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# HARRIS COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT 110 (HCWCID110)

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## 2024 Hazard Mitigation Plan



APRIL 17, 2024

19023 Joanleigh Drive, Spring, TX 77388



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# Section I. Introduction and Adoption

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## Introduction

Natural hazards are extreme natural events that can cause loss of life, damage to property, and disrupt human activities. Every year in the United States, natural hazards lead to disasters that threaten millions of lives and result in billions of dollars in damage. While it is impossible to prevent an event from occurring, impacts from natural hazards to people and property can be lessened and is called hazard mitigation. Over twenty years ago, Congress recognized the need to support a new kind of planning that would help local communities understand and reduce their vulnerability to natural hazards by preparing a local hazard mitigation plan. Congress passed the Disaster Mitigation Act (DMA) of 2000 which amended the Robert T. Stafford Disaster and Emergency Act (Stafford Act). The Code of Federal Regulation (CFR) provides the regulatory requirements outlined in the DMA to be eligible for mitigation project grant funding.

Recognizing the need to be able to apply for grants to support infrastructure projects and improve resistance to natural hazards, Harris County Water Control and Improvement District No. 110 (HCWCID110) set out to prepare a local hazard mitigation plan (HMP or Plan). This Plan is a single jurisdiction plan representing the planning area over which HCWCID110 has jurisdictional authority. It was prepared in accordance with the guidelines provided by FEMA and the Texas Division of Emergency Management (TDEM). It sets the stage for long-term disaster resistance through identification and implementation of actions that will, over time, reduce the exposure of people and property to hazards.

In April 2022, FEMA released its updated Local Mitigation Planning Guide, FEMA's official policy on, and interpretation of, local hazard mitigation planning requirements. In May 2023, FEMA released the revised Local Mitigation Planning handbook to guide local governments as they prepare a hazard mitigation plan. The handbook emphasizes the shift to community resilience with a whole community approach that ensures vulnerable populations are represented. **Community Resilience** is a community's ability to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. Activities such as disaster preparedness (which includes prevention, protection, mitigation, response, and recovery) and reducing community stressors (the underlying social, economic, and environmental conditions that can weaken a community) are key steps to resilience.

The intent of the plan is to:

- Identify actions for risk reduction that has been discussed with the whole community
- Focus resources on the greatest risks and vulnerabilities
- Build partnerships by involving organizations, businesses, and residents
- Increase awareness and education of threats and hazards as well as their risks
- Provide demographic information based on current information
- Focus on outreach to the whole community and stakeholders during the planning process
- Align risk reduction with other community activities

- Communicate priorities to State and Federal officials
- Review and incorporate other plans and reports with this plan

## Summary

HCWCID110 is a political subdivision of the State of Texas governed by a five-member Board of Directors. Each director is assigned a Precinct, see Figure 1. HCWCID110 provides water, sewer, and drainage services to its residential and commercial development within its boundaries, which is generally east and west of I-45, between Cypresswood Drive and Louetta Drive. It also provides parks and recreational services and owns and operates the Forest Oaks Swim and Racquet Club and Forest Oaks Park.

Daily operations are led by District Management supported by an administrative staff and a maintenance staff. HCWCID110 supports approximately 2,450 water and sewer connections. HCWCID110 owns and operates two water plants, one elevated storage tank, one wastewater treatment plant, and eight lift stations. It maintains seven detention ponds and one lake as well as the Forest Oaks Swim and Racquet Club and Forest Oaks Park. It has two administrative buildings and several outbuildings.

*Figure 1 - HCWCID110 Map Showing Director Precinct Assignments*





## **Adoption by the HCWCID110 Board of Directors**

The Mitigation Planning Committee (MPC) advised the HCWCID110 Board of Directors (Board) of its intent to prepare the hazard mitigation plan. It will refrain from presenting the Plan for adoption by the Board until after it has been submitted for review and approval by the Texas Division of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA). Once the MPC receives notice from FEMA that the Plan is Approved Pending Adoption (APA), which indicates there are no more changes to the Plan required by FEMA, the MPC will recommend that the Board formally adopt the Plan. The Board's formal resolution will be included in the Plan as Appendix F.

## **Community Profile**

### **Planning Area**

HCWCID110 is located in Southeast Texas, approximately 25 miles north of downtown Houston, see Figure 2 for its location within the State (red star). HCWCID110 is located within Harris County and is a part of the Houston Extra-Jurisdictional Territory (ETJ), see Figure 3. The State of Texas Constitution gives home rule jurisdictions the ability to give consent to an ETJ area requesting that a political subdivision be created. On February 21, 1968, the City of Houston consented to the formation of the HCWCID110, an area encompassing approximately 1,300.472 acres. It covers approximately 2.032 square miles. See Figure 4 for its location within Harris County, which provides an aerial view of the 1,300.472 acres. Figure 5 provides the Texas Commission of Environmental Quality (TCEQ) map of the HCWCID110 area.

Cypress Creek runs through the planning area. Ground surface elevations across the planning area vary from 88 feet to 120 feet (NAVD 88 2001 Adjustment). The coast prairie soil consists of mostly deep, dark gray, neutral to slightly acid clay loams and sandy clays that poorly drains (Texas State Historical Association, 2019b). Due to the flat terrain and slow drainage, much of the area is considered wetland.

Figure 2 - HCWCID110 Location within Texas  
 (www.mapsofworld.com)









Figure 4 - HCWCID110 Planning Area (in red)

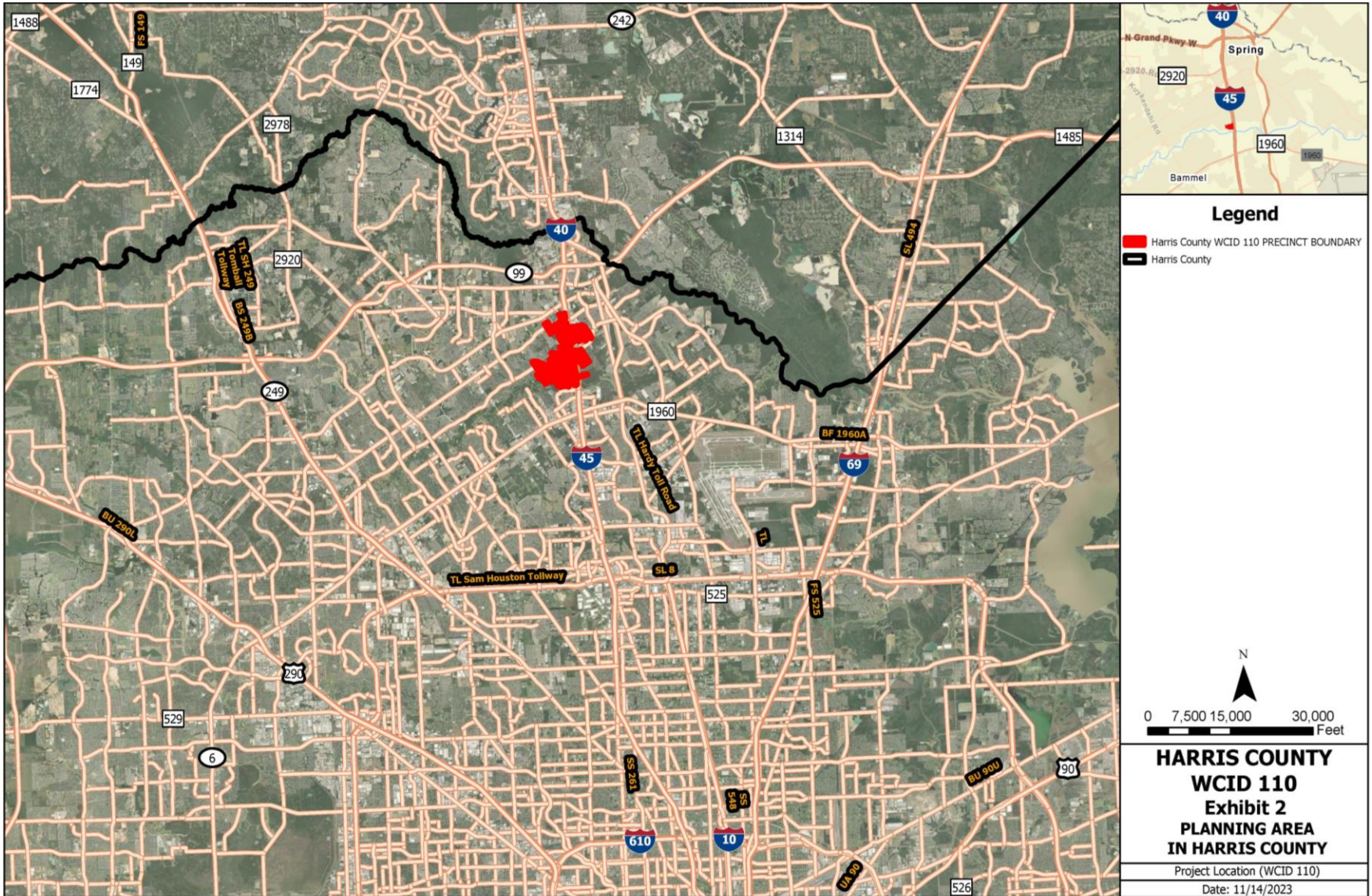
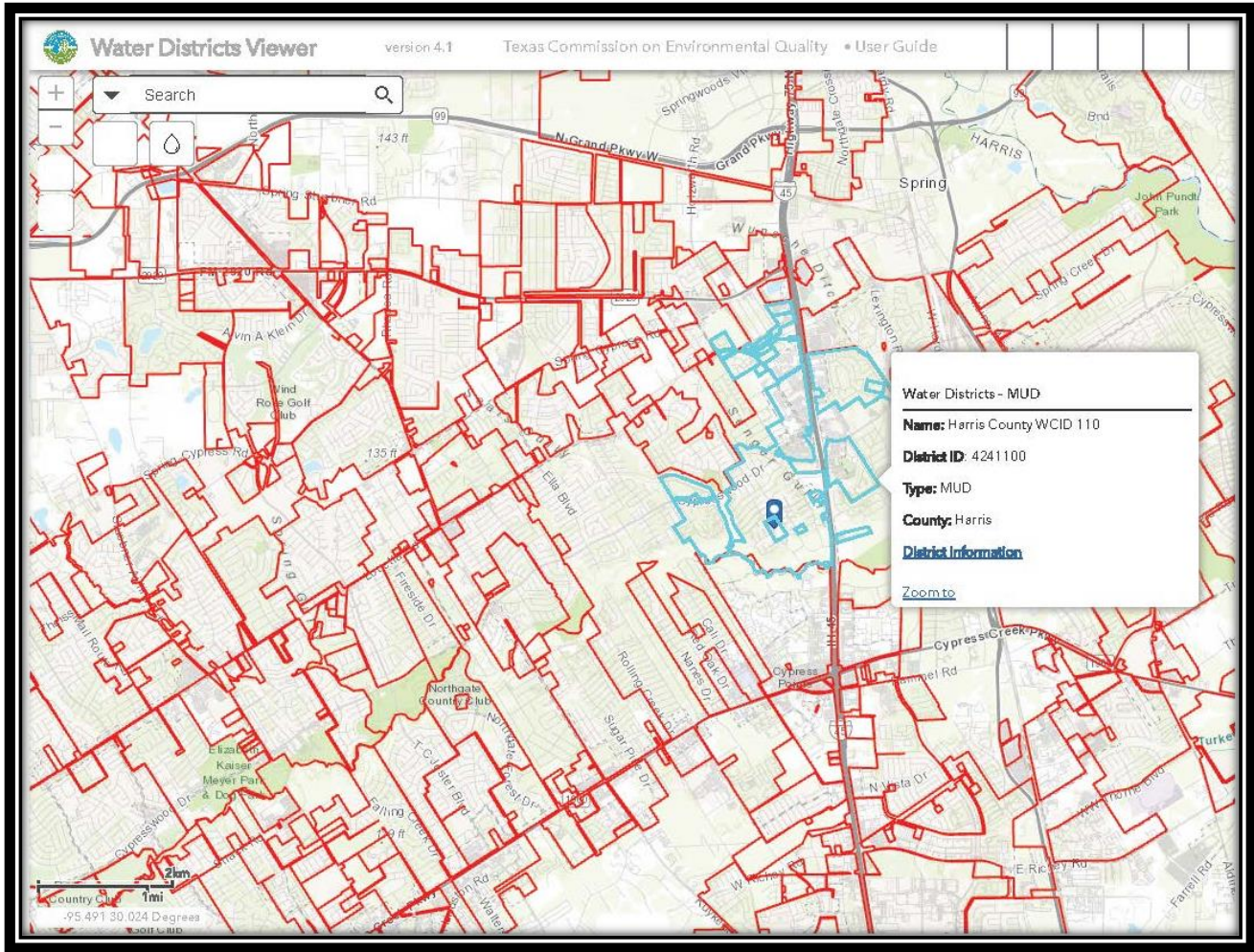




Figure 5 - TCEQ Map of HCWCID110 Planning Area

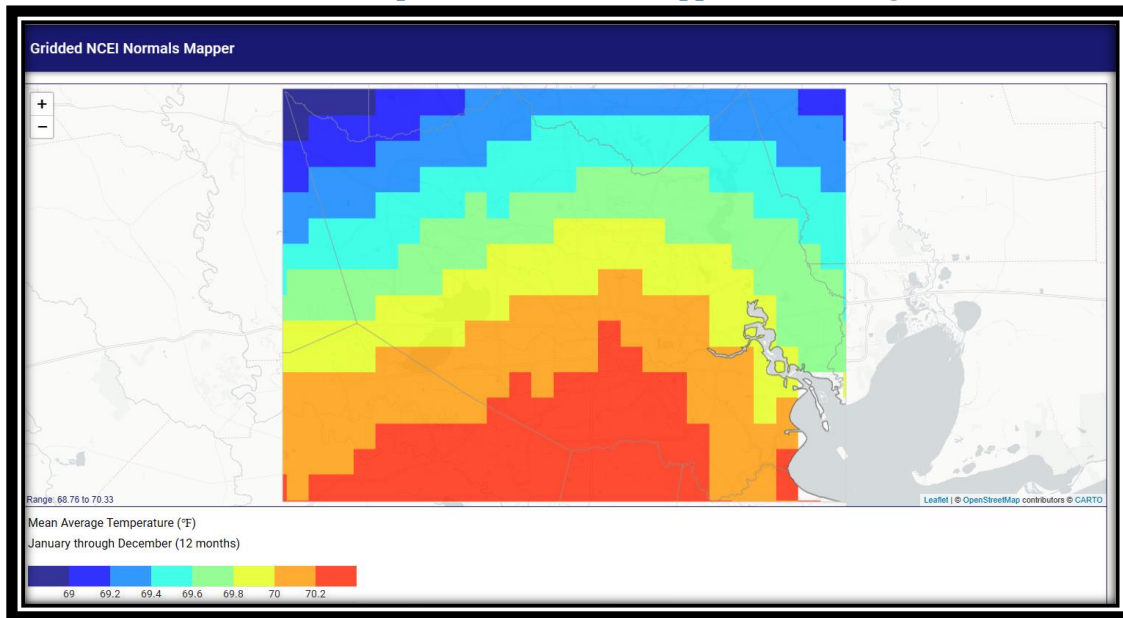


## Climate

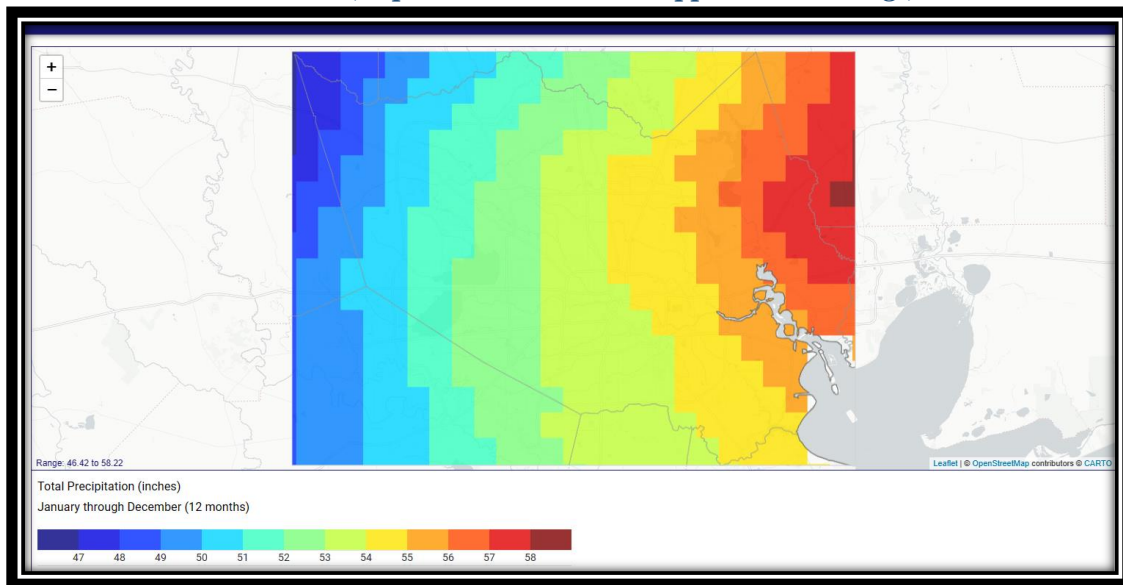
The climate for the HCWCID110 planning area is classified as a humid subtropical climate, with tropical influences. August normally ranks as the warmest month at a range of 90.25-95.63 °F and January the coldest month at a range of 41.06-46.44 °F. The National Centers for Environmental Information (NCEI) for Figure 6 shows the 2023 mean average temperature for Harris County ranges from 68.76-70.33°F. The 2023 normal annual precipitation ranges from 46.42-58.22 inches as illustrated in Figure 7 for Harris County.



*Figure 6 - 2023 Annual Average Temperature for Harris County  
(<https://ncei-normals-mapper.rcc-acis.org>)*



*Figure 7 - 2023 Annual Precipitation for Harris County  
(<https://ncei-normals-mapper.rcc-acis.org/>)*

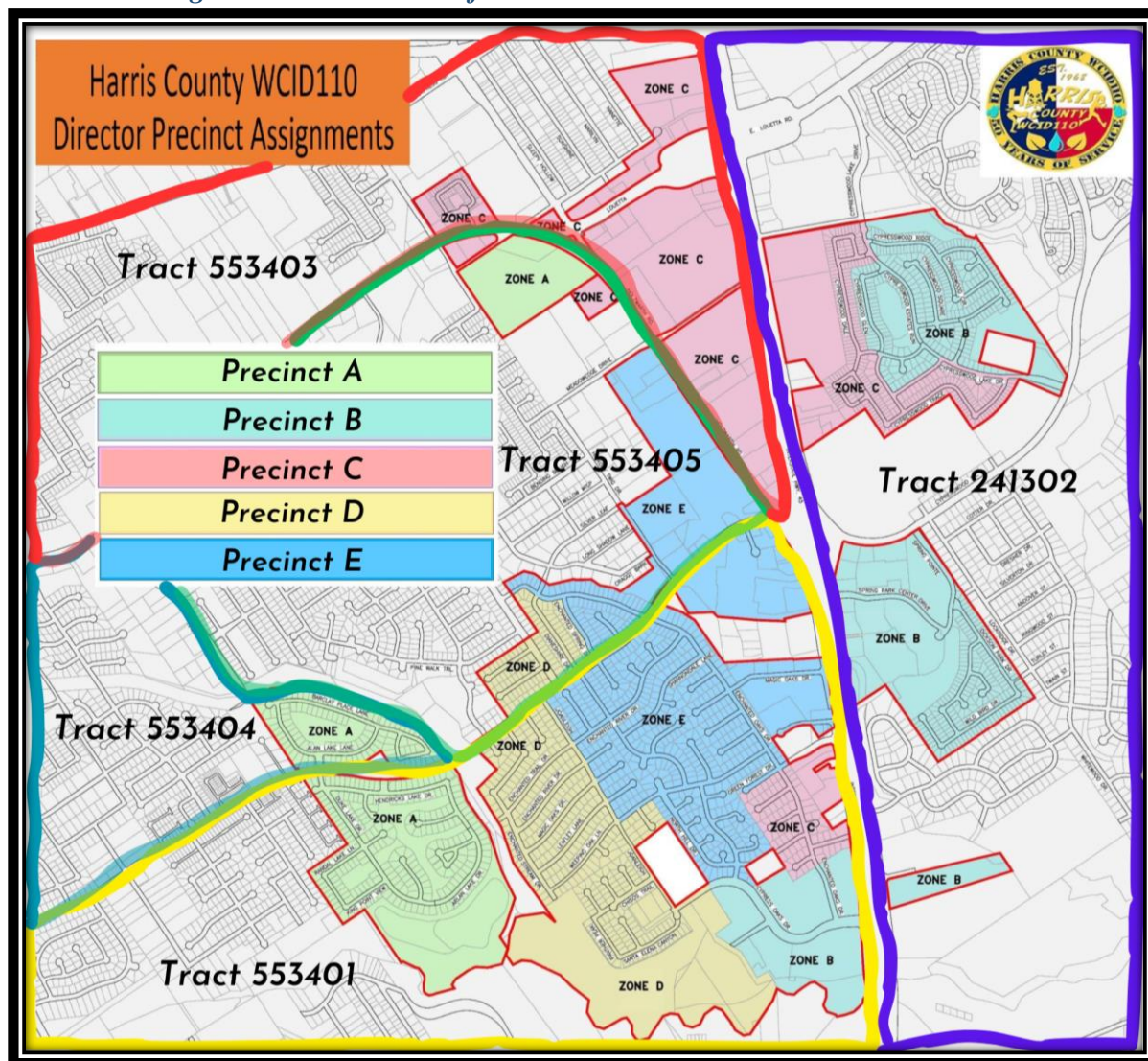


## Population and Growth

The entire State of Texas has had significant population growth since 2010. As reported in the United States Census America Counts Stories, “The population of Texas, the largest in land area among the Lower 48 states, increased by 470,708 in 2022, continuing a steady uptick. From 2000 to 2022, the state gained 9,085,073 residents, more than any other state”. [Texas Population Passes the 30-Million Mark in 2022 \(census.gov\)](https://www.census.gov/newsroom/2022/08/texas-population-passes-30-million-mark-in-2022.html)

The Houston Metropolitan Statistical Area (MSA) area grew 18%, adding more than 1.1 million new residents (increased from 6.2 million as of the 2012 estimate to 7.3 million as of the 2022 estimate). The City of Houston also experienced an increase in population between 2010-2020 by 10%, therefore it is presumed that the HCWCID110 planning area also grew. HCWCID110’s population information is derived from US Census, Census Tract Data. The planning areas lies in five census tracts (553401, 553403, 553404, 553405, and 241302), although it is not completely in any one census tract. Figure 8 illustrates the intersection of the census tract boundaries and HCWCID110’s boundaries.

*Figure 8 - Intersection of Census Tracts and HCWCID110 Boundaries*



Using the Census tract total, Figure 8 was used to determine the percentage of the population of HCWCID110 within each tract. Table 1 represents that weighted determination estimating the planning area’s population is comprised of approximately 6,039 people.

The population trend information is used to estimate future shifts that could significantly change the character of the area. Population trends can provide a basis for making decisions on the type of mitigation approaches to be considered and the locations in which these approaches could be applied. Census Data for population change is at the county level. Harris County’s population change between 2010 and 2020 increased 15.6%, it is reasonable to assume the planning area population increased similarly between Houston and the County by approximately 10-15%.

*Table 1 - Weighted Average of HCWCID110 Population by Census Tract*

Census Tract	Total Population	% HCWCID110 in Tract	Weighted amount
553401	4,556	75%	3,417
553403	8,289	15%	1,243
553404	3,188	2%	64
553405	5,610	5%	281
241302	6,895	15%	1,034
<b>TOTAL</b>	<b>28,538</b>		<b>6,039</b>

Population density allows for broad comparison of settlement intensity across geographic areas. In the U.S., population density is typically expressed as the number of people per square mile of land area. Population size and density are both important for describing and predicting the status of the population. Following the same calculation as population, the population density average for the planning area is approximately 709 persons per square mile. A breakdown of the population density by census tract and then weighted by planning area is found in Table 2.

*Table 2 - Weighted average of HCWCID110 Population Density by Census Tract*

Census Tract	Pop density	% HCWCID 110 in Tract	Weighted amount
553401	3,223.50	75%	2,418
553403	3,234.00	15%	485
553404	4,092.10	2%	82
553405	5,610.00	5%	281
241302	1,874.70	15%	281
<b>AVERAGE</b>	<b>3,606.86</b>		<b>709</b>

**Land Use**

Land development creates impervious surfaces through the construction of roads, parking lots, and other structures. The Multi-Resolution Land Characteristics Consortium (MRLC) is

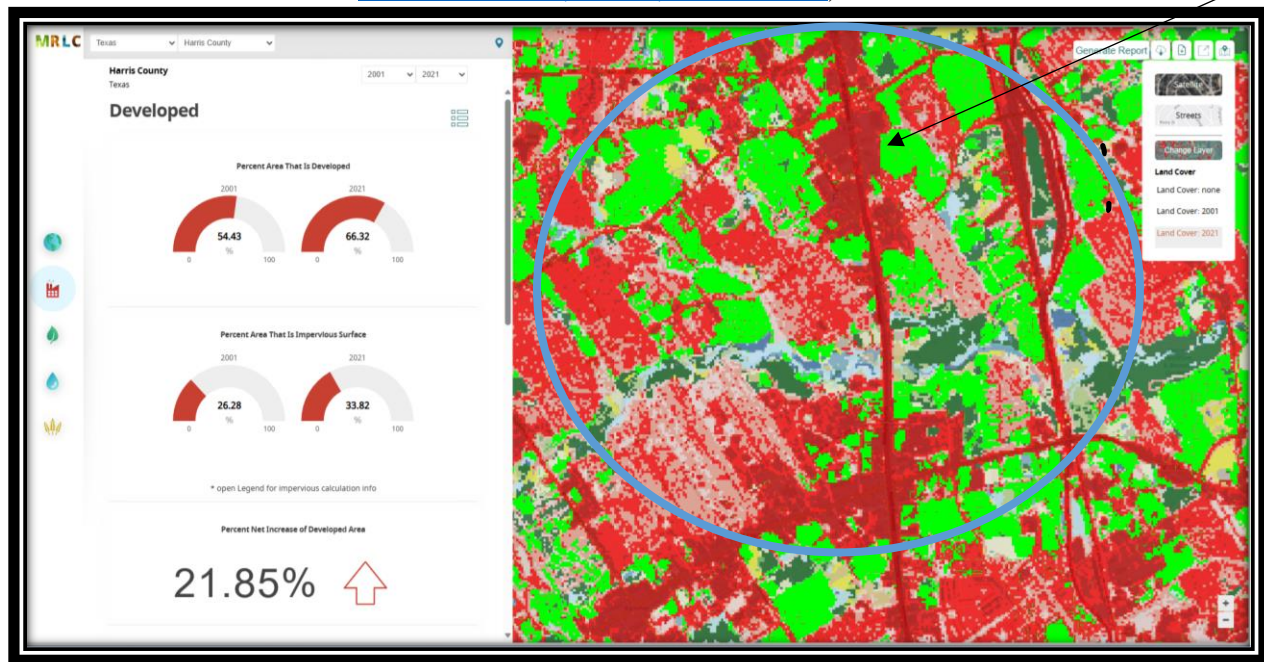


a group of federal agencies that coordinate and generate consistent and relevant land cover information at the national scale for a wide variety of environmental, land management, and modeling applications.

The MRLC EVA Tool drills down to the County level and compares land cover changes over a period of time. Reviewing the period from 2001 until 2021, Harris County’s development has increased almost 22%. More development and increased impervious surfaces could create a greater risk for increased flooding. While the data is at the County level, zooming into the HCWCID110 planning area (most found in the blue circle in Figure 9) indicates medium intensity. Green indicates developed gains and red indicates developed loss. Developed classes are also color coded with the definition shown above.

- **Developed, High Intensity** - Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.
- **Developed, Medium Intensity** - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.
- **Developed, Low Intensity** - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.
- **Developed, Open Space** - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

*Figure 9 - MRLC 2001 to 2021 Land Cover Change, Zoom view of Planning Area (Multi-Resolution Land Characteristics (MRLC) Consortium | Multi-Resolution Land Characteristics (MRLC) Consortium)*



### Household Median Income and Education

Census data provides socio-economic data by tract. The American Community Survey (ACS) five-year estimates are good data sources for small geographic areas (areas with fewer than 65,000 residents). Using the 2017-2021 ACS Five-Year Narrative Profile for the five census tracts, Table 3 estimates the following for household median income and education for that five-year period ([United States - Census Bureau Profiles Results](#)). On average, the planning area’s household

median income in that five year period was approximately \$97,000 compared to \$67,321 for the State of Texas (ACS 2017-2021). Approximately 92% of the population has graduated high school and approximately 39% have graduated college. The national average college graduation for that time period was 33.7%.

**Table 3 - ACS Five Year Household Median Income and Education by Census Tract**

Census Tract	Average Household Size	Education Bachelors	Graduated High School	Household Median Income
553401	2.91	41.8%	92.5%	\$ 114,716.00
553403	2.21	13.8%	90.5%	\$ 34,336.00
553404	3.39	49.7%	94.5%	\$ 143,523.00
553405	2.82	47.6%	93.0%	\$ 88,821.00
241302	2.96	40.5%	90.3%	\$ 103,122.00
<b>2017-2021 AVERAGE</b>	<b>2.858</b>	<b>38.7%</b>	<b>92.2%</b>	<b>\$ 96,903.60</b>

**Housing Units**

Using the ACS Five Year Census data on housing units, of the 10,642 housing units in the five census tracts, approximately 2,209 units are located in the HCWCID110 planning area. Of those units, approximately 2,090 are occupied and approximately 119 are vacant. The occupied number is consistent with the number of homes that HCWCID110 services water and sewer connections (2,100 homes with 2,467 connections).

**Table 4 - HCWCID110 Estimated Housing Unit Data by Census Tract**

Census Tract	Total Housing Units	% HCWCID 110 in Tract	HCWCID110 Weighted amount	Total Occupied Units	% HCWCID 110 in Tract	HCWCID110 Weighted amount	Total Vacant Units	% HCWCID 110 in Tract	HCWCID110 Weighted amount
553401	1,617.00	75%	1,212.75	1,546.00	75%	1,159.50	71	75%	53.25
553403	3,215.00	15%	482.25	2,979.00	15%	446.85	236	15%	35.40
553404	1,151.00	2%	23.02	1,124.00	2%	22.48	27	2%	0.54
553405	2,078.00	5%	103.90	1,971.00	5%	98.55	107	5%	5.35
241302	2,581.00	15%	387.15	2,414.00	15%	362.10	167	15%	25.05
<b>TOTAL</b>	<b>10,642.00</b>		<b>2,209.07</b>			<b>2,089.48</b>			<b>119.59</b>

**The HCWCID110 Whole Community**

HCWCID110’s planning area is a vibrant community located within easy driving distance to two international airports, one major port, the world’s largest medical complex, next to one major highway (I-45), and the fourth largest city in the US (Houston). There are two elementary schools and one high school that residents can attend. HCWCID110 is supported by Harris County Constable Precinct 4 and the Harris County Sheriff’s Office. There are two emergency services buildings located in the planning area.

## Commuting Patterns

While addressing potential hazards, it is important to note that much of the workforce in the planning area is mobile, using their own vehicle to commute in, around, and to the Houston metropolitan areas. Many workers commute out of the area over 30 minutes from home. Table 5 provides the average commuting time to work by census tract.

*Table 5 - Average Commuting Time by Census Tract*

Census Tract	Commuting to Work average time (minutes)
553401	33.5
553403	33.1
553404	35.7
553405	26.4
241302	26.6
<b>2017-2021 AVERAGE</b>	<b>31.06</b>

## Labor Force

HCWCID110 is located in Harris County. Harris County’s largest industry sector is health care and social assistance as reported on the Harris County Economic Development website ([Economic Development \(harriscountytexas.gov\)](http://EconomicDevelopment.harriscountytexas.gov)). The following illustration (Figure 10) shows the leading industry sector for the County. As a microcosm of the larger community, it is surmised that the planning area is similar to the County’s industry sector.

*Figure 10 - Industry Sectors Harris County, Texas 2021*





A closer look at the industry sectors employment share by industry, trade, transportation, and utilities are the leading industries with approximately 20.6%. The Harris County Economic Development Department prepared the following illustration in Figure 11. [Economic Development \(harriscountytexas.gov\)](http://harriscountytexas.gov)

*Figure 11 - Industry Sectors Harris County, Texas 2021*



### Major Employers

Figure 12 illustrates the top local employers for the Houston area as reported by the Houston Chronicle. For Precinct 3, the top five employers are ExxonMobil, Hewlett Packard Enterprise, Southwestern Energy, Cameron International, and Grayloc Products. ([Harris County Economic Highlights Booklet 2023.pdf \(harriscountytexas.gov\)](http://harriscountytexas.gov))

*Figure 12 - Top Local Employers in Harris County, Texas 2022*

Houston Chronicle 100: Top local employers															
RANK	COMPANY	2022 Employees	Companywide	RANK	COMPANY	2022 Employees	Companywide	RANK	COMPANY	2022 Employees	Companywide	RANK	COMPANY	2022 Employees	Companywide
1	Walmart	34,000	2.3 million	26	NOV	4,814	27,807	51	Marathon Petroleum Corp.	1,680	17,700	76	Amegy Bank	739	930
2	H-E-B	32,635	145,000	27	LyondellBasell Industries	4,810	19,224	52	St. Joseph Medical Center / Steward Health Care	1,500	43,000	77	Ascend Performance Materials	725	2,862
3	Memorial Hermann Health System	29,130	29,130	28	Kelsey-Seybold Clinic	4,512	4,688	53	IES Holdings	1,499	6,500	78	Comfort Systems USA	715	13,470
4	Houston Methodist	28,304	28,304	29	Southwest Airlines	4,340	55,000	54	KPMG	1,439	236,000	79	Cadence Bank	695	6,639
5	The University of Texas MD Anderson Cancer Center	22,088	22,088	30	Enterprise Products	3,450	7,244	55	Comcast	1,380	122,000	80	Stewart Title Guaranty Co.	684	6,209
6	Amazon	20,000	1.6 million	31	Occidental Petroleum (Oxy)	3,350	11,678	56	Alight Solutions	1,308	16,000	81	EOG Resources	672	2,765
7	Kroger	15,000	450,000	32	Halliburton	3,228	42,735	57	ChampionX Corp.	1,308	7,203	82	Mustang Cat	623	952
8	Texas Children's Hospital	14,378	14,613	33	bp America	3,200	63,300	58	ZT Corporate	1,300	3,000	83	Westlake	600	16,000
9	HCA Houston Healthcare	12,614	18,343	34	Deloitte	3,141	345,000	59	CBRE Group	1,257	100,000	84	Leslie Doggett Industries	583	1,632
10	United Airlines	11,832	80,862	35	Kinder Morgan	3,023	10,530	60	Koh's	1,200	100,000	85	Vinson & Elkins	580	1,363
11	The University of Texas Medical Branch	11,826	15,296	36	Chevron Phillips Chemical	2,913	5,000	61	Silver Eagle Distributors Houston	1,150	1,150	86	Engie North America	536	170,000
12	Exxon Mobil	11,814	62,798	37	Bank of America	2,410	208,000	62	Enbridge	1,100	12,000	87	JLL	500	100,000
13	The University of Texas Health Science Center at	11,539	11,925	38	Hewlett Packard Enterprise	2,200	60,000	63	Huntsman Chemical Co.	1,060	9,245	88	Triple-S Steel Holdings	500	2,200
14	Baylor College of Medicine	9,561	9,854	39	NRG Energy	2,200	6,500	64	Oceaneering International	1,000	8,500	89	Camden Property Trust	500	1,625
15	Dalkin Comfort Technologies North	8,819	12,084	40	Accenture	2,075	699,000	65	Nabors Industries	892	11,648	90	Harvey   Harvey-Cleary	498	707
16	Harris Health System	8,659	8,831	41	Universal Plant Services	2,075	2,797	66	APA Corp. (Apache Corp.)	850	2,160	91	Norton Rose Fulbright	464	6,954
17	Schlumberger	7,802	92,000	42	TechnipFMC	2,000	20,932	67	Calpine	835	2,100	92	NOW (DistributionNOW)	455	2,191
18	St. Luke's Health	7,223	24,553	43	Group 1 Automotive	1,965	14,500	68	Aldi	822	40,000	93	Sun Coast Resources	450	1,000
19	Shell USA	7,000	80,000	44	Waste Management (WM)	1,945	50,000	69	TC Energy	822	7,362	94	Transwestern	434	1,980
20	Chevron	7,000	37,498	45	Phillips 66	1,929	13,669	70	ABS	800	5,100	95	David Weekley Homes	434	1,598
21	Michael E. DeBakey VA Medical Center	5,900	5,900	46	ConocoPhillips	1,880	9,900	71	Marathon Oil	774	1,568	96	Murphy Oil Corp.	406	687
22	JPMorgan Chase & Co.	5,800	270,000	47	Ernst & Young	1,843	300,000	72	Hess Corp.	769	1,545	97	Baker Botts	404	1,260
23	Baker Hughes	5,068	54,000	48	The Friedkin Group	1,823	5,645	73	LJA Engineering	769	1,350	98	SPB Hospitality	400	18,000
24	Academy Sports + Outdoors	5,030	22,404	49	Kirby Corp.	1,803	5,043	74	Perry Homes	769	1,305	99	Schulte Building Systems	388	679
25	CenterPoint Energy	4,860	9,400	50	Randalls Food Markets (a division of Albertsons)	1,696	300,000	75	Frost	754	4,800	100	Crane Worldwide Logistics	336	2,170

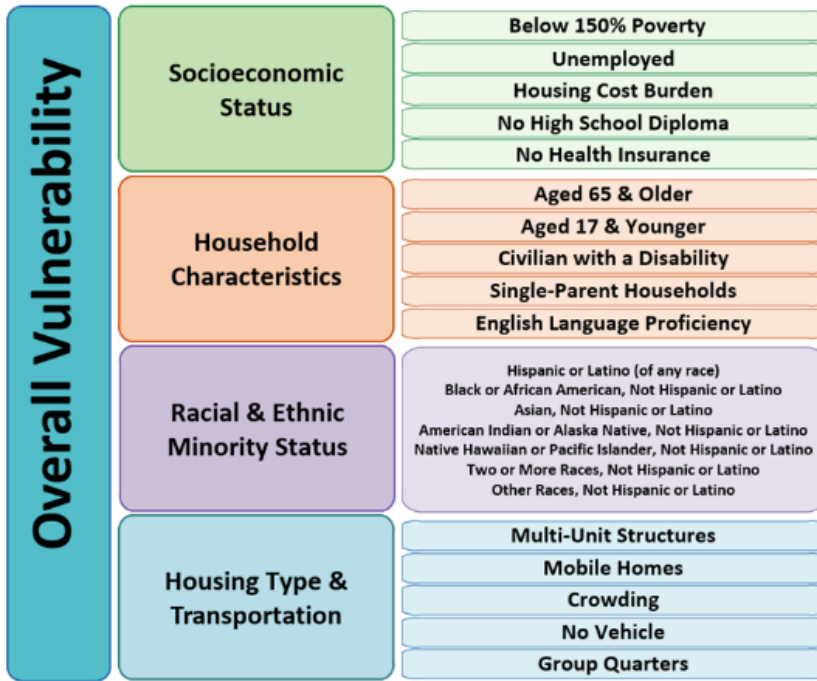
Source: By Houston Chronicle Business Staff | June 17, 2022 | Updated: June 16, 2022 10:20 PM  
 In determining the top local employers, we included full- and part-time employees at public and private companies and medical institutions in the Houston region. In a tie, the company with more employees companywide is listed first.

## Social Vulnerability

To assist community preparation and response to hazardous events like natural disasters, The Center for Disease Control (CDC) and Agency for Toxic Substances and Disease Registry (ATSDR) has created a database to help identify and map socially vulnerable populations called the Social Vulnerability Index (SVI). The CDC/ATSDR SVI uses U.S. Census data to determine the social vulnerability by census tract. The SVI ranks each tract on 16 factors, including poverty, lack of vehicle access, and crowded housing, and groups them into four related themes, socioeconomic status, housing characteristics, racial and minority status, and housing type/transportation ([CDC/ATSDR SVI Fact Sheet](#) | [Place and Health](#) | [ATSDR](#)).

Table 6 shows data by census tract, the four themes and the overall summary of vulnerability by

American Community Survey (ACS), 2016-2020 (5-year) data for the following estimates:



census tract. A percentile ranking represents the proportion of tracts (or counties) that are equal to or lower than a tract (or county) of interest in terms of social vulnerability. For example, a CDC/ATSDR SVI ranking of 0.85 signifies that 85% of tracts (or counties) in the state or nation are less vulnerable than the tract (or county) of interest and that 15% of tracts (or counties) in the state or nation are more vulnerable.

([CDC/ATSDR SVI Frequently Asked Questions \(FAQ\) | Place and Health | ATSDR](#)).

Possible scores range from 0 (lowest vulnerability) to 1 (highest vulnerability), so the higher the score, the more vulnerable the census tract is either by theme or overall vulnerability. For census tract ending in 553401, there is a low level of vulnerability. However, for census tract ending in 553405 there is a medium level of vulnerability overall. A closer look by theme indicates there is a medium to high vulnerability in housing type as well as transportation and minority status and language. This information can be helpful as a community prepares and responds to natural hazard events.

**Table 6 - SVI Data by HCWCID110 Census Tracts**

County	Census Tract	Socio Economic	Household Composition and Disability	Minority Status and Language	Housing Type and Transportation	Overall Summary
Harris County	48201553401	0.0658	0.1505	0.1345	0.0716	<b>0.0417</b>
Harris County	48201553403	0.5062	0.3785	0.5091	0.5828	<b>0.5071</b>
Harris County	48201553404	0.2682	0.3136	0.2849	0	<b>0.0924</b>
Harris County	48201553405	0.4344	0.3333	0.5368	0.7166	<b>0.5122</b>
Harris County	48201241302	0.1369	0.1973	0.604	0.1217	<b>0.1327</b>

Using U.S. Census Tract Profile 2022 American Community Survey 5-Year Estimate data, Table 7 shows the following: percentage of the population in the tract that is 65 years or older; under the poverty level; and disabled. This information also can help the planning area have a better understanding of the more vulnerable populations that may need assistance during or after a disaster. Table 8 from the Decennial Census 2020 provides by census tract the number and



percentage of some of the most vulnerable populations, children, children under 5, older populations (65 and older), those living alone, female households with no spouse or partner present.

**Table 7 - Census Tract Percentage of Population Characteristics**  
(United States - Census Bureau Profile)

County	Census Tract	Poverty	Disability	Older Population = or>65
Harris County	48201553401	8.60%	0.09%	15.70%
Harris County	48201553403	13.50%	11.50%	9.80%
Harris County	48201553404	19.40%	12.20%	8.80%
Harris County	48201553405	11.90%	11.70%	6.80%
Harris County	48201241302	2.30%	6.90%	6.90%

**Table 8 - Census Tract Percentage of Population Characteristics**  
(PROFILE OF GENERAL POPULATION AND HOUSING CHARACTERISTICS,  
<https://api.census.gov/data/2020/dec/dp>)

Label	Texas		Census Tract 2413.02; Harris		Census Tract 5534.01; Harris		Census Tract 5534.03; Harris		Census Tract 5534.04; Harris		Census Tract 5534.05; Harris	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Total population	29,145,505	100.0%	6,895	100.0%	4,556	100.0%	8,289	100.0%	3,188	100.0%	5,610	100.0%
Under 5 years	1,819,260	6.2%	436	6.3%	251	5.5%	481	5.8%	153	4.8%	357	6.4%
5 to 9 years	2,006,756	6.9%	410	5.9%	320	7.0%	529	6.4%	206	6.5%	380	6.8%
65 to 69 years	1,347,475	4.6%	333	4.8%	277	6.1%	352	4.2%	213	6.7%	244	4.3%
70 to 74 years	1,054,914	3.6%	258	3.7%	228	5.0%	272	3.3%	192	6.0%	178	3.2%
75 to 79 years	691,749	2.4%	157	2.3%	185	4.1%	187	2.3%	127	4.0%	123	2.2%
80 to 84 years	429,452	1.5%	97	1.4%	83	1.8%	88	1.1%	52	1.6%	82	1.5%
85 years and over	397,545	1.4%	88	1.3%	80	1.8%	66	0.8%	43	1.3%	77	1.4%
Living alone	1,249,863	11.9%	253	10.5%	99	6.4%	259	8.7%	56	5.0%	220	11.2%
65 years and over	308,800	2.9%	57	2.4%	23	1.5%	37	1.2%	26	2.3%	40	2.0%
With own children under 18 [3]	188,661	1.8%	41	1.7%	18	1.2%	54	1.8%	14	1.2%	31	1.6%
Female householder, no spouse or partner present:	2,829,133	27.0%	592	24.5%	294	19.0%	757	25.4%	194	17.3%	477	24.2%
Living alone	1,363,048	13.0%	266	11.0%	137	8.9%	387	13.0%	101	9.0%	196	9.9%
65 years and over	584,540	5.6%	101	4.2%	88	5.7%	148	5.0%	59	5.2%	63	3.2%
With own children under 18 [3]	645,779	6.2%	130	5.4%	49	3.2%	168	5.6%	28	2.5%	115	5.8%
Households with individuals under 18 years	3,739,350	35.6%	861	35.7%	558	36.1%	1,151	38.6%	407	36.2%	717	36.4%
Households with individuals 65 years and over	2,810,509	26.8%	641	26.6%	520	33.6%	693	23.3%	419	37.3%	453	23.0%

Decennial Census, DEC Demographic Profile, Table DP1, 2020,

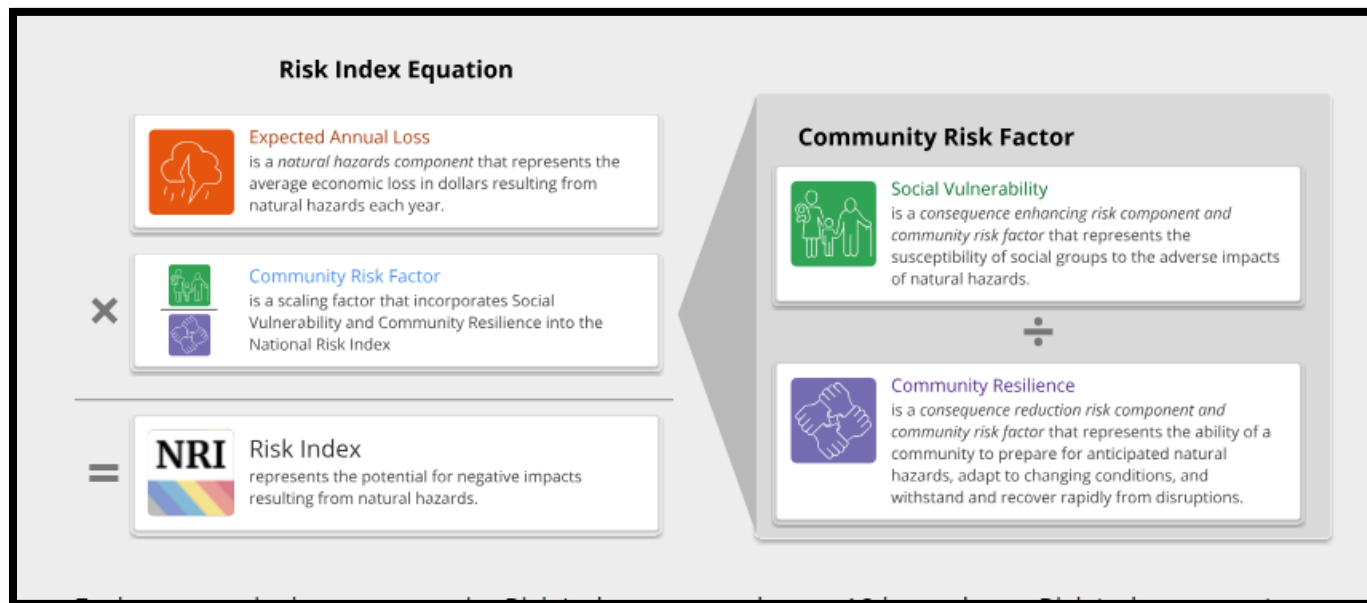
<https://data.census.gov/table/DECENNIALDP2020>. Demographic Profile. Accessed on December 8, 2023.

## Social Vulnerability

Social Vulnerability measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. [Comparison Report - Census Tract | National Risk Index \(fema.gov\)](#)

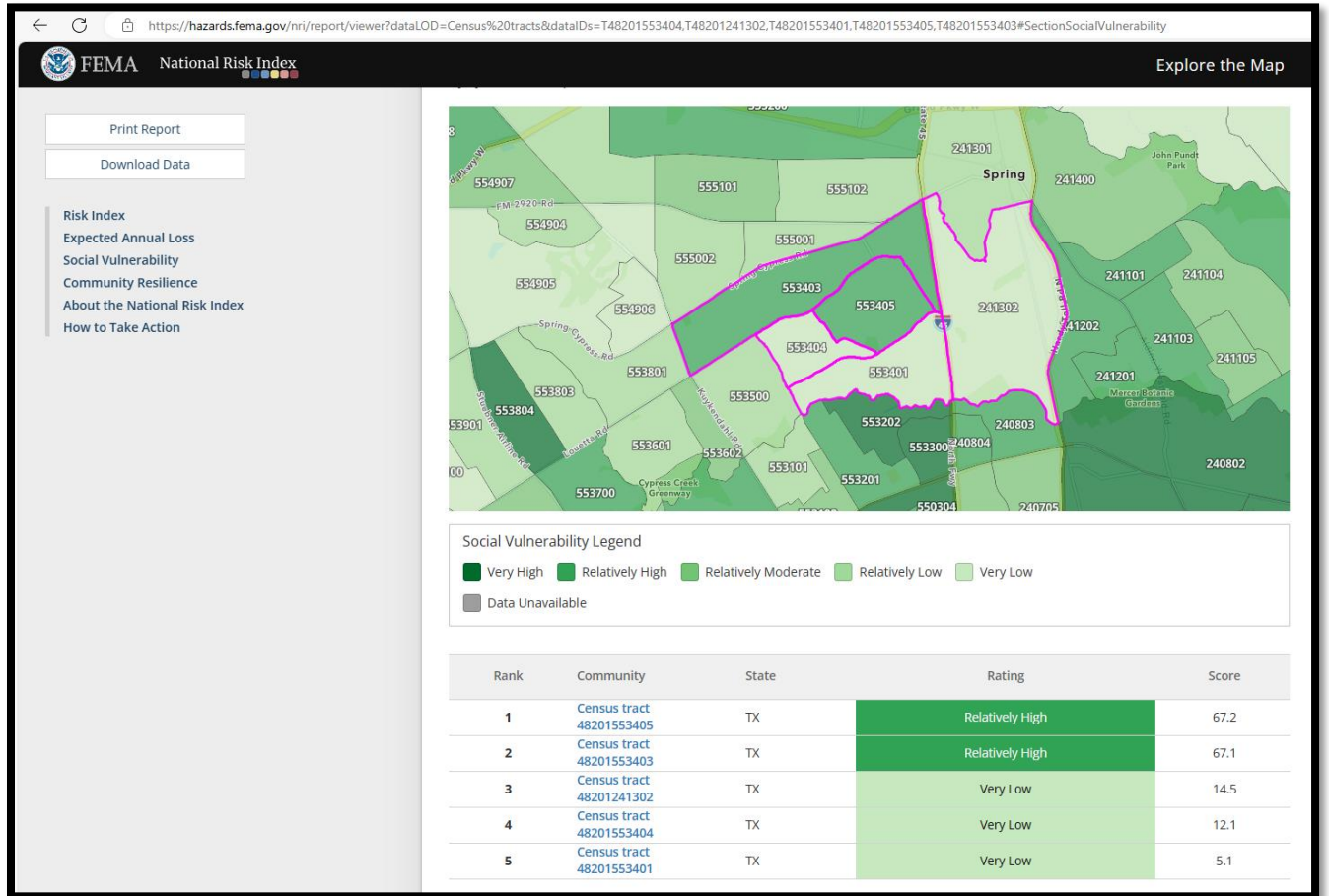
FEMA has created a website dedicated to help communities determine risk so it can determine measures to mitigate risk. The National Risk Index ( <https://hazards.fema.gov/nri>), “is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards. The Risk Index leverages available source data for natural hazard and community risk factors to develop a baseline risk measurement for each United States county and Census tract.” (<https://hazards.fema.gov/nri/learn-more>). Figure 13 shows the Risk Index Equation that is used to produce the risk index.

**Figure 13 - FEMA’s Risk Index Equation**  
 ([Determining Risk | National Risk Index \(fema.gov\)](https://hazards.fema.gov/nri/learn-more))



The community receives a score, which is represented by its percentile ranking among all other communities as the same level of risk. For Census tract ending in 553405, it received a score of 67.2 which means its risk index is greater than 67.2% of all US Census tracts. Communities also receive a rating which is a qualitative rating that describes the community compared to all other communities at the same level. The same Census tract received a “Relatively High” rating. Figure 14 illustrates the social vulnerability score and rating for the five Census tracts located within the planning area. In the Risk Assessment section of the plan, each hazard will look at expected annual loss and community resilience scoring and rating for the planning area.

