Jefferson County Drainage District No. 7

2025 HAZARD MITIGATION PLAN UPDATE



NOVEMBER 27, 2024

Table of Contents

Section 1. Introduction and Adoption	6
Introduction	6
Summary	7
Adoption by Board of Commissioners	8
Community Profile	9
Update Summary	
Section 2. The Planning Process	
The Purpose of the Plan	
Changes from the Last Plan	
The Planning Process	
Documentation of the Planning Process	43
Community Participation	43
Local Capabilities Assessment and Integration	47
Participation in the NFIP	54
Section 3. Hazard Identification and Risk Assessment	
Changes from the Last Plan	56
Introduction	56
Identifying Hazards	57
Hazards Omitted	
Hazard Damage Summary Information	60
Coastal Erosion	67
Drought	72
Extreme Heat	80
Flood	87
Hailstorm	102
Hurricane/Tropical Storm	107
Lightning	114
Levee Failure	120
Severe Thunderstorm/High Wind	121
Tornado	127

Winter Storm	
Community Assets	
Analyze Risk	
Summarize Vulnerability	
Section 4. Mitigation Strategy	
Update from Last Plan	
Introduction	
Mitigation Goal	
Status of Actions from Last Plan	
New Actions	
Section 5. Plan Maintenance Process	
Introduction	
Update from Last Plan	
Monitoring, Evaluating and Updating the Plan	
Integration into Existing Plans, Procedures, and Programs	
Continued Public Involvement	
Appendices	
Appendix A – Minutes from MPC Meetings	
Appendix B – Stakeholder Letter	
Appendix C – Public Notice	
Appendix D – Presentation to Stakeholders and Public	
Appendix E – Board of Commissioners Adoption	
Appendix F – Results from Public Survey	
Appendix G – FIRM MAPS	

List of Figures

Figure 1 - DD7 Loca	ation within Texas (randymaj	iors.org)	9
---------------------	------------------------------	-----------	---

Figure 2 - DD7 Watersheds	10
Figure 3 - Jefferson County Drainage District Boundaries (Sidwell's Portico (mygisonline.com)	11
Figure 4 - DD7 Map of District Systems	12
Figure 5 - 2023 Annual Average Temperature for Upper Coast	13
Figure 6 - 2023 Annual Precipitation for Upper Coast	13
Figure 7 - Accumulated Precipitation for Port Arthur 2023	14
Figure 8 - Average High and Low Temperature at Beaumont Regional Airport	14
Figure 9 - Working Land comparison in Jefferson County Texas	17
Figure 10 - Working Lands, Jefferson County	17
Figure 11 - Hospitals and Nursing/Assisted Living Homes in Planning Area	20
Figure 12 - 2022 Job Groups (Jefferson County, TX / Data USA)	21
Figure 13 - 2022 Jefferson County Industry Sectors (Jefferson County, TX / Data USA)	21
Figure 14 - Top Industry in Jefferson County by Jobs, 2021	21
Figure 15 - Census Tracts for the Planning Area- Red Circle	22
Figure 16 - CRE Profile for Census Tract ending in 005400	27
Figure 17 - CRE Profile for Census Tract ending in 006600	28
Figure 18 - CRE Profile for Census Tract Jefferson County	29
Figure 19 - CRE Profile for Census Tract Jefferson County -cont	30
Figure 20 - FEMA's Risk Index Equation	31
Figure 21 - Planning Area Census Tract View (Black Rectangle) National Risk Index / FEMA.gov	31
Figure 22 - Planning Area County View (Orange Rectangle) National Risk Index / FEMA.gov	32
Figure 23 - Risk Index for Census Tract ending in 005400	33
Figure 24 - Social Vulnerability for Census Tract ending in 005400	33
Figure 25 - RAPT map of Critical Facilities in DD7 Planning area (Blue pin is DD7 location)	34
Figure 26 - Steps to Prepare a Plan Update	38
Figure 27 - Outreach for the Survey, Planning Information and Meetings	45
Figure 28 - Categories for Capabilities Assessment	47
Figure 29 - FEMA Concept of Risk Diagram	57
Figure 30 - 2024 Disasters and Locations	60
Figure 31 - Funding Obligations by FEMA Disaster Category	62
Figure 32 - Visual Summary of Disaster Declarations for Jefferson County, Texas 1953-2024	63
Figure 33 - Visual Summary of Disaster Declarations for Jefferson County, Texas 2020-2024	64
Figure 34 - Coastal Erosion in Jefferson County (1950-2019)	68
Figure 35 - USGS Coastal Vulnerability Index	69
Figure 36 - U.S. Drought Monitor – Drought.gov	73
Figure 37 - Palmer Drought Index (Source NCEI/NOAA)	74
Figure 38 - Drought Classification (US Drought Monitor)	75
Figure 39 - Drought Impact Report for Jefferson County Texas – January 2014 to September 2024	76
Figure 40 - Maximum Number of Consecutive Dry Days Over Remainder of 21st Century	77
Figure 41 - National Risk Index – Drought	79
Figure 42 - NWS Heat Index	82
Figure 43 - Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity	83
<i>Figure 44</i> - Estimated Days Per Year >90° F Over Remainder of 21st Century	84
Figure 45 National Pick Index - Extreme Heat	96
T is a real of the theorem in the second	

Figure 46 - Flood Zone Overlay for DD7	
Figure 47 - State of Texas SFHA	
Figure 48 - Flood Events (2020-2024)	
Figure 49 - State of Texas Historical Flood Losses (2000-2021)	
Figure 50 - NWS Flood Stage for Tide Station at Rainbow Bridge	
Figure 51 - Rain Gauge Locations in DD7	
Figure 52 - Rainfall During Hurricane Harvey at 13 Rain Gauges in DD7	
Figure 53 - RL and SRL Data (State of Texas HMP 2023)	
Figure 54 - TWDB RL Viewer	
Figure 55 - TWDB SRL Viewer	
Figure 56 - Average Precipitation Estimate Over the Rest of the Century	
Figure 57 - National Risk Index – Flooding	
Figure 58 - National Risk Index – Extreme Heat	
Figure 59 - Hurricane/Tropical Storm Tracks 2004-2024	
Figure 60 - National Risk Index – Hurricane/Tropical Storm	
Figure 61 - Total Lightning Density – Vaisala (2023)	
Figure 62 - Lightning Density Map	
Figure 63 - U.S. Lightning Leaders in 2023 - Vaisala	
Figure 64 - National Risk Index – Lightning	
Figure 65 - Designated Catastrophe Area Map – DD7	
Figure 66 - National Risk Index – Strong Wind	
Figure 67 - FEMA's National Risk Index for Tornados	
Figure 68 - Tornado Events (2014-2024)	
Figure 69 - National Risk Index – Tornado	
Figure 70 - Average Snowfall per year	
Figure 71 - Winter Storm Events (2000-2024)	
Figure 72 - Sperry Piltz Ice Accumulation Index (SPIA)	
Figure 73 - National Risk Index – Winter Weather	
Figure 74 - Description of Evaluation Criteria for Mitigation Prioritization	

List of Tables

Table 1 - Incorporated Areas of Jefferson County	15
Table 2 - Buildings/Infrastructure within Jefferson County Drainage District #7	15
Table 3 - Building Permits Survey Data 2020-2024 for CBSA Beaumont/Port Arthur	16
Table 4 - 2023 Local Area Unemployment Statistics (LAUS) Report (LAUS - Texas LMI)	21
Table 5 - Planning Area Census Tract Social Vulnerability Index	24
Table 6 - Census Tract Percentage of Population Characteristics	26
Table 7 – DD7 Mitigation Planning Committee (MPC)	39

Table 8 - DD7 Hazard Mitigation Plan Update Schedule	41
Table 9 - Stakeholders for the DD7 Hazard Mitigation Plan Update 2025	42
Table 10 – DD7 Administrative/Technical Capabilities	48
Table 11 - Regulatory Mitigation Capabilities Regulatory Tool (ordinances, codes, plans)	50
Table 12 - Fiscal Capabilities Financial Resources Capabilities	52
Table 13 - Education and Outreach Capabilities	53
Table 14 - No. of Buildings by Type in Planning Area (JCAD)	54
Table 15 - 2019 and 2025 Hazards	56
Table 16 - Classifications and Definitions for Hazards	57
Table 17 - Hazard Summary Table for JCDD7	58
Table 18 - Hazards Omitted	59
Table 19 - Summary of Jefferson County Damages by Hazards	61
Table 20 - Jefferson County Presidential and Emergency Declarations, 1953-2024	65
Table 21 - Palmer Drought Severity Index	74
Table 22 - Heat Events in Jefferson County, 2020 – 2024	81
Table 23 - RL and SRL Residential Data by Municipality 2018 and 2024	95
Table 24 - RL Statistics for DD7	96
Table 25 - SRL Statistics for DD7	98
Table 26 - Hail Events in Jefferson County (2014-2024)	103
Table 27 - TORRO Hailstorm Intensity Scale	104
Table 28 - Hurricane/Tropical Storms that Impacted Jefferson County from 2004-2024	109
Table 29 - Saffir/Simpson Hurricane Scale	110
Table 30 - Tropical Cyclone Classifications	110
Table 31 - NCEI Data for Lightning – 1/1/2000 to 9/1/2024	115
Table 32 - LAL Scale (NOAA)	117
Table 33 - Beaufort Wind Scale (Source: NOAA)	123
Table 34 - Enhanced Fujita (EF) scale	129
Table 35 - Hazard Ranking	138
Table 36 - Status of actions from the DD7 2019 Hazard Mitigation Plan	140
Table 37 - Ranking of Actions to Determine Priority Level	147
Table 38 - List of Actions by Action No.	148
Table 39 - Mitigation Action Table	150
Table 40 - Maintenance Schedule	201
Table 41 - Reports, Plans, and Processes Reviewed in Support of 2025 DD7 Hazard Mitigation P	lan
	202

Section 1. Introduction and Adoption

Introduction THIS PLAN IS AN UPDATE

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 (Staffard 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.

Jefferson County Drainage District No. 7 (DD7 or the District) completed its original Hazard Mitigation Plan which was adopted in 2005 and updated the plan in 2013 and again in 2019. For the current update, DD7 hired a mitigation plan consultant to assist the District.

The DD7 2025 Plan is a single-jurisdiction plan.

An important step in the long-term strategy of improving resistance to hazards is the development of a hazard mitigation plan. The DD7 Hazard Mitigation Plan Update was prepared in accordance with the guidelines provided by FEMA and the Texas Division of Emergency Management (TDEM). The original plan set the stage for long-term disaster resistance through identification of actions that will, over time, reduce the exposure of people and property to hazards. Completion of the original Plan, and adoption by the Board of Commissioners, was a significant step toward identifying potential hazards that threaten the planning area, assessing risk, and implementing mitigation actions that will reduce property damages, injuries, and loss of life from hazards. Approval of the original Plan and each subsequent update reviewed and approved by TDEM and FEMA also establish eligibility for certain mitigation grant funds. This plan update continues the District's efforts to build a safe and resilient community and to be eligible for FEMA mitigation grants.

Each iteration of the District's update, following FEMA's updated guidance and training, is more inclusive with actionable strategies, striving to integrate elements of mitigation planning with other plans in the community. 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 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 current updated plan, while incorporating much of the past plans relevant data is to:

- Consider all natural hazards. Include any newly identified hazards where there is a potential negative impact as a result of the hazard and remove hazards that are no longer deemed a hazard, or the impact is negligible
- Update the hazard/risk data with increased attention to community resiliency to changing conditions
- Update development data
- Review, update or revise as necessary the goals and actions from the last Plan
- Update the demographic information based on current information
- Improve outreach to the whole DD7community and stakeholders during the planning process
- Review and update plans or reports for inclusion in this update of the Plan

While much of the information in the plan has been updated, the purpose of the plan is the same - to reduce the loss of life and property within the District's planning area and lessen the negative impacts of natural disasters. Vulnerability to several natural hazards has been identified through research, analysis, and public input. These hazards threaten the safety of residents and have the potential to damage or destroy both public and private property, disrupt the local economy, and impact the overall quality of life of individuals who live, work, and enjoy recreation in the area.

While natural hazards cannot be eliminated, the effective reduction of a hazard's impact can be accomplished through thoughtful planning and action. One of the most effective tools a community can use to reduce hazard vulnerability is developing, adopting, and updating a hazard mitigation plan. While the District includes hazards that can impact the community, it is important to note the District has a specific authority – flood control within is jurisdictional boundary. Therefore, actions for certain hazards (e.g. lightning), outside of the District's mission of flood and stormwater control, will be focused on protecting DD7 employees and assets as the Cities and Counties that are located within DD7's planning area provide essential services for protecting the community and their plans will cover the mitigation actions for the natural hazards.

Summary

Jefferson County Drainage District No. Seven (DD7) is one of three Drainage Districts within Jefferson County, Texas. It is a conservation and reclamation district and a political subdivision of the State of Texas that was established in February 1946. It was created to serve the drainage needs within the southern part of Jefferson County, including the construction and maintenance of drains, ditches and levees, another other improvements (e.g. pump stations). DD7 is governed by a five-member Board of Commissioners, elected at large to represent specific regions within the District.

The District covers an area of 107.5 square miles and encompasses the cities of Port Arthur, Groves, Nederland and Port Neches and unincorporated areas of Jefferson County. Two thirds of the District is below five (5) feet above mean sea level. Sixty (60) to Seventy (70) percent of the District drains to Taylor's Bayou. Rainfall for this area averages between 53-61 inches per year.

In 1962, as a joint venture between DD7 and the U.S. Army Corps of Engineers, a Hurricane Flood Protection System was incorporated into the District at a cost of \$84 million; the District paid 30% of the cost, U.S. Government 70%.

The District maintains 281 miles of concrete and earthen drainage channels, 36 miles of levee and floodwall, and 20 Pump Stations (19 pump stations and 1 annex station at Alligator Bayou Pump Station) serve the District with a combined pumping capacity of 8.2 million gallons per minute.

Emergency response is the responsibility of the incorporated Cities and Jefferson County. The Cities own and maintain the roadside ditches, however, the ditches that are owned by DD7 are a part of routine maintenance. After an event, it is standard procedure that DD7 identifies ditches that need cleaning (as well as crossings). There are known problem areas that are regularly checked during and after an event.

Both the Cities and the County have early warning capability. Citizens in the area rely mostly on local weather, which is reported to be very capable. DD7 has 15 rain gauges at ten of the pump stations intake bays and three other gauges near main channels.

There are five sections of this Plan and an appendices section. Each section provides updates since the last plan (2019-2024) to the natural hazards that threaten the District and the people and property exposed to those hazards, the planning process, and the maintenance process as well as status of the actions from the last plan and providing new mitigation action items. As in past years, when considering the magnitude of past events, the number of people and properties affected, and the severity of damage, flood hazards clearly are the most significant natural hazard to threaten the District. Sections one through five (the Introduction and Community Profile, the Planning Process, the Hazard Identification and Risk Assessment, the Mitigation Strategy, and the Plan Maintenance) and the appendices include all federally required elements of a disaster mitigation plan that apply to the entire planning area.

Adoption by Board of Commissioners

The Mitigation Planning Committee (MPC) advised the Board of Commissioners (Board) of its intent to update 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 E.

Community Profile

DD7 is in Southeast Texas, see Figure 1 for its location within the State (red star). It encompasses a 107.5 square mile area of the southeastern part of Jefferson County which includes the cities of Port Arthur, Port Neches, Groves and Nederland and portions of unincorporated Jefferson County. Its borders from the east, the Sabine Neches Canal and Sabine Lake, from the south, the Gulf of Mexico and the Big Hill Reservoir, from the north, the Neches River and Pine Island Bayou, and from the west, the Hillebrandt Bayou. The major watersheds can be found in Figure 2. The County has three drainage districts. Figure 1 shows the boundaries by Drainage District, with DD7's circled in red.





Figure 2 - DD7 Watersheds





Figure 3 - Jefferson County Drainage District Boundaries (<u>Sidwell's Portico</u> (mygisonline.com)

The District implements and maintains drainage projects throughout the District's 107.5 square mile area of responsibility which lies wholly within Jefferson County and includes the cities of Port Arthur, Port Neches, Groves, Nederland, and part of Jefferson County. With flood control and drainage at the core of the District's mission, Figure 4 illustrates the labyrinth of District ditches, canals, detention ponds, pump stations, and levee systems that supports that mission.

Geologic Features

The area covered by Jefferson County Drainage District No. Seven (DD7) is located in southeast Texas. Southeast Texas is characterized by gently sloping or nearly flat topography. Ground surface elevations across the District vary from 20 feet to 0 feet above mean sea level. The geologic structure is nearly flat strata, with bedrock types comprised of deltaic sands and muds. Data from the Bureau of Economic Geology at the University of Texas at Austin

identifies the land as "expansive clay and mud – locally silty, locally calcareous, flat to low; hilly prairie; commonly tilled".





Climate

The climate of the region is humid subtropical, with hot summers and mild winters. August normally ranks as the warmest month at a range of 89.1-95.63 °F and January the coldest month at a range of 41.06-59.44 °F. The Southern Regional Climate Center (SRCC) provides open source climate data. For annual average temperatures, the Texas data is broken into ten

regions. DD7 resides within the Upper Coast (TX-08- shaded green in picture to the right). The last complete year is 2023. Figure 5 shows the 2023 annual average temperature for Upper Coast of Texas 72.5°F. A review of the Beaumont Region Airport annual temperature shows the area can range from average high (July) of 91°F and a low of 44°F, slightly higher than the Upper Coast averages. The 2023 normal annual precipitation monthly rate was 3.2 inches as illustrated in Figure 6 for the Upper Coast. The site also lists 39.92



inches for that year with 77 days reported of rain. That amount of rain is less than the normal average of approximately 61 inches of rain a year as illustrated in NOAA's NOWData chart in Figure 7.



Figure 6 - 2023 Annual Precipitation for Upper Coast (Southern Regional Climate Center | Monthly Graphs (tamu.edu)





Figure 7 - Accumulated Precipitation for Port Arthur 2023 (Climate (weather.gov)

Figure 8 - Average High and Low Temperature at Beaumont Regional Airport



The note in the chart: The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures. <u>Beaumont Municipal Airport Climate, Weather By Month,</u> <u>Average Temperature (Texas, United States) - Weather Spark</u>

Population and Growth

According to the U.S. Census, Quick Facts, Jefferson County 2023 population estimate is 251,496 down 2% since 2020 which was 256,526. (U.S. Census Bureau QuickFacts: Jefferson County, Texas). The District's planning area includes both incorporated and unincorporated areas. The population totals indicated in Table 1 are for the cities of Groves, Nederland, Port Arthur and Port Neches, located within Jefferson County DD7 boundaries. The planning area includes approximately 15% of unincorporated Jefferson County.

Jurisdiction	2020 Population Estimate	2023 Population Estimate
Groves	17,340	16,764
Nederland	18,665	18,118
Port Arthur	56,027	55,547
Port Neches	13,702	13,591
Unincorporated Jefferson County (15%)	38,479	37,724
Total	144,213	141,744

Table 1 - Incorporated Areas of Jefferson County (Source: US Census Bureau, 2020 to 2023 Estimates)

The City of Port Arthur is the largest municipality in the planning area and as of 2023 had an estimated population of 55,547.

Table 2 identifies the total number and estimated value of buildings/infrastructure within Jefferson County DD7. The table indicates there are 37,153 residential buildings, 3,681 commercial buildings and 39 district owned buildings/facilities. The data in Table 2 is used periodically throughout this section to identify the overall District-wide exposure for certain hazards that equally impact the entire planning area such as hurricanes/tropical storms.

Table 2 - Buildings/Infrastructure within Jefferson County Drainage District #7
(Source: Jefferson County Central Appraisal District 2023 Certified Totals
Crystal Reports - TotalsReport rpt)

Туре	2019 Number of Structures	2019 Estimated Value	2023 Number of Structures	2023 Estimated Value	
Residential Buildings	37,554	\$3,787,834,229.00	37,153	\$6,162,398,391.00	
Commercial Buildings	3,077	\$6,616,744,224.00	3,681	\$8,753,330.062.00	

Туре	2019 Number of Structures	2019 Estimated Value	2023 Number of Structures	2023 Estimated Value
District-owned	34	\$43,121,010.00	39	\$102,440,310.00
Buildings or				
structures				
Total	40,655	\$10,447,699,463.00	40,873	\$15,018,168,763.00

The US Census Building Permits Survey (BPS) provides national, state, and local statistics on the number of new privately-owed housing units authorized by building permits in the United. States. The data is at the state, core based statistical area, county, and permit-issuing place. For this plan, the CBSA Port Arthur-Beaumont is used. Table 3 shows the annual number of residential permits issued for the Port Arthur-Beaumont area. While not all of 2024 is completed, the table indicates that new residential permits continues to decline annually. Commercial data is not captured so use of the JCAD is best available data.

 Table 3 - Building Permits Survey Data 2020-2024 for CBSA Beaumont/Port Arthur

 Building Permits Survey (BPS)

Beaumont/Port Arthur MSA CSA999, CBSA13140	2020	2021	2022	2023	Sep-24
Residential (1-5 home)	1,753	1,585	1,368	1,181	605

For this area, recent growth is commercial and industrial properties with slight decrease in residential properties.

The local governments and District work together to lessen the risk to the planning area. The cities and the county strictly enforce their respective floodplain ordinances, with a one-foot freeboard requirement above base flood elevation for the Cities and two-foot above the base flood elevation for the County and requires all new construction to be designed and constructed to withstand 110 mile per hour wind loads, loads (3-second gusts), which significantly reduces the potential vulnerability of new development to hazards that have had the highest historical impact on property.

Land Use

Land development creates impervious surfaces through the construction of roads, parking lots, and other structures. Comparing 2017 and 2022, Texas A&M Natural Resource Institute maintains the Texas Land Trends that tracts working lands within the State of Texas. Working lands including cropland, grazing land, timber, wildlife management and an other category which includes orchards and other agricultural lands not defined by cropland. Comparing 2017 to 2022 for Jefferson County, cropland, timber, and other decreased, however, grazing slightly increased and wildlife management increased. Figure X is a graphical comparison and Figure X is the same information but in table format so that the exact numbers are shown.



Figure 9 - Working Land comparison in Jefferson County Texas Texas A&M Natural Resources Institute. 2020. Texas Land Trends: A database of compiled and analyzed values for working lands in Texas. College Station, TX. USA. URL: http://txlandtrends.org

Figure 10 - Working Lands, Jefferson County

Texas A&M Natural Resources Institute. 2020. Texas Land Trends: A database of compiled and analyzed values for working lands in Texas. College Station, TX. USA. URL: http://txlandtrends.org

Working	tands ACR	ES			*	ılı ≡ i
1997	127,964	133,449	64,127	81,761	2,418	409,719
2002	62,938	125,256	64,561	70,204	5,345	328,304
2007	108,025	156,426	63,436	75,286	6,553	409,726
2012	69,800	199,566	63,344	74,338	4,116	411,164
2017	34,687	227,263	71,044	80,151	2,876	416,021
2022	22,388	227,660	67,759	78,805	3,114	399,726
Change	-105,576	94,211	3,632	-2,956	696	-9,993

Working with the Multi-Resolution Land Characteristics (MRLC) consortium, the U.S. Geological Survey (USGS) provides a mapping tool (MRLC NLCD Viewer) to show land cover and land change information. Using that tool, which can provide graphing at a county level, Jefferson County is shown as a yearly land cover zonal histogram by class

across the County in area percentage. Figure 10A shows developed intensity and developed open space along with other very useful information. Comparing 2020 to 2023, developed high and medium intensity has been relatively flat from 1.67/4.31 in 2020 to 1.71/4.4 in 2023. Development in open space has been increasing slightly 3.89 in 2020 to 4.03 in 2023. Change from land cover has been almost negligible since 2020.



Figure 10A Jefferson County Area percentage of land Cover change USGS, MRLC Viewer

Household Median Income and Education

Census data provides socio-economic data. The American Community Survey (ACS) fiveyear estimates are good data sources for small geographic areas (areas with fewer than 65,000 residents). Using the 2018-2022 ACS Five-Year Narrative Profile for the communities within the planning area, The below table estimates the following for household median income and education for that five-year period (<u>United States - Census Bureau Profiles Results</u>). On average, the planning area's household median income in that five year period was approximately \$65,236 compared to \$73,035 for the State of Texas (ACS 2018-2022). Approximately 87% of the population has graduated high school and approximately 20% have graduated college. The national average college graduation for that time period was 32%.

Census 2018-2022	Average Household	Education Bachelors	Graduated High	Median Household
	Size		School	Income
Groves	2.8	13.80%	86.70%	\$ 64,737

Nederland	2.55	27.30%	93.40%	\$ 73,706
Port Arthur	2.71	11.40%	77.10%	\$ 45,357
Port Neches	2.76	27.20%	92.00%	\$ 85,086
Unincorporated Jefferson County (15%)	2.57	19.90%	84.80%	\$ 57,294

The DD7 Whole Community

DD7's planning area is a vibrant community located within two hours of two international airports and the fourth largest city in the US (Houston). It has one regional airport (Jack Brooks) one major port (Port Arthur), railway (the Kansas City Southern Rail connected to Union Pacific) and waterway (The Sabines-Neches Waterway). Major transportation arteries include US Highway 69/96, State Highway (SH) 82, SH87, and SH73, SH366 and SH 365, Memorial Boulevard, Martin Luther King Drive, and W. Port Arthur Road (Spur 93)

Schools - There are three independent school districts (ISDs) in the planning area:

- Port Arthur (PAISD) 8 elementary schools, 2 middle schools and 3 high schools.
- Nederland ISD 4 elementary schools, 2 middle schools, 1 high schools, and 1 alternative education center.
- Port Neches Groves ISD 2 primary schools, 2 intermediate schools, 2 middle schools, 1 high school and 1 alternative education center.

Hospitals and Nursing Homes - There are 4 hospitals, 8 either nursing homes or assisted living facilities located in the planning area. <u>Resilience Analysis and Planning Tool (RAPT)</u>, see figure 11.





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 and throughout the County and regional areas over 20 minutes from home.

Census 2018-2022	Mean Travel Time To Work (minutes)
Groves	22.7
Nederland	18.3
Port Arthur	23.0
Port Neches	19.0
Unincorporated Jefferson County (15%)	20.8

Labor Force

Data regarding the labor force is at the county level. From 2021 to 2022, employment in Jefferson County, TX declined at a rate of -0.906%, from 105k employees to 104k employees. The most common job groups, by number of people living in Jefferson County, TX, are Sales & Related Occupations (12,107 people), Construction & Extraction Occupations (10,377 people), and Office & Administrative Support Occupations (9,943 people). Figure 12 illustrates the share breakdown of the primary jobs held by residents of Jefferson County, TX.

Figure 12 - 2022 Job Groups (Jefferson County, 1A / Data OSA	Figure	12 -	2022	Job	Groups	(Jefferson	County,	TX	Data	USA)
--	--------	------	------	-----	--------	------------	---------	----	------	------

Management Occupations	Health Diagn & Treating Practitioners Other Technic Occupations 3.57%	osing :& cal	Busin Finan Opera Occup 2	ness & ncial ations pations 27%	Sales & Relate Occupations	ed	Office & Adminis Suppor	i strative t Occupi	ations	Construction & Extraction Occupations	Production Occupations
	Architecture	Health Technolog	co gists &	Community & Social	11.6%			9.52%			
ducation	Engineering Occupations	a recrimer	ians Se Oi	Service Occupations	Food	Healthcare Sup	oport	Personal Care &	Law Enforcement		7.26%
nstruction, &	2.23%	1.81%		1.71%	Preparation &	UCCUPATIONS		Service Accunations	workers Including	9.94%	Transportation
ibrary	Computer & Mathem Occupations	atical Arts, Design, Entertainment, Sports, & Media Occupations		Entertainment, dia Occupations OCD10/	Serving Related Building & Grounds		Cleaning &	2.12% 1.99%		Installation,	Occupations
Iccupations	1.25% Legal Occupation	s I	0.901% Life, Physical, & Social Science Occupations		Occupations	Maintenance Occup	oations	Fire Fighting & Prevention, & Other Protective Service Workers Including Supervisors		Occupations	
6.41%	0.969%		0.8	886%	6.17%	4.13%		1.78	1%	3.09%	3.68%
	0.44% 0.207% 0.000% 0.17% 4.15% 1.0% 3.0% 3.0% 2013 2014 2015 2016 2017 2018 2019 2022 2022										

Table 4 - 2023 Local Area Unemployment Statistics (LAUS) Report (LAUS - Texas LMI)

Area	Civilian Labor	Employment	Unemployment	t Unemployment				
	Force			Rate				
Port Arthur	21,173	19,301	1,872	8.8%				
Jefferson County	103,246	96,784	6,462	6.3%				
Beaumont-Port Arthur	169,044	159,071	9,973	5.9%				
MSA								
Texas	15,067,153	14,472,524	594,629	3.9%				
Source: Texas Labor Market Information – 2023. There was no data for Groves, Nederland,								
and Port Neches.								

Major Industries and Leading Employers

The following illustrations (Figure 13) shows the employment by leading industry sectors 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 (Jefferson County, TX | Data USA). Health care and social services are the leading industry in 2021 and 2022.

Figure 13 - 2022 Jefferson County Industry Sectors (Jefferson County, TX / Data USA)

Health Care & Social Assistance	Educational Services	Retail Trade	Administrative & Support & Waste Management Services 478% Professional, Scientific, & Technical Services	Transportation & Warehousing #65%	Public Administration
13.3%	9.23%	Manufacturing	Accommodation **	Other Services, Except Public	Wholesale Trade
Construction			& Food Services	Administration	2.51%
12.2%		1.5%	7.52% 128	Finance & Real & Real Insurance Leas	Estate ntal & 0.755% April 1000 0.555% 0.555% Information 0.779%

Figure 14 - Top Industry in Jefferson County by Jobs, 2021

Economic-Overview-Jefferson-County-Texas.pdf



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).

To help find out about the factors, the SVI can be queried on a Census Tract level and a county level. Using the Census Tract level can help provide more detailed information for the planning area since the location is southeast Jefferson County. A map of the US Census Tracts for Jefferson County was used to determine what tracts are in the planning area. See Figure 15.

Figure 15 - Census Tracts for the Planning Area- Red Circle



<u>Census - Census Tract Reference Map</u>)



Table 5 shows data by census tract, the four themes and the overall summary of vulnerability



by 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 010902, there is a low level of vulnerability. However, for census tract ending in 005100 there is a medium/high level of vulnerability overall. A closer look by theme indicates there is a medium to high vulnerability in housing type and transportation as well as socio economic and racial and ethnic minority status. This information can be helpful as a community prepares and responds to natural hazard events.

