2023

BOARD OF DIRECTORS
VICTOR CARAWAY
LES HANKAMER, JR.
SCOTT KAHLA
RICK NICELY
GREGGORY TURNER

GENERAL MANAGER
JERRY SHADDEN

TRINITY BAY CONSERVATION DISTRICT 2023 HAZARD MITIGATION PLAN UPDATE

Adopted April 12, 2023

TRINITY BAY CONSERVATION DISTRICT (TBCD) HAZARD MITIGATION PLAN UPDATE

TABLE OF CONTENTS

Table List

Figure List

SECTION 1 – INTRODUCTION AND ADOPTION

This Plan is an Update

Trinity Bay Conservation District (TBCD or the District) has participated in Hazard Mitigation Plans (HMP) since 2011 first participating in the 2011 update to the Houston-Galveston Area Council Regional Multi-Jurisdictional Hazard Mitigation Plan and then a standalone TBCD Hazard Mitigation Plan. The TBCD plan was approved by the Federal Emergency Management Agency (FEMA) in 2015 and adopted by the Board of Directors on September 17, 2015. The Disaster Mitigation Act of 2000 (DMA, Section 201.6 (c)(4)(i)) requires a plan maintenance process, which includes reviewing and updating the plan every five years. While the update should have taken place in 2020, for various reasons, the update did not start until 2022 with the goal to have the plan approved and adopted in early 2023. This is the District's second plan update.

The intent of the current, updated plan, while incorporating much of the information from the earlier plans is to:

- Include any newly identified hazards or remove hazards that are no longer deemed a hazard;
- Update the hazard/risk data;
- Review and update development data;
- Review, update or revise as necessary any changes in priorities, goals, and actions from the last plan;
- Update the demographic information based on current information;
- Provide progress in the local mitigation efforts;
- Provide a planning process for key stakeholders and the public to review and a chance for input to the update;
- Review and update plans or reports for inclusion in this update of the plan; and
- Reorganize/consolidate/add sections

An important step in the process of improving resistance to hazards is the development of a hazard mitigation plan. The TBCD Hazard Mitigation Plan (HMP) Update was prepared in accordance with the guidelines provided by FEMA and the Texas Division of Emergency Management (TDEM). The original TBCD HMP was prepared for several purposes. It set the stage for long-term disaster resistance through identification of actions that will, over time, reduce the exposure of people and property to hazards. Completion of the original plan, and adoption by the District's Board, was a significant step toward identifying potential hazards that threaten the TBCD' jurisdictional area of responsibility, assessing risk, and implementing mitigation actions that will reduce property damages, injuries, and loss of life from hazards. Approval of the original plan and each subsequent update reviewed and approved by TDEM and FEMA also establish eligibility for certain mitigation grant funds. This HMP update continues the District's efforts to build a safe and resilient community and to be eligible for FEMA mitigation grants.

Summary

There are five sections of this plan all with the focus on the years after the current plan was approved 2016-2022 – the Introduction and Community Profile, the Planning Process, the

Hazard Profiling and Risk Assessment, the Mitigation Strategy, and the Plan Maintenance section. Each section provides updates in the last five/six years to the natural hazards that threaten the District, the people and property exposed to those hazards, the planning process, how hazards are recognized in the District's normal processes and functions, and priority mitigation action items. As in past years, when taking into account, the magnitude of past events, the number of people and properties affected, and the severity of damage, flood hazards clearly are the most significant natural hazard to threaten TBCD and its mandate to help mitigate against floods. Since the last plan update, the District has taken tremendous efforts to prevent flooding, however, it also faced some of its greatest challenges in these last five years, specifically 2017 with Hurricane Harvey and 2019 with Hurricane Imelda.

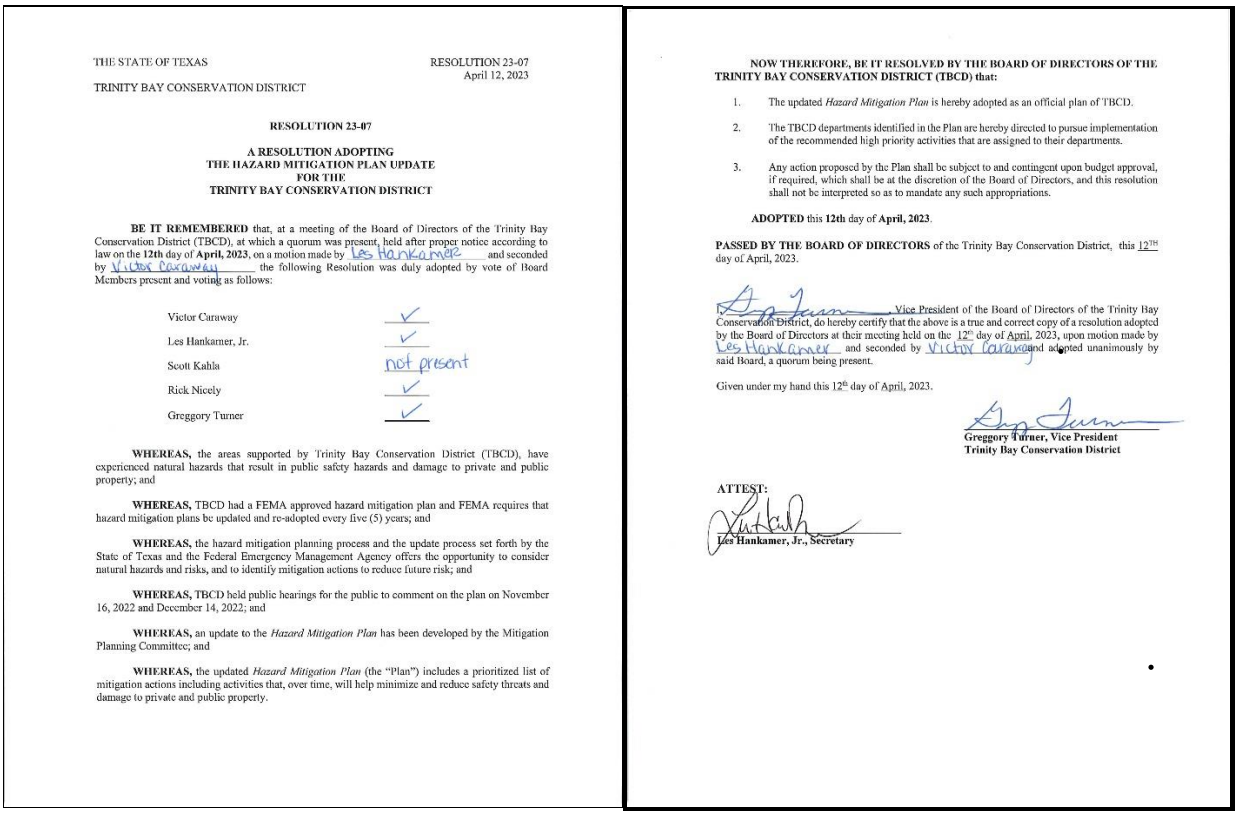
Notable changes to this plan from the last iteration are as follows:

- After a review of a hazard, if the hazard occurs in the area and has not been fully mitigated by the jurisdictional authority of the District, it was included. This includes a drought, extreme heat and winter storms.
- After review of the hazard, if all mitigation efforts that TBCD has authority to do have been done, it is considered fully mitigated with no further actions needed.
- After review of the hazard, while the hazard may be possible in the planning area, but the likelihood and magnitude are minimal, the District omitted the hazard with explanation
- The goal has been updated from earlier versions.
- The section that described Texas State agencies and the NFIP program have been removed.
- Recognizing the importance of external stakeholder and public review and input to the hazard mitigation plan, the District did more outreach to solicit these two important group's views and expertise.
- A couple of hazards include other hazards as part of the profile:
    - Flood includes landslides and erosion as one hazard
    - Hurricane/Tropical Strom includes storm surge as one hazard
- The plan format has been consolidated to five sections from ten sections.

Adoption by TBCD Board of Directors

The District advised the Board of Directors of its intent to update the hazard mitigation plan but refrained from presenting the updated plan for adoption until after public review and incorporation and then submission for review and approval by the Texas Division of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA). Upon receiving notice from FEMA that this plan is approved pending adoption (APA), which indicates there are no more changes required by FEMA to the Plan, TBCD will formally adopt the plan and include the Board of Director's formal resolution in the document, see below.

Adoption by TBCD Board of Directors



THE STATE OF TEXAS

TRINITY BAY CONSERVATION DISTRICT

RESOLUTION 23-07
April 12, 2023

RESOLUTION 23-07

A RESOLUTION ADOPTING
THE HAZARD MITIGATION PLAN UPDATE
FOR THE
TRINITY BAY CONSERVATION DISTRICT

BE IT REMEMBERED that, at a meeting of the Board of Directors of the Trinity Bay Conservation District (TBCD), at which a quorum was present, held after proper notice according to law on the **12th** day of **April, 2023**, on a motion made by Les Hankamer and seconded by Victor Caraway the following Resolution was duly adopted by vote of Board Members present and voting as follows:

Victor Caraway	✓
Les Hankamer, Jr.	✓
Scott Kahla	not present
Rick Nicely	✓
Greggory Turner	✓

WHEREAS, the areas supported by Trinity Bay Conservation District (TBCD), have experienced natural hazards that result in public safety hazards and damage to private and public property; and

WHEREAS, TBCD had a FEMA approved hazard mitigation plan and FEMA requires that hazard mitigation plans be updated and re-adopted every five (5) years; and

WHEREAS, the hazard mitigation planning process and the update process set forth by the State of Texas and the Federal Emergency Management Agency offers the opportunity to consider natural hazards and risks, and to identify mitigation actions to reduce future risk; and

WHEREAS, TBCD held public hearings for the public to comment on the plan on November 16, 2022 and December 14, 2022; and

WHEREAS, an update to the *Hazard Mitigation Plan* has been developed by the Mitigation Planning Committee; and

WHEREAS, the updated *Hazard Mitigation Plan* (the "Plan") includes a prioritized list of mitigation actions including activities that, over time, will help minimize and reduce safety threats and damage to private and public property.

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE TRINITY BAY CONSERVATION DISTRICT (TBCD) that:

1. The updated *Hazard Mitigation Plan* is hereby adopted as an official plan of TBCD.
2. The TBCD departments identified in the Plan are hereby directed to pursue implementation of the recommended high priority activities that are assigned to their departments.
3. Any action proposed by the Plan shall be subject to and contingent upon budget approval, if required, which shall be at the discretion of the Board of Directors, and this resolution shall not be interpreted so as to mandate any such appropriations.

ADOPTED this **12th** day of **April, 2023**.

PASSED BY THE BOARD OF DIRECTORS of the Trinity Bay Conservation District, this 12TH day of April, 2023.

I, Greggory Turner, Vice President of the Board of Directors of the Trinity Bay Conservation District, do hereby certify that the above is a true and correct copy of a resolution adopted by the Board of Directors at their meeting held on the 12th day of April, 2023, upon motion made by Les Hankamer and seconded by Victor Caraway and adopted unanimously by said Board, a quorum being present.

Given under my hand this 12th day of April, 2023.

Greggory Turner, Vice President
Trinity Bay Conservation District

ATTEST:

Les Hankamer, Jr., Secretary

Community Profile

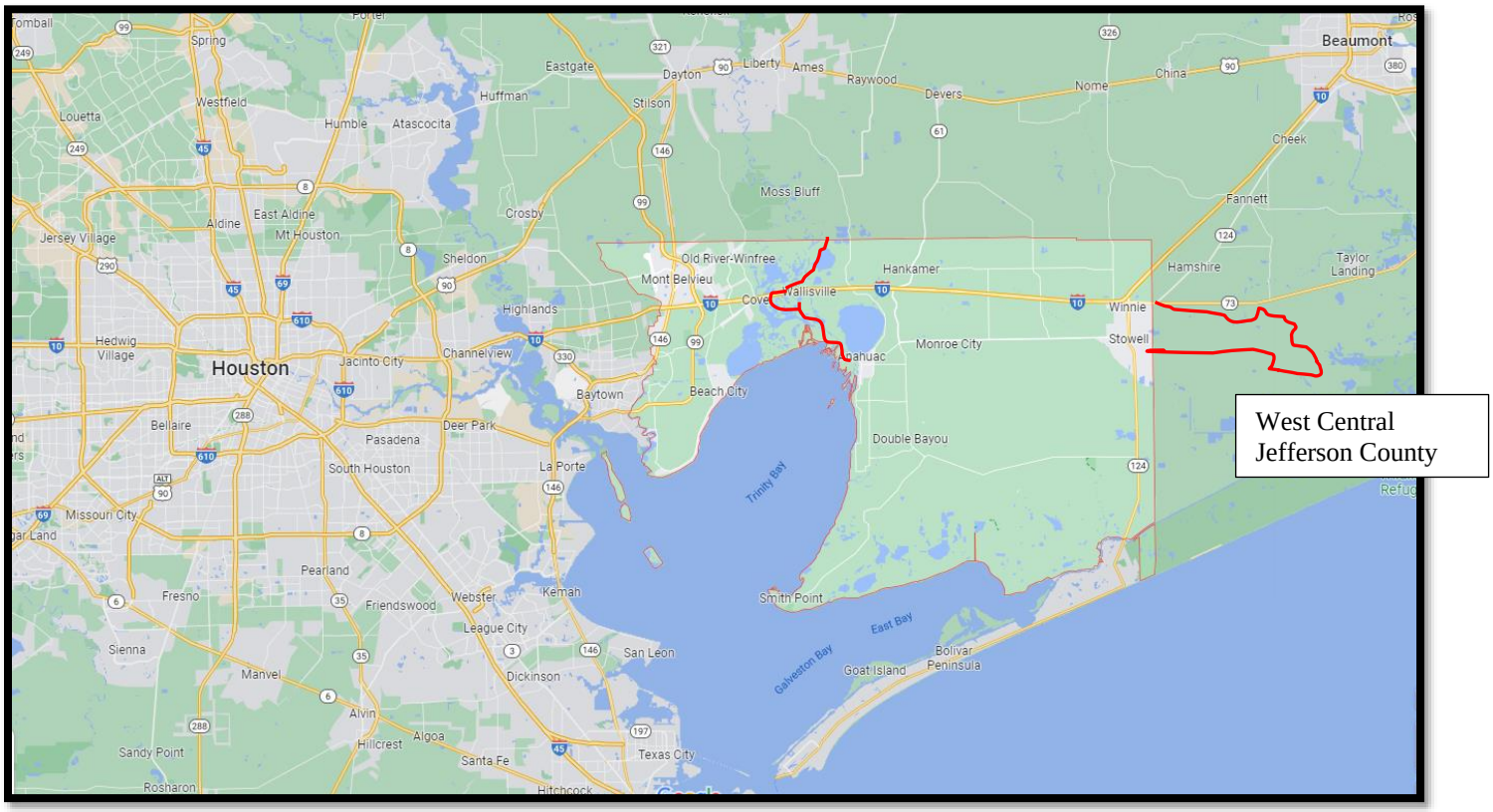
Trinity Bay Conservation District (TBCD) is located in southeast Texas (Figure A – see red circle) and covers an area of 592 square miles within the boundaries of Chambers County. Of those 592 square miles, 6 square miles is located in west central Jefferson County. The District is situated approximately 50 miles east of Houston (Harris County), approximately 85 miles northeast of Galveston (Galveston County), and 300 miles southeast of Dallas (Dallas County). Ground surface elevations across TBCD planning area vary from sea level to 50 feet above mean sea level. The topography is described as nearly flat prairie and the geologic structure is nearly flat strata. The soils are chiefly coastal clay and sandy loam. The vegetation includes tall grasses, live oaks, cypress, pine, and cedar trees, as well as hardwoods along rivers and streams. There are marshes along the southern coast and near the mouth of the Trinity River in the west. The remainder of the County is flat prairie land.

Figure A – TBCD Location in Texas

Planning Area

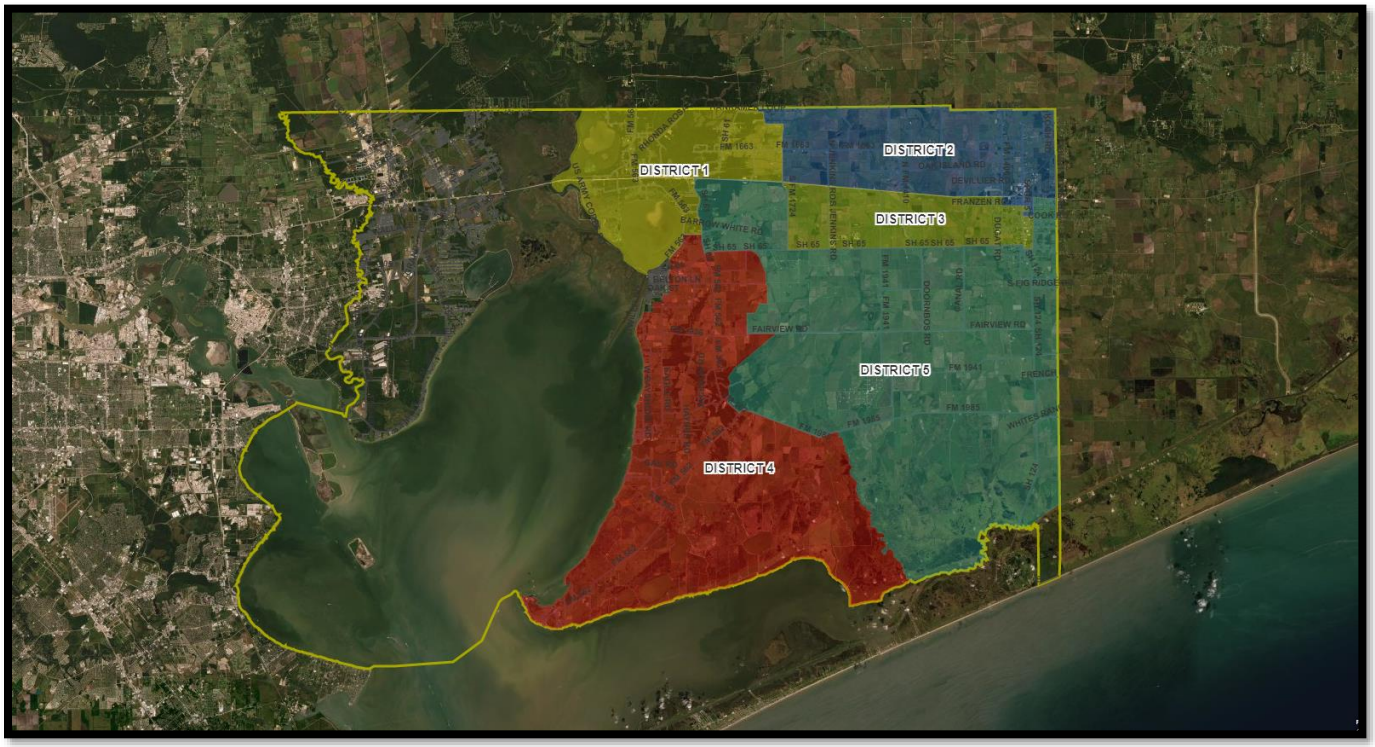
Trinity Bay Conservation District is a conservation and reclamation district formed and approved by the Texas House and Senate in May of 1949. The primary functions of TBCD are to provide storm water drainage and water and sewer services for most of East Chambers County and a small portion of west central Jefferson County. TBCD consists of approximately 592 square miles, 586 within Chambers County, six square miles in Jefferson County and includes Anhuac, Winnie, Stowell, Hankamer, Smth Point and Oak Island. Figure B is Chambers County and the dark red line delineates the boundary area (outlined) for TBCD. Major roads include Interstate 10, State Highway 124, State Highway, 65 and State Highway 61. Figure C is the demographic view of TBCD. The Hazard Mitigation Plan Update is prepared for the entire District planning area.

Figure B – Chambers County Boundaries (TBCD Boundaries are in Dark Red)



The Texas Park and Wildlife has prepared an interactive Watershed Viewer. By typing in the address or in this case, County, the viewer depicts major watersheds and sub watersheds in Chambers County, see Figure D. There are five watersheds that traverse the TBCD planning area in Chambers County: Whites Bayou-Turtle Bayou, Lower Neches Valley Authority Canal Taylor Bayou, East Fork Double Bayou, Spindletop Ditch and Spindletop Bayou. The District manages approximately 1,400 miles of ditches in the planning area. Both incorporated and unincorporated areas rely heavily on the District to provide outfall drainage and flood relief.

Figure C – TBCD Demographic Boundaries



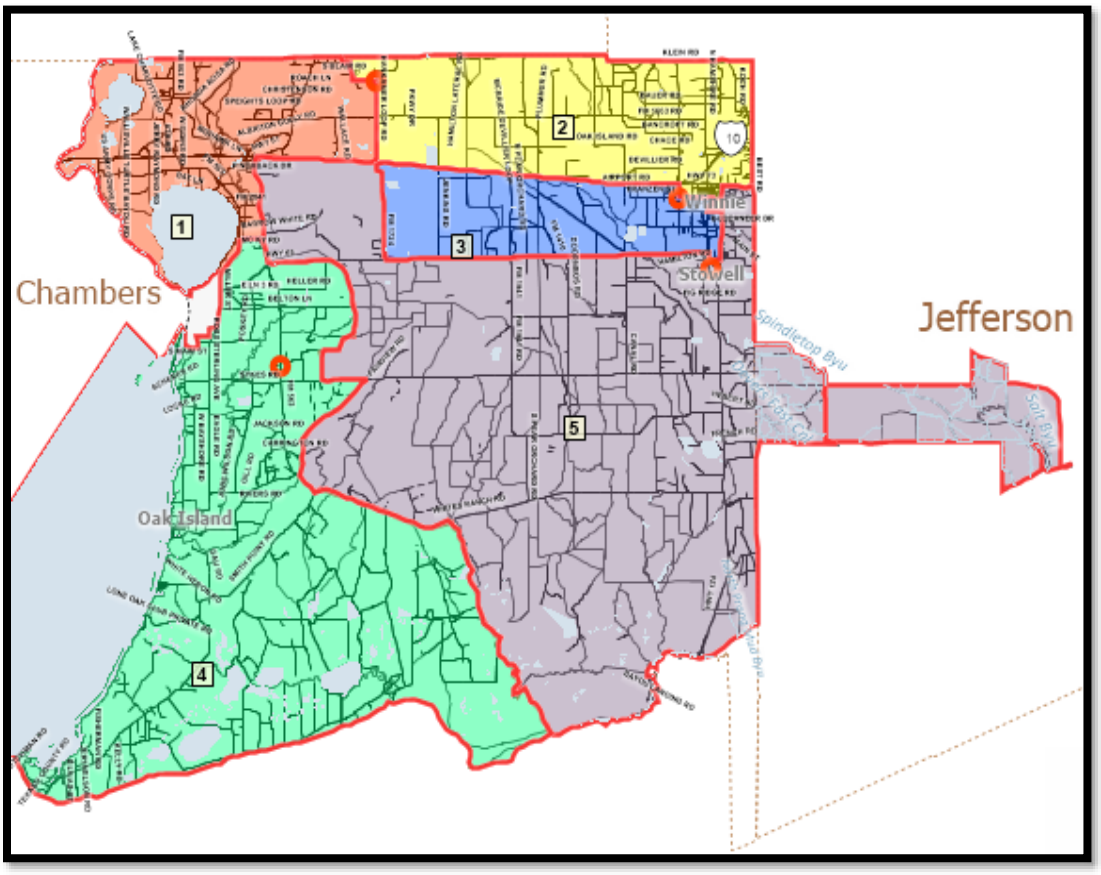
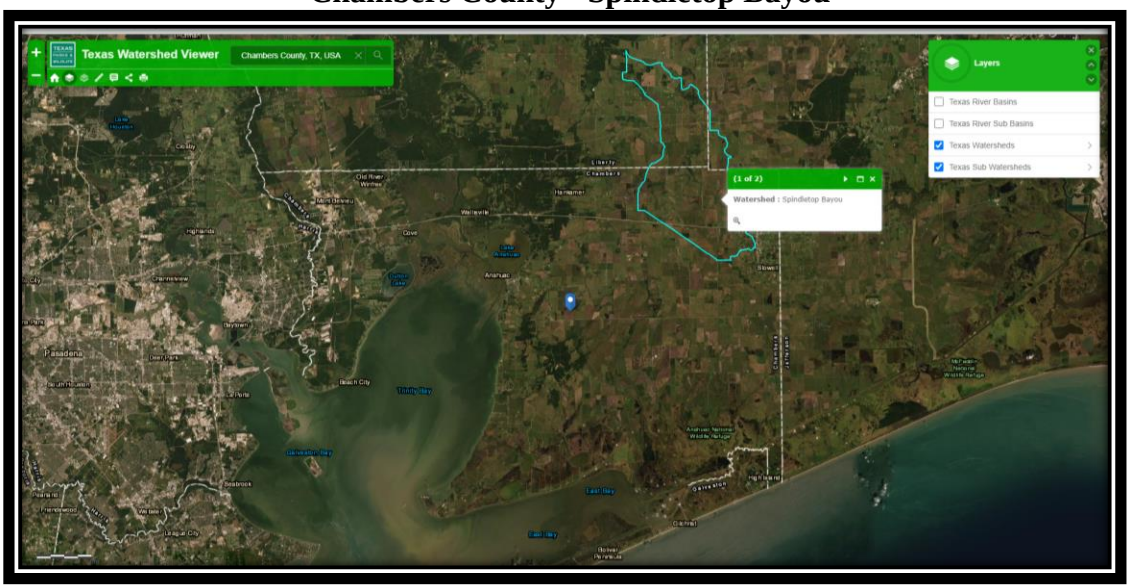


Figure D – Texas Park and Wildlife One of Five Watershed Views
Chambers County - Spindletop Bayou

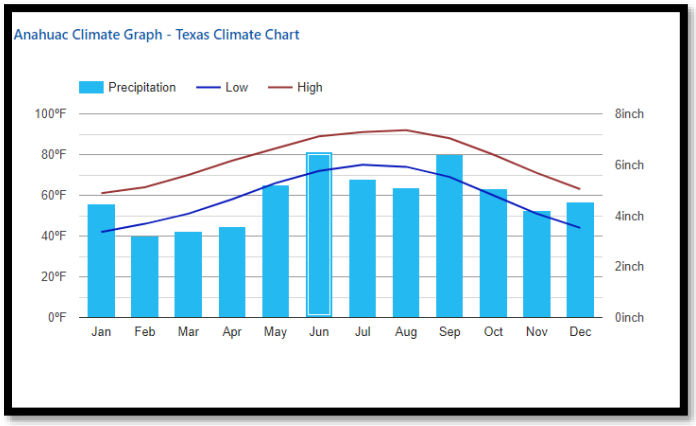


Climate

The climate of southeastern Texas is generally classified as subtropical, where prevailing southeastern winds from the Gulf of Mexico result in high temperatures and humidity. Severe weather occurs as tropical storms and hurricanes, which are associated with strong winds and heavy rainfall. Summers are hot and humid and characterized by afternoon thunderstorms. The average high temperature for July and August is about 91°F. Winters are moderate, with some rain, some frost or cold events and the rare snowfall. The coolest months are January and February with an average low temperature of 42° F. The average annual temperature is 69 ° F.

The City of Anahuac is located in TBCD planning area. A review of Anahuac's annual climate graph from US Climate Data for 2019 indicates that the average annual precipitation for the area is approximately 57.11 inches of precipitation each year. Normal monthly rainfall in the area varies from about three inches to over six inches with the heaviest rainfall during the hurricane season, June through November.

Figure E – Anahuac 2019 Climate Graph, Temperature and Precipitation



Population and Growth

TBCD is unique as it serves the Eastern part of Chambers County and a small unincorporated part of Jefferson County (122 customers). However, data regarding the community profile is largely determined at the county level. Therefore, this plan update will use Chambers County data. Where possible (e.g. population), the MPC tried to provide more detailed data for the planning area. Chambers County has several cities, however, TBCD covers east of the Trinity Bay River in Chambers County. Areas in red are part of TBCD jurisdictional area in Chambers County (see Table 1-1).

Table 1-1– Cities, and CDPs in Chambers County (TBCD serves Communities in Red)

Chambers County		
Cities	**Census Designated Placed**	**Unincorporated Communities**
Anahuac	Oak Island	Hankamer
Baytown (most in Harris County)	Stowell	Wallisville
Beach City	Winnie	
Cove		
Mont Belview (small part in Liberty County)		
Old River-Winfree (small part in Liberty)		

A review of the US Census Data comparing 2010 to 2020, the entire State of Texas has grown by nearly 15.9%. Chambers County, of which TBCD is a part of, grew 31% (35,096 in 2010 Population Census to 46,571 in 2020 Population Census). Jefferson County (six square miles of TBCD jurisdiction) grew 1.7% (252,273 in 2010 estimate to 256,526 in 2020 estimate).

The MPC compared the population information from the US Census Bureau of the cities, Census Designated Places referred to as CDP (e.g. Stowell and Winnie) and unincorporated Chambers and Jefferson County from 2010 to 2020. The team took the total unincorporated population and estimated percentage TBCD serves is approximately 20% for Chambers County and .05% for Jefferson County. Table 1-2 indicates that almost 30% of Chambers County's population is located in TBCD's jurisdiction. It also shows the population change for the areas in TBCD planning area. In the last ten years, the population declined in the cities and CDP areas but increased in the unincorporated areas.

Table 1-2 – Estimated Population for TBCD within Chambers and Jefferson County

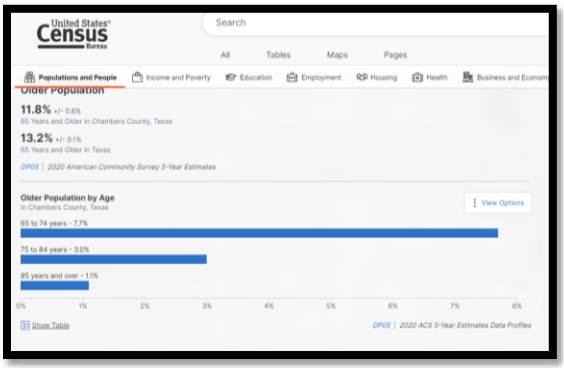
Chambers County	**35,096**	**42,571**
TBCD Planning Area	**2010 Census**	**2020 Census**
Anahuac	2,243	1,980
Stowell	1,756	1,743
Winnie	3,254	3,162
Unincorporated Chambers County	*17,184*	*23,515*
TBCD (.20)	3,437	4,703
Jefferson County Unincorporated (.005)	*31,562*	*30,961*
TBCD (.005)	158	155
TOTAL	**10,848**	**11,743**
Approximate TBCD percentage of Chambers	0.31	0.28

The table below is from US Census Bureau Quick Facts for Chambers County for 2021 (and indicates the population breakdown with approximately 6.8% under 5 years old, 28.2% under 18 years old, 11.8% was 65 years and older. Figure F provides a graphic on the percentage breakdown for all of the population in Chambers as well as a look at the population 65 and older. It is helpful to understand the breakdown of population to help identify potential vulnerable populations.

Table 1-3– Age Population Breakdown for Chambers County, 2021 Census Quick Facts

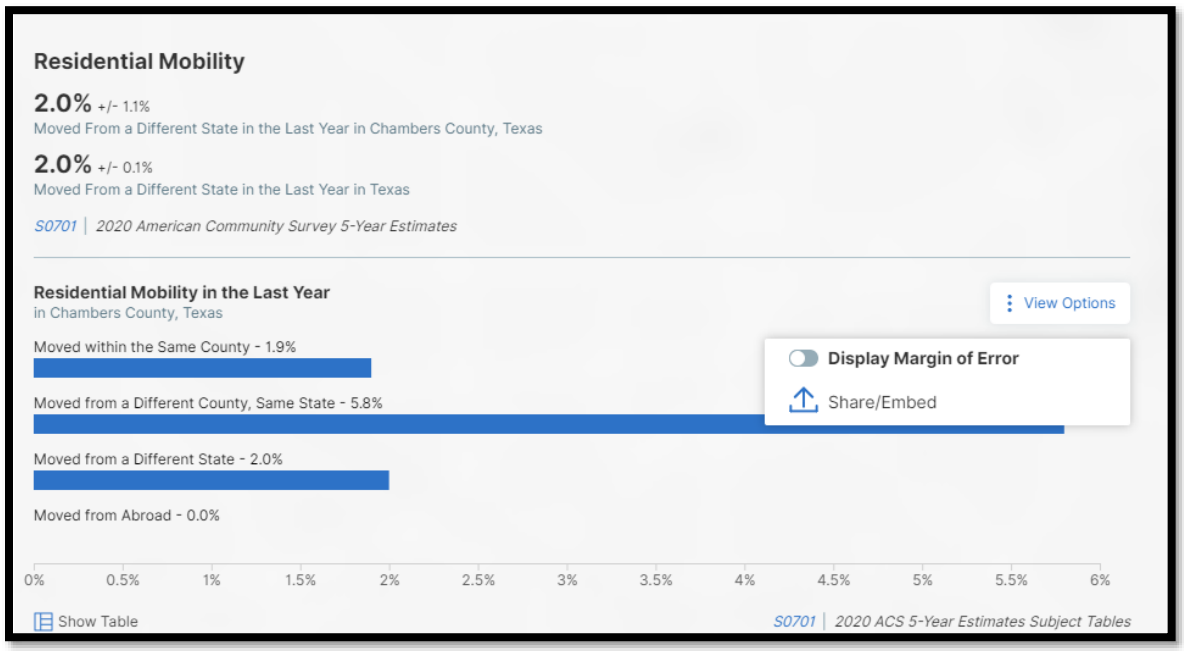
ACS DEMOGRAPHIC AND HOUSING ESTIMATES - 2020	Chambers County, Texas, United State Census Bureau			
Label	**Estimate**	**Margin of Error**	**Percent**	**Percent Margin of Error**
SEX AND AGE				
Total population	42,571	*****	42,571	(X)
Male	21,420	±196	50.3%	±0.5
Female	21,151	±196	49.7%	±0.5
Sex ratio (males per 100 females)	101.3	±1.9	(X)	(X)
Under 5 years	2,877	±185	6.8%	±0.4
5 to 9 years	3,296	±414	7.7%	±1.0
10 to 14 years	3,578	±532	8.4%	±1.2
15 to 19 years	3,437	±319	8.1%	±0.7
20 to 24 years	2,405	±335	5.6%	±0.8
25 to 34 years	5,547	±352	13.0%	±0.8
35 to 44 years	6,059	±421	14.2%	±1.0
45 to 54 years	5,736	±342	13.5%	±0.8
55 to 59 years	2,536	±356	6.0%	±0.8
60 to 64 years	2,094	±312	4.9%	±0.7
65 to 74 years	3,259	±231	7.7%	±0.5
75 to 84 years	1,272	±193	3.0%	±0.5
85 years and over	475	±175	1.1%	±0.4
Median age (years)	35.2	±0.4	(X)	(X)
Under 18 years	12,015	±158	28.2%	±0.4
16 years and over	31,772	±322	74.6%	±0.8
18 years and over	30,556	±158	71.8%	±0.4
21 years and over	28,833	±379	67.7%	±0.9
62 years and over	6,018	±332	14.1%	±0.8
65 years and over	5,006	±254	11.8%	±0.6
18 years and over	30,556	±158	30,556	(X)
Male	15,227	±137	49.8%	±0.3
Female	15,329	±77	50.2%	±0.3

Figure F – Chambers County Chart of 2020 Population (left) and specifically older population (Right), US Census 2020 ACS Data Profiles



In addition to identifying potential vulnerable populations, it is helpful to understand the population trend historically to demonstrate potential growth trends. For Chambers County, population growth since 2015 has been minimal with most of the population being between 18-64 years old (71.8%). Also, while 90.3% of population lives in the same house from one year ago, a small percentage have moved from either a different County (5.8%) or from a different State (2%) adding to the growth in the County. Figure G illustrates the residential mobility.

Figure G – Chambers County Chart of 2020 Residential Mobility, US Census 2020 ACS Data Profiles



Another trend to review is housing trends. Housing trends are also important to help with long term planning for an area. Chambers County Appraisal District (C-CAD) reports a total number of appraisals by categories each year. Table 1-4 shows the number of residential, commercial and mobile homes appraised have increased while the vacant lots have decreased indicating new builds (e.g. growth) of homes and business since 2016. Another interesting set of statistics reported by Chambers CAD since 2017 are the number of new appraisals completed and new subdivisions added as shown in Table 1-5.

Table 1-4- Chambers County (CAD) Appraisals completed by category and year

Appraisal District Categories	2016	2017	2018	2019	2020	2021
Category A - single Family residential	13,372	13,713	14,203	14,667	15,292	15,962
Category B-Multi Family residential	47	36	36	36	38	39
Category C - Vacant lots	4,706	4,798	5,085	5,326	5,382	5,348
Category F Commerical and Indsturial	1,177	1,219	1,238	1,263	1,281	1,620
Category M Mobile Home	1,025	1,026	1,045	1,072	1,086	1,157
Other categories	19,076	19,576	20,878	21,282	21,503	20,904

While not every year saw an increase in year over year trend, most years did surpass the previous. In addition, there is still growth in new builds and new subdivisions each year. The MPC reviewed subdivision permits in the last five years and more than 40% of the new subdivisions are being developed in East Chambers.

Table 1-5- Chambers County (C-CAD) New Appraisals Added by year by category

Newly appraised in Year	2017	2018	2019	2020	2021
Category A - single Family residential	341	490	464	625	670
Category B-Multi Familty residential					
Category C - Vacant lots					
Category F Commerical and Indsturial	42	19	25	18	339
Category M Mobile Home					
Other categories					
Subdivision added by year	21	19	20	16	16

In addition to the C-CAD information, the US Census Quick Facts reports on data estimates for housing trends, see Table 1-6). In 2021, Chambers County, Texas had a total of 18,108 housing units. Of these housing units, 85.8% were owner occupied with 1,052 building permits for 2021. Per the Census, this represents the number of new privately owned housing units authorized by building permits in the County. This number is a general indication of the amount of new housing stock that may have been added to the housing inventory.

In terms of households, the Census reports there are 92,988 households in Jefferson County. The average household size was 2.97.

Table 1-6 - US Census Population Estimates, Chambers County 2021 American Community Survey 5 Year Estimates

Housing, Family and Income Estimates	7-1-21
Housing Units, July 1, 2021	18,108
Owner-occupied housing unit rate, 2016-2020	85.8%
Households, 2016-2020	14.266
Median value of owner-occupied housing units	$224,400
Median selected monthly owner costs -with mortgage	$1,837
Median selected monthly owner costs –w/o mortgage	$518
Median gross rent, 2016-2020	$990
Persons per household, 2016-2020	2.97
Medium household income, 2016-2020	95,989

Housing Units Authorized by Building Permits

Source: U.S. Census Bureau, Construction-Building Permits. Updated monthly, summarized here annually. Building Permits Survey

Definition:

Building permits represent the number of new privately-owned housing units authorized by building permits in the United States. A housing unit, as defined for purposes of this report, is a house, an apartment, a group of rooms or a single room intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants live separately from any other individuals in the building and which have a direct access from the outside of the building or through a common hall. In accordance with this definition, each apartment unit in an apartment building is counted as one housing unit. Housing units, as distinguished from "HUD-code" manufactured (mobile) homes, include conventional "site-built" units, prefabricated, panelized, componentized, sectional, and modular units. Housing unit statistics in these tables exclude group quarters (such as dormitories and rooming houses), transient accommodations (such as transient hotels, motels, and tourist courts), "HUD-code" manufactured (mobile) homes, moved or relocated units, and housing units created in an existing residential or nonresidential structure.

These numbers provide a general indication of the amount of new housing stock that may have been added to the housing inventory. Since not all permits become actual housing starts and starts lag the permit stage of construction, these numbers do not represent total new construction, but should provide a general indicator on construction activity and the local real estate market.

Albeit minimal, this growth has increased the amount of people and property at risk from natural hazards. Chambers County enforces their floodplain ordinance, with a two-foot freeboard requirement above base flood elevation and requires all new construction to be designed and constructed to State of Texas regulations to withstand 3 second gust at 130 mile per hour wind loads which is led and inspected by the Texas Department of Insurance (TDI) Texas Windstorm Insurance Association (TWIA). Both significantly reduces the potential vulnerability of new development to hazards that have had the highest historical impact on property.

Household Income and Education

The median household income for Chambers County was an estimated $95,989 (Source: Quick Facts, Chambers County, Texas, US Census Bureau) compared to $63,826 for the State of Texas. Residents of the County education statistics have approximately 22.5% of the adult population holding a four-year degree or higher and 89.8% reporting to have finished high school and gone on to post-secondary education.

Place of Work

While addressing potential hazards, it is important to note that much of the workforce (67%) in Chambers County is mobile and works within 28.7 minutes from home. DATAUSA reports that employment in Chambers County grew at a rate of 4.59% from 18,900 in 2019 to 19,800 employees in 2020. (https://datausa.io/profile/geo/chambers-county-tx#economy)

It also reports there are approximately 708 employers located in Chambers County. Figure H illustrates the major industries by percentage.

Figure H – Employment by Industries

District Facilities and Equipment
TBCD owns one building located at 2500 SH 124, Stowell Texas. (Figure I – red marker). It also owns and operates two water treatment plants (West and Winnie WTPs), four water towers (Oak, Stowell, Whites, and Winnie WTs), and four waste water treatment plants (Hankamer, Winnie, Smith Point, and Oak Island WWTP). The main building is not located in the Special Flood Hazard Area.

Figure J shows the locations of all of the alert stations. In addition to the facilities, the District also owns other assets such as tractors, bulldozers, dump trucks, excavators and many other vehicles all totaling to $23,611,545.00 in insured value. These vehicles are mainly stored on District property, under a covered garage, carport, open parking and not in a floodplain. However, some of these vehicles are often in use and at various projects sites that may sit in a flood prone area. The District closely monitors weather and takes proactive steps, when possible, to move vulnerable equipment to higher ground when equipment is being operated or staged in a flood prone area. However, even with such precautions, an event like Hurricane Harvey caused damage to some of the utilities, saltwater intrusion gates, local rural wooden bridges, and culvert and detention areas but not to any equipment.

TBCD also has 24 rain gauges throughout Eastern Chambers and works with Jefferson County Drainage District No. 6 (JCDD6) and Harris County Flood Control District (HCFCD) to support the data from the gauges that can be found on both HCFCD and JCDD'6s website. A very user friendly, real time alert of rainfall amount can be viewed by the public. Figure K from JCDD6 website shows some information at a particular site.

Figure I – TBCD Main Office

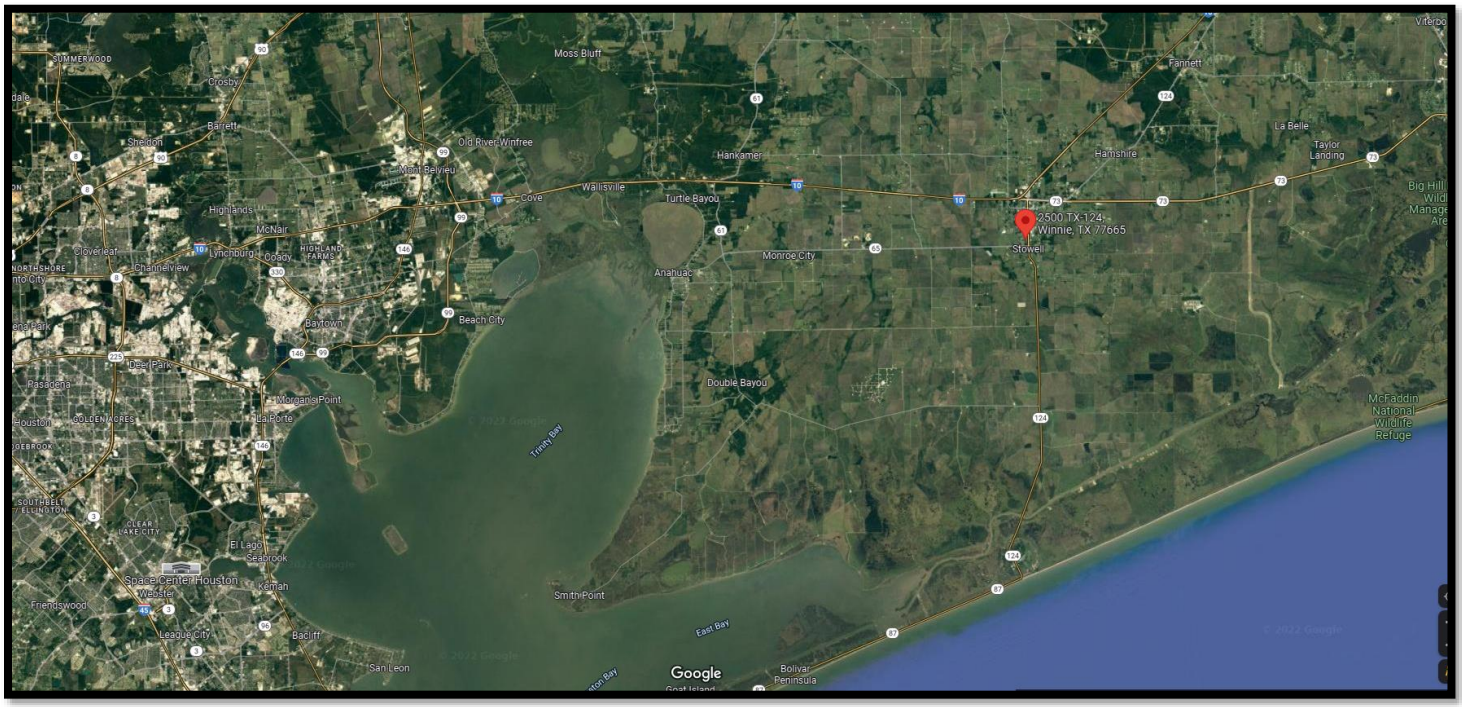


Figure J – TBCD Rain Gauges

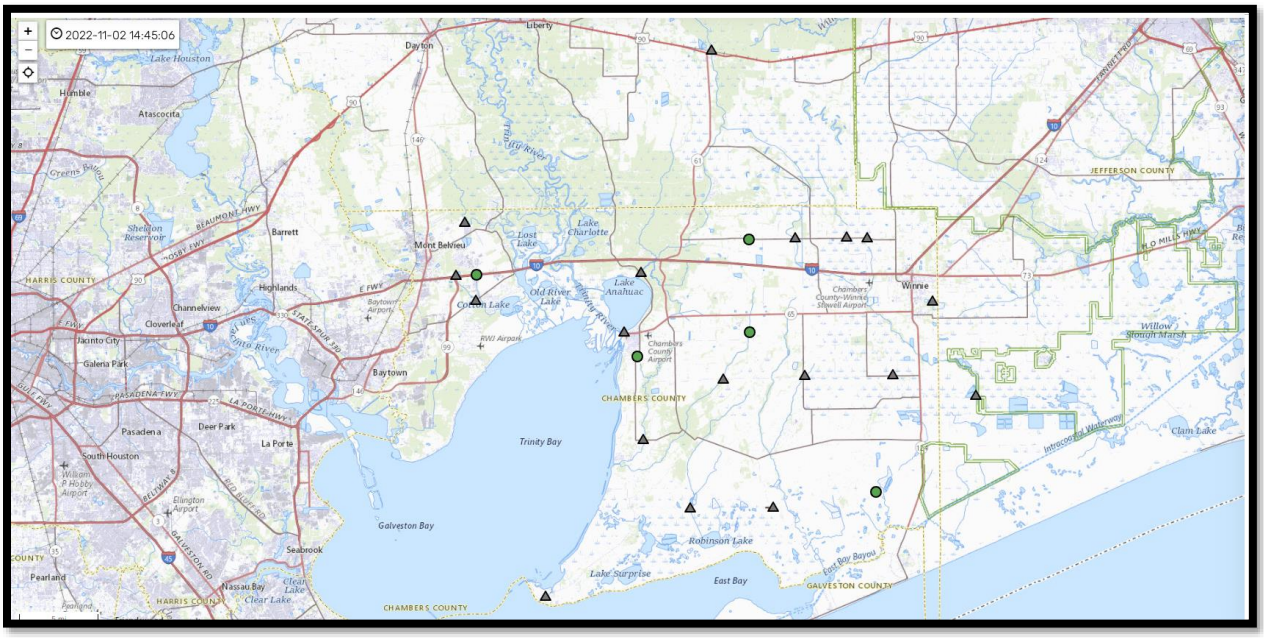
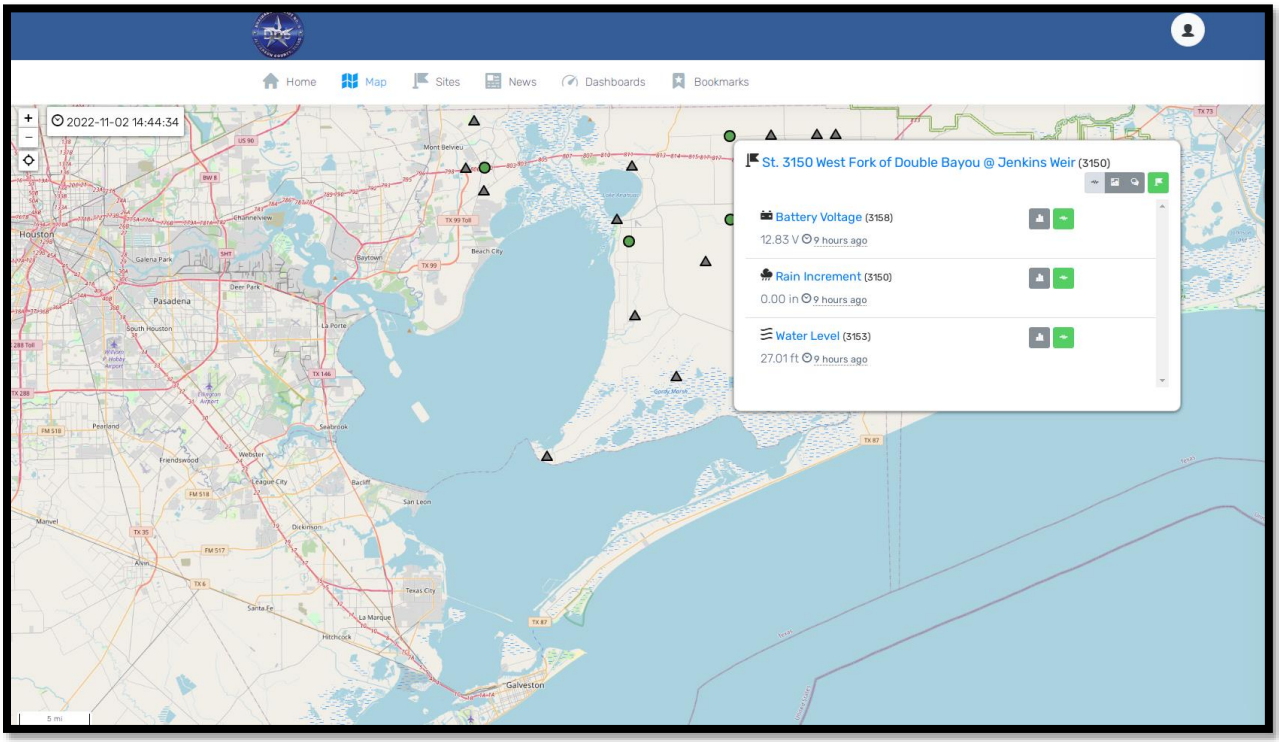


Figure K – TBCD Rain Gauge information at Station 3150 West Fork of Double Bayou @ Jenkins Weir



Other Critical Facilities

There are several critical facilities and vulnerable population facilities within the District's boundaries (e.g.: hospitals, schools, nursing homes, Police, Fire and EMS stations, City and County Buildings, wastewater treatment facilities see list below). While the County and the

Cities are responsible for these assets, the District works with them if there are flooding issues. Figure L is a map of the voluntary fire departments (VFD) and independent school districts (ISD) critical facilities within the County, in the red circle is the District's boundaries. Figure M is a CDC map of critical vulnerable population facilities in the red circle is the TBCD planning area.

