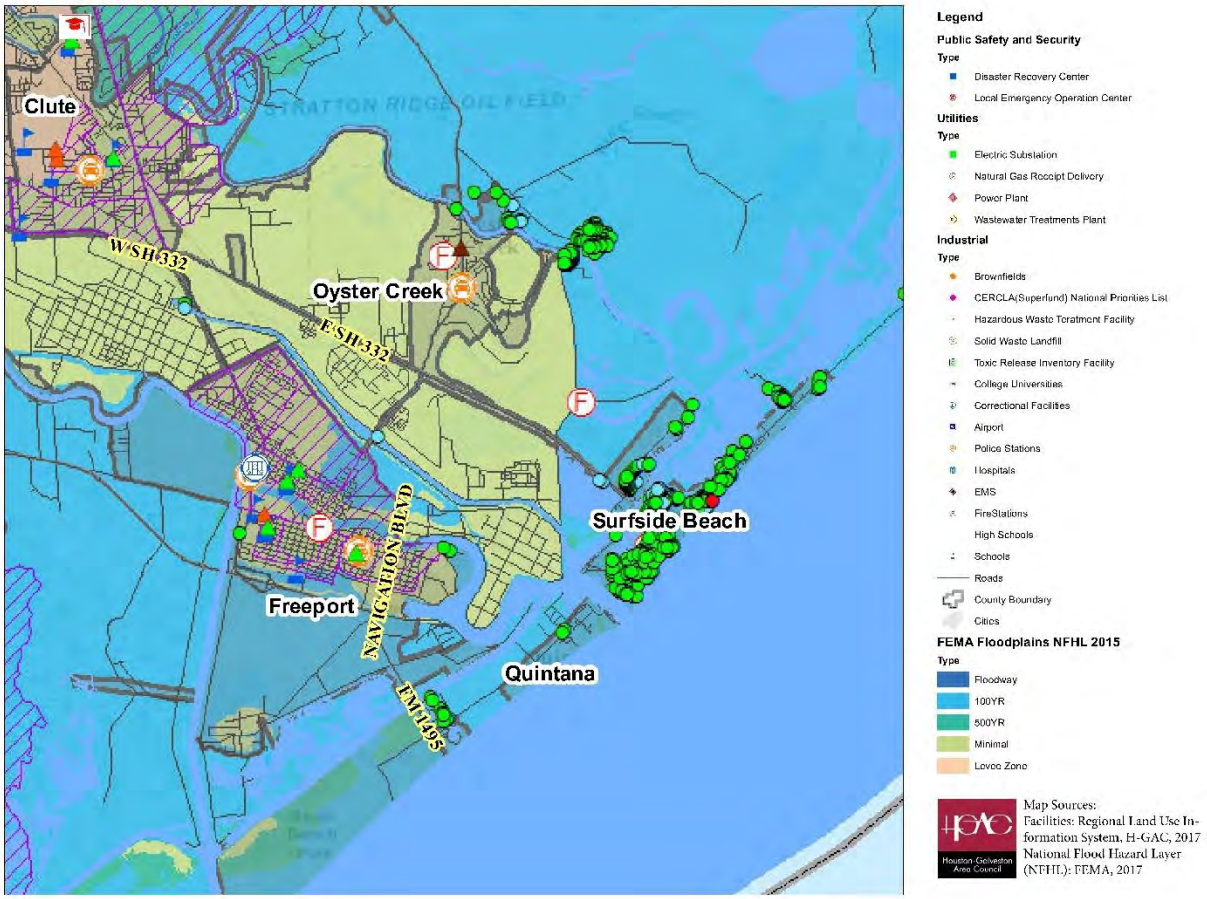
Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 1.6 feet of water; the jurisdiction can experience 3 to 4 feet of water			
Identified Vulnerabilities: • The entire city is within the 100-year floodplain • The port facility to the northeast is considered a critical facility and is within the 100-year floodplain • Residential and commercial areas throughout the city are prone to flooding **Identified Impacts:** • Residential, commercial and public property loss due to flood events • Loss of basic city services with the potential for the entire city to flood during events • Economic loss for the city with a loss of public and commercial activity • Financial loss for residents whose homes were destroyed or damaged			

Floodplains: Richwood



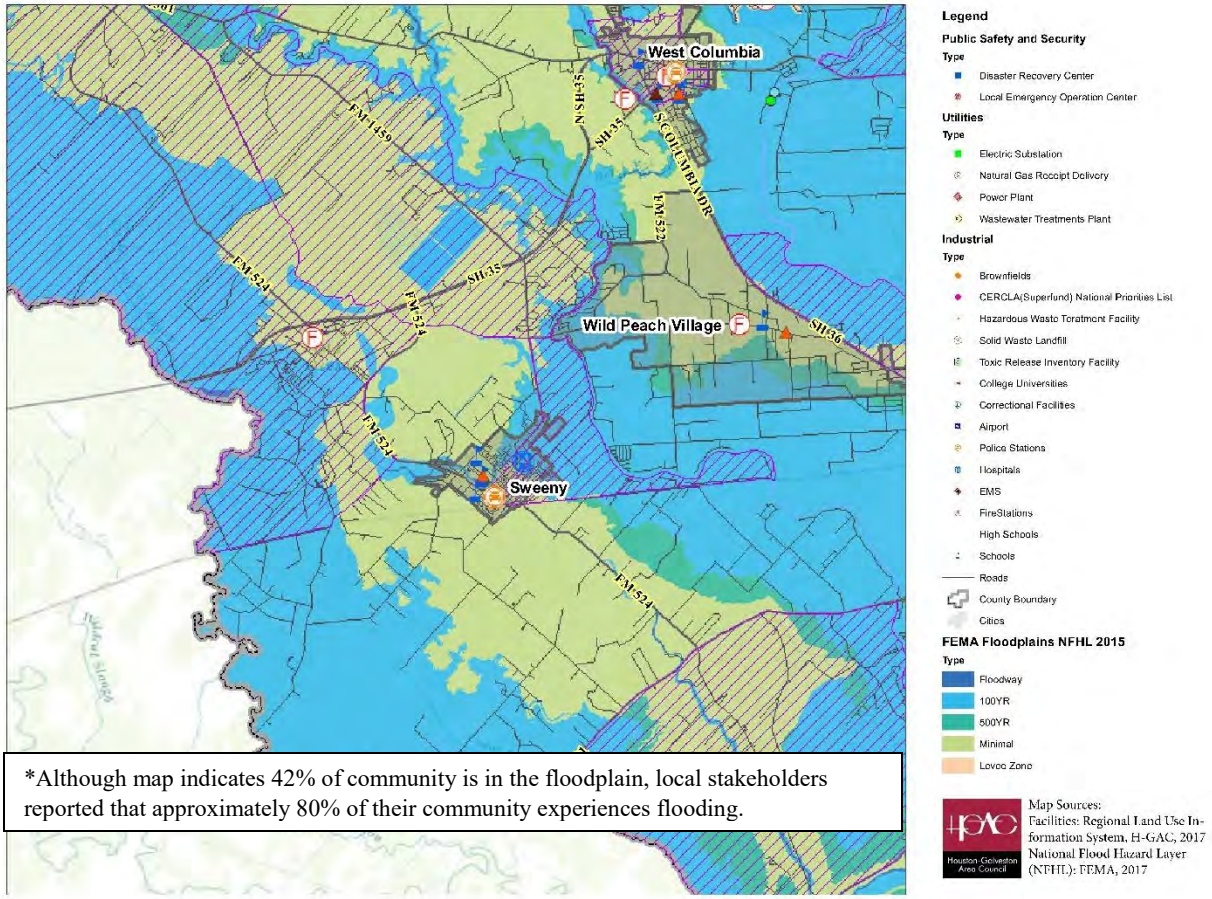
Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	5
Area Affected:	100%	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 5 feet of water; the jurisdiction can experience 6 to 7 feet of water			
Identified Vulnerabilities: • 264 homes have flooded in the past from a single event; homes to the southwest of the city along Oyster Creek are prone to flooding • Highway 2004 and Brazos Crossing neighborhood is prone to flooding **Identified Impacts:** • Residential property loss throughout the southwest of the city • Financial loss for residents displaced by the event			

Floodplains: Surfside Beach



Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 1.7 feet of water; the jurisdiction can experience 3 to 4 feet of water			
Identified Vulnerabilities: • The entire jurisdiction is located within the 100-year floodplain. • Toxic release site located in the center of town within the 100-year floodplain • Port facility and police station are located within the 100-year floodplain **Identified Impacts:** • Loss of public, commercial, and residential property throughout the city • Financial and economic loss for residents and the city due to a lack of public services, commercial activity and damage to homes • Potential for a compounding hazard; if the toxic release site is flooded this may result in a technical hazard that leads to further injuries, loss of life or property damage			

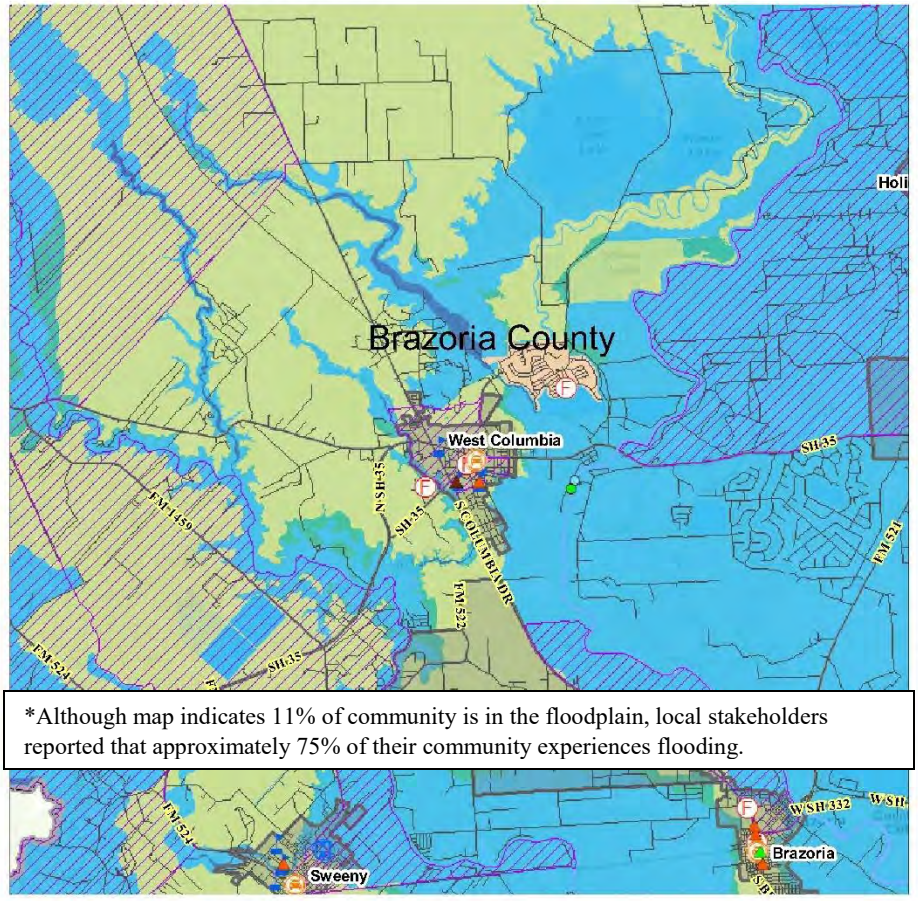
Floodplains: Sweeny

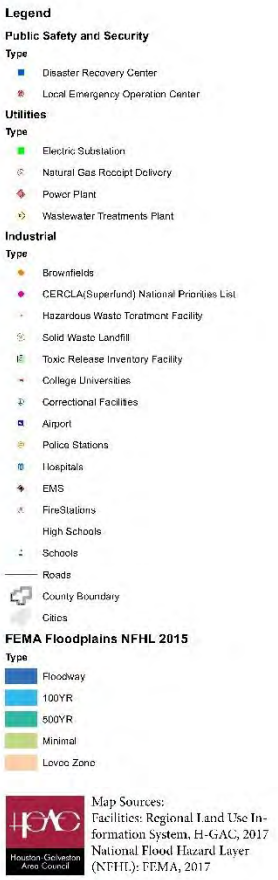


*Although map indicates 42% of community is in the floodplain, local stakeholders reported that approximately 80% of their community experiences flooding.

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	6
Area Affected:	80 %	**Annual Event Average:**	.35
Probability: Likely; 35 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 1 foot of water; the jurisdiction can experience 2 to 3 feet of water			
Identified Vulnerabilities: • Electric substation and hospital are in the AO flood zone; where sheet flooding could be expected • Roads throughout the city are prone to flooding; in past events road 524 was the only way out of the city **Identified Impacts:** • Loss of power throughout the city potentially leading to loss of communication with residents needing assistance • Loss of available hospital beds or needed medical devices and medical help in the city- leading to serious injury or death and stress on neighboring jurisdictions first responders and hospital systems • Serious injury or loss of life due to residents and visitors unable to evacuate due to flooded major roadways			

Floodplains:West Columbia



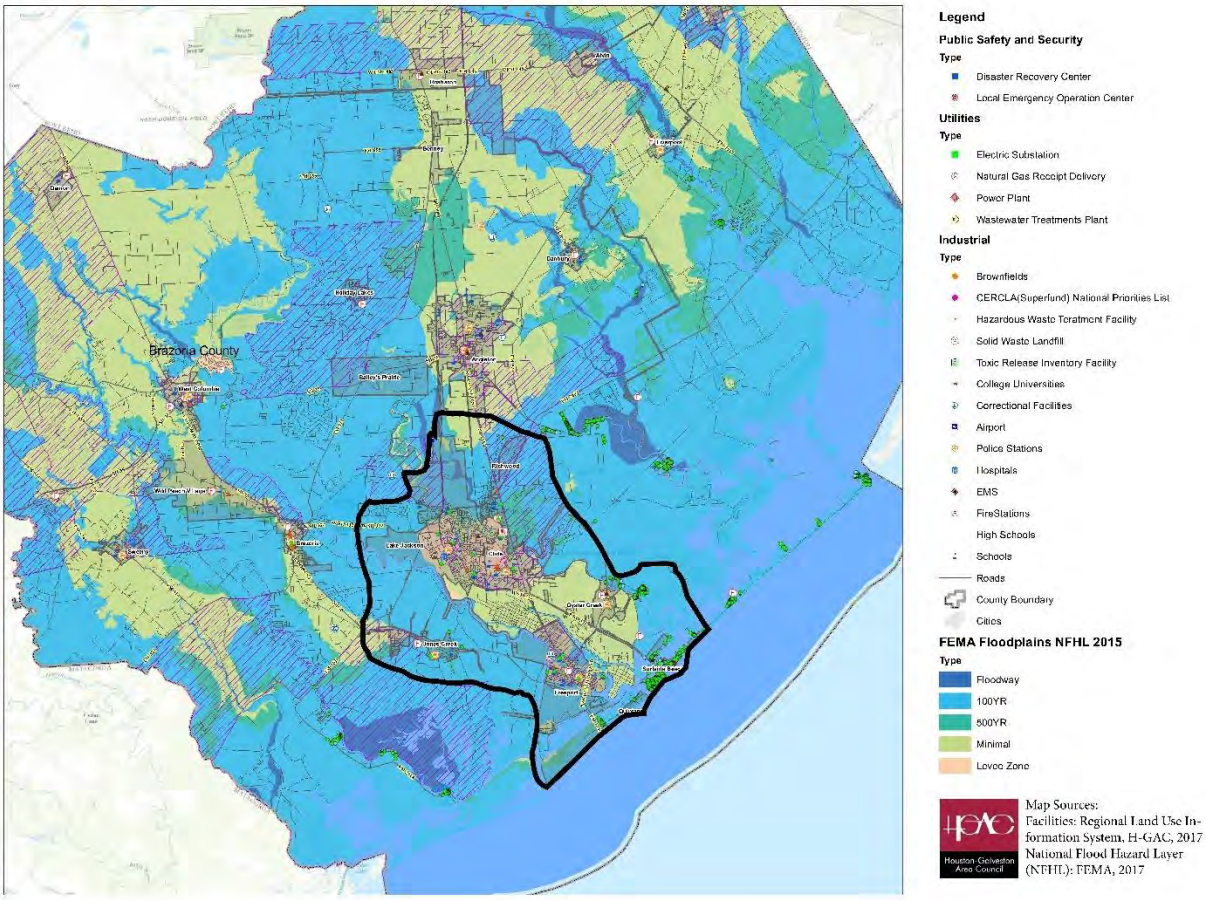


*Although map indicates 11% of community is in the floodplain, local stakeholders reported that approximately 75% of their community experiences flooding.

Map Sources: Facilities: Regional Land Use Information System, H-GAC, 2017 National Flood Hazard Layer (NFHL): FEMA, 2017

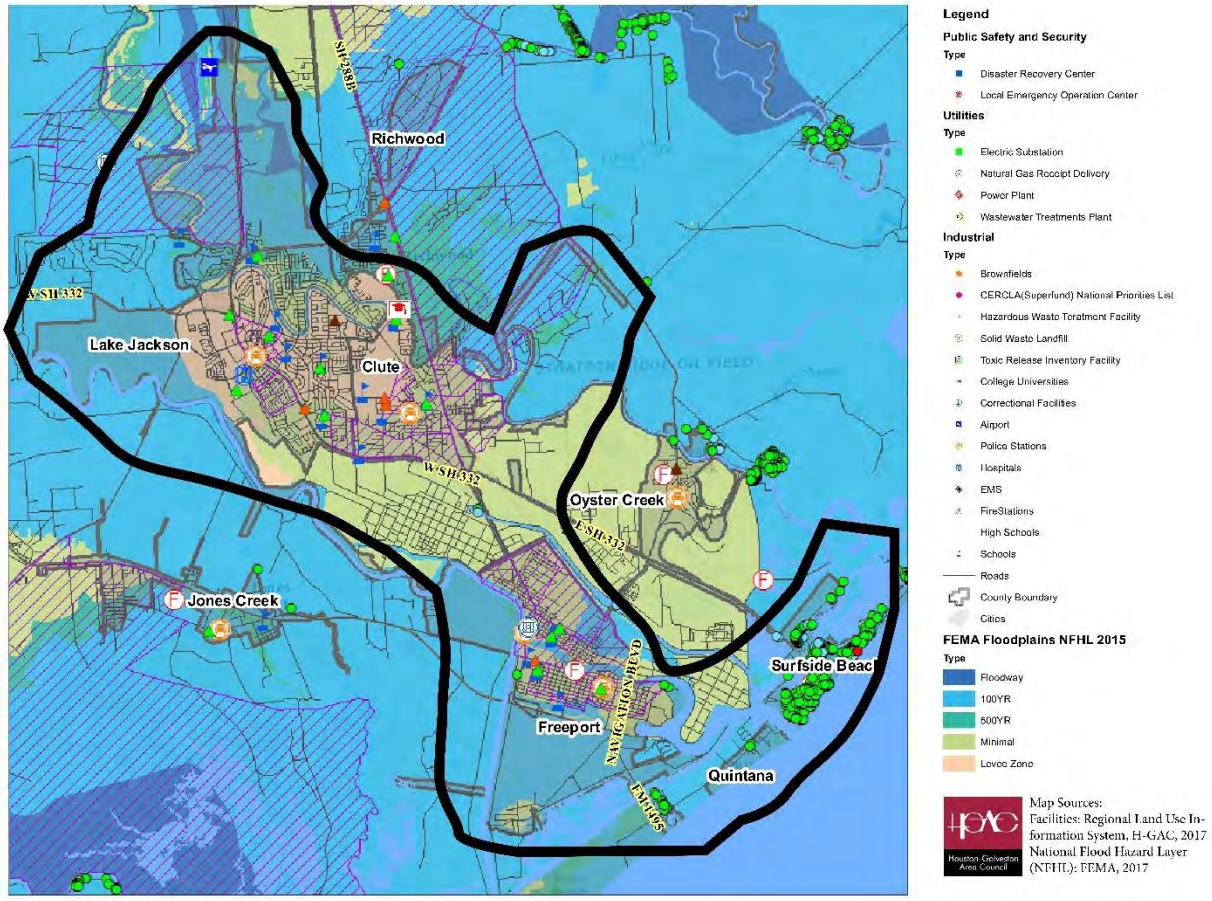
West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	6
Area Affected:	75 %	**Annual Event Average:**	.35
Probability: Likely; 35 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; the jurisdiction can experience 4 to 5 feet of water			
Identified Vulnerabilities: • 80 homes throughout the city flooded during past events, greatest damage seen along Bell Creek and along Humble Drive • Wastewater treatment facility flooded in past events due to backup • Police department and several lift stations flooded in the city due to the Brazos River **Identified Impacts:** • Residential and commercial property loss throughout the city • Serious injury or loss of life due to delayed response because of damage to police station • Reduced water quality during and after event due to potential damage to waste water treatment facility			

Floodplains: Brazosport ISD



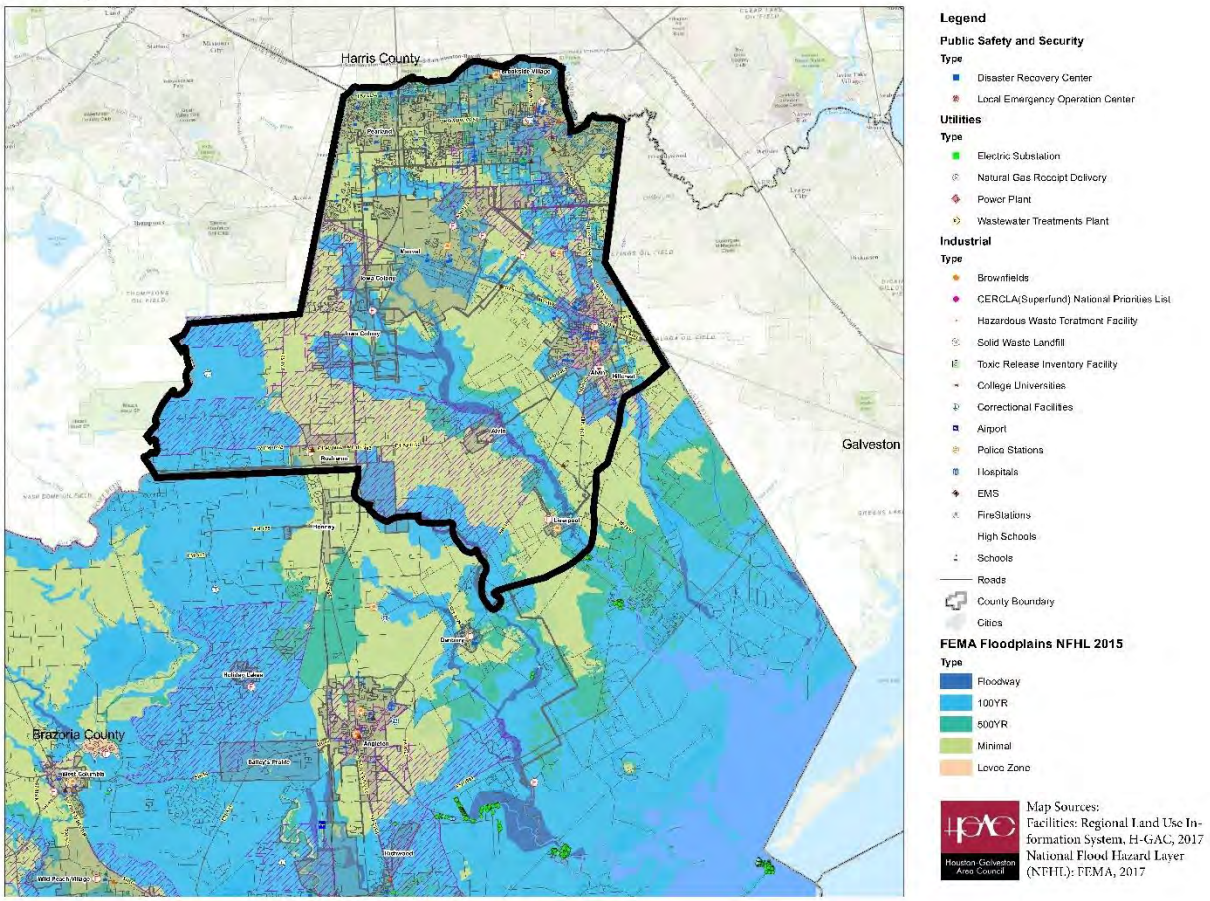
Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	0
Area Affected:	66 %	**Annual Event Average:**	0
Probability: Although there have been no reported events in the schools or administrative buildings, the school district has schools and buildings across the county. In considering this, the probability may be similar to Unincorporated Areas in the county: Very Likely; 100 percent chance the event will occur in a year			
Extent: All school buildings within the district were reopened 2 weeks after the most extensive flooding event in the county (flooding from Hurricane Harvey). Although there have been no recorded events in the district extent may be similar to the Unincorporated Areas in the county: According to past events the county has experienced 5 feet of water; the county can experience 6 to 7 feet of water.			
Identified Vulnerabilities: • 19 schools- 10 elementary schools, 3 high schools, 5 middle schools, 1 alternative school • 12,000 children 18 years and younger **Identified Impacts:** • Serious injury or loss of life due to students and staff trying to evacuate from a potentially flooding building or trying to get to school after an event and debris is still on roadways • Property and financial loss due to flood damage to schools or administrative buildings and schools closed for a prolonged period			

Floodplains: Velasco Drainage District



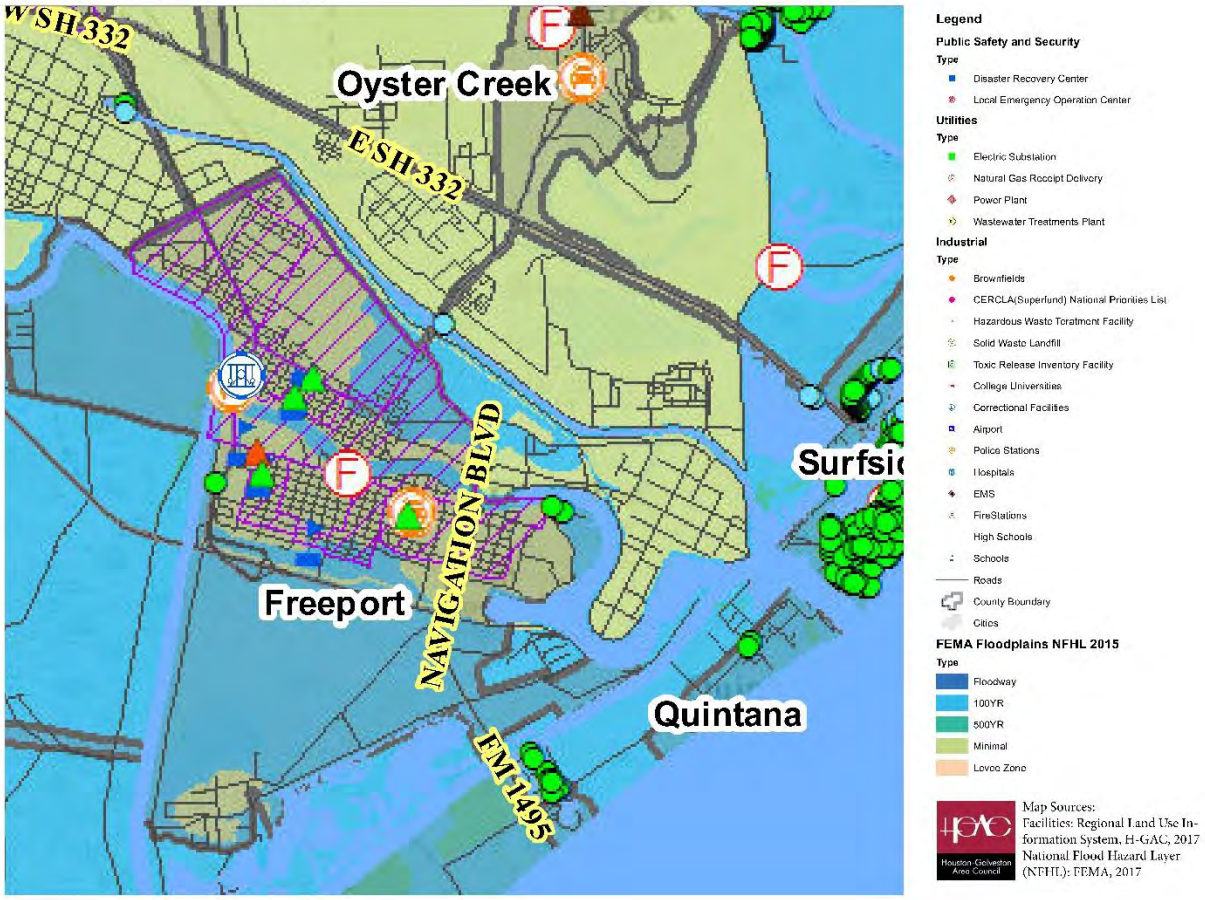
Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	5
Area Affected:	69 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; The jurisdiction can experience 4 to 5 feet of water			
Identified Vulnerabilities: • Headquarters are directly adjacent to Oyster Creek in Clute, just outside the 100-year floodplain • 14 pumps and levees **Identified Impacts:** • Potential delay in service due to potential damage to administrative buildings • Pump failure could result in a levee or dam failure leading to property loss, loss of life, and an increase in needed shelters			

Floodplains: Alvin ISD



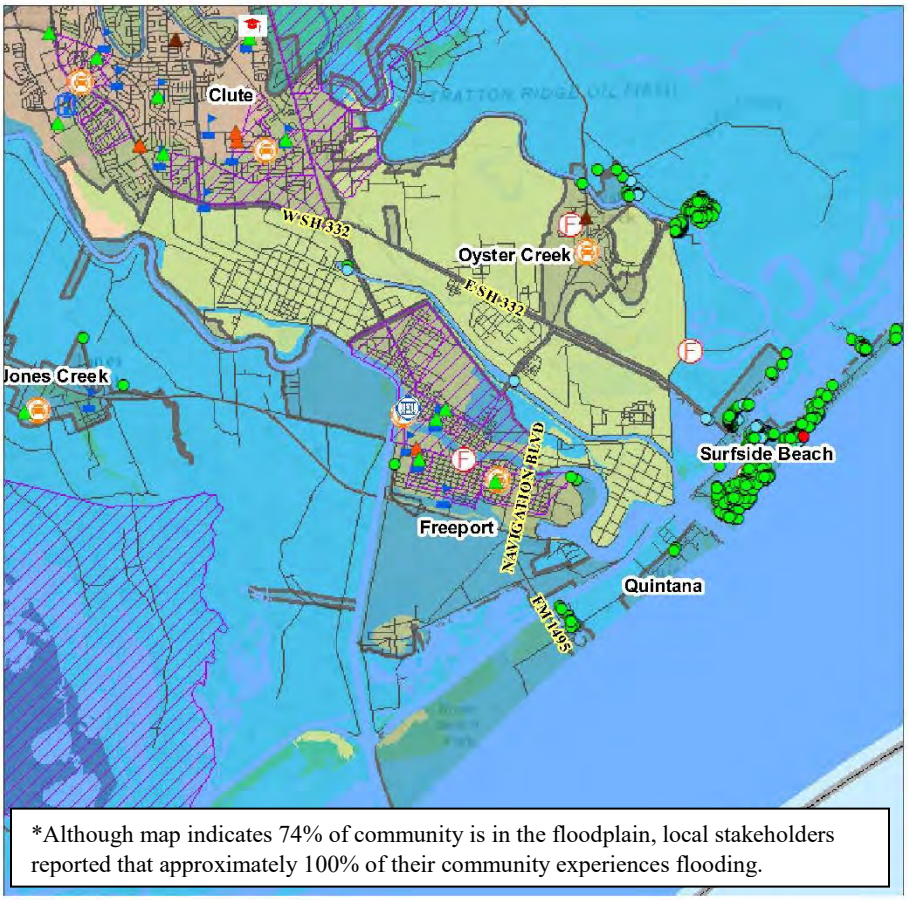
Alvin ISD			
Planning Area (Sq. mi):	252	**Occurrences since 2000:**	0
Area Affected:	39 %	**Annual Event Average:**	0
Probability: Although there have been no reported events in the schools or administrative buildings, the school district has schools and buildings across the county. In considering this the probability may be similar to Unincorporated Areas in the county: Very Likely; 100 percent chance the event will occur in a year			
Extent: All school buildings within the district were reopened less than 2 weeks after the most extensive flooding event in the county (flooding from Hurricane Harvey). Although there have been no recorded events in the district extent may be similar to the Unincorporated Areas in the county: According to past events the county has experienced 5 feet of water; the county can experience 6 to 7 feet of water.			
Identified Vulnerabilities: • 31 schools- 17 elementary schools, 3 high schools, 6 middle schools, 1 alternative school • 22,000 children 18 years and younger **Identified Impacts:** • Serious injury or loss of life due to students and staff trying to evacuate from a potentially flooding building or trying to get to school after an event and debris is still on roadways • Property and financial loss due to flood damage to schools or administrative buildings and schools closed for a prolonged period			

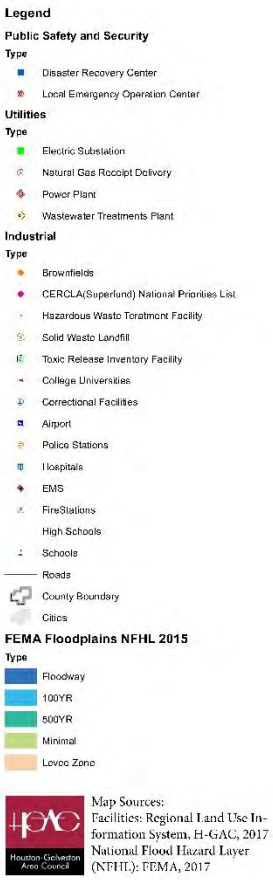
Floodplains: Port Freeport



Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; The jurisdiction can experience 4 to 5 feet of water			
Identified Vulnerabilities: • Brazos Harbor wraps around the south and east of the city. The port is in the floodplain **Identified Impacts:** • Potential for a flood hazard to turn into a technical hazard which may lead to an increase in potential injuries or loss of life • Financial loss for residents who may lose their jobs and economic loss for the city and state with one of the main ports down for a prolonged time			

Floodplains: Freeport





Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	5
Area Affected:	100 %	**Annual Event Average:**	.29
Probability: Likely; 29 percent chance the event will occur in a year			
Extent: According to past events the jurisdiction has experienced 3 feet of water; The jurisdiction can experience 4 to 5 feet of water			
Identified Vulnerabilities: • Brazos Harbor wraps around the northeast of the city. The largest industrial site in the city is in the floodplain **Identified Impacts:** • Commercial and residential property loss due to potential flood damage • Economic loss from the harbor being potentially closed due to flooding • Delay in city services due to potential impassable roadways from debris			

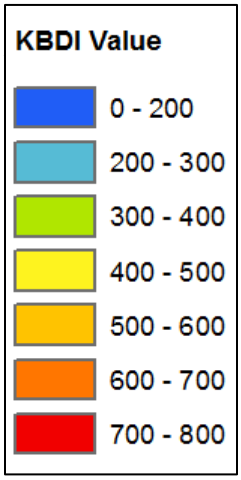
Part 6.2: Wildfire

6.2 Wildfire

A combination of the Keetch-Byram Drought Index (KBDI) and the Texas Wildfire Risk Assessment are used to assess the risk of wildfire. KBDI is an index that measures the daily water balance, precipitation, and moisture in the soil to determine the potential for wildfires. KBDI ranges from 0 to 800 units. Zero represents fully saturated soil or no indication of drought. A measurement of 800 is the maximum measurement for drought and indicates no moisture is present in the soil. In August 2011, the maximum KBDI value recorded in Brazoria County was 792. The minimum KBDI value, 41, was recorded in September of 2017. KBDI conditions can change rapidly based on short-term weather conditions, so the most extreme values should be considered when addressing wildfire risk.

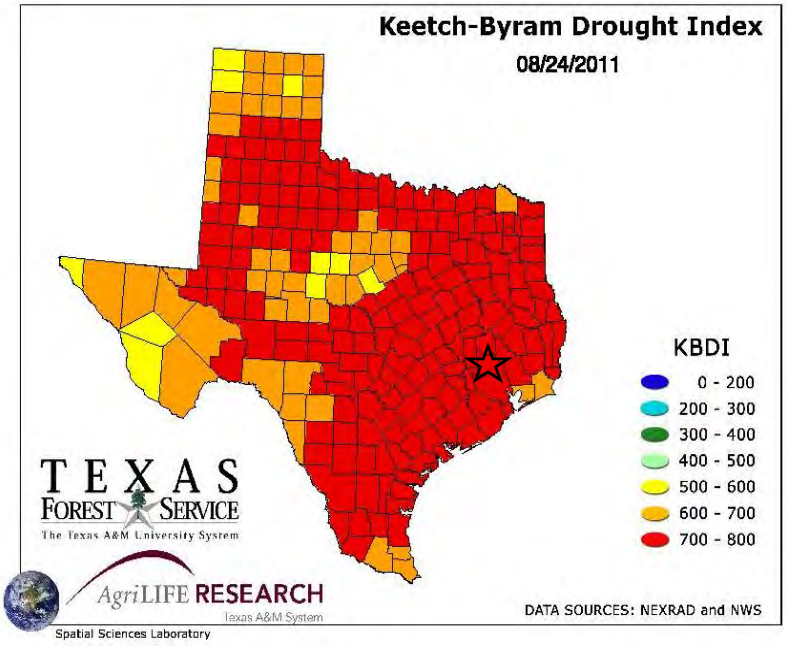
The Texas Wildfire Risk Assessment uses a variety of factors, such as fuels, vegetation, weather, and topography, to determine the fire potential of a specific land area. Particularly vulnerable are the Wildland Urban Interface (WUI) areas. These areas occur at the intersection of development and wildland. With continued population growth throughout the county, the WUI zones will become more abundant. Because most wildfires are caused by human activities, the intersection of WUI and drought are particularly dangerous.

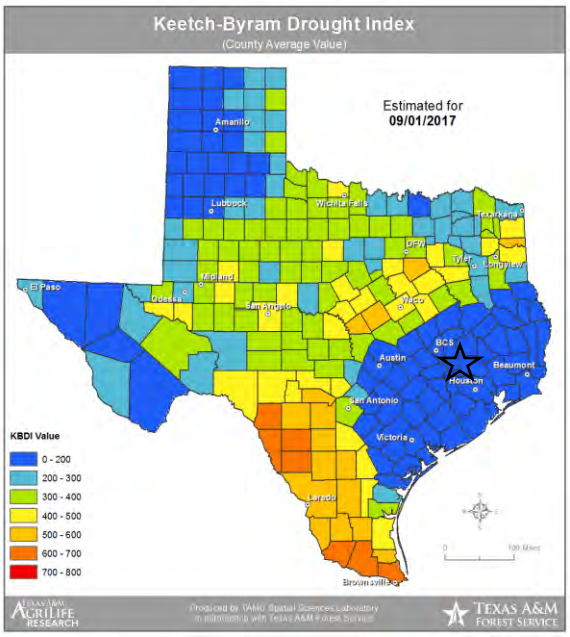
Wildland Fire Assessment System (WFAS) KBDI Value Scale:



Score	Description
0 - 200	Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity. Typical of early spring following winter precipitation.
200 – 400	Fuels are beginning to dry and contribute to wildfire intensity. Heavier fuels will still not readily ignite and burn. This is often seen in late spring or early summer.
400 – 600	Lower litter and duff layers contribute to fire intensity and will burn actively. Wildfire intensity begins to increase significantly. Larger fuels could burn or smolder for several days. This is often seen in late summer and early fall.
600 – 800	Often associated with more severe drought with increased wildfire occurrence. Intense, deep-burning fires with extreme intensities can be expected. Live fuels can also be expected to burn actively at these levels.

Source: https://twc.tamu.edu/kbdi





Source: https://twc.tamu.edu/kbdi

1

Historic Occurrence

The Texas A&M Forest Service tracks wildfire events, acres destroyed, and the initial ignition cause of the fire. Below is the historic data associated with any burns that caused recorded damage.

Date	Acres Burned	Cause	Jurisdiction	Date (Cont.)	Acres Burned (Cont.)	Cause (Cont.)	Jurisdiction (Cont.)
5/24/2006	560	Equipment use	Unincorporated	**4/25/2010**	1	Equipment use	Manvel
2/16/2007	1	Debris burning	Unincorporated	**5/17/2010**	1	Debris burning	Unincorporated
10/27/2007	3	Smoking	Surfside Beach	**5/20/2010**	1	Debris burning	Unincorporated
12/25/2007	1.5	Miscellaneous	Unincorporated	**5/23/2010**	1	Debris burning	Unincorporated
12/31/2007	1	Miscellaneous	Unincorporated	**6/15/2010**	1	Debris burning	Unincorporated
1/1/2008	0.5	Debris burning	Unincorporated	**7/4/2010**	0	Campfire	Surfside Beach
1/4/2008	0.5	Debris burning	Unincorporated	**8/5/2010**	1	Equipment use	Manvel
1/6/2008	1	Miscellaneous	Unincorporated	**8/8/2010**	2	Debris burning	Unincorporated
1/9/2008	100	Debris burning	Unincorporated	**8/11/2010**	4	Debris burning	Unincorporated
1/11/2008	0	Debris burning	Unincorporated	**10/2/2010**	1	Equipment use	Unincorporated
1/13/2008	0.5	Debris burning	Clute	**10/17/2010**	2	Debris burning	Unincorporated
1/14/2008	1	Debris burning	Unincorporated	**10/28/2010**	1	Debris burning	Unincorporated
1/22/2008	0	Debris burning	Unincorporated	**12/6/2010**	150	Miscellaneous	Unincorporated
1/28/2008	0	Debris burning	Surfside Beach	**12/12/2010**	2	Debris burning	Unincorporated
2/5/2008	5	Debris burning	Manvel	**12/23/2010**	3	Debris burning	Unincorporated
2/8/2008	4	Debris burning	Unincorporated Brazoria County	**12/26/2010**	0.25	Incendiary	Unincorporated
3/8/2008	1	Miscellaneous	Unincorporated	**12/27/2010**	100	Miscellaneous	Unincorporated
4/9/2008	1	Debris burning	Unincorporated	**12/31/2010**	0.5	Debris burning	Freeport
5/9/2008	1	Debris burning	Manvel	**12/31/2010**	0	Debris burning	Unincorporated
5/26/2008	1	Debris burning	Unincorporated	**1/6/2011**	1	Miscellaneous	Unincorporated
6/1/2008	1	Debris burning	Iowa Colony	**1/19/2011**	1.5	Miscellaneous	Bonney
7/1/2008	2	Incendiary	Manvel	**2/2/2011**	1	Miscellaneous	Unincorporated
7/1/2008	1	Equipment use	Unincorporated	**2/8/2011**	0.5	Debris burning	Unincorporated
7/8/2008	10	Debris burning	Manvel	**2/13/2011**	5	Children	Manvel
7/13/2008	2	Equipment use	Iowa Colony	**2/13/2011**	0	Children	Manvel
7/29/2008	1	Debris burning	Manvel	**2/14/2011**	30	Debris burning	Unincorporated Brazoria County
8/10/2008	1	Debris burning	Unincorporated	**2/15/2011**	20	Debris burning	Unincorporated
8/15/2008	1	Debris burning	Unincorporated	**2/18/2011**	1	Debris burning	Unincorporated
9/6/2008	1	Equipment use	Manvel	**2/19/2011**	2	Debris burning	Unincorporated
9/11/2008	1	Miscellaneous	Unincorporated	**2/24/2011**	10	Debris burning	Unincorporated
9/18/2008	1	Debris burning	Alvin	**2/28/2011**	3	Equipment use	Unincorporated
9/21/2008	1	Power Lines	Unincorporated	**3/6/2011**	2	Debris burning	Unincorporated
9/22/2008	1	Debris burning	Unincorporated	**3/6/2011**	5	Debris burning	Unincorporated
9/24/2008	1	Debris burning	Manvel	**3/7/2011**	10	Debris burning	Manvel
10/2/2008	2	Debris burning	Manvel	**3/18/2011**	1	Debris burning	Unincorporated
10/2/2008	0	Miscellaneous	Unincorporated	**3/24/2011**	0.5	Smoking	Freeport
10/3/2008	1	Power Lines	Manvel	**4/1/2011**	0.5	Miscellaneous	Surfside Beach

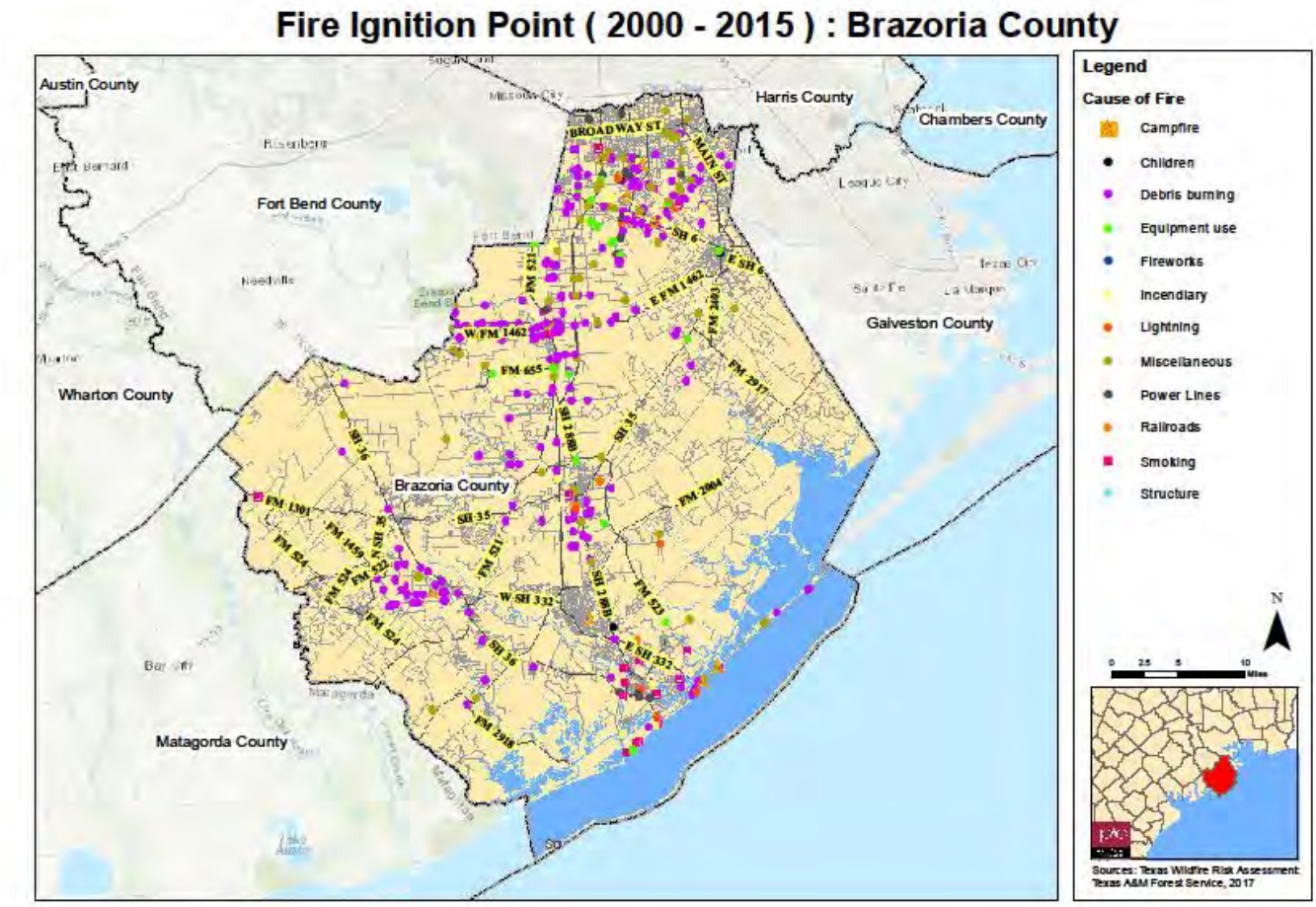
10/4/2008	2	Debris burning	Unincorporated	**4/5/2011**	0.25	Miscellaneous	Unincorporated
10/4/2008	1	Debris burning	Unincorporated	**4/13/2011**	1	Equipment use	Manvel
10/6/2008	2	Debris burning	Unincorporated	**4/15/2011**	1	Campfire	Surfside Beach
10/11/2008	1	Debris burning	Unincorporated	**4/16/2011**	2	Debris burning	Unincorporated
10/11/2008	1	Debris burning	Unincorporated	**4/22/2011**	1	Campfire	Surfside Beach
10/13/2008	1	Miscellaneous	Unincorporated	**4/27/2011**	15	Miscellaneous	Unincorporated
10/14/2008	1	Debris burning	Unincorporated	**5/1/2011**	1	Incendiary	Unincorporated
10/19/2008	1	Debris burning	Unincorporated	**5/4/2011**	1	Power Lines	Unincorporated
10/20/2008	2	Debris burning	Manvel	**5/7/2011**	1	Smoking	Unincorporated
10/28/2008	1	Debris burning	Unincorporated	**5/11/2011**	0.5	Debris burning	Unincorporated
10/29/2008	1	Debris burning	Unincorporated	**5/22/2011**	2	Debris burning	Unincorporated
11/7/2008	1	Debris burning	Bonney	**5/30/2011**	2	Miscellaneous	Unincorporated
11/10/2008	1	Debris burning	Unincorporated	**5/31/2011**	2	Debris burning	Unincorporated
11/21/2008	1	Debris burning	Unincorporated	**6/4/2011**	5	Debris burning	Freeport
11/27/2008	1	Debris burning	Unincorporated	**6/12/2011**	1	Equipment use	Unincorporated Brazoria County
11/29/2008	1	Debris burning	Unincorporated	**6/18/2011**	11	Lightning	Freeport
11/29/2008	2	Debris burning	Unincorporated	**6/18/2011**	1	Children	Unincorporated
12/3/2008	1	Debris burning	Unincorporated	**6/20/2011**	5	Miscellaneous	Unincorporated
12/8/2008	2	Debris burning	Unincorporated	**7/1/2011**	5	Debris burning	Unincorporated
12/8/2008	1	Miscellaneous	Unincorporated	**7/1/2011**	3	Debris burning	Unincorporated
12/12/2008	1	Debris burning	Unincorporated	**7/4/2011**	1	Debris burning	Unincorporated
12/12/2008	1	Debris burning	Unincorporated	**7/12/2011**	20	Railroads	Unincorporated
12/12/2008	1	Debris burning	Unincorporated	**7/14/2011**	1	Debris burning	Unincorporated
12/12/2008	1	Debris burning	Unincorporated	**7/23/2011**	1	Smoking	Freeport
12/14/2008	1	Smoking	Unincorporated	**7/30/2011**	1	Power Lines	Unincorporated
12/31/2008	1	Debris burning	Unincorporated	**8/18/2011**	1	Miscellaneous	Unincorporated
12/31/2008	1	Debris burning	Unincorporated	**8/21/2011**	5	Smoking	Unincorporated
12/31/2008	1	Debris burning	Unincorporated	**8/24/2011**	1	Miscellaneous	Unincorporated
1/1/2009	2	Railroads	Angleton	**8/28/2011**	1	Miscellaneous	Unincorporated
1/8/2009	2	Debris burning	Unincorporated	**9/2/2011**	1	Miscellaneous	Manvel
1/9/2009	1	Debris burning	Unincorporated	**9/3/2011**	1	Power Lines	Manvel
1/9/2009	1	Debris burning	Unincorporated	**9/3/2011**	0.5	Power Lines	Manvel
1/11/2009	2	Debris burning	Unincorporated	**9/3/2011**	0.5	Power Lines	Manvel
1/16/2009	6	Lightning	Freeport	**9/3/2011**	0.5	Power Lines	Manvel
1/18/2009	150	Miscellaneous	Unincorporated	**9/3/2011**	0.5	Power Lines	Manvel
1/19/2009	10	Lightning	Freeport	**9/3/2011**	0.2	Power Lines	Unincorporated
1/19/2009	0	Miscellaneous	Unincorporated	**9/3/2011**	0.2	Power Lines	Unincorporated
1/19/2009	1	Miscellaneous	Unincorporated	**9/5/2011**	10	Equipment use	Bonney
1/19/2009	1	Debris burning	Unincorporated	**9/5/2011**	15	Miscellaneous	Unincorporated
1/19/2009	2	Debris burning	Unincorporated	**9/6/2011**	0.25	Equipment use	Manvel
1/19/2009	1	Debris burning	Unincorporated	**9/6/2011**	1	Miscellaneous	Unincorporated
1/20/2009	2	Lightning	Freeport	**9/6/2011**	5	Miscellaneous	Unincorporated
1/20/2009	60	Debris burning	Unincorporated	**9/8/2011**	1.25	Miscellaneous	Unincorporated

1/20/2009	60	Debris burning	Unincorporated	**9/9/2011**	0.5	Equipment use	Manvel
1/20/2009	60	Miscellaneous	Unincorporated	**9/10/2011**	0.75	Equipment use	Unincorporated
1/20/2009	60	Debris burning	Unincorporated	**9/12/2011**	0.25	Smoking	Freeport
1/20/2009	40	Miscellaneous	Unincorporated Brazoria County	**9/13/2011**	0.5	Miscellaneous	Manvel
1/20/2009	40	Miscellaneous	Unincorporated	**9/13/2011**	150	Debris burning	Unincorporated
1/22/2009	1	Miscellaneous	Angleton	**9/13/2011**	300	Miscellaneous	Unincorporated Brazoria County
1/22/2009	1	Debris burning	Unincorporated	**9/14/2011**	1	Power Lines	Unincorporated
1/23/2009	1	Debris burning	Angleton	**9/26/2011**	4	Debris burning	Unincorporated
1/23/2009	2	Debris burning	Unincorporated	**10/12/2011**	1	Debris burning	Unincorporated
1/24/2009	1	Debris burning	Iowa Colony	**11/2/2011**	1	Debris burning	Unincorporated
1/24/2009	1	Debris burning	Unincorporated	**11/16/2011**	1	Debris burning	Unincorporated
1/24/2009	2	Debris burning	Unincorporated	**11/27/2011**	0.5	Debris burning	Angleton
1/24/2009	1	Debris burning	Unincorporated	**12/4/2011**	1	Debris burning	Unincorporated
1/25/2009	1	Debris burning	Angleton	**12/13/2011**	1	Debris burning	Unincorporated
1/25/2009	1	Debris burning	Unincorporated	**1/2/2012**	2	Debris burning	Unincorporated
1/26/2009	2	Debris burning	Unincorporated	**1/16/2012**	0	Debris burning	Unincorporated
1/28/2009	5	Miscellaneous	Bonney	**1/29/2012**	0	Debris burning	Unincorporated
1/29/2009	1	Miscellaneous	Alvin	**2/7/2012**	0	Debris burning	Unincorporated
1/29/2009	6	Incendiary	Angleton	**2/24/2012**	0	Debris burning	Unincorporated
1/29/2009	2	Miscellaneous	Angleton	**3/3/2012**	0	Debris burning	Unincorporated
1/29/2009	1	Debris burning	Unincorporated	**3/16/2012**	1	Debris burning	Unincorporated
1/30/2009	1	Miscellaneous	Unincorporated	**3/18/2012**	10	Debris burning	Unincorporated
1/31/2009	1	Children	Clute	**3/18/2012**	0	Debris burning	Unincorporated
1/31/2009	2	Debris burning	Unincorporated	**3/28/2012**	0	Debris burning	Unincorporated
1/31/2009	1	Equipment use	Unincorporated	**4/13/2012**	0	Debris burning	Unincorporated
2/1/2009	2	Debris burning	Unincorporated	**5/2/2012**	0	Debris burning	Unincorporated
2/1/2009	2	Equipment use	Unincorporated	**5/7/2012**	1	Incendiary	Freeport
2/2/2009	1	Debris burning	Manvel	**5/7/2012**	2	Power Lines	Freeport
2/3/2009	1	Debris burning	Alvin	**6/8/2012**	0	Smoking	Manvel
2/3/2009	100	Debris burning	Jones Creek	**6/9/2012**	0.25	Miscellaneous	Unincorporated
2/3/2009	1	Debris burning	Unincorporated	**6/15/2012**	0	Debris burning	Alvin
2/3/2009	10	Miscellaneous	Unincorporated	**6/22/2012**	0	Debris burning	Unincorporated
2/3/2009	5	Debris burning	Unincorporated	**6/26/2012**	1	Miscellaneous	Manvel
2/3/2009	1	Debris burning	Unincorporated	**6/28/2012**	1	Miscellaneous	Angleton
2/3/2009	1	Debris burning	Unincorporated	**7/16/2012**	0	Debris burning	Unincorporated
2/4/2009	1	Debris burning	Unincorporated	**7/28/2012**	0	Debris burning	Unincorporated
2/6/2009	1	Debris burning	Unincorporated	**8/1/2012**	0	Debris burning	Unincorporated
2/7/2009	2	Debris burning	Bailey's Prairie	**8/3/2012**	1	Miscellaneous	Angleton
2/7/2009	2	Debris burning	Brazoria	**8/11/2012**	0	Debris burning	Unincorporated
2/7/2009	175	Miscellaneous	Unincorporated	**8/12/2012**	0.25	Debris burning	Unincorporated
2/7/2009	175	Miscellaneous	Unincorporated	**8/12/2012**	0.25	Debris burning	Unincorporated
2/7/2009	1	Debris burning	Unincorporated	**8/14/2012**	0	Debris burning	Unincorporated

2/9/2009	2	Debris burning	Manvel	**8/18/2012**	100	Lightning	Unincorporated
2/12/2009	2	Debris burning	Angleton	**8/22/2012**	1	Debris burning	Angleton
2/12/2009	7	Smoking	Unincorporated	**8/22/2012**	0.25	Smoking	Freeport
2/13/2009	1	Debris burning	Unincorporated	**8/29/2012**	0.1	Smoking	Angleton
2/13/2009	1	Debris burning	Unincorporated	**8/29/2012**	0	Debris burning	Unincorporated
2/19/2009	1	Debris burning	Unincorporated	**8/30/2012**	2	Debris burning	Unincorporated
2/21/2009	1	Debris burning	Surfside Beach	**9/5/2012**	0.1	Power Lines	Freeport
2/21/2009	1	Debris burning	Unincorporated	**9/9/2012**	0.5	Miscellaneous	Unincorporated
2/22/2009	1	Debris burning	Unincorporated	**9/10/2012**	0	Debris burning	Unincorporated
2/26/2009	1	Debris burning	Unincorporated	**9/16/2012**	1	Debris burning	Unincorporated
2/28/2009	1	Debris burning	Unincorporated	**9/21/2012**	0	Debris burning	Unincorporated
3/1/2009	1	Campfire	Clute	**9/23/2012**	0.5	Lightning	Angleton
3/2/2009	1	Debris burning	Unincorporated	**9/26/2012**	2	Debris burning	Angleton
3/3/2009	1	Miscellaneous	Iowa Colony	**9/28/2012**	0	Lightning	Surfside Beach
3/3/2009	1	Smoking	Unincorporated	**10/20/2012**	0.25	Miscellaneous	Unincorporated
3/4/2009	2	Debris burning	Unincorporated	**10/25/2012**	0.25	Railroads	Unincorporated
3/4/2009	1	Debris burning	Unincorporated	**10/29/2012**	1	Equipment use	Unincorporated
3/6/2009	2	Debris burning	Unincorporated	**10/29/2012**	1	Debris burning	Unincorporated
3/6/2009	1	Debris burning	Unincorporated	**10/30/2012**	1	Debris burning	Unincorporated
3/8/2009	1	Miscellaneous	Unincorporated	**11/17/2012**	0.25	Debris burning	Unincorporated
3/9/2009	1	Miscellaneous	Manvel	**11/18/2012**	0	Debris burning	Unincorporated
3/9/2009	1	Smoking	Unincorporated	**11/19/2012**	20	Debris burning	Unincorporated
3/9/2009	1	Debris burning	Unincorporated	**11/20/2012**	0	Debris burning	Unincorporated
3/11/2009	2	Smoking	Unincorporated	**11/21/2012**	0	Debris burning	Unincorporated
3/16/2009	1	Debris burning	Unincorporated	**11/25/2012**	0	Debris burning	Unincorporated
3/17/2009	4	Debris burning	Unincorporated	**11/29/2012**	0.25	Debris burning	Manvel
3/19/2009	1	Debris burning	Unincorporated	**12/15/2012**	1	Debris burning	Unincorporated
3/19/2009	1	Equipment use	Unincorporated	**12/28/2012**	0	Debris burning	Unincorporated
3/19/2009	30	Debris burning	Unincorporated	**1/24/2013**	1	Debris burning	Unincorporated
3/21/2009	1	Debris burning	Unincorporated	**1/25/2013**	1	Debris burning	Unincorporated
3/25/2009	2	Debris burning	Unincorporated	**2/1/2013**	0	Incendiary	Unincorporated
3/26/2009	1	Debris burning	Bonney	**2/3/2013**	1	Debris burning	Manvel
3/31/2009	1	Debris burning	Unincorporated	**3/7/2013**	1	Debris burning	Unincorporated
4/3/2009	3	Debris burning	Unincorporated	**3/12/2013**	1	Railroads	Manvel
4/5/2009	2	Debris burning	Unincorporated	**3/13/2013**	1	Debris burning	Manvel
4/10/2009	1	Debris burning	Unincorporated	**3/21/2013**	1	Incendiary	Unincorporated
4/11/2009	3	Debris burning	Unincorporated	**3/23/2013**	1	Debris burning	Manvel
4/12/2009	1	Debris burning	Unincorporated	**3/26/2013**	0.1	Power Lines	Freeport
4/18/2009	1	Debris burning	Unincorporated	**4/13/2013**	0.1	Incendiary	Freeport
4/22/2009	0.5	Miscellaneous	Manvel	**5/5/2013**	1	Campfire	Freeport
4/28/2009	4	Debris burning	Unincorporated	**5/14/2013**	0	Children	Alvin
5/8/2009	2	Debris burning	Unincorporated	**5/31/2013**	0.25	Debris burning	Unincorporated
5/9/2009	1	Debris burning	Iowa Colony	**6/3/2013**	0.1	Miscellaneous	Alvin

5/9/2009	1	Debris burning	Unincorporated	**6/3/2013**	0.1	Equipment use	Alvin
5/9/2009	1	Miscellaneous	Unincorporated	**6/6/2013**	1	Lightning	Manvel
5/12/2009	0.5	Debris burning	Manvel	**6/6/2013**	1	Lightning	Manvel
5/12/2009	0.1	Miscellaneous	Manvel	**6/16/2013**	1	Incendiary	Manvel
5/15/2009	0.1	Miscellaneous	Manvel	**6/17/2013**	1	Debris burning	Unincorporated
5/18/2009	0.8	Miscellaneous	Unincorporated	**6/19/2013**	0.5	Smoking	Freeport
5/18/2009	2	Debris burning	Unincorporated	**6/22/2013**	1	Debris burning	Manvel
5/20/2009	3	Debris burning	Unincorporated	**7/1/2013**	0	Debris burning	Unincorporated Brazoria County
5/21/2009	1	Debris burning	Unincorporated	**7/4/2013**	0.5	Smoking	Freeport
5/22/2009	2	Debris burning	Unincorporated	**7/4/2013**	1	Miscellaneous	Manvel
5/23/2009	1	Debris burning	Unincorporated	**7/5/2013**	2	Debris burning	Manvel
5/29/2009	1	Debris burning	Unincorporated	**7/5/2013**	1	Debris burning	Unincorporated
5/31/2009	1	Debris burning	Unincorporated	**7/9/2013**	0.1	Miscellaneous	Unincorporated
6/11/2009	1	Debris burning	Unincorporated	**7/14/2013**	1	Debris burning	Unincorporated
6/16/2009	1	Debris burning	Unincorporated	**7/18/2013**	1	Campfire	Unincorporated
6/18/2009	5	Miscellaneous	Alvin	**7/27/2013**	1	Campfire	Manvel
6/18/2009	1	Debris burning	Unincorporated	**8/14/2013**	20	Incendiary	Unincorporated
6/18/2009	1	Miscellaneous	Unincorporated	**8/21/2013**	1	Campfire	Manvel
6/20/2009	20	Miscellaneous	Unincorporated	**8/23/2013**	1	Debris burning	Manvel
6/24/2009	2	Debris burning	Alvin	**8/25/2013**	1	Debris burning	Manvel
6/24/2009	0.5	Children	Manvel	**9/9/2013**	1	Campfire	Manvel
6/30/2009	1	Lightning	Unincorporated	**9/13/2013**	1	Debris burning	Manvel
7/1/2009	1	Debris burning	Unincorporated	**10/8/2013**	1	Campfire	Unincorporated
7/1/2009	1	Debris burning	Unincorporated	**10/25/2013**	1	Debris burning	Manvel
7/4/2009	2	Debris burning	Unincorporated	**11/16/2013**	1	Smoking	Freeport
7/5/2009	1	Power Lines	Manvel	**11/17/2013**	1	Smoking	Freeport
7/5/2009	1	Miscellaneous	Surfside Beach	**11/18/2013**	2	Smoking	Freeport
7/8/2009	1	Miscellaneous	Unincorporated	**11/21/2013**	1	Equipment use	Freeport
7/10/2009	2	Debris burning	Unincorporated	**12/23/2013**	1	Equipment use	Freeport
7/12/2009	1	Miscellaneous	Unincorporated	**1/22/2014**	2	Debris burning	Freeport
7/13/2009	1	Debris burning	Unincorporated	**2/8/2014**	1	Debris burning	Manvel
7/13/2009	1	Debris burning	Unincorporated	**2/9/2014**	1	Incendiary	Manvel
7/17/2009	2	Debris burning	Unincorporated	**2/15/2014**	2	Debris burning	Unincorporated
7/31/2009	2	Debris burning	Unincorporated	**2/21/2014**	1	Miscellaneous	Manvel
8/1/2009	1	Debris burning	Unincorporated	**2/21/2014**	67.25	Equipment use	Unincorporated
8/11/2009	0.5	Smoking	Unincorporated	**3/8/2014**	1	Debris burning	Manvel
8/15/2009	1	Miscellaneous	Manvel	**4/10/2014**	1	Incendiary	Unincorporated
8/15/2009	1	Miscellaneous	Unincorporated	**4/14/2014**	1	Debris burning	Unincorporated
8/19/2009	5	Debris burning	Unincorporated	**4/24/2014**	1	Debris burning	Manvel
8/28/2009	5	Debris burning	Unincorporated	**4/30/2014**	1	Debris burning	Manvel
9/5/2009	2	Debris burning	Unincorporated	**6/6/2014**	1	Incendiary	Manvel
9/28/2009	2	Debris burning	Unincorporated	**6/6/2014**	1	Miscellaneous	Manvel
10/3/2009	1	Debris burning	Unincorporated	**7/2/2014**	1	Debris burning	Unincorporated

11/16/2009	2	Debris burning	Brazoria	**8/6/2014**	0.25	Power Lines	Freeport
1/9/2010	1	Debris burning	Manvel	**9/1/2014**	1	Debris burning	Manvel
1/12/2010	6	Debris burning	Manvel	**9/1/2014**	1	Power Lines	Unincorporated
3/25/2010	0.5	Debris burning	Surfside Beach	**11/1/2014**	0.1	Smoking	Unincorporated
3/26/2010	1	Debris burning	Manvel	**11/10/2014**	1	Debris burning	Manvel
4/4/2010	1	Power Lines	Unincorporated	**11/10/2014**	1	Debris burning	Unincorporated
4/7/2010	1	Debris burning	Unincorporated	**11/18/2014**	1	Power Lines	Manvel
4/8/2010	3	Debris burning	Unincorporated	**11/26/2014**	1	Debris burning	Manvel
4/23/2010	1	Debris burning	Unincorporated	**7/31/2015**	0.5	Power Lines	Freeport



Brazoria County Wildfire Disaster Declarations

Year	Title	Disaster Number
1999	Extreme Fire Hazard	3142
2006	Extreme Wildfire Threat	1624

https://www.FEMA.gov/

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year. The analysis calculates the average number of events in each jurisdiction annually and then calculates the percent chance of the event occurring within a year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. The extent data also includes an estimate of what the jurisdiction could experience in the future. Information from stakeholders, Texas Forest Service, FEMA, and NOAA are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- American Community Survey (5-year, 2016) data on residential structures
- GIS analysis of residential structures within 500 to 800 KBDI zones; and
- Stakeholder identified vulnerabilities

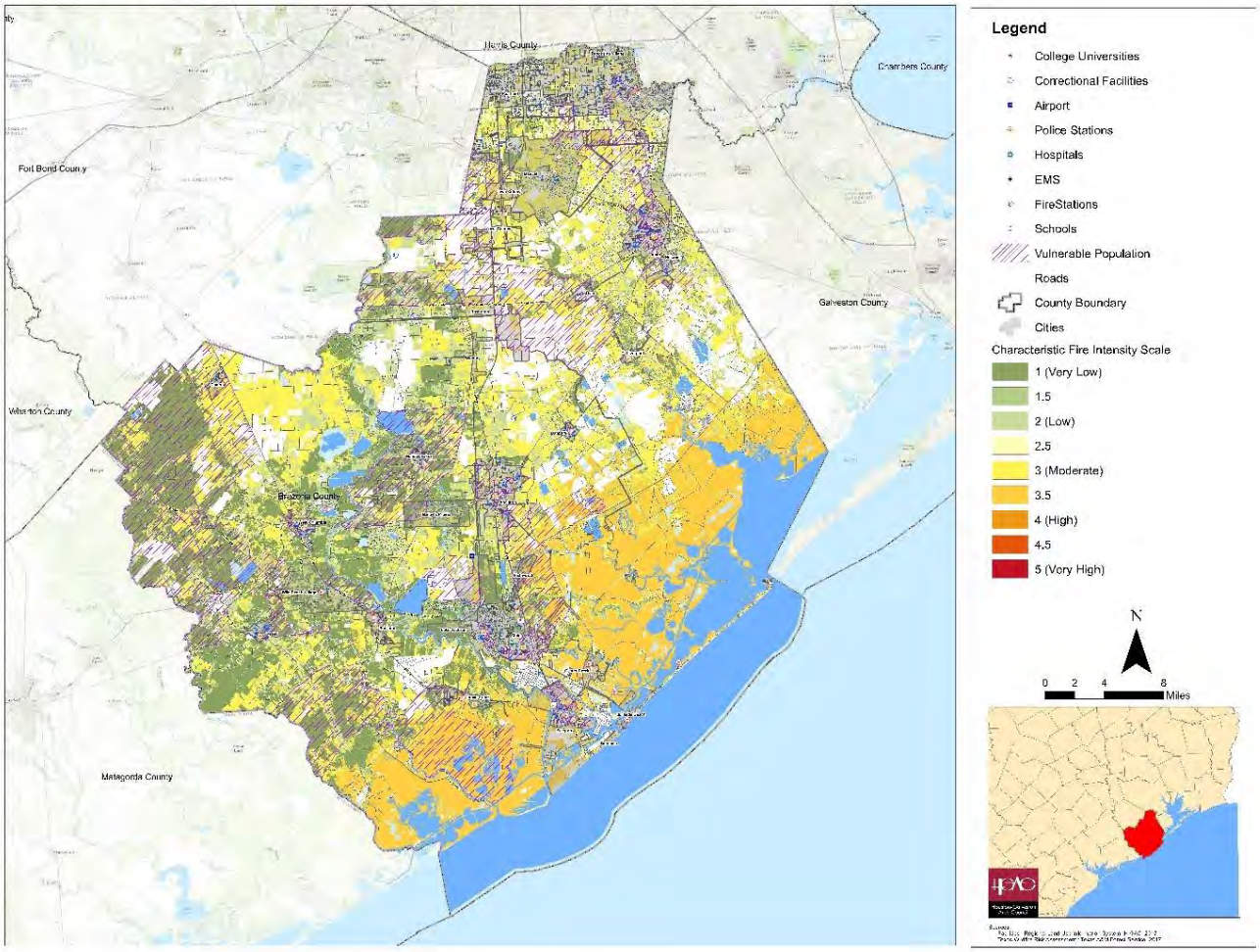
Brazoria County (All Participating Jurisdictions)

Identified Vulnerabilities:

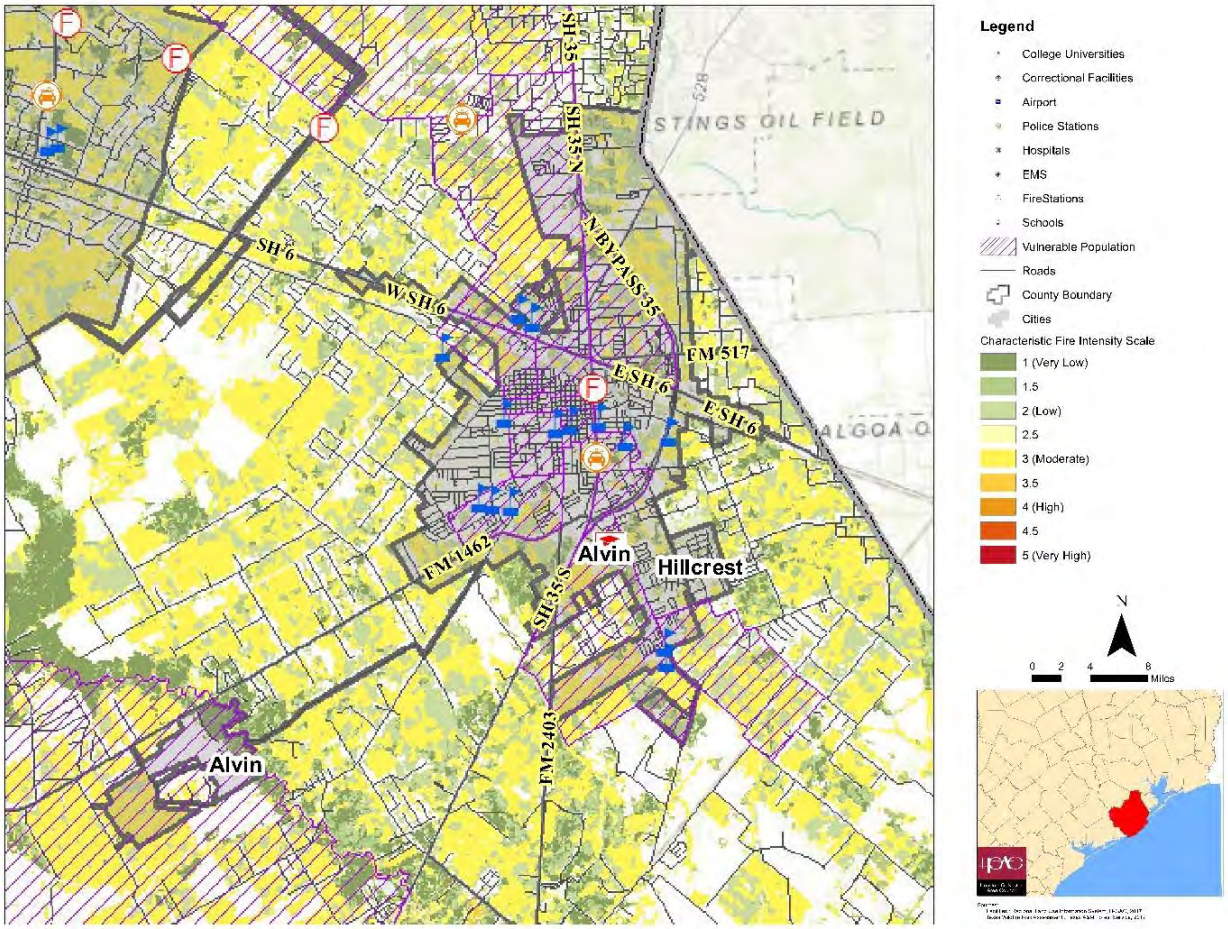
- Agriculture is a major source of revenue for the county and farmers throughout the participating jurisdictions
- Industrial sites are located throughout the county including chemical plants
- A significant proportion of individuals throughout the county are under the age of 18 or above the age of 65 years old

Identified Impacts:

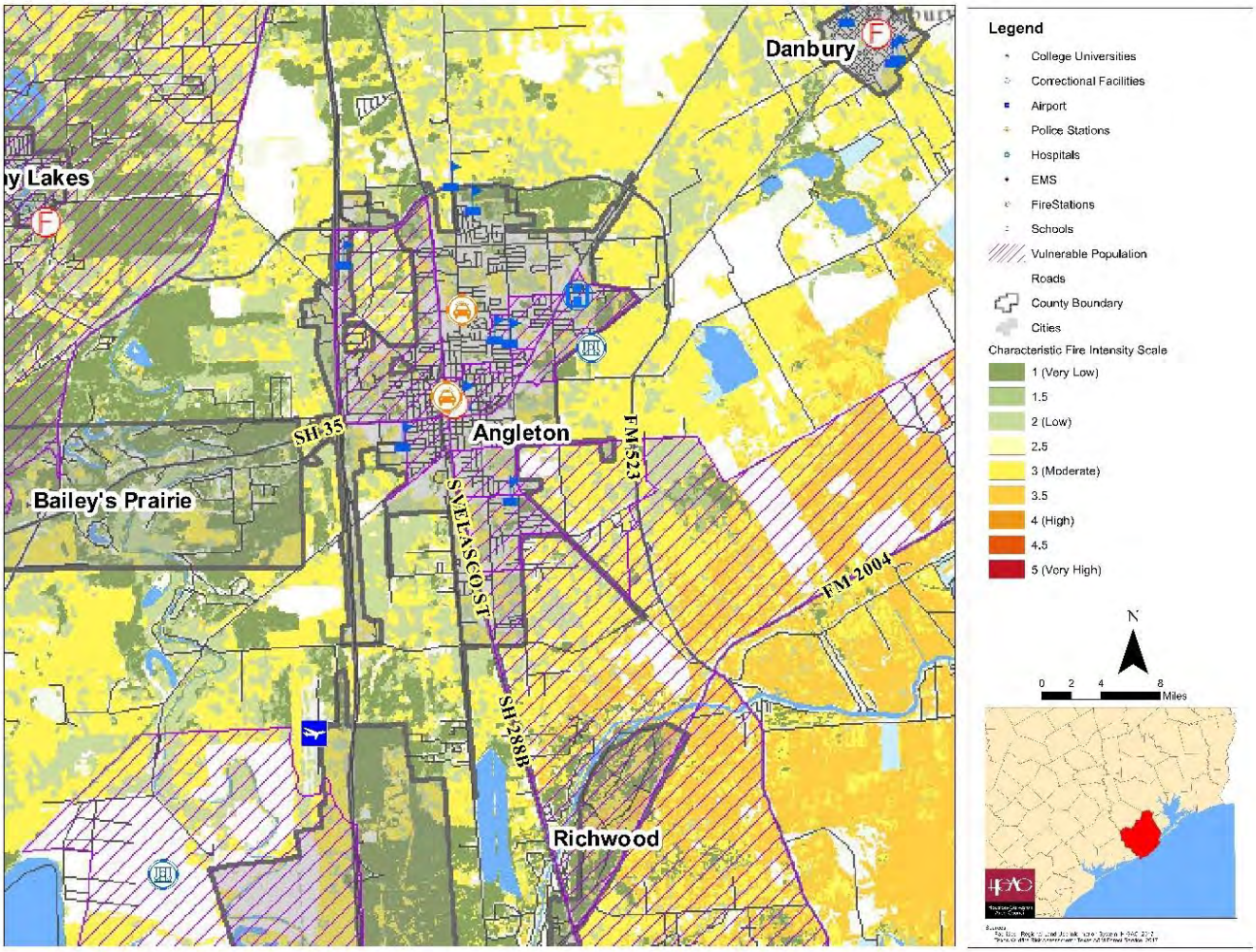
- Loss of agriculture land throughout the county (631,021 acres) may lead to an economic loss for the county of approximately 118,236,00 dollars in revenue and a loss for local farmers throughout the county as well
- If an industrial or chemical site catches fire this may lead to a technical hazard leading to an increase in property loss, serious injuries or loss of life
- Residential and commercial property loss throughout the county (identified by local jurisdictions below) may lead to a financial loss for residents and jurisdictions
- Significant injury or loss of life particularly for children and older individuals (identified by local jurisdiction below)



Brazoria County (Unincorporated Area)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2005:**	286
Area Affected:	22 %	**Annual Event Average:**	24 events a year
Probability: Very Likely; 100 percent chance event will occur in a year			
Extent: The largest wildfire in the past 12 years has been a 560-acre fire. The unincorporated areas can expect a 600-acre fire.			
Identified Vulnerabilities: • 19,898 residential structures at risk • Reliance on neighboring jurisdictions' and county healthcare and first responder's systems **Identified Impacts:** • Residential and commercial property loss throughout the county • Increased response times which may lead to greater injuries, loss of life, or property loss			

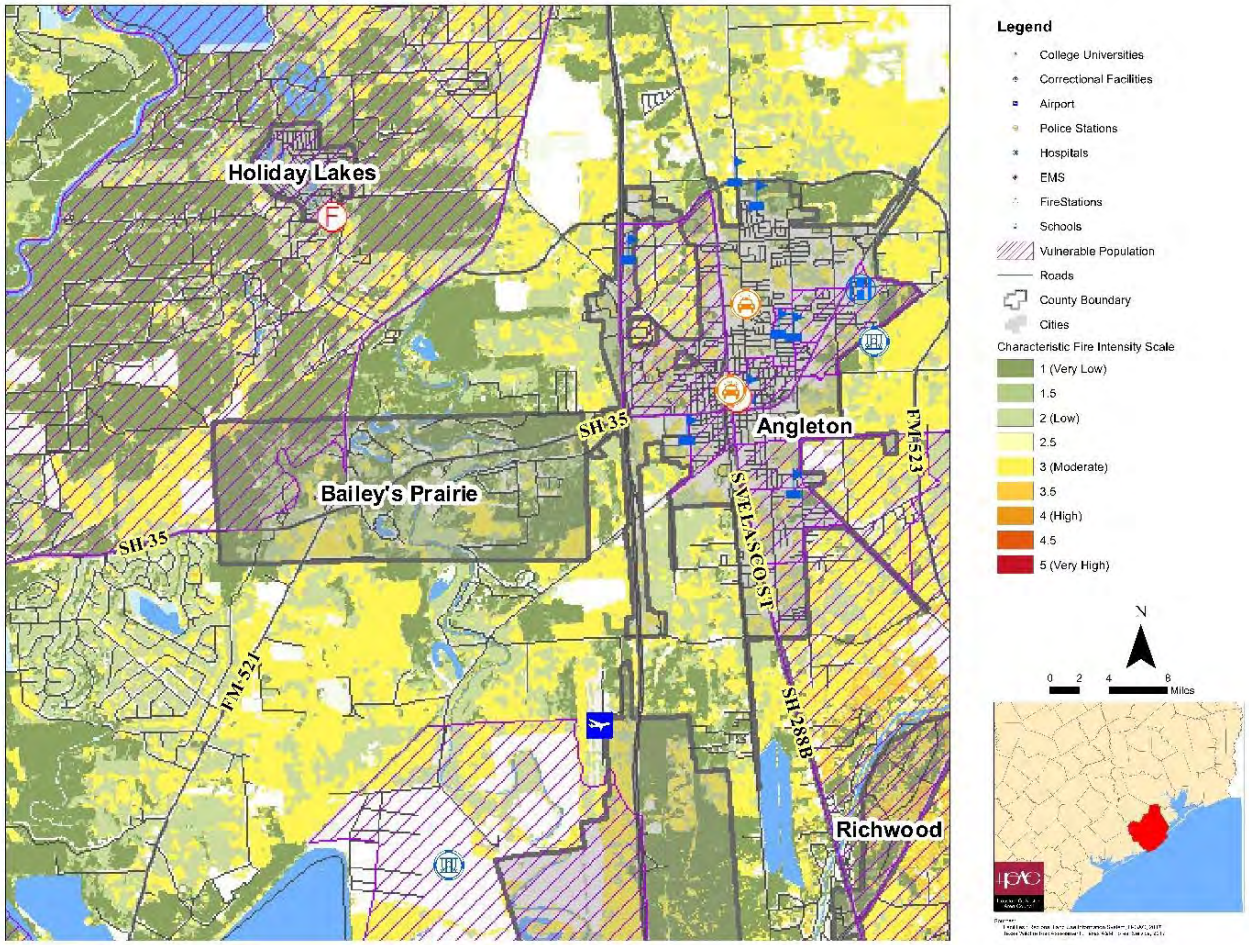


Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2005:**	9
Area Affected:	4 %	**Annual Event Average:**	.75 events a year
Probability: Very Likely; 75 percent chance event will occur in a year			
Extent: The largest wildfire in the past 12 years has been a 5-acre fire. The jurisdiction can expect a 6 to 8-acre fire.			
Identified Vulnerabilities: • 1,431 residential structures at risk • 29 percent of population are individuals 18 years and younger (7,370 children) • 13 percent of population are individuals 65 and older (3,264 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

