



# **Nueces County Texas Multi-Jurisdictional Hazard Mitigation Action Plan**

7/20/2017

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Lockwood, Andrews  
& Newnam, Inc.  
A LEO A DALY COMPANY

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## Introduction

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### Planning Area

Nueces County is located on the south central coast of Texas, and has a land area of 842 square miles and a water area of 360 square miles.

**Figure 1-1. Nueces County Location Map**



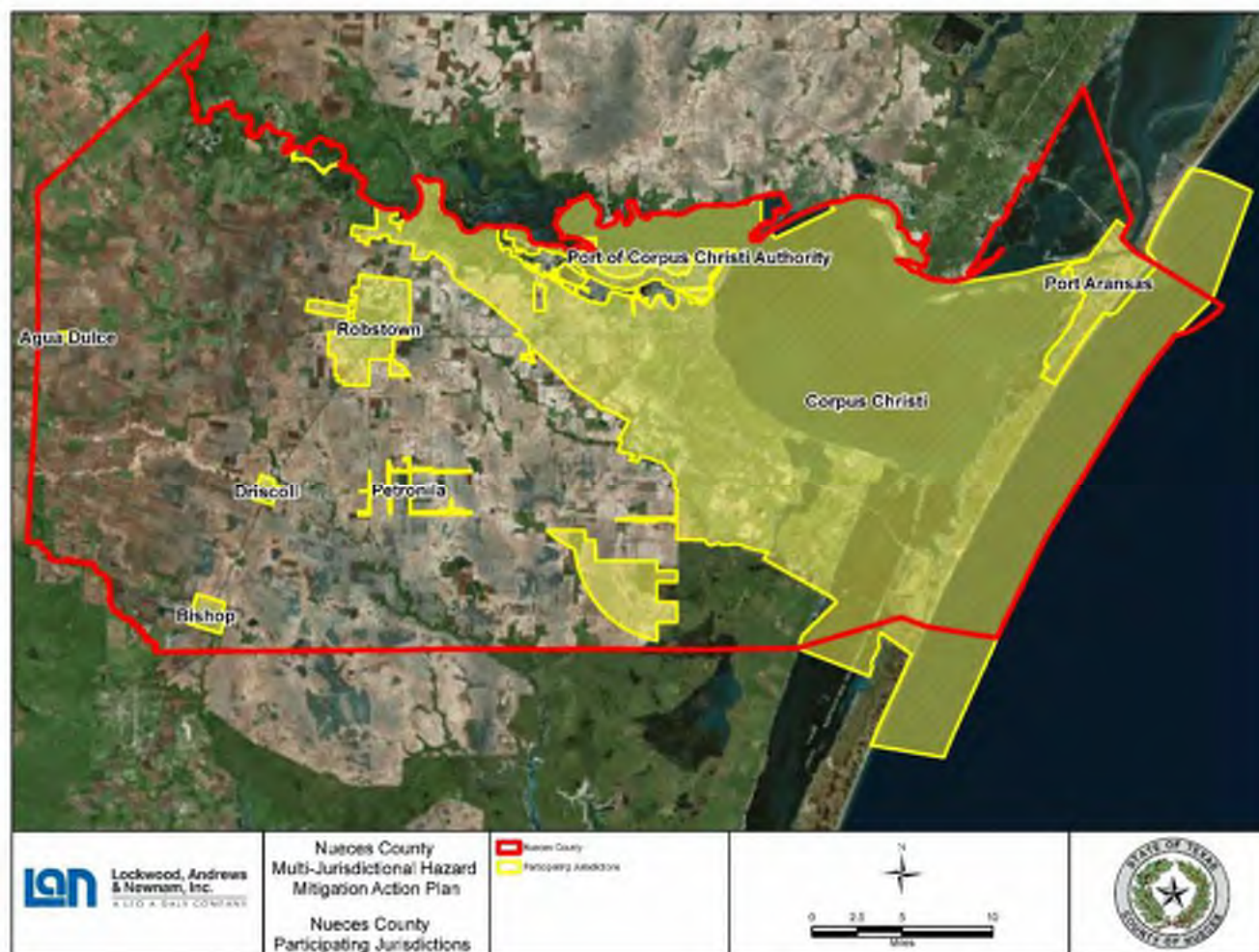
Nueces County's previous Hazard Mitigation Action Plan, or Plan, was part of the regional plan sponsored by Coastal Bend Council of Governments (CBCOG). Due to state preference that plans may not include more than two counties, Nueces County has chosen to prepare a new countywide multi-jurisdictional Plan for 2017. Participating jurisdictions in the Nueces County Multi-Jurisdictional Plan are:

- Unincorporated Nueces County,
- City of Aqua Dulce,
- City of Bishop,
- City of Corpus Christi,
- City of Driscoll,

- City of Petronila,
- City of Port Aransas,
- City of Robstown, and
- Port of Corpus Christi Authority (PCCA)

The geographic boundaries of the Port Authority are co-extensive with Nueces and San Patricio Counties. The Port Authority exercises jurisdiction over the waterways and public port facilities and all vessels using the waterways. The Authority's waterways mean collectively, the Corpus Christi Ship Channel, the La Quinta Channel, the Jewel Fulton Canal, Rincon Canal and the Intercoastal Waterway. For the purpose of the Nueces County Multi-Jurisdictional Hazard Mitigation Action Plan; information presented concerning the PCCA will be limited to the Nueces County portion of their jurisdiction. Additionally, for the purpose of profiling natural hazards on behalf of the PCCA, hazard location, extent, occurrence, probability, impact, and vulnerability will be limited to the PCCA owned parcels.

**Figure 1-2. Planning Area Map**



The multi-jurisdictional plan approach is effective in addressing natural hazard risk because the participating jurisdictions generally face the same natural hazards, have similar assets, and have successfully partnered in the past.

### **Plan Participants**

At least one representative and one staff member from each participating jurisdiction forms the Planning Team. For purposes of defining roles, stakeholders are individuals or groups that are vested in and affected by a mitigation action or policy. Examples of stakeholders include business owners, chamber of commerce, neighborhood associations, Red Cross, hospital districts, and private organizations. Public outreach also plays an important role in the Plan development. Stakeholders and the public were encouraged to participate in the development of the Plan. Section 2 includes a list of



Planning Team members and activities and meetings held that involved the Planning Team and the public.

### **Hazard Mitigation Action Planning**

Nueces County and the jurisdictions therein are susceptible to a wide range of natural hazards, including floods, hurricanes and tropical storms, drought, extreme heat, lightning, coastal erosion, hailstorms, tornados, dam and levee failure, land subsidence, expansive soils, and wildfire. These life-threatening hazards can destroy property, disrupt the economy, and lower the overall quality of life for residence. The impact of hazards can be lessened in terms of their effect on people and property through effective hazard mitigation action planning and implementation. This Plan provides an opportunity for Nueces County and the other participating jurisdictions to evaluate successful mitigation actions and explore opportunities to reduce future disaster loss.

## **Scope**

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The focus of the mitigation action plan is to reduce future losses within Nueces County by identifying mitigation strategies based on a detailed hazard risk analysis, including both an assessment of regional hazards and vulnerability. The mitigation strategies seek to identify potential loss-reduction opportunities. The goal of this effort is to work towards more disaster-resistant and resilient communities throughout Nueces County.

The scope of the hazards considered herein are those associated with natural hazards. Other planning frameworks exist in the region for hazards not addressed here, including man-made hazards such as security concerns, critical infrastructure protection, hazardous materials response, medical and public health response to terrorism. Agencies and organizations who may be contacted for further information on these topics include local emergency management agencies, Local Emergency Planning Committees (LEPCs), law enforcement agencies, fire departments, state and public health departments, the Port of Corpus Christi Authority, local drinking water suppliers, local offices of the Texas Commission on Environmental Quality, the U.S. Coast Guard, the Corpus Christi Metropolitan Planning Organization, and the Coastal Bend Council of Governments.



## Section 2: Planning Process

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### Plan Development

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Mitigation planning involves bringing together community leaders to identify natural hazards threatening their community and define key actions to implement with the goal of achieving a more disaster-resistant community. This section provides an overview of the planning process, highlighting key steps as well as providing a detailed description of how stakeholders and the public were involved.

#### Planning Team

A conference call was held on December 12, 2016 with participating jurisdictions, and Lockwood Andrews and Newnam (LAN) to identify Planning Team members. The Planning Team members identified include one member from each of the participating jurisdictions (see Table 2-1). Additionally, the call included identifying Plan stakeholders, discussing options for engaging the public, and setting a date for the plan kickoff meeting. The group also reviewed and discussed the previous hazards and mitigation actions included in the 2012 regional CBCOG Plan.