- Police – 2
- Hospitals – 1
- Volunteer Fire Deparements (VFD) - 6
- County Administration Buildings
- Wastewater Treatment Plants - 4
- Water Treatment Plant – 2 and Water Towers - 4
- Daycares - 3
- Nursing Homes - 1
- Public Schools – 2 Independent School Districts (ISD) that include two campuses each (high, middle/intermediate, elementary schools)

Figure L– ISD and VFD Critical Facilities within the TBCD Boundaries

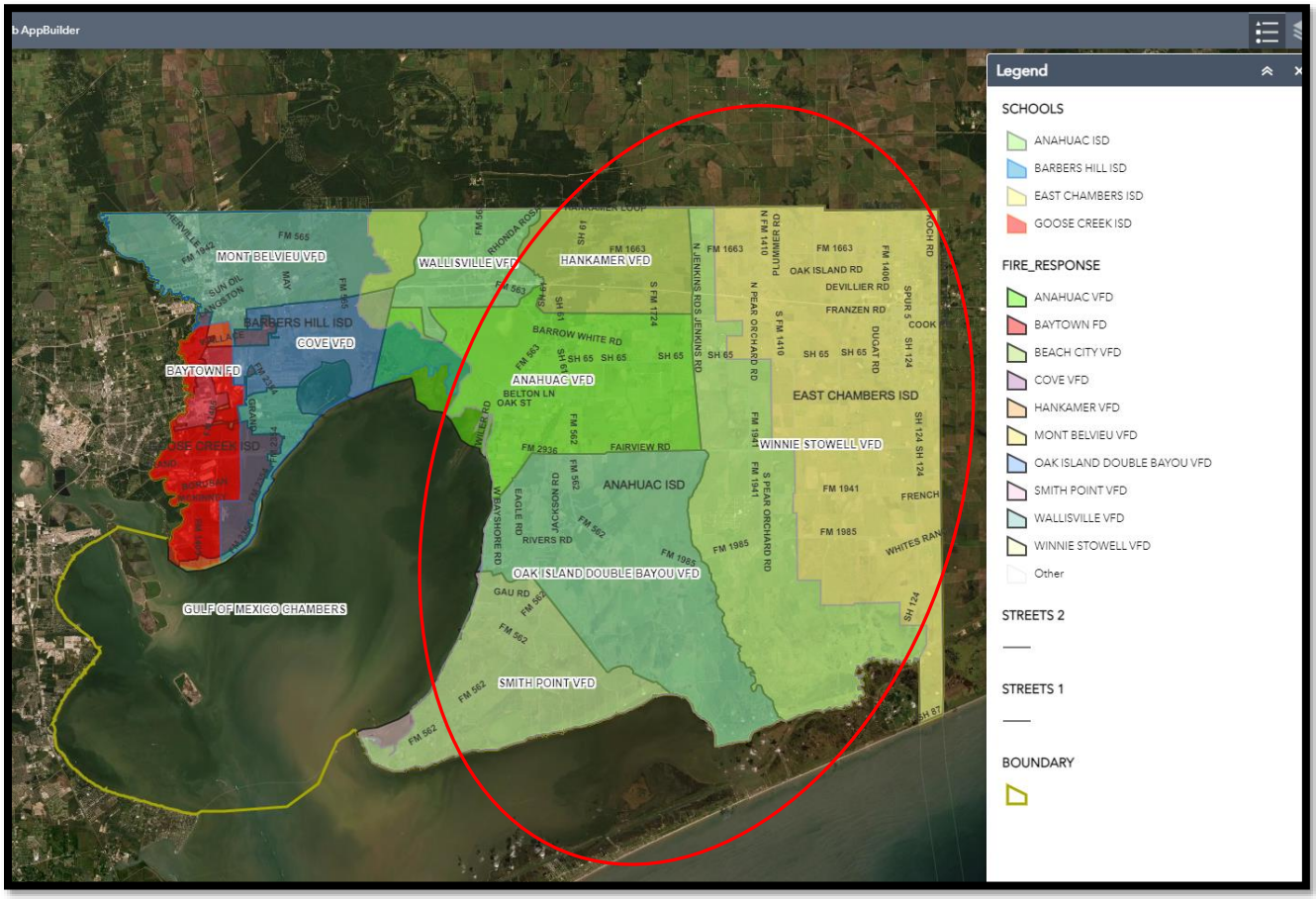
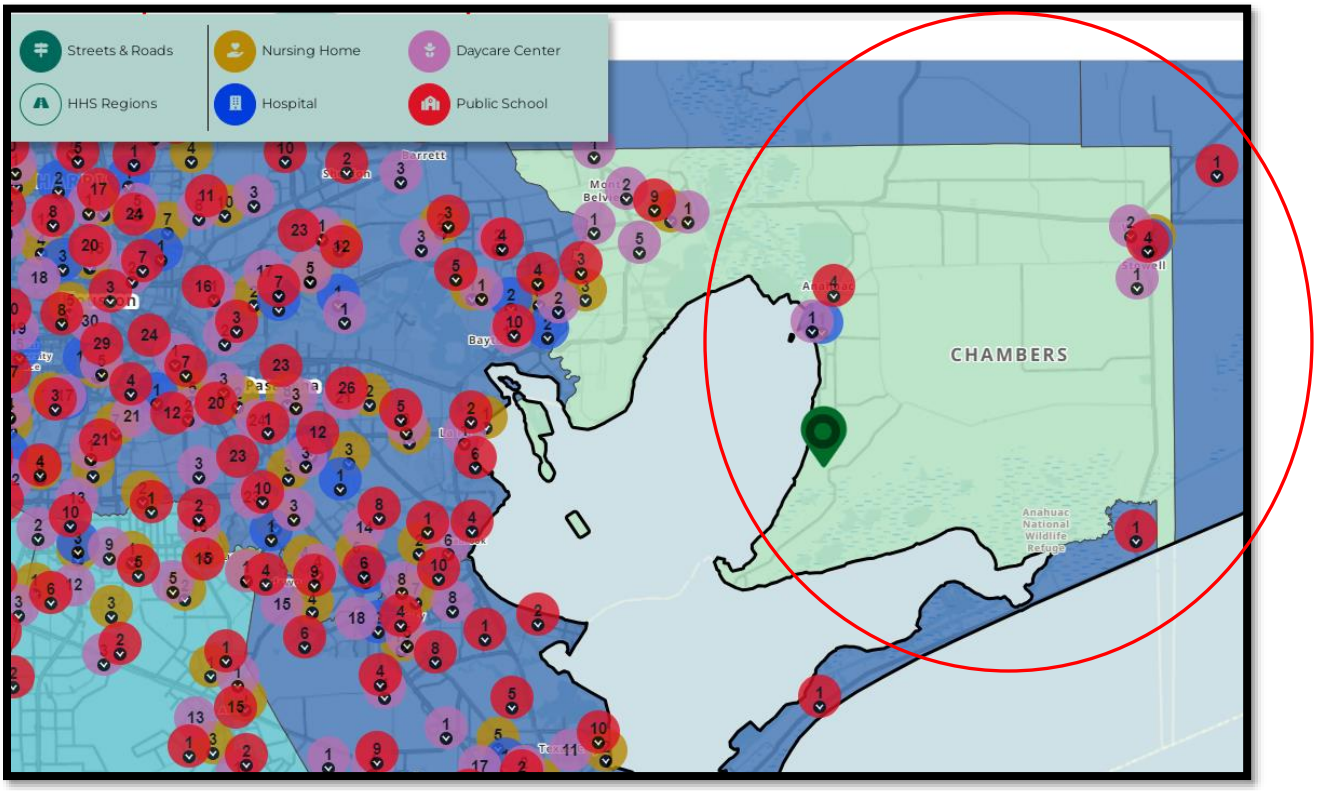


Figure M– CDC, Overall SVI Map by County Depicting Daycares, Nursing Homes, Hospitals and Public Schools



TBCD Hazard Mitigation Plan Update Goal

The last iteration of the plan used a Goal Statement which included five bullets: to protect, to reduce losses, to facilitate the development of review and approval processes with the communities, to develop actions with other local organizations, and to seek solutions to the existing problems. After review, the last bullet was removed and replaced with two bullets. The updated goal is as follows:

Figure N– 2023 Trinity Bay Conservation District Hazard Mitigation Goal Statement

Trinity Bay Conservation Districts Mitigation Goal Statement

The mitigation goals of TBCD are:

- To protect public health, safety, and welfare
- To reduce losses due to hazards by identifying hazards, minimizing exposure of citizens and property to hazards, and increasing public awareness and involvement
- To facilitate the development review and approval process to accommodate growth in a practical way that recognizes existing storm water and floodplain problems while avoiding creating new problems or worsening existing problems
- Increase cooperation with other local organizations to develop and initiate hazard mitigation actions and projects which will serve to protect the lives and property of citizens in the planning area.
- Perform Studies to recognize and address solutions to existing problems.
- Develop projects which address hazards that have been identified in the Hazard Mitigation plan.

SECTION 2 – THE PLANNING PROCESS

Update from the Last Plan

- Added detailed local capabilities assessment, integration and area of improvement.

The Purpose of the Plan

The Federal Disaster Mitigation Act of 2000 (Public Law 106-390), referred to as the 2000 Stafford Act (DMA 2000), was approved by Congress on October 10, 2000. The Act intended to assist communities in reducing their risk from natural hazards by identifying resources, information and strategies for risk reduction; and through careful planning and collaboration among public agencies, stakeholders and the public; prepare and regularly update mitigation plans. The Act required both state and local governments to develop hazard mitigation plans as a condition for federal grant assistance. These plans must be updated, reviewed, and approved every five years.

The Mitigation Planning Process

TBCD followed a well-established planning process to update its Hazard Mitigation Plan (HMP). The process is fully documented below. TBCD maintains a copy of the original and updated plans, which can be reviewed upon request.

The mitigation planning process for the 2023 HMP update was facilitated by a mitigation planning consultant. The plan update process followed the FEMA Local Hazard Mitigation Plan regulations set forth in 44 Code of Federal Regulations (CFR) Part 201.6, and is FEMA's official source for defining the requirements for original and updated local hazard mitigation plans. In addition, the FEMA Local Mitigation Planning Handbook (March 2013) was used as a practical guide to ensure all requirements were satisfied for this update.

The Mitigation Planning Committee (MPC) was reconvened. The MPC leads the review and draft of the update. During the first meeting, the team identified members who are no longer working in their respective positions and additional members who needed to be included on the MPC. Table 2-1 lists the MPC for this plan update. Minutes were prepared for each meeting to document the process and keep the plan on task. Those minutes can be found at the end of the plan in Appendix A.

Table 2-1 - Mitigation Planning Committee (MPC) for the TBCD HMP Update

MPC	Title	Organization	Role/Responsibility
Jerry Shadden	General Manager	TBCD	• Data collection, analysis of hazards, identify actions • Review drafts
Diane Newsome	Project Manager	TBCD	• Data collection, analysis of hazards, identify actions • Review drafts • Support with mapping assignments with engineering firm • Public notice support and Stakeholder notifications

MPC	Title	Organization	Role/Responsibility
Kristen Thatcher	Plan Facilitator	JSWA	• Drafting plan based on updates, data and analysis from MPC • Ensuring requirements are met for plan • Incorporating comments received from Stakeholders and Public
Dan Ward	Plan Consultant	JSWA	• Drafting plan based on updates, data and analysis from MPC • Ensuring requirements are met for plan • Incorporating comments received from Stakeholders and Public
Jeff Ward	Plan Consultant	JSWA	• Drafting plan based on updates, data and analysis from MPC • Ensuring requirements are met for plan • Incorporating comments received from Stakeholders and Public

Early in the planning update process, the MPC undertook a detailed review of every section of the existing plan. The MPC identified all the subject areas where specific updates were required. For example, census figures, the numbers and locations of District-owned buildings, impacts of recent hazard events (including Hurricane Harvey and Imelda), as some examples. The second purpose of the review was to ensure that the updated plan is fully compliant and responsive to all of the FEMA requirements. The review indicated that while changes and updates were needed throughout the document, most of the modifications were relatively limited as hazards did not change significantly and did not require a significant initial public component such as focus groups or surveys. The MPC met several times during the update process.

The first meeting took place on September 21, 2022. The purpose of the meeting was to begin the planning process, to finalize the MPC membership, to make certain decisions about contents of the plan, and to assign specific tasks to District staff and consultants. Most of the tasks were related to updating information and maps as well as identifying which areas (of each section) required updates. Each section of the current plan was then reviewed and analyzed to determine which areas required update. This included areas of the plan such as the hazards profiled (and hazard data), the risk assessment, goals, maps, status from action items in the last iteration of the plan and new action items. A schedule for the plan update was prepared, see Table 2-3.

The second MPC meeting was held on September 15, 2022. The purpose of the meeting was to review the status of various tasks, to finalize the stakeholders, review the status of the mitigation actions from the current plan and finalize the draft, to review and if needed revised goal statement. The Stakeholders are individuals or groups that are affected by a mitigation plan and/or have or specific knowledge or expertise in an area that can be helpful with the update and were invited to participate by a formal letter (see Appendix D). The Stakeholders for this update are listed in Table 2-2.

As part of the plan update, certain elements of the original plan have been retained, and irrelevant or outdated information has been edited or removed. Focus of the plan update

included incorporating new hazard information, re-evaluating the District's risk assessment, and developing and prioritizing potential mitigation actions and projects.

Table 2-2 - Stakeholders for TBCD Hazard Mitigation Plan Update

Organization	Point of Contact	Title	Method of Invite
Jefferson County	Jeff Branick	County Judge	Letter
Jefferson County Drainage District 6	Doug Canant	Interim General Manager	Letter
Jefferson County OEM	Michael White	Emergency Management Coordinator	Letter
Jefferson County Engineering	Michelle Falgout	County Engineer	Letter
Houston Galveston Area Council (H-GAC)	Cheryl Mergo	Senior Manager	Letter
City of Anahuac	Kenneth Kathan	City Administrator	Letter
Chambers County	Jimmy Sylvia	County Judge	Letter
Chambers County OEM	Ryan Holzaepfel	Emergency Management Coordinator	Letter
Chambers County Economic Development	Samantha Humphrey	Director/Public Information Officer	Letter
Chambers County Engineering	Robert Hall, Jr.	County Engineer	Letter
Liberty County	Jay Knight	County Judge	Letter
Hardin County	Wayne McDaniel	County Judge	Letter
Orange County	John Gothia	County Judge	Letter
Arboretum Nursing and Rehabilitation Center Of Winnie	Kayla Kiker	Administrator	Letter
Riceland Medical Center	Tahir Javed	President/CEO	Letter
OmniPoint Health Hospital	William Kiefer	CEO	Letter
Winnie Area Chamber of Commerce	Brady Zieschang	President	Letter
West Chambers County Chamber of Commerce	Maci Schubert	President/CEO	Letter
Greater Beaumont Chamber of Commerce	Steve Ahlenius	President/CEO	Letter
Galveston County Emergency Management	Mark Henry	County Judge/Director	Letter
Anahuac ISD	Dennis Wagner	Superintendent	Letter
East Chambers ISD	Scott Campbell	Superintendent	Letter

During the third meeting on September 29, 2022, the MPC focused provided the details for the new actions and then prioritization. Also discussed was the plan maintenance process.

The October 20, 2022, focused on reviewing the plan maintenance, capabilities, and presentation for the first public meeting. The draft plan was circulated for review prior to the first public meeting.

The team presented a review of the process and an initial draft to the public on November 16, 2022. The presentation can be found in Appendix C.

Table 2-3 – Plan Update Schedule

Date	Description
9-1-22	MPC Meeting
9-15-22	MPC Meeting
9-29-22	MPC Meeting
10-20-22	MPC Meeting
11-16-22	**First Public Meeting**
11-23-22	Data collections and review. Comments from first public meeting incorporated; updating all sections after meeting
12-5-22	Letters to stakeholders drafted, second draft review
12-5-22	Stakeholders contacted regarding public meeting and providing process for providing comments from review
12-14-22	Second Public Meeting
12-14-22	Plan uploaded to TBCD Website; Public given 30 days to review and provide comments
1-16-23	Comment cycle closes and comments incorporated
1-20-23	Plan is finalized to be sent to TDEM for review process

The MPC met November 30, 2022, to review initial input from the public and further refined the draft. The MPC finalized the draft for stakeholder input and letters were sent on December 6, 2022, for stakeholder review and comment.

The MPC presented the draft to the public on December 14, 2022, explaining how the public can retrieve the draft and provide comments and input due back to the District by January 14, 2023. There were no comments received from the public and the comments from the stakeholders were reviewed by the MPC and incorporated.

Documentation of the Planning Process

It is important to document the planning process to inform the public and other readers about the overall approach to the plan update and to document who participated and how decisions were reached. To facilitate this documentation:

- Minutes were maintained for the MPC meetings.
- A letter was forwarded to the stakeholders to describe their role in the plan and planning effort and specify the means to provide that input. An example is attached to the plan update in Appendix D.
- The MPC presented to the public the plan goals, recommended changes to hazards and a discussion of mitigation actions. The presentation and the announcement are attached in Appendix B and Appendix C.

- With a completed draft, the Stakeholders were sent a link to the draft requesting comments and those comments were incorporated.
- The MPC presented the draft plan update to the public to initiate public review and comment. The draft plan update was posted to the District's website and was mailed to interested parties upon request. The public was informed how to provide input during a 30-day comment period. The public announcement is attached (Appendix E) and presentation (Appendix F).
- The District did not receive any comments from the public and the comments received from the stakeholders were reviewed by the MPC and then incorporated into the plan.
- The MPC finalized the draft and submitted it to TDEM for review and FEMA approval.

Community Participation

Consistent with the District's standard practice of informing, engaging and involving citizens, and to fulfill public participation requirements of the mitigation planning programs, the District publicized the initiative, invited residents to review the plan update and solicited public comment.

During this plan update process, the public was involved by requesting their attendance and participation in two public presentations/meetings at District's office. The first meeting held on November 16th at 9:00 am. The District followed its notice procedures to announce the meeting to the public. The District published a public notice on November 2, 2022 and November 9, 2022 about the draft plan meeting in *The Progress and The Hometown Press* before the meeting (See Appendix B, Public Notice Document), posted the notice in the TBCD office and also on the District's website.

For the second public meeting, The District published a public notice on December 7, 2022 about the draft plan in *The Progress Newspaper and The Hometown Press* before the meeting (See Appendix E, Public Notice Document), on the District's website and in the main office. The draft of the plan update was available for public review, and the public was invited to provide input on the document for 30 days. The District did not receive any comments from the public.

Local Capabilities Assessment and Integration

Trinity Bay Conservation District is a conservation and reclamation district formed and approved by the Texas House and Senate in May of 1949. The primary functions of TBCD are to provide storm water drainage and water treatment and wastewater treatment services for most of East Chambers County and a small portion of west central Jefferson County. While TBCD does not participate in the NFIP, the Counties and jurisdictions that it supports do participate in the NFIP.

TBCD is governed by an elected five-member Board of Directors, one member for each precinct and a board attorney. The Board appoints a General Manager who oversees the operations of the District including Administration, Drainage and Utilities. The Board and the General Manager and staff provide community leadership, develop policies to guide the District in delivering projects and services in support of the community, and encourage citizen awareness and involvement.

The Capability Assessment describes the tools in the District's toolbox for implementing mitigation actions to reduce disaster losses and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects. These tools can be grouped into the following categories (see Figure O):

Figure O– Categories for Capabilities Assessment

The District has 42 employees with three internal departments – Administration, Utilities, and Drainage. It contracts out engineering and accounting support. The District works hard to ensure that all of the departments work collaboratively on hazard mitigation issues, with strong integration so that all departments can provide expertise and resources and are informed of mitigation decisions and actions. Table 2-4 lists the District's Departments and how they are involved mitigation, recognizing that some departments support the lead department for mitigation efforts. It is important to note, TBCD works closely with the County Engineers in all efforts of drainage and flood mitigation.

Table 2-4 – TBCD Departments Involved in Mitigation Efforts

Department	Mitigation Support
Administration	Planning Projects Overall Management Grant applications and support Consultant Engineer Management Consultant Accountant Management Permit Review
Utilities (water treatment and wastewater treatment)	Operations Maintenance
Drainage	Operations

Department	Mitigation Support
	Maintenance Consultant Engineer Management Permit review
Contracted – Engineering Support	Surveying Drafting and GIS Project Design Project Estimation Project Oversight and Administration Drainage Studies
Contracted- Accounting Support	Support of financial reporting

Administrative and Technical Resources

TBCD is a small staff with a large mandate. Therefore, much of the work for mitigation is done by the general manager and closely coordinated with the County as well as contracted out due to limited staff including:

- Floodplain Managers (coordination with County)
- Civil Engineers (contracted)
- GIS Coordinators (contracted and County Coordination)
- Procurement and Finance experts (contracted)
- Grant administrators (contracted

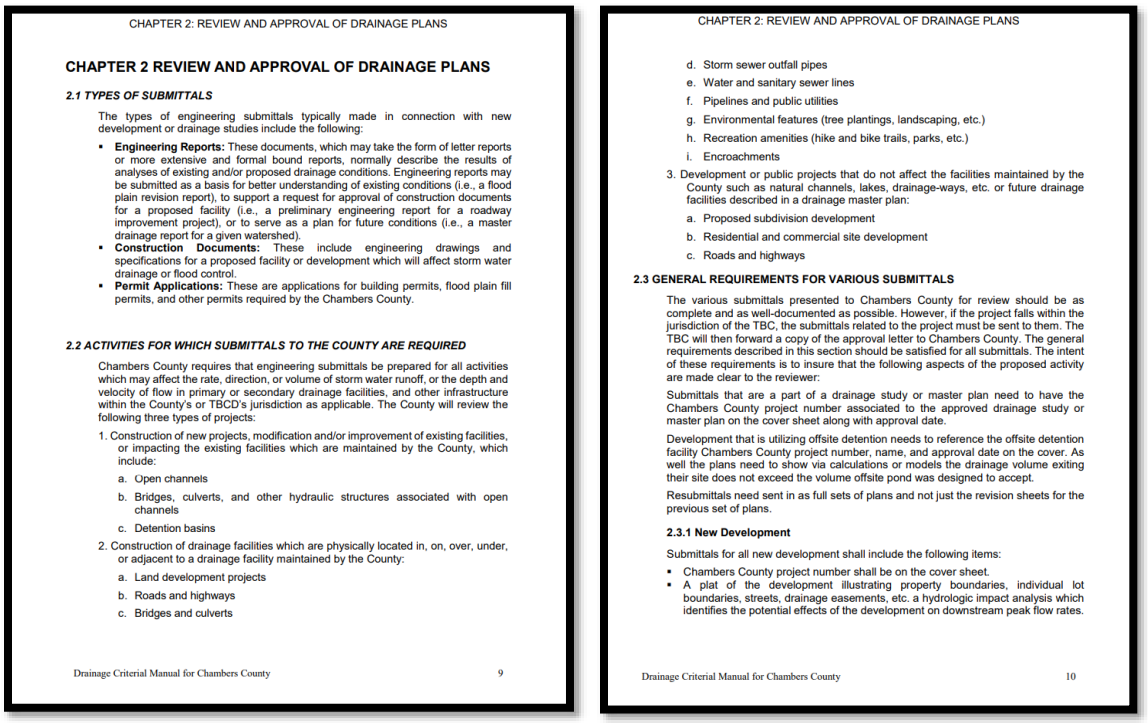
The staff is well trained in permit reviews and effectively enforces regulations in support of mitigation.

Administrative and technical resources - refers to the community's staff and their tools and skills that can be used for mitigation planning and to implement specific mitigation actions. It also refers to the ability to access and coordinate these resources effectively.

Drainage Regulations. The County and TBCD published a Drainage Criteria Manual to establish standard principles and practices for the analysis, design, and construction of primary drainage systems in Chambers County in 2005 and recently updated it in 2022. Figure P is the first page of the detailed review and approval process.

Chambers County Subdivision Manual (2020). The County published subdivision manual to implement the subdivision regulation and TBCD is part of the review process.

Figure P – Chambers County and TBCD Types and Activities that require Drainage Plan Review and Approval



CHAPTER 2: REVIEW AND APPROVAL OF DRAINAGE PLANS

CHAPTER 2 REVIEW AND APPROVAL OF DRAINAGE PLANS

2.1 TYPES OF SUBMITTALS

The types of engineering submittals typically made in connection with new development or drainage studies include the following:

- **Engineering Reports:** These documents, which may take the form of letter reports or more extensive and formal bound reports, normally describe the results of analyses of existing and/or proposed drainage conditions. Engineering reports may be submitted as a basis for better understanding of existing conditions (i.e., a flood plain revision report), to support a request for approval of construction documents for a proposed facility (i.e., a preliminary engineering report for a roadway improvement project), or to serve as a plan for future conditions (i.e., a master drainage report for a given watershed).
- **Construction Documents:** These include engineering drawings and specifications for a proposed facility or development which will affect storm water drainage or flood control.
- **Permit Applications:** These are applications for building permits, flood plain fill permits, and other permits required by the Chambers County.

2.2 ACTIVITIES FOR WHICH SUBMITTALS TO THE COUNTY ARE REQUIRED

Chambers County requires that engineering submittals be prepared for all activities which may affect the rate, direction, or volume of storm water runoff, or the depth and velocity of flow in primary or secondary drainage facilities, and other infrastructure within the County's or TBCD's jurisdiction as applicable. The County will review the following three types of projects:

1. Construction of new projects, modification and/or improvement of existing facilities, or impacting the existing facilities which are maintained by the County, which include:
   a. Open channels
   b. Bridges, culverts, and other hydraulic structures associated with open channels
   c. Detention basins
2. Construction of drainage facilities which are physically located in, on, over, under, or adjacent to a drainage facility maintained by the County:
   a. Land development projects
   b. Roads and highways
   c. Bridges and culverts

Drainage Criterial Manual for Chambers County 9

CHAPTER 2: REVIEW AND APPROVAL OF DRAINAGE PLANS

   d. Storm sewer outfall pipes
   e. Water and sanitary sewer lines
   f. Pipelines and public utilities
   g. Environmental features (tree plantings, landscaping, etc.)
   h. Recreation amenities (hike and bike trails, parks, etc.)
   i. Encroachments
3. Development or public projects that do not affect the facilities maintained by the County such as natural channels, lakes, drainage-ways, etc. or future drainage facilities described in a drainage master plan:
   a. Proposed subdivision development
   b. Residential and commercial site development
   c. Roads and highways

2.3 GENERAL REQUIREMENTS FOR VARIOUS SUBMITTALS

The various submittals presented to Chambers County for review should be as complete and as well-documented as possible. However, if the project falls within the jurisdiction of the TBC, the submittals related to the project must be sent to them. The TBC will then forward a copy of the approval letter to Chambers County. The general requirements described in this section should be satisfied for all submittals. The intent of these requirements is to insure that the following aspects of the proposed activity are made clear to the reviewer:

Submittals that are a part of a drainage study or master plan need to have the Chambers County project number associated to the approved drainage study or master plan on the cover sheet along with approval date.

Development that is utilizing offsite detention needs to reference the offsite detention facility Chambers County project number, name, and approval date on the cover. As well the plans need to show via calculations or models the drainage volume exiting their site does not exceed the volume offsite pond was designed to accept.

Resubmittals need sent in as full sets of plans and not just the revision sheets for the previous set of plans.

2.3.1 New Development

Submittals for all new development shall include the following items:

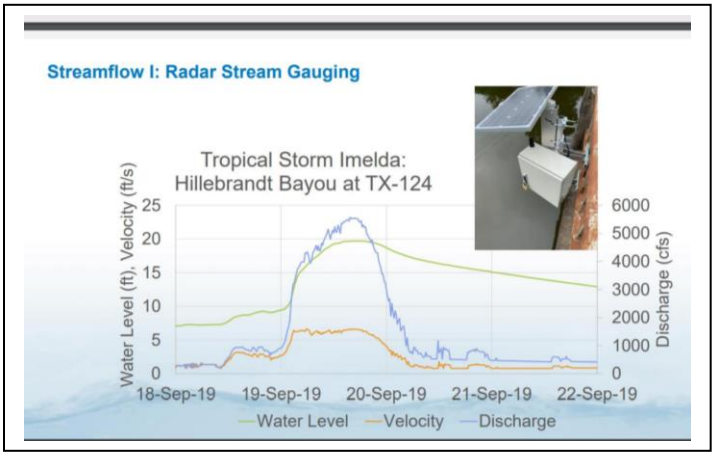
- Chambers County project number shall be on the cover sheet.
- A plat of the development illustrating property boundaries, individual lot boundaries, streets, drainage easements, etc. a hydrologic impact analysis which identifies the potential effects of the development on downstream peak flow rates.

Drainage Criterial Manual for Chambers County 10

Chambers County has permit authority for floodplain development. A permit is required to do any of the following in a floodplain: build, rebuild, bring in fill dirt, re-grade the land, excavate, add on to or improve a home or business, place a manufactured or mobile home unit, install an underground or above-ground tank, subdivide land, and place accessory buildings and temporary structures. New and improved buildings and additions, including manufactured homes, must be elevated minimum one foot above the base flood level. Buildings that are damaged more than 50 percent of their market value, regardless of whether the damage is due to flood, fire, wind or other cause - must be made compliant with the County/City's floodplain management requirements. Before the start of any activity that requires a permit, applicants must first consult with the Floodplain Administrator to determine whether a proposed project is in a floodplain. Failure to obtain a permit constitutes a violation of County/City ordinance and individuals are subject to citations, monetary fines, and legal action for their failure to obtain a permit prior to the start of construction or other activity that requires a permit. Elevations of fill pads in subdivisions are inspected and validated as part of the grading inspection. Elevation Certificates are collected before the Certificate of Occupancy (CO) is issued for buildings located within the Special Flood Hazard Area (SFHA).

From a technical perspective, the District partnered with HCFCD and Jefferson County Drainage District No. 6 to support the rain gauge data so the public can view real time rainfall data as well. Emergency Management teams can use this data as an early warning system support. Rain and depth gauge data also allows watershed models to be updated and detailed analysis performed.

Early Warning Alert System



Administrative and Technical Review Recommendation to support District Mitigation Efforts:

- Funding to continue to support the rain gauge data.
- Staff trained or hired that can provide GIS services and floodplain support for TBCD.

Regulatory and Planning

As mentioned in the Technical and Administrative section, The District has some plans used for long term planning including:

- 2015 Drought Contingency Plan
- 2005 Drainage Criteria Manual (updated 2022)
- 2019 Chambers County Master Drainage Plan
- 2020 Spindletop Bayou Watershed Drainage Study
- 2018 Chambers County Flood Insurance Study (FIS).
- 2017 Chambers County Hazard Mitigation Plan Update
- 2018 State of Texas Hazard Mitigation Plan Update

Regulatory and Planning – implementation of ordinances, polices, local laws and state statutes, and plans and programs that relate to the management and governance of growth and development to include:

- Local ordinances, zoning and building codes
- On-going plans or projects

These plans were used to inform the development of this plan update and data, facts and relevant information from each plan was used in the plan update. For instance, information from the 2020 Spindletop Bayou Watershed Drainage Study led to actions in this plan.

Brief definitions of each plan can be found in Table 2-5.

Table 2-5 - Description of Existing Plans, Trinity Bay Conservation District

Existing Plans, Trinity Bay Conservation District
Name: 2015 Drought Contingency Plan **Description:** Prepared in order to conserve the available water supply and protect the integrity of water supply facilities and provides clear guidance for initiation of plan **Relationship to Natural Hazard Mitigation Planning:** During drought, conservation is key and safe, reliable, transparent and consistent rules to preserve water is necessary to avoid a water supply shortage.
Name: 2005 (Updated 2022) Chambers County Drainage Criteria Manual **Description:** This manual was completed to support the Master Drainage Plan and Drainage Regulations that were adopted by Chambers County and TBCD. The purpose of the Drainage Criteria Manual is to outline criteria and guidance to be used by developers, engineers, and land surveyors in the design of drainage measures to manage runoff. **Relationship to Natural Hazard Mitigation Planning:** The County and TBCD completes periodic reviews of the Criteria Manual to identify mitigation actions that can be incorporated

Existing Plans, Trinity Bay Conservation District
in the Hazard Mitigation Plan. TBCD meets on an annual basis to review these regulations with the County, specifically to identify ways to expand criteria and guidance to be used by developers, engineers, and land surveyors in the design of drainage measures to manage runoff.
Name: 2019 Chambers County Master Drainage Plan **Description:** The purpose of the Master Drainage Plan (MDP) was developed to address existing drainage and flooding problems and to provide for drainage needs expected to occur in the coming years as development continues. The plan had a study area lying west of the Trinity Rivers, so while outside of TBCD jurisdiction, it was reviewed because many of the Bayous and watersheds are in or can impact TBCD planning area. **Relationship to Natural Hazard Mitigation Planning:** Plan helps with modeling information, feasibility review of projects and other information that could be helpful to District.
Name: 2020 Spindletop Bayou Watershed Drainage Study **Description:** The Spindletop study was completed to determine effective ways to mitigate future flooding. **Relationship to Natural Hazard Mitigation Planning:** Study helped identify projects to mitigate flooding.
Name: 2018 Chambers County Flood Insurance Study (FIS) **Description:** The most recent FIS for Chambers County was revised January 18, 2018. These studies were reviewed again as part of the Plan update as the information updates the existence and severity of flood hazards in the study area. **Relationship to Natural Hazard Mitigation Planning:** After analysis and evaluation of the flood profile and transects, the goal is to have improvement options that address structural flooding within the watersheds, identifying projects and prioritization of those projects.
Name: Chambers County 2017 Hazard Mitigation Plan Update **Description:** The plan was reviewed for hazard analysis, actions and other relevant information. **Relationship to Natural Hazard Mitigation Planning:** The County plan is important to review to help with coordination, hazard determination and other important mitigation efforts.
Name: 2018 State of Texas Hazard Mitigation Plan Update **Description:** The State plan provides information of hazards, events and for each region which is helpful to review. **Relationship to Natural Hazard Mitigation Planning:** State level mitigation planning.

Regulatory Support for Hazard Specific Mitigation – Floods

As mentioned earlier, TBCD has no direct responsibility for oversight of development in the floodplain. When development is proposed within the Cities or County, within the floodplain, TBCD is asked to review and comment on the subdivision, plats, multi-use and commercial developments plans by participating in the County's Standing Development Review Committee (DRC).

The Cities and County have strong development and permitting requirements for development in and out of the floodplain.

Drainage Regulations. The District regulates drainage in close coordination with the County and incorporated Cities. The District and County published a Drainage Criteria Manual to support the Master Drainage Plan and Drainage Regulations adopted by the District pursuant to the Texas Water Code Section 49.211.

Permits. The District requires a permit for pipeline and utility crossings as well as storm drainpipe tie-ins. All information is available on the District's website.

Emergency response is the responsibility of the Cities and County. The County owns and maintains 300 miles of roads and roadside drainage, however TBCD owns the majority of ditches within TBCD and is responsible for routine maintenance. After an event, it is a cooperative effort between the County Precincts, and TBCD to identify ditches that need cleaning (as well as crossings). There are known problem areas that are regularly checked during and after an event.

The County has early warning capability, ChamberWARNs. It is a community notification system. Citizens in the area rely mostly on local weather, which is reported to be very capable. TBCD has 25 stream and rainfall gauges throughout the District. These stream gauges provide data that is used by HCFCD, TBCD, JCDD6 and the Lake Charles branch of the National Weather Service to predict potential flooding. On behalf of the District, JCDD6 uploads stream gauge data to the National Weather Service every 15 minutes. Further discussion on existing policies and programs are addressed in "review and incorporation of existing plans, studies, reports and technical information".

Financial Resources

Financial Resources – Financial capabilities - the resources that a jurisdiction has access to or is eligible to use to fund mitigation actions.

The District is considered a special district within Chambers County who is the taxing authority. The District receives funds from a rate that is annually set by the County from collected taxes. Water and sewer is self-funded through collection of payments from users managed by the District and TBCD recently updated its billing software. If needed, TBCD can sell bonds to support initiatives. In addition, the District actively pursues grants through various state and federal agencies for projects and programs, including hazard mitigation.

Insured Buildings

TBCD maintains approximately $15.2 million in property insurance coverage on buildings and facilities it owns, to protect the District from damage due to structural fire, wind and lightning and flooding. TBCD also carries approximately $8.4 million in coverage for vehicles and equipment.

Financial Resources Recommendation to support District Mitigation Efforts: Similar to administrative recommendation, training dedicated to finding and understanding all types of grant funds (federal and state) could be helpful for the District to fund mitigation projects through means other than taxes and fees.

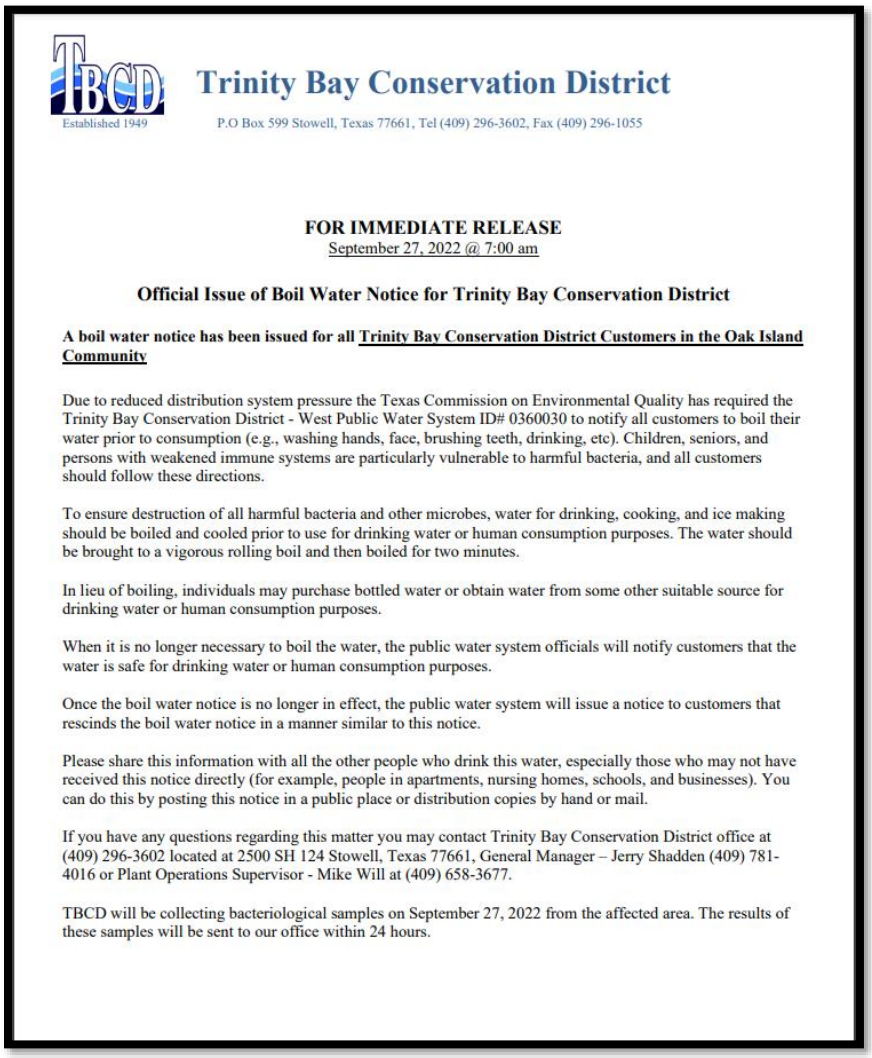
Education and Outreach

Education and Outreach –refers to education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information

The District is in the process of updating its website to be a user-friendly site to find out current information on projects from consideration and design to construction and completion, permitting information, as well as general information about the District. It communicates with its residents using a variety of media, each of which have been used to convey information, including content about hazards including:

- News Releases - News releases announcing District events and issues of public interest (e.g boil water due to low pressure) are sent to local media help publicize information to the public.
- TBCD has a rain gauges that measures the amount of precipitation in a particular area.
- A Consumer Confidence reports are sent out each year.
- Website - The District's official website provides information, applications, forms, and interactive features.
- Other Services include print pieces such as brochures, articles, public notices (see Figure Q), signage, and incorporating information into other jurisdiction's awareness campaigns.

Figure Q - Example of a District News Release to the Public



Trinity Bay Conservation District

Established 1949

P.O Box 599 Stowell, Texas 77661, Tel (409) 296-3602, Fax (409) 296-1055

FOR IMMEDIATE RELEASE
September 27, 2022 @ 7:00 am

Official Issue of Boil Water Notice for Trinity Bay Conservation District

A boil water notice has been issued for all Trinity Bay Conservation District Customers in the Oak Island Community

Due to reduced distribution system pressure the Texas Commission on Environmental Quality has required the Trinity Bay Conservation District - West Public Water System ID# 0360030 to notify all customers to boil their water prior to consumption (e.g., washing hands, face, brushing teeth, drinking, etc). Children, seniors, and persons with weakened immune systems are particularly vulnerable to harmful bacteria, and all customers should follow these directions.

To ensure destruction of all harmful bacteria and other microbes, water for drinking, cooking, and ice making should be boiled and cooled prior to use for drinking water or human consumption purposes. The water should be brought to a vigorous rolling boil and then boiled for two minutes.

In lieu of boiling, individuals may purchase bottled water or obtain water from some other suitable source for drinking water or human consumption purposes.

When it is no longer necessary to boil the water, the public water system officials will notify customers that the water is safe for drinking water or human consumption purposes.

Once the boil water notice is no longer in effect, the public water system will issue a notice to customers that rescinds the boil water notice in a manner similar to this notice.

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distribution copies by hand or mail.

If you have any questions regarding this matter you may contact Trinity Bay Conservation District office at (409) 296-3602 located at 2500 SH 124 Stowell, Texas 77661, General Manager – Jerry Shadden (409) 781-4016 or Plant Operations Supervisor - Mike Will at (409) 658-3677.

TBCD will be collecting bacteriological samples on September 27, 2022 from the affected area. The results of these samples will be sent to our office within 24 hours.

Education and Outreach Recommendation to support Mitigation Efforts: Support an awareness campaign about the District's work.

Participation in National Flood Insurance Program (NFIP) and Community Rating System (CRS)

Participation in the National Flood Insurance Program (NFIP) is important to TBCD and its residents. This is evidenced by the Cities in the planning area, and the County's commitment to regulating development and redevelopment, by adoption of provisions that exceed the minimum requirements, and by its active pursuit of mitigation opportunities. The Cities and Chambers County, with support from TBCD, are firmly committed to continued compliance with the NFIP. It is important to note that TBCD cannot participate in the NFIP as Cities and Counties do. It cannot not apply for NFIP (Cities and County do) or CRS (Cities and County do) status. However, it supports the communities within its planning area in any way it can to keep its standing in the NFIP and CRS.

TBCD is a conservation and reclamation district and a political subdivision of the State of Texas. Considering TBCD is a separate entity and does not directly participate in the NFIP, specific actions will be determined by representatives and officials with the incorporated areas and Chambers County within TBCD. With this in mind, TBCD did not identify and prioritize NFIP actions as part of the planning process. DD6 will continue to work closely with the cities and Chambers County to identify and recommend actions that will ensure continued compliance with the NFIP.

The City of Anahuac satisfied requirements for initial participation in the NFIP and joined the Emergency Program and ultimately the regular program in 1981. Stowell and Winnie as part of Chambers County satisfied requirements for initial participation in the NFIP and joined the Emergency Program and ultimately the regular program in 1983.

As mentioned at the beginning of this Section, TBCD is a conservation and reclamation district and a political subdivision of the State of Texas. Considering TBCD is a separate entity and does not directly participate in the NFIP, specific actions will be determined by representatives and officials within the incorporated areas and the County. With this in mind, the District did not identify and prioritize NFIP actions as part of the planning process. It will continue to work closely with the Cities and County to identify and recommend actions that will ensure continued compliance with the NFIP.

Tropical Storm Harvey and Aftermath
As a result of Hurricane Harvey in 2017, the District sustained damages at several crossings and culverts as well as local rural wooden bridges It caused erosion and the need clean out pumps and wells, as well as fix damaged pump motors, one air conditioning unit and an electrical circuit board.

Tropical Storm Imelda and Aftermath
In 2019, Tropical Storm Imelda brought between 25-30 inches of rain in a twelve-hour period to Chambers County. The rainfall caused devastating flooding along the I-10 corridor from Winnie eastward to Fannett, Beaumont, and Vidor. Riceland Medical Center in Winnie was evacuated as it took on water and flood waters entered numerous homes and businesses across the County.

Capabilities to Support Natural Resources
The District values open space and encourages protection of trees and wetlands in its development processes. The approval process for subdivisions within the County and Cities requires developers to delineate waterways, drainage structures, the boundaries of flood-prone areas (including floodways). As a Conservation and Reclamation District, the jurisdictional authority was expanded to include, among other things, eminent domain. The Texas Legislature ruled that the powers granted under House Bill No. 1063 were an urgent necessity for effective drainage throughout the District. It was further detailed that the creation of the Conservation and Reclamation District would result in the conservation of the natural resources of the state and eliminate health and safety hazards.

Accordingly, the continuing drainage support mission of Trinity Bay Conservation District is to: Provide flood damage reduction projects that work, with appropriate regard for community and natural values.

Expanding and Improving Capabilities

The existing capabilities of the District help to support it mission, but it is always reviewing these capabilities to see where improvement can be made. Training is so important and finding time and funds to support the District's employees to receive timely and critical support training is areas like floodplain management, GIS, rain gauge support, occupational safety, grants are necessary, and the District would like to be able to obtain more frequent training and accreditation training to help our employees help our community.

SECTION 3 – HAZARD IDENTIFICATION AND RISK ASSESSMENT

Introduction

Risk assessments are conducted to determine the potential impacts of specified hazards on human safety, the planning area economy, and both the developed and natural environments of the community. Risk, as viewed from a hazard mitigation perspective, is the potential for loss of life, personal injury, property damage, loss or other impacts created by the interaction of natural hazards with local citizens and community assets and include natural processes, such as tornadoes. FEMA has provided a diagram (Figure R) that helps best illustrate the concept of risk as the overlap between hazards and community assets – the smaller the overlap, the lower the risk. This plan update focuses on how risk has changed since the current plan was completed including changes related to land use development and integrates updated hazard information. Each hazard includes a description of the location, extent, previous occurrence and probability of future events as well as events that occurred since the 2016 plan. Hazards are then evaluated on the basis of potential impact on the community, the community's overall vulnerability and the most significant risks.

Changes from the Last Plan

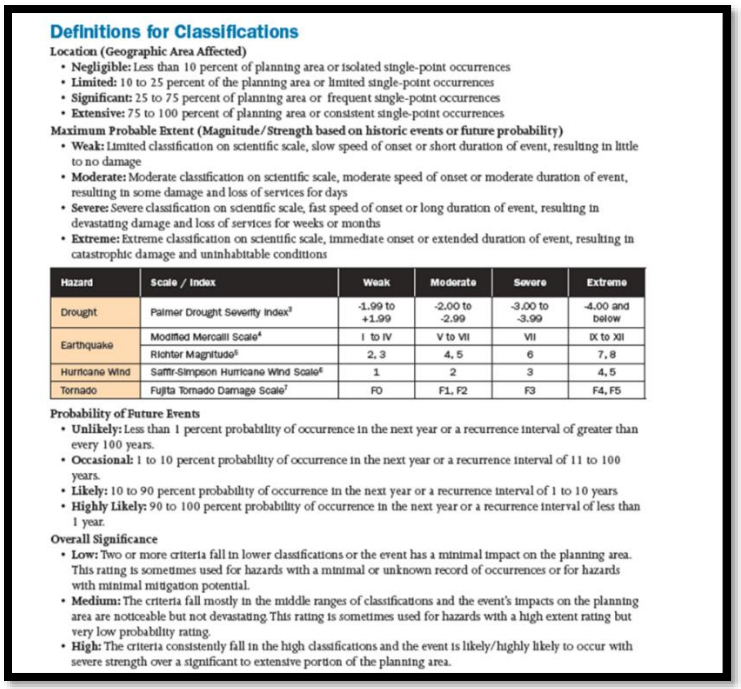
For the original Plan, the MPC considered all potential hazards that may affect Trinity Bay Conservation District. As part of the update process, the MPC reviewed the hazards included as part of the 2015 Plan and hazards not profiled in the last iteration and determined that the following hazards would be addressed in the Plan update. The hazards are floods (including landslides and erosion), tornadoes, severe thunderstorms – high wind, hurricanes, and tropical storms (including storm surge), drought, extreme heat, subsidence, wildfires, and winter storms. Numerous changes from the previous version of the Plan were incorporated, including updated maps and tables displaying the event history from the National Center for Environmental Information (NCEI) for various hazards, as well as many other less significant modifications.