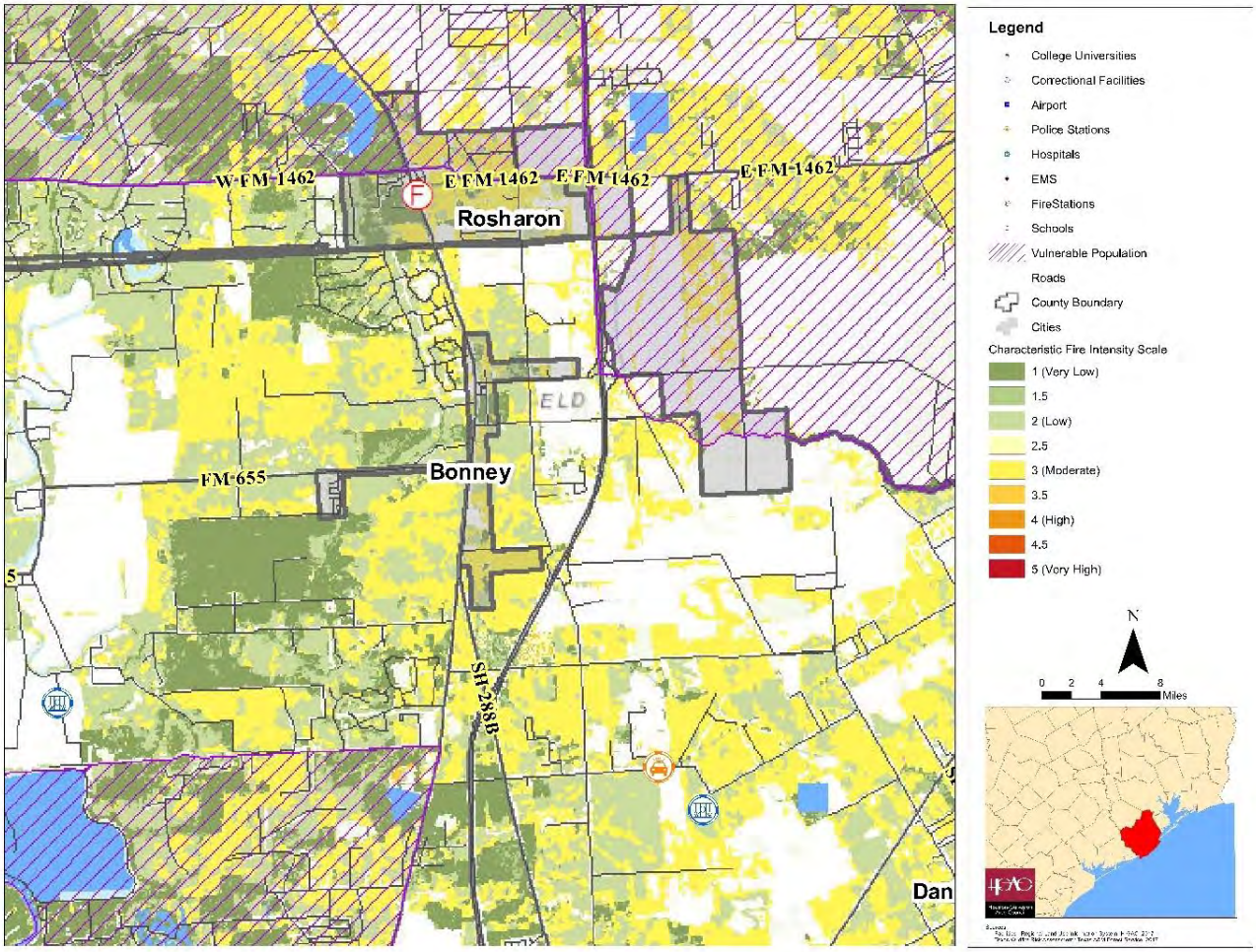


Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2005:**	14
Area Affected:	9 %	**Annual Event Average:**	1.2 events a year
Probability: Very Likely; 100 percent chance event will occur in a year			
Extent: The largest wildfire in the past 12 years has been a 6-acre fire. The jurisdiction can expect an 8 to 10-acre fire.			
Identified Vulnerabilities: • 803 residential structures at risk • 30 percent of population are individuals 18 years and younger (5,793 children) • 13 percent of population are individuals 65 and older (2,540 older individuals) **Identified Impacts:** • 43 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

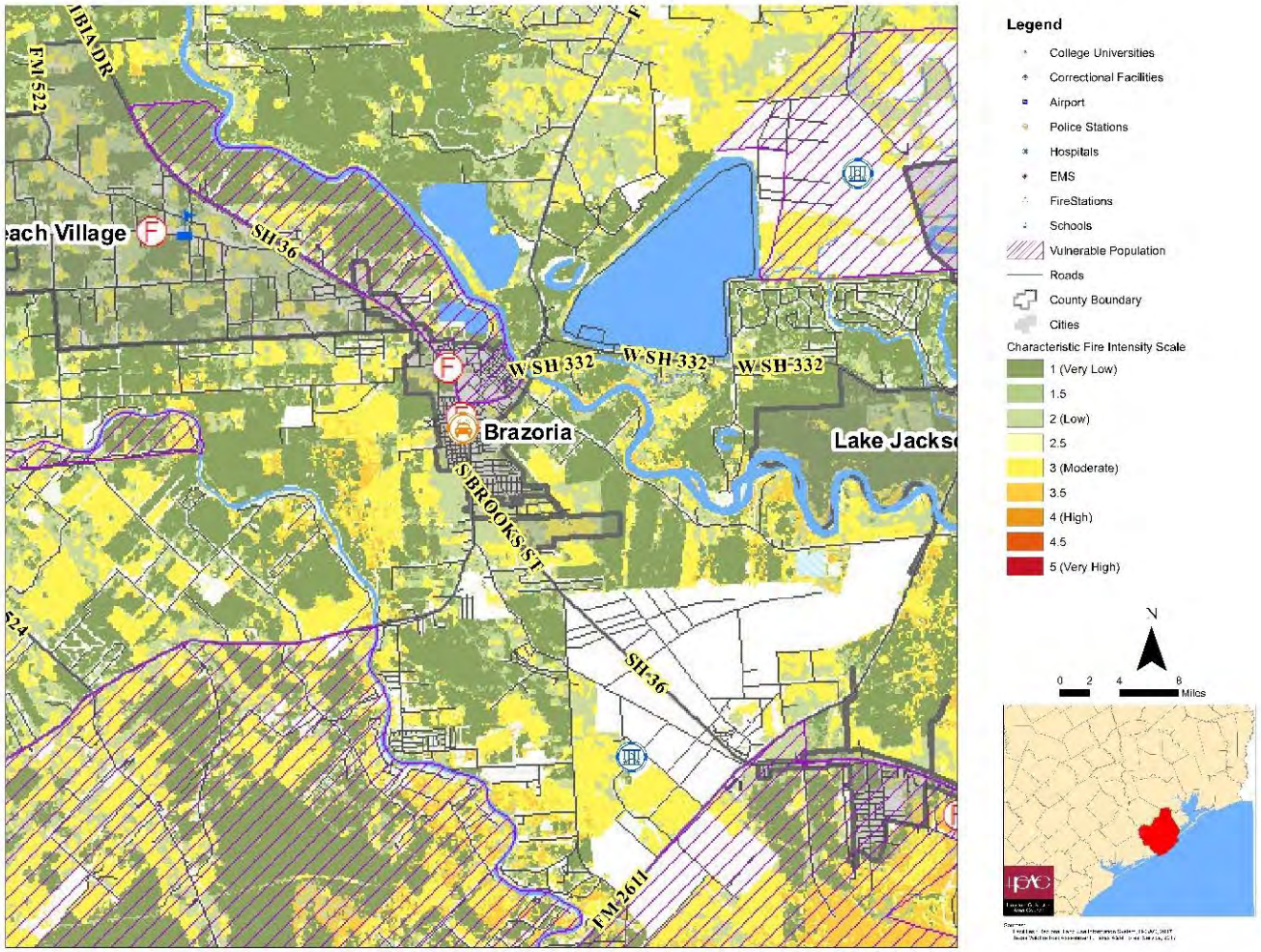
Wildfire Risk Assessment: Bailey's Prairie



Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2005:**	1
Area Affected:	22 %	**Annual Event Average:**	.08 events a year
Probability: Unlikely; 8.3 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 2-acre fire. The jurisdiction can expect a 4 to 6-acre fire.			
Identified Vulnerabilities: • 170 residential structures at risk • 26 percent of population are individuals 18 years and younger (215 children) • 14 percent of population are individuals 65 and older (114 older individuals) **Identified Impacts:** • 40 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

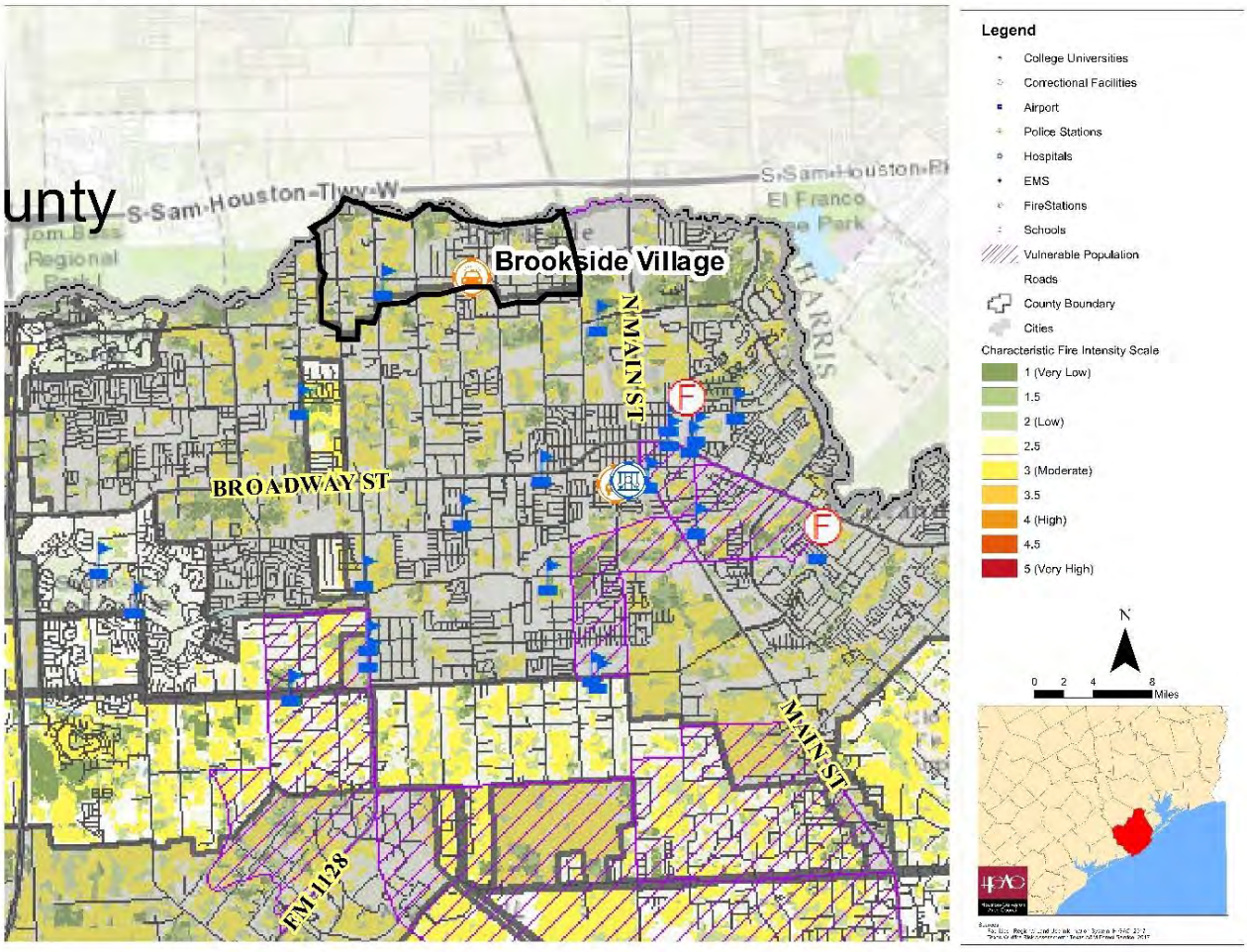


Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2005:**	5
Area Affected:	18 %	**Annual Event Average:**	.42
Probability: Likely; 41 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 10-acre fire. The jurisdiction can expect a 12 to 14-acre fire.			
Identified Vulnerabilities: • 22 residential structures at risk • 35 percent of population are individuals 18 years and younger (104 children) • 3 percent of population are individuals 65 and older (8 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

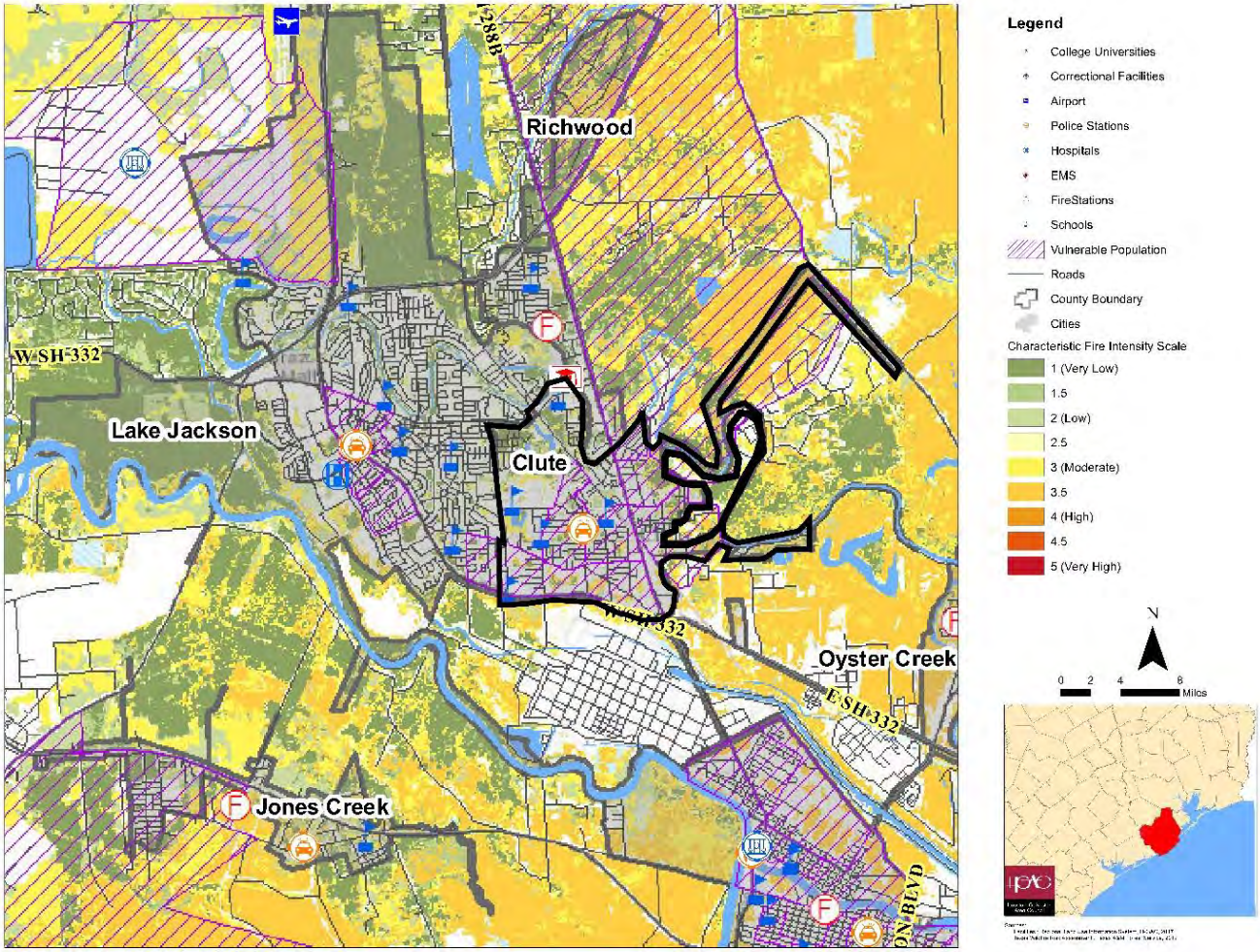


Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2005:**	2
Area Affected:	5 %	**Annual Event Average:**	.17
Probability: Unlikely; 17 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 2-acre fire. The jurisdiction can expect a 4 to 6-acre fire.			
Identified Vulnerabilities: • 282 residential structures at risk • 28 percent of population are individuals 18 years and younger (872 children) • 14 percent of population are individuals 65 and older (429 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

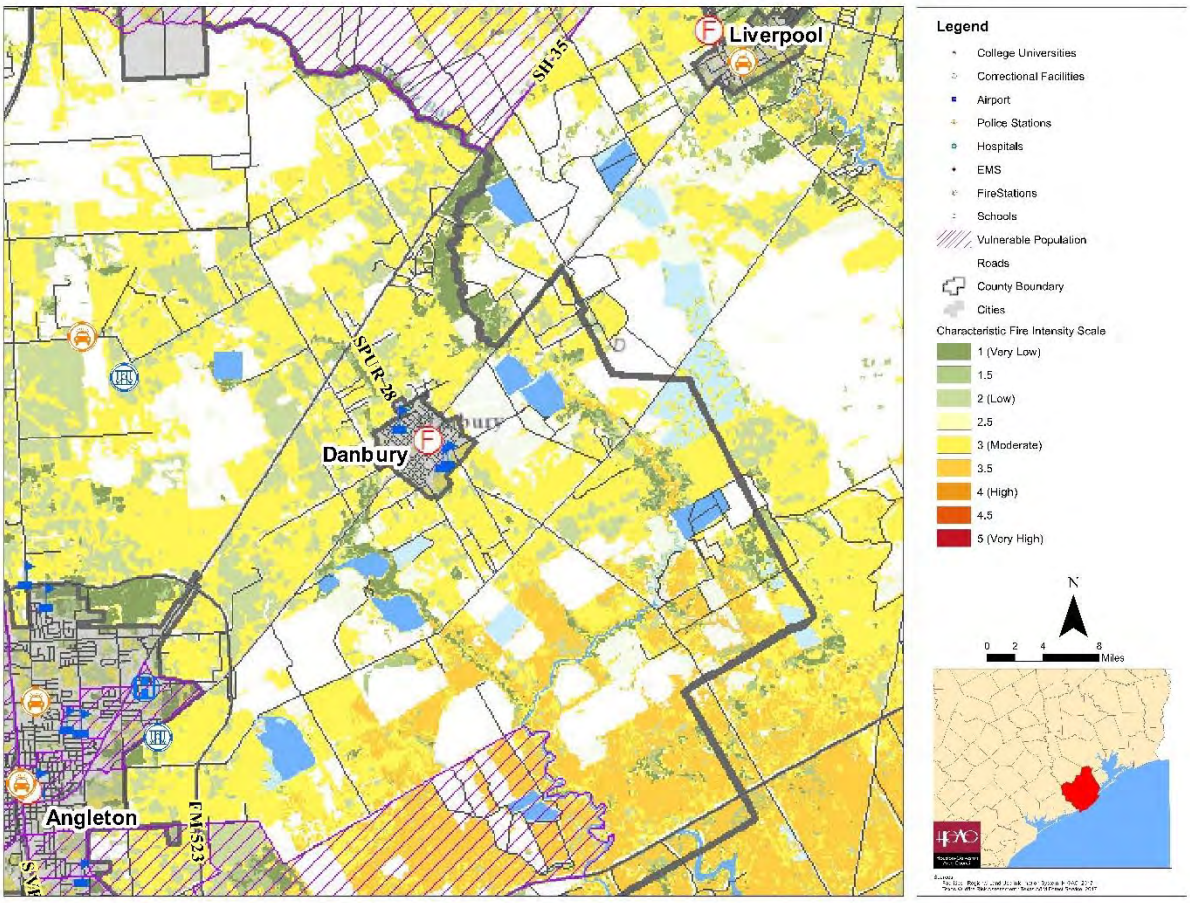
Wildfire Risk Assessment: Brookside Village



Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	0
Area Affected:	7 %	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Manvel perhaps the jurisdiction has a similar likelihood that the event will occur. Manvel's probability is: Unlikely; 5.83 percent chance event will occur in each year.			
Extent: Similarly, Manvel's extent is: The largest wildfire in the past 12 years has been a 10-acre fire. The jurisdiction can expect a 12 to 14-acre fire.			
Identified Vulnerabilities: • 122 residential structures at risk • 25 percent of population are individuals 18 years and younger (419 children) • 15 percent of population are individuals 65 and older (259 older individuals) **Identified Impacts:** • 40 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

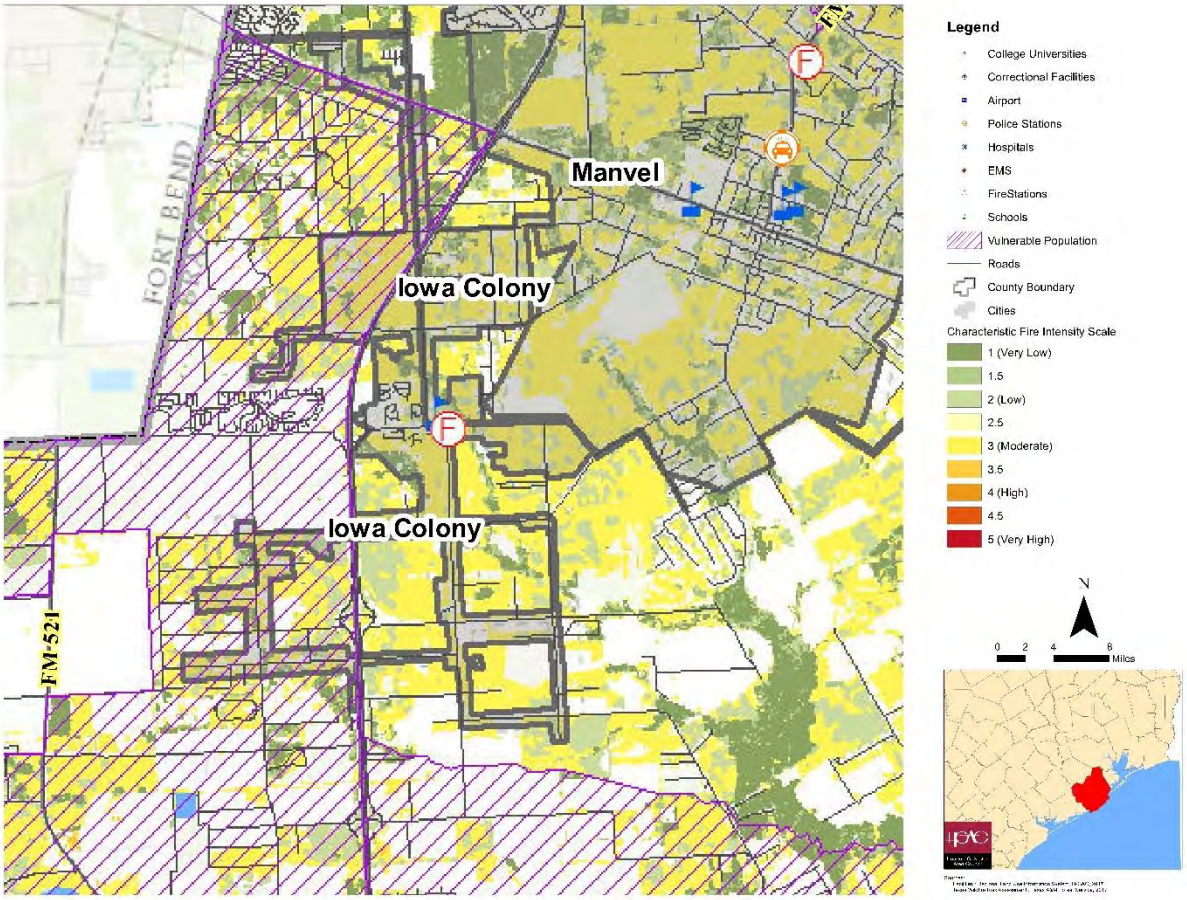


Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	3
Area Affected:	9%	**Annual Event Average:**	.25
Probability: Likely; 25 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 1-acre fire. The jurisdiction can expect a 2 to 4-acre fire.			
Identified Vulnerabilities: • 775 residential structures at risk • 35 percent of population are individuals 18 years and younger (104 children) • 3 percent of population are individuals 65 and older (8 older individuals) **Identified Impacts** • 38 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

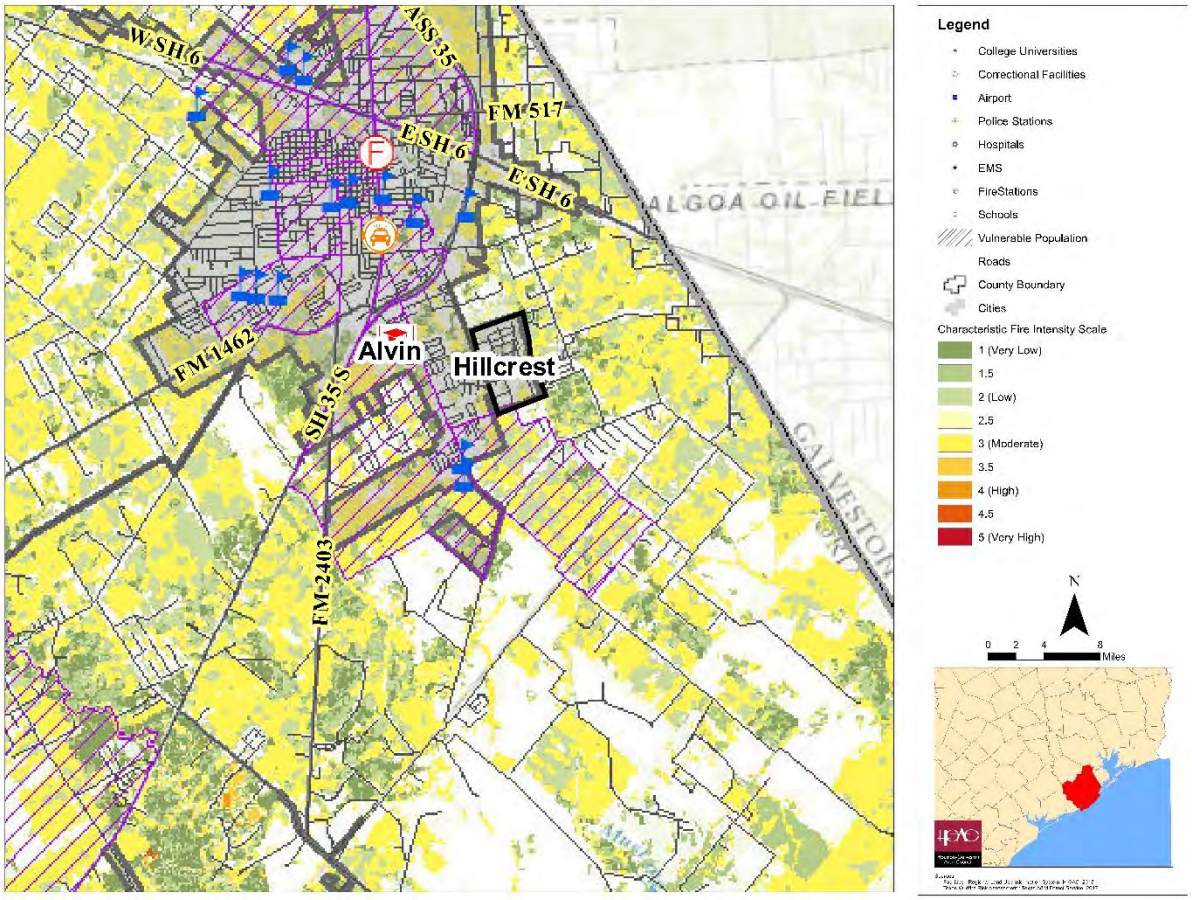


Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2005:**	0
Area Affected:	40%	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Angleton. Perhaps Danbury has a similar likelihood that the event will occur. Angleton's probability is: Highly Likely; 100 percent chance event will occur in each year.			
Extent: Similarly, Angleton's extent is: The largest wildfire in the past 12 years has been a 6-acre fire. The jurisdiction can expect an 8 to 10-acre fire.			
Identified Vulnerabilities: • 92 residential structures at risk • 28 percent of population are individuals 18 years and younger (414 children) • 8 percent of population are individuals 65 and older (120 older individuals) **Identified Impacts:** • 36 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

Wildfire Risk Assessment: Iowa Colony

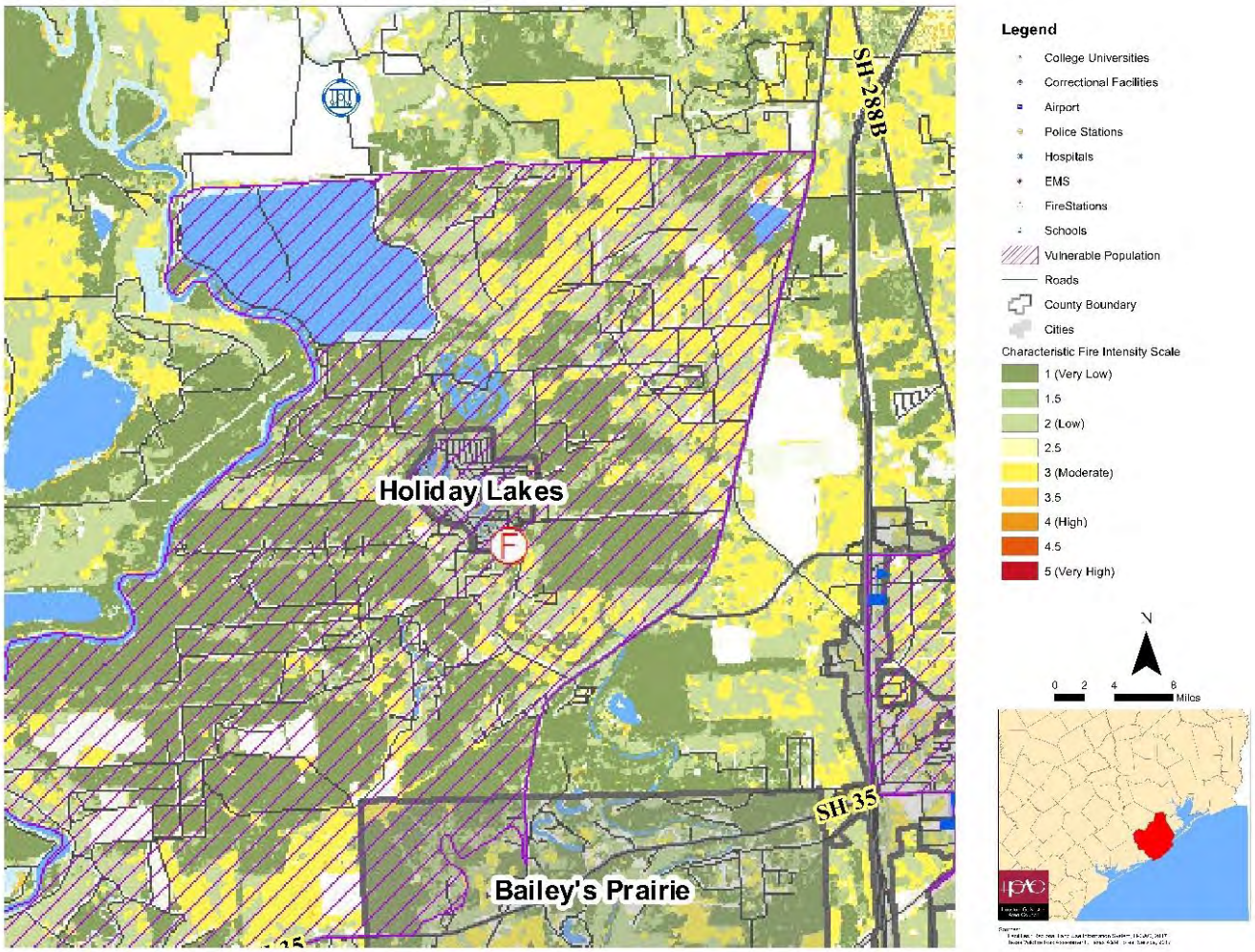


Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2005:**	5
Area Affected:	64 %	**Annual Event Average:**	.42
Probability: Likely; 42 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 2-acre fire. The jurisdiction can expect a 4 to 6-acre fire.			
Identified Vulnerabilities: • 88 residential structures at risk • 21 percent of population are individuals 18 years and younger (104 children) • 14 percent of population are individuals 65 and older (185 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			



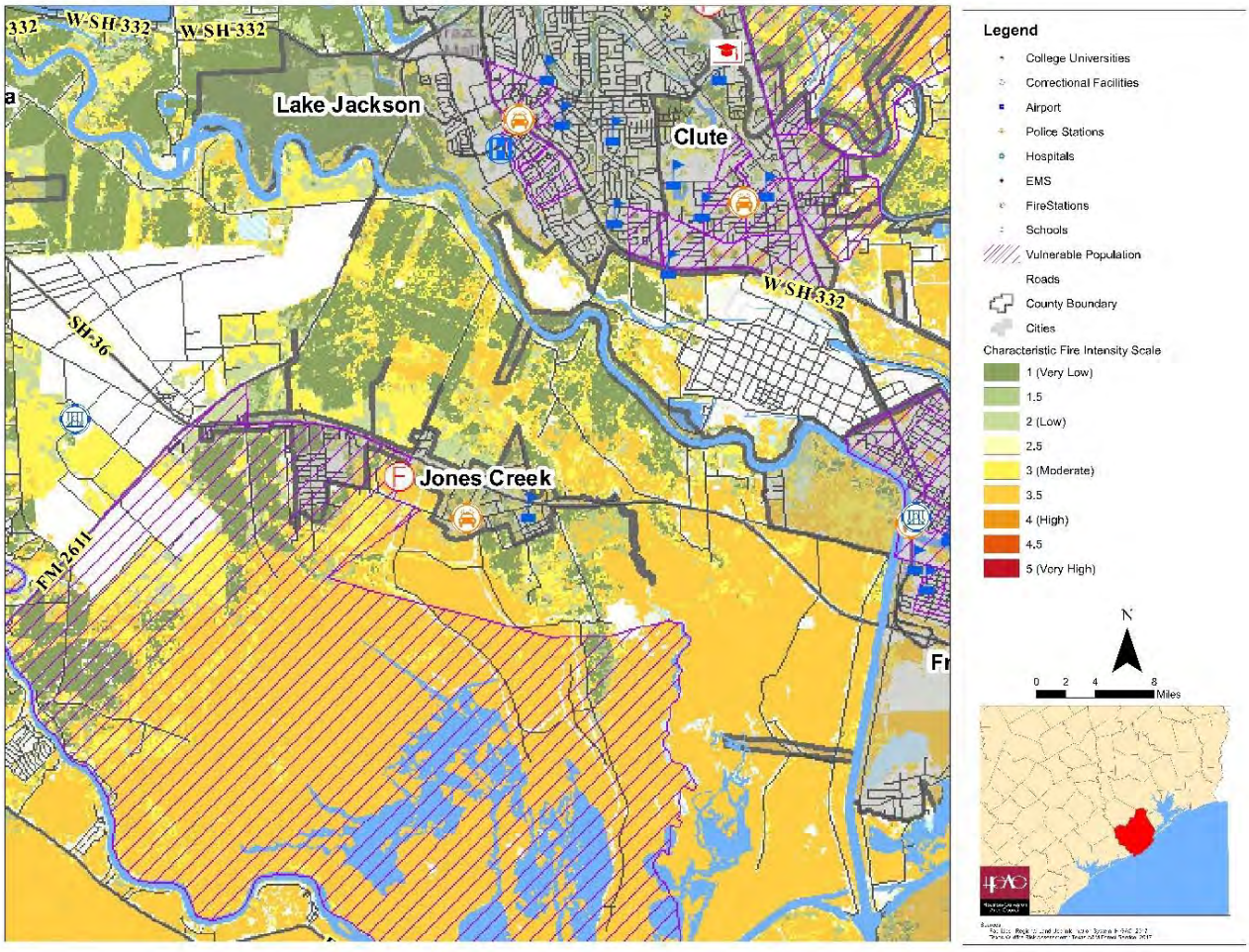
Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2005:**	0
Area Affected:	8 %	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Alvin. Perhaps Hillcrest Village has a similar likelihood that the event will occur. Alvin's probability is: Likely; 75 percent chance event will occur within a year.			
Extent: Similarly, Alvin's extent is: The largest wildfire in the past 12 years has been a 5-acre fire. The jurisdiction can expect a 6 to 8-acre fire.			
Identified Vulnerabilities: • 53 residential structures at risk • 16 percent of population are individuals 18 years and younger (129 children) • 39 percent of population are individuals 65 and older (325 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

Wildfire Risk Assessment: Holiday Lakes

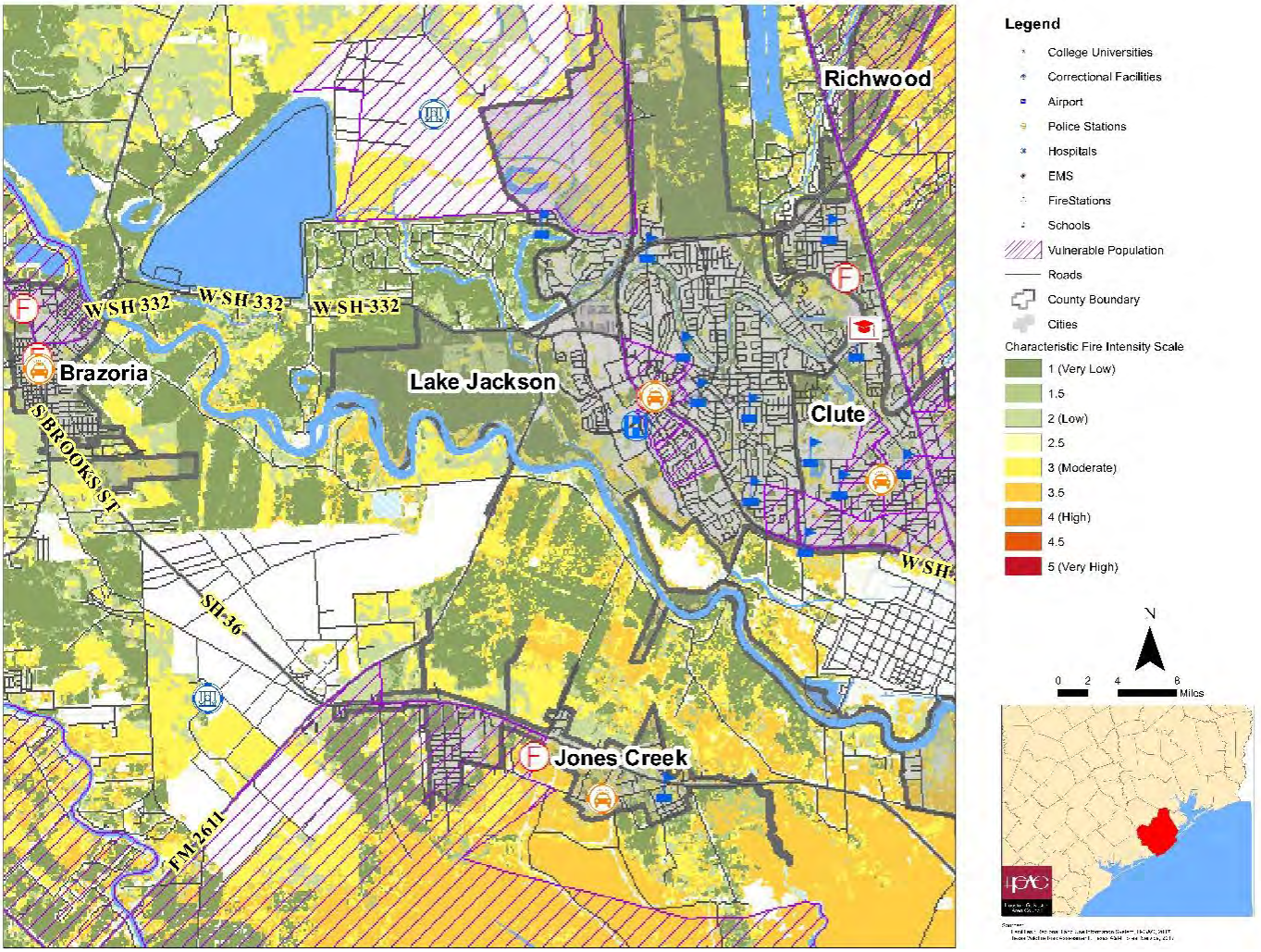


Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2005:**	1
Area Affected:	3 %	**Annual Event Average:**	.08
Probability: Unlikely; 8.3 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 1-acre fire. The jurisdiction can expect a 2 to 4-acre fire.			
Identified Vulnerabilities: • 84 residential structures at risk • 39 percent of population are individuals 18 years and younger (401 children) • 7 percent of population are individuals 65 and older (71 older individuals) **Identified Impacts:** • 46 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

Wildfire Risk Assessment: Jones Creek



Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2005:**	1
Area Affected:	10 %	**Annual Event Average:**	.08
Probability: Unlikely; 8.3 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 100-acre fire. The jurisdiction can expect a 120 to 140-acre fire.			
Identified Vulnerabilities: • 130 residential structures at risk • 28 percent of population are individuals 18 years and younger (604 children) • 14 percent of population are individuals 65 and older (307 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			



Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	0
Area Affected:	6%	**Annual Event Average:**	0

Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Jones Creek. Perhaps Lake Jackson has a similar likelihood that the event will occur. Jones Creek's probability is: Unlikely; 8.3 percent chance to occur within a year

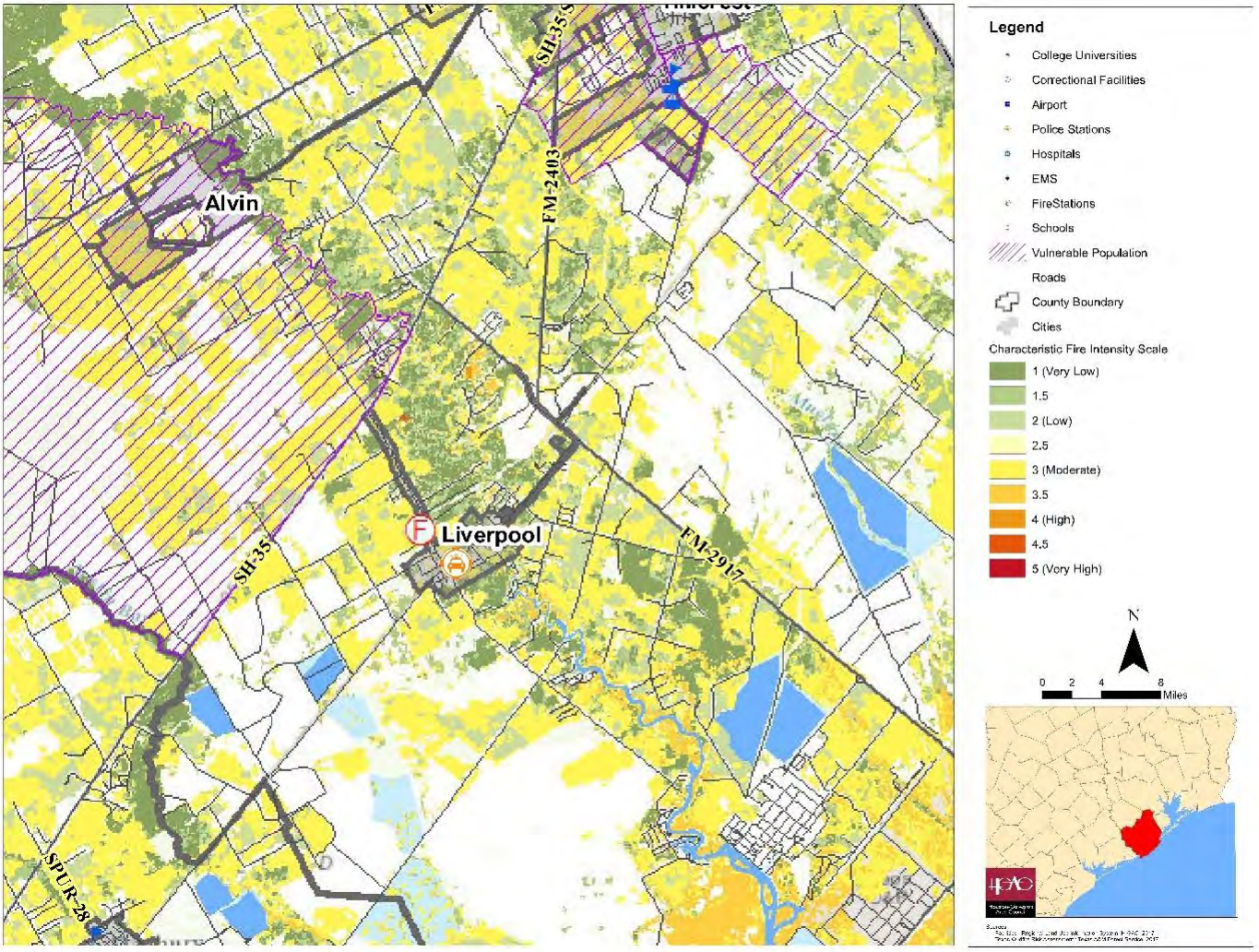
Extent: Similarly, Jones Creek's extent is: The largest wildfire in the past 12 years has been a 100-acre fire. The jurisdiction can expect a 120 to 140-acre fire.

Identified Vulnerabilities:

- 11,729 residential structures
- 35 percent of population are individuals 18 years and younger (7,372 children)
- 14 percent of population are individuals 65 and older (3,700 older individuals)

Identified Impacts:

- 49 percent of the total population may face serious illness or health conditions due to poor air quality
- Residential and commercial property loss throughout the jurisdiction



Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	0
Area Affected:	19 %	**Annual Event Average:**	0

Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Alvin. Perhaps Liverpool has a similar likelihood that the event will occur. Alvin's probability is: Likely; 75 percent chance event will occur in a given year.

Extent: Similarly, Alvin's extent is: The largest wildfire in the past 12 years has been a 5-acre fire. The jurisdiction can expect a 6 to 8-acre fire.

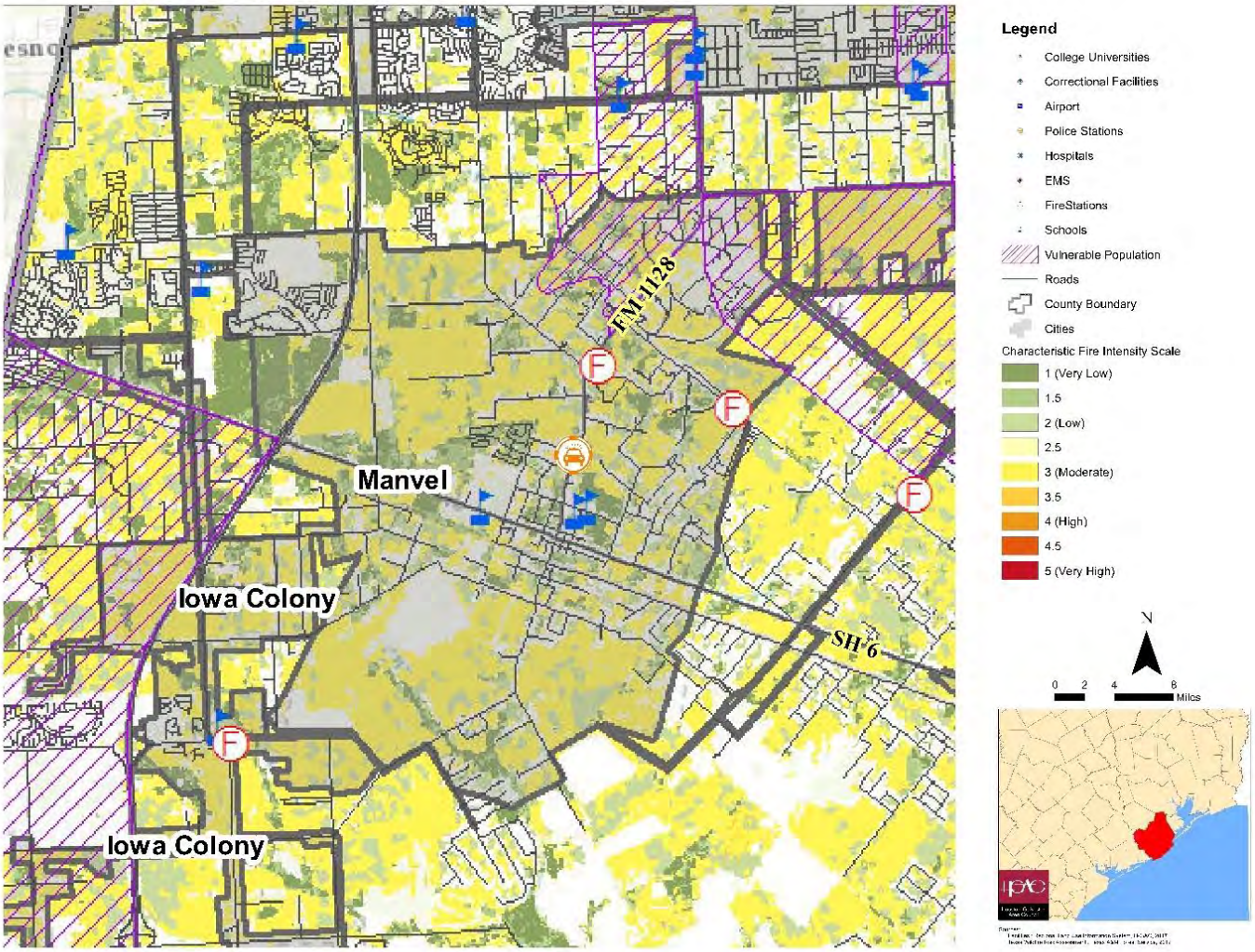
Identified Vulnerabilities:

- 37 residential structures at risk
- 28 percent of population are individuals 18 years and younger (121 children)
- 14 percent of population are individuals 65 and older (61 older individuals)

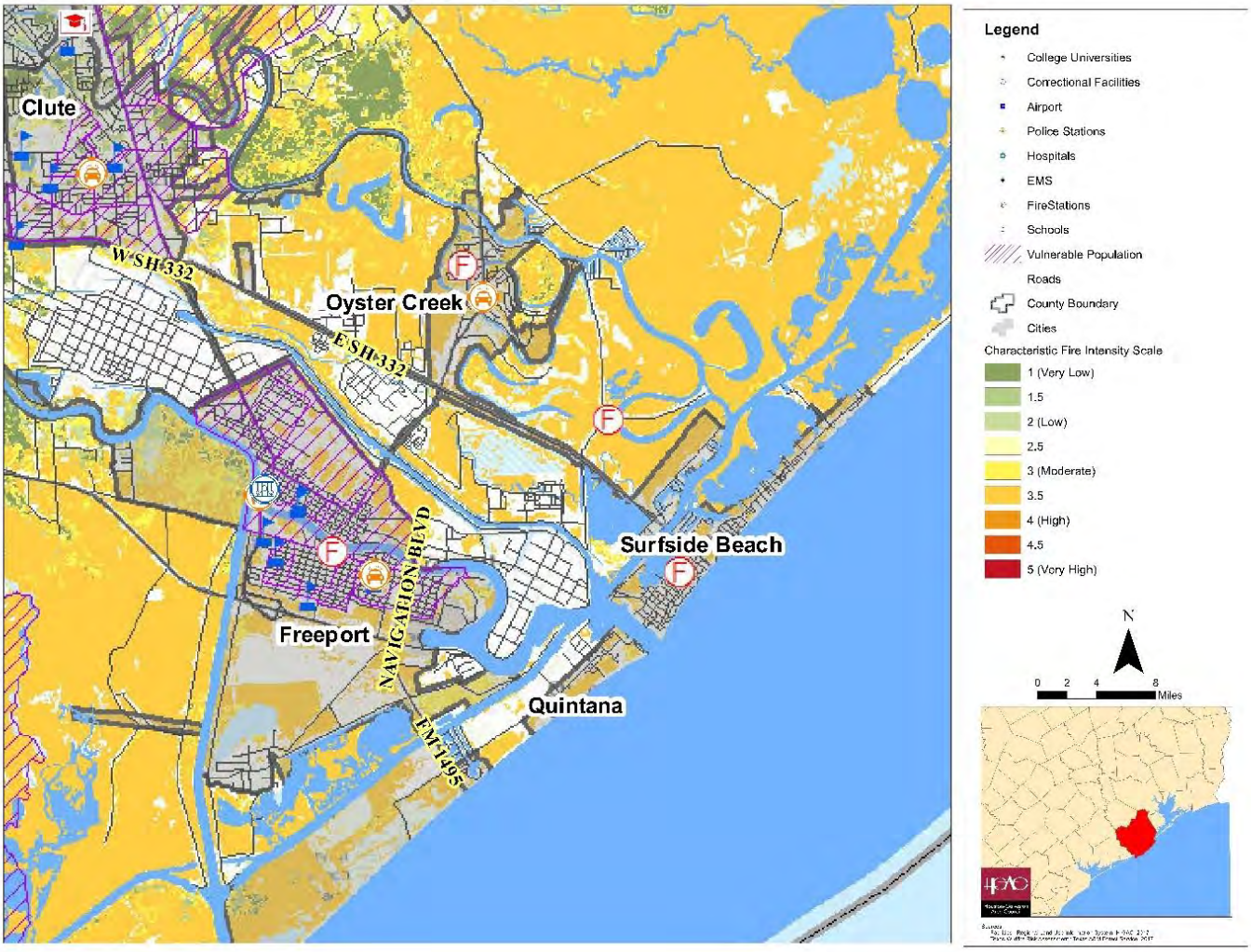
Identified Impacts:

- 42 percent of the total population may face serious illness or health conditions due to poor air quality
- Residential and commercial property loss throughout the jurisdiction

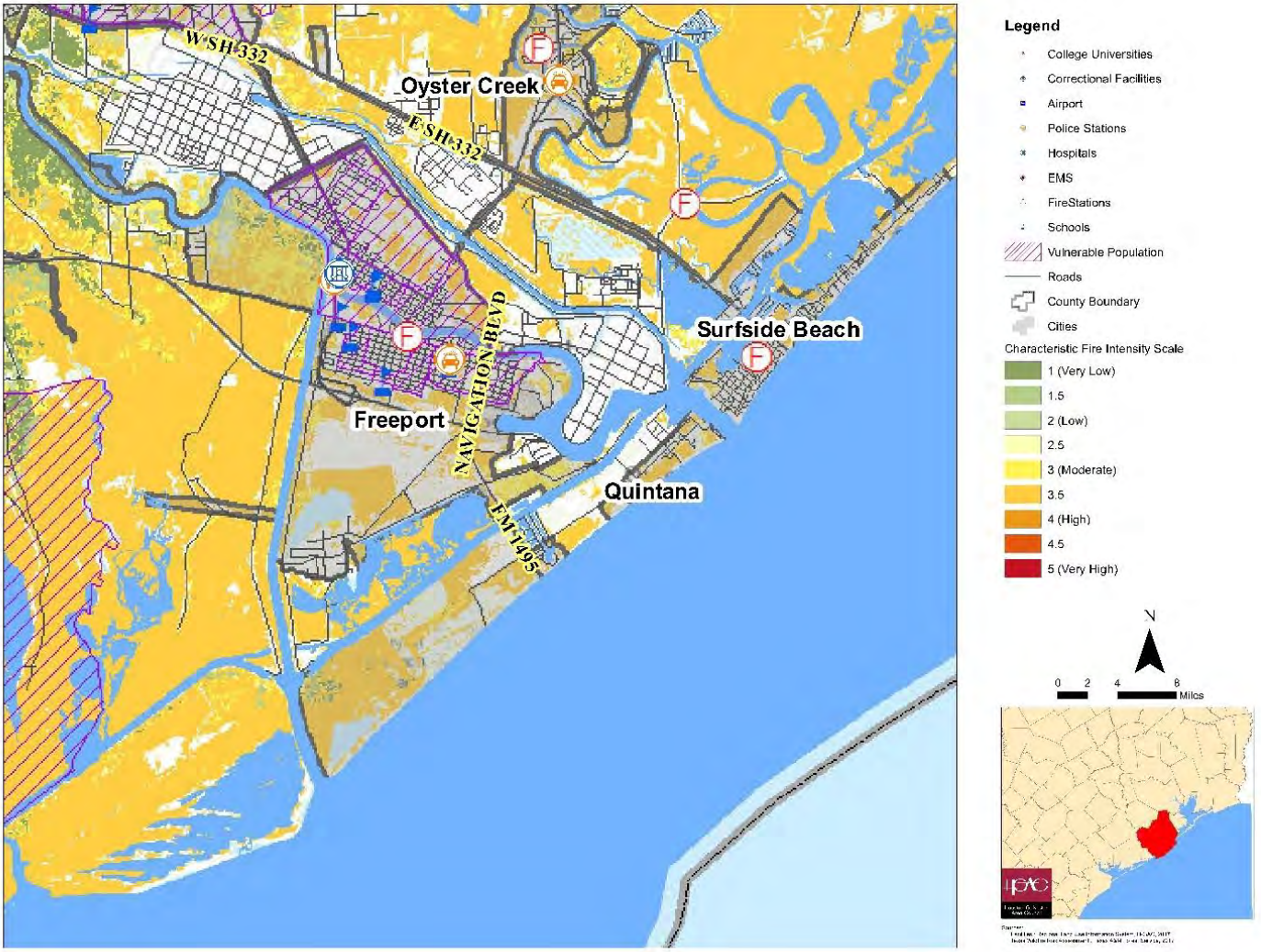
Wildfire Risk Assessment: Manvel



Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2005:**	70
Area Affected:	41 %	**Annual Event Average:**	5.83
Probability: Unlikely; 5.83 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 10-acre fire. The jurisdiction can expect a 12 to 14-acre fire.			
Identified Vulnerabilities: • 443 residential structures at risk • 31 percent of population are individuals 18 years and younger (2,265 children) • 10 percent of population are individuals 65 and older (740 older individuals) **Identified Impacts:** • 41 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			



Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2005:**	0
Area Affected:	78%	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Freeport. Oyster Creek has a similar likelihood that the event will occur. Freeport's probability is: Highly Likely; 100 percent chance to occur within a year			
Extent: Similarly, Freeport's extent is: The largest wildfire in the past 12 years has been a 10-acre fire. The jurisdiction can expect a 12 to 14-acre fire.			
Identified Vulnerabilities: • 78 residential structures at risk • 35 percent of population are individuals 18 years and younger (439 children) • 14 percent of population are individuals 65 and older (307 older individuals) **Identified Impacts:** • 49 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			



Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0
Area Affected:	74%	**Annual Event Average:**	0

Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Surfside Beach. Perhaps Quintana has a similar likelihood that the event will occur. Surfside Beach's probability is: Unlikely; 8.3 percent chance to occur within a year.

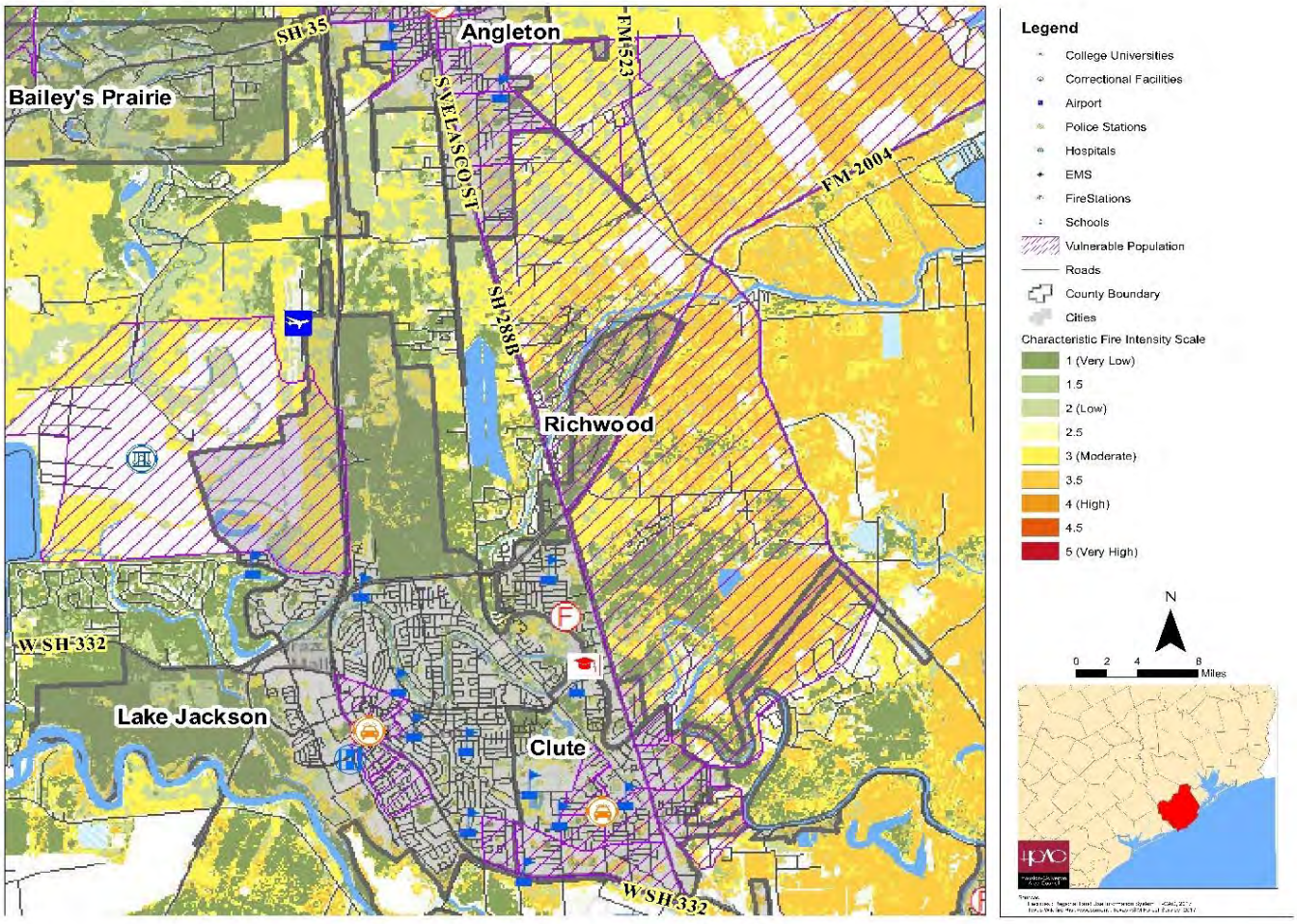
Extent: Similarly, Surfside Beach's extent is: The largest wildfire in the past 12 years has been a 1-acre fire. The jurisdiction can expect a 2 to 4-acre fire.

Identified Vulnerabilities:

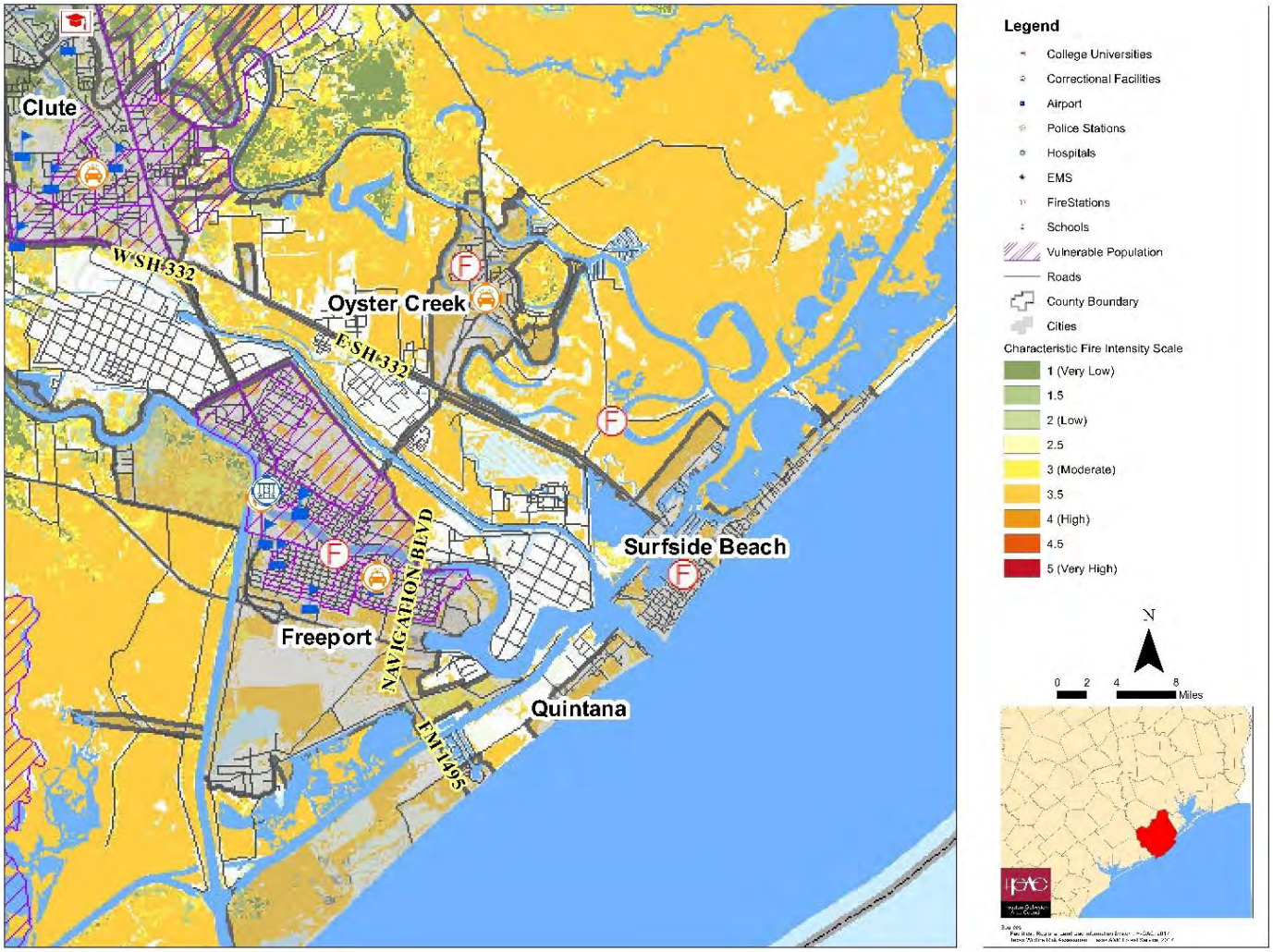
- 5 residential structures at risk
- 16 percent of population are individuals 18 years and younger (6 children)
- 3 percent of population are individuals 65 and older (1 older individual)

Identified Impacts:

- 19 percent of the total population may face serious illness or health conditions due to poor air quality
- Residential and commercial property loss throughout the jurisdiction



Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	0
Area Affected:	59 %	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Clute. Perhaps Richwood has a similar likelihood that the event will occur. Clute's probability is: Unlikely; 8.3 percent chance to occur within a year.			
Extent: Similarly, Clute's extent is: The largest wildfire in the past 12 years has been a 1-acre fire. The jurisdiction can expect a 2 to 4-acre fire.			
Identified Vulnerabilities: • 246 residential structures at risk • 26 percent of population are individuals 18 years and younger (987 children) • 19 percent of population are individuals 65 and older (101older individuals) **Identified Impacts:** • 45 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			



Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2005:**	10
Area Affected:	60 %	**Annual Event Average:**	.83

Probability: Unlikely; 8.3 percent chance to occur within a year

Extent: The largest wildfire in the past 12 years has been a 1-acre fire. The jurisdiction can expect a 2 to 4-acre fire.

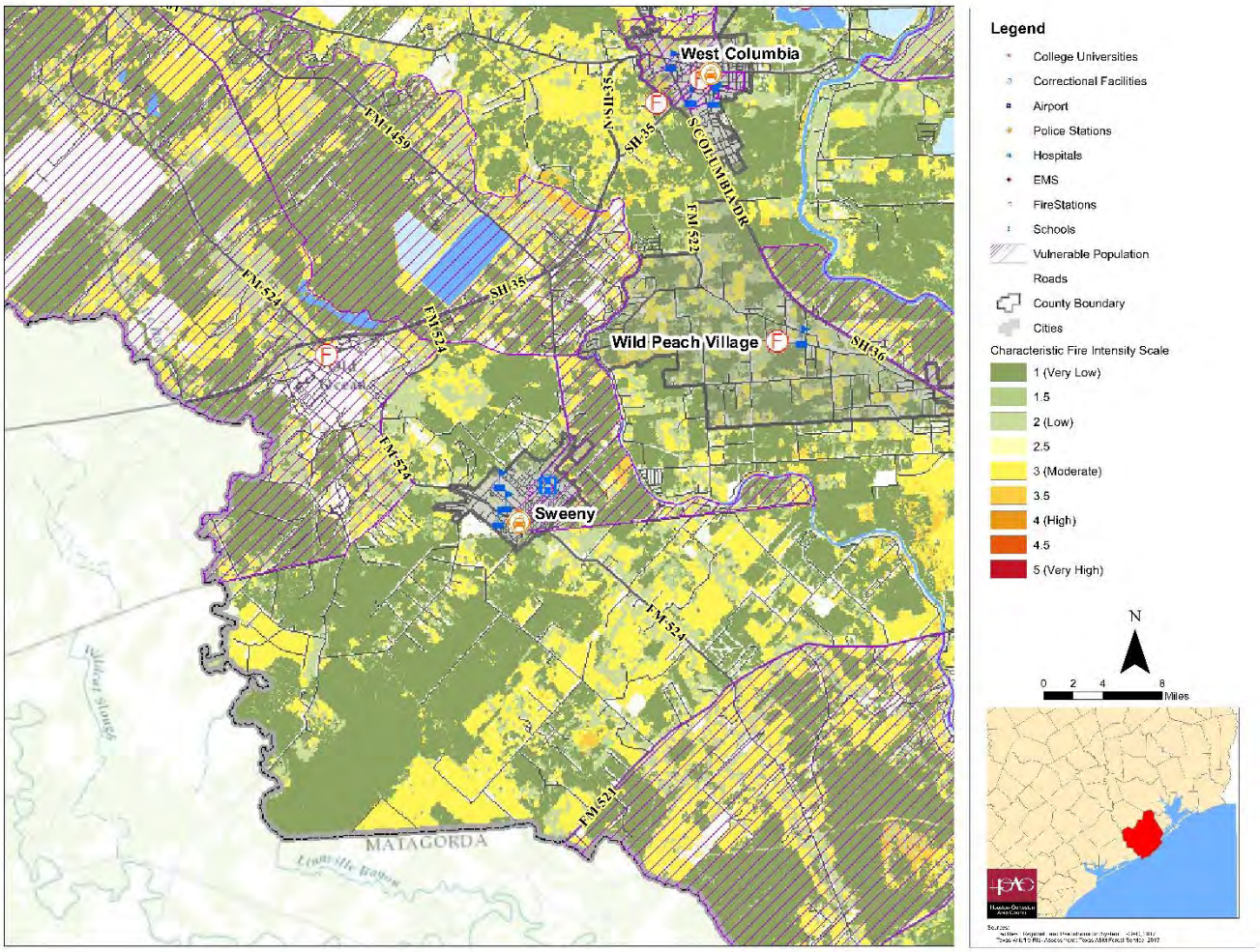
Identified Vulnerabilities:

- 205 residential structures at risk
- 16 percent of population are individuals 18 years and younger (84 children)
- 19 percent of population are individuals 65 and older (101)

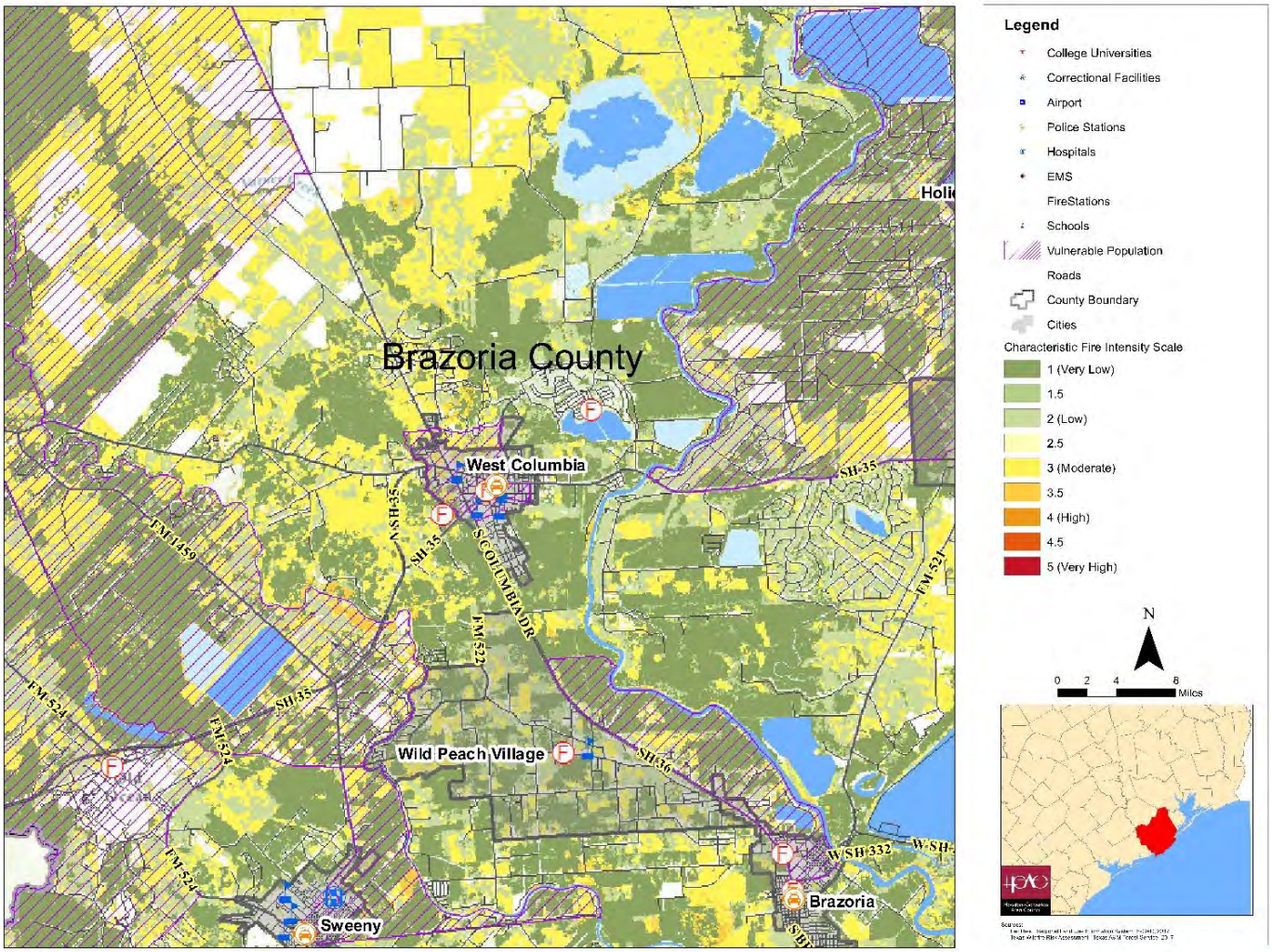
Identified Impacts:

- 35 percent of the total population may face serious illness or health conditions due to poor air quality
- Residential and commercial property loss throughout the jurisdiction

Wildfire Risk Assessment: Sweeny



Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0
Area Affected:	3 %	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Brazoria. Sweeny has a similar likelihood that the event will occur. Brazoria's probability is: Unlikely; 17 percent chance to occur within a year.			
Extent: Similarly, Brazoria's extent is: The largest wildfire in the past 12 years has been a 2-acre fire. The jurisdiction can expect a 4 to 6-acre fire.			
Identified Vulnerabilities: • 251 structures at risk • 28 percent of population are individuals 18 years and younger (1,058 children) • 18 percent of population are individuals 65 and older (686 older individuals) **Identified Impacts:** • 46 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			



West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	0
Area Affected:	8 %	**Annual Event Average:**	0

Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Brazoria. West Columbia has a similar likelihood that the event will occur. Brazoria's probability is: Unlikely; 8.3 percent chance to occur within a year.

Extent: Similarly, Brazoria's extent is: The largest wildfire in the past 12 years has been a 2-acre fire. The jurisdiction can expect a 4 to 6-acre fire.

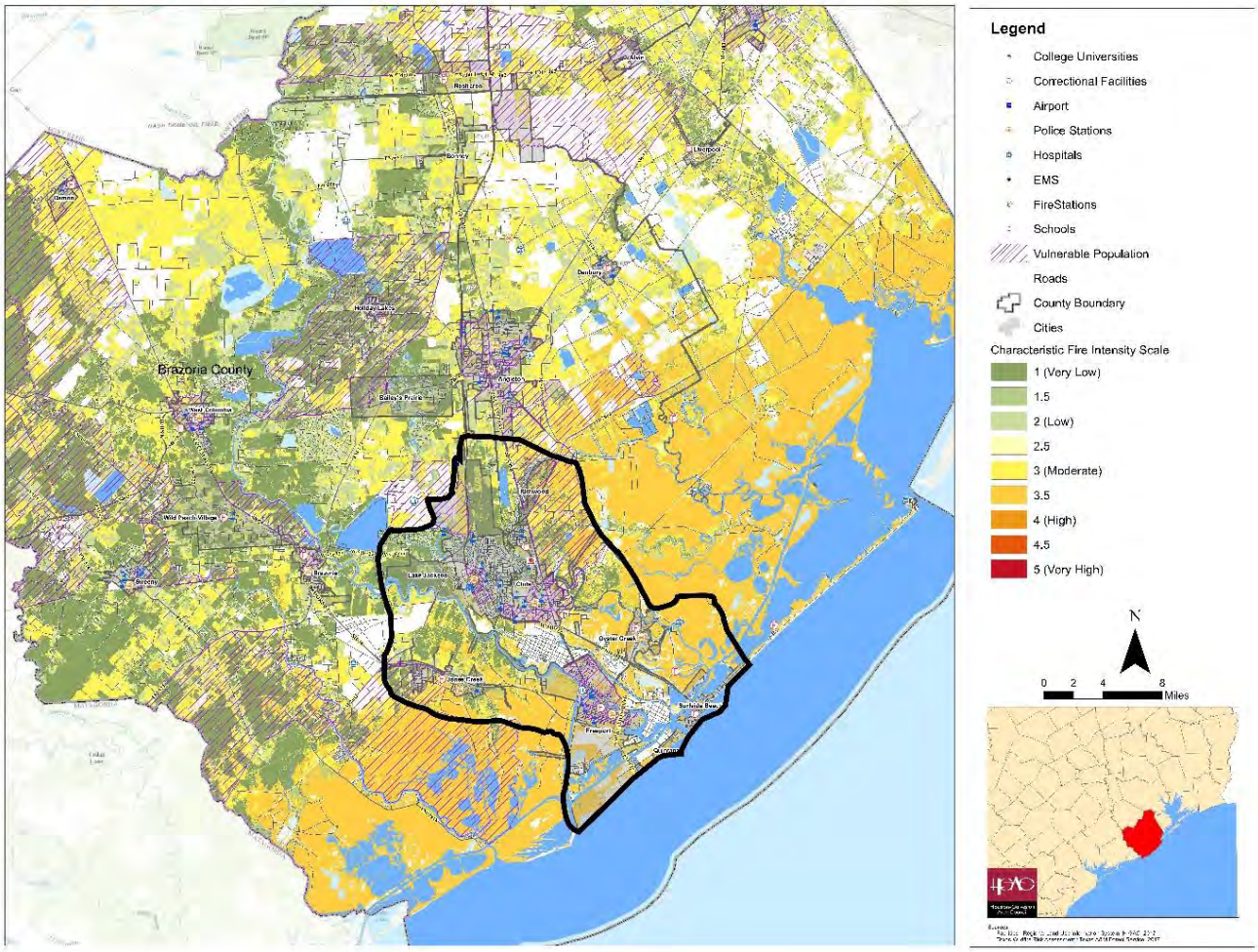
Identified Vulnerabilities:

- 246 residential structures at risk
- 29 percent of population are individuals 18 years and younger (1,120 children)
- 12 percent of population are individuals 65 and older (482 older individuals)

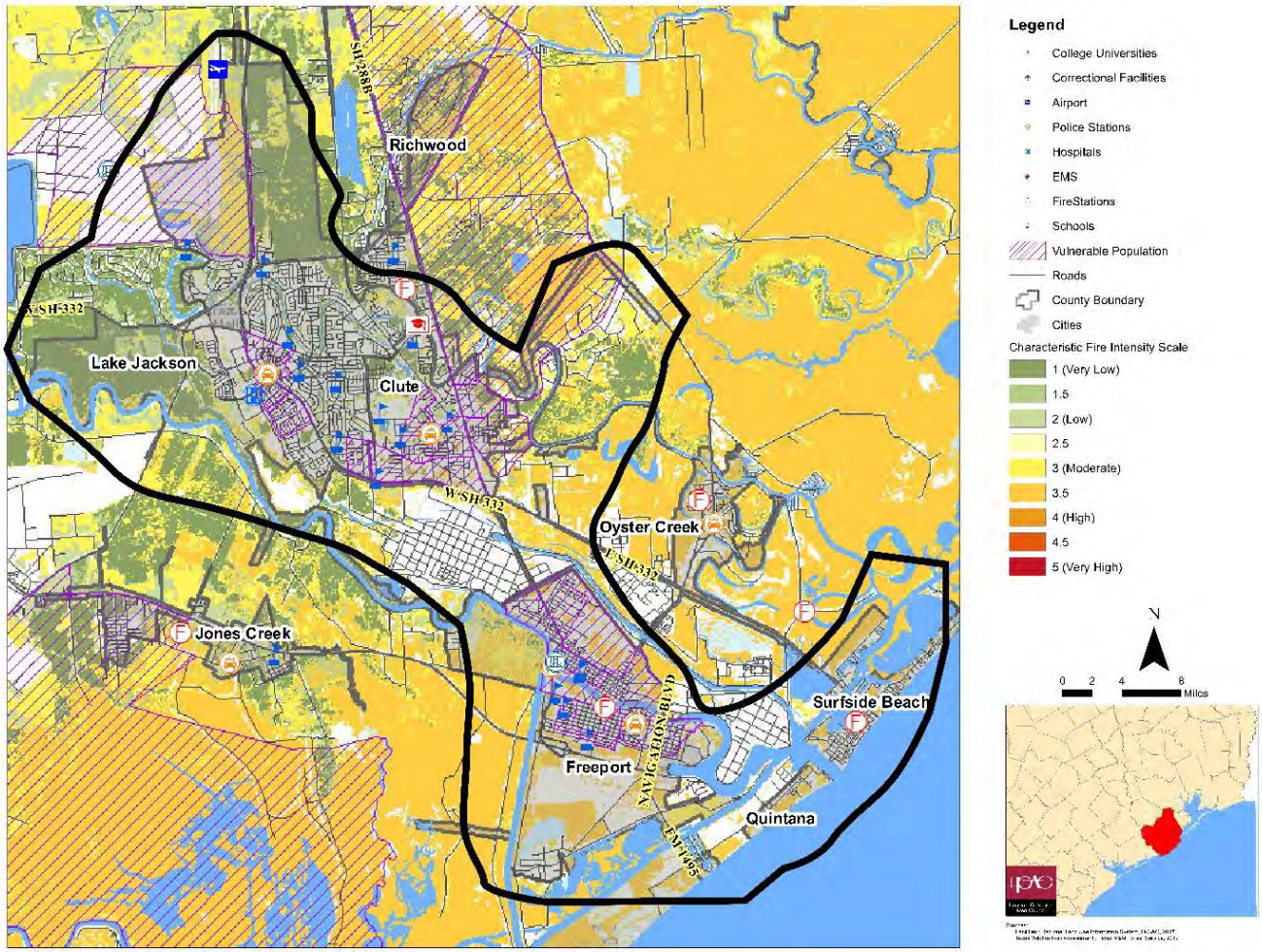
Identified Impacts:

- 41 percent of the total population may face serious illness or health conditions due to poor air quality
- Residential and commercial property loss throughout the jurisdiction

Wildfire Risk Assessment: Brazosport ISD



Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	0
Area Affected:	46 %	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is throughout Brazoria County. The ISD has a similar likelihood that the event will occur as unincorporated areas of the county. Brazoria County unincorporated area's probability is: Very Likely; 100 percent chance event will occur in a year.			
Extent: The ISD areas can expect a 75-acre fire.			
Identified Vulnerabilities: • 12,000 students 18 years and younger • 19 schools- 10 elementary schools, 3 high schools, 5 middle schools, 1 alternative school **Identified Impacts:** • 100 percent of the total identified population may face serious illness or health conditions due to poor air quality • If administration or schools need to close due to fire damage or poor air quality this may lead to a financial loss for families needing to take off work or find childcare for their children. • Academic/ educational loss for children missing school and potentially falling behind in course work			



Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	0
Area Affected:	37%	**Annual Event Average:**	0

Probability: Although the jurisdiction has no recorded events, the jurisdiction is throughout Brazoria County. Perhaps the District has a similar likelihood that the event will occur as unincorporated areas of the county. Brazoria County unincorporated area's probability is: Very Likely; 100 percent chance event will occur in a year.