Planning Team members were asked to attend all workshops during the planning process. Planning Team members that did not attend workshops were contacted by phone or email, and given a recording of the conference call. Some of the responsibilities of the Planning Team included: completing Capability Assessment Surveys, providing a public survey to the general public, providing input regarding the identification of hazards, ranking hazards, identifying mitigation goals, developing new mitigation strategies, and identifying critical facilities.

The Nueces County Multi-Jurisdictional Plan was organized using a direct representative model, as Nueces County acted as the direct representative for participating jurisdictions in this effort. Each participating jurisdiction also had a local planning team to execute planning tasks at the local level.

**Table 2-1. Planning Team**

JURISDICTION	POSITION OR TITLE	AGENCY
Nueces County*	Emergency Management Coordinator	Emergency Management
City of Agua Dulce	Mayor	Office of the Mayor
City of Bishop	Mayor	Office of the Mayor
City of Corpus Christi	Floodplain Manager	Development Services Department
City of Driscoll	Mayor	Office of the Mayor
City of Petronila	Mayor	Office of the Mayor
City of Port Aransas	Emergency Management Coordinator	Emergency Management
City of Robstown	Fire Chief / Emergency Management Coordinator	Fire Department
Port of Corpus Christi Authority	Public Safety Director Manager of Emergency Management	Security

\* County Emergency Management Coordinator serves the unincorporated areas of Nueces County and the cities of Agua Dulce, Bishop, Driscoll, and Petronila

## Planning Process

In 2012 the Coastal Bend Council of Governments coordinated a regional HMAP process and secured FEMA approval for participating Counties (including Nueces) and Cities (including Agua Dulce, Bishop, Corpus Christi, Driscoll, Port Aransas & Robstown). Recognizing the need for a new plan because of a state preference for plans no larger than one county, then Nueces County Emergency Management Coordinator began informal discussions between other Emergency Management Coordinators within Nueces County on their jurisdiction's interest in participating in a joint HMAP process. Based upon the shared interest in planning together Nueces County submitted a Hazard Mitigation Grant Program (DR-4223) to support the cost of hiring a consultant to assist with the planning process/plan development. Each participating jurisdiction included a letter of support for the grant. FEMA/TDEM awarded the grant in August 2016 and the process to create an Inter-local agreement also took place to share the cost and define responsibilities across the jurisdictions. All participating jurisdictions had their governing boards approve the Inter-local agreement and sign onto the planning process in fall of 2016 (including appointment of their HMAP planning team representatives and their local planning team). Also during fall 2016 a request for proposals for consultant services to develop a hazard mitigation action plan. Several proposals were received/evaluated and LAN was selected/awarded the contract.

The process used to prepare this Plan included following steps outlined in the Local Mitigation Plan Review Guide (FEMA, 2013). After the Planning Team was organized, a Capability Assessment Survey was developed and distributed at the Kick-Off Workshop on January 4, 2017. Hazards were ranked by both the Planning Team and residents. Specific mitigation strategies were discussed at the Mitigation Workshop on March 29, 2017. Finally, Plan Maintenance and implementation procedures were developed and are included in Section 20. A schedule of planning activities is included as Table 2-2.

**Table 2-2. Schedule of Planning Tasks**

<b>Timeline</b>	<b>Service/Deliverable</b>
<b>January 4, 2017</b>	Conduct Kickoff Meeting, Capability Assessment; identify and evaluate hazards; begin drafting MAP
<b>March 2, 2017</b>	Conduct Risk Assessment WebEx Workshop for Planning Team; begin drafting Risk Analysis; review upcoming Mitigation Strategy objectives
<b>March 29, 2017</b>	Conduct Mitigation Strategy WebEx Workshop for Planning Team, work with planning team to complete mitigation worksheets.
<b>April 26, 2017</b>	Provide MAP Draft to Planning Team at public meeting for review and comment
<b>May 1, 2017</b>	Submit MAP Draft to TDEM for review and edits
<b>September 2017</b> ( <i>assuming FEMA review completed</i> )	FEMA Approval of PLAN; participating jurisdictions adopt PLAN by resolution

## Kickoff Workshop

The Planning Team Kickoff Workshop was a Public Meeting that was held in Nueces County Commissioner's Court Chambers in the City of Corpus Christi on January 4, 2017. Adjacent jurisdictions were invited to attend by the Nueces County Emergency Management Coordinator. Nueces County served as the coordinating jurisdiction on behalf of the planning team. The initial meeting provided an opportunity to inform participating jurisdictions officials and key department personnel about how the planning process pertained to their distinct roles and responsibilities, and also to involve stakeholder groups and the general public. In addition to the kickoff presentation, participants received the following information:

- Project overview regarding the planning process;
- Public Survey access information;
- Hazard Ranking form;
- Capability Assessment survey for completion.

A hazard ranking exercise was conducted at the Kickoff public meeting to get input from residents and rank natural hazards affecting the planning area. Participants ranked hazards in terms of level of risk, frequency of occurrence, and potential impact. Overall, residents ranked Hurricanes/Tropical Storms as the highest hazard risk followed by Floods, Drought, Windstorms, Extreme Heat, Lightning, Coastal Erosion, Tornado, Hailstorms, Expansive Soils, Dam/Levee Failure, Land Subsidence, Wildfire, and Severe Winter Storms.

The Planning Team Kickoff Workshop was well-attended, with members from each of the participating jurisdictions present. Efforts were made to document key participants. The following table highlights participants for each jurisdiction. For a comprehensive list of meeting attendees, meeting handouts, and documentation refer to Appendix D.

**Table 2-3. Kickoff Workshop Participation Summary**

JURISDICTION	KEY PARTICIPANTS		PARTICIPATION
	POSITION OR TITLE	AGENCY	
Unincorporated Nueces County	Emergency Management Coordinator	Office of Emergency Management	<ul style="list-style-type: none"> <li>✓ Present for Plan Overview</li> <li>✓ Received Public Survey Access Information</li> <li>✓ Participated in Hazard Ranking Exercise</li> <li>✓ Received Capability Assessment</li> </ul>
City of Agua Dulce	Mayor	Office of Mayor	<ul style="list-style-type: none"> <li>✓ Present for Plan Overview</li> <li>✓ Received Public Survey Access Information</li> <li>✓ Participated in Hazard Ranking Exercise</li> <li>✓ Received Capability Assessment</li> </ul>
City of Bishop	Mayor	Office of Mayor	<ul style="list-style-type: none"> <li>✓ Present for Plan Overview</li> <li>✓ Received Public Survey Access Information</li> <li>✓ Participated in Hazard Ranking Exercise</li> <li>✓ Received Capability Assessment</li> </ul>

**Table 2-3. Kickoff Workshop Participation Summary (cont.)**

JURISDICTION	KEY PARTICIPANTS		PARTICIPATION
	POSITION OR TITLE	AGENCY	
City of Corpus Christi	Floodplain Manager	Department of Developmental Services	<ul style="list-style-type: none"> <li>✓ Present for Plan Overview</li> <li>✓ Received Public Survey Access Information</li> <li>✓ Participated in Hazard Ranking Exercise</li> <li>✓ Received Capability Assessment</li> </ul>
City of Driscoll	Mayor	Office of Mayor	<ul style="list-style-type: none"> <li>✓ Present for Plan Overview</li> <li>✓ Received Public Survey Access Information</li> <li>✓ Participated in Hazard Ranking Exercise</li> <li>✓ Received Capability Assessment</li> </ul>
City of Petronila	Mayor	Office of the Mayor	<ul style="list-style-type: none"> <li>✓ Present for Plan Overview</li> <li>✓ Received Public Survey Access Information</li> <li>✓ Participated in Hazard Ranking Exercise</li> <li>✓ Received Capability Assessment</li> </ul>
City of Port Aransas	Emergency Management Coordinator	Office of Emergency Management	<ul style="list-style-type: none"> <li>✓ Present for Plan Overview</li> <li>✓ Received Public Survey Access Information</li> <li>✓ Participated in Hazard Ranking Exercise</li> <li>✓ Received Capability Assessment</li> </ul>

**Table 2-3. Kickoff Workshop Participation Summary (cont.)**

JURISDICTION	KEY PARTICIPANTS		PARTICIPATION
	POSITION OR TITLE	AGENCY	
City of Robstown	Fire Chief, Emergency Management Coordinator	Fire Department	<ul style="list-style-type: none"><li>✓ Present for Plan Overview</li><li>✓ Received Public Survey Access Information</li><li>✓ Participated in Hazard Ranking Exercise</li><li>✓ Received Capability Assessment</li></ul>
Port of Corpus Christi Authority	Director of Port Security	Security	<ul style="list-style-type: none"><li>✓ Present for Plan Overview</li><li>✓ Received Public Survey Access Information</li><li>✓ Participated in Hazard Ranking Exercise</li><li>✓ Received Capability Assessment</li></ul>

KRISTV News Channel 6 in Corpus Christi, as well as the Corpus Christi Caller Times Newspaper also attended the Plan Kickoff Workshop. Public outreach efforts that resulted from the participation in the Plan Kickoff Workshop included:

- Nueces County's Emergency Management Coordinator was interviewed by the Corpus Christi Caller Times and an article regarding the hazard mitigation project and the request for public input was published in the paper the next day.
- Many of the participating jurisdictions posted a link to the public survey on their websites to solicit public input for the Plan.