After reviewing all hazards that could potentially impact Trinity Bay Conservation District, the MPC considered the flood hazard the most significant. The hazards addressed in this subsection found in Table 3-1 include the following:

Table 3-1 – 2015 Hazards and 2022 Hazards

Hazard List	2015 TBCD Plan Hazards	2022 TBCD Plan Update	Significance to Area	2022 Result
Avalanche	Not a Hazard in Area	Not a Hazard in Area	N/A	N/A
Tsunami	Not a Hazard in Area	Not a Hazard in Area	N/A	N/A
Wildfire	Profiled	Profiled	L,M,O,L	Actions
Earthquake	Profiled	Hazard possible but likelihood and magnitude minimum	N, W, U,L	Will omit
Subsidence	Did not discuss	Profiled	L,M,O,L	Actions
Landslide	Profiled	Part of flood	N,W,O,L	Actions part of flood

Hazard List	2015 TBCD Plan Hazards	2022 TBCD Plan Update	Significance to Area	2022 Result
Expansive Soils	Did not discuss	Hazard possible but likelihood and magnitude minimum	L,W,O,L	Will Omit
Erosion	Profiled	Part of flood	E, E, H,H	Actions as part of flood
Hail	Did not discuss	Hazard possible but likelihood and magnitude minimum	N,W,O,L	Will omit
Lightning	Did not discuss	Profiled	S,M,H,M	Fully Mitigated
Extreme Heat	Profiled	Profiled	S,S,H,H	Actions
Drought	Profiled	Profiled	E, M, L, M	Actions
Flood	Profiled	Profiled	E, E, L, H	Actions
Hurricane/Tropical Storm	Profiled	Profiled	E,E,H,H	Actions
Subsidence	Did not discuss	Profiled	L,M,L,L	Actions
Storm Surge	Discussed as part of H/TS	Part of Hurricane/TS	S,S, O,H	Actions as part of H/TS
Dam Failure	Profiled	Hazard possible but likelihood and magnitude minimum	N,W,U,L	Will Omit
Tornado	Profiled	Profiled	L,M,L,L	Actions
Thunderstorms/Wind	Profiled	Profiled	E,E,H,H	Actions
Winter Storm	Profiled	Profiled	L, M, U, L	Actions
Wildfire	Profiled	Profiled	L,M,U,L	Actions



Definitions for Classifications

Location (Geographic Area Affected)

- **Negligible:** Less than 10 percent of planning area or isolated single-point occurrences
- **Limited:** 10 to 25 percent of the planning area or limited single-point occurrences
- **Significant:** 25 to 75 percent of planning area or frequent single-point occurrences
- **Extensive:** 75 to 100 percent of planning area or consistent single-point occurrences

Maximum Probable Extent (Magnitude/Strength based on historic events or future probability)

- **Weak:** Limited classification on scientific scale, slow speed of onset or short duration of event, resulting in little to no damage
- **Moderate:** Moderate classification on scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days
- **Severe:** Severe classification on scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months
- **Extreme:** Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions

Hazard	Scale / Index	Weak	Moderate	Severe	Extreme
Drought	Palmer Drought Severity Index[3]	-1.99 to +1.99	-2.00 to -2.99	-3.00 to -3.99	-4.00 and below
Earthquake	Modified Mercalli Scale[4]	I to IV	V to VII	VII	IX to XII
	Richter Magnitude[5]	2, 3	4, 5	6	7, 8
Hurricane Wind	Saffir-Simpson Hurricane Wind Scale[6]	1	2	3	4, 5
Tornado	Fujita Tornado Damage Scale[7]	F0	F1, F2	F3	F4, F5

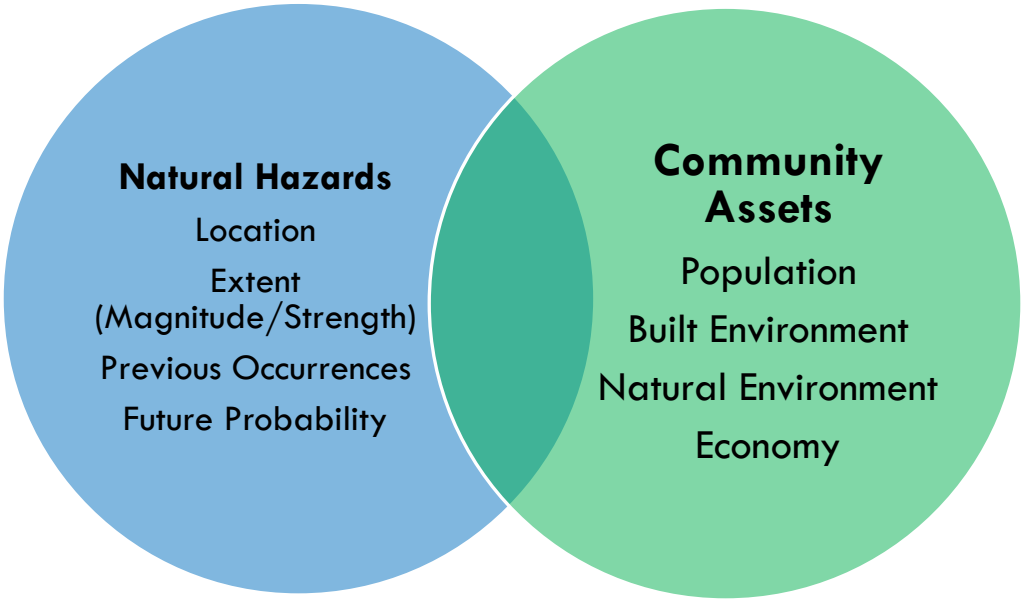
Probability of Future Events

- **Unlikely:** Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.
- **Occasional:** 1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.
- **Likely:** 10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years
- **Highly Likely:** 90 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.

Overall Significance

- **Low:** Two or more criteria fall in lower classifications or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with a minimal or unknown record of occurrences or for hazards with minimal mitigation potential.
- **Medium:** The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.
- **High:** The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

Figure R FEMA Concept of Risk Diagram



Overview of Risks

Table 3-2 identifies the total number and estimated value of buildings/infrastructure within TBCD. The table indicates there are 4,872 residential buildings, 423 commercial buildings and 8 infrastructure and utility buildings including oil and gas, electric, telephone, railroad, etc. in the District. While buildings are important and tangible to estimate value, human life is more complex. The potential annual losses from deaths and injuries are calculated by using the values in the current FEMA BCA guidance which is $5.8 million for deaths and $90,000 for treat and release injuries. This information and the data in Table 3-2 is used periodically throughout this plan update to identify the overall exposure within Trinity Bay Conservation District for certain hazards that equally impact the entire planning area such as hurricanes/tropical storms and drought.

Table 3-2 – Trinity Bay Conservation District Planning Area Structures

Type	No. of Structures
Single Family Residences	4,872
Multi Family Residences	54
Commercial Buildings/Industrial	423
Infrastructure and Utility Buildings	8
Trinity Bay Conservation District Owned Buildings (includes main building, water treatment and wastewater treatment plants)	7

Damage and losses (including physical damage, indirect and economic losses, and personal injuries and fatalities) that are associated with hazards result when an event affects areas where

people and improved property are located. After hazards are identified, estimates of risk exposure for people and property (measure of "at-risk") can be prepared.

When the full range of potential natural hazards are reviewed, it becomes apparent that some events occur frequently, and some are relatively rare. Some hazards impact large numbers of people to a limited degree, while others may cause very localized but significant damage. As described in the flood hazard profile, floods have historically caused the most property damage in Trinity Bay Conservation District.

Hazards Omitted

The District focused on hazards that occur within the planning area that historically have had enough impact (e.g. damage to property, infrastructure, injury or death) that mitigation of that hazard is necessary for the welfare of the community. Certain hazards have no history of impact in the planning area; therefore, the District has decided to omit these hazards. Important to note, while the District believes these hazards are negligible, each year it will review the hazard during its annual review to determine if the impact has changed and if so, will update the plan accordingly. The District updates the profile for each hazard and if the results of the review are negligible impact, the District removes the hazard. The following table will provide a brief explanation on each hazard that the District considered negligible impact and will not profile and be omitted from the plan update.

Table 3-3 – Trinity Bay Conservation District Omitted Hazards

Hazard Considered	Review	Reason for Omission
Earthquakes	Omit	Does not occur in the area. According to the State Plan, an earthquake occurrence for the planning area is considered exceedingly rare. There is no history of impact to critical structures, systems, populations or other community assets or vital services as a result of earthquakes and none is expected in the future.
Hail	Omit	Rare and when it does occur, not damaging enough to warrant profiling and actions.
Lightning	Omit	FULLY MITIGATED. TBCD does have lightning occurrences, but when lightning does happen, the District is protected to the best of their abilities. The District has lightning protection devices on critical facilities, lightning rods and grounding on communication buildings and surge protection on all buildings and therefore is considered fully mitigated.
Dam Failure	Omit	No significant dams in planning area or upstream that can cause damage. There is no history of impact from dam failure, therefore not profiled.
Expansive Soil	Omit	Rare and when it does occur, not damaging enough to warrant profiling and actions.

Through the profile process, for the hazards that affect the hazard area, the NCEI database indicates that, as of 7/31/22 (the database does not reflect any losses since that date), over time these hazard events caused a combined total of approximately $395 million in property damage in Chambers County. The database also indicates that have been 9 personal injuries and 7 fatalities as a result of these events (see Table 3-4). It is important to note that these numbers are for the entire County, not just the District, but it is consistent with the hazards that Trinity Bay Conservation District considers likely and impactful.

Table 3-4 Chambers County Injuries, Deaths and Damaged from Natural Hazards Source: NOAA/NCEI)

Injuries from 1950-2015	9
Injuries from 2016-2022	0
Total Injuries	9
Death from 1950-2015	7
Deaths from 2016-2022	0
Total Deaths	7
Property Damages from 1950-2016	$313,201,000
Property Damages from 2017-2021	$ 81,256,000
Total Property Damages	$394,457,000

Hazards Included

The Hazard Summary table provides an overview of the likelihood of occurrence and the estimated impact to public health, safety, and property for the hazards included in this plan update. The categories below were reviewed for each hazard profiled and summarized in Table 3-4.

Location (Geographic Area Affected)

- Negligible: Less than 10 percent of planning area or isolated single-point occurrences
- Limited: 10 to 25 percent of the planning area or limited single-point occurrences
- Significant: 25 to 75 percent of planning area or frequent single-point occurrences
- Extensive: 75 to 100 percent of planning area or consistent single-point occurrences

Maximum Probable Extent (Magnitude/Strength based on historic events or future probability)

- Weak: Limited classification on scientific scale, slow speed of onset or short duration of event, resulting in little to no damage
- Moderate: Moderate classification on scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days
- Severe: Severe classification on scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months
- Extreme: Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions

Probability of Future Events

- Unlikely: Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.
- Occasional: 1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.
- Likely: 10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years
- Highly Likely: 90 to 100 percent probability of occurrence in the next year or a recurrence interval of less than1 year.

Overall Significance

- Low: Two or more criteria fall in lower classifications or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with a minimal or unknown record of occurrences or for hazards with minimal mitigation potential.
- Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.
- High: The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

Table 3-5 Hazard Summary
(Source: Trinity Bay Conservation District)

Hazard Type	Location	Maximum Probable Event	Likelihood of Occurrence	Overall Significance
Drought	Extensive	Moderate	Likely	Medium
Extreme Heat	Significant	Moderate	Likely	Low
Flooding	Extensive	Extreme	Likely	High
Hurricane/ Tropical Storm	Extensive	Extreme	Likely	High
Thunderstorm and High Wind	Extensive	Extreme	Highly Likely	High
Subsidence	Limited	Moderate	Likely	Low
Tornado	Limited	Moderate	Likely	Low
Winter Storm	Extensive	Moderate	Likely	Medium
Wildfire	Limited	Moderate	Unlikely	Low

Numerous federal agencies maintain a variety of records regarding losses associated with natural hazards. Unfortunately, no single source is considered to offer a definitive accounting of all losses. FEMA maintains records on federal expenditures associated with declared major disasters. The U.S. Army Corps of Engineers and the Natural Resources Conservation Service

collect data on losses during the course of some of their ongoing projects and studies. As mentioned earlier in this Section, NOAA's National Center for Environmental Information database is another source where data statistics such as injuries, deaths, and damage estimates are maintained for a variety of natural hazards. The data is maintained at the county level, with more recent entries listing the specific location within the county. Although not always specific to the District, this county-wide hazard data from the NCEI is often the best available resource for documenting historical events.

In the absence of definitive data on some of the natural hazards that may occur in the District, illustrative examples are useful. Table 3-6 provides brief descriptions of particularly significant natural hazard events occurring in the City's recent history.

Both the Cities and the County have early warning capability. Citizens in the area rely mostly on local weather, which is reported to be very capable. Trinity Bay Conservation District has 24 stream and rainfall gauges throughout Trinity Bay Conservation District. These stream gauges normally provide data that is used by Trinity Bay Conservation District. These rain gauges have not been maintained since 2020 with Covid-19 but are in the process of being upgraded.

Data on Presidential Disaster Declarations characterize some natural disasters that have affected the area. In 1965, the federal government began to maintain records of events determined to be significant enough to warrant declaration of a major disaster by the President of the United States. Presidential Disaster Declarations (DRs) are made at the county level and are not specific to any one City or District. It should be noted that not all disaster declarations for Chambers County affected Trinity Bay Conservation District. However, as of 2022, 20 such disasters had been declared in Chambers County and since 2017, four declarations which are identified as part of the summary in Table below.

Table 3-6 Natural Hazard Events and Declared Major Disasters in Chambers County since 2017
(Sources: FEMA, NCEI database)

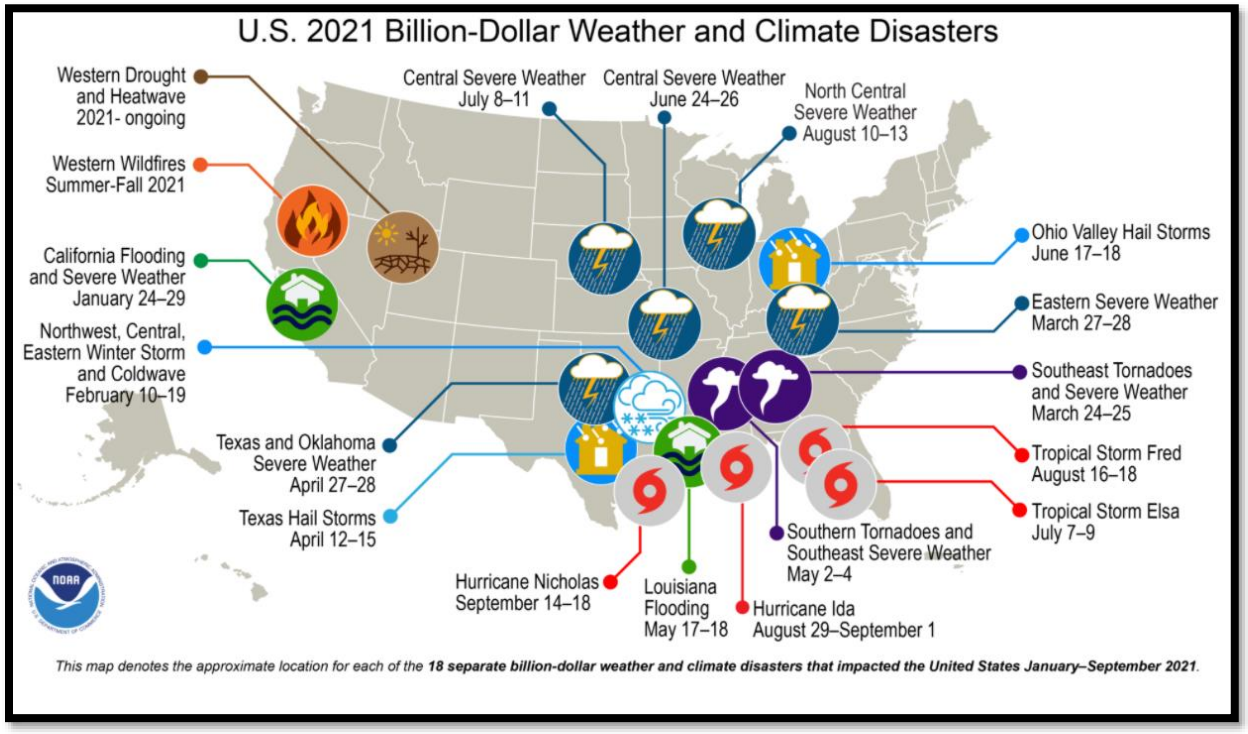
Date & Disaster (DR)	Nature of Event
August 25, 2017 (DR 4332)	Hurricane Harvey – As a result of Hurricane Harvey in 2017, the District sustained damages at several crossings and culverts as well as local rural wooden bridges It caused erosion and the need clean out pumps and wells, as well as fix damaged pump motors, one air conditioning unit and an electrical circuit board.
October 4, 2019 (DR-4466)	Tropical Storm Imelda – In 2019, Tropical Storm Imelda brought between 25-30 inches of rain in a twelve-hour period to Chambers County. The rainfall caused devastating flooding along the I-10 corridor from Winnie eastward to Fannett, Beaumont, and Vidor. Riceland Medical Center in Winnie was evacuated as it took on water and flood waters entered numerous homes and businesses across the County.

Date & Disaster (DR)	Nature of Event
March 25, 2020 (DR-4485)	Texas Covid-19 Pandemic
February 19, 2021 (DR 4586)	Texas Severe Winter Storms (Winter storm URI). Uri froze pipes at the plants.

Losses Due to Major Disasters

The U.S. has sustained 308 weather and climate disasters between 1980 and 2021. Although no definitive record exists of all public and private losses due to disasters in Trinity Bay Conservation District, estimates of the total public and private costs of natural hazards throughout the U.S. where overall damages/costs reached or exceeded $1 billion (including CPI adjustment to 2021). The total cost of these 308 events exceeds $2.085 trillion. So far in 2022, (as of October), there have been 28 weather/climate disaster events to affect the United States. These events included 18 flooding events, 2 severe storm events, 3 tropical cyclone events, 1 landslide event, 1 wildfire event, and 3 winter storm events. The illustration (Figure S) below depicts the timing and location of these disasters.

Figure S - 2021 Disasters and Locations



In most declared major disasters, the federal government reimburses at least 75% of the eligible costs of cleanup and recovery and possibly more depending on the severity of the disaster. The remaining percentage is covered by the state and affected local jurisdictions.

Trinity Bay Conservation District has experienced numerous disasters and has actively applied for and administered various grants over the years. The District has applied for several grants since the last version of the Plan, but none have been awarded at the time of this writing.

Drought

UPDATE FROM LAST PLAN

- Information on the Drought Impact Reporter (DIR) added.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description

Drought is generally defined as a condition of climatic dryness severe enough to reduce soil moisture and water supplies below the requirements necessary to sustain normal plant, animal, and human life. In Texas, drought is often defined in terms of agricultural and hydrologic drought:

- Agricultural drought is considered a dry period of sufficient duration and intensity that crop and animal agriculture are markedly affected.
- Hydrologic drought is considered a long-term condition of abnormally dry weather that ultimately leads to the depletion of surface and ground water supplies. During hydrologic drought, a significant reduction in flow of rivers, streams, and springs is notable.

Texas is divided into ten climatic divisions that range from substantially heavy precipitation through semi-arid to arid climates. Most of Texas is prone to periodic droughts of differing degrees of severity. One reason is the state's proximity to the Great American Desert of the southwestern United States. In every decade since recordation, Texas has fallen victim to one or more serious droughts.

Location-Drought

Chambers County is susceptible to all ranges of drought defined by the Palmer Drought Severity Index and the NWS Heat Index (see Extent). Since drought occurs on a regional scale, all of the Trinity Bay Conservation District is equally at risk as it can occur anywhere in the jurisdiction. The geographic area affected is considered extensive.

Previous Occurrence

According to the NCEI database, Chambers County, including the planning area, has experienced seven drought or heat related events in the period from 1996 to 2022. All 20 events occurred between 1996 and 2000. The database provides no records of drought events prior to 1996, although presumably occurrences follow the same pattern and frequency as shown in the NCEI list. Also note that the drought events are listed by months. For example, if a drought lasts several continuous months, it is listed in the database as separate events. If the continuous months are combined into single events, the number of events is reduced from 20 to 11 events. Table 3-7 describes the one drought event since the 2015 Plan spanning over 5 months. This event is not associated injuries, deaths damages in Chambers County.

Table 3-7 – Drought in Chambers County, 2016 - 2021
(Source: NOAA/NCEI)

Location	Date	Type	Dth	Inj	PrD	CrD	Description
CHAMBERS (ZONE)	04/05/2022 to 07/01/2022	Drought	0	0	0.00K	0.00K	Due to prolonged dry period, severe drought began over parts of Southeast Texas in early April through July.
Totals:			0	0	0.00K	0.00K	

Future Occurrence

Based on 11 events of drought and extreme heat events within 27 years, a event occurs approximately once every 2.45 years on average in Chambers County and since droughts occur at a regional level, Trinity Bay Conservation District can expect a drought event approximately once every 2.45 years or a 40% chance annually. The probability of future events is considered likely.

Extent

The U.S. Drought Monitor Drought Intensity Scale classifies drought by 5 categories, D0 through D4, with D4 being the most extreme drought conditions, see Figure T. The maximum drought extent experienced for Chambers County is a Category D2 drought as reported by the U.S. Drought Monitor in 2022 – Drought.gov (Figure U). While the monitor classification is severe, the maximum probable extent the District can expect is considered moderate with most events resulting in little to no damage, and the most extreme event potentially causing severe crop damage, pasture loss, and widespread water shortages or restrictions.

Figure T- Drought Classification (US Drought Monitor)

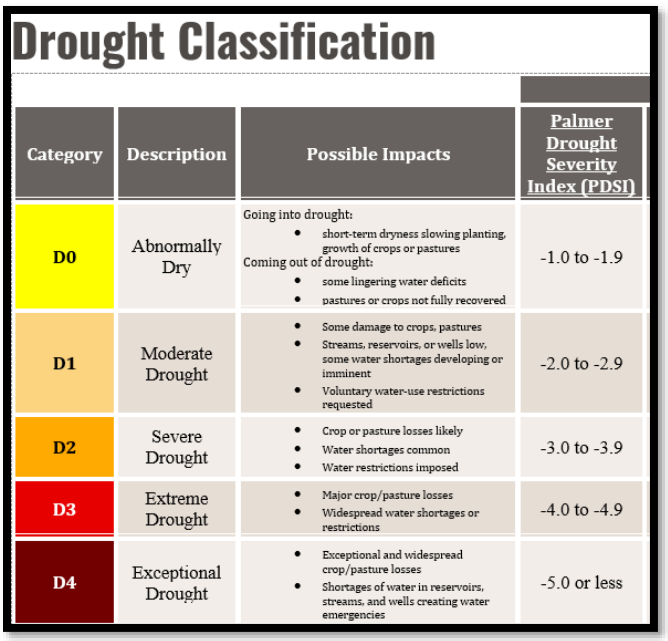
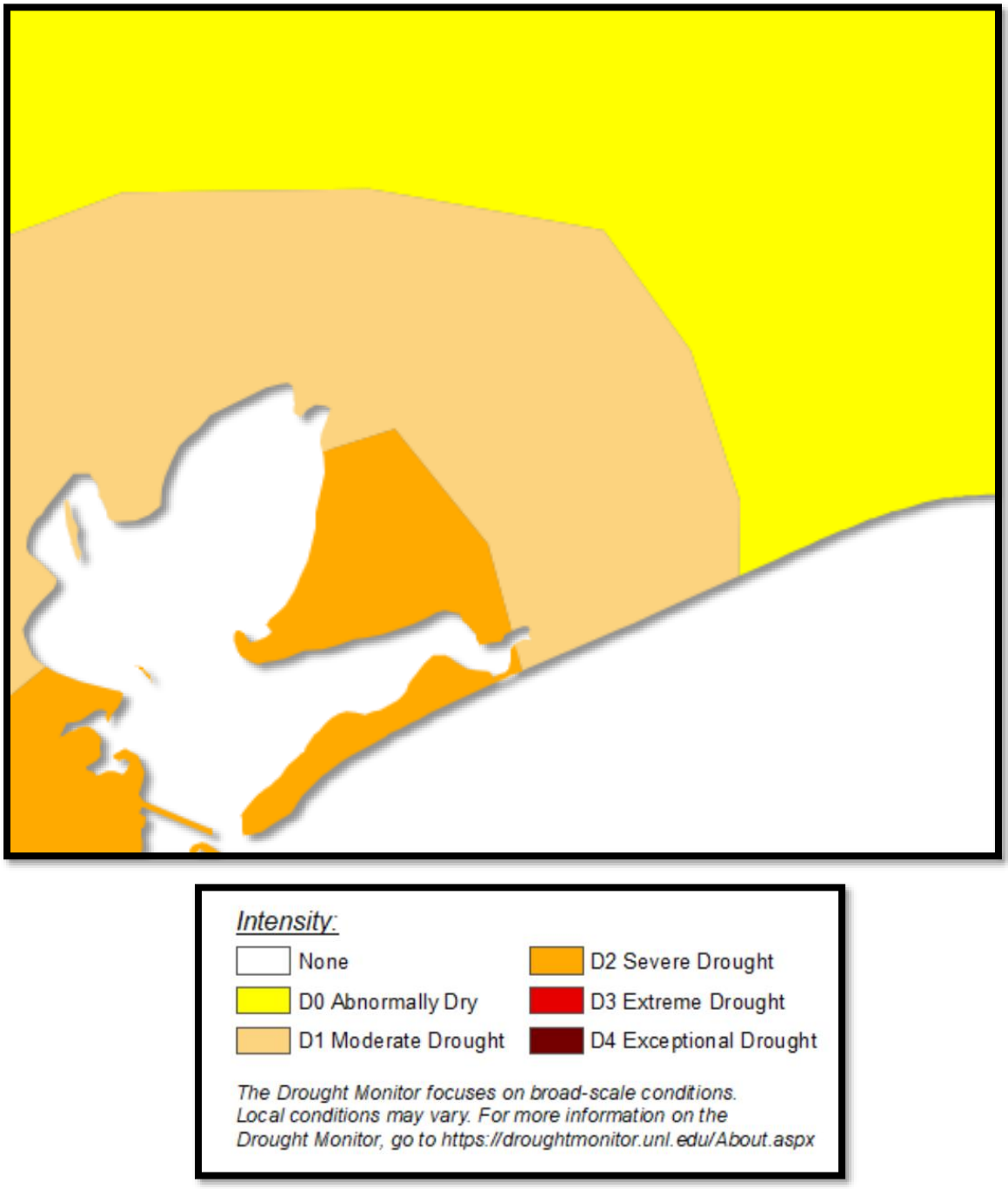


Figure U - Current Drought Conditions in the TBCD Planning Area (October 2022)



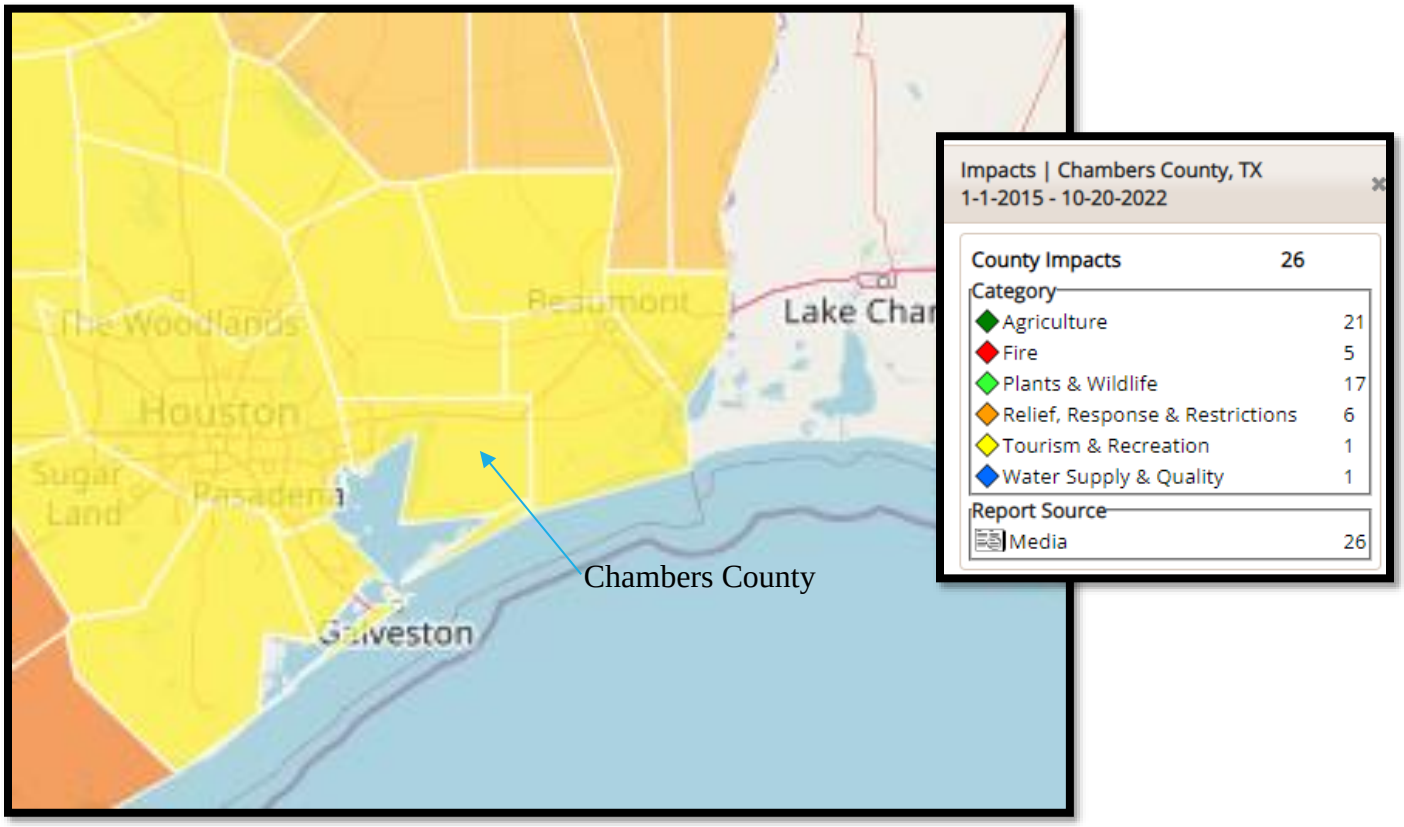
Impact

The Drought Impact Reporter (DIR) is the nation's first comprehensive database of drought impacts. The database contains information from multiple federal agencies including the U.S. Department of Agriculture Risk Management Agency, the National Oceanic and Atmospheric Administration TRACS program and Sectoral Applications Research Program. The DIR reports on County level but since drought impacts on a regional level, it can be surmised that the same

impacts were experienced in TBCD. Figure V describes the number of impacts reported by category with plants and wildlife, agriculture; relief, response and restrictions and fire being reported (see the report below). The impact of drought to the District is experienced when drought causes grasses used for soil stabilization to die. The District must work to preserve the grasses by finding drought resistant grasses for the ditches to be stabilized so they do not become less stable and prone to possible erosion. Other than the grasses, the District's facilities and assets (eg. Equipment) are not impacted by drought, just the landscape around the TBCD complex.

In addition to the impacts reflected in the DIR, drought impacts were greatest on major population centers, prompting water conservation and reduction measures over an extended period. The Texas Agricultural Extension Service projected a $5.2 billion statewide economic loss as a result of the 2011 drought. In the Southeast Texas area, damage from the extended drought in 2011 reached record proportions as many crops were completely lost and large numbers of animals were sold because of insufficient grazing. In the Southeast Texas region, property damage was estimated at $10 million and agricultural losses were estimated at $100 million. Specific numbers for TBCD are not available.

Figure V - Drought Impact Report for Chambers County, Texas



Vulnerability

Though the NCEI reports 11 drought heat events, Trinity Bay Conservation District's mission and jurisdictional authority is explicitly limited to activities related to controlling floods. Therefore, they only have the authority to mitigate the effects of drought on District owned facilities and personnel. In extreme cases of drought, the District would need to preserve and support grass stabilization in all District ditches, however there is no vulnerability to the District's facilities and assets (e.g. equipment) due to drought. The overall significance of drought in the planning area is considered medium.

Extreme Heat
UPDATE FROM LAST PLAN

- Due to NCEI data limits for extreme heat, NOWData was used for impact and some vulnerability.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description
The 2018 Texas HMP Update defines extreme heat as a combination of very high temperatures and, usually, exceptionally humid conditions. When persisting over a period of time, it is called a heat wave. Extreme heat kills by pushing the human body beyond its limits. Under normal conditions, the body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work harder to maintain a normal temperature.

Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions are often prerequisites for dust storms.

Most heat disorders occur because the victim has been overexposed to heat or has over-exerted themselves, considering age and physical condition. Other conditions that can promote and exacerbate heat-related illnesses include stagnant atmospheric conditions and poor air quality.

Location- Extreme Heat
Chambers County is susceptible to all ranges of extreme heat as defined by the Palmer Drought Severity Index and the NWS Heat Index (see Extent). Since extreme heat occur on regional scale, all of the Trinity Bay Conservation District is equally at risk as it can occur anywhere in the jurisdiction. However, TBCD can only support mitigation efforts as they apply to its facilities and assets and therefore, the geographic area affected is considered significant.

Previous Occurrence
According to the NCEI database, Chambers County, including the planning area, the database provides no records of extreme heat, however, events defined as “Heat” are summarized below. There have been no specific occurrences or property damage reported due to extreme heat.

Table 3-8 - Extreme Heat Events in Chambers County, 2016 - 2021
(Source: NOAA/NCEI)

Date	Dths	Injs	Property Damage	Crop Damage	Notes
7/6/2000	0	0	0	0	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

Date	Dths	Injs	Property Damage	Crop Damage	Notes
					during a 2-week period. Only traces of rainfall were observed during this period.
8/29/2000	0	0	0	0	Excessive heat occurred over southeast Texas during the last 3 days of August. High temperatures reached well over 100 degrees over inland areas.
9/1/2000	0	0	0	0	A record setting heat wave continued over southeast Texas through the first week of September 2000. Temperatures over southeast Texas began to cool on the 6th. A heat wave with temperatures of this duration and magnitude is unprecedented for southeast Texas
09/22/2005	1	0	0	0	Deaths were all associated with the evacuation for Hurricane Rita, both before and after Rita's arrival.
6/24/2009	0	0	0	0	Hot, humid conditions led to heat indices above 105 degrees for several days in late June

Future Occurrence

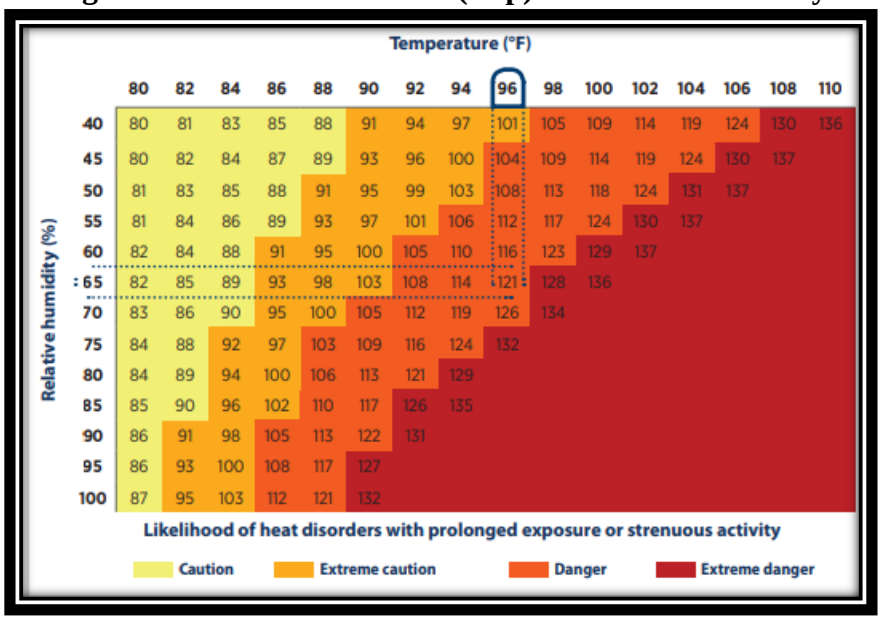
Based on 5 events of drought and extreme heat events within 27 years, an extreme heat event occurs approximately once every 5.4 years on average in Chambers County and since extreme heat occurs at a regional level, Trinity Bay Conservation District can expect an extreme heat event approximately once every 5.4 years or an 18.5% chance annually. The probability of future events is considered is likely.

Extent

The National Weather Service (NWS) maintains a Heat Index (Figure W) which helps provide information on perceived heat and dangers of exposure considering the relationship between air temperature and relative humidity. This table shows that as the temperature (horizontal axis) and relative humidity (vertical axis) each increase, they combine to create a heat index (colored values) that feels hotter than the actual temperature. For example, when the temperature is 96°F, with 65 percent humidity, it actually feels like 121°F.

July and August are usually the warmest months of the year for the TBCD planning area and in July/August of 2022, the average temperature was 91 °F. With the average relative humidity in July and August of approximately 75 percent, using the figure below, would feel more like 109 degrees. In addition, after review of historical occurrences (see Table 3-8), the highest heat index reached above 105 °F for several days. The District can expect to see events anywhere on the scale ranging all the way to extreme danger. The extent is moderate.

Figure W – NWS Heat Index (Top) in Chambers County

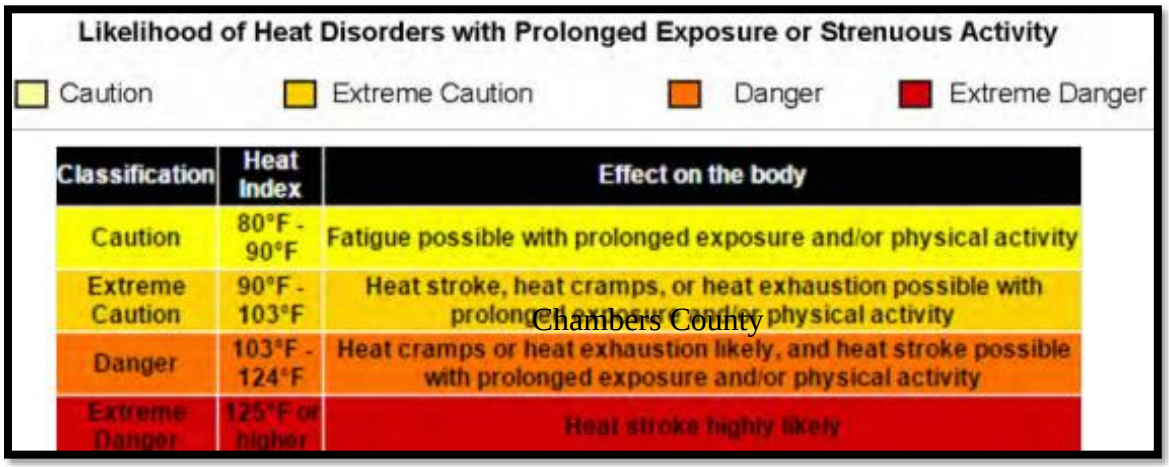


Relative humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Impact

The NWS also posts the impact of prolonged exposure to Extreme Heat, see Figure X. Extreme heat is reported on the County level but impacts on a regional level, it can be surmised that the same impacts were experienced in TBCD. Figure X describes the levels of impact and heat disorders that can be caused by extreme heat. In the County and planning area, the was no property damage estimated from any prior event.

Figure X – Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity



Chambers County

Vulnerability

Though the NCEI reports 5 heat events, Trinity Bay Conservation District's missions and jurisdictional authority is explicitly limited to activities related to controlling floods. Therefore, they only have the authority to mitigate the effects of extreme heat on District owned facilities and personnel. In prolonged cases of extreme heat, the District would need to monitor establish cooling locations for employees that work outside as well. The overall significance is low.

FLOOD

UPDATE FROM LAST PLAN

- Events since 2015, were updated and described.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description Flood

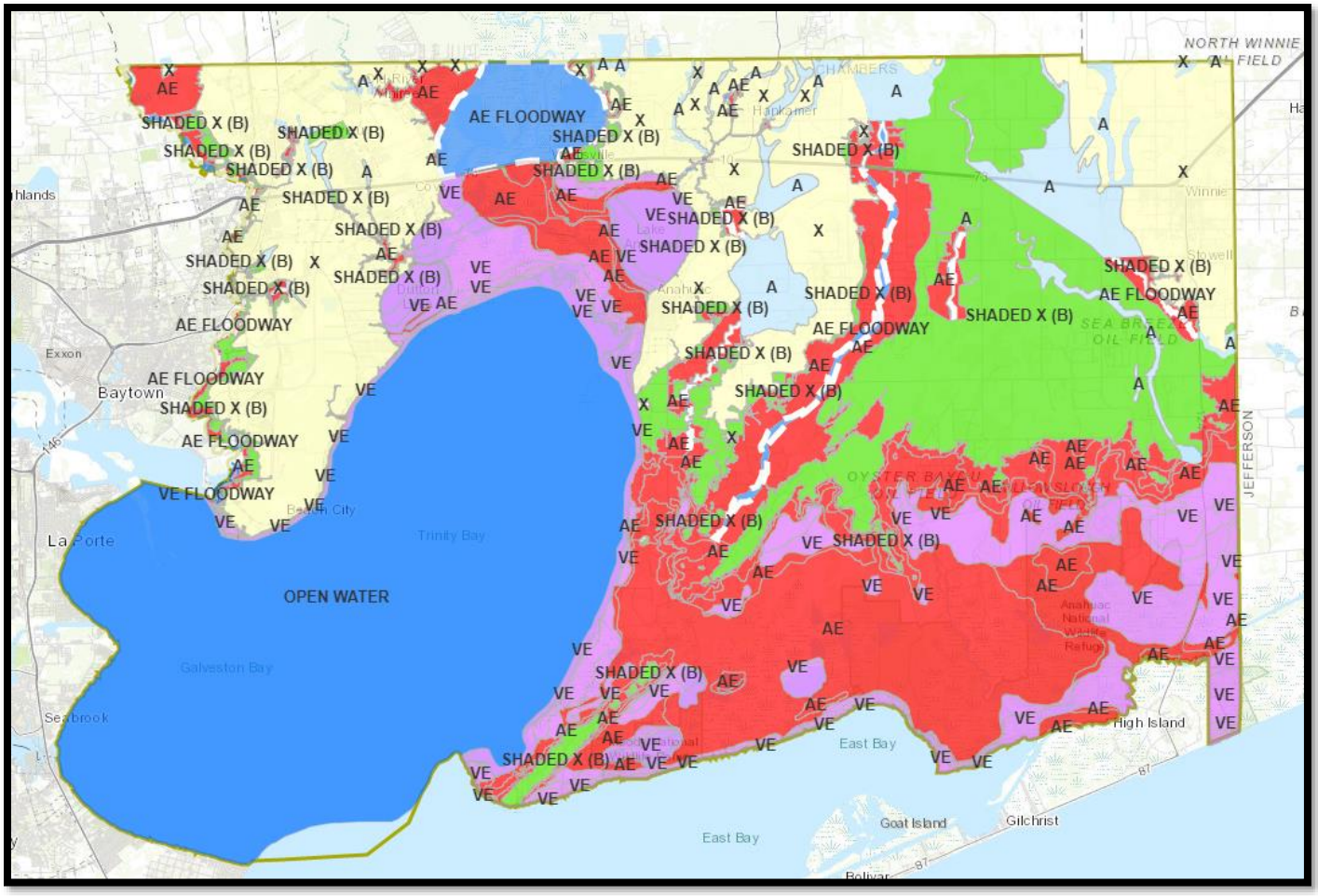
When rainfall runoff collects in rivers, creeks, and streams and exceeds the capacity of channels, floodwaters overflow onto adjacent lands. Floods result from rain events, whether short and intense or prolonged and less intense. In recent years, most flooding in Trinity Bay Conservation District has been associated with storms that originate as hurricanes and tropical storms that subsequently move inland.

Floods have been and continue to be the most frequent, destructive, and costly natural hazard facing the State of Texas. Ninety percent of the State's damage reported for major disasters is associated with floods. Records indicate that the streams draining Trinity Bay Conservation District have flooded throughout the area's history. Most recently, since the last version of the Plan, Trinity Bay Conservation District has been impacted by six flood events, including Hurricane Harvey and Hurricane Imelda described below.

Location - Flood

The location of the 1% (100-year) and 0.2% (500-year) annual chance event floodplains for Trinity Bay Conservation District are shown in Figures Z. These are the locations within the planning area that are at greatest risk of flooding. There are 4,174 NFIP policies in force throughout the Chambers County. This is a substantial increase from the 2,953 flood policies in force during the last version of this Plan. The geographic area affected is considered extensive. The map below shows flood zones in the County.

Figure Y – Trinity Bay Conservation District FEMA Flood Zone Overlay



Previous Occurrences

The NCEI Storm Events Database only lists flood events from 1996 to present. The NCEI indicates that Chambers County has experienced 26 flood events between 1996 and 2022. Of this total, since the last planning effort was underway, six flood events have occurred in the County, all of which occurred in the planning area. Property damages for these events totaled just over $80.68 million with the majority of that occurring during Imelda in 2019. The NCEI reported 0 deaths and 0 injuries from the last six flood events. The six flood events that have occurred in the District since the last planning effort was under way are listed below.

Table 3-9 Flood Events in Trinity Bay Conservation District 2016 – 2022
(Source: NOAA/NCEI)

Location	Date	Type	Prop Damage	Event Description
MONT BELVIEU	06/04/2016	Flash Flood	$10,000.00	High rainfall led to flooded roadways from Mont Belvieu east down I-10 to the town of Cove.
WINNIE	12/03/2016	Flash Flood	$5,000.00	Street flooding was reported in around the town of Winnie.
MONT BELVIEU	03/29/2017	Flash Flood		Street flooding caused car stalling in and around FM 565 south of Interstate 10, especially between the Grand Parkway and the Cove area.
STOWELL	06/04/2017	Flash Flood	$3,000.00	Highway 124 became impassable, and one car was flooded.
BEACH CITY, MONT BELVIEU, HANKAMER, ANAHUAC, AND MONROE CITY	08/27/2017	Flash Flood		Significant road flooding occurred across District. Costs are not listed in flash flood but are found in hurricanes/tropical storms
HANKAMER, WINNIE AND LAKE ANAHUAC	09/18/2019	Flash Flood	$80,050,000	Numerous roads in Winnie and Hankamer areas closed. Numerous structures flooded. Riceland Medical Center was taking on water, evacuated six patients and staff.
			$80,068,000	

**Damage estimates for certain events are Countywide, or the larger local area and are not specific to TRINITY BAY CONSERVATION DISTRICT, but the entire area affected from those floods.*

Future Occurrence

Trinity Bay Conservation District has experienced six flood events between 2016 and 2022. Six events were reported over seven years which suggests an 85.7 % chance annually of a flood occurring each year on average. Though frequently, flooding is limited to street flooding and costs confined to debris removal. This probability follows the same pattern as prior years, with nearly one event occurring in the County every year. The District can expect nearly one flood event each year. The future probability is considered likely.

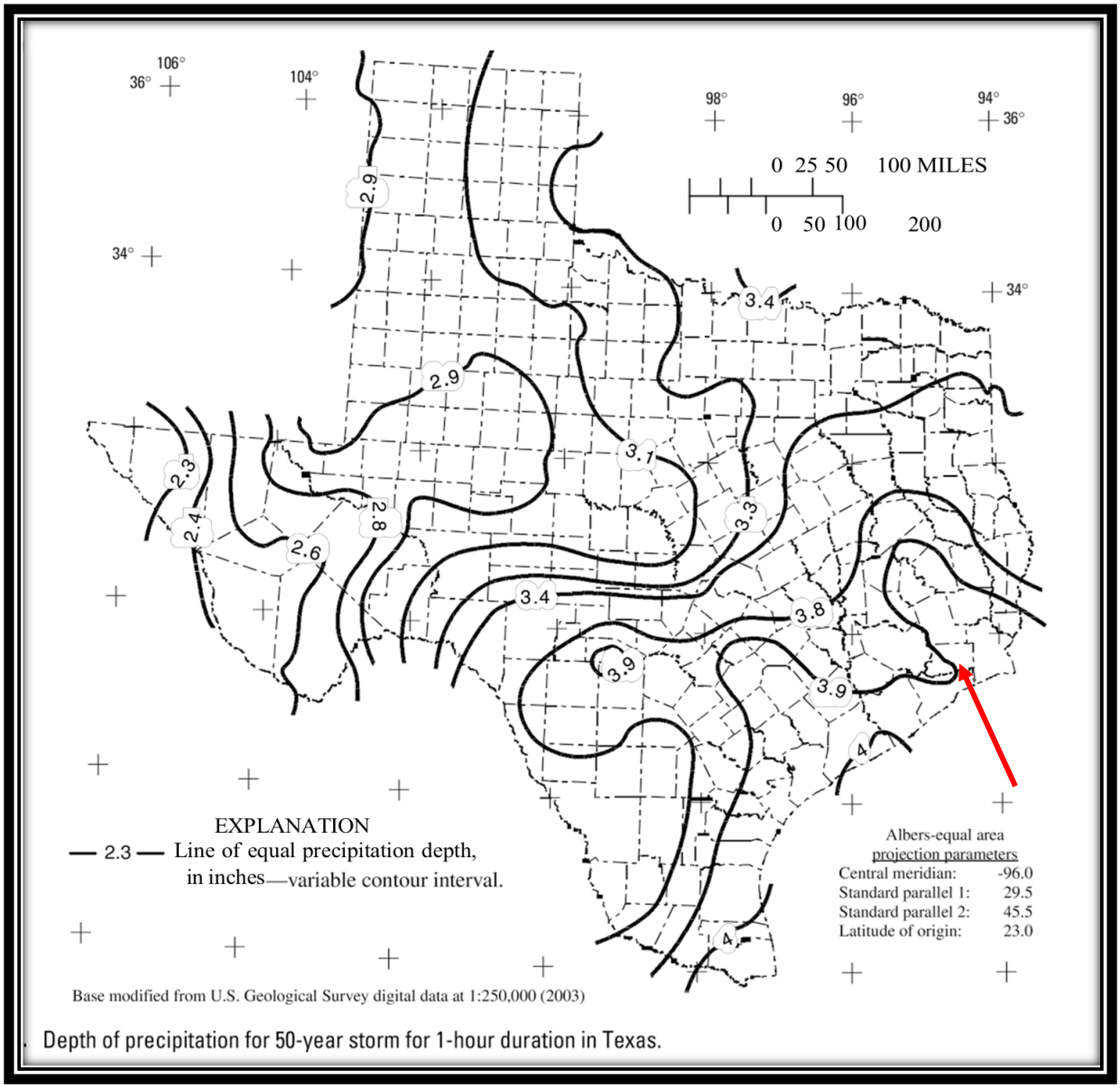
Flood Extent

Flood severity is measured in various ways, including frequency, depth, velocity, duration and contamination, among others. In Trinity Bay Conservation District, characterizing the severity of the flood hazard depends on what part of the District is being considered, but generally speaking the issues relate to how often floods occur. Floods are and continue to be the most frequent, destructive, and costly natural hazard facing Trinity Bay Conservation District.

Trinity Bay Conservation District has been actively pursuing projects to reduce the severity of flooding in the area. There are 24 rain gauges throughout and around the District that are monitored for water levels and rainfall totals. These rain gauges have not been maintained since 2020 with Covid-19 but are in the process of being upgraded.

The maximum probable extent of a future flood is considered extreme. For flood, depth is one key measure of magnitude and is measured in feet or inches. Figure Z illustrates the United States Geological Study (USGS) 50-year storm map to the right the planning area, for a 50-year storm event of 1 hour, TBCD (red arrow) can expect, on average, an increase of 4.0" of water in one hour on the ground.