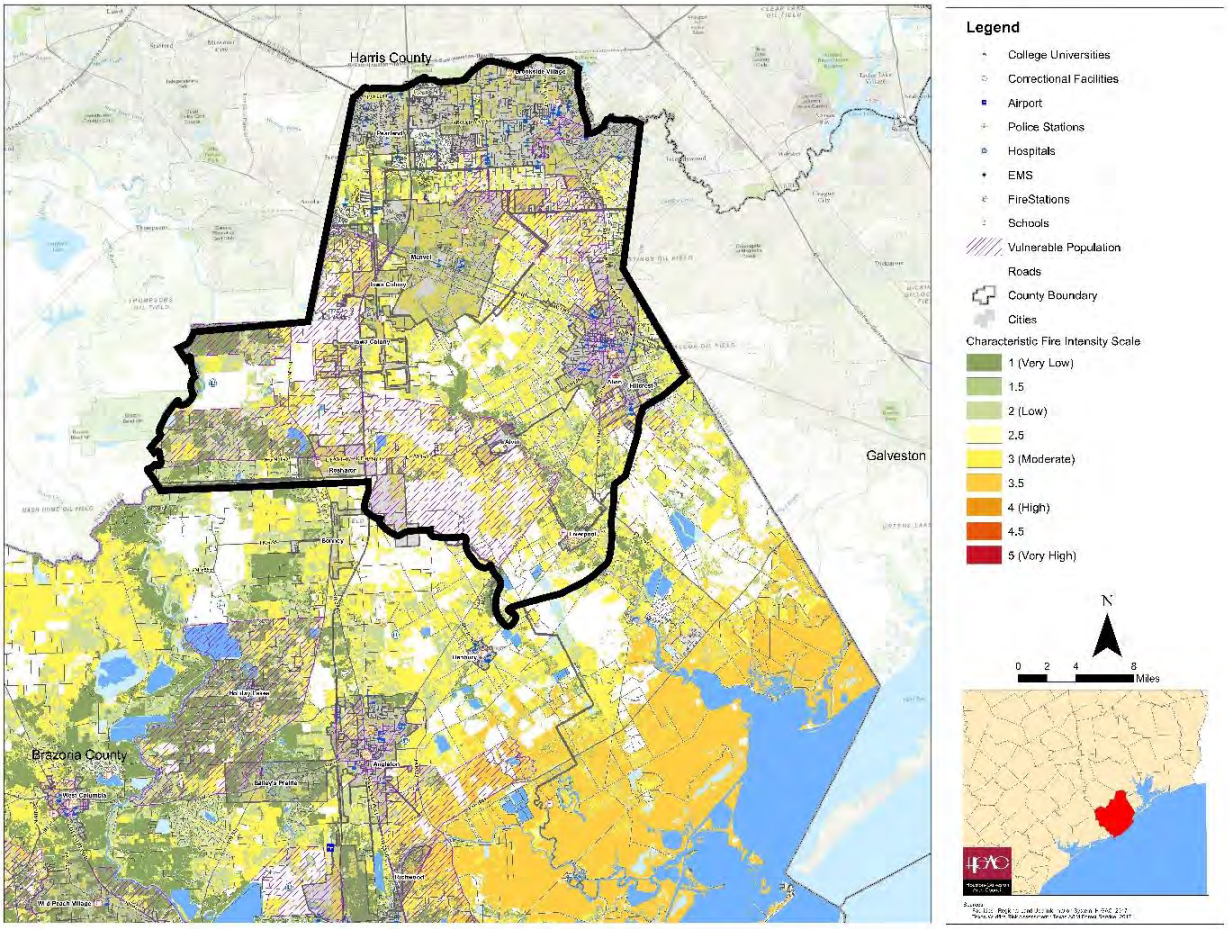
Extent: Similarly, Brazoria County unincorporated area's extent is: The largest wildfire in the past 12 years has been a 560-acre fire. The unincorporated areas can expect a 600-acre fire.

Identified Vulnerabilities:

- Administrative building
- 14 pump stations and levees

Identified Impacts:

- If the district's infrastructure becomes damaged this may lead to a decrease in service or slower services, in extreme circumstances this may lead to a decrease in agriculture production
- Financial cost of repairing administration building, pumps and levees damaged



Alvin ISD			
Planning Area (Sq. mi):	252	**Occurrences since 2000:**	0
Area Affected:	23 %	**Annual Event Average:**	0

Probability: Although the jurisdiction has no recorded events, the jurisdiction is throughout Brazoria County. Perhaps the ISD has a similar likelihood that the event will occur as unincorporated areas of the county. Brazoria County unincorporated area's probability is: Very Likely; 100 percent chance event will occur in a year.

Extent: The ISD area can expect a 103-acre fire.

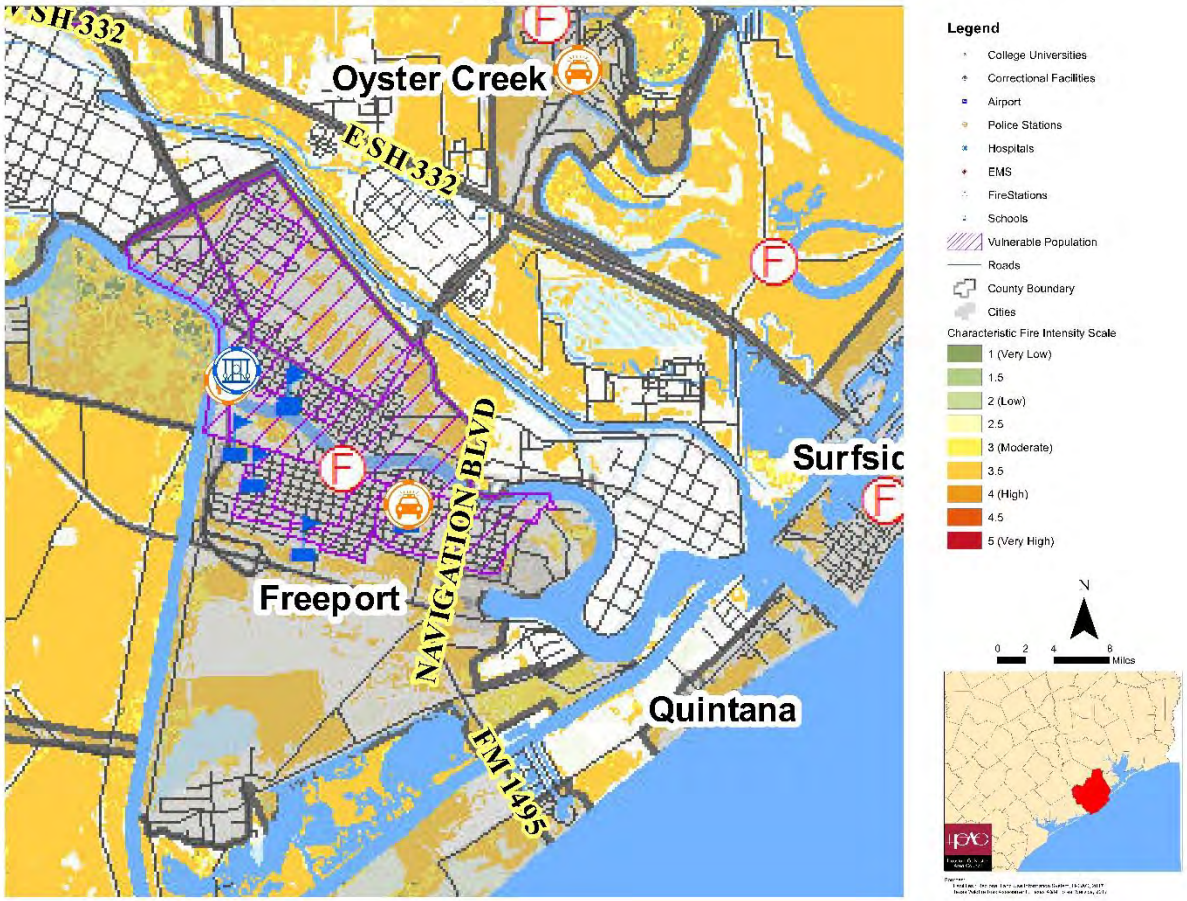
Identified Vulnerabilities:

- 31 schools- 17 elementary schools, 3 high schools, 6 middle schools, 1 alternative school
- 22,000 children 18 years and younger

Identified Impacts:

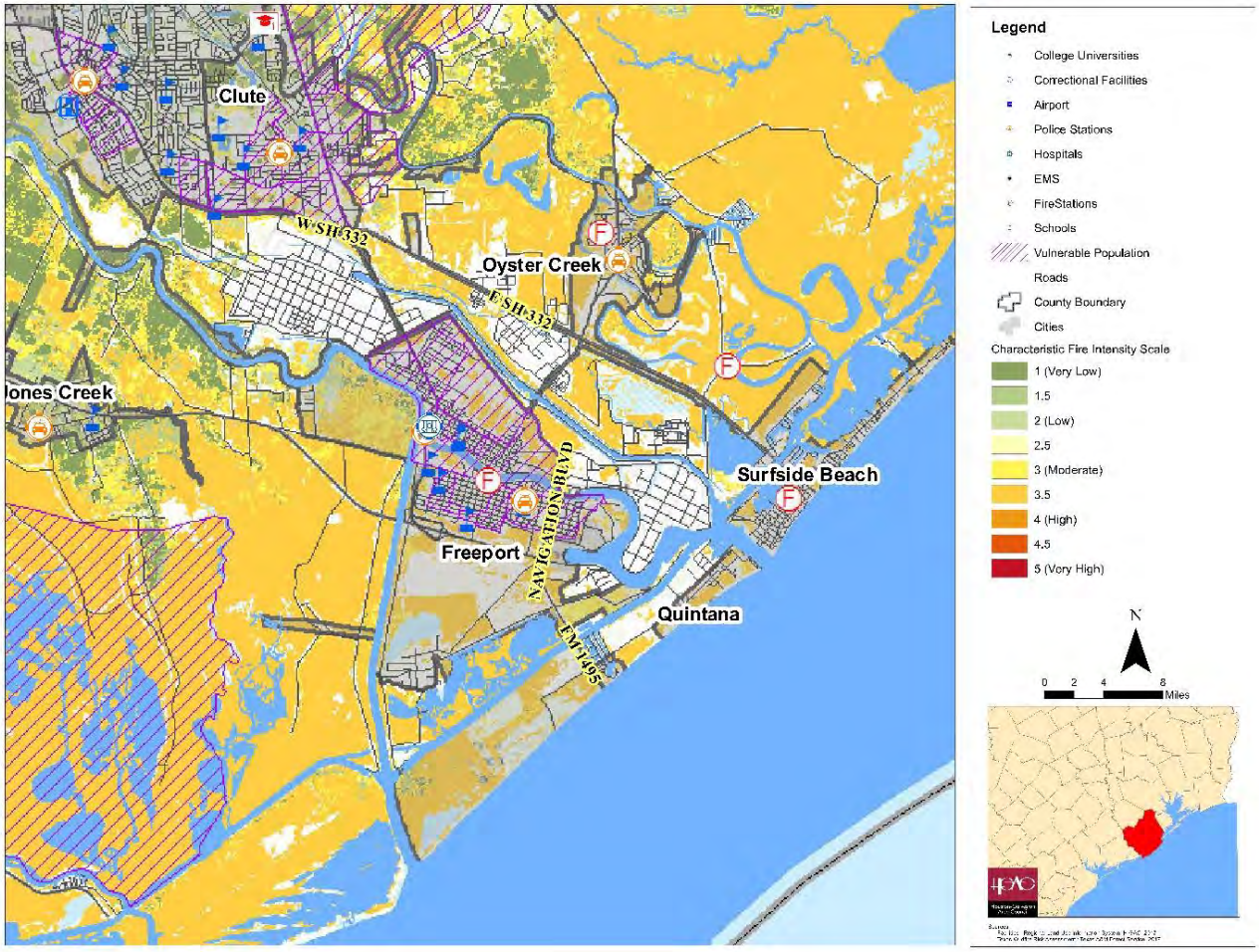
- 100 percent of the total identified population may face serious illness or health conditions due to poor air quality
- If administration or schools need to close due to fire damage or poor air quality this may lead to a :
  - financial loss for families needing to take off work or find childcare for their children
  - Academic/ educational loss for children missing several days of school and potentially falling behind in course work

Wildfire Risk Assessment: Port Freeport



Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	26
Area Affected:	12 %	**Annual Event Average:**	2.2
Probability: Highly Likely; 100 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 10-acre fire. The jurisdiction can expect a 12 to 14-acre fire.			
Identified Vulnerabilities: • Port facilities, equipment, and administrative buildings **Identified Impacts:** • If a wildfire spreads throughout the port facilities this could endanger employees and may create a loss of life and serious injury • The port is one of 18 ports in Texas, if the port had to close due to a fire this may have an impact on the local and state economy; leading to a potential loss of $226.6 million dollars per day			

Wildfire Risk Assessment: Freeport



Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	26
Area Affected:	31 %	**Annual Event Average:**	2.2
Probability: Highly Likely; 100 percent chance to occur within a year			
Extent: The largest wildfire in the past 12 years has been a 10-acre fire. The jurisdiction can expect a 12 to 14-acre fire.			
Identified Vulnerabilities: • 697 residential structures at risk • 29 percent of population are individuals 18 years and younger (1,120 children) • 12 percent of population are individuals 65 and older (482 older individuals) **Identified Impacts:** • 45 percent of the total population may face serious illness or health conditions due to poor air quality • Residential and commercial property loss throughout the jurisdiction			

2017

Part 6.3: Hurricanes & Tropical Storms

6.3 Hurricanes and Tropical Storms

The Saffir-Simpson Scale ranks hurricanes that are formed in the Atlantic Ocean and Northern Pacific Ocean east of the international date line. The scale considers winds and the amount of damages that could be sustained by the storm. Category 1 is the lowest category of storm, while Category 5 is the strongest level storm. Tropical storms are tropical cyclones that have winds between 39 to 73 mph. While tropical cyclone winds do not reach the wind speeds for the Saffir- Simpson scale, according to the Beaufort Wind Scale, tropical storms are capable of producing winds that could break or uproot trees or create considerable structural damage.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt. 119-153 km/h	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110mph 83-95 kt. 154-177 km/h	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (Major)	111-129 mph 96-112 kt. 178-208 km/h	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (Major)	130-156 mph 113-136 kt. 209-251 km/h	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months
5 (Major)	157 mph min. 137 kt. min. 252 km/h	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Historic Occurrence

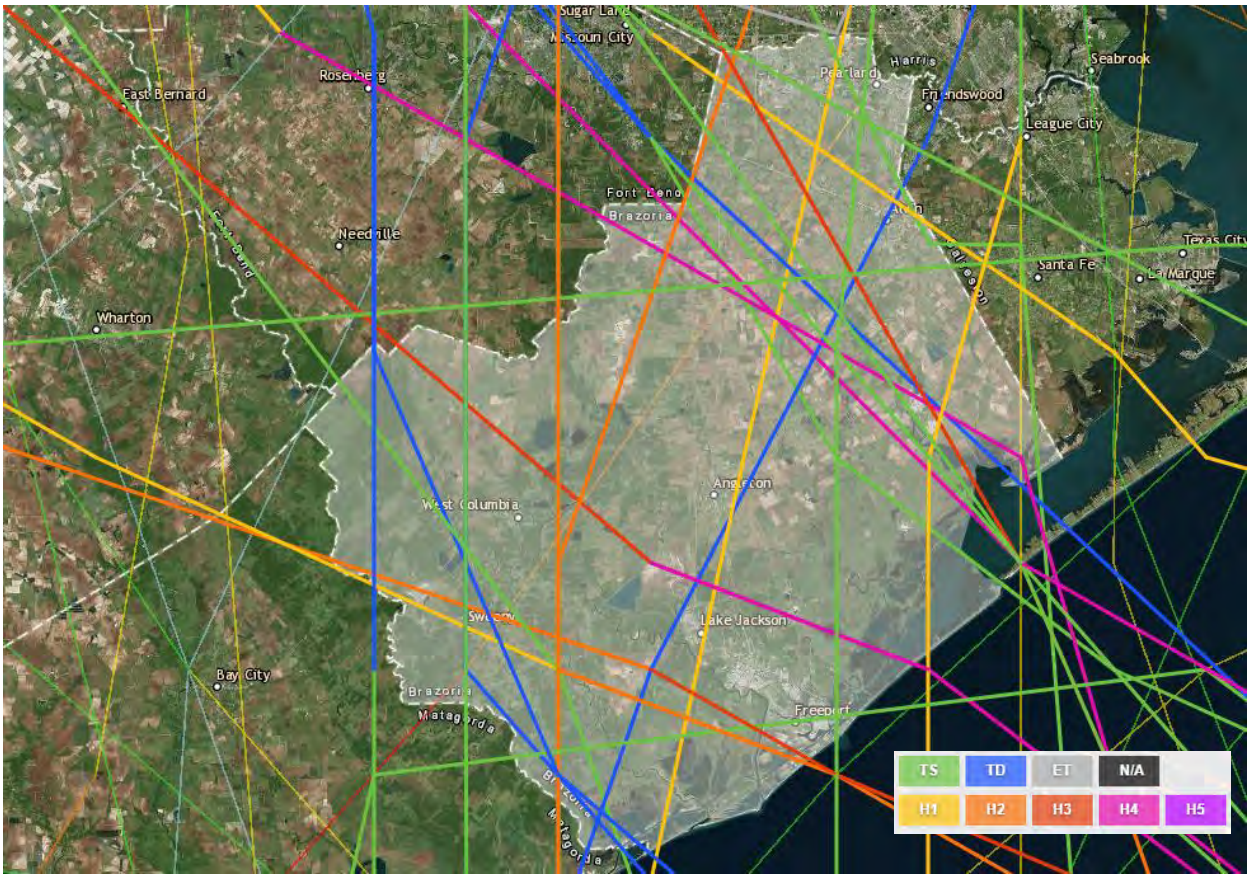
Based on recorded data, twelve hurricanes and tropical storms have direct paths over Brazoria County. Hurricanes and tropical storms since 2000 are in included in the list below, and their monetary impact is also noted. There were no reported injuries or deaths from these events or crop damage.

Date	Event Type	Property Damage (2015 Dollars)	Notes
6/5/2001	Tropical Storm	$22,200,000	None
9/5/2002	Tropical Storm	$0	None
7/14/2003	Hurricane (Typhoon)	$1,270,000	Hurricane Claudette. In Brazoria County, 2 single family homes were destroyed, 10 received major damage, and 39 received minor damage. 2 businesses were destroyed and 9 received major damage totaling $655,000. The highest recorded tide level, 6.99 feet above mean low water, occurred in Freeport at the Brazos River levee.
8/30/2003	Tropical Storm	$30,000	Tropical Storm Grace became the second tropical cyclone in less than two months to make landfall around Port O'Connor. There was no damage due to Grace's winds. Total rainfall amounts included 5.57 inches in Freeport
9/1/2003	Tropical Storm	$8,000	This flash flood event was from the remnants of Tropical Storm Grace. Rainfall totals from the 1st and 2nd were 4.75 inches in Freeport.

8/29/2005	Storm Surge/Tide	$40,000	Minor coastal flooding from swells created by Hurricane Katrina caused a bulkhead to break in Surfside. Washed out some roads and broke a few sewer lines.
9/23/2005	Hurricane (Typhoon)	$500,000	None
9/12/2008	Storm Surge/Tide	$1,000,000,000	Significant damage occurred due to surge along gulf facing sections including Quintana and Surfside areas. Surge estimates of 7 to 10 feet were obtained from high water marks.
9/12/2008	Hurricane (Typhoon)	$700,000,000	Ike produced damage due to high storm surge and high winds over the region. Brazoria County was located to the left of the landfall where winds and surge were not quite as high, but still enough to produce significant damage. Storm surge estimates were 7 to 10 feet with wind gusts to hurricane force.
6/15/2015	Tropical Storm	$0	Surge flooded impacted Surfside beaches, the Treasure Island subdivision and San Luis Pass Park. In the village of Surfside Beach, Seashell, Surf and Beach Roads were closed due to high water form storm surge. All countywide beach access roads were closed. Storm surge flooding was two feet deep in the Treasure Island subdivision. Heavy rain caused the flooding of Chocolate and Halls Bayous. There were trees downed by winds that were blocking roads in the town of Angleton.
6/21/2017	Tropical Storm	$0	There was minor coastal flooding around Surfside and Blue Water Highway with minimal impact.
8/25/2017	Tropical Storm	$2,000,000,000	Slow moving Tropical Storm Harvey produced torrential rains and catastrophic flooding. Several tornadoes touched down. Major to record flooding occurred along the Brazos and San Bernard Rivers and several other creeks and tributaries including Oyster Creek.

NCDC: https://www.ncdc.noaa.gov/stormevents/

NOAA: Historical Hurricane Tracks in Brazoria County Map (1871 -Present)



Source: NOAA https://coast.noaa.gov/hurricanes/

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring within a given year. The analysis calculates the average number of events in each jurisdiction annually and then calculates the percent chance of the event occurring within a year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Information from stakeholders, FEMA, NOAA, and the Department of Homeland Security (DHS) are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- FEMA's Hazus analysis software
- Stakeholder identified vulnerabilities
- American Community Survey (ACS, 5-year, 2016) Data on building stock and residents

Hazus was used to determine the economic loss and calculate the building stock at risk of hurricane damage in Brazoria County. The complete Hazus report is in Appendix C. Stakeholders provided valuable insight into additional vulnerabilities within their communities. These findings are provided in condensed charts for each jurisdiction.

Brazoria County (All participating jurisdictions)

Identified Vulnerabilities:

While participating jurisdictions identified flooding as one of the main effects of hurricanes, flooding is addressed in the first section. In this section vulnerabilities from hurricane winds are addressed. High winds can tear down powerlines, trees, barns, fences, and multitude of other debris can be blown into roadways and homes during the event.

Additionally, residences and commercial buildings could be damaged or destroyed due to events; older residential neighborhoods and structures without a permanent foundation were identified as one of the main vulnerabilities throughout the county. While current building codes address the vulnerability of wind damage to structures, older buildings (particularly residential buildings) were built when less stringent building codes were in place; therefore, older residential building and residences without a permanent foundation are a focus in this section.

- According to Hazus 4,086 commercial residential buildings are at risk
- According to Hazus 90,641 residential buildings are at risk
- According to Hazus 26,654 individuals will be displaced from their homes
- Based on the Hazus reports residential buildings in comparison to commercial buildings are most at risk of the effects of hurricanes throughout the county

Brazoria County (All participating jurisdictions)

Identified Impacts:

- Downed powerlines could impact communication and daily active leading to a finical loss for the county, cities and individuals, and could impede first responders from reaching those in need or residents evacuating
- Strong winds could prevent first responders from traveling to assist individuals, because of unsafe driving conditions such as debris hitting emergency vehicles
- Critical facilities could sustain wind damage, potentially delaying first responders reaching those in need and city services after the event
- Economic and financial loss for cities and individuals including property loss:
    - According to Hazus there could be a potential of $ 29,401,709 in residential loss or 87 percent of total loss
    - According to Hazus there could be a potential of $2,672,546 in commercial property loss or 8 percent of total loss

Brazoria County (Unincorporated)

Planning Area (Sq. mi):	1,475	**Occurrences since 1871:**	26
Area Affected:	100 %	**Annual Event Average:**	.18 events a year

Probability: Unlikely; 17 percent chance to occur a year

Extent: The strongest hurricane in the past was a category 5 hurricane; the unincorporated areas can expect to see a category 5 hurricane in the future

Identified Vulnerabilities:

- Vulnerable populations are concentrated near the coast near the San Bernard Wildlife Refuge
- Critical facilities including: 3 fire station, 5 schools, 1 shelter, and 2 correctional facilities

Identified Impacts:

- Vulnerable populations located near the coast could sustain greater injury or loss of life due to the lack of resources to evacuate or to contact responders when they need help
- Critical facilities and equipment could be damaged with windows broken or roofs blown off or destroyed by high winds
- First responders could be delayed, this may increase serious injury or loss of life throughout the county

Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	4
Area Affected:	100%	**Annual Event Average:**	.24
Probability: Unlikely; 24 percent chance occurring within a given year			
Extent: According to past events, the strongest tornado was an F0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 6,275 Residential buildings built before 1980 (65.8% of housing stock) • 1,334 Mobile Homes (14% of housing stock) • 42 Boats/ RVs/ Vans acting as main housing (.4 % of housing stock) **Identified Impacts:** • Almost 85 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and potential increase in serious injuries or loss of life throughout the jurisdiction.			

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 1871:**	7
Area Affected:	100 %	**Annual Event Average:**	.048 events a year
Probability: Unlikely; 4.8 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 1 hurricane; the jurisdiction can expect to see a category 3 to 5 hurricane in the future			
Identified Vulnerabilities: • 6,426 Residential buildings built before 1980 (80 % of housing stock) • 685 Mobile Homes (8.5 % of housing stock) **Identified Impacts:** • Almost 90 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and potential increase in serious injuries or loss of life throughout the jurisdiction.			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 1871:**	4
Area Affected:	100%	**Annual Event Average:**	.027 events a year
Probability: Unlikely; 2.7 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 3 to 5 hurricane in the future			
Identified Vulnerabilities: • 82 Residential buildings built before 1980 (80.5% of housing stock) • 22 Mobile Homes (19.5% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 1871:**	5
Area Affected:	100%	**Annual Event Average:**	.034 events a year
Probability: Unlikely; 3.4 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 3 to 5 hurricane in the future			
Identified Vulnerabilities: • 107 Residential buildings built before 1980 (73.1% of housing stock) • 30 Mobile Homes (20.5% of housing stock) • 4 Boats/ RVs/ Vans acting as main housing (2.7% of housing stock) **Identified Impacts:** • 96 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 1871:**	8
Area Affected:	100%	**Annual Event Average:**	.055 events a year
Probability: Unlikely; 5.5 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 3 to 5 hurricane in the future			
Identified Vulnerabilities: • 1,129 Residential buildings built before 1980 (80% of housing stock) • 144 Mobile Homes (10.2% of housing stock) • 14 Boats/ RVs/ Van acting as main housing (1% of housing stock) **Identified Impacts:** • 91 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 1871:**	5
Area Affected:	100%	**Annual Event Average:**	.034 events a year
Probability: Unlikely; 3.4 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 1 hurricane; the jurisdiction can expect to see a category 2 to 4 hurricane in the future			
Identified Vulnerabilities: • 480 Residential buildings built before 1980 (79.1% of housing stock) • 7 Mobile Homes (1.2% of housing stock) **Identified Impacts:** • Almost 81 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 1871:**	7
Area Affected:	100%	**Annual Event Average:**	.048 events a year
Probability: Unlikely; 4.8 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) • 312 Mobile Homes (6% of housing stock) • 26 Boats/ RVs/ Vans acting as main housing (.5% of housing stock) **Identified Impacts:** • Approximately 71 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 1871:**	4
Area Affected:	100%	**Annual Event Average:**	.027 events a year
Probability: Unlikely; 2.7 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 500 Residential buildings built before 1980 (86.2% of housing stock) • 4 Mobile Homes (.7% of housing stock) **Identified Impacts:** • Almost 87 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 1871:**	6
Area Affected:	100 %	**Annual Event Average:**	.041 events a year
Probability: Unlikely; 4.1 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 263 Residential buildings built before 1980 (60% of housing stock) • 122 Mobile Homes (27.9% of housing stock) **Identified Impacts:** • Almost 83 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 1871:**	9
Area Affected:	100 %	**Annual Event Average:**	.062 events a year
Probability: Unlikely; 6.2 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 3 to 5 hurricane in the future			
Identified Vulnerabilities: • 289 Residential buildings built before 1980 (82.9% of housing stock) **Identified Impacts:** • Almost 83 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 1871:**	4
Area Affected:	100%	**Annual Event Average:**	.027
Probability: Unlikely; 2.7 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 3 to 5 hurricane in the future			
Identified Vulnerabilities: • 271 Residential buildings built before 1980 (64.8% of housing stock) • 216 Mobile Homes (51.8% of housing stock) • 5 Boats/ RVs/ Van acting as main housing (1.2% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 1871:**	7
Area Affected:	100%	**Annual Event Average:**	.048 events a year
Probability: Unlikely; 4.8 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 3 to 5 hurricane in the future			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) • 165 Mobile Homes (19.1% of housing stock) • 4 Boats/ RVs/ Van acting as main housing (.5% of housing stock) **Identified Impacts:** • About 85 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 1871:**	7
Area Affected:	100%	**Annual Event Average:**	.048 events a year
Probability: Unlikely; 4.8 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 5 hurricane in the future			
Identified Vulnerabilities: • 8,272 Residential buildings built before 1980 (70.1% of housing stock) • 6 Mobile Homes (.1% of housing stock) • 9 Boats/ RVs/ Vans acting as main housing (.1% of housing stock) **Identified Impacts:** • About 71 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 1871:**	9
Area Affected:	100 %	**Annual Event Average:**	.062 events a year
Probability: Unlikely; 6.2 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 5 hurricane in the future			
Identified Vulnerabilities: • 177 Residential buildings built before 1980 (72.2% of housing stock) • 37 Mobile Homes (15.1% of housing stock) **Identified Impacts** • Approximately, 87 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 1871:**	4
Area Affected:	100 %	**Annual Event Average:**	.027 events a year
Probability: Unlikely; 2.7 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 971 Residential buildings built before 1980 (32.8% of housing stock) • 329 Mobile Homes (11.1% of housing stock) • 77 Boats/ RVs/ Van acting as main housing (2.6% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 1871:**	5
Area Affected:	100 %	**Annual Event Average:**	.034 events a year
Probability: Unlikely; 3.4 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 356 Residential buildings built before 1980 (68.6% of housing stock) • 231 Mobile Homes (44.5% of housing stock) • 23 Boats/ RVs/ Vans acting as main housing (4.4% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 1871:**	6
Area Affected:	100 %	**Annual Event Average:**	.041 events a year
Probability: Unlikely; 4.1 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 554 Residential buildings built before 1980 (83.9% of housing stock) • 59 Mobile Homes (8.9% of housing stock) **Identified Impacts:** • About 94 percent of the housing stock was either built before 1980 or does not have a permanent foundation this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 1871:**	3
Area Affected:	100 %	**Annual Event Average:**	.021 events a year
Probability: Unlikely; 2.1 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 1 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 356 Residential buildings built before 1980 (68.6% of housing stock) • 231 Mobile Homes (44.5% of housing stock) • 23 Boats/ RVs/ Vans acting as main housing (4.4% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 1871:**	6
Area Affected:	100 %	**Annual Event Average:**	.041 events a year
Probability: Unlikely; 4.1 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 739 Residential buildings built before 1980 (72.2% of housing stock) **Identified Impacts:** • 72 percent of the housing stock was either built before 1980; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 1871:**	5
Area Affected:	100 %	**Annual Event Average:**	.034
Probability: Unlikely; 3.4 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 1,220 Residential buildings built before 1980 (73% of housing stock) • 127 Mobile Homes (7.6% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 1871:**	4
Area Affected:	100%	**Annual Event Average:**	.027 events a year

Probability: Unlikely; 2.7 percent chance to occur within a year

Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future

Identified Vulnerabilities:

- 1,447 Residential buildings built before 1980 (88.3% of housing stock)
- 38 Mobile Homes (2.3% of housing stock)

Identified Impacts:

- About 93 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.

Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 1871:**	0
Area Affected:	100%	**Annual Event Average:**	0

Probability: Although there have been no recorded events in the ISD, the ISD is throughout the county. Consequently, the ISD's probability may be like unincorporated areas of Brazoria County. Brazoria County's unincorporated area's probability is: Unlikely; 17 percent chance to occur a year

Extent: Similarly, Brazoria County's unincorporated area's extent is: The strongest hurricane in the past was a category 5 hurricane; the unincorporated areas can expect to see a category 5 hurricane in the future

Identified Vulnerabilities:

- 12,000 students
- 19 schools- 10 elementary schools, 3 high schools, 5 middle schools, 1 alternative school

Identified Impacts:

- Serious injury or loss of life if an event occurs during school hours or during extracurricular activities
- Financial loss for the school district if any of the schools or administrative buildings are damaged due to the event
- If administration or schools need to close due to flood damage or flooding throughout the community this may lead to a:
    - financial loss for families needing to take off work or find childcare for their children
    - Academic/ educational loss for children missing several days of school and potentially falling behind in course work

Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 1871:**	5
Area Affected:	100%	**Annual Event Average:**	.034 events a year
Probability: Unlikely; 3.4 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 5 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • Administrative building just outside of the 100-year floodplain and along the coast. **Identified Impacts:** • Finical loss for the port, local are, and the state if the port must close for a prolonged time			

Alvin ISD			
Planning Area (Sq. mi):	256	**Occurrences since 1871:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: Although there have been no recorded events in the ISD, the ISD is throughout the county. Consequently, the ISD's probability may be like unincorporated areas of Brazoria County. Brazoria County's unincorporated area's probability is: Unlikely; 17 percent chance to occur a year			
Extent: Similarly, Brazoria County's unincorporated area's extent is: The strongest hurricane in the past was a category 5 hurricane; the unincorporated areas can expect to see a category 5 hurricane in the future			
Identified Vulnerabilities: • 31 schools- 17 elementary schools, 3 high schools, 6 middle schools, 1 alternative school • 22,000 children 18 years and younger, adds an additional 1,000 students per year **Identified Impacts:** • Serious injury or loss of life if an event occurs during school hours or during extracurricular activities • Financial loss for the school district if any of the schools or administrative buildings are damaged due to the event. • If administration or schools need to close due to flood damage or flooding throughout the community this may lead to a: o financial loss for families needing to take off work or find childcare for their children o Academic/ educational loss for children missing several days of school and potentially falling behind in course work			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 1871:**	5
Area Affected:	100 %	**Annual Event Average:**	.034 events a year
Probability: Unlikely; 3.4 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • Port facilities, equipment, and administrative buildings **Identified Impacts:** • Serious injury or loss of life if an event occurs while staff or visitors are at the port • Financial loss for the port if damage occurs and needs repair or replacement • Economic loss for the surrounding cities and state if the port is closed for a prolonged time.			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 1871:**	5
Area Affected:	100 %	**Annual Event Average:**	.034 events a year
Probability: Unlikely; 3.4 percent chance to occur within a year			
Extent: The strongest hurricane in the past was a category 3 hurricane; the jurisdiction can expect to see a category 4 to 5 hurricane in the future			
Identified Vulnerabilities: • 4,004 Residential buildings built before 1980 (86.2% of housing stock) • 229 Mobile Homes (4.9% of housing stock) **Identified Impacts:** • About 91 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

2017

Part 6.4: Drought

6.4 Drought

The Palmers Hydrological Drought Severity Index (PHDI) is the typical way extent of drought is observed throughout the United States. This regional index considers dry and wet spells over an extended period to calculate the range in the Index. The greater the number the more extreme the drought in a specific area.

Drought has particularly adverse effects on agriculture which is major industry in Brazoria County. The most extreme conditions occurred in 2011. The county's PHDI rating was < -4.0 (Extreme Drought) from March 2011 through January 2012. There were periods of severe drought preceding and following this period from August 2010 through October 2014. The agricultural loses are estimated at $5.2 billion, though specific numbers by county are not available for this event.

Palmers Drought Severity Index	
< -4.0	Extreme Drought
-3.99 to -3.0	Severe Drought
-2.99 to -2.0	Moderate Drought
-1.99 to -1.0	Mild Drought
-0.99 to -0.5	Incipient Drought
-0.49 to 0.49	Near Normal
0.5 to 0.99	Incipient Moist Spell
1.0 to 1.99	Moist Spell
2.0 to 2.99	Unusual Moist Spell
3.0 to 3.99	Very Moist Spell
> 4.0	Extreme Moist Spell

Source: https://www.ncdc.noaa.gov/

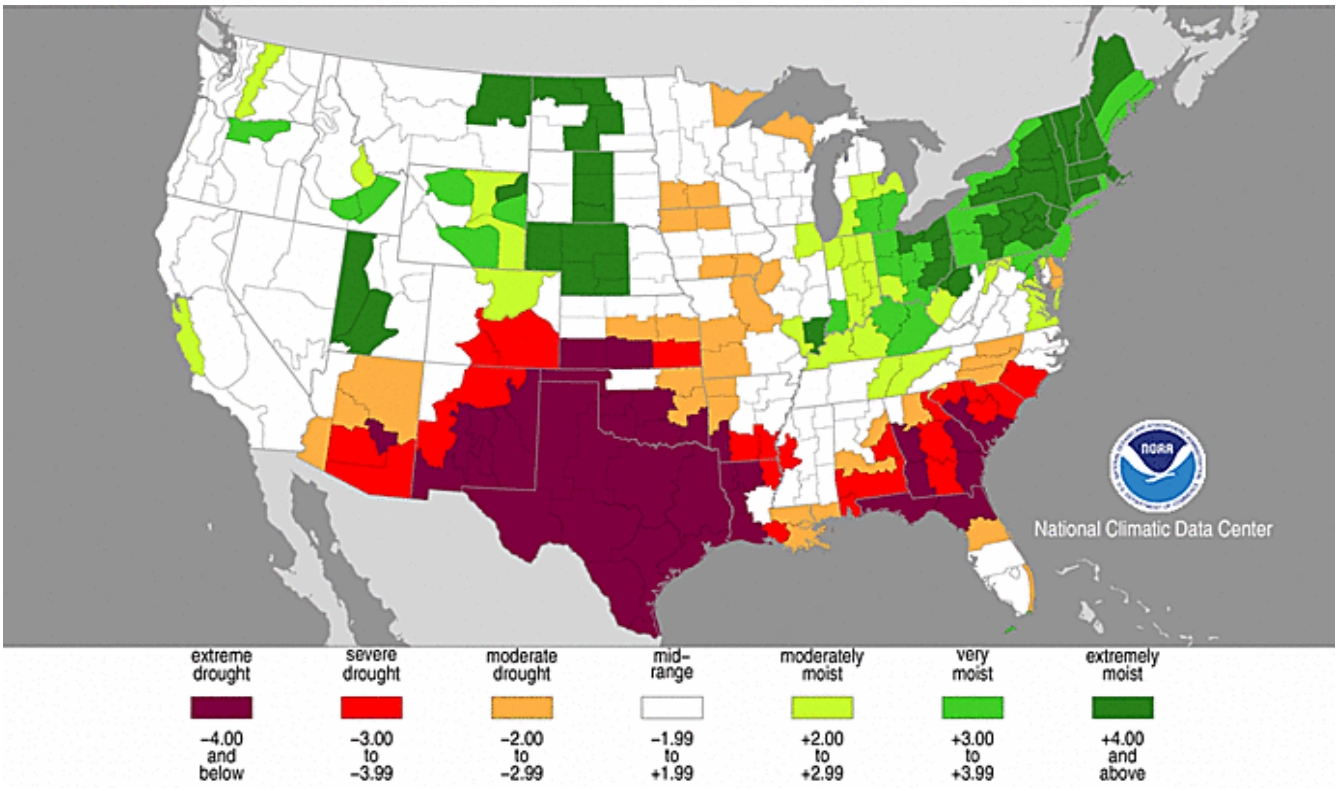
Historic Occurrence

In Brazoria County's recent history, there have been two major droughts. Zero injuries, deaths, crop or property damage was reported during these events in the county. This information is listed below at the county level. There is no county-level data available for property and agricultural losses for the most recent and most extreme drought event.

Date	Notes
8/1/2000	Severe drought continued across southeast Texas through the month of August. Rainfall for the month of August averaged only 30 to 50 percent of normal across southeast Texas. Several cities were placed under water rationing with large crop losses were noted across the area. Wildfires became increasingly common, especially toward the end of the month. Drought losses in dollars will be computed at the end of the summer growing season.
9/1/2000	Severe drought continued across southeast Texas through September 2000. The combination of excessive heat and dryness caused many wildfires to burn during the first week of the month. Water rationing continued during the first half of the month in several small communities. Water line breaks and small grass fires were a common problem across southeast Texas, especially at the beginning of the month. By the end of September, damage estimates for the season to cotton, wheat, and forage crops and increased irrigation reached $102.3 million for southeast Texas.
10/1/2011	No notes were recorded for this event from the NCDC. However, the map directly below demonstrates the extent of the drought in 2011. Additionally, 5.2 billion dollars in agriculture loss throughout the state of Texas was reported during this event. (http://twri.tamu.edu/publications/txh2o/fall-2011/timeline-of-droughts-in-texas/)

Source: https://www.ncdc.noaa.gov/

Palmers Drought Severity Index: October 2011



Maps source: https://www.ncdc.noaa.gov/

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within the next five years. The analysis calculates the average number of events in each jurisdiction annually and then calculates the percentage of that event occurring within a year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Information from stakeholders, USDA, CDC, and NOAA are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- GIS analysis of vulnerable populations
- USDA livestock production projections; and
- Stakeholder identified vulnerabilities

All Participating Jurisdictions			
Area Impacted:	Drought is not contained to a boundary and is measured by region through the Palmers Drought Severity Index. Consequently, it can arise equally in all participating jurisdictions and in the unincorporated areas of the county.	**Occurrences since 2000**	3
		Annual Event Average	.18
Probability: Likely**;** 18 % chance that an event will occur within a year			
Extent: As shown above through the Palmers Drought Severity Index maps, drought can vary greatly in terms of extent and duration. Based on the historical events in the county, all participating jurisdictions can expect moist to extreme drought throughout the planning area. The planning area can expect to see extreme drought in the future.			
Identified Vulnerabilities: • Drought can greatly affect agriculture production. While Brazoria County has a diverse economy, agriculture remains a prominent part of the economy. For example, Brazoria County ranks fourth in Texas for rice production. In addition, the county has hay, cattle, soybean crops with crops representing 61% of production and cattle 39 %. In total, agriculture represents 118.2 million dollars for the county annually. **Identified Impacts:** • The potential loss of crops and the loss of revenue for local farmers and the entire county may impact economic standing and mental wellbeing of farmers and those taking a financial loss from the occurrence.			

Part 6.5: Lightning

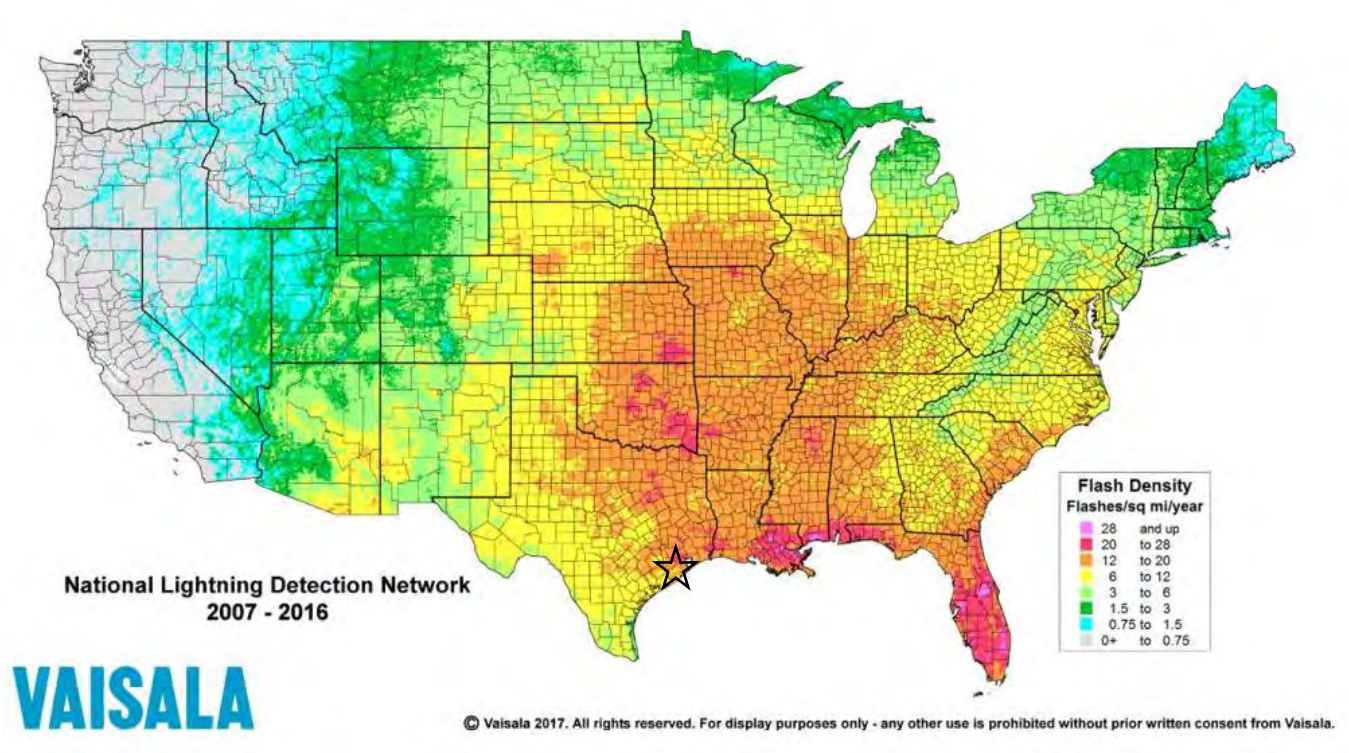
6.5 Lightning

There are two typical ways the magnitude of lightning is measured. The first is through the Lightning Activity Levels (LAL) grid. The National Oceanic and Atmospheric Administration (NOAA) considers how many cloud to ground strikes occur over a given period as well as rainfall to measure the amount of lighting activity occurring.

LAL	Cloud & Storm Development	Lighting Strikes/15 per minute
1	No thunderstorms	None
2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 clouds to ground strikes in a five-minute period.	1 to 8
3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 clouds to ground strikes in a 5-minute period.	9 to 15
4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 clouds to ground strikes in a 5-minute period	16 to 25
5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 clouds to ground strikes in a 5-minute period.	Greater than 25
6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.	Greater than 25

Source: https://www.ncdc.noaa.gov/

The second method is through the National Lightning Detection Network by Vaisala. This Network works by recording when lightning strikes the ground, considering the location, time, and polarity of the strike. According to this Network, Brazoria County is rated 12-20 flashes per square mile per year.



Historic Occurrences

There have been 2 deaths in the county due to lightning in the past 17 years; one death was reported in Angleton on August 24th, 2000. Another death was reported in Danbury on October 7th, 2007. Three injuries were reported from lightning since 2000; two injuries were reported in Quintana in 2006 and one injury was reported in Danbury on June 25th, 2007.

Jurisdiction	Date	Property Damage	Notes
Angleton	8/24/2000	$0	Lightning struck and killed 31-year-old man on motorcycle.
Quintana	6/30/2006	$0	Two victims sought shelter under a cabana on Surfside Beach when lightning struck. Both went to the hospital, but were released with minor injuries.
Unincorporated	4/25/2007	$50,000	Lightning strike to residential home caused home fire.
Lake Jackson	6/5/2007	$30,000	Lightning struck a home on the 200 block of Peppermint Drive causing a fire.
Unincorporated	6/15/2007	$210,000	Home was destroyed by fire caused by a lightning strike.
Danbury	6/25/2007	$0	Lightning strike at a Brazoria County golf course, seriously injuring one golfer.
Danbury	10/7/2007	$0	A 30-year-old male was killed by a lightning strike while standing underneath a tree.
Manvel	4/17/2014	$1,000	A lightning strike caused a grass fire on a golf course.
Iowa Colony	4/17/2014	$1,000	A lightning strike set a palm tree on fire.
Iowa Colony	4/17/2014	$15,000	A lightning strike caused a fire at a two-story residential home.
Manvel	4/17/2014	$15,000	A lightning strike set fire to a structure in Manvel.
Lake Jackson	4/14/2015	$5,000	A lightning strike caused damage to a structure.
Freeport	5/21/2016	$3,000	Lightning that struck a power pole in Freeport caused power outages throughout the city.

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year. The analysis calculates the average number of events in each jurisdiction annually and then calculates the percent chance of the event occurring within a year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Information from stakeholders, Texas Forest Service, and NOAA are the sources of data.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- American Community Survey (ACS 5-year 2016) Data on structures
- GIS analysis of structures and critical facilities exposed to lightning damage; and
- Stakeholder identified vulnerabilities

Extent

The magnitude of lightning was not recorded for each historical event; not all participating jurisdictions have a history of all lightning strikes that may have occurred in their jurisdiction; and lighting flashes per event for each jurisdiction was not found. Due to these data limitations and considering that lightning is not contained to a particular geographic area or jurisdiction, extent for the entire county was estimated; NOAA's Severe Weather Data Inventory does provide a history of flashes per event on the county level. According to the Data Inventory, the entire planning area saw approximately a range of lightning flashes per event between an average of 12 to 61 flashes per event from 2000 to 2017.

Brazoria County (All Jurisdictions)

Identified Vulnerabilities:

As described in the hazard identification section, lightning can strike anywhere, but is more likely to strike tall trees and structures, and in open fields. As noted in the historical occurrences above, lighting can cause serious injury to residents and property in these places. Lightning can also cause wildfires that could destroy or damage residential, commercial, public property or agricultural lands. Additionally, lightning could hit a structure directly and cause a structural fire. In considering this, vulnerabilities throughout the county include:

- Agricultural and parkland areas throughout the county including the Brazoria National Wildlife Refuge, Justin Hurst Wildlife and San Bernard National Wildlife Refuge
- Residential buildings throughout the county (identified below by jurisdiction)
- Communication towers (no data was found for the exact number of towers throughout the county)
- Critical facilities throughout the county (identified below by jurisdiction)

Identified Impacts:

- Residential, commercial, and public property loss throughout the county due to wildfires or structural fires started by lightning
- In total, 631,021 acres in total throughout the county in farmland at risk if a lightning strike causes a wildfire (accounting for 118,236,00 dollars in revenue). Leading to financial and economic loss for individual farmers and the county
- Lightning striking a communication tower may lead to a loss of communication for a particular jurisdiction or for a large portion of the county. This could lead to an inability to reach people in need.
- In the instance that lightning does strike a critical facility without a generator or the generator does not work, critical facilities could lose power. This may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events

Brazoria County (Unincorporated)

Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	2
Area Affected:	100 %	**Annual Event Average:**	.12 events a year

Probability: Unlikely; 12 percent chance event occurs within a year

Extent: According to past events there have been .12 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.

Identified Vulnerabilities:

- Critical facilities including: 3 fire station, 5 schools, 1 shelter, 2 correctional facilities

Identified Impacts:

- 11 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events.

Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 14 schools, 5 electrical substations, 4 fire stations, 2 EMS, 1 wastewater treatment plant, 2 shelters, 6 police stations, and 1 emergency operation center • 1,431 residential structures at risk **Identified Impacts:** • 29 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.05 events a year
Probability: Unlikely; 5 percent chance of the event occurring within a year			
Extent: According to past events there have been .05 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 3 correctional facilities, 1 electrical substation, 1 EMS, 2 fire stations, 9 schools, 3 shelters, 9 police stations, and 2 hospitals • 803 residential structures at risk **Identified Impacts:** • 29 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • 170 residential structures at risk **Identified Impacts:** • Relying on first responders in neighboring jurisdictions may lead to a delayed response time which could increase the loss of life, serious injuries, or structures damaged • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • 22 residential structures at risk **Identified Impacts:** • Relying on first responders in neighboring jurisdictions may lead to a delayed response time which could increase the loss of life, serious injuries, or structures damaged • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 correctional facility, 1 electrical substation, 1 EMS, 4 fire stations, 9 schools, 6 shelters, 2 police stations, 2 hospitals, 6 shelters, and 2 emergency operation centers • 282 residential structures at risk **Identified Impacts:** • 36 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • 1 police station • 122 residential structures at risk **Identified Impacts:** • 1 critical facility could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 EMS, 1 electrical substation, 1 fire station, 5 schools, 5 shelters, 2 police stations, 2 hospitals, 1 emergency operation center, and 1 wastewater treatment • 775 residential structures at risk **Identified Impacts:** • 19 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Lightning striking a wastewater treatment facility without a generator could impede water quality thoroughwort the area • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2000:**	2
Area Affected:	100 %	**Annual Event Average:**	.12
Probability: Unlikely; 12 percent chance event occurs within a year			
Extent: According to past events there have been .12 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 electrical substation, 1 EMS, 1 fire station, 3 schools, and 1 police station • 92 residential structures at risk **Identified Impacts:** • 7 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2000:**	2
Area Affected:	100 %	**Annual Event Average:**	.12

Probability: Unlikely; 12 percent chance event occurs within a year

Extent: According to past events there have been .12 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.

Identified Vulnerabilities:

- Critical facilities including: 1 EMS and 1 school
- 88 residential structures at risk

Identified Impacts:

- 2 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events.
- Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock

Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0

Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.

Extent: According to past events there have been 0 events recorded per year. . According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.

Identified Vulnerabilities:

- 53 residential structures at risk

Identified Impacts:

- Relying on first responders in neighboring jurisdictions may lead to a delayed response time which could increase the loss of life, serious injuries, or structures damaged
- Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0

Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.

Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.

Identified Vulnerabilities:

- 84 residential structures at risk

Identified Impacts:

- Relying on first responders in neighboring jurisdictions may lead to a delayed response time which could increase the loss of life, serious injuries, or structures damaged
- Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock

Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0

Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.

Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.

Identified Vulnerabilities:

- Critical facilities including: 1 school and 1 shelter
- 130 residential structures at risk

Identified Impacts:

- 2 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events.
- Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock

Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	2
Area Affected:	100 %	**Annual Event Average:**	.12
Probability: Unlikely; 12 percent chance event occurs within a year			
Extent: According to past events there have been .12 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 dam, 1 electrical substation, 2 EMS, 2 fire stations, 1 hospital, 2 police stations, 7 schools, 9 shelters, and 1 wastewater treatment facility **Identified Impacts:** • 2 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Lightning striking a wastewater treatment facility without a generator could impede water quality thoroughwort the area • Lightning striking an electrical substation could allow for • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 fire station and 2 police stations • 37 residential structures at risk **Identified Impacts:** • 3 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2000:**	2
Area Affected:	100 %	**Annual Event Average:**	.12
Probability: Unlikely; 12 percent chance event occurs within a year			
Extent: According to past events there have been .12 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 EMS, 2 fire stations, 3 police stations, 4 schools, and 1 shelter • 443 residential structures at risk **Identified Impacts:** • 11 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 fire station, 1 police station, 1 power plant, and 1 shelter • 78 residential structures at risk **Identified Impacts:** • 4 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	1
Area Affected:	100 %	**Annual Event Average:**	.059
Probability: Unlikely; 5 percent chance of the event occurring within a year			
Extent: According to past events there have been .05 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • 5 residential structures at risk **Identified Impacts:** • Relying on first responders in neighboring jurisdictions may lead to a delayed response time which could increase the loss of life, serious injuries, or structures damaged • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 police station, 1 school, and 1 shelter • 246 residential structures at risk **Identified Impacts:** • 3 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0

Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.

Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.

Identified Vulnerabilities:

- Critical facilities including: 1 fire station, and 1 police station
- 205 residential structures at risk

Identified Impacts:

- 2 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events.
- Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0

Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.

Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.

Identified Vulnerabilities:

- Critical facilities including: 1 electrical substation, 1 EMS, 2 fire stations, 1 hospital, 2 emergency operations centers, 3 police stations, 2 schools, 1 shelter, 3 schools, 2 power plants
- 251 structures at risk

Identified Impacts:

- 4 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events.
- Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. . According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Critical facilities including: 1 electrical substation, 1 EMS, 1 fire station, 3 schools, 3 shelters, 4 police stations, and 1 powerplant • 246 residential structures at risk **Identified Impacts:** • 4 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The ISD has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • 19 schools- 10 elementary schools, 3 high schools, 5 middle schools, 1 alternative school • 12,000 children 18 years and younger **Identified Impacts:** • Serious injury or loss of life due to students and staff outside or trying to get inside during an event • Property and financial loss due to a lightning strike hitting a building or hitting equipment or trees on school property			

Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to NOAA's data inventory, the jurisdiction could see 12 to 61 flashes per event.			
Identified Vulnerabilities: • Administrative buildings and equipment **Identified Impacts:** • If lightning strikes the administrative building or equipment this may lead to a loss or reduction in service, in extreme cases this may impact proper drainage throughout the planning areas and could lead to a decrease in agriculture production.			

Alvin ISD			
Planning Area (Sq. mi):	252	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The ISD has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to Vaisala, the jurisdiction could see 6 to 20 strikes per square mile per year.			
Identified Vulnerabilities: • 31 schools- 17 elementary schools, 3 high schools, 6 middle schools, 1 alternative school • 22,000 children 18 years and younger **Identified Impacts:** • Serious injury or loss of life due to students and staff outside or trying to get inside during an event • Property and financial loss due to a lightning strike hitting a building or hitting equipment or trees on school property • Financial loss for families if parents/ guardians need to take off work/ find childcare during a school closure			

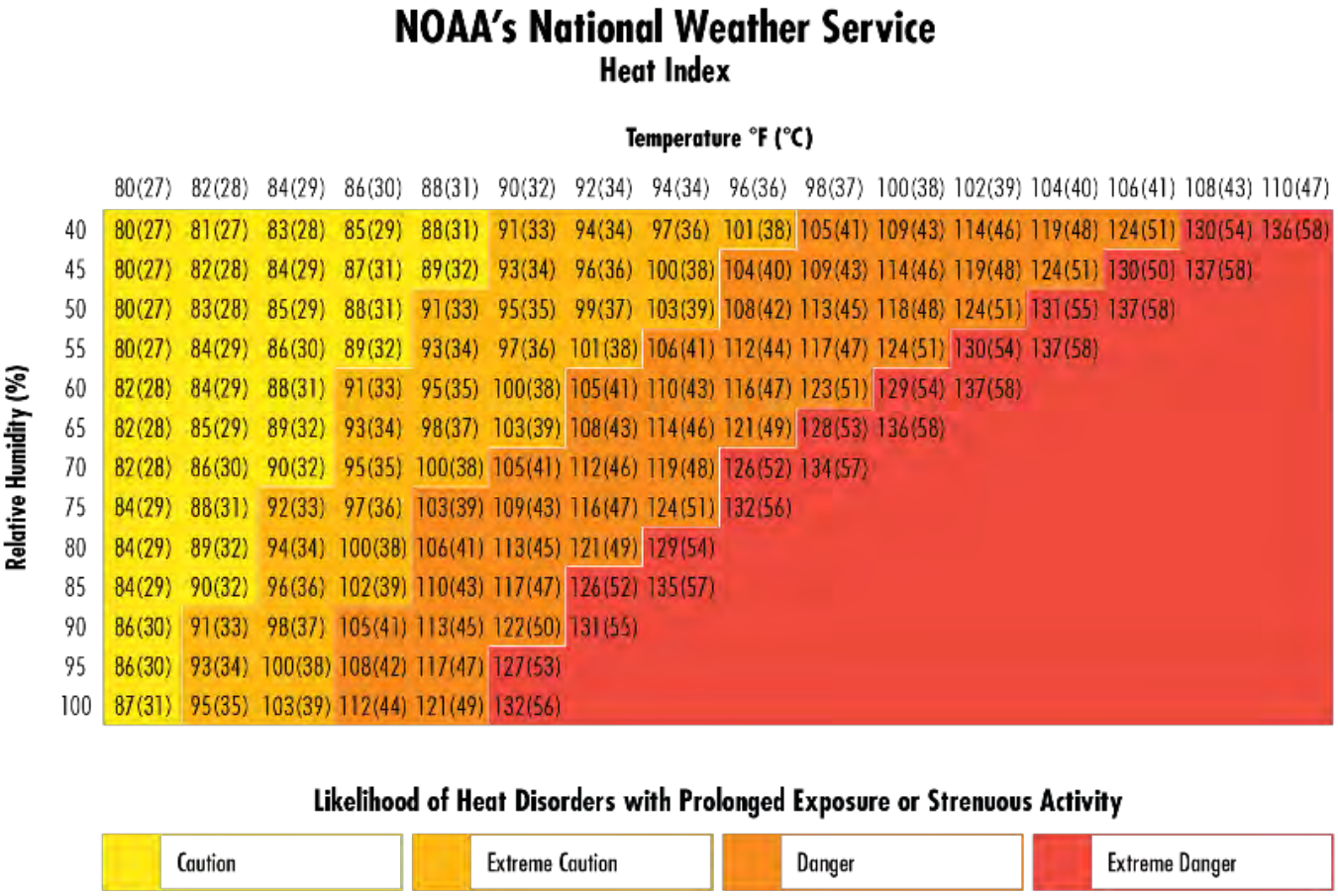
Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: The jurisdiction has no recorded lightning strikes. However, lightning strikes have been recorded in other areas of the county and are not geographically based. Therefore, probability may be similar to surrounding jurisdictions: Unlikely; 12 percent chance event occurs within a year.			
Extent: According to past events there have been 0 events recorded per year. According to Vaisala, the jurisdiction could see 6 to 20 strikes per square mile per year.			
Identified Vulnerabilities: • Tall cranes, metal terminals and cargo ships are all a potential target for lightning strikes **Identified Impacts:** • Damage to administrative building, port facilities and equipment could have a finical impact on the port and an economic loss for the county and the state • Serious injury or loss of life for staff or visitors at the port during an event • The port is one of 18 ports in Texas, if the port had to close due to a fire this may have an impact on the local and state economy; leading to a potential loss of $226.6 million dollars per day			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	1
Area Affected:	100 %	**Annual Event Average:**	.059
Probability: Unlikely; 6 percent chance of the event occurring within a year			
Extent: According to past events there have been .05 events recorded per year. According to Vaisala, the jurisdiction could see 6 to 20 strikes per square mile per year.			
Identified Vulnerabilities: • Critical facilities including: 1 correctional facility, 5 electrical substation, 2 EMS, 3 fire stations, 6 schools, 5 shelters, 8 police stations, 1 emergency operations center, 2 wastewater treatment plants, and 1 power plant • 697 residential structures at risk **Identified Impacts:** • 4 critical facilities could lose power or catch on fire if lightning strikes; this may slow down first responders and allow for greater loss of life, injury, or property damage particularly when lighting is accompanied by flooding or other hazardous events. • Damage to homes caused by lightning may lead to a financial loss for residents and/ or injury or loss of life in a house fire or electrical shock			

Part 6.6: Heat Events

6.6 Heat Event

Heat Events are defined by NOAA as a period of heat resulting from the combination of elevated temperatures and relative humidity. A Heat Event occurs whenever heat index values meet or exceed locally/regionally established advisory thresholds. Fatalities or major impacts on human health occurring when ambient weather conditions meet heat advisory criteria are reported using the Heat Event (NCDC).



Historic Occurrences

June to August are the months that Brazoria County could experience the most severe heat, with average temperatures between 90 and 100 degrees. According to NOAA's database, zero deaths, injuries, crop or property damage were reported from 2000 to 2017 due to Heat Events.

Date	Event	Jurisdiction	Notes
7/6/2000	Heat Event	County wide	Excessive heat impacted southeast Texas for much of the month of July. High temperatures ranged from 98 to 105 degrees daily over all but the immediate coast during a 2-week period. Only traces of rainfall were observed during this period.
8/29/2000	Heat Event	County wide	Excessive heat occurred over southeast Texas during the last 3 days of August.
9/1/2000	Heat Event	County wide	A record setting heat wave continued over southeast Texas through the first week of September 2000. A heat wave with temperatures of this duration and magnitude is unprecedented for southeast Texas.
6/24/2009	Heat Event	County wide	Hot, humid conditions led to heat indices above 105 degrees for several days in late June.

Source: https://www.ncdc.noaa.gov

1

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Additionally, extent estimates the worst event the jurisdiction could experience in the future. Information from stakeholders, USDA, CDC, and NOAA are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- American Community Survey (ACS, 2016, 5-year) Data on residents
- GIS analysis of vulnerable populations
- USDA production projections; and
- Stakeholder identified vulnerabilities

<table>
<tr><th colspan="3">All Participating Jurisdictions</th></tr>
<tr><td rowspan="2">Area Affected: Heat events are not contained to a specific boundary and past events are measured by county; this event can arise in all participating jurisdictions equally.</td><td>Occurrences since 1990:</td><td>4</td></tr>
<tr><td>Annual Event Average:</td><td>.15</td></tr>
<tr><td colspan="3">Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.

Although the probability based on past occurrences appears low, participating jurisdictions at the public meeting voiced that all jurisdictions experience high temperatures and humidity particularly during summer months.</td></tr>
<tr><td colspan="3">Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit.</td></tr>
<tr><td colspan="3">Vulnerabilities: While heat events have the potential to damage buildings and crops, vulnerable populations are most at risk in the county during these events. According to the Centers for Disease Control and Prevention (CDC), adults over 65 years of age, infants, children, individuals with chronic illnesses, low-income, outdoor workers, and athletes are the most vulnerable populations to heat related illnesses. The data available on these specified populations suggests that approximately 48% of the population in Brazoria County is vulnerable to heat related illnesses.</td></tr>
<tr><td colspan="3">Impacts:

• 631,021 acres in total throughout the county in farmland (accounting for 118,236,00 dollars in revenue) may be impacted resulting in financial loss for farmers and the county as a whole
• Serious illness or loss of life throughout the county</td></tr>
</table>

Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • Critical facilities including: 3 fire station, 5 schools, and 1 shelter **Identified Impacts:** • Potential lack of shelters throughout the unincorporated areas could lead to an increase of serious illness or loss of life or stress on other shelters and critical facilities throughout the other areas in the county			

Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 29 percent of population are individuals 18 years and younger (7,370 children) • 13 percent of population are individuals 65 and older (3,264 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 30 percent of population are individuals 18 years and younger (5,793 children) • 13 percent of population are individuals 65 and older (2,540 older individuals) **Identified Impacts:** • 43 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 26 percent of population are individuals 18 years and younger (215 children) • 14 percent of population are individuals 65 and older (114 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (104 children) • 3 percent of population are individuals 65 and older (8 older individuals) **Identified Impacts:** • 38 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (872 children) • 14 percent of population are individuals 65 and older (429 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 25 percent of population are individuals 18 years and younger (419 children) • 15 percent of population are individuals 65 and older (259 older individuals) **Identified Impacts:** • 40 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (104 children) • 3 percent of population are individuals 65 and older (8 older individuals) **Identified Impacts:** • 38 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (414 children) • 8 percent of population are individuals 65 and older (120 older individuals) **Identified Impacts:** • 36 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 21 percent of population are individuals 18 years and younger (104 children) • 14 percent of population are individuals 65 and older (185 older individuals) **Identified Impacts:** • 35 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit**.**			
Identified Vulnerabilities: • 16 percent of population are individuals 18 years and younger (129 children) • 39 percent of population are individuals 65 and older (325 older individuals) **Identified Impacts:** • 55 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 39 percent of population are individuals 18 years and younger (401 children) • 7 percent of population are individuals 65 and older (71 older individuals) **Identified Impacts:** • 46 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (604 children) • 14 percent of population are individuals 65 and older (307 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit.			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (7,372 children) • 14 percent of population are individuals 65 and older (3,700 older individuals) **Identified Impacts:** • 49 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (121 children) • 14 percent of population are individuals 65 and older (61 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 31 percent of population are individuals 18 years and younger (2,265 children) • 10 percent of population are individuals 65 and older (740 older individuals) **Identified Impacts:** • 41 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (439 children) • 14 percent of population are individuals 65 and older (307 older individuals) **Identified Impacts:** • 49 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 16 percent of population are individuals 18 years and younger (6 children) • 3 percent of population are individuals 65 and older (1 older individual) **Identified Impacts:** • 19 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 26 percent of population are individuals 18 years and younger (987 children) • 9 percent of population are individuals 65 and older (101 older individuals) **Identified Impacts:** • 35 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 16 percent of population are individuals 18 years and younger (84 children) • 19 percent of population are individuals 65 and older (101) **Identified Impacts:** • 35 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (1,058 children) • 18 percent of population are individuals 65 and older (686 older individuals) **Identified Impacts:** • 46 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 29 percent of population are individuals 18 years and younger (1,120 children) • 12 percent of population are individuals 65 and older (482 older individuals) **Identified Impacts:** • 41 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 12,000 students 18 years and younger, while school is out for summer typically for the hottest months of the year, students in summer school or participating in school events such as athletic events would be vulnerable **Identified Impacts:** • Students under age 18 and staff over the age of 65 may face serious illness or health conditions due to high temperatures and humidity when participating in summer school activities			

Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • Administrative building and 14 pump stations and levees **Identified Impacts:** • A heat event may lead to damage to levees or pumps throughout the district. This may result in financial loss for the district in time and funds needed to fix a broken structure or equipment			

Alvin ISD			
Planning Area (Sq. mi):	252	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 22,000 students 18 years and younger **Identified Impacts:** • Students under age 18 and staff over the age of 65 may face serious illness or health conditions due to high temperatures and humidity when participating in summer school activities			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • Over 20 staff and numerous visitors throughout the port **Identified Impacts:** • With large metal structures throughout the port visitors and staff may be more likely to experience heat related illness.			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; .75 events to occur in the next 5 years. A 14 percent chance of the event happening in the next year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 40 percent of population are individuals 18 years and younger (4,861 children) • 7 percent of population are individuals 65 and older (836 older individuals) **Identified Impacts:** • 47 percent of the total population may face serious illness or health conditions due to high temperatures and humidity			

2017

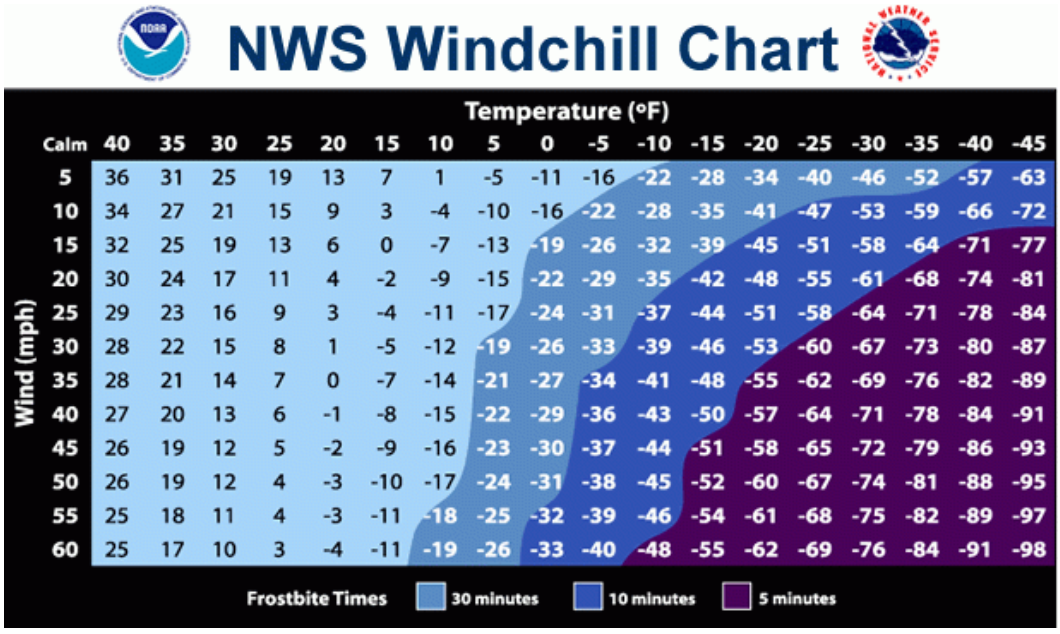
Part 6.7: Winter Weather

6.7 Winter Weather

The two main charts used to measure the magnitude of winter storms is the Sperry-Piltz Ice Accumulation (SPIA) Index Parameters and the National Weather Service's Windchill Chart. The SPIA chart measures the extent of ice in a region considering wind speed and the depth of ice on surfaces. The NWS Windchill Chart considers wind speed and temperatures to determine the amount of time frostbite may occur.

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-October, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
0	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
2	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
3	0.10 – 0.25	>= 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
4	0.25 – 0.50	>= 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
5	0.50 – 0.75	>= 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	>= 25	
	1.00 – 1.50	>= 15	
	> 1.50	Any	

Source: http://www.spia-index.com/



Source: http://www.nws.noaa.gov/om/cold/wind_chill.shtml

1

The national weather service and NOAA also have a variety of watches and warnings for freeze, frost, wind, and ice events; these have been organized in a chart below.

Watch/ Warning/ Advisory	Description
Winter Storm Watch	Issued when there is the potential for significant and hazardous winter weather within 48 hours. It is possible hazardous weather may occur. Significant and hazardous winter weather is defined as: 5 inches or more of snow/sleet within a 12-hour period or 7 inches or more of snow/sleet within a 24-hour period. And/ or enough ice accumulation to cause damage to trees or powerlines and/or a life threatening or damaging combination of snow and/or ice accumulation with wind.
Winter Storm Warning	Issued when a significant combination of hazardous winter weather is occurring or imminent. Significant and hazardous winter weather is defined as above.
Ice Storm Warning	¼ inch or more of ice accumulation.
Winter Weather Advisory	Issued for any amount of freezing rain, or when 2 to 4 inches of snow (alone or in combination with sleet and freezing rain) is expected to cause a significant inconvenience, but not serious enough to warrant a warning.
Freeze Watch	Issued when there is a potential for significant, widespread freezing temperatures within the next 24-36 hours.
Freeze Warning	Issued when significant, widespread freezing temperatures are expected.
Frost Advisory	Issued when the minimum temperature is forecast to be 33 to 36 degrees on clear and calm nights during the growing season.
Wind Chill Advisory	Issued when wind chills of -5F to -19F are expected east of the Blue Ridge Mountains and when wind chills of -10 to -24F are expected along and west of the Blue Ridge Mountains and in Frederick and Carroll Counties in Maryland.
Wind Chill Warning	Issued when wind chills of -20F or lower are expected east of the Blue Ridge Mountains, and when wind chills of -25F or lower are expected along and west of the Blue Ridge Mountains and in Frederick and Carroll Counties in Maryland.

Source: www.weather.gov/lwx/WarningsDefined#Winter Storm Watch

Historic Occurrences

There have been no occurrences where deaths, injuries, or property or crop damage was reported.

Jurisdiction	Date	Event	Notes
Brazoria County	2/3/2011	Ice Storm	A period of freezing rain and freezing drizzle led to icy roads, especially bridges and overpasses, and numerous accidents. Between one and two tenths of an inch of ice accumulated.
Brazoria County	1/28/2014	Winter Weather	Light snow was observed just to the west of the Pearland area. No accumulation was reported.
Brazoria County	12/8/2017	Heavy Snow	1 to 3 inches of snow were measured around Pearland, Alvin and the Lake Jackson area.

Source: https://www.ncdc.noaa.gov/stormevents/

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Additionally, extent information provides an estimate of the worst event the jurisdiction could experience in the future. Information from stakeholders, Centers for Disease Control and Prevention (CDC), and NOAA are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- American Community Survey (ACS, 5-year, 2016) data on residents
- GIS analysis of vulnerable populations
- Stakeholder identified vulnerabilities

According to the CDC, adults over 65 years of age and children are the most vulnerable populations to winter weather related illnesses. The data available on these populations suggests that approximately 48% of the population in Brazoria County is vulnerable to winter weather.

<table>
<tr><th colspan="3">All Participating Jurisdictions</th></tr>
<tr><td rowspan="2">Area Effected: Like heat events winter weather does not have a geographic boundary. This hazard can affect all planning areas equally.</td><td>Occurrences since 2000:</td><td>3</td></tr>
<tr><td>Annual Event Average:</td><td>.18</td></tr>
<tr><td colspan="3">Probability: Unlikely; 18 percent chance to occur within a given year.</td></tr>
<tr><td colspan="3">Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2</td></tr>
<tr><td colspan="3">Identified Vulnerabilities:
From the public meeting participating jurisdictions identified icy roads as a main vulnerability; icy road conditions create dangerous roadways that make people unable to drive to work school etc. at most a few days a year during the winter. Additionally, according to the CDC, adults over 65 years of age and children are the most vulnerable populations to winter weather related illnesses. The data available on these populations suggests that approximately 48% of the population in Brazoria County is vulnerable to winter weather.

Identified Impacts:
• Power outages caused by frozen limbs that fall and damage powerlines has a far-reaching impact on the jurisdictions participating in this plan. It can cause loss of life, loss of wages for closed businesses, and can cause students to miss school.
• Frozen falling limbs can also cause harm to individuals and costly damage to homes, vehicles, and other property.
• Icy roadways may lead to accidents with severe injury or loss of life and monetary loss for residents
• Extreme and/or prolonged freezing temperatures can cause damage to levee and dam pumps throughout the county. This may result in expensive financial repairs.</td></tr>
</table>

Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • Critical facilities including: 3 fire station, 5 schools, 1 shelter, 2 correctional facilities • All county-owned roadways **Identified Impacts:** • Ice on power lines may lead to power outages throughout the unincorporated areas leading to the 1 shelter being overwhelmed with individuals • Icy roadways may lead to accidents with serious injury or loss of life and finical loss for residents			

Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 29 percent of population are individuals 18 years and younger (7,370 children) • 13 percent of population are individuals 65 and older (3,264 older individuals) **Identified Impacts:** • 42 percent of the total population may face serious illness or health conditions due to low temperatures			

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance of the event occurring within a year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 30 percent of population are individuals 18 years and younger (5,793 children) • 13 percent of population are individuals 65 and older (2,540 older individuals) **Identified Impacts:** • 43 percent of the total population may face serious illness or health conditions due to low temperatures			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 26 percent of population are individuals 18 years and younger (215 children) • 14 percent of population are individuals 65 and older (114 older individuals) **Identified Impacts:** • 50 percent of the total population may face serious illness or health conditions due to low temperatures			

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (104 children) • 3 percent of population are individuals 65 and older (8 older individuals) **Identified Impacts:** • 38 percent of the total population may face serious illness or health conditions due to low temperatures			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (872 children) • 14 percent of population are individuals 65 and older (429 older individuals) **Identified Impacts:** • 32 percent of the total population may face serious illness or health conditions due to low temperatures			

Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 25 percent of population are individuals 18 years and younger (419 children) • 15 percent of population are individuals 65 and older (259 older individuals) **Identified Impacts:** • 40 percent of the total population may face serious illness or health conditions due to low temperatures			

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (104 children) • 3 percent of population are individuals 65 and older (8 older individuals) **Identified Impacts** • 38 percent of the total population may face serious illness or health conditions due to low temperatures			

Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (414 children) • 8 percent of population are individuals 65 and older (120 older individuals) **Identified Impacts:** • 36 percent of the total population may face serious illness or health conditions due to low temperatures			

Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance of the event happening within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 21 percent of population are individuals 18 years and younger (104 children) • 14 percent of population are individuals 65 and older (185 older individuals) **Identified Impacts:** • 35 percent of the total population may face serious illness or health conditions due to low temperatures			

Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 16 percent of population are individuals 18 years and younger (129 children) • 39 percent of population are individuals 65 and older (325 older individuals) **Identified Impacts:** • 55 percent of the total population may face serious illness or health conditions due to low temperatures			

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 39 percent of population are individuals 18 years and younger (401 children) • 7 percent of population are individuals 65 and older (71 older individuals) **Identified Impacts:** • 46 percent of the total population may face serious illness or health conditions due to low temperatures			

Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (604 children) • 14 percent of population are individuals 65 and older (307 older individuals) **Identified Impacts:** • 52 percent of the total population may face serious illness or health conditions due to low temperatures			

Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (7,372 children) • 14 percent of population are individuals 65 and older (3700 older individuals) **Identified Impacts:** • 49 percent of the total population may face serious illness or health conditions due to low temperatures			

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (121 children) • 14 percent of population are individuals 65 and older (61 older individuals). **Identified Impacts:** • 52 percent of the total population may face serious illness or health conditions due to low temperatures			

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 31 percent of population are individuals 18 years and younger (2,265 children) • 10 percent of population are individuals 65 and older (740 older individuals) **Identified Impacts:** • 41 percent of the total population may face serious illness or health conditions due to low temperatures			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 35 percent of population are individuals 18 years and younger (439 children) • 14 percent of population are individuals 65 and older (307 older individuals) **Identified Impacts:** • 49 percent of the total population may face serious illness or health conditions due to low temperatures			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 16 percent of population are individuals 18 years and younger (6 children) • 3 percent of population are individuals 65 and older (1 older individual) **Identified Impacts:** 19 percent of the total population may face serious illness or health conditions due to low temperatures			

Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 26 percent of population are individuals 18 years and younger (987 children) • 9 percent of population are individuals 65 and older (342 older individuals) **Identified Impacts:** • 35 percent of the total population may face serious illness or health conditions due to low temperatures			

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 16 percent of population are individuals 18 years and younger (84 children) • 19 percent of population are individuals 65 and older (101 older individuals) **Identified Impacts:** • 35 percent of the total population may face serious illness or health conditions due to low temperatures			

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 28 percent of population are individuals 18 years and younger (1,058 children) • 18 percent of population are individuals 65 and older (686 older individuals) **Identified Impacts:** • 46 percent of the total population may face serious illness or health conditions due to low temperatures			

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 29 percent of population are individuals 18 years and younger (1,120 children) • 12 percent of population are individuals 65 and older (482 older individuals) **Identified Impacts:** • 41 percent of the total population may face serious illness or health conditions due to low temperatures			

Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 12,000 children 18 years and younger • Traveling on icy roads to school **Identified Impacts:** • 100 percent of the identified population may face serious illness or health conditions due to low temperatures • School closures may lead to: o A financial loss for families needing to find childcare or take off work o Students falling behind in course work o A potential increase in car crashes/ injuries if school closes during the middle of the day and parents are traveling on icy roads to pick up their students			

Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • Administrative building and 14 pump stations and levees **Identified Impacts:** • An event may lead to damage to levees or pumps throughout the district. This may result in financial loss for the district in time and funds needed to fix a broken structure or equipment, which could lead to a delay in service for the county			

Alvin ISD			
Planning Area (Sq. mi):	252	**Occurrences since 2000:**	4
Area Affected:	100 %	**Annual Event Average:**	.15 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Based on past occurrences recorded above, the highest temperature recorded for the planning area is 105 degrees. The planning area can see temperatures from 110 degrees Fahrenheit to 120 degrees Fahrenheit			
Identified Vulnerabilities: • 22,000 students 18 years and younger • Traveling on icy roads to school **Identified Impacts:** • 100 percent of the identified population may face serious illness or health conditions due to low temperatures • School closures may lead to: o A financial loss for families needing to find childcare or take off work o Students falling behind in course work A potential increase in car crashes/ injuries if school closes during the middle of the day and parents are traveling on icy roads to pick up their students			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • Over 20 staff and numerous visitors throughout the port **Identified Impacts:** • Ice or cold conditions may lead to the port closing for a period leading to a potential economic loss for the surrounding areas and state • If staff or visitors are present during icy conditions they may fall on ice leading to injury			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	3
Area Affected:	100 %	**Annual Event Average:**	.18 events a year
Probability: Unlikely; 18 percent chance to occur within a given year.			
Extent: Past events described above demonstrate that the county has experienced a winter weather advisory and an ice damage index of 1; all participating jurisdiction could potentially see a winter storm warning and an Ice Damage Index of 2			
Identified Vulnerabilities: • 40 percent of population are individuals 18 years and younger (4,861 children) • 7 percent of population are individuals 65 and older (836 older individuals) **Identified Impacts:** • 47 percent of the total population may face serious illness or health conditions due to low temperatures			

2017

Part 6.8: Hail

6.8 Hail

NOAA's National Centers for Environmental Information (NCEI) intensity scale for hail is the typical way to measure the extent for hail storms. This scale considers the size of an individual piece of hail. A hail storm is considered severe if hail reaches one inch in diameter or roughly the size of a quarter.