Using U.S. Census Tract Profile 2022 American Community Survey 5-Year Estimate data, Table 6 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 6 from the Census 2023 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 5 - Planning Area Census Tract Social Vulnerability Index CDC/ATSDR SVI: Data and Documentation Download | Place and Health | ATSDR)

State	County	Census Tract	Socio Economic	Housing Characteristics	Racial and Ethnic Minority Status	Housing Type and Transportation	Overall Track summary Ranking
Texas	Jefferson County	48245005100	0.7946	0.5122	0.8192	0.1764	0.5805

State	County	Census Tract	Socio Economic	Housing Characteristics	Racial and Ethnic Minority Status	Housing Type and Transportation	Overall Track summary Ranking
Texas	Jefferson County	48245005400	0.805	0.9821	0.9902	0.4215	0.8647
Texas	Jefferson County	48245005500	0.8975	0.8075	0.8292	0.4554	0.8161
Texas	Jefferson County	48245005600	0.7129	0.7472	0.966	0.1509	0.6079
Texas	Jefferson County	48245005900	0.7657	0.5963	0.9015	0.2092	0.6149
Texas	Jefferson County	48245006100	0.7382	0.7939	0.9477	0.4437	0.7426
Texas	Jefferson County	48245006300	0.9429	0.7835	0.986	0.6509	0.8994
Texas	Jefferson County	48245006400	0.9158	0.951	0.8698	0.3266	0.8504
Texas	Jefferson County	48245006500	0.7518	0.8704	0.7913	0.9268	0.9053
Texas	Jefferson County	48245006600	0.9	0.9215	0.8149	0.7744	0.9293
Texas	Jefferson County	48245006700	0.9141	0.959	0.7895	0.3761	0.8606
Texas	Jefferson County	48245006800	0.7391	0.9136	0.6742	0.5879	0.796
Texas	Jefferson County	48245006900	0.5676	0.3405	0.6173	0.8128	0.618
Texas	Jefferson County	48245007002	0.8081	0.852	0.6964	0.8603	0.8865
Texas	Jefferson County	48245007003	0.8189	0.9763	0.6079	0.7246	0.8969
Texas	Jefferson County	48245007004	0.752	0.7241	0.6992	0.8163	0.8135
Texas	Jefferson County	48245007100	0.6278	0.8095	0.3905	0.1852	0.5199
Texas	Jefferson County	48245010100	0.8698	0.7727	0.7975	0.414	0.7744
Texas	Jefferson County	48245010200	0.9269	0.7349	0.7749	0.2912	0.7545
Texas	Jefferson County	48245010300	0.6312	0.8302	0.8003	0.6557	0.7474
Texas	Jefferson County	48245010400	0.3548	0.5342	0.2643	0.8098	0.5196
Texas	Jefferson County	48245010500	0.5725	0.7163	0.5642	0.3368	0.5564
Texas	Jefferson County	48245010600	0.499	0.4752	0.2865	0.5602	0.4883
Texas	Jefferson County	48245010700	0.4151	0.3095	0.0781	0.1498	0.2296

State	County	Census Tract	Socio Economic	Housing Characteristics	Racial and Ethnic Minority Status	Housing Type and Transportation	Overall Track summary Ranking
Texas	Jefferson County	48245010800	0.4302	0.1332	0.0391	0.1946	0.1962
Texas	Jefferson County	48245010901	0.2594	0.2925	0.0365	0.2401	0.1955
Texas	Jefferson County	48245010902	0.1076	0.3105	0.0806	0.1828	0.1176
Texas	Jefferson County	48245011001	0.5218	0.5648	0.1241	0.5064	0.4818
Texas	Jefferson County	48245011002	0.1486	0.3165	0.1103	0.3518	0.1949
Texas	Jefferson County	48245011101	0.157	0.5446	0.0483	0.2966	0.2242
Texas	Jefferson County	48245011102	0.4808	0.851	0.0673	0.5258	0.5514
Texas	Jefferson County	48245011204	0.0829	0.213	0.0499	0.5976	0.1895
Texas	Jefferson County	48245980000	-999	-999	-999	-999	-999
Texas	Jefferson County	48245980200	-999	-999	0.6256	-999	-999
Texas	Jefferson County	48245980300	-999	-999	0.6742	-999	-999

 Table 6 - Census Tract Percentage of Population Characteristics

 (U.S. Census Bureau QuickFacts: Jefferson County, Texas; Texas; United States)

Population – 2023	Groves	Nederland	Port Neches	Port Arthur	Jefferson County	Average
Persons 65 and older	17.3%	16.2%	15.6%	13.2%	15.9%	15.64%
Persons with a Disability (under 65)	7.8%	8.5%	7.4%	10.8%	10.0%	8.90%
Persons in Poverty	10.7%	7.9%	8.6%	26.7%	18.5%	14.48%
Person under 5	7.3%	6.0%	7.5%	8.0%	6.5%	7.06%

Community reslience is the capacity of individuals and households within a community to absorb the exterenal stresses of disaster. To measure this, The US Census produced the Community Resilience Estimates for Equity (CRE) Profiles to provide information about social vulnerability and equity and can be prepared at a state, county and census tract level. Figures

16 and 17 are CRE Profile for Census Tracts ending in planning area. Figure 18 is for information for Jefferson County.



Figure 17 - CRE Profile for Census Tract ending in 006600 Community Resilience Estimates for Equity Profiles (census.gov)



The comparison shows that by drilling down to the census data, a more complete picture of that area's vulnerability can be shown as opposed to the full county information.

Figure 18 - CRE Profile for Census Tract Jefferson County Community Resilience Estimates for Equity Profiles (census.gov)



Figure 19 - CRE Profile for Census Tract Jefferson County -cont <u>Community Resilience Estimates for Equity Profiles (census.gov)</u>



Social Vulnerability measures the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. <u>Comparison Report - Census Tract | National Risk Index (fema.gov)</u> FEMA has created a website dedicated to help communities determine risk so it can determine measures to mitigate risk. The National Risk Index (<u>https://hazards.fema.gov/nri</u>), "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 20 shows the Risk Index Equation that is used to produce the risk index.

Figure 20 - FEMA's Risk Index Equation (Determining Risk | National Risk Index (fema.gov))



Figure 21 - Planning Area Census Tract View (Black Rectangle) National Risk Index |



Figure 22 - Planning Area County View (Orange Rectangle) <u>National Risk Index |</u> <u>FEMA.gov</u>



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 005400, it received a score of 58.31 which means its risk index is greater than 58.31% 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 Low" rating for expected annual loss but a very high for social vulnerability. Figure 23 illustrates the Risk and Figure 24 illustrates the social vulnerability which is "Relatively High" at 89.85. 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 23 - Risk Index for Census Tract ending in 005400 <u>National Risk Index / FEMA.gov</u>

Figure 24 - Social Vulnerability for Census Tract ending in 005400 National Risk Index / FEMA.gov



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 DD7 planning area, a map from FEMA Resilience Analysis and Planning Tool (RAPT) can provide emergency planners, responders and facility providers (e.g., water and sanitary sewer) with maps that can show (through the use of a color code), where government buildings (e.g., emergency response, police, or fire), schools, hospitals, and nursing homes are located as well as facilities such as powerplants and transmission lines.as shown in Figure 25 for the planning area. The blue pin is DD74's location. <u>Resilience Analysis and Planning Tool (RAPT) (arcgis.com)</u> There are a number of critical facilities that are not owned by the cities, the county or DD7. Examples include hospitals and nursing homes. The cities and county critical facilities include but are not limited to emergency services like police, fire, and rescue.

It is important to note that while these facilities are located in the planning area, DD7, as a drainage district, only has the authority for drainage issues. While it is important to understand where critical and community facilities are located in the planning area for drainage plans and mitigation actions, the cities, county, State and private entities have responsibility for all other aspects of these facilities except for the buildings and equipment owned by DD7.

Figure 25 - RAPT map of Critical Facilities in DD7 Planning area (Blue pin is DD7 location)



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 district, community lifelines are addressed by the local city and county **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, highpotential 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.

emergency management coordinators. This plan will focus on the District's critical facilities and 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.

District Facilities: main office building, pump Stations, warehouses, vehicle sheds, data centers, maintenance shops, fabrication shops, generator buildings, electrical shops, fuel rooms, and the annex at Alligator Bayou are all considered critical to the mission of the District.

Throughout the planning area, there are hospitals, nursing and assisted living facilities, schools, fire, rescue and EMT facilities, police and prison facilities, communications facilities, water and wastewater facilities, transmission facilities, pipelines, railways, highways, and ports that are considered critical and the District works with the local communities to help protect those structures through mitigation actions designed to mitigate flooding of those facilities.

Update Summary

Changes in Development. Both population and land use change has been negligible since 2019. In addition, all development within the Planning Area is required to provide no impact on the community's vulnerability to natural hazards. For DD7's part of development planning, it continues to require no adverse impact review of permits for drainage plans before approval. The Cities and the County for their part, enforce higher standards within the Special Flood
Hazard Area (SFHA) such as fill mitigation and finished floor elevations up to the base flood elevation, decreasing vulnerability as compared to minimum standards.

Changes in Priorities and Progress. There have been no changes in priorities for DD7. In the mitigation strategy section (Section 4), is a status update of all actions identified in the previous plan from 2019.

Integrating the Mitigation Plan into other Planning Mechanisms. Iterations of this plan have been reviewed and integrated into the Master Drainage Plan, the Capital Budgets list, the Drainage Criteria Manual, and the Neches Region V Regional Flood Plan. DD7 has been a stakeholder in hazard mitigation plan updates including the regional Jefferson/Hardin/Orange County Hazard Mitigation Plan Update and the Jefferson County Drainage District No. 6 Plan Update, and through that role, provides information regarding the DD7 hazard mitigation to the planning committees of those jurisdictions.

Section 2. The Planning Process

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.

Changes from the Last Plan

Since the last iteration of the plan, the District made extensive efforts for outreach to the stakeholders and the public. The MPC requested stakeholder participation and then set a schedule for the stakeholders to learn about the process, understand how they can help through two meetings, and proactively review and comment on the draft plan. In addition to stakeholder outreach, the public outreach also increased through surveys, notification through social media platforms as well as traditional platforms (website, newspaper notification) and meetings outside of the public meetings at locations (Effie and Wilton Hebert Library) and times suitable to multiple audiences. This outreach helped increase participation and input from these groups to the plan.

The Planning Process

This section includes a description of the planning process used to update the 2025 DD7 Plan, including how it was prepared, who was involved in the process, and how the public was involved. The District followed a well-established planning process to update its Hazard

Mitigation Plan (HMP). The Plan Update process followed the FEMA Local Hazard Mitigation Plan regulations set forth in 44 Code of Federal Regulations (CFR) Part 201.6 and is FEMA's official source for defining the requirements for original and updated local hazard mitigation plans. In addition, the FEMA Local Mitigation Planning Handbook (May 2023) was used as a practical guide to ensure all requirements were satisfied for this update. The Local Mitigation Planning Handbook suggests organizing the updates around four steps as illustrated in Figure 26.

Figure 26 - Steps to Prepare a Plan Update (FEMA Local Mitigation Planning Handbook, May,2023 p. 2)



The MCP reaffirmed that this update will be a single jurisdiction plan for DD7. The plan would follow the same resource organization utilizing the support from three key groups:

- The Mitigation Planning Committee
- The Stakeholders
- The Public

Mitigation Planning Committee

The Mitigation Planning Committee (MPC) was reconvened. The MPC leads the review and draft of the update 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:
 - Reviewing and updating the hazards of concern
 - > Developing a public and stakeholder outreach program
 - Assuring the data and information used in the plan update process is the best available
 - Reviewing and updating the hazard mitigation strategy and goals
 - Identification and screening of mitigation actions
 - > Reviewing plan documents prior to submission to TDEM and FEMA
 - Ensure that the plan meets the requirements of DMA 2000

During the first meeting, the team identified members who are no longer working in their respective positions and additional members who needed to be included on the MPC. Table 7 lists the MPC members for this plan update. Minutes were prepared for each meeting to document the process and keep the plan on task. Those minutes can be found at the end of the plan in Appendix A.

MPC Member	Title and Department
Garrett Boudoin	Field Engineer, JCDD7
Toby Davis	District Engineer, JCDD7
Allen Sims	Assistant Manager/District Engineer
Kristen Thatcher	Plan Consultant, JSWA
Chase Ward	Plan Consultant, JSWA

 Table 7 – DD7 Mitigation Planning Committee (MPC)

Early in the planning update process, the MPC undertook a detailed review of every section of the existing plan. The MPC identified all the subject areas where specific updates were required. For example, census figures, the numbers, and locations of buildings, impacts of recent hazard events, as some examples. The second purpose of the review was to ensure that the updated plan is fully compliant and responsive to all the FEMA requirements including understanding better the future climate change impacts and ensuring the mitigation strategy benefits all residents. Table 8 is the schedule that was prepared.

The review indicated that there were changes and updates with the new FEMA guidance that would require some research, revision, and more diligent outreach. The MPC met ten times during the update process and will be briefly summarized as the minutes are attached to the plan in Appendix A.

August 9, 2024 - The purpose of the meeting was to begin the planning process, finalize the MPC membership, identify potential stakeholders, to make certain decisions about contents of the plan, and to assign specific tasks to District staff and consultants. Each section of the current plan was then reviewed and analyzed to determine which areas required update. The 2019 hazards were reviewed, the goal was reintroduced, and the team discussed plans, studies and reports that were completed since 2019 for review. The team also discussed an outreach

strategy. Lastly, a schedule was put in place to keep the process on schedule as shown in Table 8.

August 16, 2024 – The MPC reviewed the actions in the 2019 plan so a status could be provided and a decision if the action was completed, ongoing, or no longer a priority. The stakeholder list was finalized, and the capabilities assessment commenced. There was discussion on development in the last five years as well as updating the critical facilities. The outreach plan was formulated starting with a public survey and a letter inviting stakeholders to participate.

August 22, 2024 – At this meeting the MPC, using the hazard profiles, prioritized the hazards and worked on assets vulnerable to the hazards. Additional work was down on the local capabilities review and the outreach work.

August 29, 2024 – With the outreach strategy finalized, a letter was drafted inviting stakeholders to participate. The outreach materials and surveys were uploaded to the District's website and information regarding the survey was publicized through the District's social media channels, on its websites and requested stakeholders notify their communities. The mitigation strategy and goal were updated and finalized. The team began work on the mitigation actions.

September 13, 2024 –The outreach materials and surveys were uploaded to the District's website and information regarding the survey was publicized through the District's social media channels, on its websites and requested stakeholders notify their communities. The team continued to work on the details of the actions. Discussion regarding the maintenance process took place and a goal for the first draft for the MPC review was set as well as the first meeting with Stakeholders (September 19th)

September 30, 2024—The MPC prioritized the actions. The MPC further refined the first draft, prepared for the public meeting (October 16th), and worked on the second tier of outreach prior to the first public meeting.

October 15, 2024 – The MPC prepared for the outreach and public meetings.

October 31, 2024 – The MPC discussed input from the stakeholders and the public to incorporate in the plan and finalized the draft for MPC review. Once comments were incorporated, the second stakeholder meeting was scheduled for November 7th.

November 19, 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 for November 27th.

December 27, 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.



 Table 8 - DD7 Hazard Mitigation Plan Update Schedule

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 update to the stakeholders on September 11, 2024, by mail and email. The Stakeholders for this update are listed in Table 9.

Stakeholder Member	Title	Organization	
Matthew Kaufman	Deputy Director	Sabine Neches Navigation District	
Kyle Reed	Project Manager	Sabine Neches Navigation District	
Doug Canant	Chief Operating Officer	Jefferson County DD6	
Michelle Falgout	County Engineer	Jefferson County	
Jeff Branick	County Judge	Jefferson County	
Betty J. Reyard	President	Lamar State College Port Arthur	
Richard Reed		Lamar State College Port Arthur	
William Rash		Lamar State College Port Arthur	
Stuart Kieschnick	Superintendent	Nederland ISD	
Mark Porterie	Superintendent	Port Arthur ISD	
Radermon Scypion		Port Arthur ISD	
Edgar Redeaux		Port Arthur ISD	
Mike Gonzales	Superintendent	Port Neches Groves ISD	
Robert Grimm	Jefferson County EMC	Jefferson County	
Terry Morton	Fire Chief/EMC	Nederland	
Lance Billeaud	Fire Chief/EMC	Groves	
Eloy Vega	Fire Chief/EMC	Port Neches	
Jermey Houston	EMC w/PA Police Department	Port Arthur	
Robert Havens	Deputy Fire Chief/Deputy EMC	Port Arthur	
Diana LaBorde	President/CEO	Nederland Chamber of Commerce	
Crystal Jordan	Executive Director	Port Neches Chamber of Commerce	
Letha Knaus	Executive Director	Groves Chambers of Commerce	
Joe Tant	President	Port Arthur Chambers of Commerce	
Jeff Newman	Executive Vice President	Motiva Refinery	
Claire Jackson		Motiva Refinery	
Mark Skobel	Vice President & General Manager	Valero Refinery	
Carol Hebert	Public Affairs Manager	Valero Refinery	
Gary Parsley	Plant Manager	Chevron-Phillips Chemical Plant	
Kim Hoyt	Plant Director	Indorama Ventures Oxides LLC	
Jed Franzen		Indorama Ventures Oxides LLC	
Rodney Dillon	Plant Manager	Flint Hills Chemical	
Josh Snow	President	Medical Center of Southeast Texas	
Stephen McDowell		Texas Parks & Wildlife	
Darrell Jacob	Plant Manager	TOTAL Refinery	
John Lycan	Plant Manager	BASF Chemical Plant	

Table 9 - Stakeholders for the DD7 Hazard Mitigation Plan Update 2025

Stakeholder outreach was performed early on, and continually throughout the planning process. There were two formal presentations and one request for input on the 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.

September 19, 2024 – The MPC explained the importance of mitigation planning, this plan update, and how the stakeholders could help and provide input the drafting process.

November 7, 2024 – The MPC summarized the first draft of the plan and solicited review and input from the stakeholders.

November 27, 2024 – The MPC, after receiving initial public and stakeholder review, requested final review and comment to incorporate in the final draft to be presented for public review and comment for 30 days.

Documentation of the Planning Process

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

- Minutes were maintained for the MPC meetings.
- A letter was sent to the stakeholders to invite them to be a stakeholder and to describe their role in the plan and planning effort and specify the means to provide that input. An example is attached to the plan update in Appendix C. Additional virtual meetings were also held with the stakeholders who were invited by email. Appendix X includes the presentations.
- An online hazard mitigation public survey was developed and made accessible through the District's website.
- Outreach meetings were held.
- Outreach material was created and disseminated through the District's website, social media platforms, and notices in public buildings. Print material was prepared for each public meeting.
- Two public meetings were held. The draft plan update was posted to the District's website and was mailed to interested parties upon request. The public was informed how to provide input during a 30-day comment period.

Once comments were received, the MPC finalized the draft and submitted it to TDEM for review and FEMA approval.

Community Participation

Consistent with the District's standard practice of informing, engaging, and involving citizens, and to fulfill public participation requirements of the mitigation planning programs, the MPC

developed an outreach plan that publicized the initiative, invited residents to review the plan update, and solicited public comment.

The goal of the outreach strategy included:

- Public Awareness of the importance of hazard mitigation planning
- Special considerations to invite vulnerable populations to participate
- Public Awareness of the District's Hazard Mitigation Plan
- Public input on the Plan

This strategy was implemented as follows:

- A hazard mitigation plan update public survey was created to gauge:
 - Resident's experience with hazards
 - Resident's perception of risks from hazards
 - Knowledge of importance of Mitigation Planning
 - Knowledge of the District's Hazard Mitigation Plan
 - > Support of community programs that support Mitigation
- The survey was available on the District's website from August 12, 2024 until October 30, 2024.
- The Public was made aware of the survey through the District's social media platforms, District website, and public meetings. Figure 27 are photos and screen shots of the advertising. Appendix D 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 confirmed assessed risk.
- The MPC met with various groups at locations close to them, to share information on the District's plan. In addition, 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.
- In an effort to reach vulnerable populations, meetings were held during the evening at a local public library to give the community an opportunity to partake in the plan update. Meetings were also held in the morning for individuals who could not attend meetings during the day. Stakeholders who worked with vulnerable populations were asked to inform constituents of the meetings and how they can help. Every effort was made to reach all members of the public through print (newspaper), public displays, social media, notices placed on public boards, and the District's website.
- During this Plan update process, the public was invited to attend two public meetings during the drafting of the plan update. The first meeting was held October 16th. Preliminary sections of the Plan update were available for public review at this meeting. The public was invited to provide input on the document for 30 days at the second public meeting (November 27th). Outreach meetings were held at the Effie and Wilton Hebert Library prior to the public meetings. The District 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 27 - Outreach for the Survey, Planning Information and Meetings





Publisher's Certificate of Publication

STATE OF TEXAS COUNTY OF JEFFERSON

Ron Prince, being duly sworn, on oath says he is and during all times herein stated has been an employee of The Port Arthur Newsmedia publisher and printer of the The Port Arthur News (the "Newspaper"), has full knowledge of the facts herein stated as follows:

 The Newspaper printed the copy of the matter attached hereto (the "Notice") was copied from the columns of the Newspaper and was printed and published in the English language on the following days and dates: 10/05/24

2. The sum charged by the Newspaper for said publication is the actual lowest classified rate paid by commercial customer for an advertisement of similar size and frequency in the same newspaper in which the Notice was published.

3. There are no agreements between the Newspaper, publisher, manager or printer and the officer or attorney charged with the duty of placing the attached legal advertising notice whereby any advantage, gain or profit accrued to said officer or attorney 4. The Newspaper meets the qualifications set out in Section 2051.044, Texas Government Code, as follows:

1. The Newspaper devotes not less than 25% of its total column lineage to general interest items;

2. Is published at least once a week;

3. Is entered as second-class postal matter in Jefferson County where published; and

 Has been published regularly and continuously for at least 12 months prior to the first date of publication stated above.

faceled 10%

Ron Prince, publisher

Subscribed and sworn to before me this 5th Day of October, 2024

JO ESKRIN

NOTARY PUBLIC

LARGE

Mary Jo Eskridge, Notary Public State of Alabama at Large My commission expires 03-02-2026

Account # 206404 Ad # 1891280

JEFFERSON CO DRAINAGE DIST #7 P.O. BOX 3244 PORT ARTHUR TX 77643 PUBLIC NOTICE

Jefferson County Drainage District No. 7 (JCDD7) is updating its Hazard Mitigation 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 where JCDD7 will present an overview of the importance of the plan, the status of the planning process and explain how the public can support the initiative. The actions identified in this plan are intended to help protect the citizens, property, and natural environment throughout the District. The District will hold two meetings with the public on October 16th to discuss. The first meeting will be held at the JCDD7 Office, 3400 Hwy 73, Port Arthur at 9:30 am. The second meeting will be held at the Effie & Wilton Hebert Public Library, 2025 Merriman Street, Port Nechencouraged to come to either meeting.

Port Arthur News: Oct. 5, 2024 MEETINGS 10.16.24

Local Capabilities Assessment and Integration

The Capability Assessment describes the tools in the District's toolbox for implementing mitigation actions to reduce disaster losses and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. These tools can be grouped into the following categories (see Figure 28):

Figure 28 - Categories for Capabilities Assessment



The MPC reviewed existing District's capabilities, considering authorities, policies, programs, and resources available. The assessment of the mitigation goals, programs, and capabilities included grouping them into the four categories described in Figure 28.

Administrative and Technical Resources

The MPC used the FEMA Local Mitigation Planning Handbook Worksheet 4 – Capability Assessment by category to help identify what capabilities apply and do not apply to the District as well as to see if there is a gap that can be built on to increase the District's capabilities. Table 10 represents the District's administrative capabilities.

Administrative/Tech Capabilities	YES/NO	Department/Position or Comment
Planner/engineer with knowledge of land development/land management practices	Yes	Permit Administrator
Engineer/professional trained in Construction practices related to buildings and/or infrastructure	Yes	District Engineer
Planner/engineer/scientist with an understanding of natural hazards	Yes	Engineer
Transportation Planner	No	Not part of jurisdictional authority but DD7 could request receiving information for potential input for areas that impact projects.
Resiliency Planner	No	Not part of jurisdictional authority but DD7 could request receiving information for potential input for areas that impact projects.
Personnel skilled in GIS	Yes	Engineer
Full-time building official	Yes	Assistant District Manager
Floodplain Manager	No	Not part of jurisdictional authority but DD7 could request receiving information for potential input for areas that impact projects.
Emergency Manager	Yes	Assistant District Manager
Grant Writer	Yes	District RPLS
Other Personnel	Yes	
GIS Data Hazard areas Critical facilities Building footprints Land use Assessor data Warning systems Other	Yes/No	Engineer. District has some data but not all of the data listed.

Table 10 – DD7 Administrative/Technical Capabilities

Improving and Expanding Administrative and Technical Resources Capabilities

To determine if there is a gap, the MPC reviewed the jurisdictional authority of the District. While there are some administrative functions that DD7 does not have authority (e.g., floodplain manager), it could request from the jurisdictions in their planning area that has that authority to receive information or attend meetings when DD7 projects, facilities or interests may be impacted. Another area of improvement is to try to link data from the 15 DD7 rain gauges to other agency gauges to provide real-time data for the public. While both the cities and the County have early warning capability, and citizens in the area rely mostly on local weather for rain gauge data, DD7's 15 rain gauges at twelve of the pump stations intake bays and three other gauges near main channels could be used to help emergency management support for these areas.

Regulatory and Planning

While DD7 does not have direct oversight of development in the floodplain and with subdivision plans, it is part of the review and approval process with the county and the cities. As part of that review, DD7 provides interested parties a clear and consistent review process and documents outlined in the Rules and Regulations Guidelines. These guidelines, as well as all other needed forms and documents can be easily downloaded from the District's website, DD7 - Jefferson County Drainage District #7 and are summarized below.

- **DD7 Master Drainage Plan, 2019** In November, 2019, the District adopted a Plan Related to Drainage and Flood Damage Reduction that examined how development is reviewed and to lay the coordination and analysis groundwork required by statute so the District could develop, adopt, implement and enforce regulations relating to its review and approval of development proposal.
- **DD7 Drainage Regulations, 2019.** In 2019, the District prepared rules, regulations and guidelines to provide efficient, consistent and orderly development of drainage facilities within the District's jurisdiction by applying generally accepted engineering criteria and establish factual and scientific data required for planning and designing future drainage facilities, in order to achieve adequate retention, detention and conveyance from storm and flood waters through the District's jurisdiction.
 - **Permits**. DD7 controls certain activities within its jurisdictional authority. The District grants permits and requires on-site availability of such permits. Jefferson County Drainage District No. 7 requires that a permit be applied for and approved

by the Board of Commissioners for the following activities.

• Any pipeline, utility or other facility is constructed upon or across any property, easements, or rights-of-way owned or controlled by the District and used for drainage, hurricane flood protection or other operations of DD7.

- Any new structure or modification to existing structure, discharging into any property, easements, or rights-of-way owned or controlled by the District and used for drainage, hurricane flood protection or other operations of Drainage District No. 7.
- Any new flow or change to existing flow into any property, easements, or rights-of-way owned or controlled by the District and used for drainage, hurricane flood protection or other operations of Drainage District No.
- Utility/Pipeline Crossing Permit Application All permitting/access through or over the Jefferson County Drainage District No.7/U.S. Army Corps of Engineers Hurricane Flood Protection Levee (DD7/COE HFPL) facilities requires compliance with 33 U.S.C. 408 (Section 408). A Minor Section 408 or Major Section 408 COE review and approval will be required as part of the permitting process. However, all applications must be filed/processed through DD7.

Drainage Criteria Manual for Jefferson County DD7, November 2019. – The primary purpose of this drainage criteria manual is to establish standard principles and practices for the analysis, design, and construction of primary drainage systems within Jefferson County Drainage District No. 7 (DD7). This Drainage Criteria Manual is issued to support the Master Drainage Plan and Drainage Regulations that have been adopted by the Jefferson County Drainage District No. 7 pursuant to the authority set forth in the Texas Water Code §49.211

Using the FEMA worksheet 4, the District reviewed the plans and tools available from a regulatory perspective and their jurisdictional authority as shown in Table 11.

Regulatory Tool	YES/ NO	Explanation/Comment/Discussion
Comprehensive Plan	Yes	2002 Master Drainage Plan Study, currently updating
Zoning Ordinance	No	Responsibility with City / County
Subdivision Ordinance	No	
Site plan review requirements	Yes	Drainage Criteria Manual and Master Drainage Plan (Plan related to Drainage and Flood Damage Reduction-November 2019)
Growth management Ordinance	No	
Floodplain Management Plan and Floodplain Ordinance	No	Responsibility with City / County

Table 11 - Regulat	tory Mitigation	Capabilities	Regulatory	Tool	(ordinances,	codes, plans)
--------------------	-----------------	---------------------	-------------------	------	--------------	---------------

Regulatory Tool	YES/ NO	Explanation/Comment/Discussion
Other special purpose ordinance (stormwater, steep slope, wildfire)	Yes	Drainage Criteria Manual and Master Drainage Plan
Building Code Effectiveness Grading Schedule (BCEGS) Rating	No	Responsibility with City
Building Code	No	Responsibility with City
Fire Department International Organization for Standardization (ISO) rating	No	Responsibility with City / County
Erosion or sediment control program	Yes	Jefferson County Storm Water Coalition
Stormwater Management program	Yes	Same as above, regional activities with other municipalities
Capital Improvements plan	No	Special Projects (Informal Budget List)
Economic Development Plan	No	Responsibility with City / County
Local Emergency Operation plan	No	The County has an Emergency Operation Plan, however, DD7 has internal personnel plan for Storm Duty
Elevation Certificates	No	Flood Plain Management
Other plans	No	Hazard Mitigation Plan Regional Watershed Planning (Neches Region 5)
Flood insurance study or other engineering study for streams	No	No, working with FEMA to get the Hurricane Flood Protection Levee (HFPL) recertified and new maps approved.

Improving Regulatory and Planning Capabilities

The District continues to review its regulations and drainage criteria, however, establishing an annual review with report would help formalize that process.

Financial Resources

The District uses ad valorem tax from its jurisdictional area to support flood control facilities and services in the jurisdictional area. In addition, the District actively pursues grants through various state and federal agencies for projects and programs, including hazard mitigation.

Financial Tools	YES/NO
Grants - FEMA (FMA, HMGP) Community Development Block Grant (CDBG), State Grants	Yes
Capital Improvement Project Funding	Yes
Authority to levy taxes for specific purposes	No
Fees for water, sewer, gas, or electric services	No
Impact fees for new development	No
Incur Debt through general obligation bonds	Yes
Incur Debt through special tax bonds	Yes
Incur debt through private activities	No
Withhold spending in hazard-prone areas	No
Stormwater Service fees	No
Other	Yes

Table 12 - Fiscal Capabilities Financial Resources Capabilities

• Insured Buildings

DD7 maintains approximately \$102 Million property insurance coverage on buildings and facilities it owns, to protect the District from damage due to structural fire, wind and lightning (hazards other than flood) and approximately \$1.65 Million in coverage for building contents. It also carries windstorm insurance.

Improving Regulatory and Financial Capabilities

DD7 will continue to review its rules and guidelines to ensure these rules are supporting mitigation efforts. It will continue to look for funding opportunities with its communities, the County, state and federal agencies and grants to fund mitigation efforts listed in the mitigation action table.

Education and Outreach

DD7 actively communicates with its residents using a variety of media, each of which have been used to convey information, including content about flood hazards:

- News releases News releases announcing District events and issues of public interest are sent to local media help publicize information to the public;
- Mailings Information that could impact the public is also sent by mail to directly reach the constituents; and
- Website The District's official website provides information, applications, forms, and interactive features such as maps. It also helps sponsor the Jefferson County Stormwater Quality Coalition website which hosts public education material, construction information and other important documentation





Table 13 - Education and Outreach Capabilities

Education and Outreach Tools	YES/NO	Comments
Program/Organization	No	Jefferson County Stormwater Quality Coalition
Community Newsletters	No	
Hazard awareness campaigns (such as Firewise, Storm Ready, Severe Weather Awareness Week, school programs, public events)	Yes	Southeast Texas Alert Network (STAN) outreach capabilities
Local news	Yes	
Organizations that represent/advocate for/interact with underserved and vulnerable communities	No	
Social media	Yes	Facebook
Other	Yes	Website

Improving Education and Outreach Capabilities

DD7 will utilize its website and the websites of the communities within its planning area and the County to provide updated information regarding work being done in support of mitigation, efforts individual can do to help with mitigation and raise awareness of the tools available to the public to help understand weather events.

Participation in the NFIP

DD7 is a conservation and reclamation district and a political subdivision of the State of Texas. Considering DD7 is a separate entity and does not directly participate in the NFIP, specific actions will be determined by representatives and officials with the incorporated areas and Brazoria County within the District. With this in mind, DD7 did not identify and prioritize NFIP actions as part of the planning process. DD7 will continue to work closely with the City of Port Arthur, City of Port Neches, Groves, Nederland, and Jefferson County to identify and recommend actions that will ensure continued compliance with the NFIP.

Participation with the National Flood Insurance Program (NFIP) and the Community Rating System (CRS) are important to the citizens within the jurisdictional area of DD7. This is evidenced by the Cities Port Arthur, Port Neches, Groves, Nederland, and Jefferson County County's commitment to regulating development and redevelopment, adoption of provisions that exceed the minimum requirements, and by their active pursuit of risk mitigation opportunities. Cities and Counties are eligible to apply and maintain status within the NFIP and CRS and in doing so, residents can receive NFIP backed flood insurance and when steps are met, discounted rates through the CRS program.

Changes in Development

Per the Jefferson County Appraisal District (JCAD) as of 2024, there are 37,153 total residential housing units and 3,681 commercial buildings located within the Planning Area. Comparing it to the 2019 numbers, there is an increase in total building in a five-year period of approximately 8.73%, as shown in Table 14 driven by the commercial building increases.

Туре	2019 No.	2024 No.	Variance	% Change
Residential Buildings	37,554	37,153	-401	1.07%
Commercial Buildings	3,077	3,681	604	19.63%
Total	37,554	40,834	3,280	8.73%

Table 14 - No. of Buildings by Type in Planning Area (JCAD)

The Cities and County are responsible for the building code and development ordinances, and these communities have instituted ordinances to ensure homes and commercial buildings are built to withstand 110 mile per hour wind loads at three seconds gusts and requires any building in the floodplain to be at least one-foot above the Base flood elevation with an elevation certificate establishing the height. While there has been a steady increase of development, the jurisdictions recognize the importance to institute measures to limit damage and exposure of citizens and structures to floods and high wind hazards implementation of these codes and ordinances.

While DD7 does not have direct oversight of development in the floodplain and with subdivision plans, it is part of the review and approval process with the County and the Cities. As part of that review, DD7 provides interested parties a clear and consistent review process and documents outlined in the Rules and Regulations Guidelines. These guidelines, as well as all other needed forms and documents can be easily downloaded from the District's website

While there has been a decrease in residential development but an increase in commercial development, sound policies and implementation by the communities have not caused an increase in hazard vulnerability to these new buildings.