Figure Z – Atlas of Depth Duration Frequency of Precipitation Annual Maxima for Texas
Depth of Precipitation for 50 Year Storm, 1 hour duration



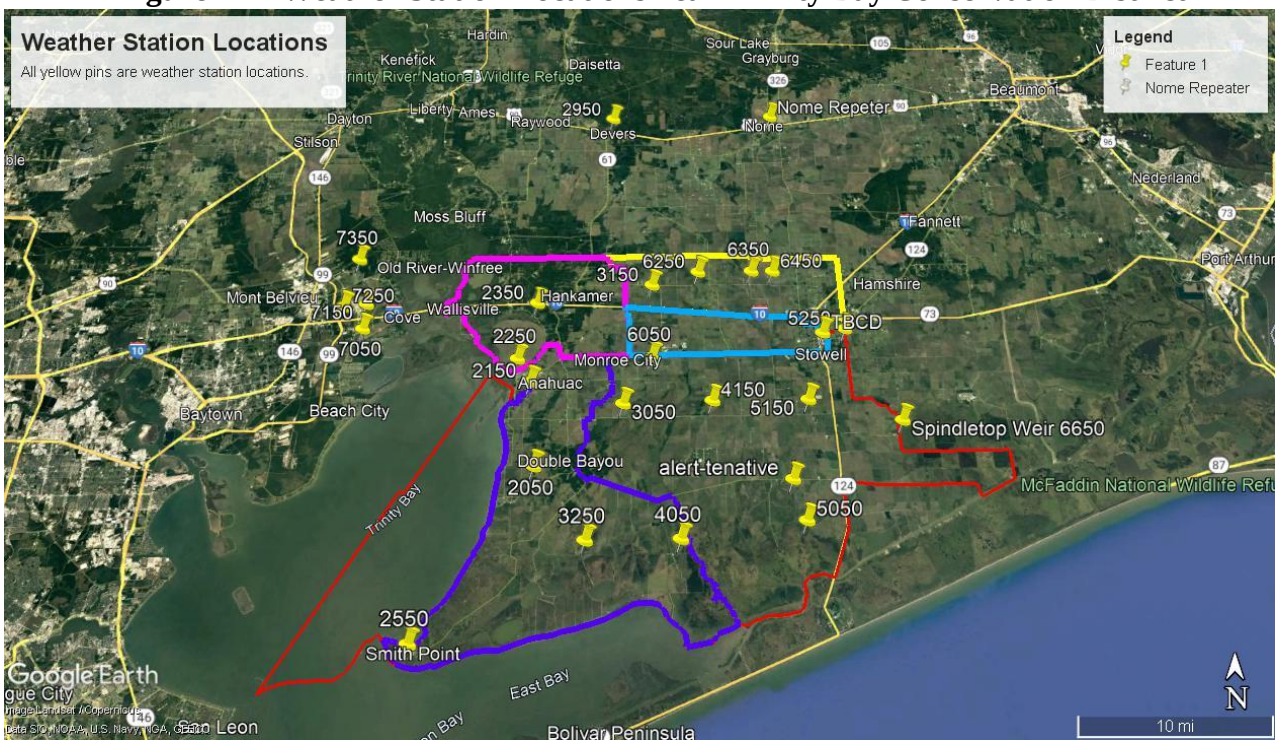
Depth of precipitation for 50-year storm for 1-hour duration in Texas.

Flash floods almost always result from rains associated with hurricanes and tropical storms. The planning area also experiences the second greatest frequency of thunderstorms in the United States and is conducive to frequent, heavy rainfall – which typically results in an annual rainfall of over 50 inches. The flooding problems in the District are considered severe in some areas. The flat terrain, clay soils and impervious surfaces found in this area contribute to the flood problem. In the District, there are 4,174 active flood insurance policies, many of which sit within the floodplain. Flooding can occur during any month of the year in Trinity Bay Conservation District; however, the greatest likelihood of the occurrence is mid-summer to early winter. Mid-summer flooding (July, August, and September) is most likely to result from tropical storm and hurricane development. Flooding in the fall to early winter (October, November and December) usually results from stationary weak cold fronts.

Trinity Bay Conservation District has been actively pursuing projects to reduce the severity of flooding in the area. There are 24 rain gauges throughout and around the District that are monitored for water levels and rainfall totals. These rain gauges have not been maintained since 2020 with Covid-19, but are in the process of being upgraded.

The maximum probable extent of a future flood is considered extreme.

Figure AA- Weather Station Locations near Trinity Bay Conservation District



These gauges show real time data including water level, rain increments, water temperature, location and pictures. The chart below (3-9) which can be retrieved from the JCDD6 website, shows the hourly rain increments from August 25-31, 2019 and the second chart 3-10 shows the

accumulate amount of rain from August 25-29, 2017 at Site 7220 Mayhaw Diversion Structure near Spindletop Bayou due to Hurricane Harvey.

Table 3-10 Rain Increments for Gauge 7220 Mahaw Diversion Structure near Spindletop Bayou

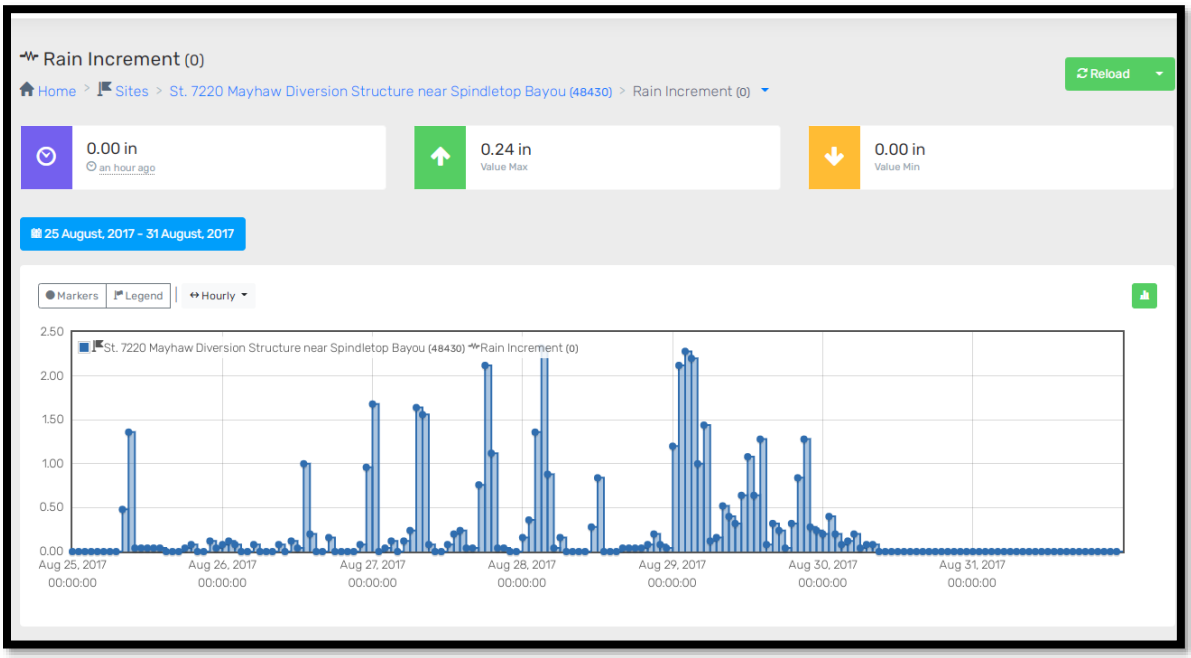
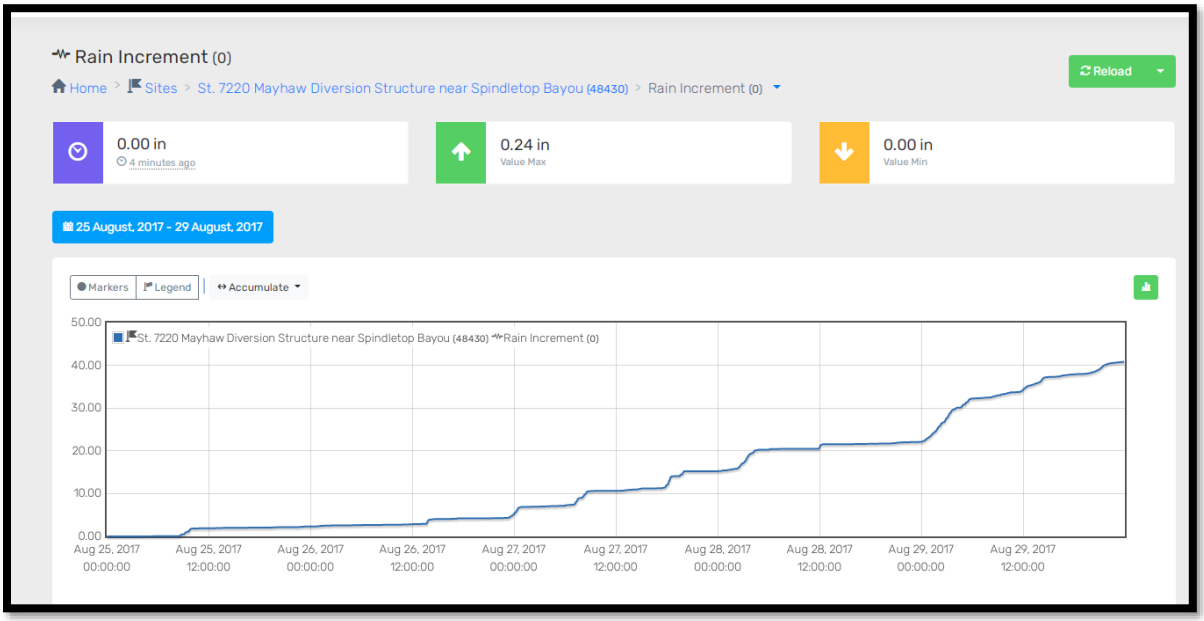


Table 3-11 August 25-29, 2019 Accumulative Rainfall Total for 7220 Mahaw Diversion Structure near Spindletop Bayou



As noted by the above figures, Hurricane Harvey a tremendous amount of rain in a short period of time. Many nearby gauges show similar data. This information can be retrieved for any day, event or time period after the gauges were installed and still operational.

Impact

The following describes the inventory counts for buildings in Trinity Bay Conservation District.

Table 3-12 Structures within Trinity Bay Conservation District

Type	Number of Structures
Single Family Homes	4,872
Multi-family Homes	54
Total Residential	4,926
Commercial Buildings	423
Infrastructure and Utility Buildings	8

Flood insurance policies and claims information can be used to identify buildings in mapped floodplains (where lenders require insurance) and where flooding has occurred (where owners are sufficiently concerned that they purchase flood insurance even if not required). This characterization of flood risk is described below.

Data provided by FEMA indicate that as of October 2022, 4,174 federal flood insurance policies were in-force. Those 4,174 are within Chambers County, therefore some of those may not be within the District boundaries. These insurance policies are administered by the National Flood Insurance Program (NFIP). There are 61 Repetitive Loss structures, 40 of those are Severe Repetitive Loss structures in Trinity Bay Conservation District. Of those 61 properties, 31 are insured and thus, 49.2 percent are not insured. 18 of the 40 Severe Repetitive Loss structures are currently insured and thus, approximately 55 percent are not insured.

NFIP Repetitive Loss Properties

In recent years, FEMA has focused considerable attention on the Repetitive Loss (RL) subset of insured buildings. These properties have received two or more claim payments of at least $1,000 over a ten-year period. FEMA's database identifies 33 properties as RL properties in Trinity Bay Conservation District (the remaining 28 properties mentioned above are also SRL properties which are broken out and analyzed separately). This number includes properties with active flood insurance policies as well as those with inactive policies. Note that the two of those RL properties are listed as mitigated in FEMA's Database and are not included below. Collectively, they had received claim payments of over $19.2 million (includes payments for building damage and contents damage).

As of October 2022, repetitive loss statistics for areas within Trinity Bay Conservation District showed 31 Repetitive Loss properties. Of this total, all 31 were categorized as residential properties. Table 3-12 summarizes the RL Statistics for Trinity Bay Conservation District (SRL properties are broken out and analyzed separately).

Table 3-13 RL Statistics for Trinity Bay Conservation District (Source: FEMA, 2022)

Properties	Building Payments	Contents Payments	Total	# of claims	Average
31	$5,943,594	$2,518,302	$8,461,897	65	$130,183

Flood Risk to Residential Repetitive Loss Properties

Table 3-13 provides a summary of residential repetitive flood insurance claims for individual streets with two homes or more on the RL List in Trinity Bay Conservation District. The building, contents, and total claims data has been combined for streets that include more than one repetitive loss property. Address data about individual sites is omitted for privacy reasons. The table shows that the 31 residential repetitive loss properties received claim payments over $8.4 million (includes payments for building damage and contents damage).

Table 3-14 Summary of Residential NFIP Repetitive Loss Statistics; Trinity Bay Conservation District

Street Name	RL Properties	Number of Claims	Total Paid	Average Claim Payment
********)	5	10	$1,040,320	$104,032
*********	3	6	$1,346,100	$224,350
*********	3	7	$898,148	$128,306
*********	2	5	$696,265	$139,253
Remaining Properties on Individual Streets	18	37	$4,481,062	$121,109
Grand Total	**31**	**65**	**$8,461,895**	**$130,183**

Trinity Bay Conservation District has an extensive history of repetitive loss flood claims, so it is possible to perform a relatively simple statistical risk assessment using average annual losses and a present value coefficient calculation to project losses over a planning horizon. Residential flood risk is calculated by a simple methodology that uses the FEMA default present-value coefficients from the benefit-cost analysis software modules. To perform this calculation, the repetitive loss data were reviewed to determine an approximate period over which the claims occurred. This method should not be used for risk assessments for individual properties because of the generalizations that are used, but the method is appropriate for larger numbers of properties and

policies that are spread over an entire jurisdiction. It is presumed that more accurate figures would be somewhat higher because the underlying statistics are for properties that had flood insurance, were flooded, and had paid claims. There are nearly always some properties in a jurisdiction that are flooded in big events, and do not have flood insurance (or did not make claims) and are thus not represented in the sample.

Most of the flood claims in this query occurred between 1979 and 2022, a period of 43 years. Table 3-14 summarizes the projected 100-year risk to all RL properties. Based on a 100-year horizon and a present value coefficient of 14.27 (the coefficient for 100 years using the mandatory Office of Management and Budget (OMB) discount rate of 7.0 percent), the projected flood risk to these properties is shown at the bottom of the table. FEMA guidance defines net present value as "The benefits of a mitigation measure that are counted into the future (for the duration of the project useful life) and then discounted using an OMB-established discount rate." When we take the historical losses of $19,200,342 experienced over a 43-year period, we derived annualized losses of $446,519. We then determine the net present value of annualized losses of $446,519 over a one-hundred-year horizon. To do this we use the 100-year net value coefficient of 14.27. The calculated net present value of a $446,519 annual loss over the next 100 years is $6,371,826.

The difference between $19,200,342 experienced over a 43-year period and a projected $6,371,826 over the next 100 years, is that the latter is a net present value calculation. It must be understood that individuals can obtain and cancel flood insurance policies, and the flood hazard depends on many variables, including the weather, so this projection is simply an estimate of potential damages. Therefore, if not mitigated, the net present value of projected flood risk over a 100-year timeframe is $6,371,826. While it is an estimate, it offers a useful metric that can be used in assessing the potential cost effectiveness of mitigation actions.

Table 3-15– Projected 100-year Flood Risk in Trinity Bay Conservation District to Severe Repetitive Loss and Repetitive Loss Properties (Source: FEMA NFIP query October 2022)

Data	Value
Period in years	43
Number of claims	170
Average claims per year	3.95
Total value of claims	$19,200,342
Average value of claims per year	$446,519
Projected risk, 100-year horizon	**$6,371,826**

Table 3-15 shows the above risk to just residential Repetitive Loss Properties. There have been 65 claims in the 43-year period, for an average number of 1.5 claims per year.

Table 3-16 – Projected 100-year Flood Risk in Trinity Bay Conservation District to Residential Repetitive Loss Areas (Source: FEMA NFIP query October 2022)

Data	Value
Period in years	43
Number of claims	65
Average claims per year	1.5
Total value of claims	$**8,461,897**
Average value of claims per year	$196,788
Projected risk, 100-year horizon	**$2,808,164**

NFIP SEVERE REPETITIVE LOSS PROPERTIES

In 2004 FEMA began to develop the Severe Repetitive Loss (SRL) Grant Program in an effort to reduce or eliminate flood damages to residential properties that met certain minimum requirements. FEMA initiated the program early in 2008. The SRL Grant Program has since been included in the FMA Grant Program, with SRL properties being a top priority. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

SRL properties are a subset of the RL list, but were not included in the analyses above. As of October 2022, Trinity Bay Conservation District had 37 properties on the SRL list (3 of the original 40 were mitigated), 35 of which are residential and 18 are insured.

Table 3-16 provides loss estimates for SRL properties in Trinity Bay Conservation District summarized at the street level, as calculated by FEMA and the NFIP.

Table 3-17 – Projected 100-year Flood Risk, Severe Repetitive Loss Properties in Trinity Bay Conservation District
(Source: FEMA/NFIP, Query October 2022)

Street Name	Properties	Claims	Total Claims ($)	Average Claim Payment
**********	7	14	$1,111,161	$79,368
**********	4	11	$1,210,283	$110,025
**********	3	6	$959,920	$159,986
**********	2	5	$1,774,637	$354,927
**********	2	5	$314,072	$62,814
**********	2	4	$401,384	$100,346
Remaining 17 streets each with only one SRL property.	17	60	$4,966,984	$82,783
	37	**105**	**$10,738,445**	**$102,270**

It should be noted that some of the properties on this list may be at far greater flood risk than indicated, because there may have been periods where the owner(s) did not carry flood insurance, with the result that they may have been damaged but there is no record of it. This type of analysis is not totally conclusive. It would be possible to perform relatively simple engineering studies to better assess risks for properties with just a few claims, but where data suggests that sites may be vulnerable to additional flood-related losses.

The information in this section should be used for planning purposes only, i.e. as the basis for additional steps in risk assessment, and eventually (where warranted) targeted mitigation actions to reduce the risk.

Risk in Trinity Bay Conservation District to Severe Repetitive Loss Areas (Source: FEMA NFIP query October 2022)

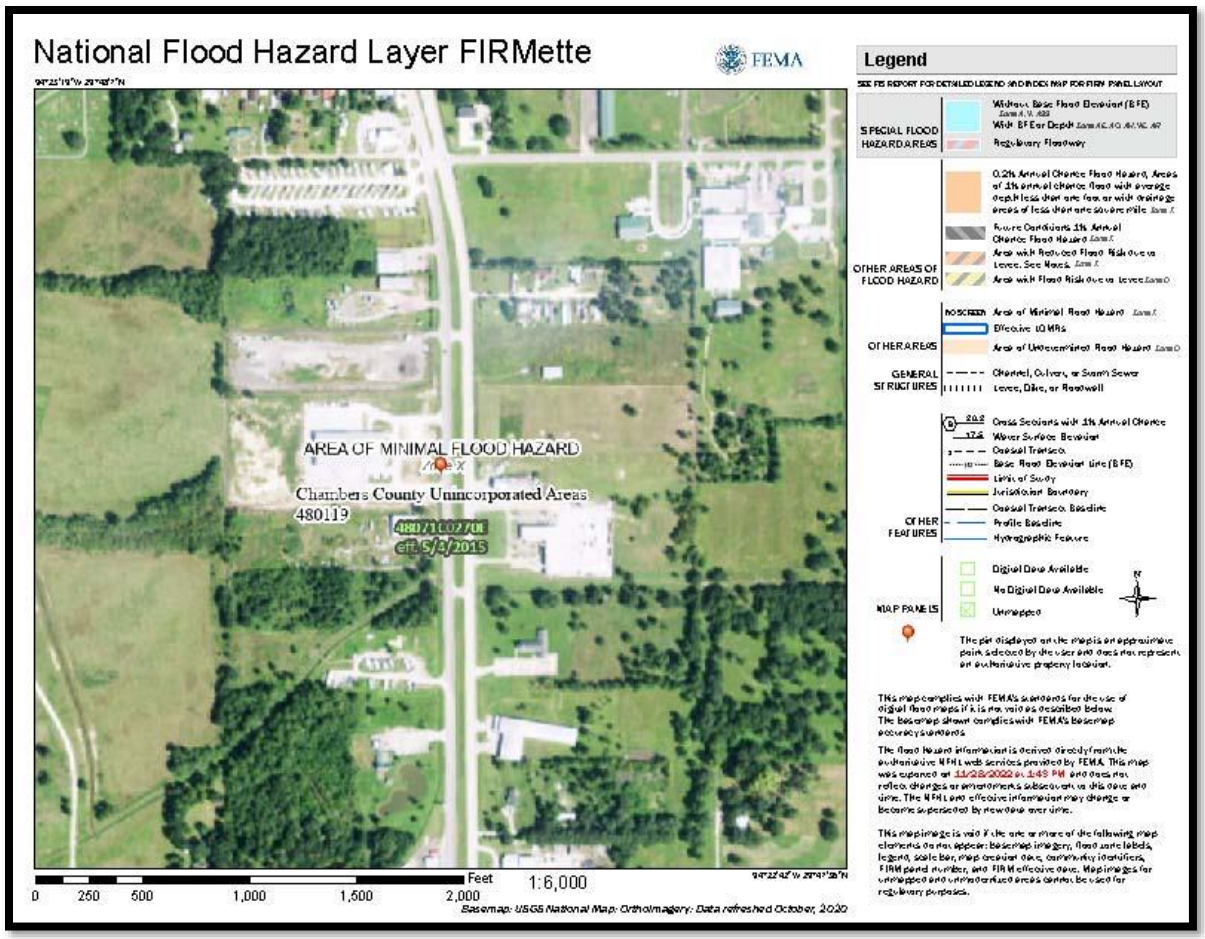
Data	Value
Period in years	43
Number of claims	105
Average claims per year	2.4
Total value of claims	$ 10,738,445
Average value of claims per year	$249,731
Projected risk, 100-year horizon	**$3,563,665**

FLOOD RISKS – TBCD BUILDINGS

Trinity Bay Conservation District owns one main building on SH 124. This building is not located in the Special Flood Hazard Area and has never experienced flooding, see below. It also has four wastewater treatment plants, two water plants and four water towers, see Figure BB.

Figure BB – Trinity Bay Conservation District Owned Facilities

NAME	ADDRESS	CITY
Hankamer Wastewater Treatment Plant	999 Speights Road	Hankamer
Main Office	2500 SH 124	Stowell
Oak Island Wastewater Treatment Plant	401 Eagle Road	Anahuac
Oak Island Water Tower	1888 Eagle Road	Anahuac
Smith Point Wastewater Treatment Plant	120 Hawkins Camp Road	Smith Point
Stowell Water Tower	16308 Hwy. 65	Stowell
West Water Treatment Plant	524 Hwy. 65	Anahuac
Winnie Wastewater Treatment Plant	760 E. Buccaneer	Stowell
Winnie Water Treatment Plant	1529 FM 1406	Winnie
Whites Park Water Tower	7151 Hwy. 61	Anahuac



Public Schools. There are four Independent School Districts located in Chambers County, two are located within the TBCD boundaries. The below maps in Figure CC from outlines where the schools fall in relation to the floodplain area.

Figure CC – Anahuac ISD FIRMETTE

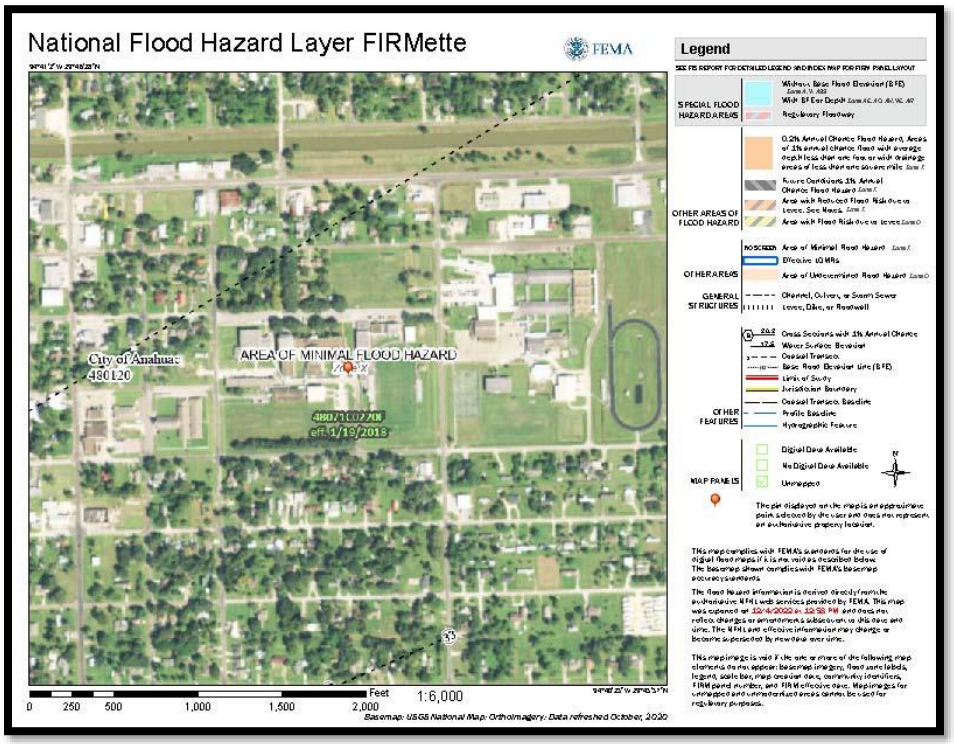
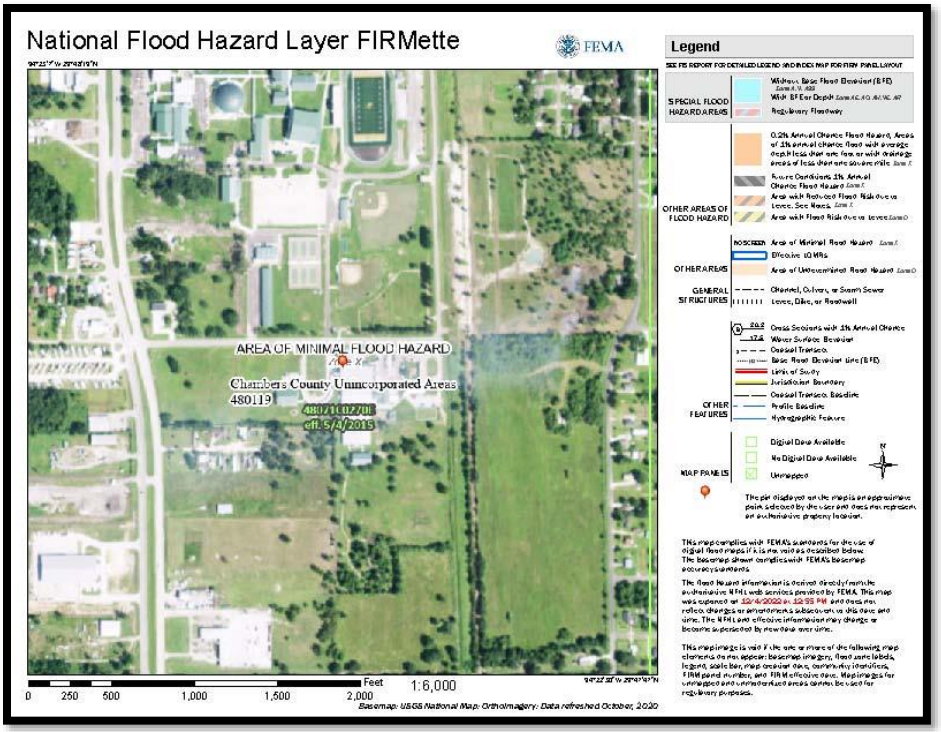


Figure CC – East Chambers ISD FIRMETTE



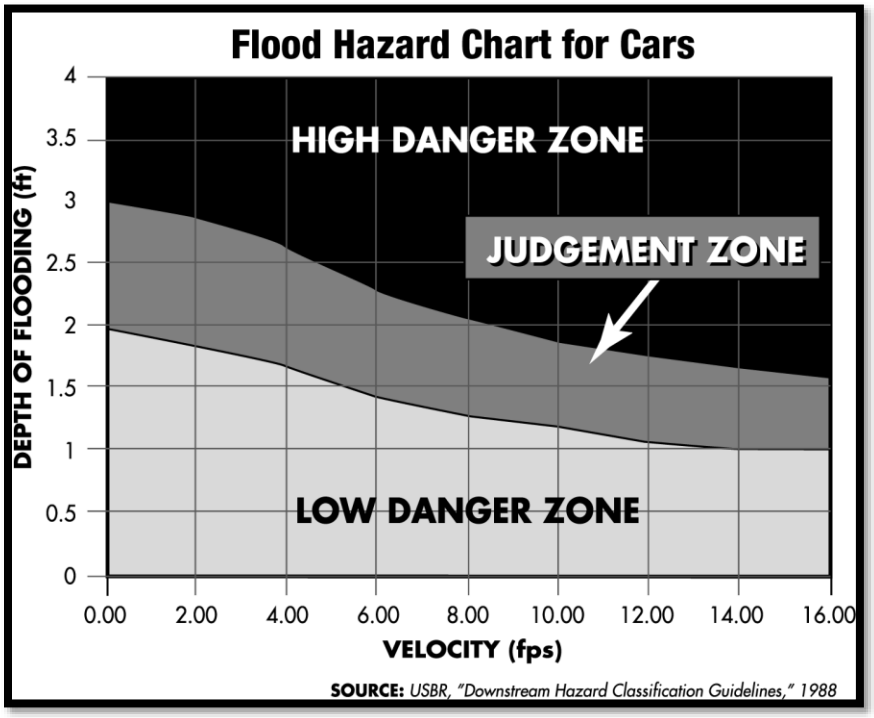
FLOOD RISKS – DISTRICT ASSESTS

Aside from District facilities, Trinity Bay Conservation District also owns other assets such as tractors, bulldozers, dump trucks, excavators and many other vehicles totaling to $8,458,540.00 in insured value. These vehicles are mainly stored on District property, under a covered garage, carport, open parking and not in a floodplain. However, some of these vehicles are often in use and at various project sites that may sit in a floodprone area. Trinity Bay Conservation District closely monitors the weather and takes proactive steps, when possible, to move vulnerable equipment to higher ground when equipment is being operated or staged in a floodprone area.

FLOOD RISKS – ROADS

Nationwide, flooded roads pose the greatest threat to people during floods. Most of the more than 200 people who die in floods each year are lost when they try to drive across flooded roads. Driving into water is the number one weather-related cause of death in Central Texas. Statewide, between 1960 and 1996, 76% of flood-related deaths were vehicle-related. As illustrated in Figure DD, flood hazards for cars vary with both velocity and depth of floodwaters. Many cars will float in less than 24 inches of water. Fast-moving water can quickly wash cars off the road or wash out a low section of road.

Figure DD – Flood Hazard Chart for Cars
(Source: Downstream Hazard Classification Guidelines)



Although most roads in the area are unlikely to have deep or fast-moving water during flood conditions up to the level of the 100-year flood, many are still known to flood regularly. The Texas Department of Transportation (TXDOT) maintains the freeways that run through the City and County. These major roadways include the following:

- I-10 runs generally East/West from Chambers to Harris Counties in Texas
- State Highways
- SH 61 runs generally South/North Anahuac to Chambers County
- SH 73 runs generally East/West from Chambers County to I-10
- SH 99 runs generally South/North
- SH 146, like US 99 and 124, runs generally S/N

When building new State roads or upgrading existing roads, the TXDOT considers the NFIP's floodplain and floodway requirements to evaluate the impact of new and replacement structures. Chambers County and the local jurisdictions consider floodplain and floodway impacts in its planning and design for area roads. Within the local jurisdictions, developers must satisfy the jurisdiction's drainage criteria and other aspects of road designs in order for the jurisdiction to accept ownership.

Replacing roads and bridges damaged or washed out by floods costs millions of dollars each year. If the damage is caused by a Presidentially declared disaster, FEMA may pay up to 75% of the repair or replacement costs, with the remaining 25% covered by the State and local governments. The full costs of a damaging event that is not declared a major disaster must be borne by the State and local communities.

TXDOT inspects State bridges for structural integrity and to determine if erosion is a risk. Where erosion has been identified, stabilization measures have been put into place.

Although most roads in the area are unlikely to have deep or fast-moving water during flood conditions up to the level of the 100-year flood, many are still known to flood regularly. Within Chambers County, there are approximately 300 miles of roads. TXDOT maintains the freeways that run through the Cities. Due to the extensive flooding to roads in the County, it would be near impossible to generate a list of flood-prone roads. Due to this reason, many of the Cities and the County do not close roads due to flooding. However, they do close major underpasses where water tends to get much deeper. This is accomplished by waiting until the water is deep enough to warrant closure. There are water depth signs at these major underpasses.

When building new state roads or upgrading existing roads, TXDOT considers the floodplain and floodway requirements to evaluate the impact of new and replacement structures. The Cities and the County consider floodplain and floodway impacts their planning and design for area roads. The Cities require developers to satisfy the drainage criteria in order for the Cities to accept ownership.

FLOOD RISKS – LOCAL DRAINAGE

Many areas and streets experience accumulations of rainfall that are slow to drain away, which may cause disruption of normal traffic, soil erosion, and water quality problems. Local drainage problems contribute to the frequency of flooding, increase ditch maintenance costs, and are perceived to adversely affect the quality of life in some neighborhoods.

Many areas prone to shallow, local drainage flooding are not shown on the City or County's Flood Insurance Rate Maps. One measure of the magnitude of this problem is the number of flood insurance policies in-force on buildings that are outside of the mapped floodplain. Local drainage flooding throughout some subdivisions in Trinity Bay Conservation District is a problem, even during frequent rainstorms. It is a concern because access for emergency services (fire, emergency medical) can be limited. While the depth of water generally is relatively shallow, a number of homes have been flooded repetitively and are identified by FEMA as repetitive loss properties.

When building new state roads or upgrading existing roads, TxDOT considers the NFIP's floodplain and floodway requirements to evaluate the impact of new and replacement structures. The local Cities and County similarly considers floodplain and floodway impacts in its planning and design for roads. Developers must satisfy the City's or County's drainage criteria and other aspects of road designs in order for them to accept ownership. Specific to reducing flood risks, the low chord of any new bridges must be at least one foot above the Base Flood Elevation.

Replacing roads and bridges damaged or washed out by floods costs millions of dollars each year. If the damage is caused by a Presidentially declared disaster, FEMA historically reimburses to 75% of the repair or replacement costs, with the remaining 25% covered by the state and local governments. The full costs of a damaging event that is not declared a major disaster must be borne by the state and local communities.

TxDOT inspects state bridges every two years for structural integrity and to determine if erosion is a risk. Where erosion has been identified, stabilization measures have been put into place.

The District closely monitors maintained ditches for signs of erosion during and after flood events. This erosion can loosen dirt on the banks and cause it to slide into the ditch. When signs of erosion are found, the District will reseed and revegetate the banks to help stabilize them.

Vulnerability

Properties identified as Repetitive or Severe Repetitive Loss properties are considered vulnerabilities because they are documented structures that are repeatedly impacted by flooding hazards. This data is especially important because this data may, at times, identify structures that suffer from localized flooding outside of the designated Special Flood Hazard Area. As mentioned above, homeowners living in RL or SRL properties are vulnerable as well as critical infrastructure including buildings, facilities, roads and drainage systems. Other properties that are not RL or SRL can and have sustained damages from very severe storms or unforeseen circumstances. The overall significance of flooding in the District is considered high.

Hurricane and Tropical Storm

UPDATED FROM LAST PLAN

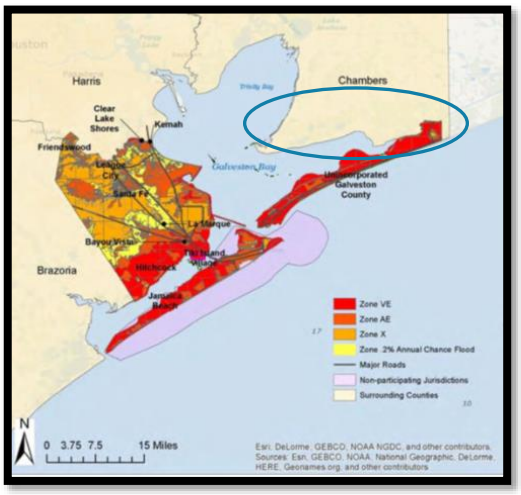
- Events since 2015, were updated and described.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description - Hurricane and Tropical Storm

A hurricane begins as a tropical depression with wind speeds below 39 mph. As it intensifies, it may develop into a tropical storm, with further development producing a hurricane. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye", the storm's core, is an area of low barometric pressure and is generally 20 to 30 miles wide. The storm may extend outward 100 - 400 miles in diameter. As a hurricane approaches, the skies will begin to darken and winds will grow in strength. As a hurricane nears land, it can bring torrential rains, high winds, storm surges, and severe flooding. A single hurricane can persist for more than 2 weeks over open waters and can run a path across the entire length of the Eastern Seaboard. August and September are peak months during the hurricane season that extends from June 1 through November 30. Hurricanes and tropical storms also bring storm surge as a result of extreme winds pushing on the surface of the ocean, causing the water to rise to a height above normal sea level. When storm surge encounters land, it is measured in height above normal tide levels. Storm surge can exacerbate flooding issues, especially on the coast.

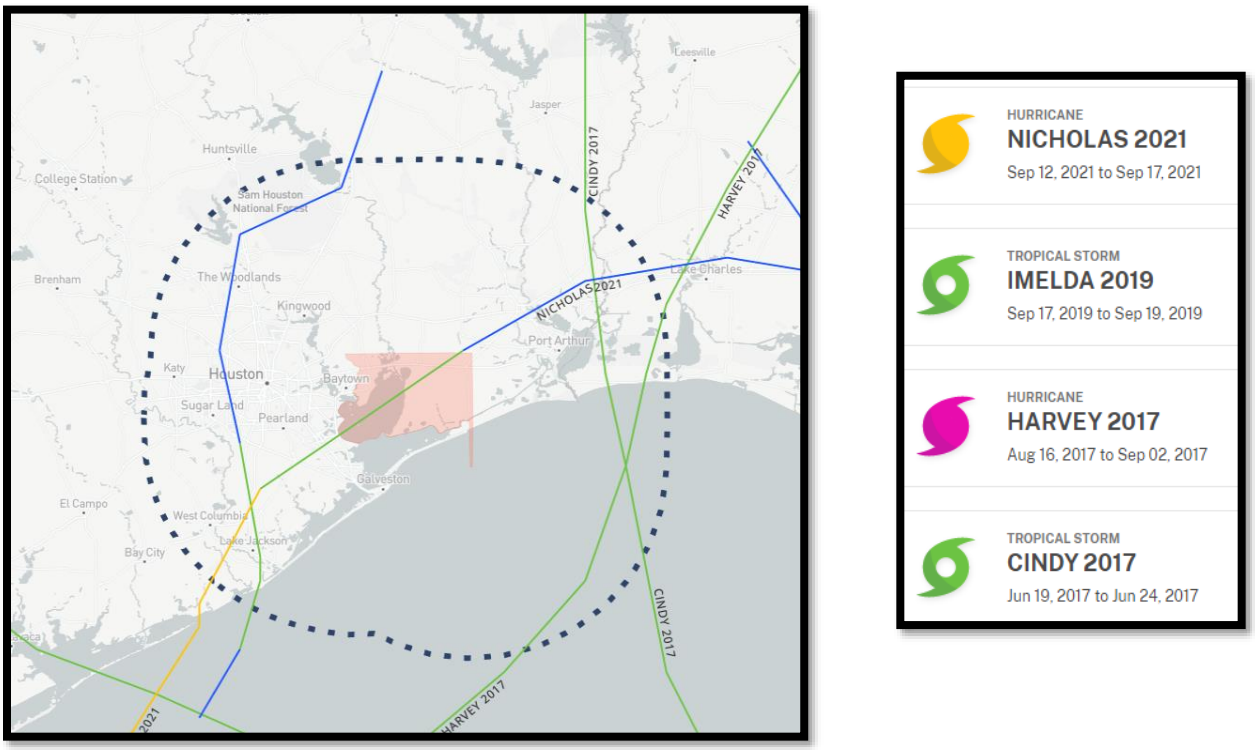
Location

Trinity Bay Conservation District planning area, located within close proximity to the Gulf of Mexico, is exposed to risk from hurricanes and tropical storms. Due to the widespread effects of hurricanes and tropical storms, the entire planning area is affected equally. Since 1842 and 2022, there have been 35 Hurricanes and 30 Tropical Storms within 50 nautical miles of Chambers County. Since the last version of the Plan, there have been four hurricanes or tropical storms within 50 nautical miles of Chambers County. Figure EE shows the location of Chambers County, indicated by the red area, and the paths of the four hurricanes and tropical storms that came within 50 nautical miles of the County since the last iteration of the Plan (dotted black line). The geographic area affected by hurricanes and tropical storms is considered extensive.



The Texas 2018 Hazard Mitigation Plan Update included the following inundation zones. Southeast Chambers County (blue circle) has both VE and AE zones and is the area most likely to be affected by inundation due to storm surge, as shown in the picture.

Figure EE - Historical Hurricane/Tropical Storm Tracks 2016-2021
(Source: NOAA Historical Hurricane Tracks)



Previous Occurrences

The NCEI Storm Events Database is limited to hurricane and tropical storm events from 1998 to 2022 so NOAA's Historical Hurricane Tracks was used. NOAA indicates that between 1842 and 2022 there were 35 hurricanes and 30 tropical storms within 50 miles of Chambers County. The four events since 2016 are shown in the table below. The only storm surge event reported in the NCEI database was in 2008. However, many times, storm surge is categorized with a hurricane or tropical storm and damages are not broken out separately.

Table 3-18- Hurricanes and Tropical Storms Trinity Bay Conservation District 2016 - 2022
(Source: NOAA/NCEI)

Storm Name	Date Range	Max Wind Speed	Min Pressure	Max Category	Property Damage
NICHOLAS 2021	Sep 12, 2021 to Sep 17, 2021	65	988	H1	No damages reported in the NCEI database
IMELDA 2019	Sep 17, 2019 to Sep 19, 2019	40	1003	TS	$80 Million
HARVEY 2017	Aug 16, 2017 to Sep 02, 2017	115	937	H4	$1 Million

Storm Name	Date Range	Max Wind Speed	Min Pressure	Max Category	Property Damage
CINDY 2017	Jun 19, 2017 to Jun 24, 2017	50	991	TS	No damages reported in the NCEI database

Recent Significant Historic Events

Tropical Storm Cindy (06/19/2017 – 06/24/2017): Chambers County was closest to the center of Cindy and experienced most of the highest rainfall totals with some areas receiving 3 to 5 inches.

Tropical Storm Harvey (08/25/2017 – 08/30/2017): Slow moving Tropical Storm Harvey produced torrential rainfall across Liberty and Chambers Counties. Major to record flooding occurred along the Trinity River and along numerous creeks and tributaries. $1 Million in property damage was experienced in the County. As a result of Hurricane Harvey in 2017, the District sustained damages at several crossings and culverts as well as local rural wooden bridges It caused erosion and the need clean out pumps and wells, as well as fix damaged pump motors, one air conditioning unit and an electrical circuit board.

Tropical Storm Imelda (09/17/2019 – 09/19/2019): In 2019, Tropical Storm Imelda brought between 25-30 inches of rain in a twelve-hour period to Chambers County. The rainfall caused devastating flooding along the I-10 corridor from Winnie eastward to Fannett, Beaumont, and Vidor. Riceland Medical Center in Winnie was evacuated as it took on water and flood waters entered numerous homes and businesses across the County.

Future Occurrence

Because the effects of hurricanes and tropical storms are regional in nature, the events that impacted Chambers County are assumed to have impacted Trinity Bay Conservation District as well. The District has experienced 65 hurricane and tropical storm events between 1842 and 2022. With 65 events reported over 180 years, a hurricane or tropical storm occurs approximately every 2.77 years on average. Therefore, there is a 36% chance of a hurricane or tropical storm event affecting the planning area in any given year. The future occurrence is considered likely.

Extent

Table 3-19 identifies the criteria for each stage of development. Table 3-20, The Saffir / Simpson Hurricane Scale is used to classify storms by numbered categories. Hurricanes are classified as Categories 1 through 5 based on central pressure, wind speed, and damage potential. Trinity Bay Conservation District can expect to experience a storm ranging from a tropical depression to a category 5 hurricane in the planning area. The maximum probable extent is considered extreme.

Table 3-19 Classification of Tropical Cyclones

Stage of Development	Criteria
Tropical Depression (development)	**Maximum sustained surface wind speed is < 39 mph**

Stage of Development	Criteria
Tropical Storm	**Maximum sustained wind speed ranges 39 - <74 mph**
Hurricane	**Maximum sustained surface wind speed 74 mph+**
Tropical Depression (dissipation)	**Decaying stages of a cyclone in which maximum sustained surface wind speed has dropped below 39 mph**

Table 3-20 Saffir/Simpson Hurricane Scale

Storm Category	Central Pressure	Sustained Winds	Potential Damage
1	> 980 mbar	74 - 95 mph	**Minimal**
2	965 – 979 mbar	96 - 110 mph	**Moderate**
3	945 – 964 mbar	111 – 130 mph	**Extensive**
4	920 – 944 mbar	131 – 155 mph	**Extreme**
5	**< 920 mbar**	**> 155 mph**	**Catastrophic**

Hurricane and Tropical Storm Impact

In Trinity Bay Conservation District, hurricanes as severe as Category 4 have been experienced in the planning area. Category 5 storms have been experienced in nearby areas and the District can expect to experience a Category 5 storm in the future. The type of impacts that can be expected are hurricane-force winds which drive rain into buildings causing water damage, downed trees, debris-blocked roads, disabled power lines, roof and mobile home damage. Hurricanes and tropical storms also bring heavy rains which have caused nearby creeks to exceed their capacity, inundating the surrounding area. The District can expect to see tropical storms and hurricanes as severe as Category 5 causing extreme and catastrophic damage in some cases. Hurricanes and tropical storms may also cause significant erosion by combining high winds with heavy surf and storm surge to significantly affect the rate of erosion.

Vulnerability

Trinity Bay Conservation District's missions and jurisdictional authority being explicitly limited to activities related to controlling floods, they only have the authority to mitigate the effect of hurricanes and tropical storm winds on District owned facilities and personnel. Trinity Bay Conservation District built a new administrative building which is hardened to protect District Staff. The building also has windows that can withstand winds up to 150 mph and has a backup generator. Hurricane and tropical storm events have a very long warning time, so when an event is expected to hit, all employees will be evacuated other than essential personnel. That essential personal can easily stay within the administrative building throughout the duration of an event. Even though District facilities and personnel are not vulnerable to hurricanes, based on our analysis, aside from District facilities, Trinity Bay Conservation District also owns other assets such as tractors, bulldozers, dump trucks, excavators and many other vehicles totaling to

$8,458,545.00 in insured value. Those vehicles are mainly stored in garages, under cover or parking lots. However, some of these vehicles are often in use and at various project sites that may sit in a floodprone area. Trinity Bay Conservation District closely monitors the weather and takes proactive steps, when possible, to move vulnerable equipment to higher ground when equipment is being operated or staged in a floodprone area.

Severe hurricanes and tropical storms have flooded thousands of homes, closed and damaged many roads throughout the District and damaged District buildings and equipment in the past. Several different areas within the District remain cause for concern among District, City and County officials. Flooded roads and debris accumulation from downed trees and damaged structures can impede emergency responders and hinder their timely response to calls for assistance. Additionally, utility interruption can occur from downed power lines causing an interruption in service to residents and critical infrastructure. This could degrade critical services and reduce or eliminate the ability of critical infrastructure to meet demand for service. The District works to keep ditches unimpeded and frequently applies for and administers grants to better control and reduce flooding within the District. When a hurricane or tropical storm is expected to impact the area, Chambers County and nearby Cities have warning systems in place to notify residents. The overall significance of hurricanes and tropical storms in the District is considered high.

Severe Thunderstorm/ High Wind
UPDATED FROM LAST PLAN

- Events since 2015, were updated and described.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description

Thunderstorms are the by-products of atmospheric instability, which promotes vigorous rising of warm air. A typical thunderstorm may cover an area three miles wide. The National Weather Service (NWS) considers a thunderstorm "severe" if it produces tornadoes, hail of 0.75 inches or more in diameter, or winds of 58 miles per hour (50 Knots) or more. Structural wind damage may imply the occurrence of a severe thunderstorm. Thunderstorms/High winds affect the entire planning area.

Location - Severe Thunderstorm/ High Wind

Chambers County is listed as Designated Catastrophe Area by the Texas Department of Insurance. The map below shows the "3-Second Gust Design Wind Speed" map from the Texas Department of Insurance according to the 2018 IBC. This map is used to design buildings to withstand reasonably anticipated winds in order to minimize property damage. The below figure shows the 3-second gust wind speeds at 33 ft. above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years). The District sits within the 140 – 150 and the geographic area affected is considered extensive.

Figure FF- 3-Second Gust Design Wind Speed
(Source: 2018 IBC Design Wind Speed for Risk Category II Buildings)

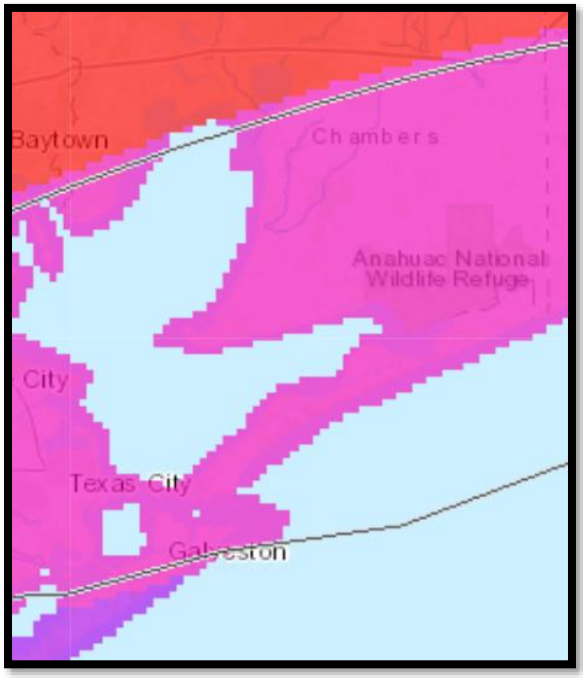
Wind Details

Wind Speed	141 Vmph
10-year MRI	78 Vmph
25-year MRI	95 Vmph
50-year MRI	109 Vmph
100-year MRI	119 Vmph
10,000-year MRI	167 Vmph
100,000-year MRI	189 Vmph
1,000,000-year MRI	209 Vmph

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-22 Standard. Wind speeds

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-22 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years). Values for 10-year MRI, 25-year MRI, 50-year MRI and 100-year MRI are Service Level wind speeds, all other wind speeds are Ultimate wind speeds.

Site is in a hurricane-prone region as defined in ASCE/SEI 7-22 Section 26.2. Glazed openings shall be protected against wind-borne debris as specified in Section 26.12.3.



Previous Occurrences

The NCEI Storm Events Database categorizes Thunderstorm events from 1951 to 2022 by County, however. The NCEI indicates that between 1951 and 2022 there were 42 High Wind events, 25 of which had property damage that. For these events, the NCEI database reported no fatalities or injuries and a total of $943,750 in property damages. Table 3-21 summarizes the 3 events that have occurred in the District since the last version of this Plan.

Table 3-21 Severe Thunderstorm High Wind Events within Trinity Bay Conservation District 2016 - 2022
(Source: NOAA/NCEI)

Location	Date	Type	Mag	Damage	Description
Winnie	5/26/2018	Thunderstorm Wind	55 kts. EG	$25,000.00	There was damage to a hangar at the Winnie-Stowell Airport.
Cove	10/31/2018	Thunderstorm Wind	55 kts. EG		Thunderstorm winds snapped large softwood trees a few feet from their trunks. One to three inch diameter branches were broken off. There was minor home damage.
Mont Belvieu	10/27/2021	Thunderstorm Wind	50 kts. EG	$18,000.00	There was minor damage to a school building. Trees and fences were down in the area.
				$43,000.00	

Most of the events with property damage reported caused downed trees and, in some cases, downed powerlines. There were only two events since the last version of the Plan causing over $43,000 in damage.