Size	Hail Diameter (Inches)	Description
H0	1/4	Pea Size
H1	1/2	Small Marble Size
H2	¾	Penny or Large Marble Size
H3	7/8	Nickel Size
H4	1	Quarter Size
H5	1 ¼	Half Dollar Size
H6	1 ½	Walnut or Ping Pong Ball Size
H7	1 ¾	Golfball Size
H8	2	Hen Egg Size
H9	2 ½	Tennis Ball Size
H10	2 ¾	Baseball Size
H11	3	Teacup Size
H12	4	Grapefruit Size
H13	4 ½	Softball Size

Source: https://www.ncei.noaa.gov/

Historic Occurrences

Since 2000, Brazoria County experienced 47 hail events. Twenty-eight were considered severe (quarter sized and above). Baseball sized hail or size H10 is the largest size hail the County experienced.

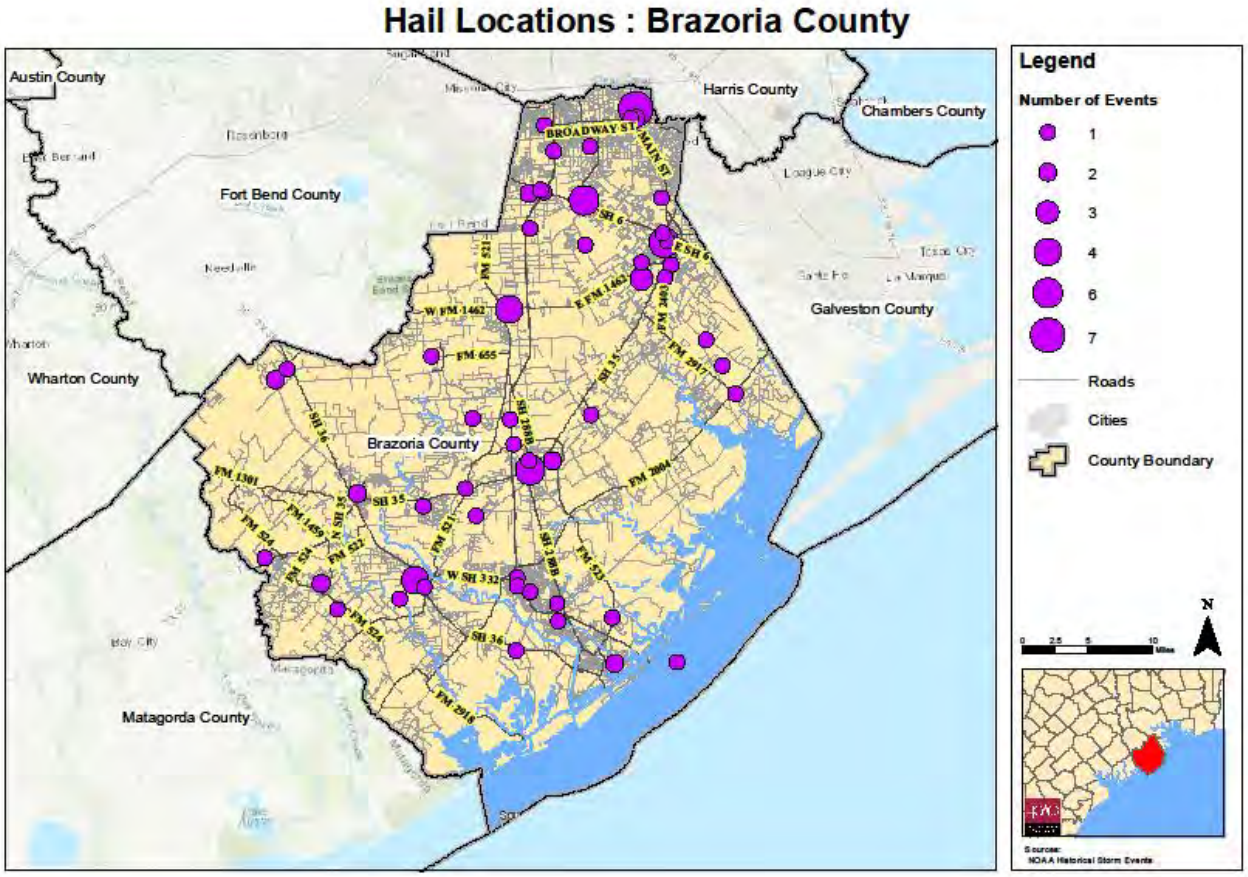
Jurisdiction	Date	Magnitude	Property Damage	Notes
Clute	4/2/2000	1.75	$50,000	
Alvin	5/2/2000	0.88	$15,000	
Manvel	5/2/2000	0.88	$15,000	
Manvel	4/16/2001	0.75	$10,000	
Manvel	9/21/2001	0.75	$2,000	Dime size hail at State Highway 288 and County Road 58.
Unincorporated	3/30/2002	1	$10,000	Quarter sized hail occurred at FM 762 and Meyer Field
Lake Jackson	4/8/2002	0.75	$5,000	Lake Jackson and Richwood Village received 3/4 inch
Brazoria	4/8/2002	1	$10,000	Sheriff reported quarter sized Hail at CR 521 in Brazoria.
Alvin	5/30/2002	1.75	$15,000	CR 435 just south of FM 1462.
Sweeny	8/27/2002	0.75	$10,000	Dime size hail.
Iowa Colony	12/30/2002	0.75	$5,000	3/4-inch hail.
Danbury	8/11/2003	0.75	$3,000	
Alvin	6/5/2004	0.75	$7,000	
Sweeny	6/14/2004	0.75	$10,000	
Freeport	7/29/2005	1	$9,000	
Unincorporated	4/21/2006	0.75	$2,000	
Unincorporated	4/21/2006	0.75	$2,000	
Unincorporated	5/14/2006	1	$8,000	Quarter size hail near FM 521.
Unincorporated	5/14/2006	0.75	$3,000	

Alvin	10/12/2006	0.75	$0	Penny-sized hail between Angleton and Alvin.
Bailey's Prairie	3/12/2007	2.5	$35,000	Quarter to tennis ball size hail between Lake Jackson and Sweeny.
Brazoria	3/12/2007	2.25	$200,000	Residence and 2 cars damaged by near Tennis ball-size hail. Roof damage to a city facility. 43 vehicles damaged. Damage reported to two other businesses and few homes in Brazoria.
Angleton	3/14/2007	0.75	$5,000	Penny size hail.
Bailey's Prairie	6/3/2009	1.75	$2,000	Golfball sized hail was observed near Baileys Prairie.
Iowa Colony	6/6/2011	1.75	$0	Golf ball size hail fell near the intersection of State Highway 288 and State Highway 6.
Alvin	4/4/2012	1	$1,000	Quarter sized hail reported in Alvin.
Alvin	4/4/2012	2.75	$5,000	Baseball sized hail reported along Community Drive in Alvin.
Alvin	4/4/2012	1.75	$4,000	Golfball sized hail reported at a gas station in Alvin.
Alvin	4/4/2012	1.75	$4,000	Golfball sized hail reported at Alvin Community College.
Lake Jackson	4/4/2012	1	$1,000	Quarter sized hail reported in Lake Jackson.
Brazoria	4/4/2012	1.75	$1,000	Golfball sized hail reported by television viewers in Brazoria.
Unincorporated	4/20/2012	1	$0	Quarter sized hail reported.
Manvel	3/31/2013	0.75	$0	The penny size hail was reported in the town of Manvel.
Iowa Colony	4/2/2013	1	$0	A severe thunderstorm produced quarter sized hail along Highway 6 between Fresno and Manvel.
Iowa Colony	6/8/2013	0.75	$0	The hail was reported at the intersection of Highway 288 and FM Road 101.
Angleton	4/17/2015	2.5	$15,000	Egg to tennis ball sized hail was reported in Angleton.
Oyster Creek	4/17/2015	1	$0	Quarter sized hail was reported at Landers Road.
Angleton	4/17/2015	1	$0	There were multiple reports of quarter sized hail in and around the Angleton area.
Lake Jackson	4/17/2015	1.5	$2,000	Ping pong sized hail was observed in the Lake Jackson area.
Unincorporated	4/17/2015	2	$0	Two-inch hail observed to the west of Danbury along SH 288.
Angleton	4/17/2015	1	$0	Quarter sized hail was observed in the Angleton area.
Iowa Colony	4/17/2015	1	$0	Quarter sized hail was observed south of Iowa Colony.
Iowa Colony	4/19/2015	0.88	$0	Nickel sized hail was reported near the intersection of FM 521 and FM 2234.
Iowa Colony	4/19/2015	1	$0	Quarter sized hail was reported near the intersection of FM 518 and Kirby Drive.
Manvel	5/26/2015	0.75	$0	Dime size hail was reported between Manvel and Pearland.
Unincorporated	5/13/2016	1	$0	Quarter size hail was reported about two miles southeast of Sweeney.
Jones Creek	5/21/2016	1.5	$2,000	Ping pong ball size hail was observed in Jones Creek from this severe thunderstorm.

Source: https://www.ncdc.noaa.gov/stormevents/

Hail Location Map: Brazoria

Location and quantity of hail events that have occurred throughout the County from 2002 to present.



Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Information from stakeholders, ACS, and NOAA are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- American Community Survey (ACS, 2016, 5-year) data on residential buildings
- GIS analysis of structures and critical facilities exposed to hail damage; and
- Stakeholder identified vulnerabilities

Brazoria County (All participating jurisdictions)

Identified Vulnerabilities:

- During the county-wide public meeting attendees described critical facilities including emergency response vehicles (fire trucks, ambulances etc.) as vulnerabilities throughout the county.
    - Uncovered parking lots may lead to damaged vehicles
    - Facility's generators located outside may be damaged.
    - Damage to critical facilities, including roof damage or window damage, may occur as well.
- Identified vulnerable populations throughout the county, identified in the county profile, may be more vulnerable financially if they sustain damage to a personal vehicle, property

Identified Impacts:

- Strong winds or hail could prevent first responders from traveling to assist individuals, because of unsafe driving conditions such as debris hitting emergency vehicles
- Critical facilities could sustain hail damage- windows of response vehicles broken, potentially delaying first responders reaching those in need and city services during and after the event
- Financial loss for individuals whose vehicles or homes are damaged by hail-including cost to repair hail damage and potential financial loss from potential loss of a job because of the lack of transportation to and from their job
- Financial loss for jurisdictions that need to replace damaged buildings or infrastructure, including damaged roofs or equipment

Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	8
Area Affected:	100 %	**Annual Event Average:**	.47
Probability: Likely; 47 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 2-inch hail (H8); the jurisdiction could see H9 to H10 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 3 fire station, 5 schools, 1 shelter, and 2 correctional facilities **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury			

Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	8
Area Affected:	100%	**Annual Event Average:**	.47
Probability: Likely; 47 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 14 schools, 5 electrical substations, 4 fire stations, 2 EMS, 1 wastewater treatment plant, 2 shelters, 6 police stations, and 1 emergency operation center • 1,431 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2000:**	4
Area Affected:	100%	**Annual Event Average:**	.235
Probability: Likely; 23.5 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 2.5-inch hail (H9); the jurisdiction could see H10 to H11 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 3 correctional facilities, 1 electrical substation, 1 EMS, 2 fire stations, 9 schools, 3 shelters, 9 police stations, and 2 hospitals • 803 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	2
Area Affected:	100%	**Annual Event Average:**	.12
Probability: Unlikely; 12 percent chance event will occur in a year			
Damage: According to past events, the jurisdiction has recorded 2.5-inch hail (H9); the jurisdiction could see H10 to H11 hail in the future.			
Identified Vulnerabilities: • 170 residential structures at risk **Identified Impacts:** • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 22 residential structures at risk **Identified Impacts:** • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	3
Area Affected:	100%	**Annual Event Average:**	.18
Probability: Unlikely; 12 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 2.5-inch hail (H9); the jurisdiction could see H10 to H11 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 correctional facility, 1 electrical substation, 1 EMS, 4 fire stations, 9 schools, 6 shelters, 2 police stations, 2 hospitals, 6 shelters, and 2 emergency operation centers • 282 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 1 police station • 122 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	1
Area Affected:	100 %	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 1.75-inch hail (H7); the jurisdiction could see H8 to H9 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 EMS, 1 electrical substation, 1 fire station, 5 schools, 5 shelters, 2 police stations, 2 hospitals, 1 emergency operation center, and 1 wastewater treatment • 775 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded .75-inch hail (H2); the jurisdiction could see H3 to H4 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 electrical substation, 1 EMS, 1 fire station, 3 schools, and 1 police station • 92 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2000:**	7
Area Affected:	100%	**Annual Event Average:**	.41
Probability: Likely; 41 percent chance event will occur in a year			
Greatest Extent of Damage: According to past events, the jurisdiction has recorded 1-inch hail (H4); the jurisdiction could see H5 to H6 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 EMS and 1 school • 88 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 53 residential structures at risk **Identified Impacts:** • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 84 residential structures at risk **Identified Impacts:** • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 1.5-inch hail (H6); the jurisdiction could see H7 to H8 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 school and 1 shelter • 130 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	3
Area Affected:	100%	**Annual Event Average:**	.18
Probability: Unlikely; 18 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 2.5-inch hail (H6); the jurisdiction could see H7 to H8 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 dam, 1 electrical substation, 2 EMS, 2 fire stations, 1 hospital, 2 police stations, 7 schools, 9 shelters, and 1 wastewater treatment facility **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 fire station and 2 police stations • 37 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2000:**	5
Area Affected:	100%	**Annual Event Average:**	.29
Probability: Unlikely; 2.9 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded .75-inch hail (H2); the jurisdiction could see H3 to H4 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 EMS, 2 fire stations, 3 police stations, 4 schools, and 1 shelter • 443 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 6 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded 1-inch hail (H4); the jurisdiction could see H5 to H6 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 fire station, 1 police station, 1 power plant, and 1 shelter • 78 residential structures at risk **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 5 residential structures at risk **Identified Impacts:** • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0

Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.

Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.

Identified Vulnerabilities:

- Critical facilities including: 1 police station, 1 school, and 1 shelter
- 246 residential structures at risk

Identified Impacts:

- Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury
- Financial loss for individuals whose homes or cars are damaged due to the event
- Economic loss for the city due to public facilities that may be damaged

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0

Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.

Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.

Identified Vulnerabilities:

- Critical facilities including: 1 fire station, and 1 police station

Identified Impacts:

- Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury
- Financial loss for individuals whose homes or cars are damaged due to the event
- Economic loss for the city due to public facilities that may be damaged

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.06
Probability: Unlikely; 6 percent chance event will occur in a year			
Extent: According to past events, the jurisdiction has recorded .75-inch hail (H2); the jurisdiction could see H3 to H4 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 electrical substation, 1 EMS, 2 fire stations, 1 hospital, 2 emergency operations centers, 3 police stations, 2 schools, 1 shelter, 3 schools, 2 power plants **Identified Impacts:** • Damage to critical facilities and equipment including uncovered emergency vehicles may impede response time and lead to increase loss of life or serious injury			

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 246 residential structures at risk **Identified Impacts:** • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 19 schools- 10 elementary schools, 3 high schools, 5 middle schools, 1 alternative school • 12,000 children 18 years and younger **Identified Impacts:** • Serious injury could occur if students or staff are outside during event • Financial loss for the school district if buildings are damaged due to hail • 100 percent of the identified population may face serious illness or health conditions due to low temperatures • School closures may lead to: o A financial loss for families needing to find childcare or take off work o Students falling behind in course work • A potential increase in car crashes/ injuries if school closes during the middle of the day and parents are traveling to pick up their students during a hail event			

Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 14 pump stations and administrative building **Identified Impacts:** • If pump stations are damaged due to hail or administrative building is damaged, there could be a delay in service and a financial loss for the District			

Alvin ISD			
Planning Area (Sq. mi):	252	**Occurrences since 2000:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: Although there have been no recorded events, hail is not contained to a specific area; the probability of hail can be similar to neighboring jurisdictions. Considering surrounding jurisdictions, the probability is: Likely; 47 percent chance event will occur in a year.			
Extent: In considering surrounding jurisdictions the extent is: the largest hail recorded is 2.75-inch hail (H10); the jurisdiction could see H11 to H12 hail in the future.			
Identified Vulnerabilities: • 31 schools- 17 elementary schools, 3 high schools, 6 middle schools, 1 alternative school • 22,000 children 18 years and younger **Identified Impacts:** • Serious injury could occur if students or staff are outside during event • Financial loss for the school district if buildings are damaged due to hail • School closures may lead to: o A financial loss for families needing to find childcare or take off work o Students falling behind in course work • A potential increase in car crashes/ injuries if school closes during the middle of the day and parents are traveling to pick up their students during a hail event			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Although there have been no recorded events, Port Freeport is near the City of Freeport. The likelihood of the event happening in the Port maybe similar to the city. Freeport's probability is: Unlikely; 5.9 percent chance event will occur in a year.			
Extent: Similarly, the City of Freeport's extent is: According to past events, the jurisdiction has recorded 1-inch hail (H2); the jurisdiction could see H3 to H4 hail in the future.			
Identified Vulnerabilities: • Port facilities, equipment, and administrative buildings **Identified Impacts:** • Serious injury or loss of life if an event occurs while staff or visitors are at the port • Financial loss for the port if damage occurs and economic loss for the surrounding cities and state if the port is closed for a prolonged time.			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance event will occur in a year.			
Extent: According to past events, the jurisdiction has recorded 1-inch hail (H2); the jurisdiction could see H3 to H4 hail in the future.			
Identified Vulnerabilities: • Critical facilities including: 1 correctional facility, 5 electrical substations, 2 EMS, 3 fire stations, 6 schools, 5 shelters, 8 police stations, 1 emergency operations center, 2 wastewater treatment plants, and 1 power plant • 697 residential structures at risk **Identified Impacts:** • Financial loss for individuals whose homes or cars are damaged due to the event • Economic loss for the city due to public facilities that may be damaged			

2017

Part 6.9: Tornado

6.9 Tornado

Before 2007, tornadoes were ranked through the Fujita Scale. The Enhanced Fujita Scale replaced the Fujita Scale in 2007 and is a set of wind estimates (not measurements) based on damage. The higher the number the more intense the tornado. Both the Fujita Scale and the Enhanced Fujita Scale are below.

Fujita Scale			Enhanced Fujita Scale		
Scale	**Fastest 1/4 mile (mph)**	**3 second gust (mph)**	**EF Number**	**3 Second Gust (mph)**	**Typical Damage**
F0	40-72	45-78	0	65-85	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
F1	73-112	79-117	1	86-109	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
F2	113-157	118-161	2	110-137	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-207	162-209	3	138-167	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
F4	208-260	210-261	4	168-199	Devastating damage. Whole frame houses Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
F5	261-318	262-317	5	200-234	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly more than 109 yards; high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source: http://www.spc.noaa.gov/

Historic Occurrence

There has been no crop damage or deaths reported due to tornadoes in the county. There have been six injuries reported over the last 17 years due to tornadoes. One injury was reported in the City of Brazoria in 2003. Three injuries were reported in Manvel and two injuries were reported in unincorporated Brazoria County in 2015.

Jurisdiction	Date	Event Type	Magnitude	Property Damage	Notes
Unincorporated	5/2/2000	Tornado	F0	$25,000	Barn damaged at FM 521 and FM 1462.
Angleton	9/14/2000	Funnel Cloud		$0	Numerous funnel clouds sighted.
Angleton	9/14/2000	Funnel Cloud		$0	Numerous funnel clouds sighted.
Quintana	5/7/2001	Funnel Cloud		$0	
Freeport	5/7/2001	Funnel Cloud		$0	
Angleton	5/31/2001	Funnel Cloud		$0	
Manvel	6/5/2001	Tornado	F0	$40,000	A tornado touched down near Highway 6 and County Road 99, downing trees and damaging one home.
Liverpool	6/5/2001	Funnel Cloud		$0	
Alvin	8/30/2001	Tornado	F0	$45,000	Fire Department reported a tornado near FM 2351 and County Road 129. Damage included a few metal roofs torn off buildings and trees down.
Brazoria	8/30/2001	Tornado	F0	$5,000	tornado touched down 2.5 miles southeast of Wild Peach Village.
Unincorporated	9/4/2001	Funnel Cloud		$0	A waterspout moved over land as a funnel near Chocolate Bayou and dissipated near Liverpool.
Brazoria	12/12/2001	Tornado	F1	$200,000	Several homes in the Lazy Oak Ranch Subdivision on CR 461A had roof damage. A machine shop on CR 461 sustained heavy damage, along with the cars and boats in its parking lot. Numerous trees were down from the San Bernard River to the Lazy Oak subdivision.
Brazoria	12/12/2001	Tornado	F0	$200,000	There was roof and structural damage to homes and businesses, in a 10-block area, along TX Highway 36 in Brazoria. A 175-foot internet tower was blown down, signs were bent over, and minor roof damage to Brazoria Elementary school.
Lake Jackson	9/6/2002	Tornado	F0	$5,000	Tornado sighted west Lake Jackson and CR 332
West Columbia	9/7/2002	Tornado	F0	$25,000	Downed trees in West Columbia along Hwy 36.
Iowa Colony	10/9/2003	Tornado	F0	$2,000	Tornado caused damage to a barn.
Brazoria	11/17/2003	Tornado	F0	$75,000	Tornado touch down in downtown Brazoria. Roof damage to several buildings along Highway 36 with tree damage in Old Town Brazoria. A semi-trailer was lifted and over-turned on its side at intersection of Road 332 and Highway 36.
Unincorporated	6/30/2004	Funnel Cloud		$0	Several reports of funnel cloud off FM 521.
Oyster Creek	5/14/2006	Tornado	F0	$5,000	Tornado sighted by restaurant customers near FM 523 caused minimal damage.
Oyster Creek	4/25/2007	Tornado	EF0	$0	CR 459 and FM 227 in the community of Demi-John.
Alvin	5/11/2007	Funnel Cloud		$0	
Angleton	7/1/2007	Funnel Cloud		$0	
Clute	7/27/2007	Funnel Cloud		$0	
Unincorporated	7/10/2008	Funnel Cloud		$0	Sighted near the intersection of FM 521 and CR 32.
Unincorporated	1/9/2012	Tornado	EF0	$15,000	Damaged a barn and a shed near the Brazos Bend State Park.
Unincorporated	1/9/2012	Tornado	EF0	$20,000	This EF-0 tornado destroyed a shed and blew off the top of a rice dryer.

Bonney	1/9/2012	Tornado	EF0	$10,000	This EF-0 tornado rolled over two semi-tractor trailers on Highway 288 near the intersection of Highway 288 and South County Road 48.
Unincorporated	9/12/2012	Funnel Cloud		$0	At the Brazoria National Wildlife Refuge near the intersection of FM 2004 and FM 523.
Alvin	9/12/2012	Funnel Cloud		$0	Intersection of Highway 6 and Highway 35.
Alvin	5/28/2014	Funnel Cloud		$0	Three were reported off of Highway 6 west of the town of Alvin.
Angleton	7/6/2014	Funnel Cloud		$0	State Highway 35 just to the west of Angleton.
Angleton	7/6/2014	Funnel Cloud		$0	Just to the north of Angleton.
Unincorporated	7/24/2014	Funnel Cloud		$0	A funnel cloud was sighted to the east of Danbury.
Bonney	7/24/2014	Funnel Cloud		$0	Spotted just outside the town of Bonney.
Unincorporated	4/26/2015	Funnel Cloud		$0	A funnel cloud was sighted in Damon.
Unincorporated	5/5/2015	Funnel Cloud		$0	Two funnel clouds were sighted.
Unincorporated	5/17/2015	Funnel Cloud		$0	Near the intersection of FM 2004 and FM 2917.
Jones Creek	10/31/2015	Tornado	EF1	$50,000	One mile southwest south of Jones Creek where it uprooted several large trees. The tornado then crossed Highway 36 and severely damaged a mobile home just north of the roadway. Estimated peak wind speed was 90 mph.
Lake Jackson	10/31/2015	Tornado	EF0	$50,000	Tracked from a subdivision south of the Brazos Mall knocking down fences and shallow rooted trees. It then continued into a subdivision to the northeast of the mall uprooting several large trees. Estimated peak wind speed was 85 mph.
Unincorporated	10/31/2015	Tornado	EF0	$50,000	In a field south of Liverpool and damaged a cattle handling area. The tornado tracked into the town of Liverpool and produced minor damage to trees and structures. The tornado lifted north of town. The estimated peak wind was 80 mph.
Angleton	10/31/2015	Tornado	EF0	$200,000	Severely damaged a farm house and barn then flipped three trailers over at an RV park before weakening. Estimated peak wind was 90 mph.
Manvel	10/31/2015	Tornado	EF1	$50,000	Tracked along Wink Road. The tornado injured 3 people as it destroyed one mobile home and damaged several other mobile homes. The estimated peak wind was 100 mph.
Unincorporated	10/31/2015	Tornado	EF1	$200,000	Damaged 15 to 20 trailers and overturned 1 trailer. An elderly couple sustained injuries in the overturned trailer. The estimated peak wind was 90 mph.
Unincorporated	10/31/2015	Tornado	EF2	$2,000,000	Down just east of Clover Field Airport. Expanded in size and weakened in intensity as it approached FM 518 over the last half of its track. There was extensive tree damage along the entire track. Estimated peak wind was 115 mph.
Unincorporated	10/31/2015	Tornado	EF2	$2,000,000	East of Clover Field Airport. This tornado expanded in size and weakened in intensity as it approached FM 518 over the last half of its track. There was extensive tree damage along the entire track. Estimated peak wind was 115 mph.
Sweeny	2/14/2017	Tornado	EF0	$100,000	Along CR 321 and intersection of FM 524 and CR 321. Damage was mainly to trees and power lines. Estimated peak winds were 75 mph.
Unincorporated	3/5/2017	Tornado	EF0	$0	Touched down around FM 2611 and CR 659.
Unincorporated	5/22/2017	Tornado	EF0	$200,000	Damaged a porch roof in the back of a home, destroyed a pump house and damaged a trailer, and knocked over several trees.
Liverpool	5/22/2017	Funnel Cloud		$0	Funnel cloud was sighted in the Liverpool area.

Unincorporated	8/25/2017	Tornado	EF0	$30,000	Touched down near HWY 36 with numerous trees snapped or downed. Barn also damaged.
Bailey's Prairie	8/25/2017	Tornado	EF0	$100,000	East of West Columbia damaging trees, roofs, and outbuildings off of highway 35. A barn and several outbuildings were also destroyed on the east side of the Brazos River. Property was flooded.
Oyster Creek	8/25/2017	Funnel Cloud		$0	
Danbury	8/25/2017	Tornado	EF0	$100,000	Damaged a barn along with several trees off of County Road 207. Crossed Hwy 35. Snapped and/or downed several trees along County Rd 45 before lifting at the Crocodile Encounter on County Rd 48.
Liverpool	8/25/2017	Tornado	EF0	$50,000	West of Liverpool. 4 power poles downed on highway 35 along with trees near the Gulf Coast Speedway. Damaged some barns and outbuildings as well as trees on County Road 511.
Iowa Colony	8/25/2017	Tornado	EF0	$500,000	It struck a new subdivision along county road 56 and highway 288. Roofs and fences were damaged and several trees snapped and/or downed.

Source: https://www.ncdc.noaa.gov/stormevents/

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year. The analysis calculates the average number of events in each jurisdiction annually and then calculates the percent chance of the event occurring within a year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Information from stakeholders and NOAA are the sources of data for the analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- American Community Survey (5-year, 2016)
- GIS analysis of structures exposed to tornado damage; and
- Stakeholder identified vulnerabilities.

Brazoria County (All participating jurisdictions)

Identified Vulnerabilities:

Similar to the hurricane section, this section identifies vulnerabilities from high winds. High winds can tear down powerlines, trees, barns, fences, and multitude of other debris can be blown into roadways and homes during the event.

Additionally, residences and commercial buildings could be damaged or destroyed due to wind events; older residential neighborhoods and structures without a permanent foundation were identified as one of the main vulnerabilities throughout the county. While current building codes address the vulnerability of wind damage to structures, older buildings (particularly residential buildings) were built when less stringent building codes were in place; therefore, older residential building and residences without a permanent foundation are a focus in this section.

Identified Impacts:

- Downed powerlines could impact communication and daily active leading to a finical loss for the county, cities and individuals, and could impede first responders from reaching those in need or residents evacuating
- Strong winds could prevent first responders from traveling to assist individuals, because of unsafe driving conditions such as debris hitting emergency vehicles
- Critical facilities could sustain wind damage, potentially delaying first responders reaching those in need and city services during and after the event
- Economic and financial loss for cities and individuals including property loss

Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	18
Area Affected:	100%	**Annual Event Average:**	1.06
Probability: Highly Likely; 100 percent chance of event occurring in each year			
Extent: According to past events, the strongest tornado was an EF1; the jurisdiction can see an EF1 to EF2 in the future.			
Identified Vulnerabilities: • Critical facilities including: 3 fire station, 5 schools, 1 shelter, 2 correctional facilities **Identified Impacts:** • Critical facilities and equipment could be damaged with windows broken or roofs blown off or destroyed by high winds • First responders could be delayed, this may increase serious injury or loss of life throughout the county			

Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	4
Area Affected:	100%	**Annual Event Average:**	.24
Probability: Likely; 24 percent chance occurring within a given year			
Extent: According to past events, the strongest tornado was an F0 (EF0); the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 6,275 Residential buildings built before 1980 (65.8% of housing stock) • 1,334 Mobile Homes (14% of housing stock) • 42 Boats/ RVs/ Vans acting as main housing (.4 % of housing stock) **Identified Impacts:** • Almost 81 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and potential increase in serious injuries or loss of life throughout the jurisdiction.			

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2000:**	7
Area Affected:	100%	**Annual Event Average:**	.41
Probability: Likely; 41 percent chance of event occurring in each year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 6,426 Residential buildings built before 1980 (80 % of housing stock) • 685 Mobile Homes (8.5 % of housing stock) **Identified Impacts:** • Almost 90 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and potential increase in serious injuries or loss of life throughout the jurisdiction.			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 82 Residential buildings built before 1980 (85.5% of housing stock) • 22 Mobile Homes (22.9% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest tornado was a funnel cloud; the jurisdiction can see a EF0 to EF1 in the future.			
Identified Vulnerabilities: • 107 Residential buildings built before 1980 (73.1% of housing stock) • 30 Mobile Homes (20.5% of housing stock) • 4 Boats/ RVs/ Vans acting as main housing (2.7% of housing stock) **Identified Impacts:** • 96 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	4
Area Affected:	100%	**Annual Event Average:**	.24
Probability: Likely; 24 percent chance occurring within a given year			
Extent: According to past events, the strongest tornado was an F1(EFI); the jurisdiction can see a EF2 to EF3 in the future.			
Identified Vulnerabilities: • 1,129 Residential buildings built before 1980 (80% of housing stock) • 144 Mobile Homes (10.2% of housing stock) • 14 Boats/ RVs/ Vans acting as main housing (1% of housing stock) **Identified Impacts:** • 91 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Manvel perhaps the jurisdiction has a similar likelihood that the event will occur Manvel's probability is: Unlikely; 12 percent chance event will occur in each year.			
Extent: Similarly, Manvel's extent is: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF2 to EF3 in the future.			
Identified Vulnerabilities: • 480 Residential buildings built before 1980 (79.1% of housing stock) • 7 Mobile Homes (1.2% of housing stock) **Identified Impacts:** • Almost 81 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest event was a funnel cloud; the jurisdiction can see a EF10 to EF1 in the future.			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) • 312 Mobile Homes (6% of housing stock) • 26 Boats/ RVs/ Vans acting as main housing (.5% of housing stock) **Identified Impacts:** • Approximately 71 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 500 Residential buildings built before 1980 (86.2% of housing stock) • 4 Mobile Homes (.7% of housing stock) **Identified Impacts:** • Almost 87 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2000:**	2
Area Affected:	100%	**Annual Event Average:**	.12
Probability: Unlikely; 12 percent chance of event occurring in a year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities and Impacts: • 263 Residential buildings built before 1980 (60% of housing stock) • 122 Mobile Homes (27.9% of housing stock) **Identified Impacts:** • Almost 88 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2000:**	**0**
Area Affected:	100%	**Annual Event Average:**	**0**
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Alvin. Perhaps Hillcrest Village has a similar likelihood that the event will occur. Alvin's probability is: Likely; 24 percent chance event will occur in each year.			
Extent: Similarly, Alvin's extent is: According to past events, the strongest tornado was an F0 (EF0); the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 289 Residential buildings built before 1980 (82.9% of housing stock) **Identified Impacts:** • Almost 83 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Bailey's Prairie. Perhaps Holiday Lakes has a similar likelihood that the event will occur. Bailey's Prairie extent is: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: Similarly, Holiday Lake's extent is: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) • 216 Mobile Homes (51.8% of housing stock) • 5 Boats/ RVs/ Vans acting as main housing (1.2% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest tornado was an EF1; the jurisdiction can see a EF2 to EF3 in the future.			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) • 165 Mobile Homes (19.1% of housing stock) • 4 Boats/ RVs/ Van acting as main housing (.5% of housing stock) **Identified Impacts:** • About 85 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	2
Area Affected:	100%	**Annual Event Average:**	.12
Probability: Unlikely; 12 percent chance event will occur in each year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 8,272 Residential buildings built before 1980 (70.1% of housing stock) • 6 Mobile Homes (.1% of housing stock) • 9 Boats/ RVs/ Vans acting as main housing (.1% of housing stock) **Identified Impacts:** • About 71 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	3
Area Affected:	100%	**Annual Event Average:**	.18
Probability: Unlikely; 18 percent chance event will occur in each year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 177 Residential buildings built before 1980 (72.2% of housing stock) • 37 Mobile Homes (15.1% of housing stock) **Identified Impacts:** • Approximately, 87 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2000:**	2
Area Affected:	100%	**Annual Event Average:**	.12
Probability: Unlikely; 12 percent chance event will occur in each year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF2 to EF3 in the future.			
Identified Vulnerabilities: • 971 Residential buildings built before 1980 (32.8% of housing stock) • 329 Mobile Homes (11.1% of housing stock) • 77 Boats/ RVs/ Van acting as main housing (2.6% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	3
Area Affected:	100%	**Annual Event Average:**	.18
Probability: Unlikely; 18 percent chance event will occur in each year			
Extent: According to past events, the strongest tornado was an EF0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 356 Residential buildings built before 1980 (68.6% of housing stock) • 231 Mobile Homes (44.5% of housing stock) • 23 Boats/ RVs/ Vans acting as main housing (4.4% of housing stock) **Identified Impacts:** • 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest event was a funnel cloud; the jurisdiction can see an EF0 to EF1 in the future.			
Identified Vulnerabilities: • 554 Residential buildings built before 1980 (83.9% of housing stock) • 59 Mobile Homes (8.9% of housing stock) **Identified Impacts:** • About 94 percent of the housing stock was either built before 1980 or does not have a permanent foundation this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0

Probability: Although the jurisdiction has no recorded events, the jurisdiction is near Clute. Perhaps Richwood has a similar likelihood that the event will occur. Clute's probability is: Unlikely: 5.9 percent chance to occur within a given year.

Extent: Similarly, Clute's extent is: According to past events, the strongest event was a funnel cloud; the jurisdiction can see a EF10 to EF1 in the future.

Identified Vulnerabilities:

- 356 Residential buildings built before 1980 (68.6% of housing stock)
- 231 Mobile Homes (44.5% of housing stock)
- 23 Boats/ RVs/ Vans acting as main housing (4.4% of housing stock)

Identified Impacts:

- 100 percent of the housing stock was either built before 1980 or does not have a permanent foundation this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0

Probability: Although there have been no recorded events, the city of Surfside is near the jurisdiction of Quintana which has experienced one tornado; the probability maybe like Quintana's which is: Unlikely; 5.9 percent chance of event occurring in a year.

Extent: Similarly, Surfside Beach's **e**xtent maybe like Quintana's which is: According to past events, the strongest event was a funnel cloud; the jurisdiction can see an EF0 to EF1 in the future.

Identified Vulnerabilities:

- 356 Residential buildings built before 1980 (68.6% of housing stock)
- 231 Mobile Homes (44.5% of housing stock)
- 23 Boats/ RVs/ Van acting as main housing (4.4% of housing stock)

Identified Impacts:

- 72 percent of the housing stock was either built before 1980; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest tornado was an F0; the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 1,220 Residential buildings built before 1980 (73% of housing stock) • 127 Mobile Homes (7.6% of housing stock) **Identified Impacts:** • 81 percent of the housing stock was either built before 1980 or does not have a permanent foundation this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	1
Area Affected:	100%	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest tornado was an F0 (EF0); the jurisdiction can see a EF1 to EF2 in the future.			
Identified Vulnerabilities: • 1,447 Residential buildings built before 1980 (88.3% of housing stock) • 38 Mobile Homes (2.3% of housing stock) **Identified Impacts** • About 92 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is throughout Brazoria County. Perhaps the ISD has a similar likelihood that the event will occur as unincorporated areas of the county. Brazoria County unincorporated area's probability is: Very Likely; 100 percent chance event will occur in a year.			
Extent: Similarly, Brazoria's extent is: According to past events, the strongest tornado was an EF1; the jurisdiction can see an EF1 to EF2 in the future.			
Identified Vulnerabilities: • 12,000 students • 19 schools- 10 elementary schools, 3 high schools, 5 middle schools, 1 alternative school **Identified Impacts:** • Serious injury or loss of life if an event occurs during school hours or during extracurricular activities • Financial loss for the school district if any of the schools or administrative buildings are damaged due to the event. • School closures due to damage or during the day of the event may lead to: o A financial loss for families needing to find childcare or take off work o Students falling behind in course work • A potential increase in car crashes/ injuries if school closes during the middle of the day and parents are traveling to pick up their students during an event			

Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is throughout Brazoria County. Perhaps the district has a similar likelihood that the event will occur as unincorporated areas of the county. Brazoria County unincorporated area's probability is: Very Likely; 100 percent chance event will occur in a year.			
Extent: Similarly, Brazoria's extent is: According to past events, the strongest tornado was an EF1; the jurisdiction can see an EF1 to EF2 in the future.			
Identified Vulnerabilities: • Administrative building 14 pump stations and levees throughout the district **Identified Impacts:** • Finical loss for the district if buildings, equipment or levees are damaged during the event			

Alvin ISD			
Planning Area (Sq. mi):	256	**Occurrences since 1871:**	0
Area Affected:	100 %	**Annual Event Average:**	0
Probability: Although the jurisdiction has no recorded events, the jurisdiction is throughout Brazoria County. Perhaps the ISD has a similar likelihood that the event will occur as unincorporated areas of the county. Brazoria County unincorporated area's probability is: Very Likely; 100 percent chance event will occur in a year.			
Extent: Similarly, Brazoria's extent is: According to past events, the strongest tornado was an EF1; the jurisdiction can see an EF1 to EF2 in the future.			
Identified Vulnerabilities: • 31 schools- 17 elementary schools, 3 high schools, 6 middle schools, 1 alternative school • 22,000 children 18 years and younger, adds an additional 1,000 students per year **Identified Impacts:** • Serious injury or loss of life if an event occurs during school hours or during extracurricular activities • Financial loss for the school district if any of the schools or administrative buildings are damaged due to the event. • School closures due to damage or during the day of the event may lead to: o A financial loss for families needing to find childcare or take off work o Students falling behind in course work • A potential increase in car crashes/ injuries if school closes during the middle of the day and parents are traveling to pick up their students during an event			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	0
Area Affected:	100%	**Annual Event Average:**	0
Probability: Although there have been no recorded events, the Port of Freeport is near the jurisdiction of Freeport which has experienced one tornado; the probability maybe like Freeport's which is: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: Similarly, the Port of Freeport's **e**xtent maybe like the Jurisdiction of Freeport's which is: According to past events, the strongest event was a funnel cloud; the jurisdiction can see an EF0 to EF1 in the future.			
Identified Vulnerabilities: • Port facilities, equipment, and administrative buildings **Identified Impacts:** • Serious injury or loss of life if an event occurs while staff or visitors are at the port • Financial loss for the port if damage occurs and economic loss for the surrounding cities and state if the port is closed for a prolonged time.			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	1
Area Affected:	100 %	**Annual Event Average:**	.059
Probability: Unlikely; 5.9 percent chance of event occurring in a year			
Extent: According to past events, the strongest event was a funnel cloud; the jurisdiction can see an EF0 to EF1 in the future.			
Identified Vulnerabilities: • 4,004 Residential buildings built before 1980 (82.9% of housing stock) • 229 Mobile Homes (4.9% of housing stock) **Identified Impacts:** • About 88 percent of the housing stock was either built before 1980 or does not have a permanent foundation; this may lead to an increase in home damage, a financial loss for residents, and a potential increase in serious injuries or loss of life throughout the jurisdiction.			

2017

Part 6.10: Dam & Levee Failure

6.10 Dam and Levee Failure

According to FEMA's Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams, extent is measured through judging the potential for human, economic, lifeline, and environmental loss.

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected.	Yes (But not necessary for this classification)

Source: https://www.fema.gov/

Historic Occurrence

Brazoria County does not have any dam or levee failures identified since 2000. There was a levee breech near West Columbia in a neighborhood to the north, Columbia Lakes, during Hurricane Harvey on August 27th, 2017. While this levee protects hundreds of homes and during this event the county evacuated these neighborhoods and residents to the south-east, this incident was not a levee break. The breeched levee increased flooding in the nearby neighborhoods.

There are 51 known dams and levees in Brazoria County. These dams are maintained by public, state, federal, local, or partnering entities. All dams have been classified as 'Low' in the hazard potential classification.

Jurisdiction	Name	Hazard Potential Classification
Unincorporated County	Beal Reservoir Levee	Low
Unincorporated County	Black Ranch Lake Levee	Low
Unincorporated County	Brazos River Club Levee	Low
Unincorporated County	Mallard Lake Club Dam	Low
Alvin	Division Lake Levee	Low
Unincorporated County	Lake Jackson Levee	Low
Unincorporated County	Mowery Lake Levee	Low
Alvin	Duck Lake Dam	Low
Unincorporated County	Solutia Reservoir Levee	Low
Unincorporated County	Salt Bayou Lake Water	Low
Brazoria	Brazoria Reservoir Dam	Low
Lake Jackson	Buffalo Camp Bayou Reservoir Dam	Low
Liverpool	Dingle Lake Number 1 Levee	Low
Danbury	Lazy CZ Number 1 Reservoir Levee	Low
Danbury	McCullough Lake Levee	Low
Danbury	McCullough Number 17 Reservoir	Low
Danbury	Reservoir Number Levee Complex 2	Low
Danbury	Reservoir Number 9 Levee Complex 2	Low
Unincorporated County	Linnville Bayou Reservoir Dam	Low
Unincorporated County	Markle Lake Levee	Low
Unincorporated County	San Bernard Reservoir Number 1	Low
Unincorporated County	San Bernard Reservoir Number 2 Levee	Low
Unincorporated County	San Bernard Reservoir Number 3 Levee	Low
Angleton	Angleton Fishing & Hunting Club Levee	Low

Angleton	Bar X Ranch Lake Levee	Low
Unincorporated County	Bieri Lakes Reservoir Number 1 Levee	Low
Unincorporated County	Bieri Lakes Reservoir Number 2 Levee	Low
Unincorporated County	Bieri Lakes Reservoir Number 3 Levee	Low
Unincorporated County	Bieri Lakes Reservoir Number 4 Levee	Low
Angleton	Bintliff Lake Levee	Low
Angleton	Coale Dam	Low
Angleton	Hudeck Reservoir Levee	Low
Unincorporated County	Mccormack Reservoir Number 3 Levee	Low
Unincorporated County	Mccormack Reservoir Number 4 Levee	Low
Unincorporated County	Tigner-Farrer Levee	Low
Holiday Lakes	William Harris Reservoir Dam	Low
Unincorporated County	Raleigh Farms Reservoir Levee	Low
Unincorporated County	Brazoria City Reservoir Levee	Low
Brazoria	Dacus Lake Dam	Low
Unincorporated County	TDCJ Clemens Unit Dam 1	Low
Unincorporated County	TDCJ Clemens Unit Dam 2	Low
Unincorporated County	Columbia Lakes Reservoir Dam	Low
Unincorporated County	Griffth Reservoir Levee	Low
Unincorporated County	Lagoon Reservoir Dam	Low
Unincorporated County	Live Oak 1 Levee	Low
Unincorporated County	Live Oak 2 Levee	Low
Unincorporated County	Pappas Lakes and Lodge Levee	Low
Alvin	Amoco Chemicals Reservoir Levee	Low
Unincorporated County	Dingle Lake 2 Levee	Low
Unincorporated County	Mustang Lake East Dam	Low
Unincorporated County	Mustang Lake West Dam	Low

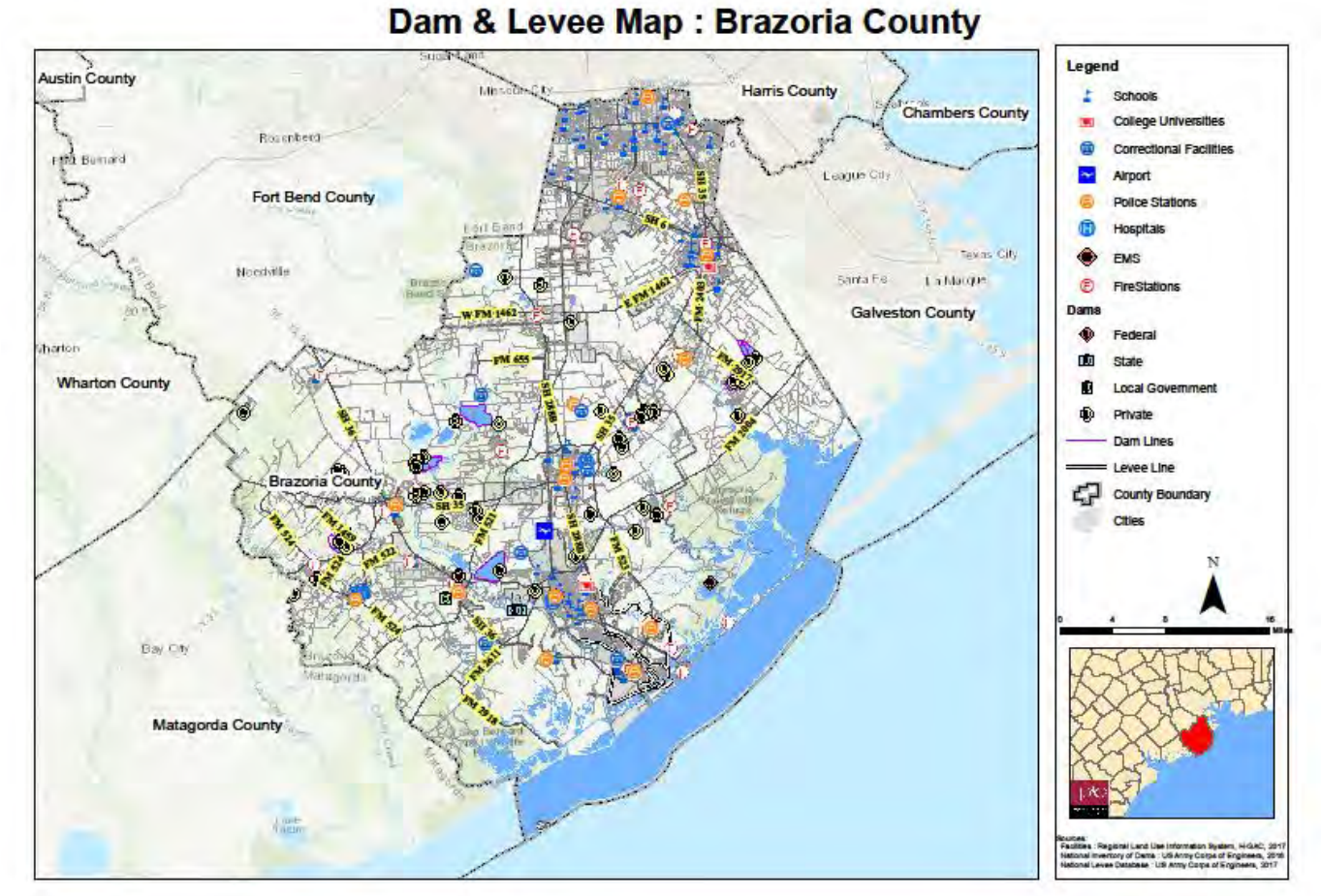
Hazard Analysis & Vulnerability Identification

A data deficiency exists for dams throughout the county. An inundation map and modeling a dam failure could not be completed with current information available. More research and information regarding dams is needed and is included as a mitigation action in this plan.

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within the next five years. The analysis calculates the average number of events in each jurisdiction annually and then multiplies by five. With no recorded occurrences in the last 17 years and limited data there is unknown information.

The hazard analysis also provides hazard extent data for each affected jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Information from stakeholders, FEMA**,** and H-GAC's critical facilities database were used for this analysis.

Only the communities at risk of experiencing impacts from a dam or levee failure are profiled. Those jurisdictions include Unincorporated Brazoria County, Holiday Lakes, West Columbia, Bailey's Prairie, Brazoria, Freeport, Port of Freeport, and Oyster Creek. The remaining jurisdictions participating in this plan are not at risk for dam and failure and will not be profiled.



Brazoria County (All Jurisdictions)
Identified Vulnerabilities: As described in the hazard identification section, there are no records of failed dams or levees in the county and no available inundation maps. For the purposes of this plan, all immediately downstream critical facilities, residences, and human life will be treated as vulnerable to dam and levee failures. Each dam and levee has a low hazard classification, and some flooding can be expected in the event of a complete or partial failure. Because of the low hazard classification, this analysis only considered structures and property within 1 mile of dams and levees. Based on this assumption, the following vulnerabilities have been identified: • 667 residences immediately downstream of dam and levees are considered vulnerable. • Approximately 1,057 acres of agricultural land is vulnerable • 84 downstream critical facilities are vulnerable to a dam and levee failure
Potential Impacts: • Residential, commercial, and public property loss throughout the county due to flooding in localized areas or throughout the county • In total, 631,021 acres in total throughout the county in farmland at risk of flooding due to a dam or levee failure • Mass evacuations during a levee breech or failure may strain shelters throughout the county or may create a potential for an increase in car accidents leading to serious injury or financial loss for residents throughout the county • Destroyed powerlines or electrical substations may lead to a loss of communication for a particular jurisdiction or for a large portion of the county. This could lead to an inability to reach people in need. • In the instance that flooding occurs at critical facility without a generator or the generator does not work, critical facilities could lose power and may not be usable due to flooding or power outage. This may slow down first responders and allow for a greater loss of life, injury, or property damage particularly when dam or levee failure is accompanied by other hazardous events.

Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	0
Area Affected:	6%	**Annual Event Average:**	0
Probability: Not Likely, Less than 10% chance event will occur within the next 5 years			
Greatest Extent of Damage: Complete failure of dam and levees during major rain event.			
Identified Vulnerabilities: • 312 residential structures • Vulnerable populations are concentrated near the coast near the San Bernard Wildlife Refuge • Critical facilities including: 3 fire station, 5 schools, 1 shelter, 2 correctional facilities **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures.			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	0
Area Affected:	6%	**Annual Event Average:**	0
Probability: Not Likely, Less than 10% chance event will occur within the next 5 years			
Greatest Extent of Damage: Complete failure of dam and levees during major rain event.			
Identified Vulnerabilities: • 11 residential structures at risk **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures.			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	0
Area Affected:	5%	**Annual Event Average:**	0
Probability: Complete failure of dam and levees during major rain event.			
Greatest Extent of Damage: Not Likely, Less than 10% chance event will occur within the next 5 years			
Identified Vulnerabilities: • Critical facilities including: 1 correctional facility, 1 electrical substation, 1 EMS, 4 fire stations, 9 schools, 6 shelters, 2 police stations, 2 hospitals, 6 shelters, and 2 emergency operation centers • 14 residential structures at risk **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures.			

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	0
Area Affected:	30%	**Annual Event Average:**	0
Probability: Not Likely, Less than 10% chance event will occur within the next 5 years			
Greatest Extent of Damage: Complete failure of dam and levees during major rain event.			
Identified Vulnerabilities: • 26 residential structures at risk **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures.			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0
Area Affected:	15%	**Annual Event Average:**	0
Probability: Not Likely, Less than 10% chance event will occur within the next 5 years			
Greatest Extent of Damage: Complete failure of dam and levees during major rain event.			
Identified Vulnerabilities: • Critical facilities including: 1 fire station, 1 police station, 1 power plant, and 1 shelter • 8 residential structures at risk **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures.			

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	0
Area Affected:	27%	**Annual Event Average:**	0
Probability: Not Likely, Less than 10% chance event will occur within the next 5 years			
Greatest Extent of Damage: Complete failure of dam and levees during major rain event.			
Identified Vulnerabilities: • Critical facilities including: 1 electrical substation, 1 EMS, 1 fire station, 3 schools, 3 shelters, 4 police stations, and 1 powerplant • 66 residential structures at risk **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures.			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	0
Area Affected:	45%	**Annual Event Average:**	0
Probability: Not Likely, Less than 10% chance event will occur within the next 5 years			
Greatest Extent of Damage: Complete failure of dam and levees during major rain event.			
Identified Vulnerabilities: • Administrative buildings, cargo ships, equipment, semi-trucks • Over 20 staff and visitors at the port **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures. • Economic losses would also be expected if port activities were to be halted due to levee failures. • Loss of staff wages due to closing of port.			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	0
Area Affected:	33%	**Annual Event Average:**	0
Probability: Not Likely, Less than 10% chance event will occur within the next 5 years			
Greatest Extent of Damage: Complete failure of dam and levees during major rain event.			
Identified Vulnerabilities: • Critical facilities including: 1 correctional facility, 5 electrical substations, 2 EMS, 3 fire stations, 6 schools, 5 shelters, 8 police stations, 1 emergency operations center, 2 wastewater treatment plants, and 1 power plant • 230 residential structures exposed to hazard **Identified Impacts:** • Expensive repairs and rebuilding associated with flooding of properties and structures.			

Part 6.11: Expansive Soils

6.11 Expansive Soils

The chart below shows the Linear Extensibility Percent (LEP) and Coefficient of Linear Extent (COLE) to show the Shrink-Swell Class of expansive soils. COLE is a test frequently used to characterize expansive soils. COLE is a measure expressed as a fraction of the change in a soil sample dimension from the moist to dry state. The LEP is a measure expressed as a percentage of the change in a soil sample dimension from the moist to dry state. The Shrink-Swell Class is found in comparing these two measurements. A Moderate to Very High rating marks soils that have the potential to contract and expand, leading to broken foundations and water pipes, for example.

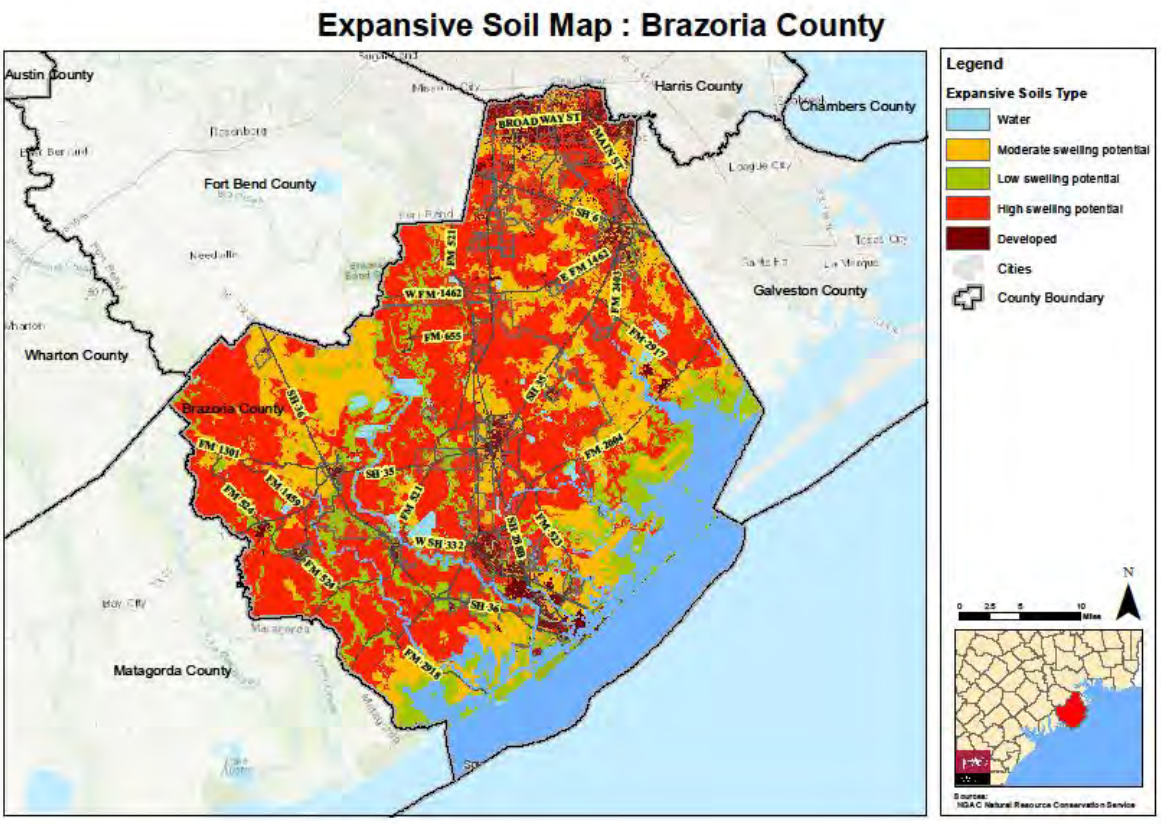
Shrink-Swell Class	Linear Extensibility Percent (LEP)	Coefficient of Linear Extent (COLE)
Low	3	0.03
Moderate	3 to 6	.03-.06
High	6 to 9	.06-.09
Very High	Greater than or equal to 9	Greater than or equal to 0.09

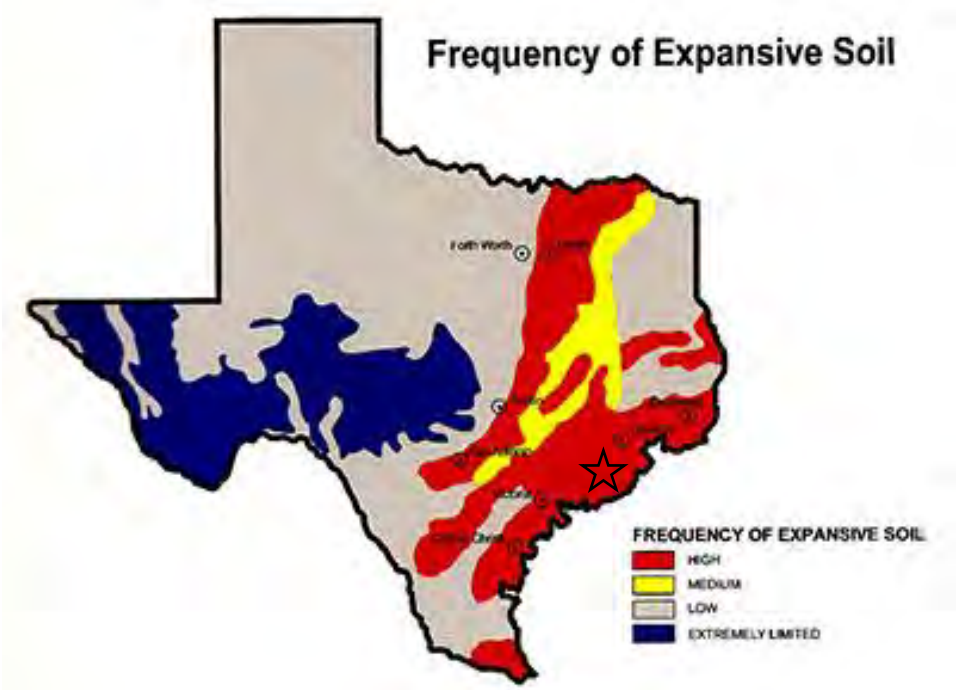
Source: https://www.nrcs.usda.gov

Brazoria County Expansive Soils Data

Jurisdiction	Low Swelling Potential	Moderate Swelling Potential	High Swelling Potential
Unincorporated			X
City of Alvin			X
City of Angleton			X
City of Baileys Prairie			X
City of Bonney			X
City of Brazoria			X
City of Brookside Village			X
City of Clute			X
City of Danbury			X
City of Iowa Colony			X
City of Hillcrest Village			X
Town of Holiday Lakes			X
City of Jones Creek			X
City of Lake Jackson			X
City of Liverpool			X
City of Manvel			X
City of Oyster Creek			X
City of Quintana		X	
City of Richwood			X
City of Surfside Beach		X	
City of Sweeny			X
City of West Columbia			X
Brazosport ISD			X
Velasco Drainage District			X
Port of Freeport			X

While there are no previous events recorded, the chart directly above and the Expansive Soil Map directly below help define the extent and location of expansive soils for each of the participating jurisdictions. The Frequency of Expansive Soils map further below helps to demonstrate the probability of expansive soils in the planning area.





Source: http://www.tellafirma.com/find-texas-expansive-soils/. Star notes Brazoria county's general location.

Hazard Analysis & Vulnerability Identification

The hazard analysis provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. A data deficiency for "Occurrences" was addressed by assigning 1 occurrence for any jurisdiction that had Moderate to High shrink swell classes.

Information from stakeholders, USDA's Natural Resource Conservation Services**,** and H-GAC's critical facilities database were used for this analysis.

To identify vulnerabilities for each jurisdiction, this plan used the following methods:

- American Community Survey (ACS 2016, 5 year) data on residential structures
- GIS analysis of structures within the high to very high shrink swell classes; and
- Stakeholder identified vulnerabilities.

Brazoria County (All Jurisdictions)
Identified Vulnerabilities: Broken foundations and water pipes in commercial and residential buildings and public property. While newer buildings can be impacted; older buildings including critical facilities and homes are more likely to be impacted; this is due to older buildings being exposed to numerous weather events and seasons, having building standards that do not take expansive soils into account, and the lack of engineering solutions to mitigate expansive soils in the past. Therefore, the vulnerabilities focus on older buildings in each of the jurisdictions.
Identified Impacts: Jurisdictions can be impacted by expensive financial costs to repair foundations and water lines for public facilities. School districts, home owners, and business owners could also be impacted by broken pipes, cracked foundations, and other structural repairs caused by expanding and contracting soils. Pipes in critical facilities may also lead to a loss of service, or damaged roads/bridges can increase response time to get to someone in need.

Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	1
Area Affected:	85%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • Critical facilities including: 3 fire station, 5 schools, 1 shelter, and 2 correctional facilities **Identified Impacts:** • Financial cost to county to repair foundations for public facilities • Cracked pipes in critical facilities may lead to a loss of service or increased response time to get to someone in need.			

Alvin			
Planning Area (Sq. mi):	25.6	**Occurrences since 2000:**	1
Area Affected:	75%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 6,275 Residential buildings built before 1980 (65.8% of housing stock) • Critical facilities including: 14 schools, 5 electrical substations, 4 fire stations, 2 EMS, 1 wastewater treatment plant, 2 shelters, 6 police stations, and 1 emergency operation center **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Angleton			
Planning Area (Sq. mi):	11.27	**Occurrences since 2000:**	1
Area Affected:	75%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 6,426 Residential buildings built before 1980 (80 % of housing stock) • Critical facilities including: 3 correctional facilities, 1 electrical substation, 1 EMS, 2 fire stations, 9 schools, 3 shelters, 9 police stations, and 2 hospitals **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Bailey's Prairie			
Planning Area (Sq. mi):	7.7	**Occurrences since 2000:**	1
Area Affected:	75%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 82 Residential buildings built before 1980 (85.5% of housing stock) **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Bonney			
Planning Area (Sq. mi):	1.66	**Occurrences since 2000:**	1
Area Affected:	75 %	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 107 Residential buildings built before 1980 (73.1% of housing stock) **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities			

Brazoria			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	1
Area Affected:	75%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			

Identified Vulnerabilities:

- 1,129 Residential buildings built before 1980 (80% of housing stock)
- Critical facilities including: 1 correctional facility, 1 electrical substation, 1 EMS, 4 fire stations, 9 schools, 6 shelters, 2 police stations, 2 hospitals, 6 shelters, and 2 emergency operation centers

Identified Impacts:

- Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities
- Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.

Brookside Village			
Planning Area (Sq. mi):	2.085	**Occurrences since 2000:**	1
Area Affected:	50%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			

Identified Vulnerabilities:

- 480 Residential buildings built before 1980 (79.1% of housing stock)
- 1 police station

Identified Impacts:

- Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities
- Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.

Clute			
Planning Area (Sq. mi):	5.6	**Occurrences since 2000:**	1
Area Affected:	75 %	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) • Critical facilities including: 1 EMS, 1 electrical substation, 1 fire station, 5 schools, 5 shelters, 2 police stations, 2 hospitals, 1 emergency operation center, and 1 wastewater treatment **Identified Impacts** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Danbury			
Planning Area (Sq. mi):	1.0	**Occurrences since 2000:**	1
Area Affected:	75%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 500 Residential buildings built before 1980 (86.2% of housing stock) • Critical facilities including: 1 electrical substation, 1 EMS, 1 fire station, 3 schools, and 1 police station **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Iowa Colony			
Planning Area (Sq. mi):	7.33	**Occurrences since 2000:**	1
Area Affected:	50%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 263 Residential buildings built before 1980 (60% of housing stock) • Critical facilities including: 1 EMS and 1 school **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Hillcrest Village			
Planning Area (Sq. mi):	0.4	**Occurrences since 2000:**	1
Area Affected:	25%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 289 Residential buildings built before 1980 (82.9% of housing stock) **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities			

Holiday Lakes			
Planning Area (Sq. mi):	1	**Occurrences since 2000:**	1
Area Affected:	25%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities			

Jones Creek			
Planning Area (Sq. mi):	2.6	**Occurrences since 2000:**	1
Area Affected:	25 %	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 3,347 Residential buildings built before 1980 (64.8% of housing stock) • Critical facilities including: 1 school and 1 shelter **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Lake Jackson			
Planning Area (Sq. mi):	20.9	**Occurrences since 2000:**	1
Area Affected:	25%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 8,272 Residential buildings built before 1980 (70.1% of housing stock) • Critical facilities including: 1 dam, 1 electrical substation, 2 EMS, 2 fire stations, 1 hospital, 2 police stations, 7 schools, 9 shelters, and 1 wastewater treatment facility **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Liverpool			
Planning Area (Sq. mi):	1.1	**Occurrences since 2000:**	1
Area Affected:	25 %	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 177 Residential buildings built before 1980 (72.2% of housing stock) • Critical facilities including: 1 fire station and 2 police stations **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Manvel			
Planning Area (Sq. mi):	23.6	**Occurrences since 2000:**	1
Area Affected:	25 %	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 971 Residential buildings built before 1980 (32.8% of housing stock) • Critical facilities including: 1 EMS, 2 fire stations, 3 police stations, 4 schools, and 1 shelter **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Oyster Creek			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	1
Area Affected:	25%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 356 Residential buildings built before 1980 (68.6% of housing stock) • Critical facilities including: 1 fire station, 1 police station, 1 power plant, and 1 shelter **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0
Area Affected:	10%	**Annual Event Average:**	0
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of low; the jurisdiction can see a moderate to very high shrink swell class in the future.			
Identified Vulnerabilities: • 554 Residential buildings built before 1980 (83.9% of housing stock) **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities			

Richwood			
Planning Area (Sq. mi):	3.1	**Occurrences since 2000:**	1
Area Affected:	50 %	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 356 Residential buildings built before 1980 (68.6% of housing stock) • Critical facilities including: 1 police station, 1 school, and 1 shelter **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	0
Area Affected:	10%	**Annual Event Average:**	0
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of low; the jurisdiction can see a moderate to high shrink swell class in the future.			
Identified Vulnerabilities: • 356 Residential buildings built before 1980 (68.6% of housing stock) • Critical facilities including: 1 fire station, and 1 police station **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

Sweeny			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	1
Area Affected:	75 %	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 1,220 Residential buildings built before 1980 (73% of housing stock) • Critical facilities including: 1 electrical substation, 1 EMS, 2 fire stations, 1 hospital, 2 emergency operations centers, 3 police stations, 2 schools, 1 shelter, 3 schools, 2 power plants **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

West Columbia			
Planning Area (Sq. mi):	2.58	**Occurrences since 2000:**	1
Area Affected:	50%	**Annual Event Average:**	.06

Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.

Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.

Identified Vulnerabilities:

- 1,447 Residential buildings built before 1980 (88.3% of housing stock)
- Critical facilities including: 1 electrical substation, 1 EMS, 1 fire station, 3 schools, 3 shelters, 4 police stations, and 1 powerplant

Identified Impacts:

- Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities
- Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.

Brazosport ISD			
Planning Area (Sq. mi):	200	**Occurrences since 2000:**	1
Area Affected:	75%	**Annual Event Average:**	.06

Probability: Very Likely; based off the frequency of expansive soils map above, the ISD has a high chance of seeing expansive soils within the year.

Extent: Based off Brazoria County's expansive soils map above, the ISD has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.

Identified Vulnerabilities:

- 19 schools- 10 elementary schools, 3 high schools, 5 middle schools, 1 alternative school

Identified Impacts:

- Cracked pipes and foundations in buildings may lead to a finical loss for the school district
- A disruption in school services for repairs could result in loss wages for parents who cannot find alternative childcare, and disrupt educational progress of students.

Velasco Drainage District			
Planning Area (Sq. mi):	236	**Occurrences since 2000:**	1
Area Affected:	75%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • Administrative building • 14 pump stations and levees **Identified Impacts:** • Financial cost of repairing the foundation of the administration building and pumps and levees damaged			

Alvin ISD			
Planning Area (Sq. mi):	256	**Occurrences since 1871:**	0
Area Affected:	75 %	**Annual Event Average:**	0
Probability: Very Likely; based off the frequency of expansive soils map above, the ISD has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the ISD has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 31 schools- 17 elementary schools, 3 high schools, 6 middle schools, 1 alternative school **Identified Impacts:** • Cracked pipes and foundations in buildings may lead to a finical loss for the school district • A disruption in school services for repairs could result in loss wages for parents who cannot find alternative childcare and disrupt educational progress of students.			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	1
Area Affected:	10%	**Annual Event Average:**	.06
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • Port facilities and administrative buildings **Identified Impacts:** • Cracked pipes and foundations in buildings may lead to a finical loss for the port. • A disruption of economic activities at the port due to required repairs			

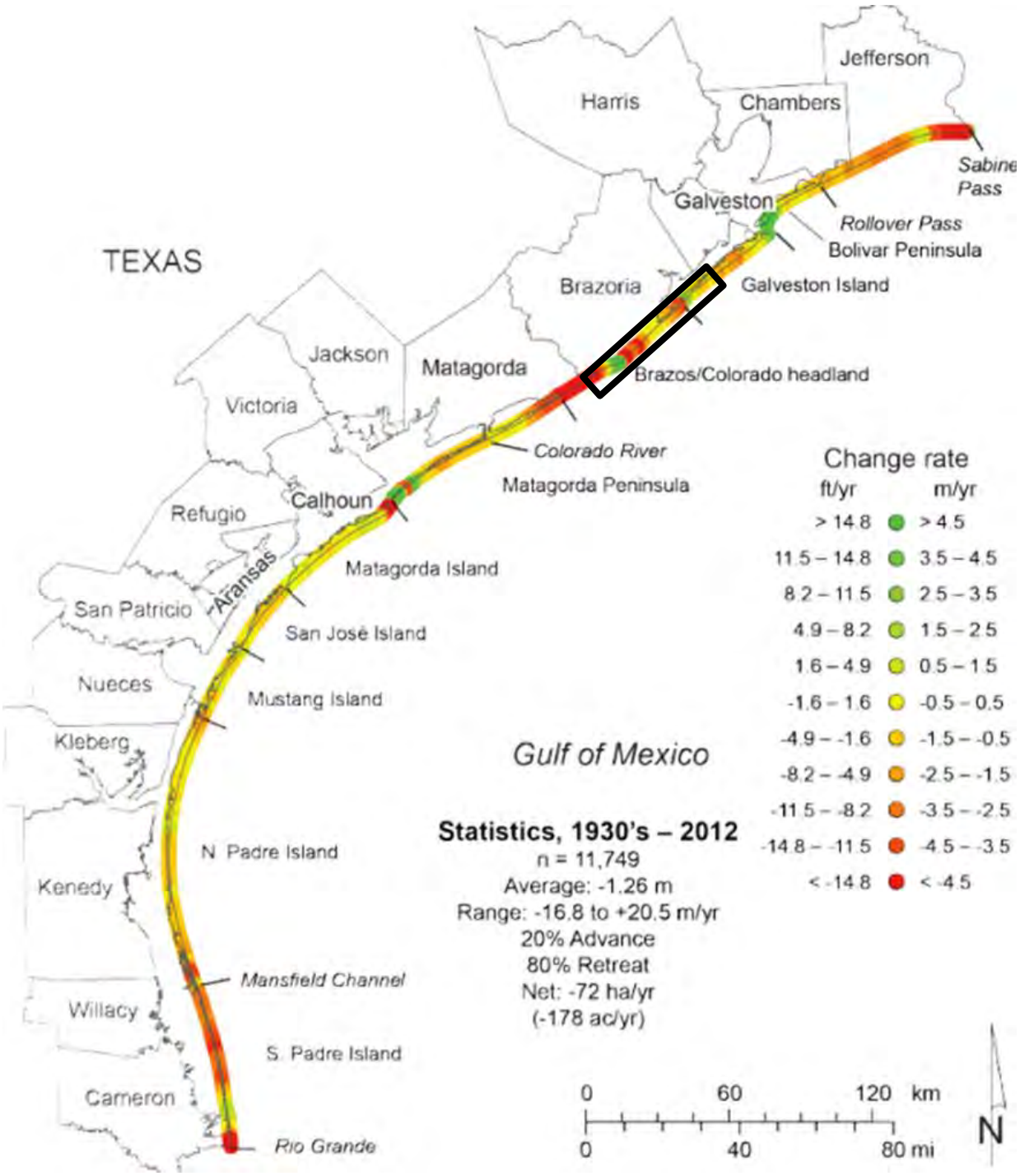
Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	1
Area Affected:	10%	**Annual Event Average:**	
Probability: Very Likely; based off the frequency of expansive soils map above, the jurisdiction has a high chance of seeing expansive soils within the year.			
Extent: Based off Brazoria County's expansive soils map above, the jurisdiction has a current shrink-swell class of high; the jurisdiction can see a high to very high shrink swell class in the future.			
Identified Vulnerabilities: • 4,004 Residential buildings built before 1980 (82.9% of housing stock) • Critical facilities including: 1 correctional facility, 5 electrical substations, 2 EMS, 3 fire stations, 6 schools, 5 shelters, 8 police stations, 1 emergency operations center, 2 wastewater treatment plants, and 1 power plant **Identified Impacts:** • Financial cost to residents and jurisdiction of repairing foundations for homes and public facilities • Cracked pipes in critical facilities may lead to a loss of service or length the time first responders take to get to someone in need.			

2017

Part 6.12: Coastal Erosion

6.12 Coastal Erosion

Coastal Erosion is measured through feet or meters lost per year. The map below shows the southeast coast of Texas with Brazoria County labeled between Galveston and Matagorda counties.



Source: Coastal Erosion Planning & Response Act. Black rectangle shows general Brazoria area

1

Historic Occurrence

There have been no recorded erosion events in the county between 2000 to 2017.

Hazard Analysis & Vulnerability Identification

The hazard analysis uses historic hazard event data to determine the probability of an event occurring again within a given year.

The hazard analysis also provides hazard extent data for each participating jurisdiction. The extent data is the most extreme data recorded during a storm or hazard event and represents the worst damage a jurisdiction has experienced in recent history. Information from stakeholders, FEMA**,** and H-GAC's critical facilities database were used for this analysis.

The jurisdictions below are alongside the coast and are profiling this hazard. All other participating jurisdictions are not profiling coastal erosion.

Brazoria County (All Participating Jurisdictions Impacted by Coastal Erosion)

Identified Vulnerabilities:

- Local shops and businesses that depend on tourism
- Community infrastructure include roads, bridges, and critical facilities along the coast
- Residents living along the coast
- Port infrastructure

Identified Impacts:

- Economic loss for jurisdictions and the county if local businesses have to close due to damage or loss of tourists/ customers
- Financial loss for business owners along the coast that need to make repairs to buildings or have less customers over time
- Closure of the port due to repairs may lead to an economic loss for the county
- Residential and commercial property loss throughout the county along the coast may lead to a financial loss for residents and jurisdictions that need to repair or replace property

Brazoria County (Unincorporated)			
Planning Area (Sq. mi):	1,475	**Occurrences since 2000:**	0; Ongoing
Area Affected:	30 %	**Annual Event Average:**	0; Ongoing
Probability: Likely; coasts are affected by storms and other natural events as well as development along the coast on a day-to-day basis.			
Greatest Extent of Damage: According to the map above the county is seeing < 14.8 feet per year; the county could expect to see greater than 14.8 feet per year			
Identified Vulnerabilities: • Treasure Island Beach- Beach erosion • Follett's Island- Wetlands protection in southeast of the county **Identified Impacts:** • Financial cost of beach replenishment for the county • Potential loss of revenue from tourism along the coast • Loss of natural habitat and wildlife along the coast			

Quintana			
Planning Area (Sq. mi):	2	**Occurrences since 2000:**	0; Ongoing
Area Affected:	100 %	**Annual Event Average:**	0; Ongoing
Probability: Likely; coasts are affected by storms and other natural events as well as development along the coast on a day-to-day basis.			
Greatest Extent of Damage: According to the map above the jurisdiction is seeing < 14.8 feet per year; the jurisdiction could expect to see greater than 14.8 feet per year			
Identified Vulnerabilities: • Residential and commercial property along the coast **Identified Impacts:** • Financial cost of beach replenishment for the jurisdiction • Potential loss of revenue from tourism along the coast • Loss of natural habitat and wildlife along the coast			

Surfside Beach			
Planning Area (Sq. mi):	2.2	**Occurrences since 2000:**	0; Ongoing
Area Affected:	100 %	**Annual Event Average:**	0; Ongoing
Probability: Likely; coasts are affected by storms and other natural events as well as development along the coast on a day-to-day basis.			
Greatest Extent of Damage: According to the map above the jurisdiction is seeing < 14.8 feet per year; the jurisdiction could expect to see greater than 14.8 feet per year			
Identified Vulnerabilities: • Breakaways • Residential and commercial property along the coast • Land near Beach Drive **Identified Impacts:** • Financial cost of beach replenishment for the jurisdiction • Potential loss of revenue from tourism along the coast • Loss of natural habitat and wildlife along the coast			

Port Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	0; Ongoing
Area Affected:	75 %	**Annual Event Average:**	0; Ongoing
Probability: Likely; coasts are affected by storms and other natural events as well as development along the coast on a day-to-day basis.			
Greatest Extent of Damage: According to the map above the jurisdiction is seeing < 14.8 feet per year; the jurisdiction could expect to see greater than 14.8 feet per year			
Identified Vulnerabilities: • Erosion along the fence line • Safety of vessels throughout the port **Identified Impacts:** • Financial cost of land lost and equipment or infrastructure damaged • Loss of natural habitat and wildlife along the coast			

Freeport			
Planning Area (Sq. mi):	2.81	**Occurrences since 2000:**	0; Ongoing
Area Affected:	75%	**Annual Event Average:**	0; Ongoing
Probability: Likely; coasts are affected by storms and other natural events as well as development along the coast on a day-to-day basis.			
Greatest Extent of Damage: According to the map above the jurisdiction is seeing < 14.8 feet per year; the jurisdiction could expect to see greater than 14.8 feet per year			
Identified Vulnerabilities: • Residential and commercial property along the coast particularly near the Brazos River Delta **Identified Impacts:** • Financial cost of beach replenishment for the jurisdiction • Potential loss of revenue from tourism along the coast • Loss of natural habitat and wildlife along the coast			

2017

Part 7: Mitigation Strategy

Part 7: MITIGATION STRATEGY

The planning process, hazard analysis, and vulnerability assessment serve as a foundation for a meaningful hazard mitigation strategy. The mitigation strategy provides an outline for how the county and the local jurisdictions aim to address and reduce the risks associated with the natural hazards identified in the HMAP and reduce the potential impact on residents and structures identified through the Vulnerability Analysis. The mitigation strategy is divided into three sections the mission statement, goals and objectives, and the mitigation action plan. The mission statement provides the overall purpose of the mitigation strategy and the HMAP. The goals and objectives provide milestones for how the county aims to meet this purpose. The mitigation action plan details specific mitigation actions, or projects, programs, and polices the county aims to meet these goals and objectives.