Section 3. Hazard Identification and Risk Assessment

Changes from the Last Plan

As part of the update process, the MPC reviewed the hazards included in the most current plan and determined if any hazards should be added or removed. The hazards that were profiled in the 2019 plan and are in this updated plan are shown in Table 15. The hazards in red are being added to the 2025 plan update and were not in the previous iteration from 2019. The MPC also reviewed if climate change further impacts the hazard and during the vulnerability analysis added a socially vulnerable populations segment. Numerous changes from the current plan were incorporated, including updated maps and tables displaying the event history from the National Center for Environmental Information (NCEI) for various hazards, community profile information, as well as many other less significant modifications.

Hazards from 2019 Plan	Hazards for 2025 Plan
Flood	Coastal Erosion
Hurricanes/Tropical Storms	Drought
Levee Failure	Extreme Heat
Severe Thunderstorm/High Wind	Flood
Tornado	Hailstorm
	Hurricane/Tropical Storm
	Levee Failure
	Lightning
	Severe Thunderstorm/High Wind
	Tornado
	Winter Storm

Table 15 - 2019 and 2025 Hazards

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 29) 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 hazard, location, extent, previous occurrence, probability of future events based on historical analysis, and if climate change can affect the probability of the hazard. Hazards are then evaluated based on potential impact on the community, the worst-case scenario for the community, the community's overall vulnerability with a subset of analysis on socially vulnerable populations.

Figure 29 - FEMA Concept of Risk Diagram



Identifying Hazards

The Hazard Summary Table (Table 16) 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 definitions in Table 17 were reviewed for each hazard profiled and summarized. Each hazard received an overall significance classification of Low, Medium, or High. *Table 16 - Classifications and Definitions for Hazards*

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.				
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.

Maximum Probable Extent (Magnitude 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.

Overall Significance

Low: Two or more criteria fall in lower classifications, or the event has a minimal impact on the planning area. This rating is sometimes used for hazards with a minimal or unknown record of occurrences or for hazards with minimal mitigation potential.

Medium: The criteria fall mostly in the middle ranges of classifications and the event's impacts on the planning area are noticeable but not devastating. This rating is sometimes used for hazards with a high extent rating but very low probability rating.

High: The criteria consistently fall in the high classifications and the event is likely/highly likely to occur with severe strength over a significant to extensive portion of the planning area.

Table 17 - Hazard Summary Table for JCDD7

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)
Coastal Erosion	Limited	Moderate	Occasional	Medium
Drought	Extensive	Weak	Likely	Medium
Extreme Heat	Extensive	Weak	Likely	Medium
Flood	Significant	Severe	Likely	High
Hailstorm	Extensive	Moderate	Occasional	Low

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)
Hurricane/ Tropical Storm	Extensive	Extreme	Highly Likely	High
Levee Failure	Significant	Extreme	Occasional	High
Lightning	Extensive	Moderate	Likely	Medium
Severe Thunderstorms/ High Wind	Extensive	Severe	Highly Likely	High
Tornado	Extensive	Severe	Likely	Medium
Winter Storm	Extensive	Moderate	Occasional	Medium

Hazards Omitted

The District focused on hazards that occur within the planning area that historically have had enough impact (e.g., damage to property, infrastructure, injury, or death) that mitigation of that hazard is necessary for the welfare of the community. Certain hazards have no history of impact in the planning area; therefore, the District decided to omit these hazards. Important to note, while the District believes these hazards are negligible, each year it will review the hazard during its annual review to determine if the impact has changed and if so, will update the Plan accordingly. None of these hazards were included in the 2019 Plan.

Table 18 - Hazards Omitted

Natural Hazard	Review	Reason for Omission
Dam Failure	Omit	The Mitigation Planning Committee has discussed this hazard in depth and decided that based on their research there would be no potential damage to the planning area if any of the dams upstream to DD7 were to failure. It was decided to omit the hazard.
Earthquake	Omit	The state plan indicates that earthquake occurrence is very rare and there is no history of impact to Jefferson County.
Subsidence	Omit	Subsidence has not been a risk to planning area based on no historical record of any occurrence. In addition, JCDD7 reviewed the Houston/Galveston subsidence reports that

Natural Hazard	Review	Reason for Omission
		indicates that planning area has a de-minimus level of subsidence, therefore the hazard will not be profiled.
Wildfire	Omit	There is no historical damage from wildfire in the planning area. All DD7 owned facilities are outside the wildlife- urban interface (WUI), therefore the hazard will not be profiled.

Hazard Damage Summary Information

According to the NOAA NCEI Climate Monitoring website, The U.S. has sustained 391 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. For 2024, the total cost of the 15 weather/climate disaster events to affect the United States was \$37.9 billion. The events included 1 drought event, 4 flooding events, 13 severe storm events and 2 winter storm events. Figure 30 depicts the timing and location of these disasters.



Figure 30 - 2024 Disasters and Locations

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 (USACE) and the Natural Resources Conservation Service (NRCS) 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. This county-wide hazard data from the NCEI is often the best available resource for documenting historical events. Two sources used to help provide important data are the NCEI database and FEMA's declared disaster database. The State of Texas's 2023 Hazard Mitigation Plan summarizes damages by hazards by county from data from the NCEI database for 2001-2021. The MPC summarized the State's findings for Jefferson County as shown in Table 19. It is important to note that this data is for the entirety of Jefferson County and that this data is not available for just DD7.

Table 19 - Summary of Jefferson County Damages by Hazards(TDEM Hazard Mitigation Plan, 2023)

							Severe			Coastal	Levee
Category	Drought	Extreme Heat	Flood	Hailstorm	Hurricane	Lightning	Thunderstorm	Winterstorm	Tornado I	Erosion	Failure
Ranking	165	143	5	235	11	26	33	96	10	N/A	N/A
Number of Events	1	2	79	61	9	10	86	12	12		
Property Damage	\$0.00	\$0.00	\$374,146,302.00	\$0.00	\$469,623,689.00	\$651,525.00	\$5,178,960.00	\$673,626.00	\$34,559,125.00		
Crop Damage	\$0.00	\$0.00	\$0.00	\$0.00	\$1,321,624.00	\$0.00	\$0.00	\$0.00	\$0.00		
Fatalities	0	0	10	0	0	3	0	1	0		
Injuries	0	0	1	0	12	7	2	0	11		
Annualized Losses	\$0.00	\$0.00	\$17,006,650.09	\$0.00	\$21,346,531.00	\$29,615.00	\$235,407.00	\$30,619.00	\$1,570,869.00		
Average Annual Event 2000-2016	0.06	0.1	3.35	2.8	0.31	0.53	3.41	0.47	0.82		
Annual Average											
Frequency Change	-29.41%	-10.00%	6.60%	-1.80%	24.20%	-0.17%	12.70%	13.70%	-51.00%		
Probability	Unlikely	Unlikely	Highly Likely	Highly Likely	Likely	Likely	Highly Likely	Highly Likely	Highly Likely		

Losses Due to Major Disasters

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 are 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 for several days. 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 follows in Figure 31.

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

Figure 31 - Funding Obligations by FEMA Disaster Category

Data on Presidential Disaster Declarations characterize some natural disasters that have affected the area. In 1965, the federal government began to maintain records of events determined to be significant enough to warrant declaration of a major disaster by the President of the United States. Presidential Disaster Declarations (DRs) are made at the county level and are not specific to any one city or district. FEMA's website on Disaster Declaration for States and Counties (Disaster Declarations for States and Counties | FEMA.gov_) provides a summary illustration for Jefferson County, Texas from 1953-2024 of Disaster Declarations as shown in Figure 32. A total of 22 natural disaster declarations have been made for Jefferson County since 1953. By hazard, flood top the list with seven, followed by hurricane/tropical storm with seven, severe storms with five.





Since the end of 2019, there have been three Presidentially Declared Disasters - hurricane and severe ice storm, for Jefferson County as represented in Figure 33.





2024

Jefferson County has persevered through many natural disasters. Table 20 details the Presidential Declared Disasters and Emergency Declarations that the County experienced from 1953 until 2024. Highlighted in yellow are the declarations from 2020-2024 (since the last plan was completed). Each disaster is costly and challenging. The goal of this plan is mitigation and to reduce the impact of future disasters like these mentioned below. COVID-19 disaster declaration is in this table, but this plan will not detail this biological disaster.

Declaration	Disaster		
Date	Number	💌 Туре 📃 💌	Title 🗾 🔽
07/09/2024	4798	Hurricane	Hurricane Beryl
02/19/2021	4586	Severe Ice Storm	Severe Ice Storm
12/9/2020	4572	Hurricane	Hurricane Laura
03/25/2020	4485	Biological	COVID-19
10/4/2019	4466	Flood	Tropical Storm Imelda
08/25/2017	4332	Hurricane	Hurricane Harvey
11/25/2015	4245	Severe Storm	Severe Storm
9/9/2011	4029	Fire	Wildfire
09/13/2008	1791	Hurricane	Hurricane Ike
01/11/2006	1624	Fire	Extreme Wildfire
09/24/2005	1606	Hurricane	Hurricane Rita
11/05/2002	1439	Severe Storm	Severe Storm
06/09/2001	1379	Coastal Storm	Tropical Storm Allison
10/21/1998	1257	Flood	Flooding
09/23/1998	1245	Severe Storm	Hurricane Georges
08/26/1998	1239	Severe Storm	Tropical Storm Charley
10/18/1994	1041	Flood	Severe Storm
7/18/1989	836	Flood	Tropical Storm Allison
5/19/1989	828	Severe Storm	Severe Storm
9/26/1980	632	Flood	Tropical Storm Danielle
7/28/1979	595	Flood	Severe Storm
4/26/1979	580	Severe Storm	Storm & Flash Flood
6/25/1973	393	Flood	Severe Storm

Table 20 - Jefferson County Presidential and Emergency Declarations, 1953-2024

This information is helpful as it also shows that flooding is one of the most damaging hazards along with hurricanes and tropical storms and severe winter storms/ice storms.

As mentioned earlier, the MPC reviewed the State of Texas Hazard Mitigation Plan (2023). In addition, The MPC reviewed the National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NOAA, NCEI) hazard database, FEMA's Disaster Declarations, Risk Index, neighboring counties and cities (Harris, Fort Bend, Pearland, Alvin, Brazoria) Hazard Mitigation Plans, USDA Drought Disasters for Jefferson County, General Land Office regional plan, TWDB 2022 State of Water Report, US Census Bureau data, Region 6 San Jacinto Regional Flood Plan, 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.
- Jefferson/Hardin/Orange and JCDD6 Hazard Mitigation Plans Updates: Plan's goals, actions and hazards were reviewed to gather data for this plan.
- CDC Social Vulnerability database was used for information on risk for vulnerable population.
- US Census Data was used for information on population, density, housing, education, workforce and other community profile information.
- Region 5 Neches Regional Flood Plan provides data from a regional perspective on flooding.
- TWDB 2022 State of Water Report reviewed demands by usage type for the County.

The next part of this section focuses on hazard identification, the potential impact of these hazards, and the community's vulnerability from each hazard. While climate change may have an impact on certain hazards, future trends are not clear if climate change has any impact for hail, lightning, and tornadoes and therefore will not be addressed.

Coastal Erosion

Update from last plan

• This hazard was not profiled in the 2019 plan

Hazard Description

Coastal erosion is the gradual deterioration of shorelines and displacement caused by both physical and chemical forces. Some examples are water movements, wind, and meteorological conditions. Coastal erosion is quantified by assessing the loss of shoreline over time. The Texas General Land Office (GLO) reports that 'sixty-four percent of the Texas coast is eroding at an average rate of about six feet per year. FEMA estimates that every dollar spent on erosion control and mitigation to preserve wetlands and other natural ecosystems will provide a return on average of four dollars in cost-savings in the future." (Coastal Erosion (texas.gov))

Location

The coastline and bay shoreline of Jefferson County is susceptible to coastal erosion, which is shown in Figure 34. The coastline on the Gulf of Mexico is in the orange and red portions of the scale. However, DD7 (shown in the green highlighted section) is not directly on this coast, however, does have coastline on Sabine Lake and the Neches River. This figure does not document the potential coastal erosion on these lakes or rivers, however. Additionally, erosion can occur on levees found in JCDD7. This erosion can cause structural integrity which will be discussed further in the "levee failure" portion of this plan.



Figure 34 - Coastal Erosion in Jefferson County (1950-2019) Coastal Resource Management Viewer (arcgis.com)

Previous Occurrences

No historical damage was listed in the NCEI database; however, coastal erosion typically occurs from a single event like the hurricanes/tropical storms and that damage would likely be documented under hurricane in the database and not a coastal erosion event. There is also gradual erosion over time that is not a single event that would be documented in the NCEI database.

Future Occurrences

Reviewing the hazard based on annual erosion per year in the Coastal Resource Management Viewer found in ArcGIS in the earlier section, it is anticipated that southern Jefferson County may continue to lose between 8-20+ feet per year. However, DD7 planning area does not show potential coastal erosion along Sabine Lake or Neches River in this resource.

Extent

Coastal erosion is measured through feet (or meters) lost per year on the shoreline. The USGS Coastal Vulnerability Index is a tool that classifies based on following variables: geomorphology, regional coastal slope, tide range, wave height, relative sea-level rise and shoreline erosion and accretion rates. The combination of these variables and the association of these variables with each other furnishes a broad overview of regions where physical changes are likely to occur due to sea-level rise.

Figure 35 indicates that the vast majority of Jefferson County is "Very High" on the Coastal Vulnerability Index. This is very similar results found in the Coastal Resource Management Viewer in ArcGIS. Again, this figure does not document potential coast loss on the DD7 area where the Sabine Lake or Neches River is found.





According to the Texas Hazard Mitigation Plan (2023) has Jefferson County ranked #2 in Texas at -37.8 feet in endpoint erosion rate from 1930-2019. This is another source that does not quantify the rate of loss in the Sabine Lake or Neches River, and just documents erosion along the Gulf of Mexico, which is not directly connected to DD7.

Impact

The most likely impact from coastal erosion would be a reduction in wildlife refuge area, financial cost of replenishment of land on the coast, and potential damage to residential homes on the coast. In addition, this erosion could cause damage to levees found in the area, which could cause partial or full levee failure. The effects of levee failure will be documented in more depth in the "Levee Failure" section of the Risk Assessment.

Effect of Climate Change on Coastal Erosion

Climate change could cause more frequent and extreme hurricanes and tropical storms. This in turn could cause more coastal erosion in the planning area.

Impact to District Employees: Climate change does not have an impact on District employees.

Impact to District Assets and Service: Climate change could further erode the coast and the natural and infrastructure assets that the District has built to protect the 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.

There is not significant difference in vulnerability between social groups regarding coastal erosion. This is mainly due to coastal erosion being a slow process over time. In addition, typically people that live near the coastline are often in higher income brackets that have the monetary capabilities to recover from any damage to their property due to coastal erosion.

Overall Vulnerability

Coastal erosion is a factor that affects certain portions of the planning area particularly areas adjacent to Sabine Lake and the Neches River. There are typically not specific coastal erosion events, but rather a slow reduction in coastlines over time.

There may be some cost for the District including:

- Financial cost of replenishment of land on the coast
- Potential loss of revenue from tourism
- Loss of natural habitat and wildlife along the coast
- Financial cost of upkeep on levees from gradual breakdown from erosion.

Potential or projected development could cause stress to the ecosystems and watershed which could weaken the areas that are used to help protect the shorelines. Similarly, populations also bring infrastructure which also could add stress to the ecosystems and watersheds. For instance, an increase in population, brings more stress on groundwater discharge and wastewater systems. Less visible hazards such as toxins, pathogens, saltwater intrusion, and wastewater discharge threaten coastal ecosystems and wildlife as well as the people who live, work, and play along the coasts. These contaminants can enter the coastal waterways through seepage, spills, runoff, or through groundwater discharge.

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development the ability of new development to withstand winter weather impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. Land use changes could alter the impact of drought by causing degradation of water quality, quantity, and soil properties.
- Projected changes in population With an increase in population, more people will be exposed to winter weather events. Additionally, the age of the population, changes in their geography, and how climate change could alter the winter weather received (rain versus snow) will be important to continue to assess future changes in vulnerability. Population increase could place further strains on the infrastructure.
Drought

Update From Last Plan

• This hazard was not profiled in the 2019 plan

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

DD7 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 the planning area is equally at risk.

Previous Occurrences

Drought.gov data recorded 9 years with drought conditions of at least severe drought (D2 or higher) for Jefferson County since the year 2000. There have been 2 years (2022, 2023) with severe drought events since the previous plan was completed in 2019.

Figure 36 shows the extent of all recorded droughts in Jefferson County since 2000. Data shows that there have been multiple cases of D3 and D4 drought in the County (extreme and exceptional drought conditions).



Figure 36 - U.S. Drought Monitor – Drought.gov

Future Occurrences

Based on 9 years (2000, 2006, 2008, 2010, 2011, 2012, 2014, 2022, 2023) with at least severe drought conditions in the last 24 years, a drought can be expected once every 2.66 years on average in Jefferson County. Since drought is a regional hazard, all the planning area can expect drought at the same rate. When calculating on a yearly basis, JCDD7 can expect a drought at 37.5%.

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.

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 21 identifies the values used to define the PDSI. During the 2011 event the PDSI was -4.0 and again in 2023.

I	Table 21 - Palmer Drought Severity Ind	lex
(Source: NOAA,	National Weather Service - Climate I	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)	

Figure 37 - Palmer Drought Index (Source NCEI/NOAA)

+3.0 or +3.9 (Very Moist Spell) +4.0 or above (Extremely Moist)





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 38 below provides the description and impact for each category.

Category	Description	Possible Impacts
D0	Abnormally Dry	 Going into drought: short-term dryness slowing planting, growth of crops or pastures Coming out of drought: some lingering water deficits pastures or crops not fully recovered
D1	Moderate Drought	 Some damage to crops, pastures Streams, reservoirs, or wells low, some water shortages developing or imminent Voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likelyWater shortages commonWater restrictions imposed
D3	Extreme Drought	Major crop/pasture lossesWidespread water shortages or restrictions
D4	Exceptional Drought	 Exceptional and widespread crop/pasture losses Shortages of water in reservoirs, streams, and wells creating water emergencies

Figure 38 - Drought Classification (US Drought Monitor)

The maximum drought extent experienced in DD7 is a Category D4 (exceptional drought) that was reported by the U.S Drought Monitor in 2011 and again in 2023 (Figure 38).

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. Figure 39 describes the number of impacts reported by category with plants, wildlife, and agriculture being reported with the greatest frequency. This data from the DIR in the chart below was queried starting January 2014.

Figure 39 - Drought Impact Report for Jefferson County Texas – January 2014 to September 2024



Apart from the impacts already mentioned in the Disaster Impact Report (DIR), drought had its most significant effects in 2023, leading to the implementation of several months long water conservation and reduction measures in parts of the area. 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 entire region was significant, with property damage estimated at \$10 million and agricultural losses amounting to approximately \$100 million. There is not a quantifiable amount for the 2022/2023 droughts yet, however, costs are anticipated to be similar to the 2011 events. Population increase could place further strains on the infrastructure. Land use changes could alter the impact of drought by causing degradation of water quality, quantity, and soil properties.

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. The Center for Climate and Energy Solutions reports that "Risk of drought is expected to grow due to reduced precipitation and higher temperatures caused by climate change. Droughts can have far-reaching impacts including degraded water quality, low river flows with ecological implications, saltwater intrusion in tidal river areas and land subsidence"

(Resilience Strategies for Drought, 2018 resilience-strategies-for-drought.pdf (c2es.org)). With an extended and warmer climate, droughts can become longer, more frequent, and more severe for DD7.

According to the NOAA's Climate Mapping for Resilience and Adaption (CMRA) tool there is an estimated increase in potential consecutive dry days per year over the rest of the century in Jefferson County if fossil fuel emissions continue at current levels (characterized as higher emissions). However, estimations lower potential consecutive dry days per year by late this century 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 40 below shows the comparison of the maximum number of consecutive dry days over time based on these lower or higher emissions.

Impact to Employees: Climate change does not have an impact on District employees.

Impact to Assets and Service: While climate change does not have an impact to assets, drought can impact water service as conservation of water during a drought lessens the amount of water available for distribution which impacts service and income for the District.



Figure 40 - Maximum Number of Consecutive Dry Days Over 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.

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 income potential.

Overall Vulnerability

Drought risks to people and property within the district cannot be distinguished by area. 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. Vulnerable assets may include residential, commercial, and critical facility buildings, crops, farms, landscaping, and common assets such as drinking water. Water distribution, water transmission lines, and water wells are affected by drought as well.

The National Risk Index shows drought is relatively low risk (75.8 national percentile) and relatively low (76.1 national percentile) in expected annual loss. This index estimates a 180 thousand dollar expected annual loss for the County as a whole. The National Risk index also notes that their ranks for drought are just based on potential agricultural impacts. The Drought Impact Reported shown in a previous section showed that most of the damage from drought in this area is agricultural or plant/wildlife.



Figure 41 - National Risk Index – Drought

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development Any areas of growth could be potentially impacted by the drought hazard because the entire district is exposed and vulnerable to droughts. Future growth and development could impact the amount of potable water available due to a drain on the available water resources. An increased drain on water resources would not only impact the district's population, but it would also exacerbate impacts to other areas of the district, as discussed above, including agriculture and recreational facilities.
 - Projected changes in population If there is an increase in population, the demand for water supply will increase. During a drought, the amount of water needed might not be available. This might require reallocation of water resources to meet demands during a drought. If needed, Jefferson County may pass special ordinances regulating the amount of water consumed and used during periods of drought to conserve water.

Extreme Heat

Update From Last Plan

• This hazard was not profiled in the 2019 plan

Hazard Description

The most recent Texas HMP update describes extreme heat as a combination of very high temperatures along with exceptionally humid conditions. If these conditions persist over a prolonged 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.

There are a multitude of ways to classify extreme heat conditions. For example, NOAA classifies extreme heat as Heat Index (this is described in the "Extent" section of this plan) of 105 degrees or higher for at least two days and nights not dropping below 75 degrees. The NWS criteria is a Heat Index of 105 degrees for two hours or more. FEMA classifies extreme heat as temperatures above 90 degrees for at least two days. 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, considering 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 the planning area 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 just 1 extreme heat event for Jefferson County since the start of 2020. These events are summarized in Table 22. The NOAA database showed that during those heat events there were no recorded deaths or injuries. This event had multiple entries for the same day, so those duplicates were not counted. This event occurred in the summer of 2023, which was a season of prolonged heat for the entire region. However, there is extreme heat conditions in this planning area nearly every year, particularly in the summer

months. The NCEI database may not record each of those events, as they typically will document just the most severe cases and may not document an event if there is no recorded damage.

Location	County/Zone	<u>St.</u>	Date	<u>Time</u>	<u>T.Z.</u>	<u>Type</u>	<u>Mag</u>	<u>Dth</u>	<u>lnj</u>	<u>PrD</u>	<u>CrD</u>
Totals:								0	0	0.00K	0.00K
LOWER JEFFERSON COUNTY (LOWER JEFFERSON COUNTY (ТΧ	08/01/2023	00:00	CST-6	Heat		0	0	0.00K	0.00K
UPPER JEFFERSON COUNTY (UPPER JEFFERSON COUNTY (ТΧ	08/01/2023	00:00	CST-6	Heat		0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

Table 22 - Heat Events in Jefferson County, 2020 – 2024(Source: NOAA/NCEI)

Future Occurrences

Based on the NCEI database recording 1 heat event over the last 5 years, an extreme heat event has an approximately 20% chance annually in DD7. As previously discussed, there is extreme heat nearly every year in this region, but this percentage is just based on NCEI database reported cases. The extent section will go into more detail on how a typical summer day can reach "extreme heat" categories.

Extent

The National Weather Service (NWS) released a Heat Index (Figure 42) 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. The maximum probable extent DD7 can expect is considered severe/extreme which corresponds to the NWS classifications of "Danger" and "Extreme Danger" as shown on Figure 42, however that will likely increase as the effects of climate change worsen, causing higher temperatures more frequently and for longer periods of time.

For an example, the weather data was collected for July 1st, 2024, around Port Arthur in Jefferson County. This data shown below indicates that at around 2:00pm the temperature reached 96 degrees and was 58% humidity. The "feels like" temperature or the "Heat Index" of the NWS chart would have that around 116 degrees which is in the "danger" level (shown in the red circle). If it were at the same humidity and just a few degrees warmer, it would reach the "extreme danger" level. For instance, this is over the 105-degree Heat Index that NWS classifies as an extreme heat event. However, this did not show in the NCEI database as a recorded event.

Time	Temperature	Dew Point	Humidity
12:53 AM	81 °F	79 °F	94 %
1:53 AM	80 °F	79 °F	96 %
2:53 AM	80 °F	78 °F	94 %
3:53 AM	80 °F	78 °F	94 %
4:53 AM	80 °F	78 °F	94 %
5:53 AM	80 °F	78 °F	94 %
6:53 AM	80 °F	78 °F	94 %
7:53 AM	83 °F	80 °F	91 %
8:53 AM	86 °F	78 °F	77 %
9:53 AM	89 °F	76 °F	65 %
10:53 AM	91 °F	75 °F	59 %
11:53 AM	93 °F	77 °F	59 %
12:53 PM	95 °F	77 °F	56 %
1:53 PM	96 °F	79 °F	58 %
2:53 PM	97 °F	79 °F	56 %
3:16 PM	84 °F	77 °F	79 %

Figure 42 - NWS Heat Index

	NWS	Не	at Ir	ndex			Te	empe	rature	e (°F)	1						
		80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
	40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
01-1226	45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
(%)	50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
ty (55	81	84	86	89	93	97	101	106	112	117	124	130	137			
idi	60	82	84	88	91	95	100	105	110	116	123	129	137				
Ę	65	82	85	89	93	98	103	108	114	121	128	136					
Ŧ	70	83	86	90	95	100	105	112	119	126	134						
ive	75	84	88	92	97	103	109	116	124	132							
lat	80	84	89	94	100	106	113	121	129								
Re	85	85	90	96	102	110	117	126	135							100	
2520000	90	86	91	98	105	113	122	131								no	AR
	95	86	93	100	108	117	127										-)
	100	87	95	103	112	121	132										The second s
1	Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity																
	Caution Extreme Caution Danger Extreme Danger									er							

Impact

he NWS also tracks the impact of extreme heat with prolonged exposure or when completing strenuous activities. Figure 43 shows effects on the body at different heat index levels.

Figure 43 - 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 DD7, the risk of extreme heat affects all people and properties uniformly across the entire area.

Certain populations, such as older adults and those with lower incomes, may 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.

Moreover, excessive heat also puts 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 DD7, 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. Population increase could place further strains on the infrastructure that are used to cool building and people. Land use changes could alter the impact of extreme heat by causing degradation of water quality, quantity, and soil properties.

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. The Massachusetts Institute of Technology (MIT) created a Climate Portal to provide scientifically supported information regarding climate change to the public. It states:

Climate change has led to about 1.8° F (1° C) of average global warming so far. We emphasize the word "average" because this slight rise in average temperatures can cause a much steeper rise in record highs and very hot days. In recent years, weather stations around the world are recording a growing number of extreme heat events and record-high temperatures. Climate change is also making the world more humid on average. Hot, humid

days don't just feel muggier than dry days—they are also more dangerous. The human body cools itself by sweating, and if the air is too humid, sweat cannot evaporate, and the body will keep getting hotter. This condition can quickly lead to fatal heat stroke for people who cannot get to a cooler place. (Source: Extreme Heat | MIT Climate Portal)

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 Jefferson 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 44 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 44 - Estimated Days Per Year >90°F Over Remainder of 21st Century

Impact to Employees: Higher temperatures for longer durations from climate change could leave employees who work outside vulnerable to heat related illnesses like heat stroke.

Impact to Assets and Service: Extreme heat could cause equipment to overheat and fail, and a secondary impact if there is a long duration of extreme heat with no precipitation, could cause a drought, which could mandate water service as conservation of water during a drought lessens the amount of water available for distribution which impacts service and income for the District.

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, may 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 DD7 cannot be distinguished by area; the hazard is reasonably predicted to have uniform probability of occurrence across the entire planning area. 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 most risk of injury or death from future extreme heat events.

The National Risk Index (shown in Figure 45) shows extreme heat is relatively moderate (86.6 national percentile) and relatively moderate (86.0 national percentile) in expected annual loss. This index estimates a \$654 thousand dollar expected annual loss.



Figure 45 - National Risk Index – Extreme Heat

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

Potential or projected development - Understanding future changes that impact vulnerability in the district can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. Areas targeted for potential future growth and development could be potentially impacted by extreme temperatures since the entire district is exposed. However, due to increased standards and codes, new developments can be less vulnerable to extreme temperatures in comparison with the aging building stock.

Projected changes in population – If the district has an increase in population, it will expose more people to the hazards mentioned earlier from extreme heat.

Flood

Update from last plan

• Events since 2019 were updated and described.

Hazard Description

The NOAA National Severe Storms Laboratory describes a flood as an overflow of water onto land that is typically dry. Floods can happen during heavy rains, when ocean waves come on shore, when snow melts quickly, or when dams or levees break. Damaging flooding may happen with only a few inches of water, or it may cover a house to the rooftop. Floods can occur within minutes or over a long period, and may last days, weeks, or longer. Floods are the most common and widespread of all weather-related natural disasters. Records show that up to 90 percent of the State of Texas's reported damage from natural disasters comes from flooding. (Severe Weather 101: Flood Basics (noaa.gov)). The two types of floods that most impact JCDD7 are flash flooding and riverine flooding. In addition, even though DD7 is not directly along the gulf coast there is still a risk of coastal flooding and storm surge from large storms.

- River flooding primarily results from an extended precipitation event that occurs at, or upstream from, the affected area. River flooding can also occur when traditional flood-control structures, such as levees and dikes, are overtopped. Significant river flooding events in many coastal areas are often the result of tropical cyclones, such as Hurricane Floyd (1999) or Hurricane Harvey (2017).
- 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.
- Coastal flooding occurs in areas directly adjacent to coastal waters. There are several distinct causes:
 - High-tide flooding occurs in low-lying coastal areas during extreme high tides (also known as perigean or king tides). These tides occur a few times per year when the sun, moon, and earth align. By definition, a coastal storm is not necessary for high-tide flooding to occur. However, even relatively weak onshore winds can increase the level of flooding.
 - Storm surge results from more severe storms such as tropical cyclones (hurricanes and typhoons) and nor'easters, as strong winds drive water onshore. For example, Hurricane Hugo (1989) and Hurricane Ike (2008) generated extensive storm surge. Communities do not have to be directly in or next to the path of a large storm to experience surge effects. Wave setup, an increase in water levels caused by breaking waves offshore (while the storm is approaching the coast), increases the height of storm surges.

Location

The location of the 1% (100-year) and 0.2% (500-year) chance of an event in the floodplain are designated as flood zones and are the locations within the planning area that are at greatest risk of flooding. The Figure 46 shows the location of the flood zones in DD7 and surrounding areas. It also shows the areas at reduced flood risk due to the levees in the District. FEMA has created Flood Insurance Rate Maps (FIRMs) that can provide more details and are attached in Appendix G.



Figure 46 - Flood Zone Overlay for DD7

There are also areas called Special Flood Hazard Area (SFHA) that are most susceptible to flooding. These are areas with a 1% chance or higher to experience a flood each year. That means that these areas have at least a one in four chance of flooding during a standard 30-year mortgage. Figure 47 was used in the 2023 Texas Hazard Mitigation Plan to show the areas with the largest number in the SFHA. The darker blue parts have the highest percentage of SFHA.