Neither of these events impacted District facilities or assets, though these events were within the District boundaries.

Future Occurrence

Trinity Bay Conservation District has experienced 3 high wind events between 2016 and 2022, causing an estimated $43,000 in property damage. Similarly, since 1951, there have been 42 events. Calculations involving 3 events reported over 7 years, and 42 events reported over 72 years suggest a high wind event can be expected every 1.7 years on average. Though a high wind event does not happen every year, some years contain multiple events, and the District should expect to see high wind events in any given year. Future probability is considered highly likely.

Extent

The most widely accepted descriptive wind scale is the Beaufort Wind Scale shown in Table 3-22. The table below described the force of the storm and the wind speed, classification and appearance that is associated with each wind force. In the planning area Trinity Bay Conservation District can expect to experience wind events ranging from light winds to hurricane force winds.

Table 3-22 Beaufort Wind Scale (Source: NOAA)

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
0	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	Near Gale	Sea heaps up, waves 13-19 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
8	34-40	Gale	Moderately high (18-25 ft.) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	41-47	Strong Gale	High waves (23-32 ft.), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	Storm	Very high waves (29-41 ft.) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects
11	56-63	Violent Storm	Exceptionally high (37-52 ft.) waves, foam patches cover sea, visibility more reduced
12	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced

Impact

In Trinity Bay Conservation District, though there are extreme events, most wind damage has been limited to downed trees, debris-blocked roads, and disabled power lines with the occasional roof and mobile home damage. Trinity Bay Conservation District has experienced several severe thunderstorms and high winds up to 50 Knots and one event measured at 85 Knots. Similar events could affect Trinity Bay Conservation District in the future. The type of impacts that can be expected are associated with the magnitudes from the Beaufort Wind Scale, which indicate storms as severe as a "Hurricane force wind" extent, involving trees being broken or uprooted along with considerable structural damage. The maximum probable extent is considered extreme.

Vulnerability

According to the NCEI, there have been 18 severe thunderstorm and high wind events with winds over 50 Knots within Trinity Bay Conservation District. The District's missions and jurisdictional authority being explicitly limited to activities related to controlling floods, they only have the authority to mitigate the effects of severe thunderstorms and high wind on District owned facilities and personnel. Trinity Bay Conservation District built a new administrative building which is hardened to protect District Staff. The building also has windows that can withstand winds up to 150 mph and has a backup generator. The District also plans to periodically perform engineering and structural surveys on Trinity Bay Conservation District facilities to ensure that they are sufficiently protected from effects of hazards. High wind can also down trees and limbs which can block ditches or damage equipment and in certain storms, exacerbate flooding. The District monitors equipment and clears ditches as soon as possible to prevent or reduce further damages in these events. Aside from District facilities, Trinity Bay Conservation District also owns other assets such as tractors, bulldozers, dump trucks, excavators and many other vehicles totaling to $8,458,545.00 in insured value. These vehicles are mainly stored on District property, under a covered garage, carport, open parking and not in a floodplain. These assets may have some risk of being damaged by severe thunderstorms and high winds either while in storage or on project sites. However, the size and number of vehicles owned by the District make trying to protect all of them from severe thunderstorms and high winds not possible. The overall significance of high wind events is considered high.

Subsidence (coastal) and Erosion

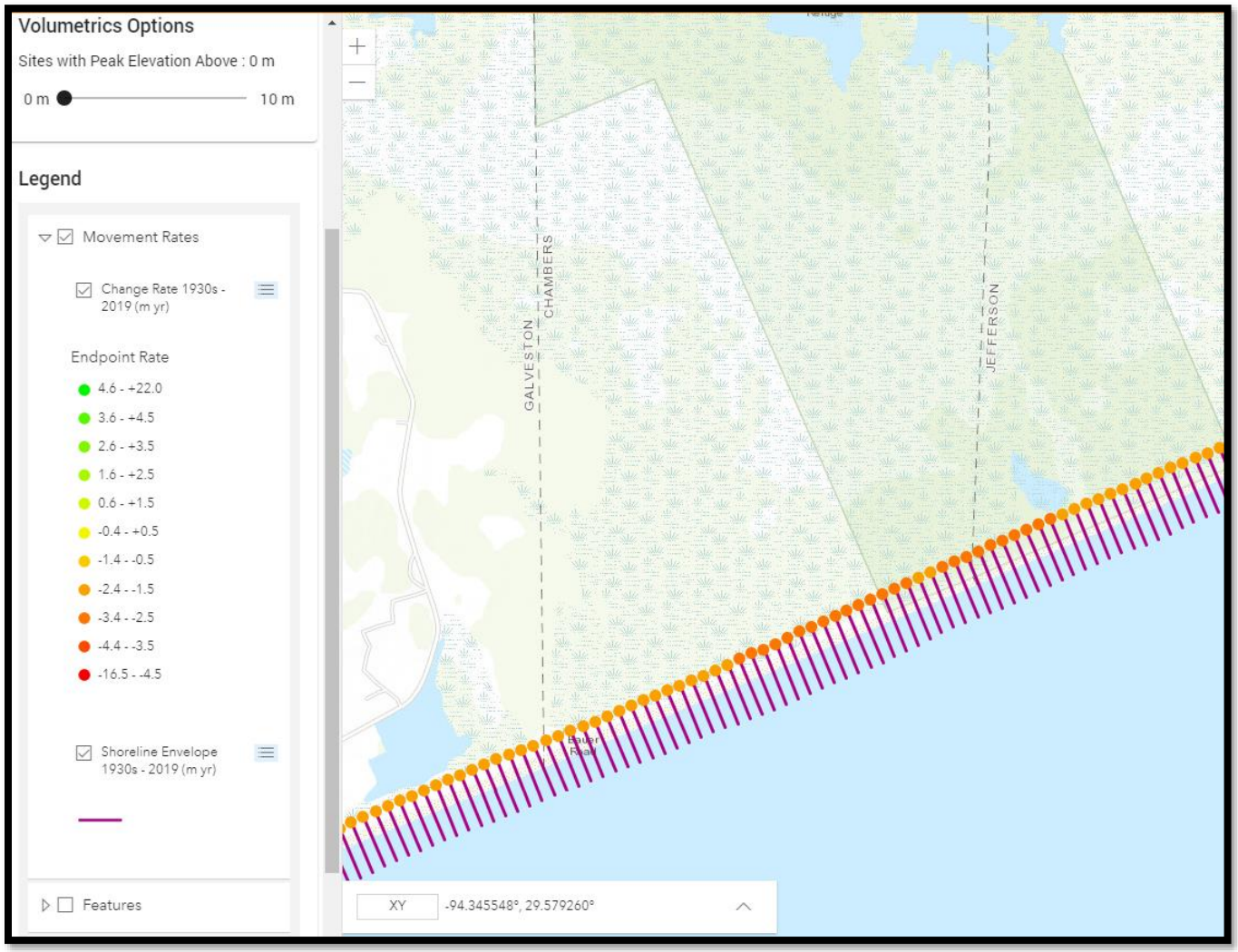
UPDATE FROM LAST PLAN

- Stand-alone action in this iteration
- This section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description – Subsidence (coastal) and Erosion
In coastal areas, sinking land, known as subsidence, leads to higher sea-level and increased flood risk. 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.

Location
Trinity Bay Conservation District's includes a small section of coastline. This coastline in shifting and retreating landward. This retreat can result in loss of public and private property and important natural habitats such as beaches, dunes, and marshes. The figure below shows the loss in shoreline from the 1930s to 2019. As shown, the shoreline has lost between 1.5 and 3.4 feet of shoreline since the 1930s. The geographic area affected is considered limited.

Figure GG– Texas Gulf Shoreline Movement and Beach-Foredune Elevations and Volumes to 2019
Source: Bureau of Economic Geology



Previous Occurrence
For Chamber County as a whole the NCEI reports there have been no coastal erosion or land subsidence events between 1950 and 2022. However, due to the nature of the hazard, there is not a specific event that causes it as can be seen in the figure above, the coastline has receded between 1.5 and 3.5 feet since the 1930s.

Information from the Texas Water Development Board (TWDB) provides a report from Karl W. Ratzlaff of the U.S. Geological Survey dated November 1982. In the abstract of this report Mr. Ratzlaff states, “In Jefferson County which neighbors to the east the planning area, “the Spindletop Dome area subsided approximately 5 feet (1.5 meters) during 1925-77, and the Port Acres area subsided about 3 feet (0.9 meter) during 1959-77, mainly from the withdrawal of oil or gas and associated ground water. Local subsidence caused by sulfur mining in the Spindletop Dome area has been estimated to exceed 10 feet (3.0 meters).”

Future Occurrence
Future probability is based in part on historical data. With sea level rise and worsening hurricanes and tropical storms, it is plausible that this land subsidence will follow the same pattern of receding, if not get exponentially worse. The probability of future event is considered likely.

Extent
Coastal erosion and coastal land subsidence is measured as a rate, in terms of either linear feet (i.e., the feet of shoreline recession per year) or as volumetric loss (i.e., cubic yards of eroded sediment per linear foot of shoreline frontage per year). As shown in the previous figure, the Gulf-facing shoreline in Chambers County is experiencing coastal erosion at rates ranging from -1.5 feet per year to -3.5 feet per year, depending on location. While this is not as severe as other areas of the Texas Coast, it is nevertheless cause for concern by the District.

Impact
The biggest impact of coastal subsidence and erosion in Trinity Bay Conservation District is the potential loss of wetlands which is an important natural resource that needs to be protected. It can also destroy natural ecosystems and natural barriers that can protect from other natural hazards including hurricanes/tropical storms.

Vulnerability
In Trinity Bay Conservation District, because there is only a small section of coastline, the District is far less vulnerable than other parts of Texas. However, with a small coastline, it is easier to manage and implement measures to protect the area from coastal subsidence and erosion. With a slow rate of coastal subsidence and erosion, and due to the fact that there is no record of any historical building damage as a result, the overall significance and vulnerability in the District is considered low.

Tornadoes

UPDATE FROM LAST PLAN

- Events since 2015, were updated and described.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

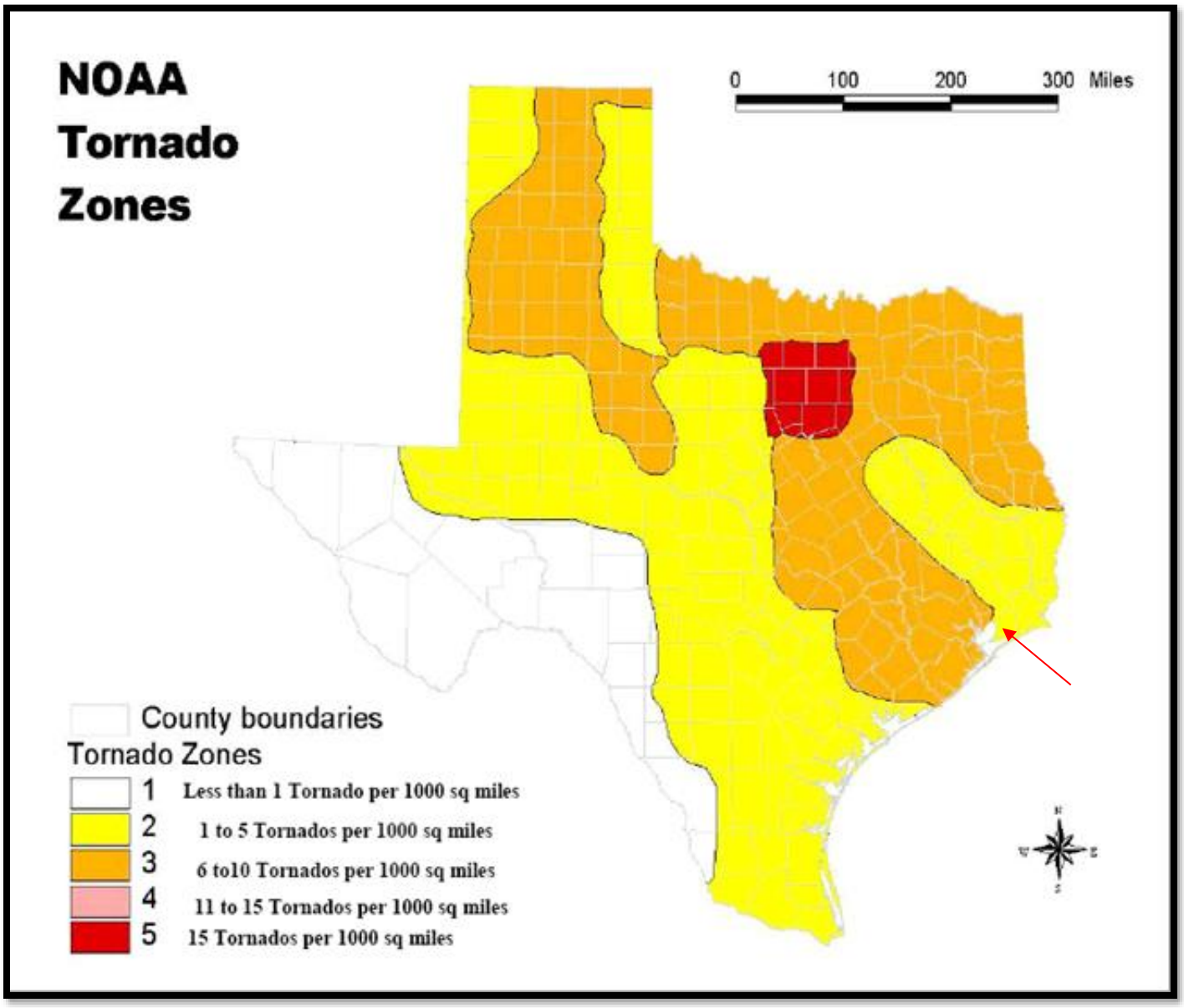
Hazard Description

The National Weather Service defines a tornado as a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. Tornadoes can form any time of the year; but the season of greatest activity extends from March to August.

Location - Tornadoes

Figure GG illustrates the frequency of tornado strikes in Texas per 1,000 square miles, the arrow denotes the approximate location of Trinity Bay Conservation District, which falls within the zone for 1-5 tornadoes in a 1,000 square mile per the NOAA Prediction Center Map. While tornadoes can occur in any month in Texas and at all hours of the day or night, they occur with greatest frequency during the late spring and early summer months, during late afternoon and early evening hours. There is some potential for the full range of tornadoes (from EF-0 to EF5) to impact most areas of Texas, including Trinity Bay Conservation District, although events at the lesser end of the scale are much more likely. Northern Texas is most vulnerable, but the area around Trinity Bay Conservation District experiences considerable activity. The tornado hazard affects the entire planning area approximately equally. All structures in the District are vulnerable to the effects of tornadoes (particularly tornadoes at the more intense end of the Enhanced Fujita scale). However, highly engineered commercial (and other non-residential) structures are typically less vulnerable to the effects of tornadoes than are residential structures, with some exceptions. The geographic area affected from tornadoes is considered limited.

Figure HH - Tornado Activity in Texas
(Source: NOAA – Storm Prediction Center)



Previous Occurrences

The NCEI Storm Events Database only categorizes tornado events prior to 1993 by County, however, it has narratives and location maps describing the impacts of those events. The NCEI indicates that between 1950 and 2022, Chambers County experienced 26 tornados, however some were reported multiple times in the database or multiple tornadoes occurred as a part of the same storm. However, looking at the narratives, there were 20 tornado events that impacted Trinity Bay Conservation District. For these events, the NCEI database reported 4 fatalities and 8 injuries and a total of $1,555,000 in damages. Two tornadoes occurred in the planning area since that last version of the Plan, one caused $50,000 in property damage and the other caused $13,000 in crop damage. Table 3-23 summarizes the two tornadoes that have occurred in Trinity Bay Conservation District, since the last version of the Plan.

Table 3-23 Tornadoes within Trinity Bay Conservation District 2016 - 2022 (Source: NOAA/NCEI)

Location	Date	Mag	Dth	Inj	Property Damage	Description
COVE	03/29/2017	EF0	0	0	$13,000 crop damage, not included in total	This EF-0 tornado was the last of four brief tornadoes from an HP supercell which moved across southeast Harris County and southern Chambers County. This short-lived tornado was confined to the end of Kendall Road along Dutton Lake where there was some small tree damage. The Houston Hobby terminal doppler radar showed a brief couplet at this location, and the tree fall pattern supported this rotation. Estimated peak winds were 75 mph.
COVE	10/31/2018	EF1	0	0	$50,000	An EF-1 tornado touched down and caused damage within the Lanai Subdivision along Interstate 10 between FM 3180 and FM 565. Several homes sustained minor roof damage and numerous trees were uprooted. There were some snapped trees and power lines. One large trailer was overturned.
Totals:			0	0	$50,000.00	

The NCEI database is not complete but continues to add more information which makes the historic events reported for just Trinity Bay Conservation District more accurate.

Future Occurrence

Trinity Bay Conservation District has experienced 26 tornadoes between 1950 and 2022, causing an estimated $1,555,000 in property damage. These 26 tornado events were assessed as 15 F0 and EF0 tornadoes, with 10 assessed as F1 and EF1s, three assessed as an F2 and two assessed as F3s. One event from 1959 did not have a magnitude listed. Calculations based on 26 events reported over 72 years suggest Trinity Bay Conservation District experiences a tornado event approximately every 2.77 years on average. Therefore, there is a 36% chance of a tornado event in any given year. The probability of future events is considered likely.

Extent

Tornado damage severity is measured by the Enhanced Fujita Tornado Scale (EF-Scale). The Enhanced Fujita Scale assigns numerical values based on wind speed and categorizes tornadoes from zero to five representing increasing degrees of damage. Tornadoes are related to larger vortex formations, and therefore often form in convective cells such as thunderstorms or in the right forward quadrant of a hurricane or tropical storm, far from the hurricane eye. Table 3-24 describes the categories for the Enhanced Fujita Tornado Scale. Trinity Bay Conservation District can expect to experience a tornado ranging from EF0 to EF5 in the planning area, though

the most severe event the District has experienced is an F3. The maximum probable extent is considered moderate.

Table 3-24 - The Enhanced Fujita (EF) Scale

Enhanced Fujita (EF) Scale		
Enhanced Fujita Category	**Wind Speed (mph)**	**Potential Damage**
EF0	65-85	**Light damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	86-110	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	**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.
EF4	166-200	**Devastating damage**. Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
EF5	>200	**Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (109 yd.); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Impact

In Trinity Bay Conservation District, most wind damage has been limited to downed trees, blocked roads, and disabled power lines with the occasional roof damage. Historically, Trinity Bay Conservation District has experienced tornadoes limited to EF0-F3 strength. The type of impacts that can be expected are associated with those magnitudes from EF0-EF3 described below:

- EF0-Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
- EF1-Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.

- EF2-Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
- EF3-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.

Vulnerability

According to the NCEI, there have been 26 tornadoes within Trinity Bay Conservation District, including 15 F0 and EF0 tornadoes, with 10 F1 and EF1s, three F2s and two F3s. Mobile and manufactured homes are the most susceptible to tornado damage as they can be easily displaced or overturned in high winds. Trinity Bay Conservation District's mission and jurisdictional authority being explicitly limited to activities related to controlling floods, they only have the authority to mitigate the effects of severe thunderstorms and high wind on District owned facilities and personnel. Trinity Bay Conservation District built a new administrative building which is hardened to protect District Staff. The building also has windows that can withstand winds up to 150 mph and has a backup generator. The District also plans to periodically perform engineering and structural surveys on Trinity Bay Conservation District facilities to ensure that they are sufficiently protected from effects of hazards. Tornadoes also frequently down trees and limbs which can block ditches or damage equipment and in certain storms, exacerbate flooding. The District monitors equipment and clears ditches as soon as possible to prevent or reduce further damages in these events. Aside from District facilities, Trinity Bay Conservation District also owns other assets such as tractors, bulldozers, dump trucks, excavators and many other vehicles totaling to 8,458,545.00 in insured value. These vehicles are mainly stored on District property, under a covered garage, carport, open parking. However, the size and number of vehicles owned by the District make trying to protect all of them from tornadoes is infeasible. The overall significance of tornado events is considered low.

Winter Storm
UPADATE FROM LAST PLAN

- Events since 2015 were updated and described.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description
Winter Storm includes heavy snow and blizzards, sleet, ice storm (or freezing rain), frost/freeze or a mix of these. Severe winter weather can down trees, cause widespread power outages, damage property, and cause fatalities and injuries. The effect of severe winter storms on Texas is quite disruptive compared to other regions that normally experience severe winter weather. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia.

A heavy snowfall for the state is an accumulation of four or more inches of snow in a 12- hour period. This amount of snow accumulation usually occurs in the northern half of the state and in the higher elevations of West Texas and is rare in the District.

Blizzards are the most perilous of all winter storms, characterized by low temperatures and strong winds in excess of 35 mph, bearing large amounts of blowing or drifting snow. Blizzards take a terrible toll in livestock and people caught in the open. In Texas, blizzards are most likely to occur in the Panhandle and South Plains Regions and are rare in the District.

An ice storm occurs when rain falls out of the warm upper layers of the atmosphere into a cold and dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. Damage can occur with half an inch of rain freezing on trees and utility wires; the damage increases if there are high winds. Based on this, an icing event is categorized an ice storm at half an inch.

Location
Although winter storms in Texas occur less frequently than they do further north, they occur often enough to be considered a viable, seasonal threat. Texans are most familiar with four types of winter storms: snowstorms, blizzards, cold waves and ice storms. In Trinity Bay Conservation District, Texas snowstorms, cold waves and ice storms are most common. Generally, the winter storm season in Texas runs from late November to mid-March, although severe winter weather has occurred as early as October and as late as May in some areas. Within Trinity Bay Conservation District, the risk to people and property from winter weather cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire District. All people and assets are considered to have the same degree of exposure. Figure HH shows the average annual snowfall totals for the United States. The map shows southeastern Texas receives less than eight inches of snow per year. The geographic area affected is considered significant.

Figure II - United States Average Annual Snowfall Map

Previous Occurrence

For Chamber County as a whole the NCEI reports there have been one winter storm and ice storm event between 1950 and 2022. Although the query results begin in 1950 the only reported event is in 1997. The NCEI database is still being compiled for certain events prior to 1996, although presumably occurrences prior to this date follow the same pattern as found in the NCEI list. For this event, the NCEI database reported no fatalities, no injuries and no damages. No events occurred in the planning area since that last version of the Plan. Table 3-25 summarizes the winter and ice storm event that has occurred in Trinity Bay Conservation District.

While not captured in the database, a Presidential Declaration occurred in February 2021 (DR-4586) after Winter Storm Uri dumped record amounts of snow on Texas, with the frigid temperatures and severe weather impacting all 254 counties in the state in February 2021. Millions of Texans lost power. Snow and ice paired with ultra-low temperatures caused widespread road closures and dangerous travel conditions. State emergency management leaders activated warming centers in communities across Texas and numerous personnel were deployed to assist stranded motorists and conduct welfare checks. The Texas Comptroller reported that Winter Storm Uri knocked out power for nearly 70 percent of Texans and disrupted water utilities, leaving many Texans without heat or running water for extended periods in the frigid cold. It resulted in between $80 billion and $130 billion in financial losses to the state economy, and what's more, claimed at least 210 lives.

For TBCD, the estimated cost to repairs broken pipes and other issues as a result of the prolonged freeze was approximately $35,000.00.

Table 3-25 Winter Storms and Ice Storms within Chambers County 1950 - 2022 (Source: NOAA/NCEI)

Location	Date	Type	Property Damage	Description
CHAMBERS (ZONE)	1/12/1997	Ice Storm	$0	Freezing rain/sleet event occurred on the 12th-13th. Trees, powerlines and roadways were all effected. The weight of the ice caused trees and powerlines to snap/fall. Glazed roadways posed hazardous driving conditions. Over 1100 traffic accidents were reported in Southeast Texas which accounted for 3 deaths. Estimated damage was set at $800,000 across Southeast Texas.
Totals:			$0	

Future Occurrence

Future probability is based in part on historical data. Given that there are only three recorded events since 1996 and one Presidential Disaster declaration in 2021, the District can expect a winter storm or ice storm event once every 8.6 years on average. There is about a 12% chance of the District experiencing a winter storm or ice storm in any given year. The probability of future event is considered likely.

Extent

Trinity Bay Conservation District's subtropical climate makes snow accumulation rare. However, the Gulf of Mexico provides the moisture source when a strong Arctic cold front brings below freezing temperatures to southeastern Texas. When conditions are right, warmer moisture-laden air overrides the below-freezing temperatures near the surface and freezing rain and sleet result, creating ice to accumulate. Using the Sperry-Piltz Ice Accumulation Index Figure II, (SPAI Index), Trinity Bay Conservation District planning area could expect to fall within a 0-3 ice damage index range. The maximum probable extent is considered moderate.

Figure JJ – SPAI Index

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

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	

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

Impact

Winter storms in Texas, although not as numerous or severe as in the northern States, do occur and with sufficient severity to be a minor threat to people and property as colder temperatures are generally minimal in the area, with effects mainly limited to humans, although occasionally there may be relatively minor effects on infrastructure such as freezing pipes or electrical grids. Winter storms may place any and all residents within the District at risk of injury or death during any given occurrence. During extreme weather conditions, elderly persons, small children and infants and/or the chronically ill who do not have adequate heating in their homes may become more vulnerable to injury or death. Many homes in the area have inadequate cold-weather pipe protection, so are at a greater risk of freezing and bursting water pipes when the outdoor temperature drops to 20°F. Trinity Bay Conservation District is in a climatic region that is unlikely to experience snow depths sufficient to cause significant property damage such as collapsed roofs.

Vulnerability

According to the NCEI, there have been three winter storm and ice storm events within Trinity Bay Conservation District. In addition, there was one recent (February 2021) winter/ice storm Presidential Disaster (Winter storm Uri). While Trinity Bay Conservation District facilities are built to withstand freezing temperatures, some of the pipes at the towers and treatment plants froze from prolonged exposure. The District also plans to periodically perform engineering and structural surveys on Trinity Bay Conservation District facilities to ensure that they are sufficiently protected from effects of hazards, including covering and protecting any exposures pipes. In addition to frozen pipes, severe winter weather can also down trees and limbs which can block ditches or damage equipment and in certain storms, exacerbate flooding. The District monitors equipment and clears ditches as soon as possible to prevent or reduce further damages in these events. The overall significance in the District is considered medium.

Wildfire

UPDATE FROM LAST PLAN

- Events since 2015, were updated and provided.
- In addition, this section was formatted to explicitly address: Location, Previous Occurrence, Future Occurrence (Probability), and Extent. Also explicitly addressed are Impact and vulnerability summary.

Hazard Description – Wildfire

Wildfires are uncontrolled fires often occurring in wildland areas and can consume houses or agricultural resources if not contained. Wildfires/urban interface is defined as the area where structures and other human development blend with undeveloped wildland. Wildfires often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may fill the area for miles around. As mentioned, wildfires can be human-caused through acts such as arson or campfires or can be caused by natural events such as lightning. Wildfires can be categorized into three types:

- Wildfires occur in very rural areas and are fueled primarily by natural vegetation.
- Interface fires occur in areas where homes or other structures are endangered by the wildfires. The fires are fueled by both natural vegetation and man-made structures. These are often referred to as Wildland Urban Interface fires.

Location

Trinity Bay Conservation District's increasing population will impact areas that are located within the Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire. In Texas nearly 85 percent of wildfires occur within two miles of a community. Texas A&M Forest Service provides a Texas Wildfire Risk Explorer Tool that provides wildfire risk information including wildfire threat, wildland urban interface, surface fuels and other very helpful information for planning support. The two maps below created from the Texas A&M risk assessment tools show where people live in the Chambers County and the second maps shows the WUI. WUI is simply a subset of the *Where People Live* dataset. The primary difference is populated areas surrounded by sufficient non-burnable areas (i.e., interior urban areas) are removed from the Where People Live data set, as these areas are not expected to be directly impacted by a wildfire. The geographic area affected is considered limited.

Figure KK – Where People Live
Source: Texas Wildfire Risk Explorer

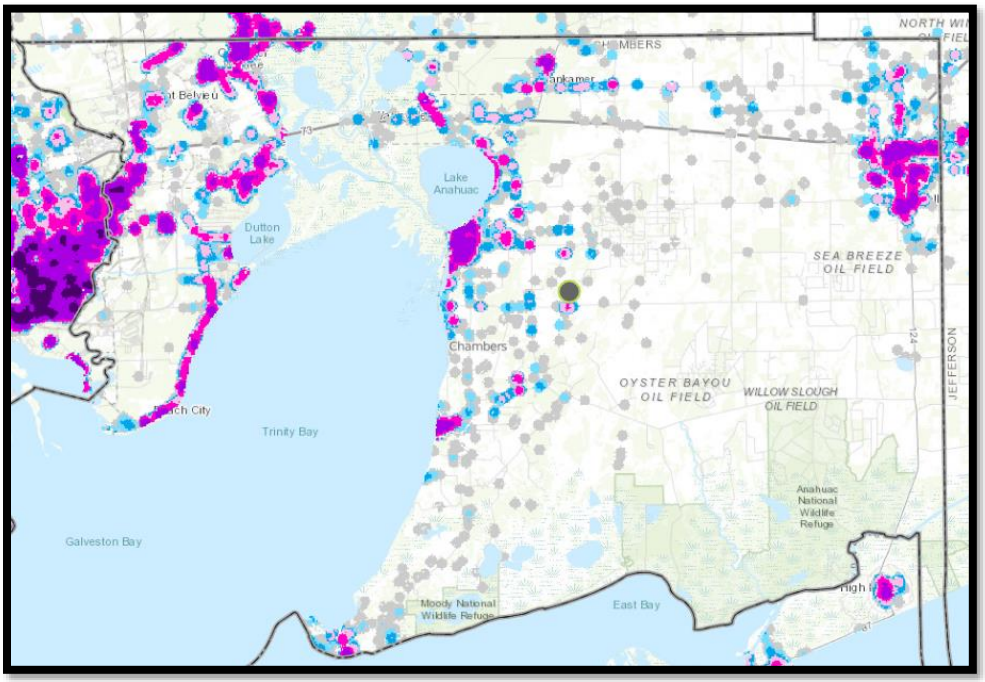
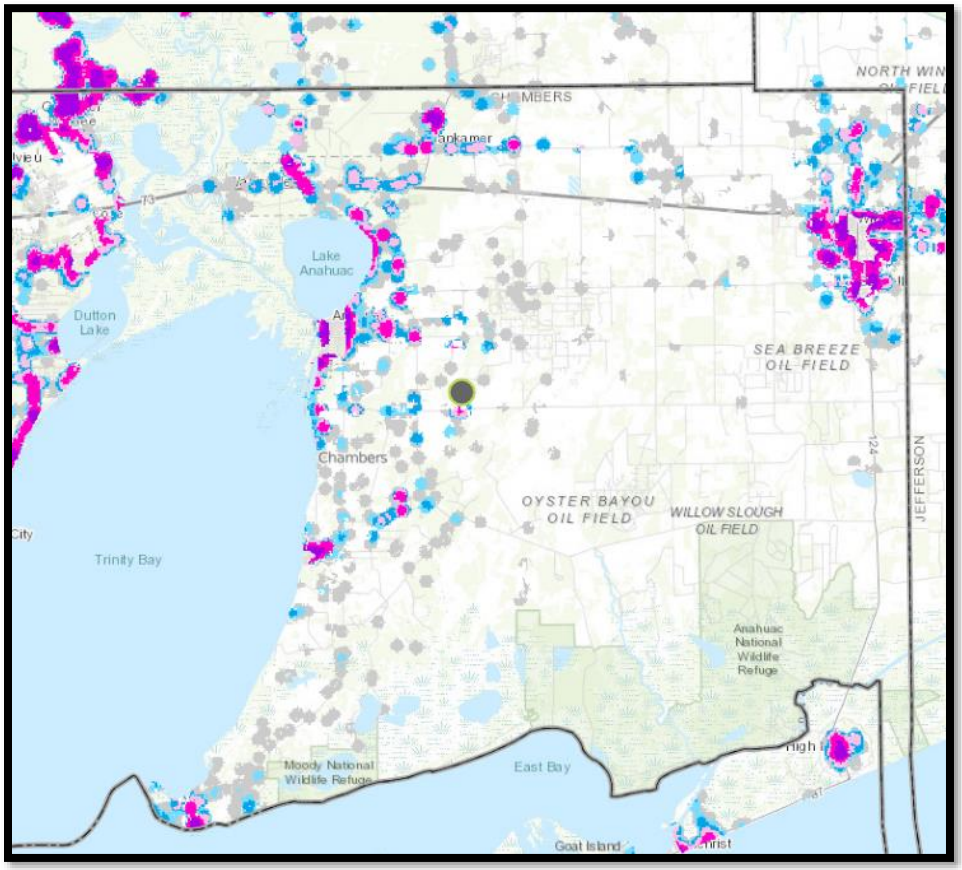
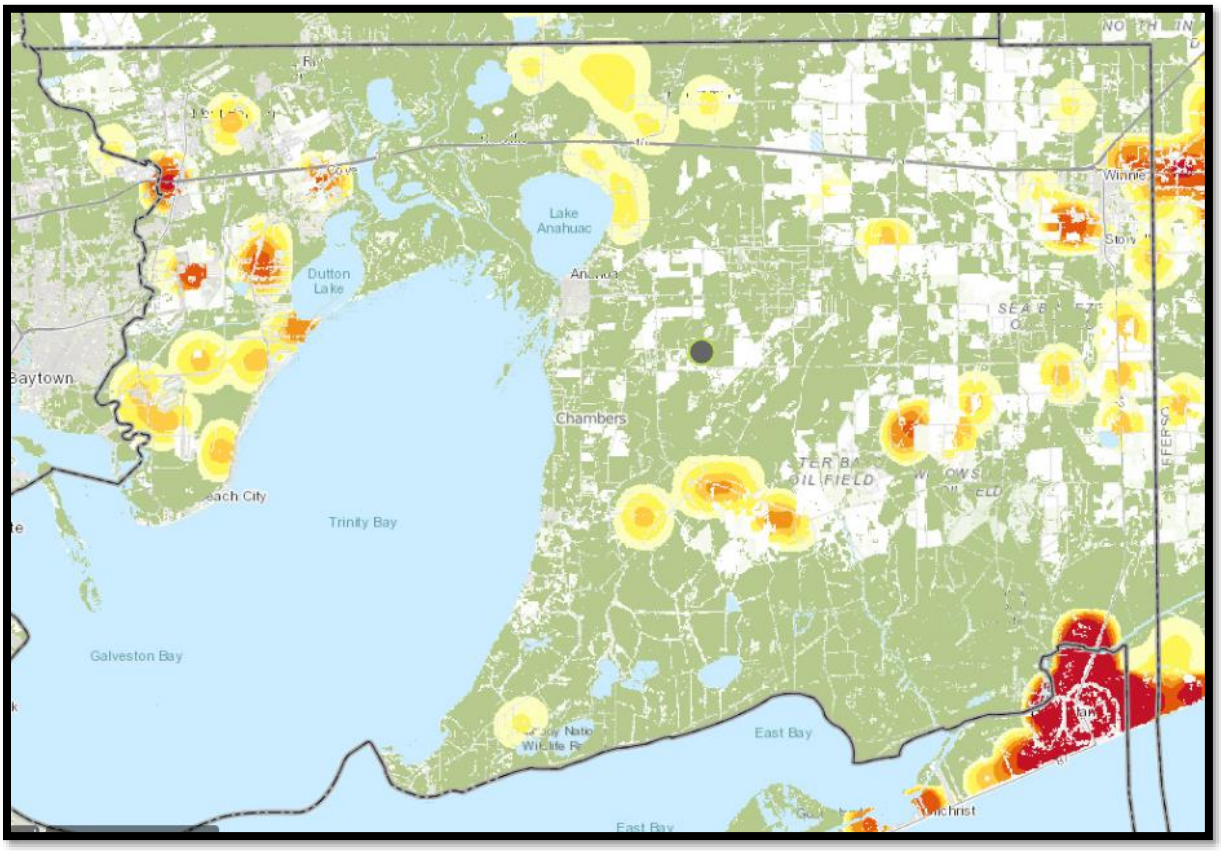


Figure LL – Wildland Urban Interface
Source: Texas Wildfire Risk Explorer



While there is little wildland interface in Trinity Bay Conservation District, Figure LL, identifies (shaded red) areas of the District vulnerable to wildfires based on wildfire ignition density. These areas are predominately the less populated and less developed areas of the District.

Figure MM – Wildland Ignition Density
Source: Texas Wildfire Risk Explorer



Previous Occurrence
For Chamber County as a whole the NCEI reports there have been no wildfire events between 1950 and 2022. However, the District has reported that there have been some brush fires near I-10.

Future Occurrence
Future probability is based in part on historical data. Given that there are no recorded events, the future probability is considered low, but will continue to increase as time goes on and population density increases. The probability of future event is considered unlikely.

Extent
The Texas Wildfire Risk Assessment Portal (TxWRAP) is the primary mechanism for Texas A&M Forest Service (TFS) to deploy wildfire risk information and create awareness about wildfire issues across the state. It is comprised of a suite of applications tailored to support specific workflow and information requirements for the public, local community groups, private landowners, government officials, hazard-mitigation planners, and wildland fire managers.

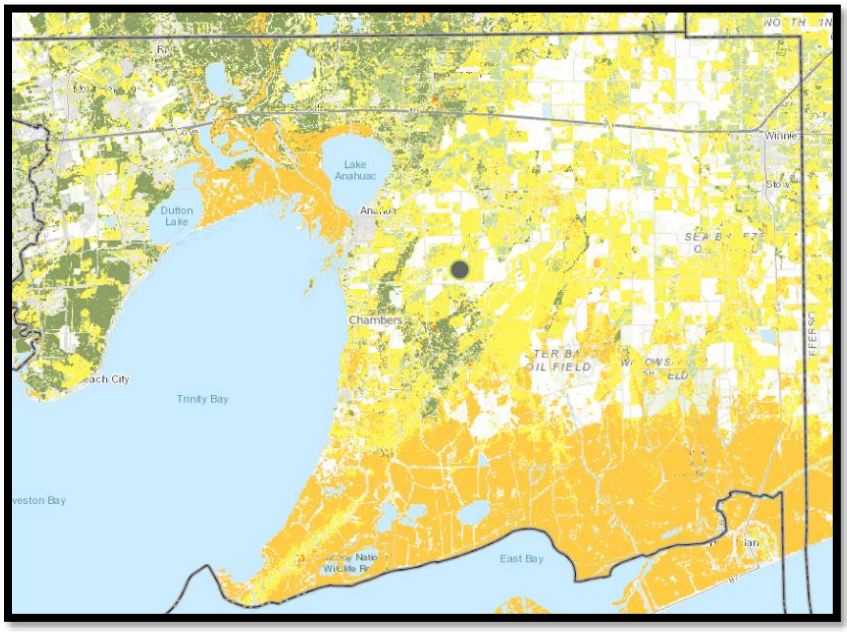
Collectively these applications will provide the baseline information needed to support mitigation and prevention efforts across the State. TxWRAP uses a Characteristic Fire Intensity Scale (FIS), see Figure MM. The FIS determines potential fire intensity based on high to extreme weather conditions, fuels and topography.

Figure NN – Texas Forest Service Characteristic Fire Intensity Scale (FIS)

Class 1 Very Low	Very small, discontinuous flames, usually less than one foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
Class 2 Low	Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
Class 3 Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
Class 4 High	Large flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
Class 5 Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

For the District, the FIS is considered between 2 and 3 - low to moderate on the scale. The maximum probable extent is considered moderate. The FIS levels for Trinity Bay Conservation District is depicted in Figure NN

Figure OO – Trinity Bay Conservation District Fire Intensity Scale levels
Source: Texas Wildfire Risk Explorer



Impact
For the areas located closest to the Wildland Urban Interface, Wildfires could spread and burn property, crops, and structures, including District facilities and assets as well as grasses used for ditch stabilization. Though there have not been any reported wildfires in the NCEI, they are still possible in the planning area. District assets and facilities closest to the WUI are most at risk.

Vulnerability

In Trinity Bay Conservation District, because there is little urban-wildland interface, there is limited risk for wildfires. The potential magnitude of wildland fires in the District is variable, but generally considered unlikely because the area has relatively little fuel load, and the detection and suppression capabilities of the Cities and County are good. The District's assets and facilities, while low potential, could be impacted from a spread of a wildfire. The potential for major or highly intense fires is very low.

Due to the fact that there is no record of any historical building damage as a result of wildfire, in the event that a wildfire did occur, negligible impact is anticipated, if any. The overall significance and vulnerability in the District is considered low.

Analyze Risk

Once establishment of the hazard areas, extent, impact and probability are complete and community assets identified, analysis can be conducted to identify where community specific vulnerabilities and problem areas exist. In addition to this information, Community Assets were also reviewed. Throughout this process, the District updated its critical infrastructure list to better assess what, exactly, is at risk. Using this information and the most recent experience of disasters, the District ranked the hazards and developed actions to mitigate those hazards.

Hazard rankings were based on the impact to assets and hazard analysis. Hazards were ranked using a high, medium, or low ranking, defined as follows:

Low	Unlikely to occur in area and impact is negligible
Medium	Likely to occur in area, with moderate impact
High	Highly likely to occur in area and impact could cause significant damage including fatalities

Summarize Vulnerability

Once establishment of the hazard areas, extent, impact and probability are complete and community assets identified, analysis can be conducted to identify where community specific vulnerabilities and problem areas exist. Using this information, the District ranked the hazards and developed actions to help mitigate those hazards. The ranking list is in Table 3-26.

Table 3-26 Hazard Ranking

Hazard	Overall Significance
Flood	High
Hurricane/Tropical Storm	High
Thunderstorm and High Wind	High
Drought	Medium
Winter Storm	Medium
Extreme Heat	Low
Tornado	Low
Wildfire	Low
Subsidence (Coastal) and Erosion	Low

Social Vulnerability Index (SVI)

The Center for Disease Control's (CDC) Agency for Toxic Substances and Disease Registry (ATSDR) Geospatial Research, Analysis & Services Program (GRASP) created databases to help emergency response planners, public health officials and other government organizations identify and map communities that will most likely need support before, during, and after a hazardous event – Social Vulnerability Index. GRASP uses U.S. Census data to determine social vulnerability of every census track or by County using 16 Social factors grouping them into four related themes. (Figures OO and PP). The data is then mapped and scored. Chambers County 2020 National Overall SVI score is 0.4924 (possible scores range from 0-lowest vulnerability to

1-highest vulnerability) and Statewide Overall SVI score is 0.1462). The map depicts by color lowest to highest vulnerable populations.

Figure PP – CDC/ATSDR GRASP SVI Themes

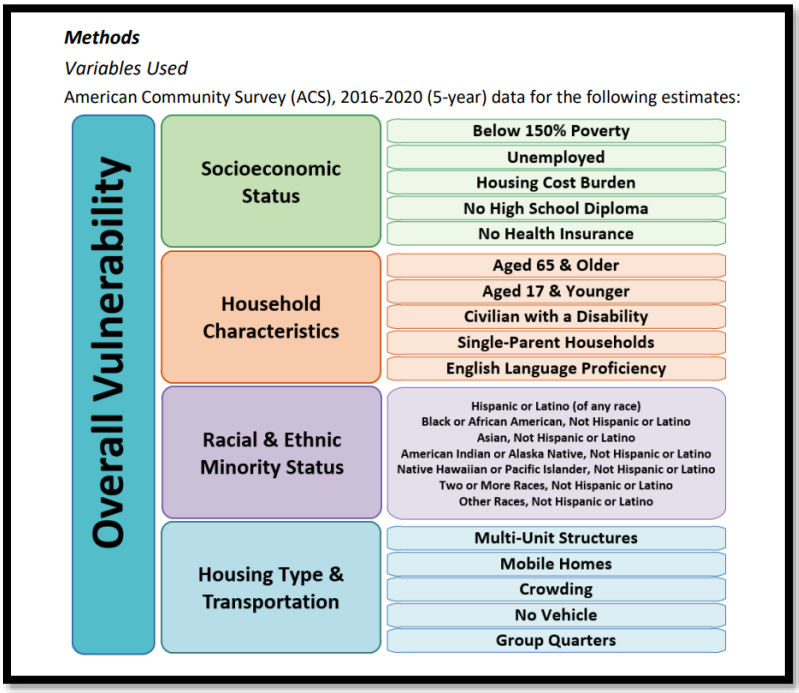
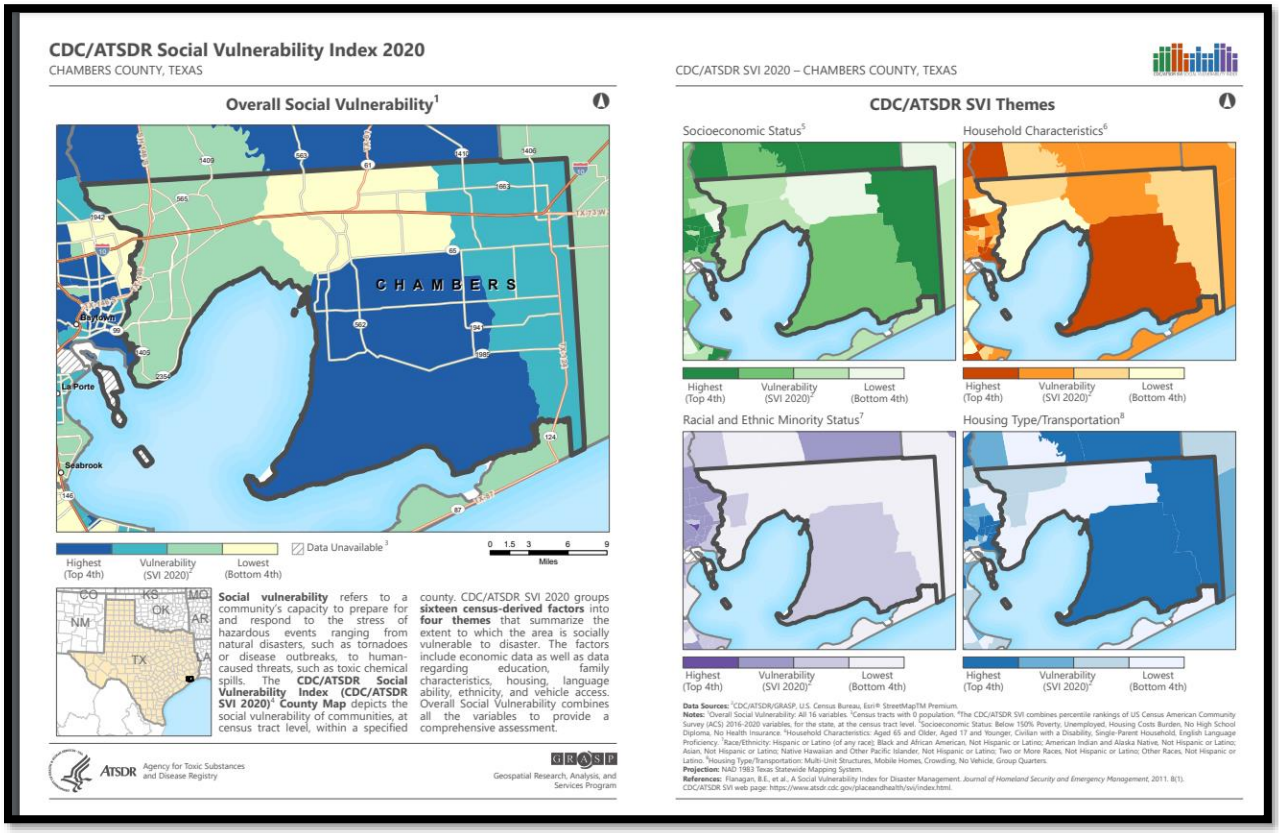


Figure QQ –SVI 2020 – Chambers County, Texas (Source CDC/ATSDR GRASP)



Section 4 – MITIGATION STRATEGY

Update from Last Plan

- Removed table of linking goals to actions
- Updated the mitigation goal
- Provided the status of the actions in the approved 2015 plan. The on-going actions were placed into the current hazard mitigation table and rank reassessed.
- Reformatted the Mitigation Action Table

Mitigation Strategy

As the State of Texas 2018 Hazard Mitigation plan emphasized, hazard mitigation planning pays off and having a strategy and plan is key to that success.

TEXAS IS THE NUMBER ONE DISASTER STATE IN THE COUNTRY. INVESTING IN HAZARD MITIGATION IS CRITICAL TO REDUCING THE IMPACTS OF NATURAL DISASTERS SUCH AS HURRICANE HARVEY. ACCORDING TO THE PEW CHARITABLE TRUSTS, IN 2005, RESEARCH BY A GROUP OF INDEPENDENT EXPERTS FOUND THAT FOR EVERY DOLLAR INVESTED IN ACTIONS TO REDUCE DISASTER LOSSES, THE NATION SAVES ABOUT $4 IN FUTURE COSTS, IN 2011, FEMA MITIGATION PROGRAMS HELPED COMMUNITIES IN U.S. BY PROVIDING $252 MILLION IN GRANTS FOR FLOOD MITIGATION. FEMA ESTIMATES THAT THE MITIGATION PROJECTS IMPLEMENT FROM THAT FUNDING WILL STAVE OFF APPROXIMATELY $502 MILLION IN POTENTIAL FLOOD-RELATED LOSSES. DEVELOPMENT A SMART MITIGATION PLAN TO APPLY FOR FEMA'S HAZARD MITIGATION GRANT PROGRAM IS A BEST PRACTICE FOR LONG-TERM MITIGATION STRATEGY.

State of Texas Hazard Mitigation Plan, October 2018)

TBCD has developed a range of policies, programs and procedures to serve as a framework for its hazard mitigation strategy, the long-term blueprint for reducing the potential losses identified in the risk assessment. Strategies include daily operations that contribute to reducing the impact of future hazards as well as specific hazard mitigation projects. The TBCD mitigation planning strategy is to:

- Develop and maintain a comprehensive understanding of risks in its jurisdictional responsibility
- Develop and pursue hazard mitigation funding opportunities
- Implement cost-effective hazard mitigation projects
- Ensure that citizens are informed about the potential effects of natural hazards
- Seek additional ways to integrate hazard mitigation into all schedules (maintenance, mowing as examples) plans and projects

The first step of the mitigation strategy involved review of the current plan's mitigation goal, to assess whether it remains reflective of the District's mitigation strategy. The MPC also reviewed the State's goals from their 2018 update. While much of the goals is still relevant, the MPC further refined the statement to make those goals more concise and centric to hazard mitigation. The updated mitigation goal is as follows:

Mitigation Goal

The goal of this plan is to support the District's efforts to protect the community's health, safety, and welfare by identifying and increasing public awareness of natural hazards and mitigating risks due to those hazards without creating new problems. The Goal Statement is below.