**Figure 14 - Social Vulnerability Score for the Five Census tracts in HCWCID110**

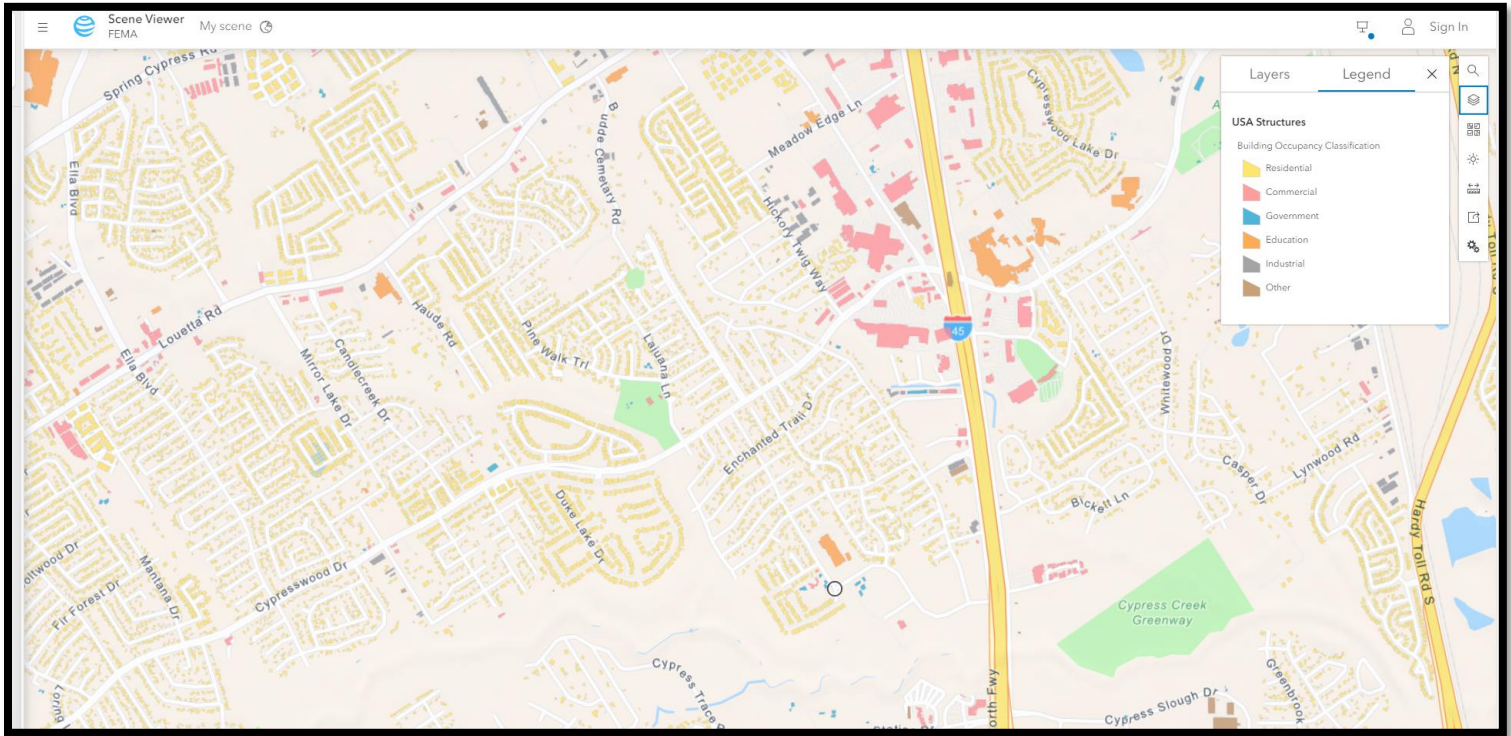


### Community Critical Facilities and Lifelines

Critical facilities are those that provide essential community services and emergency functions and are typically defined to include police and fire stations, schools, and emergency operations centers. Most of the critical facilities and lifelines infrastructures and support are done by the city or county. However, it is important for all organizations who have critical facility responsibility to know what critical facilities are in their area. For the HCWCID110 planning area, a map from ArcGIS, *My Scene* can provide emergency planners, responders and facility providers (like water and sanitary sewer) with maps that can show (through the use of a color code), where government buildings (like emergency response or fire), schools, commercial and residential structures are located. Figure 15 shows the planning area’s map.



*Figure 15 - Scene Viewer Map of Structures by Type in HCWCID110 Planning Area*  
[My scene \(arcgis.com\)](https://myscene.arcgis.com)



Critical infrastructure can include the roads and bridges that provide ingress and egress and allow emergency vehicles access to those in need and the utilities that provide water, electricity, and communication services to the community. Community lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society. The National Response Framework identifies seven lifelines as critical for maintaining public health, safety, and economic viability and include safety and security; health and medical; communications; hazardous materials; food, water, sheltering; energy; and transportation. While extremely important, from a hazard mitigation planning perspective for a special utility district, community lifelines

**Critical Facilities** are those facilities considered critical to the health and welfare of the population and that are especially important following a hazard. As defined for this HMP, critical facilities include transportation systems, lifeline utility systems, high-potential loss facilities, and hazardous material facilities, and essential facilities

Essential Facilities are a subset of critical facilities that include those facilities that are important to ensure a full recovery following the occurrence of a hazard event. For the county risk assessment, this category was defined to include police, fire, EMS, schools/colleges, shelters, senior facilities, and medical facilities.

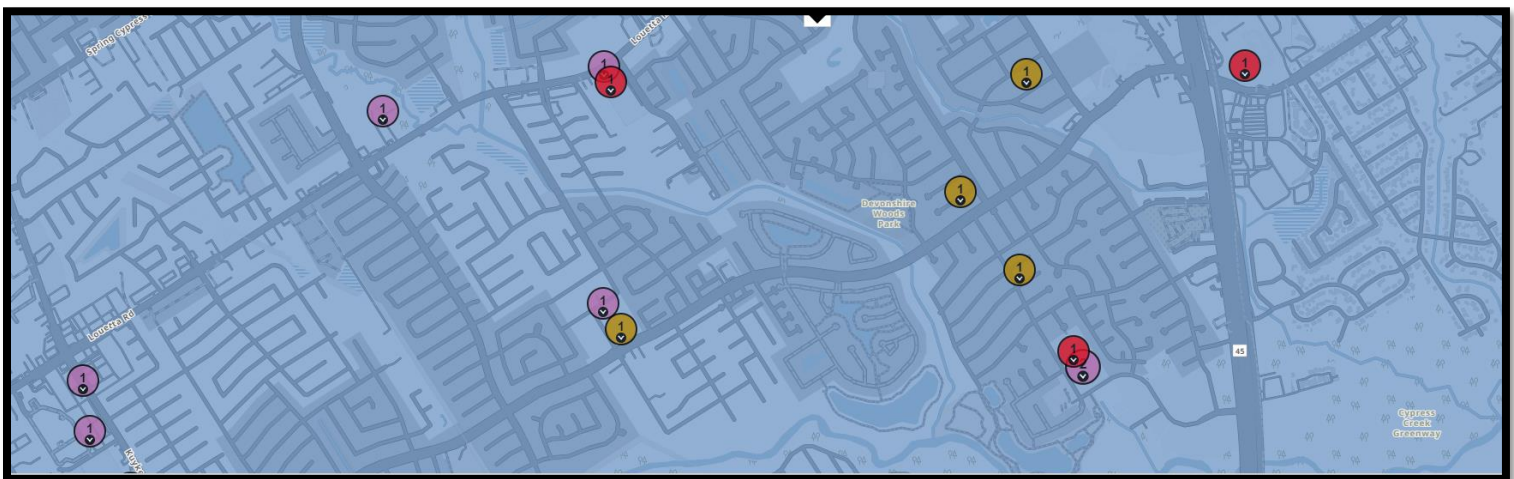
Lifelines enable the continuous operation of critical business and government functions and are essential to human health and safety or economic security.

are addressed by the local emergency management coordinators of which the lifeline water and health and safety measures that HCWCID110 provides during and after disaster are coordinated with the emergency management efforts. This plan will focus on the critical facilities located in the planning area for identification purposes only to help understand what is impacted from a hazard so a mitigation action can be developed.

HCWCID110 has identified three critical facility buildings that maintain continuity of essential community services in its planning areas that are not associated with HCWCID110. Additionally, HCWCID110 owns and operates two water plants, eight lift stations, one wastewater treatment plant, one administration building and one elevated storage tank that support essential community services.

In addition, it is important to understand where key facilities like hospitals, schools, and nursing homes are within the planning area primarily for emergency management purposes but also for continuity of services that HCWCID110 provides. The Center for Disease Control (CDC) ATSDR has an interactive map built to show social vulnerability at various levels (e.g. county, census tract, state as examples). It has a map feature that can show how many nursing homes, hospitals, and schools are in the area.

**Figure 16 - CDC Map of Planning Area Key Facilities**  
**[CDC/ATSDR Social Vulnerability Index \(SVI\) | Place and Health | ATSDR](#)**



## Section 2. The Planning Process

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### The Purpose of the Plan

Over twenty years ago, Congress recognized the need to support a new kind of planning that would help local communities understand and reduce their vulnerability to natural hazards by preparing a local hazard mitigation plan. Congress passed the Disaster Mitigation Act (DMA) of 2000 which amended the Robert T. Stafford Disaster and Emergency Act (Stafford Act). The Code of Federal Regulation (CFR) provides the regulatory requirements outlined in the DMA. 44 CFR § 201.6(d)(3) stipulates that a local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years to continue to be eligible for mitigation project grant funding.

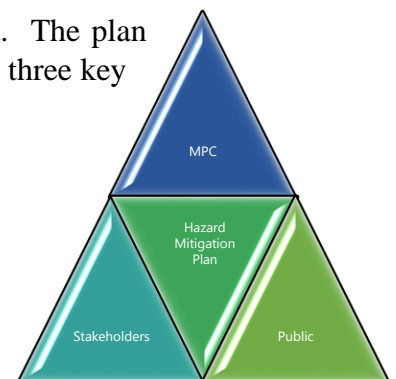
The Act intended to assist communities in reducing their risk from natural hazards by identifying resources, information, and strategies for risk reduction, and through careful planning and collaboration among public agencies, stakeholders, and the public prepare and regularly update mitigation plans. To implement the DMA 2000 planning requirements, in April 2022 FEMA released a Local Mitigation Planning Guide, FEMA’s official policy on, and interpretation of, local hazard mitigation planning requirements. In May 2023 FEMA released the Local Mitigation Planning handbook to guide local governments as they update a hazard mitigation plan. The handbook emphasizes the shift to community resilience and a whole community approach ensuring vulnerable populations are represented.

### The Planning Process

This section includes a description of the planning process used for the HCWCID110 Hazard Mitigation Plan, including how it was prepared, who was involved in the process, and how the public was involved. HCWCID110 followed a well-established planning process to prepare its Hazard Mitigation Plan (HMP). The 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 (May 2023) was used as a practical guide to ensure all requirements were satisfied. The Local Mitigation Planning Handbook suggests organizing the plan around four steps as illustrated in Figure 17.

The HMP is a single jurisdiction plan for the HCWCID110 planning area. The plan followed the recommended resource organization utilizing the support from three key groups:

- The Mitigation Planning Committee
- The Stakeholders
- The Public





**Figure 17 - Steps to Prepare a Plan**  
(FEMA Local Mitigation Planning Handbook, May,2023 p. 2)



**Mitigation Planning Committee**

The Mitigation Planning Committee (MPC) consists of the HCWCID110 Board Members, District Manager, Engineering, Legal and Planning consultants. The MPC leads the drafting of the plan as well as the annual review of the plan. Members are responsible for:

- Providing guidance and overseeing the planning process
- Attending and participating in meetings
- Establishing a timeline for completion of the plan
- Assisting with the development and completion of certain planning elements, including:
  - Determining the planning process and schedule
  - Identifying and profiling the hazards of concern and preparing the risk assessment for each hazard
  - Developing a public and stakeholder outreach program
  - Assuring the data and information used in the plan process is the best available
  - Providing a capability assessment of HCWCID110’s considering authorities, policies, programs, and resources available
  - Determining the hazard mitigation strategy and goals
  - Identifying, screening and prioritization of mitigation actions and implementation
  - Determining the maintenance process for the plan
  - Reviewing plan documents prior to submission to TDEM and FEMA
  - Ensuring that the plan meets the requirements of DMA 2000

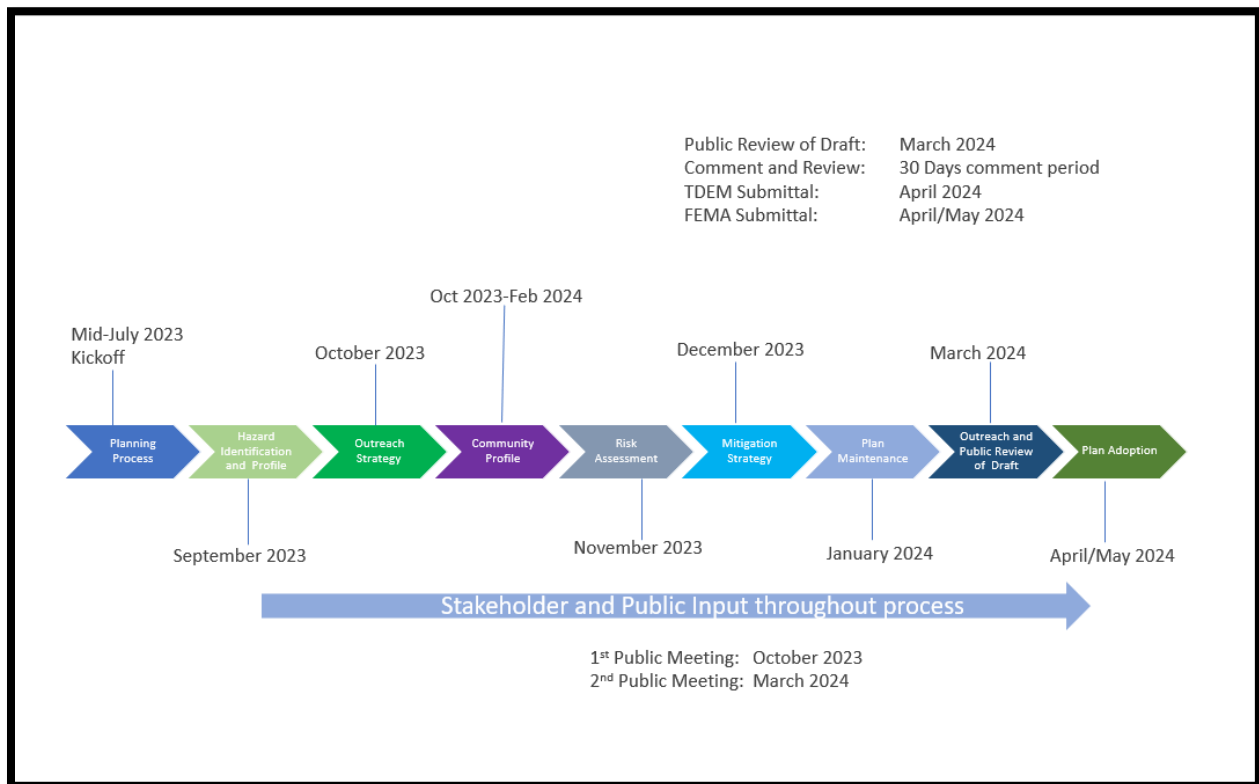
During the first meeting, the team confirmed the composition of the Mitigation Planning Committee (MPC) and their respective positions. Roles and responsibilities were determined, each phase was discussed and the documents and data needed for each phase were discussed as well as a tentative work schedule, shown in Figure 18. Table 9 lists the MPC members for this plan. 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 9 - HCWCID110, 2024 Mitigation Planning Committee (MPC)**

<b>MPC Member</b>	<b>Title and Department</b>	<b>Role/Responsibility</b>
Jeanie Perkins	<b>First Vice-President HCWCID110 Board of Directors</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
Vanessa Sommer	<b>Secretary HCWCID110 Board of Directors</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
Brian Mills	<b>District Manager HCWCID110</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
Maria Salinas Parker	<b>District Attorney Sanford, Kuhl, Hagan, Kugle, Parker, Kahn, LLP</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
Josh Kahn	<b>District Attorney Sanford, Kuhl, Hagan, Kugle, Parker, Kahn, LLP</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
Deidra Daniels	<b>District Paralegal Sanford, Kuhl, Hagan, Kugle, Parker, Kahn, LLP</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
John Davis	<b>District Engineer Langford Engineering</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
Norman Gutierrez	<b>EIT Langford Engineering</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, and draft review
Matt Zeve	<b>Engineer and Plan Consultant Gauge Engineering</b>	Data collection, analysis of hazards, identify actions, mitigation strategy, outreach strategy, map support, and draft review
Jeff Ward	<b>Plan Consultant JSWA Inc.</b>	Drafting plan based on data and analysis from MPC, reports and plans, ensuring requirements are met for plan, and incorporating Stakeholders and Public comments

MPC Member	Title and Department	Role/Responsibility
Kristen Thatcher	<b>Plan Consultant JSWA Inc.</b>	Drafting plan based on data and analysis from MPC, reports and plans, ensuring requirements are met for plan, and incorporating Stakeholders and Public comments
Chase Ward	<b>Plan Consultant JSWA Inc.</b>	Drafting plan based on data and analysis from MPC, reports and plans, ensuring requirements are met for plan, and incorporating Stakeholders and Public comments

*Figure 18 - Draft Schedule for HCWCID110 HMP*



The MPC met seven times during the planning process and will be briefly summarized as the minutes are attached to the plan in Appendix A.

**July 12, 2023** - The purpose of the meeting was to begin the planning process, learn about the changes required from the recently released local mitigation planning handbook, finalize the MPC membership, to make certain decisions about contents of the plan, and to assign specific tasks to HCWCID110 staff and consultants. Most of the tasks were related to information and data gathering, maps, and identifying the planning area. The plan structure was discussed as well. The



team also discussed an outreach strategy. Lastly, a tentative schedule was put in place to keep the process on schedule as shown in Figure 18.

**August 7, 2023** - The stakeholder role was explained. Stakeholders are individuals and organizations that may be affected by mitigation actions and policies and who can provide specific information on topics or provide input from a different point of view in the community. The MPC identified hazards that impact the planning area and hazards that could be omitted. The team further refined the outreach strategy and began the review of local capabilities.

**September 13, 2023** - The MPC finalized the stakeholder list and using the hazard profile information, began to classify and rank the hazards. The outreach documents were shared: Draft survey, facts sheets and brochures for the team to review and provide feedback. The MPC determined the first public meeting would be held in October.

**November 1, 2023** – Information from the risk assessment was provided so that the team could begin to work on the mitigation strategy. The local capabilities assessment continued.

**December 13, 2023** – Mitigation actions were finalized and the local capabilities assessment were finalized. A date for the first stakeholder meeting was finalized for December 27<sup>th</sup>. The MPC discussed that the draft would be ready for MPC review on February 5, 2024 and after comments were back, the next stakeholder meeting and public meeting would be set.

**February 27, 2024** - Input received from the stakeholders was provided and the MPC reviewed the input and prepared the final draft for public review and input. The final draft date was set, and the second public meeting and outreach meetings were set.

**April 16, 2024** - The MPC received comments from the 30-day public comment period. After reviewing, the team incorporated comments received in preparation to submit the final plan for TDEM to review.

## **Stakeholders**

Stakeholders are individuals and organizations that may be affected by mitigation actions and policies and who can provide specific information on topics or provide input from a different perspective in the community including:

- Local and regional agencies involved in hazard mitigation activities
- Agencies that have the authority to regulate development
- Neighboring communities
- Representatives of businesses, academia, and other private organizations
- Representatives of nonprofit organizations, including community-based organizations, that work directly with and/or provide support to underserved communities and socially vulnerable populations, among others.

The MPC identified stakeholders and sent an invitation to participate in the plan process (by mail and email) to the stakeholders on December 14, 2023 and an example of the letter can be found in Appendix B. The stakeholders for this plan are listed in Table 10.

*Table 10 - HCWCID110 2024 Stakeholders*

First name	Last name	Title	Organization
Vlad	Ibarra	Deputy Emergency Management Coordinator	Houston Office of Emergency Management
Jeremy	Phillips	Community Services Division Director	Harris County Flood Control District
Mark	Evans	Planning and Government Affairs Director	North Harris County Regional Water Authority
Mark	Adam	Board President	Pine Forest MUD
Daniel	Meacham	Board President	Timber Lane Utility District
Renee	Granberry	Board President	CNP Utility District
Lonnie and Beth	Wright	Municipal Operations Consulting Inc.	Harris County MUD 104 and MUD 249
Milton	Rahman	Executive Director and County Engineer	Harris County Engineering Department
Tom	Ramsey	Harris County Precinct 3 Commissioner	Harris County Precinct 3
Todd	Ward	Risk Mitigation Department Manager	Harris County Flood Control District
Jenny	McGown	Superintendent	Klein Independent School District
Lupita	Hinojosa	Superintendent	Spring Independent School District
Adam	Teitze	Principal	Lemm Elementary School
Jalen	Hemphill	Principal	Spring High School
Melissa	Warford	Principal	McNabb Elementary
Scott	Seifert	Fire Chief	Harris County Emergency Services District 7
Brittany	Ray	Resilience Planner	Harris County Office of Homeland Security and Emergency Management
Vicente	Medina	Constable Captain	Harris County Precinct 4
Kevin	Walker	Constable Sergeant	Harris County Precinct 4
Scott	Davis	Chief Executive Officer	HCA Houston Healthcare - Northwest

Stakeholder outreach was performed early on and continually throughout the planning process. There were two formal presentations and one request for input on the first draft of the plan. The stakeholders were also invited to the public meetings. Input was received throughout the drafting process. A brief description of the three stakeholder meetings is below.

**December 27, 2023** – The MPC explained the importance of mitigation planning, this plan process, information and data on the plan draft, and how the stakeholders could help and provide input the drafting process.

**February 15, 2024** – The MPC summarized the first draft of the plan and solicited review and input from the stakeholders.

**March 13, 2024** – The 30-day comment period of the draft plan was open and stakeholders were asked to review and provide comments back for incorporation of the final draft to be submitted to TDEM by mid-April.

## 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 drafting the plan 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 in Appendix B. Additional virtual meetings were also held with the stakeholders who were invited by email. Appendix C includes the presentations.
- An online hazard mitigation public survey was developed and made accessible through HCWCID110’s website.
- Outreach material was created and disseminated through HCWCID110’s website, social media platforms, and use of HCWCID110’s digital billboard. Print material was prepared for each public meeting.
- Two public meetings were held. The draft plan was posted to HCWCID110’s website and was mailed to interested parties upon request. The public was informed how to provide input during a 30-day comment period.
- Once comments were received, the MPC finalized the draft and submitted it to TDEM for review and FEMA approval.

## Community Participation

Consistent with HCWCID110’s standard practice of informing, engaging, and involving citizens, and to fulfill public participation requirements of the mitigation planning programs, the MPC developed an outreach plan that publicized the initiative and the survey, invited residents to review the draft plan, and solicited public comment.

The goal of the outreach strategy included:

- Public Awareness of the importance of hazard mitigation planning through surveys, presentations and educational materials using various media to inform the public (website, Facebook, digital display, and printed and online newsletters (monthly and quarterly distributed))
- Public Awareness of HCWCID110’s Hazard Mitigation Plan, process and tentative timeline



- Public input on the Plan

This strategy was implemented as follows:

- A hazard mitigation plan public survey was created to gauge:
  - Resident’s experience with hazards
  - Resident’s perception of risks from hazards
  - Knowledge of importance of Mitigation Planning
  - Support of community programs that support Mitigation
- The survey was available on HCWCID110’s website throughout the planning process.
- The Public was made aware of the survey through HCWCID110’s social media platforms, District’s website, Board Meetings, monthly and quarterly newsletters and digital display. Figures 19, 20 and 21 are a few visual examples.

*Figure 19 - Digital Display announcing Hazard Mitigation Public Survey*



Figure 20 - HCWCID110 Stakeholder and Public Presentations

**How to find the survey:**

- HCWCID website: [FLOOD CONTROL INFO | wcid110](#)
- Survey has 10 questions
- Responses will help will plan information (e.g. confirmation of hazards, understanding concerns and concern areas)
- Learn more about plans from the fact sheet provided on the website

The image shows a screenshot of the HCWCID110 website. At the top, there is a navigation menu with links for HOME, ABOUT WCID110, BOARD & STAFF, BOARD MEETINGS, and IMPORTANT NOTICES. Below this is a secondary menu with links for DISTRICT DOCUMENTS LIBRARY, FLOOD CONTROL INFO, PRECINCT 4 CONSTABLES, TRASH & RECYCLE, PARKS & RECREATION, FOREST OAKS RENTALS, DISTRICT COMMUNICATIONS, and DISTRICT ANNOUNCEMENTS. The main content area features a section titled 'WCID110 Hazard Mitigation Plan 2023' with several sub-sections: 'What is Hazard Mitigation?', 'What is a Hazard Mitigation Plan?', 'What is the benefit of a Hazard Mitigation Plan?', 'Goal of the plan:', and 'How can you help?'. A red arrow points from the 'Website' text to the website screenshot. Another red arrow points from the 'Take the Survey' button in the screenshot to the 'Take the Survey' button in the text block.

Figure 21 - HCWCID110 Website outreach for Hazard Mitigation Public Survey

The image shows a screenshot of the HCWCID110 website. At the top, there is a navigation menu with links for HOME, ABOUT WCID110, BOARD & STAFF, BOARD MEETINGS, and IMPORTANT NOTICES. Below this is a secondary menu with links for DISTRICT DOCUMENTS LIBRARY, FLOOD CONTROL INFO, PRECINCT 4 CONSTABLES, TRASH & RECYCLE, PARKS & RECREATION, FOREST OAKS RENTALS, DISTRICT COMMUNICATIONS, and DISTRICT ANNOUNCEMENTS. The main content area features a section titled 'WCID110 Hazard Mitigation Plan 2023' with several sub-sections: 'What is Hazard Mitigation?', 'What is a Hazard Mitigation Plan?', 'What is the benefit of a Hazard Mitigation Plan?', 'Goal of the plan:', and 'How can you help?'. A blue arrow points from the 'Take the Survey' button in the screenshot to the 'Take the Survey' button in the text block.

**HOME**    **ABOUT WCID110**    **BOARD & STAFF**    **BOARD MEETINGS**    **IMPORTANT NOTICES**

**DISTRICT DOCUMENTS LIBRARY**    **FLOOD CONTROL INFO**    **PRECINCT 4 CONSTABLES**    **TRASH & RECYCLE**

**PARKS & RECREATION**    **FOREST OAKS RENTALS**    **DISTRICT COMMUNICATIONS**    **DISTRICT ANNOUNCEMENTS**

## WCID110 Hazard Mitigation Plan 2023

**What is Hazard Mitigation?**

- Hazard mitigation lessens the impact of natural hazards by taking action before the next event.

**What is a Hazard Mitigation Plan?**

- Hazard mitigation plans raise awareness of hazards, risks, and local vulnerabilities. They also identify ways to reduce risk and focus local resources on the greatest risks.

**What is the benefit of a Hazard Mitigation Plan?**

- It is an investment in the future safety and sustainability of the area. Planning helps communities act now, before a disaster occurs, to reduce losses. They are also a prerequisite for many FEMA grants.

**Goal of the plan:**

- The goal of the plan is to identify projects that can reduce damages from future hazards. The plan will include a risk assessment and hazard mitigation strategy for each of the primary hazards of concern for the District.

**How can you help?**

1. Take the [public survey](#).
2. Attend the public hearing and provide input. The public hearing is scheduled for Thursday, October 19 at 9 a.m. in the Forest Oaks Clubhouse in the Board Room and Rental Room.
3. Review the plan.

**FACT SHEET ABOUT MITIGATION PLANNING**  
Information from FEMA  
(Hazard Mitigation Planning for Local Communities (fema.gov))

**Hazard Mitigation is...**

Hazard mitigation describes actions taken to help reduce or eliminate long-term risks caused by hazards or disasters, such as flooding, drought, hurricanes and tropical storms, wildfires, or water storms. As the costs of disaster management and recovery continue to rise, governments and citizens must find ways to reduce hazard risks to our communities. While communities make plans and approve new developments and improvements to existing structures, mitigation can and should be an important component of the planning effort.

**Hazard Mitigation Planning**

Harris County Water Control and Improvement District 10 (HCWCID 10 or District 10) is in the process of developing a hazard mitigation plan. Mitigation plans must be reviewed and approved locally, approved by the Texas Department of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA) and their families adopted by the District.

While mitigation can and should be taken before a disaster occurs, hazard mitigation is also essential after a disaster. Once after disasters, repairs and reconstruction are completed, it is crucial to help us to simply restore damaged property to pre-disaster conditions. These efforts may get the community back to normal for a time, but the repetition of pre-disaster conditions may result in a repetitive cycle of damage, reconstruction, and displaced damage. This recurrent reconstruction becomes more expensive as time goes by.

Hazard mitigation breaks this repetitive cycle by taking a long-term view of rebuilding and recovering following disasters. The implementation of such hazard mitigation actions leads to building stronger, safer and smarter communities that are better able to reduce future injuries and future damage.

*Click on the image to see the Fact Sheet About Mitigation Planning (pdf document)*

**Take the Survey** →

- As a result of these platforms, over 45 surveys were completed.
- Appendix E shows the results of the survey.
- Results from the survey were provided to the MPC and the stakeholders.
- The MPC used this information as they drafted actions and assessed risk.
- The MPC asked the stakeholder group to share information on the importance of hazard mitigation plans and let their constituents know how they can get involved.

A second tier of the outreach strategy included prepared materials that could be distributed at meetings and found on HCWCID110’s dedicated website section to the Hazard Mitigation plan that included:

- Fact Sheet about Mitigation Planning
- Harris County Water Control District (HCWCID110) Hazard Mitigation Plan Flyer
- Presentations given to the Stakeholders and the Public
- Hazard Mitigation Efforts Updates included in the quarterly and monthly distributed electronic and mailed newsletters. Figure 22 is the dedicated section of the website. Figure 23 is the February-April 2024 Newsletter that includes an update. Figure 24 is the flyer and Figure 25 is one page of the fact sheet.

*Figure 22 - Dedicated section of HCWCID110 website for the HMP*





Figure 23 - Section of February-April 2024 HCWCID110 Quarterly Newsletter on HMP

FEBRUARY - APRIL 2024

# HARRIS COUNTY WCID110 FOREST OAKS PARKS AND RECREATION



## Forest the Park Ranger



### What's Inside?

- District Information
- FOSRC General Information
- Forest Oaks Memberships
- Forest Oaks Rentals
- Forest Oaks Park Info
- Hazard Mitigation Updates
- MOC - Water Utility Operator
- EyeOnWater App Setup
- Trash and Recycling
- Electronic Recycling Event
- Forest Oaks Projects
- Rivera Tennis Academy
- On Deck with Aquatics
- Adult Swim
- What's Happening at FOSRC
- Holistic Health and Wellbeing
- Mills' Minute

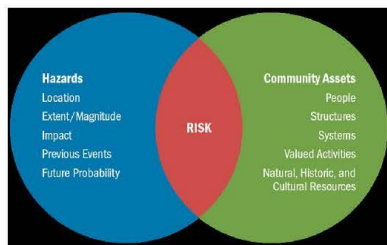
# HAZARD MITIGATION EFFORTS OF WCID110

The District has been working with our consultants on the creation of a Hazard Mitigation plan. This plan is a requirement to pursue grant funding for hazard mitigation projects which range from flooding and natural disasters to infrastructure improvements like generators and emergency response equipment.



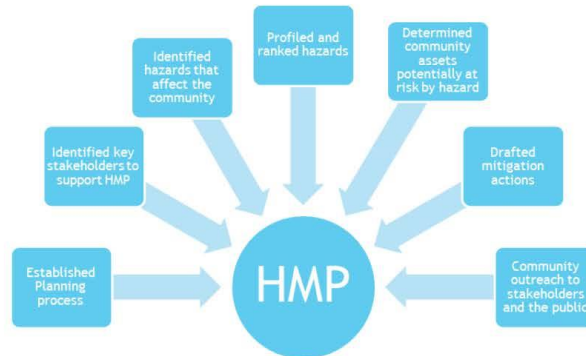
## Why Prepare a Hazard Mitigation Plan?

- Provides a framework to lessen the impacts of natural disasters.
- Analyzes and assesses natural hazards and their risk on the community.
- Establishes a mitigation strategy that encompasses goals, actions to reduce risk that are prioritized, and an implementation plan for the prioritized actions.
- Engages the whole community (e.g., surveys, meetings).
- Allows HCWCID110 to be eligible for pre- and post-disaster mitigation funding.
- Gives an opportunity to integrate our plans and strategies with other community planning initiatives.



By identifying potential hazards, HCWCID110 can then create mitigation strategies for each hazard. This process has been completed by the Mitigation Planning Committee (MPC), which is made up of two board members, WCID110 staff, engineering consultants, and our hazard mitigation consultants.

The MPC identified community stakeholders in November 2023 and held a stakeholder meeting in late December to share the plan and get feedback from those individuals and entities. The MPC is now revising the plan and will share it with the public in the coming weeks.



The stakeholder presentation is available on the District website along with the Hazard Mitigation survey which was used when deciding which hazards can and need to be addressed. As this plan continues to be developed, additional information will be provided to our residents. It is also important to remember that this plan does NOT commit our district to any financial obligations for any projects, but it does provide the opportunity to minimize the cost through grant funding up to 75% on some potential projects.

**Updates on Flood Control can be found on the District website under the Flood Control Information page.**





Figure 24 - HCWCID110 Flyer

**Harris County Water Control Improvement District (WCID110) Hazard Mitigation Plan (2023)**

**What is Hazard Mitigation?**  
Hazard mitigation lessens the impacts of natural hazards by taking actions before the next event.

**What is a Hazard Mitigation Plan?**  
Hazard mitigation plans raise awareness of hazards, risks, and local vulnerabilities. They also identify ways to reduce risk and focus local resources on the greatest risks.

**What is the benefit of a Hazard Mitigation Plan?**  
It is an investment in the future safety and sustainability of the area. Planning helps communities act now, before a disaster occurs, to reduce losses. They are also a prerequisite for many FEMA grants.

**Goal of the plan:**  
The goal of the plan is to identify projects that can reduce damages from future hazards. The plan will include a risk assessment and hazard mitigation strategy for each of the primary hazards of concern for the District.

**How can you help?**

1. Take the public survey
2. Attend the public meetings and provide input
3. Review the plan

Figure 25 - HCWCID110 Fact Sheet

**FACT SHEET ABOUT MITIGATION PLANNING**  
Information from FEMA  
(Hazard Mitigation Planning for Local Communities (fema.gov))

**Hazard Mitigation is...**  
Hazard mitigation describes actions taken to help reduce or eliminate long-term risks caused by hazards or disasters, such as flooding, droughts, hurricanes and Tropical storms, wildfires, or winter storms. As the costs of disaster management and recovery continue to rise, governments and citizens must find ways to reduce hazard risks to our communities. While communities make plans and approve new developments and improvements to existing infrastructure, mitigation can and should be an important component of the planning effort.

**Hazard Mitigation Planning**  
Harris County Water Control and Improvement District 110 (HCWCID 110 or District) is in the process of developing a hazard mitigation plan. Mitigation plans must be reviewed and updated, formally approved by the Texas Department of Emergency Management (TDEM) and the Federal Emergency Management Agency (FEMA) and then formally adopted by the District.

While mitigation can and should be taken before a disaster occurs, hazard mitigation is also essential after a disaster. Often after disasters, repairs and reconstruction are completed in such a way as to simply restore damaged property to pre-disaster conditions. These efforts may get the community back to normal for a time, but the replication of pre-disaster conditions may result in a repetitive cycle of damage, reconstruction, and repeated damage. This recurrent reconstruction becomes more expensive as years go by.

Hazard mitigation breaks this repetitive cycle by taking a long-term view of rebuilding and recovering following disasters. The implementation of such hazard mitigation actions leads to building stronger, safer and smarter communities that are better able to reduce future injuries and future damage.

**Types of Mitigation Techniques**

**Natural Resource Protection** – Actions that minimize hazard loss and preserve or restore the functions of natural systems. Includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

**Structural Projects** – Actions that involve the construction of structures to reduce the impact of a hazard. Includes dams, setback levees, floodwalls, retaining walls, and safe rooms.

**Emergency Services** – Actions that protect people and property during and immediately after a hazard event. Includes warning systems, emergency response services, and the protection of essential facilities.

**Prevention** – Government, administrative, or regulatory actions that influence the way land and buildings are developed to reduce hazard losses. Includes planning and zoning, floodplain laws, capital improvement programs, open space preservation, and stormwater management regulations.

**Property Protection** – Modification of buildings or structures to protect them from a hazard or removal of structures from a hazard area. Includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass.

**Public Education and Awareness** – Actions to inform citizens and elected officials about hazards and ways to mitigate them. Includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education.

**Common Mitigation Actions**

- Drainage projects including detention, retention, channelization, and culvert expansion.
- Enforcement of building codes, floodplain management codes and environmental regulations.
- Public safety measures such as continual maintenance of roadways, culverts, and dams.
- Protecting critical facilities and infrastructure from future hazard events.
- Planning for hazard mitigation, emergency operations, disaster recovery, and continuity of operations.
- Development and distribution of outreach materials related to hazard mitigation.
- Deployment of warning systems to alert and notify the public.
- Acquisition of relocation of structures, such as purchasing buildings located in a floodplain.
- Acquisition of undeveloped hazard prone lands to ensure no future construction occurs there.
- Retrofitting of structures and design of new construction, such as elevating a home or building.



## Mitigation Planning Process, Implementation and Monitoring

The mitigation planning process encourages communities to integrate mitigation into their day-to-day decision making about land use planning, floodplain management, site design and other functions. Mitigation plans:

**Organize the Planning Process and Resources:** Assemble the resources needed for a successful mitigation planning process. This includes reaching out to technical experts, defining the planning area, and identifying individuals, agencies, neighboring jurisdictions, businesses, and other partners to participate in the process. This includes whole community outreach for input and participation in the planning process.

**Assess Risks:** Identify the characteristics and potential consequences of hazards. This includes understanding where the hazard may occur and what people, property or community assets may be in harm's way.

**Develop a Mitigation Strategy:** Set priorities and develop long-term strategies for avoiding or minimizing the undesired effects of disasters. Communities base their strategy on an assessment of their unique regulatory, administrative, and financial capabilities that can support mitigation.

**Adopt and Implement the Plan:** Bring the plan to life by adopting it and implementing the mitigation actions outlined in the strategy.

**Monitor the plan's implementation:** Ensures it remains relevant as community priorities and development patterns change. A plan must be updated every 5 years.

## Benefits of Hazard Mitigation

Mitigation is an investment in your community's future safety and sustainability. Mitigation planning helps you act now, before a disaster, to reduce losses when a disaster occurs. The planning process helps you think through how to plan, design, and develop your community while building partnerships for risk reduction.

Other benefits of mitigation planning include:

- Protecting public safety and preventing loss of life and injury.
- Reducing damage to existing and future development.
- Hazard Mitigation Planning for Local Communities
- Maintaining community continuity and strengthening the social connections that are essential for recovery.
- Preventing damage to your community's unique economic, cultural, and environmental assets.
- Minimizing downtime, accelerating recovery, and reducing the costs of disaster response.
- Helping accomplish other community objectives, such as capital improvements, infrastructure protection, open space preservation and economic resiliency.

Mitigation plans are also a prerequisite for certain kinds of non-emergency disaster assistance, such as Hazard Mitigation Assistance projects, including those funded by the Building Resilient Infrastructure and Communities program.

## Natural Hazard Mitigation Saves

Natural hazard mitigation saves \$6 on average for every \$1 spent on Federal mitigation. The National Institute of Building Sciences estimates that adopting the latest building codes is affordable and saves \$11 per \$1 invested.



- During this process, the public was invited to attend two public meetings during the drafting of the plan. The first meeting was held on October 19, 2023. A presentation with preliminary sections of the draft was available for public review at this meeting. The public was notified through social media, on the website and in a Public Notice published in *The Houston Business Journal*. Figure 26 is the Notice on the website and agenda item. Figure 26 is a picture of the meeting and Figure 27 is the Notice published in *The Houston Business Journal*.

**Figure 26 - First Public Meeting Notice on Website and live streamed**

**Harris County WCID110**

**Forest Oaks Parks and Recreation**

**Public Hearing Notice - 10/19/23**

**Important Water District Notices**

- REGIONAL WATER AUTHORITY RATE DECREASE 10/1/23
- WHERE DOES MY WATER BILL PAYMENT GO??

# Figure 27 - Published Notice of First Public Meeting

SEPTEMBER 29 - OCTOBER 5, 2023
HOUSTON BUSINESS JOURNAL | 45

LEGALS

#### REQUEST FOR COMPETITIVE SEALED PROPOSALS

The San Jacinto River Authority (SJRA) will receive Request for Competitive Sealed Proposals for the following Highlands Division Project:

**Project Number:** CSP 422-0036-A

**Project Name:** Slip 7 Improvements Phase 2

**Project Description:** Construction Services

**Mandatory Pre-Proposal Conference:** Thursday, October 12, 2023, 9:00 A.M. (CST)  
SJRA Highlands Division - 1108 E. Canal Rd., Houston, TX 77061

**Solicitation Date:** Friday, October 20, 2023, 11:00 A.M. (CST)

Request for Competitive Sealed Proposals (RFP) solicitation information and pricing which will enable SJRA to determine the "best value" contractor in accordance with the provisions of Chapter 49 of the Texas Water Code, and Texas Government Code 2259. SJRA reserves the right to reject or accept any proposal and award to the most advantageous proposal received. Local, minority, and small contractors are encouraged to apply.

All electronic sealed proposals shall be received **no later than 11:00 A.M. (CST)**, Friday, October 20, 2023. All responses received after that time will not be accepted.

**Electronic Proposals:** shall be submitted through the **Brains Valley e-Marketplace site** at <https://brainsvalley.com/procurement/login.aspx>. All interested Respondents are required to register as a "supplier" at the above web address by clicking on "Supplier Registration" to be able to upload a proposal response.

**COPIES OF SOLICITATION DOCUMENTS**

Solicitation Documents may be downloaded from the Brains Valley e-Marketplace site at <https://brainsvalley.com/procurement/login.aspx>. All interested Respondents are required to register as a "supplier" to view the solicitation documents.

The SJRA reserves the right to reject any or all submissions and to waive informatics and irregularities.

#### INVITATION TO BIDDERS

Sealed bids, in duplicate, addressed to **Board of Directors, Northwest Harris County Municipal Utility District No. 5**, will be received at the office of PCL, Inc., 10777 Westchase, Suite 900, Houston, Texas, 77042 (Phone: 281-531-8700) OR electronically through [www.CivicUSA.com](https://www.CivicUSA.com), until **10:00 AM Local Time, Friday, October 13, 2023**, at which time all bids will be opened and publicly read at the office of PCL, Inc. and through Microsoft Teams. The Call number is (832) 680-2379 and the Conference ID is 113 167 2439 for the furnishing of all material, equipment, labor and transportation necessary or incidental to the "Construction of Water Treatment Plant No. 2, 2 Headwork Modifications and Lift Station Addition for Northwest Harris County MUD No. 5, Harris County, Texas."

**Scope of Project:**

Scope of work to include, but not limited to: Construction of new 21-6 inch diameter storm lift station; modification to the headwork structure by demolition of existing four main, piping, valve fittings, pipe supports, and concrete wall section; installation of new piping, pipe supports, and hardware; relocate headwork platform walkway section to deaeration chamber along with new stairs, handrails, and concrete landing; rehabilitation of headwork structure to include but not limited to power washing, abrasive blasting, and repairing headwork interior channel; abatement and install new piping, valves, and appurtenances; site work to include but not limited to demolition of force mains, installation of sanitary sewer, force mains, manholes, pavement replacement, bollards, dewatering, groundwater control system, and site restoration; electrical system updates; provide labor materials, equipment, and appurtenances for bypass pumping; in accordance with the plans and specifications. Complete in place.

Bids received after the closing time will be returned unopened.

A non-mandatory pre-bid conference will be held on **Monday, October 2, 2023, at 10:00 AM Local Time, OneStop 15342 Grand Road, Cypress, Texas 77429**.

Plans, specifications and bid documents are available at [www.CivicUSA.com](https://www.CivicUSA.com) search: 11095-60.

A bidder submitting Electronic Bids must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and bid securities must be submitted through [www.CivicUSA.com](https://www.CivicUSA.com).

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

#### INVITATION TO BIDDERS

Riskey Road MUD Date: September 22, 2023

Sealed Electronic Bids addressed to **Riskey Road Municipal Utility District**, Attention: Dennis M. Cain, President, Board of Directors, will be electronically received, until 10:00 a.m. Local Time, Friday, October 6, 2023, and then publicly opened and read at **Vogler & Spencer Engineering, Inc. for "HIOC Sanitary Sewer CI/PP Lift Station Repair within Riskey Road Municipal Utility District, Harris County, Texas."** In addition to the opening of sealed Bids at the address above, you may view the public opening of sealed Bids via **CivicUS**. To join via **CivicUS** login to your account to access the posting of the Bid Summary Document immediately following the bid opening.

Scope of Work of the Contract Documents includes the following: **Carrollville Flow-Tite (CI/PP) Lift Station on I-10 with 21-inch sanitary sewer lines and pipe repairs on I-10 and I-10-26th, sanitary sewer lines. Work shall include, but not be limited to, inspect, prepare, construct, and complete sanitary sewer lines.**

Bids received after the closing time will be returned unopened.

Each Bid must be accompanied by a Bid bond or a certified cashier's check, acceptable to the Owner, in an amount not less than two percent (2%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder. If a certified or cashier's check is provided, the successful bidder shall deliver, at the bid opening address, the original certified or cashier's check within one (1) business day of receipt of the bid opening.

Copies of the bidding documents may be reviewed and obtained from [www.CivicUSA.com](https://www.CivicUSA.com), search: 95900-843-6-UTL. Bidders must register on this website in order to view and/or download specifications, plans, soils report, and environmental reports for this Project. There is NO charge to view or download documents.

Bidder must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and Bid Securities must be submitted through [www.CivicUSA.com](https://www.CivicUSA.com). Bidder must register on this website to submit a Bid and Bid Securities and there is NO charge to submit Bids and Bid Securities on this website.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed, or agreed to using an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and results in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

#### INVITATION TO BIDDERS

Sealed Bids addressed to **Branson County Municipal Utility District No. 28**, Attention: Mr. Nigel Brooks, Director, Board of Directors, will be received electronically at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042, until 10:00 a.m. Local Time, Tuesday, October 10, 2023, and then publicly opened and read at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042 for "Water Treatment, Sanitary Sewer, Drainage Facilities, and Detention Facilities & Alternate Paving and Appurtenances to Sene Creek at Highland Glen Section 7 for Branson County Municipal Utility District No. 28, Branson County, Texas." In addition to the opening of sealed Bids at the address above, you may attend the Bid Opening by telephone by dialing +1 346-202-6170. Phone Conference ID: 669 519 8676.

Scope of Work of the Contract Documents includes the following: **Primary and secondary drainage facilities and detention facilities & alternate paving and appurtenances.**

Bids received after the closing time will be returned unopened. A pre-bid conference will be held remotely on **Tuesday, October 3, 2023, at 10:00 a.m. Local Time** at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042. To attend the audio format non-mandatory pre-bid conference, dial +1 346-202-6170. Phone Conference ID: 635 091 5124.

Each Bid must be accompanied by a Bid bond or a certified cashier's check, acceptable to the Owner, in an amount not less than two percent (2%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder. If a certified or cashier's check is provided, the successful bidder shall deliver, at the bid opening address, the original certified or cashier's check within one (1) business day of receipt of the bid opening.

Bidding documents may be examined at LJA Engineering, Inc., AGC of Texas, Construction Council, and Annex or be obtained by prospective bidders on supplies upon payment of \$100.00 non-refundable plus one dollar (\$50.00 for electronic copy) for each set of documents at LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042, or at <https://lja.com>. Checks should be made payable to LJA Engineering, Inc. No cash will be accepted.

A bidder submitting electronic Bids must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all electronic Bids and Bid Securities must be submitted through [www.CivicUSA.com](https://www.CivicUSA.com). Bidder must register and obtain bidding documents on this website for the requirement payment amount (if any) to submit an electronic bid.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed or agreed to through the use of an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and results in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

#### INVITATION TO BIDDERS

Sealed Bids addressed to **Branson County Municipal Utility District No. 28**, Attention: Mr. Nigel Brooks, Director, Board of Directors, will be received electronically at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042, until 10:00 a.m. Local Time, Tuesday, October 10, 2023, and then publicly opened and read at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042 for "Water Treatment, Sanitary Sewer, Drainage Facilities, and Detention Facilities & Alternate Paving and Appurtenances to Sene Creek at Highland Glen Section 7 for Branson County Municipal Utility District No. 28, Branson County, Texas." In addition to the opening of sealed Bids at the address above, you may attend the Bid Opening by telephone by dialing +1 346-202-6170. Phone Conference ID: 669 519 8676.

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Copies of the bidding documents may be reviewed and obtained from [www.CivicUSA.com](https://www.CivicUSA.com), search: 19900-843-1-UTL. Bidders must register on this website in order to view and/or download specifications, plans, soils report, and environmental reports for this Project. There is NO charge to view or download documents.

Bidder must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and Bid Securities must be submitted through [www.CivicUSA.com](https://www.CivicUSA.com). Bidder must register on this website to submit a Bid and Bid Securities and there is NO charge to submit Bids and Bid Securities on this website.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed, or agreed to using an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and results in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

#### NOTICE OF PUBLIC HEARING

Harris County Water Control and Improvement District No. 110 (the "District") is preparing a Hazard Mitigation Plan (the "Plan"), as required by the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). The public is invited to a meeting for an overview of the importance of the Plan, the nature of the Plan, and an explanation of how the public can support the initiative. The Plan is required to be eligible for certain types of federal grants. The Plan 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 the 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. This meeting will be held on **OCTOBER 19, 2023, at 9 A.M.**, at 19623 JOANNEIGH DR., SPRING, TEXAS 77388. The public may also attend this Hearing via Zoom audio/visual conference. To join by phone, call 346-226-7799. The Meeting ID is 252 884 4 and the Passcode is 789866.

<https://a02ebwv.com/j/9R1205281644?pwd=7d1a0335340835a5a3tUN1u53kU102>. To join by phone, call 346-226-7799. The Meeting ID is 252 884 4 and the Passcode is 789866.

- The second public meeting was held on March 13, 2024. HCWCID110 published notice again in (See Appendix C, Public Notice Documents), as well as advertising again on HCWCID110's website, digital board and through social media platforms. HCWCID110 encouraged the public to provide comments, by email, through the website portal or by mail. Comments provided were reviewed to determine how best to incorporate into the plan.



Figure 28 - Notice of Second Public Meeting - HCWCID110 Website

**Harris County WCID110**

WATER AND SEWER BILLING / SERVICE INQUIRIES  
281-367-5511

Board Meeting Mar. 13 @ 5 p.m. >

**Forest Oaks Parks and Recreation**

HOME	ABOUT WCID110	BOARD & STAFF	BOARD MEETINGS	DISTRICT PROJECTS
DISTRICT DOCUMENTS LIBRARY	HAZARD MITIGATION INFO	PRECINCT 4 CONSTABLES	TRASH & RECYCLE	
PARKS & RECREATION	FOREST OAKS RENTALS	DISTRICT COMMUNICATONS	DISTRICT ANNOUNCEMENTS	

Playground Construction Project Update 3/6/24:

## Forest Oaks Playground is OPEN FOR PLAY!!!

**Notice of Public Hearing for WCID110 Hazard Mitigation Plan**

Harris County Water Control and Improvement District No. 110 (the "District") is preparing a Hazard Mitigation Plan (the "Plan"), as required by the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). The public is invited to the second of two meetings with the public to be held on March 13, 2024, to discuss the final draft, receive input, and explain how the public can provide additional input. The comment period is open for 30 days and will start March 13, 2024, and run until April 15, 2024. Members of the public are encouraged to attend. This meeting will be held on March 13, 2024, at 4:00 p.m., at 19023 Joanleigh Dr., Spring, Texas 77388. The Public may also attend this Hearing via Zoom audio/video conference. To join by video, use the following link: <https://www.zoom.us/join>. The Meeting ID 847 7048 9673 and the Passcode is 477138.

Figure 29 - Notice of Second Public Meeting - Blog Post

HOME	ABOUT WCID110	BOARD & STAFF	BOARD MEETINGS	DISTRICT PROJECTS
DISTRICT DOCUMENTS LIBRARY	HAZARD MITIGATION INFO	PRECINCT 4 CONSTABLES	TRASH & RECYCLE	
PARKS & RECREATION	FOREST OAKS RENTALS	DISTRICT COMMUNICATONS	DISTRICT ANNOUNCEMENTS	

## WCID110 - Notice of Public Hearing for Hazard Mitigation Plan Draft

NOTICE OF PUBLIC HEARING

Harris County Water Control and Improvement District No. 110 (the "District") is preparing a Hazard Mitigation Plan (the "Plan"), as required by the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). The public is invited to the second of two meetings with the public to be held on March 13, 2024, to discuss the final draft, receive input, and explain how the public can provide additional input. The comment period is open for 30 days and will start March 13, 2024, and run until April 15, 2024. Members of the public are encouraged to attend. This meeting will be held on March 13, 2024, at 4:00 p.m., at 19023 Joanleigh Dr., Spring, Texas 77388. The Public may also attend this Hearing via Zoom audio/video conference. To join by video, use the following link: <https://www.zoom.us/join>.

The Meeting ID 847 7048 9673 and the Passcode is 477138.

Information from this meeting will be added to the [HAZARD MITIGATION PAGE](#) on the District website along with a PDF version of the plan draft and a web-based feedback tool for public comment.

Featured Posts

Recent Posts



## Local Capabilities Assessment and Integration

The State of Texas Constitution gives home rule jurisdictions the ability to give consent to an ETJ area requesting a political subdivision be created. On February 21, 1968, the City of Houston consented to the formation of the HCWCID110, an area encompassing approximately 1,300.472 acres. It covers approximately 2.032 square miles. HCWCID110 is a political subdivision of the State of Texas operating pursuant to the terms and provisions of Article XVI, Section 59 of the Constitution of the State of Texas and Chapters 49 and 54 of the Texas Water Code and governed by a five-member Board of Directors. HCWCID110 provides water, sewer, and drainage services to its residential and commercial development within its boundaries, which is generally east and west of I-45, between Cypresswood Drive and Louetta Drive. It also provides parks and recreational services and owns and operates the Forest Oaks Swim and Racquet Club and Forest Oaks Park.

Daily operations are led by District Management supported by an administrative staff and a maintenance staff. HCWCID110 supports approximately 2,450 water and sewer connections. HCWCID110 owns and operates two water plants, one elevated storage tank, one wastewater treatment plant and eight lift stations. It maintains seven detention ponds and one lake as well as Forest Oaks Swim and Raquet Club and Forest Oaks Park. The Board, HCWCID110 Manager, and staff provide community leadership, develop policies to guide HCWCID110 in delivering projects and services in support of the community, and encourage citizen awareness and involvement.

The Capability Assessment describes the tools in HCWCID110'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 30): Administrative and Technical Resources, Planning and Regulatory, Financial, and Education and Outreach.

Unlike a city or county, HCWCID110's authority is limited. HCWCID110 has broad authority to supply and store water for domestic, commercial, and industrial use; operate sanitary systems; and provide irrigation, drainage, and water-quality services. It has the power to incur debt, levy taxes, charge for services and adopt rules for those services, enter into contracts, obtain easements, and exercise eminent domain. It cannot create ordinances including zoning, building code, and public health and safety; however, it can institute a drought plan, along with a drainage policy for Commercial Properties, which drainage policy provides certain rules, regulations, and policies relating to the cleaning, maintenance, and repair of drainage facilities on commercial properties located in HCWCID110 including a certification of compliance requirement. Each category will be reviewed to determine the capabilities of HCWCID110 and when it must rely on the authority of the cities and county.

*Figure 30 - Categories for Capabilities Assessment*



**Administrative and Technical Resources**

HCWCID110 has a small but highly trained and effective staff that includes a District Manager, Office Management Staff, a Maintenance Manager, and Maintenance Staff. It also uses professional consultants for most of the support to mitigation planning and actions including:

- Civil Engineers
- GIS Coordinators
- Procurement and Finance experts
- Legal Staff
- Stormwater Management
- Municipal Operations and Consulting
- Bookkeeper
- Auditor

**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.

HCWCID110 used FEMA’s Worksheet 4: Capability Assessment to list which capabilities it has authority to administer or if HCWCID110 relies on the County/City. In most cases from the list, the capability falls under the County/City agencies. For instance, Harris County and the City of Houston have 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 to a minimum of 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).