Figure 47 - State of Texas SFHA

Previous Occurrences

The NCEI Storm Events Database lists 18 flood events in the last 5 years in Jefferson County as a whole. If multiple line items in the table are from the same day, those are only counted as a single event. The total recorded property damage for those events equals about 5.2 million. *Figure 48 - Flood Events (2020-2024)*

Location	County/Zone	<u>St.</u>	Date	<u>Time</u>	<u>T.Z.</u>	<u>Type</u>	Mag	<u>Dth</u>	lnj	<u>PrD</u>	<u>CrD</u>
Totals:								0	0	5.222M	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	05/14/2020	14:38	CST-6	Flash Flood		0	0	75.00K	0.00K
LAKEVIEW	JEFFERSON CO.	ТΧ	05/17/2021	09:26	CST-6	Flash Flood		0	0	100.00K	0.00K
CHEEK	JEFFERSON CO.	ТΧ	05/17/2021	12:02	CST-6	Flash Flood		0	0	5.000M	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	09/14/2021	10:15	CST-6	Flash Flood		0	0	0.00K	0.00K
BEAUMONT	JEFFERSON CO.	ТΧ	10/27/2021	11:30	CST-6	Flash Flood		0	0	0.00K	0.00K
WEST PORT ARTHUR	JEFFERSON CO.	ТΧ	07/01/2022	07:19	CST-6	Flash Flood		0	0	25.00K	0.00K
PEAR RIDGE	JEFFERSON CO.	ТΧ	10/28/2022	18:30	CST-6	Flash Flood		0	0	0.00K	0.00K
CHINA	JEFFERSON CO.	ТΧ	12/30/2022	04:46	CST-6	Flash Flood		0	0	0.00K	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	01/24/2023	16:40	CST-6	Flash Flood		0	0	10.00K	0.00K
PORT NECHES	JEFFERSON CO.	ТΧ	06/22/2023	14:50	CST-6	Flash Flood		0	0	0.00K	0.00K
AMELIA	JEFFERSON CO.	ТΧ	09/15/2023	12:53	CST-6	Flash Flood		0	0	2.00K	0.00K
HAMSHIRE	JEFFERSON CO.	ТΧ	11/30/2023	21:15	CST-6	Flash Flood		0	0	0.00K	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	01/24/2024	04:40	CST-6	Flash Flood		0	0	0.00K	0.00K
FANNETT	JEFFERSON CO.	ТΧ	01/25/2024	04:15	CST-6	Flash Flood		0	0	0.00K	0.00K
CENTRAL GARDENS	JEFFERSON CO.	ТΧ	04/29/2024	03:40	CST-6	Flash Flood		0	0	10.00K	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	05/02/2024	08:05	CST-6	Flash Flood		0	0	0.00K	0.00K
GILLBURG	JEFFERSON CO.	ТΧ	05/02/2024	08:51	CST-6	Flash Flood		0	0	0.00K	0.00K
BEVIL OAKS	JEFFERSON CO.	ТΧ	05/02/2024	10:51	CST-6	Flash Flood		0	0	0.00K	0.00K
CHINA	JEFFERSON CO.	ТΧ	05/02/2024	10:57	CST-6	Flash Flood		0	0	0.00K	0.00K
BEAUMONT	JEFFERSON CO.	ТΧ	05/16/2024	20:00	CST-6	Flash Flood		0	0	0.00K	0.00K
CENTRAL HGTS	JEFFERSON CO.	ТΧ	05/29/2024	21:13	CST-6	Flash Flood		0	0	0.00K	0.00K
BEAUMONT	JEFFERSON CO.	ТΧ	06/01/2024	14:15	CST-6	Flash Flood		0	0	0.00K	0.00K
CHINA	JEFFERSON CO.	ТΧ	06/01/2024	15:04	CST-6	Flash Flood		0	0	0.00K	0.00K
Totals:								0	0	5.222M	0.00K

The 2023 State of Texas Hazard Mitigation Plan includes the below map to show historical losses between 2000-2021. This data is only shown by County and does not distinguish between DD7 and the rest of the County. Jefferson County is documented to have at least 1

billion in flood damages over that period. This is listed as the 5th highest out of all Counties in the State of Texas.



Figure 49 - State of Texas Historical Flood Losses (2000-2021) State of Texas Hazard Mitigation Plan (2023)

Future Occurrences

Based on the NCEI Storm Events Database, there were 18 events in Jefferson County over the last 5 years. That means there is an estimated 3.6 flood events recorded per year. It can be expected that DD7 would have similar estimates on the number of events.

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 DD7 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.

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.

Data from the National Weather Service to help determine the extent can be found in Figure 50. The maximum probable extent of a future flood is considered extreme because the area can and has experienced major flood stage.



Figure 50 - NWS Flood Stage for Tide Station at Rainbow Bridge Tide Station at Rainbow Bridge (noaa.gov)

Rain gauges are used to assist with early flood warning for the District. There are 15 rain gauges in the planning area (data collected from 2019 plan). Figure 51 shows the location of the 13 of the 15 gauges. They are indicated by the yellow squares on the figure.



Figure 51 - Rain Gauge Locations in DD7

The purpose of the gauges is to provide water levels in key locations in the District. These readings are real-time up to the hour. The gauges will show rainfall accumulated and can provide the District with indication when flooding may occur in the area once they reach certain thresholds. Hurricane Harvey in 2017 and Hurricane Imelda in 2019 were the storms that caused the most flooding in the area in the last decade. The Figure 52 below shows the amount of rain accumulation in the 13 rain gauges during Hurricane Harvey between 8/29/2017 and 8/31/2017.

Figure 52 - Rainfall During Hurricane Harvey at 13 Rain Gauges in DD7

Date Time	8901_Total Rain_Hour	8903_Total Rain_Hour	8905_Total Rain_Hour	8907_Total Rain_Hour	8910_Total Rain_Hour	8912_Total Rain_Hour	8915_Total Rain_Hour	6916_Total Rain_Hour	8918_Total Rain_Hour	8920_Total Rain_Hour	8921_Total Rain_Hour	8922_Total Rain_Hour	8923_Total Rain_Hour
08/29 8:00	0.20	0.30	0.40	0.19	0.00	0.21	0.14	0.17	0.33	0.46	0.25	0.17	0.28
08/29 9:00	0.10	0.06	0.14	0.03	0.00	0.04	0.02	0.03	0.11	0.18	0.12	0.09	0.12
08/29 10:00	0.44	0.12	0.04	0.02	0.00	0.21	0.18	0.18	0.20	0.11	0.06	0.09	0.02
08/29 11:00	0.69	0.63	0.32	0.18	0.00	0.33	0.28	0.37	0.74	0.82	0.43	0.51	0.26
08/29 12:00	0.23	0.22	0.94	0.21	0.00	0.11	0.04	0.03	0.34	0.66	0.35	0.26	0.53
08/29 13:00	0.11	0.90	0.84	1.05	0.00	1.38	1.04	0.93	1.08	0.88	0.66	1.97	0.48
08/29 14:00	1.25	1.30	2.06	1.47	0.00	1.50	1.05	0.85	1.40	1.58	1.41	1.78	1.26
08/29 15:00	1.53	1.63	3.70	1.92	0.00	2.07	2.26	1,24	1.82	2.93	1.97	1.62	2.69
08/29 16:00	0.83	0.68	1.06	0.67	0.00	0.50	0.44	0.27	0.81	1.84	1.02	1.91	1.50
08/29 17:00	0.22	0.58	0.32	0.25	0.00	0.31	0.35	0.53	0.91	0.65	0.57	0.82	0.87
08/29 18:00	0.80	0.62	0.77	0.36	0.00	0.26	0.20	0.19	0.80	1.66	0.96	0.87	0.68
08/29 19:00	0.54	0.84	0.88	0.45	0.00	0.56	0.50	0.30	1.32	1.38	0.85	0.87	0.35
08/29 20:00	1.70	2.42	2.54	1.25	0.00	1.95	1.28	1.08	2.23	2.44	1.42	2.15	1.72
08/29 21:00	1.68	1.80	2.70	0.99	0.00	0.71	0.13	D.61	1.00	2.19	2.18	1.03	2.03
08/29 22:00	1.71	1.97	1.90	1.40	0.00	1.90	1.70	1.07	1.74	1.68	1.22	1.63	1.10
08/29 23:00	0.97	0.79	1.57	0.72	0.00	0.62	0.55	1.05	2.10	2.41	1.02	1.51	1.11
08/30 0:00	1.36	1.01	1.91	1.05	0.00	1.12	1.76	1.29	1.26	3.40	1.27	1.40	1.57
08/30 1:00	1.11	0.09	3.54	1.93	0.00	2.32	0.08	0.24	1.26	1.13	1.65	1.05	2.29
Date_Time	8901_Total Rain_Hour	8903_Total Rain_Hour	8905_Total Rain_Hour	8907_Total Rain_Hour	8910_Total Rain_Hour	8912_Total Rain_Hour	8915_Total Rain_Hour	8916_Total Rain_Hour	8918_Total Rain_Hour	8920_Total Rain_Hour	8921_Total Rain_Hour	8922_Total Rain_Hour	8923_Total Rain_Hour
08/31 14:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 16:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 17:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 18:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 19:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 21:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 22:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/31 23:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
09/01 0:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totais:	36.01	37.79	60.54	33.42	0.00	37.50	31.75	26.90	45.26	60.58	41.19	43.57	42.37

Impact

Flooding impacts people, property, and infrastructure. All flooding can impact but are not limited to temporary and permanent displacement of residents and businesses, loss of life, widespread power outages, long-term limited mobility for residents and responders, and longterm closure or limited functionality of critical infrastructure facilities including hospitals and industrial facilities. Environmental impacts also occur due to chemicals and other hazardous materials contaminating water bodies. In addition to the building inventory, infrastructure (drainage, roads) is also impacted.

Population increase could place further strains people impacted by flooding (rescues, injuries and death) and vulnerable populations, see below, as well as on the built environment. Land use changes could alter the impact of flooding by causing degradation of water quality, quantity, and soil properties.

People

While flooding can impact the entire planning area, the areas at greatest risk are the ones located within flood zones, particularly those in the 100-year zones or worse, shown in the flood zone figure in the "Location" section of this plan.

Property

There are two groups of properties at greatest risk of flooding in DD7: structures designated as Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties.

Repetitive loss data is Privacy Act protected, therefore any information included is in aggregate and from open-source data. FEMA produces an NFIP multiple loss properties (OpenFEMA Dataset) spreadsheet which provides aggregate data on RL and SRL for residential properties. Table 23 compares data from 2018 to the 2024 data. The 2018 data was aggregated from the previous JCDD7 plan in 2019 and 2024 data was collected from the OpenFEMA Dataset. There was an estimated increase in last five years of residential properties classified as RL (15.3% increase) and SRL (50% increase). When calculating the total amount of RL and SRL properties in DD7, Groves, Nederland, Port Arthur, and Port Neches data was combined to calculate an estimate total for the planning area. The 2018 SRL data was not separated by area in DD7 so only the total of 48 is shown in the table below.

OpenFEMA Database - NFIP Multiple Loss Properties										
	2018 No. of	2018 No of SRL	2024 No. of RL	2024 No of SRL						
	RL	Properties	Properties	Properties						
	Properties									
Groves	45		60	1						
Nederland	107		96	17						
Port Arthur	365		440	48						
Port Neches	32		37	6						
Total	549	48	633	72						

Table 23 - RL and SRL Residential Data by Municipality 2018 and 2024 OpenFEMA Database - NFIP Multiple Loss Properties

To be able to calculate the number of insurance claims and payment amounts for RL and SRL properties, the below Figure 53 will be used. This was taken from the 2023 State of Texas Hazard Mitigation Plan. Jefferson County is circled in red in this chart. These calculations will be completed in the following sections of the plan.

APPENDIX B: REPETITIVE AND SEVERE REPETITIVE LOSS PROPERTIES

Appendix B includes data for Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties statewide, includes the total payments number of losses and number of properties. This data was obtained from the Texas Water Development Board.

Table B-1. Repetitive and Severe Repetitive Loss Properties as of October 2022

County	Number of RL Properties	Number of Total RL Losses	Total RL Payments	Number of SRL Structures	Number of Total SRL Losses	Total SRL Payments
Hill	3	9	\$128,226	-	-	-
Hood	19	43	\$1,676,542	1	5	\$71,116
Hopkins	7	16	\$232,834	-	-	-
Houston	2	6	\$60,151	-	-	-
Howard	3	6	\$117,824	-	-	-
Hunt	7	19	\$763,862	1	4	\$242,366
Jackson	22	67	\$894,245	2	11	\$189,772
Jasper	21	62	\$3,099,708	4	22	\$1,298,593
Jefferson	2,731	7,335	\$422,764,410	489	2,048	\$130,234,038

Figure 53 - RL and SRL Data (State of Texas HMP 2023)

Repetitive Loss Properties

FEMA further classifies properties based on the number and cost of claims as Repetitive Loss or Severe Repetitive Loss policies as defined below. It is important to note that all Severe Repetitive Loss properties are also Repetitive Loss properties. However, to understand the impact of each classification, this analysis breaks those out separately. Based on the data collected from the OpenFEMA dataset, there are approximately 549 Repetitive Loss structures in DD7. Of those 549 Repetitive Loss properties, only approximately 268 are insured (about 49%).

In recent years, FEMA has focused considerable attention on the Repetitive Loss (RL) subset of insured buildings. These properties have incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event.

Table 24 summarizes RL statistics for DD7 using the 549 RL structures from the OpenFEMA database and then extrapolating the State of Texas 2023 HMP data to find estimates for total insurance payments. For example, since there are 2,731 total RL properties in Jefferson County, that means about 20.1% of the RL properties are in the DD7 planning area. 20.1% of the total insurance payments equals \$84,975,646. This same calculation can be used for the number of claims to total 1,505.

Table 24	- <i>RL</i>	Statistics	for	<i>DD7</i>
----------	-------------	-------------------	-----	------------

Properties	Total RL Payments	# of claims	Average		
549	\$84,975,646	1474	\$57,610		

Another source of RL data is the Texas Water Development Board (TWDB) Repetitive Loss Viewer. This is a mapping tool that allows searching of counties or cities and provides a total for RL properties, estimated insurance payments, and number of claims. The figure below shows RL map for the area of DD7 and its adjacent areas.



The RL numbers were totaled for each area of DD7 and were within 5% of the data shown in Table 23. The discrepancy between the two could come from different time of data collection, as well as the data in Table 24 for payments and claims being an estimation based on taking a portion of the total values for the entirety of Jefferson County.

Severe Repetitive Loss Properties

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

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

SRL properties are a subset of the RL list but were not included in the analyses above. Using the OpenFEMA dataset there are approximately 72 SRL properties in DD7. Of those 72 SRL properties, only approximately 30 are insured (about 42%).

Table 25 summarizes SRL statistics for DD7 using the 72 SRL structures from the OpenFEMA database and then extrapolating the State of Texas 2023 HMP data to find estimates for total insurance payments. For example, since there are 489 total SRL properties in Jefferson County, that means about 14.7% of the SRL properties are in DD7. 14.7% of the total insurance payments equals \$19,175,563. This same calculation can be used for to estimate number of claims to total 301.

Properties	Total SRL Payments	# of claims	Average		
72	72 \$19,175,563		\$63,706		

<i>Table 25 -</i>	SRL	Statistics	for	<i>DD7</i>
-------------------	-----	-------------------	-----	------------

Using the TWDB Repetitive Loss Viewer (map shown below) the SRL data also came within around 5-10% of each of the values in the above table.



Figure 55 - TWDB SRL Viewer Repetitive Loss (arcgis.com)

Infrastructure

Infrastructure is critical to the wellbeing of the people located in DD7. This section will document some of the most important infrastructure and how flood events can affect each.

Local Drainage. Many areas and streets experience accumulations of rainfall that are slow to drain, which may cause disruption of normal traffic, soil erosion, and water quality problems.

Local drainage problems contribute to the frequency of flooding, increase ditch maintenance costs, and are perceived to adversely affect the quality of life in some neighborhoods. Many areas prone to shallow, local drainage flooding are not shown on the Cities' or County's Flood Insurance Rate Maps.

Transportation and Emergency Services - Some of the most immediate and significant impacts of flooding are related to transportation and emergency services. Inundated roadways block the flow of people seeking to evacuate a flooded area; depending on flood severity, high water levels can render traditional methods of transportation such as automobiles and buses infeasible due to risk of drowning. Flooding can also delay or entirely prevent emergency services from reaching people in need of help. Depending on the severity of conditions, this can lead to further loss of life.

Water and Wastewater Treatment - Water and wastewater treatment plants can be impacted by flood events as these facilities are often located along water courses for discharging treated water. If these facilities are not protected from flood events, the impact on nearby communities' water supply and water quality can be devastating. The lives of nearby residents can be disrupted as they receive notices to limit water usage, and the potential of people being exposed to raw sewage overflows can cause illnesses and a significant amount of time and resources to eliminate the contamination.

Utilities - Flood events can damage power lines and other electricity distribution infrastructure. Roadway inundation often hinders the swift repair of damaged equipment, and a prolonged lack of electricity in a community will significantly magnify all the impacts previously discussed. Potential failure of power generation plants due to flooding can cause direct losses including having to replace damaged equipment in addition to surrounding facilities losing power. For example, cities and counties may depend on local refineries to provide fuel necessary to operate emergency vehicles and stormwater pumps.

Agriculture - The US Environmental Protection Agency (EPA) writes, "Because agriculture relies on the weather, climate, and water availability to thrive, it is easily impacted by natural events...including contamination of water bodies, loss of harvest or livestock, increased susceptibility to disease, and destruction of irrigation systems and other agricultural infrastructure." (Agriculture and Natural Events and Disasters | US EPA)

Schools – In the jurisdiction and across the country, floods have affected schools significantly. There is the obvious immediate risk of children and school staff if a flood were to occur. In addition, schools could be shut down for days or even weeks if a severe flood occurs which can meaningfully impact student education.

Hospitals and nursing homes – It is critical that these facilities always stay operational, especially during natural disasters like floods. If a flood shuts down one of these facilities, it

could cause injury or death to many people. In addition, many of these critical facilities are used for shelters during emergencies so it is crucial for these to stay operational.

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.

According to the Climate Mapping for Resilience and Adaption (CMRA) tool there is a potentially large variance in average annual precipitation over the rest of the century in Jefferson County if fossil fuel emissions continue at current levels (characterized as higher emissions). However, estimations show a smaller variance in average 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 56 below shows the comparison of the average precipitation estimates over the rest of the century based on these lower or higher emissions.

The reason that the variance could be larger going forward is that climate change could bring drier conditions at times which would lead to lesser total precipitation while also a chance of more hurricanes and other storms due to warmer conditions.



Figure 56 - Average Precipitation Estimate Over the Rest of the Century

Impact to Employees: Climate change could increase precipitation and rainfall which could cause an increase of flooding where employees cannot get to work or if at work, cannot get to affected areas until water recedes.

Impact to Assets and Service: Buildings and infrastructure can be damaged by more frequent or intense flooding. Also, impact to infrastructure could lessen water service available for distribution which impacts service and income for the District.

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, all District assets could be at risk of flooding.

The National Risk Index shows flooding is a very high risk (99.6 national percentile) and very high risk (99.6 national percentile) in expected annual loss. This index estimates a \$52 million dollar expected annual loss for Jefferson County as a whole.



Figure 57 - National Risk Index – Flooding

Hailstorm

Update From Last Plan

• This hazard was not profiled in the 2019 plan

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 16 hail events since the start of 2014 (6 hail events since start of 2020) (Table 26). If multiple line items in the table are from the same day, those are only counted as a single event. It is important to note that the NCEI database only collects the data from events that are reported to them. However, there are likely many more events with hail in the area that go unreported that may not have caused any damage. Since the 2019 plan was completed, there were no cases of hail damage reported to the NCEI database in Jefferson County.

Location	County/Zone	<u>St.</u>	<u>Date</u>	<u>Time</u>	<u>I.Z.</u>	<u>Type</u>	<u>Mag</u>	<u>Dth</u>	<u>lnj</u>	<u>PrD</u>	<u>CrD</u>
Totals:								0	0	0.00K	0.00K
(BPT)BEAUMONT-PT ART	JEFFERSON CO.	ТΧ	07/03/2014	15:00	CST-6	Hail	0.88 in.	0	0	0.00K	0.00K
HAMSHIRE	JEFFERSON CO.	ТΧ	04/19/2015	19:25	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
AMELIA	JEFFERSON CO.	ТΧ	04/27/2015	05:39	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
FT ACRES	JEFFERSON CO.	ТΧ	04/27/2015	16:40	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
HOLLYWOOD	JEFFERSON CO.	ТΧ	04/27/2015	16:45	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ТΧ	01/08/2016	21:45	CST-6	Hail	1.25 in.	0	0	0.00K	0.00K
AMELIA	JEFFERSON CO.	ТΧ	01/20/2017	19:30	CST-6	Hail	0.75 in.	0	0	0.00K	0.00K
PEAR RIDGE	JEFFERSON CO.	ТΧ	03/29/2017	14:01	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ТΧ	03/29/2017	16:01	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ТΧ	03/29/2017	16:17	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ТΧ	03/29/2017	16:20	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
FTACRES	JEFFERSON CO.	ТΧ	03/29/2017	16:20	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
GROVES	JEFFERSON CO.	ТΧ	03/29/2017	17:10	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
HAMSHIRE	JEFFERSON CO.	ТΧ	04/29/2017	08:16	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
<u>ELIZABETH</u>	JEFFERSON CO.	ТΧ	05/26/2018	17:23	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
GILLBURG	JEFFERSON CO.	ТΧ	05/26/2018	17:25	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
BEVIL OAKS	JEFFERSON CO.	ТΧ	11/07/2018	21:27	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
HAMSHIRE	JEFFERSON CO.	ТΧ	04/18/2020	17:33	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
LA BELLE	JEFFERSON CO.	ТΧ	04/18/2020	17:55	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
AMELIA	JEFFERSON CO.	ТΧ	12/30/2022	01:53	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
BEVIL OAKS	JEFFERSON CO.	ТΧ	04/15/2023	18:02	CST-6	Hail	1.75 in.	0	0	0.00K	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	04/15/2023	19:20	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
BEAUMONT	JEFFERSON CO.	ТΧ	04/15/2023	19:45	CST-6	Hail	1.25 in.	0	0	0.00K	0.00K
NEDERLAND	JEFFERSON CO.	ТΧ	04/15/2023	20:20	CST-6	Hail	1.25 in.	0	0	0.00K	0.00K
BROOKS	JEFFERSON CO.	ТΧ	04/27/2023	02:20	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
CHINA	JEFFERSON CO.	ТΧ	12/09/2023	19:04	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
VOTH	JEFFERSON CO.	ТΧ	03/15/2024	15:45	CST-6	Hail	1.25 in.	0	0	0.00K	0.00K
HAMSHIRE	JEFFERSON CO.	ТΧ	05/12/2024	11:38	CST-6	Hail	2.50 in.	0	0	0.00K	0.00K
FANNETT	JEFFERSON CO.	ТΧ	05/12/2024	11:45	CST-6	Hail	1.50 in.	0	0	0.00K	0.00K
(BPT)BEAUMONT-PT ART	JEFFERSON CO.	ТΧ	05/12/2024	12:13	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ТΧ	05/12/2024	12:18	CST-6	Hail	1.00 in.	0	0	0.00K	0.00K
GROVES	JEFFERSON CO.	ТΧ	05/12/2024	12:20	CST-6	Hail	2.00 in.	0	0	0.00K	0.00K
Totals:								0	0	0.00K	0.00K

Table 26 - Hail Events in Jefferson County (2014-2024)

Future Occurrences

Based on historical frequency of hail events that have been reported in Jefferson County (16 events in 10 years), it can be expected to have a hail event 1.6 times a year on average.

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 27). Using the data from Table 26 above, the intensity category for DD7 would range from H0-H7 during the last 10 years. There

was only one event of H7 which was the event in May of 2024 which resulted in up to 2.5-inch hailstones (63mm). Most of the other events were H3 and under category.

	Intensity category	Typical hail diameter (mm)*	Probable kinetic energy J m ⁻²	Typical damage impacts
H0	Hard hail	5	0-20	No damage
H1	Potentially damaging	5- 15	>20	Slight general damage to plants, crops
H2	Significant	10- 20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20- 30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25- 40	>500	Widespread glass damage, vehicle bodywork damage
Н5	Destructive	30- 50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40 -60		Bodywork of grounded aircraft dented; brick walls pitted
H7	Destructive	50 -75		Severe roof damage, risk of serious injuries
H8	Destructive	60- 90		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75- 100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Table 27 - TORRO Hailstorm Intensity Scale

H10	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 and potential damage to roofs in the most severe cases. District property most likely at-risk would-be vehicle bodywork damage and glass damage. Population increase could place further expose people to hail. Land use changes (more building as an example) could alter the impact of hail by causing damage to more 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 events.

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 DD7 were only strong enough to cause damage to crops, and minor damage to weak structures.

The National Risk Index shows hailstorms are relatively moderate risk (88.1 national percentile) and relatively moderate (86.8 national percentile) in expected annual loss. This index estimates a \$727 thousand dollar expected annual loss for the County as a whole.



Figure 58 - National Risk Index – Extreme Heat

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the planning area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The planning area considered the following factors to examine potential conditions that may affect hazard vulnerability:

• Potential or projected development - While building codes help mitigate hail damages, wood and masonry buildings tend to have more damage from hail than concrete or steel buildings. Manufactured homes are vulnerable as well, so the type of construction is important for development.

• Projected changes in population – Increase to the population also will expose more people to hailstorm events.

Hurricane/Tropical Storm

Update From Last Plan

• Events since 2019 were updated and described.

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, major hurricane. These will be quantified in the extent section of this assessment.

DD7 planning area is most susceptible to hurricane/tropical storms in the months of June to November, with August-October historically having the most activity.



Location

Due to DD7 being located near the Gulf of Mexico, there is an immediate risk for hurricane/ tropical storms in the entire planning area.

Previous Occurrences

According to the NOAA Historical Hurricane Tracks database, from 2004-2024 there have been 14 hurricane/tropical storms within a 75-mile radius of Jefferson County as shown in Figure 59. 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 the eye of Harvey was never directly over the planning area, however, that storm caused significant damage to the entire planning area. Since 2019 when the previous plan was completed, there have been 4 storms that affected DD7 (Laura 2020, Beta 2020, Delta 2020, Nicholas 2021).

Figure 59 - Hurricane/Tropical Storm Tracks 2004-2024 (Source: NOAA Historical Hurricane Tracks)



 Table 28 - Hurricane/Tropical Storms that Impacted Jefferson County from 2004-2024

		MaxWind	Minimum	
Storm Name	Date Range	Speed (MPH)	Pressure (mb)	Category Max
	9/12/21 to			
Nicholas 2021	9/17/21	65	988	H1
	10/4/20 to			
Delta 2020	10/11/20	120	953	H4
	9/17/20 to			
Beta 2020	9/25/20	55	993	TS
	8/20/20 to			
Laura	8/29/20	130	937	H4
	9/17/19 to			
Imelda 2019	9/19/19	40	1003	TS
	7/10/19 to			
Barry 2019	7/16/19	65	993	H1
	8/16/17 to			
Harvey 2017	9/2/17	115	937	H4
	6/19/17 to			
Cindy 2017	6/24/17	50	991	TS
	9/2/11 to			
Lee 2011	9/6/11	50	986	TS
	9/1/08 to			
Ike 2008	9/15/08	125	935	H4
	8/3/08 to			
Edouard 2008	8/6/08	55	996	TS
	9/12/07 to			
Humberto 2007	9/14/07	80	985	H1
	9/18/05 to			
Rita 2005	9/26/05	155	895	H5
	9/2/04 to			
Ivan 2004	9/24/04	145	910	H5

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 there were 14 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 1.43 years on average within a 75-mile radius of DD7. Therefore, there is a 70% chance of a hurricane/tropical storm event occurring with 75-miles of the planning area in any given year.

Extent

Table 29 overviews the Saffir/Simpson Hurricane Scale which is widely used to classify hurricanes by categories 1-5. The scale considers winds and the amount of damage that could be sustained by the storm. Category 1 is the lowest category of storm, while Category 5 is the strongest level storm. The entire planning area has potential to experience storm effects of all categories with 5 being the worst-case scenario. In the last 5 years, there were 4 hurricanes/ tropical storms that came within the 75-mile radius of the County. Laura in 2020 was a category 4 hurricane at landfall and the eye was about 20 miles east of Jefferson County. That was the strongest storm in terms of wind speed over the last 5 years in the planning area. If the data goes back 10 years, Hurricane Harvey was likely the most impactful storm. That was a category 4 hurricane at landfall east of the county and was a very large storm that lingered over the area for almost 2 days. This was a large reason why it was so devastating to the entire region.

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

Table 29 - Saffir/Simpson Hurricane Scale

Table 30 - Tropical Cyclone Classifications

Tropical Depression	Maximum sustained wind speed is <39 mph
Tropical Storm	Maximum sustained wind speed ranges 39 - <74 mph
Hurricane	Maximum sustained surface wind speed 74 mph+

Impact

The types of impacts that can be expected from hurricanes include but are not limited to driving rain into buildings resulting in water damage, downed trees, debris blocking roads, disrupted power lines, and damage to roofs and mobile homes. Hurricanes and tropical storms also bring heavy rains, causing nearby creeks to surpass their capacity and flood the surrounding area. Oftentimes the flooding is the most impactful effect of hurricanes, which can cause widespread damage to homes, particularly in flood zones. This is explained in more detail in the flood section of this plan. Population increase could place further strains on for evacuation and displacement. Land use changes could alter the impact of hurricane/tropical storms by causing degradation of water quality, quantity, and soil properties as well as damage to building and infrastructure

Effect of Climate Change on Hurricanes and Tropical Storms

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 severe hurricanes. As stated in the Texas 2023 Hazard Mitigation Plan:

The current climate assessment report for Texas indicates an expected increase in the intensity of very strong hurricanes, despite an expected lack of increase, or even a decrease, in hurricane frequency overall. Different research studies have produced some conflicting results. While some recent research has pointed to an apparent trend for U.S. tropical

cyclones to move more slowly at landfall, much like Hurricane Harvey, other research suggests that Texas may be spared from such a slowdown. At this point, the enhanced risk is difficult to quantify, but substantial scientific progress on this topic is likely as climate models become better able to simulate the observed spatial distribution, frequency, and intensity of hurricanes.

(2023 Texas Hazard Mitigation Plan, page 131)

Impact to Employees: Dangerous conditions from Hurricanes/Tropical Storms increased intensity from climate chance could cause an increase of flooding where employees must be evacuated or once the storm passes cannot get to work or if at work, cannot get to affected areas until water recedes.

Impact to Assets and Service: Buildings, infrastructure, equipment and trucks can be damaged by more frequent or intense storms. Also, impact to infrastructure could lessen water service available for distribution which impacts service and income for the District.

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. High winds can tear down powerlines, trees, barns, fences, and multitude of other debris can be blown into roadways and homes during the event.

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

The National Risk Index shows hurricane and tropical storms are relatively high risk (97.7 national percentile) and relatively high (97.3 national percentile) in expected annual loss. This index estimates a \$83 million dollar expected annual loss.





Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning,

and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development Any areas of growth could be potentially impacted by the hurricane and tropical storm hazard because the entire Planning Area is exposed and vulnerable; however, due to increased standards and codes, new development can be less vulnerable to the hazard compared with the aging building stock in the Planning Area.
- Projected changes in population Increased population will expose more people to the risk to hurricane and tropical storm events.

Lightning

Update From Last Plan

• This hazard was not profiled in the 2019 plan

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 does, so the distance of the lightning away 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 miles away that the lightning is estimated.

Location

Lightning can strike any location in DD7 at equal chance. Vaisala, a company that monitors total lightning across the United States providing reliable and accurate lightning information, suggests Texas, particularly East and Southeast Texas is in the higher ranges of lightning density in 2023. The map below shows this scale.



Figure 61 - Total Lightning Density – Vaisala (2023)

Previous Occurrences

According to the NCEI database, since the start of 2000 there have been 10 reported lightning events in Jefferson County. This totals 3 deaths, 7 injuries, and \$516 thousand in property damage. However, since lightning occurs every year, it can be assumed that those 10 reported events are just those events that were significant (either caused property damage, deaths, or injury). Table 31 below shows the cases of reported lightning events in the NCEI database. Since 2019 when the previous plan was completed there have been 2 reported lightning events causing damage in Jefferson County according to the NCEI database.

Location	County/Zone	<u>St.</u>	Date	<u>Time</u>	<u>IZ.</u>	<u>Type</u>	Mag	<u>Dth</u>	<u>Inj</u>	<u>PrD</u>	<u>CrD</u>
Totals:								3	7	516.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ТΧ	08/29/2007	10:00	CST-6	Lightning		1	0	0.00K	0.00K
SABINE	JEFFERSON CO.	ТΧ	07/23/2009	14:22	CST-6	Lightning		1	7	5.00K	0.00K
BEAUMONT ARPT	JEFFERSON CO.	ТΧ	07/05/2011	15:45	CST-6	Lightning		0	0	30.00K	0.00K
AMELIA	JEFFERSON CO.	ТΧ	07/06/2011	14:00	CST-6	Lightning		0	0	100.00K	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	07/06/2011	16:50	CST-6	Lightning		0	0	250.00K	0.00K
<u>GROVES</u>	JEFFERSON CO.	ТΧ	07/19/2011	05:20	CST-6	Lightning		0	0	70.00K	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	08/19/2014	15:00	CST-6	Lightning		0	0	5.00K	0.00K
CENTRAL GARDENS	JEFFERSON CO.	ТΧ	12/23/2014	12:55	CST-6	Lightning		0	0	50.00K	0.00K
PORT NECHES	JEFFERSON CO.	ТΧ	06/30/2015	10:39	CST-6	Lightning		0	0	1.00K	0.00K
AMELBULK	JEFFERSON CO.	ТΧ	05/27/2020	12:00	CST-6	Lightning		1	0	0.00K	0.00K
AMELBULK	JEFFERSON CO.	ТΧ	05/03/2024	06:30	CST-6	Lightning		0	0	5.00K	0.00K
Totals:								3	7	516.00K	0.00K

Table 31 - NCEI Data for Lightning – 1/1/2000 to 9/1/2024

Future Occurrences

Using the NCEI data in the previous section the probability of a reported lightning event that causes damage in Jefferson County is about 0.42 events per year or an event every 2.4 years. . Since lightning does occur frequently throughout every year the probability of future occurrence is considered highly likely, though a damaging event is considered likely.