Mission Statement

The HMAP aims to implement new policies, programs, and projects to reduce the risks and impacts associated with natural hazards, including public education and partnerships between local officials and residents.

Goal
Reduce the loss of public and private infrastructure throughout the county due to natural hazards

> ***Objective***
> Raise and remove structures in the 500- year floodplain through creating, implementing, and updating county programs and local codes
>
> ***Objective***
> Retrofit coastal roads to prevent loss from coastal erosion
>
> ***Objective***
> Create levees or berms to protect sewage treatment facilities throughout the county

Goal
Create predictability along the Brazos river floodplain

> ***Objective***
> Through collaborative projects with public and private partners rid oyster creek of obstructions in order to allow river to flow naturally
>
> ***Objective***
> Raise and repair lost river bank to keep flood waters in the river
>
> ***Objective***
> Partner with local and county officials to identify at least three additional measures to keep water where it should be throughout the county

Goal

Improve collaboration and communication between fire, police, medical units, and local jurisdictions

Objective

The county and all local jurisdictions shall share a common radio or communications network

Objective

Provide educational opportunities for municipalities to understand the importance of staying in contact with MACC (Multi-Agency Coordination Center)

Objective

Develop a common dispatch procedure for the county and local jurisdictions

Mitigation Action Plan

The mitigation action plan explains the specific programs, policies, and projects that the county and the local jurisdictions aim to implement for the county to reach its HMAP objectives and goals. The mitigation action plan provides the details of each mitigation action including which local department will be in charge of implementing the actions, how the county or local jurisdiction plan to pay for these actions, and the estimated time for implementing these actions.

Each jurisdiction and the county prioritized their mitigation actions based on their greatest vulnerabilities and needs. Actions were rated 1, 2, or 3 with 1 being the highest priority. Within each of the priority categories, a sub-category for feasibility was created. Each action was evaluated for feasibility using FEMA's mitigation action evaluation worksheet (Appendix A). After evaluating the mitigation actions based on priorities and feasibility, the actions were ranked. The actions are separated by jurisdiction and then ranked as described. The charts below demonstrate the final ranking of mitigation actions based on their scoring.

All Participating Jurisdictions

Jurisdiction:	All participating jurisdictions	**Action Number:**	P1
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Drought, Lightning, Heat Events, Hail, Winter Weather, Tornado, Expansive Soils		
Project Title:	Educating public on mitigation techniques		
Project Description:	Implement an outreach and education campaign to educate the public on mitigation techniques for all hazards to reduce loss of life and property.		
Responsible Entity:	County Emergency Managers, All participating jurisdictions mayors and city councils		
Losses avoided:	Residents and business owners		
Cost Estimate:	7,000	**Timeframe:**	1 month
Potential Funding Sources:	Local budget and salary, HMPG, Fire Prevention and Safety Grants	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria County, Quintana, Surfside Beach, Port Freeport, Freeport	**Action Number:**	P1.1
Hazard(s) Addressed:	Coastal Erosion		
Project Title:	Educating public on mitigation techniques		
Project Description:	Implement an outreach and education campaign to educate the public on mitigation techniques for coastal erosion to reduce loss of life and property.		
Responsible Entity:	County Emergency Managers, jurisdictions mayors, and city councils		
Losses avoided:	Residents and businesses		
Cost Estimate:	7,000	**Timeframe:**	1 month
Potential Funding Sources:	Local budget and salary, HMPG,	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Unincorporated Brazoria County, Holiday Lakes, West Columbia, Bailey's Prairie, Brazoria, Freeport, Port of Freeport, and Oyster Creek	**Action Number:**	P1.2
Hazard(s) Addressed:	Dam and Levee Failure		
Project Title:	Educating public on mitigation techniques		
Project Description:	Implement an outreach and education campaign to educate the public on mitigation techniques for dam and levee failure to reduce loss of life and property.		
Responsible Entity:	County Emergency Managers, jurisdictions, mayors and city councils		
Losses avoided:	Residents and businesses		
Cost Estimate:	7,000	**Timeframe:**	1 month
Potential Funding Sources:	Local budget and salary, HMPG	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions	**Action Number:**	P2
Hazard(s) Addressed:	Hail, Tornado, Hurricane		
Project Title:	Retrofitting structures for hail and wind protection		
Project Description:	All participating jurisdictions will retrofit city and county owned structures with roofs and window panes that can withstand hail and high wind damage.		
Responsible Entity:	Emergency Coordinator, Brazoria County		
Losses avoided:	Buildings, residents, and city/ county employees in county and city buildings when a hail storm hits.		
Cost Estimate:	20,000	**Timeframe:**	48 months
Potential Funding Sources:	HMGP, PDM, Local budgets	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions	**Action Number:**	P3
Hazard(s) Addressed:	Wildfire		

Project Title:	Technical support for residents to reduce the risk of wildfire		
Project Description:	The county and partnering cities will provide incentives and technical support for property owners to reduce underbrush throughout the county to properly cut back trees, upgrade fences, and replace landscape materials with nonflammable materials		
Responsible Entity:	County's Emergency Management Coordinator		
Losses avoided:	Homes within the wild-urban interface and residents living within these areas		
Cost Estimate:	5,000	**Timeframe:**	3 months
Potential Funding Sources:	HMPG, Current county and city budget/ staff time	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions	**Action Number:**	P4
Hazard(s) Addressed:	Wildfire		
Project Title:	Rebate program for wildfire protection		
Project Description:	The city will develop a rebate program for residents who use non-combustible material when renovating properties or building new homes		
Responsible Entity:	Mayor and County Emergency Manager		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	100,000	**Timeframe:**	12 to 24 months
Potential Funding Sources:	HMPG, current city and staff time	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions	**Action Number:**	P5
Hazard(s) Addressed:	Heat Events		
Project Title:	Installing misting stations		
Project Description:	The county and partnering cities will install misting stations throughout city and county owned parks and property.		
Responsible Entity:	County Emergency Coordinator		
Losses avoided:	Loss of life; Especially the elderly and children in the county		
Cost Estimate:	3,000	**Timeframe:**	6 to 12 months
Potential Funding Sources:	HMPG, current city and staff time	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions	**Action Number:**	P6
Hazard(s) Addressed:	Drought		
Project Title:	Adopting ordinance for drought tolerant plants		
Project Description:	All participating jurisdictions will develop an ordinance to require incorporating drought tolerant landscape design into all new county and city owned properties.		
Responsible Entity:	Emergency Coordinators for the county and partnering jurisdictions.		
Losses avoided:	Structures throughout the jurisdiction impacted by drought		
Cost Estimate:	$1,000	**Timeframe:**	3 months
Potential Funding Sources:	Current staff time	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions	**Action Number:**	P7
Hazard(s) Addressed:	Lightning		
Project Title:	Rebate program for lightning rods		
Project Description:	All participating jurisdictions will work to develop a program that offers reduced price lightning rods and technical assistance for homeowners throughout the county.		
Responsible Entity:	County Emergency Coordinator		
Losses avoided:	Homes and residents who could be affected by lightning throughout the county.		
Cost Estimate:	$150,000	**Timeframe:**	12 months
Potential Funding Sources:	HMGP, FP&S Grants	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions	**Action Number:**	P8
Hazard(s) Addressed:	Expansive Soils, Drought		
Project Title:	Drip irrigation		
Project Description:	All participating jurisdictions will install drip irrigation around critical facilities' foundations throughout the county. This action mitigates the damage that shrinking and expanding soils cause on foundations and pipes.		
Responsible Entity:	Emergency Coordinator		
Losses avoided:	Cost of repair to critical facilities' foundations, water and sewer lines.		
Cost Estimate:	$250,000	**Timeframe:**	12 months
Potential Funding Sources:	HMGP, FP&S Grants	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	All participating jurisdictions		**Action Number:**	P9
Hazard(s) Addressed:	Winter Weather			
Project Title:	Warning system for icy roadways			
Project Description:	All participating jurisdictions will install signage and sensors to alert drivers during winter weather on major roadways, curved roads, and steep roads.			
Responsible Entity:	County Emergency Coordinator			
Losses avoided:	Residents and visitors traveling throughout the county.			
Cost Estimate:	150,000	**Timeframe:**	12 months	
Potential Funding Sources:	HMGP, FP&S Grants	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	All participating jurisdictions		**Action Number:**	P10
Hazard(s) Addressed:	Flooding, Hurricane/Tropical Storm, Wildfire, Drought, Dam and Levee Failure			
Project Title:	Non-structural mitigation			
Project Description:	Preserve natural lands and green space to reduce the impacts of natural hazards. Up to 35,000 acres of land tracts could be purchased from willing sellers for their natural ecosystem services. Including floodwater storage, groundwater recharge, erosion control, drought mitigation, and wildfire damage reduction. The land will be converted to parks, wildlife management areas, community forests, and/or other public open spaces.			
Responsible Entity:	The Trust for Public Land and voluntary partnering jurisdictions.			
Losses avoided:	Reduce the loss of life and property by preserving pervious surface and open space to reduce the effects of flooding. Reduce agricultural and water reservoir losses during droughts, and reduce the loss of life and property during wildfires, floods, and dam/ levee failures by using wetlands and wetland forests as natural fire breaks and storm infrastructure.			
Cost Estimate:	$65,000,000.00	**Timeframe:**	60 months	
Potential Funding Sources:	HMGP, FMA, PDM, Philanthropic Institutions, the Deep Water Horizon Settlement, and Local budgets.	**Benefit-Cost Ratio:**	Greater than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Unincorporated Brazoria County, Holiday Lakes, West Columbia, Bailey's Prairie, Brazoria, Freeport, Port of Freeport, and Oyster Creek.		**Action Number:**	P11
Hazard(s) Addressed:	Flood, Dam and Levee Failure			
Project Title:	Updating Maps			
Project Description:	Each jurisdiction will work to update their dam and levee failure inundation maps to identify the probability and impact of a dam and levee failures in their jurisdiction. The mapping action will also identify the homes, critical facilities and agricultural lands that are vulnerable to a complete dam or levee failure, determine the extent of damage that can be expected, and show the probability and impact of dam failure. The updated inundation maps will also be made available to public.			
Responsible Entity:	County Emergency Coordinator			
Losses avoided:	Homes and residents (loss of life) who could be affected by flooding throughout the county			
Cost Estimate:	150,000	**Timeframe:**	12 months	
Potential Funding Sources:	HMGP, FP&S Grants	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Multi-Jurisdiction Mitigation Actions

Jurisdiction:	Lake Jackson, Clute, Velasco Drainage District	**Action Number:**	Z1
Hazard(s) Addressed:	Floods		
Project Title:	Flag Lake Drainage Infrastructure Project		
Project Description:	Lake Jackson, Clute, and Velasco Drainage District will conduct a Flag Lake drainage study. Runoff from Lake Jackson flows into Clute. Using the study, Clute and Velasco Drainage District would implement a drainage project that lessens the flooding impact from the Lake Jackson runoff.		
Responsible Entity:	Lake Jackson		
Partners:	Clute, Velasco Drainage District		
Losses avoided:			
Cost Estimate:	$250,000	**Timeframe:**	24 months
Potential Funding Sources:	USACE Planning Assistance to States, Flood Mitigation Assistance Program, HMGP, TWDB Research and Planning Fund	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Quintana, Freeport	**Action Number:**	N5
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms and Coastal Erosion		
Project Title:	Prevention, Property Protection		
Project Description:	Develop and implement a beach nourishment project on each jurisdiction's shoreline to mitigate the effects of coastal erosion.		
Responsible Entity:	Quintana Mayor, Freeport Parks Engineering Department		
Losses avoided:	Life safety and public property		
Cost Estimate:	$4,000,000	**Timeframe:**	48 to 60 months
Potential Funding Sources:	FEMA, HMG, CEPRA, CIAP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Bailey's Prairie

Jurisdiction:	Bailey's Prairie	**Action Number:**	A1
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Property Protection		
Project Description:	Project will clear obstacles, widen and reshape ditches, and upgrade culverts to restore adequate drainage to mitigate flooding		
Responsible Entity:	City Engineer		
Losses avoided:	Homes, businesses, and public facilities		
Cost Estimate:	$250,000	**Timeframe:**	6 months
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Bailey's Prairie	**Action Number:**	A2
Hazard(s) Addressed:	Hail		
Project Title:	Educate Public of Home Improvement Opportunities		
Project Description:	Educate elderly, low-income residents of grant funding opportunities to insulate the foundation of pier and beam homes, and update homes to withstand strong winds and hail.		
Responsible Entity:	City Council		
Losses avoided:	Life, health, and safety of vulnerable populations, and property damage		
Cost Estimate:	$2,000	**Timeframe:**	12 months
Potential Funding Sources:	Local Budget, HMGP, USDA Home Repair grant	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Bailey's Prairie	**Action Number:**	A3
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Adopting City Ordinance		

Project Description:	The city shall adopt a land use ordinance which requires any structure within the 100-year floodplain to be elevated 2 feet above base flood elevation.		
Responsible Entity:	City Council and mayor		
Losses avoided:	Homes, businesses, and residents within the 100-year flood plain.		
Cost Estimate:	$5,000	**Timeframe:**	6 months
Potential Funding Sources:	HMGP, current city budget and staff time.	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Bailey's Prairie	**Action Number:**	A4
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Adopting land-use ordinance		
Project Description:	The city shall adopt a land-use ordinance which prohibits building residential or commercial structures in the 100-year floodplain.		
Responsible Entity:	City Manager, City Council, Office of Code Enforcement		
Losses avoided:	Future buildings and infrastructure that may have been built within the 100-year flood plain		
Cost Estimate:	$5,000	**Timeframe:**	4 months
Potential Funding Sources:	Current city budget and salary, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Surfside Beach

Jurisdiction:	Surfside Beach	**Action Number:**	B1
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Coastal Erosion		
Project Title:	Installing Shoreline Structures		
Project Description:	Install groins along the beach front throughout the city specifically near Breakaway to decrease coastal erosion and damage caused by storm surge and hurricanes.		
Responsible Entity:	Mayor's Office		
Losses avoided:	Shoreline erosion, loss of natural wildlife habitat, etc.		
Cost Estimate:	$12,000,000	**Timeframe:**	36 months
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Surfside Beach	**Action Number:**	B2
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Coastal Erosion		
Project Title:	Installing Shoreline Structures		
Project Description:	Extend revetment wall to jetties throughout the city to reduce coastal erosion and decrease the impacts caused by hurricanes and storm surge.		
Responsible Entity:	Mayor's Office		
Losses avoided:	Coastal erosion, wildlife habitat, infrastructure, etc.		
Cost Estimate:	$1,300,000	**Timeframe:**	24 months
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Surfside Beach	**Action Number:**	B3
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Property Protection		
Project Description:	Install hurricane shutters on city hall/court/police station.		

Responsible Entity:	Mayor's Office		
Losses avoided:	Loss of municipal buildings, lives, essential documents, and equip		
Cost Estimate:	$35,000	**Timeframe:**	2 months
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Surfside Beach	**Action Number:**	B4
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Coastal Erosion		
Project Title:	Protecting Shorelines		
Project Description:	Develop and implement a shoreline protection program.		
Responsible Entity:	Mayor's Office		
Losses avoided:	Natural wildlife habitat, property, shoreline		
Cost Estimate:	$3,500,000	**Timeframe:**	24 months
Potential Funding Sources:	TX Coastal Coordination Council - TX Coastal Management Program, USACE-Emergency Rehabilitation of Flood Control Works	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Surfside Beach	**Action Number:**	B5
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Coastal Erosion		
Project Title:	Natural Resource Protection		
Project Description:	Acquisition of seaward property and re-establish stabilizing vegetation.		
Responsible Entity:	Mayor's Office		
Losses avoided:	Life and property along the coast		
Cost Estimate:	$1,000,000	**Timeframe:**	36 to 60 months
Potential Funding Sources:	HMGP, PDM Program, Flood Mitigation Assistance Program, HUD-Disaster Recovery	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio

	Initiative, TX Coastal Coordination Council - TX		
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

West Columbia

Jurisdiction:	West Columbia	**Action Number:**	C1
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Drought, Lightning, Heat Events, Hail, Winter Weather, Tornado, Dam and Levee Failure		
Project Title:	Structure Hardening		
Project Description:	Harden and reinforce critical facilities throughout the city: Purchase and install generators for all critical facilities, harden windows to withstand hurricane, tornado, and hail, and install irrigation system around foundations to prevent foundation cracking and breaking pipes.		
Responsible Entity:	City Administration		
Losses avoided:	Reduce the risk to critical facilities and assets during a natural hazard event		
Cost Estimate:	$1,250,000	**Timeframe:**	24-36 months
Potential Funding Sources:	HMGP, CDBG, PDM, FP&S Grants, Weatherization Assistance Program	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Lake Jackson

Jurisdiction:	Lake Jackson		**Action Number:**	D1
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Dam/ Levee Failure			
Project Title:	Jackson Oaks II Levee Service Road Repair			
Project Description:	Repair service road/levee on north side of Jackson Oaks II subdivision to reduce the flooding of home and streets.			
Responsible Entity:	Velasco Drainage District			
Losses avoided:	Reduce flood waters in streets and homes.			
Cost Estimate:	$50,000	**Timeframe:**	12 months	
Potential Funding Sources:	Local funds: Velasco Drainage will provide manpower and equipment and Lake Jackson will provide materials to bring the berm and service road back to its original height.	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Lake Jackson		**Action Number:**	D2
Hazard(s) Addressed:	Hurricane/Tropical Storms, Lightning			
Project Title:	Lightning Protection of Critical Facilities			
Project Description:	Conduct a city-wide lightning vulnerability assessment for key infrastructure. Communications, fuel storage tanks and distribution, pump systems, wells and install surge protectors or other lightning protection for property.			
Responsible Entity:	Public Works			
Losses avoided:	Reduce risk to critical facilities and assets during a storm event.			
Cost Estimate:	$25,000	**Timeframe:**	12 months	
Potential Funding Sources:	Local Budget	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Lake Jackson	**Action Number:**	D3
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Tornado, Hail, Winter Weather		
Project Title:	Protect Powerlines from winds and falling limbs		
Project Description:	Remove or trim trees that pose a threat to power lines in the event of strong winds, winter weather, or hail.		
Responsible Entity:	Public Works and Parks		
Losses avoided:	Reduce risk to critical facilities and assets during storms.		
Cost Estimate:	$200,000	**Timeframe:**	24-60 months
Potential Funding Sources:	City and Center Point funding of private contractors. Center Point has become more active in removing trees near power lines as part of their efforts to harden the system. The City would work on trees in parks and parkways near power lines.	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Holiday Lakes

Jurisdiction:	Holiday Lakes	**Action Number:**	E1
Hazard(s) Addressed:	Wildfire		
Project Title:	Becoming an active participant in Firewise USA program, and implement the program in the community.		
Project Description:	The City will become an active participant in the Firewise USA program and encourage local neighborhoods to join the program as well.		
Responsible Entity:	Mayor and city council		
Losses avoided:	Property and residents throughout the city		
Cost Estimate:	$4,000	**Timeframe:**	24 Months
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Velasco Drainage District

Jurisdiction:	Velasco Drainage District	**Action Number:**	F1
Hazard(s) Addressed:	Floods		
Project Title:	Structural Project		
Project Description:	Construct a 75-acre detention pond south of the Sea Center adjacent to the Clute/Lake Jackson Drainage Channel. Provide 800,000 gallons per minute of diverted flood water into pond.		
Responsible Entity:	Velasco Drainage District		
Losses avoided:	Mitigated damage of homes, businesses, and public facilities of Lake Jackson and Clute		
Cost Estimate:	$2,000,000	**Timeframe:**	36-60 months
Potential Funding Sources:	TWDB Small Flood Control Projects, NRCS Watershed Protection and Flood Prevention Program, Disaster Relief/Urgent needs Fund for CDBG, PDM, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Velasco Drainage District	**Action Number:**	F2
Hazard(s) Addressed:	Floods		
Project Title:	Structural Project		
Project Description:	Construct detention pond in the Clute/Lake Jackson watershed. Propose to build near the East Levee Pump Station adjacent to the Clute/Lake Jackson Pump Station.		
Responsible Entity:	Velasco Drainage District		
Losses avoided:	Mitigated damage of homes, businesses, and public facilities of Lake Jackson and Clute		
Cost Estimate:	$2,000,000	**Timeframe:**	24-36 months
Potential Funding Sources:	TWDB Small Flood Control Projects, NRCS Watershed Protection and Flood Prevention Program, Disaster Relief/Urgent needs Fund or CDBG, PDM, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Velasco Drainage District		**Action Number:**	F3
Hazard(s) Addressed:	Floods			
Project Title:	Property Protection, Structural Project			
Project Description:	Purchase and install additional pump equipment in the East Levee Pump Station. Would provide an additional 780,000 gallons capacity per minute stormwater infrastructure capacity to the Clute/Lake Jackson watershed.			
Responsible Entity:	Velasco Drainage District			
Losses avoided:	Flooding of Dow Chemical & Other Industrial & Residential areas			
Cost Estimate:	$4,500,000	**Timeframe:**	24-36 months	
Potential Funding Sources:	TWDB, Small Flood Control Projects, NRCS Watershed Protection and Flood Prevention Program, Disaster Relief/Urgent Needs Fund for CDBG, PDM, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Velasco Drainage District		**Action Number:**	F4
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Property Protection			
Project Description:	Project will clear obstacles, widen and reshape ditches, and upgrade culverts to restore adequate drainage to mitigate flooding throughout the entire drainage district.			
Responsible Entity:	Velasco Board of Supervisors			
Losses avoided:	Homes, business, and public facilities			
Cost Estimate:	$2,500,000	**Timeframe:**	48 months	
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Velasco Drainage District		**Action Number:**	F5
Hazard(s) Addressed:	Hurricane/ Tropical Storms			
Project Title:	Hurricane resistant powerline poles			
Project Description:	All new power line poles installed within the district will be resistant to hurricane winds.			
Responsible Entity:	Engineering Department			
Losses avoided:	Homes, business, and public facilities			
Cost Estimate:	$120,000	**Timeframe:**	36 months	
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Manvel

Jurisdiction:	Manvel	**Action Number:**	G1
Hazard(s) Addressed:	Floods		
Project Title:	Structural Project		
Project Description:	Flora Street drainage improvements: widen and reshape ditches, and upgrade culverts to restore adequate drainage to mitigate flooding in Manvel neighborhoods.		
Responsible Entity:	Manvel		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$100,000	**Timeframe:**	12 months
Potential Funding Sources:	FEMA-HMGP, PDM, FMA, City, County, Drainage Districts	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Manvel	**Action Number:**	G2
Hazard(s) Addressed:	Floods		
Project Title:	Structural Project		
Project Description:	Alleluia Trail Rogers Rd & All Roads off Rogers drainage improvements, including storm sewer rehabilitation and ditch deepening.		
Responsible Entity:	Manvel		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$250,000	**Timeframe:**	12 months
Potential Funding Sources:	FEMA-HMGP, PDM, FMA, City, County, Drainage Districts	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Manvel		**Action Number:**	G3
Hazard(s) Addressed:	Floods			
Project Title:	Structural Project			
Project Description:	State Highway 6 drainage improvements, including storm sewer upgrades to meet current capacities, ditch deepening, and sub regional detention ponds. Project will also widen and reshape ditches, and upgrade culverts.			
Responsible Entity:	Manvel			
Losses avoided:	Residents and existing and new properties			
Cost Estimate:	$3,000,000	**Timeframe:**	24 months	
Potential Funding Sources:	FEMA-HMGP, PDM, FMA, City, County, Drainage Districts, Gulf Coast Water Authority TXDOT	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Manvel		**Action Number:**	G4
Hazard(s) Addressed:	Floods			
Project Title:	Structural Project			
Project Description:	Gates Loop subdivision drainage improvements including deepening and widening ditches around Gates Loop and Sandy Point Rd.			
Responsible Entity:	Manvel			
Losses avoided:	Residents and existing and new properties			
Cost Estimate:	$100,000	**Timeframe:**	12 months	
Potential Funding Sources:	FEMA-HMGP, PDM, FMA, City, County, Drainage Districts	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Manvel		**Action Number:**	G5
Hazard(s) Addressed:	Floods			
Project Title:	Structural Project			
Project Description:	Reed Lane, Sherri Circle, Booth Plummer Road and 1128 South of Hwy 6, drainage improvements, including storm sewer rehabilitation and ditch deepening.			
Responsible Entity:	Manvel			
Losses avoided:	Residents and existing and new properties			
Cost Estimate:	$50,000	**Timeframe:**	12 months	
Potential Funding Sources:	FEMA-HMGP, PDM, FMA, City, County, Drainage Districts	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Manvel		**Action Number:**	G6
Hazard(s) Addressed:	Floods, Hurricanes /Tropical Storms			
Project Title:	Public Education and Planning			
Project Description:	Improve GIS database to include repetitive loss properties areas and flooded structure data. Data to be used for future drainage infrastructure planning and to provide outreach and emergency services to residents in substantial risk zones.			
Responsible Entity:	Manvel			
Losses avoided:	Residents and existing and new properties			
Cost Estimate:	$20,000	**Timeframe:**	12 months	
Potential Funding Sources:	FEMA-HMGP, PDM, FMA, SRL, City, County, Drainage Districts	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Manvel	**Action Number:**	G7
Hazard(s) Addressed:	Wildfire and Drought		
Project Title:	Public Education		
Project Description:	Conduct wildfire outreach and education campaign. Make presentations at civic club meetings and local schools. Work with Texas A&M Forest Service to develop and implement a Wild Land Urban Interface loss reduction plan.		
Responsible Entity:	Manvel and County OEM		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$10,000	**Timeframe:**	6 months
Potential Funding Sources:	PGM, HMGP, Texas Forest Service	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Manvel	**Action Number:**	G8
Hazard(s) Addressed:	Floods		
Project Title:	Property Protection		
Project Description:	Acquire Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties in the 100-year flood plain, as identified by FEMA and NFIP		
Responsible Entity:	Manvel		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$1,700,000	**Timeframe:**	18 months
Potential Funding Sources:	FEMA-HMGP, PDM, FMA, SRL, City, County, Drainage Districts	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Manvel		**Action Number:**	G9
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	City Ordinance			
Project Description:	The city shall adopt a land use ordinance which requires any structure within the 100-year floodplain to be elevated 2 feet above base flood elevation.			
Responsible Entity:	City council and mayor			
Losses avoided:	Homes, businesses, and residents within the 100-year flood plain			
Cost Estimate:	$5,000	**Timeframe:**	6 months	
Potential Funding Sources:	HGMP, current city and staff time	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Manvel		**Action Number:**	G10
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Adopting land-use ordinance			
Project Description:	The city shall adopt a land-use ordinance which prohibits building residential or commercial structures in the 100-year floodplain			
Responsible Entity:	City Manager, City Council, Office of Code Enforcement			
Losses avoided:	Future buildings and infrastructure that may have been built within the 100-year flood plain.			
Cost Estimate:	$5,000	**Timeframe:**	4 months	
Potential Funding Sources:	Current city budget and salary, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Manvel	**Action Number:**	G11
Hazard(s) Addressed:	Wildfire		
Project Title:	Education and Outreach: Firewise USA program		
Project Description:	The City will become an active participant in the Firewise USA program and implement a Firewise plan and outreach campaign in the community.		
Responsible Entity:	Mayor and city council		
Losses avoided:	Property and residents throughout the city		
Cost Estimate:	$4,000	**Timeframe:**	12 months
Potential Funding Sources:	HMP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Manvel	**Action Number:**	G12
Hazard(s) Addressed:	Hurricane/ Tropical Storms		
Project Title:	Hurricane resistant powerline poles		
Project Description:	All new power line poles installed within the jurisdiction will be wind resistant to Hurricane grade winds.		
Responsible Entity:	Engineering Department		
Losses avoided:	Homes, businesses, and public facilities		
Cost Estimate:	$120,000	**Timeframe:**	36 months
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Manvel		**Action Number:**	G13
Hazard(s) Addressed:	Hail, Hurricanes, Winter Storms			
Project Title:	Educate public of home improvement opportunities			
Project Description:	Educate elderly, low-income residents of grant funding opportunities to insulate the foundation of pier and beam homes, and update homes to withstand hurricane force winds and hail.			
Responsible Entity:	County Emergency Managers, partnering jurisdictions mayors and city councils, code enforcement and building departments			
Losses avoided:	Life, health, and safety of vulnerable populations, and property damage			
Cost Estimate:	$2,500	**Timeframe:**	6 months	
Potential Funding Sources:	HMGP, USDA Home Repair Grant	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Manvel		**Action Number:**	G14
Hazard(s) Addressed:	Wildfire			
Project Title:	Reducing underbrush for wildfire prevention			
Project Description:	The city will work to reduce underbrush on identified wild-urban interface areas through techniques such as using skid steers or goats.			
Responsible Entity:	County emergency managers, mayors			
Losses avoided:	Current and future buildings and residents in wild-urban interface areas			
Cost Estimate:	$500,000	**Timeframe:**	12-24 months	
Potential Funding Sources:	HMGP, local budget and current salary, fire prevention and safety grants	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Manvel		**Action Number:**	G15
Hazard(s) Addressed:	Tornado			
Project Title:	Tornado mitigation through rebate program			
Project Description:	The city will develop a rebate program for building owners who install straps, structural bracings, window shutters, or interlocking roof shingles in new construction or when renovating residences or businesses.			
Responsible Entity:	City Manager, Office of Code Enforcement			
Losses avoided:	Resident, homes, business, and local facilities			
Cost Estimate:	$5,000	**Timeframe:**	3 months	
Potential Funding Sources:	Current city budget and salary, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Manvel		**Action Number:**	G16
Hazard(s) Addressed:	Drought, Expansive Soils			
Project Title:	Structural and foundation protection			
Project Description:	Install moisture sensing irrigation systems at all existing and future county, local and critical facilities. Irrigation systems automatically water building to reduce the impacts of shrinking and swelling soils during drought.			
Responsible Entity:	Facilities and building departments of participating jurisdictions			
Losses avoided:	Structural foundations and anticipated cost of repairs			
Cost Estimate:	$175,000	**Timeframe:**	36-48 months	
Potential Funding Sources:	Local budgets and HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Manvel		**Action Number:**	G17
Hazard(s) Addressed:	Dam/ Levee Failure			
Project Title:	Structural			
Project Description:	Incorporate routine repairs and structural renovation efforts of dams and levee into capital improvement plans.			
Responsible Entity:	County Emergency Managers, partnering jurisdictions, mayors, city councils, capital improvement boards, engineering departments			
Losses avoided:	Lives, homes, businesses, critical assets, public facilities, and infrastructure destruction in the event of dam or levee failure.			
Cost Estimate:	$1,500,000	**Timeframe:**	24-36 months	
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Brazoria

Jurisdiction:	Brazoria	**Action Number:**	H1
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Lightning, Heat Events, Hail, Winter Weather, Tornado, Dam and Levee Failure		
Project Title:	Communication and Emergency Services		
Project Description:	Purchase radio/ communication equipment to improve communication leading up to and during natural disasters. Equipment will be protected against electrical surges caused by lightning, and elevated 4' above base flood level to protect equipment from flooding.		
Responsible Entity:	Police/Fire/Administration/Public Works		
Losses avoided:	Residents (loss of life) and existing and new properties		
Cost Estimate:	$120,000	**Timeframe:**	36-60 months
Potential Funding Sources:	Federal, State, Local, HMGP, PDM, FEMA Emergency Operations Center Funding, FEMA Emergency Management Performance Grant, USDA Rural Utilities Service Weather Radio Grant Program	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria	**Action Number:**	H2
Hazard(s) Addressed:	Floods		
Project Title:	Prevention		
Project Description:	Develop and implement a drainage improvement program: Widen and reshape city owned drainage ditches, and upgrade culverts to restore adequate drainage to mitigate flooding, and increase size of culverts, including box culverts.		
Responsible Entity:	Public works department		
Losses avoided:	Flooding of homes and roads.		
Cost Estimate:	$100,000	**Timeframe:**	12-24 months
Potential Funding Sources:	Drainage district funds available, Local funds, TWDB-Clean Water Development Board (Development Fund, USDA NRCA Watershed Protection and Flood Prevention Program, EPA-NPS Grant Program, 406 Public Assistance Program (following federal disaster declaration	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria	**Action Number:**	H3
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Lightning, Heat Events, Hail, Winter Weather, Tornado, Dam and Levee Failure		
Project Title:	Property Protection		
Project Description:	Retrofit Emergency Operations Center at City Hall. Add storm protection to glass doors and windows at EOC, Police Station, and Fire Station. Install network connection and Emergency Dispatch radio in EOC.		
Responsible Entity:	City Emergency Management		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$75,000	**Timeframe:**	12 months
Potential Funding Sources:	City funds, FEMA-HMGP and PDM program Federal, State, Local, FEMA-Emergency Management Performance Grant, Dept. of Justice-State Homeland Security Program, FEMA All Hazards Operational Planning, PDM, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria	**Action Number:**	H4
Hazard(s) Addressed:	Hurricane/ Tropical Storms and Wildfire		
Project Title:	Emergency Services		
Project Description:	Replace aging Fire/EMS chief/ EMS Command and Emergency Management Staff command vehicles that are more than 100,000 miles or older than seven years old.		
Responsible Entity:	City Administration		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$150,000	**Timeframe:**	12 months
Potential Funding Sources:	Federal, state, local, FEMA-Assistance to Fire Fighters Grant, FEMA-All Hazards Operational Planning	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria		**Action Number:**	H5
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms and Tornado, Wildfire, Hail, and Lightning			
Project Title:	Emergency Services			
Project Description:	Purchase back-up generators for all critical facilities in Brazoria.			
Responsible Entity:	Public Works Dept.			
Losses avoided:	Residents and existing and new properties			
Cost Estimate:	$100,000	**Timeframe:**	6 months	
Potential Funding Sources:	State and Local Funds, HMGP (generator "quick connect"), PDM	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria		**Action Number:**	H6
Hazard(s) Addressed:	Hurricane/ Tropical Storms and Hail			
Project Title:	Property Protection			
Project Description:	Install hurricane shutters on City Hall, fire station and police department.			
Responsible Entity:	City Emergency Management			
Losses avoided:	Prevents the need for expensive repairs, the loss of power, communication, and ability to provide emergency services.			
Cost Estimate:	$40,000	**Timeframe:**	12-24 months	
Potential Funding Sources:	USACE-Small Flood Control Projects, USDA NRCS-Emergency Watershed Protection Agency, TWDB-Clean Water State Revolving Fund, TWDB (Development Fund II)-Texas Water Development Fund, USDA NRCS-Watershed Protection and Flood Prevention Program, EPA-NPS Grant	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria		**Action Number:**	H7
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Tornado, Hail, Heat Events, Winter Storms			
Project Title:	Public Information and Education			
Project Description:	Develop severe weather warning system to alert the public of impending natural disasters.			
Responsible Entity:	Police / Fire			
Losses avoided:	Loss of life and property protection			
Cost Estimate:	$95,000	**Timeframe:**	6 months	
Potential Funding Sources:	USDA-Rural Utilities Service-Weather Radio Grant Program, DOJ-State Homeland Security Program, National Weather Service, HMGP, PDM, FEMA-Emergency Operations Center Funding, FEMA-Emergency Management Performance Grant, USDA-Environmental Quality Incentive	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria		**Action Number:**	H8
Hazard(s) Addressed:	Floods and Wildfire			
Project Title:	Emergency Services			
Project Description:	Purchase street sign and barricades to block off streets for evacuation			
Responsible Entity:	Police Department and Emergency management			
Losses avoided:	Flooding, Homes lost, loss of life			
Cost Estimate:	$2,500	**Timeframe:**	6 months	
Potential Funding Sources:	Local funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria	**Action Number:**	H9
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Property Protection		
Project Description:	Install security system for City service center.		
Responsible Entity:	Public Works		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$5,000	**Timeframe:**	12-24 months
Potential Funding Sources:	FEMA-Emergency Management Performance Grant, Dept. of Justice-State Homeland Security Program, FEMA-All Hazards Operational Planning	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria	**Action Number:**	H10
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire		
Project Title:	Emergency Services		
Project Description:	Purchase rescue vehicle		
Responsible Entity:	Fire Dept.		
Losses avoided:	Residents and existing and new properties		
Cost Estimate:	$195,000	**Timeframe:**	6 months
Potential Funding Sources:	FEMA-Assistance to Firefighter's Grant	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria		**Action Number:**	H11
Hazard(s) Addressed:	Floods, Wildfire, Tornado			
Project Title:	Emergency Services			
Project Description:	Purchase emergency medical service, fire and police rescue equipment.			
Responsible Entity:	Police, Fire, EMS, and Administrative Dept.			
Losses avoided:	Residents and existing and new properties			
Cost Estimate:	$50,000	**Timeframe:**	6 months	
Potential Funding Sources:	DOJ-State Homeland Security Program, FEMA-Assistance to Firefighter's Grant	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria		**Action Number:**	H12
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Tornado			
Project Title:	Public Information and Awareness, Emergency Services			
Project Description:	Develop evacuation plan.			
Responsible Entity:	Police/Fire/Public Works			
Losses avoided:	Residents and existing and new properties			
Cost Estimate:	$10,000	**Timeframe:**	6 months	
Potential Funding Sources:	PDM Program, FEMA Emergency Management Performance Grant, Flood Mitigation Assistance Program, HMGP, USDA Environmental Quality Incentives Program, FEMA-All Hazards Operational Planning, FEMA Hazardous Materials Assistance Program, FEMA Fire Management As	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria	**Action Number:**	H13
Hazard(s) Addressed:	Wildfire		
Project Title:	Becoming an active participant in Firewise USA program		
Project Description:	The City will become an active participant in the Firewise USA program and implement a Firewise plan and outreach campaign in the community.		
Responsible Entity:	Mayor and city council		
Losses avoided:	Property and residents throughout the city.		
Cost Estimate:	$4,000	**Timeframe:**	12 months
Potential Funding Sources:	HMP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria	**Action Number:**	H14
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Adopting land-use ordinance		
Project Description:	The city shall adopt a land-use ordinance which prohibits building residential or commercial structures in the 100-year floodplain.		
Responsible Entity:	City manager, City Council, Office of Code Enforcement		
Losses avoided:	Future buildings and infrastructure that may have been built within the 100-year floodplain.		
Cost Estimate:	$5,000	**Timeframe:**	4 months
Potential Funding Sources:	Current city budget and salary, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria	**Action Number:**	H15
Hazard(s) Addressed:	Tornado		
Project Title:	Tornado mitigation through rebate program		
Project Description:	The city will develop a rebate program for building owners who install straps, structural bracings, window shutters, or interlocking roof shingles in new construction or when renovating residences or businesses		
Responsible Entity:	City Manager, Office of Code Enforcement		
Losses avoided:	Residents, homes, business, and local facilities		
Cost Estimate:	$5,000	**Timeframe:**	3 months
Potential Funding Sources:	Current city budget and salary, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria	**Action Number:**	H16
Hazard(s) Addressed:	Hurricane/ Tropical Storm		
Project Title:	Hurricane resistant powerline poles		
Project Description:	All new power line poles installed within the jurisdiction will be wind resistant to Hurricane grade winds.		
Responsible Entity:	Engineering Department		
Losses avoided:	Homes, businesses, and public facilities		
Cost Estimate:	$120,000	**Timeframe:**	36 Months
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria		**Action Number:**	H17
Hazard(s) Addressed:	Hurricane/ Tropical Storms Hail and Winter Storms			
Project Title:	Educate public of home improvement opportunities			
Project Description:	Educate elderly, low-income residents of grant funding opportunities to insulate the foundation of pier and beam homes, and update homes to withstand hurricane force winds and hail.			
Responsible Entity:	County Emergency Managers, partnering jurisdictions mayors and city councils, code of enforcement and building departments			
Losses avoided:	Life, health, and safety of vulnerable populations, and property damage.			
Cost Estimate:	$2,500	**Timeframe:**	6 months	
Potential Funding Sources:	HMGP, USDA Home Repair Grant	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria		**Action Number:**	H18
Hazard(s) Addressed:	Dam/ Levee Failure			
Project Title:	Structural			
Project Description:	Incorporate routine repairs and structural renovation efforts of dams and levee into capital improvement plans.			
Responsible Entity:	County Emergency Managers, partnering jurisdictions, mayors, city councils, capital improvement boards, engineering departments			
Losses avoided:	Lives, homes, businesses, critical assets, public facilities, and infrastructure destruction in the event of dam or levee failure.			
Cost Estimate:	$1,500,000	**Timeframe:**	24-36 months	
Potential Funding Sources:	HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Hillcrest Village

Jurisdiction:	Hillcrest Village	**Action Number:**	I1
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Tornado, Drought, Heat Events, Hail, and Winter Storms, Expansive Soils		
Project Title:	Emergency Management Services		
Project Description:	Develop an outreach website and online notification system for residents to obtain Emergency information as well as informing the public of available programs to assist them in hazardous situations.		
Responsible Entity:	Emergency Management		
Losses avoided:	Dangerous situations avoided due to the lack of information by the residents especially the elderly and low income.		
Cost Estimate:	$5,000	**Timeframe:**	24 months
Potential Funding Sources:	Local Budgets.	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Hillcrest Village	**Action Number:**	I2
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Tornado, Heat Events, Hail, and Winter Storms		
Project Title:	Emergency Management Services		
Project Description:	Purchase and install backup 60KW generator to power Emergency Operations Command Center during power outages.		
Responsible Entity:	Emergency Management		
Losses avoided:	Loss of life due to the incapacity to respond during emergency situations.		
Cost Estimate:	$50,000	**Timeframe:**	24 months
Potential Funding Sources:	Local Budgets.	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Hillcrest Village		**Action Number:**	I3
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Flood Mitigation			
Project Description:	Partner with local Drainage District to widen and reshape drainage ditches, and upgrade culverts to restore adequate drainage to mitigate flooding.			
Responsible Entity:	Public Works and Velasco Drainage District			
Losses avoided:	Repairs to homes flooded due to improper drainage.			
Cost Estimate:	$5,000	**Timeframe:**	12 months	
Potential Funding Sources:	Local Budgets.	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Hillcrest Village		**Action Number:**	I4
Hazard(s) Addressed:	Wildfire, Drought, and Heat Events			
Project Title:	Fire Mitigation			
Project Description:	Replace outdated fire Hydrants and associated system requirements with upgraded equipment.			
Responsible Entity:	Public Works			
Losses avoided:	Repairs to city structures and homes flooded due to improper drainage.			
Cost Estimate:	$100,000	**Timeframe:**	36 months	
Potential Funding Sources:	Local Budgets.	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Hillcrest Village	**Action Number:**	I5
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Flood Mitigation		

Project Description:	Conduct an engineering survey to establish proper drainage for 24 Homes in the Flood Zone.		
Responsible Entity:	Public Works		
Losses avoided:	Repairs to city structures and homes flooded due to improper drainage.		
Cost Estimate:	$5,000	**Timeframe:**	12 months
Potential Funding Sources:	Local Budgets.	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Hillcrest Village	**Action Number:**	I6
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Flood Mitigation		
Project Description:	Purchase additional land for retention pond construction to mitigate flooding in flood zones.		
Responsible Entity:	Emergency Management		
Losses avoided:	Repairs to homes and city structures after flooding.		
Cost Estimate:	$250,000	**Timeframe:**	72 months
Potential Funding Sources:	Local, State and Federal Grants.	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Clute

Jurisdiction:	Clute	**Action Number:**	J1
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Waste water treatment plant		
Project Description:	Replace the old generator unit with a new unit at the waste water treatment plant.		
Responsible Entity:	Clute		
Losses avoided:	During any power outages, this would assure that the waste water treatment plant would continue to operate and avoid sewer back up. This plant serves Clute; Richwood		
Cost Estimate:	$225,000	**Timeframe:**	36 to 48 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Clute	**Action Number:**	J2
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Infrastructure		
Project Description:	Deepen Velasco drainage District ditch between Lake Bend Ramp; Mammoth Lake, Lakeview, College park		
Responsible Entity:	Clute, Velasco drainage District		
Losses avoided:	Clute Ramp; Lake Jackson subdivision flooding		
Cost Estimate:	$1,500,000	**Timeframe:**	24 to 36 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Clute		**Action Number:**	J3
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Refurbish Temple Ditch			
Project Description:	Refurbish Temple Ditch from Plantation to SH332, Deepen, widen, replace culverts and Clean.			
Responsible Entity:	Clute			
Losses avoided:	Temple ditch is one of the city's main ditch for drainage especially during a storm or heavy rain.			
Cost Estimate:	$750,000	**Timeframe:**	12 to 24 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Clute		**Action Number:**	J4
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Deepen VDD ditch behind high school			
Project Description:	Deepen Velasco drainage district ditch behind the Brazos wood high school to Lake Bend outfall			
Responsible Entity:	Clute			
Losses avoided:	This ditch drains both Lake Jackson and Clute during heavy rains or storms. This would avoid subdivisions in both cities from flooding.			
Cost Estimate:	$350,000	**Timeframe:**	12 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Clute	**Action Number:**	J5
Hazard(s) Addressed:	Floods		
Project Title:	College Park Pump Station		
Project Description:	Install a permanent ditch water pumping station at College Park.		
Responsible Entity:	Clute		
Losses avoided:	Flooding of Homes throughout the subdivision		
Cost Estimate:	$250,000	**Timeframe:**	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Clute	**Action Number:**	J6
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms		
Project Title:	Lexington & Creek Rd Water Pumping station		
Project Description:	Install permanent ditch water pumping station at Lexington & Creek Road.		
Responsible Entity:	Clute		
Losses avoided:	This ditch receives rain water from Lake Jackson and Clute. Flooding		
Cost Estimate:	$250,000	**Timeframe:**	24 to 36 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Clute	**Action Number:**	J7
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Flag Lake Dry Culverts		
Project Description:	Deepen ditch and replace culverts on Flag Lake Dry to increase storm water infrastructure capacity.		
Responsible Entity:	Clute		
Losses avoided:	The flooding of homes and businesses along Flag Lake Dr.		
Cost Estimate:	$200,000	**Timeframe:**	12 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Clute	**Action Number:**	J8
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Wood shore Lift Station		
Project Description:	Obtain and install a SCADA notification system for the Wood Shore sewer lift station.		
Responsible Entity:	Clute		
Losses avoided:	The is used to monitor the lift station levels and flows, and possibly pump failure. A pump failure could cause potentially sewer to back up in the subdivision.		
Cost Estimate:	$25,000	**Timeframe:**	6 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Clute		**Action Number:**	J9
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Bumpy Rd sewer lift station			
Project Description:	Deepen Wet Well at Bumpy Rd sewer lift station. This would increase the sewer capacity.			
Responsible Entity:	Clute			
Losses avoided:	The inability to keep up with the City's sewer demands in times of heavy rains			
Cost Estimate:	$350,000	**Timeframe:**	12 to 24 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Port of Freeport

Jurisdiction:	Port Freeport		**Action Number:**	L1
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Drought, Lightning, Heat Events, Hail, Winter Weather, Tornado, Dam and Levee Failure, Coastal Erosion			
Project Title:	Warning System			
Project Description:	Develop audio warning system for notifying the Port personnel and tenants of an imminent natural hazard threat.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Human injury and loss of life Property damage			
Cost Estimate:	$210,000	**Timeframe:**	4 to 6 months	
Potential Funding Sources:	Grant funding will be used with matching funds coming from Port Freeport funds.	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Port Freeport		**Action Number:**	L2
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Drought, Lightning, Heat Events, Hail, Winter Weather, Tornado, Dam and Levee Failure, Coastal Erosion			
Project Title:	Weather Station			
Project Description:	Update and expand the current weather station capabilities to give more detailed and earlier warnings of potentially threatening natural hazards.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Human injury or loss of life Property and equipment damage			
Cost Estimate:	$35,000	**Timeframe:**	3 months	
Potential Funding Sources:	Grant funds will be utilized with matching coming from Port Freeport funds.	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Port Freeport		**Action Number:**	L3
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Tornado, Dam/ Levee Failure, and Winter Storms			
Project Title:	Record Management System			
Project Description:	Identify and implement a paperless records management system to improve resilience before and after a disaster.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Data loss (financial and sales), Engineering drawings destroyed or damaged, Administrative documents such as policies and procedures, Records required by law (ex. compliance and open record data)			
Cost Estimate:	$75,000	**Timeframe:**	6 to 9 months	
Potential Funding Sources:	Grant funds would be used with the matching coming from Port Freeport funds.	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Port Freeport		**Action Number:**	L4
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Dam/ Levee Failure, and Winter Storms			
Project Title:	Drainage Improvement			
Project Description:	Implement drainage improvements to drain water away from the transit shed facilities and dock areas. Widen and reshape drainage ditches, and upgrade culverts to restore adequate drainage to mitigate flooding.			
Responsible Entity:	Port Freeport Engineering			
Losses avoided:	Building damage, Cargo damage/loss, Human injury			
Cost Estimate:	$3,150,000	**Timeframe:**	9 to 12 months	
Potential Funding Sources:	Grant funds will be used which the grant match coming from Port Freeport funds.	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Port Freeport		**Action Number:**	L5
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Wildfire, Tornado, Hail, and Winter Storms			
Project Title:	Storm Shutters			
Project Description:	Install storm shutters on all exterior Port facility windows and glass doors			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Human injury or death and Facility damage			
Cost Estimate:	$325,000	**Timeframe:**	9 to 12 months	
Potential Funding Sources:	The match will be paid with Port Freeport funds.	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L6
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Tornado, Dam/ Levee Failure, Hail, Winter Storms			
Project Title:	Communication Center Improvements			
Project Description:	Expand the information and communication capabilities of the Port Freeport Emergency Operation Center to better communicate vessel traffic and waterway information to channel users before, during and after natural disaster			
Responsible Entity:	Port Freeport Operations			
Losses avoided:	Human injury or death Marine vessel damage or loss Water channel blockage Damage to the shore line, Decreased channel depth, Environmental hazard release/spill, Vessel collision			
Cost Estimate:	$425,000	**Timeframe:**	6 to 9 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport	**Action Number:**	L7
Hazard(s) Addressed:	All Hazards		
Project Title:	Emergency Power Back-up		
Project Description:	Implement a backup power solution for critical Port Freeport infrastructure which includes a fixed back up emergency power generator for the Port Freeport Administration Building and two mobile emergency power generator trailers.		
Responsible Entity:	Port Freeport Engineering		
Losses avoided:	Lose the function of Administrative, Operation, and cargo storage facilities Impact to economy ($126.6M/day) Loss of economy income ($20.8M/day)		
Cost Estimate:	$350,000	**Timeframe:**	6 to 9 months
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Port Freeport	**Action Number:**	L8
Hazard(s) Addressed:	Coastal Erosion		
Project Title:	Erosion Barrier		
Project Description:	Add an erosion barrier wall to eliminate or reduce erosion along the Port's fence line.		
Responsible Entity:	Port Freeport Engineering		
Losses avoided:	Human injury, Cargo damage, Property damage, Loss of usable property for cargo storage		
Cost Estimate:	$250,000	**Timeframe:**	12 to 18 months
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Port Freeport		**Action Number:**	L9
Hazard(s) Addressed:	Wildfire, Drought, Heat Events			
Project Title:	Cooling zones			
Project Description:	Implement cooling zones in the Port to protect Port users from extreme heat. Cooling fans can also be utilized to deflect smoke and chemical released gases to a non-populated area.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Human injury or death, Cargo damage, Facility damage			
Cost Estimate:	$175,000	**Timeframe:**	6 to 9 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L10
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Tornado, Hail, Winter Storms			
Project Title:	Crane simulator			
Project Description:	Install a crane simulator and implement a crane training program to improve resilience after a natural disaster. This capability would allow technicians and operators to train on crane troubleshooting and repairs in a training.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	During crane down time, the technicians will be better prepared to get the crane operational again. In return, this reduces the lost time and allows vessel to get out of the port in a timelier manner.			
Cost Estimate:	$300,000	**Timeframe:**	12 to 18 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L11
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Wildfire, Tornado, Heat Events and Winter Storms			
Project Title:	Emergency Vessel Simulator			
Project Description:	Design and construct a ship vessel simulator for emergency response training to improve the response and rescue capabilities for first responders in the region. The marine training prop would be utilized to train local firefighters in a realistic live setting.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Human injury or death, Property loss, Cargo loss, Channel blockage, Dock damage, Environmental spill or release			
Cost Estimate:	$425,000	**Timeframe:**	12 to 18 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L12
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Tornado, Drought, Dam/ Levee Failure, Heat Events, and Winter Storms			
Project Title:	IT Fail-over			
Project Description:	Implement an IT fail-over at a second location to assure proper network operation during and after a natural disaster. In the event the main data center failed, the fail-over location would take over IT network operations.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Commercial interruption ($126.6M/day economic impact)			
Cost Estimate:	$225,000	**Timeframe:**	9 to 12 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L13
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Tornado, Dam/ Levee Failure and Winter Storms			
Project Title:	Weather Cameras			
Project Description:	Expand the current video management system to include weather cameras along the waterway to remotely monitoring weather conditions, search for people in distress, and evaluate damage caused by natural hazards.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Human injury or death, Vessel damage or loss, Commercial interruption ($126.6M/day in economic impact), Cargo damage or loss, Shoreline damage			
Cost Estimate:	$110,000	**Timeframe:**	9 to 12 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L14
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Wildfire, Tornado, Hail, and Winter Storms			
Project Title:	Channel lighting			
Project Description:	Add additional lighting along the waterway for increased vessel safety and visibility during poor weather conditions.			
Responsible Entity:	Port Freeport Engineering			
Losses avoided:	Human injury or death, Vessel damage or loss, Cargo damage or loss, Commercial interruption ($226.6M/day in economic impact), Shore line damage			
Cost Estimate:	$105,000	**Timeframe:**	12 to 18 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L15
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Tornado, Drought, Dam/ Levee Failure Heat Events and Winter Storms			
Project Title:	Power Back up			
Project Description:	Upgrade the IT power backup and electrical grounding protection capabilities for Port of Freeport's Data Center to protect data and IT equipment during a natural hazard.			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Commercial interruption ($226.6M/day in economic impact), Cargo damage or loss, Port facilities not functional, including the Emergency Operation Center			
Cost Estimate:	$95,000	**Timeframe:**	3 to 6 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Port Freeport		**Action Number:**	L16
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storm, Erosion, and Dam/ Levee Failure			
Project Title:	Water Flow Monitor			
Project Description:	Design and install a system which will transmit water flow characteristics for the surrounding creeks, rivers, and intracoastal waterway to a central location, so the information can be shared with other waterway users while increasing the safety of vessel			
Responsible Entity:	Port Freeport Protective Services			
Losses avoided:	Human injury or death, Vessel damage or loss, Cargo damage or loss, Commercial interruption ($226.6M/day in economic impact), Hazardous material release or spill			
Cost Estimate:	$185,000	**Timeframe:**	12 to 18 months	
Potential Funding Sources:	Match will be paid with Port Freeport funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Sweeny

Jurisdiction:	Sweeny	**Action Number:**	M1
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Dam/ Levee Failure,		
Project Title:	Drainage Improvements		
Project Description:	Implement drainage improvement program to include widening and reshaping drainage ditches, and upgrade culverts to restore adequate drainage on CR 332		
Responsible Entity:	West Brazos Drainage District #11, Sweeny, Brazoria County		
Losses avoided:	Life safety, protect property		
Cost Estimate:	$500,000	**Timeframe:**	36-60 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Sweeny	**Action Number:**	M2
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Dam/ Levee Failure		
Project Title:	Drainage		
Project Description:	Enlarge culverts along Stevenson Slough to increase stormwater infrastructure.		
Responsible Entity:	Sweeny		
Losses avoided:	Life safety and protect property		
Cost Estimate:	$125,000	**Timeframe:**	36-60 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Sweeny		**Action Number:**	M4
Hazard(s) Addressed:	Drought, Heat Events, Expansive Soils, Winter Storms			
Project Title:	Replace Infrastructure			
Project Description:	Replacement of aging water and sewer lines throughout the city that are vulnerable to failure during natural disasters.			
Responsible Entity:	Sweeny Public Works			
Losses avoided:	Protect our sewer plant with less rain water going into broken sewer lines			
Cost Estimate:	$10,000,000	**Timeframe:**	24-36 months	
Potential Funding Sources:	FEMA Grants, TWDB Grants	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Unincorporated Brazoria County

Jurisdiction:	Brazoria County	**Action Number:**	N1
Hazard(s) Addressed:	Floods		
Project Title:	Structural Project		
Project Description:	Widen and reshape drainage ditches, and upgrade culverts to restore adequate drainage to mitigate flooding. Use a drainage study to target high impact areas.		
Responsible Entity:	County Road and Bridge Dept. or County Drainage Districts		
Losses avoided:	Property and lives throughout the city		
Cost Estimate:	$350,000	**Timeframe:**	48 months
Potential Funding Sources:	Drainage district funds as available, Local funds, TWDB-Clean Water Revolving Fund, TWDB (Development Fund II), USDA NRCS-Watershed Protection and Flood Prevention Program, EPA NPS Grant Program, 406 Public Assistance, USACE-Clearing and Snagging P	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria County	**Action Number:**	N2
Hazard(s) Addressed:	Floods		
Project Title:	Public Education		
Project Description:	Implement campaign on public education of ICC (Increased Cost of Compliance) coverage.		
Responsible Entity:	Brazoria County NFIP/ private insurance agencies		
Losses avoided:	Life safety and public property		
Cost Estimate:	$5,000	**Timeframe:**	24 months
Potential Funding Sources:	Flood Mitigation Assistance Program, Hazard Grant Program, ICC training for public and insurance agents may be available free of charge through FEMA	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria County	**Action Number:**	N3
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms		
Project Title:	Structural Project, Property Protection		
Project Description:	Implement dune and beach restoration to protect county beach areas between Surfside Beach and San Luis Pass		
Responsible Entity:	County Rd and Bridge Dept. and Parks Dept.		
Losses avoided:	Life safety and public property		
Cost Estimate:	$750,000	**Timeframe:**	18 months
Potential Funding Sources:	USACE-Emergency Stream Bank and Shoreline Protection, USACE-Planning Assistance to States, HMGP, USACE-Nonstructural Alternatives to Structural Rehabilitation of Damages Flood Control Works, USACE-Planning Assistance to States	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria County	**Action Number:**	N4
Hazard(s) Addressed:	Floods		
Project Title:	Coastal River Flood Extent Analysis		
Project Description:	Determine flood extents, in Brazoria County, because of recent hurricane disasters, by analyzing the post event aerial imagery through a GIS image classification process, and compare the flood extent area to other sources, such as LIDAR surface elevate		
Responsible Entity:	Engineering		
Losses avoided:	Will prevent future loss of life and property, by refining evacuation area decisions, floodplain updates, development / building construction codes.		
Cost Estimate:	$50,000	**Timeframe:**	6 to 12 months.
Potential Funding Sources:	90 percent - HMGP, PDM, TWDB FMA; 10 percent In-kind service match on part of Brazoria County through labor and in-turn data provision.	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria County		**Action Number:**	N5
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms and Erosion			
Project Title:	Prevention, Property Protection			
Project Description:	Treasure Island Revetment project. The project also focuses on developing alternatives for a beach nourishment project near the revetment and fishing pier area to widen the beach and provide a buffer to reduce storm impacts to the existing s			
Responsible Entity:	Commissioner Donald "Dude" Payne, Brazoria County Pct. 1			
Losses avoided:	Life safety and public property			
Cost Estimate:	$4,000,000	**Timeframe:**	48 to 60 months	
Potential Funding Sources:	FEMA, HMG, CEPRA, CIAP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Brazoria County		**Action Number:**	N6
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Elevate structures in flood zone			
Project Description:	Elevate structures in flood zone. During Harvey Brazoria County had 12,000 structures flooded. Over 70% of these structures are pre-firm and do not meet current FEMA elevation standards. FEMA estimates that over 400 structures may be substantially damaged and must be elevated to meet current standards			
Responsible Entity:	Floodplain			
Losses avoided:	The County estimates 60,000,000.00 in savings from flood damage to structures.			
Cost Estimate:	$60,000,000	**Timeframe:**	24 months	
Potential Funding Sources:		**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Brazoria County	**Action Number:**	N7
Hazard(s) Addressed:	Floods		
Project Title:	NFIP Technical Material		
Project Description:	Place copies of FEMA Flood-related technical bulletins in County libraries.		
Responsible Entity:	Emergency Management		
Losses avoided:	Creating an awareness of building requirements for NFIP participants will encourage them to build sensibly or modify existing structure, to be more flood damage-resistant.		
Cost Estimate:	$1,000	**Timeframe:**	6 months
Potential Funding Sources:	PDM, HMGP, local funds	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria County	**Action Number:**	N8
Hazard(s) Addressed:	Flood and Hurricane/ Tropical Storms		
Project Title:	Property Protection		
Project Description:	Removal of debris, widen and reshape drainage ditches, and upgrade culverts to restore adequate drainage to mitigate flooding throughout the county.		
Responsible Entity:	Brazoria County and Velasco Drainage District		
Losses avoided:	Life safety and public property		
Cost Estimate:	$500,000	**Timeframe:**	12 months
Potential Funding Sources:	PDM, HMGP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria County		**Action Number:**	N9
Hazard(s) Addressed:	Floods			
Project Title:	Secure and develop park land surrounding Hanson-Riverside County Park and San Bernard River area			
Project Description:	Purchase adjacent tracts of approximately 335 acres surrounding existing Hanson-Riverside County Park footprint. This land is divided into a few tracts, but all is listed as one owner, and much of it was impacted by recent flooding by near-record levels of the San Bernard River			
Responsible Entity:	Brazoria County Parks Department			
Losses avoided:	To help mitigate future flooding to which this area is prone.			
Cost Estimate:	$6,000,000	**Timeframe:**	15 to 24 months	
Potential Funding Sources:	County funds and all available grants, commercial and governmental	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Brazoria County		**Action Number:**	N10
Hazard(s) Addressed:	Floods			
Project Title:	Secure and develop Park land of surrounding tracts near Camp Mohawk County Park			
Project Description:	Purchase approximately 160 acres adjacent to and surrounding Camp Mohawk County Park, which will involve negotiating with several landowners of smaller tracts, and one large, 107-acre tract. Minimal but useful development of trails and boardwalks would be appropriate along this new acreage, and no doubt utilized by citizens of surrounding neighborhoods who already visit the park for day use such as hiking, biking, fishing and other recreation. Such development could also be engineered and appropriately elevated so as to help mitigate future high-water issues.			
Responsible Entity:	Brazoria County Park Department			
Losses avoided:	This area along Chocolate Bayou is also historically prone to flooding. During Hurricane Harvey, this immediate vicinity received huge amounts of rain along the bayou and its watershed, and the park and surrounding neighborhoods experienced severe flooding with hundreds of homes affected. Converting remaining undeveloped land into park space is perhaps the single most practical use of it, and would likely be welcomed by the surrounding populace.			
Cost Estimate:	$7,500,000	**Timeframe:**	14 to 24 months	
Potential Funding Sources:	County Funds and any applicable grants	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Brazoria County	**Action Number:**	N11
Hazard(s) Addressed:	Floods		
Project Title:	Property Protection		
Project Description:	Dig ditch to take water that builds up in Quail Ridge subdivision to the Austin Bayou.		
Responsible Entity:	Brazoria County Road and Bridge		
Losses avoided:	Life safety and public property		
Cost Estimate:	$48,960	**Timeframe:**	10 months
Potential Funding Sources:	Road and Bridge funds operating budget, TWDB-Clean Water Revolving Fund, TWDB (Development Fund II) - Texas Water Development Fund, USDA NRCS-Watershed Protection and Flood Prevention Program, EPA NPS Grant Program ,406 Public Assistance, USACE-Clear	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria County	**Action Number:**	N12
Hazard(s) Addressed:	Floods		
Project Title:	Land Acquisitions and Park Development for Brazoria County Park System		
Project Description:	Secure and develop Park land on and surrounding Lake Tenneco		
Responsible Entity:	Brazoria County Parks Department		
Losses avoided:	Property losses during floods and preservation of floodplain and bottom land.		
Cost Estimate:	$7,000,000	**Timeframe:**	12 to 24 months
Potential Funding Sources:	County funds, mitigation grants, CBD Grants	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria County	**Action Number:**	N13
Hazard(s) Addressed:	Floods		
Project Title:	Land acquisitions and Park Development for Brazoria County Park System Near Brazos River Park		
Project Description:	Acquire available three tracts of land adjacent to and near Brazos River County Park, develop and improve Park facilities and access		
Responsible Entity:	Brazoria County Parks Department		
Losses avoided:	Flooding of residences and preservation of flood plain		
Cost Estimate:	$3,000,000	**Timeframe:**	13 to 24 months
Potential Funding Sources:	County funds, mitigation and other state and federal grants	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Brazoria County	**Action Number:**	N14
Hazard(s) Addressed:	Wildfire		
Project Title:	Public Education		
Project Description:	Purchase 500 magnetic Burn Ban signs to be displayed on all county vehicles.		
Responsible Entity:	Fire Marshal		
Losses avoided:	Educating the public about local burn bans should prevent grass or wild fires started by normally allowed outdoor burning in the unincorporated parts of the county.		
Cost Estimate:	$6,500	**Timeframe:**	12 months
Potential Funding Sources:	County budget, HMPG, PDM	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria County	**Action Number:**	N16
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, and Coastal Erosion		
Project Title:	Prevention, Property Protection, Natural Resource Protection		
Project Description:	Create a feeder beach for Follett's Island to slow the current erosion rate and protect wetlands in southeast Brazoria County.		
Responsible Entity:	Commissioner Donald "Dude" Payne, Brazoria County Pct 1		
Losses avoided:	Life safety and public property		
Cost Estimate:	$5,000,000	**Timeframe:**	18 months
Potential Funding Sources:	HMG, PD, CEPTRA, CIAP	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Brazoria County	**Action Number:**	N17
Hazard(s) Addressed:	Floods		
Project Title:	Property Aquistion		
Project Description:	Acquisition and demolition of severe repetitive loss properties along 14 miles of the Brazoria County coastline.		
Responsible Entity:	Brazoria County Floodplain Dept		
Losses avoided:	Occupied homes		
Cost Estimate:	$5,000,000	**Timeframe:**	24 months
Potential Funding Sources:	HMGP, PDM, FMA, RFC, SRL	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Angleton

Jurisdiction:	Angleton	**Action Number:**	O1
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Drought,		
Project Title:	Headwalls for Ditch 4		
Project Description:	Install cement headwalls on ditch number 4 at CR 428 Ramp; Kiber St and Angleton to help with water flow and increase stormwater infrastructure capacity.		
Responsible Entity:	Angleton Drainage District, Angleton P/W		
Losses avoided:	Flooding and soil erosion due to cement walls instead of dirt		
Cost Estimate:	$100,000	**Timeframe:**	12 to 36 months
Potential Funding Sources:	Local, State and Federal Funds	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Angleton	**Action Number:**	O2
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Tornado, Drought, Heat Events, and Winter Storms		
Project Title:	Generator for Recreation Center		
Project Description:	Restore power to the city Recreation Center, and purchase and install a back-up generator. The facility is used for housing employees as well as out of town strike teams during hurricane recovery, floods and winter storms when there was electricity to the building.		
Responsible Entity:	Parks and Recreation Dept., City Building Officials, Emergency Management		
Losses avoided:	Life-Safety during storms, flooding, and heat with a safe, warm place to stay until other sheltering can be set up.		
Cost Estimate:	$350,000	**Timeframe:**	12 months
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Angleton		**Action Number:**	O3
Hazard(s) Addressed:	Floods and Hurricane/ Tropical Storms			
Project Title:	Brushy Bayou Detention Pond			
Project Description:	Construct a detention Pond to be developed along the Brushy Bayou watershed to relieve flooding during heavy extensive rain and storms.			
Responsible Entity:	Public Works, Emergency management			
Losses avoided:	Help with flooding to the north side of our city and surrounding area and loss of life and property			
Cost Estimate:	$300,000	**Timeframe:**	12 to 24 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Angleton		**Action Number:**	O4
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Drought, and Heat Events			
Project Title:	Generator for water plant number 3			
Project Description:	Purchase and install a new 125K generator for water plant #3 to sustain the plant in case of emergency when electricity is lost and water cannot be provided to citizens.			
Responsible Entity:	Public Works			
Losses avoided:	Loss of service to citizens in the event of loss of electricity or emergency. Water would also be able to be re-routed in another water plant lost service.			
Cost Estimate:	$120,000	**Timeframe:**	12 to 36 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Angleton		**Action Number:**	O5
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Tornado, Heat Events, and Winter Storms			
Project Title:	Public Education for home owners			
Project Description:	Public education with booklets, pamphlets and social media for securing mobile homes, yard furniture in case of a natural disaster.			
Responsible Entity:	Angleton Code Enforcement, and P/W			
Losses avoided:	Life safety and prevention of homes lost with more public education on securing them. Also, prevention of furniture and fixtures being thrown around from high winds and high water that could cause damage to other property.			
Cost Estimate:	$10,000	**Timeframe:**	6 to 12 months	
Potential Funding Sources:	local, State, and Federal Funds	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Angleton		**Action Number:**	O6
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Drought, Expansive Soils, Dam/ Levee Failure, Heat Events, and Winter Storms			
Project Title:	Upgrade water & wastewater lines			
Project Description:	Upgrade old and weak water and wastewater pipes throughout the city with newer updated ones. Many of the lines are too small and were installed decades ago when the population was much less.			
Responsible Entity:	Public Works, TCEQ			
Losses avoided:	Due to old water and wastewater lines throughout the city, we have many pipes break or collapse every year. Some breaks and collapses are due to flooding in too small of pipes and other times it is due to old pipes collapsing. Methodically prioritizing			
Cost Estimate:	$5,000,000	**Timeframe:**	60 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Angleton		**Action Number:**	O7
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Tornado, Heat Events, Hail, and Winter Storms			
Project Title:	Upgrade exterior doors to City Hall			
Project Description:	All exterior doors to city hall and the rest of the building need to be upgraded to be hurricane and wind resistant. This would also improve heat resistance in case of exterior fire and better thermal protection from heat and cold.			
Responsible Entity:	Code Enforcement, City Administration			
Losses avoided:	winds, rain and flood damage to the city hall building as well as life safety inside if a severe storm was to strike during business hours			
Cost Estimate:	$120,000	**Timeframe:**	12 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Approximately a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Angleton		**Action Number:**	O8
Hazard(s) Addressed:	Drought and Heat Events			
Project Title:	Recreation Center Cooling Stations			
Project Description:	Install cooling stations inside and portable outside cooling stations for citizens to get away from the heat either due to no a/c or just cooling off in the extreme outside heat.			
Responsible Entity:	Parks Department			
Losses avoided:	life safety. Citizens having a place to cool off to avoid heat stroke.			
Cost Estimate:	$100,000	**Timeframe:**	12 to 24 months	
Potential Funding Sources:	HMPG, local, state, and federal funding.	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Angleton		**Action Number:**	O9
Hazard(s) Addressed:	Heat Events			
Project Title:	Mobile Ventilation unit			
Project Description:	mobile ventilation unit with a mister would assist the fire department in ventilating their firemen as well as fire victims needing air or cooling down.			
Responsible Entity:	Angleton Fire Dept.			
Losses avoided:	life safety			
Cost Estimate:	$125,000	**Timeframe:**	12 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Angleton		**Action Number:**	O10
Hazard(s) Addressed:	All Hazards			
Project Title:	Drone			
Project Description:	Drone to be utilized in all public safety to assist with fire, rescue and apprehension of suspects and well as public works and parks.			
Responsible Entity:	Emergency Management, Public Safety, P/W and parks			
Losses avoided:	life-safety in all types of public safety incidents, view damaged structures from the inside without having to send personnel in to an unsafe location.			
Cost Estimate:	$25,000	**Timeframe:**	2 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Angleton		**Action Number:**	O11
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Lightning, Heat Events, Hail, Winter Weather, Tornado, Dam and Levee Failure			
Project Title:	Portable light towers			
Project Description:	6 portable light towers with diesel engines that could be used by all city departments in any type of emergency when extra lighting was needed. The towers would be used for after dark call outs to severe weather to public safety emergencies.			
Responsible Entity:	Public works, Parks, All Public Safety			
Losses avoided:	life safety, interruption of city services			
Cost Estimate:	$90,000	**Timeframe:**	12 months	
Potential Funding Sources:	HMPG	**Benefit-Cost Ratio:**	Less than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jones Creek

Jurisdiction:	Jones Creek		**Action Number:**	Q1
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms Severe Thunderstorms			
Project Title:	Partner for Drainage			
Project Description:	Partner with local drainage district to maintain and improve drainage: Widen and reshape drainage ditches, and upgrade culverts to restore adequate drainage to mitigate flooding.			
Responsible Entity:	Jones Creek Streets Department			
Losses avoided:	Prevention of flooding			
Cost Estimate:	$1000	**Timeframe:**	12 to 18 months	
Potential Funding Sources:	City and County Funds	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Jones Creek		**Action Number:**	Q2
Hazard(s) Addressed:	Floods Hurricane/ Tropical Storms Severe Thunderstorms			
Project Title:	Highway Drainage			
Project Description:	Highway 36 drainage (7) ditches to be widened and reshaped. Upgrade culverts to restore adequate drainage to mitigate flooding.			
Responsible Entity:	TXDOT			
Losses avoided:	Reduction of property loss due to flooding			
Cost Estimate:	$250000	**Timeframe:**	36 months	
Potential Funding Sources:	TXDOT	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				Yes

Jurisdiction:	Jones Creek	**Action Number:**	Q3
Hazard(s) Addressed:	Floods Hurricane/ Tropical Storms Severe Thunderstorms		
Project Title:	Master Drainage		
Project Description:	Develop and implement a master drainage plan for the City.		
Responsible Entity:	Jones Creek Emergency Management		
Losses avoided:			
Cost Estimate:	100000	**Timeframe:**	18 months
Potential Funding Sources:	Flood Mitigation Assistance Program, HMPG, TWDB, USACE	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			Yes

Jurisdiction:	Jones Creek	**Action Number:**	Q4
Hazard(s) Addressed:	Hurricane/ Tropical Storms, Severe Thunderstorms, Tornado, Hail		
Project Title:	Retrofitting		
Project Description:	Retrofit City Hall/Emergency Operations Center with hurricane shutters, and any other storm related protection systems.		
Responsible Entity:	Jones Creek Emergency Management		
Losses avoided:	Protection of EOC and City Hall		
Cost Estimate:	$50,000	**Timeframe:**	When funding becomes available
Potential Funding Sources:	City Funds, FEMA HMPG and PDM Programs, State and local Grant Sources	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Jones Creek		**Action Number:**	Q5
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Severe Thunderstorms, Tornado, Hail, Winter Storms			
Project Title:	Communication			
Project Description:	Purchase radio/communication equipment for emergency response personel to communicate during disasters.			
Responsible Entity:	Jones Creek Emergency Management			
Losses avoided:	Emergency Services			
Cost Estimate:	$60,000	**Timeframe:**	When funds become available	
Potential Funding Sources:	Federal, State, and Local grants; HMPG; PDM	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Jones Creek		**Action Number:**	Q6
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Severe Thunderstorms, Tornado, Drought, Hail, Winter Storms			
Project Title:	Debris Management			
Project Description:	Develop and maintain a debris management plan to speed up the removal of debris generated by flood/hurricane events, etc.			
Responsible Entity:	Jones Creek Emergency Management			
Losses avoided:				
Cost Estimate:	$25,000	**Timeframe:**	As needed within 5 years	
Potential Funding Sources:	Public Assistance	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio	
Does this action reduce effects of hazards on existing buildings?				No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?				No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?				No

Jurisdiction:	Jones Creek	**Action Number:**	Q7
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Severe Thunderstorms, Tornado, Hail, Winter Storms		
Project Title:	Emergency Siren		
Project Description:	Installation of an emergency siren to utilize in the event of a natural or man-made disaster.		
Responsible Entity:	Jones Creek Marshal';s Department		
Losses avoided:	Siren would help prevent loss of life and property.		
Cost Estimate:	$5,000	**Timeframe:**	12 months
Potential Funding Sources:		**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			Yes
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			Yes
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Jones Creek	**Action Number:**	Q8
Hazard(s) Addressed:	Flooding, Hurricane, Wildfire, Drought, Lightning, Heat Events, Hail, Winter Weather, Tornado, Dam and Levee Failure, Coastal Erosion		
Project Title:	Training		
Project Description:	Implement emergency management training programs.		
Responsible Entity:	Jones Creek Emergency Management		
Losses avoided:	Loss of life; continuity of services during natural disasters.		
Cost Estimate:	7500	**Timeframe:**	6 months
Potential Funding Sources:	Emergency Management Institute, FEMA Training Programs	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

Jurisdiction:	Jones Creek	**Action Number:**	Q9
Hazard(s) Addressed:	Floods, Hurricane/ Tropical Storms, Wildfire, Severe Thunderstorms, Tornado, Hail, Winter Storms		
Project Title:	Generator		
Project Description:	Purchase equipment generators for critical facilities		
Responsible Entity:	Jones Creek Street Department		
Losses avoided:	Loss of life; continuity of services during natural disasters.		
Cost Estimate:	$40,000	**Timeframe:**	When funding becomes available
Potential Funding Sources:	Federal, State, and Local Funds, Public Assistance Program	**Benefit-Cost Ratio:**	More than a 1:4 cost-benefit ratio
Does this action reduce effects of hazards on existing buildings?			No
Does this action reduce effects of hazards for new buildings, infrastructure, or future development?			No
Does mitigation action identify, analyze, and prioritize actions related to continued compliance with NFIP?			No

2017

Part 8: Plan Maintenance

Part 8: PLAN MAINTENANCE

To remain an effective tool, the HMAP will undergo continuous review and updates. This practice is known as plan maintenance and requires monitoring, evaluating, updating, and implementing the plan. To accomplish this, a plan maintenance team (PMT) is comprised of representatives from each of the County's participating jurisdictions.

Plan Maintenance Team	
Plan Maintenance Team Leader	Brazoria County Emergency Management Coordinator
Jurisdiction	Responsible Entity
Unincorporated Brazoria County	Brazoria County Emergency Management Coordinator and Floodplain Administrator
Angleton	Mayor
Alvin ISD	As Directed/ Executive Director of Student Safety and Transportation
Alvin	EMC
Bonney	Mayor
Bailey's Prairie	Mayor
Brazoria	EMC
Brazosport ISD	Assistant Superintendent
Brookside Village	Mayor
Clute	EMC
Danbury	Mayor
Hillcrest Village	EMC
Holiday Lakes	Mayor and City Secretary
Iowa Colony	Police Chief
Jones Creek	Town Marshall
Lake Jackson	City Manager
Liverpool	EMC
Manvel	Fire Marshal
Oyster Creek	EMC
Port of Freeport	Safety and Security Chief
Freeport	Mayor
Quintana	EMC
Richwood	Police Chief
Surfside Beach	City Secretary
Sweeny	City Manager
Velasco Drainage District	Director
West Columbia	EMC/ Police Chief

Meeting Schedule

The PMT will hold its first meeting within two years after the plan's approval date and will continue to meet every year thereafter. A special meeting will be held 12 months prior to the plan's expiration to develop a timeline and strategy to update the plan in accordance with TDEM and FEMA's requirements.

Procedures

The PMT will meet annually to address necessary revisions to the whole planning and public participation process, and the entirety of the written plan including developing amendments, assessing the implementation progress, and identifying emerging risks and vulnerabilities in the county.

Each participating jurisdiction is responsible for reporting and requesting updates to the HMAP, and the team will explore multi-jurisdictional solutions when applicable. Any new public participation activity suggestions, changes to the maintenance or implementation procedures, mitigation actions, strategies, or required studies will be submitted to the County's representative. The representative will evaluate the items for compliance with TDEM and FEMA regulations before leading the process to adopt or approve the new items.

Recommended changes, updates, and revisions will be implemented based on available funding to support revisions, and updates and will be assigned to appropriate officials with pre-determined timelines for completion. Updates to the HMAP will then be adopted by the appropriate governing body.

Public Involvement

Continued stakeholder and public involvement will remain a vital component of the HMAP. The PMT will seek public input at all Plan Maintenance meetings and all public hearings related to the HMAP. The PMT Leader will also conduct outreach and invite the public to each Plan Maintenance meetings. The PMT Leader will advertise all meetings in local news outlets, on county and city social media pages and websites, and coordinate with all participating jurisdictions to post the meeting agenda 30 days prior to the meetings in accordance with their bylaws.

In addition, each participating jurisdiction will seek input from the public on the status of existing hazards, emerging vulnerabilities, and evaluate the HMAP's strategy with the public. During each meeting, the PMT will provide an open comment forum for an interactive discussion with the public. The development of new goals and strategies will be a joint effort between the PMT and public participants.

Progress Monitoring

It is important to monitor and evaluate the progress each jurisdiction has made toward implementing the HMAP. This ensures goals, objectives, and the mitigation strategy are regularly re-evaluated and reviewed for feasibility. Each participating jurisdiction will provide a progress report on completed or ongoing mitigation projects at each Plan Maintenance meeting. Unaddressed mitigation actions will be evaluated for relevancy and/or amended to increase feasibility.

Plan Evaluation

Procedures to monitor and evaluate the HMAP were determined during the December 18th meeting. This ensures that the entirety of the plan is regularly examined for feasibility, and that the HMAP remains a relevant and adaptive tool. An additional meeting will be held 12-months prior to the plan's expiration to develop a timeline and strategy to update the HMAP.

Plan Maintenance: Evaluation & Monitoring Procedures

Method and Procedures	Schedule	Responsible Entity
The PMT Leader will advertise all annual meetings in local newspapers, post invitations on the County social media pages, and post fliers at city and county buildings 30 days prior to the meetings in order to encourage public participation throughout the plan's maintenance process.	30 days prior to public PMT meetings	PMT Leader
Emerging risks and vulnerabilities will be identified and discussed. 1) PMT members are responsible for monitoring each hazard in their jurisdiction, and providing a written and/or verbal update on any new occurrences and emerging risks. 2) The PMT Leader will seek input from participants and the public at the annual meetings by opening the meeting for public comment.	Annually	PMT representative from each participating jurisdiction
The PMT will monitor the entirety of the planning process and the written plan to ensure the HMAP remains relevant and the strategy continues to be effective. 1) PMT members will identify new projects and/or re-prioritize existing strategies based on changes in their jurisdiction. 2) Funding sources and multijurisdictional cooperation for new initiatives will be determined. 3) PMT members will review public participation outreach strategies in order to identify new or different methods of outreach in order to reach more community members 4) The Plan Maintenance Team Leader will report on any suggestions for changing the whole written plan, planning, maintenance, or implementation process for the plan received by PMT members throughout the year. The PMT members will discuss which revisions/ suggestions they would like to implement.	Annually	PMT representative from each participating jurisdiction
Each participating jurisdiction will evaluate their progress implementing the mitigation strategy. 1) Representatives will publicly discuss progress and submit written progress reports to the team leader. 2) Completed and ongoing mitigation actions will be discussed by responsible entity. 3) Unaddressed mitigation actions will be evaluated for relevancy and/or amended to increase feasibility. 4) Feasibility of the mitigation strategy will be evaluated, and any necessary revisions will be proposed. 5) The team leader will seek comment from the public after each participating jurisdiction's presentation.	Annually	PMT, the responsible department identified in the mitigation action up for discussion, and the public.