**Administrative and Technical Review Recommendation to build upon HCWCID110 Mitigation Efforts:** HCWCID110 can increase its coordination with its City and County partners to participate on floodplain, emergency management, and other training, education and plans development.

Local Capabilities	HCWCID#110	Explanation/Comment/Discussion
<b>Administrative/Tech Capabilities</b>		
<b>Planner/engineer with knowledge of land development/land management practices</b>	Yes	Langford Engineering, Inc. is HCWCID110 Engineer and has these capabilities
<b>Engineer/professional trained in Construction practices related to buildings and/or infrastructure</b>	Yes	Langford Engineering, Inc. is HCWCID110 Engineer and has these capabilities
<b>Planner/engineer/scientist with an understanding of natural hazards</b>	Yes	Langford Engineering, Inc. is HCWCID110 Engineer and has these capabilities
<b>Transportation Planner</b>	No	Transportation planning is not responsibility of HCWCID110
<b>Resiliency Planner</b>	No	Transportation planning is not responsibility of HCWCID110
<b>Personnel skilled in GIS</b>	Yes	Langford Engineering, Inc. is HCWCID110 Engineer and has these capabilities
<b>Full-time building official</b>	No	Harris County Permits has this responsibility



Local Capabilities	HCWCID#110	Explanation/Comment/Discussion
Floodplain manager	No	Harris County is the local FPA
Emergency Manager	No	Harris County Office of Emergency Management and Homeland Security has this responsibility
Grant Writer	Yes	WCID110 has hired JSWA/Gauge
Other Personnel	Yes	WCID110 has a full-time staff
<b>GIS Data</b> Hazard areas Critical facilities Building footprints Land use Assessor data Warning systems	Yes	Most of this GIS data is maintained by other agencies such as the Harris County Appraisal District, HCFCD, HCED, HCOEM, TX GLO.  Langford Engineering, Inc. is HCWCID110 Engineer and has these capabilities

**Regulatory and Planning**

As mentioned earlier, many of the plans listed in the worksheet are for City and County purposes. However, there are some regulatory and planning efforts that HCWCID110 administers including:

- Encroachment application and procedures
- Construction/Demolition/Reconstruction/Remodel of Existing Residences application for approval
- New Construction Application for Waste/Wastewater capacity
- Change to Existing Commercial Property
- Change to Existing Office Building
- Private Detention Pond Application
- Drought Plan
- Landowner Bill of Rights

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

Local Capabilities	HCWCID110	Explanation/Comment/Discussion
Regulatory Tool		
Comprehensive Plan	N/A	WCID110 cannot mandate types of development, a key purpose of a comprehensive plan
Zoning Ordinance	N/A	WCID110 does not have authority to enact zoning ordinances

Local Capabilities	HCWCID110	Explanation/Comment/Discussion
<b>Subdivision Ordinance</b>	N/A	WCID110 does not have authority to enact subdivision ordinances
<b>Site plan review requirements</b>	N/A	WCID110 does not have authority to review site plans – this is Harris County Permits
<b>Growth management Ordinance</b>	N/A	WCID110 does not have authority to enact growth management ordinances
<b>Floodplain Management Plan and Floodplain Ordinance</b>	N/A	The floodplain administrator is in the Harris County Permits office and floodplain ordinances are set by Harris County
<b>Other special purpose ordinance (stormwater, steep slope, wildfire)</b>	N/A	WCID110 does not have ordinance authority
<b>BCEGS Rating</b>	N/A	Harris County does not participate
<b>Building Code</b>	N/A	Building codes adopted and enforced by Harris County
<b>Fire Department ISO rating</b>	Class 2 Rating	Harris County Emergency Services District No. 7 - <u><a href="http://springfd.org">ISO Rating - Spring Fire Department (springfd.org)</a></u>
<b>Erosion or sediment control program</b>	No	WCID110 can develop a stormwater management program in coordination with HCFCD and HCED
<b>Stormwater Management program</b>	No	WCID110 can develop a stormwater management program in coordination with HCFCD and HCED
<b>Capital Improvements plan</b>	Yes	WCID110 has a CIP for water/wastewater infrastructure. They can expand it to other infrastructure items in coordination with HCFCD and HCED
<b>Economic Development Plan</b>	No	Not a responsibility of WCID
<b>Local Emergency Response Plan</b>	Yes	HCWCID110 has a Drought Plan and a TCEQ approved Emergency Preparedness Plan. HCWCID110's operator also has an emergency response plan.
<b>Participate in the NFIP</b>	No	Harris County participates in the NFIP and is the FPA
<b>Elevation Certificates</b>	No	WCID110 doesn't require that property owners have ECs

Local Capabilities	HCWCID110	Explanation/Comment/Discussion
Participate in CRS	No	Harris County participates in the CRS
Other plans	Yes	Drainage policy plan, communication plan from District to residents
Flood insurance study or other engineering study for streams	No	HCFCDD completes the FIS for all of Harris County, HCFCDD has completed studies of other areas in the WCID110 service area. WCID110 can commission their own studies.

**Financial Resources**

HCWCID110 has taxing authority, water and sewer rate fees, and potential grant funding as financial resources.

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

Taxing Authority: HCWCID110 is a political subdivision created by the State of Texas and has the authority to levy and collect ad valorem property taxes. HCWCID110 operates pursuant to The Texas Constitution and Chapters 49 and 54 of the Texas Water Code, as amended, and is subject to the continued supervision of the Texas Commission on Environmental Quality (TCEQ). HCWCID110’s purpose is to provide various services such as water, sewer, and drainage to certain areas where municipal services are not available. The funds which are used to construct these facilities are obtained through the public sale of tax-exempt municipal bonds, as approved by the registered voters residing within the boundaries of HCWCID110. An annual ad valorem tax rate is established by the HCWCID110 Board of Directors and collected through HCWCID110’s Tax Assessor. Figure 31 shows the last five year’s rates.

*Figure 31 - HCWCID110 Tax Rate for 2019-2023*

**2023 Tax Rate:** \$0.32 per \$100 assessed valuation  
**2022 Tax Rate:** \$ 0.33 per \$ 100 assessed valuation  
**2021 Tax Rate:** \$ 0.36 per \$ 100 assessed valuation  
**2020 Tax Rate:** \$ 0.37 per \$ 100 assessed valuation  
**2019 Tax Rate:** \$ 0.39 per \$ 100 assessed valuation

Water and Sanitary Sewer rates and fees: HCWCID110 has the authority to establish rates and conditions under which water and sanitary sewer services are provided and contracts with an operator to operate HCWCID110's water and sewer system, collect amounts owed to HCWCID110 for such services, report monthly to HCWCID110 on the operations of HCWCID110's systems and perform any additional services set out in its contract with HCWCID110.

In addition, HCWCID110 actively pursues grants through various state and federal agencies for projects and programs, including hazard mitigation.

**Insured District Buildings**

HCWCID110 maintains approximately \$19.8 million in property insurance coverage on buildings and facilities it owns, to protect HCWCID110 from damage due to structural fire, wind, lightning, and flooding. HCWCID110 also carries approximately \$300,000 in coverage for mobile 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 HCWCID110 to fund mitigation projects through means other than taxes and fees.

Local Capabilities	HCWCID110	Explanation/Comment/Discussion
<b>Financial Tools</b>		
<b>Grants (FEMA, DOT, CDBG)</b>	Yes	WCID110 is pursuing FEMA grants and is willing to pursue other types of grants
<b>Capital Improvement Project Funding</b>	Yes	WCID110 budgets for capital improvements
<b>Authority to levy taxes for specific purposes</b>	Yes	WCID110 has taxing authority
<b>Fees for water, sewer, gas, or electric services</b>	Yes	WCID110 has authority to set water and sewer rates
<b>Impact fees for new development</b>	No	WCID110 does not have authority to assess impact fees
<b>Incur Debt through general obligation bonds</b>	Yes	General obligation and revenue bonds
<b>Incur Debt through special tax bonds</b>	Yes	Unlimited tax bonds
<b>Incur debt through private activities</b>	No	
<b>Withhold spending in hazard-prone areas</b>	No	
<b>Stormwater Service fees</b>	No	



## Education and Outreach

HCWCID110's website is a user-friendly site to find out current information on projects from consideration and design to construction and completion. It also includes application information, regulations, rates and fees, drought plans, landowner bill of rights, water quality reports, comptroller data, financial reports, board meeting agendas and minutes as well as general information about HCWCID110. It actively communicates with its residents

using a variety of media, each of which have been used to convey information, including content about hazards including:

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.

- District Announcements - News releases announcing District events and issues of public interest can be found on the website and are sent to local media to help publicize information to the public.
- Website - HCWCID110's official website provides information, applications, forms, and other important information.
- District Email list –HCWCID110 sends emails to individuals who have signed up for HCWCID110 Emailing List.
- SlickText Emergency Notifications - HCWCID110 uses SlickText as a way to provide emergency notifications through text. This is an optional communication tool and is used as needed by HCWCID110.
- Quarterly newsletters (mailed, emailed and found on website) - HCWCID110 produces a quarterly newsletter that is mailed to all residents within HCWCID110. The newsletter covers a broad range of information and provides updates from HCWCID110 consultants, upcoming programs, facility information, and other topics.
- Monthly Potpourri - HCWCID110 produces a monthly potpourri that covers some of the most important information and upcoming programs or events happening with HCWCID110 and Forest Oaks. Potpourris are mailed with the monthly water bill from MOC and available on the District website and announcement posted on social media platforms with link to online version. A hyperlink is also provided to residential customers who have opted into paperless billing for their monthly water bills.
- Events – HCWCID110 hosts events throughout the year where information can be provided.
- Digital Display - HCWCID110 has an outdoor digital display in front of the clubhouse on Joanleigh Drive that is passed by regularly by most residents that can provide information to the public.
- Presentations – Flood control projects, as well as consultant reports on projects, can be found on HCWCID110's website.
- Reference links to additional flood control resources and water conservation sources are provided on the website, e.g. Harris County Flood Control, where residents can obtain information from watersheds, rain gauges data and other important information.

Local Capabilities	HCWCID110	Explanation/Comment/Discussion
<b>Education and Outreach Tools</b>		
<b>Program/Organization</b>	No	
<b>Community Newsletters</b>	Yes	Monthly Potpourri and quarterly newsletter
<b>Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs, public events)</b>	No	
<b>Local news</b>	Yes	WCID110 collaborates with the local newspaper, Community Impact Spring/Klien
<b>Organizations that represent/advocate for/interact with underserved and vulnerable communities</b>	No	
<b>Social media</b>	Yes	The WCID110 has Facebook
<b>Other</b>	Yes	Text alerts and digital signs, open monthly board meetings, National Night Out, other community events, communicate with adjacent MUDs on common issues (drainage, etc.), state and local elected officials

**Education and Awareness Recommendation to support District Mitigation Efforts –** HCWCID110 can work with the City of Houston and Harris County for hazard awareness campaign support as staff is limited in this area as are funds for materials. Grants or City/County financial assistance for updated relevant materials and distribution would be helpful.

### **Participation in the NFIP**

Participation in the National Flood Insurance Program (NFIP) is important to HCWCID110 and its residents. This is evidenced by the cities near 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 Harris County, with support from the utility and special districts like HCWCID110, are firmly committed to continued compliance with the NFIP. It is important to note that HCWCID110 cannot participate in the NFIP as cities and counties do. It cannot apply for NFIP (only cities and county can) or CRS

(only cities and county can) status. However, it supports the communities around its planning area in any way it can to keep its standing in the NFIP and CRS.

HCWCID110 is a water control and improvement municipal utility district and a political subdivision of the State of Texas. Considering it is a separate entity and does not directly participate in the NFIP, specific actions will be determined by representatives and officials within the City of Houston and Harris County of which HCWCID110 planning area is located. With this in mind, HCWCID110 did not identify and prioritize NFIP actions as part of the planning process. HCWCID110 will continue to work closely with the City of Houston and Harris County to identify and recommend actions that will ensure continued compliance with the NFIP.

The City of Houston satisfied requirements for initial participation in the NFIP and joined the Emergency Program and ultimately the regular program in 1979. The effective Flood Insurance Rate Map for the City has been revised a number of times to reflect more detailed information and changes to the floodplain and is now used as the minimum flood hazard area within which development must conform to floodplain management regulations, the most current on January 29, 2021. It entered the CRS program in 2002 and as of 2009 its current classification is 5 giving a 25% discount to homeowner's flood insurance in the special flood hazard area (SFHA) and a 10% discount for those outside of the SFHA.

Harris County satisfied requirements for initial participation in the NFIP and joined the Emergency Program. Upon issuance and final approval of the Flood Insurance Rate Map in May 1970, the County joined the Regular Program. The effective Flood Insurance Rate Map for the County has been revised a number of times to reflect more detailed information and changes to the floodplain and is now used as the minimum flood hazard area within which development must conform to floodplain management regulations, the most current on November 15, 2019. It entered the CRS program in 2004 and as of 2014 its current classification is 7 giving a 15% discount to homeowner's flood insurance in the special flood hazard area (SFHA) and a 5% discount for those outside of the SFHA.

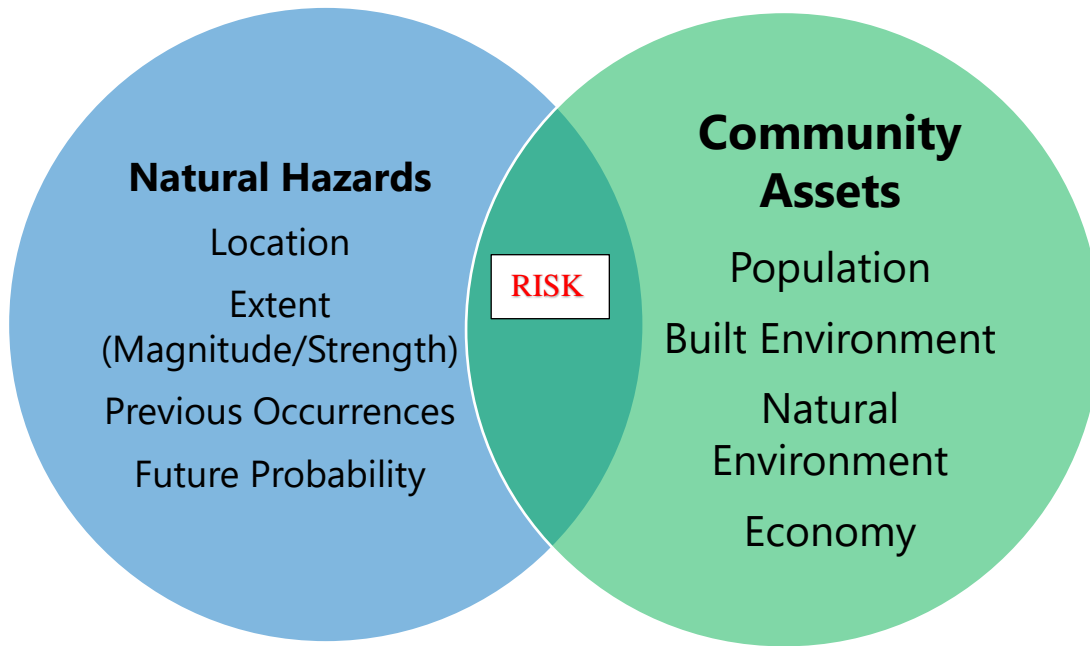


## Section 3. Hazard Identification and Risk Assessment

### Introduction

Risk assessments are conducted to determine the potential impacts of specified hazards on human safety, the 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. FEMA has provided a diagram (Figure 32) that illustrates the concept of risk as the overlap between hazards and community assets – the smaller the overlap, the lower the risk. Each hazard includes a description of the location, extent, previous occurrence, and probability of future events. Hazards are then evaluated based on potential impact on the community, the community’s overall vulnerability, and the most significant risks.

*Figure 32 - FEMA Concept of Risk Diagram*



### Overview of Risks

Table 11 compiles all injuries, deaths, and property damage that was reported to the NCEI database from all natural hazards from 2000 to 2023. It is important to note that the data was for all of Harris County as that database does not have data for just HCWCID110.

*Table 11 - Harris County Injuries, Deaths, and Damages from Natural Hazards  
(Source: NCEI)*

<b>Injuries from 2000-2023</b>	<b>247</b>
<b>Deaths from 2000-2023</b>	<b>87</b>
<b>Property Damage from 2000-2023</b>	<b>\$20.549 Billion</b>

## Hazards Included

The Hazard Summary table (Table 12) provides an overview of the likelihood of occurrence and the estimated impact on public health, safety, and property for the hazards included in this plan. The categories below were reviewed for each hazard profiled and summarized in Table 13.

*Table 12 - Classifications and Definitions for Hazards*

<b>Location (Geographic Area Affected)</b>
<b>Negligible:</b> Less than 10 percent of planning area or isolated single-point occurrences.
<b>Limited:</b> 10 to 25 percent of the planning area or limited single-point occurrences.
<b>Significant:</b> 25 to 75 percent of planning area or frequent single-point occurrences.
<b>Extensive:</b> 75 to 100 percent of planning area or consistent single-point occurrences.
<b>Probability of Future Events</b>
<b>Unlikely:</b> Less than 1% probability of occurrence in the next year or a recurrence interval of > every 100 years.
<b>Occasional:</b> 1 to 10% probability of occurrence in the next year or a recurrence interval of 11 to 100 years.
<b>Likely:</b> 10 to 90% probability of occurrence in the next year or a recurrence interval of 1 to 10 years.
<b>Highly Likely:</b> 90 to 100 percent probability of occurrence in the next year or a recurrence interval of < than 1 year.
<b>Maximum Probable Extent (Magnitude based on historic events or future probability)</b>
<b>Weak:</b> Limited classification on scientific scale, slow speed of onset or short duration of event, resulting in little to no damage.
<b>Moderate:</b> Moderate classification on scientific scale, moderate speed of onset or moderate duration of event, resulting in some damage and loss of services for days.
<b>Severe:</b> 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.
<b>Extreme:</b> Extreme classification on scientific scale, immediate onset or extended duration of event, resulting in catastrophic damage and uninhabitable conditions.
<b>Overall Significance</b>
<b>Low:</b> 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.
<b>Medium:</b> 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.
<b>High:</b> 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 13 - Hazard Summary*

<b>Natural Hazard</b>	<b>Location (N, L, S, E)</b>	<b>Maximum Extent (W, M, S, E)</b>	<b>Likelihood of Occurrence (U, O, L, H)</b>	<b>Overall Significance (L, M, H)</b>
<b>Drought</b>	Extensive	Moderate	Likely	Medium
<b>Extreme Cold/Freezes</b>	Extensive	Moderate	Likely	Medium
<b>Extreme Heat</b>	Extensive	Weak	Likely	Low
<b>Flooding</b>	Extensive	Extreme	Highly likely	High
<b>Hail</b>	Extensive	Weak	Likely	Low
<b>Hurricanes and Tropical Storms</b>	Extensive	Extreme	Highly likely	High
<b>Lightning</b>	Extensive	Moderate	Highly likely	Medium
<b>Subsidence</b>	Extensive	Weak	Unlikely	Low
<b>Thunderstorms/ damaging winds</b>	Extensive	Severe	Highly likely	High
<b>Tornados</b>	Extensive	Severe	Unlikely	Low
<b>Wildfire</b>	Significant	Weak	Unlikely	Low
<b>Winter storms</b>	Extensive	Weak	Unlikely	Low

**Hazards Omitted**

HCWCID110 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, HCWCID110 has decided to omit these hazards. Important to note, while HCWCID110 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.

*Table 14 - Hazards Omitted*

Natural Hazard	Review	Reason for Omission
Coastal erosion	Omit	Does not occur in the planning area
Dam/levee failure	Omit	While dams exist in Harris County, there are no dams close to the planning area (within 50 miles) that would have any effect on the planning area in the event of a failure
Earthquake	Omit	A query of the USGS fault database indicates there are no Classification A or B faults in Harris County Texas

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 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 HCWCID110, this county-wide hazard data from the NCEI is often the best available resource for documenting historical events.

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. FEMA’s website on Disaster Declaration for States and Counties ([Disaster Declarations for States and Counties | FEMA.gov](#)) provides a summary illustration for Harris County, Texas from 1953-2024 of Disaster Declarations as shown in Figure 33. A total of 27 disaster declarations have been made for Harris County since 1953. By hazard, floods top the list with eleven, followed by severe storms with eight, tropical storms/hurricanes with five and fire, severe ice storms and tornado with one.



Figure 33 - Visual Summary of Disaster Declarations for Harris County, Texas 1953-2023



It should be noted that not all disaster declarations for Harris County affected HCWCID110.

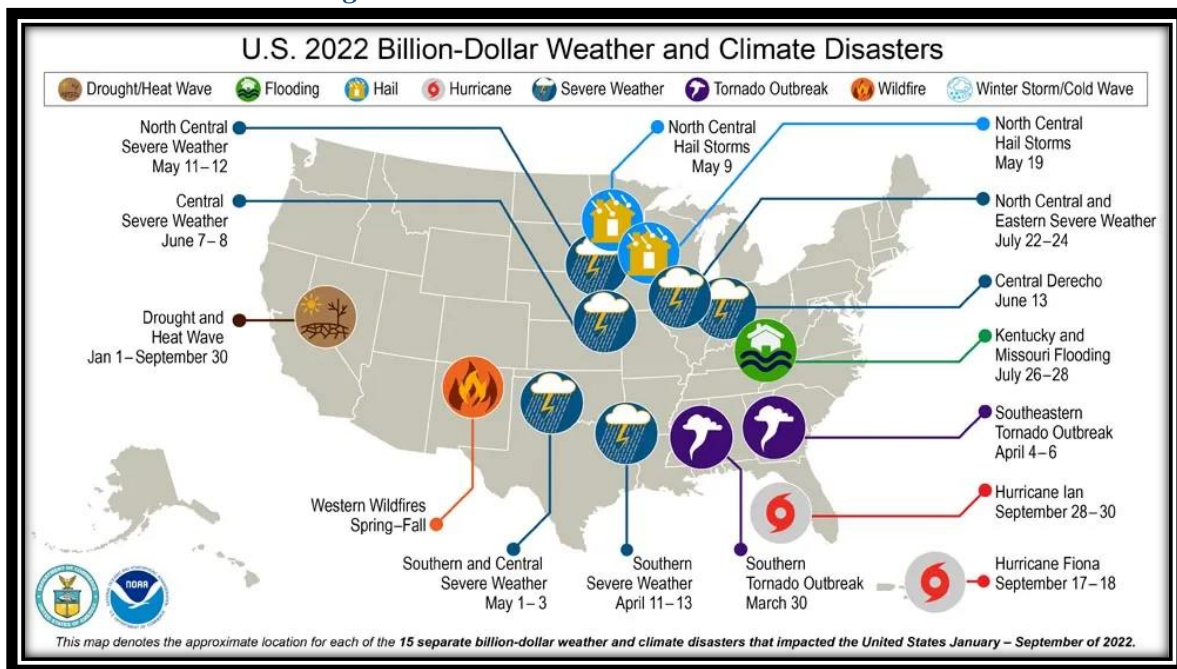
**Table 15 - Natural Hazard Events and Declared Major Disasters in Harris County**  
*(Sources: FEMA, NCEI database)*

<b>Date &amp; Disaster (DR)</b>	<b>Nature of Event</b>
July 11, 1973 DR-398	<b>Severe Storm and Flooding</b>
June 19, 1976 DR-510	<b>Flood</b>
April 26, 1979 DR-580	<b>Severe Storms</b>
September 25, 1979 DR-603	<b>Severe Storm and Flooding</b>
August 19, 1983 DR-689	<b>Hurricane Alicia</b>
October 30, 1984 DR-727	<b>Flood</b>
May 19, 1989 DR-828	<b>Flood</b>
July 18, 1989 DR 836	<b>Flood</b>
March 20, 1992 DR 937	<b>Flood</b>
December 4, 1992 DR 970	<b>Tornado</b>
October 18, 1994 DR-1041	<b>Severe Thunderstorms and Flooding</b>
August 26, 1998 DR-1239	<b>Severe Storm</b>
September 23, 1998 DR-1245	<b>Severe Storm and Flooding - Tropical Storm Francis</b>
October 21 1998 DR-1257	<b>Flood</b>
June 9, 2001 DR-1379	<b>Severe Storm and Flooding - Tropical Storm Allison</b>
November 5 2002 DR-1439	<b>Coastal Strom</b>
September 24, 2005 DR-1606	<b>Hurricane Rita</b>
January 11, 2006 DR 1624	<b>Fire</b>
October 2, 2007 DR 1730	<b>Severe Storm</b>
September 13, 2008 DR-1791	<b>Hurricane Ike</b>
May 15, 2015 DR 4223	<b>Severe Storm</b>
November 25, 2015 DR-4245	<b>Severe Storms</b>
April 25, 2016 DR-4269	<b>Flood</b>
June 11, 2016 DR-4272	<b>Texas Severe Storms and Flooding</b>
August 25, 2017 DR-4332	<b>Hurricane/Tropical Strom Harvey</b>
October 4, 2019 DR-4466	<b>Flood</b>
Feb 19, 2021 DR-4586	<b>Texas Severe Winter Storms</b>

## Losses Due to Major Disasters

According to the NOAA NCEI Climate Monitoring website, The U.S. has sustained 363 weather and climate disasters since 1980 where overall damages/costs reached or exceeded \$1 billion (<https://www.ncei.noaa.gov/access/billions/>). Although there is not one list of all private and public losses from natural disasters for the planning area, NOAA provides an annual review of disasters and costs nationwide. Using that information, for 2022, the total cost of the 18 weather/climate disaster events to affect the United States was \$165.1 billion. The events included 1 flooding event, 9 severe storm events, 3 tropical cyclone events, 2 tornado outbreaks, 1 wildfire event, 1 drought and heat wave event and 1 winter storm event. The illustration (Figure 34 below depicts the timing and location of these disasters).

*Figure 34 - 2022 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. These costs, which do not include costs incurred by other federal agencies or by state and local agencies, include those associated with:

- Public assistance for debris removal, emergency services, roads and bridges, flood control facilities, public buildings and equipment, public utilities, and parks and recreational facilities.
- Financial assistance disbursed for individual and household grants, emergency food and shelter, and other assistance to individuals.
- Grant funds set aside to support hazard mitigation.

An example is Texas Severe Winter Storms (4586-DR-TX). On February 18, 2021, Governor Abbott requested a major disaster declaration due to severe winter storms beginning on February 11, 2021, and continuing. The Governor requested a declaration for Individual Assistance; all categories of Public assistance, including snow assistance; and Hazard Mitigation for all 254 Texas counties. This event was of the severity and magnitude that the need for supplemental Federal assistance was determined to be necessary prior to the completion of joint Federal, State, and local government Preliminary Damage Assessments (PDAs). Per 44 C.F.R. § 206.33(d) and § 206.36(d), the requirement for a joint PDA may be waived for those incidents of such unusual severity and magnitude that formal field damage assessments are not required to establish the need for supplemental Federal assistance under the Stafford Act. On February 19, 2021, President Biden declared that a major disaster exists in the State of Texas. The funding obligations were as follow on Figure 35.

*Figure 35 - Funding Obligations by FEMA Disaster Category*

<b>Funding Obligations</b>	
<b>Individual Assistance</b>	<b>Amount</b>
Total Housing Assistance (HA) - Dollars Approved	\$182,111,272.91
Total Other Needs Assistance (ONA) - Dollars Approved	\$20,831,580.90
<b>Total Individual &amp; Households Program Dollars Approved</b>	<b>\$202,942,853.81</b>
Individual Assistance Applications Approved	60329
<b>Public Assistance</b>	<b>Amount</b>
Emergency Work (Categories A-B) - Dollars Obligated	\$52,271,171.42
Permanent Work (Categories C-G) - Dollars Obligated	\$41,174,728.57
<b>Total Public Assistance Grants Dollars Obligated</b>	<b>\$98,718,270.01</b>
<b>Hazard Mitigation Assistance</b>	<b>Amount</b>
Hazard Mitigation Grant Program (HMGP) - Dollars Obligated	\$3,072,907.33

The identification of hazards, however, is the start of a process to understand what hazard mitigation actions could be undertaken to reduce future risk to the residents of HCWCID110 and its business sector.



HCWCID110 reviewed the State of Texas Hazard Mitigation Plan (2023), the National Oceanic and Atmospheric Administration’s National Centers for Environmental Information (NOAA, NCEI) hazard database, FEMA’s Disaster Declarations, Risk Index, the Harris County Flood Control District’s flood warning system website database, Harris County’s Hazard Mitigation Plan, Texas A&M Forest Service, Texas Wildfire Risk Assessment (TxWRAP), USDA Drought Disasters for Harris County and the CDC’s Social Vulnerability Index. These reports were used in this plan as follows:

State of Texas Hazard Mitigation Plan (2023): Plan’s goals, actions and hazards were reviewed to gather data for this plan for mitigation strategy, goals, actions, and hazard data.

National Oceanic and Atmospheric Administration’s National Centers for Environmental Information (NOAA, NCEI): Information used to gather hazard data.

FEMA Disaster Declarations and Risk Index: Information was used for historical information and for hazard data.

Harris County Flood Control District’s Flood Warning System Database: Database was queried to provide historical and real time hazard data.

Harris County Hazard Mitigation Plan Update: Plan’s goals, actions and hazards were reviewed to gather data for this plan.

Texas A&M Forest Service Texas Wildfire Assessment: Report was reviewed to gather hazard data.

CDC Social Vulnerability database was used for information on risk for vulnerable population.

The next part of this section focuses on hazard identification, the potential impact of these hazards, and the community’s vulnerability from each hazard.

# Drought

## Hazard Description

Drought is a weather condition characterized by prolonged dryness that causes a significant decrease in soil moisture and water availability, making it challenging for plants, animals, and humans to thrive. In Texas, drought is specifically described in two main categories: agricultural drought and hydrologic drought:

- Agricultural drought refers to a dry period that lasts long enough and is intense enough to significantly impact crop and animal farming. It hampers agricultural productivity and can have adverse effects on the livelihoods of farmers and the availability of food resources.
- Hydrologic drought, on the other hand, is a more prolonged state of abnormally dry weather, leading to depletion of both surface and groundwater sources. This condition results in reduced water flow in rivers, streams, and springs, which can have far-reaching consequences on water supplies for various uses.

Texas is geographically diverse, divided into ten climatic divisions, ranging from areas with heavy precipitation to semi-arid and arid regions. As a result, different parts of the state are susceptible to periodic droughts of varying degrees of severity. This susceptibility is partly influenced by Texas' proximity to the Great American Desert in the southwestern United States. Throughout recorded history, Texas has experienced droughts in each decade, some of which have been particularly severe and had significant impacts on the state and its communities.

## Location

Harris County is susceptible to all ranges of drought as defined by the Palmer Drought Severity Index (see magnitude/extent section) and since drought occurs on regional scale, all of the HCWCID110 is equally at risk as it can occur anywhere in HCWCID110.

## Previous Occurrences

The NOAA Storm Events Database documents 14 drought events for Harris County since the year 1996. See Table 16.

**Table 16 - Drought Events in Harris County, 1996 – 2023**  
(Source: NOAA/NCEI)

EVENT_ID	Location	BEGIN_DATE	EVENT_TYPE	MAGNITUDE	DEATH	INJ	PrD	CrD
5565902	HARRIS (ZONE)	4/1/1996	Drought	N/A	0	0	0	0
5566072	HARRIS (ZONE)	5/1/1996	Drought	N/A	0	0	0	0
5566095	HARRIS (ZONE)	6/1/1996	Drought	N/A	0	0	0	0
5661694	HARRIS (ZONE)	5/1/1998	Drought	N/A	0	0	0	0
5661718	HARRIS (ZONE)	6/1/1998	Drought	N/A	0	0	0	0
5665808	HARRIS (ZONE)	7/1/1998	Drought	N/A	0	0	0	0
5669427	HARRIS (ZONE)	8/1/1998	Drought	N/A	0	0	1M	7.3M
5157144	HARRIS (ZONE)	8/1/2000	Drought	N/A	0	0	0	0
5174113	HARRIS (ZONE)	9/1/2000	Drought	N/A	0	0	0	0
1042604	COASTAL HARRIS (ZONE)	6/1/2022	Drought	N/A	0	0	0	0
1042627	INLAND HARRIS (ZONE)	6/14/2022	Drought	N/A	0	0	0	0
1048598	COASTAL HARRIS (ZONE)	7/19/2022	Drought	N/A	0	0	0	0
1054786	COASTAL HARRIS (ZONE)	8/1/2022	Drought	N/A	0	0	0	0
1054792	INLAND HARRIS (ZONE)	8/1/2022	Drought	N/A	0	0	0	0
Totals:					0	0	1M	7.3M

This table did not include the well-known droughts that affected almost all of Texas including HCWCID110 in 2011-2013. The U.S. Drought Monitor indicates that 99% of the State was suffering at least “severe” drought conditions during the droughts beginning in 2011.

**Future Occurrences**

Based on seven years (1996, 1998, 2000, 2011, 2012, 2013, and 2022) of drought events within 27 years, a drought occurs approximately once every 3.8 years on average in Harris County and since droughts occur at a regional level, HCWCID110 can expect a drought event approximately once every 3.8 years or a ~25% chance annually.

**Extent**

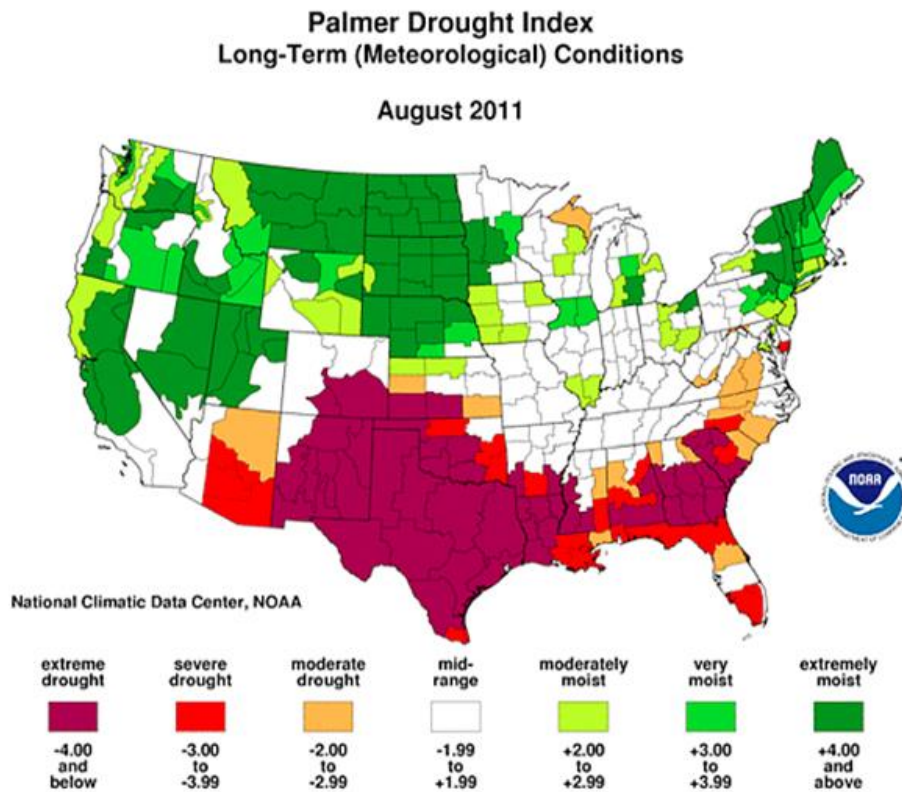
In 1965, W.C. Palmer developed an index to measure the departure of the moisture supply, called the Palmer Drought Severity Index (PDSI). The PDSI indicates the prolonged and abnormal moisture deficiency or excess and general conditions, not local variations caused by isolated rain. The PDSI is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. Figure 34 shows the National Palmer Drought Severity Index (long-term). The graphic clearly depicts most of Texas being in a very severe drought (PDSI -4.0).

The equation for the PDSI was empirically derived from the monthly temperature and precipitation scenarios of 13 instances of extreme drought in western Kansas and central Iowa and by assigning an index value of -4 for these cases. Conversely, a +4 represents extremely wet conditions. From these values, seven categories of wet and dry conditions can be defined. Table 17 identifies the values used to define the PDSI. During the 2011 event the PDSI was -4.0 and again in 2023. HCWCID110, Harris County and the State can expect to experience continued exposure to the full range of drought conditions expressed by the PDSI.

**Table 17 - Palmer Drought Severity Index**  
 (Source: NOAA, National Weather Service - Climate Prediction Center)

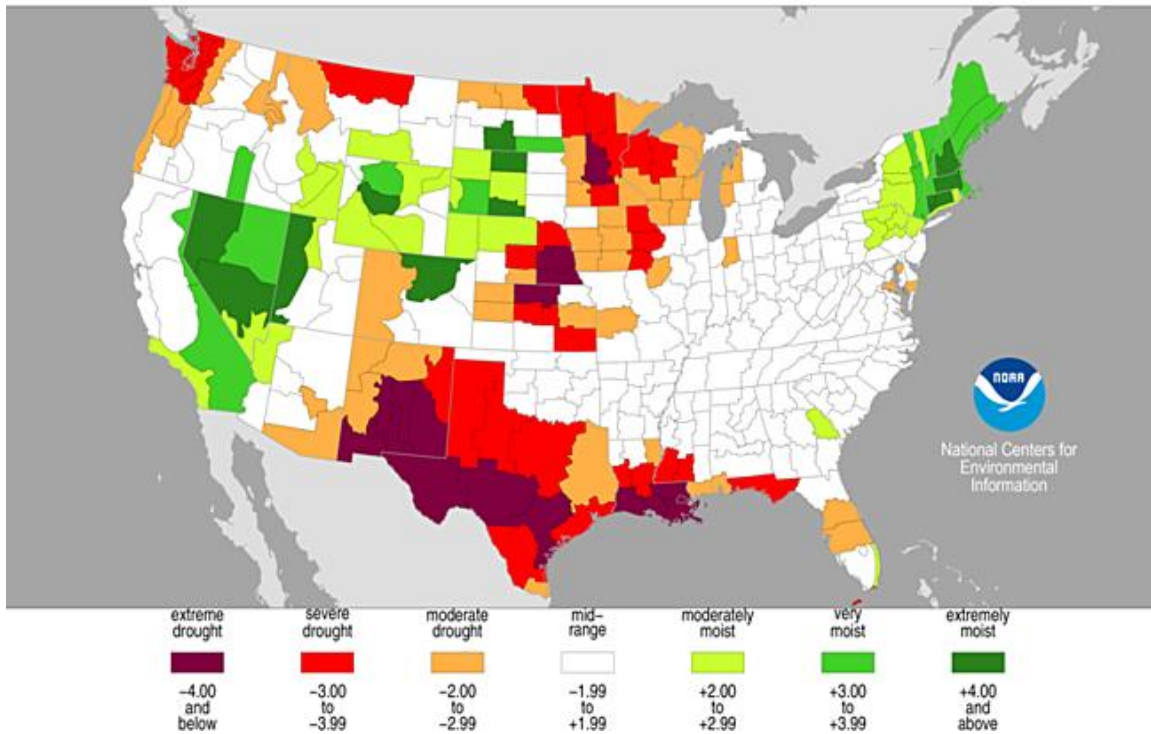
Palmer Drought Severity Index
-4.0 or less (Extreme Drought)
-3.0 or -3.9 (Severe Drought)
-2.0 or -2.9 (Moderate Drought)
-1.9 to +1.9 (Near Normal)
+2.0 or +2.9 (Unusual Moist Spell)
+3.0 or +3.9 (Very Moist Spell)
+4.0 or above (Extremely Moist)

**Figure 36 - PDSI Map**  
 (Source NCEI/NOAA)





Palmer Modified Drought Index  
September, 2023



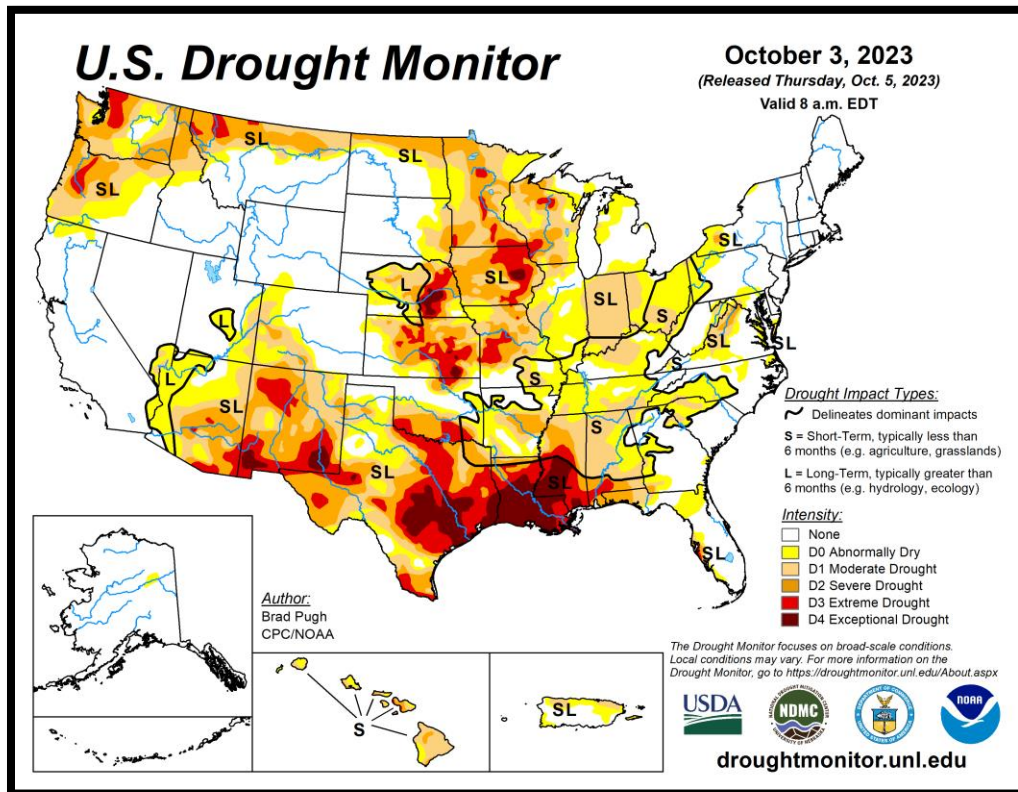
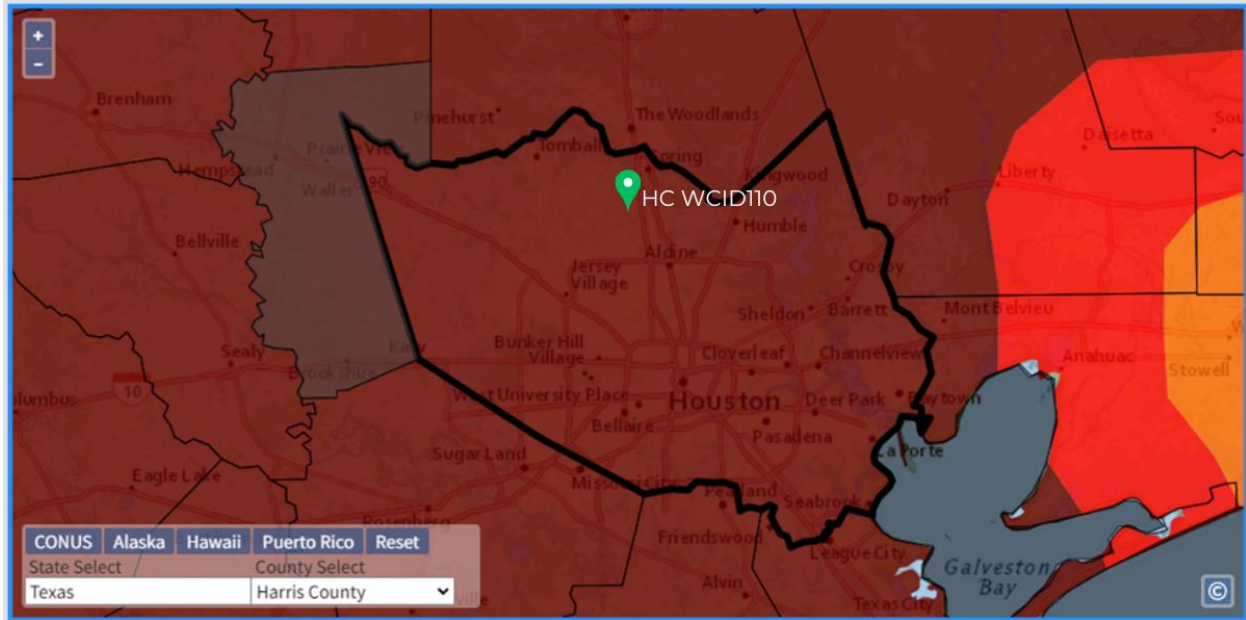
The U.S. Drought Monitor Drought Intensity Scale classifies drought by 5 categories, D0 through D4, with D4 being the most extreme drought conditions. Figure 37 below provides the description and impact for each category.

*Figure 37 - Drought Classification (US Drought Monitor)*

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: <ul style="list-style-type: none"> <li>• short-term dryness slowing planting, growth of crops or pastures</li> </ul> Coming out of drought: <ul style="list-style-type: none"> <li>• some lingering water deficits</li> <li>• pastures or crops not fully recovered</li> </ul>
D1	Moderate Drought	<ul style="list-style-type: none"> <li>• Some damage to crops, pastures</li> <li>• Streams, reservoirs, or wells low, some water shortages developing or imminent</li> <li>• Voluntary water-use restrictions requested</li> </ul>
D2	Severe Drought	<ul style="list-style-type: none"> <li>• Crop or pasture losses likely</li> <li>• Water shortages common</li> <li>• Water restrictions imposed</li> </ul>
D3	Extreme Drought	<ul style="list-style-type: none"> <li>• Major crop/pasture losses</li> <li>• Widespread water shortages or restrictions</li> </ul>
D4	Exceptional Drought	<ul style="list-style-type: none"> <li>• Exceptional and widespread crop/pasture losses</li> <li>• Shortages of water in reservoirs, streams, and wells creating water emergencies</li> </ul>

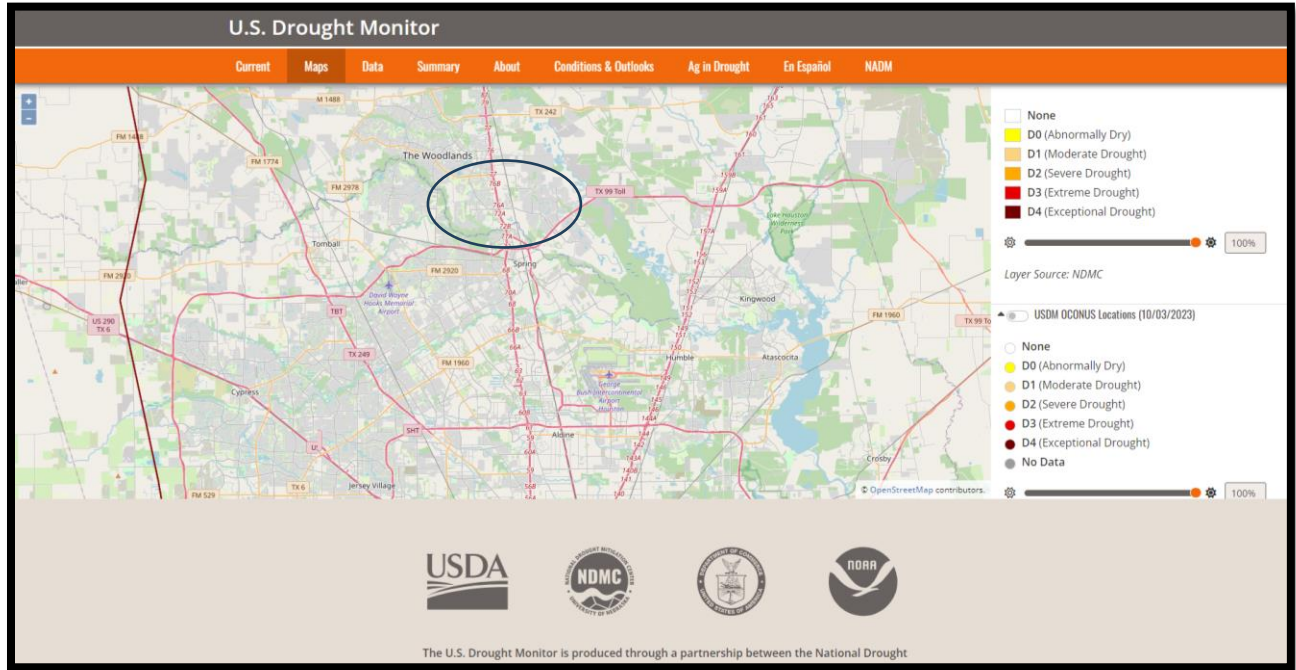
The maximum drought extent experienced in Harris County is a Category D4 (exceptional drought) that was reported by the U.S Drought Monitor in 2011 – Drought.gov (Figure 38) and again in 2023. Therefore, it is deduced that HCWCID110 also experienced a maximum D4 Drought.

**Figure 38 - U.S. Drought Monitor – Drought.gov**  
**Data from Week of 8/30/2011**



The drought condition from 10/3/23 in Harris County and HCWCID110 is shown below in Figure 39. It shows, by red outline (so the streets and cities can be seen) that the area was in extreme drought. The circle shows the planning area.

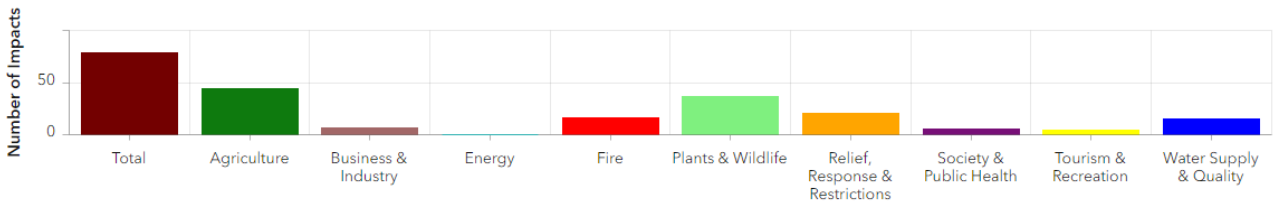
**Figure 39 - U.S. Drought Monitor – Drought.gov**  
*Data from Week of 10/3/23*



## **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 HCWCID110. Figure 40 describes the number of impacts reported by category with plants, wildlife, and agriculture being reported with the greatest frequency. This data from the DIR started being reported in July 2005.

**Figure 40 - Drought Impact Report for Harris County Texas – July 2005 to July 2023**



Apart from the impacts already mentioned in the Disaster Impact Report (DIR), drought had its most significant effects on densely populated areas, leading to the implementation of long-term water conservation and reduction measures. The Texas Agricultural Extension Service estimated a

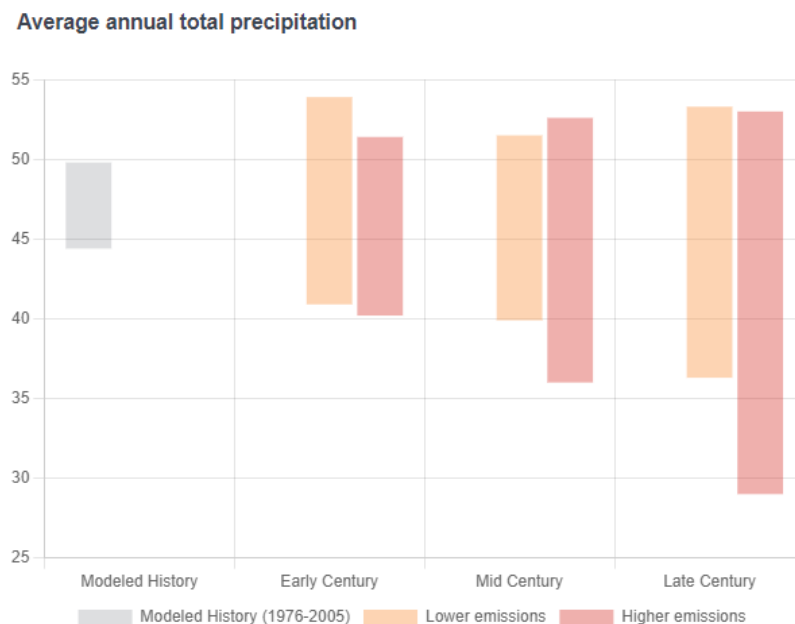
substantial economic loss of \$4 billion statewide due to the 1996 drought. As previously discussed, in 2011 the Southeast Texas region experienced an extended drought, causing record-breaking damages. Many crops were completely lost, and numerous animals had to be sold due to insufficient grazing resources. The extent of the damage in this region was significant, with property damage estimated at \$10 million and agricultural losses amounting to approximately \$100 million. Also, according to a February 2022 study by TWDB, the state’s agriculture industry alone suffered an estimated \$36 billion in direct losses from this drought. Unfortunately, specific values for HCWCID110 are not available as the data is only provided on a regional or county basis.

**Effect of Climate Change on Drought**

Due to climate change, the probability of a drought event and its duration may increase in the future. This is due to the possibility of warming trends in the climate as well as fluctuations in the rainfall patterns.

According to the NOAA’s Climate Mapping for Resilience and Adaption (CMRA) tool there is an estimated reduction in rainfall over the rest of the century in Harris County if fossil fuel emissions continue at current levels (characterized as higher emissions). However, estimations show a similar level of annual precipitation if society “lowers emissions” which is characterized by drastically reducing use of fossil fuels and reducing global emissions of heat trapping gases to zero by 2040. Figure 41 below shows the comparison of the estimated annual precipitation over time based on these lower or higher emissions.