Extent

According to NOAA, the average number of clouds to ground flashes for the State of Texas between 2009 and 2018 was 11.0 flashes per square mile per year. Vaisala suggests that Jefferson County has 74.2 lightning events per square kilometer per year which is roughly 28.6 events per square mile per year from 2016 to 2023.

Figure 62 - Lightning Density Map (https://interactive-lightning-map.vaisala.com)



Vaisala also quantifies Texas as the number one state in overall lightning count and number ten in lightning density in 2023.





In addition to flashes, 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 32 below further describes this scale.

Table 32 - LAL Scale (NOAA)

LAL	Cloud & Storm Development	Lightning Strikes/15 min
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.	

The maximum extent DD7 can expect to experience is considered in the 3 to 5 range on the LAL scale. This is based off the Vaisala models that show that Jefferson County is in the middle to high ranges of their "Total Lightning Density" scale.

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 3 reported deaths by the NCEI database for all of Jefferson County over the last 24 years. The NCEI database does not quantify the LAL for reported events, it is difficult to quantify the most severe lightning events. The maximum probable extent the County can expect to see is considered weak due to events typically causing little to no damage.

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, however there is not enough yet known.

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, the major vulnerability to assets include damage to radio equipment, buildings, and potential power outages. It is important to have early warning capabilities to alert residents of potential incoming lightning. The National Weather Service (NWS) is a great resource for emergency management personnel as well as residents to use to keep updated. The National Risk Index shows that lightning is relatively high risk (98.3 national percentile) and very high (97.8 national percentile) in expected annual loss. This index estimates a \$1.8D million dollar expected annual loss. The expected annual loss shown by the National Risk Index is significantly higher than the reported damage by NCEI database. This is likely due to the Risk Index being estimates for the future based on the number of lightning events that occur. However, it also says the historical loss ratio is relatively low.



Figure 64 - National Risk Index – Lightning

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development Future development could be impacted by lightning storms. However, new development due to increased building codes and standards may help lessen the vulnerability of new buildings.
- Projected changes in population An increase in population will expose more people to lightning hazards.

Levee Failure

The following section has been redacted due to homeland security concerns.

Severe Thunderstorm/High Wind

Update From Last Plan

• Events since 2019 were updated and described.

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 an area with some of the highest risk of severe thunderstorms.

Location

The planning area is listed as a Designated Catastrophe Area by the Texas Department of Insurance. The map below from the Texas Department of Insurance according to the 2018 IBC shows an estimate where DD7 falls. The coordinates around the center of DD7 were selected as the search query for the map below. The dataset used was the American Society of Civil Engineers (ASCE) 7-16 which is used to help design buildings to withstand reasonably anticipated winds to minimize property damage. DD7 sits at around the 140-mph range for risk category 2 (standard occupancy buildings) and the geographic area affected is considered extensive.

Figure 65 - Designated Catastrophe Area Map – DD7 (Source: ATC Hazards by Location, TDI, <u>Adopted Building Codes (texas.gov</u>))



Previous Occurrences

The NCEI Storm Event Database has reported 22 events of Thunderstorm Wind since 2019 in Jefferson County. If multiple events occurred on the same day, the duplicates were not counted.

Location	County/Zone	<u>St.</u>	<u>Date</u>	<u>Time</u>	<u>IZ.</u>	<u>Type</u>	Mag	<u>Dth</u>	<u>lnj</u>	<u>PrD</u>	<u>CrD</u>
Totals:								0	1	1.162M	0.00K
GROVES	JEFFERSON CO.	ТΧ	04/07/2019	12:35	CST-6	Thunderstorm Wind	50 kts. MG	0	0	0.00K	0.00K
BEVIL OAKS	JEFFERSON CO.	ΤХ	04/07/2019	13:05	CST-6	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00K
LA BELLE	JEFFERSON CO.	ΤХ	04/07/2019	13:06	CST-6	Thunderstorm Wind	50 kts. EG	0	0	3.00K	0.00K
AMELIA	JEFFERSON CO.	ТΧ	04/07/2019	13:14	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
<u>VITERBO</u>	JEFFERSON CO.	ТΧ	04/07/2019	13:17	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
HOLLYWOOD	JEFFERSON CO.	ΤХ	04/07/2019	13:24	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
MOREY	JEFFERSON CO.	ТΧ	05/09/2019	00:07	CST-6	Thunderstorm Wind	81 kts. EG	0	0	25.00K	0.00K
HOLLYWOOD	JEFFERSON CO.	ΤХ	05/09/2019	23:35	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
<u>GUFFEY</u>	JEFFERSON CO.	ΤХ	05/09/2019	23:50	CST-6	Thunderstorm Wind	60 kts. EG	0	0	1.000M	0.00K
(BPT)BEAUMONT-PT ART	JEFFERSON CO.	ТΧ	05/10/2019	00:05	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
ATRECO	JEFFERSON CO.	ТΧ	05/10/2019	00:49	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
(BPT)BEAUMONT-PT ART	JEFFERSON CO.	ТΧ	01/11/2020	02:22	CST-6	Thunderstorm Wind	60 kts. MG	0	0	0.00K	0.00K
<u>CHINA</u>	JEFFERSON CO.	ТΧ	05/28/2020	11:27	CST-6	Thunderstorm Wind	50 kts. EG	0	0	4.00K	0.00K
AMELIA	JEFFERSON CO.	ТΧ	08/05/2020	17:35	CST-6	Thunderstorm Wind	50 kts. EG	0	0	15.00K	0.00K
ELIZABETH	JEFFERSON CO.	ТΧ	12/19/2020	13:10	CST-6	Thunderstorm Wind	50 kts. EG	0	0	4.00K	0.00K
AMELIA	JEFFERSON CO.	ΤХ	12/19/2020	13:20	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
BEAUMONT	JEFFERSON CO.	ТΧ	12/19/2020	13:26	CST-6	Thunderstorm Wind	50 kts. EG	0	1	20.00K	0.00K
BEAUFORT GARDENS	JEFFERSON CO.	ΤХ	04/23/2021	23:55	CST-6	Thunderstorm Wind	50 kts. EG	0	0	2.00K	0.00K
HOLLYWOOD	JEFFERSON CO.	ΤХ	05/25/2022	04:20	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
HOLLYWOOD	JEFFERSON CO.	ТΧ	06/02/2022	18:08	CST-6	Thunderstorm Wind	58 kts. MG	0	0	0.00K	0.00K
NEDERLAND	JEFFERSON CO.	ΤХ	12/30/2022	02:45	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
NOME	JEFFERSON CO.	ТΧ	01/24/2023	15:45	CST-6	Thunderstorm Wind	55 kts. EG	0	0	15.00K	0.00K
CENTRAL GARDENS	JEFFERSON CO.	ТΧ	01/24/2023	16:17	CST-6	Thunderstorm Wind	50 kts. EG	0	0	1.00K	0.00K
(BPT)BEAUMONT-PT ART	JEFFERSON CO.	ΤХ	01/24/2023	16:20	CST-6	Thunderstorm Wind	56 kts. MG	0	0	0.00K	0.00K
FT ACRES	JEFFERSON CO.	ТΧ	01/24/2023	16:23	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
GILLBURG	JEFFERSON CO.	ΤХ	05/08/2023	14:42	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
PINE CREST	JEFFERSON CO.	ТΧ	05/08/2023	15:36	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
<u>GUFFEY</u>	JEFFERSON CO.	ТΧ	08/27/2023	17:16	CST-6	Thunderstorm Wind	59 kts. MG	0	0	20.00K	0.00K
BEAUMONT	JEFFERSON CO.	ΤХ	09/08/2023	13:20	CST-6	Thunderstorm Wind	50 kts. EG	0	0	10.00K	0.00K
ELIZABETH	JEFFERSON CO.	ТΧ	09/08/2023	14:09	CST-6	Thunderstorm Wind	52 kts. MG	0	0	0.00K	0.00K
NEDERLAND	JEFFERSON CO.	ТΧ	09/15/2023	13:14	CST-6	Thunderstorm Wind	55 kts. MG	0	0	0.00K	0.00K
<u>VOTH</u>	JEFFERSON CO.	ΤХ	03/15/2024	15:30	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
BROOKS	JEFFERSON CO.	ТΧ	03/21/2024	22:24	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
PORTARTHUR	JEFFERSON CO.	ΤX	04/10/2024	04:56	CST-6	Thunderstorm Wind	50 kts. EG	0	0	5.00K	0.00K
NEDERLAND	JEFFERSON CO.	ТΧ	05/02/2024	07:53	CST-6	Thunderstorm Wind	74 kts. MG	0	0	5.00K	0.00K
(BPT)BEAUMONT-PT ART	JEFFERSON CO.	ΤX	05/12/2024	12:11	CST-6	Thunderstorm Wind	50 kts. EG	0	0	0.00K	0.00K
BROOKS	JEFFERSON CO.	ΤX	05/28/2024	13:19	CST-6	Thunderstorm Wind	63 kts. MG	0	0	0.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ΤX	05/28/2024	13:36	CST-6	Thunderstorm Wind	51 kts. MG	0	0	0.00K	0.00K
Totals:								0	1	1.162M	0.00K

Future Occurrences

The chance of a Thunderstorm and High Wind event would be about 4.4 events per year based on previous reported events.

Extent

The NOAA uses the Beaufort Wind Scale to quantify the wind effects that may occur during a severe thunderstorm event. According to the scale, Jefferson County could expect to have events from 0 up to 12 on this scale with the worst-case scenario being 12. In the last 5 years the highest shown in the county was 81 knots which was category 12 and almost two dozen events at least category 10

Force	Wind	WMO	Appearance of Wind Effects			
	(Knots)	Classification	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		

Table 33 - Beaufort Wind Scale (Source: NOAA)

Force	Wind	WMO	Appearance of Wind Effects		
	(Knots)	Classification	On the Water	On Land	
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 JCDD7 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. The district has experienced severe thunderstorms and high winds up to 65 Knots. The type of impacts that can be expected are associated with the magnitudes from the Beaufort Wind Scale, which indicate storms as severe as a "Hurricane force wind" extent, involving trees being broken or uprooted along with considerable structural damage.

Population increase could place more people at risk from the impacts of severe thunderstorms/high winds.

Land use changes could alter the impact of thunderstorms/high winds to the built environment.

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. NASA's website, Global Climate Change Vital Signs of the Planet reports, "Severe thunderstorms are defined as having sustained winds above 93 kilometers (58 miles) per hour or unusually large hail, and there are two key factors that fuel their formation: convective available potential energy (CAPE) and strong wind shear. CAPE is a measure of how much raw energy is available for storms; it relates to how warm, moist, and buoyant air is in each area. Wind shear is a measure of how the speed and direction of winds change with altitude. Future conditions that are more intense and more frequent could cause the future probability to increase over what is the known probability based on historical data.

"CAPE can provide storms with the raw fuel to produce rain and hail, and vertical wind shear can pull and twist weak storms into strong, windy ones," explained Harold Brooks, a meteorologist at NOAA's National Severe Storms Laboratory.

Scientists have evidence that global warming should increase CAPE by warming the surface and putting more moisture in the air through evaporation. On the other hand, disproportionate warming in the Arctic should lead to less wind shear in mid-latitude areas prone to severe thunderstorms. So, one factor makes severe storms more likely, while the other makes them less so." Severe thunderstorms and climate change – Climate Change: Vital Signs of the Planet (nasa.gov)

Impact to Employees: Climate change could increase precipitation and rainfall during thunderstorms which could cause an increase of flooding where employees cannot get to work or if at work, cannot get to affected areas until water recedes

Impact to Assets and Service: Buildings and infrastructure can be damaged by more frequent or intense flooding due to more intense and frequent thunderstorms. Also, impact to infrastructure could lessen water service available for distribution which impacts service and income for the District.

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 DD7, homes and District buildings are at highest vulnerability from severe thunderstorms and high wind. High winds could cause some damage to roofs as well as risk of downed trees hitting buildings or vehicles. Power outages can commonly occur from these events and could be an issue for at risk communities that may be more susceptible to these outages or those without access to generators. However, there are not many prevention or warning measures for thunderstorm and high wind events. In most cases, all that can be done is using weather forecasting to alert residents and District staff of possible thunderstorms in the area.

The National Risk Index shows severe thunderstorms and high winds are relatively low risk (50.8 national percentile) and relatively low (50.0 national percentile) in expected annual loss. This index estimates a \$304 thousand expected annual loss.



Figure 66 - National Risk Index – Strong Wind

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development Any new development should be protected due to improved building codes and standards.
- Projected changes in population Increase in population exposes more people to thunderstorms and severe winds.

Tornado

Update From Last Plan

• Events since 2019 were updated and described.

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 from around 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 70 below from FEMA, it shows much of Southeast Texas including Jefferson County in the "Very High" risk of tornados.





Previous Occurrences

According to the NOAA NCEI database there have been 8 reported tornado events in Jefferson County since the start of 2014. The reported damage includes no injuries or deaths with 765 thousand in property damage. Since 2019 when the previous plan was completed there have been 5 recorded events.

Location	County/Zone	<u>St.</u>	Date	<u>Time</u>	<u>T.Z.</u>	<u>Type</u>	<u>Mag</u>	<u>Dth</u>	<u>lnj</u>	<u>PrD</u>	<u>CrD</u>
Totals:								0	0	765.00K	0.00K
BEAUMONT ARPT	JEFFERSON CO.	ТΧ	03/11/2017	14:47	CST-6	Tornado	EF0	0	0	0.00K	0.00K
LAKEVIEW	JEFFERSON CO.	ТΧ	08/07/2018	10:30	CST-6	Tornado	EF0	0	0	0.00K	0.00K
<u>CHINA</u>	JEFFERSON CO.	ТΧ	11/07/2018	14:00	CST-6	Tornado	EF0	0	0	0.00K	0.00K
FT ACRES	JEFFERSON CO.	ТΧ	10/27/2021	07:54	CST-6	Tornado	EF0	0	0	150.00K	0.00K
NEDERLAND	JEFFERSON CO.	ТΧ	05/25/2022	04:21	CST-6	Tornado	EF1	0	0	100.00K	0.00K
WEST PORT ARTHUR	JEFFERSON CO.	ТΧ	07/22/2022	10:25	CST-6	Tornado	EF0	0	0	0.00K	0.00K
LA BELLE	JEFFERSON CO.	ТΧ	01/24/2023	16:05	CST-6	Tornado	EF1	0	0	15.00K	0.00K
PORT ARTHUR	JEFFERSON CO.	ТΧ	04/10/2024	04:55	CST-6	Tornado	EF2	0	0	500.00K	0.00K
Totals:								0	0	765.00K	0.00K

Figure	<u>68</u> -	Tornado	Events	(2014-2024)
--------	-------------	---------	---------------	-------------

Future Occurrences

Based on previous occurrences, there could be expected to be 0.8 tornado events per year on average or an 80% chance for an event each year.

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 34 provides details about the categories in the Enhanced Fujita Tornado Scale. For the planning area, 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 10 years, most tornadoes have been EF0 which have winds of 65-85 mph. The worse case scenario in the last decade is EF2 that occurred in April of 2024. Based on tornado risk in the Southeast Texas region, it could still be possible for tornadoes up to EF5, however, that has not been seen even if you go back to the year 2000.

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

Table 34 - Enhanced Fujita (EF) scale

Impact

Tornado events can cause a devasting impact to the planning area. Most historical tornadoes in Jefferson County have been EF0 or EF1 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. The worst case of an EF2 in April

of 2024 would potentially cause severe roof damage, destruction of mobile homes, trees being uprooted, and cars lifted off the ground. Population increase could place more people in harm's way.Land use changes could alter the impact of tornadoes by having more development at risk from tornadoes.

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, however, as the Texas State Climatologist summarized, in the Extreme Weather in Texas, 1900-2036, "direction of future changes is largely unknown". (2021UPDATE_Climate-ExecutiveSummary-Flyer.pdf)

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 DD7 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 relatively high (97.9 national percentile) and relatively high (97.3 national percentile) in expected annual loss. This index estimates an 18 million dollar expected annual loss. However, historically as shown in the NCEI database table, there has been only around 765 thousand in damage over the last decade. If a more severe tornado (EF3 or higher) comes through the planning area, that could cause catastrophic damage.



Figure 69 - National Risk Index – Tornado

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development Any areas of growth could be potentially impacted by the tornado hazard because the entire County is exposed and vulnerable. Residential development, specifically manufactured homes, may be considered more vulnerable to tornadoes. In general, any development that has weak building and/or construction materials that could be impacted by high winds would be highly impacted by tornadoes.
- Projected changes in population An increase in population will expose more people to tornadoes.

Winter Storm

Update From Last Plan

• This hazard was not profiled in the 2019 plan

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, and downed trees and powerlines. Freezing of pipes also has been seen in recent winter storms in the area.

Location

Although winter storms in Texas occur less frequently than they do further north, they occur often enough to be considered a viable, seasonal threat. Texans are most familiar with four types of winter storms: snowstorms, blizzards, cold waves, and ice storms. Due to the nature of winter storms, all people and assets in Jefferson County DD7 have equal degree of exposure to a winter storm. The main types of events that occur in DD7 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 73 shows the average annual snowfall totals for the United States. The map shows southeastern Texas receives between 0-5 inches of snow per year. The geographic area affected is considered Extensive.





Previous Occurrences

According to the NCEI database there have been 9 recorded winter storms, winter weather, ice storm, or heavy snow events that caused damage in Jefferson County since the year 2000.

The most severe was Winter Storm Uri in February 2021, which dumped record amounts of snow on Texas, with the frigid temperatures and severe weather impacting all 254 counties in the state. Millions of Texans lost power. Snow and ice paired with ultra-low temperatures caused widespread road closures and dangerous travel conditions. State emergency management leaders activated warming centers in communities across Texas and numerous personnel were deployed to assist stranded motorists and conduct welfare checks. The Texas Comptroller reported that Winter Storm Uri knocked out power for nearly 70 percent of Texans and disrupted water utilities, leaving many Texans without heat or running water for extended periods in the frigid cold. It resulted in between \$80 billion and \$130 billion in financial losses to the state economy, and what's more, claimed at least 210 lives.

A record freeze brought challenges for our state's power generation and delivery systems (ERCOT). Mainline power interruptions challenged our generators which affected our Water Production and Wastewater systems and caused a series of cascading events including a Boil Water Notice.

Location	County/Zone	<u>St.</u>	Date	<u>Time</u>	<u>T.Z.</u>	<u>Type</u>	<u>Mag</u>	<u>Dth</u>	<u>lnj</u>	<u>PrD</u>	<u>CrD</u>
Totals:								1	0	10.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	12/11/2008	00:00	CST-6	Winter Storm		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	12/04/2009	17:00	CST-6	Winter Weather		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	02/23/2010	22:00	CST-6	Winter Weather		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	02/03/2011	08:00	CST-6	Winter Weather		0	0	10.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	01/23/2014	19:14	CST-6	Winter Weather		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	01/28/2014	07:00	CST-6	Winter Weather		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	03/04/2014	05:00	CST-6	Winter Weather		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	12/08/2017	01:00	CST-6	Winter Weather		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	01/16/2018	15:00	CST-6	Winter Weather		0	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	02/14/2021	19:00	CST-6	Winter Storm		1	0	0.00K	0.00K
JEFFERSON (ZONE)	JEFFERSON (ZONE)	ТΧ	02/17/2021	05:00	CST-6	Ice Storm		0	0	0.00K	0.00K
Totals:								1	0	10.00K	0.00K

Figure 71 - Winter Storm Events (2000-2024)

Future Occurrences

Since there have been 9 recorded winter storm events in the last 24 years it can be expected to have an event every 2.7 years or 37% chance a year. However, it is important to be prepared for a possible winter storm as when a storm does come, it can be devastating. This is largely because residents are not accustomed to dealing with the effects of the storms in this area. Also, most of the events have occurred more recently, so it possibly could be a trend that

continues. This is possibly in part due to climate change, which will be discussed in a later section.

Extent

Due to DD7 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. Most events in DD7 have been a 0-2 in the SPIA chart. However, winter storm Uri in 2021 could be considered in the 4 or 5 categories due to its effects it had on the entire region.

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) *Revised-Octuber, 2011	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS	
0	< 0.25	<15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.	
1	0.10-0.25	15 - 25	Some isolated or localized utility interruptions are	
1	0.25 - 0.50	> 15	and bridges may become slick and hazardous.	
2	0.10-0.25	25-35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation	
	0.25-0.50	15-25		
	0,50 - 0,75	<15		
	0.10 - 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive.	
2	9.25 - 0.50	25 - 35		
9	0.50 - 0.75	15 - 25		
	0.75 - 1.00	<15	Outages lasting 1 - 5 days.	
	0.25 - 0.50	>=35	Prolonged & widespread utility interruption	
	0.50 - 0.75	25 - 35	with extensive damage to main distribution	
4	0.75-1.00	15-25	feeder lines & some high voltage transmission	
A	1.00 - 1.50	< 15	lines/structures. Outages lasting 5 - 10 days.	
	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		
2	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 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 large parts of the state without power and some without water for a time. In addition, motorists are not used to the icy roads which can cause significantly more accidents. Population increase could place more people in harm's way. Land use changes could alter the

impact of winter storms by having more development at risk from the hazard or by causing degradation to properties.

Effect of Climate Change on Winter Storm

Climate change may cause more cold rainfall during winter. This is because an overall warmer planet would cause more evaporating water in the atmosphere, thus leading to more precipitation in the form of rainfall for the area. However, due to this warming trend, impacts to employees and assets will likely lessen.

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 groups that are most at risk during winter storm events are the homeless, the elderly, and those with health issues that limit them physically. The homeless due to lack of shelter, and the elderly due to limitations from being able to clear snow in driveway to leave home as well as increased risk of injury from falling on icy grounds.

Overall Vulnerability

The overall vulnerability of DD7 assets to winter storms is relatively low. The main assets at risk are pipes, crops, and infrastructure. Many assets would not likely be affected by the severity of winter storms that have historically occurred in the parts of Texas.

The National Risk Index shows winter storms are very low (22.2 national percentile) and relatively low (23.1 national percentile) in expected annual loss. This index estimates a 14 thousand dollar expected annual loss.



Figure 73 - National Risk Index – Winter Weather

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the Planning Area can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The Planning Area considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development the ability of new development to withstand winter weather impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction.
- Projected changes in population With an increase in population, more people will be exposed to winter weather events. Additionally, the age of the population, changes in their geography, and how climate change could alter the winter weather received (rain versus snow) will be important to continue to assess future changes in vulnerability.

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 have jurisdictional authority over.

People: The health, safety, security, and general well-being of the citizens within the is of paramount importance to 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. Focused on areas of its responsibility - water and sanitary sewer for the entire community including business and industry within its planning area.

Natural Environment: The District identified critical areas that provide protective benefit or reduce the magnitude of an event and areas that need protection in the event of a disaster.

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

The map on page 34 shows the community assets considered critical. There are 39 DD7 owned buildings and facilities that are also considered critical. In addition to the buildings, all infrastructure (wastewater treatment plants, lift stations as examples) are also considered critical.

Analyze Risk

Once establishment of the hazard areas, extent, impact, and probability are complete and community assets identified, analysis can be conducted to identify where community specific vulnerabilities and problem areas exist. In addition to this information, community assets were also reviewed. Throughout this process, the District updated its critical infrastructure list to better assess what exactly is at risk. Using this information and the most recent experiences from 2020-2024, the District ranked the hazards and developed actions to mitigate those hazards.

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

LowUnlikely to occur in area and impact is negligible.MediumLikely to occur in area, with moderate impact.

HighHighly likely to occur in area and impact could cause significant damage
including fatalities.

Summarize Vulnerability

DD7 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, DD7 decided to omit these hazards (such as wildfire, earthquake, dam failure and subsidence).

Once establishment of the hazard areas, extent, impact, and probability are complete and community assets identified, analysis can be conducted to identify where community specific vulnerabilities and problem areas exist. Using this information, the District ranked the hazards and developed actions to help mitigate those hazards. The ranking list is in Table 35. While all hazards have actions, the hazards deemed medium and high were given higher priority than those ranked low.

Hazard	Rank (HIGH MEDIUM LOW)
Flood	High
Hurricane/Tropical Storm	High
Levee Failure	High
Severe Thunderstorm/High Wind	High
Coastal Erosion	Medium
Drought	Medium
Extreme Heat	Medium
Lightning	Medium
Tornado	Medium
Winter Storm	Medium
Hailstorm	Low

Table 35 - Hazard Ranking

Section 4. Mitigation Strategy

Update from Last Plan

- The on-going actions were placed into the current hazard mitigation table, status provided and rank reassessed.
- For each action, discussed future conditions and vulnerable populations

Introduction

Mitigation Strategy

The District works with other local, county and regional organizations toward mitigation actions that meet the DD7's objective of migrating risks due to natural hazards, without creating new problems.

This plan emphasizes mitigation goals and actions focusing on activities that occur prior to a natural hazard that reduce damage when disasters strike. While developing new mitigation actions, the MPC carefully considered preventative activities (e.g., planning and zoning and hazard mapping), property protection (e.g., acquisitions, critical facility improvements), natural resource protection (floodplain protection), structural projects (storm sewer, roads and buildings), emergency services (warning systems, training) and public information and awareness (outreach, education and training).

The first step of the mitigation strategy involved review of the current plan's mitigation goal, to assess whether it remains reflective of the District's mitigation strategy.

Mitigation Goal

The District made no changes to its goal statement. The goal of this plan update is stated below:

The mitigation goals of DD7 are:

- To protect public health, safety, and welfare;
- To reduce losses due to hazards by identifying hazards, minimizing exposure of citizens and property to hazards, and increasing public awareness and involvement;
- To facilitate the development review and approval process to accommodate growth in a practical way that recognizes existing stormwater and floodplain problems while avoiding creating new problems or worsening existing problems; and
- To seek solutions to existing problems.

Status of Actions from Last Plan

The MPC went through each action from the 2019 iteration to provide a status of the action and to determine if the action was completed, ongoing, or no longer a priority so will be removed or changed. If the project was ongoing, it was moved to the new actions to be re-prioritized. Table 36 provides the status to the 2019 mitigation actions.

No.	Title	Jurisdiction	Description	Status Update as of 2024 and recommendation
2019-1	Hurricane Flood Protection Levee Study	JCDD7	Continue working with USACE on studies and possible upgrade to help reduce the risk of flooding new and existing structures as well all roads and nuisance flooding and to help the District review and update levees in jurisdictional area.	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-2	Update Data Operations System- Control Center	JCDD7	This will allow the District to view what pump stations are operating at a certain time (real time run info) see how the systems are working; relates to how much rain we are getting. Count rain in 15 different places in the district. Monitor pumps/generator conditions and status Monitor rainfall totals and monitor pump facility conditions throughout storm events	Status Update: Ongoing, Almost Ready to Bid Recommendation: Remain as an Action Item
2019-3	Upgrade El Vista P.S.#2	JCDD7	Harden structure – put new building in place and install a new robotic trash raking system making it much more efficient to operate.	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-4	Lateral B4A and B4A Ext. Improvements	JCDD7	Consists of widening those channels to increase the runoff capacity – upgrading/enlarging road crossing to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.	Status Update: Ongoing, Grant Application Submitted Recommendation: Remain as an Action Item
2019-5	Beauxart Gardens Central Ditch	JCDD7	Consists of widening those channels to increase the runoff capacity – upgrading/enlarging road crossing to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-6	Re-establish Impact Barriers in Turning Basin	JCDD7	To reduce the risk of barges and large vessels from impacting the Hurricane levee during major storm events. To keep vessels that may have broken loose during storm event from impacting the levee system.	Status Update: Ongoing, piece of 2019-1 Recommendation: Combine with 2019-1
2019-7	Upgrade to Lateral B4B	JCDD7	Consists of widening those channels to increase the runoff capacity – upgrading/enlarging road crossing to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.	Status Update: Ongoing, Grant App Submitted Recommendation: Combine with 2019-4
2019-8	Rehab Gate Structures – P.S. #19	JCDD7	Currently underway. Gate structures take water into detention pond. This will enhance the detention capability in existing	Status Update: Project Complete Recommendation: Remove Item

Table 36 - Status of actions from the DD7 2019 Hazard Mitigation Plan

No.	Title	Jurisdiction	Description	Status Update as of 2024 and recommendation
			watershed and reduce flooding to new and existing structures as well all roads and nuisance flooding.	
2019-9	Develop Data Collection System	JCDD7	Developing data collection system to track maintenance and system efficiencies for reporting purposes. Develop collection system where we can log all changes/repairs/upgrades/maintenance – so info can be brought up and sent. Pump/ditch/engine – depository so they are prepared to submit any info to another entities (USACE or FEMA, etc.). Helps show how things were maintained and how much money was spent to maintain system.	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-10	Repair Lateral C12	JCDD7	In need of repair from within the channel. Repairing concrete lining to ensure the lateral C12 can run more efficiently and make it easier to maintain. This will enhance the channel bank.	Status Update: Ongoing, Engineering Phase Recommendation: Remain as an Action Item
2019-11	Storm Water Management Plan	JCDD7	Help to establish regulations to control development within existing flood zones. Allows the District to enforce regulations.	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-12	Upgrade pumping capacity at each DD7 Pump Station	JCDD7	Congress authorized the Sabine to Galveston Study and appropriation of funds and work will begin shortly. Apart from the Sabine to Galveston Study, the District is constantly working to provide greater pumping capacity at all existing and future stations that will reduce potential future flooding to new and existing structures as well all roads and nuisance flooding within the District's jurisdictional boundaries.	Status Update: Ongoing, Part of Sabine Pass to Galveston Project Scope Recommendation: Remain as an Action Item, See Description modification to make more generic
2019-13	Hardening of all DD7 structures against severe storm events.	JCDD7	DD7 is evaluating all structures and is in the process of hardening structures as funds become available.	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-14	Build New Building with a safe room to shelter essential personnel during storm events	JCDD7	Construct a new facility with a break room and showers that will be able to withstand severe winds and shelter employees to be used as an EOC during and immediately after storm events.	Status Update: Complete Recommendation: Modify Description to construct a EOC breakroom, shower, and shelter
2019-15	Additional Fuel Capacity at Pump Stations	JCDD7	Each Pump Station will get additional fuel capacity. 6-8 pump stations each year for the next 3-4 years	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-16	Repair/Re-design HFPL from station. 879+57-934+75	JCDD7	Underway; working to get environmental permitting clear. Approximately \$45,000 per 100' to repair. Approximately	Status Update: Complete Recommendation: Remove Item

No.	Title	Jurisdiction	Description	Status Update as of 2024 and recommendation
			500' of repair needed, (\$225,000). 5600' of levee road surface repair, 5600' of slope resurfacing.	
2019-17	Blocks Bayou Repairs Improvements	JCDD7	The District must remove the current fence to allow DD7 more easement to repair and maintain Blocks Bayou Ditch.	Status Update: Ongoing, Phase 2 in design Recommendation: Remain as an Action Item
2019-18	A3A Detention	JCDD7	The proposed project will consist of purchasing 60 acres of open land which will be excavated to an average of 5 feet in depth to develop a detention pond with the capacity of 300 acre-feet. The detention pond will be designed to mitigate flooding of homes, businesses, and roadways within the watershed during heavy rainfall events. The detention facility will provide off-channel temporary storage of excess floodwaters. This new detention facility will fill and drain on a gravity basis and will operate without requiring additional DD7 pumping resources. This project will require environmental permitting and a cultural resource assessment.	Status Update: Ongoing, HMGP Design Phase 1 Recommendation: Remain as an Action Item
2019-19	Halbouty Detention Expansion	JCDD7	The detention pond will be designed to mitigate flooding of homes, businesses, and roadways within the watershed during heavy rainfall events by providing off-channel temporary storage of excess floodwaters. This new detention facility will fill on a gravity basis and will drain by pumping through the existing Halbouty Pump Station. The expanded facility will require the purchase and installation of additional pumps into the existing pump station which has been constructed to facilitate this expansion. The project will require underground pipeline corridor crossings, environmental permitting and a cultural resource assessment.	Status Update: Ongoing, Killing HMGP and converting to CDBG Recommendation: Remain as an Action Item
2019-20	Groves Detention	JCDD7	The proposed project will consist of purchasing 35 acres of open land which will be excavated to an average of 5 feet in depth to develop a detention pond with the capacity of 175 acre-feet. The detention pond will be designed to mitigate flooding of homes, businesses, and roadways within the watershed during heavy rainfall events. The detention facility will provide off-channel temporary storage of excess floodwaters. This new detention facility will fill and drain on a gravity basis and will operate without requiring additional DD7 pumping resources. This project will require environmental permitting and a cultural resource assessment.	Status Update: Ongoing, HMGP Design Phase 1 Recommendation: Remain as an Action Item