The PMT will develop a timeline and strategy to update the plan 12 months before it expires. The update strategy will include: 1) Identify entities responsible for drafting and submitting the update to TDEM 2) Send appropriate representatives to G-318 training. 3) Determine funding needs and funding sources for plan update.	12 months prior to HMAP's expiration	PMT, and PMT Leader

Existing Plans & Regulations

Several existing plans and programs that require integration of the HMAP have been identified by the participating jurisdictions. These known planning mechanisms will be amended to support mitigation efforts, and both plans will be reviewed for contradictions.

DRP: Disaster Recovery Plan
CP: Comprehensive Plan
FMP: Floodplain Management Plan
SMP Stormwater Management Plan
EOP: Emergency Operations Plan
COOP: Continuity of Operations Plan
TP: Transportation Plan
SO: Subdivision Ordinance
AB: Annual Budget
MA: Mutual Aid Agreement
FDPO: Flood Damage Prevention Ordinance
CIP: Capital Improvements Plan

Jurisdiction	DRP	CP	FMP	SMP	EOP	COOP	TP	SO	AB	MA	FDPO	CIP
Unincorporated Brazoria County					x				x	x		
Alvin									x	x		
Angleton	x	x	x	x	x	x	x	x	x	x	x	x
Bailey's Prairie	x	x	x		x		x	x	x	x	x	
Bonney									x	x		
Brazoria					x			x	x	x		
Brookside Village									x	x		
Clute	x		x		x				x	x		x
Danbury									x	x		
Hillcrest									x	x		
Holiday Lakes			x						x	x	x	
Iowa Colony		x	x		x			x	x	x	x	x
Jones Creek					x				x	x	x	
Lake Jackson	x	x	x	x	x		x	x	x	x		x
Liverpool									x	x		
Manvel	x	x	x	x	x	x	x	x	x	x	x	x
Oyster Creek									x	x		
Quintana								x	x	x		
Richwood					x	x			x	x		x
Surfside Beach	x		x	x	x			x	x	x	x	x
Sweeny	x		x		x	x	x		x	x		x
West Columbia	x		x		x	x	x		x	x		x
Alvin ISD									x	x		
Brazosport ISD									x			
Freeport				x				x	x		x	
Port of Freeport					x				x	x		
Velasco Drainage District	x		x	x	x				x	x		

Plan Integration

Integrating the HMAP into county and local planning mechanisms is key to its success. Effective integration allows communities to benefit from existing plans and procedures to further reduce their vulnerability and risk. Upon approval of the plan and approval of updates or revisions as proposed by the PMT, each participating jurisdiction will follow the pre-determined actions:

To update and revise existing planning mechanisms to further integrate the HMAP, all participating jurisdictions will follow a basic process(es) described in this section.

1.) Propose a policy, strategy, or regulatory amendment to the proper governing body.
2.) Advertise the amendment a minimum of 60 days before the meeting where it will be discussed. Advertising procedures for the public meeting(s) is outlined in the public involvement measures described in Section 8 of this plan, and will also abide by each jurisdiction's local regulations.
3.) Provide the public, elected officials, and governing bodies the opportunity to discuss and comment upon proposed change(s).
4.) If the proposal is accepted, the change is implemented by the appropriate governing authority.

Jurisdiction	Integration Method
Unincorporated Brazoria County	The HMAP and plan amendments will be presented to Commissioner's Court by the PMT Leader. Upon approval by Commissioner's Court, approved actions will be acted upon as funding becomes available and integrated into the identified county planning mechanisms. The PMT Leader will coordinate with the representatives tasked with maintaining the EOP and MA to incorporate the HMAP
Alvin	Alvin's PMT representative will select appropriate mitigation actions to be implemented using the City's local budget, and develop an implementation proposal. The budget request and implementation proposal will be presented before City Council. An agenda will be published 30 days before the meeting.
Angleton	The Angleton PMT representative will draft a proposal for incorporating the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented to the Planning and Zoning Commission (when applicable). Upon approval, it will be presented to the City Council for consideration. Angleton will advertise the amendment(s) no less than 30 days before the meetings. Upon approval, city staff will act to incorporate the HMAP into their existing planning mechanisms.
Bailey's Prairie	The Bailey's Prairie PMT representatives will draft a proposal for incorporating the HMAP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the City Alderman for consideration. Bailey's Prairie will advertise the amendment no less than 25 days before the meeting where it will be discussed.
Bonney	Bonney's PMT representative will select mitigation actions to be budgeted into the City of Bonney's annual budget to be implemented the following year. The proposal will be presented before City Council. An agenda will be published 30 days in advance.
Brazoria	The Brazoria City Manager will draft a proposal for incorporating the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented to the City Council and mayor for consideration. Brazoria will post an agenda for the public hearing no less than 14 days before the meeting when it will be considered. Upon approval, the city manager will initiate the process to incorporate the HMAP into their existing planning mechanisms.
Brookside	Brookside Village's PMT representative will select mitigation actions to be budgeted into the Brookside Village annual budget to be implemented the following year. The proposal will be presented before City Council. An agenda will be published 15 days in advance.

Clute	The Clute PMT representative will draft a proposal for incorporating the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented at a joint public hearing of the Planning and Zoning Commission and City Council for consideration. Clute will advertise the amendment(s) no less than 30 days before the meetings. Upon approval, city staff will act to incorporate the HMAP into their existing planning mechanisms.
Danbury	Danbury's PMT representative will select mitigation actions to be budgeted into the Danbury annual budget and be implemented the following year. The proposal will be presented before City Council and will follow General Law Type A municipality laws for adoption.
Hillcrest	Hillcrest's PMT representative will select mitigation actions to be implemented using the local budget. An agenda will be published 30 days in advance, the proposal will be presented before City Council.
Holiday Lakes	The Holiday Lakes PMT representative will draft a proposal for incorporating the HMAP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the Town Council for consideration. Holiday Lakes will advertise the amendment no less than 14 days before the meeting where it will be considered. Upon approval, city staff will act to incorporate the HMAP into their existing planning mechanisms.
Iowa Colony	The Iowa Colony PMT representative will draft a proposal for incorporating the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented at a public hearing for the Mayors and City Council's consideration. Iowa Colony will post the agenda no less than 7 days before the meetings. Upon approval, city staff will act to incorporate the HMAP into their existing planning mechanisms.
Jones Creek	Jones Creek's PMT representative will draft a proposal for incorporating the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented before City Alderman and will follow Type A municipality laws for adoption and implementation.
Lake Jackson	The Lake Jackson City Secretary and PMT representative will draft a proposal for incorporating the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented to the City Council and mayor for consideration. Lake Jackson will post an agenda of the meeting no less than 7 days before the meeting when it will be considered. Upon approval, the PMT representative will initiate the process to incorporate the HMAP into their existing planning mechanisms with the assistance of Lake Jackson City Staff.
Liverpool	Liverpool's PMT representative will select appropriate mitigation actions to be implemented using the City's local budget, and develop an implementation proposal. The budget request and implementation proposal will be presented before City Council on the first Tuesday of the month following the annual PMT meetings.
Manvel	The Manvel PMT representative will draft a proposal for incorporating the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented at a public hearing for City Council consideration. Manvel will post the agenda no less than 14 days before the meetings. Upon approval, city and county staff will act to incorporate the HMAP into their existing planning mechanisms.
Oyster Creek	Oyster Creek's PMT representative will select appropriate mitigation actions to be implemented using the City's local budget and develop an implementation proposal. The proposal will be presented before City Council. An agenda will be published 30 days before the meeting on the city's website: http://www.cityofoystercreek.org
Quintana	Quintana's mayor will select mitigation actions to be implemented using the local budget, and will integrate new flood regulations in accordance with the HMAP's recommendations into the Code of Ordinances. An agenda will be published 30 days in advance, the

	proposal will be presented before City Council on the third Tuesday after the annual PMT meeting.
Richwood	The Richwood PMT representatives will draft a proposal to incorporate the HMAP's mitigation strategy into their existing planning mechanisms. The proposal will be presented to the Town Council for consideration. Upon approval, city staff will act to incorporate the HMAP into their existing planning mechanisms.
Surfside Beach	The Surfside PMT representatives will draft a proposal for incorporating the HMAP's mitigation recommendations into the CP and SO and present to city council. Upon approval, City staff will incorporate the HMAP into the CP and SO.
Sweeny	The Sweeny City Manager will draft a proposal for incorporating the HMAP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the City Council and mayor for consideration. Sweeny will post an agenda of the meeting no less than 30 days before the meeting when it will be considered. Upon approval, the city manager will initiate the process to incorporate the HMAP into their existing planning mechanisms.
Brazosport ISD	The superintendent of Alvin ISD will coordinate with the PMT to ensure that students and their parents are provided proper educational resources, and that school integrates mitigation strategies and actions into their Improvement Plan and facilities schedules.
West Columbia	The West Columbia PMT representatives will draft a proposal for incorporating the HMAP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the City Council for consideration. West Columbia will advertise the amendment no less than 1 month before the meeting when it will be considered. Upon approval, city staff will act to incorporate the HMAP into their existing planning mechanisms.
Alvin ISD	The superintendent of Alvin ISD will coordinate with the PMT to ensure that students and their parents are provided proper educational resources, and that school integrates mitigation strategies and actions into their Improvement Plan and facilities schedules.
Port of Freeport	The Port of Freeport will incorporate the HMAP and any subsequent updates into their EOP. The fire chief is responsible for presenting amendments to the Community Advisory Council for consideration.
Freeport	The Freeport PMT representative will work with the City Manager to draft a proposal for incorporating the HMAP's mitigation recommendations into their existing planning mechanisms. The proposal will be presented to the City Council and mayor for consideration. Freeport will post an agenda of the meeting no less than 30 days before the meeting when it will be considered. Upon approval, the city manager will initiate the process to incorporate the HMAP into their existing planning mechanisms.
Velasco Drainage District	Plan amendments and updates will be presented to the Velasco Drainage District superintendent by the PMT Leader. Upon approval by the Velasco Drainage District, approved actions will be acted upon and/or integrated into their FMP, EOP, and SMP but the appointed staff member.

2017

Appendix A: Planning Process

APPENDIX A: Planning Process Documentation

Public Meeting Press Release & Advertisement

HOUSTON-GALVESTON AREA COUNCIL

PO Box 22777 • Houston, Texas 77227-2777• 713-627-3200

NEWS RELEASE

FOR IMMEDIATE RELEASE
September 29, 2017

Contact: Joey Kaspar: (713) 993-4547 or Joey.Kaspar@h-gac.com
Becki Begley: (713) 993-2410 or Becki.Begley@h-gac.com (Media Inquiries Only)

BRAZORIA COUNTY HAZARD MITIGATION PLAN KICK-OFF MEETING

The Houston-Galveston Area Council (H-GAC), in partnership with Brazoria County, City of Angleton, City of Brazoria, City of Clute, City of Iowa Colony, City of Lake Jackson, City of Liverpool, City of Quintana, City of Surfside Beach, City of Sweeny, and City of West Columbia, is hosting the first public meeting to develop Brazoria County's Hazard Mitigation Plan. The meeting will be held from 9:00 a.m. to noon, October 25, at the Nolan Ryan Center, 2925 TX-35, Alvin, TX 77511.

A Hazard Mitigation Plan is a strategic plan that proposes actions to reduce or eliminate long-term risk to people and property from future natural disasters. Public input and involvement is important for developing a comprehensive approach to reduce the effects of natural disasters on communities.

All Brazoria County residents are invited to participate and contribute their local expertise during the planning process. Mitigation actions developed by participants will be considered for inclusion in the County's Hazard Mitigation Plan to be submitted to the Federal Emergency Management Agency (FEMA).

The meeting agenda is available on H-GAC's website at http://www.h-gac.com/community/community/hazard/documents/10-25-17-Brazoria-County-Meeting-Agenda.pdf

More information on hazard mitigation plans is available on FEMA's website at https://www.fema.gov/hazard-mitigation-planning.

For more information about the meeting, contact Joey Kaspar, (713) 993-4547 or at Joey.Kaspar@h-gac.com, or Amy Combs, (713) 993-4544 or at Amy.Combs@h-gac.com.

Houston-Galveston Area Council

The Houston-Galveston Area Council (www.h-gac.com) is a voluntary association of local governments in the 13-county Gulf Coast Planning Region—an area of 12,500 square miles and more than 6 million people. H-GAC works to promote efficient and accountable use of local, state, and federal tax dollars and serves as a problem-solving and information forum for local government needs.

Public Meeting Agenda: October 25, 2017

Brazoria County
Hazard Mitigation Plan Kick-Off Meeting

October 25, 2017
9:00 am – 12:00 pm
Nolan Ryan Center
2925 TX-35
Alvin, TX 77511

Agenda

8:30-9:00 am	**Registration**
9:00 am	**Welcome & Overview of Hazard Mitigation Plans & Procedures** H-GAC Staff will provide an overview of meeting objectives, activities, and H-GAC's planning process. The presentation will also include project timelines, partner roles and responsibilities, in-kind match requirements, and exemptions.
9:15 am	**Review 2017 Risk Assessment** H-GAC staff will present the County's draft risk assessment. Attendees will participate in a breakout session to review the draft risk assessment maps, charts, and provide feedback.
10:10 am	**Local Risk Assessment & Capability Form** Meeting attendees will fill out a form describing the frequency of a hazard, and rate their mitigation capabilities in their jurisdiction.
10:15 am	**15-minute Break**
10:30 am	**Mitigation Actions Presentation & Activity** H-GAC staff will give a presentation on creating mitigation actions and facilitate a practice exercise in writing a mitigation action.
11:00 am	**Update 2011 Mitigation Actions & Write New Actions** Review 2011 mitigation actions for viability, and update actions to meet new FEMA standards. With remaining time, draft new mitigations for 2017.
12:00 pm	**Adjourn**

TEXAS A&M AGRILIFE EXTENSION

BRAZORIA County CHARM Workshop
Pearland Recreation Center
April 5, 2018

Name	Organization/Affiliation	Title	E-mail Address
Doug Stammon	Harris County Engineering	Landscape Architect	doug.stammon@hcpid.org
Larry Voice	FEMA	Civil Engineer	Larry.voice@fema.dhs.gov
Noel Perez	Harris County Engineering	Asst. Manager Fire Code	noel.perez@hcpid.org
Joey Kaspar	H-GAC	Sr. Regional Planner	joey.kaspar@h-gac.com
RAY MOND MEJIA	TDEM	PLANNING LEAD MITIGATION PLANNER	raymond.mejia@dps.texas.gov
DAN CHERNOSKY	BRAZORIA COUNTY DRAIN. #5	SUPERINTENDENT	bcdrainage district5@gmail.com
Amanda Solitro	Texas A&M	–	–
Reja	Texas A&M	–	–
Yu-Wen Chou	Texas A&M	–	–
Julie	Texas A&M	–	–
Steven Mikulcak	Texas A&M	–	–
Celing Lowry	Texas A&M	–	–
Edwin Monaghan	FEMA	GIS	
Sheila Doll	FEMA	CPCB	
Tesse Kofhal	FEMA	CPCB	
Fares Ziavi	Harris County Engineering	permit technician	Fares.ziavi@hcpid.org
LOUIS HEARN	IOWA COLONY	POLICE CHIEF	chief@cityofiowacolony.com
Kalli Clark-Egan	USACE	Civil Engineer	Kalli.clark-egan2@usace.army.mil

TEXAS A&M AGRILIFE EXTENSION

BRAZORIA County CHARM Workshop
Pearland Recreation Center
April 5, 2018

TEXAS COMMUNITY WATERSHED PARTNERS

Name	Organization/Affiliation	Title	E-mail Address
Jonathan Colwell	FEMA R6	Communication & Outreach	jonathan.colwell@fema.dhs.gov
Barry Guidry	Brazoria County	GIS Supervisor	barryg@brazoria-county.com
Zack Fletcher	Brazoria County dist 3	Asst Manager	zack.fletcher@sbcglobal.net
Michael Collins	City of Alvin	Building Official	mcollins@cityofalvin.com
Michael DUMAS	City of MANVEL	Fire Marshal/AEMC	MDUMAS@CityofManvel.com
Amy Combs	H-GAC	Regional Planner	Amy.Combs@h-gac.com
Michael White	City of Manvel	Utility Director	MWhite@cityofmanvel.com
Dinh Ho	City of Iowa Colony	Engineer	dinh@adico-llc.com
LEE WALDEN, P.E.	BRAZORIA DD #5	PRESIDENT	lee.walden@gmail.com
Jessica Chase	AgriLife Ext.	ANR Agent	jessica.chase@ag.tamu.edu
Ron Rosenwald	City of Alvin	GIS Admin	rrosenwald@psf.cityofalvin.com
Ron Schmitz	City of Alvin	EMC	rschmitz@cityofalvin.com
J. Kent Marsh, AICP	CUD City of Iowa Colony	Staff Planner	kmarsh@marshdarcypartners.com
Stacy Shutts	NASA-SSC	Sustainability Specialist	stacy.e.shutts@nasa.gov
Monty Dozier	TX A&M Agrilife Ext.	Special Ass't	mdozier@ag.tamu.edu

TEXAS A&M AGRILIFE EXTENSION

BRAZORIA County CHARM Workshop
Pearland Recreation Center
April 5, 2018

TEXAS COMMUNITY WATERSHED PARTNERS

Name	Organization/Affiliation	Title	E-mail Address
ANDREA B ROUGHTON	BRAZORIA DRAIN. DISTRICT #4	DISTRICT ENGR	abroughtone bdd4.org
TOM DANIEL	BRAZORIA DRAINAGE DIST. #4	SEN. ENG. TECH	TDANIEL@BDD4.ORG

TEXAS A&M AGRILIFE EXTENSION

BRAZORIA County CHARM Workshop
Lake Jackson Civic Center
April 6, 2018

TEXAS COMMUNITY WATERSHED PARTNERS

	Name	Organization/Affiliation	Title	E-mail Address
1	Paul Kibodeaux	Lake Jackson	Assistant Chief	pkibodeaux@lakejacksonpd.net
2	Steven Byrum-Bratsen	DDS / City of Lake Jackson		StevenBratsen@Gmail.com
3	Sheila Doll	FEMA	CPCB	–
4	Tesse Kofahl	FEMA	CPCB	–
5	Rick Martin	FEMA	CPCB	–
6	Ed Monaghan	FEMA	GIS	–
7	Andrew Moody	Surfside	CFM	Andrewbmoody55@Gmail.com
8	Steve Rook	Brazoria Co OEM	EMC	Steverook@brazoria-county.com
9	Sabrina Capuchino	BCCIC	AUC	scapuchino@cbfl.cc
10	Tonya Peterson	BCCIL	Admin. Assistant	tpete2925@yahoo.com
11	Chris Motley	Freeport	Fire Chief	cmotley@freeport.tx.us
12	Glenn LaPaint	Brazoria County	Deputy EMC	glenn1@brazoria-county.com
13	RAUL GUERRA	CITY OF LAKE JACKSON	ST+DRG SUP.	rguerra@lakejacksontx.gov.
14	Billywayne Shoemaker	City of Freeport	Building official	bshoemaker@freeport.tx.us
15	JASON HULL	PORT FREEPORT	DIRECTOR OF ENGINEERING	HULL@PORTFREEPORT.COM
16	Jonathan Colwell	FEMA	Communications & Outreach	jonathan.colwell@fema.dhs.gov
★17	DUDE PAYNE	BRAZORIA COUNTY	COMMISSIONER PCT. I	dudep@brazoria-county.com
18	Chris Hogan	Port Freeport	Director	hogan@portfreeport.com

TEXAS A&M AGRILIFE EXTENSION

BRAZORIA County CHARM Workshop
Lake Jackson Civic Center
April 6, 2018

TEXAS COMMUNITY WATERSHED PARTNERS

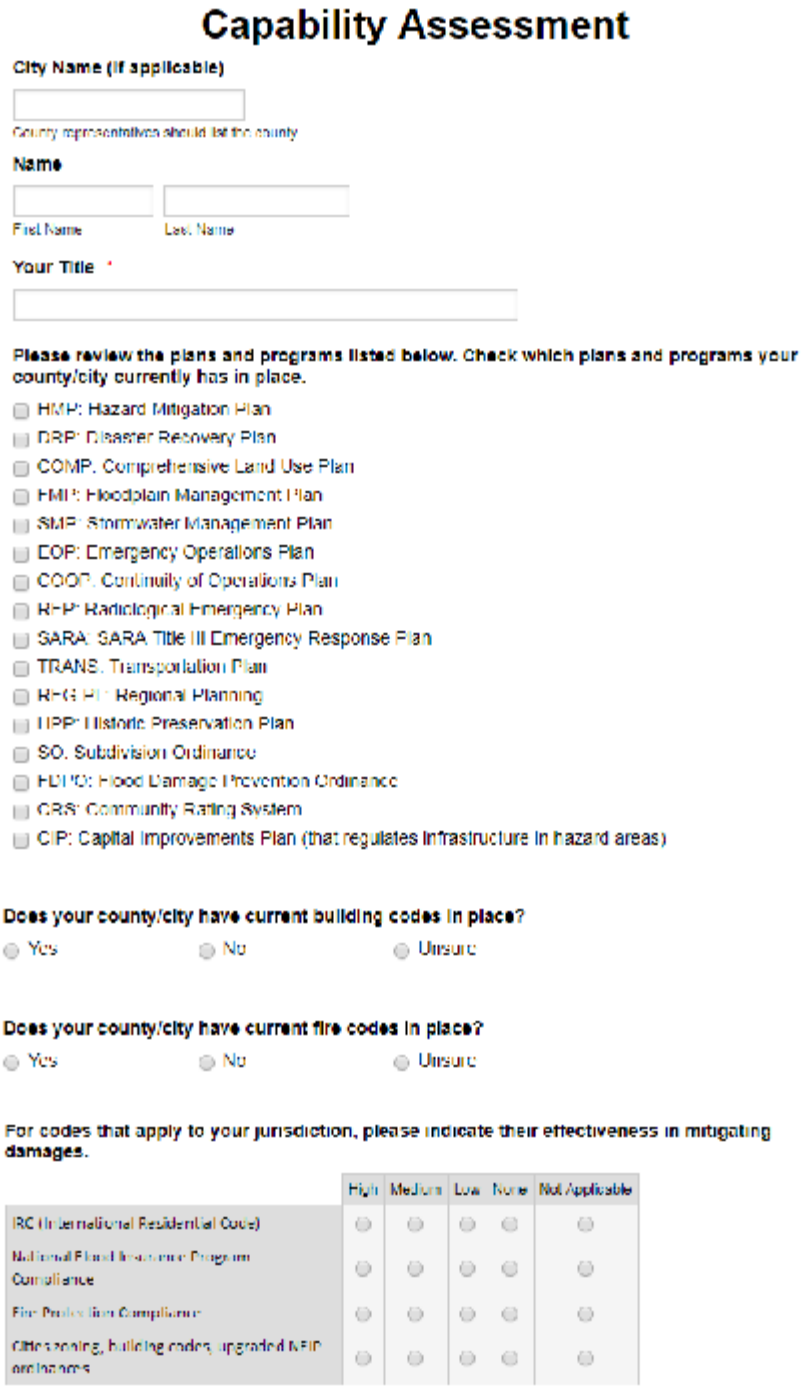
	Name	Organization/Affiliation	Title	E-mail Address
19	Paul Otis	WCPD	Chief of Police	Chief@westcolumbiatx.org
20	John Plaia	C of LJ	P.W. Superintendent	jplaia@lakejacksontx.gov
21	Debbie Sutherland	City of West Columbia	City Manager	citymanager@westcolumbiatx.org
22	Ronnie Sloat	Angleton Drain. Dist	Board of Superv	rrspec@sbcglobal.net
23	Jennifer Sanchez	U.S. Fish & Wildlife	Refuge Mgr.	Jennifer_Sanchez@FWS.gov
24	BRYAN SIDEBOTTOM	CITY OF LAKE JACKSON	DEPUTY EMC / PIO / LT	bsidebottom@lakejacksonpd.net
25	BILL YENNE	CITY OF LAKE JACKSON	CITY MANAGER	WYENNE@LAKEJACKSONTX.GOV
26	Karl Gingrich	City of Angleton	Fire Captain	KGingrich@Angleton.TX.US
27	Mike Lange	Trust for Public Land	Project Manager	mike.lange@tpl.org
28	KALLI CLARK-EGAN	USACE	Engineer	kalli.clark-egan@usace.army.mil
29	ATHELSTAN SANCHEZ	CITY OF LAKE JACKSON	ASST. CITY ENGINEER	ASANCHEZ@LAKEJACKSONTX.GOV
30	Sharon Trower	Brazoria County	Public Info Officer	sharont@brazoria-county.com
31	Beth Strope	TDEM	Regional Disaster Fin.	beth.strope@dps.Texas.gov
32	Mark Brewer	Richwood City Council	Position 1	Markbrewnger@gmail.com
33	Jeff Stafford	City of Angleton	Public Works Dir	Js.Stafford@Angleton.TX.US
34	Julie Cain	Texas A&M	—	—
35	Yu-Wen Chou	Texas A&M	—	—
36	Reja	Texas A&M	—	—

TEXAS A&M AGRILIFE EXTENSION

BRAZORIA County CHARM Workshop
Lake Jackson Civic Center
April 6, 2018

	Name	Organization/Affiliation	Title	E-mail Address
55	Raendy Anderson	City of Angleton	Ast. City Mgr	randerson@angleton.tx.
56 ☆	Laurie Kincannon	City of West Columbia	Mayor	laurie-kincannon@hotmail.com

Online Surveys



Capability Assessment

City Name (if applicable)

County representative should list the county

Name

First Name Last Name

Your Title *

Please review the plans and programs listed below. Check which plans and programs your county/city currently has in place.

- HMP: Hazard Mitigation Plan
- DRP: Disaster Recovery Plan
- COMP: Comprehensive Land Use Plan
- FMP: Floodplain Management Plan
- SMP: Stormwater Management Plan
- EOP: Emergency Operations Plan
- COOP: Continuity of Operations Plan
- REP: Radiological Emergency Plan
- SARA: SARA Title III Emergency Response Plan
- TRANS: Transportation Plan
- RPG Plan: Regional Planning
- HPP: Historic Preservation Plan
- SO: Subdivision Ordinance
- FDPO: Flood Damage Prevention Ordinance
- CRS: Community Rating System
- CIP: Capital Improvements Plan (that regulates infrastructure in hazard areas)

Does your county/city have current building codes in place?

Yes No Unsure

Does your county/city have current fire codes in place?

Yes No Unsure

For codes that apply to your jurisdiction, please indicate their effectiveness in mitigating damages.

	High	Medium	Low	None	Not Applicable
IRC (International Residential Code)					
National Flood Insurance Program Compliance					
Fire Protection Compliance					
(Wildfire zoning, building codes, upgraded WUI ordinances					

Hazard Mitigation Planning Team

Jurisdiction:	

Primary Point of Contact

Name:	
Title:	
Email:	
Phone:	

Please include the information of your jurisidiction's planning team. The planning team consists of anyone who will help your jurisdiction with the Hazard Mitigation Plan:

Other Team Members:

Name:	
Title:	
Email:	

Name:	
Title:	
Email:	

Name:	
Title:	
Email:	

Name:	
Title:	
Email:	



NFIP & Flood Plain Management Capability

Name

Your Title *

Email

Name of Jurisdiction

County representatives should list the county

Is your jurisdiction a National Flood Insurance Program (NFIP) Participant?

Yes No

NFIP Policy Summary

	Total Number of Policies	Total Coverage	Total Number of Losses	Total Dollars Paid
Summary				

NFIP Staff Assessment

The following questions seek information on your community's participation in and continued compliance with the NFIP. Indicate the source of information.

Is the Community FPA or NFIP Coordinator certified?

Yes No

Source Information	Comments
Community FPA	

Is floodplain management an auxiliary function?

Yes No

Source Information	Comments
Community FPA	

Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)

Local Risk & Capability Survey

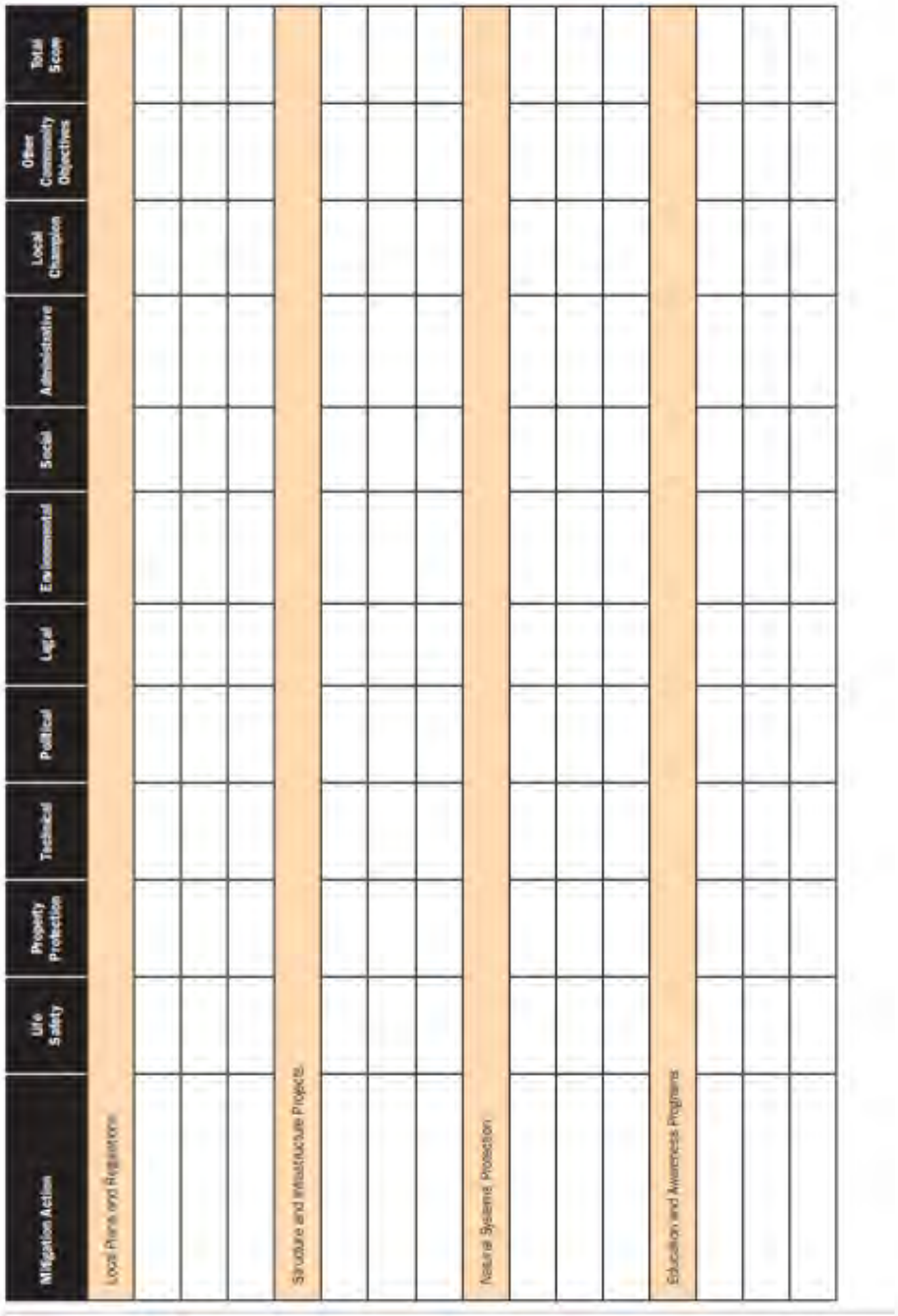
Please rate the cities/ counties ability to reduce the impact of the listed natural hazards.

Hazard	Applicable to your Community?			Current Perceived Risk			Current Ability to Reduce Damages from Hazard			Future Ability to Reduce Damages from Hazard		
Floods	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Hurricane/Tropical Storms	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Wildfire	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Severe Thunderstorms	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Tornado	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Drought	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Coastal Erosion	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Dam/Levee Failure	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Expansive Soils	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Extreme Heat	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Hail	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High
Winter Storms	Yes	No	Unknown	Low	Medium	High	Low	Medium	High	Low	Medium	High

Please rate the cities/ counties ability to reduce the impact of the listed natural hazards.

Hazard	Local Budget			Administrative Staffing			Technical Staffing			Political Determination/Resolve		
Floods	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Hurricane/Tropical Storms	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Wildfire	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Severe Thunderstorms	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Tornado	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Drought	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Coastal Erosion	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Dam/Levee Failure	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Expansive Soils	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Extreme Heat	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Hail	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Winter Storms	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High

Mitigation Prioritization Worksheet



Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
Local Plans and Regulations											
Structure and Infrastructure Projects											
Natural Systems Protection											
Education and Awareness Programs											

2017

Appendix B: Critical Facilities

APPENDIX B: Critical Facilities

TYPE	NAME
Colleges Universities	Alvin Community College
Electric Substation	ROSHARON
Electric Substation	ALVIN
Electric Substation	ALVIN AUTO
Electric Substation	UNKNOWN307671
Electric Substation	TAP303544
EMS	STARFIRE EMERGENCY MEDICAL SERVICES INCORPORATED
EMS	ALVIN EMERGENCY MEDICAL SERVICES
Fire Station	Wolfe Airpark Fire Dept.
Fire Station	County Road 143 VFD
Fire Station	Alvin Fire Department
Fire Station	Alvin Fire Station 3
Hazardous Waste Treatment Facility	INEOS USA LLC - CHOCOLATE BAYOU PLANT
Hazardous Waste Treatment Facility	MONSANTO CHOCOLATE BAYOU
High Schools	ALVIN H S
Local Emergency Operation Center	ALVIN EMERGENCY OPERATIONS CENTER
Natural Gas Receipt Delivery	CS #12 W RECEIPTS PLUS FUEL
Natural Gas Receipt Delivery	SOUTHERN PINES (DEL)
Police Station	ALVIN COMMUNITY COLLEGE POLICE DEPARTMENT
Police Station	ALVIN POLICE DEPARTMENT
Police Station	ALVIN INDEPENDENT SCHOOL DISTRICT POLICE DEPARTMENT
Police Station	HILLCREST VILLAGE CITY MARSHALS OFFICE
Police Station	Brazoria County Sheriff's Dept
Police Station	Alvin Police-Crime Stoppers
School	HOOD-CASE EL
School	ASSETS
School	MARK TWAIN EL
School	FAIRVIEW J H
School	WALT DISNEY EL
School	R L STEVENSON PRI
School	G W HARBY J H
School	ALVIN EL
School	ALVIN PRI
School	LONGFELLOW EL
School	ALVIN J H
School	MELBA PASSMORE EL
Shelter	Chocolate Bayou Worship Center

Shelter	Living Stones Church
Solid Waste Landfill	CITY OF ALVIN LANDFILL
Toxic Release Inventory Facility	MHBA CB LLLP
Toxic Release Inventory Facility	MAINLAND CUSTOM MARBLE INC.
Toxic Release Inventory Facility	INPUT/OUTPUT INC - ALVIN
Toxic Release Inventory Facility	INEOS USA LLC - CHOCOLATE BAYOU PLANT
Toxic Release Inventory Facility	LYONDELL CHEMICAL CO - CHOCOLATE BAYOU CHEMICALS PLANT
Toxic Release Inventory Facility	MONSANTO CHOCOLATE BAYOU
Toxic Release Inventory Facility	HUNTSMAN CORP (PART)
Wastewater Treatments Plant	CITY OF ALVIN WWTP
Correctional Facilities	Brazoria County Jail and Detention Ctr
Correctional Facilities	Brazoria County Juvenile Detention Center and Residential Treatment Facility
Correctional Facilities	RETRIEVE PRISON FACILITY
Electric Substation	ANGLETON
EMS	ANGLETON AREA EMERGENCY MEDICAL SERVICES
Fire Station	Holiday Lakes
Fire Station	Angleton Fire Dept.
High Schools	ANGLETON H S
Hospital	UTMB ANGLETON-DANBURY MEDICAL CENTER
Hospital	ANGLETON-DANBURY GENERAL HOSPITAL
Local Emergency Operation Center	BRAZORIA COUNTY EMERGENCY OPERATIONS CENTER
Police Station	BRAZORIA COUNTY JUVENILE DETENTION CENTER
Police Station	BRAZORIA COUNTY SHERIFFS OFFICE / BRAZORIA COUNTY JAIL
Police Station	ANGLETON INDEPENDENT SCHOOL DISTRICT POLICE DEPARTMENT
Police Station	ANGLETON POLICE DEPARTMENT
Police Station	TEXAS DEPARTMENT OF PUBLIC SAFETY - HIGHWAY PATROL REGION 2 DISTRICT A SERGEANT 0 AREA 7
Police Station	Brazoria County Sheriff's Ofc
Police Station	Angleton Police Dept.
Police Station	Brazoria County Criminal Div.
Police Station	Brazoria Cnty Criminal Cllctns
School	WESTSIDE EL
School	SOUTHSIDE EL
School	FRONTIER EL
School	NORTHSIDE EL
School	BRAZORIA CO JUVENILE DETENTION

School	ANGLETON J H SCHOOL
School	RANCHO ISABELLA EL
School	CENTRAL EL
Shelter	First Baptist Church - Angleton
Shelter	UMC Family Life Center
Shelter	Angleton ISD Admin Building
Solid Waste Landfill	SEABREEZE ENVIRONMENTAL LANDFILL
Toxic Release Inventory Facility	BENCHMARK ELECTRONICS
Toxic Release Inventory Facility	MALLINCKRODT MEDICAL INC INTERVENTIONAL PRODUCTS PLANT
Toxic Release Inventory Facility	GREIF BROTHERS CORP
Correctional Facilities	CLEMENS PRISON FACILITY
Electric Substation	BRAZORIA
Fire Station	Texas Mid-coast NWR
Fire Station	Wild Peach VFD
Fire Station	Brazoria Fire Department
Fire Station	Rivers End Fire Dept.
Local Emergency Operation Center	BRAZORIA EMERGENCY OPERATIONS CENTER-ALTERNATE
Local Emergency Operation Center	BRAZORIA EMERGENCY OPERATIONS CENTER
Police Station	BRAZORIA POLICE DEPARTMENT
Police Station	Brazoria Police Dept.
School	WILD PEACH EL
School	BARROW EL
School	WEST BRAZOS J H
Shelter	First Baptist Church of Brazoria
Shelter	Brazoria First Assembly of God - Bldg. 1
Shelter	Barrow Elementary School
Shelter	Brazoria First Assembly of God - Bldg. 2
Shelter	West Brazoria Jr High School
Shelter	Wild Peach Elementary School
Toxic Release Inventory Facility	CHEVRON PHILLIPS CHEMICAL CO LP CLEMENS TERMINAL
Police Station	BROOKSIDE VILLAGE POLICE DEPARTMENT
EMS	CLUTE EMERGENCY MEDICAL SERVICES
Fire Station	Clute VFD
High Schools	BRAZOSWOOD H S
Local Emergency Operation Center	CLUTE EMERGENCY OPERATIONS CENTER
Police Station	CLUTE POLICE DEPARTMENT
Police Station	Richwood Police Dept.
School	LIGHTHOUSE LEARNING CENTER - AEC
School	CLUTE INT

School	T W OGG EL
School	GRIFFITH EL
Shelter	T.W. Ogg Elementary School
Shelter	Madge Griffith Elementary
Shelter	Clute Intermediate School
Shelter	First Baptist Church
Shelter	First Baptist Church Of Richwood
Toxic Release Inventory Facility	INEOS USA LLC STRATTON RIDGE
Toxic Release Inventory Facility	SOUTHERN REFUSE COMPANY
Toxic Release Inventory Facility	BENCHMARK ELECTRONICS INC
Wastewater Treatments Plant	CLUTE-RICHWOOD WWTP
Fire Station	Damon Fire Dept.
High Schools	DAMON H S
School	DAMON ISD
EMS	DANBURY VOLUNTEER FIRE DEPARTMENT AND EMERGENCY MEDICAL SERVICES
Fire Station	Danbury Fire Dept.
High Schools	DANBURY H S
Police Station	DANBURY POLICE DEPARTMENT
School	DANBURY MIDDLE
School	DANBURY EL
CERCLA(Superfund) National Priorities List	GULFCO MARINE MAINTENANCE
Correctional Facilities	CITY OF FREEPORT
Electric Substation	FREEPORT
Electric Substation	VELASCO
Electric Substation	BOOSTER
Electric Substation	TAP303600
Electric Substation	BRYAN
EMS	FREEPORT FIRE AND EMERGENCY MEDICAL SERVICES DEPARTMENT
EMS	VILLAGE OF SURFSIDE BEACH EMERGENCY MEDICAL SERVICES
Fire Station	Demi John VFD
Fire Station	Jones Creek FD
Fire Station	Freeport Fire Dept.
Hazardous Waste Treatment Facility	BASF CORP - FREEPORT SITE
Hazardous Waste Treatment Facility	GULF CHEMICAL & METALLURGICAL CORP
Hazardous Waste Treatment Facility	DOW CHEMICAL CO FREEPORT FACILITY
High Schools	BRAZOSPORT H S

Local Emergency Operation Center	FREEPORT EMERGENCY OPERATIONS CENTER
Police Station	JONES CREEK POLICE DEPARTMENT
Police Station	BRAZORIA COUNTY CONSTABLE - PRECINCT 1
Police Station	FREEPORT CITY MARSHALS OFFICE
Police Station	FREEPORT POLICE DEPARTMENT
Police Station	Oyster Creek City Marshall
Police Station	Freeport Police Dept.
Police Station	Surfside Police Dept.
Police Station	Jones Creek Police Dept.
School	JANE LONG EL
School	FREEPORT INT
School	VELASCO EL
School	O'HARA LANIER MIDDLE
School	O A FLEMING EL
Shelter	Brazosport High School
Shelter	Freeport Intermediate School
Shelter	O.A. Fleming Elementary
Shelter	Velasco Elementary
Shelter	Lanier Middle School
Toxic Release Inventory Facility	SHINTECH INC
Toxic Release Inventory Facility	VERNOR MATERIAL & EQUIP
Toxic Release Inventory Facility	DSM NUTRITIONAL PRODUCTS
Toxic Release Inventory Facility	FREEPORT VINYL TECHNOLOGIES CO
Toxic Release Inventory Facility	AIR LIQUIDE FREEPORT HYCO PLANT
Toxic Release Inventory Facility	MARTIN OPERATING PTNR - FREEPORT OOS
Toxic Release Inventory Facility	SENTRY POLYMERS
Toxic Release Inventory Facility	MIDSTREAM FUEL SERVICE LLC FREEPORT 1
Toxic Release Inventory Facility	BRASKEM AMERICA INC OYSTER CREEK PLANT
Toxic Release Inventory Facility	SHIN-ETSU SILICONES OF AMERICA - CARBON FUNCTIONAL SILANES FACILITY
Toxic Release Inventory Facility	COASTAL OYSTER CREEK AMMONIA CHEMICAL PLANT
Toxic Release Inventory Facility	AIR LIQUIDE AMERICA CORP.
Toxic Release Inventory Facility	AIR LIQUIDE FREEPORT HPU PLANT
Toxic Release Inventory Facility	CONOCOPHILLIPS FREEPORT

Toxic Release Inventory Facility	NALCO CO
Toxic Release Inventory Facility	BASF CORP - HARBOR TERM INAL
Toxic Release Inventory Facility	TEXAS BARGE & BOAT INC
Toxic Release Inventory Facility	BASF CORP - FREEPORT SITE
Toxic Release Inventory Facility	CHEMICAL SPECIALTIES INC
Toxic Release Inventory Facility	HUNTSMAN ETHYLENEAMINES PLANT
Toxic Release Inventory Facility	GULF CHEMICAL & METALLURGICAL CORP
Toxic Release Inventory Facility	DOW CHEMICAL CO FREEPORT FACILITY
Toxic Release Inventory Facility	SI GROUP INC
Toxic Release Inventory Facility	MARTIN OPERATING PTNR FREEPORT FM 1495
Toxic Release Inventory Facility	US DOE BRYAN MOUND SPR SITE
Wastewater Treatments Plant	CENTRAL WWTF
Wastewater Treatments Plant	US DOE SPR BRYAN MOUND OIL SRG
Toxic Release Inventory Facility	THIRD COAST PACKAGING INC FRIENDSWOOD
EMS	IOWA COLONY VOLUNTEER FIRE DEPARTMENT
School	MERIDIANA EL
School	S F AUSTIN EL
Shelter	S.F. Austin Elementary
Toxic Release Inventory Facility	CONOCOPHILLIPS CO JONES CREEK TERMINAL
Colleges_Universities	Brazosport College
Dam	BUFFALO CAMP BAYOU RESERVOIR DAM
Electric Substation	LAKE JACKSON
EMS	LAKE JACKSON EMERGENCY MEDICAL SERVICES
EMS	LAKE Jackson Disaster Trans
Fire Station	Richwood Fire Dept.
Fire Station	Lake Jackson Fire Dept.
Hospital	BRAZOSPORT MEMORIAL HOSPITAL
Police Station	LAKE JACKSON POLICE DEPARTMENT
Police Station	Lake Jackson Police Dept
School	BESS BRANNEN EL
School	LAKE JACKSON INT
School	A P BEUTEL EL
School	ELISABET NEY EL
School	O M ROBERTS EL

School	RASCO MIDDLE
Shelter	Christ Lutheran Church
Shelter	O.M. Roberts Elementary
Shelter	Lake Jackson Intermediate School
Shelter	Elizabet Ney Elementary
Shelter	Rasco Middle School
Shelter	Bess Brannen Elementary
Shelter	A.P. Beutel Elementary
Shelter	Willow Drive Baptist Church
Shelter	Brazos wood High School
Wastewater Treatments Plant	CITY OF LAKE JACKSON
Fire Station	Liverpool VFD
Police Station	LIVERPOOL POLICE DEPARTMENT
Police Station	Liverpool Police Dept.
EMS	MANVEL EMERGENCY MEDICAL SERVICES
Fire Station	Manvel VFD
Fire Station	Manvel Fire Department
High Schools	MANVEL H S
Police Station	MANVEL POLICE DEPARTMENT
Police Station	BRAZORIA COUNTY CONSTABLE - PRECINCT 2
Police Station	Manvel Police Dept.
School	RED DUKE EL
School	E C MASON EL
School	RODEO PALMS J H
Shelter	Manvel Junior High School
Toxic Release Inventory Facility	KEESHAN & BOST CHEMICAL CO INC
Toxic Release Inventory Facility	BENCHMARK RESEARCH & TECHNOLOGY INC
Shelter	Delaware Valley School Dist.-Delaware Valley Middle/High
Hazardous Waste Treatment Facility	PHILLIPS 66 SWEENY COMPLEX
Toxic Release Inventory Facility	PHILLIPS 66 SWEENY COMPLEX
Toxic Release Inventory Facility	PHILLIPS 66 SWEENY COMPLEX
Fire Station	Oyster Creek Community VFD
Police Station	OYSTER CREEK POLICE DEPARTMENT
Shelter	Brazoria County Youth Home
Brownfields	PEARLAND ASSAULT BASEBALL CLUB
Correctional Facilities	Pearland Police Department Jail Division
Electric Substation	SOUTHWYCK
Electric Substation	PEARLAND
Electric Substation	MARY'S CREEK

EMS	PINNACLE ENTITIES INCORPORATED DOING BUSINESS AS PINNACLE AMBULANCE SERVICE
EMS	PEARLAND AREA EMERGENCY MEDICAL SERVICES
Fire Station	Pearland Fire Department
Fire Station	Pearland Fire Station 2
Fire Station	Pearland Fire Station 5
Fire Station	Pearland Fire Station 3
Fire Station	Pearland Fire Station 4
Fire Station	Brookside Village VFD
High Schools	SHADOW CREEK H S
High Schools	ROBERT TURNER COLLEGE AND CAREER H S
High Schools	GLENDA DAWSON H S
High Schools	PEARLAND H S
Hospital	MEMORIAL HERMANN PEARLAND HOSPITAL
Hospital	PEARLAND MEDICAL CENTER
Local Emergency Operation Center	PEARLAND CITY EMERGENCY OPERATIONS CENTER
Police Station	PEARLAND POLICE DEPARTMENT
Police Station	Police Dept.-Records Div.
Police Station	BRAZORIA COUNTY CONSTABLE - PRECINCT 3
Police Station	Brookside Police Dept.
School	LAURA INGALLS WILDER
School	SILVERCREST EL
School	PEARLAND J H SOUTH
School	NOLAN RYAN J H
School	SILVERLAKE EL
School	MASSEY RANCH EL
School	ROGERS MIDDLE
School	MARY BURKS MAREK EL
School	GLENN YORK EL
School	BERRY MILLER J H
School	MAGNOLIA EL
School	ALEXANDER MIDDLE
School	PEARLAND J H WEST
School	C J HARRIS EL
School	PACE CENTER
School	PEARLAND J H EAST
School	LEON H SABLATURA MIDDLE
School	H C CARLESTON EL
School	SAM JAMISON MIDDLE
School	SHADYCREST EL
School	E A LAWHON EL
School	RUSTIC OAK EL
School	CHALLENGER EL

School	BARBARA COCKRELL EL
Shelter	Pearland Junior High South
Shelter	City of Pearland Rec Center
Shelter	Faith Center Church
Shelter	First Presbyterian Church
Shelter	FIRST UNITED METHODIST CHURCH
Shelter	Pearland High School
Solid Waste Landfill	DIXIE FARM ROAD LANDFILL (HILL SAND CO)
Toxic Release Inventory Facility	EPM - ISE MAGTECH
Toxic Release Inventory Facility	BTU GASES
Toxic Release Inventory Facility	DAVIS LYNCH
Toxic Release Inventory Facility	THIRD COAST TERMINALS PEARLAND
Toxic Release Inventory Facility	TEXAS HONING, INC. (PEARLAND)
Toxic Release Inventory Facility	PACKAGING SERVICES CO INC PEARLAND FACILITY
Wastewater Treatments Plant	FAR NORTHWEST WWTP
Wastewater Treatments Plant	SOUTHWEST ENVIRONMENTAL CENTER
Wastewater Treatments Plant	LONGWOOD WWTP
Wastewater Treatments Plant	BARRY ROSE WWTF
Police Station	RICHWOOD POLICE DEPARTMENT
School	GLADYS POLK EL
Shelter	Gladys Polk Elementary
Correctional Facilities	DARRINGTON PRISON FACILITY
Correctional Facilities	RAMSEY PRISON FACILITY
Fire Station	Iowa Colony VFD
Fire Station	Rosharon Volunteer Fire Dept.
School	MANVEL J H
School	SAVANNAH LAKES EL
School	DON JETER EL
Shelter	First Baptist Church
Toxic Release Inventory Facility	SCHLUMBERGER ROSHARON CAMPUS
Fire Station	Surfside Beach VFD
Police Station	SURFSIDE BEACH POLICE DEPARTMENT
Electric Substation	SWEENY
EMS	SWEENY FIRE AND RESCUE
Fire Station	Sweeny Fire and Rescue
Fire Station	Old Ocean Fire Dept.

High Schools	SWEENY H S
Hospital	SWEENY COMMUNITY HOSPITAL
Local Emergency Operation Center	SWEENY CITY EMERGENCY OPERATIONS CENTER-ALTERNATE
Local Emergency Operation Center	SWEENY CITY EMERGENCY OPERATIONS CENTER
Police Station	SWEENY INDEPENDENT SCHOOL DISTRICT POLICE DEPARTMENT
Police Station	SWEENY POLICE DEPARTMENT
Police Station	Sweeny Police Dept.
School	SWEENY J H
School	SWEENY EL
Shelter	Sweeny Junior High School
Solid Waste Landfill	CITIES OF BRAZORIA & WEST COLUMBIA LANDFILL
Toxic Release Inventory Facility	PHILLIPS 66 CO. FREEPORT II TERMINAL
Toxic Release Inventory Facility	CONOCOPHILLIPS SAN BERNARD TERMINAL
Brownfields	BLANCHARD AUTO SALES
Electric Substation	UNKNOWN307693
EMS	CENTRAL EMERGENCY MEDICAL SERVICES INCORPORATED
Fire Station	Columbia Lakes VFD
High Schools	COLUMBIA H S
Local Emergency Operation Center	WEST COLUMBIA EMERGENCY OPERATIONS CENTER
Local Emergency Operation Center	WEST COLUMBIA EMERGENCY OPERATIONS CENTER-ALTERNATE
Police Station	BRAZORIA COUNTY CONSTABLE - PRECINCT 4
Police Station	WEST COLUMBIA POLICE DEPARTMENT
Police Station	COLUMBIA-BRAZORIA INDEPENDENT SCHOOL DISTRICT POLICE DEPARTMENT
Police Station	West Columbia City Police
School	WEST COLUMBIA EL
School	WEST COLUMBIA CHARTER SCH
Shelter	West Columbia Elementary School
Shelter	Columbia High School
Shelter	West Columbia High School
Dam	BEAL RESERVOIR LEVEE
Dam	BLACK RANCH LAKE LEVEE
Dam	BRAZOS RIVER CLUB LEVEE
Dam	MALLARD LAKE CLUB DAM
Dam	DIVISION LAKE LEVEE
Dam	LAKE JACKSON LEVEE
Dam	MOWERY LAKE LEVEE
Dam	DUCK LAKE DAM
Dam	SOLUTIA RESERVOIR LEVEE

Dam	SALT BAYOU LAKE WATER
Dam	TWIN LAKES DAM
Dam	BRAZORIA RESERVOIR DAM
Dam	DINGLE LAKE NO 1 LEVEE
Dam	LAZY C Z NO 1 RESERVOIR LEVEE
Dam	MCCULLOUGH LAKE LEVEE
Dam	RES NO 17 LEVEE-MCCULLOUGH RES COMPLEX
Dam	RESERVOIR NO 10 LEVEE-COMPLEX NO 2
Dam	RESERVOIR NO 9 LEVEE-COMPLEX NO 2
Dam	LINNVILLE BAYOU RESERVOIR DAM
Dam	MARKLE LAKE LEVEE
Dam	SAN BERNARD RESERVOIR NO 1
Dam	SAN BERNARD RESERVOIR NO 2 LEVEE
Dam	SAN BERNARD RESERVOIR NO 3 LEVEE
Dam	ANGLETON FISHING & HUNTING CLUB LEVEE
Dam	BAR X RANCH LAKE LEVEE
Dam	BIERI LAKES RESERVOIR NO 1 LEVEE
Dam	BIERI LAKES RESERVOIR NO 2 LEVEE
Dam	BIERI LAKES RESERVOIR NO 3 LEVEE
Dam	BIERI LAKES RESERVOIR NO 4 LEVEE
Dam	BINTLIFF LAKE LEVEE
Dam	CLARK RESERVOIR DAM
Dam	COALE DAM
Dam	FLAG LAKE LEVEE
Dam	HUDECK RESERVOIR LEVEE
Dam	MCCORMACK RESERVOIR NO 3 LEVEE
Dam	MCCORMACK RESERVOIR NO 4 LEVEE
Dam	TIGNER-FARRER LEVEE
Dam	WILLIAM HARRIS RESERVOIR DAM
Dam	RALEIGH FARMS RESERVOIR LEVEE
Dam	BRAZORIA CITY RESERVOIR LEVEE
Dam	DACUS LAKE DAM
Dam	TDCJ CLEMENS UNIT DAM NO 1
Dam	TDCJ CLEMENS UNIT DAM NO 2
Dam	COLUMBIA LAKES RESERVOIR DAM
Dam	GRIFFITH RESERVOIR LEVEE
Dam	LAGOON RESERVOIR DAM
Dam	LIVE OAK NO 1 LEVEE
Dam	LIVE OAK NO 2 LEVEE
Dam	PAPPAS LAKES AND LODGE LEVEE
Dam	AMOCO CHEMICALS RESERVOIR LEVEE
Dam	DINGLE LAKE NO 2 LEVEE
Dam	MUSTANG LAKE EAST DAM
Dam	MUSTANG LAKE WEST DAM

Electric Substation	MANVEL
Electric Substation	DAMON
Electric Substation	NASH
Electric Substation	TAP303549
Electric Substation	TAP303550
Electric Substation	ARCOLA
Electric Substation	HASTINGS
Electric Substation	MUSTANG BAYOU
Electric Substation	UNKNOWN307510
Electric Substation	OASIS
Electric Substation	NORTH ALVIN
Electric Substation	TAP303542
Electric Substation	TAP303543
Electric Substation	MEADOW
Electric Substation	HOFMAN
Electric Substation	RIWOOD
Electric Substation	CAVERN
Electric Substation	SINTEK
Electric Substation	SEAWAY
Electric Substation	SEAWAY SW
Electric Substation	QUINTANA
Electric Substation	TAP303551
Electric Substation	BIPORT
Electric Substation	LIVERPOOL
Electric Substation	STRATT
Electric Substation	BRAZOSPORT
Electric Substation	UNKNOWN307694
Electric Substation	UNKNOWN307695
Electric Substation	UNKNOWN307696
Electric Substation	UNKNOWN307863
Electric Substation	UNKNOWN307864
Electric Substation	UNKNOWN307865
Electric Substation	UNKNOWN307866
Electric Substation	UNKNOWN307688
Electric Substation	RETRIEVE
Electric Substation	UNKNOWN307698
Electric Substation	UNKNOWN307700
Electric Substation	UNKNOWN307801
Electric Substation	UNKNOWN308021
Electric Substation	UNKNOWN307691
Electric Substation	UNKNOWN307692
Electric Substation	UNKNOWN307862
Electric Substation	UNKNOWN307511
Electric Substation	AMOCO

Electric Substation	DOW VELASCO
Electric Substation	UNKNOWN307708
Electric Substation	SURFSIDE
Electric Substation	UNKNOWN307794
Electric Substation	BASF
Electric Substation	UNKNOWN307799
Electric Substation	TAP303552
Electric Substation	UNKNOWN308071
Natural Gas Receipt Delivery	DUHON #1
Natural Gas Receipt Delivery	GMT-FRISCO
Natural Gas Receipt Delivery	RAMSEY ENTEX
Power Plant	FREEPORT LP PRETREATMENT FACILITY
Power Plant	SWEENY IGCC PLANT
Power Plant	SWEENY COGEN FACILITY
Power Plant	CHOCOLATE BAYOU WORKS
Power Plant	ASCEND PERFORMANCE MATERIALS TEXAS INC.
Power Plant	DOW CHEMICAL TEXAS OPERATION
Power Plant	OYSTER CREEK UNIT VIII
Power Plant	BASF FREEPORT WORKS
Power Plant	FREEPORT ENERGY CENTER
Wastewater Treatments Plant	OYSTER CREEK WWTP
Wastewater Treatments Plant	CITY OF WEST COLUMBIA - WWTP

2017

Appendix C: Hazus Analysis

Hazus-MH: Flood Global Risk Report

Region Name: Brazoria County

Flood Scenario: 100-year

Print Date: Wednesday, November 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Texas

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,443 square miles and contains 10,082 census blocks. The region contains over 107 thousand households and has a total population of 313,166 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 109,747 buildings in the region with a total building replacement value (excluding contents) of 33,799 million dollars (2010 dollars). Approximately 93.55% of the buildings (and 86.99% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 109,747 buildings in the region which have an aggregate total replacement value of 33,799 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	29,401,709	87.0%
Commercial	2,672,546	7.9%
Industrial	727,466	2.2%
Agricultural	72,129	0.2%
Religion	396,214	1.2%
Government	125,448	0.4%
Education	403,471	1.2%
Total	**33,798,983**	**100.0%**

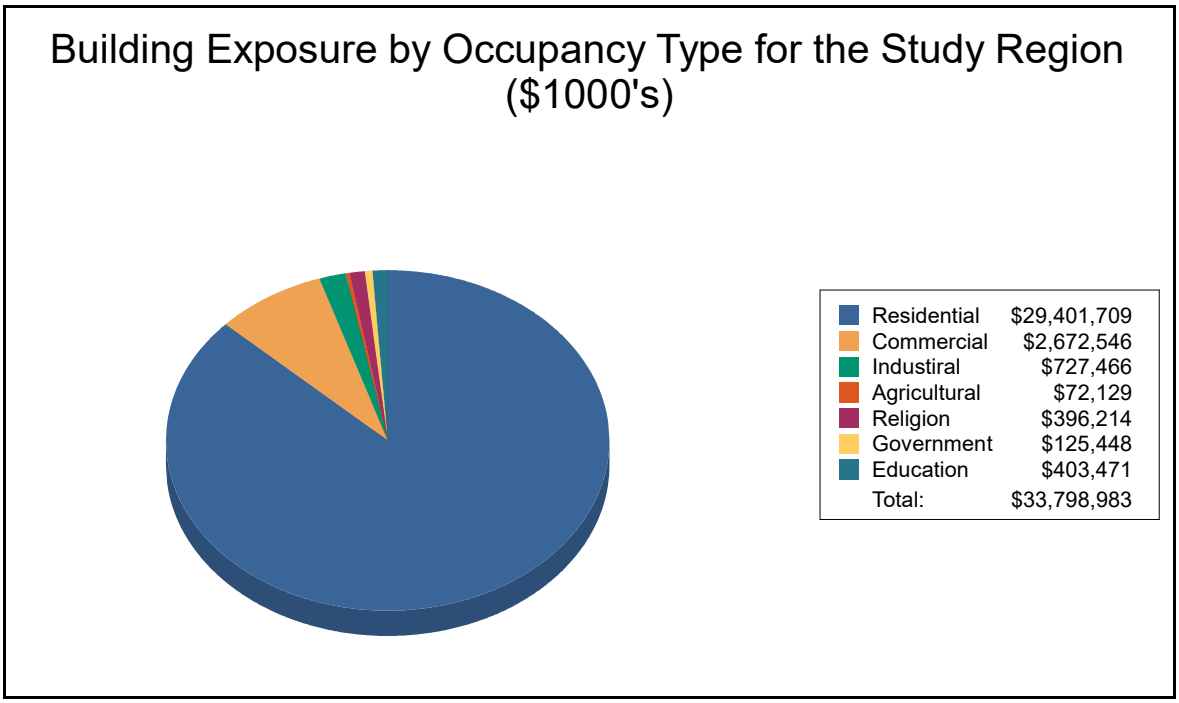
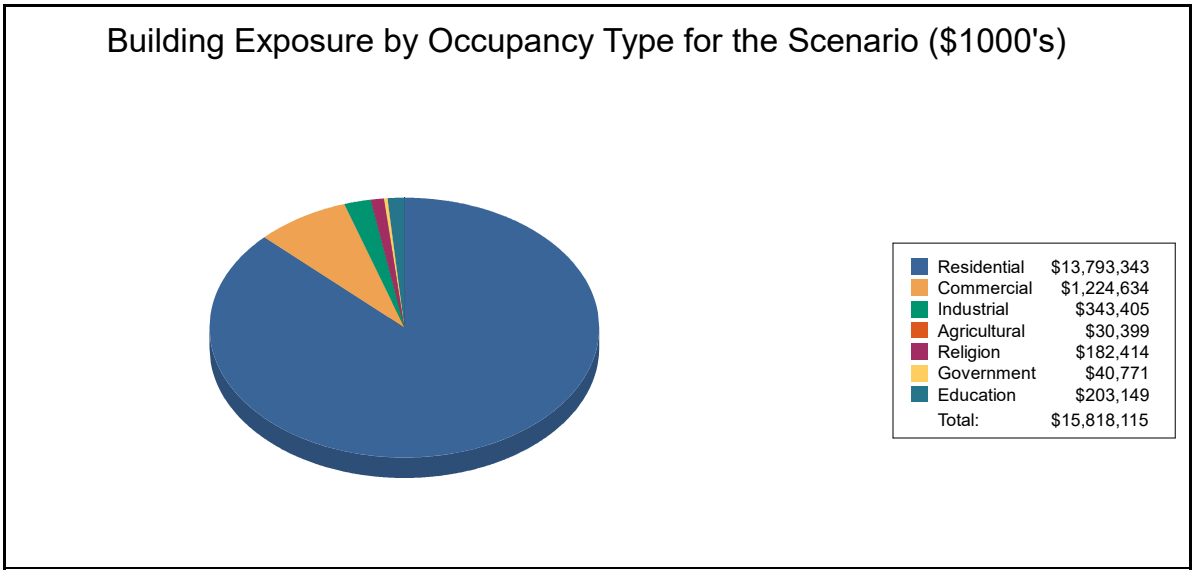


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	13,793,343	87.2%
Commercial	1,224,634	7.7%
Industrial	343,405	2.2%
Agricultural	30,399	0.2%
Religion	182,414	1.2%
Government	40,771	0.3%
Education	203,149	1.3%
Total	**15,818,115**	**100.0%**



Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 234 beds. There are 99 schools, 22 fire stations, 19 police stations and 1 emergency operation center.

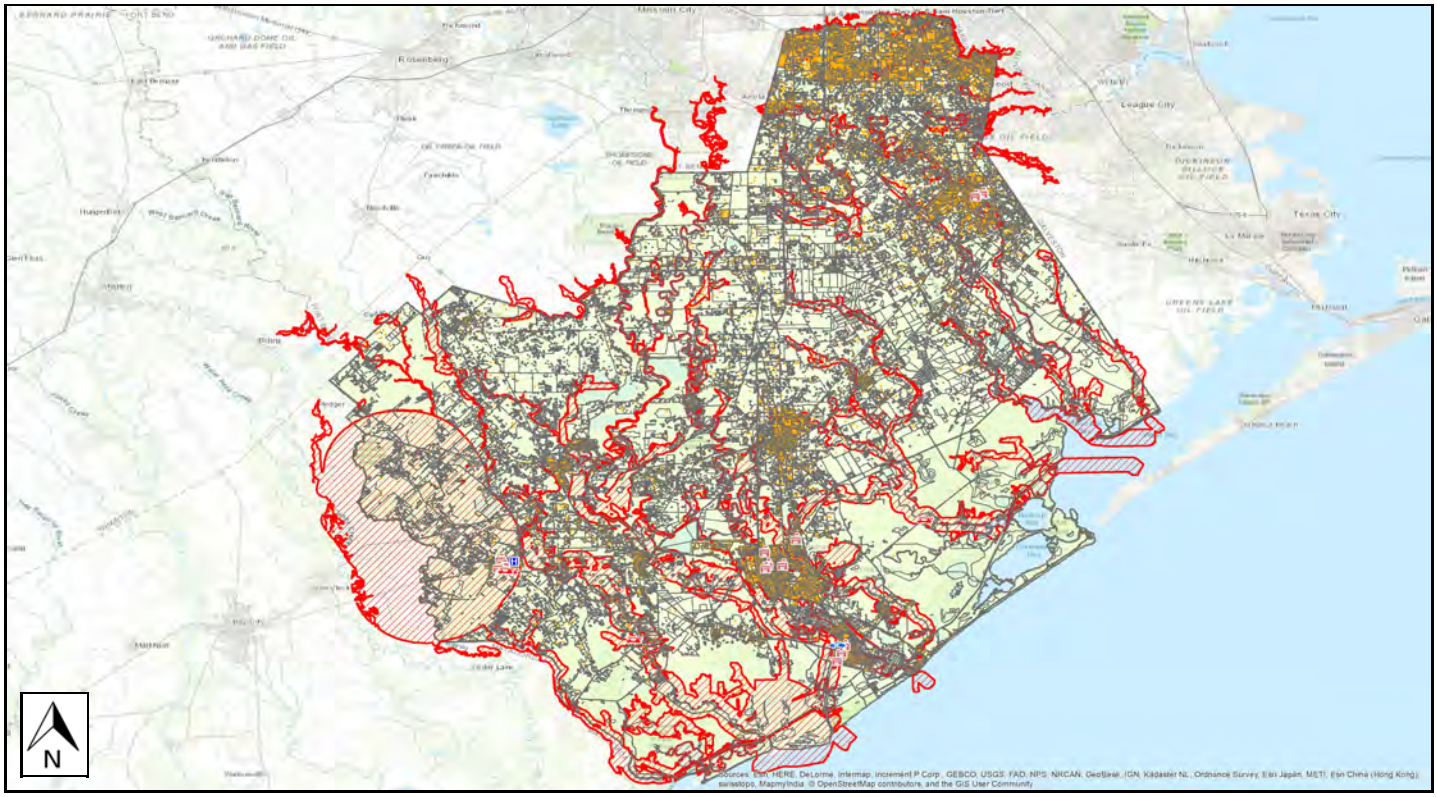
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Brazoria County
Scenario Name:	100-Year
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 5,797 buildings will be at least moderately damaged. This is over 54% of the total number of buildings in the scenario. There are an estimated 1,611 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

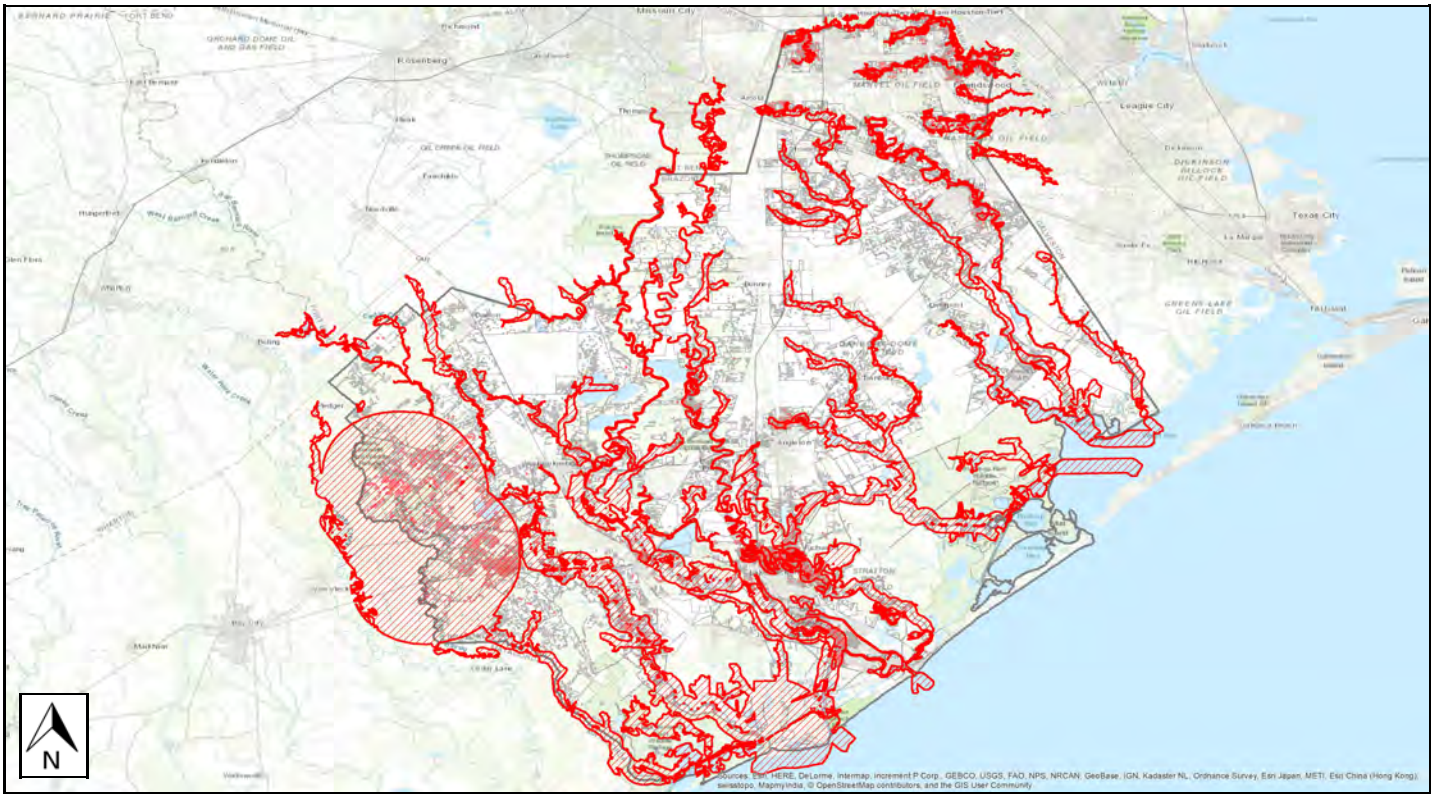


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	1	50.00	0	0.00	0	0.00	1	50.00	0	0.00	0	0.00
Commercial	30	37.04	35	43.21	10	12.35	2	2.47	3	3.70	1	1.23
Education	2	66.67	1	33.33	0	0.00	0	0.00	0	0.00	0	0.00
Government	1	25.00	0	0.00	1	25.00	2	50.00	0	0.00	0	0.00
Industrial	6	28.57	5	23.81	1	4.76	2	9.52	1	4.76	6	28.57
Religion	4	44.44	5	55.56	0	0.00	0	0.00	0	0.00	0	0.00
Residential	2,701	32.07	2,429	28.84	1,013	12.03	397	4.71	278	3.30	1,604	19.05
Total	**2,745**		**2,475**		**1,025**		**404**		**282**		**1,611**	

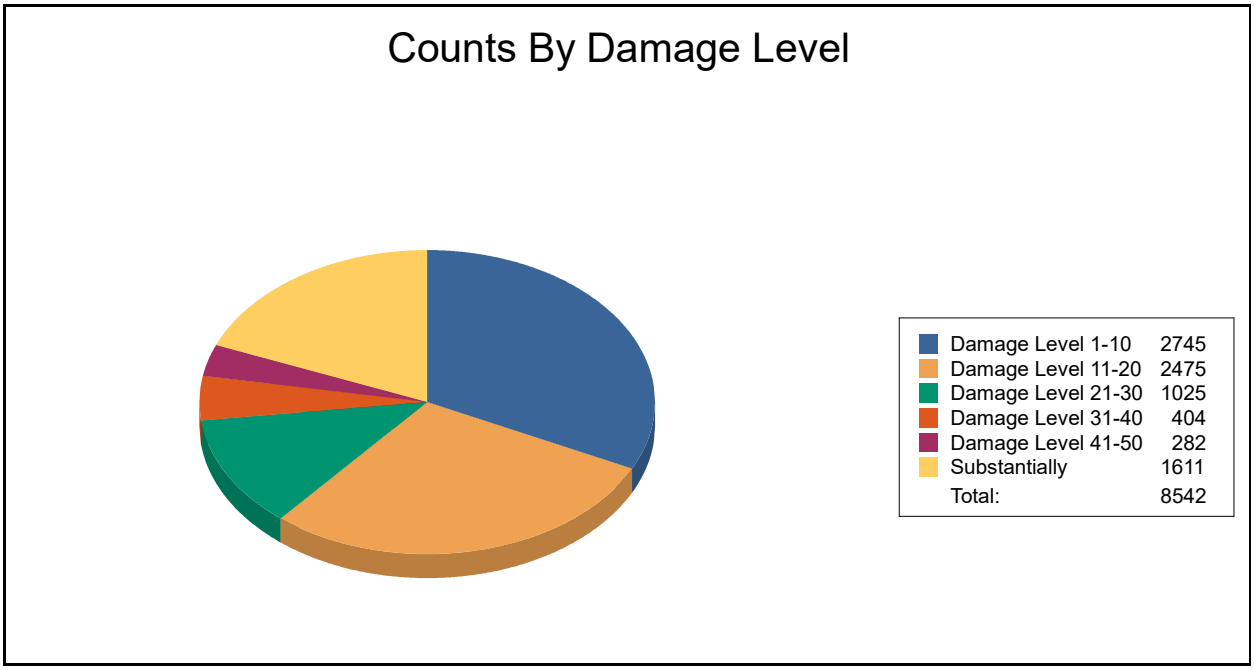


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	6	75	0	0	1	13	1	13	0	0	0	0
ManufHousing	84	15	78	14	63	11	0	0	44	8	296	52
Masonry	231	35	224	34	65	10	23	4	13	2	97	15
Steel	7	32	9	41	3	14	2	9	1	5	0	0
Wood	2,400	33	2,142	30	890	12	376	5	221	3	1,212	17

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 234 hospital beds available for use. On the day of the scenario flood event, the model estimates that 234 hospital beds are available in the region.

Before the flood analyzed in this scenario, the region had 234 hospital beds available for use. On the day of the scenario flood event, the model estimates that 214 hospital beds are available in the region.

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Before the flood analyzed in this scenario, the region had 234 hospital beds available for use. On the day of the scenario flood event, the model estimates that 234 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	22	1	0	5
Hospitals	3	0	1	1
Police Stations	19	2	0	2
Schools	99	10	2	12

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

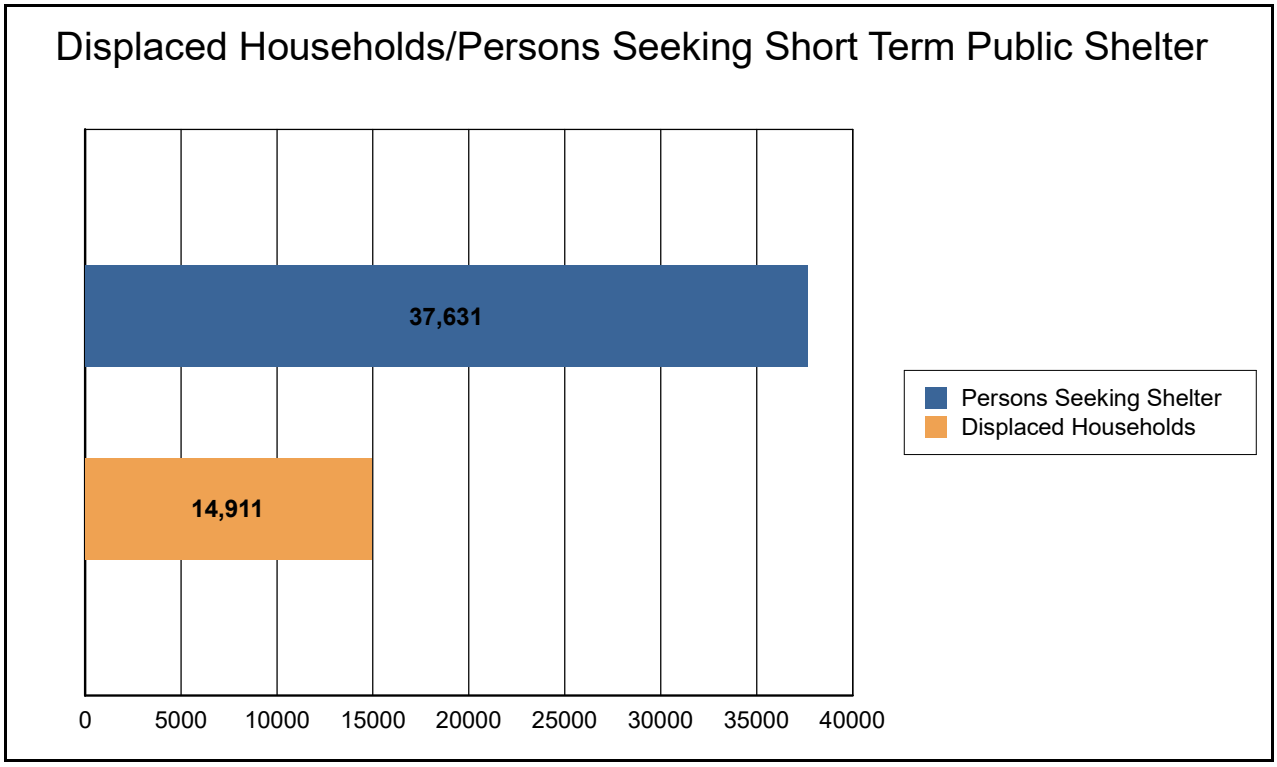
Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

Analysis has not been performed for this Scenario.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 14,911 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 37,631 people (out of a total population of 313,166) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,368.81 million dollars, which represents 8.65 % of the total replacement value of the scenario buildings.