*Figure 41 - Estimated Annual Precipitation Over Remainder of 21st Century*  
[About CMRA | Climate Mapping for Resilience and Adaptation](#)



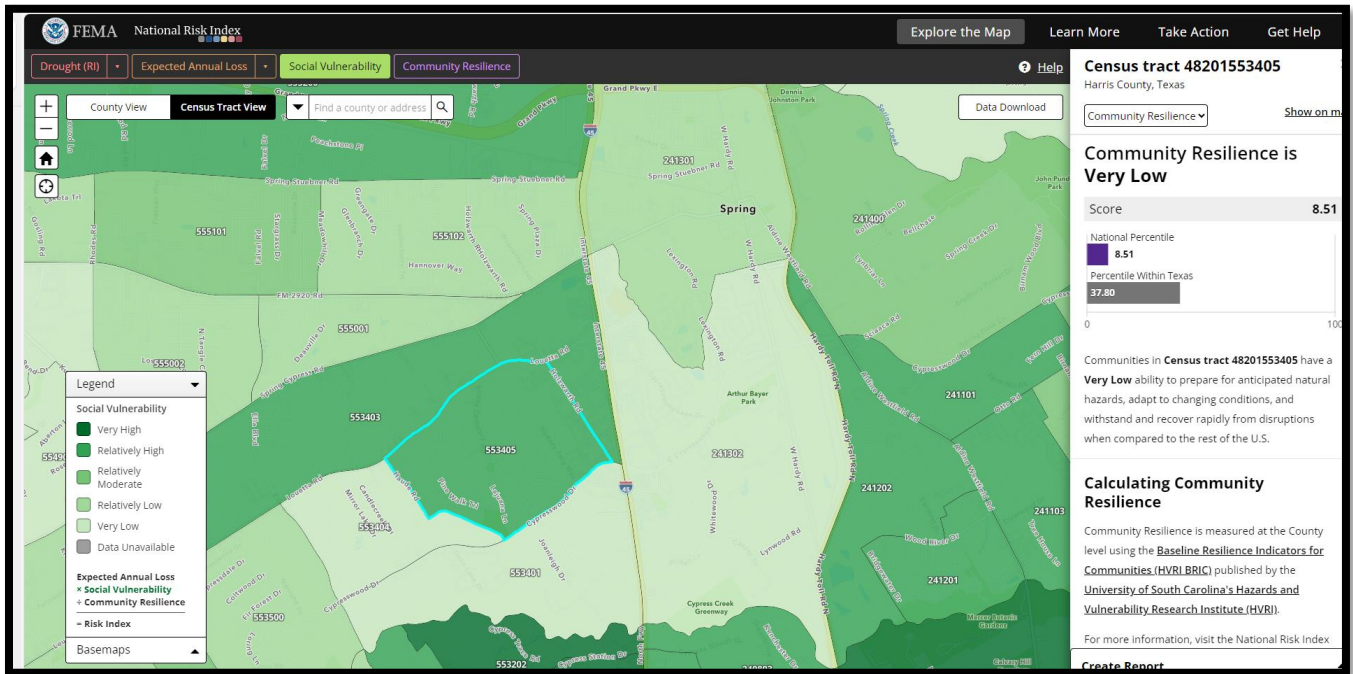


## Social Vulnerability

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

In drought conditions, there are often water supply and quality issues. This adversely impacts socially vulnerable communities such as the elderly, children, low-income families, as well as those with professions such as farmers. Low-income families may live in areas that rely on poorly maintained water systems that put them at increased risk of health problems due to contaminated drinking water or being forced to reduce consumption during drought events. These same issues could affect the elderly community that may live in care facilities. Farmers could be negatively affected by reduced crop yield during drought events which could drastically lower their income potential. Figure 42 shows the social vulnerability ranges from very high to very low for the census tracts that make up the planning area.

*Figure 42 - Social Vulnerability Index for Five Census Tracts in HCWCID110*



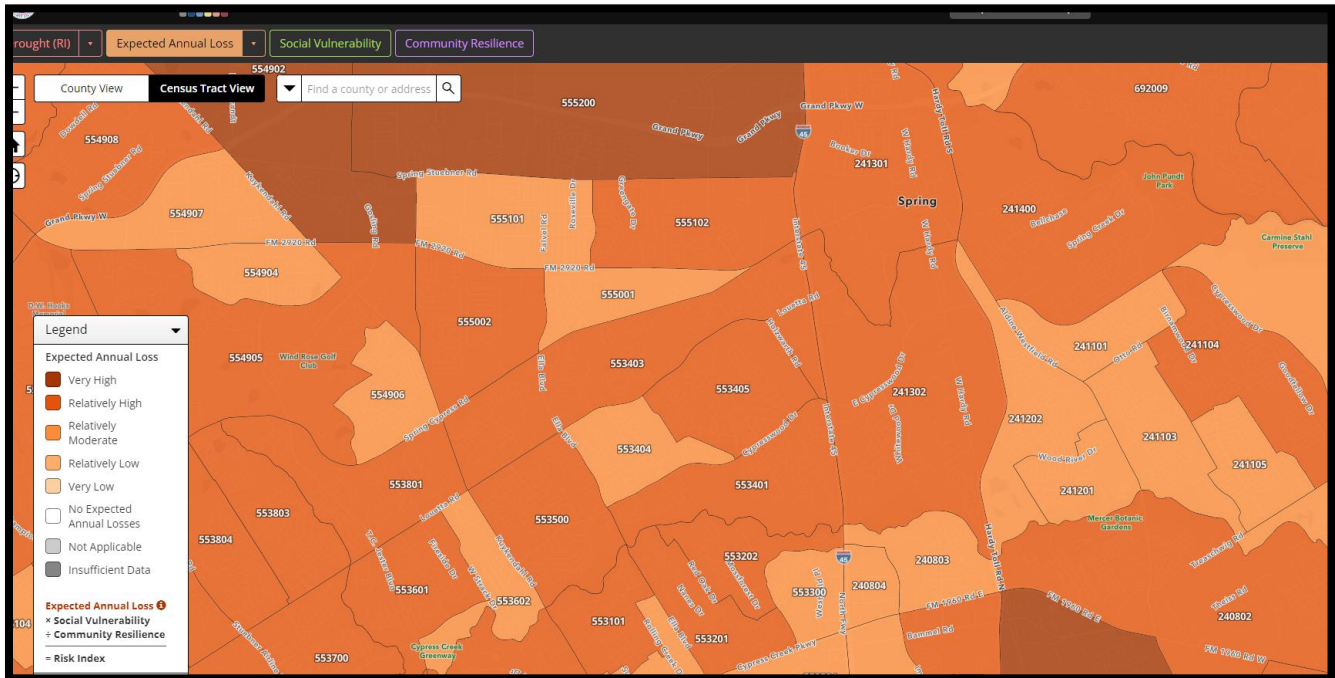
## Overall Vulnerability

Drought risks to people and property within the HCWCID110 cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire County. All people and assets are considered to have the same degree of exposure.

The drought hazard affects all residential and commercial building types about equally within the planning area. Based on the assets that HCWCID110 has authority over, vulnerable assets may include infrastructure, water distribution, water transmission lines, and water wells.

The National Risk Index shows droughts are relatively moderate risk (88.5 national percentile) and relatively moderate (86.0 national percentile) in expected annual loss. This index estimates \$387 thousand dollar expected annual loss for Harris County as a whole.

**Figure 43 - National Risk Index for Drought for County and Census Tracts**



## Extreme Heat

### Hazard Description

The 2018 Texas HMP Update provides a definition of extreme heat, describing it as a combination of very high temperatures and exceptionally humid conditions. When this combination persists over an extended period, it is referred to as a heat wave. Extreme heat poses a significant threat to human life by pushing the body beyond its normal limits. Under usual circumstances, the body's internal thermostat triggers perspiration, which evaporates to cool the body down. However, in extreme heat and high humidity, evaporation slows down, and the body must work harder to maintain a normal temperature.

Extreme heat is characterized by temperatures that are 10 degrees or more above the average high temperature for the region and last for several weeks. Humid or muggy conditions exacerbate the discomfort of high temperatures, occurring when a "dome" of high atmospheric pressure traps hazy and damp air near the ground. Excessively dry and hot conditions often precede dust storms.

Heat-related illnesses typically occur when individuals have been exposed to excessive heat or have exerted themselves beyond their capacity, taking into account factors like age and physical condition. Additionally, stagnant atmospheric conditions and poor air quality can contribute to and worsen heat-related health problems. It is crucial to be aware of the risks associated with extreme heat and take appropriate precautions to protect oneself during such conditions.

### Location

Extreme heat occurs on a regional scale, so all HCWCID110 is equally at risk. The climate in the region often bodes itself to having hot and humid summers with prolonged heat waves.

### Previous Occurrences

The NOAA Storm Events Database documents 65 extreme heat events for Harris County since the year 1996. Those events are spread over 10 years with many of the years containing multiple heat events. These events are summarized in Table 18. The NOAA database showed that during those 65 heat events there were 126 recorded deaths.

**Table 18 - Heat Events in Harris County, 1998 – 2023**  
(Source: NOAA/NCEI)

Location	Year	EVEI	MAGNITU	Total Heat Events	DEATHS	INJUR	PrD	CrD
HARRIS (ZONE)	1998	Heat	N/A	19	19	0	0	0
HARRIS (ZONE)	1999	Heat	N/A	4	11	0	0	0
HARRIS (ZONE)	2000	Heat	N/A	12	36	0	0	0
HARRIS (ZONE)	2001	Heat	N/A	20	20	0	0	0
HARRIS (ZONE)	2004	Heat	N/A	2	2	0	0	0
HARRIS (ZONE)	2005	Heat	N/A	1	34	0	0	0
HARRIS (ZONE)	2009	Heat	N/A	3	0	0	0	0
HARRIS (ZONE)	2015	Heat	N/A	1	1	0	0	0
HARRIS (ZONE)	2017	Heat	N/A	1	1	0	0	0
COASTAL HARRI:	2018	Heat	N/A	2	2	0	0	0
			Totals:	65	126	0	0	0

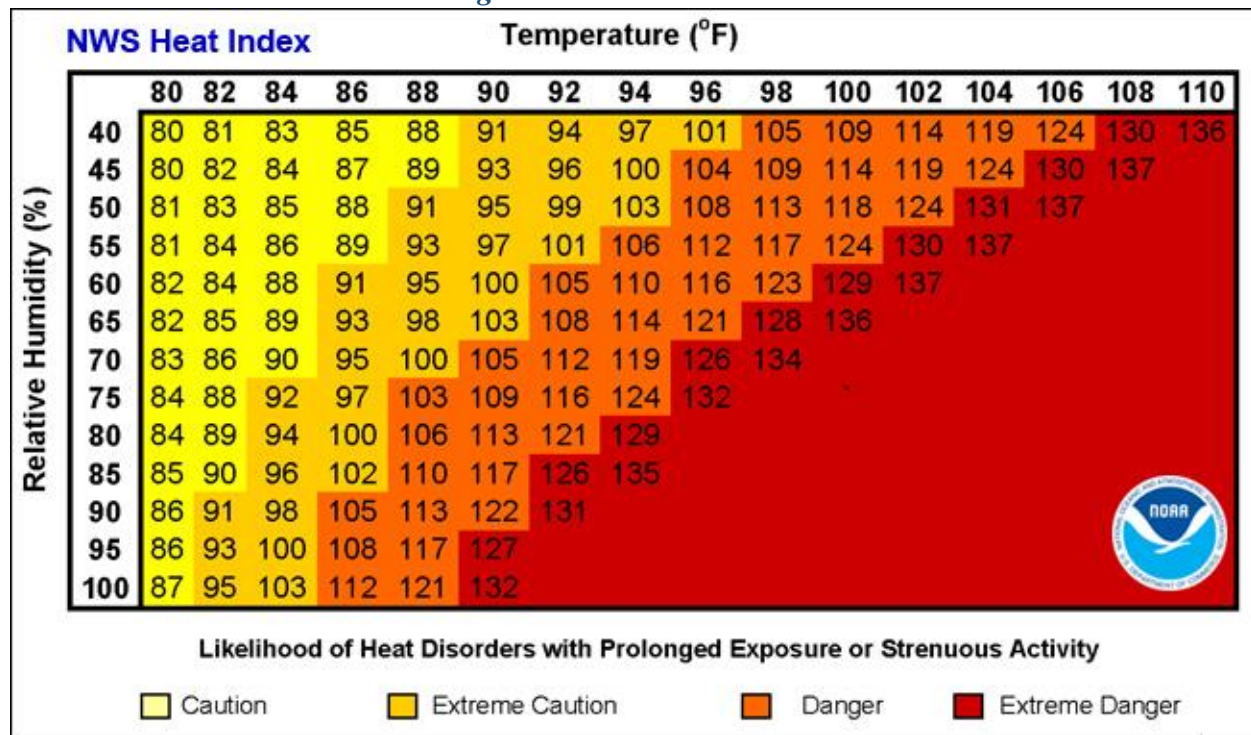
**Future Occurrences**

Based on 10 years with extreme heat events over the last 27 years, an extreme heat event occurs approximately every 2.7 years and has an approximately 37% chance annually in Harris County. Since extreme heat occurs at a regional level, HCWCID110 can expect the same chance of heat event throughout HCWCID110.

**Extent**

The National Weather Service (NWS) released a Heat Index (Figure 44) which helps describe how perceived heat changes as relative humidity and temperature changes. This index also color codes the likelihood of heat disorders at different perceived heat temperatures when people have prolonged exposure or are completing strenuous activities.

*Figure 44 - NWS Heat Index*



**Impact**

The NWS also tracks the impact of extreme heat with prolonged exposure or when completing strenuous activities. Figure 45 shows effects on the body at different heat index levels.



*Figure 45 - Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity*

Classification	Heat Index	Effect on the body
Caution	80°F - 89°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 102°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

In HCWCID110, the risk of extreme heat affects all people and properties uniformly across the entire area. There is no distinction in the probability of its occurrence; it is expected to have an equal chance of happening throughout HCWCID110.

Excessive heat can put a strain on the electrical power system. The high demand for cooling and air conditioning during extreme heat can lead to increased energy usage, potentially causing power outages. Areas experiencing power outages are directly impacted, and vulnerable populations, such as the elderly, young children, and economically disadvantaged individuals, could be particularly affected by these disruptions.

Overall, extreme heat poses a significant concern for Harris County, as it affects everyone and places additional stress on both human health and the infrastructure, particularly the electrical grid. Understanding these risks is crucial for implementing appropriate measures to protect vulnerable populations and ensure the overall well-being of residents during extreme heat events.

**Effect of Climate Change on Extreme Heat**

Due to climate change, the probability of an extreme heat event and its duration may increase in the future. This is due to the possibility of warming trends in the climate. There will also likely be more severe cases of extreme heat events based on these trends.

According to the Climate Mapping for Resilience and Adaption (CMRA) tool there is an estimated increased in extreme heat days (>90 degrees F) over the rest of the century in Harris County if fossil fuel emissions continue at current levels (characterized as higher emissions). However, estimations show a smaller increase in extreme heat days if society “lowers emissions” which is characterized by drastically reducing use of fossil fuels and reducing global emissions of heat trapping gases to zero by 2040. Figure 46 below shows the comparison of the estimated number of days per year with higher than 90 degrees Fahrenheit temperatures over the rest of the century based on these lower or higher emissions.

*Figure 46 - Estimated Days Per Year >90°F Over Remainder of 21st Century*

**Annual days with maximum temperature > 90°F**



**Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

Certain populations, such as older adults and those with lower incomes, are generally assumed to be more vulnerable to the effects of very high temperatures. This vulnerability can be attributed to their reduced physical capacity to tolerate extreme heat or their lack of access to air conditioning; or in some cases, both. These factors make them more susceptible to heat-related health issues and discomfort during prolonged periods of extreme heat.

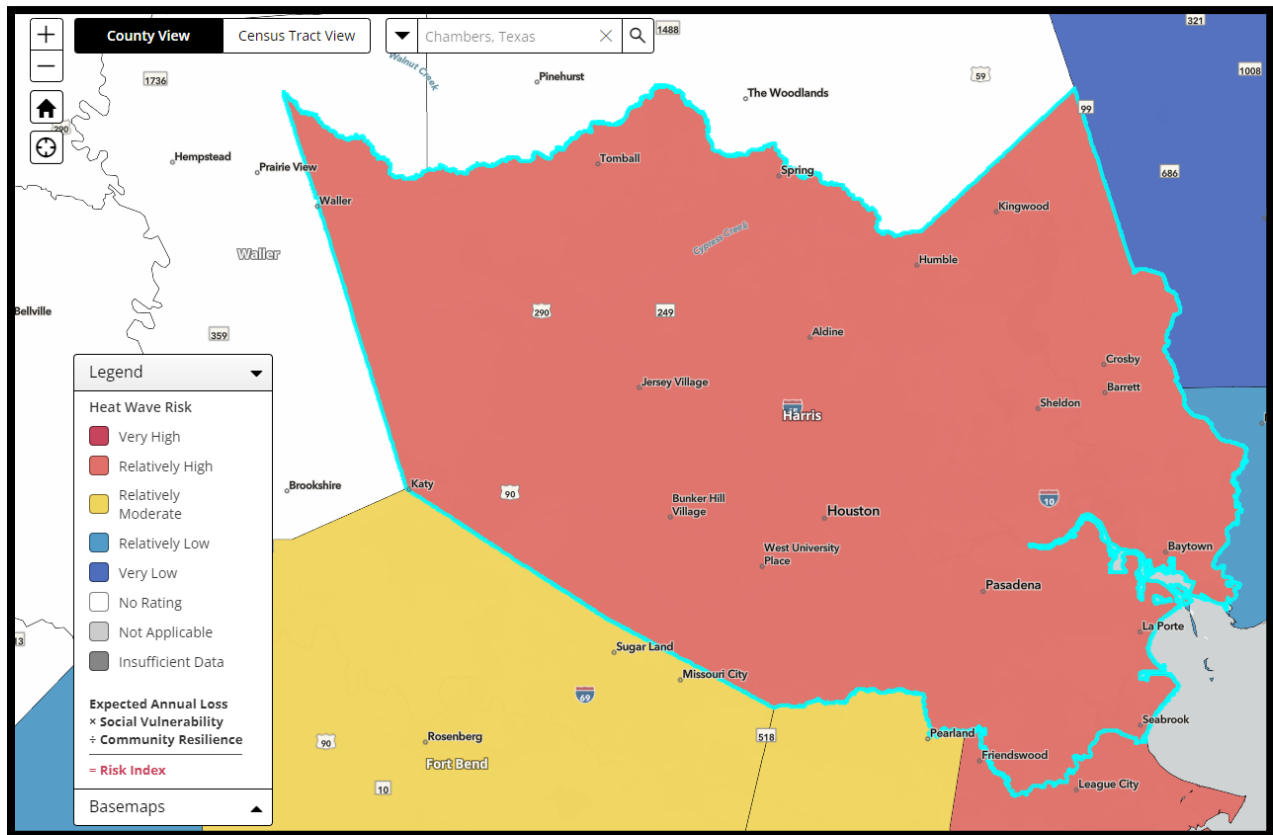
**Overall Vulnerability**

Extreme heat risks to property within the HCWCID110 cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire District. After

reviewing the NCEI database, there is no recorded property damage from extreme heat events. The chance of future damage to property is then considered negligible. As stated in the previous section, the disadvantaged population is most at risk of injury or death from future extreme heat events.

The National Risk Index shows extreme heat is a relatively high risk (99.4 national percentile) in expected annual loss. This index estimates a \$13 million dollar expected annual loss for Harris County as a whole.

**Figure 47 - National Risk Index for Extreme Heat for County and Census Tracts**



# Flood

## Hazard Description

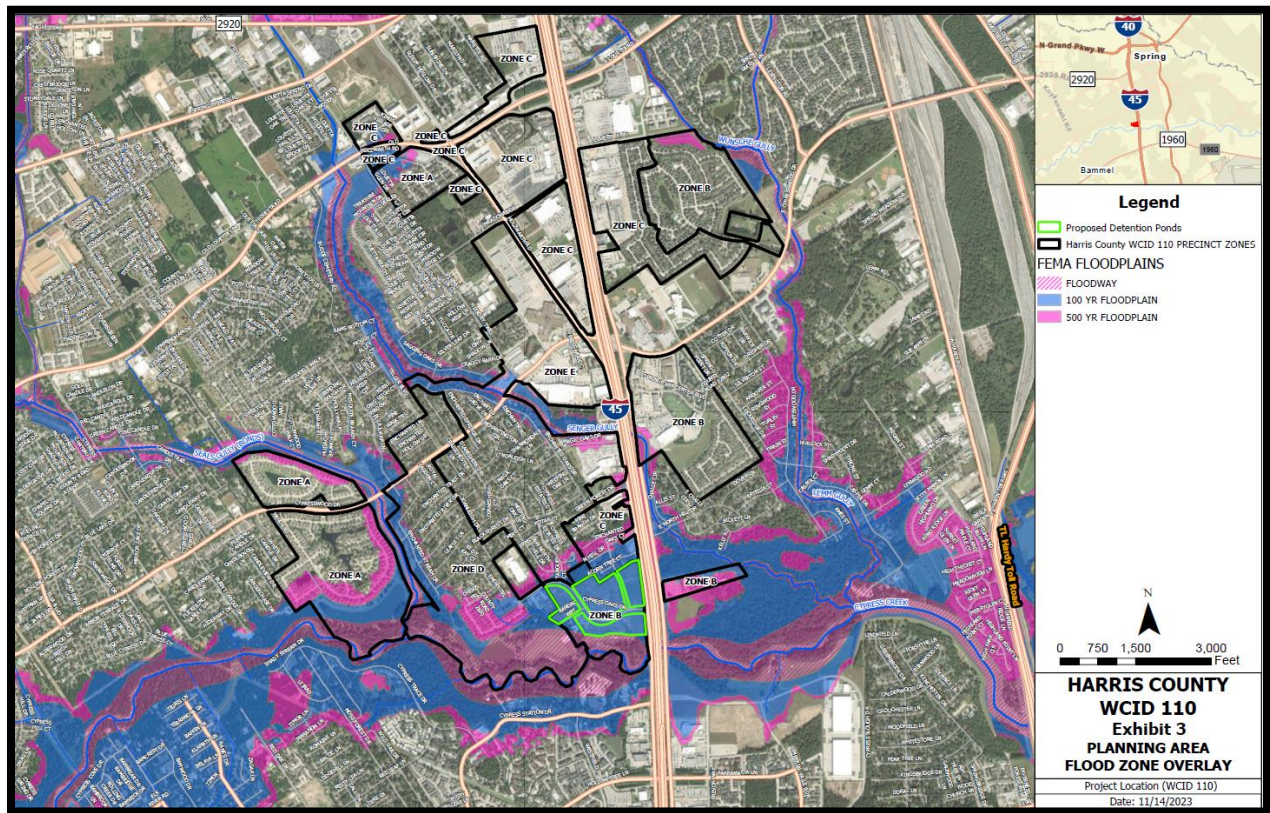
The NOAA National Severe Storms Laboratory describes a flood as an overflow of water onto land that is typically dry. Floods can occur during heavy rains, when dams or levees break, when snow melts quickly, or when ocean waves come to land. Floods are the most common type of weather-related natural disaster in the plan area. Records show that up to 90 percent of the State of Texas’s reported damage from natural disasters comes from flooding.

Flash flooding is a specific type of flood that occurs when there is heavy rainfall that is greater than what the ground can absorb. This is the most dangerous type of flood because it can happen very suddenly and there is often not much time to warn citizens of the danger.

## Location

Figure 48 below shows the location of the floodway, 1% (100-year), and 0.2% (500-year) floodplains for the area surrounding and including the planning area of HCWCID110. The dark blue color is at the highest risk of flooding.

*Figure 48 - Flood Zone Overlay for HCWCID110*



There are 94 NFIP policies in force within the planning area, insuring structures, and contents at a value of \$3,297,018.00. About 75% of those NFIP policies are in the SFHA. The geographic area affected is considered Significant.



### Previous Occurrences

The NCEI Storm Events Database lists 160 flood events in the last 20 years in Harris County as a whole. The NCEI database does not report the events for the planning area of HCWCID110 separately, but they do report the events individually for Spring. The NCEI database reports 9 flood events that affected Spring in the last 20 years. Table 19 summarizes those events and the reported damage. It appears the database does not accurately annotate the damages to parts of the county as it can be difficult to separate that data. For a more accurate representation of the damages, the NCEI database reports over \$10.3 billion dollars in damages from floods in the last 20 years for Harris County as a whole, with 61 reported deaths.

**Table 19 - Floods in Spring Texas 7/1/2003 to 7/31/2023**  
(Source: NCEI Database)

EVENT_ID	CZ_NAME_STR	LOCATION	BEGIN_DATE	EVENT_TYPE	DEATHS_DIRECT	INJURIES_DIRECT	DAMAGE_PROPERTY_NUM
5513982	HARRIS CO.	SPRING	6/22/2006	Flash Flood	0	0	\$200,000.00
63774	HARRIS CO.	SPRING	10/15/2007	Flash Flood	0	0	\$5,000.00
166508	HARRIS CO.	SPRING	4/28/2009	Flash Flood	0	0	\$10,000.00
579534	HARRIS CO.	SPRING	5/30/2015	Flash Flood	0	0	\$100,000.00
644948	HARRIS CO.	SPRING	6/1/2016	Flash Flood	0	0	\$5,000.00
720860	HARRIS CO.	SPRING	8/26/2017	Flash Flood	0	0	\$0.00
721085	HARRIS CO.	SPRING	8/27/2017	Flash Flood	0	0	\$0.00
757973	HARRIS CO.	SPRING	7/4/2018	Flash Flood	0	0	\$0.00
869176	HARRIS CO.	SPRING	9/19/2019	Flash Flood	1	0	\$0.00
Total					1	0	\$320,000.00

### Future Occurrences

Based on the NCEI Storm Events Database, there were 9 events in Spring, Texas over the last 20 years. That equals about an event every other year or 45% chance each year.

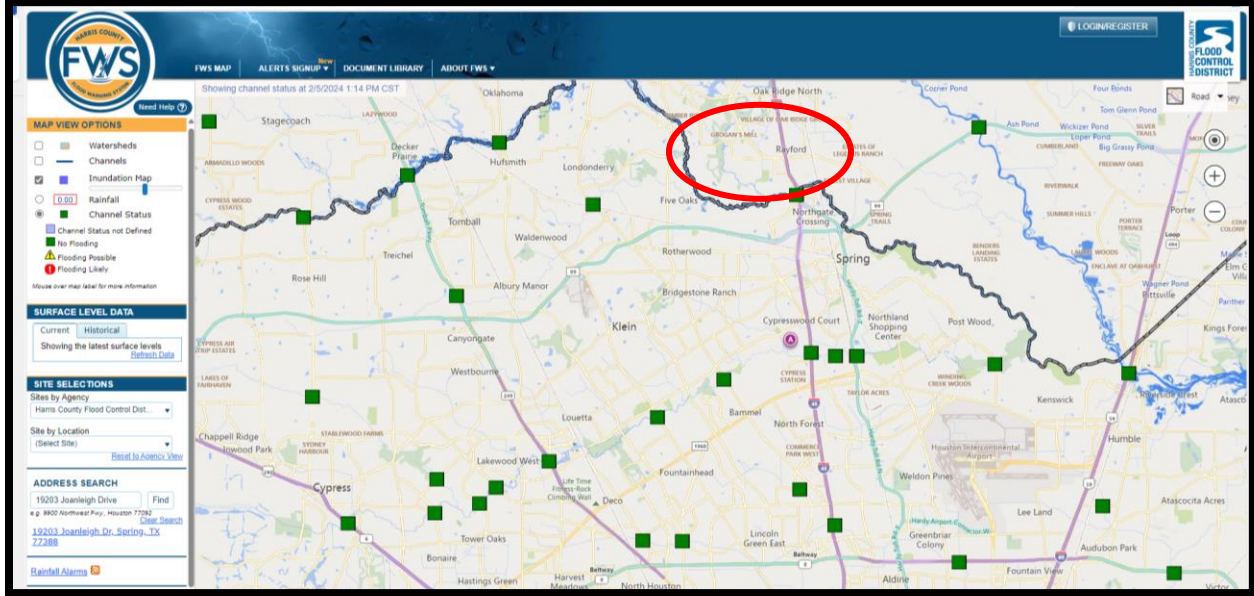
### Extent

The severity of a flood event is determined by a combination of stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing. The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow. For HCWCID110, floods are and continue to be the most frequent, destructive, and costly natural hazard facing the planning area. Once a river reaches flood stage, the National Weather Service utilizes flood categories (as shown in the box to the right) in describing the severity of a flood event in the corresponding river reach. HCWCID110 is in the Cypress Creek watershed which is flood prone.

Category	Description
Minor Flooding	Minimal or no property damage, but possibly some public threat or inconvenience
Moderate Flooding	Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
Major Flooding	Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.
Record Flooding	Flooding which equals or exceeds the highest stage or discharge observed at a given site during the period of record.

Harris County Flood Control District has 188 rain gages throughout the County that are monitored for water levels, inundation levels, and rainfall totals, with several surrounding the planning area (red circle) as shown Figure 49.

*Figure 49 - HCFCD Gages near HCWCID110*



A closer look at Sensor 1119 – 1120 Cypress Creek@I-45 can show historical rainfall, current conditions, flood frequency, and elevation information as shown in Figure 50 and 51.

*Figure 50 - Gage 1120 Cypress Creek @I-45*

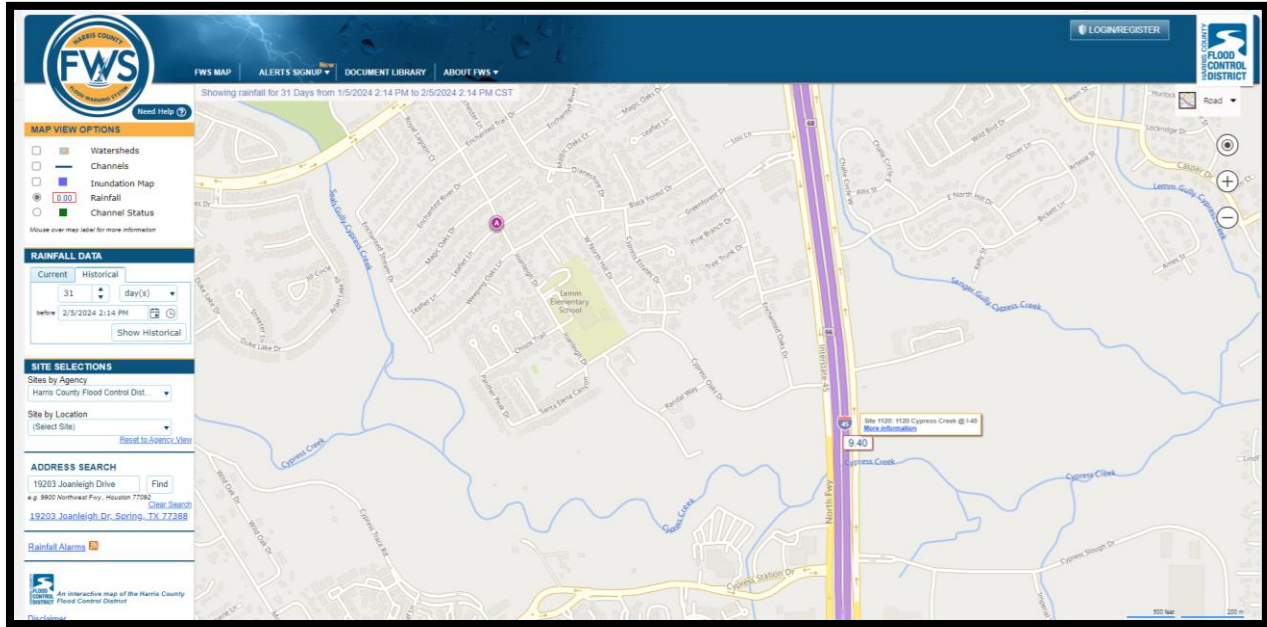
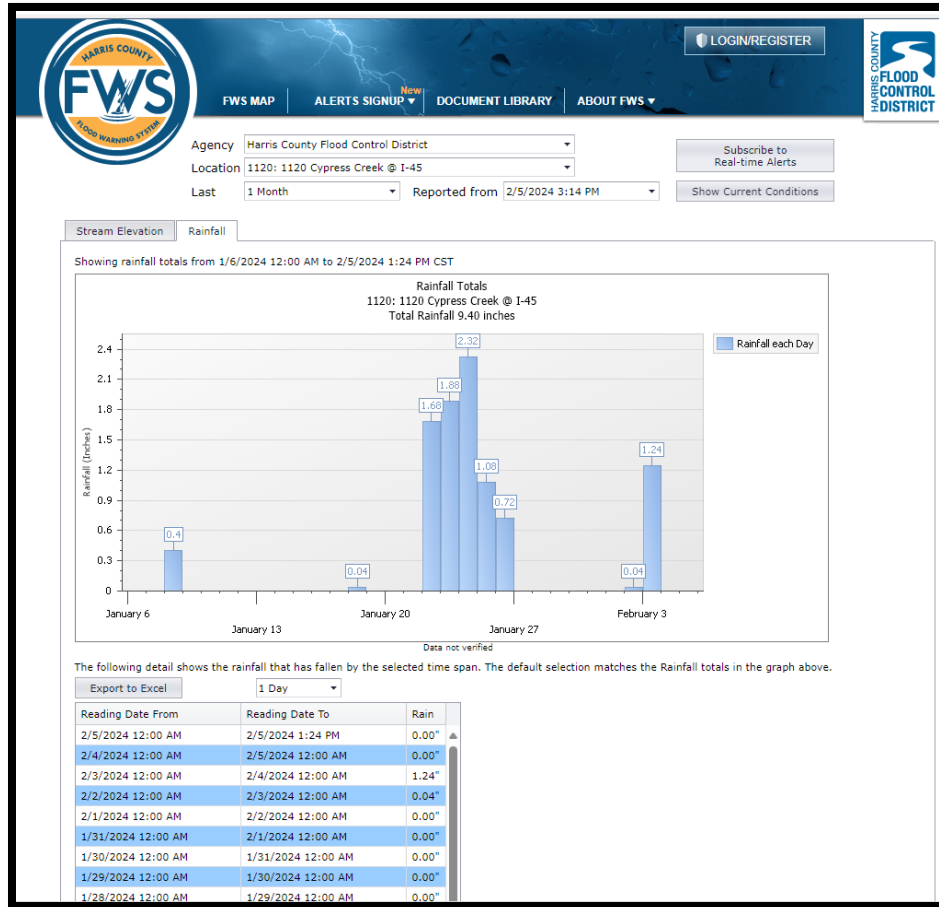
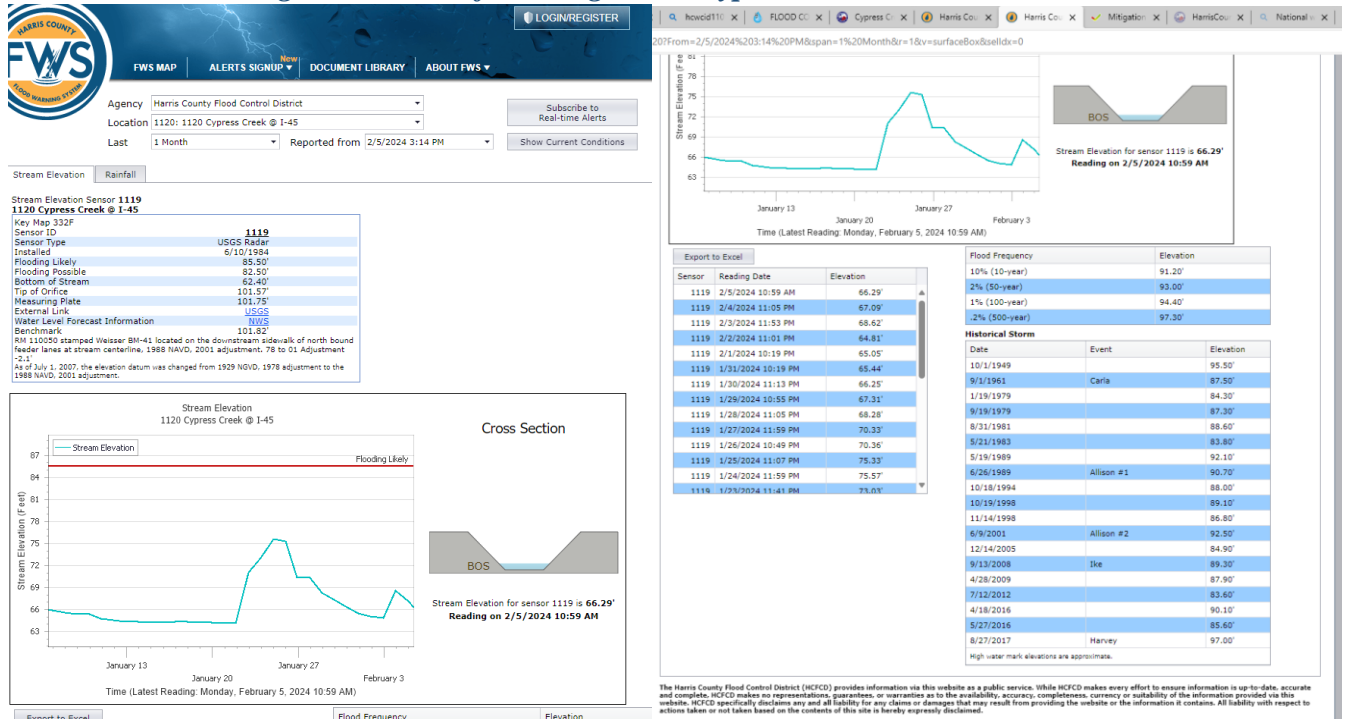
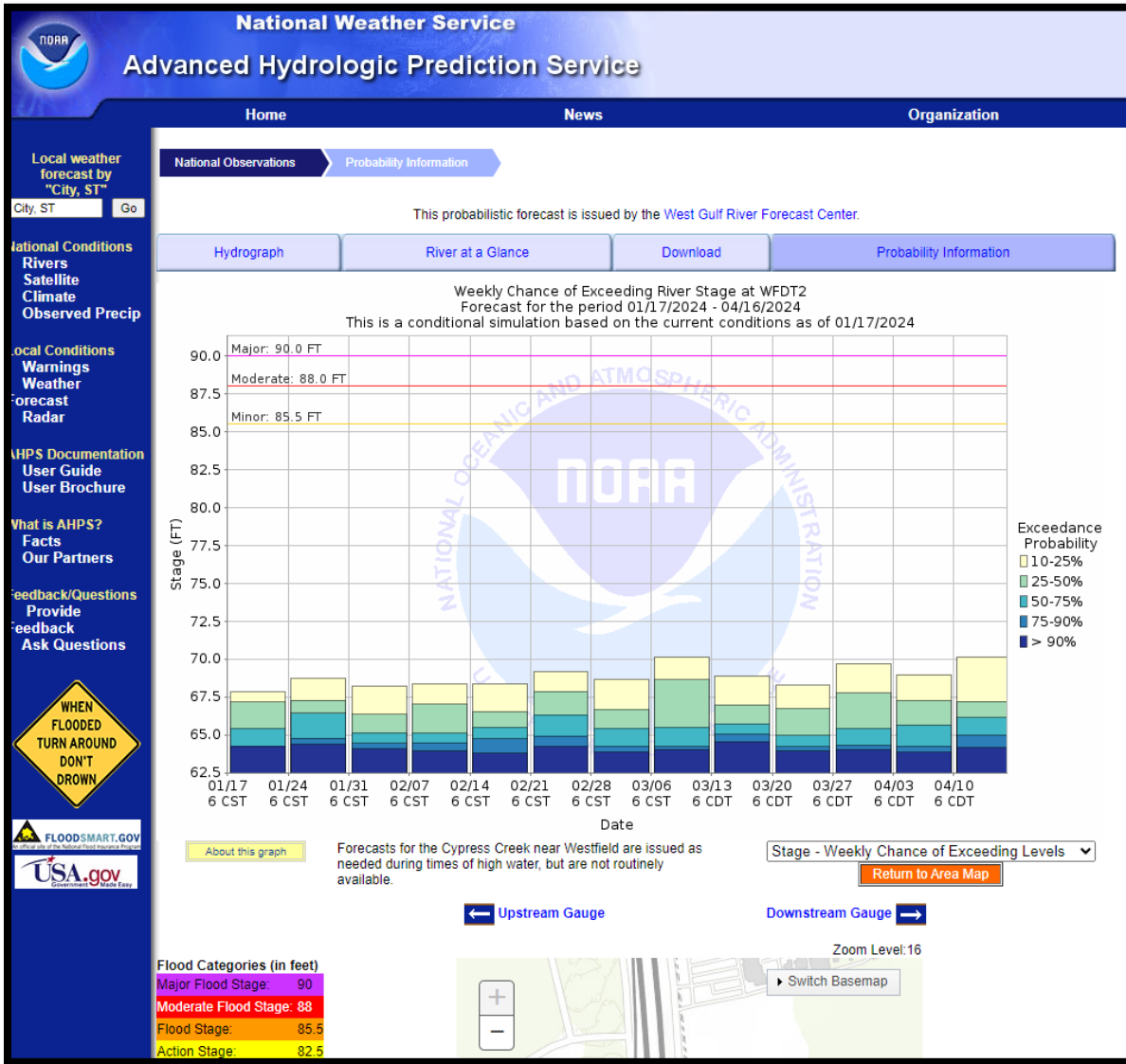


Figure 51 - Data from Gage 1120 Cypress Creek @I-45



Data from the National Weather Service to help determine the extent can be found in Figure 52.

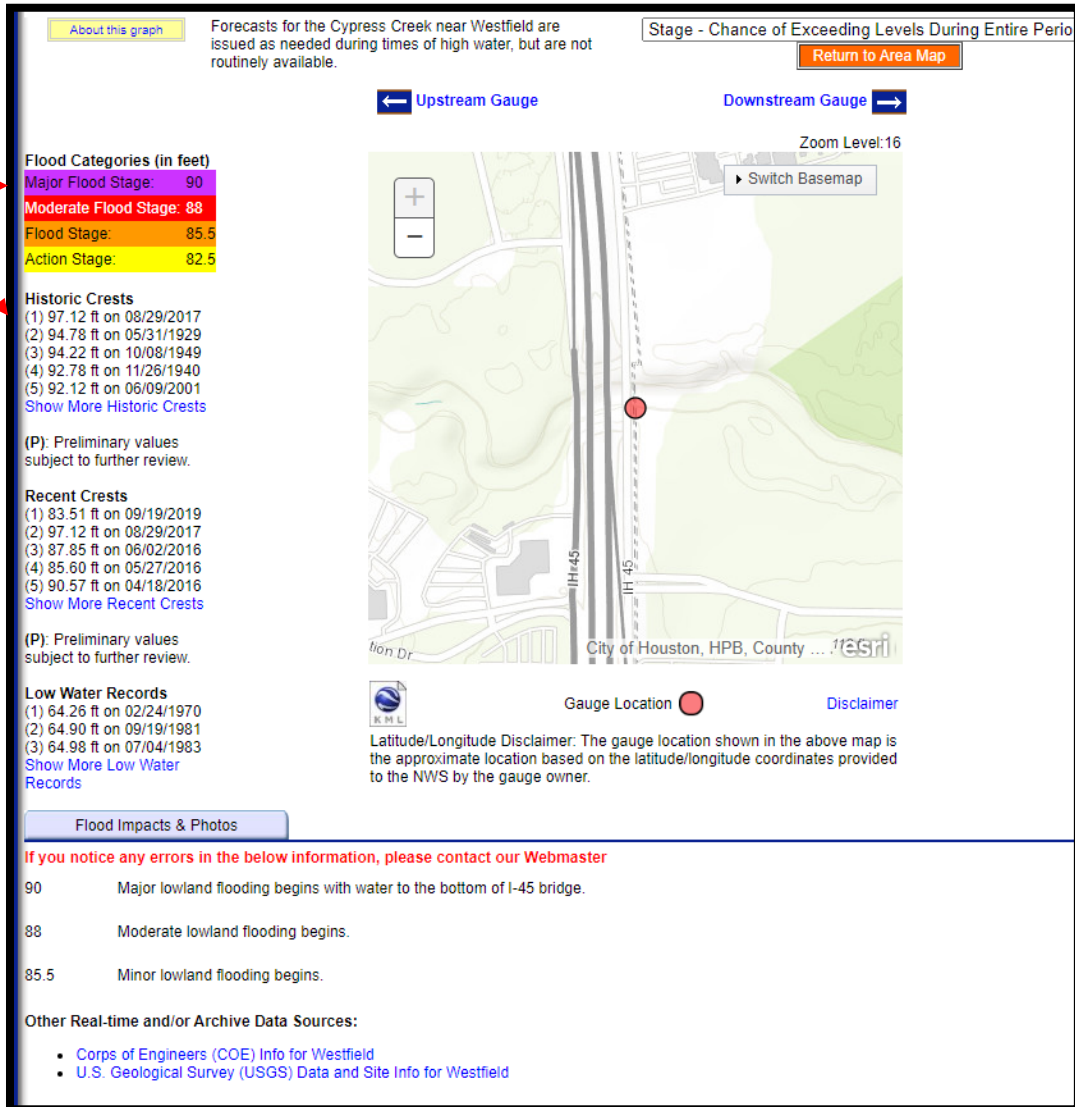
*Figure 52 - NWS River Stage for Cypress Creek Near Westfield Gauge (WFDT2)*



The maximum probable extent of a future flood is considered extreme because the area can and has experienced major flood stage as shown in Figure 53. As noted by the above figures, Hurricane Harvey dropped huge amounts of rain in a short period of time. Many nearby gauges show similar data. This information can be retrieved for any day, event or period after the gauges were installed.



Figure 53 - Cypress Creek Near Westfield historical Crest 8-29-17 -97.12 ft



## Impact

Structures impacted with the HCWCID110 planning area can be shown below.

Type	Number of Structures
Residential Housing Units (occupied and vacant)	2,209
Non-Residential Units	300
District Infrastructure and Utility Buildings	12
District owned buildings	5

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). There are 94 NFIP

policies in force within the planning area, insuring structures, and contents at a value of \$3,297,018.00. About 75% of those NFIP policies are in the SFHA.

### NFIP Repetitive Loss Properties

In recent years, FEMA has focused considerable attention on the **Repetitive Loss (RL)** properties which are a subset of insured buildings. Repetitive loss properties make up only 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation's flood insurance claim payments. An RL property is defined as a property that has received two or more claim payments of at least \$1,000 over a ten-year period. FEMA's database identifies 26 properties as RL properties in HCWCID110. This number includes properties with active flood insurance policies as well as those with inactive policies. Figure 54 provides a general area within the planning area where properties classified as RL and SRL are located. SRL, **Severe Repetitive Loss** properties are further 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.

*Figure 54 - RL and SRL Areas*

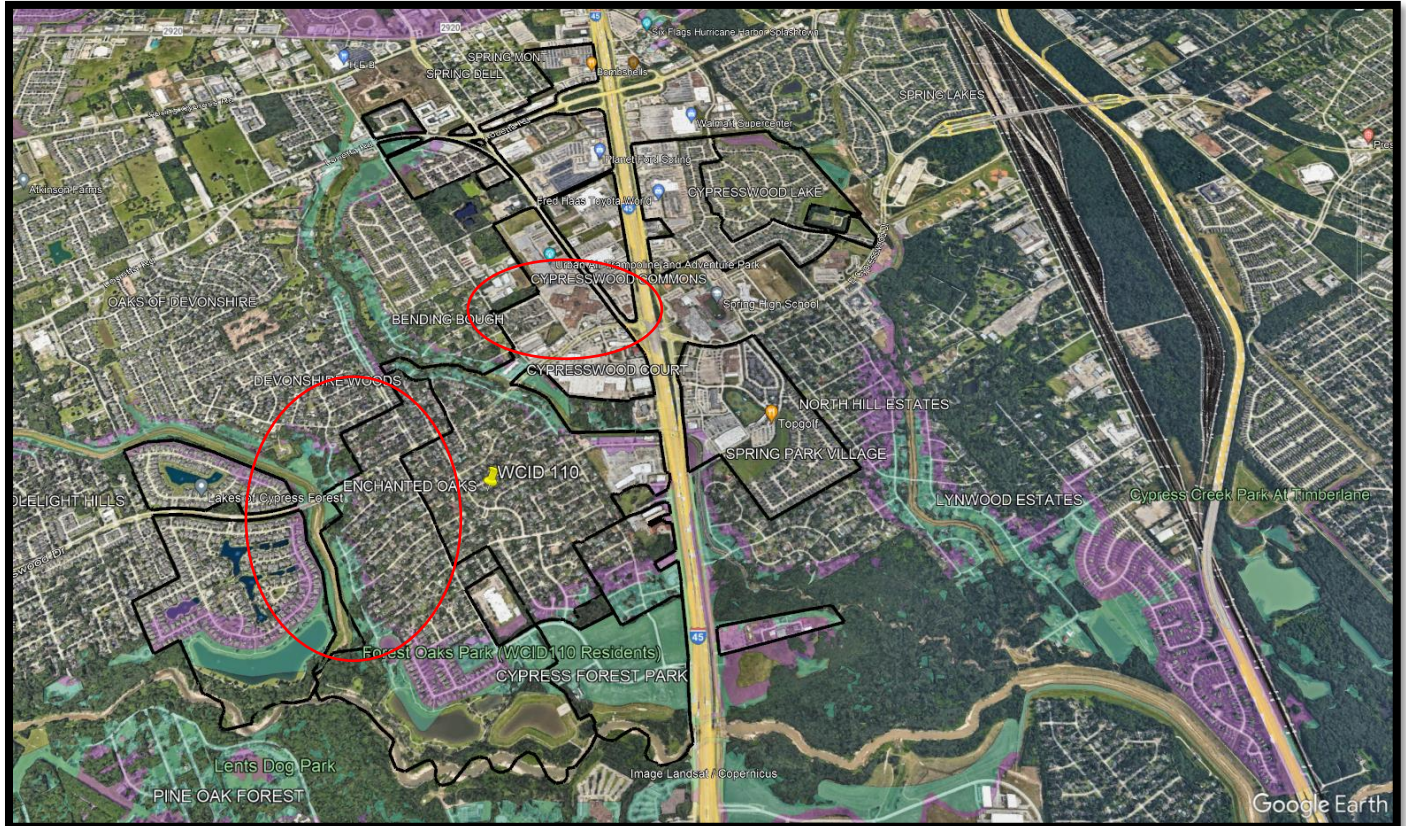


Table 20 provides a summary of residential repetitive flood insurance claims for individual streets with two homes or more on the RL List in HCWCID110. Address data about individual sites is omitted for privacy reasons. The table shows that the 26 residential repetitive loss properties received claim payments over \$5.2 million (includes payments for building damage and contents damage).

**Table 20 - RL Statistics for the HCWCID110**  
(Source: FEMA, 2023)

Properties	Building Payments	Contents Payments	Total	# of claims	Average
26	\$3,600,305.89	\$1,632,075.35	\$5,232,381.24	114	\$49,072.60

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 was 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 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 2023, a period of 44 years. Table 21 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 \$5,232,381.24 experienced over a 44-year period, we derived annualized losses of \$118,917.75. We then determine the net present value of annualized losses of \$118,917.75 over a one-hundred-year horizon. To do this we use the 100-year net value coefficient of 14.27. This results in a calculated net present value of a \$118,917.75 annual loss to be \$1,676,956.37.

The difference between \$5,232,381.24 experienced over a 44-year period and a projected \$1,696,956.37 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 damage. Therefore, if not mitigated, the net present value of projected flood risk over a 100-year timeframe is \$1,696,956.37. While it is an estimate, it offers a useful metric that can be used in assessing the potential cost effectiveness of mitigation actions.

**Table 21 - Projected 100-year Flood Risk in HCWCID110 to Repetitive Loss Properties**  
(Source: FEMA NFIP query Nov 2023)

Data	Value
Period in years	44
Number of claims	114
Average claims per year	2.59
Total value of claims	\$5,232,381.24
Average value of claims per year	\$118,917.75
<b>Projected risk, 100-year horizon</b>	<b>\$1,696,956.37</b>

SRL properties are a subset of the RL list but were not included in the analyses above. As of November 2023, HCWCID110 has 16 properties on the SRL list. Table 22 provides loss estimates for NFIP SRL properties in HCWCID110 as calculated by FEMA and the NFIP.

**Table 22 - SRL Statistics for HCWCID110**  
(Source: FEMA, 2023)

Properties	Building Payments	Contents Payments	Total	# of claims	Average
16	\$2,658,539.68	\$1,280,328.26	\$3,938,868.94	80	\$50,240.51

Table 23 details the projected 100-year flood risk for all SRL properties. This follows the same calculation described in the NFIP RL section.

**Table 23 - Projected 100-year Flood Risk in HCWCID110 to Severe Repetitive Loss Areas**  
(Source: FEMA NFIP query Nov 2023)

Data	Value
Period in years	44
Number of claims	80
Average claims per year	1.82
Total value of claims	\$3,938,868.94



Average value of claims per year	\$89,519.75
<b>Projected risk, 100-year horizon</b>	<b>\$1,277,446.83</b>

In addition to the building inventory, infrastructure (drainage, roads) is also impacted.

**Effect of Climate Change on Flooding**

The risk of flooding may intensify because of climate change. As the temperature of water rises, it often heightens the likelihood of hurricanes. Frequently, hurricane events coincide with the most severe flooding incidents.

**Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

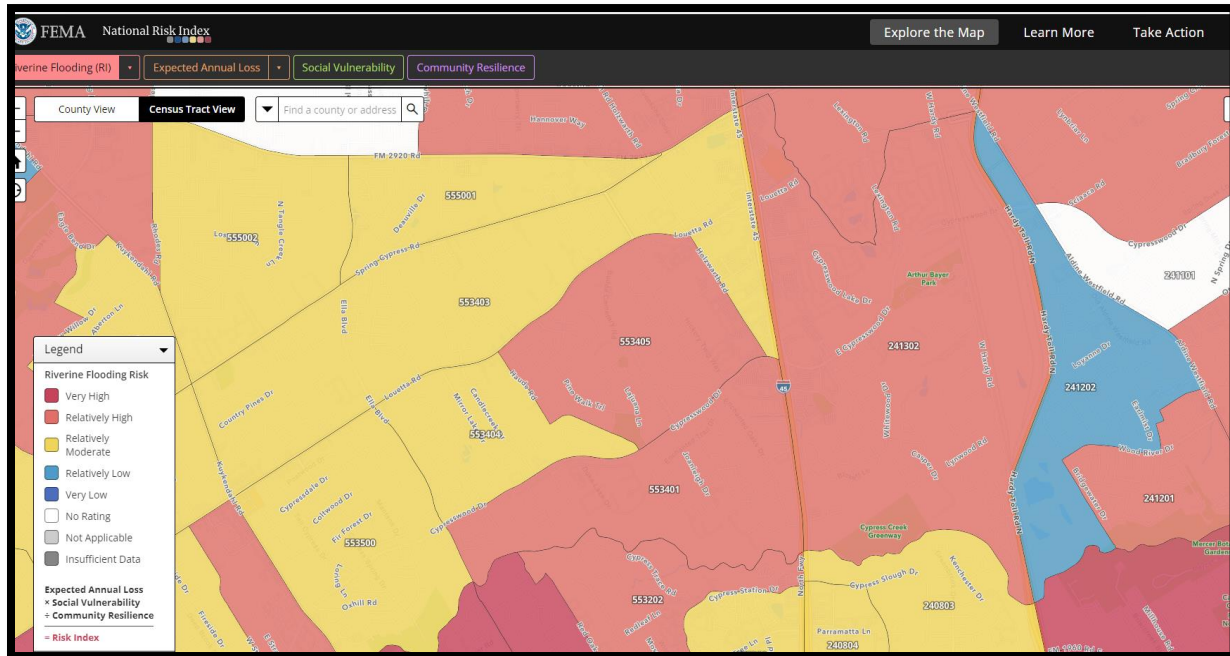
Flood events can be particularly dangerous to socially vulnerable groups such as the elderly, low-income individuals, individuals with health issues, and the homeless. In many cases, these individuals may reside in areas that are more susceptible to flooding as well as potentially live in a less reinforced home, like a mobile home. These groups also are more likely to need extra time to evacuate or need assistance to evacuate during a flood.

**Overall Vulnerability**

Structures that are identified as Repetitive Loss or Severe Repetitive Loss are at the highest risk of damage from flooding. These structures are documented to have been impacted by multiple flood events. Homeowners that live in these structures are also highly vulnerable to injury or death during a flood event. In the planning area, assets such as the wastewater treatment plant, lift stations, water tower, administrative offices, and parks are all also vulnerable to damage from flooding.