Trinity Bay Conservation Districts Mitigation Goal Statement

The mitigation goals of TBCD are:

- To protect public health, safety, and welfare
- To reduce losses due to hazards by identifying hazards, minimizing exposure of citizens and property to hazards, and increasing public awareness and involvement
- To facilitate the development review and approval process to accommodate growth in a practical way that recognizes existing storm water and floodplain problems while avoiding creating new problems or worsening existing problems
- Increase cooperation with other local organizations to develop and initiate hazard mitigation actions and projects which will serve to protect the lives and property of citizens in the planning area.
- Perform Studies to recognize and address solutions to existing problems.
- Develop projects which address hazards that have been identified in the Hazard Mitigation plan.

Status of Actions from the Last Approved Mitigation Plan

The approved 2015 plan distinguished actions by classifying them as high, medium and low priorities using the STAPLEE criteria and defined as:

- High: Meets five of the seven STAPLEE criteria
- Medium: Meets four of the seven STAPLEE criteria
- Low: Meets three of the seven STAPLEE criteria

There were 19 action items. There were seventeen high priorities and two medium priorities. One of the actions was removed, four of the actions were completed and some of the actions were merged or the work product changed but still included as ongoing. The remaining actions were reassessed and re-prioritized with the new 2022 actions. Table 4-1 provides the actions from the current plan, status, issues, and funding. It also provides the recommendation: Completed, Remove or Move to New Actions.

Table 4-1 - Status of Actions from 2015 Plan

Mitigation Actions in Current Plan (2015)	Update on Status and Recommendation
Mitigation Action No. 1 – North Lake Addition (northeast corner above I-10) Drainage Improvements – Construction of a drainage outfall channel and a detention pond to serve the area north of Interstate 10 in the Winnie community. Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $2,300,000	Update: TXDOT widened I-10 from SH 124 to Hamshire Road (approximately 5 miles) and TXDOT doubled the number of boxes under the freeway which doubled the capacity however not in use yet. There is a study commissioned by JCDD3 on the downstream impacts of the additional boxes which is to be completed approximately October 2022. If the study indicates no adverse impacts downstream, TxDOT will commission the added boxes to allow for water to flow through. TBCD has a grant application to put two box culverts on the access roads which will run perpendicular to I-10 at Ledoux Road and Koch Road intersections. Issues: It will no longer be a drainage outfall and detention due to the TxDOT work, also, this action will be merged with Mayhaw Action 2. Recommendation: Work product has changed but ongoing. Will move to 2022 Actions.
Mitigation Action No. 2- Mayhaw Extension ditch that runs under I-10 – enlarge Mayhaw Extension crossing of Interstate 10 and for a distance of 2.5 miles downstream of I-10 to serve the east side of Winnie Hazard(s) Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $4,800,000	Update: TXDOT widened I-10 from SH 124 to Hamshire Road and TXDOT doubled the amount of boxes under the freeway which doubled the capacity but not in use yet. There is a study commissioned by JCDD3 on the downstream impacts of the additional boxes which is to be completed approximately October 2022. If the study indicates no adverse impacts downstream, TxDOT will commission the added boxes to allow for water to flow through. TBCD has a grant application to put two box culverts on the access roach which will run perpendicular to I-10 around at Ledoux Road and Koch Road intersections. Issues: It will no longer be a drainage outfall and detention due to the TxDOT work, also, this action will be merged with North Lake Addition 1. Recommendation: Work product has changed but ongoing. Will move to 2022 Actions.

Mitigation Actions in Current Plan (2015)	Update on Status and Recommendation
Mitigation Action No. 3 – (Spindletop 1 – Construct a detention pond on Spindletop Bayou to serve the lower west side of Winnie. Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $3,500,000	Update: Ongoing – A drainage study was done that determined construction of a detention pond is not feasible. Therefore, the project has changed to widen Spindletop Ditch. TBCD submitted an HMGP application in to widen Spindletop Ditch from the intersection of I-10 and SH-65 to SH-124. This widening will allow capacity to increase from 1000 cubic feet to 4000 cubic feet (TxDOT will need to add culvert boxes under I-10 at SH-65 and SH 124 and widen) Issues: It will no longer be a detention pond due to feasibility study. It will be ditch widening project that TBCD has an HMGP application submitted. Recommendations: Work product has changed but ongoing. Will move to 2022 Actions.
Mitigation Action No. 4 - Spindletop 2 – Construct a detention pond on Ogden Ditch to serve the upper west side of the Winnie Community Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $3,500,000	Update: A drainage study was done that determined construction of a detention pond is not feasible. Therefore, the project has changed to widen Odgen Ditch. TBCD submitted an HMGP application in to widen Spindletop Ditch from the intersection of I-10 and SH-65 to SH-124. This widening will allow capacity to increase from 1000 cubic feet to 4000 cubic feet (TxDOT will need to add culvert boxes under I-10 at SH-65 and SH 124 and widen) Issues: It will no long be a detention pond due to feasibility study. It will be ditch widening project that TBCD has an HMGP application submitted. Recommendations: Remove. This is now part of Spindletop Ditch (see No. 3 above).
Mitigation Action No.5 - Turtle Bayou 1 – Enlarge Spring Branch Diversion, including one road crossing, to serve the south side of Hankamer.	Update: Spring Branch Diversion was last studied approximately 20 years ago. The study needs to be updated to determine feasibility of enlarging the diversion.

Mitigation Actions in Current Plan (2015)	Update on Status and Recommendation
Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $1,100,000	Issues: As the Spring Branch Diversion study is dated, it should be updated so that current mitigation projects can be determined. Recommendations: Work product has changed but ongoing. Will move to 2022 Actions.
Mitigation Action No. 6 - Turtle Bayou 2 Construct a Detention Pond on Whites Bayou to serve the area south of I-10 and north of Anahuac Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $3,500,000	Update: Merge with Turtle Bayou 1. Issues: Same issues as Turtle Bayou 1. Recommendation: Will be merged with updating study. This action will be removed in next plan and not include in action prioritization.
Mitigation Action No. 7 - (Jenkins Weir Floodgates – Reconstruct the failing Jenkins Weir to provide flood protection on the West Fork Double Bayou, north of I-10. Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $2,600,000	Update: The floodgates were repaired. Materials have been purchased for replacement which will be completed by TBCD when time and funds permit. Issues: NONE Recommendation: Ongoing. Priority moved to medium as the repair was done until replacement can be done. Will move to 2022 Actions.
Mitigation Action No. 8 - Elm Bayou Drainage Improvements – Enlarge the floodgate structure, enlarge road crossings and enlarge the ditch. Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $3,500,000	Update: Ongoing. TBCD rebuilt the floodgates after Hurricane Ike. However, before any improvements are made, an Elm Bayou Watershed study needs to be completed. Issues: NONE Recommendation: Work product has changed but ongoing. Will move to 2022 Actions.
Mitigation Action No. 9 - Onion Bayou Crossing Improvements – Enlarge the Onion Bayou floodgates and crossing structure.	Update: Ongoing. TBCD replaced the floodgates with aluminum flap gates after Hurricane Ike and widened the crossing structure. However, before any

Mitigation Actions in Current Plan (2015)	Update on Status and Recommendation
Hazard(s) Addressed: Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $2,900,000	improvements are made, an Onion Bayou Watershed study needs to be completed. Issues: NONE Recommendation: Work product has changed but ongoing. Will move to 2022 Actions.
Mitigation Action No. 10 - East Bay Watershed Drainage Improvements – Enlarge the floodgate structure, enlarge road crossings and enlarge the ditch. Addressed Hazard - Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $4,300,000	Update: Ongoing. However, before any improvements are made, an East Bay Watershed study needs to be completed. Issues: NONE Recommendation: Work product has changed but ongoing. Will move to 2022 Actions.
Mitigation Action No. 11 – Anahuac Outfall Enlargement – Enlarge the Anahuac Outfall Ditch, including road crossings, to serve the majority of Anahuac Addressed Hazard - Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $3,100,000	Update: Ongoing. While the City of Anuahuac did a drainage project that took much of the drainage and moved it to the Bay. However, before any improvements are made, a watershed study needs to be completed. Issues: NONE Recommendation: Work product has changed but ongoing. Will move to 2022 Actions.
Mitigation Action No. 12 Mayhaw Lateral 1 – Enlarge Mayhaw Lateral 1 and extend the channel to drain the area west of SH124 and south of Buccaneer, including road crossings Addressed Hazard - Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $1,700,000	Update: Ongoing. A drainage ditch was placed around the school that included replacing box culverts and crossings using $3 million HMGP fund from Hurricane Ike. Issues: While some work has been completed, a phase II is needed to continue the drainage improvements. TBCD applied for a grant through the HMGP COVID application process. Recommendation: Ongoing. Phase 2 will be added to the 2022 actions.
Mitigation Action No. 13 – (Mayhaw Bayou – Enlarge Mayhaw bayou, including	Update: Ongoing. TBCD applied under HMGP COVID grant.

Mitigation Actions in Current Plan (2015)	Update on Status and Recommendation
road crossings from Rice Festival Park to the County line. Addressed Hazard - Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $3,400,000	Issues: NONE Recommendation: Ongoing. Will be merged with Mayhaw lateral and will be added to the 2022 actions.
Mitigation Action No. 14 Spindletop Lateral 4 – Enlarge drainage channel to serve the area west of Meneley and north of Buccaneer Addressed Hazard - Flood, Hurricanes and Tropical Storms Priority: High Estimated Cost: $1,500,000	Update: COMPLETED. Issues: NONE Recommendation: Will be removed in next plan and not include in action prioritization.
Mitigation Action No. 15 – Generator for New Building Addressed Hazard - Flood, Hurricanes and Tropical Storms, severe storms/high winds Priority: High Estimated Cost: $1,000,000	Update: COMPLETED. Issues: NONE Recommendation: Will be removed in next plan and not include in action prioritization.
Mitigation Action No. 16 – Harden portion of New TBCD Administration Building. Addressed Hazard - Flood, Hurricanes and Tropical Storms, several storms/high winds Priority: High Estimated Cost: $250,000	Update: COMPLETED. Issues: NONE Recommendation: Will be removed in next plan and not include in action prioritization.

Mitigation Actions in Current Plan (2015)	Update on Status and Recommendation
Mitigation Action No. 17 – Hurricane Shutters for New Administrative Building Addressed Hazard - Flood, Hurricanes and Tropical Storms, severe storms/high winds Priority: High Estimated Cost: $100,000	Update: COMPLETED. Although not by shutters, instead TBCD installed windows that can withstand winds up to 150 mph. Issues: NONE Recommendation: Will be removed in next plan and not include in action prioritization.
Mitigation Action No. 18 – Develop and adopt a master drainage plan in order for TBCD to exercise the authority granted under Chapter 49.211 of the Texas Water Code. Chapter 49.211 requires districts to adopt master drainage plans before adopting rules relating to the review and approval of proposed development drainage plans. Addressed Hazard - Flood, Hurricanes and Tropical Storms, Priority: Medium Estimated Cost: $1,000,000	Update: Ongoing. Working with other jurisdictions supporting their studies (e.g., County, JCDD6 watershed study). Master drainage plan would be optimal for the District with funding. Issues: NONE Recommendation: Ongoing. Will be added to the 2022 actions.
Mitigation Action No. 19 – Create severe weather action plan, conduct drills, identify and promulgate evacuation and sheltering options. Addressed Hazard - Flood, Hurricanes and Tropical Storms, Severe Thunderstorms, and High Winds Priority: Medium Estimated Cost: $25,000	Update: Ongoing. TBCD has in place Debris Administrator contract and fuel under contract in advance of severe weather impacts. In addition, there are policies in place for essential personnel shelter in place at TBCD headquarters and the water treatment plants. For all administrative support, there is a plan and mechanism in place for contingency remote work abilities for staff in the event of evacuation as the two water plants are online. This iteration of the plan as part of the action, TBCD will including the need for fuel tanks so that gas is available to support the generators. Issue: Funding Recommendation: Will keep as action item.

Identification of New Actions
After a review of the actions from the last plan, the MPC began a process to identify new actions. They primary types of mitigation actions to reduce long-term vulnerability include:

- Local plans and regulations;
- Structure and infrastructure projects;
- Natural systems protections;
- Initiatives; and
- Education and Awareness programs.

The MPC utilized a version of FEMA's Mitigation Implementation Action Summary Worksheet to help describe important information about the action. After the actions were prioritized (discussed next section), the Actions Summary Worksheets were converted into the Mitigation Action Table 4-3.

Evaluate and Prioritize
In order to evaluate feasibility and analyze prioritization of actions, all new and existing actions were reviewed by the MPC. The process utilized the Mitigation Action Implementation Tool. The MPC was asked to consider the feasibility of identified mitigation actions as high, medium or low and using the Mitigation Action Evaluation Tool (Life Safety, Property Protection, Technical, Political, Legal, Environmental, Social, Administration, Local Champion, and Other Community Objectives) rank the category 1-10 with 1 being a low priority for the category and 10 being a high for the category. Low is defined as 1-50; Medium is defined as 51-75; and High is defined as 76-100. The results are depicted in Tables 4-2 and 4-3. Table 4-2 lists the action by mitigation type (e.g. Education and Awareness) and provides the hazard(s) addressed. Table 4-3 is a summary of the mitigation action by priority which High and numeric value indicating the mitigation action number. Cost-effectiveness was considered with each action.

Table 4-2 - Mitigation Scoring for Prioritization

Mitigation Action Prioritization (1-10) Ranked with 1 being low priority for that category and 10 being high for the Category Minimum Score: 1 Maximum Score 100 TOTAL SCORE BETWEEN 1-50 HAZARD IS LOW PRIORITY (L) TOTAL SCORE BETWEEN 51-75 HAZARD IS MEDIUM PRIORITY (M) TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH PRIORITY (H)	Life Safety	Property	Technical	Political	Legal	Environmental	Social	Admin	Local Champ	Other Comm	Total	Priority	Addressed Hazard DR: Drought EH: Extreme Heat F: Flood (includes landslides, erosion) H/TS: Hurricane/Tropical Storm (includes Storm Surge) SU: Subsidence T/HW: Severe Thunderstorm/ High Wind T: Tornado W: Winter storm WF: Wildfire
Education and Awareness													
Severe Weather Action Plan	5	5	7	7	10	7	1	6	10	9	67	M	DR, EH, F, H/TS, T/HW, T, W, WF
Enhance TBCD internal GIS Capabilities	4	10	10	7	10	7	1	10	10	10	79	H	DR, F, H/TS, SU, T/HW, T, W,WF
Create public education program on mitigation techniques they can do for water conservation methods for drought andprotect people and property from hazards	5	8	7	8	9	8	1	7	9	8	70	M	DR,EH, F, H/TS, SU, T/HW, T, W,WF
Structure/Infrastructure													
Mayhaw and I-10 Culvert Improvements	9	9	10	10	10	9	1	9	10	9	86	H	F, H/TS, T/HW
Spindletop Bayou Drainage Improvements	9	9	10	10	10	9	1	9	10	9	86	H	F, H/TS, T/HW
Mayhaw Bayou Drainage Improvements - Phase II	8	8	10	8	9	7	1	8	9	8	76	H	F, H/TS, T/HW
Fuel Tanks at Critical Facilities	7	9	10	8	9	8	1	8	9	7	76	H	EH, F, H/TS, T/HW, T, W, WF
Elevation of Homes near Spindletop Watershed	9	8	10	8	10	8	1	8	9	9	80	H	F, H/TS, T/HW
Winterization of Winner Water Treatment Plant	8	8	9	8	9	7	1	7	10	9	76	H	W
Winnie Lift Station Improvements	9	8	9	9	9	8	1	7	9	8	77	H	F, H/TS, T/HW
Winnie Sewer Rehabilitation Improvements	8	8	9	8	9	8	1	8	9	9	77	H	F, H/TS, T/HW
Hankamer Plant Expansion	9	10	10	9	10	8	1	10	10	9	86	H	F, H/TS, T/HW
Highway 61 Forcemain improvements	9	10	10	8	10	8	1	9	10	9	84	H	F, H/TS, T/HW
Oak Island Sanitary Sewer Collection System Rehabilitation	9	9	9	7	9	7	1	8	9	8	76	H	F, H/TS, T/HW
New Wastewater Treatment Plant West side of Winnie	9	9	9	7	9	7	1	8	9	8	76	H	F, H/TS, T/HW
Oak Island Wasterwater Treatment Plant Project	9	9	9	7	9	7	1	8	9	8	76	H	F, H/TS, T/HW
Replace wooden Brown and Root saltbarrier structures with new, metal saltbarrier structures	8	8	9	8	9	8	1	8	9	9	77	H	F, H/TS, T/HW
Spindletop Diversion Channel	7	7	8	7	8	6	1	7	9	7	67	M	F, H/TS, T/HW
Add generators that are elevated above Base Flood Elevation at the lift stations	10	7	7	6	8	6	1	6	9	8	68	M	F/H/TS, T/HW
Add Hurricane Shutters to TBCD Main Building	10	7	7	6	8	7	1	8	9	9	72	M	F/H/TS, T/HW, T
Replace exterior and interior doors with Steel doors at the TBCD Main Building	10	7	7	7	9	8	1	8	9	9	75	M	F/H/TS, T/HW, T
Add tornado shelters at each water plant facility	10	7	7	7	9	8	1	8	9	9	75	M	T
Create a cooling station at TBCD Main Building to provide employees working outside ia cool location in the event of heat exposure/exhaustion	10	7	7	6	8	7	1	8	9	9	72	M	EH
Add thermal barriers (window tinting) on TBCD Main Building	5	7	8	6	7	6	1	6	9	7	62	M	EH
Natural Systems Protections													
Jenkins Weir Floodgates	7	7	8	7	8	6	1	7	9	7	67	M	F, H/TS, T/HW
Keep vegetation clear around the Marsh to reduce flammable material	6	7	7	6	8	6	1	6	9	8	64	M	WF
Add a waterline with fire hydrants on I-10	9	9	9	7	9	7	1	8	9	8	76	H	WF
Continue to construct a levee system around Robinson Lake	8	8	9	8	9	8	1	8	9	9	77	H	F, H/TS, SU, T/HW
Replace landscape around Main TBCD building with drought tolerant varieties and create defensible spaces around facilitiies	5	7	8	6	7	6	1	6	9	7	62	M	DR, WF
Find drought resistant grasses to preserve grasses used for soil stabilization	6	7	7	6	8	6	1	6	9	8	64	M	DR
Initiatives													
Add rain gauges at critical watershed points	8	8	9	9	9	7	1	8	9	8	76	H	DR, F, H/TS, T/HW
Local Plans (studies/reports)/Regulations													
Updating Spring Branch Diversion Study to Determine Feasibility of Enlarging	8	6	7	7	9	7	1	7	9	7	68	M	F, H/TS, T/HW
Elm Bayou Watershed Study	7	5	7	7	8	6	1	7	9	8	65	M	F, H/TS, T/HW
Onion Bayou Watershed Study	7	7	7	6	8	6	1	6	9	8	65	M	F, H/TS, T/HW
East Bay Watershed Study	6	7	7	6	8	6	1	6	9	8	64	M	F, H/TS, T/HW
Anahuac Outfall Ditch Study	6	7	7	6	8	7	1	8	9	9	68	M	F, H/TS, T/HW
Master Drainage Plan	8	7	7	7	9	8	1	8	9	9	73	M	F, H/TS, T/HW
Double Bayou Drainage Relief Watershed Study	7	7	7	7	9	7	1	7	9	8	69	M	F, H/TS, T/HW

Table 4-3 - Mitigation Action Summary of Prioritization

Action Table No.	MITIGATION ACTION SUMMARY OF PRIORITIZATION TOTAL SCORE BETWEEN 1-50 HAZARD IS LOW PRIORITY (L) TOTAL SCORE BETWEEN 51-75 HAZARD IS MEDIUM PRIORITY (M) TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH PRIORITY (H)	Total	Priority
1	Spindletop Bayou Drainage Improvements	86	H
2	Mayhaw and I-10 Culvert Improvements	86	H
18	Hankamer Plant Expansion	86	H
19	Highway 61 Forcemain Improvements	84	H
14	Elevation of Homes near Spindletop Watershed	80	H
20	Enhance TBCD internal GIS Capabilities	79	H
16	Winnie Lift Station Improvements	77	H
17	Winnie Sewer Rehabilitation Improvements	77	H
28	Replace wooden Brown and Root saltbarrier structures with new, metal saltbarrier structures	77	H
30	Continue to construct a levee system around Robinson Lake	77	H
9	Mayhaw Bayou Drainage Improvements - Phase II	76	H
12	Fuel Tanks at Critical Facilities	76	H
15	Winterization of Winnie Water Treatment Plant	76	H
21	Oak Island Sanitary Sewer Collection System Rehabilitation	76	H
22	Oak Island Wastewater Treatment Plant Project	76	H
25	Add rain gauges at critical watershed points	76	H
26	New Wastewater Treatment Plant West side of Winnie	76	H
29	Add a waterline with fire hydrants on I-10	76	H
34	Replace exterior and interior doors with Steel doors at the TBCD Main Building	75	M
35	Add tornado shelters at each water plant facility	75	M
10	Master Drainage Plan	73	M
33	Add Hurricane Shutters to TBCD Main Building	72	M
36	Create a cooling station at TBCD Main Building to provide employees working outside ia cool location in the event of heat exposure/exhaustion	72	M
23	Create public education program to educate public on mitigation techniques they can do for water conservation methods for drought and protect people and property from hazards	70	M
13	Double Bayou Drainage Relief Watershed Study	69	M
3	Updating Spring Branch Diversion Study to Determine Feasibility of Enlarging	68	M
8	Anahuac Outfall Ditch Study	68	M
32	Add generators that are elevated above Base Flood Elevation at the lift stations	68	M
27	Spindletop Diversion Channel	67	M
4	Jenkins Weir Floodgates	67	M
11	Severe Weather Action Plan	67	M
5	Elm Bayou Watershed Study	65	M
6	Onion Bayou Watershed Study	65	M
7	East Bay Watershed Study	64	M
31	Keep vegetation clear around the Marsh to reduce flammable material	64	M
38	Find drought resistant grasses to preserve grasses used for soil stabilization	64	M
37	Add thermal barriers (window tinting) on TBCD Main Building	62	M
24	Replace landscape around Main TBCD building with drought tolerant varieties and create defensible spaces around facilities.	62	M

New Mitigation Actions

The District has 38 actions for this iteration of the plan and information regarding each action is described in The Mitigation Action Table 4-4. Each action provides:

- Title and if moved from past plan or is a new action for this iteration
- Hazards that action addresses
- Description of the action
- The agency that would lead the efforts on the action
- Estimated cost and potential funding sources
- Approximate time frame for project
- The Priority it received (H/M/L)
- If the action protects current buildings and infrastructure, or new or both
- Discussion of cost and benefit considerations.

Table 4-4 TBCD Mitigation Actions 1-38

2022 MITIGATION ACTION TABLE * A= Actions reducing risk to existing buildings and infrastructure * B= Actions reducing risk to new development Action # 1			
Title: SPINDLETOP BAYOU DRAINAGE IMPROVEMENTS (moved from current plan into new actions)			
Hazard	Description/Issue	Implementing Department	
Flood Hurricane/TS Thunderstorm/High Wind	Widening Spindletop Ditch from the intersection of Interstate-10 and State Highway 65 to State Highway 124. Bridges need to be increased from 1,400 square feet to 4,000 square feet for the increase water flow.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$27,545,000.00	2022-2027	H	A/B
Cost and Benefits Considerations			
TBCD has submitted an HMGP application for this work.			

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 2

Title: MAYHAW AND I-10 CULVERT IMPROVEMENTS
(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	Adding four box culverts on the access roads which will run perpendicular to Interstate-10 at Ledoux Road (3) and Koch Road (1) intersections and rebuild the headwalls.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$2,420,000.00	2022-2027	H	A/B

Cost and Benefits Considerations
TBCD has submitted an HMGP application for this work.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 3

Title: UPDATING SPRING BRANCH DIVERSION STUDY TO DETERMINE FEASIBILITY OF ENLARGING

(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	The Spring Branch Diversion was last studied approximately 20 years ago. The study needs to be updated to determine the feasibility of enlarging the Diversion to possibly include one road crossing to serve the south side of Hankamer (Turtle Bayou) and constructing a detention Pond on Whites Bayou to serve the area south of I-10 and north of Anahuac (Whites Bayou).	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$250,000-$500,000	2022-2027	H	A/B

Cost and Benefits Considerations
This study will help with project scoping and developing hazard mitigation projects and alternatives, including feasibility studies and engineering design.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 4

Title: JENKINS WEIR FLOODGATES
(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	The floodgates were failing which provided flood protection on the west Fork Double Bayou, north of I-10. The floodgates were repaired until the replacement could take place. Materials have been purchased for the replacement which will be completed by TBCD when time and funds permit.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$2,600,000.00	2022-2027	M	A/B

Cost and Benefits Considerations

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 5

Title: ELM BAYOU WATERSHED STUDY

(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	TBCD rebuilt the floodgates after Hurricane Ike. However, before any improvements are made, an Elm Bayou watershed study needs to be completed.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$250,000-$500,000	2022-2027	M	A/B

Cost and Benefits Considerations
This study will help with project scoping and developing hazard mitigation projects and alternatives, including feasibility studies and engineering design.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 6

Title: ONION BAYOU WATERSHED STUDY
(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	While TBCD replaced the floodgates with aluminum flap gates after Hurricane Ike and widened the crossing structure, an Onion Bayou watershed study needs to be completed.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$250,000-$500,000	2022-2027	M	A/B

Cost and Benefits Considerations
This study will help with project scoping and developing hazard mitigation projects and alternatives, including feasibility studies and engineering design.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 7

Title: EAST BAY WATERSHED STUDY
(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	An East Bay Watershed study is needed to help determine what projects would best alleviate flooding for the area.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$250,000-$500,000	2022-2027	M	A/B

Cost and Benefits Considerations
This study will help with project scoping and developing hazard mitigation projects and alternatives, including feasibility studies and engineering design.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action # 8

Title: ANAHUAC OUTFALL DITCH
(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	While the City of Anuahuac did a drainage project that took much of the drainage and moved it to the Bay, an Anahuac Outfall Ditch study is needed to help determine what projects would best alleviate flooding for the area.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$250,000-$500,000	2022-2027	M	A/B

Cost and Benefits Considerations
This study will help with project scoping and developing hazard mitigation projects and alternatives, including feasibility studies and engineering design.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action # 9

Title: MAYHAW BAYOU DRAINAGE IMPROVEMENTS - PHASE II
(moved from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	A drainage ditch was placed around the school that included replacing box culverts and crossings using $3 million GLO (Mayhaw lateral and Mayhaw Bayou) funds from Hurricane Ike. While some work has been completed, a phase II is needed to continue the drainage improvements. Enlarge Mayhaw Bayou, including road crossings from Rice Festival Park to the County line and lateral from Mayhaw Bayou to SH124 down LeBlanc using 6x6 concrete boxes.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$5,000,000.00	2022-2027	H	A/B

Cost and Benefits Considerations
TBCD has submitted an HMGP application for this work.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 10

Title: MASTER DRAINAGE PLAN
(from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	Develop and adopt a master drainage plan in order for TBCD to exercise the authority granted under Chapter 49.211 of the Texas Water Code. Chapter 49.211 requires districts to adopt master drainage plans before adopting rules relating to the review and approval of proposed development drainage plans.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$1,000,000.00	2022-2027	M	A/B

Cost and Benefits Considerations

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 11

Title: SEVERE WEATHER ACTION PLAN
(from current plan into new actions)

Hazard	Description/Issue	Implementing Department
Drought Extreme Heat Flood Hurricane/TS Thunderstorms/HW Tornado Winterstorm Wildfire	TBCD has in place both Debris Administrator contract and fuel contract in advance of severe weather impacts. In addition, there are policies in place for essential personnel shelter in place at TBCD headquarters and the water treatment plants. For all administrative support, there is a plan and mechanism in place for contingency remote work abilities for staff in the event of evacuation as the two water plants are online. This iteration of the plan as part of the action, TBCD will including the need for fuel tanks so that gas is available to support the generators.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$25,000.00	2022-2027	M	A/B

Cost and Benefits Considerations

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 12

Title: 2022 NEW ACTION: FUEL TANKS AT CRITICAL FACILITIES

Hazard	Description/Issue	Implementing Department
Extreme Heat Flood Hurricane/TS Thunderstorms/HW Tornado Winter Storm Wildfires	In addition to the Main building, TBCD has 2 Water Treatment Plants and 4 Sewer Plants. While equipped with generators in event of power loss, without a dedicated fuel source, the generators could stop performing without gas. During massive outages, while fuel contracts are in place, there is a timeframe from power outage to delivery that must be accounted for. Therefore, TBCD needs permanent, onsite fuel tanks at the Administration Building so that gas and diesel fuel are available to support the generators and transportation to the generators.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$150,000.00	2022-2025	H	A

Cost and Benefits Considerations

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 13

Title: 2022 NEW ACTION: DOUBLE BAYOU DRAINAGE RELIEF WATERSHED STUDY

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	In order to help alleviate flooding from the Double Bayou, including East and West Fork Double Bayou areas, a feasibility study on best way to improve drainage from the intersection of Sykes and South Main to SH-563 is needed.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$250,000-$500,000	2022-2027	M	A/B

Cost and Benefits Considerations

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action # 14

Title: 2022 NEW ACTION: ELEVATION OF HOMES NEAR SPINDLETOP WATERSHED

Hazard	Description/Issue	Implementing Department
Flood Hurricane/TS Thunderstorm/High Wind	Lead a grant effort to have approximately 10-20 homes elevated in the east part of the County at the Spindletop Watershed area.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$4,000,000.00	2022-2032	H	A

Cost and Benefits Considerations

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action # 15

Title: 2022 NEW ACTION: WINTERIZATION OF WINNIE AND ANUHAC WATER TREATMENT PLANTS

Hazard	Description/Issue	Implementing Department
Winter Storm	Build a metal building enclosure over the discharge pumps that are outside of the water treatment plants	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$4,000,000.00	2022-2032	H	A

Cost and Benefits Considerations

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 16

Title: 2022 NEW ACTION: WINNIE LIFT STATION IMPROVEMENTS (including back up permanent generators and communications at each site)

Hazard	Description/Issue	Implementing Department
Flood Hurricanes/TS Thunderstorm/HW	The lift stations flooded in the past. Therefore, elevate the tank and put new controls and rebuild the station so that they won't flood again to include back up permanent generators and communications at each site.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$2,000,000.00	2022-2027	H	A

Cost and Benefits Considerations
TBCD has submitted an HMGP application for this work.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 17

Title: 2022 NEW ACTION: WINNIE SEWER REHABILIATION IMPROVEMENTS

Hazard	Description/Issue	Implementing Department
Flood Thunderstorms/HW Hurricanes/TS	Replacing the existing piping with HDPE and then smoke test the lines for leaking in the lines from the Street to each house.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$2,910,000.00		H	A

Cost and Benefits Considerations
TBCD has submitted an HMGP application for this work.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 18

Title: 2022 NEW ACTION: HANKAMER PLANT EXPANSION

Hazard	Description/Issue	Implementing Department
Flood Hurricanes/TS Thunderstorm/HW	Due to the growth in the area, the current .3 MGD is at capacity and will be insufficient in the near future, therefore, TBCD needs to add .3 Million Gallons per day (MGD) at the Steel Waste water Treatment plant	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$9,000,000.00	2022-2027	H	A

Cost and Benefits Considerations
GLO provided a grant for the .3 MGD, however, with the growth in the area another .3 MGD is needed

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 19

Title: 2022 NEW ACTION: HIGHWAY 61 FORCEMAIN IMPROVEMENTS

Hazard	Description/Issue	Implementing Department
Flood Hurricanes/TS Thunderstorm/HW	Rapid development between Highway 61 and I-10 requires enlarging the current forcemain from 4 to 10 and then on the other side of I-10 10 to 12.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$1,700,000.00	2022-2024	H	A

Cost and Benefits Considerations
TBCD has submitted an HMGP application for this work.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 20

Title: 2022 NEW ACTION: ENHANCE TBCD'S GIS CAPABILITIES

Hazard	Description/Issue	Implementing Department
Drought Flood Hurricane/TS Thunderstorm/High Wind Subsidence Tornado Winter storm Wildfire	TBCD does not have internal GIS capabilities. Help with identification and mapping (ARCGIS over 20 years old that is being currently used).	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
Cost Estimate: $20,000-50,000 grants	2022-2032	H	A/B

Cost and Benefits Considerations
Cost is for purchasing new software programs and hardware and training.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 21

Title: 2022 NEW ACTION: OAK ISLAND SANITARY SEWER COLLECTION SYSTEM REHABILITATION

Hazard	Description/Issue	Implementing Department
Flood Hurricanes/TS Thunderstorm/HW	The Oak Island sanitary sewer collection is in such poor condition the gravity lines remain in a "charged" condition from infiltration and inflow. Project will provide approximately 30,350 LF of six and eight inch gravity sewer rehabilitation by method of pipe bursting and will harden again infiltration and inflow as well as provide for prevention of overflow. Once installed, smoke test will be done to make sure of no leakages.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$3,500,000.00	2022-2032	H	A/B

Cost and Benefits Considerations
Oak Island is a sea level, so inundating with average storm events and ground water infiltration.

2022 MITIGATION ACTION TABLE

* A= Actions reducing risk to existing buildings and infrastructure

* B= Actions reducing risk to new development

Action # 22

Title: 2022 NEW ACTION: OAK ISLAND WASTEWATER TREATMENT PLANT PROJECT

Hazard	Description/Issue	Implementing Department
Flood Hurricanes/TS Thunderstorm/HW	The Oak Island wastewater treatment plant is in poor condition and is susceptible from future storm damages and flooding. The project will provide for a new 0.2 MGD concrete wastewater treatment facility and lift station.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$6,375,000.00	2022-2032	H	A/B

Cost and Benefits Considerations
It flooded during Ike with storm surge of over 25 feet overtopping the eight foot hurricane fence around it.

* A= Actions reducing risk to existing buildings and infrastructure * B= Actions reducing risk to new development Action #23
Title: New Action - CREATE PUBLIC EDUCATION PROGRAM ON PROTECTION FROM HAZARDS AND WATER CONSERVATION

Hazard	Description/Issue	Implementing Department	
Drought Extreme Heat Flood Hurricane/TS Thunderstorm/High Wind Subsidence Tornado Winter storm Wildfire	Create public education program to educate public on mitigation techniques that can do to protect people and property from hazards. Create water conservation methods to be sent to the public in advance of drought contingency.	TBCD	
Cost Estimate/Funding	**Time Frame**	**Priority**	**Risk Focus (A/B) ***
Cost Estimate: $5,000	2022-2032	M	A/B
Cost and Benefits Considerations			
Will help the public in advance of events.			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #24

Title: New Action - REPLACE LANDSCAPE AROUND MAIN TBCD DISTRICT WITH DROUGHT TOLERANT VARIETIES AND DEFENSIBLE SPACE

Hazard	Description/Issue	Implementing Department	
Drought Wildfire	The District will replace any drought resistant landscape with drought tolerant varieties as well as create defensible space to protects its infrastrucure.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
Cost Estimate: $5,000	2022-2027	M	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #25

Title: New Action - ADD RAIN GAUGES AT CRITICAL WATERSHED POINTS

Hazard	Description/Issue	Implementing Department	
Drought Flood Hurricane/Tropical Storms Thunderstorm/High winds	Rain gauges provide critical data to help with analyzing real time information to help with scoping project and preparing grant applications. In addition, farmers and other jurisdictions use the data.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$75,000	2022-2032	H	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #26

Title: New Action - NEW WASTEWATER TREATMENT PLANT WEST SIDE OF WINNIE			
Hazard	Description/Issue	Implementing Department	
Flood Hurricane/Tropical Storms Thunderstorm/High winds	Due to rapid growth forecast (500-1000 single family homes) on the west side of Winnie, in order to meet the capacity at that location, a new .3 MGD plant would need to be built.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$9,000,000	2022-2027	H	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development
Action #27

Title: New Action - SPINDLETOP DIVERSION DITCH

Hazard	Description/Issue	Implementing Department
Flood Hurricane/Tropical Storms Thunderstorm/High winds	THREE PARTS TO PROJECT: PART 1 A diversion channel, just downstream of the confluence with Ogden Ditch west of Spindletop Bayou, is proposed to reduce the contributing stormwater along Spindletop Bayou. This proposed diversion channel will discharge at the Gulf Intercostal Waterway. A lateral structure was used in the HEC-RAS model to simulate the weir structure to divert water from the main stem to the proposed channel. In this alternative condition, there would be approximately 1,300 cfs diverted from Spindletop Bayou to the proposed channel. Bentley FlowMaster software package was used to size the diversion channel to convey diverted flows in this alternative. Construct approximately 63,150 feet of earthen/grass channel with side slopes 4:1. Bottom width 165 feet and top width 200 feet. PART 2: Culvert Improvements at IH-10 along Unnamed Tributary 1 Proposes a replacement of the existing box culverts with larger sizes to reduce the WSEL at the road. This improvement would reduce the WSEL by 3.37 feet at IH-10. by replace approximately 275 linear feet (LF) of (3) 6-ft by 4-ft RCBC with (3) 12-ft by 10-ft RCBC. PART 3: This improvement alone will decrease WSEL by 0.2 feet at the service road north of IH-10 by replacing approximately 245 LF of (5) 10-ft by 10-ft RCBC with (7) 12-ft by 12-ft RCBC.	TBCD

Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B)
PART 1: $111,000,000 PART 2: $ 2,550,000 PART 3: $ 5,900,000	2025-2035	M	A/B

Cost and Benefits Considerations

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #28

Title: New Action - REPLACE WOODEN BROWN AND ROOT SALTBARRIER STRUCTURE			
Hazard	Description/Issue	Implementing Department	
Flood Hurricane/Tropical Storms Thunderstorm/High winds	Replace wooden Brown and Root saltbarrier structures with new, concrete saltbarrier structures.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$2,500,000	2025-2035	H	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #29

Title: New Action - WATERLINE ON I-10			
Hazard	Description/Issue	Implementing Department	
Wildfire	Add a waterline with fire hydrants on I-10 from SH 124 to FM 1724.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$6,000,000	2025-2035	H	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #30

Title: New Action - CONTINUATION OF ROBINSON LAKE LEVEE SYSTEM			
Hazard	Description/Issue	Implementing Department	
Flood Hurricane/Tropical Storms Subsidence Thunderstorm/High winds	Continue to construct a levee system around Robinson Lake.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$10,000,000	2025-2035	H	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #31

Title: New Action - VEGETATION CLEARING NEAR MARSH			
Hazard	Description/Issue	Implementing Department	
Wildfire	Keep vegetation clear around the Marsh to reduce flammable material.	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$75,000	2025-2035	M	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #32

Title: New Action - ADD GENERATORS ABOVE BFE AT LIFT STATIONS			
Hazard	Description/Issue	Implementing Department	
Flood Hurricane/Tropical Storms Thunderstorm/High winds	Add generators and have them raised above the base flood elevation (BFE) at each lift station	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$75,000	2025-2035	M	A/B
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #33

Title: New Action - ADD HURRICANE SHUTTERS TO TBCD MAIN BUILDING			
Hazard	Description/Issue	Implementing Department	
Flood Hurricane/Tropical Storms Thunderstorm/High winds Tornadoes	Add Hurricane shutters to further harden the TBCD Main Building	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$100,000	2025-2035	M	A
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #34

Title: New Action - REPLACE EXTERIOR AND INTERIOR DOORS WITH STEEL DOORS AT TBCD MAIN BUILDING			
Hazard	Description/Issue	Implementing Department	
Flood Hurricane/Tropical Storms Thunderstorm/High winds Tornadoes	Replace interior doors with Steel doors at the TBCD Main Building	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$100,000	2025-2035	M	A
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #35

Title: New Action - ADD TORNADO SHELTERS AT EACH WATER PLANT FACILITY			
Hazard	Description/Issue	Implementing Department	
Tornadoes	Add a tornado shelter at each water plant facility	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$150,000	2025-2035	M	A
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #36

Title: New Action - CREATE A COOLING STATION AT TBCD MAIN BUILDING			
Hazard	Description/Issue	Implementing Department	
Extreme Heat	Create a cooling station at TBCD Main Building to provide employees working outside ia cool location in the event of heat exposure/exhaustion	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$5,000	2025-2035	M	A
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #37

Title: New Action - ADD THERMAL BARRIERS (WINDOW TINTING) ON TBCD Main Building			
Hazard	Description/Issue	Implementing Department	
Extreme Heat	Add thermal barriers (window tinting) on Main buildings to keep building temperatures cooler in summer months	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$5,000	2025-2035	M	A
Cost and Benefits Considerations			

* A= Actions reducing risk to existing buildings and infrastructure
* B= Actions reducing risk to new development

Action #38

Title: New Action - PROCURE DROUGHT RESISTANT GRASSES FOR SOIL STABILIZATION			
Hazard	Description/Issue	Implementing Department	
Drought	Find drought resistant grasses to preserve grasses used for soil stabilization	TBCD	
Cost Estimate/Funding	Time Frame	Priority	Risk Focus (A/B) *
$5,000	2025-2035	M	A
Cost and Benefits Considerations			

Section 5 - Plan Maintenance Process

Introduction

The plan maintenance section of this document details the formal process that will ensure that TBCD hazard mitigation plan remains a responsive and relevant document. The maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. It also describes how the District will integrate public participation throughout the plan and implementation process and explain how the District plans to incorporate the mitigation strategies outlined in this plan into existing planning mechanisms.

Update from Last Plan

The process did not change significantly from the last plan. The only update is utilization of the District's website more to disseminate information to the public. The Hazard Mitigation Plan Update is a collaborative process and led by the General Manager of the District who is the coordinator for the annual review, for forwarding any amendments to the Plan to the Texas Division of Emergency Management and for data collections in preparation of year four, where the District will begin the update process to this plan.

Monitoring, Evaluating, and Updating the Plan

The maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years.

The minimum task of the annual hazard mitigation planning team meeting will be the evaluation of the progress of the plan and incorporating the actions into other plans, reviewing risk assessment and hazards, reviewing the strategy and keeping key stakeholders and the public informed and involved. This review will include:

- Summary of any hazard events that occurred during the prior year and their impact on the community.
- Review of successful mitigation action identified in the plan.
- Review actions that were not completed to understand if there are impediments impacting the action. (e.g., financial, technical, etc.)
- Re-evaluate the action plan to determine if the timeline for identified projects remains accurate. (e.g., if funding becomes available, a long-term activity could become a near-term project)
- Recommendation for new mitigation actions and projects.
- Changes in potential for funding.
- Collection of maps and data to help with data needs for next iteration of plan.
- Impact of any other planning programs within the District that involve hazard mitigation.
- Review planning process to ensure key members are involved and updated including stakeholders and the public.
- Review the hazards and the risk assessment to see if any updates or changes occurred or need to be re-assessed.
- Review the goal and strategy to ensure relevancy and current.

In addition to the scheduled reports, the General Manager will convene meetings after damaging natural hazard events to review the effects of such events. Based on those effects, adjustments to the mitigation goals and actions may be made or additional event-specific actions identified. Such revisions shall be documented as outlined below:

Circumstances or conditions under which the TBCD will initiate Plan reviews and updates outside of the annual review:

- On the recommendation of the General Manager or on its own initiative, the District Board may initiate a Plan review at any time.
- At approximately the one-year anniversary of the updated plan's adoption, and every year thereafter (Annual Progress Reports).
- After natural hazard events that appear to significantly change the apparent risk to District assets, operations and/or citizens.
- When activities of the District, County, or the State significantly alter the potential effects of natural hazards on District assets, operations and/or citizen. Examples include completed mitigation projects that reduce risk, or actions or circumstances that increase risk.
- When new mitigation opportunities or sources of funding are identified.

In addition to the circumstances listed above, revisions that warrant changing the text of this Plan update or incorporating new information may be prompted by a number of circumstances, including identification of specific, new mitigation projects, completion of several mitigation actions, or requirements for qualifying for specific funding. Minor revisions may be handled by addenda.

Major comprehensive review of and revisions to this Hazard Mitigation Plan Update will be considered on a five-year cycle. The 2023 Plan will enter its next review cycle sometime in 2027, with adoption of that update in 2028. The MPC will be reconvened to conduct the comprehensive evaluation and revision.

Integration into Existing Plans, Procedures, and Programs

FEMA requires the project requirements from the Hazard Mitigation Plan shall be incorporated into other planning mechanisms, as applicable, during the routine re-evaluation and update of the District Plans. The current hazard mitigation plan was reviewed to assess what data could be used for several District reports that were prepared from 2016-2022. Members of the MPC either participate or provide information to the Cities, Drainage Districts and County capital improvement, comprehensive plan, emergency management plan, engineering design criteria, drainage studies, master utility plan and FIRM review committees to help facilitate data from this plan was reviewed and appropriately incorporated to those plans. Data from the following plans/studies was used as follows:

- 2019 Chambers County Master Drainage Plan - (which includes the Storm water Management Plan) reviewed the ordinances discussed in the plan.
- 2020 Spindletop Bayou Watershed Drainage Study - were reviewed to identify subject areas where mitigation activities and principles can be incorporated.
- 2018 Chambers County Flood Insurance Study (FIS) - Flood Insurance Rate Maps (FIRMs) and the preliminary maps. Chambers County FIS and FIRMs were reviewed to assist with identifying areas vulnerable to flooding within the District.

- 2017 Chambers County Hazard Mitigation Plan Update Chambers (EMP) 2017. As part of the Plan update, the EMP reviewed this plan to assist with identifying the hazards profiled in the HMP update, process and procedures to facilitate update.
- 2018 State of Texas Hazard Mitigation Plan Update- Reviewed hazards profile, data and other information pertinent to the region.

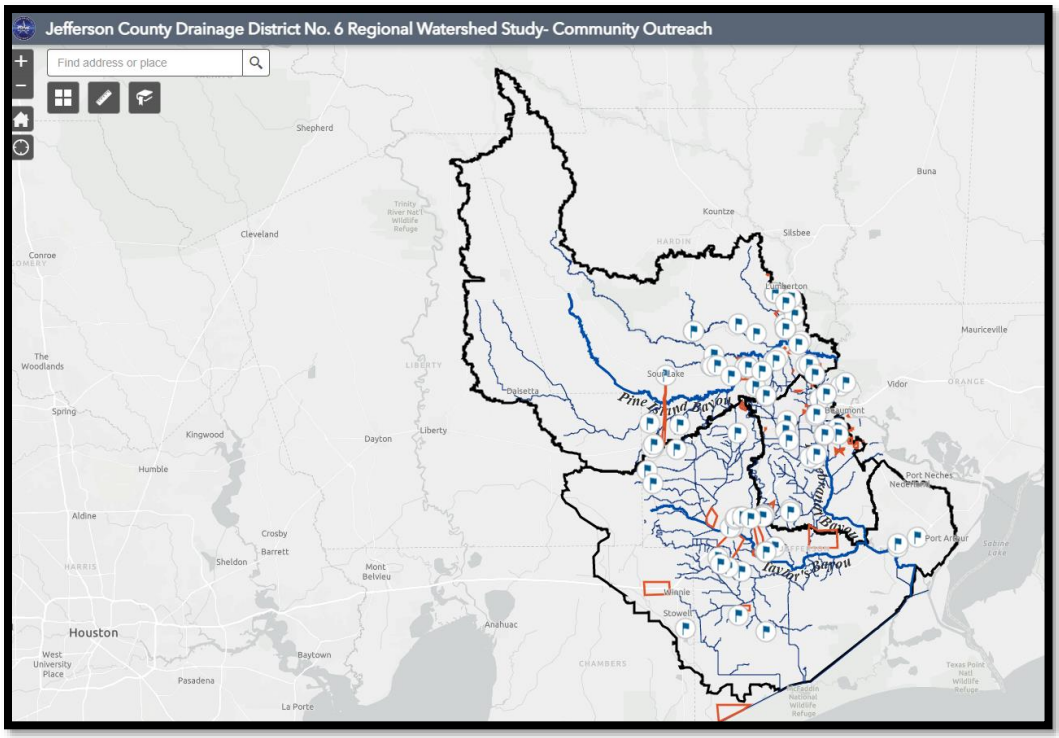
As with all plans and capabilities that are in place, the District continually reviews current documents and best management practices to continue to expand and improve services to our community. To better provide these capabilities, the MPC would continue to reach out to other City and County departments to incorporate their capabilities. This would include setting up meetings with City departments on an annual basis to review and incorporate any new capabilities.

In addition to the reports listed above, the following plans, studies and reports were reviewed, and necessary data was incorporated into this plan update:

- Chambers County HMP update 2023- is working on its plan update at the same time as the District. The District has participated in two of its meetings, July and November as of this plan update.

Also, NOAA's NCEI databases and FEMA RL and SRL Data were used in support of the risk assessment.

Figure RR– Jefferson County Drainage District No. 6 Regional Watershed Study



Plan Update Integration

The District will work with the Houston-Galveston Area Council (H-GAC) to have this current iteration of plan discussed and provide information from it for the hazard and emergency management plans currently being drafted. The District will reach out to the emergency management departments, and engineering departments in the Cities and County to share this plan's risk assessments and actions to discuss collaborative efforts to work together to mitigate risk and viable projects from these actions. TBCD will work with JCDD6 on their Regional Watershed Study that encompasses Taylors Bayou, Hillebrandt Bayou and Pine Island Bayou watershed. The purpose of the project is to identify areas of high flood risk, determine potential sources of flooding and develop large-scale regional flood reduction solutions to mitigate flood risk and as seen by the Map in Figure RR impacts the TBCD planning area. The District will work with formal deadlines (e.g., JCDD6 Regional Watershed Study timeframes) as well as through interagency meetings throughout the year to help continue to share information on this plan updates work.

Continued Public Involvement

Upon adoption of the Plan update, the public will be periodically updated through posts (on the District's website) and on the Annual Progress Reports under the plan monitoring strategy described above.

TBCD will involve the public in the plan maintenance process and during the major comprehensive review to the Plan in the same ways used during the original plan development. The public will be notified when the revision process is started and provided the opportunity to review and comment on changes to the plan and priority action items. It is expected that a combination of informational public meetings, surveys and questionnaires, draft documents posted on the website, and public Board meetings will be undertaken.

APPENDICES

Update from Last Plan:

- Removed descriptions of hazards

APPENDIX A

Minutes from the MPC Meetings

Trinity Bay Conservation District (TBCD)
Hazard Mitigation Plan Update Meeting Minutes
Thursday, September 1, 2022 9:00 am CST MPC Attendees

Attendees	Department
Jerry Shadden	General Manager, Trinity Bay Conservation District
Diane Newsome	Project Manager, Trinity Bay Conservation District
Kristen Thatcher	Plan Consultant, JSWA

Introductions
Background and purpose of hazard mitigation plan (HMP) update

- Updating the HMP helps communities identify and understand risk from natural hazards that impact the community which helps to identify actions to reduce losses from those hazards and establish a coordinated process to implement the plan. It also keeps a community eligible to apply for FEMA mitigation grant funds.
- The current HMP has expired.
- The 2023 plan update will be a single jurisdiction plan.