### **Hazard Identification**

Hazard identification and ranking was a major component of the Plan Kickoff Meeting. Following the Kickoff Meeting the Planning Team reviewed the public input received concerning the hazard ranking and formulated the final ranked list of natural hazards to be incorporated into the Plan. Hazards identification is documented in detail in Section 3 of this Plan.

## **G-318 Local Mitigation Planning Workshop**

On February 14-15, 2017, the Texas Department of Emergency Management held a G-318 Local Mitigation Planning Workshop. Members from the participating jurisdiction and LAN attended the workshop.

### **Risk Assessment**

A preliminary risk assessment for the Nueces County Multi-Jurisdictional Plan was completed in March 2017 and the results were presented to Planning Team members via webinar on March 29, 2017. The resulting risk assessment profiled hazard events, provided information on previous occurrences, estimated probability of future events, and detailed the spatial extent and magnitude of impact on people and property. A hazard profile and vulnerability analysis for each of the natural hazards can be found in Sections 5 through 18 in this Plan.

### **Mitigation Review and Development**

The mitigation strategy development for the Plan involved creating mitigation goals and new mitigation actions. Previous mitigation actions from the CBCOG regional plan were reviewed as a baseline for new actions, goals, and objectives. The Planning Team reviewed their respective mitigation actions from the previous plan to determine projects that are still viable and may be included in the Nueces County Multi-Jurisdictional Plan.

An inclusive and structured process was used to develop and prioritize mitigation actions for this Plan, including the following steps:

1. Potential mitigation actions were developed and the list narrowed down to those that were most likely to be implemented, most cost-effective in reducing risk, and most likely to receive political and community support.
2. A Problem Statement was developed for each hazard to determine actions to mitigate the specific problem or risk, background information on why the action is needed was documented as well as who (by title) will oversee implementation of the project. Timeframe for implementation was defined and any obstacles to implementation such as local environmental groups opposing the project or lack of community support was identified.
3. Participants were provided an inventory of federal and state funding sources that could potentially assist in implementing the proposed mitigation actions. Planning Team Members considered benefits that would result from the mitigation actions versus the cost of those projects. Economic impact of implementing one action over another was a consideration.
4. Planning Team Members identified and prioritized proposed actions, costs and benefits, effects on existing buildings and future development, implementation schedules, and potential funding sources.



**Table 2-4. Planning Team Meeting Attendance Summary**

Jurisdiction	Kickoff & Public Meeting	Risk Assessment Workshop	Mitigation Strategy Workshop	Provide MAP Draft to Planning Team for Comments
Meeting Date	January 4, 2017	March 2, 2017	March 29, 2017	April 17, 2017
Unincorporated Nueces County	X	X	X	X
City of Agua Dulce	X	X	X	X
City of Bishop	X	X	X	X
City of Corpus Christi	X	X	X	X
City of Driscoll	X	X	X	X
City of Petronila	X	X	X	X
City of Port Aransas	X	X	X	X
City of Robstown	X	X	X	X
Port of Corpus Christi Authority	X	X	X	X

X = Attended. Detailed attendance records are included in Appendix D.

C = Did not attend.

## Resources and Existing Plans

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### Resources

A variety of resources were utilized in compiling the data needed to perform the hazard analysis. Resources included FEMA, the United States Army Corps of Engineers (USACE), Texas A&M Forest Service, National Oceanic and Atmospheric Administration (NOAA), the 2011 National Land Cover Database, the Texas Water Development Board (TWDB), the Texas Geographic Society, the Texas State Data Center, the Texas Division of Emergency Management (TDEM), and local hazard event reports.

Review of the Nueces County Beach Management and Coastal Erosion Response Plan, Nueces County Coastal Parks Master Plan, Texas Coastwide Erosion Response Plan, Port of Corpus Christi USACE Dredging Report of 2015, Floodplain Management Plan, Storm Water Management Plan, and Nueces County Community Wildfire Protection Plan provided essential data for developing actions to implement and incorporate into the mitigation plan.

### **Incorporation of Existing Plans**

Current projects and studies were utilized as a starting point for discussing mitigation actions and how to incorporate the Plan into other local planning mechanisms such as budgetary, administrative, and development initiatives. Previous hazard events, occurrences, and hazard risk data were identified through NOAA's National Climatic Data Center (NCDC), Texas Geographic Society, U.S. Geographic Society, U.S. Department of Agricultural, local reporting, and other sources. The preliminary results were presented at the Risk Assessment webinar in order to facilitate a discussion to help participants develop actions for their jurisdiction. Furthermore, these studies were used as a starting point for suggesting grant and mitigation activities based on local and FEMA's Hazard Mitigation Assistance (HMA) funding.

### **Assessing Future Community Capabilities**

Local capability to implement identified mitigation actions can be challenging. Communities can benefit from Mutual Aid Agreements with their neighboring County. This increases their capability to undertake and implement mitigation actions. Executing future cooperative agreements with the County and neighboring jurisdictions to maximize budget and grant monies was discussed at the Mitigation Strategy workshop.

## **Public and Stakeholder Involvement**

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An important component of mitigation planning is public participation and stakeholder involvement. Input from individual citizens and the community as a whole provides the Planning Team with a greater understanding of local concerns and increases the likelihood of successfully implemented mitigation actions. If citizens and stakeholders are involved they are more likely to gain a greater appreciation of the hazards present in their community and take steps to reduce their impact. Neighboring communities as well as local and regional stakeholders were invited via email and phone and provided an overview of the planning process and how they may work with participating jurisdictions to apply for future project funding to implement mitigation projects relative to their specific hazard risks.

## Stakeholders

The following groups represent a partial list of organizations invited to provide input into the Plan.

**Table 2-5. Plan Stakeholders**

JURISDICTION / ENTITY	TITLE
Unincorporated Nueces County	Emergency Management Coordinator
City of Corpus Christi	Floodplain Manager, Interim Director of Development Services, Emergency Management Coordinator
City of Port Aransas	Emergency Management Coordinator
Port of Corpus Christi Authority	Director of Port Security, Public Safety Director
City of Robstown	Fire Chief/ Emergency Management Coordinator , Assistant Fire Chief
City of Bishop	Emergency Management Coordinator, Mayor, City Secretary
City of Driscoll	Emergency Management Coordinator, Mayor, Administrative Consultant
City of Agua Dulce	Emergency Management Coordinator, Mayor, City Secretary
City of Petronila	Emergency Management Coordinator, Mayor
Nueces County Coastal Parks Department	Parks Director
Nueces County Colonia Initiative Committee	Director
Nueces County School Superintendents	Superintendent CCISD
Nueces County Oso Creek Committee	Deputy Executive Director
Nueces County Drainage Districts 2	Superintendent
Nueces River Authority	Deputy Director
Nueces County Fire Chiefs Association	Director
Nueces County AgriLife Extension	County Coordinator

## Public Participation

Public involvement in the development of the plan included two public meetings prior to Plan approval and adoption. Public input was sought using three methods: open public

meetings; public survey; and the draft Plan was made available for public review on the Nueces County website, as well as other social media platforms.

Reaching the segment of the public without access to computers or the Internet was a consideration in garnering public support. In addition to the copies of the draft Plan hosted on planning partner websites, planning partners held paper copies so citizens without internet access had an opportunity to review the plan. Assistance was provided by news coverage from the Corpus Christi Caller Times newspaper. Articles were developed for the local newspaper and posted to news websites. Public Meetings Notices and information regarding the project were also posted in the Corpus Christi Caller Times newspaper. Plan publicity was shared to social media platforms and community websites.

### **Public Participation Survey**

In addition to the open public meetings, Nueces County Multi-Jurisdictional Plan participants were able to solicit input from citizens and stakeholders through the use of a Public Survey. The survey was designed to obtain data and information from the residents of participating jurisdictions. Participating communities solicited surveys through their websites, social media, and utility bills. Copies of the survey were distributed by local officials and at public meetings. A total of 12 responses to the survey were completed which provided valuable input in the development of the Plan. A summary of the survey findings is provided in Appendix B.

Public feedback assisted in driving the direction of hazard profiling, developing mitigation actions for areas of concern expressed in the survey, and allowed for the community to voice their concerns and involve those interested in the HMAP for the participating jurisdictions future involvement. Public feedback was also used in the cost-benefit analysis and prioritization of mitigation actions by factoring public opinion into the ranking criteria.