The National Risk Index shows floods are relatively high risk for three census tracts (red) and relatively moderate for two of the census tracts (yellow) and very high (92 national percentile for the average of the five census tracts) in expected annual loss. This index estimates a \$676 million dollar expected annual loss for Harris County as a whole.

Figure 55 - National Risk Index for Flooding for County and Census Tracts



Riverine Flooding

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48201553405	TX	Relatively High	97.66	0   100
2	Census tract 48201241302	TX	Relatively High	97.22	0   100
3	Census tract 48201553401	TX	Relatively High	95.74	0   100
4	Census tract 48201553403	TX	Relatively Moderate	88.01	0   100
5	Census tract 48201553404	TX	Relatively Moderate	85.15	0   100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48201553405	TX	\$537,881	Relatively High	Very Low	1.35	\$725,605	97.66
2	Census tract 48201241302	TX	\$725,887	Very Low	Very Low	0.84	\$612,804	97.22
3	Census tract 48201553401	TX	\$594,031	Very Low	Very Low	0.7	\$418,700	95.74
4	Census tract 48201553403	TX	\$100,659	Relatively High	Very Low	1.35	\$135,650	88.01
5	Census tract 48201553404	TX	\$124,617	Very Low	Very Low	0.81	\$101,378	85.15

## Freezes/Extreme Cold

### Hazard Description

According to the National Weather Services, extreme cold/freezing in the Southern United States is considered any temperature below 32 degrees Fahrenheit. Wind chill plays a part in extreme cold as well. Wind chill is used to describe how the rate of heat loss in the body results from a combination of low temperature and the wind. The more wind there is the quicker heat is carried away from the body. This causes the effects of the extreme cold to become more severe.

### Location

Due to the nature of extreme cold/freezing the entire planning area will be affected at the same rate. This affect also typically extends to the entirety of Harris County as temperatures are often very similar for the entire county.

### Previous Occurrences

According to the NOAA NCEI database, extreme cold and windchill are reported on a county basis. As discussed in the location section, all parts of the HC WCID100 would be affected at the same rate as Harris County overall. The NCEI database reports 5 extreme cold events in the last 20 years. All these events were documented in January of 2018. Table 24 quantified these 5 events. There were a reported 5 deaths in those January 2018 extreme cold events, mostly due to hypothermia.

*Table 24 - Extreme Cold Events 7/1/2003 to 7/31/2023*

Location	County/Zone	St.	Date	Time	LZ.	Type	Mag	Dth	Inj	PrD	CrD
<b>Totals:</b>								5	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	01/02/2018	00:45	CST-6	Extreme Cold/wind Chill		1	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	01/02/2018	00:45	CST-6	Extreme Cold/wind Chill		1	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	01/02/2018	00:45	CST-6	Extreme Cold/wind Chill		1	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	01/16/2018	16:00	CST-6	Extreme Cold/wind Chill		1	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	01/17/2018	00:00	CST-6	Extreme Cold/wind Chill		1	0	0.00K	0.00K
<b>Totals:</b>								5	0	0.00K	0.00K

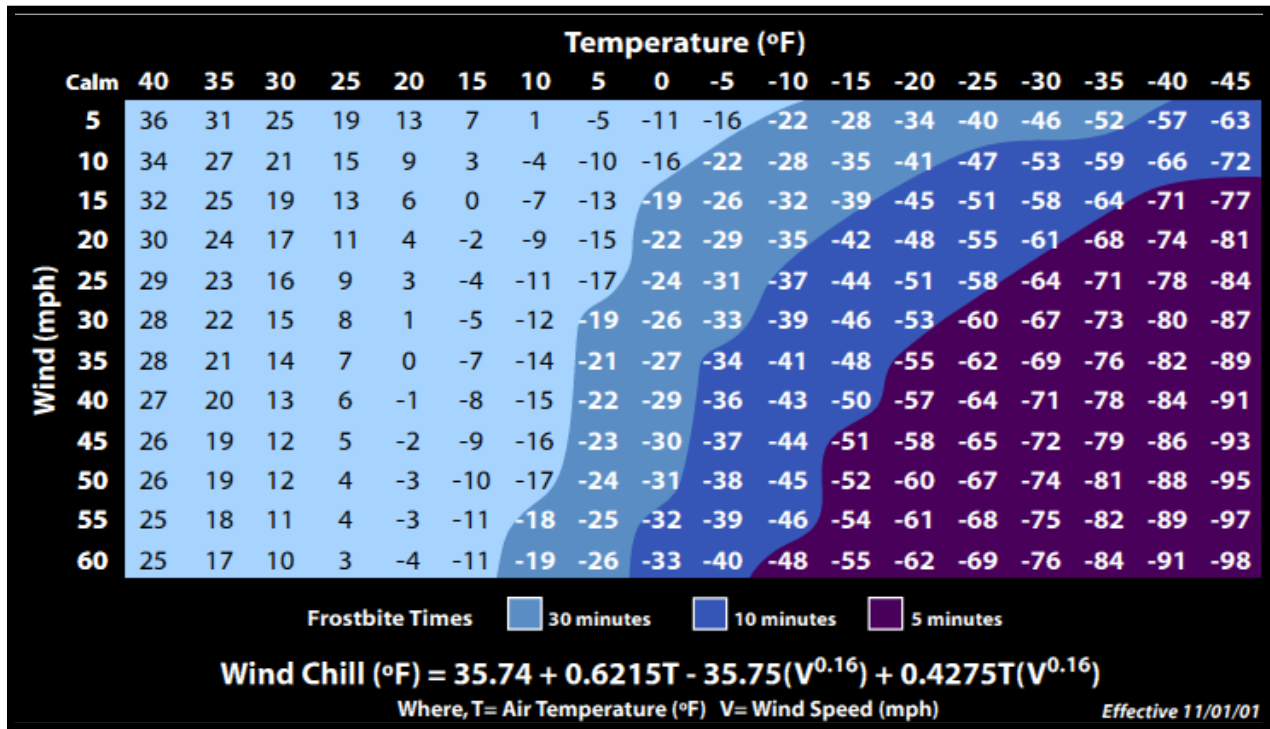
### Future Occurrences

Since there was just one reported year with extreme cold events in the last 20 years, the planning area can expect a yearly chance of 5% for an extreme cold event.

### Extent

The National Weather Service has created a chart to document temperature and wind speed. Ultimately this creates a wind chill value based on the two. The NWS was able to calculate how long it would take a person to be frostbitten based on the wind chill.

Figure 56 - Wind Chill Chart from the NWS



**Impact**

Extreme cold events and ultimately severe wind chill can cause frostbite to people. Frostbite causes damage to body tissue and can cause loss of feeling in extremities. The NWS suggests getting inside to a warm area if a person starts to feel these symptoms during an extreme cold event.

Extreme cold events can also cause hypothermia, which is when the body temperature drops below 95 degrees Fahrenheit. Hypothermia is extremely serious and can be deadly. If a person survives, they can still have lasting damage to their internal organs. Typical signs of hypothermia include exhaustion, slurred speech, shivering, and memory loss.

**Effect of Climate Change on Freezes/Extreme Cold**

The probability of freezing and extreme cold events in the planning area might be impacted by a changing climate. Some evidence suggests that while climate change leads to warmer and longer summers, it could also result in more severe cold during winter months. Being ready for the effects of freeze events in the planning area is crucial, particularly as most residents are unaccustomed to dealing with such temperatures.

**Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability influences the social, economic, demographic, and housing characteristics of a



community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

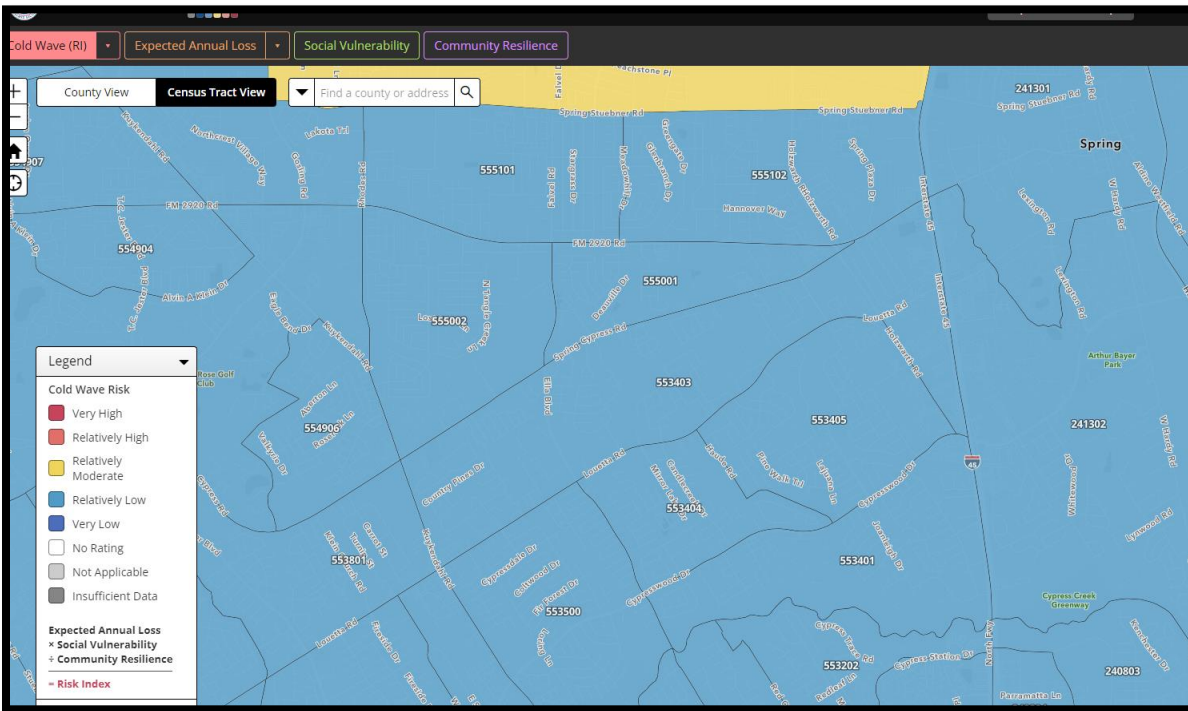
The groups most susceptible to negative effects of freezes and extreme cold are the homeless as well as those that are low-income. These groups may not have the ability to stay warm during these freezing temperatures which can cause effects such as frostbite or hypothermia.

### Overall Vulnerability

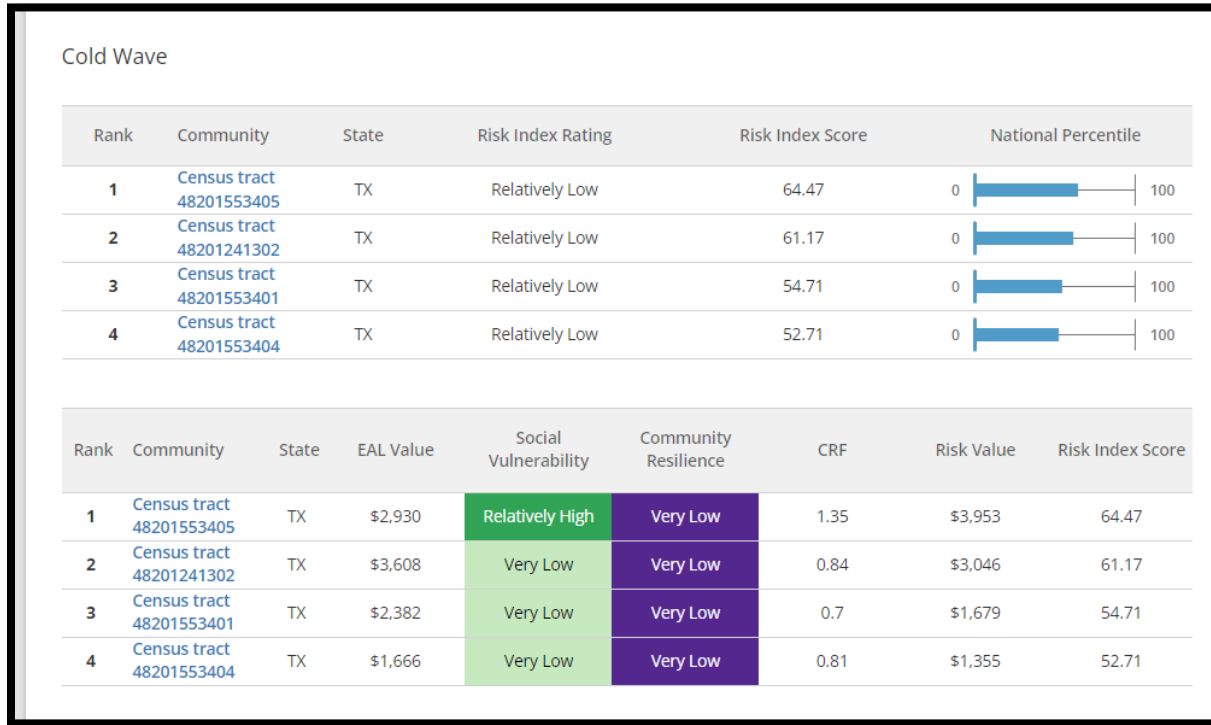
The overall vulnerability of extreme cold and freezes is relatively low. This is mainly due to the climate in HCWCID110 having a low chance of extended freezing temperatures. Typically, when there are sub-freezing temperatures, they last for a short period of time.

The National Risk Index shows extreme cold as relatively low (64.5 national percentile) and very high (98.5 national percentile) in expected annual loss. This is largely due to extreme cold events being uncommon in the area and when they do occur the population in the area is not accustomed to dealing with the effects.

*Figure 57 - National Risk Index for Extreme Cold for County and Census Tracts*



*Figure 58 (cont.) - National Risk Index for Extreme Cold for County and Census Tracts*



# Hail

## Hazard Description

Hailstorms are a type of severe thunderstorm that can cause significant damage. During the formation of a hailstorm, ice crystals begin to develop within a low-pressure front as warm air rises rapidly into the upper atmosphere and cools down. These frozen droplets gradually gather and accumulate into ice crystals until they become precipitation. Hailstones are typically round or irregularly shaped masses of ice that are greater than 0.75 inches in diameter. The size of the hailstones is directly influenced by the size and intensity of the storm itself. According to the NOAA National Severe Storms Laboratory, the fall speed of hailstones can range from 9-25 mph for small hailstones, up to 100 mph for large hailstones (4 inches or greater). In more severe and larger storms, hailstones can grow, posing greater risks to property, crops, and people.

## Location

Hailstorms affect the entire planning area equally. All parts of the planning area have been affected by hailstorms at some point in the past.

## Previous Occurrences

According to the National Centers for Environmental Information (NCEI) Storm Events database, there have been 262 hail events in Harris County in the last 20 years. When the search is narrowed down to Spring, Texas the query returns 6 hail events in the last 20 years totaling an estimated \$84,000.00 in property damage (Table 25).

*Table 25 - Hail events in Spring, Texas since 7/1/2003*

EVENT_ID	CZ_NAME_STR	BEGIN_LOCATION	BEGIN_DAT	EVENT_TYPE	MAGNITUDE	DEATHS	INJURIES	DAMAGE_PROP
5498983	HARRIS CO.	SPRING	3/29/2006	Hail	0.75	0	0	\$5,000.00
5509466	HARRIS CO.	SPRING	5/4/2006	Hail	1.5	0	0	\$75,000.00
5509468	HARRIS CO.	SPRING	5/4/2006	Hail	0.75	0	0	\$3,000.00
32165	HARRIS CO.	SPRING	5/10/2007	Hail	2.5	0	0	\$0.00
134912	HARRIS CO.	SPRING	11/12/2008	Hail	0.75	0	0	\$1,000.00
526453	HARRIS CO.	SPRING	8/11/2014	Hail	1	0	0	\$0.00
Total:						0	0	\$84,000.00

## Future Occurrences

Based on historical frequency of hail events in Harris County overall, there would be expected 13.1 hail events per year on average. If narrowed down to Spring exclusively, it would be an approximate 30% chance of a hail event per year or an event every 3.33 years.

## Extent

Hailstorm intensity is measured by the size of the hail and the damage it may cause. NCEI database uses the TORRO Hailstorm Intensity Scale (Table 26). Using the data from Table 25 above, the intensity category for Spring Texas would range from H0-H7 during the last 20 years. There was

only one event over an H4 which was the event in May of 2007 which resulted in up to 2.5-inch hailstones (63mm). Most of the other events were under the H3 category.

*Table 26 - TORRO Hailstorm Intensity Scale*

	Intensity category	Typical hail diameter (mm)*	Probable kinetic energy J m <sup>-2</sup>	Typical damage impacts
<b>H0</b>	Hard hail	5	0-20	No damage
<b>H1</b>	Potentially damaging	5-15	>20	Slight general damage to plants, crops
<b>H2</b>	Significant	10-20	>100	Significant damage to fruit, crops, vegetation
<b>H3</b>	Severe	20-30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
<b>H4</b>	Severe	25-40	>500	Widespread glass damage, vehicle bodywork damage
<b>H5</b>	Destructive	30-50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
<b>H6</b>	Destructive	40-60		Bodywork of grounded aircraft dented; brick walls pitted
<b>H7</b>	Destructive	50-75		Severe roof damage, risk of serious injuries
<b>H8</b>	Destructive	60-90		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
<b>H9</b>	Super Hailstorms	75-100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
<b>H10</b>	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open



## **Impact**

Based on historical records from the NCEI database the largest potential impact of hailstorms in the planning area would cause damage to glass and bodywork on vehicles. There is also a low chance of damage to District buildings.

## **Effect of Climate Change on Hail**

Climate change could cause future hailstorms to be more extensive and at a higher category level. It will be important to monitor the effects of hail in the planning area over the coming years to determine if a larger amount of resources need to be allocated in future plans to help mitigate losses from event.

## **Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

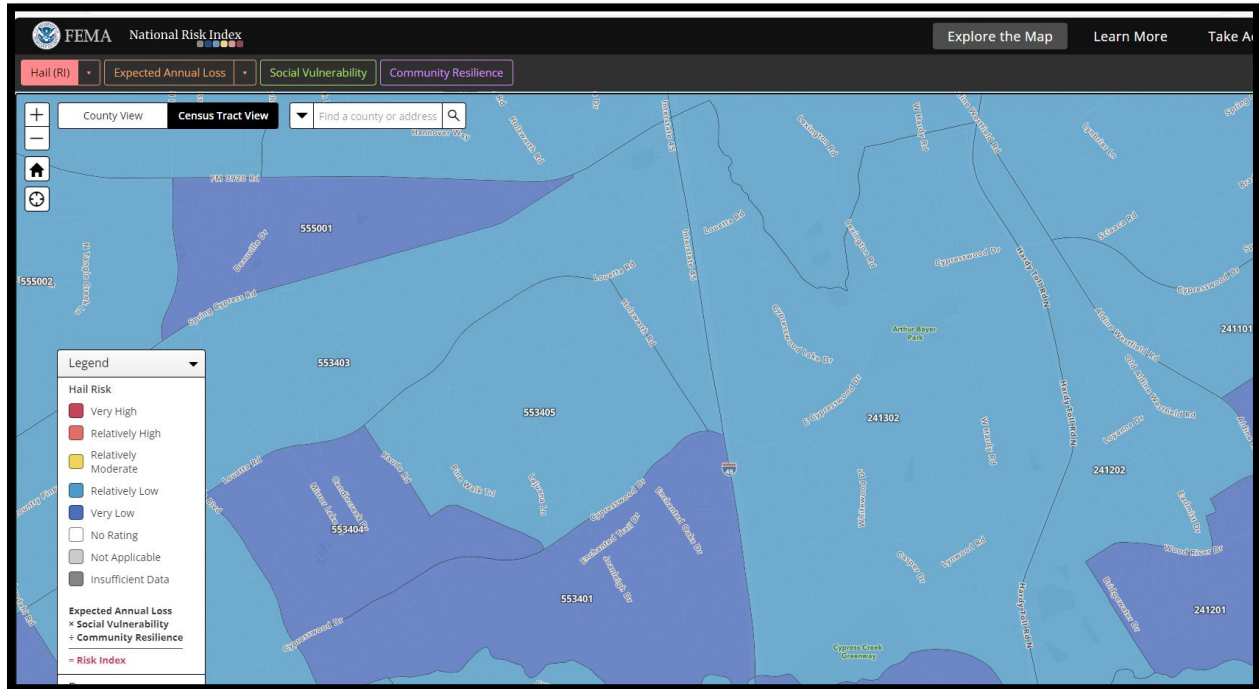
Social vulnerability to hail could likely affect low-income individuals as well as those that rely on farming for their income more than other groups. For low-income individuals this is because they are more prone to not have a home without covered parking or a garage. Hailstorms in this area are more likely to cause bodywork damage to vehicles. Farmers can be heavily affected by hailstorms as they could destroy their crop yields and in turn their income.

## **Overall Vulnerability**

Due to the size of the hail that has occurred previously in the planning area, people are not highly vulnerable to hail events. As stated in the previous sections, most hailstorms in HCWCID110 were only strong enough to cause damage to crops, and minor damage to weak structures.

The National Risk Index shows hail is relatively moderate risk (94.1 national percentile) and relatively moderate (93.2 national percentile) in expected annual loss, see Figure 52. This index estimates a \$1.4 million dollar expected annual loss for Harris County as a whole.

Figure 59 - National Risk Index for Hail for County and Census Tracts



Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48201241302	TX	Relatively Low	53.2	0   100
2	Census tract 48201553405	TX	Relatively Low	53.07	0   100
3	Census tract 48201553401	TX	Very Low	42.99	0   100
4	Census tract 48201553404	TX	Very Low	39.21	0   100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48201241302	TX	\$2,657	Very Low	Very Low	0.84	\$2,243	53.2
2	Census tract 48201553405	TX	\$1,650	Relatively High	Very Low	1.35	\$2,226	53.07
3	Census tract 48201553401	TX	\$1,615	Very Low	Very Low	0.7	\$1,138	42.99
4	Census tract 48201553404	TX	\$1,031	Very Low	Very Low	0.81	\$839	39.21

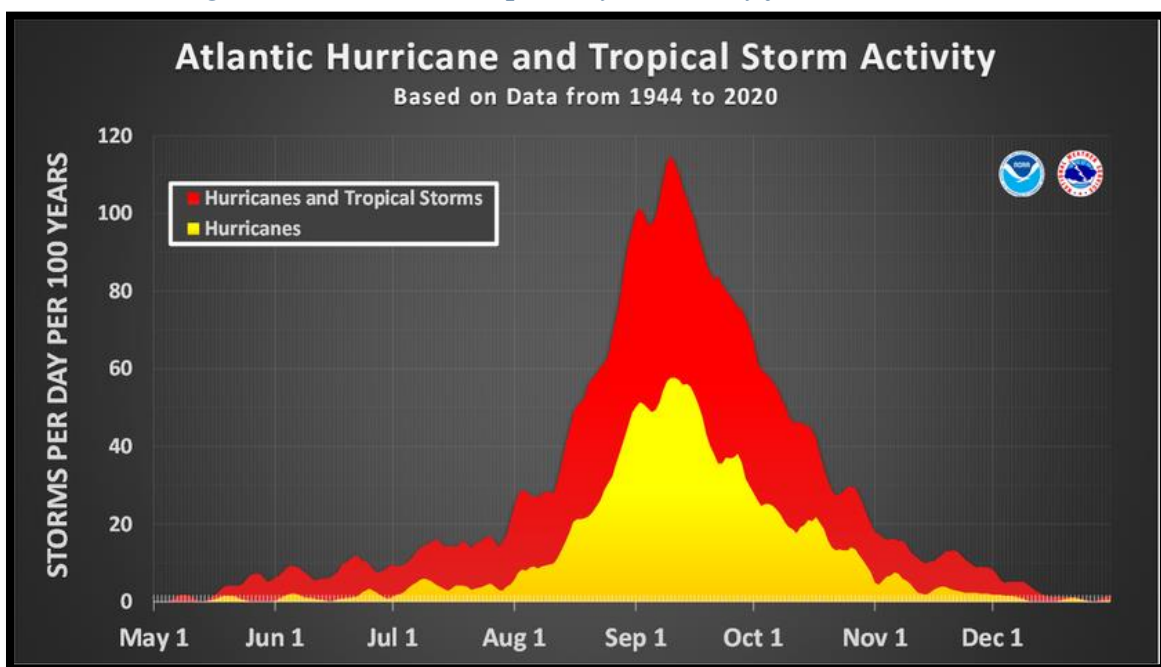
## Hurricanes and Tropical Storms

### Hazard Description

According to the National Hurricane Center, a tropical cyclone is a rotating, organized system of clouds and thunderstorms that originate over tropical or subtropical waters. There are 4 classifications: tropical depression, tropical storm, hurricane, and major hurricane. These will be quantified in the extent section of this assessment.

The Atlantic hurricane season runs from June 1 to November 30. The Atlantic basin includes the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Based on a 30-year climate period from 1991 to 2020, an average Atlantic hurricane season has 14 named storms, 7 hurricanes, and 3 major hurricanes (Category 3, 4, or 5 on the Saffir-Simpson Hurricane Wind Scale). HCWCID110 planning area is most susceptible to hurricane/tropical storms in the months of June to November, with August-October historically having the most activity.

*Figure 60 - Seasonal Tropical Cycle Activity for Atlantic Basin*



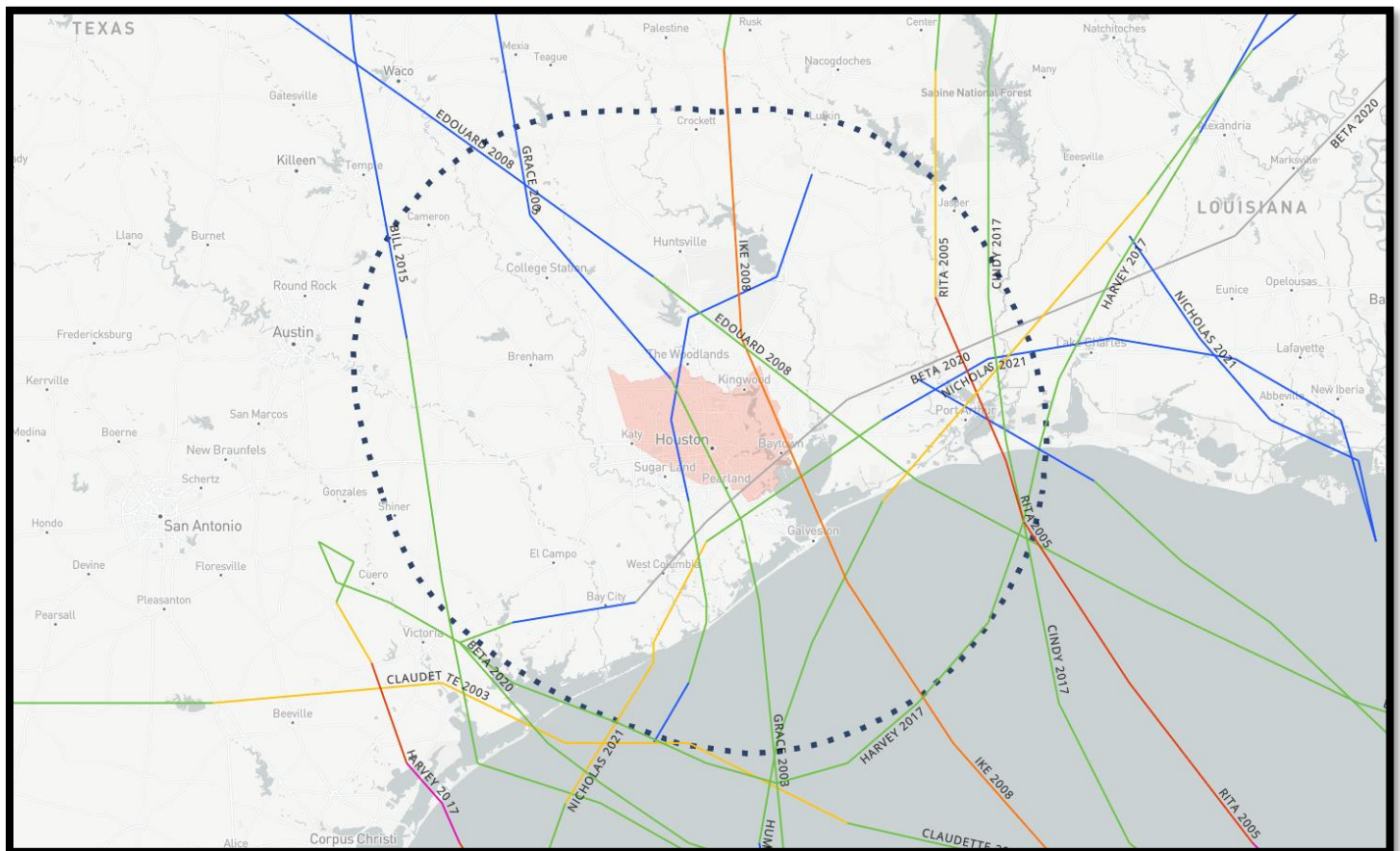
### Location

Due to HCWCID110 and Harris County in total being near the Gulf of Mexico, there is an immediate risk for hurricane/tropical storms in the entire planning area. Since the storms typically affect large areas, HCWCID110 is generally affected in a similar magnitude as Harris County as a whole. Due to most of the national data being based on the county, the forthcoming data will be referring to Harris County entirely.

### Previous Occurrences

According to the NOAA Historical Hurricane Tracks database, from 2003-2023 there have been 13 hurricane/tropical storms within a 75-mile radius of Harris County as shown in Figure 61 below. The search area was set to 75-mile radius as even though the center of the storm does not go over the planning area, the effects of the storm can often still be felt strongly. A perfect example is Hurricane Harvey in 2017. The NOAA Hurricane Tracks show that Harvey was barely in the 75-mile radius, however, that storm caused significant damage to the entire county.

*Figure 61 - Hurricane/Tropical Storm Tracks 2003-2023  
(Source: NOAA Historical Hurricane Tracks)*





Storm Name	Date Range	Max Wind Speed (mph)	Minimum Pressure (mb)	Category Max
Nicolas 2021	9/12/21 to 9/17/21	75	988	H1
Beta 2020	9/17/20 to 9/25/20	63	993	TS
Imelda 2019	9/17/19 to 9/19/19	46	1003	TS
Harvey 2017	8/16/17 to 9/2/17	132	937	H4
Cindy 2017	6/19/17 to 6/24/17	57	991	TS
Bill 2015	6/16/15 to 6/21/15	57	997	TS
Ike 2008	9/1/08 to 9/15/08	144	935	H4
Edouard 2008	8/3/08 to 8/6/08	63	996	TS
Humberto 2007	9/12/07 to 9/14/07	92	985	H1
Rita 2005	9/18/05 to 9/26/05	178	895	H5
Ivan 2004	9/2/04 to 9/24/04	166	910	H5
Grace 2003	8/30/03 to 9/2/03	40	1007	TS
Claudette 2003	7/7/03 to 7/17/03	92	979	H1

It is important to note that the values in the above table are when each storm was at full strength and not necessarily the strength the storm was at point of causing impact to the planning area. Typically, the storm is at its greatest strength over the Gulf of Mexico and may quickly weaken once it reaches land.

### Future Occurrences

Since hurricanes and tropical storms are regional in nature, the events that impacted Harris County are assumed to have impacted HCWCID110 as well. Since there were 13 hurricane/tropical storms recorded by the NOAA Hurricane Track in the last 20 years, it could be expected that a hurricane/tropical storm would occur every 1.54 years on average within a 75-mile radius of Harris County as a whole. Therefore, there is a 65% chance of a hurricane/tropical storm event occurring with 75-miles of the planning area and Harris County in any given year.

**Extent**

Table 27 overviews the Saffir/Simpson Hurricane Scale which is widely used to classify hurricanes by categories 1-5. The entire planning area of HCWCID110 has potential to experience storm effects of all categories.

*Table 27 - Saffir/Simpson Hurricane Scale*

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

*Table 28 - Tropical Cyclone Classifications*

<b>Tropical Depression</b>	<b>Maximum sustained wind speed is &lt;39 mph</b>
<b>Tropical Storm</b>	<b>Maximum sustained wind speed ranges 39 - &lt;74 mph</b>
<b>Hurricane</b>	<b>Maximum sustained surface wind speed 74 mph+</b>

**Impact**

The types of impacts that can be expected from hurricanes include, but are not limited to, downed trees, disabled power lines, roof damage and general building damage. In HCWCID110, most likely impacted buildings and services include the wastewater treatment plant, lift stations, water tower, administrative offices, parks, and trash services. Hurricanes can also cause flooding due to the large amount of rainfall in addition to storm surge that may occur along Cypress Creek location causing issues for residents and community and district buildings located around the area as well as street flooding.

**Effect of Climate Change on Hurricane and Tropical Storm**

There is significant concern that climate change may cause more frequent and powerful hurricanes. This is partly because hurricanes thrive on higher gulf temperatures. If the climate trends to being warmer in the future, there would likely be longer hurricane seasons, and more total hurricanes, and potentially stronger hurricanes.

**Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

Vulnerable populations include, elderly, low income, people with health issues, the homeless, and residents that may struggle to evacuate. They may require extra time to evacuate or need assistance to evacuate and are more likely to seek or need medical attention or do not have the means and

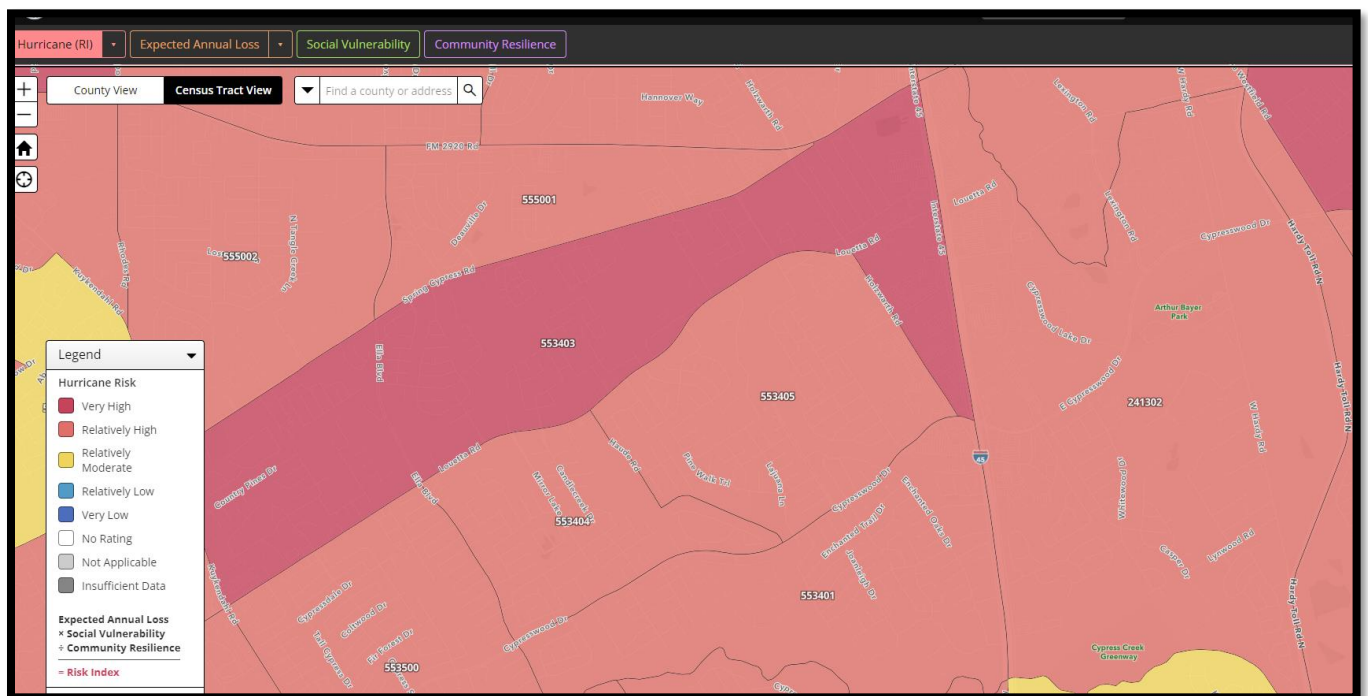
transportation support to evacuate. In addition, some of these groups are statistically more likely to have a home like a mobile home that are less reinforced to handle the effects of a hurricane.

### Overall Vulnerability





Hurricanes in the planning area can be devastating, causing destruction of buildings and potential injury or death to individuals. The entire planning area is equally at risk for hurricanes.

The National Risk Index shows hurricanes are very high risk (100.0 national percentile) and very high (100.0 national percentile) in expected annual loss. This index estimates a \$1.2 billion dollar expected annual loss for Harris County as a whole.

*Figure 62 - National Risk Index for Hurricanes for County and Census Tracts*



**Figure 62 (cont.) - National Risk Index for Hurricanes for County and Census Tracts**

Hurricane					
Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	<a href="#">Census tract 48201241302</a>	TX	Relatively High	94.51	0  100
2	<a href="#">Census tract 48201553405</a>	TX	Relatively High	94.11	0  100
3	<a href="#">Census tract 48201553401</a>	TX	Relatively High	88.53	0  100
4	<a href="#">Census tract 48201553404</a>	TX	Relatively High	85.99	0  100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	<a href="#">Census tract 48201241302</a>	TX	\$2,301,051	Very Low	Very Low	0.84	\$1,942,580	94.51
2	<a href="#">Census tract 48201553405</a>	TX	\$1,372,625	Relatively High	Very Low	1.35	\$1,851,678	94.11
3	<a href="#">Census tract 48201553401</a>	TX	\$1,382,954	Very Low	Very Low	0.7	\$974,770	88.53
4	<a href="#">Census tract 48201553404</a>	TX	\$871,663	Very Low	Very Low	0.81	\$709,111	85.99



# Lightning

## Hazard Description

Lightning is a massive electrical spark that occurs in the atmosphere, connecting clouds, the air, or the ground. In its initial stages of development, the air acts as an insulator, keeping the positive and negative charges in the clouds and between the clouds and the ground separate. However, as the opposite charges accumulate and intensify, the insulating capacity of the air breaks down, leading to a rapid discharge of electricity known as lightning. This lightning flash temporarily equalizes the charged regions in the atmosphere until the opposite charges begin to accumulate once more, setting the stage for potential future lightning strikes.

Energy from a lightning channel can heat the air up to 50,000 degrees Fahrenheit. Thunder is the sound heard from a lightning strike and can be heard up to 25 miles away according to the NOAA National Severe Storms Laboratory. Light travels faster than sound, so the distance of the lightning from a location can be estimated by counting the time delay between the lightning strike and when the sound is heard and then dividing by 5. This will provide the distance (in miles) that the lightning is estimated.

## Location

Lightning can strike any location in HCWCID110 so it can be assumed that the entire District is exposed at the same risk as any other.

## Previous Occurrences

According to the NCEI database, since July 2003 there have been 59 reported lightning events in Harris County. This totals 10 deaths, 26 injured, and over \$1.1 million in property damage. However, since lightning occurs every year, it can be assumed that those 59 reported events are just those events that were significant (either caused property damage, deaths, or injury). Table 29 below shows the cases of reported lightning events in the NCEI database for Spring, Texas alone. The table shows that there has been one reported death from lightning in Spring in the last 20 years.

*Table 29 - NCEI Data for Spring Texas Lightning – 7/1/2003 to 7/31/2023*

EVENT_ID	CZ_NAME_STR	BEGIN_LOCATION	BEGIN_DATE	EVENT_TYPE	DEATHS_DIRECT	INJURIES_DIRECT	RTY_NUM	DAMAGE_PROPE	DAMAGE_CR	OPS_NUM
863859	HARRIS CO.	SPRING	6/27/2019	Lightning	1	0	0	0	0	0

## Future Occurrences

Using the NCEI data in the previous section the probability of a reported lightning event in Harris County is about 2.95 events per year and about 0.05 events per year in Spring or 5% chance.

## Extent

The NOAA measures the number of lightning strikes in an interval of time which is quantified in a scale called the Lightning Activity Levels (LALs). Table 30 below further describes this scale.

*Table 30 - LAL Scale (NOAA)*

<b>LAL</b>	<b>Cloud &amp; Storm Development</b>	<b>Lightning Strikes/15 min</b>
1	No thunderstorms.	-
2	Cumulus clouds are common but only a few reach the towering cumulus stage. A single thunderstorm must be confirmed in the observation area. The clouds produce mainly virga, but light rain will occasionally reach the ground. Lightning is very infrequent.	1-8
3	Towering cumulus covers less than two-tenths of the sky. Thunderstorms are few, but two to three must occur within the observation area. Light to moderate rain will reach the ground, and lightning is infrequent.	9-15
4	Towering cumulus covers two to three-tenths of the sky. Thunderstorms are scattered and more than three must occur within the observation area. Moderate rain is common, and lightning is frequent.	16-25
5	Towering cumulus and thunderstorms are numerous. They cover more than three-tenths and occasionally obscure the sky. Rain is moderate to heavy, and lightning is frequent and intense.	>25
6	Similar to LAL 3 except thunderstorms are dry.	

**Impact**

As described in the previous occurrences section, lightning events can cause injury, death, and property damage. The risk is still relatively low as there were only 10 reported deaths by the NCEI database for all of Harris County over the last 20 years.

**Effect of Climate Change on Lightning**

Climate change may cause more severe storms which as a result could cause more frequent lightning strikes and thus a higher LAL.

**Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

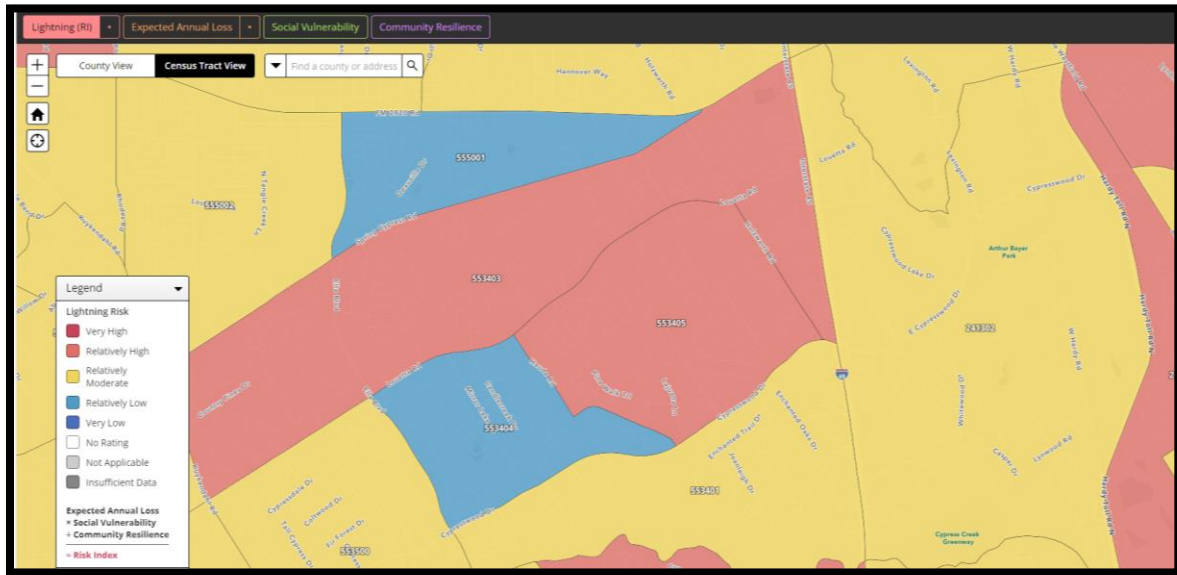
Lightning poses the risk of power outages, which can be life-threatening for individuals dependent on electricity for life support. Generally, those without adequate shelter during a lightning storm and those relying on continuous power sources for survival are the most vulnerable populations.

## Overall Vulnerability

For the planning area, District buildings and the water tower are the largest vulnerability from lightning events. However, there are not many prevention or warning measures for lightning. In most cases, all that can be done is using weather forecasting to alert District staff of possible lightning in the area.

The National Risk Index shows lightning is very high risk (100.0 national percentile) and very high (99.9 national percentile) in expected annual loss. This index estimates a \$10 million dollar expected annual loss for Harris County as a whole.

**Figure 63 - National Risk Index for Lightning for County and Census Tracts**



Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48201553405	TX	Relatively High	76.9	0   100
2	Census tract 48201241302	TX	Relatively Moderate	71.48	0   100
3	Census tract 48201553401	TX	Relatively Moderate	52.68	0   100
4	Census tract 48201553404	TX	Relatively Low	45.55	0   100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48201553405	TX	\$11,437	Relatively High	Very Low	1.35	\$15,429	76.9
2	Census tract 48201241302	TX	\$14,926	Very Low	Very Low	0.84	\$12,601	71.48
3	Census tract 48201553401	TX	\$9,445	Very Low	Very Low	0.7	\$6,657	52.68
4	Census tract 48201553404	TX	\$6,330	Very Low	Very Low	0.81	\$5,150	45.55

## Severe Thunderstorms – High Wind

### Hazard Description

The NOAA National Severe Storms Laboratory (NSSL) describes a severe thunderstorm as any event that contains one or more of the following: hail one inch or greater, winds gusting more than 50 knots (57.5 mph), or a tornado.

Most thunderstorms occur in the spring and summer months and typically in the afternoon or evening hours. However, they can happen at any time of year and any time of day. The NOAA NSSL lists Texas as any area with some of the highest risk of severe thunderstorms.

### Location

Severe thunderstorms can happen over the entire planning area at the same rate.

### Previous Occurrences

The NCEI Storm Event Database has reported 252 events of thunderstorm and high wind in the last 20 years in Harris County as a whole. There is no reporting from the NCEI regarding HCWCID110 individually but for Spring there are reported 11 events in the last 20 years as shown in Table 31.

**Table 31 - Thunderstorm Wind Events 7/1/2003 to 7/31/2023**

EVENT_ID	CZ_NAME	STR	ATION	BEGIN_DATE	EVENT_TYPE	DE	DEATHS_DIRECT	INJURIES_DIRECT	DAMAGE_PROPERTY_NUM
5404779	HARRIS CO.		SPRING	5/1/2004	Thunderstorm Wind	52	0	0	0
5403460	HARRIS CO.		SPRING	5/11/2004	Thunderstorm Wind	50	0	0	\$15,000.00
5418601	HARRIS CO.		SPRING	8/28/2004	Thunderstorm Wind	52	0	0	\$25,000.00
5502154	HARRIS CO.		SPRING	4/21/2006	Thunderstorm Wind	60	0	0	\$5,000.00
27552	HARRIS CO.		SPRING	4/25/2007	Thunderstorm Wind	50	0	0	\$2,000.00
60171	HARRIS CO.		SPRING	9/4/2007	Thunderstorm Wind	52	0	0	\$5,000.00
475657	HARRIS CO.		SPRING	10/27/2013	Thunderstorm Wind	52	0	0	\$2,000.00
630551	HARRIS CO.		SPRING	4/27/2016	Thunderstorm Wind	55	0	0	0
675036	HARRIS CO.		SPRING	1/2/2017	Thunderstorm Wind	52	0	0	0
830410	HARRIS CO.		SPRING	5/3/2019	Thunderstorm Wind	52	0	0	0
857872	HARRIS CO.		SPRING	10/29/2019	Thunderstorm Wind	52	0	0	0
					Total		0	0	\$54,000.00

The NCEI did not capture the June 2023 storm that caused significant damage throughout the District with approximately \$100,000 in damage from downed trees, fences, debris, power loss for multiple days, impacted services like trash collection.

### Future Occurrences

Since there is no data for HCWCID110 individually, the best estimate for future occurrence would be to use Spring, Texas data. Since Spring has had 12 events in the last 20 years that means the chance of another thunderstorm and high wind event would be 55% chance per year or one every 1.8 years.

### Extent

The NOAA uses the Beaufort Wind Scale (Table 32) to quantify the wind effects that may occur during a severe thunderstorm event. According to the scale HCWCID110 could expect to have events from 0 up to 12 on this scale.



**Table 32 - 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"
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**

Most events that were reported in Spring, Texas mostly caused damage to vegetation and trees. At the upper level of the winds that the planning area has seen there may be some damage to structures and it may cause downed trees. There may also be damage to powerlines which may cause power outages in the area.

## **Effect of Climate Change on Severe Thunderstorms and High Wind**

Climate change may cause more severe thunderstorms due to possible changes in moisture in the air as well as higher than average temperatures in the air. A key component of what causes severe thunderstorms is convective available potential energy (CAPE). Scientists have found that global warming could increase CAPE because of warming of the surface and increased moisture in the air through evaporation.

## **Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

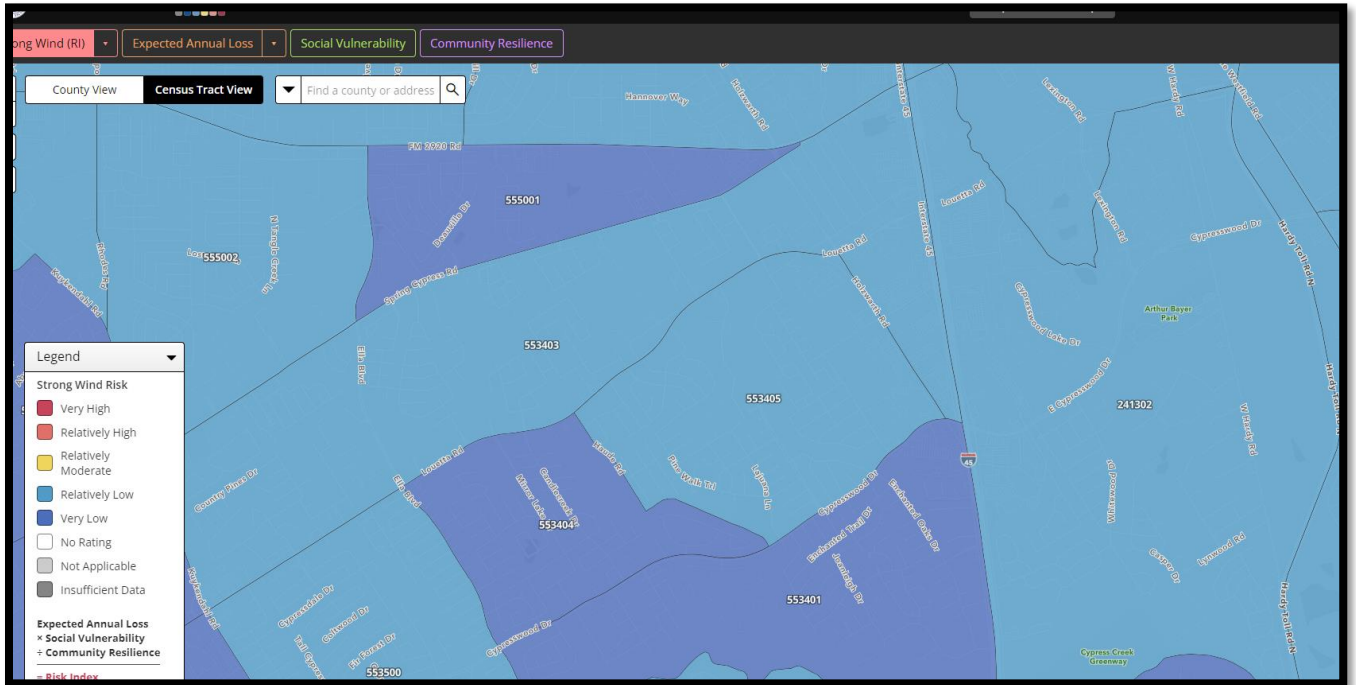
Severe thunderstorms pose the risk of power outages, which can be life-threatening for individuals dependent on electricity for life support. Generally, those without adequate shelter during a severe thunderstorm and those relying on continuous power sources for survival are the most vulnerable populations.

## **Overall Vulnerability**

Like lightning events, for HCWCID110, District buildings and the water tower have the largest vulnerability from severe thunderstorm events. However, there are not many prevention or warning measures for severe thunderstorms. In most cases, all that can be done is using weather forecasting to alert District staff of possible thunderstorms in the area.

The National Risk Index shows severe thunderstorms and high wind are relatively high risk (95.6 national percentile) and relatively high (94.3 national percentile) in expected annual loss. This index estimates a \$2.3 million dollar expected annual loss for Harris County as a whole.

**Figure 64 - National Risk Index for Thunderstorms/High Winds for County/Census Tracts**



**Strong Wind**

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48201553405	TX	Relatively Low	31.45	0   [Progress Bar]   100
2	Census tract 48201241302	TX	Relatively Low	29.85	0   [Progress Bar]   100
3	Census tract 48201553401	TX	Very Low	22.92	0   [Progress Bar]   100
4	Census tract 48201553404	TX	Very Low	21.05	0   [Progress Bar]   100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48201553405	TX	\$2,645	Relatively High	Very Low	1.35	\$3,569	31.45
2	Census tract 48201241302	TX	\$3,743	Very Low	Very Low	0.84	\$3,160	29.85
3	Census tract 48201553401	TX	\$2,363	Very Low	Very Low	0.7	\$1,666	22.92
4	Census tract 48201553404	TX	\$1,577	Very Low	Very Low	0.81	\$1,283	21.05

## **Subsidence**

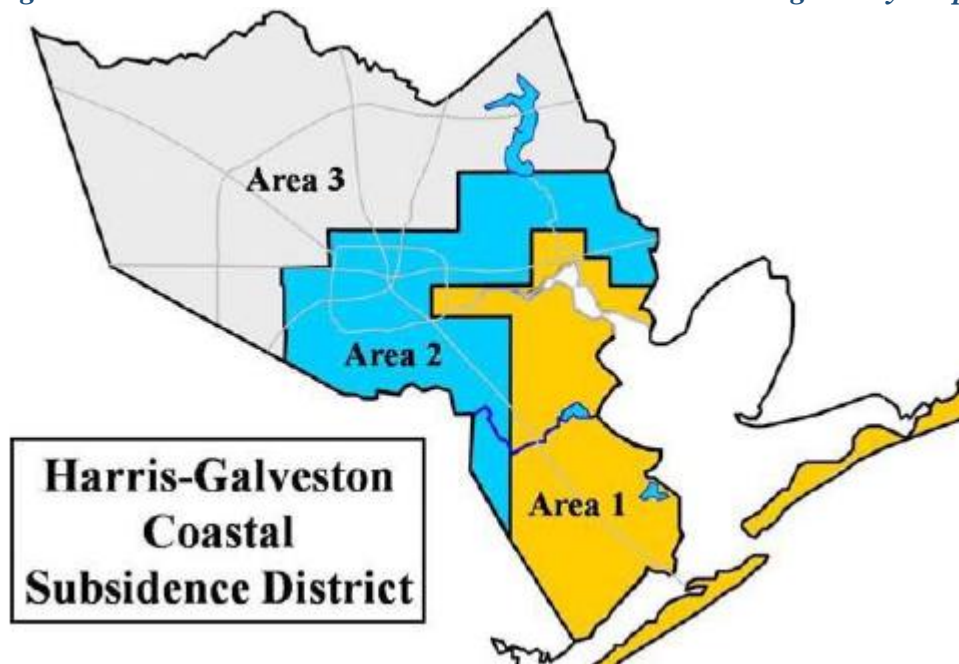
### **Hazard Description**

According to the U.S. Geological Survey, subsidence occurs when large amounts of groundwater has been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts and ultimately falls in on itself. Subsidence occurs over large areas rather than a small spot like in a sinkhole. Some land subsidence is natural over long amounts of time; however, the main cause of subsidence is from actions like mining and removal of groundwater from humans.