Building-Related Losses

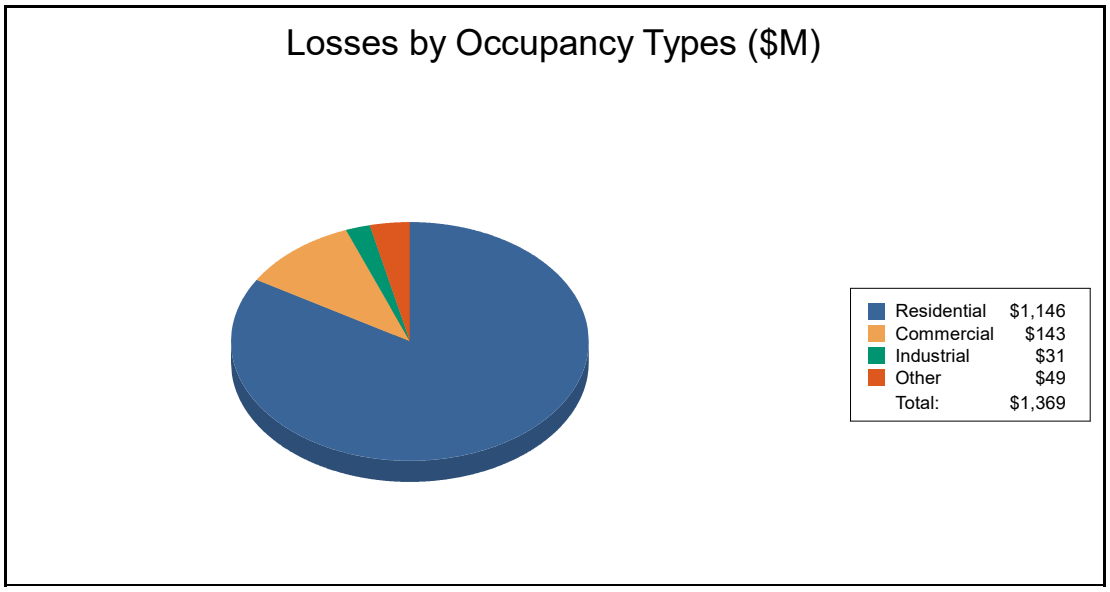
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 1,361.36 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 83.73% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	731.76	38.15	9.33	8.83	788.08
	Content	411.57	100.64	18.39	36.92	567.51
	Inventory	0.00	2.15	3.30	0.33	5.77
	Subtotal	**1,143.32**	**140.94**	**31.02**	**46.08**	**1,361.36**
Business Interruption						
	Income	0.04	0.84	0.00	0.46	1.34
	Relocation	2.13	0.17	0.00	0.19	2.49
	Rental Income	0.50	0.06	0.00	0.01	0.56
	Wage	0.10	1.02	0.00	1.94	3.06
	Subtotal	**2.76**	**2.09**	**0.00**	**2.61**	**7.45**
ALL	**Total**	**1,146.08**	**143.03**	**31.02**	**48.68**	**1,368.81**



Appendix A: County Listing for the Region

Texas

- Brazoria

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Texas				
Brazoria	313,166	29,401,709	4,397,274	33,798,983
Total	**313,166**	**29,401,709**	**4,397,274**	**33,798,983**
Total Study Region	**313,166**	**29,401,709**	**4,397,274**	**33,798,983**

Hazus-MH: Flood Global Risk Report

Region Name: Brazoria County

Flood Scenario: 500-year

Print Date: Wednesday, November 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Texas

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,443 square miles and contains 10,082 census blocks. The region contains over 107 thousand households and has a total population of 313,166 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 109,747 buildings in the region with a total building replacement value (excluding contents) of 33,799 million dollars (2010 dollars). Approximately 93.55% of the buildings (and 86.99% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 109,747 buildings in the region which have an aggregate total replacement value of 33,799 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	29,401,709	87.0%
Commercial	2,672,546	7.9%
Industrial	727,466	2.2%
Agricultural	72,129	0.2%
Religion	396,214	1.2%
Government	125,448	0.4%
Education	403,471	1.2%
Total	**33,798,983**	**100.0%**

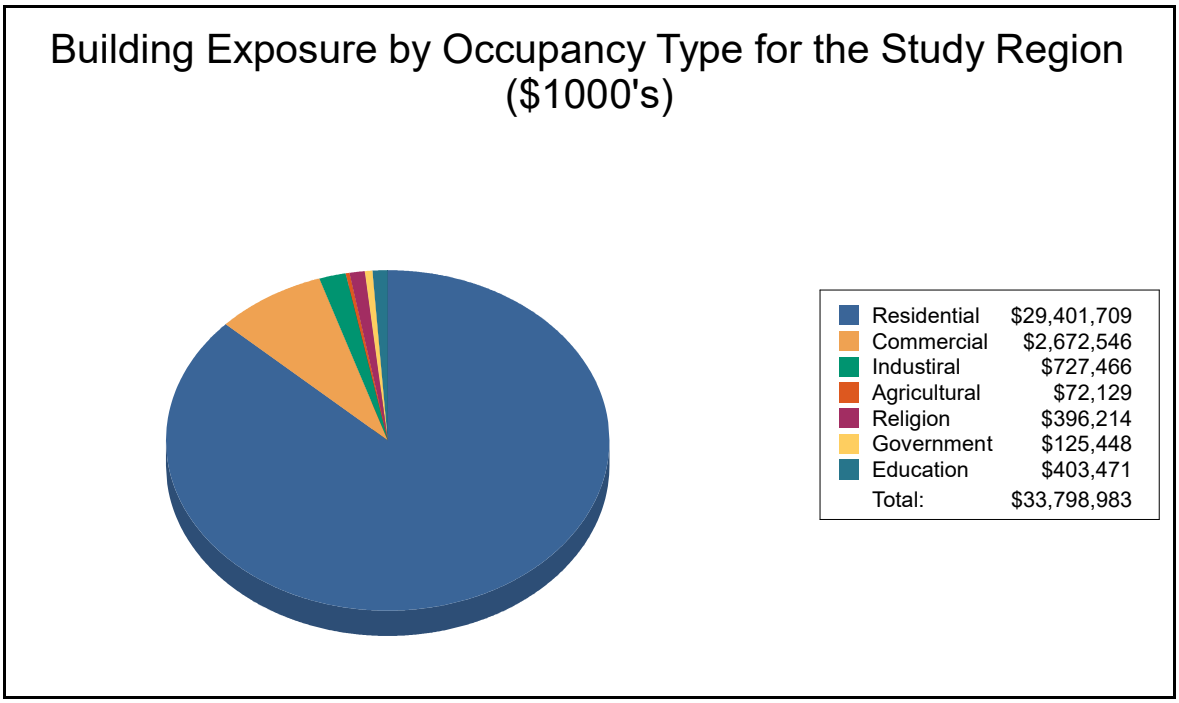
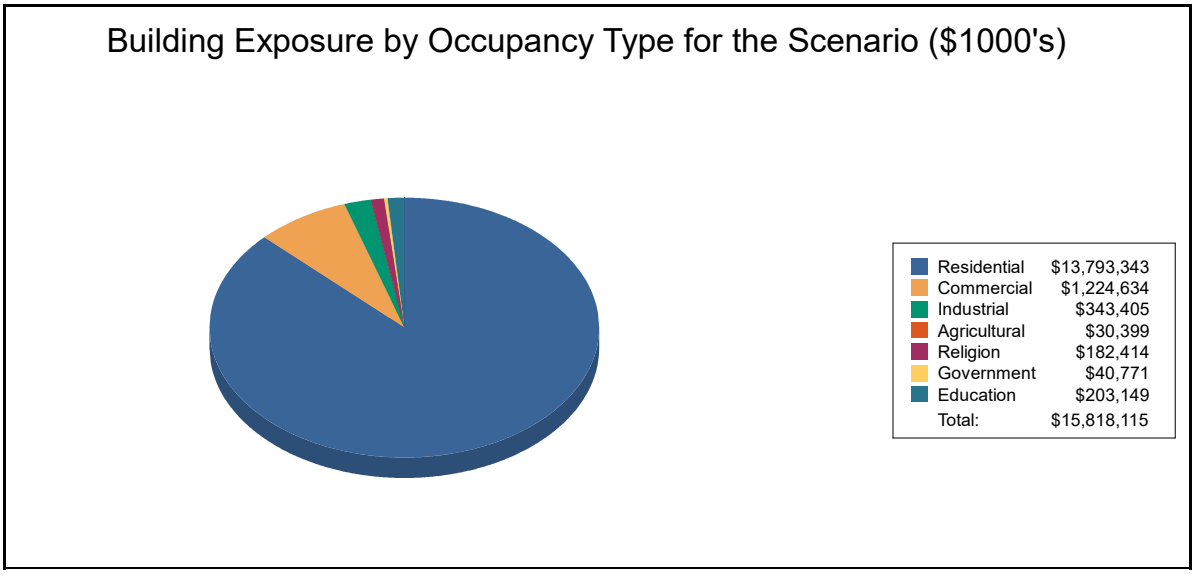


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	13,793,343	87.2%
Commercial	1,224,634	7.7%
Industrial	343,405	2.2%
Agricultural	30,399	0.2%
Religion	182,414	1.2%
Government	40,771	0.3%
Education	203,149	1.3%
Total	**15,818,115**	**100.0%**



Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 234 beds. There are 99 schools, 22 fire stations, 19 police stations and 1 emergency operation center.

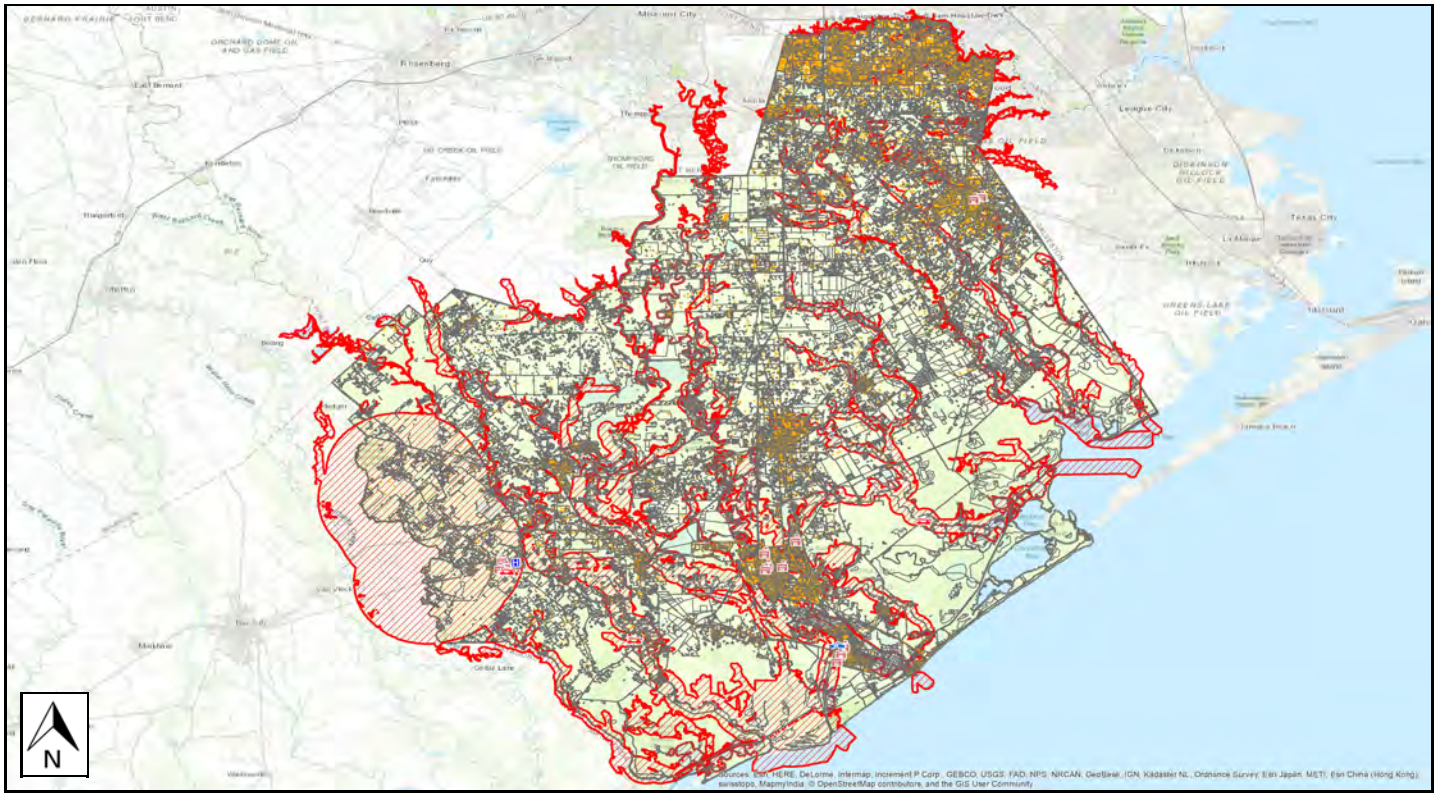
Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Brazoria County
Scenario Name:	500-Year
Return Period Analyzed:	500
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 8,194 buildings will be at least moderately damaged. This is over 57% of the total number of buildings in the scenario. There are an estimated 1,939 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

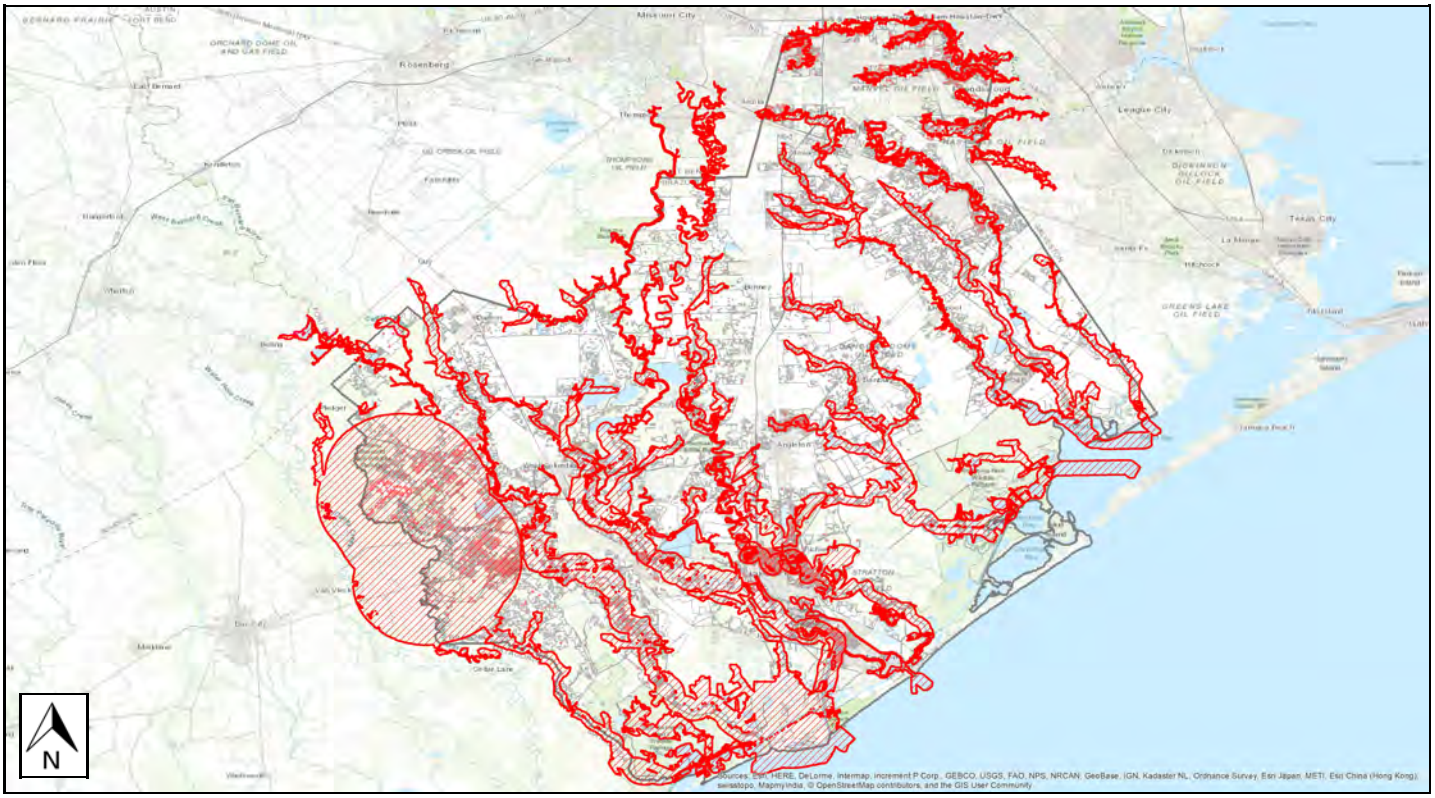


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00	1	50.00
Commercial	45	40.18	52	46.43	0	0.00	5	4.46	1	0.89	9	8.04
Education	7	87.50	0	0.00	1	12.50	0	0.00	0	0.00	0	0.00
Government	3	75.00	0	0.00	0	0.00	0	0.00	1	25.00	0	0.00
Industrial	7	29.17	9	37.50	1	4.17	1	4.17	2	8.33	4	16.67
Religion	9	64.29	4	28.57	1	7.14	0	0.00	0	0.00	0	0.00
Residential	3,361	29.32	3,508	30.61	1,409	12.29	782	6.82	477	4.16	1,925	16.79
Total	**3,432**		**3,574**		**1,412**		**788**		**481**		**1,939**	

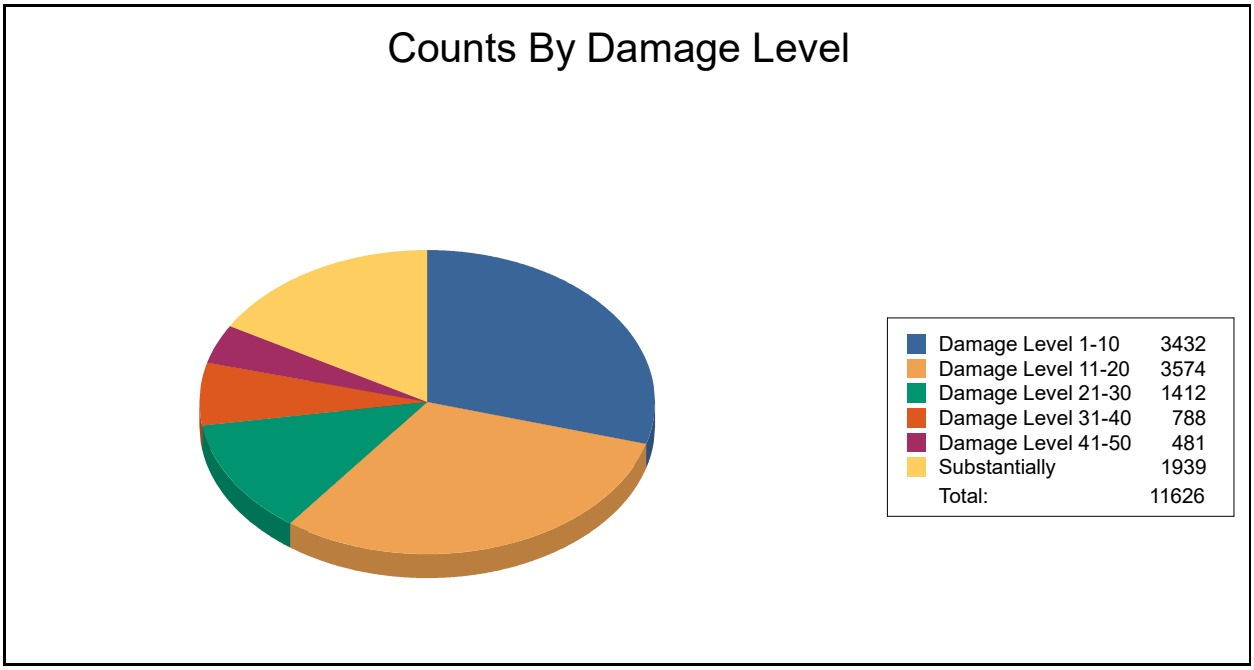


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	6	50	4	33	0	0	1	8	0	0	1	8
ManufHousing	73	11	81	12	59	9	0	0	53	8	391	60
Masonry	319	33	331	34	109	11	54	6	28	3	126	13
Steel	15	42	17	47	0	0	2	6	1	3	1	3
Wood	3,008	30	3,131	32	1,243	13	730	7	397	4	1,410	14

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 234 hospital beds available for use. On the day of the scenario flood event, the model estimates that 234 hospital beds are available in the region.

Before the flood analyzed in this scenario, the region had 234 hospital beds available for use. On the day of the scenario flood event, the model estimates that 234 hospital beds are available in the region.

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Before the flood analyzed in this scenario, the region had 234 hospital beds available for use. On the day of the scenario flood event, the model estimates that 214 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	22	3	1	5
Hospitals	3	1	0	1
Police Stations	19	1	1	2
Schools	99	10	2	16

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

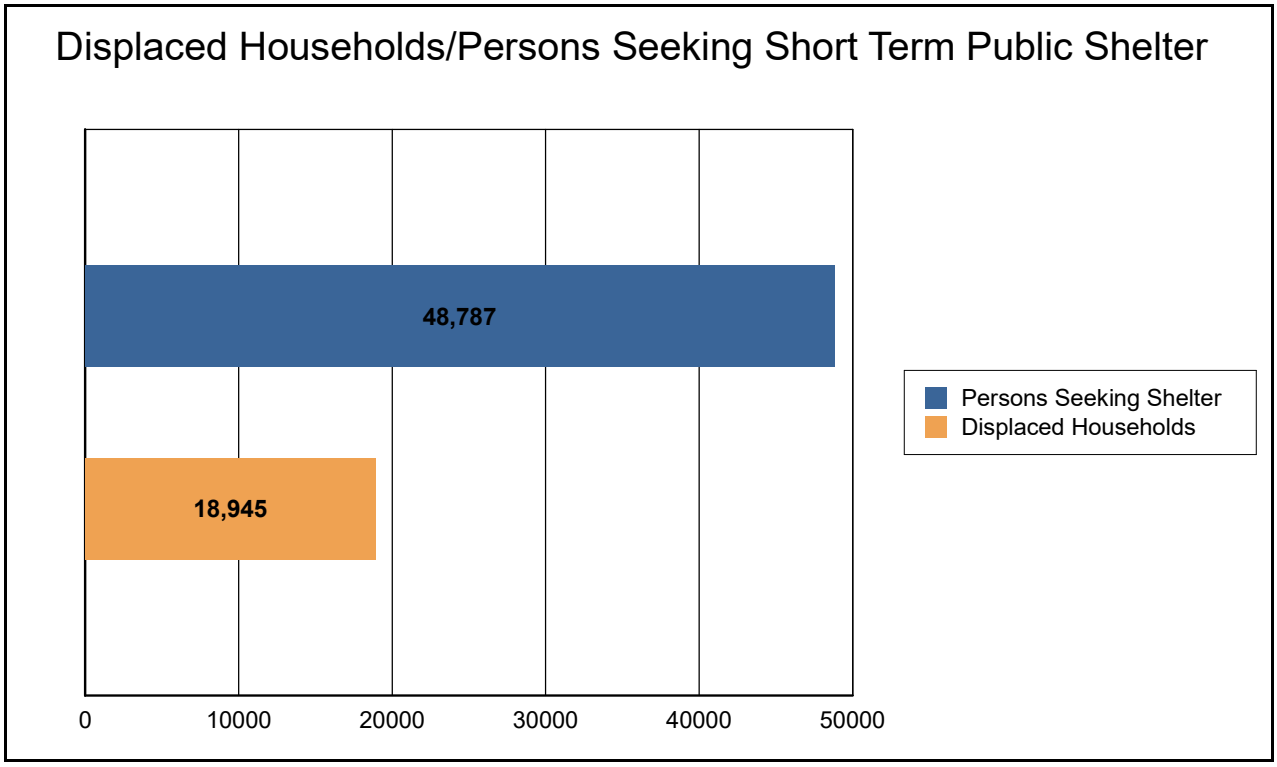
Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

Analysis has not been performed for this Scenario.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 18,945 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 48,787 people (out of a total population of 313,166) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 1,897.96 million dollars, which represents 12.00 % of the total replacement value of the scenario buildings.

Building-Related Losses

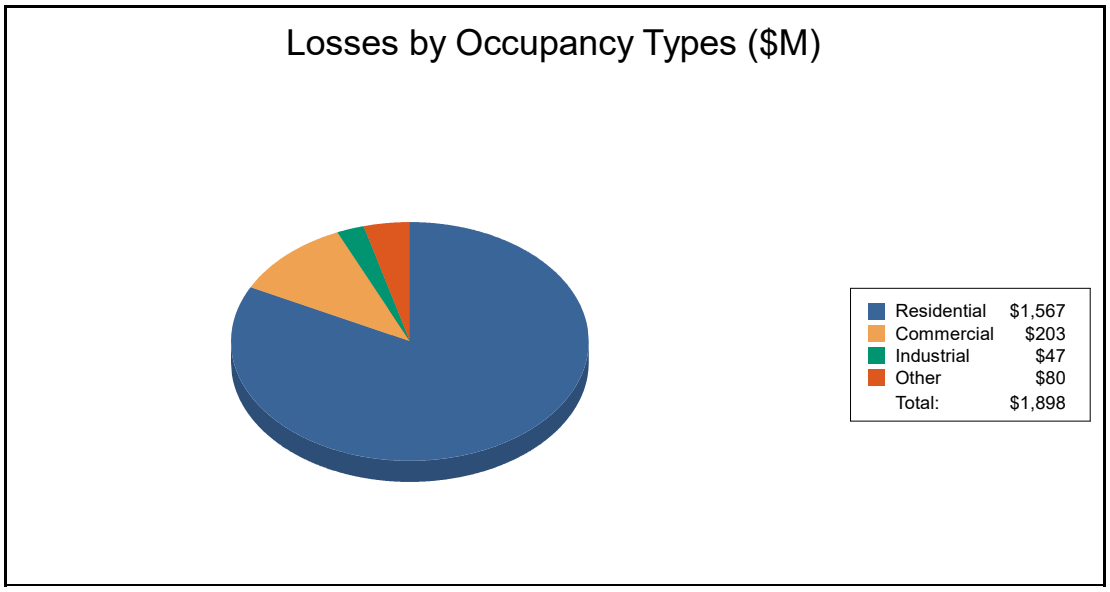
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 1,888.22 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 82.56% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1,004.77	55.72	14.30	16.99	1,091.78
	Content	558.62	141.18	27.87	59.84	787.51
	Inventory	0.00	3.47	5.06	0.40	8.92
	Subtotal	**1,563.39**	**200.37**	**47.23**	**77.23**	**1,888.22**
Business Interruption						
	Income	0.05	1.17	0.00	0.56	1.77
	Relocation	2.77	0.25	0.00	0.24	3.26
	Rental Income	0.66	0.11	0.00	0.01	0.78
	Wage	0.13	1.41	0.00	2.39	3.93
	Subtotal	**3.61**	**2.94**	**0.00**	**3.19**	**9.74**
ALL	**Total**	**1,566.99**	**203.32**	**47.23**	**80.43**	**1,897.96**



Appendix A: County Listing for the Region

Texas

- Brazoria

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Texas				
Brazoria	313,166	29,401,709	4,397,274	33,798,983
Total	**313,166**	**29,401,709**	**4,397,274**	**33,798,983**
Total Study Region	**313,166**	**29,401,709**	**4,397,274**	**33,798,983**

Hazus-MH: Hurricane Global Risk Report

Region Name: Brazoria County

Hurricane Scenario: Probabilistic 1000-year Return Period

Print Date: Wednesday, November 08, 2017

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Texas

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 1,443.05 square miles and contains 50 census tracts. There are over 106 thousand households in the region and has a total population of 313,166 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 109 thousand buildings in the region with a total building replacement value (excluding contents) of 33,799 million dollars (2014 dollars). Approximately 94% of the buildings (and 87% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 109,747 buildings in the region which have an aggregate total replacement value of 33,799 million (2014 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

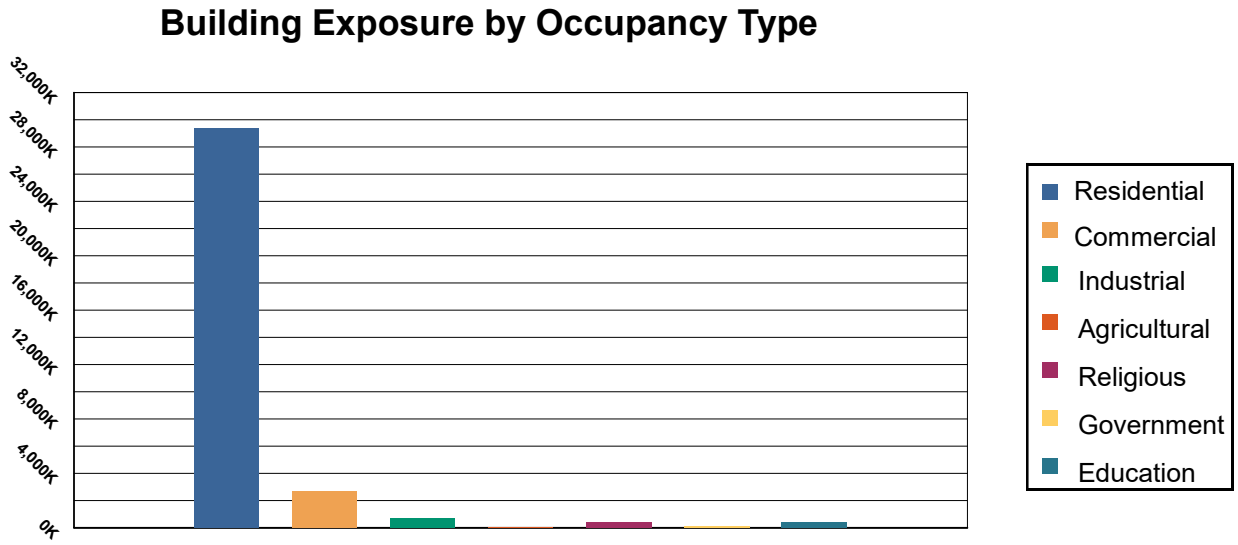


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	29,401,709	86.99 %
Commercial	2,672,546	7.91%
Industrial	727,466	2.15%
Agricultural	72,129	0.21%
Religious	396,214	1.17%
Government	125,448	0.37%
Education	403,471	1.19%
Total	**33,798,983**	**100.00%**

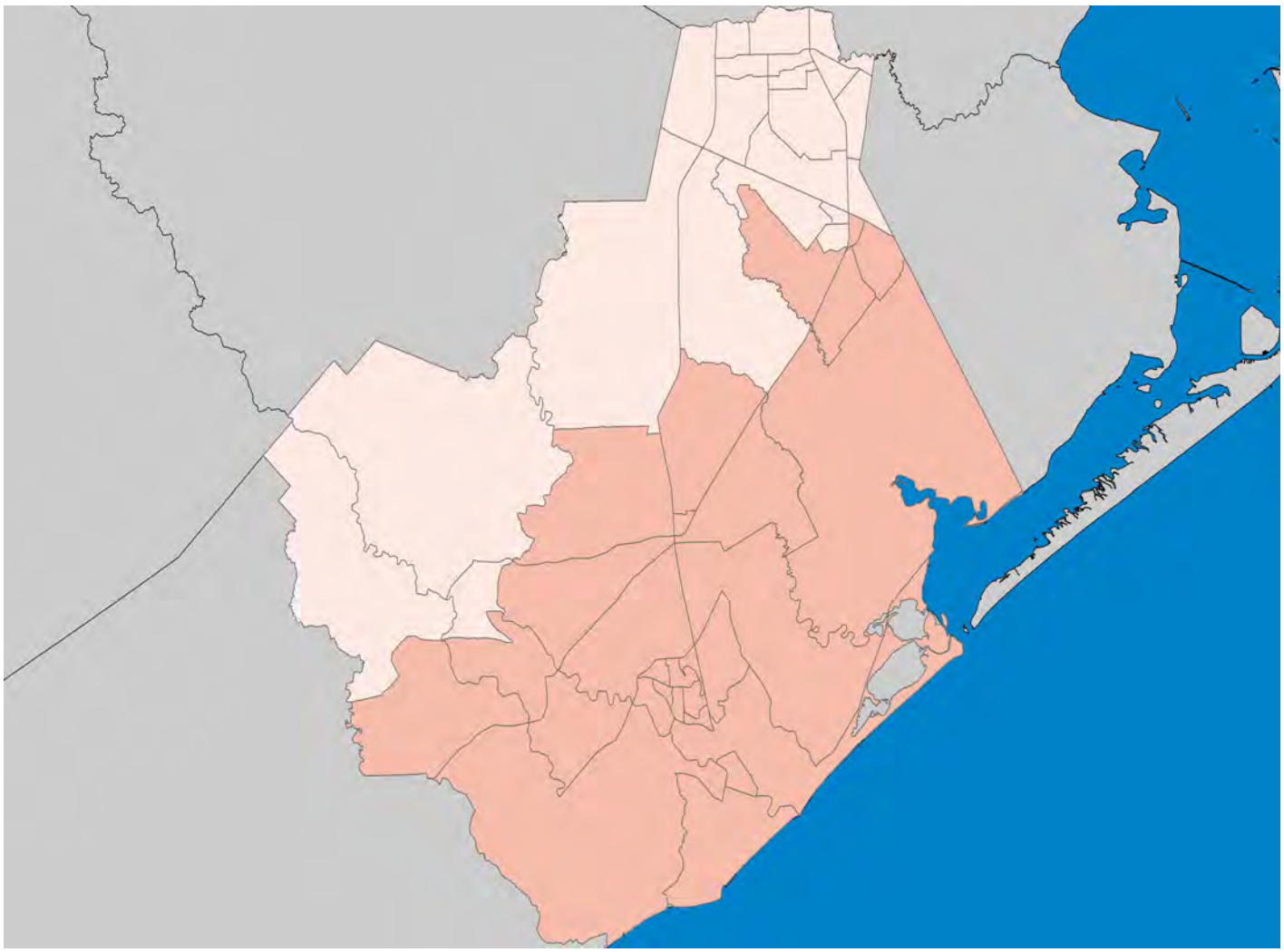
Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 234 beds. There are 99 schools, 22 fire stations, 19 police stations and 1 emergency operation facilities.

Hurricane Scenario

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Thematic Map with peak gust windfield and HU track



Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 66,546 buildings will be at least moderately damaged. This is over 61% of the total number of buildings in the region. There are an estimated 14,446 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

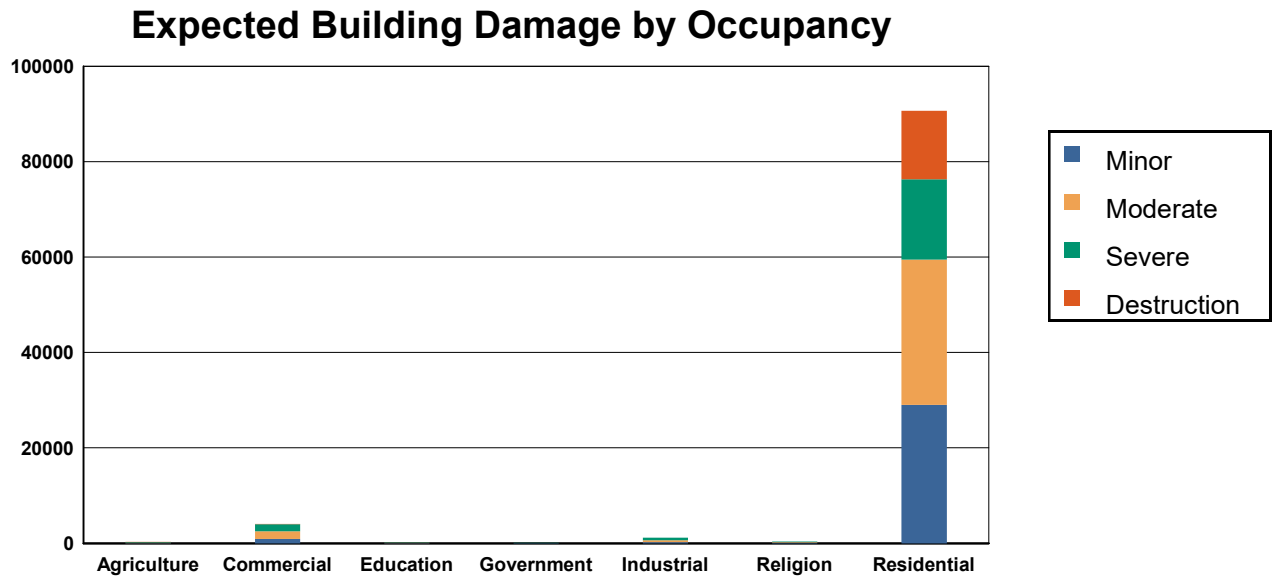


Table 2: Expected Building Damage by Occupancy : 1000 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	29	9.43	36	11.82	73	23.70	118	38.51	51	16.54
Commercial	580	12.44	900	19.29	1,595	34.17	1,533	32.85	58	1.24
Education	23	13.41	27	16.11	51	30.29	67	40.05	0	0.13
Government	16	12.10	21	16.32	40	30.79	53	40.51	0	0.28
Industrial	164	12.25	227	16.89	408	30.44	531	39.55	12	0.87
Religion	59	12.71	100	21.43	150	32.02	156	33.51	2	0.34
Residential	12,026	11.71	28,992	28.24	30,511	29.72	16,814	16.38	14,324	13.95
Total	**12,897**		**30,304**		**32,827**		**19,273**		**14,446**	

Table 3: Expected Building Damage by Building Type : 1000 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	78	12.16	79	12.19	210	32.55	278	43.06	0	0.04
Masonry	1,283	12.21	2,872	27.34	3,521	33.52	2,104	20.03	724	6.90
MH	10,784	79.16	388	2.85	747	5.49	245	1.80	1,458	10.70
Steel	201	12.92	177	11.38	472	30.36	684	44.01	21	1.32
Wood	8,196	10.26	24,205	30.29	23,998	30.03	13,803	17.27	9,714	12.15

Essential Facility Damage

Before the hurricane, the region had 234 hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (only 0.00%) are available for use by patients already in the hospital and those injured by the hurricane. After one week, 0.00% of the beds will be in service. By 30 days, 9.00% will be operational.

Thematic Map of Essential Facilities with greater than 50% moderate

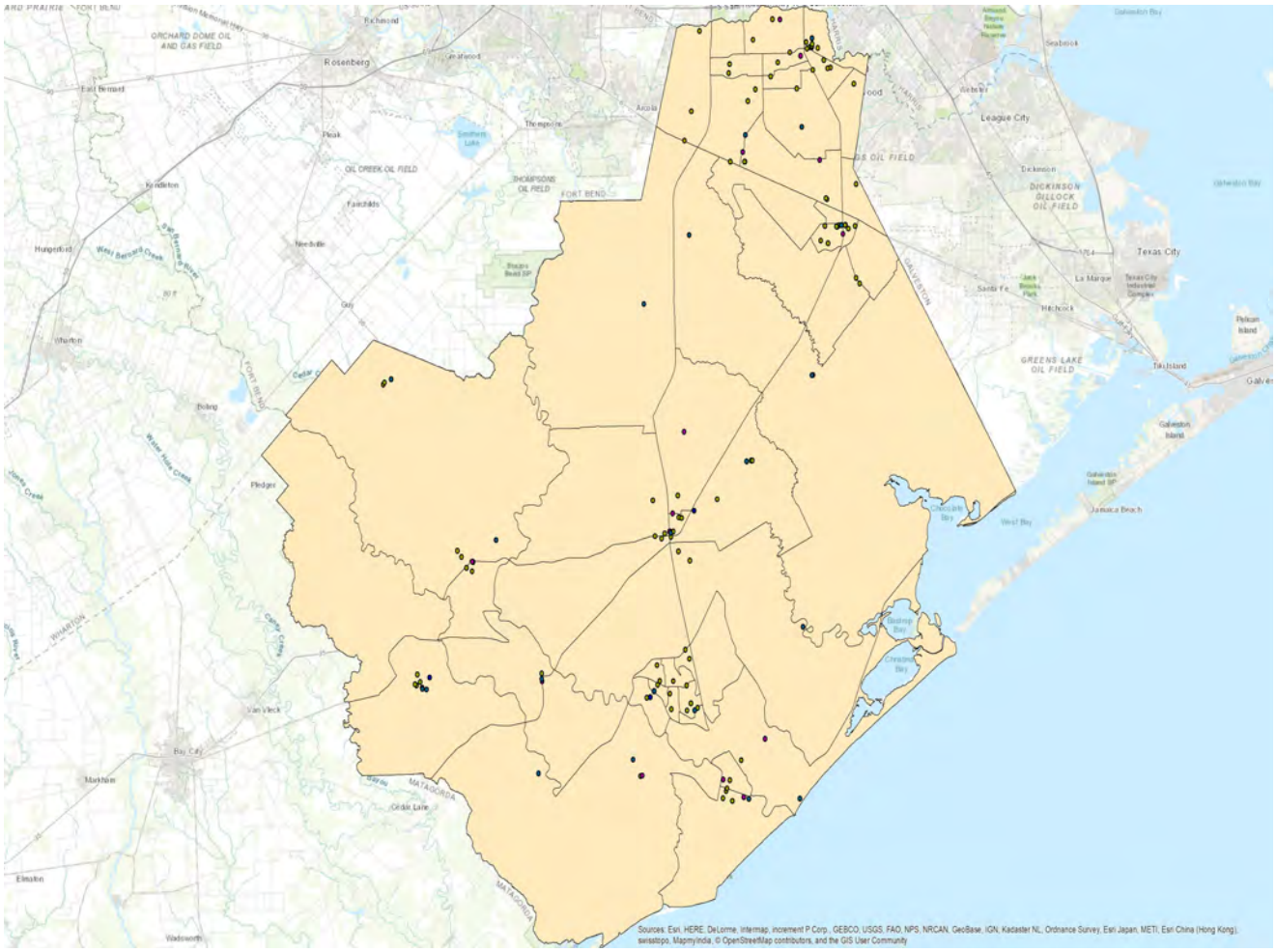
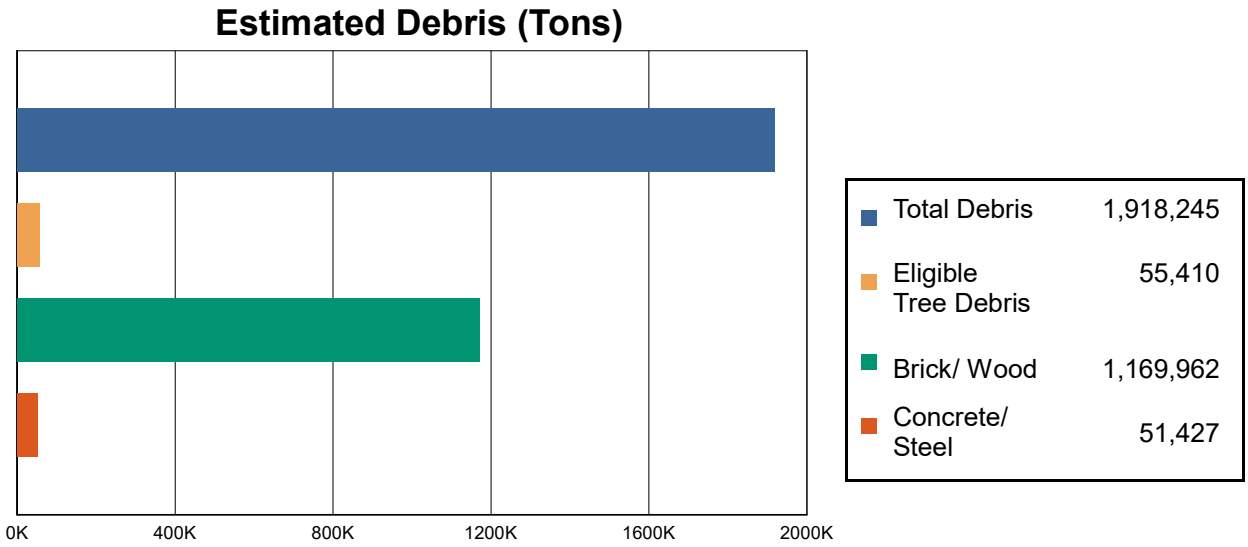


Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	1	0	1
Fire Stations	22	19	0	21
Hospitals	3	3	1	0
Police Stations	19	19	0	13
Schools	99	99	0	0

Induced Hurricane Damage

Debris Generation

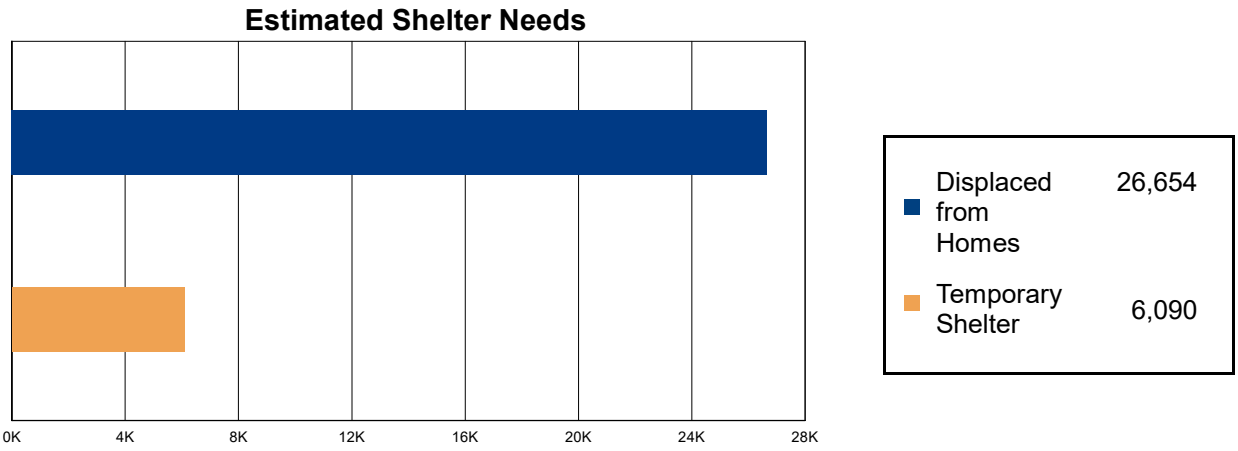


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 1,918,245 tons of debris will be generated. Of the total amount, 632,573 tons (33%) is Other Tree Debris. Of the remaining 1,285,672 tons, Brick/Wood comprises 91% of the total, Reinforced Concrete/Steel comprises of 4% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 49210 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 55,410 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

Social Impact

Shelter Requirement



Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 26,654 households to be displaced due to the hurricane. Of these, 6,090 people (out of a total population of 313,166) will seek temporary shelter in public shelters.

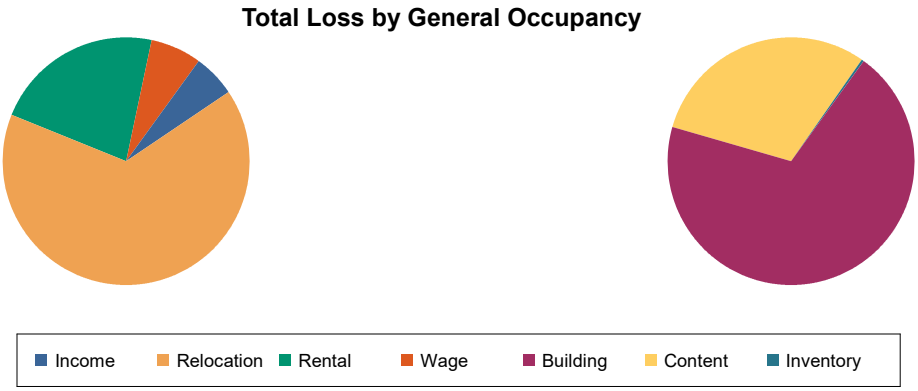
Economic Loss

The total economic loss estimated for the hurricane is 15296.8 million dollars, which represents 45.26 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 15,297 million dollars. 2% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 88% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



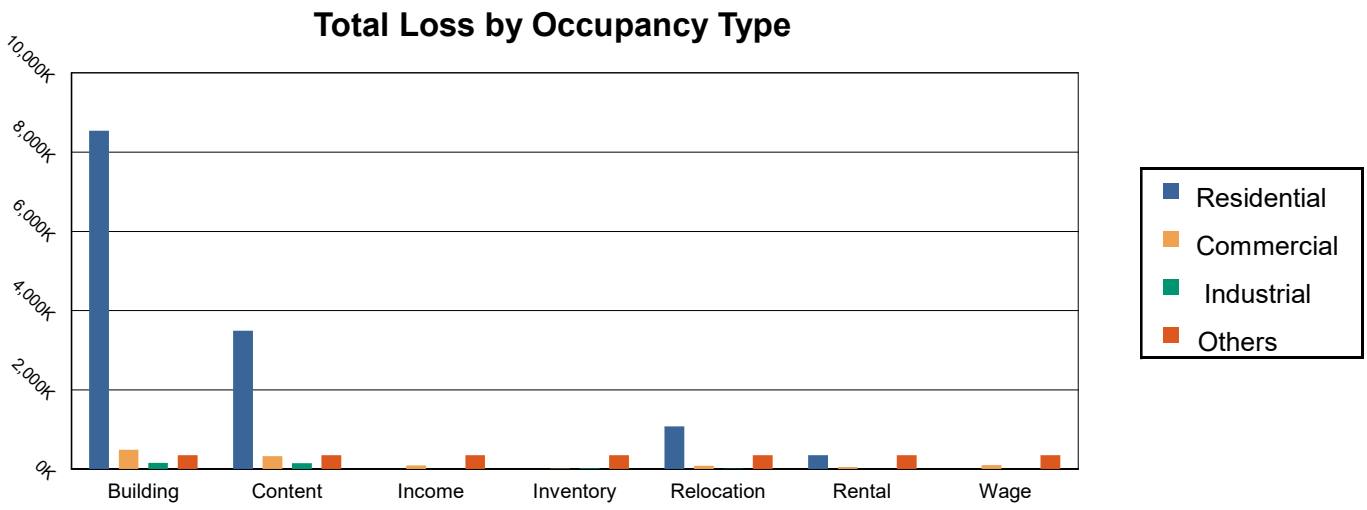


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	8,537,798.32	483,904.56	154,953.52	176,329.58	9,352,985.97
	Content	3,492,952.03	325,507.33	145,398.56	118,348.33	4,082,206.25
	Inventory	0.00	8,768.39	22,156.69	1,958.53	32,883.61
	Subtotal	**12,030,750.35**	**818,180.27**	**322,508.77**	**296,636.44**	**13,468,075.83**
Business Interruption Loss						
	Income	2,632.73	93,233.11	2,873.38	2,257.09	100,996.30
	Relocation	1,074,981.95	79,648.21	10,611.49	36,309.99	1,201,551.64
	Rental	351,253.79	49,340.11	2,059.39	3,844.42	406,497.71
	Wage	6,169.24	100,601.60	4,519.44	8,362.46	119,652.74
	Subtotal	**1,435,037.70**	**322,823.03**	**20,063.71**	**50,773.95**	**1,828,698.39**
Total						
	Total	**13,465,788.05**	**1,141,003.30**	**342,572.48**	**347,410.39**	**15,296,774.22**

Appendix A: County Listing for the Region

Texas
- Brazoria

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Texas				
Brazoria	313,166	29,401,709	4,397,274	33,798,983
Total	**313,166**	**29,401,709**	**4,397,274**	**33,798,983**
Study Region Total	**313,166**	**29,401,709**	**4,397,274**	**33,798,983**

Quick Assessment Report

November 8, 2017

Study Region : Brazoria County

Scenario : Probabilistic

Regional Statistics

Area (Square Miles)	1,443
Number of Census Tracts	50
Number of People in the Region	313,166

General Building Stock

Occupancy	*Building Count*	*Dollar Exposure ($ K)*
Residential	102,667	29,401,709
Commercial	4,666	2,672,546
Other	2,414	1,724,728
Total	109,747	33,798,983

Scenario Results

Number of Residential Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	390	13	0	0	403
20	12,270	1,472	51	72	13,865
50	29,314	9,603	1,523	1,232	41,672
100	24,995	13,995	4,376	3,486	46,852
200	29,961	19,406	8,370	6,715	64,452
500	31,997	27,467	13,405	11,857	84,725
1000	28,992	30,511	16,814	14,324	90,641

Number of Buildings Damaged

Return Period	*Minor*	*Moderate*	*Severe*	*Destruction*	*Total*
10	441	15	0	0	457
20	12,937	1,658	72	74	14,741
50	30,804	10,617	1,855	1,246	44,522
100	26,112	15,159	5,131	3,519	49,920
200	31,430	21,177	9,801	6,782	69,190
500	33,445	29,670	15,515	11,967	90,598
1000	30,304	32,827	19,273	14,446	96,850

Shelter Requirements

Return Period	*Displaced Households (#Households)*	*Short Term Shelter (#People)*
10	0	0
20	104	21
50	1,260	270
100	5,397	1,176
200	11,256	2,624
500	20,468	4,709
1000	26,654	6,090

Economic Loss (x 1000)

	Property Damage (Capital Stock) Losses		Business Interruption (Income) Losses
ReturnPeriod	Residential	Total	
10	35,116	35,813	795
20	344,228	364,500	33,776
50	1,725,419	1,909,965	288,220
100	3,552,626	3,960,211	577,756
200	5,693,060	6,555,734	985,210
500	9,483,735	10,702,035	1,524,986
1000	12,030,750	13,468,076	1,828,698
Annualized	128,635	144,315	20,474

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

2017

Appendix D – Repetitive Loss Properties

APPENDIX D: REPETITIVE LOSS PROPERTIES

ID Number	Community Name	Insured?	Occupancy	Losses	Total Paid	SRL Indicator
0043136	Alvin, City of	No	Single Fmly	2	46,237.00	
0039608	Alvin, City of	No	Single Fmly	2	26,568.39	
0025303	Alvin, City of	No	Single Fmly	2	33,855.89	
0025979	Alvin, City of	No	Single Fmly	2	20,093.44	
0034406	Alvin, City of	No	Single Fmly	2	22,603.52	
0037725	Alvin, City of	No	Single Fmly	2	28,011.42	
0044696	Alvin, City of	No	Single Fmly	4	42,795.95	
0045113	Alvin, City of	No	Single Fmly	3	31,783.93	
0017532	Alvin, City of	No	Other Resid	3	80,190.94	
0025767	Alvin, City of	No	Single Fmly	2	15,013.86	
0018679	Alvin, City of	No	Single Fmly	2	16,362.74	
0025650	Alvin, City of	No	Single Fmly	8	194,513.27	VU
0025914	Alvin, City of	Sdf	Single Fmly	5	140,630.86	V
0186126	Alvin, City of	No	Single Fmly	2	13,736.02	
0017530	Alvin, City of	No	Other Resid	2	41,622.42	
0017531	Alvin, City of	No	Other Resid	2	42,543.60	
0119332	Alvin, City of	No	Single Fmly	2	7,028.87	
0038459	Alvin, City of	No	Single Fmly	2	8,001.13	
0091027	Alvin, City of	Yes	Single Fmly	7	112,386.10	V
0172629	Alvin, City of	No	Single Fmly	4	51,396.47	VU
0186127	Alvin, City of	No	Single Fmly	2	42,779.08	
0262697	Alvin, City of	Yes	Single Fmly	2	187,084.33	
0093931	Alvin, City of	Yes	Single Fmly	4	45,562.95	
0181441	Alvin, City of	No	Single Fmly	2	29,500.92	
0002706	Alvin, City of	No	Single Fmly	7	25,295.97	
0012934	Alvin, City of	No	Single Fmly	2	24,694.51	
0044043	Alvin, City of	No	Single Fmly	2	37,764.26	
0017471	Alvin, City of	No	Single Fmly	2	23,186.56	
0115764	Alvin, City of	No	Single Fmly	2	44,839.61	
0012871	Alvin, City of	No	Assmd Condo	8	93,909.49	VU
0186547	Alvin, City of	Yes	Single Fmly	3	129,834.67	
0013252	Alvin, City of	No	Single Fmly	8	134,372.79	VU
0262686	Alvin, City of	Yes	Single Fmly	2	71,774.23	
0091319	Alvin, City of	No	Single Fmly	3	36,007.08	
0186093	Alvin, City of	No	Single Fmly	2	5,770.49	
0179567	Alvin, City of	No	Single Fmly	2	7,182.03	
0185406	Alvin, City of	No	Single Fmly	2	16,430.78	
0044581	Alvin, City of	No	Othr-Nonres	5	41,072.42	VNU
0035331	Alvin, City of	No	Single Fmly	2	35,300.95	
0083529	Alvin, City of	No	Othr-Nonres	3	14,522.54	
0211587	Alvin, City of	No	2-4 Family	2	62,991.36	
0186085	Alvin, City of	Yes	Single Fmly	2	71,096.80	
0262683	Alvin, City of	Yes	Single Fmly	2	26,038.70	
0212640	Alvin, City of	Yes	Single Fmly	2	12,786.90	
0186118	Alvin, City of	No	Single Fmly	2	14,338.60	
0108987	Alvin, City of	Sdf	Single Fmly	6	283,637.73	V
0169739	Alvin, City of	No	Single Fmly	4	63,000.73	
0025156	Alvin, City of	No	Othr-Nonres	2	16,815.93	
0096873	Alvin, City of	Yes	Single Fmly	5	60,338.99	
0186548	Alvin, City of	No	Single Fmly	2	65,545.18	
0018615	Alvin, City of	No	Single Fmly	3	17,930.71	

0068838	Alvin, City of	No	Single Fmly	2	5,081.69	
0186160	Alvin, City of	Yes	Single Fmly	2	111,779.18	
0044364	Alvin, City of	No	Othr-Nonres	2	4,271.50	
0002937	Alvin, City of	No	Single Fmly	5	67,573.24	VU
0185925	Alvin, City of	Yes	Single Fmly	3	94,036.24	
0025983	Alvin, City of	No	Single Fmly	2	14,718.00	
0036616	Alvin, City of	No	Single Fmly	2	39,416.14	
0181159	Alvin, City of	Yes	Single Fmly	3	102,127.05	
0183779	Alvin, City of	No	Single Fmly	3	103,657.68	
0025954	Alvin, City of	No	Single Fmly	2	14,712.84	
0068830	Alvin, City of	Yes	Single Fmly	5	65,560.64	
0069910	Alvin, City of	No	Single Fmly	3	42,033.54	
0185441	Alvin, City of	No	Assmd Condo	2	11,752.61	
0185254	Alvin, City of	No	Single Fmly	2	23,884.08	
0091026	Alvin, City of	No	Single Fmly	3	42,891.30	
0094233	Alvin, City of	Yes	Single Fmly	3	60,116.71	
0262682	Alvin, City of	Yes	Single Fmly	2	88,131.69	
0185383	Alvin, City of	No	Single Fmly	2	13,526.00	
0096871	Alvin, City of	No	Othr-Nonres	2	6,963.84	
0044015	Alvin, City of	No	Single Fmly	2	14,599.11	
0018500	Alvin, City of	Yes	Single Fmly	3	25,277.78	
0026659	Alvin, City of	Yes	Single Fmly	3	20,239.02	
0026843	Alvin, City of	No	Single Fmly	2	23,820.71	
0025092	Alvin, City of	No	Single Fmly	2	20,630.71	
0096878	Alvin, City of	Yes	Single Fmly	5	141,139.80	V
0185556	Alvin, City of	Yes	Single Fmly	3	49,718.70	
0039734	Alvin, City of	No	Single Fmly	2	15,500.00	
0169084	Alvin, City of	No	Single Fmly	4	69,887.87	VU
0262698	Alvin, City of	Yes	Single Fmly	2	63,132.53	
0026006	Alvin, City of	Sdf	Single Fmly	7	205,694.67	V
0180165	Alvin, City of	Yes	Single Fmly	4	81,023.75	
0025896	Alvin, City of	Sdf	Single Fmly	4	106,073.60	V
0118860	Alvin, City of	Sdf	Single Fmly	4	54,609.94	V
0038040	Alvin, City of	No	Single Fmly	5	68,622.29	
0185093	Alvin, City of	Yes	Single Fmly	3	92,324.27	P
0068846	Alvin, City of	Sdf	Single Fmly	7	178,132.27	V
0180134	Alvin, City of	Yes	Single Fmly	4	115,985.68	V
0185562	Alvin, City of	Yes	Single Fmly	2	28,956.16	
0040526	Alvin, City of	No	Single Fmly	4	5,210.36	
0017301	Alvin, City of	Yes	Single Fmly	2	18,418.99	
0168559	Alvin, City of	Yes	Single Fmly	2	12,584.46	
0026052	Alvin, City of	No	Single Fmly	2	12,032.80	PU
0045107	Alvin, City of	Yes	Single Fmly	5	104,082.22	P
0134935	Alvin, City of	No	Single Fmly	3	36,800.83	
0068827	Alvin, City of	No	Single Fmly	2	19,223.06	
0018475	Alvin, City of	No	Single Fmly	2	21,348.16	
0026317	Alvin, City of	No	Single Fmly	2	18,965.02	
0068828	Alvin, City of	No	Single Fmly	2	28,595.87	
0026446	Alvin, City of	No	Single Fmly	2	21,256.83	
0017492	Alvin, City of	No	Single Fmly	2	30,687.64	
0018380	Alvin, City of	Yes	Single Fmly	5	90,867.84	V
0043905	Alvin, City of	No	Other Resid	3	27,292.20	
0037512	Alvin, City of	No	Other Resid	2	21,030.00	
0043906	Alvin, City of	No	Other Resid	2	26,908.39	

0045108	Alvin, City of	No	Single Fmly	2	6,979.62	
0068832	Alvin, City of	No	Othr-Nonres	2	38,098.65	
0068835	Alvin, City of	Yes	Single Fmly	3	46,801.13	
0044706	Alvin, City of	Yes	Single Fmly	3	80,912.91	
0118804	Alvin, City of	No	Single Fmly	5	101,968.74	MVU
0168132	Alvin, City of	No	Single Fmly	5	105,449.79	MVU
0069902	Alvin, City of	Yes	Single Fmly	4	159,106.93	MV
0017797	Angleton, City of	No	Single Fmly	2	13,339.47	
0039824	Angleton, City of	No	Single Fmly	2	18,699.13	
0017798	Angleton, City of	No	Othr-Nonres	2	13,084.37	
0026690	Angleton, City of	No	Single Fmly	2	5,676.81	
0046456	Angleton, City of	No	2-4 Family	2	4,952.81	
0098432	Angleton, City of	No	Single Fmly	2	4,227.05	
0042414	Angleton, City of	No	Single Fmly	10	150,187.03	VU
0038393	Angleton, City of	No	Single Fmly	2	6,612.14	
0004492	Angleton, City of	No	Single Fmly	2	17,486.92	
0068987	Angleton, City of	No	Single Fmly	4	12,787.95	
0241877	Angleton, City of	No	Single Fmly	2	60,037.03	
0000800	Angleton, City of	No	Single Fmly	9	164,910.64	VU
0001873	Angleton, City of	Sdf	Single Fmly	8	164,011.86	V
0026135	Angleton, City of	Sdf	Single Fmly	5	52,195.91	V
0068991	Angleton, City of	No	Single Fmly	2	8,274.56	
0093902	Angleton, City of	No	Single Fmly	2	28,842.08	
0045764	Angleton, City of	No	Single Fmly	3	20,609.62	
0037424	Angleton, City of	Sdf	Single Fmly	4	78,309.75	V
0068978	Angleton, City of	Yes	Single Fmly	2	12,980.02	
0013091	Angleton, City of	No	Single Fmly	2	5,490.38	
0077125	Angleton, City of	No	Single Fmly	2	16,618.44	
0025350	Angleton, City of	No	Single Fmly	6	92,122.44	VU
0118938	Angleton, City of	No	Single Fmly	2	5,793.80	
0069694	Angleton, City of	No	Single Fmly	2	3,868.55	
0017804	Angleton, City of	Sdf	Single Fmly	5	40,198.06	V
0241492	Angleton, City of	No	Single Fmly	2	7,526.06	
0262773	Angleton, City of	Yes	Single Fmly	2	26,725.19	
0093940	Angleton, City of	No	Single Fmly	2	9,092.40	
0043406	Angleton, City of	No	Single Fmly	2	8,420.82	
0026358	Angleton, City of	No	Single Fmly	5	10,667.28	
0045057	Angleton, City of	No	Single Fmly	2	7,010.74	
0038461	Angleton, City of	No	Single Fmly	5	27,090.94	
0043608	Angleton, City of	No	Single Fmly	5	27,642.42	
0046301	Angleton, City of	No	Single Fmly	4	18,292.72	
0167356	Angleton, City of	Yes	Single Fmly	2	17,241.21	
0068984	Angleton, City of	No	Single Fmly	2	11,789.94	
0042918	Angleton, City of	Yes	Single Fmly	2	13,619.03	
0026560	Angleton, City of	No	Single Fmly	2	11,459.55	
0018586	Angleton, City of	No	Single Fmly	2	9,886.00	
0042272	Angleton, City of	Yes	Single Fmly	3	28,965.49	
0017510	Angleton, City of	Yes	Single Fmly	3	41,981.64	
0170982	Angleton, City of	No	Single Fmly	2	24,257.32	
0168453	Angleton, City of	No	Single Fmly	3	33,212.86	
0170983	Angleton, City of	No	Single Fmly	2	8,798.36	
0037487	Angleton, City of	No	Single Fmly	2	27,871.12	
0026467	Angleton, City of	No	Single Fmly	2	21,501.07	
0033619	Angleton, City of	No	Single Fmly	2	26,082.85	

0042755	Angleton, City of	Yes	Single Fmly	2	19,006.41	
0025582	Angleton, City of	No	Single Fmly	2	26,698.91	
0026842	Angleton, City of	No	Single Fmly	7	187,020.51	VU
0046353	Angleton, City of	No	Othr-Nonres	2	13,769.00	
0068986	Angleton, City of	Yes	Single Fmly	3	23,985.96	
0035285	Angleton, City of	No	Othr-Nonres	2	6,024.22	
0026841	Angleton, City of	Sdf	Single Fmly	5	85,722.42	V
0008370	Angleton, City of	No	Single Fmly	5	30,652.15	
0241631	Angleton, City of	Yes	Single Fmly	2	7,395.80	
0026008	Angleton, City of	No	Single Fmly	2	6,994.09	
0172280	Angleton, City of	Yes	Single Fmly	3	31,541.81	
0026130	Angleton, City of	No	Single Fmly	2	9,132.30	
0043634	Angleton, City of	No	Single Fmly	2	6,810.00	
0017793	Angleton, City of	No	Single Fmly	2	3,067.75	
0043453	Angleton, City of	No	Single Fmly	2	3,127.62	
0262771	Angleton, City of	Yes	Single Fmly	2	312,767.59	P
0036349	Angleton, City of	No	Single Fmly	2	8,256.94	
0077080	Angleton, City of	No	Single Fmly	2	10,272.60	
0017816	Angleton, City of	No	Single Fmly	7	59,498.02	VU
0068989	Angleton, City of	No	Single Fmly	2	3,654.45	
0017767	Angleton, City of	No	Single Fmly	2	9,849.88	
0004923	Angleton, City of	No	Single Fmly	5	87,727.10	VU
0025555	Angleton, City of	Yes	Single Fmly	2	9,853.65	
0068980	Angleton, City of	No	Othr-Nonres	3	13,578.75	
0068981	Angleton, City of	No	Single Fmly	5	149,997.94	VU
0012898	Angleton, City of	Sdf	Single Fmly	7	207,224.97	V
0013043	Angleton, City of	No	Single Fmly	3	35,932.96	
0245319	Angleton, City of	No	Single Fmly	2	3,756.88	
0171472	Angleton, City of	No	Othr-Nonres	2	49,100.41	
0048719	Angleton, City of	No	Othr-Nonres	5	64,163.10	
0044660	Angleton, City of	No	Othr-Nonres	3	61,780.79	
0044863	Angleton, City of	No	Othr-Nonres	2	42,729.35	
0076302	Angleton, City of	No	Single Fmly	5	16,119.39	
0025891	Angleton, City of	Sdf	Single Fmly	5	121,991.97	V
0044609	Angleton, City of	Sdf	Single Fmly	6	139,804.41	V
0044942	Angleton, City of	Yes	Single Fmly	5	59,951.62	
0068976	Angleton, City of	Yes	Single Fmly	4	50,211.98	
0036903	Angleton, City of	No	Single Fmly	2	22,058.94	
0167354	Angleton, City of	Yes	Othr-Nonres	3	204,873.67	
0097093	Angleton, City of	No	Single Fmly	2	20,080.99	
0025112	Angleton, City of	No	Other Resid	4	14,599.58	
0025113	Angleton, City of	No	Other Resid	4	31,765.86	
0001868	Angleton, City of	No	Other Resid	5	33,675.70	
0033296	Angleton, City of	No	2-4 Family	2	22,194.18	
0045291	Angleton, City of	No	Assmd Condo	2	30,634.19	
0258541	Baileys Prairie, Village of	Yes	Single Fmly	2	284,896.09	
0262774	Baileys Prairie, Village of	Yes	Single Fmly	2	257,250.74	
0119199	Baileys Prairie, Village of	No	Single Fmly	3	76,074.94	
0260309	Baileys Prairie, Village of	Yes	Single Fmly	2	29,569.12	
0258526	Baileys Prairie, Village of	Yes	Single Fmly	2	137,768.45	
0250014	Baileys Prairie, Village of	Yes	Single Fmly	3	322,423.97	P
0013179	Baileys Prairie, Village of	Yes	Single Fmly	3	137,908.79	
0260268	Baileys Prairie, Village of	Yes	Single Fmly	2	242,743.61	P
0259946	Baileys Prairie, Village of	Yes	Single Fmly	2	79,809.46	

0017490	Brazoria County	No	Assmd Condo	2	12,043.88	
0017609	Brazoria County	No	Single Fmly	2	24,880.66	
0048508	Brazoria County	No	Single Fmly	2	7,031.65	
0018519	Brazoria County	No	Single Fmly	2	7,187.06	
0041008	Brazoria County	No	Single Fmly	2	3,946.10	
0025212	Brazoria County	No	Single Fmly	3	6,450.08	
0038788	Brazoria County	No	Single Fmly	2	4,814.82	
0025662	Brazoria County	No	Single Fmly	3	9,888.99	
0026721	Brazoria County	No	Unknown	2	28,495.94	
0015991	Brazoria County	No	Single Fmly	2	25,547.26	
0038638	Brazoria County	No	Single Fmly	2	16,608.61	PU
0041786	Brazoria County	No	Single Fmly	2	5,105.06	
0017543	Brazoria County	No	Single Fmly	4	97,583.69	
0026798	Brazoria County	No	Single Fmly	3	50,685.00	
0017452	Brazoria County	No	Single Fmly	2	34,716.83	
0018567	Brazoria County	No	Single Fmly	3	80,966.83	
0018559	Brazoria County	No	Single Fmly	2	18,071.81	
0016094	Brazoria County	No	Single Fmly	2	4,254.77	
0015990	Brazoria County	No	Single Fmly	4	33,437.04	
0036167	Brazoria County	No	Single Fmly	3	54,332.15	
0035346	Brazoria County	No	Single Fmly	2	14,367.73	
0043105	Brazoria County	No	Single Fmly	2	42,431.12	
0045452	Brazoria County	No	Single Fmly	2	4,743.92	
0037731	Brazoria County	No	Single Fmly	3	6,119.59	
0041184	Brazoria County	No	Single Fmly	3	11,069.46	
0069967	Brazoria County	No	Single Fmly	2	50,822.91	
0071507	Brazoria County	No	Single Fmly	2	54,833.36	
0026033	Brazoria County	No	Single Fmly	2	31,132.88	
0045541	Brazoria County	No	Single Fmly	2	24,714.61	
0026319	Brazoria County	No	Single Fmly	2	25,814.74	
0040644	Brazoria County	No	Single Fmly	2	36,747.17	
0026524	Brazoria County	No	Single Fmly	2	22,037.00	
0037485	Brazoria County	No	Single Fmly	2	28,641.59	
0037251	Brazoria County	No	Single Fmly	2	29,718.42	
0017514	Brazoria County	No	Single Fmly	2	56,118.69	
0039205	Brazoria County	No	Single Fmly	3	6,959.50	
0044406	Brazoria County	No	Single Fmly	2	44,308.83	
0026527	Brazoria County	No	Unknown	2	6,427.00	
0017612	Brazoria County	No	Single Fmly	3	10,701.05	
0015181	Brazoria County	No	Assmd Condo	2	29,901.70	
0017567	Brazoria County	No	Single Fmly	2	53,334.84	
0045810	Brazoria County	No	Single Fmly	3	21,362.59	
0043640	Brazoria County	No	Single Fmly	2	24,819.59	
0026372	Brazoria County	No	Single Fmly	3	30,100.74	
0045662	Brazoria County	No	Single Fmly	2	4,329.50	
0043301	Brazoria County	No	Single Fmly	3	8,745.33	
0035676	Brazoria County	No	Single Fmly	2	25,743.10	
0045069	Brazoria County	No	Single Fmly	2	38,851.11	
0039449	Brazoria County	No	Single Fmly	3	43,503.06	
0045227	Brazoria County	No	Single Fmly	2	12,194.03	
0044711	Brazoria County	No	Single Fmly	2	11,296.84	
0042669	Brazoria County	No	Single Fmly	2	23,195.62	
0002700	Brazoria County	No	Single Fmly	7	89,447.38	
0026824	Brazoria County	No	Single Fmly	2	21,754.08	

0044943	Brazoria County	No	Single Fmly	3	8,393.36	
0048431	Brazoria County	No	Single Fmly	2	2,597.46	
0045341	Brazoria County	No	Single Fmly	2	10,325.61	
0025216	Brazoria County	No	Single Fmly	3	66,055.89	
0026867	Brazoria County	No	Single Fmly	6	112,395.92	VU
0045167	Brazoria County	No	Single Fmly	2	10,687.78	
0068235	Brazoria County	No	Single Fmly	2	19,689.07	
0018638	Brazoria County	No	Single Fmly	2	13,400.00	
0025348	Brazoria County	No	Single Fmly	2	55,238.96	
0038750	Brazoria County	No	Single Fmly	2	17,041.72	
0025758	Brazoria County	No	Single Fmly	3	9,500.73	
0041510	Brazoria County	No	Single Fmly	2	17,218.96	
0026778	Brazoria County	No	Single Fmly	2	7,289.00	
0038506	Brazoria County	No	Single Fmly	2	6,481.31	
0044355	Brazoria County	No	Single Fmly	2	4,801.55	
0045525	Brazoria County	No	Single Fmly	2	10,620.01	
0017547	Brazoria County	No	Single Fmly	2	3,998.07	
0046054	Brazoria County	No	Single Fmly	2	20,273.22	
0025177	Brazoria County	No	Single Fmly	2	9,527.00	
0018491	Brazoria County	No	Othr-Nonres	2	4,827.25	
0026801	Brazoria County	No	Single Fmly	2	41,629.84	
0025952	Brazoria County	No	Single Fmly	2	24,735.20	
0018393	Brazoria County	No	Single Fmly	2	37,415.60	
0018385	Brazoria County	No	Assmd Condo	2	74,786.45	
0017358	Brazoria County	No	Single Fmly	2	36,125.90	
0026334	Brazoria County	No	Single Fmly	2	53,335.62	PU
0017583	Brazoria County	No	Single Fmly	3	32,787.84	
0026285	Brazoria County	No	Single Fmly	2	27,541.40	
0025475	Brazoria County	No	Single Fmly	2	34,370.30	
0043561	Brazoria County	No	Single Fmly	3	12,114.56	
0073452	Brazoria County	No	Single Fmly	2	24,505.54	
0003824	Brazoria County	No	Single Fmly	2	32,758.06	
0026001	Brazoria County	No	Single Fmly	3	44,873.92	PU
0068857	Brazoria County	No	Single Fmly	2	8,463.75	
0002845	Brazoria County	No	Single Fmly	2	41,346.98	
0017484	Brazoria County	No	Single Fmly	2	15,324.86	
0026847	Brazoria County	No	Single Fmly	2	47,652.64	
0045420	Brazoria County	No	Single Fmly	2	3,551.62	
0018514	Brazoria County	No	Single Fmly	2	20,585.44	
0097082	Brazoria County	No	Single Fmly	2	18,834.40	
0026831	Brazoria County	No	Single Fmly	3	35,853.68	
0042560	Brazoria County	No	Single Fmly	2	27,047.65	
0068848	Brazoria County	No	Single Fmly	2	32,405.73	
0018684	Brazoria County	No	Single Fmly	2	58,425.10	
0050856	Brazoria County	No	Single Fmly	2	8,475.83	
0045409	Brazoria County	No	Single Fmly	2	17,291.89	
0044654	Brazoria County	No	Single Fmly	3	8,034.50	
0016047	Brazoria County	No	Single Fmly	3	51,310.69	
0071775	Brazoria County	No	Single Fmly	3	35,188.37	
0068864	Brazoria County	No	Single Fmly	2	6,732.41	
0042523	Brazoria County	No	Single Fmly	4	46,661.21	
0044361	Brazoria County	No	Single Fmly	3	56,948.25	
0017564	Brazoria County	No	Single Fmly	2	6,677.66	
0017581	Brazoria County	No	Single Fmly	2	38,312.48	

0025095	Brazoria County	No	Single Fmly	2	40,297.45	PU
0040997	Brazoria County	No	Single Fmly	2	13,465.77	
0068856	Brazoria County	No	Single Fmly	2	45,067.08	
0072004	Brazoria County	No	Single Fmly	2	7,318.92	
0018672	Brazoria County	No	Single Fmly	3	12,362.94	
0043697	Brazoria County	No	Single Fmly	2	18,299.65	
0241503	Brazoria County	No	Single Fmly	2	43,929.56	
0262102	Brazoria County	Yes	Single Fmly	2	155,934.70	
0013052	Brazoria County	No	Single Fmly	9	49,979.76	VU
0260270	Brazoria County	Yes	Single Fmly	2	73,253.85	
0120350	Brazoria County	No	Single Fmly	2	70,058.77	
0168658	Brazoria County	No	Single Fmly	2	97,238.94	
0168156	Brazoria County	No	Single Fmly	2	47,431.47	
0093357	Brazoria County	No	Single Fmly	2	14,995.66	
0262602	Brazoria County	Yes	Single Fmly	2	140,516.97	
0026240	Brazoria County	No	Othr-Nonres	3	16,298.19	
0044325	Brazoria County	No	Othr-Nonres	2	28,598.53	
0068019	Brazoria County	No	Othr-Nonres	2	9,599.73	
0168586	Brazoria County	No	Single Fmly	2	45,398.32	
0037444	Brazoria County	Yes	Single Fmly	3	79,953.55	
0262738	Brazoria County	Yes	Single Fmly	2	86,957.59	
0168908	Brazoria County	Yes	Single Fmly	2	43,487.07	
0119841	Brazoria County	Yes	Single Fmly	3	40,350.54	
0069988	Brazoria County	No	Single Fmly	2	59,311.90	
0044934	Brazoria County	No	Single Fmly	8	200,349.02	VU
0186065	Brazoria County	No	2-4 Family	3	19,712.92	
0167357	Brazoria County	Yes	Single Fmly	3	92,345.11	
0069916	Brazoria County	No	Single Fmly	5	230,526.64	VU
0182795	Brazoria County	No	Single Fmly	2	73,558.03	
0068061	Brazoria County	Sdf	Single Fmly	5	120,663.84	V
0025142	Brazoria County	No	Single Fmly	8	246,124.12	VU
0038688	Brazoria County	No	Single Fmly	2	17,698.82	
0178178	Brazoria County	Yes	Single Fmly	2	6,225.12	
0119540	Brazoria County	Yes	Single Fmly	3	32,529.87	
0118722	Brazoria County	No	Single Fmly	3	12,060.11	
0016042	Brazoria County	No	Othr-Nonres	2	14,084.11	
0068020	Brazoria County	Yes	Single Fmly	4	19,735.82	
0097189	Brazoria County	Yes	Single Fmly	3	29,033.67	
0119333	Brazoria County	No	Single Fmly	3	14,860.57	
0259940	Brazoria County	Yes	Single Fmly	2	237,980.04	
0168895	Brazoria County	No	Single Fmly	2	116,058.87	
0026291	Brazoria County	No	Assmd Condo	2	7,482.14	
0186066	Brazoria County	No	2-4 Family	2	7,045.01	
0260275	Brazoria County	Yes	Single Fmly	2	172,933.79	
0122421	Brazoria County	No	Single Fmly	4	42,801.28	
0077678	Brazoria County	No	Single Fmly	3	60,503.31	
0258537	Brazoria County	Yes	Single Fmly	2	5,703.35	
0119177	Brazoria County	No	Single Fmly	4	38,495.34	
0068977	Brazoria County	Yes	Single Fmly	5	104,681.32	V
0040416	Brazoria County	Yes	Single Fmly	5	245,157.72	V
0015957	Brazoria County	No	Single Fmly	2	3,529.35	
0025189	Brazoria County	No	Single Fmly	2	38,251.40	
0017763	Brazoria County	Yes	Single Fmly	2	9,049.74	
0009021	Brazoria County	No	Single Fmly	5	34,960.30	

0003976	Brazoria County	Sdf	Single Fmly	8	734,139.66	V
0044098	Brazoria County	Yes	Single Fmly	3	17,725.16	
0036865	Brazoria County	Yes	Single Fmly	4	230,169.47	
0025962	Brazoria County	Yes	Single Fmly	3	89,580.49	
0035344	Brazoria County	No	Single Fmly	2	17,451.70	
0258522	Brazoria County	Yes	Single Fmly	2	53,143.00	
0039696	Brazoria County	No	Single Fmly	2	7,558.95	
0245312	Brazoria County	No	Single Fmly	3	51,355.60	
0124920	Brazoria County	No	Single Fmly	3	44,806.73	
0018704	Brazoria County	No	Single Fmly	4	51,733.51	
0172737	Brazoria County	Yes	Single Fmly	2	28,655.37	
0025243	Brazoria County	No	Single Fmly	2	20,873.82	
0025347	Brazoria County	No	Single Fmly	2	5,015.28	
0124442	Brazoria County	Yes	Single Fmly	4	45,771.55	
0180875	Brazoria County	Yes	Single Fmly	2	39,958.61	
0183384	Brazoria County	Yes	Single Fmly	2	5,122.61	
0122388	Brazoria County	Yes	Single Fmly	3	27,373.89	
0005611	Brazoria County	No	Single Fmly	9	119,038.11	VU
0115671	Brazoria County	No	Single Fmly	2	61,259.55	PU
0026499	Brazoria County	No	Single Fmly	4	109,139.25	
0241961	Brazoria County	No	Single Fmly	3	60,723.02	
0116975	Brazoria County	No	Single Fmly	3	39,167.22	
0018756	Brazoria County	No	Single Fmly	2	45,853.41	
0017536	Brazoria County	No	Single Fmly	2	66,772.89	
0040017	Brazoria County	No	Single Fmly	4	70,099.66	
0068071	Brazoria County	No	Single Fmly	3	72,448.54	PU
0168434	Brazoria County	No	Single Fmly	3	99,885.23	
0180895	Brazoria County	No	Single Fmly	2	84,149.95	
0025299	Brazoria County	No	Single Fmly	3	21,345.53	
0013231	Brazoria County	No	Single Fmly	2	12,434.61	
0119178	Brazoria County	Sdf	Single Fmly	4	77,921.81	V
0178985	Brazoria County	Yes	Single Fmly	2	23,859.38	
0123765	Brazoria County	No	Single Fmly	3	34,656.48	
0071508	Brazoria County	No	Single Fmly	4	53,592.26	
0026729	Brazoria County	No	Single Fmly	2	3,082.88	
0069678	Brazoria County	Yes	Single Fmly	3	4,421.90	
0260231	Brazoria County	Yes	Single Fmly	2	66,790.60	
0045743	Brazoria County	No	Single Fmly	3	10,776.24	
0017409	Brazoria County	No	Single Fmly	2	33,774.18	
0258833	Brazoria County	Yes	Single Fmly	2	191,129.79	
0035941	Brazoria County	No	Single Fmly	2	34,191.54	
0017544	Brazoria County	No	Single Fmly	4	226,179.30	VU
0026837	Brazoria County	No	Single Fmly	7	34,938.83	
0258518	Brazoria County	Yes	Single Fmly	2	343,479.67	
0258834	Brazoria County	Yes	Single Fmly	2	204,824.07	
0260365	Brazoria County	Yes	Single Fmly	2	104,055.15	
0124439	Brazoria County	Yes	Single Fmly	3	97,343.14	
0033833	Brazoria County	No	Single Fmly	2	8,042.98	
0248779	Brazoria County	Yes	Single Fmly	2	50,245.44	
0196109	Brazoria County	No	Single Fmly	2	106,155.48	
0259609	Brazoria County	Yes	Single Fmly	2	106,103.46	
0213206	Brazoria County	Yes	Single Fmly	2	61,018.04	
0039567	Brazoria County	No	Single Fmly	2	31,751.04	
0026276	Brazoria County	Yes	Single Fmly	3	39,612.20	