## Section 3: Hazard Identification and Risk Assessment Overview

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### Hazard Identification

The purpose of this section is to provide background information for the hazard identification process, as well as descriptions for the natural hazards identified.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, the participating jurisdictions identified 14 hazards that are to be addressed in the Plan. These hazards were identified utilizing input from Planning Team members, and a review of the current State of Texas Hazard Mitigation Plan (“State Plan”). Readily available online information from reputable sources such as federal and state agencies was also evaluated to supplement information as needed. Based on this review, 14 hazards were identified as significant.

**Table 3-1. Hazard Descriptions**

HAZARD	RANKING	DESCRIPTION
Hurricanes/ Tropical Storms	1	Hurricanes and tropical storms are intense tropical weather systems that produce damaging winds, generate storm surge, and heavy rainfall.
Flood	2	A flood is the accumulation of water within a body of water, which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream, ocean, lake or other watercourse susceptible to flooding. Flooding is the partial or complete inundation of otherwise normally dry land. Types of flooding include riverine, coastal, and shallow flooding.

**Table 4-1. Hazard Descriptions (Cont.)**

HAZARD	RANKING	DESCRIPTION
<b>Drought</b>	3	Droughts can be classified as meteorological, hydrological, agricultural, or socioeconomic droughts. A meteorological drought is a reduction of precipitation from the expected average or typical precipitation patterns. A hydrologic drought occurs when below average rainfall impacts streams, lakes, reservoirs, and groundwater levels. Agricultural droughts are brought on by insufficient moisture in the soil, typically impacting crops. Socioeconomic droughts occur when water demand exceeds supply due to a precipitation-related supply shortfall. Droughts may initiate or exacerbate other hazards, such as extreme heat or wildfires.
<b>Windstorms</b>	4	A windstorm is a storm with high winds or violent gusts with little or no rain. The windstorm hazard excludes extreme wind events that occur with other wind-related natural hazards such as hurricanes, tropical storms, and tornados which are addressed elsewhere in this plan.
<b>Extreme Heat</b>	5	Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period. If extreme heat conditions persist, it may be considered a heat wave.
<b>Lightning</b>	6	Lightning is a sudden electrostatic discharge during an electrical storm between electrically charged regions of a cloud, between that cloud and another cloud, or between a cloud and the ground.
<b>Coastal Erosion</b>	7	Coastal erosion is the “loss of land, marshes, wetlands, beaches, or other coastal features within the coastal zone because of the actions of wind, waves, tides, storm surges, subsidence, or other forces” <sup>1</sup> . Coastal erosion may result in the temporary redistribution of coastal sediments, or the long-term loss of coastal sediments and sediment accumulation.

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<sup>1</sup> Texas Natural Resources Code, Section 33.601

**Table 4-1. Hazard Descriptions (Cont.)**

HAZARD	RANKING	DESCRIPTION
<b>Tornado</b>	8	A tornado is a violently rotating column of air extending between, and in contact with, a cloud and the surface of the earth. Tornadoes have wind speeds of 250 miles per hour or more. Damage paths can be in excess of one mile wide and 50 miles long.
<b>Hailstorm</b>	9	Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Nearly all severe thunderstorms produce hail aloft, though it may melt before reaching the ground. Multi-cell thunderstorms produce many hailstones, but not usually large hailstones. In the life cycle of the multi-cell thunderstorm, the mature stage is relatively short so there is not much time for growth of the hailstone. Supercell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud. In general hail 2 inches (5 cm), a little larger than golf ball, or larger in diameter is associated with supercells. Non-supercell storms are capable of producing golf ball size hail. In all cases, the hail falls when the thunderstorm's updraft can no longer support the weight of the ice. The stronger the updraft the larger the hailstone can grow <sup>2</sup> .
<b>Expansive Soils</b>	10	Expansive soils contain minerals such as clay that are prone to large volume changes (swelling and shrinking). Soils with a high content of expansive minerals can shrink in drier seasons forming deep cracks. This shrinkage can remove support from buildings or other structures and result in damaging subsidence.
<b>Dam Failure</b>	11	A dam is a barrier that is constructed to hold back water. A dam failure is a systematic failure of a dam structure resulting in the uncontrolled release of water, often resulting in floods that could exceed the 100-year flood plain boundaries. A levee is an embankment built to prevent overflow from a body of water. A levee failure is when a levee embankment fails, or is intentionally breached, causing the previously contained water to flood the land...

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<sup>2</sup> NOAA

**Table 4-1. Hazard Descriptions (Cont.)**

HAZARD	RANKING	DESCRIPTION
<b>Dam Failure (cont.)</b>	11	...behind the levee.
<b>Land Subsidence</b>	12	Land subsidence is the decrease in the lands surface elevation due to the loss of subsurface support. Land subsidence can be caused by both natural processes and manmade actions. Land subsidence caused by natural processes typically occurs over a long period of time, usually thousands to millions of years. Short-term land subsidence is generally the result of manmade actions such as: excessive ground-water withdrawal, oil and gas drilling, mining operations, collapse of buried infrastructure like pipelines for water, sewer and storm or the leakage of underground pipes that erode adjacent soils. Subsidence from groundwater withdrawal and oil and gas production usually occur over large areas, while subsidence from collapsed or leaking pipelines is generally localized.
<b>Wildfire</b>	13	A wildfire is an uncontrolled fire almost exclusively fueled by natural vegetative fuels. Fuel may come in the form of grass, brush, or tress. Wildfire risk increases with high concentrations of connected fuels. Meteorological conditions such as high temperatures, low humidity, droughts, and high wind can also increase wildfire risk. Humans are the most common source of initial ignition in wildfires. Sparks from agricultural, industrial, or automobile activity may start a wildfire.
<b>Severe Winter Storms</b>	14	A severe winter storm event is defined as a storm with snow, ice, or freezing rain. Severe winter storms are rare for the Texas Coastal area. Sever winter storms may include snowstorms, blizzards, cold waves and ice storms. Snowstorms include four or more inches of snow in a 12-hour period. Blizzards are characterized by low temperatures and strong winds in excess of 35 mph with large amounts of drifting snow. A cold wave is a winter cold front with a drastic drop in temperature. An ice storm occurs when rain falls out of the warm and moist upper layers of the atmosphere into a cold and dry layer near the ground. <sup>3</sup>

<sup>3</sup> State of Texas Mitigation Plan Update 2013



# Risk Assessment Overview

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The risk assessment includes seven general parameters that are described for each hazard; description, location, extent, occurrence, probability, impact, and vulnerability.

Frequency of return, or probability, was calculated by dividing the number of events in the recorded time period for each hazard by the overall time period that the resource database recorded events.

Applicable hazard profiles include a description of a general vulnerability assessment. Vulnerability is the total of assets that are subject to damages from a hazard (based on historic recorded damages). Assets in the region were inventoried and defined in hazard zones where appropriate.

## Section 4: Vulnerability Assessment Overview

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### Vulnerable Assets Overview

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Vulnerable assets are those that are susceptible to damage and loss from hazard events. A community's vulnerability to a natural hazard is measured as a function of that community's existing and future vulnerable assets including, but not limited to, populations, critical and non-critical infrastructure, property, and systems. Quantifying existing assets is the first step in defining a community's vulnerability to natural hazards. Existing assets are defined below for the county and participating jurisdictions.

The City of Corpus Christi is the county seat and the largest city in the county. Populations for the unincorporated county and participating jurisdictions are included in the Existing Asset sections below. A description of the county land cover is shown in Table 4-1.

**Table 4-1 – Nueces County Land Cover<sup>1</sup>**

Land Cover Type	Percent of Area
Residential	2.86%
Commercial and Industrial	8.98%
Agricultural	47.21%
Forested, Shrub, and Grassland	7.88%
Wetlands	4.09%
Unknown and Barren	2.06%
Water	26.97%

### **Critical Facilities**

For the purpose of hazard mitigation, FEMA defines critical facilities as hospitals, fire stations, police stations, courthouse, communications, and similar facilities where essential programs/services are provided. Other facilities such as public schools may be deemed by a community to be a critical facility as well. These facilities should be given special consideration when formulating regulatory alternatives and floodplain management plans. A critical facility should not be located in a floodplain if at all possible. If located in a floodplain it should be provided a higher level of protection so that it can continue to function and provide services during and after a flood. Hazard mitigation actions to mitigate risk to critical facilities located in the 100-year floodplain, or potentially impacted by future flood conditions, are included in this Plan by jurisdiction. Critical Facilities are tabulated in Appendix D of the Plan.