### **Location**

The Harris-Galveston Coastal Subsidence District (HGCSA) created the 1999 Regulatory Plan. According to their website (<https://hgsubsidence.org/>), this plan was developed with the goal to reduce groundwater withdrawal to a level that no longer contributes to further subsidence with HCWCID110. They say the research shows that no more than 20% of total water demand can be sourced from groundwater. Figure 65 shows the three areas that were in this regulatory plan. HCWCID110 is in Area 3. The groundwater withdrawal reduction plan has lowered the subsidence risk to negligible in Area 3.

*Figure 65 - Harris-Galveston Coastal Subsidence District Regulatory Map*



### **Previous Occurrences**

Harris County was historically at risk for subsidence due to dependence on groundwater pumping. However, due to the HGCSA Regulatory Plan in 1999, over the last 20 years the dependence on groundwater has dramatically decreased. Subsidence typically happens slowly over time so there are generally not historical events. Figure 66 is the HGCSA data for annual subsidence rates in





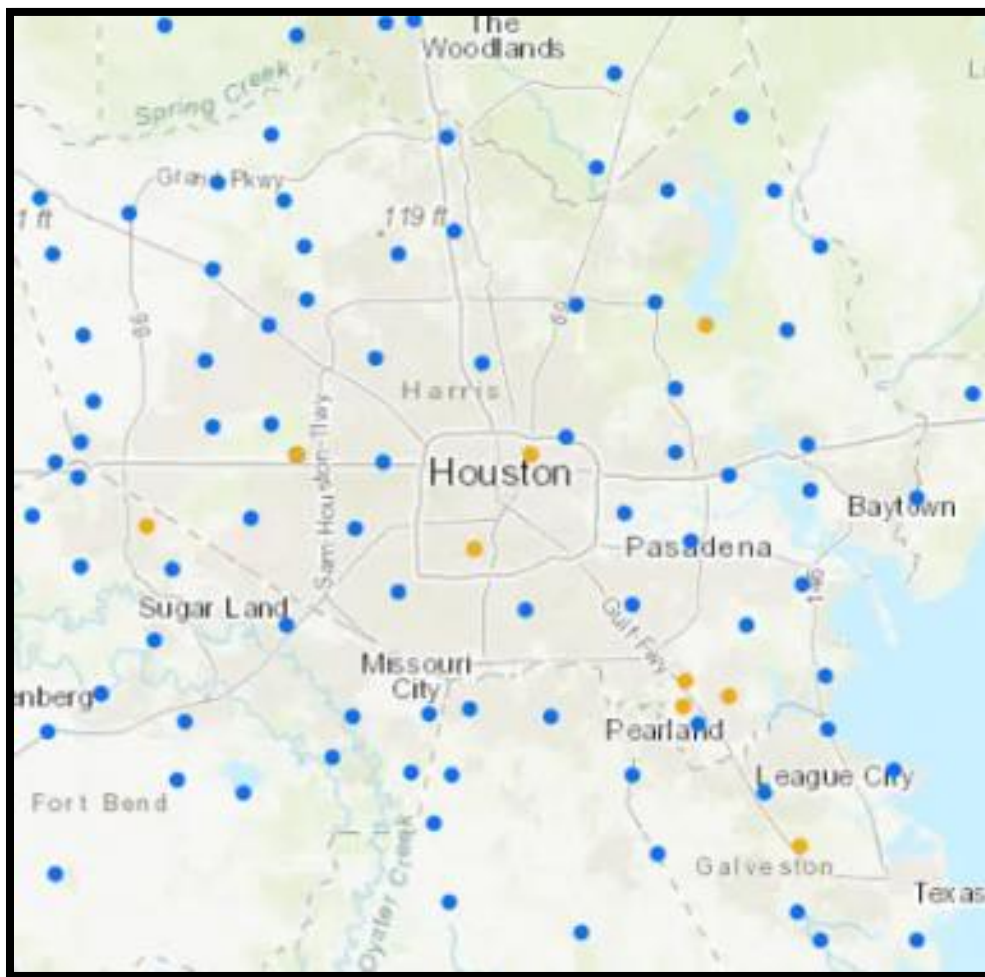
a concerted effort to lessen the need for groundwater pumping in the area and that will continue to reduce the chance of subsidence over time.

**Extent**

According to the United States Geological Survey, elevation or elevation change measurements are used to calculate subsidence rates. There are multiple measurement tools including using interferometric synthetic aperture radar (InSAR), continuous GPS (CGPS) measurements, campaign global positioning system (GPS) surveying, and spirit-leveling surveying.

The HCGCSD uses 95 permanent global positioning system (GPS) monitoring stations to gather subsidence measurements in the area.

*Figure 67 - Continuous GPS Monitoring Stations*



**Impact**

The potential impact of subsidence in the plan area if it were to occur in the future would be damage to district buildings, wells, and underground pipes (including water, wastewater, storm water, and sewage underground pipes and lines).

### **Effect of Climate Change on Subsidence**

Climate change could potentially increase the natural occurrence of subsidence in the plan area. This is due to the potential warmer, drier summers possibly causing soil drying and compaction. This in turn could contribute to natural subsidence to occur. However, due to regulatory actions described in the previous sections by the HCGCSD, there would not be an expected difference in “man-made” subsidence due to the limits on groundwater extraction.

### **Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

In HCWCID110 there is likely no increase in susceptibility of social groups to subsidence. This is in large part due to lack of risk of subsidence to the planning area overall. If there was future damage from subsidence, there would be an equal chance of occurrence over all people and parts of HCWCID110.

### **Overall Vulnerability**

As stated in the previous sections, the vulnerability to subsidence in HCWCID110 is low to none. The area’s proactive approach to limiting subsidence since the 1999 HGCSD Regulatory Plan has made an extremely positive impact. If these regulations continue, future vulnerability will likely continue to be negligible.

# Tornadoes

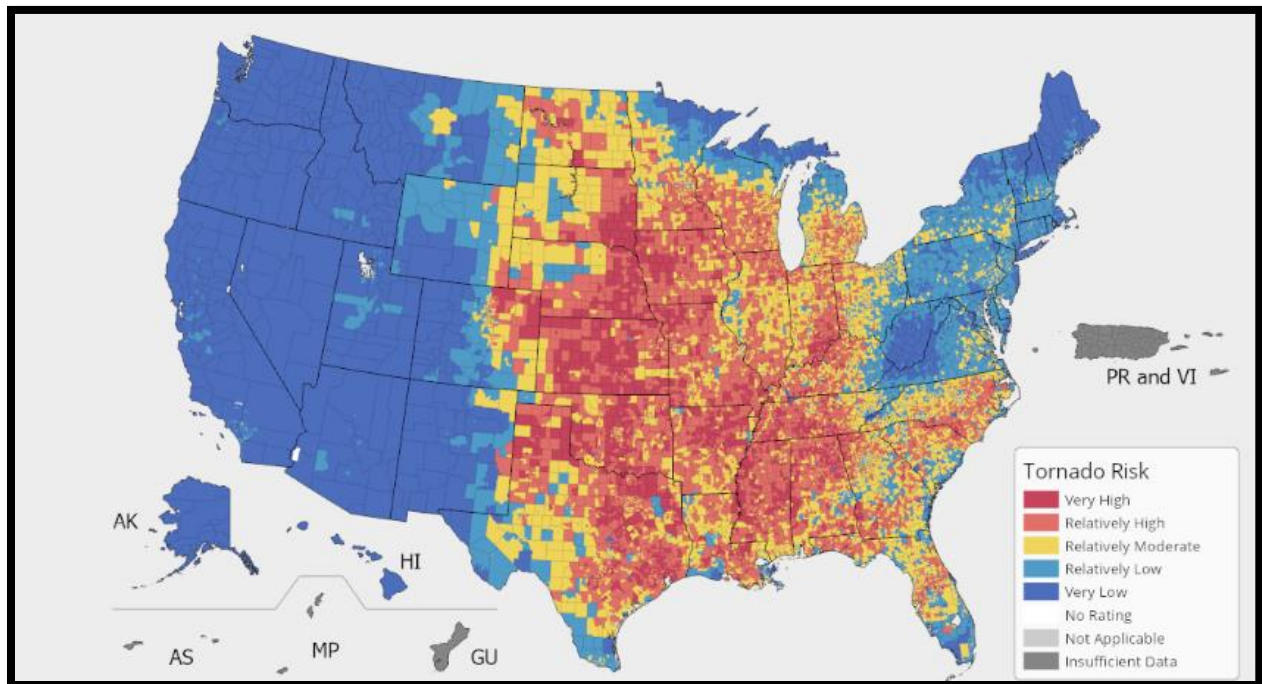
## Hazard Description

According to the NOAA, a tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground. Because wind is invisible, it is hard to see a tornado unless it forms a condensation funnel made up of water droplets, dust, and debris. The National Weather Service says that the greatest tornado activity occurs in Spring and Summer between March to August. However, tornadoes can happen at any time of year.

## Location

Tornados can happen anywhere at any time; however, Texas is known as one of the tornado capitals of the Country. As previously stated, the late Spring and early Summer have the highest density of tornado activity according to the NOAA National Severe Storms Laboratory. In addition, the most likely time for a tornado is between 4-9 p.m. According to Figure 68 below from FEMA, it shows much of Southeast Texas including Harris County in the “Very High” risk of tornados.

*Figure 68 - FEMA’s National Risk Index for Tornados*



## Previous Occurrences

According to the NOAA NCEI database there have been 61 reported tornado events in Harris County between 7/1/2003 and 7/31/2023. The reported damage includes, 1 death, 12 injuries, and \$24.9 million dollars in property damage. When looking at just Spring, Texas, the NCEI database shows no reported cases of tornadoes that caused damage.



### Future Occurrences

Even though there have been no reported cases of tornados causing damage in Spring, Texas which includes the planning area, in the last 20 years that does not mean that will likely continue. This is because there have been 61 reported events in Harris County and any one of those events could have affected the planning area. Based on those numbers, there is about 3.05 tornado events per year expected in Harris County.

### Extent

Tornado damage severity is assessed using the Enhanced Fujita Tornado Scale (EF-Scale). This scale assigns numerical values to tornadoes based on their wind speed and categorizes them from zero to five, representing increasing levels of damage. Tornadoes typically form within larger vortex formations and are commonly associated with convective cells like thunderstorms or can occur in the right forward quadrant of a hurricane or tropical storm, far from the hurricane's eye. Table 33 provides details about the categories in the Enhanced Fujita Tornado Scale. For the planning area of HCWCID110, it is important to be prepared for the possibility of experiencing tornadoes ranging from EF0 to EF5, each with varying degrees of damage potential. However, according to the data collected from the NCEI database over the last 20 years, most tornadoes have been EF0 which have winds of 65-85 mph.

*Table 33 - Enhanced Fujita (EF) scale*

Enhanced Fujita Category	Wind Speed (mph)	Potential Damage
<b>EF0</b>	65-85	<b>Light damage.</b> Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
<b>EF1</b>	86-110	<b>Moderate damage.</b> Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
<b>EF2</b>	111-135	<b>Considerable damage.</b> 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.
<b>EF3</b>	136-165	<b>Severe damage.</b> 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.
<b>EF4</b>	166-200	<b>Devastating damage.</b> Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
<b>EF5</b>	>200	<b>Incredible damage.</b> 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**

Tornado events can cause a devastating impact to the planning area. Most historical tornadoes in HCWCID110 have been EF0 according to the NCEI database. EF0 tornadoes cause impacts such as peeling surface off some roofs, some damage to gutters or siding, branches being broken off trees, and shallow-rooted trees being pushed over.

## **Effect of Climate Change on Tornadoes**

Climate change could have a similar impact on tornadoes as was documented in this plan for severe thunderstorms. This is because tornadoes occur during a thunderstorm when there is an updraft of warm air causing a vortex in the center of the storm. This vortex swells with water vapor, which creates a funnel cloud that spirals, thus starting a tornado. Therefore, if climate change may cause a higher likelihood of a severe thunderstorm, there may also be a higher likelihood of tornadoes in the planning area.

## **Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

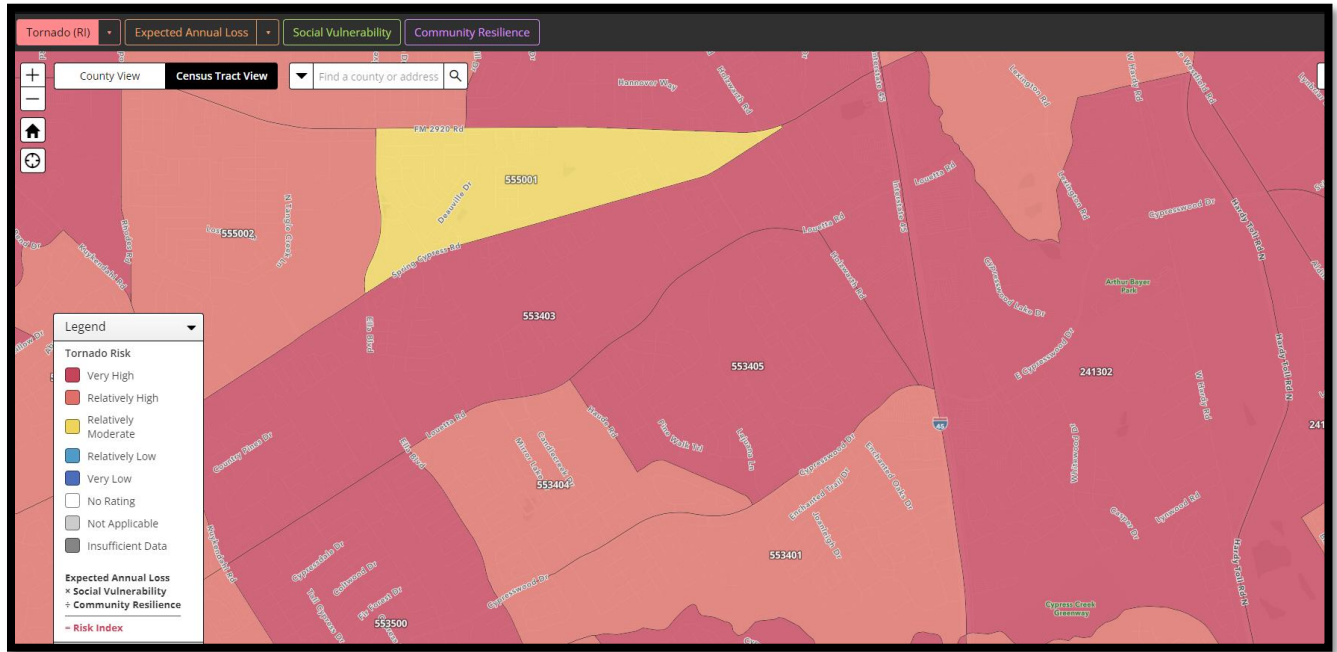
Tornadoes pose the risk of power outages, which can be life-threatening for individuals dependent on electricity for life support. Populations that live in mobile homes are also more at risk due to the home being less prepared for dealing with the effects of a tornado. Low-income households may also be at further risk if they are less likely to be able to afford wind insurance.

## **Overall Vulnerability**

All assets in HCWCID110 are potentially vulnerable to damage from tornadoes. To help prevent against injury or death from tornadoes, it is important for officials to have early warning capabilities from services such as the National Weather Service (NWS). These officials then need to have the ability to broadcast the warning to anyone that is in their jurisdiction.

The National Risk Index shows tornadoes are very high (100.0 national percentile) and very high (100.0 national percentile) in expected annual loss. This index estimates a \$354 million dollar expected annual loss for Harris County as a whole.

Figure 69 - National Risk Index for Tornadoes for County and Census Tracts



Tornado

Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48201553405	TX	Very High	96.8	0   ██████████   100
2	Census tract 48201241302	TX	Very High	94.49	0   ██████████   100
3	Census tract 48201553401	TX	Relatively High	81.91	0   ██████████   100
4	Census tract 48201553404	TX	Relatively High	75.99	0   ██████████   100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48201553405	TX	\$428,645	Relatively High	Very Low	1.35	\$578,245	96.8
2	Census tract 48201241302	TX	\$560,109	Very Low	Very Low	0.84	\$472,852	94.49
3	Census tract 48201553401	TX	\$362,618	Very Low	Very Low	0.7	\$255,590	81.91
4	Census tract 48201553404	TX	\$248,539	Very Low	Very Low	0.81	\$202,190	75.99

# Wildfires

## Hazard Description

Wildfires are uncontrolled fires that frequently occur in wildland areas, and if left unchecked, they can engulf houses or agricultural resources. The interface between wildlands and human development, known as the wildfires/urban interface, is a critical zone where structures and human-made developments blend with undeveloped wilderness.

These fires often start unnoticed, but once ignited, they spread rapidly, fueled by dry vegetation and strong winds. Dense smoke from the wildfires can cover vast areas, sometimes stretching for miles around, serving as a signal of their presence. Wildfires can be initiated by human activities, such as arson or poorly managed campfires, or they can be triggered naturally, like when lightning strikes.

According to the Northwest Fire Science Consortium, there are three types of wildfires:

1. Ground fire – these burn mostly in decayed roots below the ground. These often can go undetected for a long time because there is little smoke and do not spread quickly.
2. Surface fire – these burn mostly moss, vegetation, shrubs, small trees, and loose needles on the surface of the ground. They can consume the forest canopy and are the most common type of wildfire.
3. Crown fire – these are typically ignited by a surface fire and can get into the canopy of trees. These often spread rapidly with the aid of wind.

## Location

Wildfires can be most dangerous in the Wildland Urban Interface (WUI). As described in the hazard description section, the WUI is described as a transition zone between the land that is developed by humans and the undeveloped land or wilderness. As more population growth occurs in the WUI there is more risk for damage from wildfire.

## Previous Occurrences

Neither the NCEI nor the National Climatic Data Center (NCDC) show any history of wildfire within all of Harris County since 1950.

## Future Occurrences

Given that there is no record of wildfires in Harris County or the planning area, the future probability is negligible but possible.

## Extent

The Fire Intensity Scale (FIS) is used by the Texas Wildfire Risk Assessment Portal (TxWRAP). 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. The FIS categorizes fire intensity on a scale of Class 1 to 5. Figure 70 below details each of the categories.



*Figure 70 - Fire Intensity Scale (FIS)*

<b>Class 1 Very Low</b>	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.
<b>Class 2 Low</b>	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.
<b>Class 3 Moderate</b>	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.
<b>Class 4 High</b>	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.
<b>Class 5 Very High</b>	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 HCWCID110, the FIS is Class 1 or 2 (very low to low). This is shown in Figure 71. This data was collected from the Texas Wildfire Risk Explorer.

*Figure 71 - HCWCID110 FIS*



## Impact

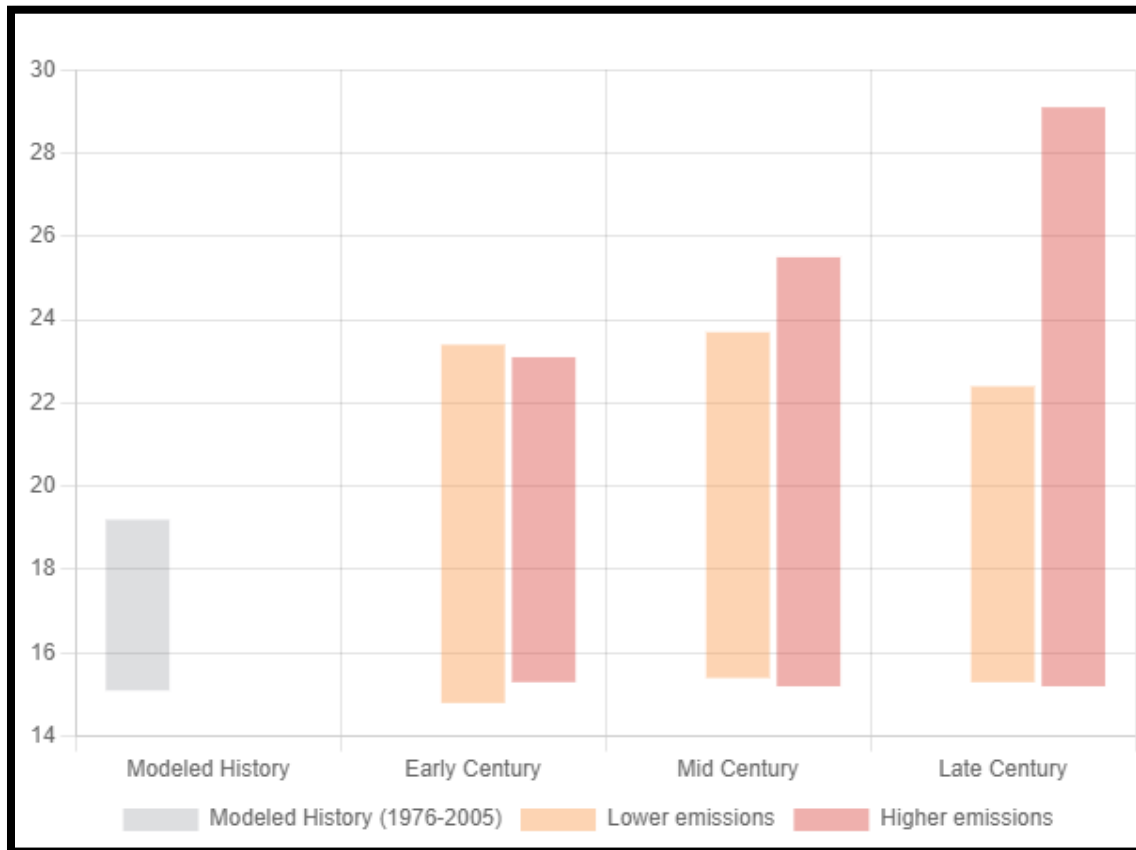
The potential impact of wildfire in the planning area includes damage to district buildings and wastewater treatment facilities.

### Effect of Climate Change on Wildfire

Climate change could play a role in the likelihood of wildfires and their intensity. However, the United States Geological Survey finds that there is not a direct relationship with wildfire and climate change. However, their researchers did find a correlation between years with wildfires and years with warmer temperatures in the summer. This leads to a conclusion that indirectly a warmer climate may lead to more wildfires.

According to the Climate Mapping for Resilience and Adaption (CMRA) tool there is an estimated increase in number of consecutive dry days on average over the rest of the century in Harris County if fossil fuel emissions continue at current levels (characterized as higher emissions). However, estimations show a more similar level of consecutive dry days if society “lowers emissions” which is characterized by drastically reducing use of fossil fuels and reducing global emissions of heat trapping gases to zero by 2040. Figure 72 below shows the comparison of the estimated maximum dry days over time based on these lower or higher emissions. Having consecutive dry days is often a condition for a wildfire starting.

*Figure 72 - Estimated Number of Consecutive Dry Days for Remainder of 21st Century*



## Social Vulnerability

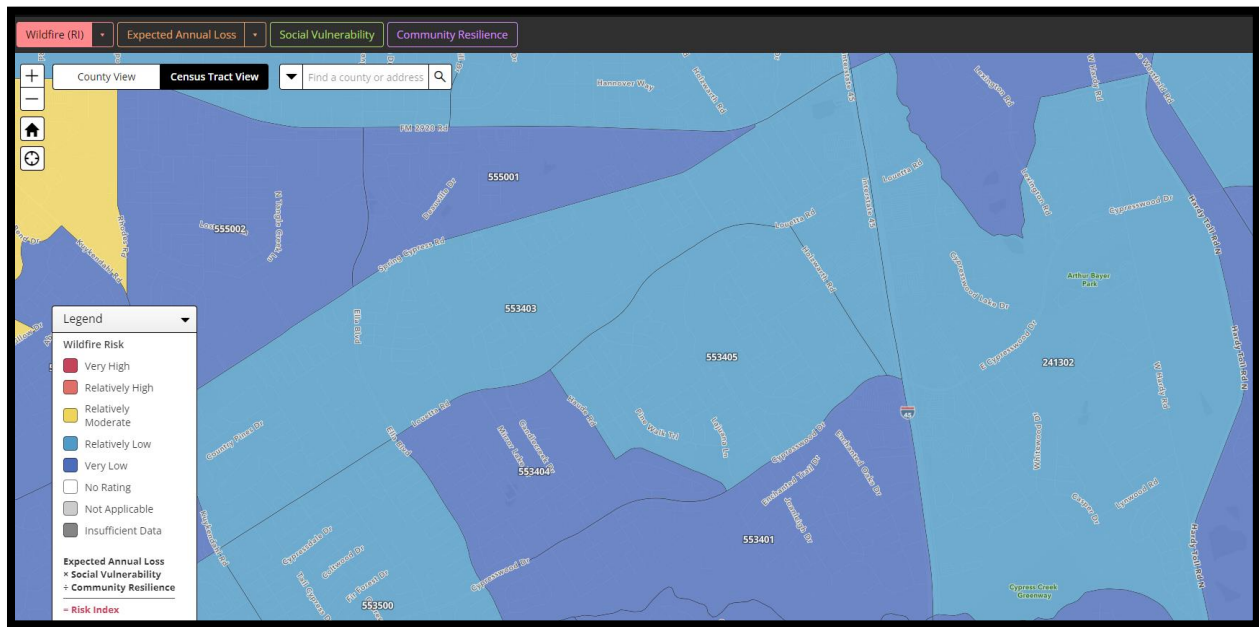
Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

Wildfire effects are most pronounced in groups such as the elderly, children, and those with health concerns such as with their respiratory system. This is largely due to the air pollution from the smoke of wildfire.





## Overall Vulnerability

The National Risk Index shows wildfires are relatively moderate risk (87.9 national percentile) and relatively moderate (87.9 national percentile) in expected annual loss (Figure 73). This index estimates a 1.1 million dollar expected annual loss for Harris County as a whole.

*Figure 73 - National Risk Index for Wildfires for County and Census Tracts*



**Figure 73 (cont.) - National Risk Index for Wildfires for County and Census Tracts**

Wildfire					
Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48201553405	TX	Relatively Low	53.64	0  100
2	Census tract 48201241302	TX	Relatively Low	52.01	0  100
3	Census tract 48201553401	TX	Very Low	49.69	0  100
4	Census tract 48201553404	TX	Very Low	30.27	0  100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48201553405	TX	\$336	Relatively High	Very Low	1.35	\$454	53.64
2	Census tract 48201241302	TX	\$476	Very Low	Very Low	0.84	\$402	52.01
3	Census tract 48201553401	TX	\$476	Very Low	Very Low	0.7	\$335	49.69
4	Census tract 48201553404	TX	\$53	Very Low	Very Low	0.81	\$43	30.27



## Winter Storms

### Hazard Description

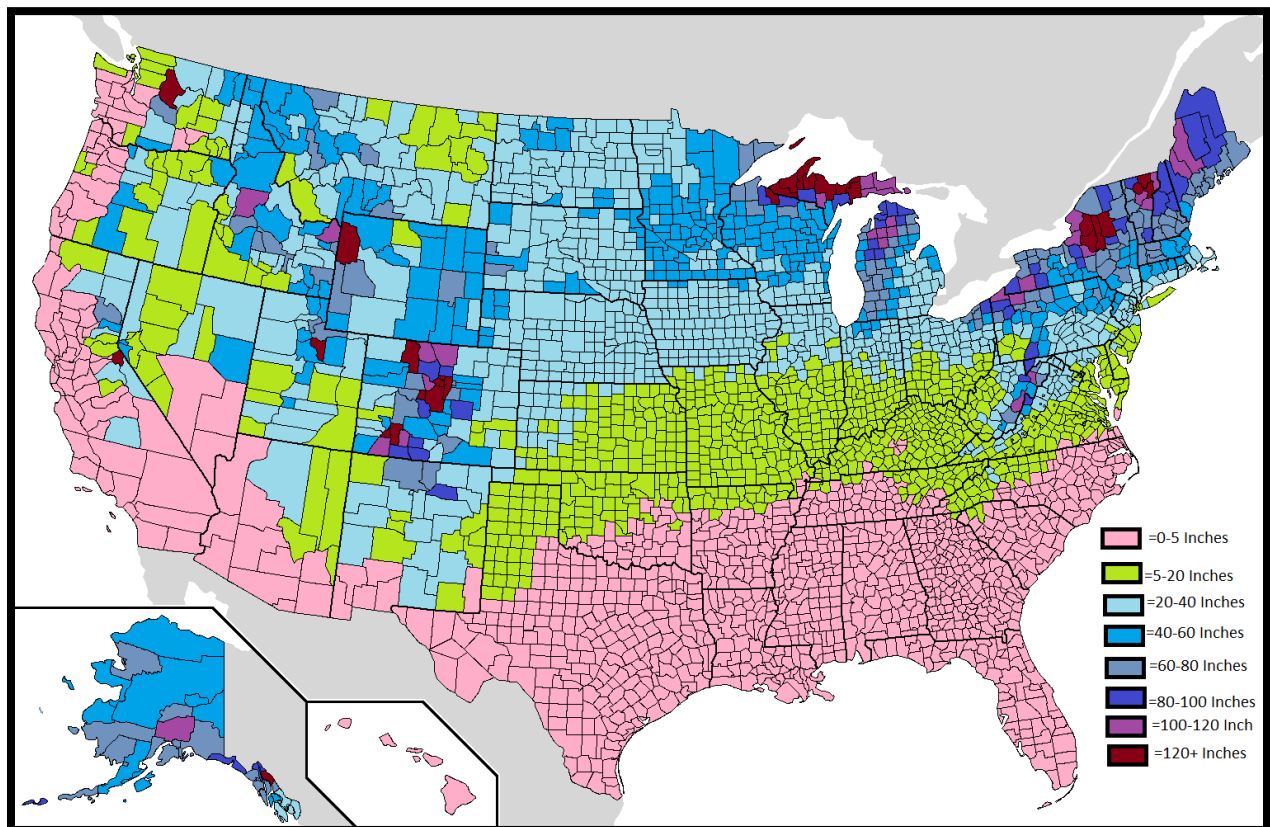
According to the National Weather Service, a winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow or a combination of events) is categorized as 7 inches or more of snow in 12 hours or less; or 9 inches or more in 24 hours covering at least 50 percent of the zone or encompassing most of the population.

Some of the largest risks of damage from winter storms are traffic accidents from icy roads, hypothermia from prolonged exposure to cold, downed trees and powerlines, and frozen/ruptured water utility pipes for residential/commercial properties and water plants.

### Location

Due to the nature of winter storms, all people and assets in Harris County have equal degree of exposure to a winter storm, which means the entire planning area has the same risk. Winter storms in Texas are less frequent than more northern regions of the Country, but they still occasionally occur in the planning area. The main types of events that occur are snowstorms, cold waves, and ice storms. Blizzards are not common in the planning area. The typical winter storm season is from November to middle of March but can extend just outside those time periods.

*Figure 74 - Average Snowfall per year*



### Previous Occurrences

According to the NCEI database there have been 9 recorded storm events in Harris County over the last 20 years. These events only occurred in two separate years, 2014 and 2021. As shown in Table 34, none of these events have recorded any damage or casualties. However, while not recorded in the NCEI database, Winter Storm Uri in February of 2021 caused an estimated \$10 to \$20 billion dollars of damage to Texas as a whole. According to the National Weather Service, this winter storm surpassed Hurricane Harvey (2017) in monetary damages. This storm left most people in Texas without power and hundreds of people passed away due to the conditions.

*Table 34 - NCEI Recorded Winter Storms 7/1/2003 to 7/31/2023*

Location	County/Zone	St.	Date	Time	LZ.	Type	Mag	Dth	Inj	PrD	CrD
<b>Totals:</b>								0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	01/23/2014	23:30	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	03/03/2014	21:45	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	03/03/2014	21:45	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	03/03/2014	21:45	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	03/03/2014	21:45	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	03/03/2014	21:45	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	03/03/2014	21:45	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">HARRIS (ZONE)</a>	HARRIS (ZONE)	TX	03/03/2014	21:45	CST-6	Winter Storm		0	0	0.00K	0.00K
<a href="#">INLAND HARRIS (ZONE)</a>	INLAND HARRIS (ZONE)	TX	02/14/2021	20:00	CST-6	Winter Storm		0	0	0.00K	0.00K
<b>Totals:</b>								0	0	0.00K	0.00K

### Future Occurrences

To best predict the future probability of a winter storm, the use of historical data is needed. Since there were just 2 years with recorded winter storm events in the past 20 years in Harris County, there is a 10% chance of the planning area to have a winter storm each year.

### Extent

Due to HCWCID110 being in a subtropical climate there is not frequently snow accumulation that would cause significant damage. The Sperry-Piltz Ice Accumulation Index (SPIA) predicts potential damage from approaching ice storms. This index uses National Weather Service forecast data to help make its prediction. Figure 75 below quantifies the damage 0-5 based on ice amount and wind predictions.

*Figure 75 - SPIA Index (Copyright, February 2009)*  
[SPIA Index \(spia-index.com\)](http://spia-index.com)

ICE DAMAGE INDEX	AVERAGE NWS ICE AMOUNT (in inches) <small>*Revised-October, 2011</small>	SUSTAINED WINDS (mph)	DAMAGE AND IMPACT DESCRIPTIONS <small>(*Modified-January, 2019)</small>
<b>0</b>	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
<b>1</b>	0.10 – 0.25	15 - 25	Some isolated or localized utility outages possible, typically lasting only a few hours. Roads/bridges may become slick and hazardous. Some tree limb damage.
	0.25 – 0.50	< 15	
<b>2</b>	0.10 – 0.25	25 - 35	Numerous utility interruptions expected, typically lasting 24 to 72 hours. Roads/travel conditions may be extremely hazardous. Moderate tree damage expected.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
<b>3</b>	0.10 – 0.25	> = 35	Widespread utility outages with damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages may last from 3 to 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
<b>4</b>	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 to 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
<b>5</b>	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	

**Impact**

Some of the largest impacts of winter storms in the planning area are to infrastructure like the power grid and utility pipes. Due to the lack of winter storms that the area receives, in many cases the communities are ill prepared to deal with the impacts. This was shown in Winter Storm Uri in 2021, that left most of the County without power and some without water for an extended period of time. In addition, motorists are not used to the icy roads which can cause significantly more accidents and impacted the ability to commute to work.

**Effect of Climate Change on Winter Storm**

According to the Environmental Defense Fund (edf.org), climate change may cause more snowfall during winter storm events. This is because an overall warmer planet would cause more evaporating water in the atmosphere, thus leading to more precipitation in the form of snowfall or rainfall.

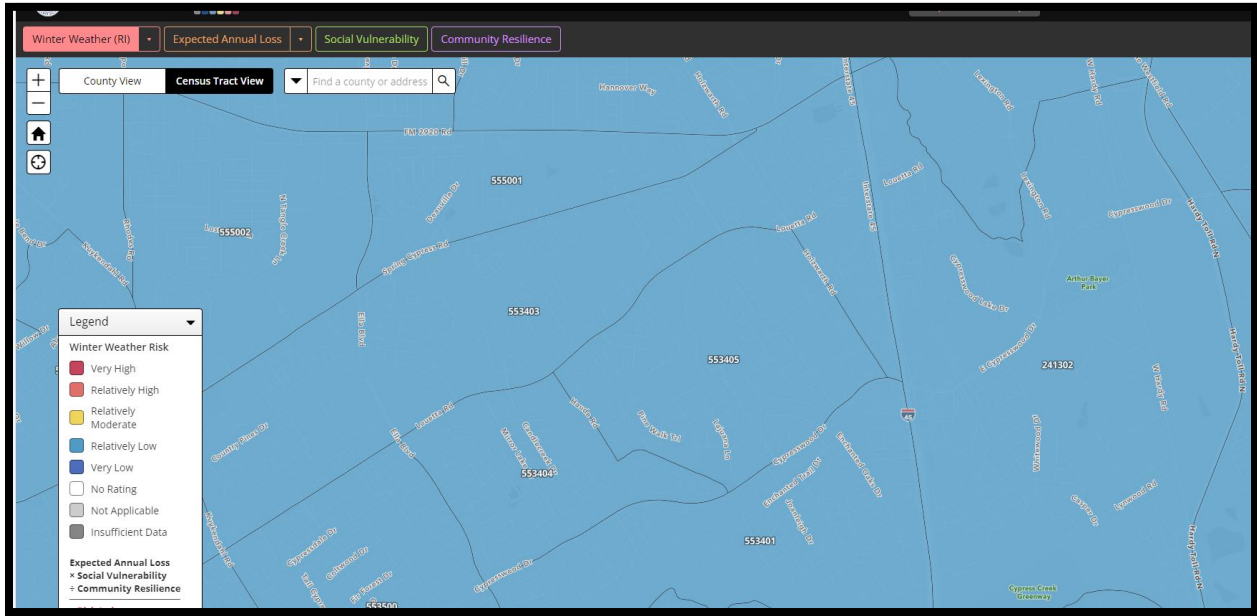
**Social Vulnerability**

Social vulnerability is defined as the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. Social vulnerability considers the social, economic, demographic, and housing characteristics of a community that influence its ability to prepare for, respond to, cope with, recover from, and adapt to environmental hazards.

The National Risk Index shows the areas most at risk during winter storm events are the annual loss. This index estimates \$873 thousand dollar expected annual loss for Harris County as a whole.

This is largely due to winter storm events being uncommon in the area and when they do occur the population in the area is not accustomed to dealing with the effects.

**Figure 76 - National Risk Index for Winter Storm for County and Census Tracts**



Rank	Community	State	Risk Index Rating	Risk Index Score	National Percentile
1	Census tract 48201553405	TX	Relatively Low	48.34	0   [Progress Bar]   100
2	Census tract 48201241302	TX	Relatively Low	45.79	0   [Progress Bar]   100
3	Census tract 48201553401	TX	Relatively Low	35.8	0   [Progress Bar]   100
4	Census tract 48201553404	TX	Relatively Low	32.77	0   [Progress Bar]   100

Rank	Community	State	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
1	Census tract 48201553405	TX	\$1,017	Relatively High	Very Low	1.35	\$1,373	48.34
2	Census tract 48201241302	TX	\$1,426	Very Low	Very Low	0.84	\$1,204	45.79
3	Census tract 48201553401	TX	\$903	Very Low	Very Low	0.7	\$636	35.8
4	Census tract 48201553404	TX	\$604	Very Low	Very Low	0.81	\$492	32.77



## Community Assets

There are four main categories of assets that are to be considered: People, Economy, Built Environment, and Natural Environment. Although all assets found in the plan area may have some vulnerability to natural hazards discussed in this plan, the assets described below only encompass those that HCWCID110 has jurisdictional authority over.

People: The health, safety, security and general well-being of the citizens within the HCWCID110 is of paramount importance to HCWCID110. The District focused on areas of its responsibility - water and sanitary sewer for the entire community including dense population, access and functional need populations, children, populations that are dependent on assistance during emergencies and visiting populations.

Economy: A thriving economy is also important to HCWCID110. The District focused on areas of its responsibility - water and sanitary sewer for the entire community including business and industry within its planning area.

Natural Environment: HCWCID110's Park must be prepared for disaster or reduce the magnitude of an event and areas that need protection in the event of disaster.

Built Environment: HCWCID110's building and infrastructure, as well as residents, industry and businesses located in the planning area. Specifically for HCWCID110's buildings and infrastructure:

HCWCID110 Administrative Office (Forest Oaks Swim and Racquet Club) – 19023 Joanleigh Drive, Spring, TX 77388

Water Plant 1 – 19438 Enchanted Oaks, Spring, TX 77388

Water Plant 2 – 19803 Cypresswood Falls, Spring, TX 77373

Elevated Storage Tank – 19007 Joanleigh Rd, Spring, TX 77388

Wastewater Treatment Plant – 627 Cypress Oaks Dr, Spring, TX 77388

Lift Station 1 – 19111 Enchanted Stream, Spring, TX 77388

Lift Station 2 – 19614 Hickory Twig, Spring, TX 77388

Lift Station 3 – 19300 Interstate-45A, Spring, TX 77373

Lift Station 4 – 22332 Holzwarth, Spring, TX 77388

Lift Station 5 – 20330 Interstate-45, Spring TX 77373

Lift Station 6 – 931 E. Cypresswood B, Spring, TX 77373

Lift Station 7 – 140 Lou Lane, Spring, TX 77388

Lift Station 8 – 2355 ½ Cypresswood Dr, Spring, TX 77388

## Section 4. Mitigation Strategy

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### Introduction

As the State of Texas 2023 Hazard Mitigation Plan emphasized, “hazard mitigation is a preventative measure and supports the development of disaster-resilient communities.”

(2023 Texas Hazard Mitigation Plan, page 14, [TDEM Website Files - State of Texas HMAP Update - 10.27.23.pdf](#) - [All Documents](#) ([sharepoint.com](#)))

HCWCID110 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. The risk analysis and capability assessment help inform the strategy. The mitigation strategy has three main components: mitigation goals, mitigation actions, and an action plan to carry out the actions.

The first step of the mitigation strategy involves describing what the community wants to achieve and are broad, long-term policy and vision statements that help explain what the mitigation strategy wants to achieve – HCWCID110’s Mitigation Goal.

### Mitigation Goal

HCWCID110 reviewed its risk assessment findings, its outreach findings, the State’s goals and the community’s goals as guides for its mitigation goals. The mitigation goal of this plan is to support HCWCID110’s efforts to protect the community by mitigating risks due to natural hazards that:

- Minimize loss of life, injury and damage to property, the economy, and the environment from natural hazards.
- Build and enhance local mitigation capabilities to ensure the safety and resilience of all community members. Reduce damage to public buildings and ensure continuity of emergency services.

TEXAS EXPERIENCES MORE NATURAL DISASTERS THAN ALMOST ANY OTHER STATE IN THE COUNTRY, AN AVERAGE OF ONE EVERY EIGHT MONTHS. TEXAS HAS EXPERIENCED THE HIGHEST NUMBER OF BILLION-DOLLAR DISASTERS AND LEADS THE UNITED STATES IN TOTAL CUMULATIVE COSTS FROM DISASTERS SINCE 1980, ACCORDING TO THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION (NCEI), 2021 BILLION-DOLLAR DISASTER REPORT.

NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2022). <https://www.ncei.noaa.gov/access/billions/>, DOI: 10.25921/stkw-7w73 and 2023 Texas Hazard Mitigation Plan, page 2.

- Maintain the jurisdiction’s natural and man-made systems including public utility systems that protect against natural hazards.
- Increase cooperation and coordination among private entities, local agencies, state agencies, and federal agencies.

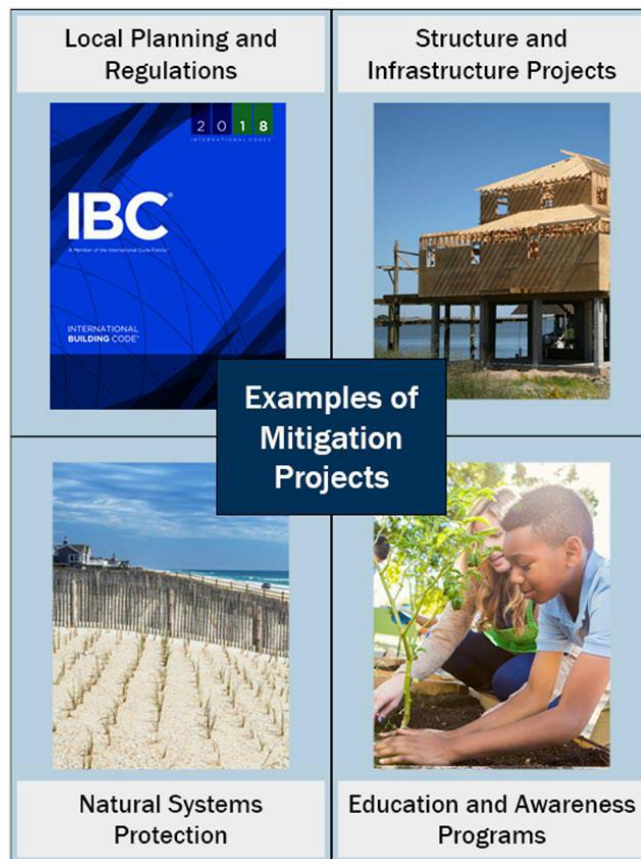
## Mitigation Actions

Part of the mitigation strategy is to have specific actions that are identified and detailed that reduce risk to natural hazards. These actions are specific projects and activities that help achieve the goals. Mitigation actions generally fall into four categories: local plans and regulation; structure and infrastructure projects; natural systems protection and nature-based solutions; and education and awareness. After the actions were considered and analyzed, the MPC utilized a version of FEMA’s Mitigation Action Implementation (Worksheet 8) to help identify the components needed to carry out a mitigation action.

After the actions were prioritized (discussed next section), the Actions Summary Worksheets were converted into the Mitigation Action Table.

### Evaluate and Prioritize

In order to evaluate feasibility and analyze prioritization of actions, all 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. Descriptions of the criteria are in Figure 77.





*Figure 77 - Description of Evaluation Criteria for Mitigation Prioritization*

### **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?

Low is defined as 1-50; Medium is defined as 51-75; and High is defined as 76-100. The results are depicted in Table 35. The addressed hazards were also provided.

Table 36 is a summary of the mitigation actions by priority numeric value number then assigned priority definition high/medium/low. Cost-effectiveness was considered with each action. Table 37 lists the actions by the action number and shows the hazard(s) the action could mitigate.

HCWCID110 has 23 actions in the Plan. Each action provides:

- Action number
- Title
- Hazards that action addresses
- Description of the action
- Implementing department and staff
- Estimated cost and potential funding sources
- Approximate time frame for project
- The priority classification received (High(H)/Medium (M)/Low (L))
- If the action protects current buildings and infrastructure, or new or both
- Discussion of cost and benefit considerations.
- Future conditions considerations if applicable and risk population address

*Table 35 - Ranking of Hazards to Determine Priority Level (High/Medium/Low)*

Action No.	<p style="text-align: center;"><b>MITIGATION ACTION SUMMARY OF PRIORITIZATION</b></p> <p style="text-align: center;">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)</p>	T o t a l	P r i o r i t y
1	Generators for critical facilities	89	H
4	HCWCID110 Stormwater Detention Project	86	H
13	Provide links to House and Harris County EM Departments on District website	85	H
9	Create a cooling station at HCWCID Buildings	82	H
12	Work with EM Departments (Harris County and COH) to support a public education program on protection from hazards and water conservation	82	H
19	Winterization of Water and Sewer Treatment Plants	82	H
2	Debris Removal Plan	81	H
23	Program Development for Permitting of Private Stormwater Detention Basins	81	H
18	Establish Process with Harris County Subsidence District (HCSD) on Subsidence Information	80	H
15	Lightning Rods and Surge Protectors at Building and Critical Facilities	79	H
21	Connect Waste Water Reclaimed Water Conservation System to all Four Area Lakes	77	H
22	Expanding wastewater reclaimed abilities	77	H
3	Debris Removal Equipment	75	M
16	Lightning Detection Systems for Parks, Recreation fields, and pool	75	M
17	Ensure all Critical Facilities' pipes are insulated	75	M
5	Replace landscape around District Buildings, and critical facilities with drought tolerant varieties and defensible space	74	M
11	Procure drought resistant grasses for soil stabilization	73	M
14	Work with Regional Flood planning organizations so that projects are studied that could impact the planning area	73	M
20	Work with HCFCD to prioritize bank stabilization at Cypress Creek	72	M
6	Vegetation clearing	70	M
10	Add thermal barriers (window tinting) to HCWCID110 Buildings	68	M
7	Add Hurricane Shutters to HCWCID110 Buildings	66	M
8	Replace Exterior and Interior doors with steel doors at HCWCID110 Buildings	64	M

*Table 36 - Ranking of Hazards to Determine Priority Level*

Action No.	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)	Priority	Addressed Hazard	
			Addressed Hazard	Addressed Hazard
			<b>D:</b> Drought	
			<b>EC/F:</b> Extreme Cold/Freeze	
			<b>EH:</b> Extreme Heat	
			<b>F:</b> Flooding	
			<b>H:</b> Hail	
			<b>H/TS:</b> Hurricane/Tropical Storm	
			<b>L:</b> Lightning	
			<b>S:</b> Subsidence	
			<b>T/HW:</b> Thunderstorm/ Damaging Winds	
			<b>T:</b> Tornado	
			<b>WF:</b> Wildfire	
			<b>W:</b> Winter storm	
1	Generators for critical facilities	89	H	EC/F, F, H/TS, T/HW, W
2	Debris Removal Plan	81	H	F, H/TS, T/HW, T
3	Debris Removal Equipment	75	M	F, H/TS, T/HW, T
4	HCWCID110 Stormwater Detention Project	86	H	F, H/TS, T/HW
5	Replace landscape around District Buildings, and critical facilities with drought tolerant varieties and defensible space	74	M	D, EH, WF
6	Vegetation clearing	70	M	WF
7	Add Hurricane Shutters to HCWCID Buildings	66	M	H, H/TS, T/HW, T
8	Replace Exterior and Interior doors with steel doors at HCWCID Buildings	64	M	F, H/TS, T/HW, T
9	Create a cooling station at HCWCID Buildings	82	H	EH
10	Add thermal barriers (window tinting) to HCWCID 110 Buildings	68	M	EH
11	Procure drought resistant grasses for soil stabilization	73	M	D, EH
12	Work with EM Departments (Harris County and COH) to support a public education program on protection from hazards and water conservation	82	H	D, EC/F, EH, F, H, H/TS, L, S, T/HW, T, WF, W
13	Provide links to House and Harris County EM Departments on District website	85	H	D, EC/F, EH, F, H, H/TS, L, S, T/HW, T, WF, W
14	Work with Regional Flood planning organizations so that projects are studied that could impact the planning area	73	M	D, F, H, H/TS, S, T/HW, W
15	Lightning Rods and Surge Protectors at Building and Critical Facilities	79	H	F, TS
16	Lightning Detection Systems for Parks, Recreation fields, and pool	75	M	L
17	Ensure all Critical Facilities' pipes are insulated	75	M	L
18	Establish Process with Harris County Subsidence District (HCSD) on Subsidence Information	80	H	EC/F, W
19	Winterization of Water and Sewer Treatment Plants	82	H	S
20	Work with HCFCD to prioritize bank stabilization at Cypress Creek	72	M	EC/F, W, H/TS, T
21	Connect Waste Water Reclaimed Water Conservation System to all Four Area Lakes	77	H	F/TS
22	Expanding wastewater reclaimed abilities	77	H	D, EH, F, T/HW
23	Program Development for Permitting of Private Stormwater Detention Basins	81	H	F/TS

*Table 37 - Mitigation Actions*

<b>ACTION NO. 1</b>				
<b>Title: GENERATORS FOR CRITICAL FACILITIES</b>				
<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<p><b>Extreme Cold/Freezes</b>  <b>Flooding</b>  <b>Hurricane/Tropical Storms</b>  <b>Thunderstorms/Damaging winds</b>  <b>Winter storm</b></p>	<p>While HCWCID110 has permanent generators at most critical facilities, it utilizes mobile generators for lift station infrastructure. These mobile generators (currently 10 years old) would need to be replaced within the next five years. In addition, the Constable Building, owned by HCWCID110, does not have a permanent generator, a grant could help facilitate purchasing a new generator for this building.</p>			<p><b>HCWCID110 Board and Staff</b></p>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<p><b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants</b></p>	<p><b>\$150,000 each</b></p>	<p><b>H</b></p>	<p><b>Within the next five years</b></p>	<p><b>1. Existing Building and Infrastructure</b></p>
<b>Cost Benefit (avoided losses)</b>	<p><b>Future Conditions Consideration (e.g.: climate change, population change)</b></p>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<p><b>Infrastructure protection</b></p>	<p><b>Continued and growing threats to the power of critical infrastructure requires the need for backup power sources.</b></p>			<p><b>Protecting critical infrastructure provides for the health and safety of the population.</b></p>

**ACTION NO. 2**

**Title: DEBRIS REMOVAL PLAN**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<p align="center"><b>Flooding Hurricane/Tropical Storms Thunderstorms/ Damaging Winds Tornadoes</b></p>	<p align="center"><b>Establish a formal debris removal plan so that in the event of a disaster a plan is in place.</b></p>			<p align="center"><b>HCWCID110 Board and Staff</b></p>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<p align="center"><b>FEMA planning grants</b></p>	<p align="center"><b>\$15,000</b></p>	<p align="center"><b>H</b></p>	<p align="center"><b>1-3 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure 2. New Building</b></p>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<p align="center"><b>Infrastructure, Homes and property</b></p>	<p align="center"><b>This will allow for rapid response of future climatic hazard events.</b></p>			<p align="center"><b>Ensuring continuity of service after a climatic event provides for the health and safety of the population.</b></p>



**ACTION NO. 3**

**Title: DEBRIS REMOVAL EQUIPMENT**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<p align="center"><b>Flooding</b></p> <p align="center"><b>Hurricane/Tropical Storms</b></p> <p align="center"><b>Thunderstorms</b></p> <p align="center"><b>Damaging Winds</b></p> <p align="center"><b>Tornados</b></p>	<p align="center"><b>Purchase debris removal equipment for District equipment to assist in the quick removal of debris from critical areas within HCWCID110 for continuity of service and access to infrastructure.</b></p>			<p align="center"><b>HCWCID110 Board and Staff</b></p>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<p align="center"><b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, State Grants</b></p>	<p><b>\$300,000</b></p>	<p><b>M</b></p>	<p><b>1-3 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure</b></p> <p align="center"><b>2. New Building</b></p>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<p><b>Homes and property</b></p>	<p align="center"><b>Ensuring continuity of service after a climatic event provides for the health and safety of the population.</b></p>			<p align="center"><b>Ensuring continuity of service after a climatic event provides for the health and safety of the population.</b></p>

**ACTION NO. 4**

**Title: HCWCID110 STORMWATER DETENTION PROJECT**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<p align="center"><b>Flooding Hurricane/Tropical Storms Thunderstorms Damaging Winds</b></p>	<p align="center"><b>Create detention ponds on both sides of Cypress Oaks Drive to I-45 where Cypress Creek floods and the current embankments on Cypress Oaks Drive impede the flow of water causing the subdivisions around the area to flood.</b></p>			<p align="center"><b>HCWCID110 Board and Staff</b></p>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<p align="center"><b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants</b></p>	<p align="center"><b>\$12,000,000</b></p>	<p align="center"><b>H</b></p>	<p align="center"><b>1-5 Years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure 2. New Building</b></p>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<p align="center"><b>Infrastructure, Homes and property</b></p>	<p align="center"><b>Next generation modeling will help show increased depth of rainfall which will help with the H&amp;H data used for the design to meet the risk.</b></p>			<p align="center"><b>Design will take into account any potential negative impacts to the area.</b></p>

**ACTION NO. 5**

**Title: REPLACE LANDSCAPE AROUND DISTRICT BUILDING AND CRITICAL FACILITIES WITH DROUGHT TOLERANT VARIETIES AND DEFENSIBLE SPACE**

Hazard(s) Addressed	Description of Action			Implementing Department
<p align="center"><b>Drought Extreme Heat Wildfire</b></p>	<p align="center">Replace any non-drought tolerant landscaping with drought tolerant varieties as well as create defensible space to protect the infrastructure.</p>			<p align="center"><b>HCWCID110 Board and Staff</b></p>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<p align="center"><b>State Wildfire grants, FEMA Grants, Houston Urban Forestry Program</b></p>	<p align="center"><b>\$5,000</b></p>	<p align="center"><b>M</b></p>	<p align="center"><b>1-5 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure</b></p>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<p align="center"><b>Infrastructure and property</b></p>	<p align="center">As temperatures continue to rise and droughts continue to occur with longer durations, prepare for potential wildfire increases.</p>			<p align="center">As part of the analysis, the District reviews the impacts to the whole community.</p>

**ACTION NO. 6**

**Title: VEGETATION CLEARING**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Wildfire</b>	Keep vegetation clear around areas that a wildfire could start though a maintenance program.			<b>HCWCID110 Board and Staff</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
Texas Forest Service	\$10,000	M	1-3 years	<b>1. Existing Building and Infrastructure</b> <b>2. New Building</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Infrastructure, Homes and property</b>	As temperatures continue to rise and droughts continue to occur with longer durations, prepare for potential wildfire increases.			As part of the analysis, the District reviews the impacts to the whole community.