No.	Title	Jurisdiction	Description	Status Update as of 2024 and recommendation
2019-21	Rodair Gully Detention	JCDD7	Construct a detention pond on Rodair Gulley in the vicinity of West Port Arthur Road. Detention Pond will be of adequate size to reduce flooding downstream while allowing for improvement to the upstream drainage channels.	Status Update: Ongoing Recommendation: Remain as an Action Item
2019-22	Project Scoping support: Cost to hire for Data Collection and analysis for Projects identified from USACE/DD7 Master Drainage Study (e.g. H&H, FFE, Project Identification, BCAs	JCDD7	The District is working on a Master Drainage Plan Study with the USACE. Once a project is identified, certain project specific data collection and analysis is needed including Hydrology and Hydraulics (H&H) studies, Surveying First Floor Elevations throughout the planning are (FFEs), Benefit Cost analysis (BCAs) as well as other data collection and documents required to determine application grant eligibility. Each identified project from the USACE/DD7 Master Drainage Plan Study would benefit the community either protection of residential and commercial structures, commercial properties or agricultural areas	Status Update: Ongoing, FMA Apps in with (1) awarded Recommendation: Remain as an Action Item
2019-23	Shreveport Pump Station and it is a drainage project.	JCDD7	The existing Shreveport Pump Station was originally designed (1940s) to handle a relatively small watershed along the city's seawall during a 10-year storm event. In recent years, the City has shown increased interest of further developing. These developments would send additional water through the city's interior drainage system to Shreveport Pump Station. In its current state, the pump station is not capable of handling any additional water. In addition to the proposed increase, the station has experienced an increase in flows due to development since original construction. Now DD7 is in the process of enlarging all stations to handle 25- year Atlas 14 rain events widths storage to accommodate 100- year storm runoff. The existing concrete structure is seeing significant spalling due to years of erosion. It is proposed that a new structure be built to house new, larger pumps. This would increase the capacity of the station to the point that it could better support its existing watershed and withstand any future developments in the area. The proposed project will consist of the design, construction, and implementation of the new Shreveport Pump Station along the seawall in Port Arthur, Texas. The pump station will be designed to mitigate the flooding of homes, businesses, and roadways within the	Status Update: Ongoing, HMGP/CDBG Recommendation: Remain as an Action Item
No.	Title	Jurisdiction	Description	Status Update as of 2024 and recommendation
---------	---	--------------	---	---
			watershed during heavy rainfall events. This project could require environmental permitting and a cultural resource assessment	
2019-24	Rodair Gully Pump Station(s) and Siphon(s).	JCDD7	Rodair Gully is one of the few complete gravity-drained channels within DD7's system. Because this watershed currently does not have any pumping capabilities, it is subject to the tidal influences of Taylors Bayou. This pump station would help to relieve the localized flooding experienced in 25-year to 100-year storm events in Central Gardens and Beauxart Gardens (portions of the unincorporated areas of Jefferson County) and some parts of the City of Nederland. The current level of protection for the Rodair Gully channel is a 4% probability storm event (25-year). The proposed project will consist of the design, construction, and implementation of a new stormwater pumping station that will be placed along the existing Rodair Gully drainage channel and/or multiple stations placed within the Rodair Gully system to allow for regional detention. The proposed project improvements also consist of designing and constructing Siphon(s) from Central Gardens area to Rodair System to mitigate flood waters impacting homes, businesses, and roadways. The pump station(s) will be designed to mitigate the flooding of homes, businesses, roadways within the watershed during heavy rainfall events. A proposed main Rodair Gully pump station will be strategically located along the Hurricane Flood Protection Levee (HFPL) in order to move runoff outside of the District's surge barrier. This project will require environmental permitting and a cultural resource assessment.	Status Update: Ongoing, HMGP / COVID / Sabine to Galveston Project Recommendation: Keep as Action Item, modified language to include all active projects
2019-25	Improvements on McFadden/Weiss Canal Channel to reduce flooding.	JCDD7		Status Update: No longer feasible Recommendation: Remove, no longer planned action item
2019-26	Hardening portion of new building (see below)	JCDD7		Status Update: Included in 2019-13 Recommendation: Remove Item

No.	Title	Jurisdiction	Description	Status Update as of 2024 and recommendation
2019-27	Construct EOC (see below)	JCDD7		Status Update: Complete Recommendation: Remove Item
2019-28	Reparation/upgrade levee systems (see below)	JCDD7		Status Update: Included in 2019-1, changed to be more detailed in Sabine to Galveston Study Recommendation: Remove Item
2019-29	Inundation map development (see below)	JCDD7		Status Update: Included in 2019-22 Recommendation: Remove Item
2019-30	Main C at 14 th Street Improvements	JCDD7	In need of repair from within the channel. Repairing concrete lining to ensure the Main C can run more efficiently and make it easier to maintain. This will enhance the channel bank.	Status Update: Ongoing Recommendation: Add as an Action Item
2019-31	Rodair Siphon(s) from Central Gardens	JCDD7	If description modification in item 2019-24 is not okay' d, add item for Rodair Siphon specifically. The proposed project consists of designing and constructing Siphon(s) from Central Gardens area to Rodair System to mitigate flood waters impacting homes, businesses, and roadways.	Status Update: Ongoing, HMGP. Piece of 2019-24* Recommendation: Determine if description in 2019-24 covers this action item. If desired, add as an Action Item

New Actions

Identification of New Actions

After a review of the actions in the current plan, the MPC began a process to identify new actions. The MPC utilized a version of FEMA's Mitigation Implementation Action Summary Worksheet to help describe important information about the action. In addition, the MPC tried to determine impacts from climate adaptation and on socially vulnerable populations.

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

Evaluate and Prioritize

To evaluate feasibility and analyze prioritization of actions, all new and existing actions were reviewed by the MPC. The process utilized the Mitigation Action Implementation Tool. The MPC was asked to consider the feasibility of identified mitigation actions as high, medium, or low and using the Mitigation Action Evaluation Tool (Life Safety, Property Protection, Technical, Political, Legal, Environmental, Social, Administration, Local Champion, and Other Community Objectives) rank the category 1-10 with 1 being a low priority for the category and 10 being a high for the category. Descriptions of the criteria are in Figure 77.

Figure 74 - 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 37. The addressed hazards were also provided.

				Р
				r
	Action (no.)	MITIGATION ACTION SUMMARY OF PRIORITIZATION		i
	Moved from		Т	0
	2020 actions	TOTAL SCORE BETWEEN 1-50 HAZARD IS LOW PRIORITY (L)	0	r
	to current	TOTAL SCORE BETWEEN 51-75 HAZARD IS MEDIUM PRIORITY (M)	t	i
Action	actions	TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH PRIORITY (H)	а	t
No.			1	у
1	2019-1 and 6	Hurricane Flood Protection Levee Study	88	Ĥ
14	2019-16	Repair / Redesign HFPL System at Various Locations	88	Н
31		Main A Channel Improvements	82	Н
32		Main B Channel Improvements	82	Н
22		Main C Channel Improvements	02	ш
33	2010 12	The end of manner in proceedings to each DD7 During Station	01	п
10	2019-12	Upgrade puriping capacity at each DD/ Purip Station	01	п
23		Main C at 14th Succet improvements	81	п
24		Rotal Sphon(s) non-Central Gatelia	81	н
28		Charles Dayour Daip Station and System Opgrades	81	н
35		rangenor buyor i and balani an bytech opgades	81	н
35		Redair Cally Dirch Improvements	01	11
36	2010.2	Ionado El Vieto D C 42	80	н
3	2019-3	Upgrade ELVING F.S.#2 Panoirs and Improvements to Dump Station # 2. West Part Arthur Paed Dump Station	80	п
20	2010 5	Repairs and improvements to Puint Station # 5, west roll Aluna Road ruling Station	70	п Ц
15	2019-5	Beatwart Gaudeits Central Dirch	79	н
21	2019-17	Biocks Dayou repairs in provenients Shewanone Jumy Station and it is a drainage project	79	н
21	2019-23	Since optimized and the start of the starting	79	н
25	2017-24	Renairs and Improvements to Pumo Station # 5 Central P S	79	н
29		Repairs that Direch Improvements	79	н
30		Star Lake Purm Station and System Improvements	79	н
37		Pure Oil Dick Improvements	79	н
2	2019-2	Undate Data Operations System-Control Center	78	н
17	2019-19	Parlie Data Optimise Synam Control Control	78	н
4	2019-4 and 7	Lateral B4A and B4A Ext. Improvements Upgrade to Lateral B4B	77	Н
6	2019-8	Rehab Gate Structures - PS #19	77	Н
18	2019-20	Groves Detention	77	Н
19	2019-21	Rodair Gully System Detention Pond(s)	77	Н
34		Q th Avenue Detention Pond Improvement	77	н
8	2019-10	Renair Lateral C12	76	н
16	2019-18	A3A Detention	76	Н
11	2019-13	Hardening of all DD7 structures against severe storm events	70	М
9	2019-11	Storm Water Management Plan	69	М
7	2019-9	Develop Data Collection System	68	М
13	2019-15	Additional Fuel Capacity at Pump Stations	68	М
12	2019-14	Build New Building with a Safe Room to Shelter Essential Personnel During Storm Events	66	М
		Project Scoping support: Cost to hire for Data Collection and analysis for Projects identified from USACE/DD7 Master Drainage Study (e.g. H&H,		
20	2019-22	FFE, Project Identification, BCAs)	66	М
46		Lightning detectors	52	М
49		Vulnerability assessment of district buildings to determine which can be better protected from the effects of winter storm	50	L
40		Develop/Update drought contingency plan. Adopt and implement water restrictions identified in the plan.	49	L
48		Have a pre-determined best available refuge area.	49	L
50		Ensure all critical facility pipes are insulated	49	L
39		Replace landscape around district buildings and critical facilities with drought tolerant varieties.	48	L
42		Formalize employee safety precautions (light clothing, rest, potable water, shade)	48	L
43		Have blinds or other coverings at windows installed to protect window if hailstorm breaks window	48	L
47		Retrofit district buildings with lightning mitigation equipment (lightning rods, surge protection)	48	L
44		Regularly inspect and maintain roofing system.	47	L
41		Weather strip doors and windowsills to keep cool air in. Cover windows that receive morning or afternoon sun with shades/drapes/awnings.	46	L
45		Process in place to check HAC equipment (hail can damage condensing coils y denting the exchange fins)	45	L
38		Improvements to Main C Diversion Channel with New Pump Station	44	L

Table 37 - Ranking of Actions to Determine Priority Level

The Table 38 provides a list of each action by its action number. The table also shows it if was one moved from the 2019 plan and its priority level.

Table 38 - List of Actions by Action No.

Action	Action	MITIGATION ACTION SUMMARY OF	
No.	(no.)	PRIORITIZATION	
	Moved	TOTAL SCODE DETWEEN 1 50 HAZADD IS LOW	P
	actions to	PRIORITY (I)	rio
	current	TOTAL SCORE BETWEEN 51-75 HAZARD IS MEDIUM	rity
	actions	PRIORITY (M)	
		TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH	
		PRIORITY (H)	
1	2019-1	Hurricane Flood Protection Levee Study	Н
2	and 6	Undeta Data Operations System Control Conter	ц
2	2019-2	Upgrade El Visto D S #2	п
3	2019-3	Letarel D4A and D4A Fut Immercements Up and to Letarel	п
4	2019-4 and 7	B4B	п
5	2019-5	Beauxart Gardens Central Ditch	Н
6	2019-8	Rehab Gate Structures - PS #19	Н
7	2019-9	Develop Data Collection System	М
8	2019-10	Repair Lateral C12	Н
9	2019-11	Storm Water Management Plan	М
10	2019-12	Upgrade pumping capacity at each DD7 Pump Station	Н
11	2019-13	Hardening of all DD7 structures against severe storm events	М
12	2019-14	Build New Building with a Safe Room to Shelter Essential	М
		Personnel During Storm Events	
13	2019-15	Additional Fuel Capacity at Pump Stations	М
14	2019-16	Repair / Redesign HFPL System at Various Locations	Н
15	2019-17	Blocks Bayou Repairs Improvements	Η
16	2019-18	A3A Detention	Н
17	2019-19	Halbouty Detention Expansion	Η
18	2019-20	Groves Detention	Η
19	2019-21	Rodair Gully System Detention Pond(s)	Η
20	2019-22	Project Scoping support: Cost to hire for Data Collection and	М
		analysis for Projects identified from USACE/DD7 Master	
21	2010 22	Drainage Study (e.g. H&H, FFE, Project Identification, BCAs)	ц
21	2019-23	Sineveport Pump Station and It is a dramage project.	п
22	2019-24	Moin C at 14th Street Improvements	П
23	2019-30	Podair Sinhon(a) from Control Cordona	П Ц
24	2019-31	Robality and Improvements to Dump Station # 5. Control D.S.	П Ц
25		Repairs and Improvements to Pump Station # 2, West Dort	п
20		Arthur Road Pump Station	п

Action	Action	MITIGATION ACTION SUMMARY OF	
No.	(no.)	PRIORITIZATION	
	Moved		—
	from 2019	TOTAL SCORE BETWEEN 1-50 HAZARD IS LOW	Prio
	actions to	TOTAL SCOPE RETWEEN 51.75 HAZARD IS MEDIUM	orit
	actions	PRIORITY (M)	Y
	uctions	TOTAL SCORE BETWEEN 76-100 HAZARD IS HIGH	
		PRIORITY (H)	
27		Crane Bayou Pump Station and System Upgrades	Н
28		Alligator Bayou Pump Station and System Upgrades	Н
29		Magnolia Ditch Improvements	Н
30		Star Lake Pump Station and System Improvements	Н
31		Main A Channel Improvements	Н
32		Main B Channel Improvements	Н
33		Main C Channel Improvements	Н
34		9 th Avenue Detention Pond Improvement	Н
35		Crane Bayou Channel Improvements	Н
36		Rodair Gully Ditch Improvements	Н
37		Pure Oil Ditch Improvements	Н
38		Improvements to Main C Diversion Channel with New Pump Station	L
39		Replace landscape around district buildings and critical	L
10		facilities with drought tolerant varieties.	-
40		Develop/Update drought contingency plan. Adopt and	L
41		Weather strip doors and windowsills to keep cool air in Cover	T
		windows that receive morning or afternoon sun with	L
		shades/drapes/awnings.	
42		Formalize employee safety precautions (light clothing, rest,	L
		potable water, shade)	
43		Have blinds or other coverings at windows installed to protect window if hailstorm breaks window	L
44		Regularly inspect and maintain roofing system.	L
45		Process in place to check HAC equipment (hail can damage	L
46		Lightning detectors	М
47		Retrofit district buildings with lightning mitigation equipment	L
		(lightning rods, surge protection)	
48		Have a pre-determined best available refuge area.	L
49		Vulnerability assessment of district buildings to determine	L
50		Ensure all critical facility pince are insulated	т
50		Ensure an entical facility pipes are insulated	L

The Mitigation Action Table for the 2025 Hazard Mitigation Plan Update is listed below at Table 39.

I able 39 - Mitigation Action Table								
ACTION NO. 1 (moved from current plan (no. 2019-1 and 6) into new actions)								
Title: Hurricane Flood Protection Levee Study								
Hazard(s) Addressed]	Description	n of Action	Implementing Department				
Coastal Erosion Flood Hurricane/Tropical Storm Levee Failure	Continue worl possible upgrad flooding new a roads and nuiss District review area. To reduce from impacting storm events. broken loose d the levee syste	king with U de to help f and existing ance floodi and updat the risk o g the risk o g the Hurria To keep ve uring storn m.	DD7 and outside engineering, construction, grant management contractors					
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:				
FEMA (FMA Grant) Capital Budget USACE	\$1,800,000- \$2,000,000	Н	5-10 years	 Existing Building and Infrastructure New Building 				
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popu	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations				
Infrastructure, Homes and Property	Next gene increased dept H&H data u	change, population change)populationNext generation modeling will help show ncreased depth of rainfall which will help with the H&H data used for the design to meet the risk.Design will take intra any potential negativ to the area.						

ACTION NO. 2 (moved from current plan (no. 2019-2) into new actions)								
Title: Update Data Operations System - Control Center								
]	Description	n of Action	Implementing Department					
This will allow stations are ope run info) see he to how much ra different places pumps/generat rainfall totals a throughout stor	the District erating at a ow the syst ain we are s in the dist or condition and monitor rm events.	DD7 and outside engineering, construction, grant management contractors						
Cost Estimate	Priority	Reduces Risk to:						
\$5,000,000 H 3-5 years			 Existing Building and Infrastructure New Building 					
Future Cond cha Awareness and increased and put	itions Con nge, popul d data abou d more inte olic prepare	Risk Addressed with note on benefit to vulnerable populations As part of the analysis, the District reviews the impacts to the whole community. As part of the analysis, the District reviews the impacts to the whole community						
	oved from curre Ie: Update Data This will allow stations are operation of the properties of the properties of the properation o	ACTION oved from current plan (r ele: Update Data Operation Description This will allow the Distriction stations are operating at a run info) see how the syst to how much rain we are different places in the dist pumps/generator condition rainfall totals and monitor throughout storm events. Cost Estimate Priority \$5,000,000 H \$5,000,000 H Future Conditions Con change, popul Awareness and data about increased and more inte public prepare	ACTION NO. 2 oved from current plan (no. 2019-2) into new action de: Update Data Operations System - Control Cent Description of Action This will allow the District to view what pump stations are operating at a certain time (real time run info) see how the systems are working; relates to how much rain we are getting. Count rain in 15 different places in the district. Monitor pumps/generator conditions and status. Monitor rainfall totals and monitor pump facility conditions throughout storm events. Cost Estimate Priority Time Frame \$5,000,000 H 3-5 years Future Conditions Consideration (e.g.: climate change, population change) Awareness and data about the growing threat from increased and more intense storms will help the public prepare for disasters.					

1

ACTION NO. 3 (moved from current plan (no. 2019-3) into new actions)									
	Title: Upgrade El Vista P.S.#2								
Hazard(s) Addressed]	Description	n of Action	Implementing Department					
Hail Hurricane/Tropical Storms Lightning Flood Thunderstorms/Damaging Winds Tornados Winter Storm	Harden structu install a new ro much more eff	re – put ne obotic trash icient to op	DD7 Engineering Department						
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:					
Capital Budget Grants	\$2,000,000	Н	5-10 years	 Existing Building and Infrastructure New Building 					
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations					
Estimated Cost: \$ Dependent upon what is being built. As winds cause damage in the area, the benefit to build at a wind resistant level that would protect live and property has a high benefit to the cost.	Continued and infrastructure r assets.	l growing t equires the	Protecting critical infrastructure provides for the health and safety of the population. Protecting critical infrastructure provides for the health and safety of the population.						

ACTION NO. 4 (moved from current plan (no. 2019-4 and 7 into new actions)							
Title: Lateral B4A and B4A Ext. Improvements Upgrade to Lateral B4B							
Hazard(s) Addressed]	Descriptio	n of Action	Implementing Department			
Flood Hurricane/Tropical Storms Thunderstorms/High Winds	Consists of wid the runoff capa crossing to red existing structu flooding. Cons increase the ru road crossing t new and existin nuisance flood	dening thos acity – upgr uce out of ares as well sists of wide noff capaci o reduce of ng structure ing.	DD7 Engineering Department				
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
Capital Budget Grants	\$8,000,000	Н	3-5 years	 Existing Building and Infrastructure New Building 			
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popu	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations			
Infrastructure, homes and property	Continued and infrastructure r assets.	l growing t requires the	hreats to the critical e need to protect these	Protecting critical infrastructure provides for the health and safety of the population. Protecting critical infrastructure provides for the health and safety of the population.			

ACTION NO. 5 (moved from current plan (no. 2019-5) into new actions)									
	Title: Beauxart Gardens Central Ditch								
Hazard(s) Addressed]	Descriptio	n of Action	Implementing Department					
Flood Tropical Storm/Hurricane	Consists of wid the runoff capa crossing to red existing structu flooding.	dening thos acity – upg luce out of ures as well	DD7 and outside engineering, construction, grant management contractors						
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:					
Capital Budget Grants	\$2,300,000	Н	3-5 years	 Existing Building and Infrastructure New Building 					
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popu	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations					
Infrastructure, Homes and Property Remove inundation from all the structures for 100-yr and 10-yr -Contain the 100-year future conditions flows within channel -Estimated reduction of \$36.5 M in present value damages	Next gene increased dept H&H data u	eration moo h of rainfal sed for the	leling will help show l which will help with the design to meet the risk.	Design will take into account any potential negative impacts to the area.					

ACTION NO. 6 (moved from current plan (no. 2019-8) into new actions)							
	Title: Rel	nab Gate S	tructures - P.S. #19				
Hazard(s) Addressed]	Descriptio	n of Action	Implementing Department			
Flood Hurricane/Tropical Storm	Gate structures take water into detention pond. This will enhance the detention capability in existing watershed and reduce flooding to new and existing structures as well all roads and nuisance flooding.			DD7 and outside engineering, construction, grant management contractors			
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
Capital Budget Grants	\$4,000,000	Н	3-5 years	 Existing Building and Infrastructure New Building 			
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popu	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations			
Infrastructure, Homes and Property	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.Protecting critical infrastructure provides for the health and safety of the population.			

ACTION NO. 7 (moved from current plan (no. 2019-9) into new actions)								
	Title: Develop Data Collection System							
Hazard(s) Addressed		Description	n of Action	Implementing Department				
Flood Levee Failure Hurricane/Tropical Storm	Developing da maintenance a purposes. Dev log all changes info can be bro Pump/ditch/en prepared to sul (USACE or FI were maintain to maintain sys	ata collection nd system of elop collect s/repairs/up ought up an agine – depo bmit any in EMA, etc.). ed and how stem.	DD7 and outside engineering, construction, grant management contractors					
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:				
Capital Budget Grants	\$1,000,000	М	 Existing Building and Infrastructure New Building 					
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	Risk Addressed with note on benefit to vulnerable populations					
Infrastructure, Homes and Property	Next gene increased dept H&H data u	eration moc h of rainfal sed for the	Design will take into account any potential negative impacts to the area.					

ACTION NO. 8 (moved from current plan (no. 2019-10) into new actions)				
	Tit	tle: Repair	Lateral C12	
Hazard(s) Addressed]	Description	n of Action	Implementing Department
Flood Hurricane/Tropical Storms	In need of repair from within the channel. Repairing concrete lining to ensure the lateral C12 can run more efficiently and make it easier to maintain. This will enhance the channel bank.			DD7 and outside engineering, construction, grant management contractors
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
Capital Budget Grants	\$3,000,000 - \$6,000,000	Н	3-5 years	 Existing Building and Infrastructure New Building
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations
Infrastructure, Homes and Property - Remove inundation from up to 2 structures (10-yr) and 249 structures (100-yr) -Significant reduction for 100-yr inundation and Estimated reduction of \$18 M in present value damages	Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.

ACTION NO. 9 (moved from current plan (no. 2019-11) into new actions)				
	Title: Sto	orm Water	Management Plan	
Hazard(s) Addressed]	Description	n of Action	Implementing Department
Flood Hurricane/Tropical Storms Thunderstorms/Damaging Winds	Help to establish regulations to control development within existing flood zones. Allows the District to enforce regulations.			DD7 and outside engineering, construction, grant management contractors
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
Capital Budgets Grants	\$100,000	М	3-5 years	 Existing Building and Infrastructure New Building
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations
Infrastructure, Homes and Property	Awareness and education about the growing threat from increased and more intense storms will help the public prepare for disasters.			As part of the analysis, the District reviews the impacts to the whole community. As part of the analysis, the District reviews the impacts to the whole community.

ACTION NO. 10 (moved from current plan (no. 2019-12) into new actions) Title: Upgrade pumping capacity, structures, pumps. engines. and equipment at each DD7 Pump Station						
Hazard(s) Addressed		Description of Action Implementing Department				
Flood Hail Hurricane/Tropical Storm Lightning Thunderstorms/High Wind Tornado Winter Storm	Congress authorized the Sabine to Galveston Study and appropriation of funds and work will begin shortly. Apart from the Sabine to Galveston Study, the District is constantly working to provide greater pumping capacity, improving station structures, updating/replacing existing pumps and engines, updating/replacing existing			DD7 and outside engineering, construction, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
Capital Budget Grants	\$50,000,000	Н	5-10 years	 Existing Building and Infrastructure New Building 		
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	Risk Addressed with note on benefit to vulnerable populations			
People, Infrastructure, Homes and Property	Next gene increased dept H&H data u	eration moc h of rainfal sed for the	leling will help show l which will help with the design to meet the risk.	Design will take into account any potential negative impacts to the area.		

ACTION NO. 11 (moved from current plan (no. 2019-13) into new actions)				
Title: H	ardening of all	DD7 struc	tures against severe storn	n events
Hazard(s) Addressed		Description	n of Action	Implementing Department
Flood Hail Hurricane/Tropical Storm Lightning Thunderstorms/High Wind Tornado Winter Storm	DD7 is evaluating all structures and is in the process of hardening structures as funds become available.			DD7 and outside engineering, construction, grant management contractors
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
Capital Budget Grants	\$10,000,000	M	5-10 Years	1. Existing Building and Infrastructure 2. New Building
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations
People, Infrastructure, Homes and Property	Next gene increased dept H&H data u	eration mod h of rainfal sed for the	leling will help show l which will help with the design to meet the risk.	Design will take into account any potential negative impacts to the area.

ACTION NO. 12 (moved from current plan (no. 2019-14) into new actions) Title: Build New Building with a Safe Room to Shelter Essential Personnel During Storm Events						
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Flood Hail Hurricane/Tropical Storm Lightning Thunderstorms/High Wind Tornado Winter Storm	Construct a new JCDD7 facility with a break room and showers that will be able to withstand severe winds and shelter employees to be used as an EOC during and immediately after storm events			DD7 and outside engineering, construction, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
Capital Budget Grants	\$3,000,000 - \$5,000,000	М	 Existing Building and Infrastructure New Building 			
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
People	Hail, Hurricanes/TS and more frequent thunderstorm/high wind is a byproduct on increased intensity events.			This is to protect District employees		

ACTION NO. 13 (moved from current plan (no. 2019-15) into new actions)					
	Title: Addition	al Fuel Ca	pacity at Pump Stations		
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Flood Tropical Storm/Hurricane	Each Pump Station will get additional fuel capacity to service properties within watershed(s).			DD7 and outside engineering, construction, grant management contractors	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
Capital Budget Grants	\$4,000,000	M	 Existing Building and Infrastructure New Building 		
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popu	Risk Addressed with note on benefit to vulnerable populations		
Infrastructure Protection	Continued a critical infrast	nd growing ructure req power s	Protecting critical infrastructure provides for the health and safety of the population.		

ACTION NO. 14 (moved from current plan (no. 2019-16) into new actions)					
Title: Repair / Re-design HFPL System at Various Locations					
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Coastal Erosion Drought Extreme Heat Flood Hailstorm Hurricane/Tropical Storm Lightning Thunderstorm/High Wind Tornado Winter storm	Repair and/or Re-design various locations along the Hurricane Flood Protection Levee (HFPL). These HFPL locations may require environmental permitting. Repairs to HFPL may include but are not limited to subsidence, sluffoffs, erosion, settlement, fencing, road surfacing, etc.			JCDD7 Administration, Engineering, and Operations	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO	\$500,000 - \$1,000,000	Н	1-5 years	 Existing Building and Infrastructure New development HFPL System 	
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations	
People, Homes, Assets, and Property	Continued and growing threats to the critical infrastructure requires the need for repair and redesign.			Protecting critical infrastructure provides for the health and safety of the population.	

ACTION NO. 15 (moved from current plan (no. 2019-17) into new actions)						
	Title: Blocks Bayou Repairs Improvements					
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Flood Hurricane/Tropical Storm	Consists of making repairs to the existing channel and improving the existing channel by enlarging it or any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			JCDD7 Administration, Engineering, and Operations		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
FEMA Grants (HMGP, FMA, BRIC), CDBG DR Grants, TxDOT, USACE and GLO	\$2,000,000 - \$3,000,000	Н	1-3 years	 Existing Building and Infrastructure New Development 		
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
People, Homes, Assets, and Property	Continued and growing threats to the critical infrastructure requires the need for repair and redesign.			Protecting critical infrastructure provides for the health and safety of the population.		

ACTION NO. 16 (moved from current plan (no. 2019-18) into new actions)						
Title: A3A Detention						
Hazard(s) Addressed		Description	n of Action	Implementing Department		
Flooding Hurricane/Tropical Storms	The proposed project will consist of purchasing 60 acres of open land which will be excavated to an average of 5 feet in depth to develop a detention pond with the capacity of 300 acre-feet. The detention pond will be designed to mitigate flooding of homes, businesses, and roadways within the watershed during heavy rainfall events. The detention facility will provide off-channel temporary storage of excess floodwaters. This new detention facility will fill and drain on a gravity basis and will operate without requiring additional DD7 pumping resources. This project will require environmental permitting and a cultural resource assessment.			DD7 Administration, Engineering and outside engineering, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG	\$6,000,000	Н	 Existing Building and Infrastructure New Building 			
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	Risk Addressed with note on benefit to vulnerable populations			
People, Homes, Assets, and Property	Continued infrastructu	and growin re requires rede	Protecting critical infrastructure provides for the health and safety of the population.			

ACTION NO. 17 (moved from current plan (no. 2019-19) into new actions)							
Title: Halbouty Detention Expansion							
Hazard(s) Addressed]	Description	n of Action	Implementing Department			
Flood Hurricane/Tropical Storms	The detention flooding of ho within the wat by providing of excess floodwa will fill on a gr pumping throu Station. The ex- purchase and i the existing pu- constructed to project will rec- crossings, envi-	pond will b mes, busing ershed duri off-channel aters. This ravity basis ugh the exis spanded fac nstallation imp station facilitate th quire under ironmental sment.	DD7 Administration, Engineering and outside engineering, grant management contractors				
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
HMGP FMA CDBG	\$10,000,000	Н	1. Existing Building and Infrastructure				
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	Risk Addressed with note on benefit to vulnerable populations				
People, Infrastructure and property	Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.			

ACTION NO. 18 (moved from current plan (no. 2019-20) into new actions)				
	Ti	tle: Grove	s Detention	
Hazard(s) Addressed]	Description	n of Action	Implementing Department
Flood Hurricane/Tropical Storms	The proposed j acres of open 1 average of 5 fe pond with the of detention pond flooding of how within the wate The detention facilit basis and will of DD7 pumping environmental assessment.	project will and which et in depth capacity of will be de- mes, busine ershed duri facility will age of exce ity will fill operate wit resources. permitting	DD7 Administration, Engineering and outside engineering, grant management contractors	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
HMGP FMA CDBG	\$13,000,000	Н	3-5 years	 Existing Building and Infrastructure New Development
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	Risk Addressed with note on benefit to vulnerable populations	
People, Infrastructure and property	Next gene increased dept H&H data u	eration mod h of rainfal sed for the	Design will take into account any potential negative impacts to the area.	

ACTION NO. 19 (moved from current plan (no. 2019-21) into new actions)						
	Title: Rodair Gully System Detention Pond(s)					
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Flood Hurricane/Tropical Storms	Construct possible detention pond(s) on Rodair Gulley system in the vicinity of West Port Arthur Road, adjacent to Rodair Gully Lateral 5, and/or any alternative location(s) that are found by performing an H&H study of the system. Detention Pond(s) will be of adequate size to reduce flooding downstream while allowing for improvement to the upstream drainage channels.			DD7 Administration, Engineering and outside engineering, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG	\$3,000,000	Н	1-5 years	 Existing Building and Infrastructure New Development 		
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	Risk Addressed with note on benefit to vulnerable populations			
People, Infrastructure and property	Next generatio increased deptl H&H data used	n modeling n of rainfal l for the de	Design will take into account any potential negative impacts to the area.			

ACTION NO. 20 (moved from current plan (no. 2019-22) into new actions)							
Title: Project Scoping support: Cost to Hire for Data Collection and Analysis for Projects identified from USACE/DD7 Master Drainage Study (e.g. H&H, FFE, Project Identification, BCAs)							
Hazard(s) Addressed		Description	n of Action	Implementing Department			
Flood Hurricane/Tropical Storms	The District is working on a Master Drainage Plan Study with the USACE. Once a project is identified, certain project specific data collection and analysis is needed including Hydrology and Hydraulics (H&H) studies, Surveying First Floor Elevations throughout the planning are (FFEs), Benefit Cost analysis (BCAs) as well as other data collection and documents required to determine application grant eligibility. Each identified project from the USACE/DD7 Master Drainage Plan Study would benefit the community either protection of residential and commercial structures, commercial properties or agricultural areas			DD7 Administration, Engineering and outside engineering, grant management contractors			
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
HMGP FMA CDBG	\$5,000,000	М	1-3 years	 Existing Building and Infrastructure New Development 			
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	Risk Addressed with note on benefit to vulnerable populations				
People, Infrastructure and property	Next gene increased dept H&H data u	eration mod h of rainfal sed for the	Design will take into account any potential negative impacts to the area.				