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<sup>1</sup> Homer, C.G., Dewitz, J.A., Yang, L., Jin, S., Danielson, P., Xian, G., Coulston, J., Herold, N.D., Wickham, J.D., and Megown, K., 2015, [Completion of the 2011 National Land Cover Database for the conterminous United States- Representing a decade of land cover change information](#). *Photogrammetric Engineering and Remote Sensing*, v. 81, no. 5, p. 345-354

# Unincorporated Nueces County Existing Assets

POPULATION*	
15,274 (Unincorporated)	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates] Unincorporated Nueces County figure represents the balance of the total population in the county, less each individual jurisdiction participating in the plan.

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	132.85 Miles
Rail	84.29 Miles
Crop Land*	312,734.7 Acres; \$76,735,126 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
8210	\$406,888,603	4,202	\$487,429,634

\*Nueces County Appraisal District, 2016 Appraisal Roll

# City of Agua Dulce Existing Assets

POPULATION*	
820	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates]

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	1.15 Miles
Rail	0 Miles
Crop Land*	2.45 Acres; \$602 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
221	\$17,541,361	259	\$20,771,243

\*Nueces County Appraisal District, 2016 Appraisal Roll

# City of Bishop Existing Assets

POPULATION*	
3,150	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates]

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	2.9 Miles
Rail	2.5 Miles
Crop Land*	539.02 Acres; \$132,258 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
466	\$115,889,915	1,162	\$99,373,071

\*Nueces County Appraisal District, 2016 Appraisal Roll

# City of Corpus Christi Existing Assets

POPULATION*	
324,074	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates]

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	381.6 Miles
Rail	50.06 Miles
Crop Land*	24,632.44 Acres; \$6,044,014.65 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
28,382	\$7,148,005,369	82,947	\$10,238,656,508

\*Nueces County Appraisal District, 2016 Appraisal Roll

# City of Driscoll Existing Assets

POPULATION*	
752	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates]

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	2.96 Miles
Rail	1.41 Miles
Crop Land*	464.67 Acres; \$114,014.81 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
272	\$25,502,273	221	\$13,255,055

\*Nueces County Appraisal District, 2016 Appraisal Roll



# City of Petronila Existing Assets

POPULATION*	
114	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates]

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	132.85 Miles
Rail	84.29 Miles
Crop Land*	926.66 Acres; \$227,373.01 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
114	\$3,714,796	38	\$3,201,138

\*Nueces County Appraisal District, 2016 Appraisal Roll

# City of Port Aransas Existing Assets

POPULATION*	
3,955	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates]

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	9.58 Miles
Rail	0 Miles
Crop Land*	0 Acres; \$0 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
6,621	\$414,531,219	2,768	\$774,547,552

\*Nueces County Appraisal District, 2016 Appraisal Roll

# City of Robstown Existing Assets

POPULATION*	
11,576	

\*Source: U.S. Census Bureau [2011-2015 American Community Survey 5-Year Estimates]

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	42.80 Miles
Rail	12.46 Miles
Crop Land*	6,580.37 Acres; \$1,614,612.05 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
2,118	\$151,390,423	3,188	\$183,445,540

\*Nueces County Appraisal District, 2016 Appraisal Roll

# Port of Corpus Christi Authority Existing Assets

POPULATION	
N/A	

CRITICAL INFRASTRUCTURE	
Type	Quantity
Major Roadways	10.4 Miles
Rail	27.4 Miles
Crop Land*	0 Acres; \$0 Value

\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

NON-CRITICAL FACILITIES: PROPERTY*			
Commercial		Residential	
Parcels	Total Improvement Value	Parcels	Total Improvement Value
245	\$174,026,681	0	\$0

\*Nueces County Appraisal District, 2016 Appraisal Roll

## Vulnerable Future Assets

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Future growth and development in the county may affect hazard vulnerability. For identification of a community's future assets, it is useful to consider anticipated population growth, development trends, and planning and development management efforts. Based on population projections for the county planning area provided by the Texas State Data Center, the county, overall, is expected to grow approximately 1% annually from 2015 to 2040. Nueces County experiences steady growth in development including services to support the tourism industry, oil and gas industry, port activity, and agricultural land.

Future assets is another important matrix to assess a jurisdiction's vulnerability to natural hazards. With development comes the need to address the risk of natural hazards for larger populations and increased numbers of non-critical and critical facilities. Historically, hurricanes, tropical storms, and flooding has been a widespread problem for the Plan area; potential for these hazards creates limitations for urban land uses. A goal of community officials in the Plan area is to develop strategies to ensure that future development has reduced risk of impact by natural hazards while not inhibiting community growth. Vulnerability including potential dollar losses is defined for each hazard by jurisdiction in Sections 5 through Section 18 of this Plan.

## Special Population Considerations

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While the Port of Corpus Christi Authority lacks a resident, Census-recognized population, there is a significant working population that would be impacted by any natural hazards affecting the Port of Corpus Christi Authority. According to a 2015 study,<sup>2</sup> the Port of Corpus Christi generated 13,770 direct jobs. Many of these 13,770 employees would be expected to be located on PCCA property for significant periods of time.

Some of the jurisdictions in the plan are tourist destinations. The Cities of Corpus Christi and Port Aransas have significant seasonal tourist populations. These non-permanent populations may be more hazard-vulnerable than resident populations. Unlike residents, tourists are not as familiar with the community and its hazards and may not know how the appropriate measures to take to protect themselves from natural hazards.

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<sup>2</sup> [http://portofcc.com/wp-content/uploads/CorpusChristi2016\\_FINAL-1.pdf](http://portofcc.com/wp-content/uploads/CorpusChristi2016_FINAL-1.pdf)

## Section 5: Hurricane and Tropical Storms

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### Hurricane and Tropical Storms Hazard Overview

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#### Description

Hurricanes and tropical storms are intense tropical weather systems that produce damaging winds, generate storm surge, and heavy rainfall.

#### Location

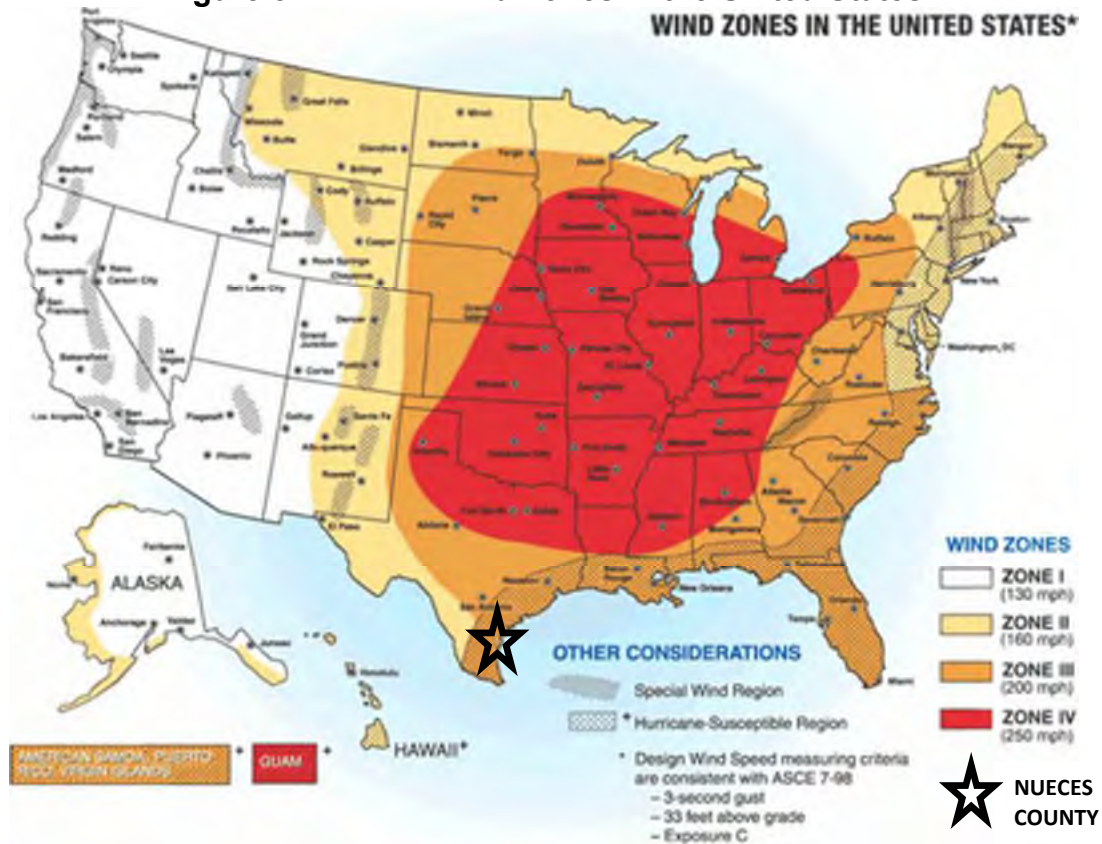
Hurricanes and tropical storms do not have a specific geographic boundary and can occur throughout the county uniformly. It is assumed that the county planning area including all participating jurisdictions are uniformly exposed to hurricane and tropical storm activity. According to FEMA Wind Zones in the United States, the entirety of Nueces County is identified as a Hurricane-Susceptible Region and is located in Wind Zone III, associated to winds as high as 200 mph.