0017337	Brazoria County	No	Single Fmly	2	55,768.80	
0025692	Brazoria County	No	Single Fmly	2	11,006.83	
0025971	Brazoria County	Yes	Single Fmly	4	231,536.06	
0119188	Brazoria County	No	Single Fmly	3	87,258.58	
0185452	Brazoria County	Yes	Single Fmly	2	11,058.31	
0248121	Brazoria County	Yes	Single Fmly	2	107,750.64	
0097144	Brazoria County	No	Single Fmly	3	60,620.91	
0185461	Brazoria County	Yes	Single Fmly	2	63,948.44	
0249003	Brazoria County	Yes	Single Fmly	2	46,595.95	
0260170	Brazoria County	Yes	Single Fmly	2	86,726.66	
0172225	Brazoria County	No	Single Fmly	2	18,842.11	
0069864	Brazoria County	No	Single Fmly	2	18,716.66	PU
0039988	Brazoria County	No	Othr-Nonres	4	14,360.60	
0124434	Brazoria County	No	Single Fmly	3	53,867.72	
0124286	Brazoria County	No	Single Fmly	3	46,721.18	
0093930	Brazoria County	Yes	Single Fmly	4	162,206.35	
0259901	Brazoria County	Yes	Single Fmly	2	75,120.27	
0249917	Brazoria County	Yes	Single Fmly	2	335,203.86	
0185624	Brazoria County	No	Single Fmly	2	24,004.73	
0180345	Brazoria County	No	Single Fmly	2	64,273.40	
0182796	Brazoria County	No	Single Fmly	2	12,331.58	
0262689	Brazoria County	Yes	Single Fmly	2	34,734.29	
0118765	Brazoria County	No	Single Fmly	2	19,552.51	
0238039	Brazoria County	Yes	Single Fmly	3	76,201.57	
0072214	Brazoria County	No	Single Fmly	3	71,015.67	
0124248	Brazoria County	No	Single Fmly	2	14,500.43	
0018394	Brazoria County	No	Single Fmly	2	25,774.95	
0184085	Brazoria County	Yes	Single Fmly	3	101,437.92	
0214088	Brazoria County	No	Single Fmly	2	134,437.55	
0262691	Brazoria County	Yes	Single Fmly	2	84,002.26	
0262692	Brazoria County	Yes	Single Fmly	2	105,747.47	
0260241	Brazoria County	Yes	Single Fmly	2	191,336.66	
0168246	Brazoria County	No	Single Fmly	2	43,788.52	
0168245	Brazoria County	No	Single Fmly	2	76,323.56	
0119168	Brazoria County	No	Single Fmly	3	95,007.53	
0249284	Brazoria County	Yes	Single Fmly	2	62,007.65	
0197026	Brazoria County	Sdf	Single Fmly	5	217,742.03	V
0018346	Brazoria County	No	Single Fmly	6	70,849.54	
0068028	Brazoria County	Yes	Single Fmly	4	58,154.62	
0097717	Brazoria County	No	Single Fmly	3	64,741.16	
0068031	Brazoria County	No	Single Fmly	3	75,339.66	
0242964	Brazoria County	No	Single Fmly	2	25,605.36	
0257879	Brazoria County	Yes	Single Fmly	2	83,891.44	
0017523	Brazoria County	No	Single Fmly	2	32,452.23	
0249893	Brazoria County	Yes	Single Fmly	2	110,076.11	
0073818	Brazoria County	No	Single Fmly	5	56,843.06	
0259654	Brazoria County	Yes	Single Fmly	2	133,618.00	
0259907	Brazoria County	Yes	Single Fmly	2	154,214.25	
0242894	Brazoria County	Yes	Othr-Nonres	2	64,937.53	
0197031	Brazoria County	Yes	Single Fmly	2	9,574.65	
0250040	Brazoria County	Yes	Single Fmly	2	162,020.24	
0013265	Brazoria County	No	Single Fmly	4	32,882.05	
0071585	Brazoria County	No	Single Fmly	5	56,715.06	VU
0041764	Brazoria County	No	Single Fmly	2	6,504.96	

0091182	Brazoria County	No	Single Fmly	3	59,847.50	
0036573	Brazoria County	No	Single Fmly	8	42,536.31	VU
0044887	Brazoria County	Sdf	Single Fmly	5	71,825.90	V
0052718	Brazoria County	No	Othr-Nonres	2	6,048.00	
0249202	Brazoria County	No	Single Fmly	2	123,245.66	
0182067	Brazoria County	No	Single Fmly	2	34,278.19	
0212801	Brazoria County	Yes	Single Fmly	3	182,823.75	
0043428	Brazoria County	No	Single Fmly	5	87,856.07	VU
0120629	Brazoria County	No	Single Fmly	2	21,501.64	
0017445	Brazoria County	No	Single Fmly	2	20,629.25	
0092100	Brazoria County	No	Single Fmly	2	63,626.86	
0191938	Brazoria County	Yes	Single Fmly	2	14,974.39	
0001452	Brazoria County	No	Single Fmly	4	23,475.89	
0026290	Brazoria County	No	Single Fmly	3	10,367.13	
0097801	Brazoria County	No	Single Fmly	5	30,883.72	
0017577	Brazoria County	No	Single Fmly	2	3,713.00	
0005681	Brazoria County	Yes	Single Fmly	6	113,190.44	V
0069945	Brazoria County	No	Single Fmly	2	12,151.41	
0002283	Brazoria County	Yes	Single Fmly	12	174,121.42	V
0071443	Brazoria County	No	Single Fmly	3	13,770.97	
0248119	Brazoria County	No	Single Fmly	3	44,093.12	
0005598	Brazoria County	No	Single Fmly	16	203,275.39	VU
0091481	Brazoria County	No	Single Fmly	4	14,669.18	
0008184	Brazoria County	No	Single Fmly	8	55,486.30	VU
0098456	Brazoria County	No	Single Fmly	2	39,575.14	
0250894	Brazoria County	No	Single Fmly	2	6,002.00	
0249347	Brazoria County	Yes	Single Fmly	2	59,362.85	
0089730	Brazoria County	No	Single Fmly	4	10,265.14	
0262776	Brazoria County	Yes	Single Fmly	2	43,650.73	
0038958	Brazoria County	No	Single Fmly	4	41,470.24	
0076993	Brazoria County	No	Single Fmly	2	7,259.60	
0259900	Brazoria County	Yes	Single Fmly	2	261,187.67	
0260208	Brazoria County	Yes	Single Fmly	2	8,368.34	
0025289	Brazoria County	No	Single Fmly	2	67,168.84	
0026686	Brazoria County	No	Single Fmly	2	26,678.03	
0118940	Brazoria County	Yes	Single Fmly	4	166,210.35	
0068834	Brazoria County	Sdf	Single Fmly	8	416,947.33	V
0259776	Brazoria County	Yes	Single Fmly	2	24,997.72	
0262778	Brazoria County	Yes	Single Fmly	2	19,252.91	
0260188	Brazoria County	No	Single Fmly	2	235,549.57	
0037865	Brazoria County	Yes	Single Fmly	3	52,466.97	
0070577	Brazoria County	Yes	Single Fmly	4	373,752.91	V
0125806	Brazoria County	No	Single Fmly	2	35,553.12	
0069911	Brazoria County	No	Single Fmly	2	34,220.67	
0094547	Brazoria County	No	Single Fmly	2	10,339.34	
0212735	Brazoria County	No	Single Fmly	2	43,624.25	
0103529	Brazoria County	No	Single Fmly	2	41,790.13	
0044343	Brazoria County	No	Single Fmly	2	20,034.80	
0260108	Brazoria County	Yes	Single Fmly	2	150,270.18	
0257770	Brazoria County	Yes	Single Fmly	2	40,232.12	
0250233	Brazoria County	Yes	Single Fmly	3	352,570.41	P
0045260	Brazoria County	No	Single Fmly	2	93,096.01	PU
0262693	Brazoria County	Yes	Single Fmly	2	109,372.97	
0002925	Brazoria County	Sdf	Single Fmly	14	325,253.70	V

0186008	Brazoria County	No	Single Fmly	2	18,535.99	
0068840	Brazoria County	No	Single Fmly	2	12,031.41	
0073506	Brazoria County	No	Single Fmly	3	18,006.77	
0262777	Brazoria County	Yes	Single Fmly	2	30,067.61	
0182139	Brazoria County	No	Single Fmly	3	68,553.80	
0026535	Brazoria County	No	Single Fmly	2	9,153.85	
0258615	Brazoria County	Yes	Single Fmly	2	156,914.36	P
0185567	Brazoria County	No	Single Fmly	2	33,280.46	
0258665	Brazoria County	Yes	Other Resid	2	451,860.28	
0076297	Brazoria County	Yes	Single Fmly	5	81,192.19	
0117184	Brazoria County	No	Single Fmly	2	6,442.13	
0097191	Brazoria County	No	Single Fmly	2	8,511.17	
0119184	Brazoria County	Yes	Single Fmly	2	34,122.92	
0070550	Brazoria County	No	Single Fmly	2	9,051.93	
0249245	Brazoria County	Yes	Single Fmly	2	150,097.43	
0114145	Brazoria County	No	Single Fmly	3	46,689.08	
0262779	Brazoria County	Yes	Single Fmly	2	27,048.06	
0068033	Brazoria County	No	Single Fmly	6	76,509.03	VU
0241627	Brazoria County	Yes	Single Fmly	3	152,446.56	
0249327	Brazoria County	Yes	Single Fmly	3	225,632.60	P
0262775	Brazoria County	Yes	Single Fmly	2	128,300.15	
0214084	Brazoria County	Yes	Single Fmly	2	51,747.75	
0116490	Brazoria County	No	Single Fmly	4	16,444.55	
0098371	Brazoria County	Yes	Single Fmly	2	12,428.24	
0128227	Brazoria County	Yes	Single Fmly	2	4,650.70	
0025474	Brazoria County	No	Single Fmly	4	15,081.25	
0054508	Brazoria County	No	Single Fmly	2	3,906.55	
0069785	Brazoria County	Sdf	Single Fmly	8	336,611.36	V
0259217	Brazoria County	Yes	Single Fmly	2	5,214.56	
0186558	Brazoria County	No	Single Fmly	3	24,434.29	
0185429	Brazoria County	No	Single Fmly	2	11,227.27	
0262694	Brazoria County	Yes	Single Fmly	2	109,578.83	
0042450	Brazoria County	No	Single Fmly	2	66,512.01	PU
0048795	Brazoria County	No	Single Fmly	2	72,811.20	
0025663	Brazoria County	No	Single Fmly	2	33,226.36	
0018767	Brazoria County	No	Single Fmly	3	8,057.28	
0025145	Brazoria County	Yes	Single Fmly	3	234,160.43	
0056573	Brazoria County	Sdf	Single Fmly	9	167,324.94	V
0167757	Brazoria County	No	Single Fmly	3	72,023.69	
0069874	Brazoria County	No	Single Fmly	2	39,666.35	
0054704	Brazoria County	No	Single Fmly	3	17,362.23	
0068159	Brazoria County	No	Single Fmly	2	98,036.63	
0076942	Brazoria County	No	Single Fmly	2	44,611.06	
0069898	Brazoria County	No	Single Fmly	4	55,666.46	
0080412	Brazoria County	No	Single Fmly	2	68,015.63	
0125780	Brazoria County	No	Single Fmly	2	36,264.51	
0186662	Brazoria County	No	Single Fmly	3	32,483.27	
0005651	Brazoria County	No	Single Fmly	6	37,638.87	VU
0052447	Brazoria County	No	Single Fmly	2	11,740.67	
0018669	Brazoria County	Sdf	Single Fmly	5	57,353.88	V
0012841	Brazoria County	No	Single Fmly	2	46,518.89	
0098428	Brazoria County	No	Single Fmly	2	24,353.45	
0099052	Brazoria County	No	Single Fmly	3	16,119.84	
0073465	Brazoria County	No	Single Fmly	3	64,081.84	

0017481	Brazoria County	No	Single Fmly	2	6,910.65	
0116829	Brazoria County	No	Single Fmly	2	42,916.30	
0186830	Brazoria County	No	Single Fmly	2	34,165.62	
0017295	Brazoria County	No	Single Fmly	4	16,487.94	
0035511	Brazoria County	No	Single Fmly	2	14,273.02	
0180670	Brazoria County	No	Single Fmly	3	18,819.63	
0177556	Brazoria County	No	Single Fmly	2	18,325.27	
0124278	Brazoria County	No	Single Fmly	3	22,514.81	
0016048	Brazoria County	No	Single Fmly	2	54,607.59	
0018614	Brazoria County	No	Single Fmly	2	7,364.94	
0186067	Brazoria County	No	2-4 Family	2	42,964.76	
0182799	Brazoria County	No	Single Fmly	2	53,426.77	
0071431	Brazoria County	Yes	Single Fmly	5	88,202.72	
0124405	Brazoria County	No	Othr-Nonres	2	14,841.20	
0197136	Brazoria County	No	Single Fmly	2	28,313.07	
0071594	Brazoria County	Yes	Single Fmly	3	147,210.09	
0069745	Brazoria County	No	Single Fmly	3	65,339.66	
0069922	Brazoria County	No	Single Fmly	2	24,688.02	
0186750	Brazoria County	No	Single Fmly	3	17,795.63	
0184787	Brazoria County	No	Single Fmly	2	11,735.10	
0012880	Brazoria County	No	Single Fmly	4	46,422.45	
0099014	Brazoria County	No	Single Fmly	2	9,821.77	
0033684	Brazoria County	No	Single Fmly	2	17,202.90	
0044452	Brazoria County	No	Single Fmly	2	7,558.87	
0026788	Brazoria County	No	Single Fmly	2	3,648.06	
0037132	Brazoria County	Yes	Single Fmly	4	159,208.88	
0258622	Brazoria County	Yes	Single Fmly	2	187,637.39	
0258751	Brazoria County	Yes	Busi-Nonres	2	98,189.10	
0026860	Brazoria County	No	Single Fmly	2	10,015.42	
0260487	Brazoria County	Yes	Single Fmly	2	36,657.03	
0002662	Brazoria County	No	Single Fmly	2	52,740.16	
0002495	Brazoria County	No	Othr-Nonres	3	16,535.09	
0179784	Brazoria County	No	Single Fmly	4	242,060.99	
0068081	Brazoria County	No	Single Fmly	4	88,481.75	
0124860	Brazoria County	No	Single Fmly	2	15,395.17	
0168603	Brazoria County	No	Single Fmly	2	88,049.03	
0093925	Brazoria County	No	Single Fmly	2	26,588.55	
0244633	Brazoria County	No	Single Fmly	3	125,247.14	
0025796	Brazoria County	No	Single Fmly	2	2,240.64	
0262110	Brazoria County	Yes	Single Fmly	2	25,024.01	
0259692	Brazoria County	Yes	Single Fmly	2	36,787.12	
0026160	Brazoria County	No	Single Fmly	2	27,099.96	
0034529	Brazoria County	Yes	Single Fmly	2	27,644.71	
0049649	Brazoria County	No	Single Fmly	3	15,020.48	
0026127	Brazoria County	No	Single Fmly	2	2,927.45	
0016008	Brazoria County	Sdf	Single Fmly	7	321,717.10	V
0098922	Brazoria County	No	Single Fmly	2	25,727.34	
0119604	Brazoria County	No	Single Fmly	3	8,939.32	
0117416	Brazoria County	No	Single Fmly	2	5,535.68	
0037256	Brazoria County	No	Single Fmly	2	8,005.73	
0018561	Brazoria County	No	Single Fmly	2	15,373.80	
0250436	Brazoria County	No	Single Fmly	2	14,815.34	
0088274	Brazoria County	No	Single Fmly	4	57,807.29	
0178769	Brazoria County	Yes	Single Fmly	2	13,950.43	

0098565	Brazoria County	Yes	Single Fmly	4	14,293.21	
0089795	Brazoria County	No	Single Fmly	4	71,899.30	
0123020	Brazoria County	Yes	Single Fmly	3	58,813.58	
0124018	Brazoria County	Yes	Single Fmly	3	24,128.71	
0125809	Brazoria County	No	Single Fmly	3	94,657.84	
0094862	Brazoria County	No	Single Fmly	2	21,803.39	
0127389	Brazoria County	Yes	Single Fmly	3	40,254.67	
0136023	Brazoria County	Yes	Single Fmly	3	107,707.01	
0183898	Brazoria County	Yes	Single Fmly	2	64,957.26	
0035850	Brazoria County	Yes	Single Fmly	9	178,671.55	V
0100533	Brazoria County	No	Single Fmly	4	61,310.13	VU
0246925	Brazoria County	No	Single Fmly	2	48,192.55	
0018727	Brazoria County	No	Othr-Nonres	3	44,747.27	
0250274	Brazoria County	Yes	Single Fmly	2	21,072.50	
0071586	Brazoria County	Sdf	Single Fmly	4	103,176.67	V
0185454	Brazoria County	No	Single Fmly	2	25,213.13	
0089736	Brazoria County	Yes	Single Fmly	2	58,710.51	
0186125	Brazoria County	Yes	Single Fmly	2	110,319.14	
0125810	Brazoria County	No	Single Fmly	2	31,907.79	
0037583	Brazoria County	No	Single Fmly	2	52,431.35	
0002672	Brazoria County	No	Single Fmly	3	23,107.18	
0168027	Brazoria County	No	Single Fmly	2	14,058.22	
0119307	Brazoria County	No	Single Fmly	2	28,008.65	
0068080	Brazoria County	Yes	Single Fmly	2	9,929.83	
0118378	Brazoria County	No	Single Fmly	4	58,432.69	
0039513	Brazoria County	No	Single Fmly	2	11,941.11	
0053985	Brazoria County	No	Othr-Nonres	2	7,293.46	
0068233	Brazoria County	No	Single Fmly	3	63,796.40	
0259912	Brazoria County	Yes	Single Fmly	2	272,003.39	P
0044725	Brazoria County	No	Single Fmly	2	14,335.83	
0070689	Brazoria County	No	Assmd Condo	4	118,950.22	PU
0168081	Brazoria County	Yes	Single Fmly	2	139,687.14	
0116568	Brazoria County	No	Single Fmly	2	89,626.94	
0026826	Brazoria County	No	Single Fmly	2	3,253.06	
0018674	Brazoria County	No	Single Fmly	2	5,383.34	
0256590	Brazoria County	Yes	Single Fmly	3	113,477.52	
0115890	Brazoria County	No	Single Fmly	2	42,538.79	
0180872	Brazoria County	Yes	Single Fmly	2	23,378.12	
0098377	Brazoria County	Sdf	Single Fmly	4	156,553.44	V
0260330	Brazoria County	Yes	Single Fmly	2	166,460.60	
0122026	Brazoria County	No	Single Fmly	2	11,129.47	
0068050	Brazoria County	No	Single Fmly	2	8,774.19	
0179400	Brazoria County	Yes	Single Fmly	3	140,098.38	
0025974	Brazoria County	Sdf	Single Fmly	16	386,608.14	V
0069923	Brazoria County	Yes	Single Fmly	4	180,594.94	
0073440	Brazoria County	Yes	Single Fmly	3	133,474.25	
0113228	Brazoria County	Yes	Single Fmly	3	107,253.56	
0114690	Brazoria County	Yes	Single Fmly	3	134,744.76	
0073441	Brazoria County	Yes	Single Fmly	4	141,990.78	V
0069610	Brazoria County	Yes	Single Fmly	2	101,225.31	
0101644	Brazoria County	No	Single Fmly	2	4,822.75	
0043106	Brazoria County	No	Single Fmly	2	20,482.87	
0180095	Brazoria County	No	Single Fmly	2	160,951.99	VU
0179052	Brazoria County	No	Single Fmly	2	41,072.57	

0253470	Brazoria County	Yes	Single Fmly	2	213,325.20	
0250078	Brazoria County	Yes	Single Fmly	2	34,200.04	
0000932	Brazoria County	No	2-4 Family	5	25,276.43	
0258547	Brazoria County	Yes	Single Fmly	2	163,270.72	
0180131	Brazoria County	Yes	Single Fmly	2	61,283.28	
0259944	Brazoria County	Yes	Single Fmly	2	27,548.96	
0260220	Brazoria County	Yes	Single Fmly	2	231,222.83	
0247192	Brazoria County	Yes	Single Fmly	3	131,460.61	
0257948	Brazoria County	Yes	Assmd Condo	2	194,844.66	
0262814	Brazoria County	Yes	Single Fmly	2	5,941.53	
0018521	Brazoria County	Yes	Single Fmly	2	45,976.62	
0002861	Brazoria County	No	Single Fmly	9	68,094.46	VU
0012901	Brazoria County	No	Other Resid	2	5,518.10	
0026060	Brazoria County	No	Single Fmly	2	5,792.89	
0045874	Brazoria County	No	Single Fmly	3	28,725.26	PU
0182964	Brazoria County	Yes	Single Fmly	2	58,145.18	
0178768	Brazoria County	Yes	Single Fmly	2	7,832.23	
0119731	Brazoria County	Sdf	Single Fmly	4	53,437.69	V
0119568	Brazoria County	No	Single Fmly	4	90,843.65	VU
0050733	Brazoria County	No	Othr-Nonres	2	6,236.72	
0113243	Brazoria County	No	Single Fmly	2	119,528.70	
0258716	Brazoria County	Yes	Single Fmly	2	179,838.10	
0259186	Brazoria County	Yes	Single Fmly	2	278,300.79	
0258240	Brazoria County	Yes	Single Fmly	2	314,291.13	
0045401	Brazoria County	Yes	Single Fmly	4	36,551.82	
0112890	Brazoria County	Yes	Single Fmly	3	89,558.97	
0258423	Brazoria County	Yes	Single Fmly	2	55,656.69	
0262815	Brazoria County	Yes	Single Fmly	2	336,603.93	
0070275	Brazoria County	No	Single Fmly	2	102,273.19	
0042514	Brazoria County	No	Single Fmly	4	72,681.91	
0045921	Brazoria County	Sdf	Single Fmly	5	335,247.69	V
0112974	Brazoria County	Yes	Single Fmly	3	161,614.89	
0017551	Brazoria County	No	Single Fmly	10	384,355.46	VU
0118755	Brazoria County	No	Single Fmly	3	83,861.33	
0070680	Brazoria County	No	Single Fmly	4	90,603.31	
0248077	Brazoria County	No	Single Fmly	2	12,891.94	
0025998	Brazoria County	No	Single Fmly	2	14,232.68	
0012996	Brazoria County	Sdf	Single Fmly	10	119,631.23	V
0026412	Brazoria County	No	Single Fmly	2	29,911.69	
0112967	Brazoria County	No	Single Fmly	3	133,680.58	
0068097	Brazoria County	No	Single Fmly	3	22,839.39	
0069942	Brazoria County	Yes	Single Fmly	3	38,558.61	
0115564	Brazoria County	Yes	Single Fmly	2	60,189.75	
0033980	Brazoria County	No	Single Fmly	5	67,913.27	
0068072	Brazoria County	Sdf	Single Fmly	4	97,604.33	V
0070114	Brazoria County	Yes	Single Fmly	3	81,778.86	
0072219	Brazoria County	Yes	Single Fmly	3	111,483.70	
0044789	Brazoria County	No	Single Fmly	3	8,496.51	
0026200	Brazoria County	No	Single Fmly	4	44,171.24	
0045013	Brazoria County	Yes	Single Fmly	5	91,474.84	V
0026741	Brazoria County	No	Single Fmly	2	41,883.78	
0119310	Brazoria County	No	Single Fmly	2	10,007.54	
0119170	Brazoria County	No	Single Fmly	4	61,512.90	VU
0119172	Brazoria County	Yes	Single Fmly	3	36,009.99	

0119569	Brazoria County	No	Single Fmly	3	130,458.76	
0262104	Brazoria County	Yes	Single Fmly	2	23,913.33	
0244058	Brazoria County	No	Single Fmly	4	61,681.44	VU
0002693	Brazoria County	No	Single Fmly	2	8,826.11	PU
0014120	Brazoria County	No	Single Fmly	5	49,585.50	VU
0074646	Brazoria County	No	Single Fmly	2	26,871.00	
0002898	Brazoria County	No	Single Fmly	10	192,521.44	VU
0018450	Brazoria County	No	Single Fmly	2	36,763.76	
0026710	Brazoria County	No	Single Fmly	4	85,730.95	
0051941	Brazoria County	Sdf	Single Fmly	9	343,594.54	V
0026548	Brazoria County	Yes	Single Fmly	3	224,593.85	
0018677	Brazoria County	Yes	Single Fmly	3	52,123.64	
0026277	Brazoria County	No	Single Fmly	2	45,674.85	
0037534	Brazoria County	Sdf	Single Fmly	7	203,074.66	V
0018632	Brazoria County	Sdf	Single Fmly	8	251,790.27	V
0018320	Brazoria County	No	Single Fmly	12	210,095.88	VU
0017404	Brazoria County	Yes	Single Fmly	6	132,750.81	V
0262717	Brazoria County	Yes	Single Fmly	2	74,341.56	
0259854	Brazoria County	Yes	Single Fmly	2	174,435.40	
0260308	Brazoria County	Yes	Single Fmly	2	185,884.28	
0037756	Brazoria County	Yes	Single Fmly	4	141,378.48	
0038353	Brazoria County	Yes	Single Fmly	2	16,767.61	
0260310	Brazoria County	Yes	Single Fmly	2	286,075.44	
0258807	Brazoria County	Yes	Single Fmly	2	124,433.51	
0182281	Brazoria County	No	Single Fmly	2	9,670.34	
0118883	Brazoria County	Yes	Single Fmly	2	29,450.59	
0096880	Brazoria County	No	Single Fmly	4	68,885.74	
0123864	Brazoria County	Yes	Single Fmly	3	31,050.28	
0025201	Brazoria County	Yes	Single Fmly	4	25,072.12	
0119200	Brazoria County	Yes	Single Fmly	4	47,588.11	
0144558	Brazoria County	Yes	Single Fmly	3	37,943.71	
0124661	Brazoria County	Yes	Single Fmly	3	36,628.82	
0008288	Brazoria County	Yes	Single Fmly	3	284,820.45	
0038281	Brazoria County	No	Single Fmly	2	8,851.55	
0018336	Brazoria County	No	Single Fmly	2	64,494.21	
0070686	Brazoria County	No	Single Fmly	2	11,325.81	
0025593	Brazoria County	No	Single Fmly	2	6,422.75	
0025652	Brazoria County	No	Single Fmly	2	10,288.39	
0018639	Brazoria County	No	Single Fmly	2	3,920.19	
0025730	Brazoria County	No	Single Fmly	2	12,865.77	
0003492	Brazoria County	Sdf	Single Fmly	8	88,001.20	V
0117336	Brazoria County	No	Assmd Condo	3	169,640.29	
0190283	Brazoria County	No	Single Fmly	3	136,194.71	
0080808	Brazoria County	No	Othr-Nonres	4	85,320.25	
0041955	Brazoria County	Sdf	Single Fmly	10	125,331.24	P
0069672	Brazoria County	Sdf	Single Fmly	5	123,584.31	V
0025467	Brazoria County	Yes	Single Fmly	3	108,496.16	
0047306	Brazoria County	No	Single Fmly	7	171,717.36	VU
0076991	Brazoria County	No	Single Fmly	2	8,653.61	
0100354	Brazoria County	No	Single Fmly	2	10,553.61	
0008217	Brazoria County	No	Single Fmly	11	73,592.46	VU
0017503	Brazoria County	No	Single Fmly	2	33,054.36	
0017546	Brazoria County	No	Single Fmly	2	47,048.50	
0039931	Brazoria County	No	Single Fmly	2	22,423.00	

0080419	Brazoria County	No	Single Fmly	3	11,342.54	
0093914	Brazoria County	No	Single Fmly	4	65,834.14	VU
0096796	Brazoria County	No	Single Fmly	2	8,882.82	
0259500	Brazoria County	Yes	Single Fmly	2	135,007.63	
0069926	Brazoria County	No	Single Fmly	2	33,967.83	
0118910	Brazoria County	No	Single Fmly	2	9,778.55	
0073438	Brazoria County	No	Single Fmly	2	3,919.75	
0026757	Brazoria County	No	Single Fmly	2	20,933.07	
0097113	Brazoria County	No	Single Fmly	2	11,785.70	
0120643	Brazoria County	No	Single Fmly	2	43,628.18	
0117436	Brazoria County	No	Othr-Nonres	2	55,653.26	PNU
0098917	Brazoria County	No	Single Fmly	3	55,439.98	
0068847	Brazoria County	No	Single Fmly	4	34,648.16	
0068854	Brazoria County	No	Single Fmly	3	31,128.16	
0116879	Brazoria County	No	Single Fmly	2	37,661.91	
0035180	Brazoria County	No	Single Fmly	3	40,308.42	PU
0120553	Brazoria County	No	Single Fmly	2	25,937.74	
0114093	Brazoria County	No	Single Fmly	3	110,231.76	
0044665	Brazoria County	No	Assmd Condo	7	303,266.07	PU
0045182	Brazoria County	No	Single Fmly	3	40,730.02	
0018490	Brazoria County	No	Single Fmly	2	5,381.55	
0260331	Brazoria County	Yes	Single Fmly	2	202,901.78	
0260201	Brazoria County	Yes	Single Fmly	2	186,196.31	
0025852	Brazoria County	No	Single Fmly	2	24,035.71	
0026320	Brazoria County	Yes	Single Fmly	3	60,673.61	
0026497	Brazoria County	No	Single Fmly	2	15,949.37	
0026058	Brazoria County	No	Single Fmly	3	46,774.95	
0041433	Brazoria County	No	Single Fmly	3	117,361.17	
0025991	Brazoria County	Yes	Single Fmly	3	139,015.15	
0039095	Brazoria County	Yes	Single Fmly	3	155,381.19	
0017505	Brazoria County	No	Single Fmly	2	21,173.00	
0026166	Brazoria County	Yes	Single Fmly	3	91,910.30	
0039732	Brazoria County	Yes	Single Fmly	2	14,942.66	
0115588	Brazoria County	Yes	Single Fmly	3	18,430.11	
0259951	Brazoria County	Yes	Single Fmly	2	350,942.12	
0016053	Brazoria County	No	Single Fmly	5	55,034.28	VU
0180141	Brazoria County	Yes	Single Fmly	2	8,826.74	
0119792	Brazoria County	Yes	Single Fmly	2	15,477.31	
0017655	Brazoria County	Yes	Single Fmly	2	8,263.68	
0025851	Brazoria County	No	Single Fmly	4	13,944.34	
0182775	Brazoria County	Yes	Single Fmly	2	41,239.42	
0260102	Brazoria County	Yes	Single Fmly	2	88,119.03	
0177067	Brazoria County	No	Single Fmly	2	27,511.02	
0005813	Brazoria County	No	Single Fmly	4	55,382.62	VU
0045235	Brazoria County	No	Single Fmly	2	14,250.60	
0180126	Brazoria County	No	Single Fmly	3	72,516.93	
0262710	Brazoria County	Yes	Single Fmly	2	7,325.58	
0069969	Brazoria County	No	Othr-Nonres	2	13,865.96	
0002910	Brazoria County	No	Single Fmly	2	8,006.71	
0015953	Brazoria County	No	Single Fmly	5	27,704.26	
0257915	Brazoria County	Yes	Single Fmly	2	96,367.79	
0018645	Brazoria County	No	Single Fmly	3	12,964.20	
0119351	Brazoria County	No	Single Fmly	2	5,839.53	
0262806	Brazoria County	Yes	Other Resid	2	150,000.00	

0118878	Brazoria County	No	Single Fmly	2	43,152.09	
0025818	Brazoria County	No	Single Fmly	2	20,009.92	
0260354	Brazoria County	Yes	Single Fmly	2	176,182.20	P
0003374	Brazoria County	No	Single Fmly	5	51,275.95	VU
0216653	Brazoria County	No	2-4 Family	2	49,825.56	
0017515	Brazoria County	No	Single Fmly	2	40,190.81	PU
0018663	Brazoria County	No	Single Fmly	2	19,536.61	PU
0025679	Brazoria County	No	Single Fmly	5	204,997.84	VU
0118876	Brazoria County	No	Single Fmly	2	33,424.19	
0015971	Brazoria County	No	Single Fmly	2	30,601.54	PU
0071472	Brazoria County	No	Single Fmly	4	59,085.52	VU
0099013	Brazoria County	No	Single Fmly	2	75,360.96	
0069920	Brazoria County	Yes	Single Fmly	4	82,770.62	
0242698	Brazoria County	Yes	Single Fmly	3	10,936.91	
0070569	Brazoria County	Sdf	Single Fmly	8	169,476.50	V
0068083	Brazoria County	No	Single Fmly	5	75,960.75	
0179564	Brazoria County	Sdf	Single Fmly	4	91,018.06	V
0168802	Brazoria County	Yes	Single Fmly	2	147,933.52	
0114251	Brazoria County	No	Single Fmly	3	140,786.15	
0112240	Brazoria County	Yes	Single Fmly	4	135,594.78	
0069936	Brazoria County	Sdf	Single Fmly	5	234,767.30	V
0044313	Brazoria County	No	Single Fmly	2	9,966.09	
0049796	Brazoria County	No	Single Fmly	3	34,624.90	
0116885	Brazoria County	No	Single Fmly	2	9,414.50	
0008454	Brazoria County	No	Single Fmly	7	180,189.30	VU
0119171	Brazoria County	Yes	Single Fmly	2	18,698.05	
0039427	Brazoria County	No	Single Fmly	2	20,543.32	
0096794	Brazoria County	Sdf	Single Fmly	4	43,629.62	V
0257769	Brazoria County	Yes	Single Fmly	2	101,800.00	
0124246	Brazoria County	No	Single Fmly	2	5,625.80	
0112927	Brazoria County	No	Single Fmly	3	89,706.13	
0118459	Brazoria County	No	Single Fmly	2	25,493.78	
0119185	Brazoria County	No	Single Fmly	2	12,303.20	
0025789	Brazoria County	No	Single Fmly	2	15,414.32	
0025561	Brazoria County	No	Single Fmly	2	9,353.79	PU
0026827	Brazoria County	No	Single Fmly	4	43,771.25	
0013222	Brazoria County	No	Single Fmly	7	151,966.18	VU
0012991	Brazoria County	No	Single Fmly	7	94,499.76	VU
0097237	Brazoria County	No	Single Fmly	3	140,460.76	
0120525	Brazoria County	No	Single Fmly	2	8,615.19	
0026449	Brazoria County	No	Single Fmly	2	10,754.53	
0119542	Brazoria County	No	Single Fmly	2	9,225.36	
0068003	Brazoria County	No	Single Fmly	3	43,553.34	
0121552	Brazoria County	No	Single Fmly	2	14,989.53	
0025514	Brazoria County	Yes	Single Fmly	3	10,231.07	
0120647	Brazoria County	No	Othr-Nonres	2	57,981.01	
0124435	Brazoria County	No	Othr-Nonres	2	36,241.62	
0017608	Brazoria County	No	Single Fmly	2	66,349.63	
0117821	Brazoria County	Yes	Single Fmly	4	82,603.40	
0045236	Brazoria County	No	Assmd Condo	3	61,754.75	
0026384	Brazoria County	No	Single Fmly	2	33,003.90	
0112852	Brazoria County	Yes	Single Fmly	3	155,584.34	
0112962	Brazoria County	No	Single Fmly	2	46,525.66	
0073423	Brazoria County	Sdf	Single Fmly	4	259,366.45	V

0036666	Brazoria County	No	Single Fmly	2	19,468.49	
0026199	Brazoria County	No	Single Fmly	5	94,376.33	VU
0121969	Brazoria County	No	Single Fmly	2	9,566.64	
0088306	Brazoria County	No	Single Fmly	6	118,211.03	VU
0069992	Brazoria County	No	Single Fmly	4	53,619.02	
0048504	Brazoria County	No	Single Fmly	3	14,435.04	
0257779	Brazoria County	Yes	Single Fmly	2	61,411.18	
0259798	Brazoria County	Yes	Single Fmly	2	18,716.11	
0118932	Brazoria County	Yes	Single Fmly	2	25,357.18	
0119167	Brazoria County	No	Single Fmly	2	10,860.56	
0044114	Brazoria County	Yes	Single Fmly	3	33,221.67	
0002704	Brazoria County	No	Single Fmly	5	27,854.83	
0118922	Brazoria County	No	Single Fmly	3	110,641.57	
0168435	Brazoria County	No	Single Fmly	3	50,952.56	
0118646	Brazoria County	No	Single Fmly	2	31,306.08	
0018515	Brazoria County	No	Single Fmly	7	155,397.10	VU
0017252	Brazoria County	No	Single Fmly	3	14,910.33	
0069861	Brazoria County	No	Single Fmly	2	61,105.33	
0025804	Brazoria County	No	Single Fmly	2	9,414.51	
0026042	Brazoria County	No	Othr-Nonres	2	2,681.25	
0025104	Brazoria County	No	Othr-Nonres	2	50,420.27	
0025105	Brazoria County	No	Single Fmly	2	33,663.65	PU
0048666	Brazoria County	No	Single Fmly	3	18,394.75	
0018437	Brazoria County	No	Single Fmly	2	9,833.42	
0017488	Brazoria County	No	Single Fmly	2	8,516.00	
0044283	Brazoria County	No	Single Fmly	3	9,173.37	
0045237	Brazoria County	No	Single Fmly	4	54,570.24	
0025384	Brazoria County	No	Single Fmly	3	10,314.57	
0068844	Brazoria County	No	Single Fmly	2	59,397.44	
0003059	Brazoria County	No	Other Resid	2	30,053.52	
0017558	Brazoria County	No	Single Fmly	2	23,248.20	
0044611	Brazoria County	No	Single Fmly	3	49,053.60	
0048453	Brazoria County	No	Othr-Nonres	2	121,322.56	
0044302	Brazoria County	No	Single Fmly	2	26,209.26	
0026108	Brazoria County	No	Single Fmly	4	12,751.45	
0044865	Brazoria County	No	Othr-Nonres	4	98,235.93	
0001455	Brazoria County	No	2-4 Family	3	32,860.54	
0017562	Brazoria County	No	Single Fmly	2	4,870.41	
0018474	Brazoria County	No	Single Fmly	5	155,565.14	MVU
0015995	Brazoria County	No	Othr-Nonres	3	41,027.66	
0115874	Brazoria County	No	Othr-Nonres	2	10,482.74	
0068099	Brazoria County	No	Single Fmly	5	241,745.22	MVU
0099153	Brazoria County	No	Single Fmly	2	9,495.36	
0097543	Brazoria County	No	Single Fmly	4	133,248.83	
0026012	Brazoria County	No	Single Fmly	3	65,363.46	
0050101	Brazoria County	No	Single Fmly	2	6,180.93	
0018726	Brazoria County	No	Single Fmly	8	353,082.01	MVU
0017559	Brazoria County	No	Single Fmly	14	496,501.26	MVU
0092099	Brazoria County	No	Single Fmly	2	27,400.00	
0044348	Brazoria County	No	Single Fmly	2	31,591.50	
0026836	Brazoria County	No	Single Fmly	2	27,696.74	
0071528	Brazoria County	No	Single Fmly	3	118,062.28	
0041346	Brazoria County	No	Single Fmly	2	17,503.00	
0018423	Brazoria County	No	Single Fmly	2	42,067.52	

0042610	Brazoria County	Yes	Single Fmly	6	146,550.94	MV
0074487	Brazoria, City of	Sdf	Single Fmly	4	95,778.50	V
0044973	Brazoria, City of	Sdf	Single Fmly	7	102,012.11	V
0249030	Brazoria, City of	Yes	Single Fmly	2	14,057.35	
0035273	Brazoria, City of	No	Single Fmly	3	4,494.36	
0119186	Brazoria, City of	No	Single Fmly	3	59,965.44	
0048874	Brazoria, City of	No	Single Fmly	2	2,717.42	
0168162	Brazoria, City of	Yes	Single Fmly	2	45,473.43	
0091965	Brazoria, City of	Yes	Single Fmly	3	43,525.71	
0080413	Brazoria, City of	Yes	Single Fmly	5	73,015.76	
0045287	Brazoria, City of	Yes	Single Fmly	3	21,918.98	
0119179	Brazoria, City of	Yes	Single Fmly	2	6,658.20	
0213229	Brazoria, City of	Yes	Single Fmly	4	42,111.48	
0093170	Brazoria, City of	No	Single Fmly	4	42,945.52	
0239616	Brazoria, City of	Yes	Single Fmly	3	74,007.36	
0093911	Brazoria, City of	No	Single Fmly	4	48,812.55	
0068030	Brazoria, City of	No	Single Fmly	3	13,101.43	
0118729	Brazoria, City of	No	Single Fmly	2	8,095.04	
0123800	Brazoria, City of	No	Single Fmly	2	61,286.24	
0048882	Brazoria, City of	No	Single Fmly	4	9,335.08	
0045259	Brazoria, City of	No	Single Fmly	3	6,326.91	
0168428	Brazoria, City of	Yes	Single Fmly	2	16,181.36	
0044886	Brazoria, City of	No	Single Fmly	3	15,060.39	
0039376	Brazoria, City of	No	Single Fmly	2	5,679.84	
0038629	Brazoria, City of	Yes	Single Fmly	4	9,517.08	
0112880	Brookside Village, City of	Yes	Assmd Condo	3	167,979.78	
0259975	Brookside Village, City of	Yes	Single Fmly	2	395,808.78	
0071471	Brookside Village, City of	No	Single Fmly	2	14,958.28	
0069944	Brookside Village, City of	No	Single Fmly	2	5,913.17	
0168026	Brookside Village, City of	Yes	Single Fmly	3	75,075.07	
0168137	Brookside Village, City of	No	Single Fmly	4	81,368.22	
0036827	Brookside Village, City of	No	Single Fmly	2	37,949.10	
0117784	Brookside Village, City of	No	Single Fmly	2	72,547.49	
0173724	Brookside Village, City of	No	Single Fmly	3	56,497.33	
0182797	Brookside Village, City of	No	Single Fmly	2	5,752.29	
0182798	Brookside Village, City of	No	Single Fmly	3	218,330.53	
0068067	Brookside Village, City of	No	Single Fmly	4	154,021.53	VU
0071481	Brookside Village, City of	No	Single Fmly	4	72,717.10	
0070927	Brookside Village, City of	No	Single Fmly	3	74,899.99	
0115799	Brookside Village, City of	No	Single Fmly	2	83,867.20	
0040015	Brookside Village, City of	No	Single Fmly	4	114,494.37	
0044773	Brookside Village, City of	No	Single Fmly	3	35,252.87	
0004477	Brookside Village, City of	No	Single Fmly	8	108,188.31	VU
0187054	Brookside Village, City of	Yes	Single Fmly	2	13,000.22	
0071430	Brookside Village, City of	No	Single Fmly	3	35,542.48	
0072209	Brookside Village, City of	No	Single Fmly	3	72,445.88	
0001459	Brookside Village, City of	Sdf	Single Fmly	9	249,064.62	P
0117731	Brookside Village, City of	No	Single Fmly	3	72,463.69	
0114986	Brookside Village, City of	No	Single Fmly	2	92,894.58	
0113277	Brookside Village, City of	No	Single Fmly	2	63,442.77	
0114739	Brookside Village, City of	No	Single Fmly	2	34,759.14	
0114608	Brookside Village, City of	Yes	Single Fmly	2	84,961.03	
0025090	Brookside Village, City of	No	Single Fmly	3	39,657.37	
0002814	Brookside Village, City of	No	Single Fmly	10	197,556.72	VU

0112914	Brookside Village, City of	Yes	Single Fmly	2	55,415.02	
0025161	Brookside Village, City of	Sdf	Single Fmly	7	208,928.84	V
0113044	Brookside Village, City of	No	Single Fmly	2	106,241.01	
0112557	Brookside Village, City of	Yes	Single Fmly	2	89,938.32	
0241552	Brookside Village, City of	Yes	Single Fmly	2	47,299.74	
0001910	Brookside Village, City of	No	Single Fmly	5	158,193.83	MVU
0115985	Brookside Village, City of	No	Single Fmly	2	84,895.42	
0045116	Clute, City of	No	Single Fmly	2	5,772.06	
0119195	Clute, City of	No	Single Fmly	2	8,854.94	
0119583	Clute, City of	No	Single Fmly	2	16,124.55	
0119191	Clute, City of	No	Othr-Nonres	2	13,883.74	
0112956	Clute, City of	Yes	Single Fmly	4	16,246.69	
0018296	Clute, City of	No	Single Fmly	2	13,691.62	
0038851	Clute, City of	No	Othr-Nonres	4	33,999.86	VNU
0118914	Clute, City of	Yes	Single Fmly	2	61,172.54	
0095192	Clute, City of	Yes	Single Fmly	3	62,497.91	
0124195	Clute, City of	No	Single Fmly	2	10,036.85	
0068429	Clute, City of	No	Single Fmly	2	2,898.91	
0068430	Clute, City of	Yes	Single Fmly	4	57,985.39	
0026744	Clute, City of	No	Single Fmly	2	11,639.00	
0041418	Clute, City of	No	Single Fmly	7	32,038.87	
0026688	Clute, City of	No	Assmd Condo	2	9,612.40	
0097563	Clute, City of	Sdf	Single Fmly	8	151,901.08	V
0119181	Clute, City of	No	Single Fmly	2	4,931.40	
0035370	Clute, City of	No	Othr-Nonres	2	33,711.44	
0040207	Clute, City of	No	Othr-Nonres	3	19,259.82	
0096848	Clute, City of	No	Single Fmly	3	72,769.46	
0112465	Clute, City of	No	Othr-Nonres	3	115,534.18	
0260271	Danbury, City of	Yes	Single Fmly	2	85,349.29	
0025204	Danbury, City of	No	Single Fmly	2	11,341.33	
0258801	Danbury, City of	Yes	Single Fmly	2	113,452.84	
0118751	Danbury, City of	No	Single Fmly	2	30,836.22	
0096866	Danbury, City of	Yes	Single Fmly	3	31,461.19	
0100353	Danbury, City of	No	Single Fmly	2	18,754.11	
0257214	Danbury, City of	Yes	Single Fmly	2	149,178.02	
0118859	Danbury, City of	No	Single Fmly	2	12,866.68	
0119190	Danbury, City of	Yes	Single Fmly	3	89,986.13	
0015145	Freeport, City of	No	Othr-Nonres	3	65,382.86	
0038724	Freeport, City of	No	Single Fmly	2	7,918.18	
0067999	Freeport, City of	No	Single Fmly	6	55,794.76	
0118739	Freeport, City of	No	Single Fmly	4	10,457.30	
0068000	Freeport, City of	No	Single Fmly	2	4,391.78	
0068001	Freeport, City of	Yes	Single Fmly	3	16,008.42	
0120650	Freeport, City of	No	Single Fmly	2	20,762.62	
0169488	Freeport, City of	No	Othr-Nonres	2	19,708.76	
0044926	Freeport, City of	No	Othr-Nonres	2	5,733.65	
0118971	Freeport, City of	Sdf	Othr-Nonres	4	156,559.12	VN
0118888	Freeport, City of	No	Single Fmly	2	12,830.94	
0018564	Freeport, City of	No	Single Fmly	3	23,340.46	
0172115	Freeport, City of	Sdf	Single Fmly	6	127,378.17	V
0025590	Freeport, City of	No	Single Fmly	3	10,542.68	
0119548	Freeport, City of	No	Single Fmly	3	40,732.21	
0128027	Freeport, City of	No	Single Fmly	2	84,254.69	
0018720	Freeport, City of	No	Single Fmly	3	58,491.24	

0119551	Freeport, City of	No	Single Fmly	2	23,413.72	
0254767	Freeport, City of	Yes	Othr-Nonres	2	210,684.47	
0026236	Freeport, City of	No	Single Fmly	2	51,480.22	
0182777	Freeport, City of	Yes	Single Fmly	2	71,492.93	
0026711	Freeport, City of	No	Single Fmly	2	5,340.77	
0068008	Freeport, City of	Yes	Single Fmly	2	44,385.57	
0118916	Freeport, City of	No	Single Fmly	2	17,141.41	
0119183	Freeport, City of	No	Single Fmly	2	5,775.25	
0118886	Freeport, City of	Yes	Single Fmly	3	65,068.74	
0124249	Freeport, City of	Yes	Single Fmly	3	37,595.11	
0043575	Freeport, City of	No	Single Fmly	2	3,093.64	
0041928	Freeport, City of	No	Othr-Nonres	2	4,653.00	
0068005	Freeport, City of	No	Assmd Condo	2	18,884.44	
0038996	Freeport, City of	No	Single Fmly	2	15,199.95	
0068010	Freeport, City of	Yes	Single Fmly	3	39,762.98	
0038133	Freeport, City of	Yes	Single Fmly	3	53,028.00	
0118889	Freeport, City of	No	Single Fmly	2	21,511.66	
0037909	Freeport, City of	No	Single Fmly	3	6,625.65	
0016077	Freeport, City of	No	Othr-Nonres	3	30,482.58	
0068011	Freeport, City of	No	Other Resid	2	11,460.97	
0018323	Freeport, City of	No	Assmd Condo	2	20,770.53	
0026090	Freeport, City of	No	Single Fmly	2	4,665.56	
0026147	Freeport, City of	No	Single Fmly	3	12,154.49	
0068013	Freeport, City of	No	Single Fmly	2	11,169.06	
0043786	Freeport, City of	No	Single Fmly	2	14,906.40	
0157859	Freeport, City of	No	Single Fmly	3	305,681.41	MVU
0068017	Freeport, City of	No	Single Fmly	2	7,927.30	
0041487	Hillcrest Village, City of	No	Single Fmly	2	8,254.14	
0017489	Hillcrest Village, City of	No	Single Fmly	2	14,956.29	
0026419	Hillcrest Village, City of	No	Single Fmly	2	25,202.95	
0017526	Hillcrest Village, City of	No	Single Fmly	2	17,237.97	
0068839	Hillcrest Village, City of	No	Single Fmly	7	47,962.71	
0026834	Hillcrest Village, City of	No	Single Fmly	2	34,157.43	
0258592	Holiday Lakes, Town of	Yes	Single Fmly	2	97,300.00	P
0071503	Iowa Colony, City of	Yes	Single Fmly	4	171,947.87	V
0115661	Iowa Colony, City of	No	Single Fmly	3	43,782.28	
0194832	Iowa Colony, City of	No	Single Fmly	2	61,034.14	
0168456	Iowa Colony, City of	No	Single Fmly	2	53,831.52	
0071470	Iowa Colony, City of	No	Single Fmly	8	225,486.74	VU
0125959	Iowa Colony, City of	Yes	Single Fmly	3	78,161.05	
0068014	Jones Creek, Village of	No	Single Fmly	3	21,389.25	
0122117	Jones Creek, Village of	No	Single Fmly	2	70,446.44	
0025677	Jones Creek, Village of	Yes	Single Fmly	5	27,333.54	
0038948	Jones Creek, Village of	No	Single Fmly	2	11,642.73	
0250744	Jones Creek, Village of	Yes	Single Fmly	3	157,447.50	
0252007	Jones Creek, Village of	Yes	Single Fmly	2	56,482.83	
0040361	Jones Creek, Village of	No	Single Fmly	2	10,855.32	
0043309	Jones Creek, Village of	No	Single Fmly	2	22,429.73	
0017575	Jones Creek, Village of	Yes	Single Fmly	2	31,198.14	
0068015	Jones Creek, Village of	No	Single Fmly	2	3,341.31	
0036431	Jones Creek, Village of	No	Single Fmly	2	4,866.04	
0040963	Jones Creek, Village of	No	Single Fmly	2	15,200.19	PU
0015139	Jones Creek, Village of	No	Single Fmly	5	95,938.88	VU
0017586	Jones Creek, Village of	No	Single Fmly	2	22,370.51	PU

0045643	Jones Creek, Village of	No	Single Fmly	2	11,487.33	
0025664	Jones Creek, Village of	No	Single Fmly	2	10,986.69	
0017462	Lake Jackson, City of	No	Single Fmly	4	14,929.74	
0119858	Lake Jackson, City of	Yes	Single Fmly	2	19,633.38	
0259643	Lake Jackson, City of	Yes	Single Fmly	2	94,094.35	
0106780	Lake Jackson, City of	No	Single Fmly	3	11,723.38	
0025754	Lake Jackson, City of	Yes	Single Fmly	3	19,568.49	
0119194	Lake Jackson, City of	No	Single Fmly	2	44,042.08	
0168452	Lake Jackson, City of	Yes	Single Fmly	2	4,195.11	
0026758	Lake Jackson, City of	Yes	Single Fmly	4	21,998.72	
0088134	Lake Jackson, City of	No	Single Fmly	2	5,508.31	
0017508	Lake Jackson, City of	No	Othr-Nonres	3	18,385.24	
0044710	Lake Jackson, City of	No	Single Fmly	3	30,525.53	
0043556	Lake Jackson, City of	No	Othr-Nonres	2	21,287.90	
0046816	Lake Jackson, City of	No	Single Fmly	3	35,478.46	
0045242	Lake Jackson, City of	No	Othr-Nonres	2	12,084.23	
0040369	Lake Jackson, City of	No	Single Fmly	4	15,364.62	
0049728	Lake Jackson, City of	Yes	Single Fmly	3	10,499.62	
0025828	Lake Jackson, City of	No	Single Fmly	3	11,097.79	
0044504	Lake Jackson, City of	No	Single Fmly	2	9,832.78	
0045288	Liverpool, City of	No	Single Fmly	2	14,491.03	
0044125	Liverpool, City of	Yes	Single Fmly	2	17,008.00	
0123863	Liverpool, City of	No	Single Fmly	2	39,559.22	
0045103	Liverpool, City of	No	Single Fmly	2	19,224.77	
0034320	Manvel, City of	No	Single Fmly	2	11,537.70	
0113964	Manvel, City of	Yes	Single Fmly	3	44,401.14	
0069918	Manvel, City of	No	Single Fmly	2	11,429.82	
0121370	Manvel, City of	No	Single Fmly	2	29,600.60	
0116004	Manvel, City of	No	Single Fmly	2	19,469.65	
0242161	Manvel, City of	Yes	Single Fmly	3	76,454.03	
0116812	Manvel, City of	No	Single Fmly	3	43,433.95	
0017435	Manvel, City of	Sdf	Single Fmly	5	154,364.25	V
0116813	Manvel, City of	Yes	Single Fmly	3	64,767.24	
0168804	Manvel, City of	Yes	Single Fmly	2	71,770.74	
0083536	Manvel, City of	No	Single Fmly	3	115,009.07	
0081789	Manvel, City of	No	Single Fmly	4	104,351.99	VU
0005609	Manvel, City of	No	Single Fmly	3	28,411.65	
0069001	Manvel, City of	No	Single Fmly	2	16,920.62	
0115730	Manvel, City of	No	Single Fmly	4	49,163.31	
0045537	Manvel, City of	No	Single Fmly	6	265,874.07	VU
0116833	Manvel, City of	No	Single Fmly	3	65,597.68	
0026047	Manvel, City of	No	Single Fmly	5	53,529.20	
0115660	Manvel, City of	No	Othr-Nonres	3	55,492.42	
0114624	Manvel, City of	Yes	Single Fmly	2	45,729.99	
0071462	Manvel, City of	Yes	Single Fmly	4	235,670.65	
0026780	Manvel, City of	No	Single Fmly	7	169,215.30	VU
0169495	Manvel, City of	Yes	Single Fmly	2	94,575.53	
0071457	Manvel, City of	No	Single Fmly	2	10,134.35	
0258291	Manvel, City of	Yes	Single Fmly	2	139,468.63	
0038723	Manvel, City of	Yes	Single Fmly	3	35,781.48	
0043388	Manvel, City of	No	Single Fmly	2	36,752.39	
0038814	Manvel, City of	No	Single Fmly	2	17,929.48	
0124247	Oyster Creek, City of	No	Assmd Condo	2	218,139.46	
0121436	Oyster Creek, City of	No	Single Fmly	3	18,488.47	

0119539	Oyster Creek, City of	Yes	Single Fmly	4	15,235.82	
0025696	Oyster Creek, City of	No	Single Fmly	2	7,528.31	
0016013	Oyster Creek, City of	No	Single Fmly	2	12,647.57	
0026118	Oyster Creek, City of	No	Othr-Nonres	2	8,697.51	
0025581	Oyster Creek, City of	No	Othr-Nonres	2	6,395.23	
0025363	Oyster Creek, City of	No	Single Fmly	2	8,169.53	
0181880	Quintana, Town of	No	Single Fmly	2	14,803.31	
0017261	Richwood, City of	No	Single Fmly	2	54,194.00	
0044101	Richwood, City of	No	Single Fmly	2	4,556.37	
0045839	Richwood, City of	Sdf	Othr-Nonres	6	84,780.62	PN
0040112	Richwood, City of	No	Single Fmly	2	4,414.86	
0045729	Richwood, City of	No	Single Fmly	7	69,719.97	VU
0018502	Richwood, City of	Yes	Single Fmly	4	32,091.63	
0128028	Richwood, City of	Yes	Single Fmly	4	87,207.94	
0244402	Richwood, City of	No	Single Fmly	2	11,602.69	
0183782	Richwood, City of	No	Single Fmly	2	7,189.92	
0017585	Richwood, City of	No	Single Fmly	7	79,630.85	VU
0048476	Richwood, City of	No	Single Fmly	3	16,320.09	
0183771	Surfside Beach, City of	Yes	Single Fmly	2	108,366.00	
0183772	Surfside Beach, City of	No	Single Fmly	2	88,098.48	
0186536	Surfside Beach, City of	Yes	Single Fmly	2	11,639.91	
0146331	Surfside Beach, City of	Sdf	Single Fmly	4	101,978.10	V
0179113	Surfside Beach, City of	No	Single Fmly	2	133,788.30	
0182772	Surfside Beach, City of	Yes	Single Fmly	2	135,556.81	V
0179186	Surfside Beach, City of	No	Single Fmly	2	235,742.49	VU
0177146	Surfside Beach, City of	Yes	Single Fmly	2	40,564.05	
0026214	Surfside Beach, City of	No	Single Fmly	4	11,234.86	
0178846	Surfside Beach, City of	Yes	Single Fmly	2	13,398.73	
0124243	Surfside Beach, City of	No	Single Fmly	2	4,337.48	
0124199	Surfside Beach, City of	No	Single Fmly	2	11,271.85	
0123745	Surfside Beach, City of	No	Single Fmly	3	40,345.81	
0124412	Surfside Beach, City of	No	Single Fmly	4	28,589.54	
0123939	Surfside Beach, City of	Yes	Single Fmly	3	25,589.92	
0179144	Surfside Beach, City of	No	Single Fmly	2	121,039.99	VU
0179071	Surfside Beach, City of	Yes	Single Fmly	2	38,447.21	
0178847	Surfside Beach, City of	Yes	Single Fmly	2	16,147.07	
0181073	Surfside Beach, City of	No	Single Fmly	2	3,595.00	
0124942	Surfside Beach, City of	No	Single Fmly	3	42,017.74	
0181197	Surfside Beach, City of	Yes	Single Fmly	2	14,617.30	
0068621	Surfside Beach, City of	No	Othr-Nonres	9	448,968.69	PNU
0123948	Surfside Beach, City of	Yes	Single Fmly	3	18,805.86	
0124313	Surfside Beach, City of	No	Single Fmly	3	51,876.65	
0181068	Surfside Beach, City of	No	Othr-Nonres	2	138,955.94	
0123949	Surfside Beach, City of	Yes	Othr-Nonres	2	20,036.99	
0119586	Surfside Beach, City of	Sdf	Othr-Nonres	4	229,942.97	PN
0162115	Surfside Beach, City of	No	Other Resid	2	19,212.80	
0132860	Surfside Beach, City of	No	Single Fmly	5	38,298.27	
0119838	Surfside Beach, City of	Sdf	Single Fmly	4	111,166.20	V
0124577	Surfside Beach, City of	No	Single Fmly	2	20,085.00	
0124214	Surfside Beach, City of	No	Single Fmly	2	10,192.00	
0182776	Surfside Beach, City of	No	Single Fmly	2	16,948.66	
0098410	Surfside Beach, City of	No	Othr-Nonres	4	293,530.78	VNU
0119315	Surfside Beach, City of	No	Single Fmly	3	12,279.14	
0124221	Surfside Beach, City of	No	Single Fmly	3	68,279.12	

0045738	Surfside Beach, City of	Sdf	Othr-Nonres	6	336,596.20	VN
0124345	Surfside Beach, City of	No	Single Fmly	2	13,396.43	
0181066	Surfside Beach, City of	Yes	Single Fmly	2	25,900.87	
0098357	Surfside Beach, City of	No	Single Fmly	4	59,261.97	
0132884	Surfside Beach, City of	No	Single Fmly	3	67,926.05	
0183053	Surfside Beach, City of	No	Single Fmly	2	35,728.78	
0123978	Surfside Beach, City of	No	Single Fmly	2	6,341.00	
0181827	Surfside Beach, City of	No	Single Fmly	2	122,096.60	
0048327	Surfside Beach, City of	No	Single Fmly	2	5,376.49	
0179695	Surfside Beach, City of	Yes	Single Fmly	2	26,239.99	
0181171	Surfside Beach, City of	No	Single Fmly	2	28,170.70	
0118915	Surfside Beach, City of	No	Single Fmly	3	38,409.75	
0182768	Surfside Beach, City of	No	Othr-Nonres	2	153,069.79	
0124408	Surfside Beach, City of	No	Single Fmly	2	50,778.81	
0123962	Surfside Beach, City of	No	Single Fmly	3	51,792.11	
0118747	Surfside Beach, City of	No	Single Fmly	3	22,116.97	
0254975	Surfside Beach, City of	Yes	Single Fmly	2	35,723.07	
0015175	Surfside Beach, City of	Yes	Single Fmly	5	25,410.73	
0181267	Surfside Beach, City of	Yes	Single Fmly	3	26,790.91	
0181732	Surfside Beach, City of	Yes	Single Fmly	2	10,600.84	
0124201	Surfside Beach, City of	No	Single Fmly	3	94,363.14	
0180876	Surfside Beach, City of	No	Single Fmly	2	18,348.40	
0124289	Surfside Beach, City of	Yes	Single Fmly	3	20,677.02	
0157057	Surfside Beach, City of	No	Single Fmly	2	42,782.51	
0121662	Surfside Beach, City of	Yes	Othr-Nonres	3	90,587.36	
0184358	Surfside Beach, City of	Yes	Single Fmly	2	19,498.18	
0181076	Surfside Beach, City of	No	Single Fmly	2	19,282.14	
0178982	Surfside Beach, City of	No	Single Fmly	2	13,935.77	
0182770	Surfside Beach, City of	Yes	Single Fmly	2	14,016.04	
0178845	Surfside Beach, City of	No	Single Fmly	2	10,521.10	
0026825	Surfside Beach, City of	No	Othr-Nonres	2	4,297.71	
0179062	Surfside Beach, City of	Yes	Single Fmly	3	54,989.88	
0181245	Surfside Beach, City of	No	Single Fmly	2	18,022.73	
0180243	Surfside Beach, City of	Yes	Single Fmly	2	17,217.73	
0184498	Surfside Beach, City of	No	Single Fmly	2	12,818.41	
0180196	Surfside Beach, City of	No	Single Fmly	2	20,340.72	
0181074	Surfside Beach, City of	No	Single Fmly	2	16,355.66	
0146325	Surfside Beach, City of	No	Single Fmly	2	32,396.36	
0124575	Surfside Beach, City of	Yes	Single Fmly	3	12,725.08	
0182962	Surfside Beach, City of	No	Single Fmly	2	20,371.95	
0181075	Surfside Beach, City of	No	Single Fmly	2	40,452.31	
0183235	Surfside Beach, City of	Yes	Single Fmly	2	5,591.27	
0180083	Surfside Beach, City of	Yes	Single Fmly	2	18,333.21	
0213522	Surfside Beach, City of	No	Single Fmly	2	95,306.64	
0178848	Surfside Beach, City of	Yes	Single Fmly	2	17,997.58	
0157071	Surfside Beach, City of	Yes	Single Fmly	3	27,215.20	
0044060	Surfside Beach, City of	Sdf	Single Fmly	5	49,744.35	V
0178966	Surfside Beach, City of	Yes	Single Fmly	2	28,607.98	
0123813	Surfside Beach, City of	Yes	Single Fmly	3	37,852.65	
0178994	Surfside Beach, City of	No	Single Fmly	2	12,904.98	
0123953	Surfside Beach, City of	Yes	Single Fmly	3	55,539.14	
0182965	Surfside Beach, City of	No	Single Fmly	2	27,651.10	
0124022	Surfside Beach, City of	No	Single Fmly	2	5,662.47	
0180093	Surfside Beach, City of	No	Single Fmly	2	42,939.23	

0180148	Surfside Beach, City of	No	Single Fmly	2	33,508.92	
0124437	Surfside Beach, City of	Sdf	Single Fmly	4	50,925.06	V
0042831	Surfside Beach, City of	Yes	Single Fmly	6	34,125.81	
0016107	Surfside Beach, City of	No	Single Fmly	3	5,679.55	
0181414	Surfside Beach, City of	No	Single Fmly	2	52,969.15	
0178988	Surfside Beach, City of	Yes	Single Fmly	2	71,907.14	
0119166	Surfside Beach, City of	No	Single Fmly	4	27,126.08	
0177170	Surfside Beach, City of	No	Single Fmly	3	81,299.53	
0189639	Surfside Beach, City of	Yes	Single Fmly	2	19,710.15	
0124230	Surfside Beach, City of	Yes	Single Fmly	3	26,467.53	
0179059	Surfside Beach, City of	No	Single Fmly	2	72,904.44	
0026820	Surfside Beach, City of	No	Assmd Condo	5	145,196.64	
0182963	Surfside Beach, City of	No	Single Fmly	2	11,095.06	
0119169	Surfside Beach, City of	No	Single Fmly	3	124,441.35	
0025947	Surfside Beach, City of	No	Single Fmly	2	8,216.89	
0178983	Surfside Beach, City of	Yes	Single Fmly	2	23,464.34	
0178765	Surfside Beach, City of	No	Single Fmly	2	11,551.50	
0124245	Surfside Beach, City of	No	Single Fmly	2	11,044.41	
0181198	Surfside Beach, City of	Yes	Single Fmly	2	22,333.71	
0182767	Surfside Beach, City of	No	Single Fmly	2	5,528.24	
0182961	Surfside Beach, City of	No	Single Fmly	2	50,348.99	
0124372	Surfside Beach, City of	No	Single Fmly	3	38,543.24	
0181771	Surfside Beach, City of	Yes	Single Fmly	2	32,296.42	
0037907	Surfside Beach, City of	No	Othr-Nonres	2	17,536.10	
0038438	Surfside Beach, City of	No	Assmd Condo	3	28,024.00	
0046398	Surfside Beach, City of	No	Single Fmly	2	8,966.30	
0026192	Surfside Beach, City of	No	Othr-Nonres	3	32,579.50	
0048324	Surfside Beach, City of	No	Othr-Nonres	3	11,169.47	
0016111	Surfside Beach, City of	No	Othr-Nonres	2	31,692.88	
0026430	Surfside Beach, City of	No	Single Fmly	2	5,346.10	
0182164	Surfside Beach, City of	No	Single Fmly	2	72,015.36	
0124574	Surfside Beach, City of	No	Single Fmly	3	33,366.43	
0151758	Surfside Beach, City of	No	Single Fmly	2	28,150.67	
0119587	Surfside Beach, City of	No	Single Fmly	3	21,761.81	
0157854	Surfside Beach, City of	No	Single Fmly	3	146,124.03	
0025708	Surfside Beach, City of	No	Single Fmly	4	112,965.98	
0025460	Surfside Beach, City of	No	Single Fmly	6	38,288.90	MVU
0181072	Surfside Beach, City of	No	Single Fmly	2	193,965.11	
0191655	Surfside Beach, City of	No	Single Fmly	2	76,672.32	
0151760	Surfside Beach, City of	No	Single Fmly	2	60,574.59	
0111176	Surfside Beach, City of	No	Single Fmly	3	66,842.86	
0180870	Surfside Beach, City of	No	Single Fmly	2	57,958.90	
0124421	Surfside Beach, City of	No	Single Fmly	4	137,297.76	
0119801	Surfside Beach, City of	No	Single Fmly	3	151,870.78	
0124016	Surfside Beach, City of	No	Othr-Nonres	2	64,857.31	
0124200	Surfside Beach, City of	No	Single Fmly	3	115,543.81	MVU
0124463	Surfside Beach, City of	No	Othr-Nonres	3	548,942.69	
0184784	Surfside Beach, City of	Yes	Single Fmly	2	73,084.49	
0123952	Surfside Beach, City of	No	Single Fmly	4	14,151.98	
0005637	Sweeny, City of	No	Single Fmly	5	104,788.96	VU
0076282	Sweeny, City of	Yes	Single Fmly	4	57,125.85	
0068234	Sweeny, City of	Sdf	Single Fmly	5	103,772.84	V
0120587	Sweeny, City of	Yes	Single Fmly	4	259,322.43	
0042598	Sweeny, City of	No	Single Fmly	5	104,429.51	VU

0195023	Sweeny, City of	Yes	Single Fmly	3	12,263.41	
0103528	Sweeny, City of	No	Othr-Nonres	3	53,012.05	
0239143	West Columbia, City of	Yes	Assmd Condo	2	87,761.65	
0097231	West Columbia, City of	No	Single Fmly	3	43,517.27	
0096730	West Columbia, City of	No	Single Fmly	2	53,860.71	
0026747	West Columbia, City of	No	Single Fmly	2	11,048.00	
0026123	West Columbia, City of	No	Single Fmly	2	38,123.01	PU
0001026	West Columbia, City of	No	Single Fmly	10	147,014.56	VU
0033821	West Columbia, City of	No	Single Fmly	4	53,837.13	
0119323	West Columbia, City of	No	Single Fmly	2	6,923.77	
0096729	West Columbia, City of	No	Single Fmly	2	9,630.81	
0118936	West Columbia, City of	No	Single Fmly	2	6,996.76	
0260848	West Columbia, City of	Yes	Single Fmly	2	55,425.58	
0195149	West Columbia, City of	Sdf	Single Fmly	5	52,285.54	V
0042422	West Columbia, City of	No	Single Fmly	3	8,146.47	
0098916	West Columbia, City of	No	Single Fmly	3	58,431.99	

MEMORANDUM

To: The Honorable Mark Guthrie, Mayor and Members of the Richwood City Council

From: Michael Coon, City Manager

Date: October 22, 2018

Subject: Discuss and consider approval of interlocal agreement to continue Richwood's participation in the regional stormwater management program

State and Federal law require certain permitting and reporting standards for local governments' stormwater infrastructure. To save costs, the City of Richwood has historically partnered with the County and other local entities to contract with the same provider for these services. This interlocal agreement is simply reconfirming Richwood's desire to participate in this local stormwater coalition. If the City were to procure these services separately, it would easily cost the City double the $13,000 that is required under the proposed agreement.

THE STATE OF TEXAS §
§
COUNTY OF BRAZORIA §

INTERLOCAL AGREEMENT FOR A REGIONAL STORMWATER MANAGEMENT PROGRAM

WHEREAS, the Parties, which consist of the City of Lake Jackson, the City of Clute, the City of Alvin, the City of Angleton, the City of Freeport, the City of Richwood, Brazoria County (hereinafter called "Entities"), and Velasco Drainage District, Angleton Drainage District, Brazoria County Conservation and Reclamation District 3, and Brazoria County Drainage District 4 (hereinafter called "Districts"), agree that it would be advantageous to continue implementation of a regional stormwater management program and associated permit application forms for the Texas Pollutant Discharge Elimination System Phase II Stormwater Discharge Permit, which is required by the TCEQ in TPDES General Permit TXR040000 originally issued August 13, 2007 and subsequently renewed every five years; and

WHEREAS, the governing bodies of each party find that the subject of this agreement is necessary for the benefit of the public, and that each party has the legal authority to perform and to provide the governmental function or service which is the subject matter of this agreement; and

WHEREAS, the governing bodies of each party find that the performance of this agreement is in the common interest of all parties.

NOW THEREFORE, BE IT RESOLVED that the parties, pursuant to Chapter 791 of the Texas Government Code (Interlocal Cooperation Act) each acting through their respective governing bodies, hereby enter into this Interlocal Agreement.

I. RECITALS

All the recitals and preambles hereinabove stated are found to be true and correct and are incorporated herein and made a part of this agreement.

II. PURPOSE

The purpose of this agreement is to develop and implement a regional stormwater management program (SWMP) and associated permit application forms for the Texas Pollutant Discharge Elimination System (TPDES) Phase II Stormwater Discharge Permit (the Project).

III. Scope of Services

(a) Each Entity and District agrees to pay a proportionate share of the cost of every expense incurred in performing the Project. Estimated costs are attached as Exhibit A. Each Entity and District

understands that the proportionate costs shall increase or decrease as parties join or withdraw from this Agreement.

(b) Each Entity and District shall appoint one representative to the steering committee. Decisions to develop and implement the project shall be by a majority decision of the steering committee.

(c) Brazoria County will be responsible for drafting agreements related to consulting services necessary to implement the project. The agreements will be submitted to the steering committee before Brazoria County executes the agreements.

(d) All Entities and Districts will have an opportunity to review and provide input to the permit application and submittals prior to submission to TCEQ.

(e) Brazoria County will bill monthly the Entities/Districts for their share of the cost for implementation of the SWMP.

(f) All of the Entities and Districts shall pay said bill within 30 days of receipt.

IV. TERM OF AGREEMENT

The Effective Date of this Agreement is September 1, 2018.

This Agreement will be in effect for one year from the Effective Date hereof and will be considered automatically renewed for each succeeding year. This Agreement shall not be renewed past September 30, 2023.

V. AMENDMENTS

Amendments may be made to this Agreement upon the approval of the governing body of each Entity and District.

VI. WITHDRAWING FROM OR JOINING AGREEMENT

A party may withdraw from this Agreement, following a vote of its governing body, provided it has notified the steering committee of such action in writing at least 60 days before its intended withdrawal date. Withdrawal shall not relieve any Entity or District of any obligation incurred prior to the withdrawal.

Additional political subdivisions may become parties to this Agreement by first obtaining endorsement by the steering committee, approving the terms and conditions of the Agreement, providing funding support that shall be determined by the steering committee, providing a certified copy of a resolution or order by the political subdivision's governing body indicating its consent to join this Agreement, and affixing hereto the signature of its authorized representative indicating the date of approval of this Agreement by said entity.

VII. TERMINATION

This Agreement may be dissolved at any time by the written consent of a majority of the parties, in the event of the dissolution of the Agreement, whether voluntary or involuntary or by operation of law. Any funds remaining after payment of the debts and obligations accrued pursuant to this Agreement shall be returned to the Entities and Districts on an equal basis.

VIII. CURRENT REVENUES

Each party shall pay for the performances of services under this agreement from current revenues.

IX. DISCRIMINATION

No one, on the grounds of race, creed, color, national origin, disability, age, or gender, shall be subject to discrimination in the performance of this Agreement.

X. FORCE MAJEURE

No Party shall be deemed in violation of this Agreement if it cannot perform any of the obligations hereunder by reason of strikes, boycotts, labor disputes, embargoes, act of God, acts of the public enemy, acts of superior governmental authority, riots, rebellion, sabotage, or other circumstances for which it is not responsible or which is not within its control.

XI. MISCELLANEOUS PROVISIONS

a) Venue: Venue for any lawsuit involving this agreement shall be in Brazoria County, Texas.

b) Choice of Law: This Agreement is governed by the laws of the State of Texas

c) Entire Agreement: This Agreement constitutes the entire agreement between the Entities and Districts, and all negotiations and all understandings between the Parties are merged herein. The terms and conditions of this agreement specifically replace and supersede any prior discussions, terms, documents, correspondence, conversations, or other written or oral understanding not contained herein or specifically adopted by reference.

d) Exhibits: All exhibits are attached and are incorporated into the agreement.

e) Partial Invalidity: If any term, provision, covenant, or condition of this agreement is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the provisions shall remain in full force and effect and shall in no way be affected, impaired, or invalidated.

f) Survival: Any provisions which by their terms survive the termination of this agreement shall bind its legal representatives, heirs, and assigns as set forth herein.

g) Assignment: The Parties shall not assign, transfer, or encumber any right or interest in this agreement, in whole or in part, without prior written approval of the other Party.

h) Benefits: This agreement shall bind, and the benefits thereof shall inure to the respective parties hereto, their heirs, legal representative, executors, administrators, successors, and assigns.

i) Amendments: This agreement can be supplemented and/or amended only by a dated written document executed by both parties.

j) Gender: Words or any gender used in this agreement shall be held and constructed to include any other gender and words in the singular number shall be held to include the plural, and vice versa, unless the context requires otherwise.

k) Multiple Copies: This agreement may be executed in multiple counterparts each of which constitutes an original.

l) Article and Section Headings: The Article and Section headings contained herein are for convenience and reference and are not intended to define or limit the scope of any provision of this agreement.

m) Misspelled Words: Misspelling of one or more words in this agreement shall not void this agreement. Such misspelled words shall be read so as to have the meaning apparently intended by the parties.

This agreement shall take effect upon execution by all signatories.

BRAZORIA COUNTY

By _____

Title _____

Date _____

CITY OF LAKE JACKSON

By _____

Title _____

Date _____

CITY OF ALVIN

By _____

Title _____

Date _____

CITY OF FREEPORT

By _____

Title _____

Date _____

CITY OF CLUTE

By _____

Title _____

Date _____

BRAZORIA COUNTY DRAINAGE DISTRICT 4

By _____

Title _____

Date _____

CITY OF ANGLETON

By _____

Title _____

Date _____

VELASCO DRAINAGE DISTRICT

By _____

Title _____

Date _____

ANGLETON DRAINAGE DISTRICT

By _____

Title _____

Date _____

CITY OF RICHWOOD

By _____

Title _____

Date _____

BRAZORIA COUNTY CONSERVATION AND RECLAMATION DISTRICT 3

By _____

Title _____

Date _____

LJA ENGINEERING
2615 Calder Avenue, Suite 500, Beaumont, Texas 77702
t 409.833.3363 f 409.833.0317 LJA.com TBPE F-1386 TBPLS 10105600

Brazoria County Stormwater Quality Coalition

Scope of Services

Permit Implementation for Permit Year 1 of the 3nd Permit Term (FY 2019)

Minimum Control Measure 1.0

I. Assist with implementation of Public Education, Outreach, and Involvement Program in compliance with TPDES General Permit No. TXR040000.

A. Develop and make available public education materials on the impacts of illegal dumping and littering
B. Develop educational materials to be distributed to local schools
C. Maintain multi-jurisdiction stormwater website
D. Conduct SWMP committee meetings
E. Maintain all associated permit compliance records/documentation
F. Provide assistance with Stormwater Hotline calls

Minimum Control Measure 2.0

II. Assist with implementation of Illicit Discharge Detection and Elimination Program in compliance with TPDES General Permit No. TXR040000.

A. Update outfall inventory map
B. Field work – Outfall inspections (20% of identified outfalls)
C. Provide assistance with enforcement of local illicit discharge regulations
D. Maintain all associated permit compliance records/documentation

Minimum Control Measure 3.0

III. Assist with implementation of Construction Site Stormwater Runoff Control Program in compliance with TPDES General Permit No. TXR040000.

A. Conduct construction site inspections
B. Monitor permittee owned construction sites
C. Provide construction SWPPP review assistance/training
D. Maintain all associated permit compliance records/documentation

Minimum Control Measure 4.0

IV. Assist with implementation of Post-Construction Stormwater Management Program in compliance with TPDES General Permit No. TXR040000.

A. Conduct inspections of post construction control measures
B. Provide assistance with enforcement of local post-construction control regulations
C. Provide post-construction control plan review assistance
D. Maintain all associated permit compliance records/documentation

Minimum Control Measure 5.0

V. Assist with implementation of Good Housekeeping Program in compliance with TPDES General Permit No. TXR040000.

   A. Conduct municipal facility inspections
   B. Employee training program
   C. Conduct parking lot inspections
   D. Conduct municipal structural control inspections, if applicable
   E. Maintain all associated permit compliance records/documentation

TMDL/Impaired Water Bodies

VI. Assist with implementation of the BMPs associated with the TMDL/Impaired Water Bodies section of the Brazoria County Stormwater Management Program.

   A. Provide stakeholder representation at TCEQ Water Quality/TMDL meetings
   B. Develop public education materials
   C. Conduct analysis of progress made toward reaching established benchmarks

Additional Services

VII. Additional Permit Compliance Activities

   A. Permit term 2; Year 5 annual report development
   B. Stakeholder representation (TXR040000 Permit Renewal Meetings)
   C. TXR040000 permit renewal tasks
      a. Draft Permit Review
      b. SWMP Revisions
      c. Permit Application Development/Submittal
      d. TCEQ Permit Negotiations
      e. Public Notice Process

*All scope items listed will be implemented in accordance with the measureable goals established in the Brazoria County Stormwater Management Program.

Brazoria County Stormwater Quality Coalition

Brazoria County, City of Lake Jackson, City of Angleton, City of Alvin, City of Freeport, City of Clute, City of Richwood, Angleton DD, Velasco DD, Brazoria DD4, Brazoria C&R3

Stormwater Management Program Implementation
Estimated Budget

Key Implementation Activities by MCM	Permit Year 1 (FY 2019)	Permit Year 2 (FY 2020)	Permit Year 3 (FY 2021)	Permit Year 4 (FY 2022)	Permit Year 5 (FY 2023)
1.0 Public Education, Outreach, and Involvement					
Development of Public Education Materials	$16,000.00	$16,000.00	$16,000.00	$16,000.00	$16,000.00
Contractor Training and Outreach Program					
Reproduction Costs for Brochures, Flyers and other materials					
Conduct Public Meetings					
SWMP Committee Meetings					
Record Maintenance/Data Entry					
2.0 Illicit Discharge Detection and Elimination					
Regulatory Enforcement Assistance	$18,000.00	$18,000.00	$18,000.00	$18,000.00	$18,000.00
Outfall Screening					
Maintain/Update Outfall Inventory Map					
Record Maintenance/Data Entry					
3.0 Construction Site Stormwater Runoff Control					
Regulatory Enforcement Assistance	$45,000.00	$45,000.00	$45,000.00	$45,000.00	$45,000.00
Construction SWPPP Review					
Training Programs for Permitting Personnel					
Monitor Permittee Owned Construction Projects					
Construction Site Inspections and Enforcement					
Record Maintenance/Data Entry					
4.0 Post-Construction Stormwater Management					
Regulatory Enforcement Assistance	$16,000.00	$16,000.00	$16,000.00	$16,000.00	$16,000.00
Inspection of Post-Construction Controls					
Training Programs for Plan Review Personnel					
Plan Review Assistance					
Record Maintenance/Data Entry					
5.0 Good Housekeeping for Municipal Operations					
Employee Training Programs	$10,000.00	$10,000.00	$10,000.00	$10,000.00	$10,000.00
Municipal Facility Inspections					
Parking Lot Inspections					
Record Maintenance/Data Entry					
TMDL/Impaired Water Bodies					
TMDL/Stakeholder Representation	$8,000.00	$8,000.00	$8,000.00	$8,000.00	$8,000.00
Public Education Development					
Focused BMP Implementation					
Additional Services					
Stakeholder Representation	$30,000.00	$19,000.00	$19,000.00	$19,000.00	$19,000.00
Permit Renewal Tasks					
Development/Submittal of Annual Reports					
Total Annual Cost for Combined Activities	**$143,000.00**	**$132,000.00**	**$132,000.00**	**$132,000.00**	**$132,000.00**
Cost per participant (based on 11)	**$13,000.00**	**$12,000.00**	**$12,000.00**	**$12,000.00**	**$12,000.00**

MEMORANDUM

To: The Honorable Mark Guthrie, Mayor and Members of the Richwood City Council

From: Michael Coon, City Manager

Date: October 22, 2018

Subject: Discuss and consider appointing Lindsay Koskiniemi as Finance Director

The City of Richwood received 35 applications for the newly created Finance Director position. After completing an initial review of the applications, a supplemental questionnaire and an Excel assessment were sent to the top applicants. The results of from the questionnaire and assessment were then used to select the final candidates to be interviewed. Staff interviewed four applicants and Ms. Koskiniemi was everyone's top choice. In addition to previously serving as a deputy finance director for a county, she also has great experience serving as a project manager for two different public works departments. We all believe that her knowledge and experience will be great assets for the City of Richwood.

MEMORANDUM

To: The Honorable Mark Guthrie, Mayor and Members of the Richwood City Council

From: Michael Coon, City Manager

Date: October 22, 2018

Subject: Workshop – City Zoning Regulations

The purpose of this workshop is to (1) learn about the history of zoning and why it was created, (2) discuss State laws regarding zoning, and (3) discuss potential changes to the current zoning regulations and their potential impact on the City.

With regards to the potential changes, listed below are some of the specific areas in the zoning code that staff would like to discuss.

- Property setbacks
- Minimum and maximum lot sizes
- Maximum lot coverage
- Refining and adding definitions for key terms