**ACTION NO. 7**

**Title: ADD HURRICANE SHUTTERS TO HCWCID110 BUILDINGS**

Hazard(s) Addressed	Description of Action			Implementing Department
<p align="center"><b>Hail</b></p> <p align="center"><b>Hurricane/Tropical Storms</b></p> <p align="center"><b>Thunderstorms</b></p> <p align="center"><b>Damaging Winds</b></p> <p align="center"><b>Tornados</b></p>	<p align="center"><b>Add Hurricane Shutters to further harden the HCWCID110 Main Building, Constable Building and auxiliary building(s).</b></p>			<p align="center"><b>HCWCID110 Board and Staff</b></p>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<p align="center"><b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants,</b></p>	<p align="center"><b>\$100,000</b></p>	<p align="center"><b>M</b></p>	<p align="center"><b>1-3 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure</b></p>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<p align="center"><b>Building protection</b></p>	<p align="center">Continued and growing threats to the critical infrastructure requires the need to protect these assets.</p>			<p align="center">Protecting critical infrastructure provides for the health and safety of the population.</p>



**ACTION NO. 8**

**Title: REPLACE EXTERIOR AND INTERIOR DOORS WITH STEEL DOORS ON HCWCID110 BUILDINGS**

Hazard(s) Addressed	Description of Action			Implementing Department
<p align="center"><b>Flooding Hurricane/Tropical Storms</b></p> <p align="center"><b>Thunderstorms Damaging Winds</b></p> <p align="center"><b>Tornados</b></p>	<p align="center"><b>Replace interior and exterior doors with steel doors at the Main Building, auxiliary building(s).</b></p>			<p align="center"><b>HCWCID110 Board and staff</b></p>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<p align="center"><b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants</b></p>	<p align="center"><b>\$50,000</b></p>	<p align="center"><b>M</b></p>	<p align="center"><b>1-3 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure</b></p>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<p align="center"><b>Main Building and auxiliary protection</b></p>	<p align="center">Continued and growing threats to the critical infrastructure requires the need to protect these assets.</p>			<p align="center">Protecting critical infrastructure provides for the health and safety of the population.</p>

**ACTION NO. 9**

**Title: CREATE COOLING STATIONS AT MAIN BUILDING AND RECREATION CENTER BUILDING**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Extreme Heat</b>	<b>Create cooling and charging stations at Main Building and auxiliary buildings to provide employees and the public a cool location in the event of heat exposure/exhaustion, prolonged power outages, or relief.</b>			<b>HCWCID110 Board and Staff</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>Operating Budget</b>	<b>\$20,000</b>	<b>H</b>	<b>1-3 years</b>	<b>1. Existing Building and Infrastructure 2. New Building</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Protection of people</b>	<p>Extreme heat is a major public health concern in the United States. The trend of increasing frequency and duration of heat events (“heat waves”) is expected to continue in the future.</p>			<p>Risk factors for heat-related deaths are bed confinement due to medical illness, living alone, being socially isolated, and not having access to air conditioning. Vulnerable populations include outside workers, older adults, children, communities of color, the homeless, individuals with a mental health disability, individuals with chronic medical conditions, individuals without access to air-conditioning, and low-income communities. Barriers to access or use of cooling centers include limited access to transportation, fear of leaving home or inability to leave home, not wanting to leave pets behind.</p>

**ACTION NO. 10**

**Title: ADD THERMAL BARRIERS (WINDOW TINTING) ON HCWCID110 BUILDINGS**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Extreme Heat</b>	<b>Update thermal barriers (e.g., window tinting) on HCWCID110 buildings and any infrastructure with windows to keep building temperatures cooler in summer months</b>			<b>HCWCID110 Board and Staff</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>Operations</b>	<b>\$5,000</b>	<b>M</b>	<b>1-3 years</b>	<b>1. Existing Building and Infrastructure</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Protection of Main Building</b>	<b>Continued and growing threats to the critical infrastructure requires the need to protect these assets.</b>			<b>Protecting critical infrastructure provides for the health and safety of the population.</b>

**ACTION NO. 11**

**Title: PROCURE DROUGHT RESISTANT GRASSES FOR SOIL STABILIZATION**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Drought Extreme Heat</b>	<b>Find and use drought resistant grasses to preserve grasses used for soil stabilization.</b>			<b>HCWCID110 Board and Staff</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>Operations</b>	<b>\$20,000</b>	<b>M</b>	<b>1-3 years</b>	<b>1. Existing Building and Infrastructure 2. New Building</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Infrastructure, homes and property</b>	Continued and growing threats to the critical infrastructure requires the need to protect these assets.			Protecting critical infrastructure provides for the health and safety of the population.

**ACTION NO. 12**

**Title: WORK WITH EMERGENCY MANAGEMENT DEPARTMENTS (CITY OF HOUSTON AND HARRIS COUNTY) TO SUPPORT A PUBLIC EDUCATION PROGRAM ON PROTECTION FROM HAZARDS AND WATER CONSERVATION**

Hazard(s) Addressed	Description of Action			Implementing Department
<p align="center"> <b>Drought</b>  <b>Extreme Cold/Freezes</b>  <b>Extreme Heat</b>  <b>Flooding</b>  <b>Hail</b>  <b>Hurricane/Tropical Storm</b>  <b>Lightning</b>  <b>Subsidence</b>  <b>Thunderstorm</b>  <b>Damaging Wind</b>  <b>Tornado</b>  <b>Wildfire</b>  <b>Winter storm</b> </p>	<p align="center"> <b>Working with the Emergency Management Departments in City of Houston and Harris County, create a public education program to educate the public on mitigation techniques that homeowners can learn to protect their families and property. Create water conservation methods to be sent to the public in advance of implementation of the drought contingency plan.</b> </p>			<p align="center"> <b>HCWCID110Board and Staff</b>  <b>Harris County OEM</b>  <b>City of Houston OEM</b> </p>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<p align="center"> <b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO</b> </p>	<p align="center"><b>\$15,000</b></p>	<p align="center"><b>H</b></p>	<p align="center"><b>1-3 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure</b></p>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<p align="center"><b>People, Homes, assets and Property</b></p>	<p align="center"> <b>Awareness and education about the growing threat from increased and more intense storms will help the public prepare for disasters.</b> </p>			<p align="center"> <b>As part of the analysis, the District reviews the impacts to the whole community.</b> </p>



**ACTION NO. 13**

**Title: PROVIDE LINKS TO HOUSTON AND HARRIS COUNTY EM DEPARTMENTS ON DISTRICT WEBSITE**

Hazard(s) Addressed	Description of Action			Implementing Department
<p align="center"> <b>Drought                      Flooding                      Hail                      Hurricane/Tropical Storm                      Subsidence                      Thunderstorm                      Damaging Wind                      Winter storm</b> </p>	<p align="center"> <b>Create dedicated page for Emergency Preparedness and Response on HCWCID110's website by providing resources from Harris County and City of Houston Emergency Management Departments so public can access in the event of an emergency or possible natural disaster.</b> </p>			<p align="center"> <b>HCWCID110 Board and Staff</b> </p>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<p align="center"><b>Operating</b></p>	<p align="center"><b>\$0</b></p>	<p align="center"><b>H</b></p>	<p align="center"><b>1-3 years</b></p>	<p align="center"> <b>1. Existing Building and Infrastructure                      2. New Building</b> </p>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<p align="center"><b>People, homes and property</b></p>	<p align="center"> <b>Awareness and education about the growing threat from increased and more intense storms will help the public prepare for disasters.</b> </p>			<p align="center"> <b>As part of the analysis, the District reviews the impacts to the whole community.</b> </p>

**ACTION NO. 14**

**Title: WORK WITH REGIONAL FLOOD PLANNING ORGANIZATIONS SO THAT PROJECTS ARE STUDIED THAT COULD IMPACT THE AREA**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Flooding Hurricane/Tropical Storms</b>	Work with regional flood planning organizations to ensure problem areas are studied with the goal of finding solutions that could be grant worthy projects.			<b>HCWCID110 Board and Staff District Engineering Consultants</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants</b>	<b>\$2,500</b>	<b>M</b>	<b>1-3 years</b>	<b>1. Existing Building and Infrastructure 2. New Building</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Infrastructure, Homes and property</b>	Design will take into account climate adaption and resilience using best available data.			Design will take into account vulnerable populations.

**ACTION NO. 15**

**Title: LIGHTNING RODS AND SURGE PROTECTORS AT HCWCID110 BUILDINGS AND PLANTS**

Hazard(s) Addressed	Description of Action			Implementing Department
<b>Lightning</b>	<b>Install new lightning rods on all district facilities, plant buildings, and water storage tanks as well as surge protectors throughout all district buildings.</b>			<b>HCWCID110 Board and Staff District Engineering Consultants</b>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<b>Operating State or Federal Grants</b>	<b>\$100,000</b>	<b>H</b>	<b>1-3 years</b>	<b>1. Existing Building and Infrastructure</b>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<b>Buildings and facility protection</b>	Lightening may surge under climate change, but studies are limited.			This is to protect District assets.

**ACTION NO. 16**

**Title: LIGHTNING DETECTION SYSTEMS FOR PARKS, RECREATION FIELDS AND POOL**

Hazard(s) Addressed	Description of Action			Implementing Department
<p align="center"><b>Lightning</b></p>	<p align="center">Place high accuracy short range lightning detection equipment at Forest Oaks Park and Forest Oaks Swim and Racquet Club facility to provide visual and audio alerts for approaching heavy storm activity or when lightning is detected in the area.</p>			<p align="center"><b>HCWCID110 Board and Staff</b></p>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<p align="center"><b>State grants, City of Houston</b></p>	<p align="center"><b>\$5,000 - \$10,000 plus software upgrades</b></p>	<p align="center"><b>M</b></p>	<p align="center"><b>1-3 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure</b></p>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<p align="center"><b>Early warning system could save lives for those outside at parks or recreational areas.</b></p>	<p align="center"><b>Adapting to more intense storms or increased quantity of storms.</b></p>			<p align="center"><b>To protect populations outside at parks, recreation fields, and pool.</b></p>

**ACTION NO. 17**

**Title: ENSURE ALL CRITICAL FACILITIES PIPES ARE INSULATED**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Extreme Cold/Freezes Winter storm</b>	<b>Insulate all pipes that are outside and exposed to the elements, including exterior pipe covers, spray foam insulation in facility walls, new insulation in attics, and any other identifiable areas where pipes are not properly insulated.</b>			<b>HCWCID110 Board and Staff District Engineering Consultants District Operator</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>Operating</b>	<b>\$50,000</b>	<b>M</b>	<b>1-3 years</b>	<b>1. Existing Building and Infrastructure</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Buildings and infrastructure</b>	<b>Extreme weather may surge under climate change, but studies are limited.</b>			<b>This is to protect City assets.</b>



**ACTION NO. 18**

**Title: ESTABLISH PROCESS WITH HCSD ON SUBSIDENCE INFORMATION**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Subsidence</b>	<b>Establish process for receiving information from the Harris County Subsidence District (HCSD) on subsidence impacts for planning area.</b>			<b>HCWCID110 Board and Staff District Engineering Consultants</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>Operating</b>	<b>Minimal</b>	<b>H</b>	<b>1-3 years</b>	<b>1. Existing Building and Infrastructure 2. New Building</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Building and Infrastructure, homes and property</b>				

**ACTION NO. 19**

**Title: WINTERIZATION OF WATER AND SEWER TREATMENT PLANTS**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Extreme Cold/Freezes</b> <b>Winter Storm</b> <b>Hurricane/Tropical Storms</b> <b>Tornadoes</b>	<b>Build a building enclosure over the discharge pumps that are outside of the treatment plant.</b>			<b>HCWCID110</b> <b>Board and Staff</b> <b>District Engineering Consultants</b> <b>District Operator</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO</b>	<b>\$550,000</b>	<b>H</b>	<b>1-5 years</b>	<b>1. Existing Building and Infrastructure</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Protection of infrastructure</b> <b>Homes</b>	<b>Extreme weather may surge under climate change, but studies are limited.</b>			<b>This is to protect District assets.</b>

**ACTION NO. 20**

**Title: WORK WITH HCFCO TO PRIORTIZE BANK STABILIZATION AT CYPRESS CREEK**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Flooding Hurricane/Tropical Storms</b>	<b>Erosion of the banks at Cypress Creek causes damage to HCWCID110's Parks and Infrastructure and a stormwater detention facility.</b>			<b>HCWCID110 Board and Staff District Engineering Consultants District Stormwater Consultants</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO</b>	<b>\$750,000</b>	<b>M</b>	<b>1-5 years</b>	<b>1. Existing Building and Infrastructure</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Protection of Parks and Recreation Center</b>	<b>Design will take into account climate adaption and resilience using best available data.</b>			<b>Design will take into account vulnerable populations.</b>

**ACTION NO. 21**

**Title: CONNECT WASTEWATER RECLAIMED WATER CONSERVATION SYSTEM TO ALL FOUR AREA LAKES**

Hazard(s) Addressed	Description of Action			Implementing Department
<p align="center"><b>Drought Extreme Heat Flooding Hurricane/Tropical Storms</b></p>	<p align="center"><b>Extend current reclaimed water system to connect with three storm water detention ponds in Forest Oaks Park. Currently only one of the four lakes is connected to the reclaimed water system.</b></p>			<p align="center"><b>HCWCID110 Board and Staff District Engineering Consultants</b></p>
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
<p align="center"><b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO</b></p>	<p align="center"><b>\$750,000</b></p>	<p align="center"><b>H</b></p>	<p align="center"><b>1-5 years</b></p>	<p align="center"><b>1. Existing Building and Infrastructure</b></p>
Cost Benefit (avoided losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations
<p align="center"><b>Protection of Water Supply</b></p>	<p align="center">Design will take into account climate adaption and resilience using best available data.</p>			<p align="center">Design will take into account vulnerable populations.</p>

**ACTION NO. 22**

**Title: EXPANDING WASTEWATER RECLAIMED ABILITIES**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Drought Extreme Heat Flooding Hurricane/Tropical Storms</b>	<b>Irrigation systems do not cover the entire planning area so building out the system in conjunction with soil stabilization (see action 12) would protect the area of erosion.</b>			<b>HCWCID110 Board and Staff District Engineering Consultants</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO</b>	<b>\$500,000</b>	<b>H</b>	<b>1-5 years</b>	<b>1. Existing Building and Infrastructure</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Protection planning area</b>	<b>Design will take into account climate adaption and resilience using best available data.</b>			<b>Design will take into account vulnerable populations.</b>



**ACTION NO. 23**

**Title: PROGRAM DEVELOPMENT FOR PERMITTING OF PRIVATE STORMWATER DETENTION BASINS**

<b>Hazard(s) Addressed</b>	<b>Description of Action</b>			<b>Implementing Department</b>
<b>Drought Extreme Heat Flooding Hurricane/Tropical Storms</b>	<b>Developing and funding the inspection and permitting of private stormwater detention basins within HCWCID110.</b>			<b>HCWCID110 Board and Staff District Engineering Consultants District Legal Consultants</b>
<b>Potential Funding Sources</b>	<b>Cost Estimate</b>	<b>Priority</b>	<b>Time Frame</b>	<b>Reduces Risk to:</b>
<b>FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO</b>	<b>\$50,000</b>	<b>H</b>	<b>1-5 years</b>	<b>1. Existing Building and Infrastructure</b>
<b>Cost Benefit (avoided losses)</b>	<b>Future Conditions Consideration (e.g.: climate change, population change)</b>			<b>Risk Addressed with note on benefit to vulnerable populations</b>
<b>Protection planning area</b>				

## Section 5. Plan Maintenance Process

### Introduction

The plan maintenance section of this document details the formal process that will ensure that HCWCID110 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 HCWCID110 will integrate public participation throughout the plan and implementation process and explain how HCWCID110 plans to incorporate the mitigation strategies outlined in this plan into existing planning mechanisms.

### Monitoring, Evaluation and Updating the Plan

Sustained maintenance keeps the mitigation goals and actions moving forward and keeps key stakeholders and the public involved. Key components include monitoring, evaluating, and updating. The maintenance process includes a schedule for monitoring and evaluating the plan annually and producing an updated plan every five years. HCWCID110’s schedule can be found in Table 38.

**Develop Procedures For:**

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**Monitoring.** Tracking the implementation of the plan over time.

**Evaluating.** Assessing the effectiveness of the plan at achieving its stated purpose and goals.

**Updating.** Reviewing and revising the plan at least once every 5 years.

*Table 38 - Monitoring, Evaluating and Updating Schedule*

Plan Maintenance Step	When	Description
<b>Monitoring</b>	Annually, near the anniversary of adoption	<ul style="list-style-type: none"> <li>• Status updates on actions</li> <li>• Progress report</li> <li>• Identify mid-course corrections</li> </ul> LEAD: District Manager
<b>Evaluating</b>	Once every two years, can be included with monitoring. Also would occur after a disaster event	<ul style="list-style-type: none"> <li>• Use a prepared form to evaluate how the plan has been carried out</li> <li>• Record lesson learned</li> </ul> LEAD: District Manager
<b>Updating</b>	Will begin on the anniversary of the fourth year of the adoption or after a disaster event	<ul style="list-style-type: none"> <li>• Review the plan and update</li> <li>• Follow update guidelines from FEMA</li> </ul> LEAD: District Manager

## Monitoring

Tracking progress on mitigation actions reduces the amount of work it takes to update actions at the five-year update. To help facilitate that process, the MPC will hold an annual hazard mitigation plan review meeting. The team will use the following report to monitor the progress of the actions:

<b>Report Period</b>	<b>From Date:</b>		<b>To Date:</b>	
<b>Mitigation Action Project Name</b>				
<b>Mitigation Action Code</b>				
<b>Administering Department or Agency</b>				
<b>Point of Contact Name</b>				
<b>Contact Phone Number</b>				
<b>Contact Email</b>				
<b>Project Status</b>	<input type="checkbox"/> Project Completed <input type="checkbox"/> Project Cancelled Reason for cancelation:  <input type="checkbox"/> Project on Schedule <input type="checkbox"/> Project delayed Reason for Delay:  <input type="checkbox"/> Anticipated Completion Date:			

As part of the annual review process, the team will provide the following:

- 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.

## Evaluating for Effectiveness

Evaluating means looking at how well the plan is meeting its goals. This goes a step beyond monitoring; it asks if the plan is serving its intended purpose. It lets the planning team see if any changes need to be made. This review will include: an evaluation of the progress of incorporating the actions into other plans, reviewing risk assessment and hazards, reviewing the strategy and keeping key stakeholders and the public informed and involved. HCWCID110 plans to use FEMA Region 3’s checklist as a guide.

Discussion Checklist	
Planning Process	<input type="checkbox"/> Reach out to all planning partners to get them familiar with the HMP. This will build accountability. It will also help to make the five-year update less of a lift.
	<input type="checkbox"/> Make sure expectations for the review are specific. Ask communities to bring new information or data.
	<input type="checkbox"/> Work data and actions from your HMP into other plans, policies and programs.
	<input type="checkbox"/> Invite new partners that did not participate in the last plan update.
	<input type="checkbox"/> Discuss ways to fund your next plan update. Seek funding in year three to have in place by year four.
Risk Assessment	<input type="checkbox"/> Record any major state or federal disaster/declarations or hazard events that affected you in the past year. Update your hazard profiles as needed.
	<input type="checkbox"/> Discuss any changes in population, land use or development in high-hazard areas. Document any impacts on community vulnerability.
	<input type="checkbox"/> Factor in any new hazard data, tools or risk information. Think about any new information on the effect of future conditions, such as climate change.
	<input type="checkbox"/> Check whether there are new flood maps. Also, look at relevant Risk MAP products. For jurisdictions that take part in the NFIP, the plan must include regulatory flood mapping products.
Mitigation Strategy	<input type="checkbox"/> Encourage local partners to get familiar with the identified mitigation projects. This helps partners share accountability. It will also help them prepare for funding opportunities.
	<input type="checkbox"/> Discuss whether local capabilities or risk reduction goals have changed.
	<input type="checkbox"/> Check that the mitigation actions still align with local capabilities and risk reduction goals.
	<input type="checkbox"/> Report mitigation progress and successes. Include funding received and training held.
Implementation	<input type="checkbox"/> Discuss whether new training, data, funding sources or technical assistance could help you carry out mitigation actions. Identify the next steps.
	<input type="checkbox"/> Brainstorm non-FEMA funding sources. Base these on how your mitigation goals align with other plans.
	<input type="checkbox"/> Plan ways to make your mitigation priorities and actions known to potential funding partners. This way, when funds are available, you are ready to apply.

## Updating

Major comprehensive review of and revisions to this Hazard Mitigation Plan Update will be considered on a five-year cycle. The 2024 Plan will enter its next review cycle sometime in 2028, with adoption of that update in 2029. The MPC will be reconvened to conduct the comprehensive evaluation and revision.

Circumstances or conditions under which the HCWCID110 will initiate Plan reviews and updates outside of the annual review:

- On the recommendation of HCWCID110 District Manager or on its own initiative, HCWCID110 Board may initiate a Plan review at any time.
- After natural hazard event(s) that appear to significantly change the apparent risk to District assets, operations and/or citizens.
- When activities of HCWCID110, 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. In addition to the scheduled reports, HCWCID110 District 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:

- 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 HCWCID110 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.

## Integration into Existing Plans and Procedures

HCWCID110 is a political subdivision of the State of Texas. HCWCID110 will work to find out what local, regional and state plans already exist that could benefit from information found in this plan. Examples include but not limited to:

- City of Houston Comprehensive Plan
- Harris County Comprehensive Plan
- San Jacinto Regional Flood Plan
- Harris County and City of Houston's Hazard Mitigation Plans



- Harris County and City of Houston stormwater management plan, wastewater and water plans
- Harris County Flood Control District's watershed reports and flood control reports and partnership opportunities

## **Continued Public Involvement**

This plan is meant to be a living document rather than a document that is only updated every five years. In order to keep the public involved in this on-going process, HCWCID110 will:

- Maintain a publicly accessible copy of the plan available online
- Post notice of any changes to the plan on the website
- Work to try and create a system for feedback and publicize opportunities for feedback

HCWCID110 will work to integrate materials and public feedback into related and on-going public engagement activities.

# Appendices

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## Appendix A – Minutes from MPC Meetings



### Minutes

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PROJECT:	Hazard Mitigation Plan	MEETING DATE:	7/12/2023
PROJECT NO:	1168	TIME:	7:30 – 9:00 AM
SUBJECT:	Hazard Mitigation Plan Kick Off Meeting		
LOCATION:	19023 Joanleigh Drive, Spring, TX 77388		
ATTENDEES:	Jeanie Perkins – First Vice President Vanessa Sommer - Secretary Brian Mills – District Manager Matt Zeve – Gauge Engineering Jeff Ward – JSWA, Inc		

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#### 1. Introductions

Members were introduced to one another and a discussion of roles, responsibilities and project schedule were discussed.

#### 2. Project Plan, Goals, and Processes

The purpose of the meeting was to begin the planning process, learn about the changes required from the recently released local mitigation planning handbook, finalize the MPC membership, to make certain decisions about contents of the plan, and to assign specific tasks to HCWCID110 staff and consultants.

#### 3. Plan requirements Outline

There general outline of the plan requirements were discussed and how best to obtain data regarding those sections: Community Profile, Planning Process, Hazard Identification and Risk Assessment, Mitigation Strategy and Maintenance.

#### 4. Outreach Plan

There was a discussion of current ways the District communicates and outreaches to the community to see what could support outreach for this plan.





## Minutes

PROJECT: Hazard Mitigation Plan  
 PROJECT NO: 1168  
 SUBJECT: Hazard Mitigation Plan Mitigation Planning Committee (MPC) First Meeting Minutes  
 LOCATION: 19023 Joanleigh Drive, Spring, TX 77388  
 MEETING DATE: 8/7/2023  
 TIME: 3:00 – 5:00 PM  
 ATTENDEES: Jeanie Perkins – First Vice President  
 Vanessa Sommer - Secretary  
 Brian Mills – District Manager  
 Matt Zeve – Gauge Engineering  
 Jeff Ward – JSWA, Inc  
 Kristen Thatcher – JSWA, Inc  
 Chase Ward – JSWA, Inc  
 John Davis – Langford Engineering, Inc. (District Engineer)  
 Deidra Daniels – SK Law  
 Maria Paker – SK Law (Attorney for the District)  
 Josh Kahn – SK Law

### 1. **Finalize stakeholders**

The Team reviewed the draft list and suggested some changes and additions. District staff will populate the list reach information and provide to the MPC on or at the next meeting.

### 2. **FEMA Hazard Identification**

The Team reviewed FEMA's list of hazards and Harris County's list natural hazards from its Hazard Mitigation Plan and removed the hazards that do not occur in the area. They also discussed hazards that do impact the area and the mitigation responsibilities of the Conservation and Improvement District verses Harris County's from the identified hazards based on their jurisdictional authority. The following hazards were identified as occurring in the planning area and if the District has the authority to provide mitigation actions.

Natural Hazard	Hazard Occurs within the HCWCID110 Planning Area	Mitigation Authority	Provide a risk profile
Coastal erosion	No	N/A – not going to assess as it does not occur in area.	No
Dam/levee failure	While dams exist in Harris County, none of the dams closes to the planning area would have any effect on the planning area in the event of a failure.	N/A – not going to assess as it does not occur in area.	No
Drought	Yes	Yes. The District has authority to conserve water and protect its assets.	Yes
Earthquake	A query of the USGS fault database indicates there are no Classification A or B faults in Harris County Texas <a href="https://www.usgs.gov/centers/naturalhazardscenter/products/earthquake-hazard-assessments">Quaternary Fault and Fold Database of the United States (usgs.gov)</a>	N/A – not going to assess as it does not occur in area.	No





## Minutes

Natural Hazard	Hazard Occurs within the HCWCID110 Planning Area	Mitigation Authority	Provide a risk profile
Extreme Cold/Freezes	Yes	Yes. The District has the authority to protect its assets	Yes
Extreme Heat	Yes	Yes. The District has authority to conserve water protect its assets.	Yes
Flooding	Yes	Yes. The District has the authority to support regional drainage facilities and take an active role in pursuing flood mitigation to alleviate flooding in the District.	Yes
Hurricanes and Tropical Storms	Yes	Yes. The District has the authority to support regional drainage facilities and take an active role in pursuing flood mitigation to alleviate flooding in the District.	Yes
Mass movement (landslides, sinkholes, and subsidence)	Yes	Yes. The District has the authority to protects its assets.	Yes
Thunderstorms/damaging winds	Yes	Yes. The District has the authority to protect its assets.	Yes
Hail	Yes	The District has the authority to protect its assets.	Yes
Extreme Heat	Yes	Yes. The District has authority to conserve water and protect its assets.	Yes
Lightning	Yes	The District has the authority to protect its assets.	Yes
Tornadoes	Yes	The District has the authority to protect its assets.	Yes
Winter storms	Yes	The District has the authority to protect its assets.	Yes
Wildfire	Yes	The District has the authority to protect its assets.	Yes

### 3. Outreach Plan

The MPC discussed the importance of outreach and education and awareness of what is a hazard mitigation plan and its importance. To help gauge the community's overall concerns and awareness, a survey will be created to be placed on the District's website. Responses will inform local natural hazard mitigation planning. The MPC will use responses for potential mitigation actions and confirm the hazards the team identified and prioritized.

### 4. Schedule





## Minutes

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PROJECT: Hazard Mitigation Plan  
PROJECT NO: 1168  
SUBJECT: Hazard Mitigation Plan Mitigation Planning Committee  
(MPC) First Meeting Minutes  
LOCATION: 19023 Joanleigh Drive, Spring, TX 77388  
ATTENDEES: Jeanie Perkins – First Vice President  
Vanessa Sommer - Secretary  
Brian Mills – District Manager  
Matt Zeve – Gauge Engineering  
Jeff Ward – JSWA, Inc  
Chase Ward – JSWA, Inc

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### 1. **Finalize stakeholders**

The team evaluated the draft stakeholder list. District staff will populate the list with any information they have and JSWA will finalize the remainder of the list.

### 2. **Review draft hazard Profiles (PowerPoint Presentation)**

MPC reviewed the criteria for each of the classifications: Location, Maximum Probable Extent, Probability of Future Events, and Overall Significance

### 3. **Using the draft hazard profiles, hazard classification and ranking (high/medium/low)**

Using the criteria listed below the MPC went through each hazard and ranked each of the classifications, as defined below. The results are as follows:

#### **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% probability of occurrence in the next year or a recurrence interval of > every 100 years.

**Occasional:** 1 to 10% probability of occurrence in the next year or a recurrence interval of 11 to 100 years.

**Likely:** 10 to 90% 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 < than 1 year.







## Minutes

### 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.

Natural Hazard	Location (N, L, S, E)	Maximum Extent (W, M, S, E)	Likelihood of Occurrence (U, O, L, H)	Overall Significance (L, M, H)	Community Assets at risk
Drought	E	M	L	M	Infrastructure, Water Wells, Water Transmission lines, Water distribution
Extreme Cold/Freezes	E	M	L	M	Infrastructure, Water Wells, Water transmission lines, Water distribution
Extreme Heat	E	W	L	L	None
Flooding	E	E	H	H	Wastewater treatment plant, lift stations, water tower, admin offices, parks
Hail	E	W	L	L	District buildings
Hurricanes and Tropical Storms	E	E	H	H	Wastewater treatment plant, lift stations, water tower, admin offices, parks, trash services, and debris pickup
Lightning	E	M	H	M	District buildings and water tower
Subsidence	E	W	U	L	District buildings, all wells, and pipes



## Minutes

Natural Hazard	Location (N, L, S, E)	Maximum Extent (W, M, S, E)	Likelihood of Occurrence (U, O, L, H)	Overall Significance (L, M, H)	Community Assets at risk
Thunderstorms/ damaging winds	E	S	H	H	District buildings and water tower
Tornados	E	S	U	L	All assets
Wildfire	S	W	U	L	District buildings, wastewater treatment
Winter storms	E	W	U	L	None

#### 4. Draft Survey

The District was provided with a list of 10 draft survey questions from JSWA. It was discussed that these questions are templates and questions could be removed or added as the District sees fit. JSWA explained that this survey will be presented to the public and is typically put on the planning area's website and any social media accounts that may be available. JSWA will provide the District with a link that can be shared to any platform. MPC discussed the importance of getting survey out to public as soon as possible to allow for longest time for results.

#### 5. Schedule

MPC reviewed the upcoming schedule to determine when to have the first public meeting. From discussions, it appears that October 19<sup>th</sup> may be the best day to have the meeting. The next MPC meeting will also need to be scheduled and the District will get with JSWA staff to pick a date once the public meeting date is confirmed.

#### Actions from meeting

Action Item	Assigned
Prepare minutes and distribute to MPC	JSWA
Update stakeholder list and distribute for review	MPC
Review draft survey questions and provide any changes	District staff <b>COMPLETED</b>
Determine where to place survey	District staff <b>COMPLETED</b>
Schedule public meeting	MPC (District staff to confirm date and time and coordinate with JSWA)
Schedule next MPC meeting	MPC



## Minutes

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PROJECT: Hazard Mitigation Plan  
PROJECT NO: 1168  
SUBJECT: Hazard Mitigation Plan Mitigation Planning Committee (MPC) Meeting Minutes  
LOCATION: 19023 Joanleigh Drive, Spring, TX 77388  
MEETING DATE: 11/1/2023  
TIME: 9:00 – 11:00 PMAM

ATTENDEES: James Williams - President  
Jeanie Perkins – First Vice President  
Jerry Strickland – Second Vice President  
Vanessa Sommer – Secretary  
Tom Dowdy - Treasurer  
Brian Mills – District Manager  
Matt Zeve – Gauge Engineering  
Jeff Ward – JSWA, Inc  
Chase Ward – JSWA, Inc  
Kristen Thatcher – JSWA, Inc  
Maria Salinas Parker – Sanford Kuhl Parker Kahn LLP  
John Davis – Langford Engineering  
Norman Gutierrez – Langford Engineering

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### 1. **Review Minutes from 9-13-23 meeting**

The team reviewed and approved the minutes from the 9-13-23 meeting.

### 2. **Mitigation Goal**

The MPC reviewed examples of goals, including the State of Texas Hazard Mitigation Goals, and drafted the following goal statement for the plan:

The goal of this plan is to support the Harris County Water Conservation and Improvement District's efforts to protect the community by mitigating risks due to natural hazards that:

- Minimize loss of life, injury and damage to property, the economy, and the environment from natural hazards.
- Build and enhance local mitigation capabilities to ensure the safety and resilience of all community members. Reduce damage to public buildings and ensure continuity of emergency services.
- Maintain the jurisdiction's natural and man-made systems including public utility systems that protect against natural hazards.
- Increase cooperation and coordination among private entities, local agencies, state agencies and federal agencies.

### 3. **Mitigation Actions**

Part of the mitigation strategy is to have specific actions that are identified and detailed that reduce risk to natural hazards. Mitigation actions generally fall into four categories: local plans and regulation; structure and infrastructure projects; natural systems protection and nature-based solutions; and education and awareness.

The MPC discussed some of the issues natural hazards like flooding have caused in the area and what actions could be prepared to address those issues. A subset of members were tasked with preparing a draft action

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## Minutes

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Item report for Board review and input at the next meeting.

#### 4. Local capabilities

Each jurisdiction has a unique set of tools available to increase their resilience from natural hazards. These tools are capabilities that include laws, policies, programs, staff, funding and other resources on hand to carry out the plan's mitigation strategy. The plan must describe what authorities, policies, programs, funding, and resources HCWCID has to accomplish hazard mitigation and if there are areas that could be added, expanded, or improved. A subset of members were tasked with completed a draft of the District's capabilities utilizing the enabling legislation as guidance. The draft will be prepared for full Board review and input at the next meeting.

#### 5. Schedule

MPC will be given some dates to confirm the next MPC meeting.

#### Actions from meeting

Action Item	Assigned
Prepare minutes and distribute to MPC	JSWA
Prepare Mitigation Action Report for Board review	Subset of MPC
Prepare Local Capabilities report for Board review	Subset of MPC
Provide Enabling Legislation	District staff
Schedule next MPC meeting	MPC

**HARRIS COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 110  
MINUTES OF MEETING OF BOARD OF DIRECTORS**

**December 13, 2023**

<b>THE STATE OF TEXAS</b>	<b>§</b>
<b>COUNTY OF HARRIS</b>	<b>§</b>
<b>HARRIS COUNTY WATER CONTROL AND</b>	<b>§</b>
<b>IMPROVEMENT DISTRICT NO. 110</b>	<b>§</b>

The Board of Directors (the “Board”) of Harris County Water Control and Improvement District No. 110 (the “District”) met in **regular session**, open to the public, at the designated meeting place of the Board in the District on **December 13, 2023, at 9:00 a.m.** Whereupon, at 9:08 a.m., the roll was called of the duly constituted officers and members of the Board, to-wit:

James N. Williams	-	President
Jeannie Perkins	-	First Vice President/Asst. Secretary
Jerry A. Strickland	-	Second Vice President
Vanessa Sommer	-	Secretary
Tom Dowdy	-	Treasurer/Investment Officer

All Directors were present, thus constituting a quorum.

Also present at the meeting were Brian Mills, District Manager; Shane Breyette, Maintenance Manager; John Davis and Norman Gutierrez of Langford Engineering Inc. (“LEI”), Engineers for the District; Ryan Fortner of Revenue Management Services (“RMS”); J.C. Reno of Storm Water Solutions (“SWS”); Pat Hall of Equi-Tax, Tax Assessor/Collector for the District; Kim Shelnett of Myrtle Cruz, Inc. (“Myrtle Cruz”), Bookkeeper for the District; Captain Medina and Sgt. Walker of Harris County Precinct 4 Constables’ Office; Mike Williams and Mario Garcia of Municipal Operations (“MOC”), Operators for the District; Stephen Eustis of R.W. Baird (“Baird”), Financial Advisors for the District; Kenneth Farrer of Best Trash; Matt Zeve of Guage Engineering; Kristen Thatcher of JSWA; Maria S. Parker, Joshua J. Kahn, and Deidra Daniels (paralegal) of Sanford Kuhl Hagan Kugle Parker Kahn, LLP (“SK Law”), Attorneys for the District; and members of the Public listed on the attached Attendance Sheet.

The meeting was called to order and the following business was conducted.

Some Agenda items were taken out of order.

**HEAR FROM THE PUBLIC**

The Board noted that no Public wished to address the Board.

**HAZARD MITIGATION**

The Board recognized Mr. Zeve, who advised that the Hazard Mitigation Plan (the “HMP”) Committee met on December 11, 2023, and reviewed with the Board the prioritized action items and discussed holding a virtual Stakeholders’ meeting on December 27, 2023.

Upon motion by Director Strickland, seconded by Director Sommer, and after full discussion, the board voted unanimously to approved the prioritized action items and the scheduling of a virtual Stakeholders’ meeting on December 27, 2023.



## Appendix B – Stakeholder Letter

**HARRIS COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. 110**  
**1980 Post Oak Boulevard, Suite 1380**  
**Houston, Texas 77056**

December 14, 2023

Mr. Todd Ward  
Risk Mitigation Department Manager  
Harris County Flood Control District  
9900 NW Freeway  
Houston, TX 77092

RE: Request to Participate as a Stakeholder to the Harris County Water Control and Improvement District No. 110 Local Hazard Mitigation Plan

Dear Mr. Ward:

Harris County Water Control and Improvement District No. 110 (“HCWCID110” or the “District”) is in the process of preparing a Hazard Mitigation Plan (the “HMP”), a prerequisite to certain kinds of nonemergency disaster assistance programs such as Hazard Mitigation Assistance grants. While the HMP is drafted by a Mitigation Planning Committee (the “MPC”) comprised of members from HCWCID110’s Board, staff, and outside consultants, the MPC recognizes the importance of receiving input and expertise from the community throughout the planning process.

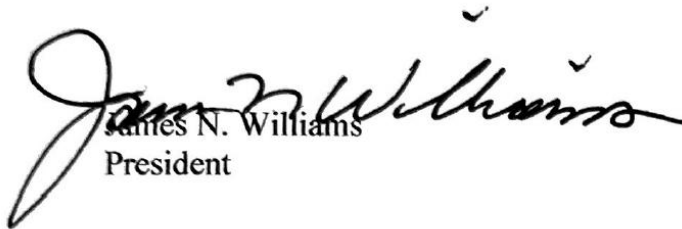
The planning process is an opportunity to bring together a wide range of community-based partners representing the interests of the entire community. The MPC has identified individuals and organizations who may be affected by mitigation actions and policies and who can provide specific information on topics or provide input from a different point of view in the community including:

- Local and regional agencies involved in hazard mitigation activities
- Agencies that have the authority to regulate development
- Neighboring communities
- Representatives of businesses, academia, and other private organizations
- Representatives of nonprofit organizations, including community-based organizations, that work directly with and/or provide support to underserved communities and socially vulnerable populations, among others.

This is a great opportunity for your organization to be involved in the planning process and the MPC would like to cordially invite you to be a member of the stakeholder group. Participation includes providing information and reviewing the HMP from your experience and perspective to ensure that it is representative of the entire District. It will not require any in-person meetings. We will have a video conference call to provide background on the HMP and how stakeholders can help draft the HMP and we will email you a link to review the HMP, as well as invite you to attend the public meetings.

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

Sincerely,



James N. Williams  
President

## Appendix C – Public Notice

**NOTICE OF PUBLIC HEARING/HARRIS COUNTY WATER  
CONTROL AND IMPROVEMENT DISTRICT NO. 110/HAZARD  
MITIGATION PLAN (the Plan”)  
AFFIDAVIT OF PUBLICATION  
THE STATE OF TEXAS**

The Affiant, Kim DeShazer, having knowledge of the matters hereinafter set forth, after being duly sworn, deposes and states under oath that the following statements are true and correct;

1. Affiant is the Senior Account Executive of the Houston Business Journal; a weekly newspaper published in Harris County, Texas and of general circulation in Harris, Chambers, Liberty, Montgomery, Waller, Fort Bend, Brazoria and Galveston Counties.
2. The notice, of which the annexed is true copy, was published on September 29th, 2023 in the classified advertising of said publication.

Further Affiant sayeth not.

Executed this the 30<sup>th</sup> day of January, 2024..

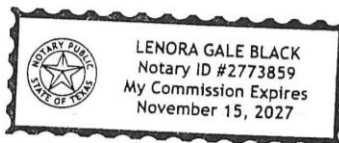
Affiant:

Printed Name: Kim DeShazer

SUBSCRIBED AND SWORN BEFORE ME, on the 30<sup>th</sup> day of January, 2024.

by Lenora Gale Black  
Notary Public

Lenora Gale Black  
Typed Name of Notary





LEGALS

**REQUEST FOR COMPETITIVE SEALED PROPOSALS**

The San Jacinto River Authority (SJRA) will receive Request for Competitive Sealed Proposals for the following Highlands Division Projects:

**Project Number:** CSP #22-0036-A  
**Project Name:** Siphon 7 Improvements Phase 2  
**Project Description:** Construction Services

**Mandatory Pre-Proposal Conference:** Thursday, October 12, 2023, 9:00 A.M. (CST)  
 SJRA Highlands Division – 1108 E. Canal Rd.,  
 Highlands, TX 77562

**Solicitation Due Date:** Friday, October 20, 2023, 11:00 A.M. (CST)

Request for Competitive Sealed Proposals (CSP) solicits information and pricing which will enable SJRA to determine the "best value" contractor, in accordance with the provisions of Chapter 49 of the Texas Water Code, and Texas Government Code 2269. SJRA reserves the right to reject or accept any proposal and award to the most advantageous proposal received. Local, minority, and small contractors are encouraged to apply.

All electronic sealed proposals shall be received prior to 11:00 A.M. (CST), Friday, October 20, 2023. All responses received after that time will be rejected.

Electronic Proposals shall be submitted through the Brazos Valley e-Marketplace site at: <https://arabidbid.com/vawcnet/login.aspx>. All interested Respondents are required to register as a "supplier" at the above web address by clicking on "Supplier Registration" to be able to upload a proposal response.

**COPIES OF SOLICITATION DOCUMENTS**

Solicitation Documents may be downloaded from the Brazos Valley e-marketplace site at: <https://arabidbid.com/vawcnet/login.aspx>. All interested Respondents are required to register as a "supplier" to view the solicitation documents.

The SJRA reserves the right to reject any or all submissions and to waive informalities and irregularities.

**INVITATION TO BIDDERS**

Sealed bids, in duplicate, addressed to **Board of Directors, Northwest Harris County Municipal Utility District No. 5**, will be received at the office of BGE, Inc., 10777 Westheimer, Suite 500, Houston, Texas, 77042 (Phone: 281-558-8700) OR electronically through [www.CivcastUSA.com](http://www.CivcastUSA.com) until 10:00 AM Local Time, Friday, October 13, 2023, at which time all bids will be opened and publicly read at the office of BGE, Inc. and through Microsoft Teams. The Call-in number is (832) 680-2579 and the Conference ID is 113 167 2438 for the furnishing of all material, equipment, labor and supervision necessary or incidental to "Construction of Wastewater Treatment Plant No. 2 Headwork Modifications and Lift Station Addition for Northwest Harris County MUD No. 5, Harris County, Texas."

**Scope of Project:**  
 Scope of work to include but not limited to: Construction of new 21-6" diameter concrete lift stations; modification to the headwork structure by demolition of existing, force mains, piping, valves, fittings, pipe supports, and concrete wall section, installation of new piping, pipe supports, and handrails; relocate headwork platform walkway section to dechlorination chamber along with new stairs, handrails, and concrete landing; rehabilitation of headwork structure to include but not limited to power washing, abrasive blasting, and recasting headwork interior channel, aboveground and influent piping, valves, and appurtenances; site work to include but not limited to demolition of force mains, installation of sanitary sewers, force main, manholes, pavement replacement, bollards, dewatering, groundwater control system, and site restoration; electrical system updates; provide labor material, equipment, and appurtenances for bypass pumping; in accordance with the plans and specifications. Complete in place.

Bids received after the closing time will be returned unopened.

A non-mandatory pre-bid conference will be held on Monday, October 2, 2023, at 10:00 AM Local Time. On-Site 15342 Grant Road, Cypress, Texas 77429.

Plans, specifications and bid documents are available at [www.civcastusa.com](http://www.civcastusa.com); search: 11095-00.

A bidder submitting Electronic Bids must submit its Bid and bid securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and bid securities must be submitted through [www.civcastusa.com](http://www.civcastusa.com).

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

**INVITATION TO BIDDERS**

Richey Road MUD Date: September 22, 2023

Sealed Electronic Bids addressed to Richey Road Municipal Utility District, Attention Dennis M. Cain, President, Board of Directors, will be electronically received, until 10:00 a.m. Local Time, Friday, October 6, 2023, and then publicly opened and read at Vogler & Spencer Engineering, Inc. for "HIOC Sanitary Sewer CIPP Liner Repairs within Richey Road Municipal Utility District, Harris County, Texas." In addition to the opening of sealed Bids at the address above, you may view the public opening of sealed Bids via Civcast. To join via Civcast login to your account to access the posting of the Bid Summary document immediately following the bid opening.

Scope of Work of the Contract Documents includes the following: Cured-In-Place-Pipe (CIPP) liner repairs on 18-inch to 21-inch sanitary sewer lines and point repairs on 8-inch to 12-inch sanitary sewer lines. Work shall include all appurtenances to insure proper function of sanitary sewer trunk lines.

Bids received after the closing time will be returned unopened.

Each Bid must be accompanied by a Bid bond or a certified or cashier's check, acceptable to the Owner, in an amount not less than two percent (2%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder. If a certified or cashier's check is provided, the successful bidder shall deliver, at the bid opening address, the original certified or cashier's check within one (1) business day of receipt of the bid opening.

Copies of the bidding documents may be reviewed and obtained from [www.CivcastUSA.com](http://www.CivcastUSA.com); search: 0990-003-6-ITL. Bidders must register on this website in order to view and/or download specifications, plans, soils report, and environmental reports for this Project. There is NO charge to view or download documents.

Bidder must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and Bid Securities must be submitted through [www.CivcastUSA.com](http://www.CivcastUSA.com). Bidder must register on this website to submit a Bid and Bid Security and there is NO charge to submit Bids and Bid Securities on this website.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed, or agreed to using an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and result in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

**INVITATION TO BIDDERS**

Sealed Bids addressed to Brazoria County Municipal Utility District No. 28, Attention: Me Nigel Brooks, President, Board of Directors, will be received electronically or at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042, until 10:00 a.m. Local Time, Tuesday, October 10, 2023, and then publicly opened and read at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042 for "Water, Sanitary Sewer, Drainage Facilities, and Detention Facilities and Alternate Paving and Appurtenances to Serve Creekside at Highland Glen Section 2 for Brazoria County Municipal Utility District No. 28, Brazoria County, Texas." In addition to the opening of sealed Bids at the address above, you may attend the Bid Opening by telephone by dialing +1 346-202-6170, Phone Conference ID: 469 319 8678.

Scope of Work of the Contract Documents includes the following: water, sanitary sewer, drainage facilities and detention facilities & alternate paving and appurtenances.

Bids received after the closing time will be returned unopened. A non-mandatory pre-bid conference will be held remotely on Tuesday, October 3, 2023, at 10:00 a.m. Local Time at the office of LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042. To attend the audio format non-mandatory pre-bid conference, dial +1 346-202-6170, Phone Conference ID: 633 001 5124.

Each Bid must be accompanied by a Bid bond or a certified or cashier's check, acceptable to the Owner, in an amount not less than two percent (2%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder. If a certified or cashier's check is provided, the successful bidder shall deliver, at the bid opening address, the original certified or cashier's check within one (1) business day of receipt of the bid opening.

Bidding documents may be examined at LJA Engineering, Inc., AGC of Texas, Construct Contract, and Amtek or may be obtained by prospective bidders or suppliers upon payment of \$100.00 non-refundable plus cost of delivery (\$50.00 for electronic copy) for each set of documents at LJA Engineering, Inc., 3600 W. Sam Houston Parkway S., Suite 150, Houston, Texas 77042, or at <https://bids.lja.com>. Checks should be made payable to LJA Engineering, Inc. No cash will be accepted.

A bidder submitting electronic Bids must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all electronic Bid and Bid Securities must be submitted through [bids.lja.com](http://bids.lja.com). Bidders must register and obtain bidding documents on this website for the requirements payment amount (if any) to submit an electronic bid.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed or agreed to through the use of an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and result in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

**INVITATION TO BIDDERS**

Harris County MUD No. 1 Date: September 22, 2023

Sealed Electronic Bids addressed to Harris County Municipal Utility District No. 1, Attention Doug Caldwell, Jr., President, Board of Directors, will be electronically received, until 10:00 a.m. Local Time, Friday, October 6, 2023, and then publicly opened and read at Vogler & Spencer Engineering, Inc. for "Water Interconnect with Harris-Montgomery Counties Municipal Utility District No. 386 within Harris County Municipal Utility District No. 1, Harris County, Texas." In addition to the opening of sealed Bids at the address above, you may view the public opening of sealed Bids via Civcast. To join via Civcast login to your account to access the posting of the Bid Summary document immediately following the bid opening.

Scope of Work of the Contract Documents includes the following: Provide and install water line and water meter.

Bids received after the closing time will be returned unopened.

Each Bid must be accompanied by a Bid bond or a certified or cashier's check, acceptable to the Owner, in an amount not less than two percent (2%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder. If a certified or cashier's check is provided, the successful bidder shall deliver, at the bid opening address, the original certified or cashier's check within one (1) business day of receipt of the bid opening.

Copies of the bidding documents may be reviewed and obtained from [www.CivcastUSA.com](http://www.CivcastUSA.com); search: 19900-045-4-ITL. Bidders must register on this website in order to view and/or download specifications, plans, soils report, and environmental reports for this Project. There is NO charge to view or download documents.

Bidder must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and Bid Securities must be submitted through [www.CivcastUSA.com](http://www.CivcastUSA.com). Bidder must register on this website to submit a Bid and Bid Security and there is NO charge to submit Bids and Bid Securities on this website.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed, or agreed to using an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and result in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

**INVITATION TO BIDDERS**

Electronic Bids addressed to SSIT INC. FOR THE BENEFIT OF GALVESTON COUNTY MUNICIPAL UTILITY DISTRICT NO. 79, Attention Board of Directors, will be electronically received, Friday, October 6, 2023 until 9:30 a.m. Local Time, and then publicly opened and read at IDS Engineering Group, 13430 Northwest Freeway, Suite 700, Houston, Texas 77040 for "SANITARY SEWER LIFT STATION TO SERVE MARLOW LAKE NORTH, Project No. 2334-012-01, Contract No. 1 for SSIT INC. FOR THE BENEFIT OF GALVESTON COUNTY MUNICIPAL UTILITY DISTRICT NO. 79, TEXAS CITY, GALVESTON COUNTY, Texas" using the CivCast USA ("CivCast") website: [www.CivCastUSA.com](http://www.CivCastUSA.com). In addition to the opening of electronic Bids via the address above, you may access the public opening of electronic Bids via tele-conference. To join the bid opening conference remotely please dial (605) 472-5684 and use access code 4182636.

Scope of Work of the Contract Documents includes the following: the construction of a 6-foot diameter sanitary sewer lift station including site paving, grading, yard piping, and appurtenances.

Bids received after the closing time will be returned unopened. A pre-bid conference will be held remotely on Friday, September 29, 2023 at 9:30 a.m. Local Time. The Prebid is NOT Mandatory. For access to the teleconference for both the pre-bid and the bid opening, dial (605) 472-5684, and use access code: 4182636.

Each Bid must be accompanied by a Bid bond or a certified or cashier's check, acceptable to the Owner, in an amount not less than 5 percent (5%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder. If a certified or cashier's check is provided, the successful bidder shall deliver, at the bid opening address, the original certified or cashier's check within one (1) business day of receipt of the bid opening.

Copies of the bidding documents may be reviewed and obtained from [www.CivcastUSA.com](http://www.CivcastUSA.com); search "Sanitary Sewer LS to serve Marlow Lake North". Bidders must register on this website in order to view and/or download specifications, plans, soils report, and environmental reports for this Project. There is NO charge to view or download documents.

Bidder must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and Bid Securities must be submitted through [www.CivCastUSA.com](http://www.CivCastUSA.com). Bidder must register on this website to submit a Bid and Bid Security and there is no charge to submit Bids and Bid Securities on this website.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed, or agreed to using an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and result in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

SSIT INC. FOR THE BENEFIT OF GALVESTON COUNTY MUNICIPAL UTILITY DISTRICT NO. 79 SEPTEMBER 2023

**INVITATION TO BIDDERS**

Sealed bids addressed to Bridgeland Development, LP on behalf of HCMUD 490, will be received in the office of HR Green, Inc., 11011 Richmond Ave, Suite 200, Houston, Texas 77042 (Phone: 713-955-9996) until 2:00 p.m. on Wednesday, October 11, 2023 at which time all bids will be opened and publicly read via Microsoft Teams for the furnishing of all material, equipment, labor and supervision necessary or incidental to the "Construction of TRAFFIC SIGNAL AT NORTH BRIDGELAND LAKE PKWY & PEEK RD." Call in number to join the bid opening is 347-378-3366 and conference ID is 9363556147.

**Scope of Project:**  
 1. Install Traffic Signals and cabling at one intersection including foundation.  
 2. Install underground conduit for traffic signal timing and loop detectors.

A non-mandatory pre-bid conference will be held virtually via Microsoft Teams on Wednesday, October 4, 2023, at 2:00 p.m. Call in number to join the Teams meeting is 347-378-3366 and conference ID is 4830703484.

Plans, specifications and bid documents are available at [www.civcastusa.com](http://www.civcastusa.com); search: 210837.

A cashier's check or bid bond 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 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.

**NOTICE OF PUBLIC HEARING**

Harris County Water Control and Improvement District No. 110 (the "District") is preparing a Hazard Mitigation Plan (the "Plan"), as required by the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). The public is invited to a meeting for an overview of the importance of the Plan, status of the planning process, and an explanation of how the public can support the initiative. The Plan is required to be eligible for certain types of federal grants. The Plan 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 the 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. This meeting will be held on OCTOBER 19, 2023, at 9 A.M., at 19023 JOANLEIGH DR., SPRING, TEXAS 77388. The Public may also attend this hearing via Zoom audio/video conference. To join by video, use the following link: <https://us02wch.zoom.us/j/81920528844?pwd=TFMxUjVWUWp0b0p0VW50aUlnUjNlUzE5KUt02>. To join by phone, call 346-248-7799. The Meeting ID 819 2052 8844 and the Passcode is 789406.