The effects of a hurricane can be felt as far as 150 miles from the center of the storm. The most damaging effects of a storm, both in terms of wind damage and storm surge, are likely to be felt within the radius of maximum wind (RMW). The average RMW of Atlantic hurricanes has been observed to be about 30 miles<sup>1</sup>. A 30 mile buffer applied to the storms that have occurred in the planning area encompasses the entire planning area. Consequently, the entire planning area should be considered at risk of hurricane or tropical storm damage.

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<sup>1</sup> Source: A Note on the Radius of Maximum Wind for Hurricanes, S.A. Hsu and Zhondge Yan, 1998

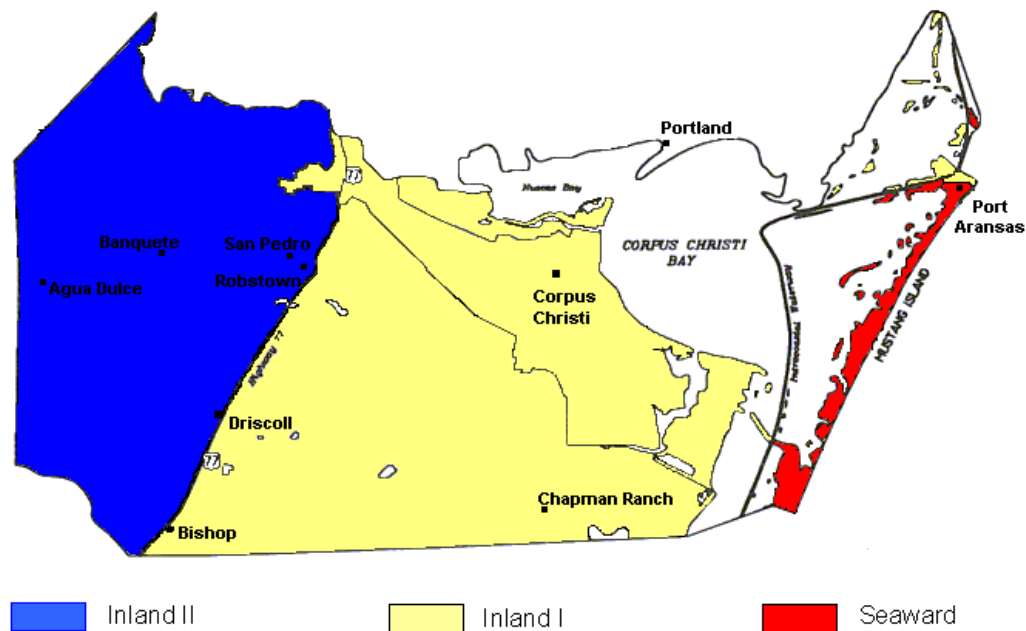
**Figure 5-1. FEMA Wind Zones in the United States**



The Texas Windstorm Insurance Association (TWIA) was established under the Texas Department of Insurance (TDI) by the Texas Legislature in 1971 following Hurricane Celia. TWIA provides windstorm and hail insurance along the Texas seacoast. Recommended design and inspection requirements for structures along the coast have been developed by TDI based on historical damages. Three designated catastrophe areas have been defined for Nueces County. Designated catastrophe areas are established for territories subject to unusually frequent and severe damage resulting from windstorm or hailstorms. Designated catastrophe areas for Nueces County include: Seaward, Inland I, and Inland II. Adopted design wind speeds for these designated catastrophe areas are shown in Figure 8-2 and defined below:

- Seaward: 130 mph 3-second gust design wind speed
- Inland I: 120 mph 3-second gust design wind speed
- Inland II: 110 mph 3-second gust design wind speed

**Figure 5-2 TDI Designated Catastrophe Areas**



### **Extent**

Hurricane intensity is categorized by the Saffir-Simpson Scale, ranked 1 – 5, in order of lowest to highest wind speed. This scale, while it is based on a limited suite of characteristics of hurricane intensity, provides an informative framework with which hurricanes can be discussed. Category 3, 4, and 5 storms are considered to be the most dangerous hurricanes. There is a significant potential for property damage and loss of life associated with Category 3 -5 storms. Only 20% of the total tropical hurricane landfalls are from Category 3-5 storms, yet Category 3-5 storms have caused 70% of the hurricane-related damage in the United States. Category 1 and 2 storms, while generally not as dangerous as Category 3-5 storms, still require consideration and preparation. For example, Hurricane Ike was a Category 2 storm, yet was the third most destructive hurricane to make landfall in the United States. Table 5-1 describes Saffir-Simpson Scale hurricane categories and associated storm surge estimates.

Historically strong Category 3 storms have occurred throughout the planning area. Given the planning area's coastal location, the participating jurisdictions could potentially experience a Category 5 storm in the future.



**Table 5-1. Saffir-Simpson Hurricane Wind Scale<sup>2</sup>**

Category	Maximum Sustained Wind Speed (MPH)
1	74-95
2	96-110
3	111-129
4	130-155
5	157+

### Occurrences

The typical Atlantic hurricane season runs from June to October. While the majority of storms occur within this range, storms have occurred outside of this window. Between 1842 and 2016, a total of 14 unique storms crossed the planning area. A detailed breakdown of storms by intensity and jurisdiction is presented in Table 5-2. No Category 4 or Category 5 Hurricanes crossed the planning area during this time.

**Table 5-2. Historical Occurrences<sup>3</sup>**

Hurricanes and Tropical Storms Intersecting Planning Area (1842 – 2016)					
Jurisdiction	Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
Nueces County	14	7	2	2	3

### Probability

The annual probability and reoccurrence intervals of tropical storms and hurricanes is presented in Table 5-3. Probability and reoccurrence intervals are calculated by dividing the number of events by the observation period. It should be noted that these probabilities reflect the previous occurrence of the center of a storm tracking over a jurisdiction. In actuality, due to the size of these storms, the impacts would be felt across the planning area.

<sup>2</sup> Landsea, C.W., Pielke, R.A. Jr., Mestas-Nunez, A.M., Knaff, J.A. (1999)  
Atlantic Basin Hurricanes: Indices of Climatic Changes. *Climactic Change*, 42:89-129.

<sup>3</sup>NOAA

**Table 5-3. Reoccurrence Probability**

Annual Probability of Storms by Jurisdiction					
Jurisdiction	Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
Nueces County	8%	4%	1.1%	1.1%	1.7%

### **Impact**

Nueces County is a coastal county; the entire planning area will be vulnerable to the impacts of wind brought on by hurricanes and tropical storms. While all jurisdictions are impacted by hurricanes and tropical storms, the impacts felt by each jurisdiction may vary depending upon the characteristics of a particular storm. Storm surge travels with the storm and may make landfall ahead of the center of the storm. Storm surge can cause severe flooding in coastal areas; impacting the jurisdictions along the coast.

Additionally, hurricanes and tropical storms produce large amounts of rain. This rain can overwhelm drainage systems. Even hurricanes or tropical storms that have weakened after making landfall can continue to drop significant quantities of water. This water can lead to flooding.

The impacts to communities from a category 5 storm could be near complete destruction of any and all assets. Houses and commercial property could be destroyed. In addition to the destruction of property, populations can be displaced if their homes are destroyed. Power and other utilities can be interrupted, even by lower category storms. Crops can be severely damaged, resulting in economic impacts.