The plan update process
The plan update will be led by the Mitigation Planning Committee (MPC) who will:

- Determine what has changed within the TBCD planning area since 2015.
- Use FEMA guidance to guide plan update by reviewing current plan against that guidance to ensure all requirements are met.
- Provide information on changes in planning area and assets at risk over the past five years as well as any actions to protect those areas.
- Review and update any hazards that have occurred over the past five years.
- Review and provide the status of action items in current plan and after hazard profiles are complete, add new actions for each hazard that were not in the plan previously.

Identify MPC, Roles and Responsibilities
The Team identified the following members to comprise the MPC:

MPC	Title	Org.	Role/Responsibility
Jerry Shadden	General Manager	TBCD	• Data collection, analysis of hazards, identify actions • Review drafts
Diane Newsome	Project Manager	TBCD	• Data collection, analysis of hazards, identify actions • Review drafts • Support with mapping assignments with engineering firm
Kristen Thatcher	Plan Facilitator	JSWA	• Drafting plan based on updates, data and analysis from MPC

MPC	Title	Org.	Role/Responsibility
			• Ensuring requirements are met for plan • Incorporating comments received from Stakeholders and Public
Dan Ward	Plan Consultant	JSWA	• Drafting plan based on updates, data and analysis from MPC • Ensuring requirements are met for plan • Incorporating comments received from Stakeholders and Public
Jeff Ward	Plan Consultant	JSWA	• Drafting plan based on updates, data and analysis from MPC • Ensuring requirements are met for plan • Incorporating comments received from Stakeholders and Public

Review current stakeholders and update (need list before next meeting – 9-15-22)
The Stakeholder group will be comprised of diverse interests including other government agencies, neighboring communities, businesses, civic groups, local NGOs, schools and drainage districts to help review and update mitigation plan. Initial discussion included the following organizations however, the team will work on the list and points of contact for each stakeholder and finalize before the next MPC meeting.

Organization	Point of Contact	Title
Jefferson County		
Jefferson County Drainage District 6		
Jefferson County OEM		
Jefferson County Engineering		
Houston Galveston Area Council (H-GAC) (Lead)		
Houston Galveston Area Council (H-GAC) (Econ.)		
City of Anahuac		
Chambers County		
Chambers County OEM		
Chambers County Engineering		
Liberty County		
Hardin County		
Orange County		
Chambers County ISD		
Arboretum Nursing And Rehabilitation Center Of Winnie		
Winnie Community Hospital		
Bayside Community Hospital		
Winnie Area Chamber of Commerce		
West Chambers County Chamber of Commerce		
Jefferson County Chamber of Commerce		
Rycelin Hospital		

Mitigation Strategy and Goals

The MPC (see below) reviewed the current mitigation goal as well as the State's 2018 Mitigation Goals. An action item was taken to finalize the mitigation goal statement after that review and discussion.

Trinity Bay Conservation Districts Mitigation Goal Statement
The mitigation goals of TBCD are:

- To protect public health, safety, and welfare
- To reduce losses due to hazards by identifying hazards, minimizing exposure of citizens and property to hazards, and increasing public awareness and involvement
- To facilitate the development review and approval process to accommodate growth in a practical way that recognizes existing storm water and floodplain problems while avoiding creating new problems or worsening existing problems
- In cooperation with other local organizations to develop and initiate hazard mitigation actions and projects which will serve to protect the lives and property of citizens in the planning area.
- To seek solutions to existing problems

Discuss outreach strategy

The MPC needs input from diverse interests to help review and update its plan. TBCD will use its website, public notice, email and public meetings to reach out to these communities.

a. Stakeholders will be finalized and then a letter from TBCD to the Stakeholders requesting their input to the draft, and how to provide that input back to the MPC.
b. Public Meeting 1 on November 16th. To ensure citizens understand what TBCD is doing on their behalf, and to provide a chance for input on community vulnerabilities and mitigation activities that will inform the plan's content. This public meeting is also an opportunity to educate the public about hazards and risks in the community, types of activities to mitigate those risks, and how these impact them as well as explain the process for the draft and the timeline for draft completion and public review.

Review Hazards from Last Plan

Using the overall FEMA hazard list, the MPC compared the hazards profiled in the current plan (2015) to determine if the hazard can affect the area, maximum probable extent, likelihood of occurrence and overall significance. Using the FEMA definition for classifications, the MPC defined each hazard. After review of hazard to the defined jurisdictional location, if the hazard does not occur in the area, no further classifications took place as the team recommended the

hazard could be omitted (N/A) from a risk assessment and potential actions. As an example, after location review, avalanche and tsunamis do not occur in the planning area.
In addition, if a hazard, not previously profiled, is located in the area, the classification review occurred. After the review, the team discussed if all measures that the District could take to mitigate that hazard had been exhausted. If that were the case, the hazard would be profiled but not receive a risk assessment and in the omission section it the mitigation efforts would be explained (fully mitigated). For instance, the team discussed earthquakes, dam failure, tornadoes and hail and concluded that while these hazards could occur in the area, it is rare and all actions to mitigate (e.g. all buildings are hardened and equipment is covered) are already in place, therefore, while profiled, a full risk assessment will not take place. The team also reviewed any historical occurrences and geological analysis for subsidence in the area and it was concluded that there were occurrences but that the hazard should be profiled.

Finally, some hazards seem to be able to be merged with other hazards. After the review and discussion, risk will be assessed and mitigation actions will be determined for: drought, extreme heat, flood (including landslide and erosion), hurricane/tropical storms (including storm surge), severe thunderstorms/high wind, subsidence, winter storm, and wildfires.

Using the definitions provided for each classification (see below), the team defined (first letter of definition, e.g. **N** for negligible for location) each hazard location, maximum probable extent, probability of future event, and overall significance. (See table labeled Hazard Significance).

Location	Max. Probable Event	Likelihood of Occurrence	Overall Significance
N, L, S, E	W, M, S, E	U, O, L, H	L, M, H

Definitions for Classifications

Location (Geographic Area Affected)
- **Negligible:** Less than 10 percent of planning area or isolated single-point occurrences
- **Limited:** 10 to 25 percent of the planning area or limited single-point occurrences
- **Significant:** 25 to 75 percent of planning area or frequent single-point occurrences
- **Extensive:** 75 to 100 percent of planning area or consistent single-point occurrences

Maximum Probable Extent (Magnitude/Strength based on historic events or future probability)
- **Weak:** Limited classification on scientific scale, slow speed of onset or short duration of event, resulting in little to no damage
- **Moderate:** Moderate classification on scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days
- **Severe:** Severe classification on scientific scale, fast speed of onset or long duration of event, resulting in devastating damage and loss of services for weeks or months
- **Extreme:** Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions

Hazard	Scale / Index	Weak	Moderate	Severe	Extreme
Drought	Palmer Drought Severity Index[3]	-1.99 to +1.99	-2.00 to -2.99	-3.00 to -3.99	-4.00 and below
Earthquake	Modified Mercalli Scale[4]	I to IV	V to VII	VII	IX to XII
	Richter Magnitude[5]	2, 3	4, 5	6	7, 8
Hurricane Wind	Saffir-Simpson Hurricane Wind Scale[6]	1	2	3	4, 5
Tornado	Fujita Tornado Damage Scale[7]	F0	F1, F2	F3	F4, F5

Probability of Future Events
- **Unlikely:** Less than 1 percent probability of occurrence in the next year or a recurrence interval of greater than every 100 years.
- **Occasional:** 1 to 10 percent probability of occurrence in the next year or a recurrence interval of 11 to 100 years.
- **Likely:** 10 to 90 percent probability of occurrence in the next year or a recurrence interval of 1 to 10 years
- **Highly Likely:** 90 to 100 percent probability of occurrence in the next year or a recurrence interval of less than 1 year.

Overall Significance
- **Low:** Two or more criteria fall in lower classifications or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with a minimal or unknown record of occurrences or for hazards with minimal mitigation potential.
- **Medium:** The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating This rating is sometimes used for hazards with a high extent rating but very low probability rating.
- **High:** The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

HAZARD SIGNIFICANCE

Hazard List (Complete List from the FEMA Local Mitigation Handbook, March 2013)	2015 TBCD Plan Hazards	2022 TBCD Plan Update	Significance to Area (see def. below)
Avalanche	N/A	Does not occur in area	N/A
Dam Failure	Profile but no RA	Levee in wildlife preserve	N, W, U, L
Drought	Overview but no RA	Occurs in area breaks waterlines when it gets dry causing water breaks e.g. happened once in ten years	S,M,O, L
Earthquake	Overview but no RA	Does not really occur in area	N, W, U,L
Erosion	Did not discuss	overview	E, E, H,H
Expansive Soils	Did not discuss	Hazard possible but likelihood and magnitude minimum	L,W,O,L
Extreme Cold	Did not discuss	Happens but rare	S,S, O,H
Extreme Heat	Overview but no RA	Losing power, part of drought	S,S,H,H
Flood	Flood	Risk	E,E,O,H
Hail	Did not discuss	Happens but rare	N,W,O,L
Hurricane	Hurricane/Tropical Storms	Occurs Need RA	E,E,H,H
Landslide	Overview but no RA	Heavy flooding causes the dirt to loosen causes dirt to slide to ditch	N,W,O,L
Lightning	Did not discuss	Overview	S,M,H,M
Sea Level Rise	Did not discuss	See erosion	N,W,U,L
Severe Thunderstorms/Wind	Severe Thunderstorms/ High Wind	RA	S,S,H,H
Winter Storm	Overview but no RA	Risk	S,S, O,H
Storm Surge	Discussed as part of H/TS	Discussed as part of H/TS	E,E,O,H
Subsidence	Did not discuss	Risk	L,W,O,L
Tornado	Tornado	RA-waterspouts (fallout shelter at school)	L,M,O,L
Tsunami	N/A	Does not occur in area	N/A
Wildfire	Overview but no RA	Grassfires, grant waterline down I-10 at one time	L,M,O,L

Existing plans, studies, reports and technical information that can support mitigation planning

The team discussed reports and studies that have occurred in the last five years or have relevance to mitigation planning and will review. The studies that were deemed relevant will be distributed to the team for review and incorporation.

Document/map request/building inventory/permit information

The team discussed the need RL/Claims information on a macro level for the area is needed as well as data needed to update the maps that will be included in the plan update.
A request for information and documents was provided.

Schedule

A tentative schedule was provided as guidance to the team, subject to change as plan progresses. The next meeting, September 15th will be at 2:00 pm CST. An agenda and attachments will be provided.

Date	Description
9-1-22	Roles and responsibilities outlined Review of data needed and assignment of lead Review of current plan: Hazards, goals, current actions, development changes; review of plans or reports for inclusion in plan. Review hazards in 2015 plan Determine changes to hazards, goals and discuss how hazards addressed must have mitigation action TBCD facilities reviewed Discuss stakeholders
9-15-22	Current Actions updated to be finalized next meeting New Actions to be discussed Local capabilities discussed to be finalized next meeting Local Development update discussed to be finalized next meeting TBCD facilities finalized Finalize Stakeholders
9-29-22	Risk Assessment complete Hazard Review and ranking New Actions reviewed for final
10-20-22	New Actions prioritized and finalized Plan maintenance process finalized
11-7-22	Draft to MPC for review
11-16-22	First Public Meeting
11-23-22	Data collections and review. Comments from first public meeting incorporated; updating all sections after meeting
11-30-22	Letters to stakeholders drafted, second draft review
12-5-22	Stakeholders contacted regarding public meeting and providing process for providing comments from review
12-14-22	Second Public Meeting
12-14-22	Plan uploaded to TBCD Website; Public given 30 days to review and provide comments
1-16-23	Comment cycle closes and comments incorporated
1-20-23	Plan is finalized to be sent to TDEM for review process

Action items identified from call (due on or before September 15th meeting).

Action Item	MPC Member
Project Worksheets (from 2015)	JS/DN
Hazard profile first draft	DW/KT
Provide requested studies	JS
Obtain building data	KT/DN
Maps (will work with LJA)	DN
Finalize Goal	JS/DN
Request current RL and Claims information	MPC

Trinity Bay Conservation District (TBCD)
Hazard Mitigation Plan Update MPC Meeting
September 15, 2022
MPC Attendees

Attendees	Department
Jerry Shadden	General Manager, Trinity Bay Conservation District
Diane Newsome	Project Manager, Trinity Bay Conservation District
Kristen Thatcher	Plan Consultant, JSWA
Dan Ward	Plan Consultant, JSWA

Review Actions in Current Plan for Update
The MPC reviewed the actions from the current plan provided an update to the actions. If any action from the current plan indicated complete, it was noted in the status and will be removed the mitigation action table and prioritization. The same process occurred for actions that were recommended to be removed.

New Actions
Using the identified hazards and risk assessment, the team discussed what new actions should be included based on the primary types of mitigation actions:

- Local plans and regulations,
- Structure and infrastructure projects,
- Natural systems protection, and
- Education and awareness programs

District Capabilities
The Capability Assessment describes the tools and staff the District's has to implement mitigation actions to reduce disaster losses and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects. These tools can be grouped into the following categories: planning and regulatory, administrative and technical, financial, and education and outreach. The District updated its current staffing needs and current capabilities and discussed areas where additional staff or tools could be helpful.

District Facilities
The District reviewed the current plan's list of District facilities buildings, maps and District assets and updated each.

Finalized stakeholder group
A final stakeholders list was distributed.

Goal Statement
The goal statement is still under review with the goal of finalizing it by the next meeting.

ACTION ITEMS TABLE DUE ON OR BEFORE NEXT MEETING

ACTION	TEAM MEMBER
Draft of mitigation actions	DW/KT
Draft of current status	DW/KT
Provide building map update	KS
Permit information	DC
Insurance information for assets	CO

Trinity Bay Conservation District (TBCD)
Hazard Mitigation Plan Update MPC Meeting
September 29, 2022
MPC Attendees

Attendees	Department
Jerry Shadden	General Manager, Trinity Bay Conservation District
Diane Newsome	Project Manager, Trinity Bay Conservation District
Kristen Thatcher	Plan Consultant, JSWA
Dan Ward	Plan Consultant, JSWA

Goal Statement

The team finalized the goal statement. The only change was to the last bullet in the last plan: to seek solutions to existing problems. It will now be two bullets:

- Perform Studies to recognize and address solutions to existing problems.
- Develop projects which address hazards that have been identified in the Hazard Mitigation plan.

The revised goal statement is as follows:

Trinity Bay Conservation Districts Mitigation Goal Statement
The mitigation goals of TBCD are:

- To protect public health, safety, and welfare
- To reduce losses due to hazards by identifying hazards, minimizing exposure of citizens and property to hazards, and increasing public awareness and involvement
- To facilitate the development review and approval process to accommodate growth in a practical way that recognizes existing storm water and floodplain problems while avoiding creating new problems or worsening existing problems
- Increase cooperation with other local organizations to develop and initiate hazard mitigation actions and projects which will serve to protect the lives and property of citizens in the planning area.
- Perform Studies to recognize and address solutions to existing problems.
- Develop projects which address hazards that have been identified in the Hazard Mitigation plan.

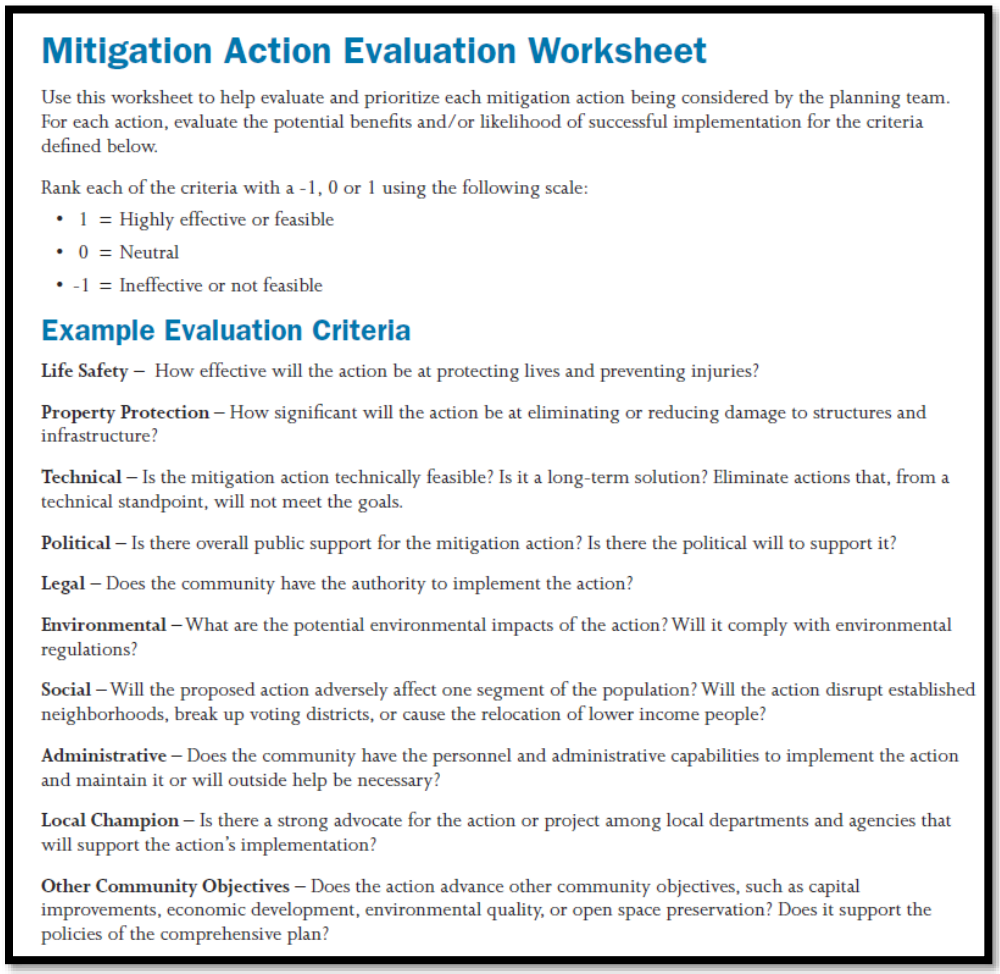
Mitigation Actions

The last meeting the team identified new actions. This meeting the MPC provided more detailed information regarding the actions including:

- Title
- If it were new or moved from current plan
- The hazard(s) the action would address
- The implementing department
- A cost estimate and potential funding source(s)
- The estimated timeframe for the work
- If the action
    - Reduced risk to existing buildings and infrastructure
    - Reduced risk to new development
- Some cost and benefit considerations to be considered for the action

Mitigation Action Prioritization

The team then took each of the actions and using the following evaluation criteria and definitions, scored each criteria (1 being lowest and 10 being highest). The results were tallied and the priority LOW, MEDIUM, HIGH, was assigned. The results are on page 3.



Mitigation Action Evaluation Worksheet

Use this worksheet to help evaluate and prioritize each mitigation action being considered by the planning team. For each action, evaluate the potential benefits and/or likelihood of successful implementation for the criteria defined below.

Rank each of the criteria with a -1, 0 or 1 using the following scale:

- 1 = Highly effective or feasible
- 0 = Neutral
- -1 = Ineffective or not feasible

Example Evaluation Criteria

Life Safety – How effective will the action be at protecting lives and preventing injuries?

Property Protection – How significant will the action be at eliminating or reducing damage to structures and infrastructure?

Technical – Is the mitigation action technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.

Political – Is there overall public support for the mitigation action? Is there the political will to support it?

Legal – Does the community have the authority to implement the action?

Environmental – What are the potential environmental impacts of the action? Will it comply with environmental regulations?

Social – Will the proposed action adversely affect one segment of the population? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?

Administrative – Does the community have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary?

Local Champion – Is there a strong advocate for the action or project among local departments and agencies that will support the action's implementation?

Other Community Objectives – Does the action advance other community objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of the comprehensive plan?

Action Table No.	MITIGATION ACTION SUMMARY OF PRIORITIZATION TOTAL SCORE BETWEEN 1-50 HAZARD IS LOW PRIORITY (L) TOTAL SCORE BETWEEN 51-75 HAZARD IS MEDIUM PRIORITY (M) TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH PRIORITY (H)	Total	Priority
1	Spindletop Bayou Drainage Improvements	86	H
2	Mayhaw and I-10 Culvert Improvements	86	H
18	Hankamer Plant Expansion	86	H
19	Highway 61 Forcemain Improvements	84	H
14	Elevation of Homes near Spindletop Watershed	80	H
20	Enhance TBCD internal GIS Capabilities	79	H
16	Winnie Lift Station Improvements	77	H
17	Winnie Sewer Rehabilitation Improvements	77	H
28	Replace wooden Brown and Root saltbarrier structures with new, metal saltbarrier structures	77	H
30	Continue to construct a levee system around Robinson Lake	77	H
9	Mayhaw Bayou Drainage Improvements - Phase II	76	H
12	Fuel Tanks at Critical Facilities	76	H
15	Winterization of Winnie Water Treatment Plant	76	H
21	Oak Island Sanitary Sewer Collection System Rehabilitation	76	H
22	Oak Island Wastewater Treatment Plant Project	76	H
25	Add rain gauges at critical watershed points	76	H
26	New Wastewater Treatment Plant West side of Winnie	76	H
29	Add a waterline with fire hydrants on I-10	76	H
10	Master Drainage Plan	73	M
23	Create public education program to educate public on mitigation techniques they can do to protect people and property from hazards	70	M
13	Double Bayou Drainage Relief Watershed Study	69	M
3	Updating Spring Branch Diversion Study to Determine Feasibility of Enlarging	68	M
8	Anahuac Outfall Ditch Study	68	M
27	Spindletop Diversion Channel	67	M
4	Jenkins Weir Floodgates	67	M
11	Severe Weather Action Plan	67	M
5	Elm Bayou Watershed Study	65	M
6	Onion Bayou Watershed Study	65	M
7	East Bay Watershed Study	64	M
31	Keep vegetation clear around the Marsh to reduce flammable material	64	M
24	Replace landscape around Main TBCD building with drought tolerant varieties and create defensible spaces around facilities	62	M

ACTION ITEMS TABLE DUE ON OR BEFORE NEXT MEETING

ACTION	TEAM MEMBER
Insurance information for assets	JS
BCA information	JS

Trinity Bay Conservation District (TBCD)
Hazard Mitigation Plan Update MPC Meeting
October 20, 2022
MPC Attendees

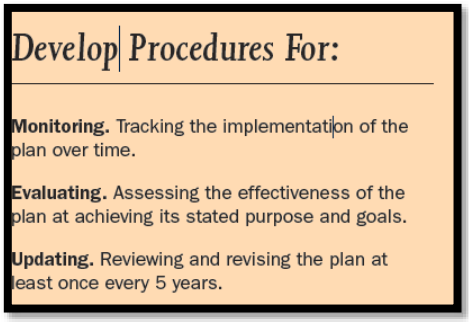
Attendees	Department
Jerry Shadden	General Manager, Trinity Bay Conservation District
Diane Newsome	Project Manager, Trinity Bay Conservation District
Kristen Thatcher	Plan Consultant, JSWA
Dan Ward	Plan Consultant, JSWA

Finalization of mitigation actions and details
The team finalized the action description and other details as well as the prioritization.

Plan Maintenance
Plan updates provide the opportunity to consider how well the procedures established in previously approved plan worked and revise as needed. The team discussed how the maintenance from the last plan worked and then discussed how the monitoring and maintenance would work for this iteration focusing on:

- Monitoring implementation
- Evaluate effectiveness
- Procedures to update (e.g., following a disaster)

- Evaluate progress to Integrate into Existing or new Plans, Procedures, and Programs
- Progress on using other plans information to be integrated with Hazard mitigation plan
- Continued Public Involvement



Map and Data needs
The team reviewed the outstanding mapping and data needs.

First Public Meeting
The team finalized the date and public notice information for the first public meeting to be held on November 16, 2022 at the District's Stowell office.

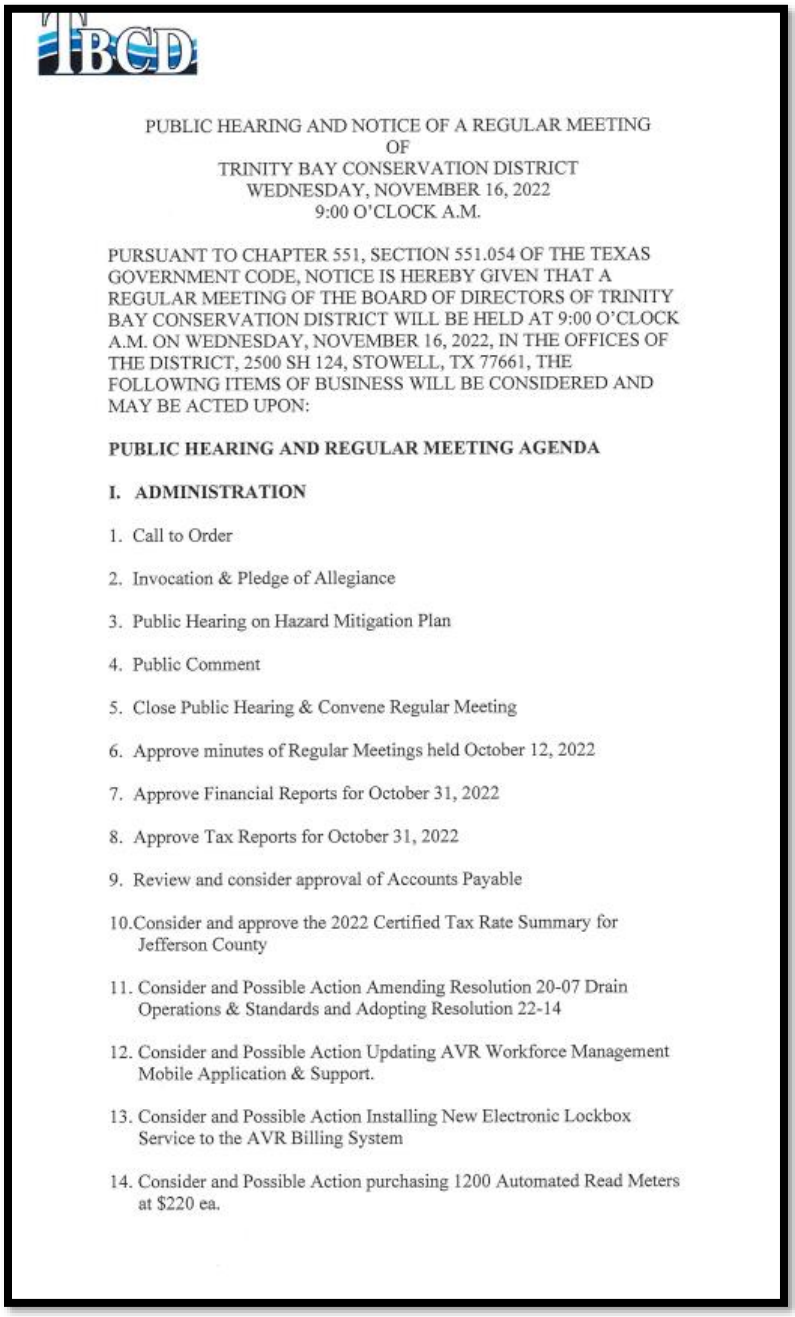
ACTION ITEMS TABLE DUE ON OR BEFORE NEXT MEETING

ACTION	TEAM MEMBER
Draft presentation for Team Review	KT
Map and Data Needs	MPC
First Draft of Plan for Team Review	KT/DW

APPENDIX B

Public Notice of First Meeting

District Notice on Public Meeting Posted 11-7-22-11-16-22
TBCD Public Hearing and Regular Meeting Agenda 11-16-22
(From TBCD website)



PUBLIC HEARING AND NOTICE OF A REGULAR MEETING
OF
TRINITY BAY CONSERVATION DISTRICT
WEDNESDAY, NOVEMBER 16, 2022
9:00 O'CLOCK A.M.

PURSUANT TO CHAPTER 551, SECTION 551.054 OF THE TEXAS GOVERNMENT CODE, NOTICE IS HEREBY GIVEN THAT A REGULAR MEETING OF THE BOARD OF DIRECTORS OF TRINITY BAY CONSERVATION DISTRICT WILL BE HELD AT 9:00 O'CLOCK A.M. ON WEDNESDAY, NOVEMBER 16, 2022, IN THE OFFICES OF THE DISTRICT, 2500 SH 124, STOWELL, TX 77661, THE FOLLOWING ITEMS OF BUSINESS WILL BE CONSIDERED AND MAY BE ACTED UPON:

PUBLIC HEARING AND REGULAR MEETING AGENDA

I. ADMINISTRATION

1. Call to Order
2. Invocation & Pledge of Allegiance
3. Public Hearing on Hazard Mitigation Plan
4. Public Comment
5. Close Public Hearing & Convene Regular Meeting
6. Approve minutes of Regular Meetings held October 12, 2022
7. Approve Financial Reports for October 31, 2022
8. Approve Tax Reports for October 31, 2022
9. Review and consider approval of Accounts Payable
10. Consider and approve the 2022 Certified Tax Rate Summary for Jefferson County
11. Consider and Possible Action Amending Resolution 20-07 Drain Operations & Standards and Adopting Resolution 22-14
12. Consider and Possible Action Updating AVR Workforce Management Mobile Application & Support.
13. Consider and Possible Action Installing New Electronic Lockbox Service to the AVR Billing System
14. Consider and Possible Action purchasing 1200 Automated Read Meters at $220 ea.

Notice of Plan Update

Trinity Bay Conservation District (TBCD)

Hazard Mitigation Plan Update

The public is invited to a meeting where TBCD will present an overview of a planning process that has taken place by the District to update its current Hazard Mitigation Plan. This planning process will lead to an updated plan of action to reduce the long-term impacts of flooding that impact citizens residing in the TBCD's planning area and other hazards that impact TBCD owned facilities. Members of the public are encouraged to attend, especially those with property located in flood-prone areas.

This meeting will be held on Wednesday, November 16, 2022 at 9:00 A.M., at TBCD Offices located at:

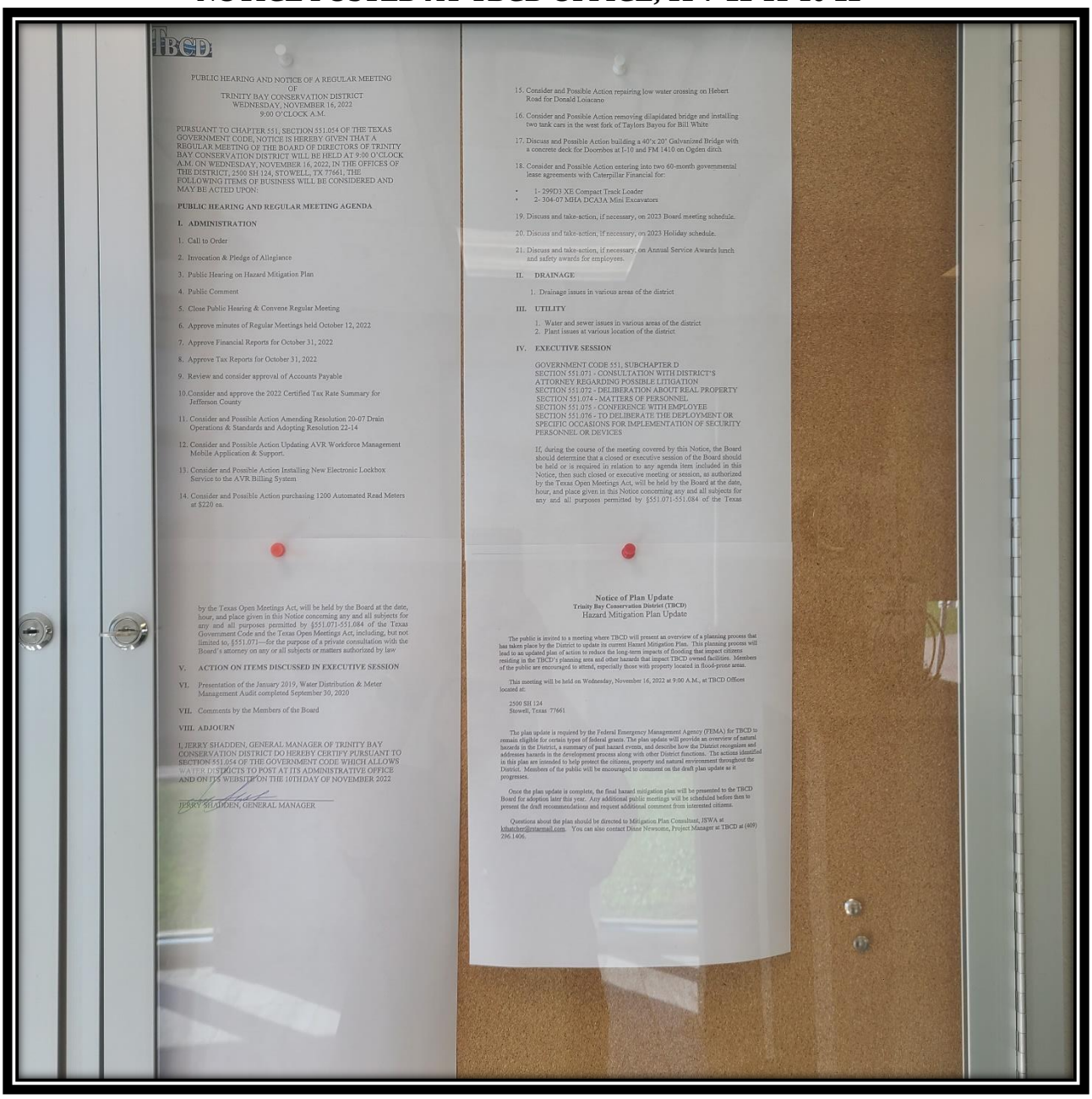
2500 SH 124
Stowell, Texas 77661

The plan update is required by the Federal Emergency Management Agency (FEMA) for TBCD to remain eligible for certain types of federal grants. The plan update will provide an overview of natural hazards in the District, a summary of past hazard events, and describe how the District recognizes and addresses hazards in the development process along with other District functions. The actions identified in this plan are intended to help protect the citizens, property and natural environment throughout the District. Members of the public will be encouraged to comment on the draft plan update as it progresses.

Once the plan update is complete, the final hazard mitigation plan will be presented to the TBCD Board for adoption later this year. Any additional public meetings will be scheduled before then to present the draft recommendations and request additional comment from interested citizens.

Questions about the plan should be directed to Mitigation Plan Consultant, JSWA at kthatcher@rstarmail.com. You can also contact Diane Newsome, Project Manager at TBCD at (409) 296.1406.

NOTICE POSTED AT TBCD OFFICE, 11-7-22-11-16-22



TBCD

PUBLIC HEARING AND NOTICE OF A REGULAR MEETING
OF
TRINITY BAY CONSERVATION DISTRICT
WEDNESDAY, NOVEMBER 16, 2022
9:00 O'CLOCK A.M.

PURSUANT TO CHAPTER 551, SECTION 551.054 OF THE TEXAS GOVERNMENT CODE, NOTICE IS HEREBY GIVEN THAT A REGULAR MEETING OF THE BOARD OF DIRECTORS OF TRINITY BAY CONSERVATION DISTRICT WILL BE HELD AT 9:00 O'CLOCK A.M. ON WEDNESDAY, NOVEMBER 16, 2022, IN THE OFFICES OF THE DISTRICT, 2500 SH 124, STOWELL, TX 77661, THE FOLLOWING ITEMS OF BUSINESS WILL BE CONSIDERED AND MAY BE ACTED UPON:

PUBLIC HEARING AND REGULAR MEETING AGENDA

I. ADMINISTRATION

1. Call to Order
2. Invocation & Pledge of Allegiance
3. Public Hearing on Hazard Mitigation Plan
4. Public Comment
5. Close Public Hearing & Convene Regular Meeting
6. Approve minutes of Regular Meetings held October 12, 2022
7. Approve Financial Reports for October 31, 2022
8. Approve Tax Reports for October 31, 2022
9. Review and consider approval of Accounts Payable
10. Consider and approve the 2022 Certified Tax Rate Summary for Jefferson County
11. Consider and Possible Action Amending Resolution 20-07 Drain Operations & Standards and Adopting Resolution 22-14
12. Consider and Possible Action Updating AVR Workforce Management Mobile Application & Support.
13. Consider and Possible Action Installing New Electronic Lockbox Service to the AVR Billing System
14. Consider and Possible Action purchasing 1200 Automated Read Meters at $220 ea.
15. Consider and Possible Action repairing low water crossing on Hebert Road for Donald Loiacano
16. Consider and Possible Action removing dilapidated bridge and installing two tank cars in the west fork of Taylors Bayou for Bill White
17. Discuss and Possible Action building a 40'x 20' Galvanized Bridge with a concrete deck for Doornbos at I-10 and FM 1410 on Ogden ditch
18. Consider and Possible Action entering into two 60-month governmental lease agreements with Caterpillar Financial for:
    - 1- 299D3 XE Compact Track Loader
    - 2- 304-07 MHA DCA3A Mini Excavators
19. Discuss and take-action, if necessary, on 2023 Board meeting schedule.
20. Discuss and take-action, if necessary, on 2023 Holiday schedule.
21. Discuss and take-action, if necessary, on Annual Service Awards lunch and safety awards for employees.

II. DRAINAGE

1. Drainage issues in various areas of the district

III. UTILITY

1. Water and sewer issues in various areas of the district
2. Plant issues at various location of the district

IV. EXECUTIVE SESSION

GOVERNMENT CODE 551, SUBCHAPTER D
SECTION 551.071 - CONSULTATION WITH DISTRICT'S ATTORNEY REGARDING POSSIBLE LITIGATION
SECTION 551.072 - DELIBERATION ABOUT REAL PROPERTY
SECTION 551.074 - MATTERS OF PERSONNEL
SECTION 551.075 - CONFERENCE WITH EMPLOYEE
SECTION 551.076 - TO DELIBERATE THE DEPLOYMENT OR SPECIFIC OCCASIONS FOR IMPLEMENTATION OF SECURITY PERSONNEL OR DEVICES

If, during the course of the meeting covered by this Notice, the Board should determine that a closed or executive session of the Board should be held or is required in relation to any agenda item included in this Notice, then such closed or executive meeting or session, as authorized by the Texas Open Meetings Act, will be held by the Board at the date, hour, and place given in this Notice concerning any and all subjects for any and all purposes permitted by §551.071-551.084 of the Texas Open Meetings Act, including, but not limited to, §551.071—for the purpose of a private consultation with the Board's attorney on any or all subjects or matters authorized by law.

V. ACTION ON ITEMS DISCUSSED IN EXECUTIVE SESSION

VI. Presentation of the January 2019, Water Distribution & Meter Management Audit completed September 30, 2020

VII. Comments by the Members of the Board

VIII. ADJOURN

I, JERRY SHADDEN, GENERAL MANAGER OF TRINITY BAY CONSERVATION DISTRICT DO HEREBY CERTIFY PURSUANT TO SECTION 551.054 OF THE GOVERNMENT CODE WHICH ALLOWS WATER DISTRICTS TO POST AT ITS ADMINISTRATIVE OFFICE AND ON ITS WEBSITE ON THE 10TH DAY OF NOVEMBER 2022

JERRY SHADDEN, GENERAL MANAGER

Notice of Plan Update
Trinity Bay Conservation District (TBCD)
Hazard Mitigation Plan Update

The public is invited to a meeting where TBCD will present an overview of a planning process that has taken place by the District to update its current Hazard Mitigation Plan. This planning process will lead to an updated plan of action to reduce the long-term impacts of flooding that impact citizens residing in the TBCD's planning area and other hazards that impact TBCD owned facilities. Members of the public are encouraged to attend, especially those with property located in flood-prone areas.

This meeting will be held on Wednesday, November 16, 2022 at 9:00 A.M., at TBCD Offices located at:

2500 SH 124
Stowell, Texas 77661

The plan update is required by the Federal Emergency Management Agency (FEMA) for TBCD to remain eligible for certain types of federal grants. The plan update will provide an overview of natural hazards in the District, a summary of past hazard events, and describe how the District recognizes and addresses hazards in the development process along with other District functions. The actions identified in this plan are intended to help protect the citizens, property and natural environment throughout the District. Members of the public will be encouraged to comment on the draft plan update as it progresses.

Once the plan update is complete, the final hazard mitigation plan will be presented to the TBCD Board for adoption later this year. Any additional public meetings will be scheduled before then to present the draft recommendations and request additional comment from interested citizens.

Questions about the plan should be directed to Mitigation Plan Consultant, ISWA at kthatcher@iswa.org. You can also contact Dixie Newsome, Project Manager at TBCD at (409) 296.1406.

THE PROGRESS PUBLIC NOTICE

Classified Word Ad Deadline: Monday 11 AM for Wednesday publication • Call 409-267-6131 • e-mail: ads@theanahuacprogress.com • online: www.theanahuacprogress.com

LEGAL NOTICES

Notice of Plan Update
Trinity Bay Conservation District (TBCD)
Hazard Mitigation Plan Update

The public is invited to a meeting where TBCD will present an overview of a planning process that has taken place by the District to update its current Hazard Mitigation Plan. This planning process will lead to an updated plan of action to reduce the long-term impacts of flooding that impact citizens residing in the TBCD'S planning area and other hazards that impact TBCD owned facilities. Members of the public are encouraged to attend, especially those with property located in flood-prone areas.

This meeting will be held on Wednesday, November 16, 2022 at 9:00 A.M., at TBCD Offices located at:
2500 SH 124
Stowell, Texas 77661

The plan update is required by the Federal Emergency Management Agency (FEMA) for TBCD to remain eligible for certain types of federal grants. The plan update will provide an overview of natural hazards in the District, a summary of past hazard events, and describe how the District recognizes and addresses hazards in the development process along with other District functions. The actions identified in this plan are intended to help the citizens, property and natural environment throughout the District. Members of the public will be encouraged to comment on the draft plan update as it progresses.

Once the plan update is complete, the final hazard mitigation plan will be presented to the TBCD Board for adoption later this year. Any additional public meetings will be scheduled before then to present the draft recommendations and request additional comment from interested citizens.

Questions about the plan should be directed to Mitigation Plan Consultant, JSWA at kthatcher@rstarmail.com. You can also contact Diane Newsome, Project Manager at TBCD at (409) 296-1406.

THE HOMETOWN PRESS PUBLIC NOTICE

LEGAL NOTICE

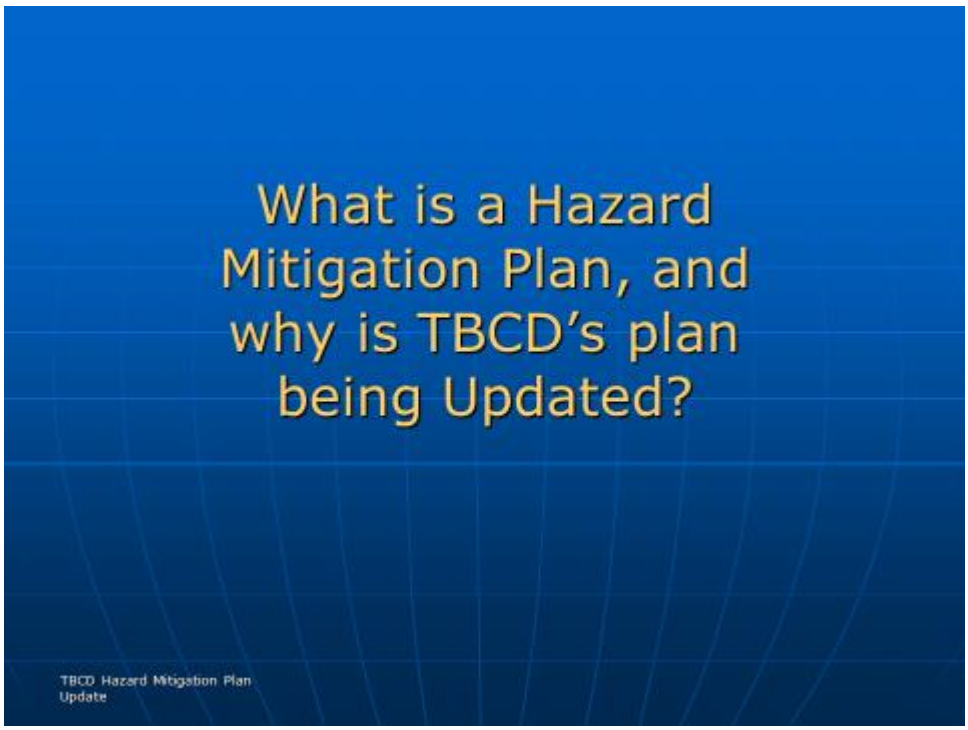
Notice of Plan Update Trinity Bay Conservation District (TBCD) Hazard Mitigation Plan Update

The public is invited to a meeting where TBCD wil present an overview of a planning process that has taken place by the District to update its current Hazard Mitigation Plan. This planning process will lead ot an updated plan of action to reduce the long-term impacts of flooding that impact citizens residing in the TBCD's planning area and other hazards that impact TBCD owned facilities. Members of the public are encouraged to attend, especially those with property located in flood-prone areas.

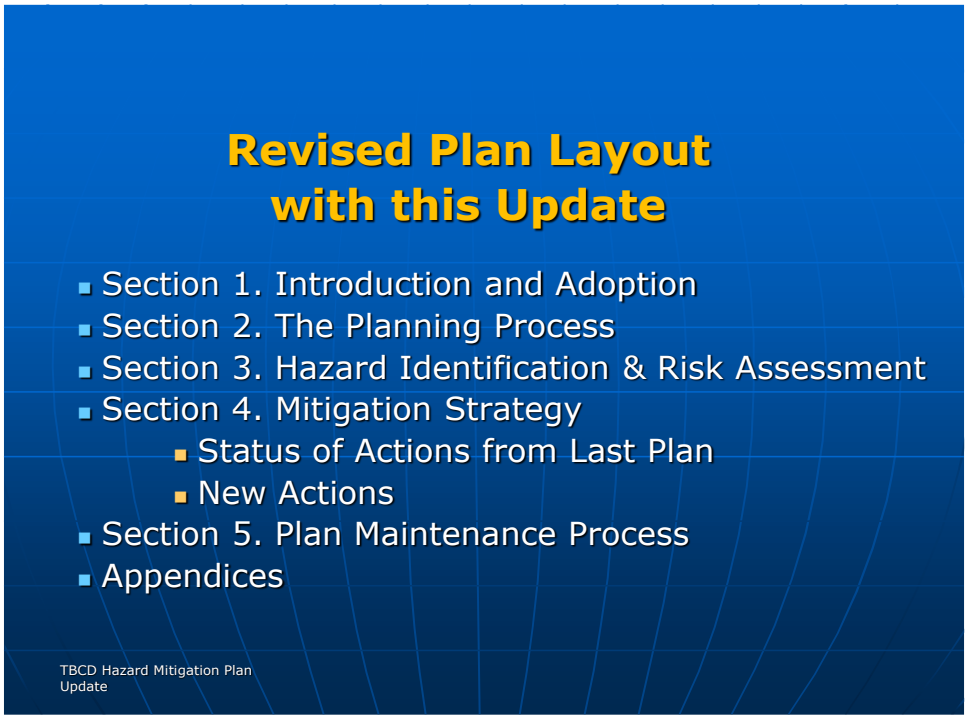
This meeting will be held on Wednesday, November 16, 2022 at 9:00 A.M., at TBCD Offices located at:
2500 SH 124
Stowell, Texas 77661
The plan update is required by the Federal Emergency Management Agence (FEMA) for TBCD to remiain eligible for certain types of federal grants. The plan update will provide an overview of natural hazards in the District, a summary of past hazard events, and describe how the Distrcit recognizes and addresses hazards in the development process along with other District functions. The actions identified in this plan are intended to help protect the citizens, property and natural environment throughout the District. Members of the public will be encourged to comment on the draft plan update as it progreses.
Once the plan update is complete, the final hazard mitigation plan will be presented to the TBCD Board for adoption later this year. Any addition public meetings will be scheduled before then to present the draft recommendations and request additional comment from interested citizens.
Questions about the plan should be directed to Mitigation Plan Consultant, JSWA at kthatcher@rstar-mail.com. You can also contact Diane Newson, Project Manager at TBCD at (409) 296.1406.

APPENDIX C

Presentation from November 16 Public Meeting




Mitigation Plan Update
▪ 5-year cyclical update is a Federal requirement to stay eligible for many kinds of disaster assistance
▪ Understand hazards and re-analyze risks
▪ Provides opportunity to update all plan sections
▪ District establishes goals and creates actions to reduce risk
▪ Mitigation Planning Committee (MPC) leads the planning efforts with support from the public and community stakeholders
TBCD Hazard Mitigation Plan Update


Revised Plan Layout with this Update
▪ Section 1. Introduction and Adoption
▪ Section 2. The Planning Process
▪ Section 3. Hazard Identification & Risk Assessment
▪ Section 4. Mitigation Strategy
▪ Status of Actions from Last Plan
▪ New Actions
▪ Section 5. Plan Maintenance Process
▪ Appendices
TBCD Hazard Mitigation Plan Update

Plan Update Process

MPC Reviewed Hazards to determine significance to TBCD jurisdictional boundaries

Location	Maximum Probable Event	Likelihood of Occurrence	Overall Significance
N, L, S, E	W, M, S, E	U, O, L, H	L, M, H

TBCD Hazard Mitigation Plan Update

Hazard Identification

- Team reviewed previously identified hazards to determine if still relevant
- While some hazards occur in the area, likelihood and magnitude are minimal therefore will be omitted:
  - earthquakes, hail, and dam failure
- Some Hazards will be merged with other hazards:
  - Hurricanes/Tropical Storms will include: storm surge
  - Drought will include: extreme heat, expansive soils
  - Flood will include: landslides, erosion
  - Winter Storm will include: extreme cold
- Some hazards occur but TBCD has fully mitigated based on its authority:
  - lightning

TBCD Hazard Mitigation Plan Update

Review determined the Hazards MPC recommends be included in Plan Update

- Drought
- Flood
- Hurricane/Tropical Storm
- Subsidence
- Severe Thunderstorms/High Wind
- Tornado
- Winter Storm
- Wildfire

Hazards that were omitted have a rationale for omission: Earthquakes considered exceedingly rare in planning area and with no history of impact to critical structures, systems, populations or other community assets or vital services and low probability of future events, therefore omitted.

TBCD Hazard Mitigation Plan Update

Plan Update Process

Goals, Strategy, Actions

TBCD Hazard Mitigation Plan Update

Plan Update Process –Draft revised Goal

Trinity Bay Conservation Districts Mitigation Goal Statement

The mitigation goals of TBCD are:

- To protect public health, safety, and welfare
- To reduce losses due to hazards by identifying hazards, minimizing exposure of citizens and property to hazards, and increasing public awareness and involvement
- To facilitate the development review and approval process to accommodate growth in a practical way that recognizes existing storm water and floodplain problems while avoiding creating new problems or worsening existing problems
- Increase cooperation with other local organizations to develop and initiate hazard mitigation actions and projects which will serve to protect the lives and property of citizens in the planning area.
- Perform Studies to recognize and address solutions to existing problems.
- Develop projects which address hazards that have been identified in the Hazard Mitigation plan.