ACTION NO. 21 (moved from current plan (no. 2019-23) into new actions)						
	Tit	le: Shreveport	Pump Sta	tion and drainage project		
Hazard(s) Addressed		D	escription	of Action		Implementing Department
Coastal Erosion Flood Hurricane/Tropical Storms Levee Failure Lightning Thunderstorm/High Wind Tornado Winter Storm	The existing handle a relat storm event. developing. T city's interior state, the pun addition to th flows due to process of en widths storag concrete struc proposed that would increa support its ex area. The pro implementati Port Arthur, T flooding of h heavy rainfal and a cultura	The existing Shreveport Pump Station was originally designed (1940s) to handle a relatively small watershed along the city's seawall during a 10-year storm event. In recent years, the City has shown increased interest of further developing. These developments would send additional water through the city's interior drainage system to Shreveport Pump Station. In its current state, the pump station is not capable of handling any additional water. In addition to the proposed increase, the station has experienced an increase in flows due to development since original construction. Now DD7 is in the process of enlarging all stations to handle 25-year Atlas 14 rain events widths storage to accommodate 100-year storm runoff. The existing concrete structure is seeing significant spalling due to years of erosion. It is proposed that a new structure be built to house new, larger pumps. This would increase the capacity of the station to the point that it could better support its existing watershed and withstand any future developments in the area. The proposed project will consist of the design, construction, and implementation of the new Shreveport Pump Station along the seawall in Port Arthur, Texas. The pump station will be designed to mitigate the flooding of homes, businesses, and roadways within the watershed during heavy rainfall events. This project could require environmental permitting and a cultural resource assessment.				
Potential Funding Sources	Cost E	stimate	Priority	Time Frame		Reduces Risk to:
HMGP FMA CDBG	H 3-5 years 1. Existing Building and Infrastructure 2. New Development				 Existing Building and Infrastructure New Development 	
Cost Benefit (avoi	avoided losses)Future Conditions Consideration (e.g.: climate change, population change)Risk Add on bene p			ldressed with note efit to vulnerable populations		
People, Infrastructure and property	Next gene rainfall whic	change, population change)population change)eration modeling will help show increased depth of th will help with the H&H data used for the design to meet the risk.Design will any potentia impacts to the			vill take into account tial negative the area.	

ACTION NO. 22 (moved from current plan (no. 2019-24) into new actions)						
	Title: Rodair Gully	Pump Sta	tion(s) and Siphon(s)			
Hazard(s) Addressed	Descriptio	on of Actio	n	Implementing Department		
Flood Hurricane/Tropical Storms	Description of ActionImplementing DepartmentRodair Gully is one of the few complete gravity-drained channels within DD7's system. Because this watershed currently does not have any pumping capabilities, it is subject to the tidal influences of Taylors Bayou. This pump station would help to relieve the localized flooding experienced in 25-year to 100-year storm events in Central Gardens and Beauxart Gardens (portions of the unincorporated areas of Jefferson County) and some parts of the City of Nederland. The current level of protection for the Rodair Gully channel is a 4% probability storm event (25-year). The proposed project will consist of the design, construction, and implementation of a new stormwater pumping station that will be placed along the existing Rodair Gully drainage channel and/or multiple stations placed within the Rodair Gully system to allow 					
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG Local Budget for Match	\$27,000,000 - \$30,000,000	 Existing Building and Infrastructure New Development 				
Cost Benefit (avoided losses)	Future Conditions Conside population	Risk Addressed with note on benefit to vulnerable populations				
People, Infrastructure and property	Next generation modeling wi rainfall which will help with the meet	ll help sho e H&H data the risk.	w increased depth of a used for the design to	Design will take into account any potential negative impacts to the area.		

ACTION NO. 23 (moved from current plan (no. 2019-30) into new actions)								
	Title: Main C at 14th Street Improvements							
Hazard(s) Add	ressed		Description	n of Action	Implementing Department			
Flood Hurricane/Tropical S	torms	In need of rep Repairing con- run more effic maintain. This	pair from wi crete lining iently and r will enhan	ithin the channel. to ensure the Main C can make it easier to ce the channel bank.	DD7 Administration, Engineering and outside engineering, grant management contractors			
Potential Funding	g Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
HMGP FMA CDBG Local Budget for Ma	tch	\$600,000 - \$1,000,000	н	1-3 years	 Existing Building and Infrastructure New Development 			
Cost Benefit (avoid	led losses)	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable populations			
People, Infrastructure and property	Next gene rainfall wh	eration modeling ich will help wir to r	g will help s th the H&H neet the rist	show increased depth of I data used for the design k.	Design will take into account any potential negative impacts to the area.			

ACTION NO. 24 (moved from current plan (no. 2019-31) into new actions)					
	Title: Rodair	Siphon(s)) from Central Gardens		
Hazard(s) Addressed]	Descriptio	n of Action	Implementing Department	
Flood Hurricane/Tropical Storms	The proposed project consists of designing and constructing Siphon(s) from Central Gardens area to Rodair System to mitigate flood waters impacting homes, businesses, and roadways.			DD7 Administration, Engineering and outside engineering, grant management contractors	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
HMGP FMA CDBG Local Budget for Match	\$4,000,000	Н	1-3 years	 Existing Building and Infrastructure New Development 	
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popu	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations	
People, Infrastructure and property	Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.	

	ACTION NO. 25						
Title: R	Title: Repairs and Improvements to Pump Station #5, Central P.S.						
Hazard(s) Addressed]	Descriptio	n of Action	Implementing Department			
Flood Hail Hurricane/Tropical Storms Lightning Tornado Thunderstorm/High Wind Winter Storms	H&H Study to equipment, pur upgrades to im out of bank flo as well all road repair and/or in sheet-pile syste bay that is in d strengthening s winds, thunder	size necess mp station, prove the l oding to ne ls and nuiss mprovemer em within t isrepair. In structure to storms, hai	DD7 Administration, Engineering and outside engineering, grant management contractors				
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
HMGP FMA CDBG Local Budget for Match	\$3,000,000	Н	1-3 years	 Existing Building and Infrastructure New Development 			
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	Risk Addressed with note on benefit to vulnerable populations				
People, Infrastructure and property	Next gene increased dept H&H data u	eration mod h of rainfal sed for the	leling will help show l which will help with the design to meet the risk.	Design will take into account any potential negative impacts to the area.			

ACTION NO. 26						
Title: Repairs and Im	provements to	Pump Sta	tion # 3, West Port Arthu	r Road Pump Station		
Hazard(s) Addressed]	Descriptio	n of Action	Implementing Department		
Flood Hail Hurricane/Tropical Storms Lightning Tornado Thunderstorm/High Wind Winter Storms	H&H Study to size necessary pump, engine, equipment, pump station, and system channel upgrades to improve the level of service to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding. A priority repair and/or improvement identified is to the pump station's discharge pipe supports. Improvements may include strengthening structure to withstand lightning, high winds, thunderstorms, hail, and winter storms.			H&H Study to size necessary pump, engine, equipment, pump station, and system channel upgrades to improve the level of service to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding. A priority repair and/or improvement identified is to the pump station's discharge pipe supports. Improvements may include strengthening structure to withstand lightning, high winds, thunderstorms, hail, and winter storms.		DD7 Administration, Engineering and outside engineering, grant management contractors
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG Local Budget for Match	\$500,000 - \$1,000,000	н	1-3 years	 Existing Building and Infrastructure New Development 		
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
People, Infrastructure and property	Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.		

ACTION NO. 27						
Ti	Title: Crane Bayou Pump Station and System Upgrades					
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Flood Hail Hurricane/Tropical Storms Lightning Tornado Thunderstorm/High Wind Winter Storms	H&H Study to size necessary pump, engine, equipment, pump station, and system channel upgrades to improve the level of service to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding. Repair, restore, remediate, and possibly enlarge the existing Crane Bayou Pump Station upstream systems including Crane Bayou Main, Atlantic Main, and all contributing laterals within the Crane Bayou watershed. Improvements may include strengthening structure to withstand lightning, high winds, thunderstorms, hail, and winter storms.			DD7 Administration, Engineering and outside engineering, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG Local Budget for Match	\$1,500,000 - \$2,000,000	Н	 Existing Building and Infrastructure New Development 			
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popu	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
People, Infrastructure and property	Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.		

ACTION NO. 28							
Title	Title: Alligator Bayou Pump Station and System Upgrades						
Hazard(s) Addressed	l	Description	n of Action	Implementing Department			
Flood Hail Hurricane/Tropical Storms Lightning Tornado Thunderstorm/High Wind Winter Storms	H&H Study to size necessary pump, engine, equipment, pump station, and system channel upgrades to improve the level of service to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding. Repair, restore, remediate, and possibly enlarge the existing Alligator Bayou and Main Outfall Canal. Improvements may include strengthening structure to withstand lightning, high winds, thunderstorms, hail, and winter storms.			DD7 Administration, Engineering and outside engineering, grant management contractors			
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
HMGP FMA CDBG Local Budget for Match	\$5,000,000	Н	 Existing Building and Infrastructure New Development 				
Cost Benefit (avoided losses)	Future Condi cha	itions Con nge, popul	Risk Addressed with note on benefit to vulnerable populations				
People, Infrastructure and property	Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.			

	ACTION NO. 29						
	Title: Ma	agnolia Di	tch Improvements				
Hazard(s) Addressed]	Description	n of Action	Implementing Department			
Flooding Hurricane/Tropical Storms	Consists of ma and improving or any other all increase the ru all road, railroa to reduce out o structures as w	aking repai the existin ternatives f noff capaci ad, and pipe of bank floc rell all road	DD7 Administration, Engineering and outside engineering, grant management contractors				
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:			
HMGP FMA CDBG Local Budget for Match	\$3,000,000 - \$5,000,000	Н	 Existing Building and Infrastructure New Development 				
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations			
People, Infrastructure and property	Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.			

ACTION NO. 30

Title: Star Lake Pump Station and System Improvements

Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Flood Hail Hurricane/Tropical Storms Lightning Tornado Thunderstorm/High Wind Winter Storms	H&H Study to upgrades to im out of bank flo as well all road restore, re-med existing Starlat include strengt lightning, high winter storms.	o size neces prove the l oding to ne ls and nuisa liate, and p ke Ditch. In hening stru winds, thu	DD7 Administration, Engineering and outside engineering, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
HMGP FMA CDBG Local Budget for Match	\$5,000,000	Н	3-5 years	 Existing Building and Infrastructure New Development 	
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	Risk Addressed with note on benefit to vulnerable populations		
People, Infrastructure and property	Next generatio increased deptl H&H data used	n modeling n of rainfal l for the de	Design will take into account any potential negative impacts to the area.		
ACTION NO 31					
---	---	--	---	--	--
Title: Main A Channel Improvements					
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Flooding Hurricane/Tropical Storms	Consists of making repairs to the existing channel and improving the existing channel by enlarging it any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			DD7 Administration, Engineering and outside engineering, grant management contractors	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
HMGP FMA CDBG Local Budget for Match	\$5,000,000	Н	3-8 years	 Existing Building and Infrastructure New Development 	
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	sideration (e.g.: climate ation change)	Risk Addressed with note on benefit to vulnerable populations	
People, Infrastructure and property	Next generatio increased dept H&H data used	n modeling h of rainfal d for the de	Design will take into account any potential negative impacts to the area.		

	ACTION NO. 32					
	Title: Ma	ain B Chan	nel Improvements			
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Flooding Hurricane/Tropical Storms	Consists of making repairs to the existing channel and improving the existing channel by enlarging it any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			DD7 Administration, Engineering and outside engineering, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG Local Budget for Match	\$5,000,000	Н	3-8 years	 Existing Building and Infrastructure New Development 		
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate ation change)	Risk Addressed with note on benefit to vulnerable populations		
People, Infrastructure and property	change, population change) Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.		

ACTION NO. 33					
	Title: Ma	in C Char	nel Improvements		
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Flooding Hurricane/Tropical Storms	Consists of making repairs to the existing channel and improving the existing channel by enlarging it any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			DD7 Administration, Engineering and outside engineering, grant management contractors	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
HMGP FMA CDBG Local Budget for Match	\$5,000,000	Н	3-8 years	 Existing Building and Infrastructure New Development 	
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate ation change)	Risk Addressed with note on benefit to vulnerable populations	
People, Infrastructure and property	change, population change) Next generation modeling will help show increased depth of rainfall which will help with the H&H data used for the design to meet the risk.			Design will take into account any potential negative impacts to the area.	

ACTION NO. 34						
Title: 9th Avenue Detention Pond Improvement						
Hazard(s) Addressed		Descript	Implementing Department			
Flooding Hurricane/Tropical Storms	The existing of increased capa businesses, and heavy rainfall temporary stor improved dete gravity basis. 7 purchase and i existing pump new pump stat structures to in pond. The pro- corridor crossi cultural resour	letention po- acity to mitid d roadways events by p- rage of exce- ntion facili The improv- nstallation station or n- tion and/or acrease the ject may re- ngs, enviro- rce assessm	DD7 Administration, Engineering and outside engineering, grant management contractors			
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG Local Budget for Match	\$5,000,000	Н	3-5 years	 Existing Building and Infrastructure New Development 		
Cost Benefit (avoided losses)	Future Co	nditions C hange, poj	Risk Addressed with note on benefit to vulnerable populations			
People, Infrastructure and property	Next generation depth of rainfaused for the de	on modeling Ill which w esign to me	Design will take into account any potential negative impacts to the area.			

ACTION NO. 35					
Title: Crane Bayou Channel Improvements					
Hazard(s) Addressed	Description of Action			Implementing Department	
Flooding Hurricane/Tropical Storms	Consists of making repairs to the existing channel and improving the existing channel by enlarging it or any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			DD7 Administration, Engineering and outside engineering, grant management contractors	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
HMGP FMA CDBG Local Budget for Match	\$5,000,000	Н	3-8 years	 Existing Building and Infrastructure New Development 	
Cost Benefit (avoided losses)	Future Condi cha	itions Con nge, popul	sideration (e.g.: climate ation change)	Risk Addressed with note on benefit to vulnerable populations	
People, Infrastructure and property	Next generatio increased depth H&H data used	n modeling n of rainfal l for the de	Design will take into account any potential negative impacts to the area.		

A CTION NO 36						
	ACTION NO. 36 Title: Rodair Gully Ditch Improvements					
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Flooding Hurricane/Tropical Storms	Consists of making repairs to the existing channel and improving the existing channel by enlarging it or any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			DD7 Administration, Engineering and outside engineering, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG Local Budget for Match	\$1,000,000	Н	3-8 years	 Existing Building and Infrastructure New Development 		
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate ation change)	Risk Addressed with note on benefit to vulnerable populations		
People, Infrastructure and property	Next generatio increased dept H&H data used	n modeling h of rainfal d for the de	Design will take into account any potential negative impacts to the area.			

ACTION NO. 37					
Title: Pure Oil Ditch Improvements					
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Flooding Hurricane/Tropical Storms	Consists of making repairs to the existing channel and improving the existing channel by enlarging it or any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			DD7 Administration, Engineering and outside engineering, grant management contractors	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
HMGP FMA CDBG Local Budget for Match	\$3,000,000 - \$5,000,000	Н	3-8 years	 Existing Building and Infrastructure New Development 	
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations	
People, Infrastructure and property	Next generatio increased dept H&H data used	n modeling h of rainfal d for the de	Design will take into account any potential negative impacts to the area.		

	ACTION NO. 38					
Title: Improvements to Main C Diversion Channel with New Pump Station						
Hazard(s) Addressed	J	Description	n of Action	Implementing Department		
Flood Hail Hurricane/Tropical Storms Lightning Tornado Thunderstorm/High Wind Winter Storms	Consists of making repairs to the existing channel and improving the existing channel by enlarging it or any other alternatives found by H&H studies to increase the runoff capacity – upgrading/enlarging all road, railroad, and pipeline crossing structures to reduce out of bank flooding to new and existing structures as well all roads and nuisance flooding.			DD7 Administration, Engineering and outside engineering, grant management contractors		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
HMGP FMA CDBG Local Budget for Match	\$100,000,000	L	5-10 years	 Existing Building and Infrastructure New Development 		
Cost Benefit (avoided losses)	Future Condi cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
People, Infrastructure and property	Next generatio increased depth H&H data used	n modeling n of rainfal l for the de	Design will take into account any potential negative impacts to the area.			

ACTION NO. 39					
Title: Replace landscape around District buildings and critical facilities with drought tolerant varieties					
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Drought Extreme Heat	Replace any n with drought to defensible space Replace any no drought tolerar defensible space	on-drought olerant vari ce to protec on-drought nt varieties ce to protec	JCDD7 Operations		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
State Wildfire grants, FEMA Grants, Houston Urban Forestry Program	\$5,000- \$10,000	L	1-5 years	1. Existing Building and Infrastructure	
Cost Benefit (avoided losses)	Future Cond	itions Con nge, popul	Risk Addressed with note on benefit to vulnerable populations		
Infrastructure and property	As temperat continue to o for p	cures contin ccur with lo otential wit	As part of the analysis, the District reviews the impacts to the whole community.		

	ACTION NO. 40					
Title: Develop/Update drought	contingency pl	an. Adopt	and implement water res	trictions identified in the plan.		
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Drought Extreme Heat	Prepare a drought contingency plan to be prepared when there is a drought declared in the area, steps to conserve water by the District.			JCDD7 Administration		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
Capital Budget State or Federal Grants		L	1. Existing Building and Infrastructure			
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
Buildings and facility protection	Awareness and from increase the p	d education d and more public prepa	As part of the analysis, the District reviews the impacts to the whole community. As part of the analysis, the District reviews the impacts to the whole community			

	ACTION NO. 41					
Title: Weather strip doors and v	windowsills to k sun wi	keep cool a ith shades/	ir in. Cover windows tha drapes/awnings.	at receive morning or afternoon		
Hazard(s) Addressed]	Description	n of Action	Implementing Department		
Extreme Heat Winter storm	Weather strip doors and windowsills and cover windows with shades/drapes/awnings to help keep either cool/warm air inside the building.			JCDD7 Administration		
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
Capital Budget	\$30,000	L	1. Existing Building and Infrastructure			
Cost Benefit (avoided losses)	Future Cond cha	itions Con inge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
Protection of District Buildings	Continued a infrastructur	and growin e requires t ass	Protecting critical infrastructure provides for the health and safety of the population.			

ACTION NO. 42					
Title: Formalize er	nployee safety]	precaution	s (light clothing, rest, pot	able water, shade)	
Hazard(s) Addressed]	Descriptio	n of Action	Implementing Department	
Extreme Heat	Establish a plan and provide training to include monitoring, acclimatization, work/rest schedules, a buddy system, and protocols for emergencies and first aid. Communicate the plan to supervisors and workers. Provide training (annually) for workers on heat illness risks, symptoms, and response procedures, as well a prevention methods.			JCDD7 Administration	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
Capital Budget Grants	\$1,000	L	1-2 years	People	
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popu	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations	
Protecting workforce. Utilization of already prepared OSHA training and documents will help offset costs.	Awareness and from increase	d educatior d temperat sta	Protecting employees		

ACTION NO. 43					
Title: Have blinds or other coverings at windows installed to protect window if hailstorm breaks window					
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Hailstorm Thunderstorm/High Winds	Provide protection to windows in the event of hail or thunderstorms/high winds			event of hail JCDD7 Administration	
Potential Funding Sources	Cost Estimate Priority Time Frame			Reduces Risk to:	
Capital Budget	\$25,000	L	1-5 years	1. Existing Building and Infrastructure	
Cost Benefit (avoided losses)	Future Condi cha	itions Cons nge, popul	sideration (e.g.: climate ation change)	Risk Addressed with note on benefit to vulnerable populations	
Protect District buildings and assets	Adapting to n days below f ind	nore storms reezing or creased nur	This is to protect District assets.		

		ACTION	N NO. 44	
T	itle: Regularly	inspect an	d maintain roofing systen	1.
Hazard(s) Addressed]	Description	n of Action	Implementing Department
Hailstorm Hurricane/Tropical Storms Thunderstorms/High winds	Establish a semi-annual process for the Operations Department to inspect the roofing system on all buildings and facilities. If work is needed, a professional contractor will be hired.			JCDD7 Operations
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
Capital Budget	Dependent upon if work is needed	L	Year 1	1. Existing Building and Infrastructure
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations
Protection of infrastructure and assets	change, population change) Hail, Hurricanes/TS and more frequent thunderstorm/high wind is a byproduct on increased intensity events.			This is to protect District assets.

ACTION NO. 45						
Title: Process in place to check	x HVAC equipr	nent (hail fin	can damage condensing c	oils and denting the exchange		
Hazard(s) Addressed	Description of Action Implementing Department					
Extreme Heat Hailstorm Flooding Hurricane/Tropical Storms Winter storm	Establish a semi-annual process for the Operations Department to check all of the HVAC equipment and perform any necessary maintenance			Establish a semi-annual process for the Operations Department to check all of the HVAC equipment and perform any necessary maintenance		JCDD7 Administration
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:		
Capital Budget	\$5,000	00 L Year 1		1. Existing Building and Infrastructure		
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations		
Protection of infrastructure and assets	Extreme Heat, Hail, Hurricanes/TS and more frequent thunderstorm/high wind is a byproduct on increased intensity events.			This is to protect District assets.		

ACTION NO. 46						
	Title: Lightning detectors					
Hazard(s) Addressed	De	escription	of Action	Implementing Department		
Lightning	Place high accurac equipment at DD7 audio alerts for ap when lightning is o	ey short ran facilities t proaching l detected in	JCDD7 Administration			
Potential Funding Sources	Cost Estimate	Priority	Reduces Risk to:			
State grants	\$5,000 - \$10,000 plus software upgrades	М	1-3 years	1. Existing Building and Infrastructure		
Cost Benefit (avoided losses)	Future Conditi chang	ons Consi ge, popula	deration (e.g.: climate tion change)	Risk Addressed with note on benefit to vulnerable populations		
Early warning system could save lives for those outside at parks or recreational areas.	Adapting to more	intense sto of stor	To protect populations outside at parks, recreation fields, and pool.			

ACTION NO. 47							
Title: Retrofit district buil	dings with ligh	tning mitig	gation equipment (lightni	ng rods, surge protection)			
Hazard(s) Addressed]	Description	n of Action	Implementing Department			
Lightning	Install new lightning rods on all district facilities, plant buildings, and lift stations as well as surge protectors throughout all district buildings.			Install new lightning rods on all district facilities, plant buildings, and lift stations as well as surge protectors throughout all district buildings.			JCDD7 Administration
Potential Funding Sources	Cost Estimate Priority Time Frame		Reduces Risk to:				
Capital Budget State or Federal Grants	\$20,000	L	1-3 years	1. Existing Building and Infrastructure			
Cost Benefit (avoided losses)	Future Cond	itions Cons nge, popul	sideration (e.g.: climate ation change)	Risk Addressed with note on benefit to vulnerable populations			
Buildings and facility protection	Lightening may surge under climate change, but studies are limited.			This is to protect District assets.			

· · · · · · · · · · · · · · · · · · ·					
ACTION NO. 48					
Tit	le: Have a pre-0	determined	d best available refuge ar	ea.	
Hazard(s) Addressed	J	Description	n of Action	Implementing Department	
Flooding Hurricane/Tropical Storms Thunderstorms/High Winds	After a disaster, there is a tremendous amount of debris that must be collected and properly disposed. A pre-determined location and then back up location will be determined and work to allow DD7's refuge will be negotiated and set prior to disaster.			JCDD7 Administration	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:	
Capital Budget	\$5,000	T		1. E-sisting Desilding and	
	φ5,000	L	1 to 3 years	Infrastructure	
	<i>43,000</i>	L	1 to 3 years	I. Existing Building and Infrastructure Risk Addressed with note on	
Cost Benefit (avoided losses)	Future Condi	L itions Cons	1 to 3 years sideration (e.g.: climate	I. Existing Building and Infrastructure Risk Addressed with note on benefit to vulnerable nonulations	

	ACTION NO. 49				
Title: Vulnerability assessment	of district build	lings to det winter	termine which can be bet storm	ter protected from the effects of	
Hazard(s) Addressed]	Description	n of Action	Implementing Department	
Winter Storm	Vulnerability assessment of district buildings to determine which can be better protected from the effects of winter storm.			JCDD7 Administration	
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to	
Capital Budget	\$10,000	L 1 to 3 years		1. Existing Building and Infrastructure	
Cost Benefit (avoided losses)	Future Cond cha	itions Con Inge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations	
Building protection	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. 50				
]	litle: Ensure a	ll critical f	acility pipes are insulated	l
Hazard(s) Addressed]	Description	n of Action	Implementing Department
Winter storm	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.			JCDD7
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
Operating	\$50,000	L	1-3 years	1. Existing Building and Infrastructure
Cost Benefit (avoided losses)	Future Cond cha	itions Con nge, popul	sideration (e.g.: climate lation change)	Risk Addressed with note on benefit to vulnerable populations
Buildings and infrastructure	Extreme weather may surge under climate change, but studies are limited.			This is to protect District assets.

Section 5. Plan Maintenance Process

Introduction

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

Update from Last Plan

The District will name a member of its team as the Hazard Mitigation coordinator. This position will lead the annual monitoring and evaluation of the plan.

Monitoring, Evaluating and Updating the Plan

The maintenance process provides a process to consider how well the procedures established in the previously approved plan worked and revise as needed. The process includes a schedule for monitoring and evaluating the plan annually or procedures to follow after a significant event (e.g., following a declared disaster), and producing an updated plan every five years.

Annual Processes Review

Monitoring and evaluating the processes of the plan (i.e., plan integration, continued public involved, or the plan maintenance process) will be done in the annual meeting that is also used to review the information in the plan. The review will include:

- Review of the current processes (plan integration, continued public involvement, and plan maintenance process)
- Determination if the process needs to be revised or revamped for the next year and in preparation for the next plan update
- If the process is being revised or revamped, a process diagram will be provided with detail of the new process and the date when the revised process will be initiated.
- Summary of any hazard events that occurred during the prior year and their impact on the community
- Review of successful mitigation action identified in the plan
- Review actions that were not completed to understand if there are impediments impacting the action (e.g., financial, technical, etc.)
- Re-evaluate the action plan to determine if the timeline for identified projects remains accurate (e.g., if funding becomes available, a long-term activity could become a near-term project)
- Recommendation for new mitigation actions and projects
- Changes in potential for funding
- Collection of maps and data to help with data needs for next iteration of plan
- Impact of any other planning programs within the District that involve hazard mitigation

• Overall Evaluation (using Worksheet 10 from the Local Mitigation Handbook, 2023) each year will be completed using worksheet 10 as the metrics criteria

In addition to the scheduled reports, the Hazard Mitigation Coordinator 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:

- On the recommendation of the Hazard Mitigation Coordinator or on its own initiative, DD7 Board of Commissioners may initiate a Plan review at any time.
- At approximately the one-year anniversary of the updated plan's adoption, and every year thereafter (Annual Progress Reports).
- After natural hazard events that appear to significantly change the apparent risk to District assets, operations and/or citizens.
- When activities of DD7, 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 several circumstances, including identification of specific, new mitigation projects, completion of several mitigation actions, or requirements for qualifying for specific funding. Minor revisions may be handled by addenda.

Major comprehensive review of and revisions to this Hazard Mitigation Plan Update will be considered on a five-year cycle. The 2025 Plan will enter its next review cycle sometime in 2029, with adoption of that update in 2030. To help prepare for that cycle, the MPC will establish a more formal schedule as outlined in Table 40. The MPC will be reconvened to conduct the comprehensive evaluation and revision.

Plan Maintenance Step	Timeline	Task	Lead and support Departments
Monitoring	Once a year.	 Obtain status updates on mitigation actions. Compile progress reports. If need, identify mid- course corrections. 	DD7 Administration
Evaluating	Once a year or after a disaster event.	• Use FEMA standard form to review and record lessons learned.	DD7 Administration and Engineering

Table 40 - Maintenance Schedule

Plan Maintenance Step	Timeline	Task	Lead and support Departments
Updating	(Starting in the fourth year). Every five years or after a disaster.	Review the plan,Review the requirements.Update the plan.	MPC led by DD7 Administration

Integration into Existing Plans, Procedures, and Programs

There are two integration processes:

- Incorporation of other plans into this plan
- Incorporation of this plan into other plans

As this plan was reviewed and updated, in addition to the County, State, and National reports and databases outlined in Section 3 of this plan, the MPC used the following local plans, budgets, or reports to provide key information for the update. These reports are described in Table 41.

Table 41 - Reports	s, Plans,	and Processes	Reviewed in	Support of	of 2025	<i>DD7</i>	Hazard .	Mitigation
			Plan					

NAME	DESCRIPTION
DD7 Master Drainage Plan	Reviewed to help identify drainage problem areas in support of mitigation actions
Port Arthur Comprehensive Plan and Port Neches Riverfront Enhancement Planning and Design Project	Reviewed the plan to understand current and future land use.
City of Port Arthur, Port Neches, Groves, and Nederland Capital Improvements Program (CIP) 2022-2027 or annual budgets	Reviewed the CIP to understand priority capital projects for the Cities or the annual budgets as the possibility of expanding or teaming on capital improvement projects that maximize mitigation effects (for example, by modifying a drainage project to address repetitive flood loss properties).
Jefferson County Capital Improvements Program (CIP) 2022-2027	Reviewed the CIP to understand priority capital projects for the City as the possibility of expanding or teaming on capital improvement projects that maximize mitigation effects by modifying a drainage project to address repetitive flood loss properties.
Hazard Mitigation Plans Jefferson/Hardin/Orange Counties, JCDD6, and State of Texas	Reviewed for hazards and actions.

NAME	DESCRIPTION
Neches Regional Flood	Reviewed for information on flooding and regional impacts as
Plan (Region 5)	well as vulnerability analysis.
Rodair Study	Reviewed data and for possible actions.
Hurricane Flood	DD7 is responsible for maintaining this levee and utilizing it to
Protection Levee Study	protect the Port Arthur area from floods. Once complete, this
	study will help DD7 assess any risks or vulnerabilities in the
	levee. This will also allow the District to prioritize resources
	and regulations in areas near any identified risks.
Data Operations System	The Data Operations Control Center helps the District monitor
Control Center	pump stations and generator conditions and status. Updating
	and expanding on these capabilities will allow the District to
	view which pump stations are operating at any time, allowing
	them to see how the systems are working and how much rain
	they are getting. The District will be able to better count
	rainfall in 15 different places and monitor rainfall totals and
	monitor pump facility conditions throughout storm events.
Stormwater management	The Storm Water Management Plan will help to establish
Plan	regulations to control development within existing flood zones.
	This will further expand the Districts existing authority and
	will allow the District to enforce regulations. This Plan can be
	updated as time goes on, ensuring the District's needs are met
	based on any changes in the District.
Pump Station Capacity and	DD7 is responsible for maintaining this levee and utilizing it to
Fuel Capacity	protect the Port Arthur area from floods. Once complete, this
	study will help DD7 assess any risks or vulnerabilities in the
	levee. This will also allow the District to prioritize resources
	and regulations in areas near any identified risks.

The second process is how the District will work with other governing bodies to have this plan reviewed and information from it potentially used in other plans, reports, or processes. FEMA's Final Rule that governs mitigation planning, requires a process for the Hazard Mitigation Plan to be incorporated into other planning mechanisms. As part of the annual review of the plan, the MPC will reach out to the communities within the planning area as well as drainage districts and neighboring cities, Jefferson County, and neighboring Orange and Hardin Counties to understand what plans are under review. It will ask to be included in notices about the plan updates and revisions to see if there are any areas where this plan can be incorporated. For instance, when the City and County plans such as the 1) Comprehensive plan, 2) National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System (NPDES-MS4), 3) Community Rating System, and 4) Engineering Design and Construction Manual (EDCM) are reviewed on their respective 5 year or 2 year review cycle, DD7 will ask to provide input from this plan to those plans.

DD7 will identify and incorporate this Plan into other planning mechanisms based on the following:

- When DD7 is listed as a stakeholder or invited to participate in other planning efforts such as the Jefferson County HMP or the DD6 HMP
- When DD7 is writing or updating other plans; such as the Master Drainage Plan or the Stormwater Management Plan.
- During reviews of this Plan, the MPC will look for other plans that this can be incorporated into
- After any changes in regulations, specifically floodplain regulation changes within the District
- On the recommendation of the General Manager.

As with all plans and capabilities that are in place, the District continually reviews current documents and best management practices to continue to expand and improve services to our community.

Additionally, when communities are reviewing their existing storm water and floodplain ordinances, DD7 will be asked to provide information from this HMP to assist in incorporating recommended changes.

Continued Public Involvement

Upon adoption of the Plan update, the public will be periodically updated through an Annual Progress Report during the Board of Commissioner's meeting under the plan monitoring strategy described above.