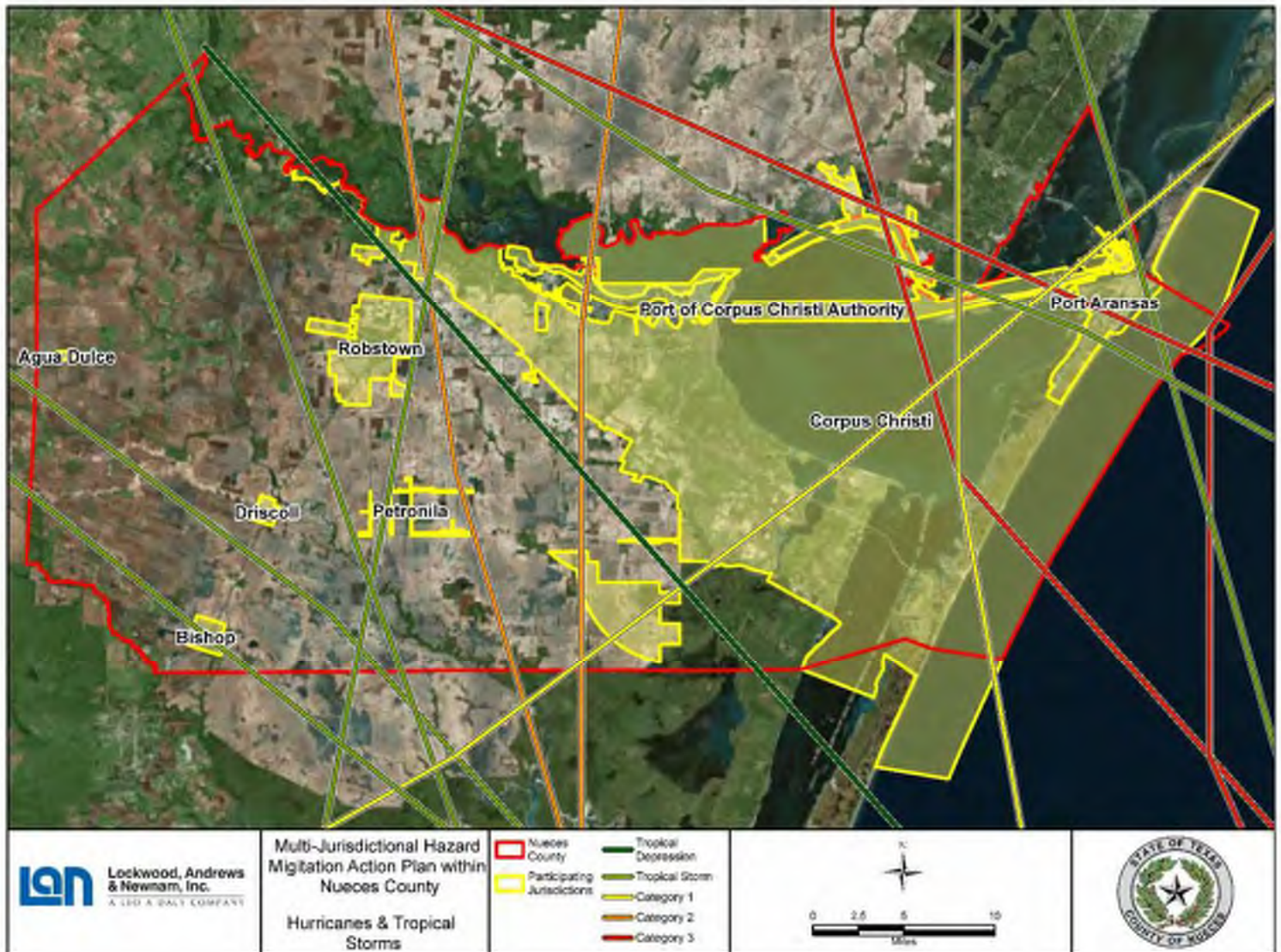
### **Vulnerability**

Due to Nueces County being located on the Texas coast and the size and power of hurricanes and tropical storms, particularly category 4 and 5 storms, all assets within the participating jurisdictions are vulnerable to potential damage by hurricanes and tropical storms.

# Unincorporated Nueces County Hurricane and Tropical Storms Hazard

LOCATION				
Area at Risk		Designated Catastrophe Area		
County Wide (Unincorporated)		Seaward, Inland 1, and Inland 2		
OCCURENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
12	7	1	2	2
PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
6.9%	4%	0.6%	1.2%	1.2%
IMPACT & VULNERABILITY				
Total Population		Land Area (Acres)		
15,274		423,946.09		
Residential Parcels		Residential Total Improvement Value		
4202		\$487,429,634		
Commercial Parcels		Commercial Total Improvement Value		
8210		\$406,888,603		
Crop Area (Acres)		Crop Value		
312,734.7		\$76,735,126		
Highway (Miles)		Railroad (Miles)		
132.85		84.29		

**Figure 5-3. Map of Hurricane & Tropical Storms  
for Unincorporated Nueces County (1842 – 2016)**

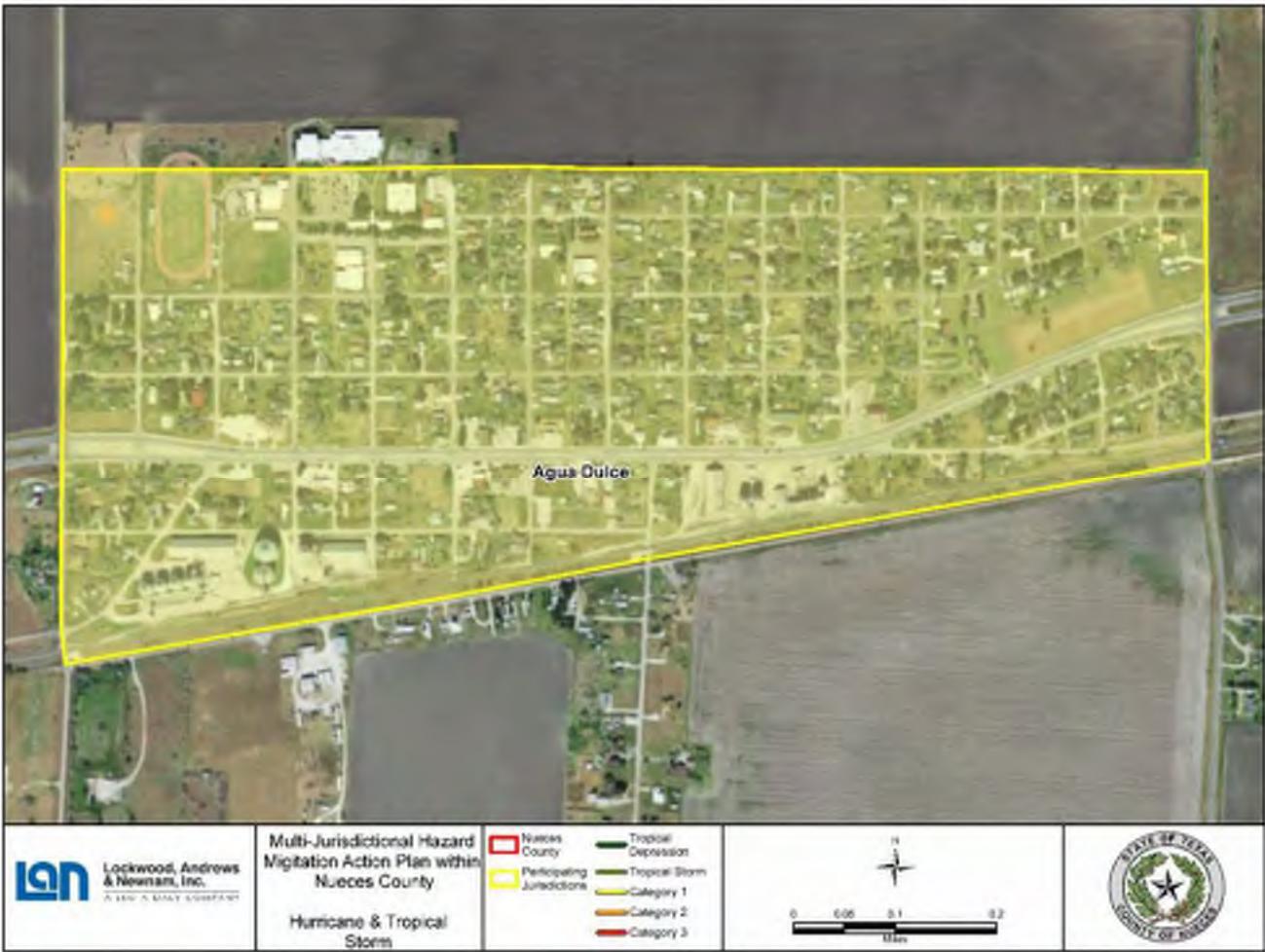


# City of Agua Dulce Hurricane and Tropical Storms Hazard

LOCATION				
Area at Risk		Designated Catastrophe Area		
City Wide		Inland 2		
OCCURRENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
0	0	0	0	0
PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
0%				
IMPACT & VULNERABILITY				
Total Population		Land Area (Acres)		
820		218.3		
Residential Parcels		Residential Total Improvement Value		
259		\$20,711,243		
Commercial Parcels		Commercial Total Improvement Value		
221		\$17,541,361		
Crop Area (Acres)		Crop Value		
2.45		\$602		
Highway (Miles)		Railroad (Miles)		
1.15		0.00		



**Figure 5-4. Map of Hurricane & Tropical Storms for City of Agua Dulce  
(1842 – 2016)**



# City of Bishop Hurricane and Tropical Storms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Inland 1 and Inland 2

OCCURENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
1	1	0	0	0

PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
0.6%	0.6%			

IMPACT & VULNERABILITY	
Total Population	Land Area (Acres)
3,150	423,946.09
Residential Parcels	Residential Total Improvement Value
1162	\$99,373,071
Commercial Parcels	Commercial Total Improvement Value
466	\$115,889,915
Crop Area (Acres)	Crop Value
539	\$132,258
Highway (Miles)	Railroad (Miles)
2.9	2.5