**INVITATION TO BIDDERS**

Electronic Bids addressed to SSIT INC. FOR THE BENEFIT OF GALVESTON COUNTY MUNICIPAL UTILITY DISTRICT NO. 79, Attention Board of Directors, will be electronically received, Friday, October 6, 2023 until 9:30 a.m. Local Time, and then publicly opened and read at IDS Engineering Group, 13430 Northwest Freeway, Suite 700, Houston, Texas 77040 for "SANITARY SEWER LIFT STATION TO SERVE MARLOW LAKE NORTH, Project No. 2334-012-01, Contract No. 1 for SSIT INC. FOR THE BENEFIT OF GALVESTON COUNTY MUNICIPAL UTILITY DISTRICT NO. 79, TEXAS CITY, GALVESTON COUNTY, Texas" using the CivCast USA ("CivCast") website: [www.CivCastUSA.com](http://www.CivCastUSA.com). In addition to the opening of electronic Bids via the address above, you may access the public opening of electronic Bids via tele-conference. To join the bid opening conference remotely please dial (605) 472-5684 and use access code 4182636.

Scope of Work of the Contract Documents includes the following: the construction of a 6-foot diameter sanitary sewer lift station including site paving, grading, yard piping, and appurtenances.

Bids received after the closing time will be returned unopened. A pre-bid conference will be held remotely on Friday, September 29, 2023 at 9:30 a.m. Local Time. The Prebid is NOT Mandatory. For access to the teleconference for both the pre-bid and the bid opening, dial (605) 472-5684, and use access code: 4182636.

Each Bid must be accompanied by a Bid bond or a certified or cashier's check, acceptable to the Owner, in an amount not less than 5 percent (5%) of the total amount Bid, as a guarantee that the successful bidder will enter into the Contract Documents and execute the Bonds on the forms provided and provide the required insurance certificates and Bonds within seven (7) days after the date Contract Documents are received by the successful bidder. If a certified or cashier's check is provided, the successful bidder shall deliver, at the bid opening address, the original certified or cashier's check within one (1) business day of receipt of the bid opening.

Copies of the bidding documents may be reviewed and obtained from [www.CivcastUSA.com](http://www.CivcastUSA.com); search "Sanitary Sewer LS to serve Marlow Lake North". Bidders must register on this website in order to view and/or download specifications, plans, soils report, and environmental reports for this Project. There is NO charge to view or download documents.

Bidder must submit its Bid and Bid Securities in compliance with Owner's Order Adopting Section 49.2731 Electronic Bidding Rules and all Bids and Bid Securities must be submitted through [www.CivCastUSA.com](http://www.CivCastUSA.com). Bidder must register on this website to submit a Bid and Bid Security and there is no charge to submit Bids and Bid Securities on this website.

By submitting a Bid, bidder acknowledges and agrees that the Contract Documents may be accepted, executed, or agreed to using an Electronic Signature, as defined by and in accordance with Owner's Electronic Signature Rules for Construction Contracts.

The Owner reserves the right to reject any or all Bids and to waive all defects and irregularities in bidding or bidding process except the time for submitting a Bid. The successful bidder, if any, will be the responsible bidder, which in the Board's judgment will be most advantageous to the District and result in the best and most economical completion of the Project.

The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Bid and the bidder agrees that the Contract Documents can be terminated if the bidder knowingly or intentionally fails to comply with a requirement of that subchapter.

SSIT INC. FOR THE BENEFIT OF GALVESTON COUNTY MUNICIPAL UTILITY DISTRICT NO. 79 SEPTEMBER 2023

**NOTICE OF PUBLIC HEARING/HAZARD MITIGATION PLAN  
(THE PLAN)  
Affidavit of Publication  
The State of Texas**

The Affiant, Sheila Stringer, having knowledge of the matters hereinafter set forth, after being duly sworn, deposes and states under oath that the following statements are true and correct;

1. Affiant is the Office Administrator of the Houston Business Journal; a weekly newspaper published in Harris County, Texas and of general circulation in Harris, Chambers, Liberty, Montgomery, Waller, Fort Bend, Brazoria and Galveston Counties.
2. The notice, of which the annexed is true copy, was published on March 1st, 2024 in the classified advertising of said publication.

Further Affiant sayeth not.

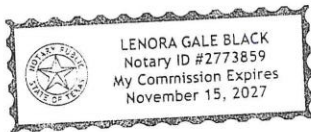
Executed this the 18th day of March, 2024.

Affiant: Sheila Stringer  
Printed Name: Sheila Stringer

SUBSCRIBED AND SWORN BEFORE ME, on the 18th day of March, 2024.

by Lenora Gale Black  
Notary Public

Lenora Gale Black  
Typed Name of Notary





Legal #s for 3/17/24

LEGALS

**ADVERTISEMENT FOR BIDS**  
GULFGATE REDEVELOPMENT AUTHORITY/TIRZ 8

**Project Name:** Maitley Rd Storm Rehabilitation – (TIRZ #8 from 01-45 to Section 5) WBS No. 21-01000-0004-7  
**Bids Due:** March 25, 2024

All bids must be submitted electronically through [www.CivicaBidUSA.com](http://www.CivicaBidUSA.com). No bids shall be accepted in person. Upload the executed offer on the bid forms provided, properly signed, with required Surety Deposit, and other Supplements to bid forms until 10:00 A.M., Friday, March 25, 2024. A cashiers check or bid bond in the amount of 10% of the total amount bid must accompany each bid. The successful bidder will be required to provide a performance and payment bond in the contract documents for the full amount of the contract.

**Scope of Project:** The Maitley Rd Storm Rehabilitation project generally involves a line bid and 5 Alternate bid improvements as follows:

**Line Bid**

The Line Bid improvement limits are from Section 56 to Airport Blvd (STA 52+88.74) including the southern portion of Airport Blvd and includes the following improvements:

- Preparatory work for sampling and analysis on Potentially Toxic/Contaminated Area (PTCA).
- Construction of high early strength 11-inch reinforced concrete pavement with line reinforced edge and dowel concrete curbs.
- Construction of high early strength 7-inch and 5-inch reinforced concrete ditches.
- Limited construction of reinforced concrete sidewalks and wheelchair ramps.
- Remove and replace storm sewer pipes with reinforced concrete storm pipe ranging in diameter from 12-in to 36-in, 18" x 23" arch pipe, 28" x 35" arch pipe, and 27" x 44" arch pipe.
- Removal and replacement of storm sewer manholes and inlets.
- Limited installation of 10-inch sanitary sewer, manholes and appurtenances.
- Installation of 8-inch water line, fire hydrant, and related appurtenances.
- Installation of proposed thermoplastic pavement markings and signage.

**Alternate 1**

The alternate 1 improvement limits are from Airport Blvd (STA 52+88.74) to 01-45 southbound feeder road, and includes the following improvements:

- Asphaltic concrete full depth reconstruction which includes asphaltic concrete, base and subgrade.
- Installation of manhole, curb and gutter, flush curb/gutter and dowel curb.
- Construction of high early strength 7-inch reinforced concrete ditches.
- Limited construction of reinforced concrete sidewalks, and wheelchair ramps.
- Installation of proposed thermoplastic pavement markings and signage.

**Alternate 2**

The alternate 2 improvement limits are from Airport Blvd (STA 52+88.74) to 01-45 southbound feeder road, and includes the following improvements:

- Preparatory work for sampling and analysis on Potentially Toxic/Contaminated Area (PTCA).
- Installation of 8-inch water line, fire hydrant, and related appurtenances.

**Alternate 3**

The alternate 3 improvement limits are from STA 1+00 to STA 17+05.92, and includes the following improvements:

- Preparatory work for sampling and analysis on Potentially Toxic/Contaminated Area (PTCA).
- Cleaning/skimming of existing reinforced concrete box (RCB) storm sewers.
- RCB storm sewer inside joint repair.

Bidders shall comply with City Ordinance 95-336 and State Order No. 1-2, and City of Houston Affirmative Action and Contract Compliance Division Minority/Women / Disadvantaged Business Enterprise (M/WBE) Procedures. The successful bidder will be required to make good faith efforts to achieve a MBE participation goal of 10 % and WBE participation goal of 8%.

The Gulfgate Redevelopment Authority/TIRZ 8 may award the contract for the project to the most responsible bidder who, in the judgment of the Gulfgate Redevelopment Authority/TIRZ 8, will be most advantageous to the Gulfgate Redevelopment Authority/TIRZ 8 and results in the best and most economical completion of the project. Bidders shall also submit qualifications with their bids as set forth in the contract documents.

Plans, specifications, and bid documents are available at [www.civicanon.com](http://www.civicanon.com).

The Gulfgate Redevelopment Authority/TIRZ 8 reserves the right to reject any or all bids, accept any bid with similar work experience or waive information in bidding. All bids received after the closing time designated will not be accepted. A **MANDATORILY PREBID CONFERENCE** will be conducted at Lockheed, Andrews and Newton, Inc. 2925 Briarpark Dr, Suite 401, Houston, Texas 77042, on **Tuesday, March 19, 2024 at 2:00 p.m.**

**NOTICE TO BIDDERS**

Sealed bids in duplicate, will be received by HARRIS COUNTY MUNICIPAL UTILITY DISTRICT NO. 102 at the office of Estess & Woodman, Inc., 11450 Conroy Center Dr. West, Suite 600, Houston, Texas 77070, until **WEDNESDAY, MARCH 20, 2024, AT 2:00 P.M.**, at which time all bids will be opened and publicly read for furnishing all material, equipment, labor and supervision necessary for completion of the following:

**1.36 MGD WASTEWATER TREATMENT PLANT HEADWORKS IMPROVEMENTS**

The major items of work include: *Demolition of existing manual bar screens and upgrade of 24-inch fine mesh; construction of new 18-inch fine mesh; construction of concrete platform and associated fundings; and access roadway installation of heavy duty storm with open channel and associated piping and electrical work; construction of dumpster pad and drain line; construction of concrete perimeter for dump truck access.*

Each bid proposal must be accompanied by a bid bond from a reliable surety company down to the order of HARRIS COUNTY MUNICIPAL UTILITY DISTRICT NO. 102 in the amount of five percent (5%) of the total bid. No bid proposal may be withdrawn for a period of sixty (60) days after the bid opening date. The CPMS/ID reserves the right to reject any or all bids, or to accept the bid deemed most advantageous to it. The successful bidder will be required to provide the performance, payment, and maintenance bond for the full amount of the contract.

A Pre-Bid Conference will be held at the office of Estess & Woodman, Inc., 11450 Conroy Center Dr. West, Suite 600, Houston, Texas 77070 on **WEDNESDAY, MARCH 13, 2024, 2:00 P.M.** Attendance is not mandatory.

Specifications and Bid Documents are available online at <https://www.civicanon.com> or may be purchased at the office of Estess & Woodman, Inc., 11450 Conroy Center Dr., Suite 600, Houston, Texas 77070, for a non-refundable fee of \$100.00. Bidding hours are Monday through Thursday from 7:30 A.M. until 5:00 P.M. and Friday from 7:30 A.M. until 12:30 P.M. Telephone 281-550-7027.

February 23, 2024  
**CATEGORICAL EXCLUSION**  
TO ALL INTERESTED AGENCIES AND PUBLIC GROUPS.

As provided by the state environmental review process adopted in the rules of the Texas Water Development Board (TWDB), 31 Texas Administrative Code (TAC) § 375.61, for projects to be funded through the Clean Water State Revolving Fund (CWSRF) Program and consistent with the National Environmental Policy Act, 42 United States Code § 4321, et seq., the TWDB staff has determined that the proposed action identified below may be exempted from formal environmental review requirements:

Northgate Creating Municipal Utility District No. 2, Harris County, Texas  
TWDB CWSRF Project No. 29545  
Northgate Creating Regional WWTP Reclaimed Storage, Supply, and Distribution  
Total Financing Amount: \$5,995,996  
Loan No. L1001607, L1001677

The Northgate Creating Municipal Utility District No. 2 (District) is proposing to use \$5,995,996 in financing from the CWSRF program for the Northgate Creating Regional WWTP Reclaimed Storage, Supply, and Distribution project to add tertiary treatment at an existing WWTP, enabling treated effluent to be used for irrigation where possible water is currently used. Tertiary treatment upgrades include the installation of disk filters, a grand storage tank, a pump station, a hydroponics tank, a building to store an air compressor, a backflow pump station, a transfer station, a sanitary manhole, associated yardwork lines, a grand driveway, and water oxidation. The proposed project also includes installation of approximately 250 linear feet of new storm water line.

The treatment plant upgrades will occur within the existing wastewater treatment plant (WWTP) site. Hydro mulch was added to the wastewater treatment facility after construction and has been regularly reseeded since. Approximately 17% of the work will replace an existing grand driveway. Through open tracking to be provided for all lines within the WWTP boundary, the proposed extension across the railroad will be installed via trenchless construction methods.

Compass Environmental Solutions, LLC (Compass) performed a Wetland Delineation, Threatened and Endangered Species Report, and Cultural Resources Assessment in a report dated December 7, 2023. Based on the wetland delineation data collected during their evaluation, Compass advised that no waters of the U.S. are present within the proposed project site. The U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) are the final authority over the jurisdictional status of both wetlands and waters of the U.S. per Section 404 of the Clean Water Act. These findings are solely the professional judgment of Compass and have not been verified by the aforementioned regulatory government agencies.

Seven federally-listed species are believed to occur within the vicinity of the subject property. However, no critical habitat is listed as occurring in the subject property and no listed species were identified during Compass field investigation. Therefore, the project is not likely to adversely affect any listed species.

There are no previously recorded significant or potentially significant historical or cultural sites within or adjacent to the project footprint, according to the Texas Historical Commission's State Site Atlas, nor in the proposed project within a protected area surrounding a historic cemetery, structure, or district.

The proposed project is not located within the 100-year floodplain however, portions of the project are located within the 500-year (or 0.2 percent) floodplain, as designated by the Federal Emergency Management Agency (FEMA). According to the Harris County Engineering Department website, "all development within the unincorporated area of Harris County without first securing a permit is prohibited." Consequently, the District should consult the Harris County floodplain administrator prior to approval of project design documents.

The staff of the TWDB recommended issuance of a Categorical Exclusion for this project; the decision to grant a Categorical Exclusion is allowed because the specified project elements will not cause significant adverse impacts to the quality of the human environment or protected natural resources. Documentation supporting this determination is on file at the TWDB.

This determination shall be revoked if it is found that:

1. the project no longer meets the requirements for a Categorical Exclusion as a result of changes in the project;
2. the project involves extraordinary circumstances as described in 31 TAC § 375.62 or
3. the project may violate or be in violation of federal, state, local, or tribal laws.

The proposed project must comply with the following special and standard environmental conditions:

**Special Environmental Conditions**

- Comply with the Flood Insurance Reform Act of 2004, federal Executive Order 11988, Texas Water Code Section 16.315, and local floodplain development ordinances. Floodplain development permissions will be obtained from the local floodplain administrator prior to construction.

**Standard Environmental Conditions**

- No activity which may affect property located or proposed eligible for listing in the National Register of Historic Places or eligible for designation as a State Archeological Landmark is authorized and the Owner has complied with the provisions of the National Historic Preservation Act and the Antiquities Code of Texas.
- If archeological sites or historic structures which may qualify for designation as a State Archeological Landmark according to the criteria in 15 Texas Administrative Code Chapter 26, or that may be eligible for listing on the National Register of Historic Places in accordance with 36 CFR Part 800, are discovered after construction operations are begun, the Contractor shall immediately cease operations in that particular area and notify the Owner, the TWDB, and the Texas Historical Commission. The Contractor shall take reasonable steps to protect and preserve the discoveries until they have been inspected by the Owner's representative and the TWDB. The Owner will promptly coordinate with the State Historic Preservation Officer and any other appropriate agencies to obtain any necessary approvals or permits to enable the work to continue. The Contractor shall not resume work in the area of the discovery until authorized to do so by the Owner.
- No activity is authorized that is likely to jeopardize the continued existence of a threatened or endangered species as listed or proposed for listing under the Federal Endangered Species Act (ESA), and/or the State of Texas Parks and Wildlife Code on Endangered Species, or to destroy or adversely modify the habitat of such species.
- If a threatened or endangered species is encountered during construction, the Contractor shall immediately cease work in the area of the encounter and notify the Owner, who will immediately implement actions in accordance with the ESA and applicable State statute. These actions shall include reporting the encounter to the TWDB, the U.S. Fish and Wildlife Service, and the Texas Parks and Wildlife Department, obtaining any necessary approvals or permits to enable the work to continue, or implement other mitigation actions. The Contractor shall not resume construction in the encounter area until authorized by the Owner.

The TWDB may not fund testing, remediation, removal, disposal, or related work for contaminated or potentially contaminated material. However, the project proponent should ensure that, if found, such materials are tested, removed, and disposed of in accordance with applicable state and federal laws.

Comments regarding this determination may be submitted to the Director of Regional Water Project Development, Texas Water Development Board, P.O. Box 15231, Austin, Texas 78711-5231 or via email at [TWDB-Development@twdb.texas.gov](mailto:TWDB-Development@twdb.texas.gov).

**NOTICE OF SALE**  
NORTHWEST HARRIS COUNTY MUNICIPAL UTILITY DISTRICT NO. 12  
(A political subdivision located within Harris County, Texas)

\$5,770,000  
Unlimited Tax Bonds Series 2024A

Northwest Harris County Municipal Utility District No. 12 will open bids on Monday, March 18, 2024 at 10:00 a.m. Houston time, at the office of the GMS Group, L.L.C., 5075 Washburn, Suite 1175, Houston, TX 77056-5606 for the District's \$5,770,000 Unlimited Tax Bonds, Series 2024A. The Board will take action to reject the bids or accept the bid that produces the lowest net effective interest rate for the Bonds at a meeting to be held on Monday, March 18, 2024 at 3:30 p.m., Houston time. The Board will conduct the meeting at the District's regular meeting place located at 1817 Macon Road, Katy, Texas 77460. The Bonds are more completely described in the "Official Notice of Sale" and the Preliminary Official Statement" which may be obtained from the GMS Group, L.L.C., Attention: John Howell, 5075 Washburn, Suite 1175, Houston, Texas, 77056-5606, (713) 622-7620 Financial Advisor to the District.

Board of Directors  
Northwest Harris County Municipal Utility District No. 12

**LEGAL NOTICE FOR REQUEST FOR**  
FOR CONSTRUCTION MANAGER AT RISK SERVICES  
RFP #973-24 – Cranbridge Park Junior High School Wang Addition

The Trench Independent School District will accept sealed QUALIFICATIONS as set in the RFP at the "Sealed BID Ancillary Services Building, Atter Zachary Bilen, CPO 1110 Baker Drive, Room 102, Trench TX 77757" until, March 28, 2024, AT 11:59 A.M. CST

RFP available online for download by 12:00 P.M. C.S.T., March 4, 2024, at the link below <https://www.civilandbid.com/show-qb-d-departments/finance/purchasing/bids-and-proposals>

**DEPARTMENT OF HOMELAND SECURITY**  
FEDERAL EMERGENCY MANAGEMENT AGENCY

**Proposed Flood Hazard Determinations for Unincorporated Area of Harris County, Texas, Case No. 22-46-2564F.** The Department of Homeland Security's Federal Emergency Management Agency (FEMA) solicits additional information or comments on proposed flood hazard determinations for the Flood Insurance Rate Map (FIRM), and where applicable, the Flood Insurance Study (FIS) report for your community. These flood hazard determinations may include the addition or modification of base Flood Elevation, base Flood Depth, Special Flood Hazard Area boundaries or zone designations, or the regulatory floodway. The FIRM and, if applicable, the FIS report have been revised to reflect these flood hazard determinations through issuance of a Letter of Map Revision (LOMR), in accordance with Title 44, Part 65 of the Code of Federal Regulations. These determinations are the basis for the floodplain management measures that your community is required to adopt or show evidence of having in effect to qualify or remain qualified for participation in the National Flood Insurance Program. For more information on the proposed flood hazard determinations and information on the statutory 90-day period provided for appeal, please visit FEMA's website at <https://www.floodmap.com/gov/na/102>, visit <http://www.fema.gov>, or call the FEMA Mapping and Insurance Exchange (PMI) toll-free at 1-877-586-8267 (1-877-FEMA-6267).

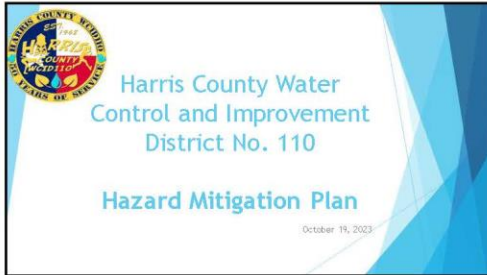
**NOTICE OF PUBLIC HEARING**

Harris County Water Control and Improvement District No. 110 (the "District") is preparing a Hazard Mitigation Plan (the "Plan"), as required by the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). The public is invited to the second of two meetings with the public to be held on March 15, 2024, to discuss the final draft, receive input, and explain how the public can provide additional input. The comment period is open for 30 days and will start March 15, 2024, and run until April 15, 2024. Members of the public are encouraged to attend. This meeting will be held on March 15, 2024, at 4:00 p.m., at 19023 Jansky Dr., Spring, Texas 77388. The public may also attend this hearing via Zoom audio/video conference. To join by video, see the following link: <https://www.zoom.us/j/9200000000>.

The Meeting ID #47 7948 9675 and the Passcode is 477158.

# Appendix D – Stakeholders and Public Presentations

1/30/2024



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**What has the Mitigation Planning Committee been up to?**

2022 Hazards profile and ranked by significance (LOW/MOD/SEV/HIGH)	Community Assets potentially at risk from identified hazard
Flood - H	Wastewater treatment plant, lift stations, water tower, admin offices, parks
Hurricane/Tropical Storm - H	Wastewater treatment plant, lift stations, water tower, admin offices, parks, trash services, and debris pickup
Thunderstorms/damaging winds - H	District buildings and water tower
Drought - M	Infrastructure, Water Wells, Water Transmission lines, Water distribution
Extreme Cold/Freezes - M	Infrastructure, Water Wells, Water transmission lines, Water distribution
Lightning - M	District buildings and water tower
Extreme Heat - L	Lightning detection systems for Parks and Recreation areas
Hail - L	District buildings
Subsidence - L	District buildings, all wells, and pipes
Tornadoes - L	All assets
Wildfire - L	District buildings, wastewater treatment
Winter Storm - L	None

**Community Asset Responsibility**  
 HCWID110 is responsible for water and sewer services for its residents, provides parks and recreations services and operates the Swim and Racquet Club and Forest Oaks Park.

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**How can the Public Help?**

- Identify community assets and problem areas
- Propose mitigation ideas
- Share ideas for long-term public involvement after plan adoption
- Participate in surveys and public meetings
- Describe issues of concern, share threat and hazard history

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**How to find the survey:**

- HCWID110 website: [FLOOD CONTROL INFO | wcid110](#)
- Survey has 10 questions
- It will run for approximately six weeks.
- Responses will help with plan information (e.g. confirmation of hazards, understanding concerns and concern areas)
- Learn more about plans from the fact sheet provided on the website

**Website**

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**RISK INFORMED**

- ▶ Do you have data/information to help further analyze a hazard?
- ▶ Are there hazards that you believe impact the area not listed?
- ▶ Are there areas that are impacted that you want the MPC to be made aware?
- ▶ Are there populations that need to be reached to better understand their ability to prepare, respond, cope and recover from a natural hazard event?
- ▶ Are there assets that need to be identified for protection?
- ▶ Are there reports/studies/assessments that you can provide for more detailed analysis?

**Collaborate   Inform**  
**Involve   Consult**

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**Actions to Mitigate Hazards**

- ▶ For each hazard, two mitigation actions are needed
- ▶ Mitigation Actions primarily fall into four categories:
  - ▶ **Local Planning and Regulations:** include government authority, policies or codes that influence the way land and buildings are developed and built.
  - ▶ **Structure and Infrastructure:** involve modifying existing structures and infrastructures to protect them from a hazard or remove them from a hazard area. This could apply to public or private as well as critical infrastructure.
  - ▶ **Natural Systems Protection:** can include green infrastructure and low impact developments, nature-based solutions, Engineering with nature, and bioengineering to incorporate natural features or processes into the built environment.
  - ▶ **Education and Awareness:** actions keep residents informed about potential natural disasters.



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**Thank You!**

**HMP Update Contacts**  
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msims@geogengineering.com

**JWA Contacts**  
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**Harris County Water Control and Improvement District No. 110 (HCWCID 110)**

**Hazard Mitigation Plan**

Stakeholder Presentation  
December 27, 2023

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**What is Hazard Mitigation?**

- One of the four components to disaster preparedness.
- Reduces impacts from natural hazards through plans, projects and services.
- There are several steps a community can take to help mitigate hazards - developing a Hazard Mitigation Plan (HWP) is one of them.

**What is a Hazard Mitigation Plan?**

- Mitigation is most effective when it is based on a comprehensive, long-term plan that is developed BEFORE a disaster occurs.
- A Hazard Mitigation Plan (HWP) is used to identify policies and actions that can be implemented to reduce risk and future losses from hazards and disasters.
- It is a community-driven, living document that encourages communities to integrate mitigation into their day-to-day operations and decisions.

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**Why Prepare a Hazard Mitigation Plan?**

- The mitigation plan:
  - Provides a framework to lessen the impacts of natural disasters
  - Analyzes and assesses natural hazards and their risk on the community
  - Establishes a mitigation strategy that encompasses goals, actions to reduce risk that are prioritized, and an implementation plan for the prioritized actions
  - Engages the whole community (e.g., surveys, meetings)
  - Allow HCWCID 110 to be eligible for pre- and post-disaster mitigation funding.
  - Gives an opportunity to integrate plan with other community planning initiatives (comprehensive plan, CRS as examples)

**Requirements for the plan**

- 2014 (b) Planning Process
- 2014 (c)(2) Risk Assessment
- 2014 (c)(2) Mitigation Strategy
- 2014 (c)(4) Risk Reduction
- 2014 (c)(1) Plan Adoption

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### PLANNING PROCESS - Building the planning team

**Board, Staff, Consultants**



**Mitigation Planning Committee (MPC)** - The core group responsible for making decisions, guiding the planning process, and agreeing upon the final contents of the plan. These are often leaders from the local communities that will adopt the plan (mayors, town administrators, county commissioners, etc.).

**Stakeholders**



**Stakeholders** - Individuals or groups that affect or can be affected by a mitigation action or policy.

**Public**



**Public Engagement** - Input from community members can strengthen the content and outcomes of the mitigation plan.

Community input and public participation are key to a successful mitigation plan

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### Risk Assessment

- ▶ Identify hazards
- ▶ Describe each hazard
- ▶ Profile each hazard
  - ▶ Location - where it might happen in the planning area
  - ▶ Extent - how minor or severe it may be
  - ▶ Previous Events - how often and where it has happened in the past
  - ▶ Future Probability - how likely it is to occur and how it may change (frequency/intensity) in the future
- ▶ Identify community assets
- ▶ Analyze impacts - the effects on assets
- ▶ Summarize vulnerability - which assets are at risk



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#### Identified Hazards

2024 Hazard ID

- Chemical
- Extreme Cold/Freeze
- Extreme Heat
- Fluvial
- Hail
- Health-care/Disruptive
- Lightning
- Thunderstorm/Downsping Wind
- Tornadoes
- Wildfire
- Winter Storms
- Winter


Consider each consideration: monitor, assess, assess, defend, and use resources

#### Hazard Profile

**DROUGHT**

Consideration: Drought is a long-term weather condition characterized by an extended period of abnormally low precipitation. It is a natural phenomenon that can occur in any region and at any time of the year. Drought is a complex phenomenon that is influenced by many factors, including climate change, land use, and water management. It can have significant impacts on the environment, agriculture, and human health. Drought is a global problem that affects billions of people and is a major threat to food security and water availability. Drought is a complex phenomenon that is influenced by many factors, including climate change, land use, and water management. It can have significant impacts on the environment, agriculture, and human health. Drought is a global problem that affects billions of people and is a major threat to food security and water availability.

**Assets**



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**RISK INFORMED**

- Do you have data/information to help further analyze a hazard?
- Are there hazards that you believe impact the area not listed?
- Are there areas that are impacted that you want the A/P/C to be made aware?
- Are there populations that need to be reached to better understand their ability to prepare, respond, cope and recover from a natural hazard event?
- Are there assets that need to be identified for protection?
- Are there reports/studies/assessments that you can provide for more detailed analysis?

**Collaborate Inform  
Involve Consult**

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**HCWCID110 Mitigation Strategy**

Goal - Support HCWCID's effort to protect community by mitigating risks due to natural hazards that:

- Minimize loss of life, injury and damage to property, the economy, and the environment from natural hazards.
- Build and enhance local mitigation capabilities to ensure the safety and resilience of all community members, reduce damage to public buildings and ensure continuity of emergency services.
- Maintain the jurisdiction's natural and man-made systems including public utility systems that protect against natural hazards.
- Increase cooperation and coordination among private entities, local agencies, state agencies, and federal agencies.

**Mitigation Action Plan**  
Details specific mitigation actions, prioritizes the actions and provides a blueprint for implementation.

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**What has the Mitigation Planning Committee been up to?**

**HMP**

**Community Asset Responsibility**  
HCWCID110 is responsible for water and sewer services for its residents, parks and recreation services, and operates the Swim and Racquet Club and Forest Oaks Park.

Hazard Parameters and ranked by significance (LOW/MEDIUM/HIGH)	Community Assets potentially at Risk from Specified Hazard
Flood - HIGH	Wastewater treatment plant, lift stations, water towers, admin offices, parks
Hurricane/Tropical Storm - HIGH	Wastewater treatment plant, lift stations, water towers, admin offices, parks, trash services, and debris pickup
Thunderstorms/damaging winds - HIGH	District buildings and water tower
Drought - MEDIUM	Infrastructure, water wells, water transmission lines, water distribution
Extreme Cold/Freeze - MEDIUM	Infrastructure, water wells, water transmission lines, water distribution
Lightning - MEDIUM	District buildings and water tower
Extreme Heat - LOW	Lightning detection systems for Parks and Recreation areas
Hail - LOW	District buildings
Subsidence - LOW	District buildings, all wells, and pipes
Tornadoes - LOW	All assets
Wildfire - LOW	District buildings, wastewater treatment
Winter Storm - LOW	None

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### Actions to Mitigate Hazards

- ▶ For each hazard, two mitigation actions are needed
- ▶ Mitigation Actions primarily fall into four categories:
  - ▶ **Local Planning and Regulations:** include government action plans, policies or codes that influence the way land and buildings are developed and built.
  - ▶ **Structure and Infrastructure:** involve modifying existing structures and infrastructures to protect them from a hazard or remove them from a hazard area. They could apply to public or private as well as critical infrastructure.
  - ▶ **Natural Systems Protection:** can include green infrastructure and low impact development, nature-based solutions, Engineering with nature and allowing/nurturing to incorporate natural features or processes into the built environment.
  - ▶ **Education and Awareness:** actions keep residents informed about potential natural disasters.



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### Actions Being Considered

- Develop an IMA of the IMA
- IMC/ID/ID 11: Stormwater Detention Project
- Provide Inlets to Storm and Water County IMA Equipment on District website
- Check existing status of IMC/ID/ID Building
- Work with IMA equipment (Storm County and ID/ID) to support public water program to provide clean water and water conservation
- Installation of Water and Sewer Treatment Plant
- Extra District Plan
- Program Development for Providing of Stormwater Detention Tanks
- Establish Process with Storm County Subdivision District (SCSD) on Subdivision Information
- Lighting Risk and Storm Protection of Building and Other of District
- Check Water Meter Protection Water Conservation System in all Districts
- Expanding water conservation in IMA

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### Actions Being Considered

- Public Personnel Equipment
- Expanding Fire Station Network for Public Protection (Fire, and gas)
- Storm and Water County IMA Equipment on District website
- Replace existing stormwater Building, and or Water Meter with drought tolerant water and water conservation
- Stormwater treatment system for water conservation
- Work with regional flood planning organization so that projects are studied that could impact the planning area
- Work with IMC/ID/ID to provide water conservation on District District
- Installation of water
- Add Stormwater Conservation System to IMC/ID/ID Building
- Add Stormwater System to IMC/ID/ID Building
- Replace Existing and Stormwater with water conservation on IMC/ID/ID Building

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### Plan Maintenance

- MONITORING THE PLAN**  
The District will monitor the mitigation actions to ensure that they are going to plan.
- EVALUATING THE PLAN**  
The District will meet regularly, and after major natural hazard events, to evaluate how well the plan is working.
- UPDATING THE PLAN**  
The District will continue to update the Plan every 5 years.
- INTEGRATING THE PLAN**  
The District will integrate data, information, and actions from the HAP into other City plans and initiatives.
- PUBLIC PARTICIPATION THROUGHOUT PLAN MAINTENANCE**  
The District is committed to public participation. Public engagement activities will align with the evaluation, monitoring, and plan update meetings as well as with larger natural hazard events.

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### How can Stakeholders Help?

Each of you has a unique expertise, experience, and community perspective

- Mitigation action ideas
- Data/information on hazard/impact/asset and community vulnerability
- Reports/ Studies/ Assessments
- Outreach to larger community

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### How to find the survey:

- HCWCID website: [FLOOD\\_CONTROL\\_INFO | wcid110](http://FLOOD_CONTROL_INFO | wcid110)
- Survey has 10 questions
- Responses will help will plan information (e.g. confirmation of hazards, understanding concerns and concern areas)
- Learn more about plans from the fact sheet provided on the website

### Website

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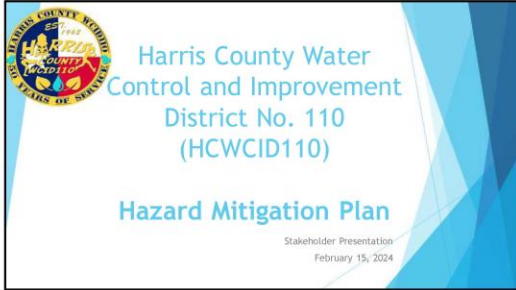
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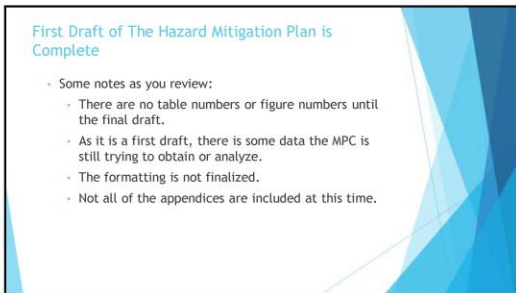
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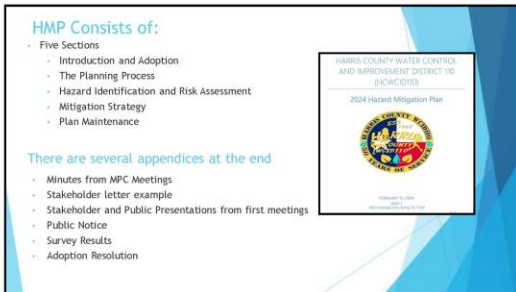
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### Risk Assessment

- Identify hazards
- Describe each hazard
- Profile each hazard
  - Location - where it might happen in the planning area
  - Extent - how minor or severe it may be
  - Previous Events - how often and where it has happened in the past
  - Future Probability - how likely it is to occur and how it may change (frequency/intensity) in the future
- Identify community assets
- Analyze impacts - the effects on assets
- Summarize vulnerability - which assets are at risk

**Risk**

**Socially Vulnerable Populations**

- Essential to include impacts to socially vulnerable populations
- The most at risk members in a community tend to suffer the greatest losses from disasters

**Impacts of Climate Change**

- Essential to include impacts to socially vulnerable populations
- The most at risk members in a community tend to suffer the greatest losses from disasters

**Stakeholders: How can we do better outreach?**

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### MPC Identified Hazards

CCD Hazard	Rating
Strong Wind	Medium
Extreme Cold/Freezes	Low
Extreme Heat	Low
Thunder	High
Hail	Low
Flashflood/Hydrological Storm	High
Lightning	Medium
Subsidence	Low
Thunderstorm/Damaging Wind	High
Tornado	Low
Ice Storm	Low
Minor Seismic	Low

*Excluded from this assessment: coastal erosion; sea level rise; landslides; and subsidence.*

### Survey Says:

How concerned are you about the following hazard?	Estimated Concern %
Strong Wind	13.33%
Extreme Cold/Freezes	15.91%
Extreme Heat	15.91%
Thunder	30.30%
Hail	2%
Flashflood/Hydrological Storm	66.67%
Lightning	2%
Subsidence	2.27%
Thunderstorm/Damaging Wind	2%
Tornado	11.36%
Ice Storm	6.22%
Minor Seismic	9.09%

*Lightning and hail were included in the survey but not in this assessment.*

**Assets**

People Structures Systems Resources Activities

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### HCWCID110 Mitigation Strategy

Goal - Support HCWCID110's effort to protect community by mitigating risk s due to natural hazards that:

- Minimize loss of life, injury and damage to property, the economy, and the environment from natural hazards.
- Build and enhance local mitigation capabilities to ensure the safety and resilience of all community members, reduce damage to public buildings, and ensure continuity of emergency services.
- Maintain the jurisdiction's natural and man-made systems including public safety systems that protect against natural hazards.
- Increase cooperation and coordination among private entities, local agencies, state agencies, and federal agencies.

**Mitigation Action Plan**  
Details specific mitigation actions, prioritizes the actions and provides a blueprint for implementation.

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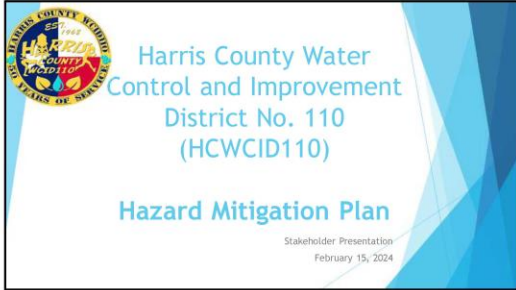
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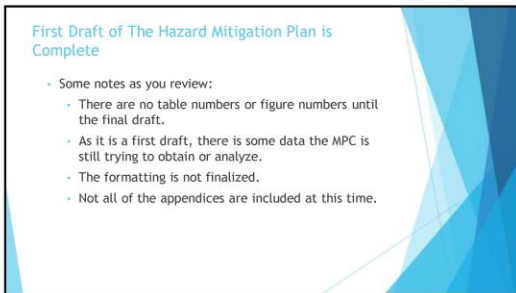
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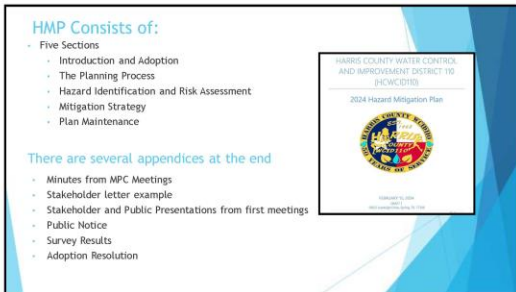
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### Risk Assessment

- Identify hazards
- Describe each hazard
- Profile each hazard
  - Location - where it might happen in the planning area
  - Extent - how minor or severe it may be
  - Previous Events - how often and where it has happened in the past
  - Future Probability - how likely it is to occur and how it may change (frequency/intensity) in the future
- Identify community assets
- Analyze impacts - the effects on assets
- Summarize vulnerability - which assets are at risk

**Socially Vulnerable Populations**

- Essential to include impacts to socially vulnerable populations
- The most at risk members in a community tend to suffer the greatest losses from disasters

**Impacts of Climate Change**

- Essential to include impacts to socially vulnerable populations
- The most at risk members in a community tend to suffer the greatest losses from disasters

**Stakeholders: How can we do better outreach?**

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### MPC Identified Hazards

CCD Hazard	Rating
Energy	Medium
Extreme Cold/Freezes	Medium
Extreme Heat	Low
Firestorm	High
Flood	Low
Hurricanes/Tropical Storms	High
Lightning	Medium
Industries	Low
Thunderstorms/Damaging Winds	High
Tornado	Low
Wildfire	Low
Minor Seismic	Low

*Excluded from this assessment: coastal erosion; sea level rise; and subsidence.*

### Survey Says:

Hazard	How concerned are you about the following hazard?	Estimated Losses/Deaths
Firestorm	33.33%	
Extreme Cold/Freezes	15.91%	
Extreme Heat	15.91%	
Flood	30.30%	
Fall	29%	
Hurricanes/Tropical Storms	60.61%	
Lightning	29%	
Industries	29%	
Thunderstorms/Damaging Winds	22.73%	
Tornado	29%	
Wildfire	11.36%	
Seismic	8.82%	
Minor Seismic	9.09%	

*Lightning and wind includes the area fire in Thunderstorms response.*

**Assets**

- People
- Structures
- Systems
- Resources
- Activities

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### HCWCID110 Mitigation Strategy

Goal - Support HCWCID110's effort to protect community by mitigating risk s due to natural hazards that:

- Minimize loss of life, injury and damage to property, the economy, and the environment from natural hazards.
- Build and enhance local mitigation capabilities to ensure the safety and resilience of all community members, reduce damage to public buildings, and ensure continuity of emergency services.
- Maintain the jurisdiction's natural and man-made systems including public safety systems that protect against natural hazards.
- Increase cooperation and coordination among private entities, local agencies, state agencies, and federal agencies.

**Mitigation Action Plan**  
Details specific mitigation actions, prioritizes the actions and provides a blueprint for implementation.

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### Does the Plan meet the requirements?

<b>Element A: Planning Process</b> Description: The planning process must be documented and include the following: - A clear statement of the purpose and scope of the plan. - A clear statement of the objectives and goals of the plan. - A clear statement of the roles and responsibilities of the planning team. - A clear statement of the timeline and milestones of the plan. - A clear statement of the resources and budget for the plan. - A clear statement of the risks and mitigation strategies for the plan. - A clear statement of the monitoring and evaluation process for the plan.	<b>Element B: Risk Assessment</b> Description: The risk assessment must be documented and include the following: - A clear statement of the risks and their potential impacts. - A clear statement of the likelihood and severity of the risks. - A clear statement of the mitigation strategies for the risks. - A clear statement of the monitoring and evaluation process for the risks.	<b>Element C: Regulatory Strategy</b> Description: The regulatory strategy must be documented and include the following: - A clear statement of the regulatory requirements that apply to the plan. - A clear statement of the strategies for meeting these requirements. - A clear statement of the monitoring and evaluation process for the regulatory strategy.
<b>Element D: Plan Maintenance</b> Description: The plan must be maintained and updated as needed to ensure it remains relevant and effective.	<b>Element E: Plan Approval</b> Description: The plan must be approved by the appropriate authority before implementation.	

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### How can Stakeholders Help?

Please review the draft, add comments, provide updated information, and ask questions

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### Thank You!

**HOW DO YOU OBTAIN THE DRAFT?**

- The shared link will be sent in an email.
- Comments are due back on or before February 27th.

**HOW DO YOU PROVIDE FEEDBACK?**

- Please download the PDF or Word Document from the link.
- Please provide feedback by:
  - Email comments or changes to Matt and Kristen (emails are to the right).
  - Please send your comments or revised file by email or link (due to size). Please incorporate your initials and date in returned documents, e.g. HCWCID1 (DRMP) rev KT 2.27.24.
  - If just a few pages, you can send pdf of those you revised or updated.
  - Any questions, please contact us.

**HMP Update Contacts**

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**JSWA Contacts**

Jeff Ward, CPE  
 Kristen Thatcher, CPE  
 kthatcher@jswaconsultants.com

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## Appendix E – Survey Results

*Question 1:*

In the past five years, which of the following hazard events have you experienced in Harris County Water Control and Improvement District No. 110 (HCWCID110)? (Check all that apply)

ANSWER CHOICES	RESPONSES	
▼ Drought	89.13%	41
▼ Severe Weather (high winds, lightning, hail)	86.96%	40
▼ Extreme Temperatures (heat and cold)	84.78%	39
▼ Flooding (Street/Land)	54.35%	25
▼ Hurricane/Tropical Storm	34.78%	16
▼ Severe Winter Storms (blizzard, heavy snow, ice)	32.61%	15
▼ Flooding (in a home or business)	17.39%	8
▼ Geologic (Landslide, sinkholes, subsidence)	13.04%	6
▼ Tornado	10.87%	5
▼ Other (please specify) <span style="float: right;"><a href="#">Responses</a></span>	8.70%	4
▼ Wildfire	4.35%	2
<b>Total Respondents: 46</b>		

*Question 2:*

How concerned are you about the following hazards in HCWCID110? Please check one for each hazard.

	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL	WEIGHTED AVERAGE
▼ Flooding - Street/Land	6.82% 3	9.09% 4	27.27% 12	20.45% 9	36.36% 16	44	3.70
▼ Severe Weather (High winds, lightning, hail)	6.82% 3	15.91% 7	25.00% 11	27.27% 12	25.00% 11	44	3.48
▼ Hurricane/Tropical Storm	6.82% 3	13.64% 6	29.55% 13	31.82% 14	18.18% 8	44	3.41
▼ Extreme Temperatures (heat and cold)	6.82% 3	25.00% 11	27.27% 12	25.00% 11	15.91% 7	44	3.18
▼ Flooding - in a home or business	13.64% 6	20.45% 9	25.00% 11	15.91% 7	25.00% 11	44	3.18
▼ Drought	8.89% 4	26.67% 12	28.89% 13	22.22% 10	13.33% 6	45	3.04
▼ Tornado	20.45% 9	31.82% 14	27.27% 12	9.09% 4	11.36% 5	44	2.59
▼ Severe Winter Storms (blizzard, heavy snow, ice)	31.82% 14	27.27% 12	18.18% 8	13.64% 6	9.09% 4	44	2.41
▼ Wildfire	50.00% 22	27.27% 12	11.36% 5	4.55% 2	6.82% 3	44	1.91
▼ Geologic (landslide, sinkholes, subsidence)	45.45% 20	34.09% 15	11.36% 5	6.82% 3	2.27% 1	44	1.86

[Comments \(5\)](#)



*Question 3:*

Please check which hazard(s) have damaged your home. (Check all that apply)

ANSWER CHOICES		RESPONSES	
Severe Weather (high winds, lightning, hail)		75.61%	31
If yes, please specify the damage sustained and or the event that caused the damage	Responses	51.22%	21
Extreme Temperatures (heat and cold)		48.78%	20
Drought		46.34%	19
Flooding (in a home or business)		34.15%	14
Hurricane/Tropical Storm		34.15%	14
Flooding (Street/Land)		31.71%	13
Tornado		14.63%	6
Severe Winter Storms (blizzard, heavy snow, ice)		12.20%	5
Geologic (Landslide, sinkholes, subsidence)		7.32%	3
Wildfire		2.44%	1
Total Respondents: 41			

**Responses:**

Roof was blown off, yard dried up, constantly lose power

Fence blew down during high winds; expensive to repair

Roof damage from trees due to high winds and tornado

Foundation movement, roof damage

Roof, power box damaged, sprinkler pipes frozen

*Question 4:*

How effective do you think the following methods are for providing hazard and disaster information?

	VERY EFFECTIVE	SOMEWHAT EFFECTIVE	NOT EFFECTIVE	UNSURE	TOTAL	WEIGHTED AVERAGE
Texting	75.00% 33	18.18% 8	4.55% 2	2.27% 1	44	1.34
Mass Notification System	50.00% 22	29.55% 13	9.09% 4	11.36% 5	44	1.82
Internet	27.27% 12	63.64% 28	4.55% 2	4.55% 2	44	1.86
Social Media	31.82% 14	43.18% 19	18.18% 8	6.82% 3	44	2.00
TV	11.36% 5	56.82% 25	29.55% 13	2.27% 1	44	2.23
Phone Calls	25.00% 11	29.55% 13	34.09% 15	11.36% 5	44	2.32
Radio	11.36% 5	45.45% 20	34.09% 15	9.09% 4	44	2.41
Outdoor Advertisement	11.36% 5	45.45% 20	29.55% 13	13.64% 6	44	2.45
Public Meetings or Awareness Events	6.82% 3	47.73% 21	29.55% 13	15.91% 7	44	2.55
County Website	4.55% 2	50.00% 22	29.55% 13	15.91% 7	44	2.57
City Website	6.67% 3	42.22% 19	37.78% 17	13.33% 6	45	2.58
Schools	9.30% 4	37.21% 16	27.91% 12	25.58% 11	43	2.70
Newspaper	2.27% 1	18.18% 8	59.09% 26	20.45% 9	44	2.98
Public Library	4.55% 2	13.64% 6	54.55% 24	27.27% 12	44	3.05
<a href="#">Comments (5)</a>						

**Question 5:**

A number of activities can reduce your community's risk from natural hazards. These activities can be both regulatory and non-regulatory. Please check the box that best represents your opinion on the following strategies to reduce the risk and loss associated with natural hazards in HCWCID110.

	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	NOT SURE	TOTAL	WEIGHTED AVERAGE
▼ Making local water, wastewater infrastructure, and other public facilities more disaster resilient	66.67% 30	26.67% 12	2.22% 1	0.00% 0	4.44% 2	0.00% 0	45	1.49
▼ Making your home more disaster resilient	43.48% 20	34.78% 16	19.57% 9	2.17% 1	0.00% 0	0.00% 0	46	1.80
▼ Develop local inventory of at-risk buildings and infrastructure	44.44% 20	31.11% 14	13.33% 6	2.22% 1	4.44% 2	4.44% 2	45	2.04
▼ Combination of regulatory (policies and standards) as well as nonregulatory (education and awareness) approaches to reducing risk	22.22% 10	53.33% 24	13.33% 6	2.22% 1	6.67% 3	2.22% 1	45	2.24
▼ Regulatory approach to reducing risk (e.g. Park facility rules and water use restrictions)	22.22% 10	46.67% 21	15.56% 7	4.44% 2	8.89% 4	2.22% 1	45	2.38

[Comments \(4\)](#)

*Question 6:*

Natural hazards can have a significant impact on a community, but planning for these events can help lessen the impacts. The following statements will help us determine the priorities of our residents regarding planning for natural hazards in HCWCID110. Please tell us how important each one is to you.

	VERY IMPORTANT	SOMEWHAT IMPORTANT	NEUTRAL	NOT VERY IMPORTANT	NOT IMPORTANT	TOTAL	WEIGHTED AVERAGE
▼ Protecting private property	86.36% 38	9.09% 4	4.55% 2	0.00% 0	0.00% 0	44	1.18
▼ Protecting critical facilities and essential community services	90.91% 40	4.55% 2	2.27% 1	0.00% 0	2.27% 1	44	1.18
▼ Protecting and reducing damages to utilities	88.89% 40	6.67% 3	0.00% 0	0.00% 0	4.44% 2	45	1.24
▼ Support to strengthening emergency services (e.g., police, fire, EMS)	63.64% 28	27.27% 12	9.09% 4	0.00% 0	0.00% 0	44	1.45
▼ Enhance the functions of natural features (e.g., streams, wetlands)	65.91% 29	15.91% 7	18.18% 8	0.00% 0	0.00% 0	44	1.52
▼ Support to expand emergency management and preparedness programs	46.51% 20	41.86% 18	6.98% 3	2.33% 1	2.33% 1	43	1.72
▼ Promoting cooperation among public agencies, residents, non-profit organizations, and local businesses	44.44% 20	40.00% 18	8.89% 4	2.22% 1	4.44% 2	45	1.82

[Comments \(4\)](#)

*Question 7:*

In the following list, please check those activities that you have done in your home, plan to do in the near future, have not done, or are unable to do. Please check one answer for each activity that you or someone in your household have done.

	HAVE DONE	PLAN TO DO	NOT DONE	UNABLE TO DO	TOTAL
▼ Talked with members in your home about what to do in case of a natural disaster or emergency	80.43% 37	10.87% 5	8.70% 4	0.00% 0	46
▼ Prepared a disaster supply kit with extra food, water, batteries, etc.	71.11% 32	22.22% 10	4.44% 2	2.22% 1	45
▼ Attend meetings or received information on natural disasters or emergency preparedness	68.89% 31	8.89% 4	17.78% 8	4.44% 2	45
▼ Developed an emergency plan for your home and family in order to decide what everyone will do in the event of a disaster or emergency	66.67% 30	22.22% 10	8.89% 4	2.22% 1	45
▼ Become trained in first aid and/or CPR	53.33% 24	26.67% 12	15.56% 7	4.44% 2	45
▼ Reviewed the National Weather Service's Hurricane and Severe Weather Guide	52.27% 23	15.91% 7	31.82% 14	0.00% 0	44
▼ Discussed or created a utility shutoff procedure in the event of a natural disaster	45.65% 21	17.39% 8	34.78% 16	2.17% 1	46
▼ Reviewed Harris County's Disaster Guide	37.78% 17	11.11% 5	51.11% 23	0.00% 0	45
▼ Searched the District's website for disaster preparedness information	31.11% 14	20.00% 9	44.44% 20	4.44% 2	45

[Comments \(4\)](#)



*Question 8:*

Is your home located in a FEMA-designated floodplain?

ANSWER CHOICES	RESPONSES	
▼ Yes	13.04%	6
▼ No	67.39%	31
▼ Unsure	19.57%	9
<b>TOTAL</b>		<b>46</b>

*Question 9:*

Do you have flood insurance and have you ever had problems obtaining flood insurance?

	YES	NO	NOT SURE	TOTAL	WEIGHTED AVERAGE
▼ Do you have flood insurance?	48.89% 22	46.67% 21	4.44% 2	45	1.56
▼ Have you ever had problems obtaining flood insurance?	4.35% 2	86.96% 40	8.70% 4	46	2.04

*Question 10:*

What types of projects do you believe the District should be doing in order to reduce damage and disruption from hazard events within HCWCID110? Please rank each option as high, medium or low priority.

	HIGH	MEDIUM	LOW	TOTAL	WEIGHTED AVERAGE
▼ Retrofit infrastructure such as roads, bridges, drainage facilities, water supply, waste water and power supply facilities	84.09% 37	13.64% 6	2.27% 1	44	1.18
▼ Retrofit and strengthen essential facilities	75.56% 34	17.78% 8	6.67% 3	45	1.31
▼ Capital projects such as lift stations, elevate critical facilities, drainage improvements and bank stabilization projects	70.45% 31	25.00% 11	4.55% 2	44	1.34
▼ Perform projects that restore the natural environments capacity to absorb the impacts from natural hazards	65.91% 29	25.00% 11	9.09% 4	44	1.43
▼ Acquire vulnerable properties and maintain as open space	43.18% 19	34.09% 15	22.73% 10	44	1.80
▼ Provide better public information about risk, and the exposure to hazards within the District	31.11% 14	40.00% 18	28.89% 13	45	1.98
▼ Assist vulnerable property owners with securing funding for mitigation	29.55% 13	36.36% 16	34.09% 15	44	2.05

## **Appendix F – Adoption Resolution**