The District will involve the public in the plan maintenance process and during the major comprehensive review to the Plan in the same ways used during the original plan development. The public will be notified when the revision process is started and provided the opportunity to review and comment on changes to the plan and priority action items. It is expected that a combination of informational public meetings, surveys and questionnaires, draft documents posted on the website, and public Commissioners meetings will be undertaken. Any changes proposed by the MPC considered significant will be distributed to the list of Stakeholders and made available for public review and comment. The Stakeholders and the public will be encouraged to review the changes and provide comments on any proposed plan revisions.

The public will be notified when the revision process is started and provided the opportunity to review and comment on changes to the plan and priority action items. It is expected that a combination of informational public meetings, public surveys, draft documents posted on the website, and public Board of Commissioner meetings will be undertaken.

The DD7 Hazard Mitigation Plan update will be posted on the District's Website and notices of its availability will be distributed to the stakeholders and the public will be notified to participate in Plan development, including Jefferson County, City of Port Arthur, City of Port Neches,

Groves, Nederland, neighboring drainage districts, adjacent counties and cities, citizens who attended public meetings and provided contact information; and the organizations, agencies, and elected officials who received notices of public meetings.

The 2030 Update of this plan will begin one year prior to expiration of this plan. The Mitigation Planning Committee will begin by reviewing the meeting notes from the annual review and evaluation meetings that will be taking place throughout the next four years. The planning committee will also review any changes in development and disasters that have occurred within the District since the last version of this Plan. This information will help determine hazards to be included in the Update of this plan and possibly identify mitigation actions needed to address hazards based on the changes in new development. The next update will follow the same planning process to allow the public input on hazards and prioritization of actions.

Appendices

Appendix A – Minutes from MPC Meetings

JCDD7 Hazard Mitigation Plan Update Friday, August 9th, 2024 Meeting Minutes

Attendees	Title and Organization
Garrett Boudoin	Field Engineer, JCDD7
Toby Davis	District Engineer, JCDD7
Allen Sims	Assistant Manager/District Engineer
Kristen Thatcher	Plan Consultant, JSWA
Chase Ward	Plan Consultant, JSWA
Dan Ward	Plan Consultant, JSWA

Discussion of FEMA updated Local Mitigation Policy Guide and Planning Handbook

MPC overviewed changes in these documents since the last plan was completed in 2019. Including the increased priority on detailing how natural hazards can be affected by climate change and how underserved and socially vulnerable communities are at higher risk to be affected by natural hazards.

Finalize DD7's Mitigation Goal Statement

After review and discussion, the MPC reaffirmed the goal statement with no changes.

The mitigation goals of DD7 are:

- To protect public health, safety, and welfare;
- To reduce losses due to hazards by identifying hazards, minimizing exposure of citizens and property to hazards, and increasing public awareness and involvement;
- To facilitate the development review and approval process to accommodate growth in a practical way that recognizes existing stormwater and floodplain problems while avoiding creating new problems or worsening existing problems; and
- To seek solutions to existing problems.

Finalize Stakeholders

The MPC reviewed the stakeholders from the previous plan. MPC will further review this list before the next meeting to see if any additional stakeholders needed to be added/removed from the list. JSWA will research names, addresses and emails for any organizations that the MPC wants in the plan as needed.

Review Hazards

The MPC reviewed the hazards that were included and omitted from the previous plan, as well as the changes in requirements of what hazards can be omitted from the time the previous plan was completed. MPC will review all possible hazards before the next meeting and decide which hazards to include in this plan. JSWA will provide MPC with a recently completed plan for a similar drainage district for ideas of what hazards to include.

Update Actions from Current Plan

The MPC overviewed each of the actions from the current plan. MPC will work to describe the status of each of the actions (complete, ongoing, changed, remove).

Outreach Strategy

The Local Mitigation Policy Guide places increased emphasis on continuing to improve the engagement of the public directly or through community-based organizations that represent potentially at-risk populations to ensure the plan establishes equitable outcomes for the whole community. CW and KT provide draft outreach strategy for the next meeting that will include digital:

- Flyers
- Surveys
- Fact sheets and Q&A sheets

The strategy will promote:

- Educating the public on hazard mitigation and the importance of a hazard mitigation plan
- Hazard awareness campaigns
- Public input sessions on hazard vulnerability and mitigation actions

Existing Studies/Reports

The team reviewed some reports/studies that have taken place since the last plan update that included input from that plan as well as could be incorporated into this update. The Regional Flood Plan (Neches Region 5) organized by TWDB used information from the last plan and information could be used for this plan.

Reviewed Draft Schedule

MPC went over the proposed schedule for the remainder of the plan update.

The next meeting will be on August 16th at 8:30 am.

Actions from meeting

Action Item	Assigned
Prepare minutes and distribute to MPC	CW/KT
Email next meeting date and time	KT

Finalize the stakeholder names and organizations	GB/TD/AS
Review hazards and decide which to include/omit	GB/TD/AS
Provide DD6 plan as an example to review for hazards	CW/KT
Review actions from previous plan and assign status	GB/TD/AS
Provide draft outreach strategy and materials to MPC	CW/KT

JCDD7 Hazard Mitigation Plan Update Friday, August 16th, 2024 Meeting Minutes

Attendees	Title and Organization
Garrett Boudoin	Field Engineer, JCDD7
Toby Davis	District Engineer, JCDD7
Allen Sims	Assistant Manager/District Engineer
Kristen Thatcher	Plan Consultant, JSWA
Chase Ward	Plan Consultant, JSWA

Finalize Stakeholders and Hazards for Profile and Risk Assessment

MPC provided a list of possible stakeholders and the list of hazards they would like to include in this plan update. CW/KT will add email addresses and addresses for each of the stakeholders so we can send them each a request to be a stakeholder.

Local Capabilities

CW/KT provided MPC with a list of potential local capabilities. MPC will review the list of possible local capabilities before the next meeting and mark each as yes/no and then a short comment for each.

Finalized hazards to be profiled

The team reviewed the hazards and the updated guidance and the following hazards will be profiled:

2024 Hazards to be Profiled
Coastal Erosion
Drought
Extreme Heat
Flood
Hailstorm
Hurricanes and Tropical Storms
Levee Failure
Lightning
Thunderstorms – High Wind
Tornadoes
Winter Storm

Critical Facilities

KT explained to MPC about what types of critical facilities are typically included in the plans. MPC will provide a list of critical facilities in the District.

Discuss Outreach Strategy

MPC will continue to review outreach items that CW/KT provided and provide any edits before the next meeting. These outreach items will be used on social media, the district website, and/or public meetings.

Update Actions from Current Plan

The MPC provided a status update for all the actions from the 2019 plan. Each was updated as ongoing, no longer feasible, or complete.

The next meeting will be on August 22^{nd} at 12:30 pm.

Action Item	Assigned
Prepare minutes and distribute to MPC	CW/KT
Email next meeting date and time	CW/KT
Finalize the stakeholder addresses and emails	CW
Review local capabilities and provide yes/no for each with short	GB/TD/AS
description	
Provide list of critical facilities in the District	GB/TD/AS
Review outreach items provided by CW/KT last week	GB/TD/AS
Get RL/SRL/NFIP data	CW/KT
Critical facilities RISK map	KT/CW

Actions from meeting

JCDD7 Hazard Mitigation Plan Update Friday, August 22nd, 2024 Meeting Minutes

Attendees	Title and Organization
Garrett Boudoin	Field Engineer, JCDD7
Toby Davis	District Engineer, JCDD7
Allen Sims	Assistant Manager/District Engineer
Kristen Thatcher	Plan Consultant, JSWA
Chase Ward	Plan Consultant, JSWA

Review actions from last meeting

The Committee reviewed the actions from the last meeting and provided a status.

Review draft hazard profiles

Each hazard profile was reviewed by the team that provided data for:

- Where hazard might happen in the planning area (location).
- How minor or severe the hazard may be (extent).
- How often and where the hazard has happened in the past (previous occurrences).
- How likely is the hazard to occur and how it may change (frequency, intensity, etc.) in the future (probability).
- Which assets are at risk from the hazard (vulnerability).

Hazard classification and ranking using hazard profile data

Using FEMA provided definitions, the MPC classified each hazard's location, extent, future occurrence, and overall significance. In addition, the team listed the assets that are at risk from the hazard helping to shape the vulnerability analysis.

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
Coastal Erosion	L	М	0	М	Pump stations, Levee system
Levee Failure	S	Ε	0	Η	Assets in Port Arthur, Groves, Nederland
Drought	Е	W	L	М	Water levee slopes to prevent soil cracking.

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
					Vegetation, Erosion control, Concrete lining
Extreme Heat	Ε	W	L	М	Vegetation, Erosion control, Concrete lining
Flood	E	S	L	Н	All assets
Hail	E	М	0	L	Equipment, vehicles, roofs, window
Hurricanes and Tropical Storms	Ε	Е	HL	Н	All assets
Lightning	Ε	М	L	М	Grounding systems to protect pump station locations, Control stations, Office buildings, maintenance facilities
Thunderstorms/ High Winds	E	S	HL	Н	All assets
Tornados	E	S	Ο	М	All assets, trees and debris are largest risk
Winter storms	E	М	0	М	Power lines, vegetation, pipes

Discuss Outreach Strategy

MPC will continue to review outreach items that CW/KT provided and provide any edits before the next meeting. These outreach items will be used on social media, the district website, and/or public meetings.

The next meeting will be on August 29th at 2:30 pm.

Actions from meeting

Action Item	Assigned
Prepare minutes and distribute to MPC	CW/KT
Email next meeting date and time	CW/KT
Review outreach items provided by CW/KT last week	GB/TD/AS

JCDD7 Hazard Mitigation Plan Update Friday, August 29, 2024 Meeting Minutes

Attendees	Title and Organization
Garrett Boudoin	Field Engineer, JCDD7
Toby Davis	District Engineer, JCDD7
Allen Sims	Assistant Manager/District Engineer
Kristen Thatcher	Plan Consultant, JSWA
Chase Ward	Plan Consultant, JSWA

Review actions from last meeting

The Committee reviewed the actions from the last meeting and provided a status.

Finalize Outreach documents and survey

MPC reviewed and approved the outreach items that CW/KT. These outreach items will be used on social media, the district website, and/or public meetings. GB will work with IT to place survey and outreach documents on DD7 website.

Mitigation Strategy

The heart of the mitigation plan is the mitigation strategy. The mitigation strategy is the longterm blueprint for reducing the potential losses identified in the risk assessment. The mitigation strategy describes how the community will accomplish the overall purpose, or mission, of the planning process. In previous meetings, the MPC reaffirmed the Mitigation Goals will stay the same from the previous iterations of the plan. Using the risk assessment information and the mitigation goals, the team began work on mitigation actions.

New Actions Discussion

The team first reviewed the four categories of mitigation:

- Local plans and regulations;
- Structure and infrastructure projects,
- Natural systems protections and nature-based solutions; and
- Education and awareness programs

For actions where the problems and problem areas are visibly known (e.g. floods), the MPC began to work on actions to include in the plan. For hazards like drought and extreme heat, the team worked on problem statements from impacts or vulnerabilities identified in the risk assessment. From there actions were drafted.

ACTION NO. (If moved from last plan, make reference here)				
Title:				
Jurisdiction: DD7				
Hazard(s) Addressed	Description of Action			Implementing Department
Name the hazard(s)the action mitigates	Be as specific as you can with what you want to accomplish. Include potential locations where applicable. Action is a measure, project, plan or activity proposed to reduce current and future vulnerabilities described in the risk assessment			By jurisdiction and then department
Potential Funding Sources	Cost Estimate	Priority	Time Frame	Reduces Risk to:
Example: FEMA Hazard Mitigation Grant Program (HMGP), local budget for match	\$100,000- \$500,000	Priority added after prioritization process	3-5 years Or Short/Medium/Long term and provide timeframe	 Existing Building and Infrastructure New Development
	Future Conditions Consideration (e.g.: climate change, population change)			Risk Addressed with note on benefit to vulnerable
Cost Benefit (avoided losses)				populations
Although a full benefit-cost analysis is not necessary, the plan must demonstrate that proposed mitigation actions will be prioritized by weighing the cost of the action versus the benefits the action will produce, in addition to other prioritization factors.				Describe how the action connects to the risk assessment.
The next meeting will be on September 13th at 1:00 pm.

Action Item	Assigned
Prepare minutes and distribute to MPC	CW/KT
Email next meeting date and time	CW/KT
Place Survey and outreach documents on website	GB/TD/AS
Continue to work on mitigation actions	GB/TD/AS
Provide options for MPC to review on actions where problem statements	KT/CW
were used	

Actions from meeting

JCDD7 Hazard Mitigation Plan Update Friday, September 13th, 2024 Meeting Minutes

Attendees	Title and Organization
Garrett Boudoin	Field Engineer, JCDD7
Toby Davis	District Engineer, JCDD7
Allen Sims	Assistant Manager/District Engineer
Kristen Thatcher	Plan Consultant, JSWA
Chase Ward	Plan Consultant, JSWA

Outreach Strategy

MPC discussed outreach strategy including the survey, flyer, fact sheet. These items have been approved and placed on the District's website.

Stakeholder Meeting

CW/KT contacted the stakeholders on 9/12/24 inviting them to join the meeting next Thursday 9/19/24. MPC discussed the positive response and expectation to have several stakeholders attending the meeting. CW/KT will provide MPC with draft presentation early next week.

Dam/Levee Failure

The MPC further conferred about dam and levee failure and its possible effects on the District. After deliberation it was decided that dam hazard will be omitted from this iteration of the plan, however, there is ongoing discussion regarding levee failure.

Plan Maintenance Process

MPC reviewed the plan maintenance that was in the 2019 plan. GB will review the entire section and advise in the next meeting if any changes need to be made. From discussions with the MPC it appears most if not all the current process will remain for this plan update.

Finalize Mitigation Actions

MPC reviewed potential actions for many of the hazards. MPC determined 2 or 3 potential actions for each of the hazards. For flood, hurricane, and thunderstorms/high wind GB will be providing further actions by the start of next week. CW/KT will then complete any sections of the Mitigation Action table that were not completed by the MPC.

The next MPC meeting will be on September 24th at 9 am CST.

Actions from meeting

Action Item	Assigned	
Prepare minutes and distribute to MPC	CW/KT	

Email next meeting invite	CW/KT
Provide stakeholder presentation to MPC for review	CW/KT
Plan maintenance review	GB/TD/AS
Mitigation actions table completion (as much as possible) for flood,	GB/TD/AS
hurricane, and thunderstorm/high wind	

JCDD7 Hazard Mitigation Plan Update Monday, September 30th, 2024 Meeting Minutes

Attendees	Title and Organization
Garrett Boudoin	Field Engineer, JCDD7
Toby Davis	District Engineer, JCDD7
Allen Sims	Assistant Manager/District Engineer
Kristen Thatcher	Plan Consultant, JSWA
Chase Ward	Plan Consultant, JSWA

Finalize Actions

MPC provided the spreadsheet of all actions.

Action Prioritization

MPC reviewed each action and ranked based on the evaluation criteria listed below.

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)



Public Meeting Scheduling

The MPC scheduled the first public meeting for 9:30 am on 10/16/24 at District office. There will be a second public meeting on the same day at 5:30 pm at Effie and Wilton Hebert Public Library.

Outreach for Public Meeting

MPC reviewed the outreach letter for the public meeting on 10/16/24. This will be sent out to the public via newspaper, social media, and district website.

Actions from meeting

Action Item	Assigned
Prepare minutes and distribute to MPC	CW/KT
Action spreadsheet completion	CW/KT
Outreach materials to be submitted for newspaper, social media, and	GB/TD/AS
website	

Appendix B – Stakeholder Letter

PHIL KELLEY MANAGER



COMMISSIONERS

RICHARD BEAUMONT CHAIRMAN

LESTER CHAMPAGNE Albert moses, jr. James gamble, sr. Matthew E. vincent

September 11, 2024

Honorable Jeff Branick County Judge 1149 Pearl Street Beaumont, TX 77701

RE: Request to Participate as a Stakeholder to the Jefferson County Drainage District No. 7 Hazard Mitigation Plan Update

Dear Honorable Branick:

Jefferson County Drainage District No. 7 ("DD7" or the "District") is in the process of preparing an update to its 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 the DD7 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.

"Storm Water Management • Serving South Jefferson County" OFFICE LOCATION: 4749 Twin City Highway, Suite 300, Port Arthur Texas 77642 MAILING ADDRESS: P.O. Box 3244, Port Arthur Texas 77643-3244 PHONE (409) 985-4369 FAX (409) 983-7564 WEB SITE • http://www.dd7.org



COMMISSIONERS

RICHARD BEAUMONT CHAIRMAN

LESTER CHAMPAGNE Albert Moses, jr. James Gamble, sr. Matthew E. Vincent

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 update 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 with draft the HMP update, 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.

Our first call will be through TEAMS and is scheduled for 3 pm on Thursday, September 19th. The Microsoft Teams link is: <u>https://teams.live.com/meet/9341697680308?p=DDFLV9RQtR5ZObdMnx</u>

You may also contact Kristen Thatcher by email for a copy of the meeting link. <u>Kthatcher.jswa@outlook.com</u>

We hope you will be able to attend.

Sincerely,

all DA.

Allen Sims, P.E. Assistant Manager

PHIL KELLEY

MANAGER

"Storm Water Management • Serving South Jefferson County"

OFFICE LOCATION: 4749 Twin City Highway, Suite 300, Port Arthur Texas 77642 MAILING ADDRESS: P.O. Box 3244, Port Arthur Texas 77643-3244 PHONE (409) 985-4369 FAX (409) 983-7564 WEB SITE • http://www.dd7.org

Appendix C – Public Notice

Publisher's Certificate of Publication

STATE OF TEXAS COUNTY OF JEFFERSON

Ron Prince, being duly sworn, on oath says he is and during all times herein stated has been an employee of The Port Arthur Newsmedia publisher and printer of the The Port Arthur News (the "Newspaper"), has full knowledge of the facts herein stated as follows:

1. The Newspaper printed the copy of the matter attached hereto (the "Notice") was copied from the columns of the Newspaper and was printed and published in the English language on the following days and dates:

10/05/24

 The sum charged by the Newspaper for said publication is the actual lowest classified rate paid by commercial customer for an advertisement of similar size and frequency in the same newspaper in which the Notice was published.

3. There are no agreements between the Newspaper, publisher, manager or printer and the officer or attorney charged with the duty of placing the attached legal advertising notice whereby any advantage, gain or profit accrued to said officer or attorney 4. The Newspaper meets the qualifications set out in Section 2051.044, Texas Government Code, as follows:

1. The Newspaper devotes not less than 25% of its total column lineage to general interest items;

2. Is published at least once a week;

3. Is entered as second-class postal matter in Jefferson County where published; and 4. Has been published regularly and con-

 Has been published regularly and continuously for at least 12 months prior to the first date of publication stated above.

Fridel

Ron Prince, publisher

Subscribed and sworn to before me this 5th Day of October, 2024

Mary Jo Eskridge, Notary Public State of Alabama at Large My commission expires 03-02-2026



Account # 206404 Ad # 1891280

JEFFERSON CO DRAINAGE DIST #7 P.O. BOX 3244 PORT ARTHUR TX 77643

PUBLIC NOTICE

Jefferson County Drainage District No. 7 (JCDD7) is updating its Hazard Mitigation 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 where JCDD7 will present an overview of the importance of the plan, the status of the planning process and explain how the public can support the initiative. The actions identified in this plan are intended to help protect the citizens, property, and natural environment throughout the District. The District will hold two meetings with the public on October 16th to discuss. The first meeting will be held at the JCDD7 Office, 3400 Hwy 73, Port Arthur at 9:30 am. The second meeting will be held at the JCDD7 Office, second meeting will be set at 5:30 pm. The public is encouraged to come to either meeting.

Port Arthur News: Oct. 5, 2024 MEETINGS 10.16.24

Appendix D – Presentation to Stakeholders and Public



















































W	(hat is Hazard Mitiaation?	
	One of the four components to disaster	
	management. Prepare/	
•	Hazard miligation describes actions taken to help teduce or eliminate long-term risks caused by hazards or disasters.	
/	There are several steps a community can take to help mitigate hazards – developing a Hazard Mitigation Pitan (HMP) is one of them.	
V	that is a Hazard Mitigation Plan?	
1		
	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 (HMP) 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	



2











5-		
-		۰۰
		20





 2024 Harard profiled and rocked by significance (00//IXTMI.HCM)
 Community. Assets potentially at Nisk hom identified harard

 Control of the significance (00/IXTMI.HCM)
 Process. Property. Kitantivskier, Allely. Backment

 Castid Broken-MEDIUM
 Process. Property. Kitantivskier, Allely. Backment
 What has the Mitigation Planning Committee been up to? People, Property, Intrastructure, Asiets, Equipment Badyament Vegetidno od moderate damage to Concete tritativcete (initi/vet) 9 Bingloves, Overheated Badyament and Verlag, Overheated Badyament 9 People, Roperty, Intathicchee, Asieth, Badyament 9 Bajapment, Pisperty, Root, Landicape Drought - MEDIUM Edreme Heat - MEDIUM Rood - HIGH Hallstorm - LOW People, Roperty, Initiatructure, Asiets, Bajapment
People, Roperty, Initiatructure, Asiets, Bajapment
Initiatructure, Buildings, Equipment, People HMP Huntoane/Tropical Storm - HIGH Levee Failure - HIGH lightning - MEDIUM
 Nundenkom/HGH vindi - HGH
 • Priodle-Nationacture, buildings, Equipment, People

 Nimador - MEDUM
 • Infractive, buildings, Equipment, People

 Winter Storm - MEDUM
 • Priodle
 the State of Texas & was clicanage of overflow for Julieron Count fection county The county ysterns, em port s of, state, federal, and resisting flood control lans and modific alian Winter Storm - MEDIUM

8







































CATTERLA.	The space of the second state of the second st	Darset B F	Esk: Assessment	Earsant C.	REGISTER Strikeg
	aparente.	Passes and	I IS SQUARE COLORED FOR STREET, SHE THE STREET,	Tax and	a the significant contrast because press that the a set fight
	In our and induced around a number of the destinant day	Supervised.	mineral	Sec.mat.	(Property)
	Approximate a second second process and second seco	guttern	The cost appropriate data include a distribution of the test in addition of a distribution of the test in addition of test in addi	2014.4+10	The pair and collect a compare during the product for prototic to the test inspection of the state of the sta
****	14. V sponsor, to be apply to operating the party of the second s	-	Restant Assessment of Art Statut, indexe pates of the providence of the sector.	\$25.4-270	Machine, which data to regardless and representation of representation for balance objection documentation and memory for all orderation provides and an experimentation of the second secon
	Approximation of the second statement of the second		ingen on the concerning the data supported after trained 1. Stillinger are entries, 4.7 strengt designer and training statistics through as basis. The gas should design a consenting or the statistic strength of the statistic design and the statistic design of the statistic strength of the statistic design and the statistic design of the statistic strength of the statistic design of the statistic design of the statistic strength of the statistic design of the	pladette	The factor objects strong and scales a strong to another our entering of the strong strong of the strong strong strong strong strong strangers are provided to state the strong s
	() None of supports. Explores Anotypics.com.		A file species of the second state of the seco		Jackson of College and an end of the College and the College a
	The pair field document incomes a person cost is design for each strategies of our present of a last training of the present software document of the present software docume	gourument	Andread A . The setting and a strangther of the hardward day over the property the setting as a set of the setting and the setting and the setting as a set of the setting and	Statem	The basic characteristic and and below many plan devices of the second s
N/V		-	There is an all states and a superconnected increases		Practication that include a special manifestory in the solide. In which beauting on meetings appending that issues which we want of the program property and their concentrations.
		-	Balance and	Statute:	speak in the second sec
- Ready	2 Plan Planta values man in append common to a compression loss from of the for oppose the	8		-	The pair that to take a plan transformers provide that to take a problem is shown on the provide the particular of a manufacture of the plant of the provide the plant of the
-	a interpret	Derset12.Pr	an Opdata		
	Integration cape which inform and sold at Second Addressingles and sources which many particular to the source of the Second Addressing and the source of th	-	Constant of the second se	Deners F. F	Tan Adoptise
and the second	Product of the second state of the second section for		States of the second state	The Original Street, or other	The squeeze manage is the registron over the fits a series of
	action of the second period of the last second		Contraction of the contraction o	Apparent	Officeptor
	11			parters.	electric is for a charge late of the relation results a matrix of the part of

















































Appendix E – Board of Commissioners Adoption

ADOPTION RESOLUTIONS TO BE ADDED AFTER ADOPTION

Appendix F – Results from Public Survey

Question 1:

In the past five years, which of the following hazard events have you experienced in the DD7 Jurisdictional Area? (Select all that apply)



Question 2:

How concerned are you about the following hazards in the DD7 Jurisdictional area? (Check all that apply) Please check one for each hazard.

	•	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED 🔻	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL 🔻	WEIGHTED - AVERAGE
•	Flooding - in a home or business	0.00% 0	0.00% 0	0.00% 0	100.00% 3	0.00% 0	З	4.00
•	Hurricane/Tropical Storm	0.00% 0	0.00% 0	33.33% 1	33.33% 1	33.33% 1	3	4.00
•	Flooding - Street/Land	0.00% 0	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3	3.67
•	Severe Weather (High winds, lightning, hail)	0.00% 0	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	3.33
•	Extreme Temperatures (heat and cold)	0.00% 0	66.67% 2	0.00% 0	0.00% 0	33.33% 1	3	3.00
•	Tornado	0.00% 0	0.00% 0	100.00% 3	0.00% 0	0.00% 0	3	3.00
•	Severe Winter Storms (blizzard, heavy snow, ice)	0.00% 0	66.67% 2	33.33% 1	0.00% 0	0.00% 0	3	2.33
•	Drought	33.33% 1	66.67% 2	0.00%	0.00%	0.00%	3	167

Question 3:

Please check which hazard(s) have damaged your home. (Check all that apply)

A	ANSWER CHOICES •					
•	Flooding (in a home or business)		100.00%	3		
•	Hurricane/Tropical Storm		100.00%	3		
•	Severe Weather (high winds, lightning, hail)		100.00%	3		
•	Drought		33.33%	1		
•	Extreme Temperatures (heat and cold)		33.33%	1		
•	Flooding (Street/Land)		33.33%	1		
•	If yes, please specify the damage sustained and or the event that caused the damage	Responses	33.33%	1		
•	Tornado		0.00%	0		
•	Severe Winter Storms (blizzard, heavy snow, ice)		0.00%	0		

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
•	Mass Notification System	66.67% 2	33.33% 1	0.00% 0	0.00% 0	3	1.33
•	Texting	33.33% 1	66.67% 2	0.00% 0	0.00% 0	3	1.67
•	Internet	0.00% 0	100.00% 3	0.00% 0	0.00% 0	3	2.00
•	Social Media	33.33% 1	33.33% 1	33.33% 1	0.00% 0	3	2.00
•	City Website	0.00% 0	100.00% 3	0.00% 0	0.00% 0	3	2.00
•	County Website	0.00% 0	100.00% 3	0.00% 0	0.00% 0	3	2.00
•	Public Meetings or Awareness Events	0.00% 0	100.00% 3	0.00% 0	0.00% 0	3	2.00
•	Schools	0.00% 0	100.00% 2	0.00% 0	0.00% 0	2	2.00
•	TV	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	2.33
•	Radio	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	2.33
•	Phone Calls	0.00% 0	66.67% 2	33.33% 1	0.00% 0	3	2.33
•	Outdoor Advertisement	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3	2.67
•	Newspaper	0.00% 0	0.00% 0	100.00% 3	0.00% 0	3	3.00
•	Public Library	0.00%	0.00% 0	33.33% 1	66.67% 2	3	3.67

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 DD7.

	-	•	STRONGLY -	AGREE 👻	NEUTRAL 🔻	DISAGREE 🔻	STRONGLY -	NOT SURE	TOTAL ¥	WEIGHTED - AVERAGE
•	Making local water, wastewater infrastructure, and other public facilities more disaster resilient		100.00% 3	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	3	1.00
•	Develop local inventory of at- risk buildings and infrastructure		33.33% 1	66.67% 2	0.00% 0	0.00% 0	0.00% 0	0.00% 0	3	1.67
•	Combination of regulatory (policies and standards) as well as nonregulatory (education and awareness) approaches to reducing risk		33.33% 1	33.33% 1	33.33% 1	0.00% 0	0.00% 0	0.00% 0	3	2.00
•	Making your home more disaster resilient		0.00% 0	100.00% 3	0.00% 0	0.00% 0	0.00% 0	0.00% 0	3	2.00
•	Regulatory approach to reducing risk (e.g. water use restrictions)		0.00% 0	33.33% 1	33.33% 1	33.33% 1	0.00% 0	0.00% 0	3	3.00

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 DD7 planning area. Please tell us how important each one is to you.

	*	VERY IMPORTANT	SOMEWHAT IMPORTANT	NEUTRAL 🔻	NOT VERY IMPORTANT	NOT IMPORTANT	TOTAL 🔻	WEIGHTED -
•	Protecting critical facilities and essential community services	100.00% 3	0.00% 0	0.00% 0	0.00% 0	0.00% 0	3	1.00
•	Protecting and reducing damages to utilities	100.00% 3	0.00% 0	0.00% 0	0.00% 0	0.00% 0	3	1.00
•	Support for drainage and retention projects	100.00% 3	0.00% 0	0.00% 0	0.00% 0	0.00% 0	3	1.00
•	Protecting private property	66.67% 2	33.33% 1	0.00% 0	0.00% 0	0.00% 0	3	1.33
•	Enhance the functions of natural features (e.g., streams, wetlands)	66.67% 2	33.33% 1	0.00% 0	0.00% 0	0.00% 0	3	1.33
•	Support to strengthening emergency services (e.g., police, fire, EMS)	66.67% 2	33.33% 1	0.00% 0	0.00% 0	0.00% 0	3	1.33
•	Promoting cooperation among public agencies, residents, non- profit organizations, and local businesses	66.67% 2	33.33% 1	0.00% 0	0.00% 0	0.00% 0	3	1.33

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 🔻
•	Attend meetings or received information on natural disasters or emergency preparedness	100.00% 3	0.00% 0	0.00% 0	0.00% 0	3
•	Talked with members in your home about what to do in case of a natural disaster or emergency	100.00% 3	0.00% 0	0.00% 0	0.00% 0	3
•	Become trained in first aid and/or CPR	100.00% 3	0.00% 0	0.00% 0	0.00% 0	3
•	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% 2	0.00% 0	33.33% 1	0.00% 0	3
•	Prepared a disaster supply kit with extra food, water, batteries, etc.	66.67% 2	0.00% 0	33.33% 1	0.00% 0	3
•	Discussed or created a utility shutoff procedure in the event of a natural disaster	66.67% 2	0.00% 0	33.33% 1	0.00% 0	3
•	Reviewed the National Weather Service's Hurricane and Severe Weather Guide	66.67% 2	0.00% 0	33.33% 1	0.00% 0	3
•	Searched the District's website for disaster preparedness information	66.67% 2	0.00% 0	33.33% 1	0.00% 0	3
•	Reviewed Harris County's Disaster Guide	0.00%	0.00% 0	100.00% 3	0.00%	3

Question 8:

Is your home located in a FEMA-designated floodplain?

ANSWER CHOICES			RESPONSES	*
•	Yes		33.33%	1
•	No		66.67%	2
•	Unsure		0.00%	0

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?		100.00% 3		0.00% 0	0.00% 0	3		1.00
•	Have you ever had problems obtaining flood insurance?		0.00% 0		100.00% 3	0.00% 0	3		2.00

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 DD7? Please rank each option as high, medium or low priority.

		•	HIGH 🔻	MEDIUM 🔻	LOW 👻	TOTAL 🔻	WEIGHTED - AVERAGE -
•	Capital projects such as lift stations, elevate critical facilities, drainage improvements and bank stabilization projects		100.00% 3	0.00% 0	0.00% 0	3	1.00
•	Retrofit infrastructure such as roads, bridges, and drainage facilities		66.67% 2	33.33% 1	0.00% 0	3	1.33
•	Perform projects that restore the natural environments capacity to absorb the impacts from natural hazards		66.67% 2	33.33% 1	0.00% 0	3	1.33
•	Retrofit and strengthen essential facilities		66.67% 2	33.33% 1	0.00% 0	3	1.33
•	Acquire vulnerable properties and maintain as open space		66.67% 2	0.00% 0	33.33% 1	3	1.67
•	Provide better public information about risk, and the exposure to hazards within the District		33.33% 1	33.33% 1	33.33% 1	3	2.00
•	Assist vulnerable property owners with securing funding for mitigation		0.00% 0	66.67% 2	33.33% 1	3	2.33

Appendix G – FIRM MAPS

Most recent FIRM Effective Panel Date: 6-3-1991

Groves Panels - 1

Nederland Panels - 1

City of Port Neches Panels - 3

City of Port Arthur Panels – 20



FIRM INDEX MAP *Preliminary 12-11-2015

Groves


Nederland



Port Neches







Port Arthur







