Mitigation Strategy and Actions

- The Mitigation Strategy describes how TBCD will accomplish the overall purpose of the planning process

Plan Update Process

- Process provides for a status of current actions
  - Completed/Not Completed
  - Priority Change
  - Move to New actions for update
- Process offers an opportunity to put additional "actions" into the plan

TBCD Hazard Mitigation Plan Update

Mitigation Actions

- Mitigation Actions reduce or eliminate long-term risk and are different from actions taken to prepare or respond to hazard events.
- Five Mitigation action types:
  - Local Plans and Regulations
  - Structure and Infrastructure Projects
  - Natural Systems Protections
  - Education and awareness
  - Initiatives
- Every hazard needs at least two actions

TBCD Hazard Mitigation Plan Update

Mitigation Actions

- 31 actions
- Prioritized (H/M/L)
- Action Info.
  - Hazard
  - Description
  - Department Lead
  - Cost estimate
  - Potential funding
  - Timeframe
  - Priority
  - Risk Focus
  - Cost/Benefit considerations

MITIGATION ACTION SUMMARY OF PRIORITIZATION

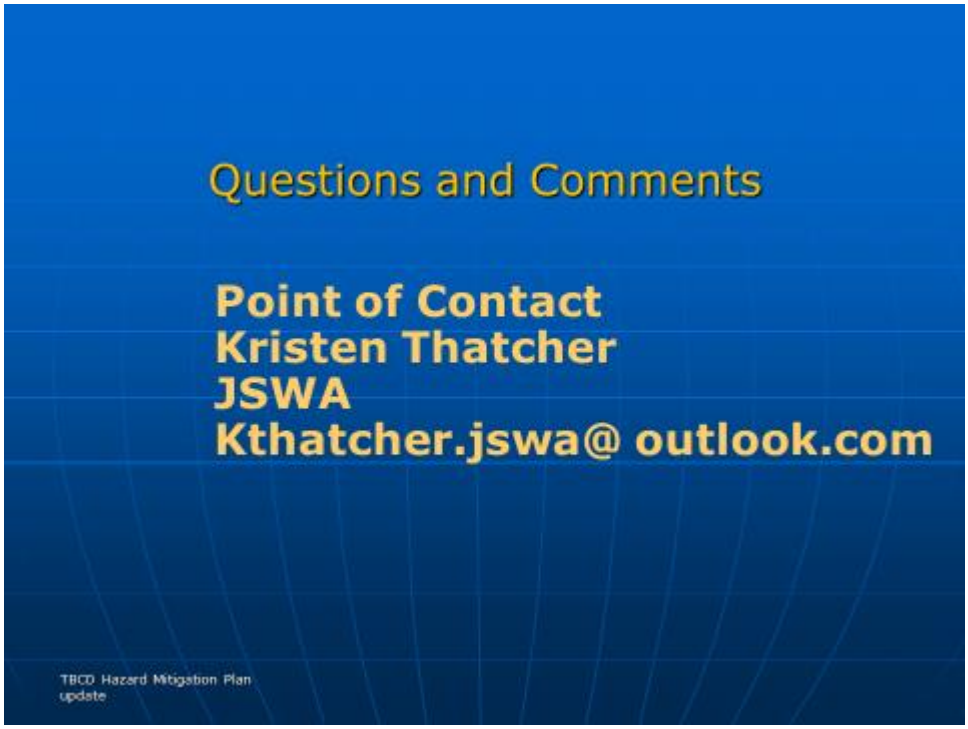
TOTAL SCORE BETWEEN 1-50 HAZARD IS LOW PRIORITY (L)
TOTAL SCORE BETWEEN 51-75 HAZARD IS MEDIUM PRIORITY (M)
TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH PRIORITY (H)

Action Table No.		Total	Priority
1	Spindletop Bayou Drainage Improvements	86	H
2	Mayhaw and I-10 Culvert Improvements	86	H
18	Hankamer Plant Expansion	86	H
19	Highway 61 Forcemain Improvements	84	H
14	Elevation of Homes near Spindletop Watershed	80	H
20	Enhance TBCD internal GIS Capabilities	79	H
16	Winnie Lift Station Improvements	77	H
17	Winnie Sewer Rehabilitation Improvements	77	H
28	Replace wooden Groyn and Rock saltbarrier structures with new, metal saltbarrier structures	77	H
30	Continue to construct a levee system around Robinson Lake	77	H
5	Mayhaw Bayou Drainage Improvements - Phase II	76	H
12	Fuel Tanks at Critical Facilities	76	H
15	Winterization of Winnie Water Treatment Plant	76	H
21	Oak Island Sanitary Sewer Collection System Rehabilitation	76	H
22	Oak Island Wastewater Treatment Plant Project	76	H
25	Add rain gauges at critical watershed points	76	H
26	New Wastewater Treatment Plant West side of Winnie	76	H
29	Add a waterline with fire hydrants on I-10	76	H
10	Master Drainage Plan	73	M
23	Create public education program to educate public on mitigation techniques they can do to protect people and property from hazards	70	M
13	Double Bayou Drainage Relief Watershed Study	69	M
3	Updating Spring Branch Diversion Study to Determine Feasibility of Enlarging	68	M
8	Anahuac Outfall Ditch Study	68	M
27	Spindletop Diversion Channel	67	M
4	Jenkins Weir Floodgates	67	M
11	Severe Weather Action Plan	67	M
9	Elm Bayou Watershed Study	65	M
6	Orson Bayou Watershed Study	65	M
7	East Bay Watershed Study	64	M
31	Keep vegetation clear around the Marsh to reduce flammable material	64	M
24	Replace landscape around Main TBCD building with drought tolerant varieties and create defensible spaces around facilities	62	M

Where we are now...

- All sections of the plan are complete in draft (see binder)
- Update and re-evaluation of Hazard Identification complete
- Risk assessment complete
- Discussion with public and stakeholders on hazards, impact and actions


Next Steps
Mitigation Planning Committee (MPC) and Stakeholders to review initial draft
Incorporate comments and changes into draft plan and present plan to submit to the Public for review (December). 30 Days to review
Incorporate Stakeholder/Public Comments and submit to TDEM/FEMA for review (January)
Incorporate TDEM/FEMA comment for APA – Approved Pending Adoption
Adopt the plan update
TBCD Hazard Mitigation Plan Update


Questions and Comments
Point of Contact
Kristen Thatcher
JSWA
Kthatcher.jswa@ outlook.com
TBCD Hazard Mitigation Plan update

APPENDIX D

Example of Stakeholder Letter

Trinity Bay Conservation District

Established 1949

P.O Box 599 Stowell, Texas 77661, Tel (409) 296-3602, Fax (409) 296-1055

December 5, 2022

The Honorable Jimmy Sylvia
County Judge
Chambers County
P.O. Box 939
Anahauc, Texas 77514

Re: Trinity Bay Conservation District, Hazard Mitigation Plan Update

Dear The Honorable Jimmy Sylvia:

As you may be aware, Trinity Bay Conservation District (TBCD or the District) is currently in the process of updating its FEMA Hazard Mitigation Plan. FEMA requires local jurisdictions to update their plans every five years, and one of the update and re-approval requirements is to have a stakeholder group and the public review and provide input to the plan. Members of a stakeholder group are individuals or organizations that are affected by a mitigation action or policy and can provide specific information on a topic or provide input from a different point of view in the community. These organization should include business, academia and other private and non-profit interests.

Your organization has been identified by the District as one that could be impacted by the mitigation actions and strategy and therefore, the District would like to invite you to be one of its stakeholders. If you accept, the District has provided a link below to download the draft for review. In addition, if you would like to provide information to be reviewed for possible inclusion in the update, please provide that information directly to our plan consultant, JSWA, attention: Kristen Thatcher (Kthatcher.jswa@outlook.com) and Dan Ward (dan.jswa@outlook.com).

ONE DRIVE: [redacted]

Comments will be considered by the Mitigation Planning Committee and incorporated as appropriate. The District asks that you please review and provide your comments back **by January 6, 2023** in order to give enough time to incorporate the comments into the draft.

Thank you very much for considering this request. It is important that stakeholders and the public have an opportunity to review and comment.

Sincerely,

Jerry Shadden
General Manager

APPENDIX E

Public Notice for Second Public Meeting 12-14-22

Notice of Plan Update

Notice of Plan Update

Trinity Bay Conservation District (TBCD)

Hazard Mitigation Plan Update

Trinity Bay Conservation District (TBCD) is currently updating its Hazard Mitigation Plan, as required by both the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). While the nature of natural hazards confronting the citizens of Chambers County has not changed significantly since the current plan was last approved, due to significant hurricane and tropical storm events in the last five years, planned hazard mitigation efforts have been updated and beneficial future mitigation actions have been added.

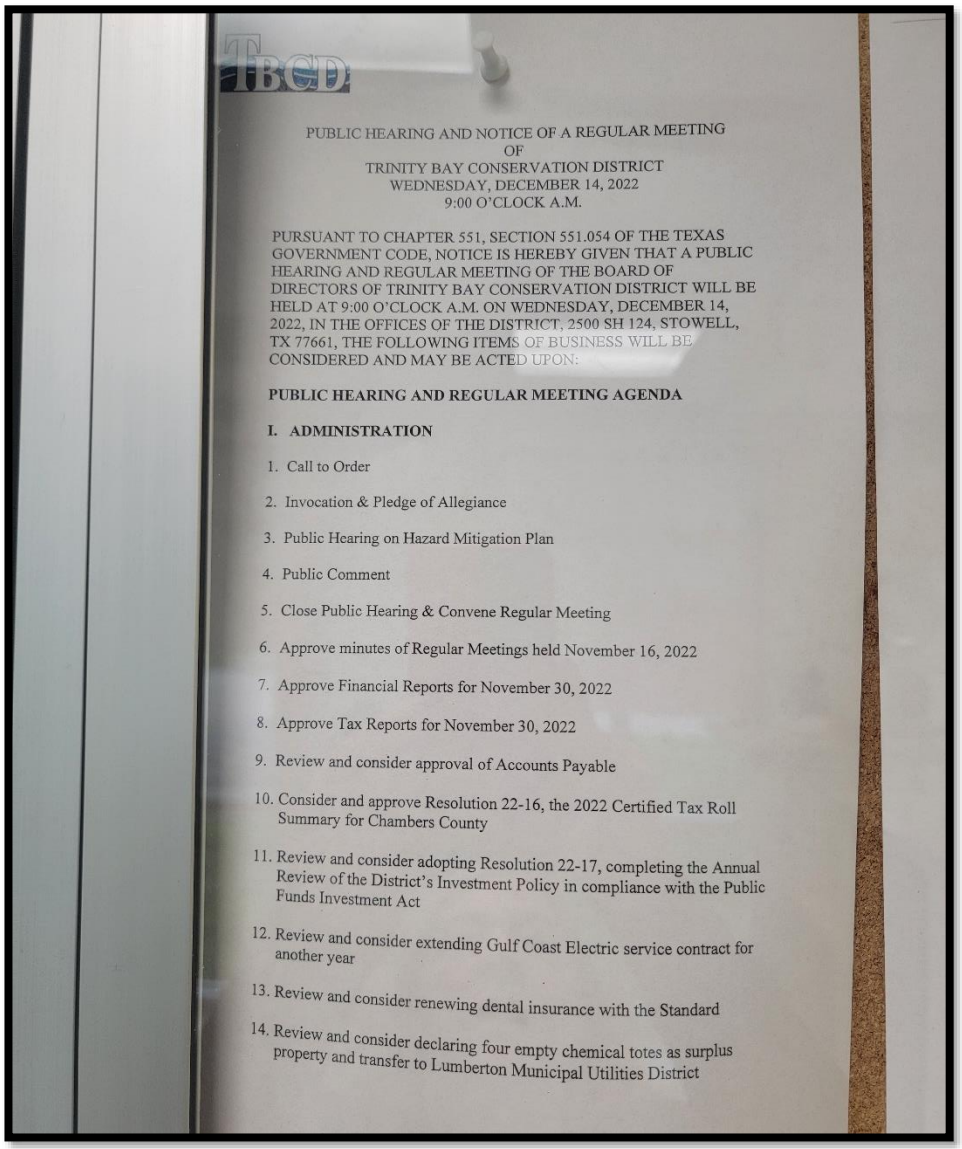
TBCD anticipates making the draft hazard mitigation plan update available to the public for review and comment on December 14, 2022. This will occur in conjunction with a public presentation, which describes the draft plan update and will start the 30-day public comment period during which residents, community organizations, and business interests can review the draft plan update and provide comments to the District before the update is finalized. The public is welcome attend the presentation at 9:30 am on Wednesday, December 14, 2022, at TBCD Offices located at:

2500 SH 124
Stowell, Texas 77661

Thereafter the draft plan update can be found online at the District's website located at: https://tbcd.org/download-and-news/. Public comments can be submitted to the District's Consultant, JSWA and Associates at the following email addresses: kthatcher@rstarmail.com or dan.jswa@outlook.com.

Once the comment period is closed, The District will review all public comments and take them under consideration as the document is finalized. Once finalized, the draft plan update will then be submitted to TDEM and FEMA for review and approval. When notification of approval is received from FEMA, the draft plan update will be presented to the Board of Directors for formal adoption, after which it will remain valid for five years. Questions regarding this important preparedness planning initiative can be directed to Diane Newsome, Project manager at TBCD at (409) 296-1406.

Notice Posted at TBCD Office 12-7-22



TBCD

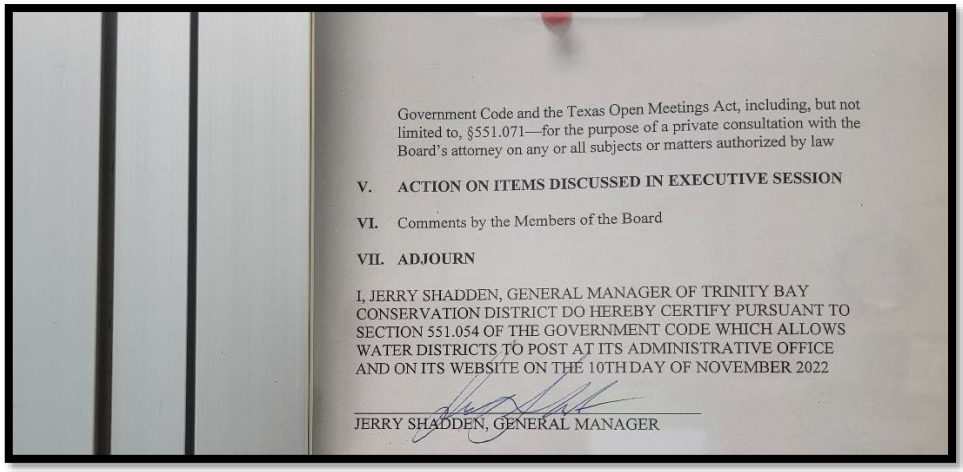
PUBLIC HEARING AND NOTICE OF A REGULAR MEETING
OF
TRINITY BAY CONSERVATION DISTRICT
WEDNESDAY, DECEMBER 14, 2022
9:00 O'CLOCK A.M.

PURSUANT TO CHAPTER 551, SECTION 551.054 OF THE TEXAS GOVERNMENT CODE, NOTICE IS HEREBY GIVEN THAT A PUBLIC HEARING AND REGULAR MEETING OF THE BOARD OF DIRECTORS OF TRINITY BAY CONSERVATION DISTRICT WILL BE HELD AT 9:00 O'CLOCK A.M. ON WEDNESDAY, DECEMBER 14, 2022, IN THE OFFICES OF THE DISTRICT, 2500 SH 124, STOWELL, TX 77661, THE FOLLOWING ITEMS OF BUSINESS WILL BE CONSIDERED AND MAY BE ACTED UPON:

PUBLIC HEARING AND REGULAR MEETING AGENDA

I. ADMINISTRATION

1. Call to Order
2. Invocation & Pledge of Allegiance
3. Public Hearing on Hazard Mitigation Plan
4. Public Comment
5. Close Public Hearing & Convene Regular Meeting
6. Approve minutes of Regular Meetings held November 16, 2022
7. Approve Financial Reports for November 30, 2022
8. Approve Tax Reports for November 30, 2022
9. Review and consider approval of Accounts Payable
10. Consider and approve Resolution 22-16, the 2022 Certified Tax Roll Summary for Chambers County
11. Review and consider adopting Resolution 22-17, completing the Annual Review of the District's Investment Policy in compliance with the Public Funds Investment Act
12. Review and consider extending Gulf Coast Electric service contract for another year
13. Review and consider renewing dental insurance with the Standard
14. Review and consider declaring four empty chemical totes as surplus property and transfer to Lumberton Municipal Utilities District



Government Code and the Texas Open Meetings Act, including, but not limited to, §551.071—for the purpose of a private consultation with the Board's attorney on any or all subjects or matters authorized by law

V. ACTION ON ITEMS DISCUSSED IN EXECUTIVE SESSION

VI. Comments by the Members of the Board

VII. ADJOURN

I, JERRY SHADDEN, GENERAL MANAGER OF TRINITY BAY CONSERVATION DISTRICT DO HEREBY CERTIFY PURSUANT TO SECTION 551.054 OF THE GOVERNMENT CODE WHICH ALLOWS WATER DISTRICTS TO POST AT ITS ADMINISTRATIVE OFFICE AND ON ITS WEBSITE ON THE 10TH DAY OF NOVEMBER 2022

JERRY SHADDEN, GENERAL MANAGER

THE PROGRESS PUBLIC NOTICE

CLASSIFIEDS

Classified Word Ad Deadline: Monday 11 AM for Wednesday publication · Call 409-267-6131 · e-mail: ads@theanahuacprogress.com · online: www.theanahuacprogress.com

Classified Word Ad Rates

$12.00 per run for up to 25 words
50¢ for ea. additional word
•ADS MUST BE PRE-PAID

AD DEADLINE
WEDNESDAY ISSUE:
MONDAY 11AM

PAYMENTS
CASH • CHECKS • VISA
MASTERCARD • AM EXPRESS

409-267-6131
theanahuacprogress.com
ads@theanahuacprogress.com

TRUCK FOR SALE

FOR SALE: 2005 F-150 PICK UP TRUCK, 150K MILES, COLD AIR (A/C) EVERYTHING WORKS GREAT! $6500 OBO. 409-673-5927.

REAL ESTATE

Lovely Anahuac Home with bay view near courthouse. 2BR, 2 Bath, 1900 SF on 203 Light Street, NO FLOODING. Listed on Zillow. $240K 409-392-8258 or hmnipp@gmail.com

LEGAL NOTICES

Notice of Plot Owners Meeting

A meeting of the plot owners of Heavenly Rest Cemetery, will be held at Wallisville Heritage Park Museum, 20136 US I-10, Wallisville, Texas 77597, on Saturday, December 17, 2022, at 6:00 p.m., to decide whether to (1) organize a non-profit corporation to operate the cemetery and (2) convey the dedicated cemetery property to the corporation. Request a copy of the proposed agenda from scott@dscottcurryatty.com.

LEGAL NOTICES

Notice of Plan Update
Trinity Bay Conservation District (TBCD) Hazard Mitigation Plan Update

Trinity Bay Conservation District (TBCD) is currently updating its Hazard Mitigation Plan, as required by both the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). While the nature of natural hazards confronting the citizens of Chambers County has not changed significantly since the current plan was last approved, due to significant hurricane and tropical storm events in the last five years, planned hazard mitigation efforts have been updated and beneficial future mitigation actions have been added.

TBCD anticipates making the draft hazard mitigation plan update available to the public for review and comment on December 14, 2022. This will occur in conjunction with a public presentation, which describes the draft plan update and will start the 30-day public comment period during which residents, community organizations, and business interests can review the draft plan update and provide comments to the District before the update is finalized. The public is welcome attend the presentation at 9:00 am on Wednesday, December 14, 2022, at TBCD Offices located at: 2500 SH 124 Stowell, Texas 77661

Thereafter the draft plan update can be found online at the District's website located at: https://tbcd.org/download-and-news/. Public comments can be submitted to the District's Consultant, JSWA and Associates at the following email addresses: kthatcher@rstarmail.com or dan.jswa@outlook.com.

Once the comment period is closed, The District will review all public comments and take them under consideration as the document is finalized. Once finalized, the draft plan update will then be submitted to TDEM and FEMA for review and approval. When notification of approval is received from FEMA, the draft plan update will be presented to the Board of Directors for formal adoption, after which it will remain valid for five years. Questions regarding this important preparedness planning initiative can be directed to Diane Newsome, Project manager at TBCD at (409) 296-1406.

LEGAL NOTICES

INVITATION TO BIDDERS

A Pre-Bid meeting will be conducted in-person at Ward, Getz & Associates, PLLC, 2500 Tanglewilde, Suite 120, Houston, Texas 77063, at 11:00 AM, Wednesday, December 21, 2022. Attendance by each prospective bidder or its representative at the pre-bid meeting IS Mandatory.

Plans, specifications, and bid documents will be available at Ward, Getz & Associates, PLLC, 2500 Tanglewilde, Suite 120, Houston, Texas 77063 for pickup for $100.00 each, payable by cash or check. Bidders should notify WGA (via email at project@wga-llp.com, with subject line "00043-041-004 Request for Bid Documents") 24 hours in advance of plan, specification, and bid document pickup.

Sealed bids addressed to Ameriport LLC should be delivered in-person to Ward, Getz & Associates, PLLC, 2500 Tanglewilde, Suite 120, Houston, Texas 77063, and will be accepted prior to 11:00 AM, Wednesday, January 4, 2022, at which time all bids will be opened and publicly read for the furnishing of all material, equipment, labor and supervision necessary or incidental for the construction of Ameriport Business Park Roadway Phase II. Bids received after the closing time will be returned unopened.

Scope of Project:
Approx. 6,500 LF of storm sewer.
Approx. 9,000 LF of waterline.
Approx. 4,500 LF of sanitary sewer.
Approx. 5,000 LF concrete curb and 10,500 SY of pavement.

A bid bond or cashier's check in the amount of 5% of the total bid amount must accompany each bid. The successful bidder will be required to provide a performance bond, a payment bond, and a one-year maintenance bond as provided for in the bid documents, for the full amount of the contract. The Owner reserves the right to reject any or all bids.

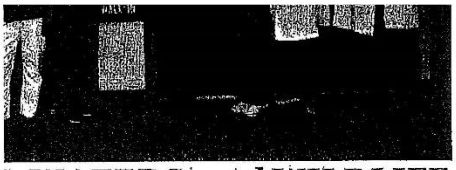
LEGAL NOTICES

INVITATION TO BIDDERS

A Pre-Bid meeting will be conducted in-person at Ward, Getz & Associates, PLLC, 2500 Tanglewilde, Suite 120, Houston, Texas 77063, at 10:00 AM, Wednesday, December 21, 2022. Attendance by each prospective bidder or its representative at the pre-bid meeting IS Mandatory.

Plans, specifications, and bid documents will be available at Ward, Getz & Associates, PLLC, 2500 Tanglewilde, Suite 120, Houston, Texas 77063 for pickup for $100.00 each, payable by cash or check. Bidders should notify WGA (via email at project@wga-llp.com, with subject line "00043-037 Request for Bid Documents") 24 hours in advance of plan, specification, and bid document pickup.

THE HOMETOWN PRESS PUBLIC NOTICE



S, WATERS, and WILDLIFE

LATE RAIN HELPED DEER

By John Jefferson

ll be a

ut guns to use ll also vent in y, and ed. Decem- merica t event Frank- at that s "... a e in In- t many

American that December day. It did mine, even though I was only five at the time and didn't understand what had happened ... or what would happen later.

I rode with my mother to pick up my father from duty at Camp Wallace, south of Alvin. He had been called back into military service and recommissioned in early 1941. War was approaching; America didn't know when.

The gate sentry asked for identification. My mother reminded him he knew her, so why the ID Howell M. Forgy was abord and helped direct the ammo movement. Another Naval officer saw the Chaplain moving toward him, patting each sailor on the back, and saying, "Praise the Lord and pass the ammunition." The officer said it encouraged everyone.

A popular song came out using that line and other chaplains were suggested as its originator. Chaplain Forgy was urged to claim his role. He modestly declined, saying it should remain a legend and not be as-

LEGAL NOTICE

Notice of Plan Update
Trinity Bay Conservation District (TBCD)
Hazard Mitigation Plan Update

Trinity Bay Conservation District (TBCD) is currently updating its Hazard Mitigation Plan, as required by both the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). While the nature of natural hazards confronting the citizens of Chambers County has not changed significantly since the current plan was last approved, due to significant hurricane and tropical storm events in the last five years, planned hazard mitigation efforts have been updated and beneficial future mitigation actions have been added.

TBCD anticipates making the draft hazard mitigation plan update available to the public for review and comment on December 14, 2022. This will occur in conjunction with a public presentation, which describes the draft plan update and will start the 30-day public comment period during which residents, community organizations, and business interests can review the draft plan update and provide comments to the District before the update is finalized. The public is welcome attend the presentation at 9:00 am on Wednesday, December 14, 2022, at TBCD Offices located at:

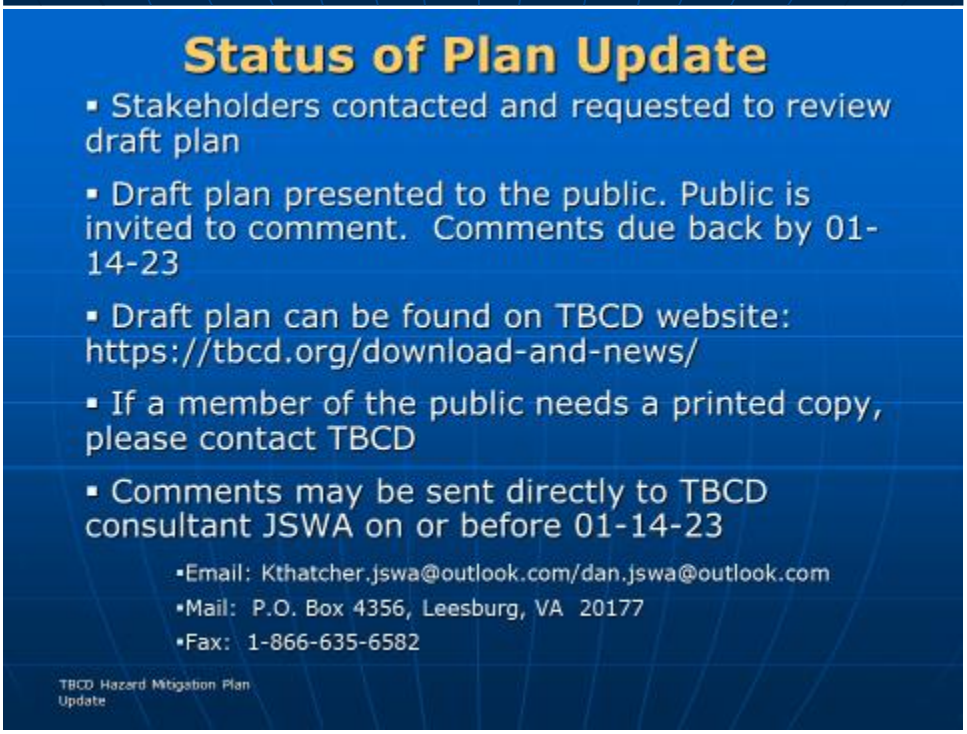
2500 SH 124
Stowell, Texas 77661

Thereafter the draft plan update can be found online at the District's website located at: https://tbcd.org/download-and-news/. Public comments can be submitted to the District's Consultant, JSWA and Associates at the following email addresses: kthatcher@rstarmail.com or dan.jswa@outlook.com.

Once the comment period is closed, The District will review all public comments and take them under consideration as the document is finalized. Once finalized, the draft plan update will then be submitted to TDEM and FEMA for review and approval. When notification of approval is received from FEMA, the draft plan update will be presented to the Board of Directors for formal adoption, after which it will remain valid for five years. Questions regarding this important preparedness planning initiative can be directed to Diane Newsome, Project manager at TBCD at (409) 296-1406.

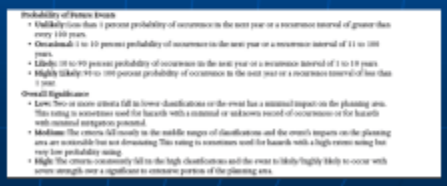
APPENDIX F

Presentation for Second Public Meeting 12-14-22



Results of Hazards Profiled

Hazard Type	Location	Maximum Probable Event	Likelihood of Occurrence	Overall Significance
Drought/Extreme Heat	Significant	Moderate	Occasional	Medium
Flooding	Extensive	Extreme	Occasional	High
Hurricane/Tropical Storm	Extensive	Extreme	Highly Likely	High
Thunderstorm and High Wind	Extensive	Extreme	Highly Likely	High
Subsidence	Limited	Moderate	Likely	Low
Winter Storm/Ext. Cold	Extensive	Weak	Unlikely	Medium
Tornado	Limited	Moderate	Occasional	Low
Wildfire	Limited	Moderate	Occasional	Low



TBCD Hazard Mitigation Plan Update

Number of Mitigation Actions by Hazard Addressed

- 2- All Hazards mitigation actions
- 27 Flood mitigation actions
- 27 Hurricane/Tropical Storm mitigation actions
- 27 Thunderstorm/High Wind mitigation actions
- 6 Drought Mitigation Actions
- 6 Winter Storm Mitigation Actions
- 6 Wildfire Mitigation Actions
- 4 Tornado Mitigations Actions
- 3 Subsidence Mitigation Actions

Many actions cover multiple hazards.

TBCD Hazard Mitigation Plan Update

Mitigation Actions

- 31 actions
- Prioritized (H/M/L)
- Action Info.
  - Hazard
  - Description
  - Department Lead
  - Cost estimate
  - Potential funding
  - Timeframe
  - Priority
  - Risk Focus
  - Cost/Benefit considerations

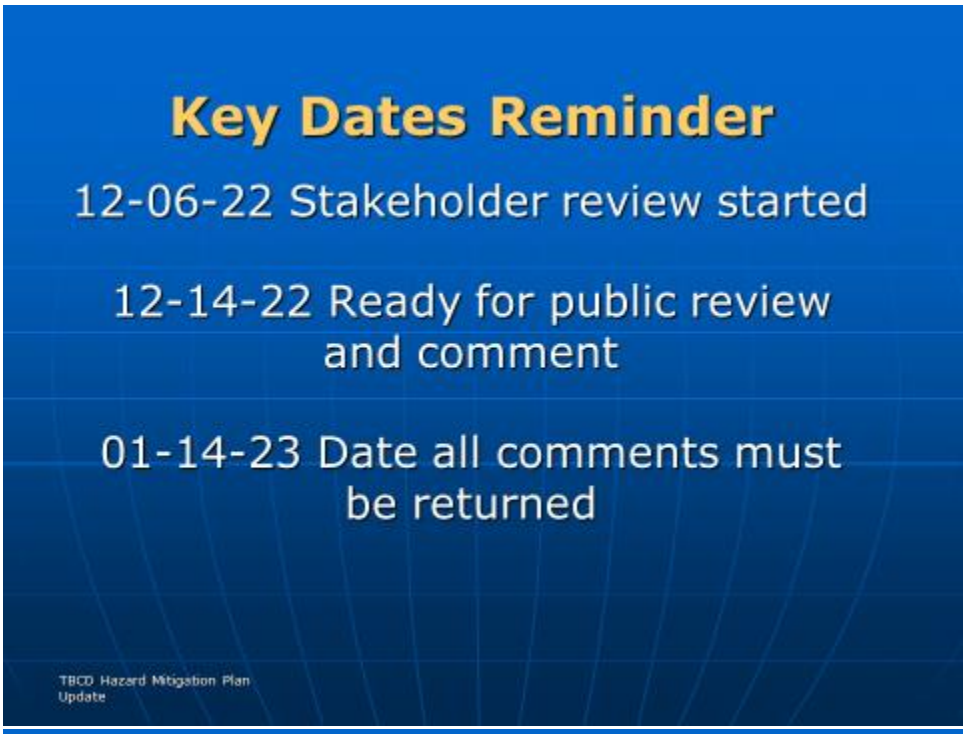
MITIGATION ACTION SUMMARY OF PRIORITIZATION

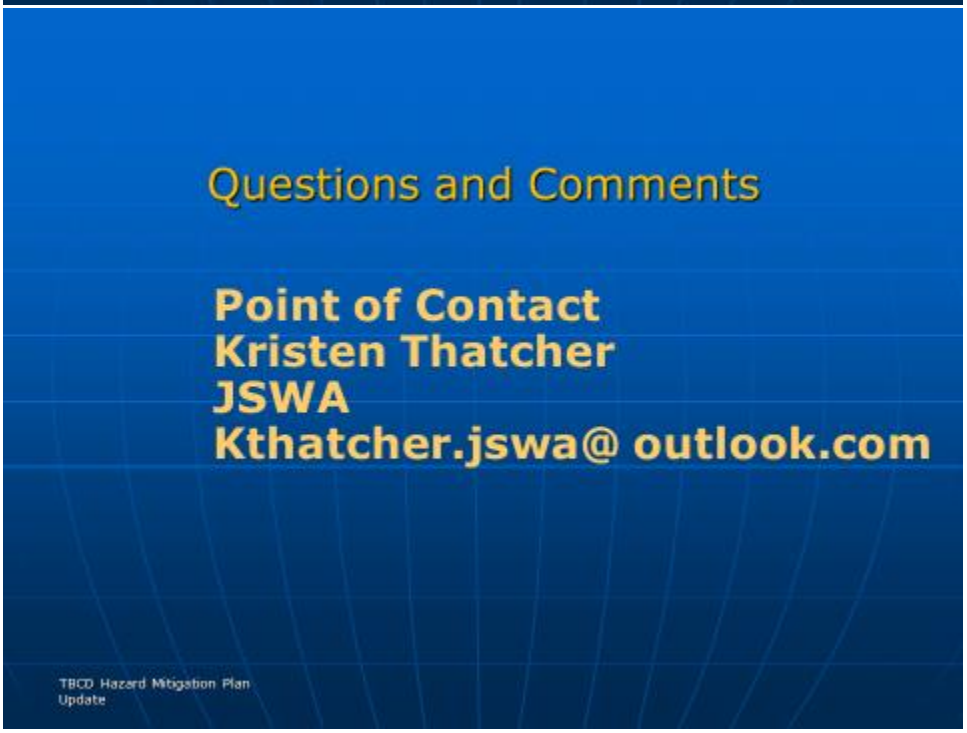
TOTAL SCORE BETWEEN 1-50 HAZARD IS LOW PRIORITY (L)
TOTAL SCORE BETWEEN 51-75 HAZARD IS MEDIUM PRIORITY (M)
TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH PRIORITY (H)

Action Table No.		Total	Priority
1	Spindletop Bayou Drainage Improvements	86	H
2	Mayhaw and I-10 Culvert Improvements	86	H
18	Hankamer Plant Expansion	86	H
19	Highway 61 Perceman Improvements	84	H
14	Elevation of Homes near Spindletop Watershed	80	H
20	Enhance TBCD internal GIS Capabilities	79	H
16	Nissie Lift Station Improvements	77	H
17	Nissie Sewer Rehabilitation Improvements	77	H
28	Replace wooden Brown and Root saltbarrier structures with new, metal saltbarrier structures	77	H
30	Continue to construct a levee system around Robinson Lake	77	H
9	Mayhaw Bayou Drainage Improvements - Phase II	76	H
12	Fuel Tanks at Critical Facilities	76	H
15	Winterization of Winnie Water Treatment Plant	76	H
21	Oak Island Sanitary Sewer Collection System Rehabilitation	76	H
22	Oak Island Wastewater Treatment Plant Project	76	H
25	Add rain gauges at critical watershed points	76	H
26	New Wastewater Treatment Plant West side of Nissie	76	H
29	Add a waterline with fire hydrants on I-10	76	H
10	Master Drainage Plan	73	M
23	Create public education program to educate public on mitigation techniques they can do to protect people and property from hazards	70	M
13	Double Bayou Drainage Relief Watershed Study	69	M
3	Updating Spring Branch Diversion Study to Determine Feasibility of Enlarging	68	M
8	Assabauc Outfall Ditch Study	68	M
27	Spindletop Diversion Channel	67	M
4	Jenkins Weir Floodgates	67	M
11	Severe Weather Action Plan	67	M
5	Elm Bayou Watershed Study	65	M
6	Orrisa Bayou Watershed Study	65	M
7	East Bay Watershed Study	64	M
31	Keep vegetation clear around the Marsh to reduce flammable material	64	M
24	Replace landscape around Main TBCD building with drought tolerant varieties and create defensible spaces around facilities	62	M

Next Steps After Public Comments

- Incorporate comments and changes into draft plan and submit to the Texas Division of Emergency Management – Submit on or before 01-31-23
  - Incorporate TDEM Comments
  - Re-submit to TDEM for FEMA review
  - Incorporate FEMA comments
  - FEMA approved pending adoption (APA)
  - TBCD Board of Directors adopts the plan update


Key Dates Reminder
12-06-22 Stakeholder review started
12-14-22 Ready for public review and comment
01-14-23 Date all comments must be returned
TBCD Hazard Mitigation Plan Update


Questions and Comments
Point of Contact
Kristen Thatcher
JSWA
Kthatcher.jswa@ outlook.com
TBCD Hazard Mitigation Plan Update

APPENDIX G

Acronyms
The following acronyms are used within this Hazard Mitigation Plan:
APA – Approval Pending Adoption
BCA- Benefit Cost Analysis
BFE- Base Flood Elevation
CFR- Code of Federal Regulation
CRS- Community Rating System
DMA- Disaster Mitigation Act
EMCs- Emergency Management Coordinators
FEMA- Federal Emergency Management Agency
FHFs- Flood Hazard Factors
FIS- Flood Insurance Study
FIRM- Flood Insurance Rate Map
FMA- Flood Mitigation Assistance
GIS- Geographic Information System
GRR- General Reevaluation Report
HMA- Hazard Mitigation Assistance
HMGP- Hazard Mitigation Grant Program
HMP- Hazard Mitigation Plan
MPC- Mitigation Planning Committee
NCEI- National Climatic Data Center
NFIP- National Flood Insurance Program
NHC- National Hurricane Center
NOAA- National Oceanic and Atmospheric Administration
NWS- National Weather Service
PA- Public Assistance
PDM-C- Pre-Disaster Mitigation Grant Program
PDSI- Palmer Drought Severity Index
Pga- Peak Ground Acceleration
PWs- Project Worksheets
RFC- Repetitive Flood Claim
RFI- Request for Information
RL- Repetitive Loss
SFHA- Special Flood Hazard Area
SHMO – State Hazard Mitigation Officer
SRL- Severe Repetitive Loss
TBCD – Trinity Bay Conservation District
TCEQ- Texas Commission on Environmental Quality
TDEM- Texas Division of Emergency Management
TWDB- Texas Water Development Board
TXDOT- Texas Department of Transportation
USACE- United States Army Corps of Engineers
USGS- United States Geological Survey

APPENDIX H

TBCD Glossary of Terms

Acre-Feet
Used to express volume of storage usually in a detention basin. One Acre-Foot is equal to one-acre times a one-foot depth or 43,560 cubic feet (325,850 gallons).

Base Flood
A flood having a 1% chance of being equaled or exceeded in any given year. This flood is sometimes called the 1% or 100-year flood.

Base Flood Elevation (BFE)
This is the elevation above the average sea level that waters from a 1% (100-year) flood will reach at a given point along a creek or bayou. These elevations are determined using hydrology and hydraulic computer models. The elevations are then mapped on the topographic data for the county to produce the 1% (100-year) floodplain.

Benefit-To-Cost Ratio
Represents the overall efficiency of a plan. Determined by dividing the value of the annual benefit by the annual cost.

Channel
A course or passage through which stormwater may move or be directed. It is a generic term used by the District in reference to ditches, bayous, creeks or other smaller tributaries. A channel can vary in shape and size, and can be either natural or man-made.

Channel Flow
The amount of stormwater flowing through a channel, often measured in cubic feet (of stormwater) per second (or CFS).

Channel Modification
A man-made change to a channel's characteristics, typically for the purposes of reducing flood damages by increasing its overall conveyance. This can be accomplished by widening and/or deepening the channel, reducing the friction by removing woody vegetation or by lining the channel with various materials.

CLOMR
A Conditional Letter of Map Revision (CLOMR) is FEMA's comment on a proposed project that would affect the hydrologic and/or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway or effective Base Flood Elevations. There is no appeal period. The letter becomes effective on the date sent. This letter does not revise an effective National Flood Insurance Program map, it indicates whether a proposed project would produce a change in a Special Flood Hazard Area by FEMA if later submitted as a request for a Letter of Map Revision.

Detention Basin
An area of land, usually adjacent to a channel that is designed to receive and hold above-normal stormwater volumes. Most stormwater detention basins in Chambers County are excavated. The detained stormwater then slowly drains over time out of the detention basin as the flow in the channel and associated water surface elevations recede. (also, Stormwater Detention)

Disaster Area
When a disaster is beyond the capabilities of state and local government to respond, the Governor must make a formal request to the President to declare the affected region a "disaster area." When the presidential declaration is enacted, federal assistance is made available to public and certain non-profit entities, as well as to individuals who were adversely affected by the disaster. The assistance is available in many forms, including monetary, temporary housing, crisis counseling and even legal assistance. For more on the Disaster Declaration process, go to: www.fema.gov/rebuild/recover/dec_guide.shtm.

Elevation Certificate
An Elevation Certificate is a detailed survey of a structure's elevation to see if it is above or below the base flood elevation. An Elevation Certificate can be used to reduce the cost of flood insurance or even remove a particular structure from the 1% (100-year) floodplain.

Encroachment
Construction, such as a wall, fence, building, etc., on the property of another.

EPA
Environmental Protection Agency

Existing Capacity
The measure of how much water a channel can currently carry, measured in cubic feet (of stormwater) per second (CFS). Also, the measure of how much water a stormwater detention facility can currently hold, usually measured in acre-feet (AC-FT) of volume.

FIRM Panel
FIRM stands for Flood Insurance Rate Map. In order to print the FEMA Flood Insurance Rate Maps at a scale of 1-inch = 1,000-feet, the maps are broken out into over 150 FIRM panels that cover the entire Harris County area.

Flap Gate
A flap gate is a simple mechanical device used to control the direction of flow of stormwater and is typically used at the end of a pipe draining into a channel. The flap gate allows water to drain from the pipe into the channel but closes when stormwater in the channel begins to rise higher than the water being delivered by the pipe.

Flood Insurance Rate Maps
Prepared by FEMA, Flood Insurance Rate Maps, or FIRMs, show areas that have the highest probability of flooding and illustrate the extent of flood hazards in a flood-prone community.

These maps are used to determine flood insurance rates for communities participating in the National Flood Insurance Program (NFIP).

Properties located in mapped zones AE, AO, A, or VE are required to have flood insurance if the owner has a federally backed mortgage on the property.

Flood Insurance Study
A study FEMA initiates to undertake a new hydraulic and/or hydrologic analysis for streams within a community. Often, these studies incorporate the new information into the FEMA Flood Insurance Rate Maps (FIRMs).

Floodplain
From time to time, bayous and creeks naturally come out of their banks due to heavy rainfall and inundate the adjacent land. This area that is inundated is referred to as a floodplain. Residences and businesses within the floodplain are considered to be at risk of being damaged by flooding. The floodplain is typically expressed by stating its frequency of occurrence. For example, the 1% (100-year) floodplain represents an area of inundation having a 1% chance of being equaled or exceeded in any given year, whereas the 2% (50-year) flood plain has a 2% chance of being equaled or exceeded in any given year. FEMA Flood Insurance Rate Maps (FIRMs) show the 1% (100-year) and 0.2% (500-year) floodplains.

Floodway
For most waterways, the floodway is where the water is likely to be deepest and fastest. It is the area of the floodplain that should be reserved (kept free of obstructions) to allow floodwaters to move downstream. Technically, the floodway is typically calculated by finding the area that must be reserved to carry and discharge the 1% (100-year) flood without increasing the base flood by more than 1-foot.

Flowline
A line formed representing the lowest point in the bottom of and along a specified length of a channel.

Fluvial Geomorphology
The study of river behavior and river-related landforms, such as riverbeds, floodplains and stream forms.

FY
Fiscal year

GIS
(Geographic Information System) - A computer program or programs used to store a wide variety of types of information and link that information to a specific geographic location. Some examples of this information the District utilizes would be streets, bayous and channels, HCAD parcel data, contours, floodplains and all the data that supports this information such as names, location and much more.

GPS
(Global Positioning System) - GPS is a system that uses satellites to accurately determine the location of any point on earth, and it helps to create the most accurate floodplain maps possible

Hydraulics
The study of moving fluid. In the case of the District's work, hydraulics refers to analyzing the movement of stormwater flows in channels, pipes and detention basins to determine certain properties like stormwater depths and stormwater velocities.

Hydrology
The study of the rainfall-stormwater runoff process. Hydrological procedures are used to estimate the expected amount of stormwater entering a drainage system from a certain amount of rain falling over a certain watershed area.

Impacts
The expected change in stormwater characteristics (i.e., stormwater flow), velocities and depths caused by proposed changes in the watershed.

Infrastructure
The land, buildings and other assorted structures that serve public use. Infrastructure typically refers to the primary drainage system, including channels and detention basins (not streets, storm sewers, and roadside ditches).

Insufficient Capacity
Exists when the desired capacity of a channel or stormwater detention facility exceeds the existing capacity; that is, when a channel or a detention facility cannot carry or hold all of the stormwater that could flow to it.

Levee
A physical barrier constructed to protect areas from rising floodwaters.

LiDAR
(Light Detection and Ranging) - LiDAR is a commercial technology that uses a laser mounted in an airplane to measure the elevation of the ground.

LOMR
(Letter of Map Revision) - FEMA's modification to an effective Flood Insurance Rate Map (FIRM), or Flood Boundary and Floodway Map (FBFM), or both. LOMRs are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). The LOMR officially revises the Flood Insurance Rate Map (FIRM) or Flood Boundary and Floodway Map (FBFM), and sometimes the Flood Insurance Study (FIS) report, and when appropriate, includes a description of the modifications. The LOMR is generally accompanied by an annotated copy of the affected portions of the FIRM, FBFM, or FIS report. An Appeal/Protest period exists only when there is a change in the BFE.

NFIP
(National Flood Insurance Program) - Created by Congress in 1968 to provide low-cost flood insurance for property owners in flood-prone communities. In exchange for flood insurance eligibility, communities agree to implement and enforce floodplain management measures to reduce the possibilities of future damage. FEMA arranges for periodic community assistance visits with local officials to provide technical assistance regarding complying with NFIP floodplain management requirements. FEMA works with local officials to evaluate the FIRMs and associated Flood Insurance Study and conducts updates as needs and priorities dictate.

NOAA
National Oceanic and Atmospheric Administration
Non-Point Sources
Indirect sources of stormwater runoff - such as roadways, yards or agricultural areas - that can be the origins of stormwater pollution in the overall drainage infrastructure.

NPDES
(National Pollutant Discharge Elimination System) - As authorized in 1990 by the Clean Water Act, NPDES is a federally mandated permit program intended to control water pollution by regulating point sources that discharge pollutants into waters of the United States. Under the storm water component of the permit program, the federal government requires municipal separate storm sewer systems (MS4s) serving a population of 100,000 or more to have a stormwater NPDES permit.

Outfall
An outfall is simply the pipe, channel, or opening where water "falls out" and then into another body of water, typically a drainage channel. In a typical stormwater detention basin, the outfall is at or connected to the lowest point of the basin so that detained water drains completely.

Peak Flow
(or Channel Peak Flow) - The maximum flow of stormwater flowing through a channel at a given location, based on a certain amount of rainfall falling in that area.

Ponding
The process, occurring after a rainfall, when water gathers in low lying areas throughout a watershed. Frequently referring to water standing in the streets when the capacity of the storm sewer is exceeded.

Repetitive Loss Property
Homes that have received more than $1,000 of flood insured damage two or more times in the last ten years will appear on the National Flood Insurance Program (NFIP) repetitive loss database and receive higher priority for certain types of buyouts.

Riparian
(Corridor or Zone) - The area of land along and adjacent to a waterway (river, bayou, creek, stream, etc.). Trees, plants and grasses along these waterways are called riparian vegetation. A

riparian zone from an ecological perspective may occur in many forms including grassland, woodland, wetland or even non-vegetative. Riparian zones may be natural or engineered for soil stabilization or restoration. In some regions the terms riparian woodland, riparian forest, riparian buffer, or riparian corridor are used to characterize a riparian zone.

Riprap
Rocks or broken pieces of concrete often placed in areas where the flow of stormwater is expected to cause erosion. The riprap serves as "armor" for areas of channels and detention basins to minimize the occurrence of erosion.

Riverine Flooding
Flooding that is the result of creeks and bayous leaving their banks as a result of a heavy rainfall. This type of flooding is mapped on the Flood Insurance Rate Maps.

Runoff
The stormwater from rainfall not absorbed by the ground that flows into the local drainage system, and ultimately, streams and bayous.

SFHA
(Special Flood Hazard Area) - An area defined on a FEMA Flood Insurance Rate Map with an associated risk of flooding.

Sheet Flow
(Overland Flow Flooding) - Flooding that occurs when intense local rainfall flows overland to reach a channel. Frequently, this condition exists when runoff exceeds storm sewer or roadside ditch capacity, and the water can "pond" in the streets deep enough to flood residences that are not even near a creek of bayou. The water will seek a path to the channel by flowing overland (Sheet Flow). When residences and other structures are in that path, flooding occurs, and this type of flooding is not identified on the Flood Insurance Rate Maps.

Stormwater Detention Basins
An area of land, usually adjacent to a channel, which is designed to receive and hold above-normal stormwater volumes. Most stormwater detention basins in Chambers County are excavated. The detained stormwater then slowly drains, over time, out of the detention basin as the flow in the channel and associated water surface elevations recede.

Substantially Damaged Property
Flood damage to a structure where the cost to repair equals or exceeds 50% of the value of the structure, excluding the land value.

Sub watershed
(also, Tributary watershed) - The land area that drains to one of the smaller streams that flow to the main channel of a watershed.

SWMP
Stormwater Management Program

SWPPP
Storm Water Pollution Prevention Plan

Tributary
A channel through which water may move or be directed that ultimately flows into a larger channel, usually bayous and creeks.

Tributary Watershed
(also Sub watershed) - The land area that drains to one of the smaller streams that flow to the main channel of a watershed.

TxDOT
Texas Department of Transportation

Unincorporated Chambers County
The area in Chambers County, Texas, which is not within an incorporated area of a city, town, or village.

Water Treatment Facility
A group or assemblage of structures, equipment, and processes that treat or condition a water supply, affecting the physical, chemical, or bacteriological quality of water distributed or otherwise offered to the public for domestic use by a public water system.

Wastewater Treatment Facility
An arrangement of devices and structures, excluding septic tanks, constructed and installed for the purpose of treatment of wastewater from domestic, commercial or industrial sources or combinations thereof, and which discharge its treated effluent into any surface water.

Water Surface Elevation
The distance the water surface in a creek or bayou is above mean sea level, measured at a given location along a creek or bayou.

Water Surface Elevation Profile
Shows the elevation above mean sea level of the 1% (100-year) or 0.2% (500-year) floodplain along all the studied stream miles in a particular watershed.

Watershed
A geographical region of land or "drainage area" that drains to a common channel or outlet, mostly creeks and bayous in Jefferson County. Drainage of the land can occur directly into a bayou or creek or through a series of systems that may include storm sewers, roadside ditches, and/or tributary channels.