**Figure 5-5. Map of Hurricane & Tropical Storms for City of Bishop (1842 – 2016)**





# City of Corpus Christi Hurricane and Tropical Storms Hazard

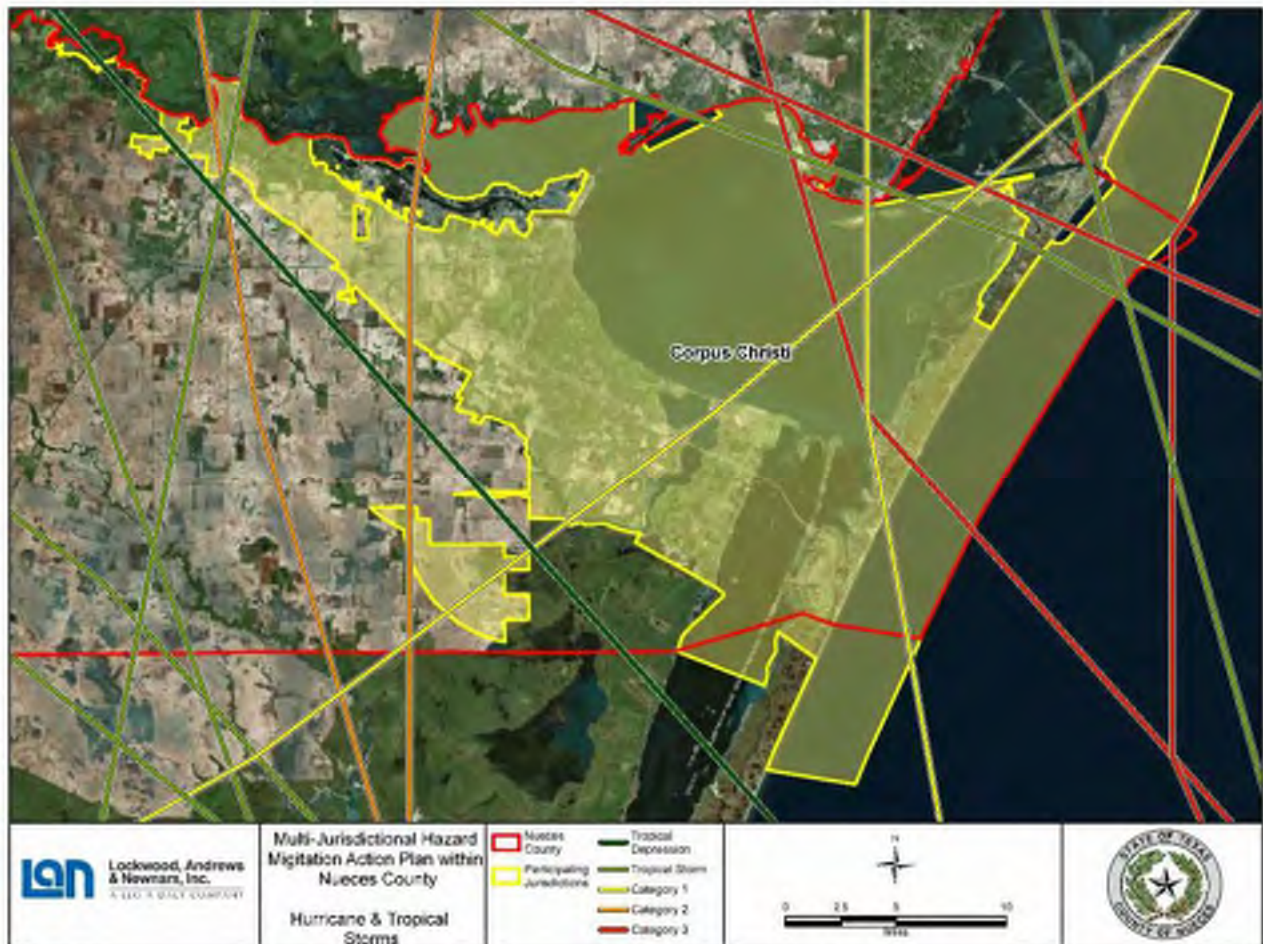
LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Seaward, Inland 1, and Inland 2

OCCURRENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
11	4	2	2	3

PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
6.3%	2.3%	1.2%	1.2%	1.7%

IMPACT & VULNERABILITY	
Total Population	Land Area (Acres)
324,074	322,267.1
Residential Parcels	Residential Total Improvement Value
82,947	\$10,238,897,626
Commercial Parcels	Commercial Total Improvement Value
28,382	\$7,148,763,878
Crop Area (Acres)	Crop Value
24634	\$6,044,015
Highway (Miles)	Railroad (Miles)
381.6	50.06

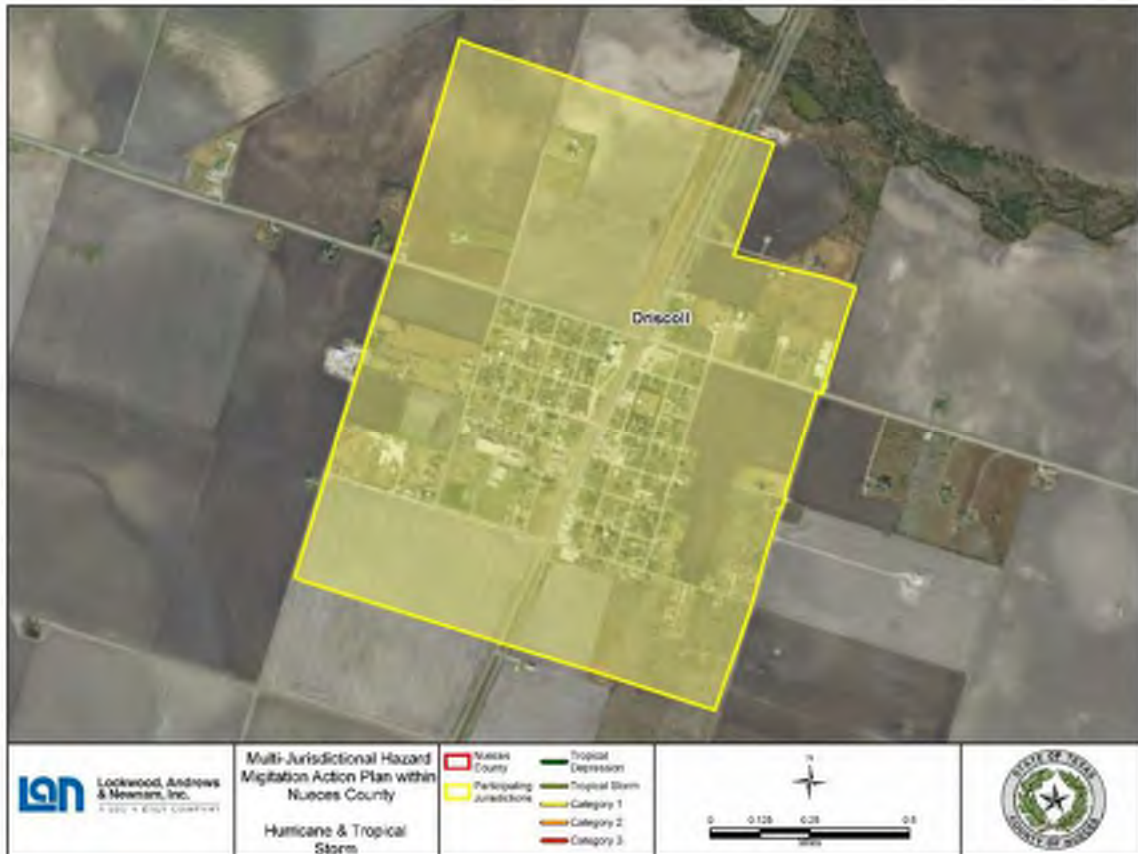
**Figure 5-6. Map of Hurricane & Tropical Storms for City of Corpus Christi  
(1842 – 2016)**



# City of Driscoll Hurricane and Tropical Storms Hazard

LOCATION				
Area at Risk		Designated Catastrophe Area		
City Wide		Inland 1 and Inland 2		
OCCURRENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
0	0	0	0	0
PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
0%				
IMPACT & VULNERABILITY				
Total Population		Land Area (Acres)		
752		744.7		
Residential Parcels		Residential Total Improvement Value		
221		\$13,255,055		
Commercial Parcels		Commercial Total Improvement Value		
272		\$25,502,273		
Crop Area (Acres)		Crop Value		
465		\$114,015		
Highway (Miles)		Railroad (Miles)		
2.96		1.41		

**Figure 5-7. Map of Hurricane & Tropical Storms for City of Driscoll (1842 – 2016)**



# City of Petronila Hurricane and Tropical Storms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Inland 1

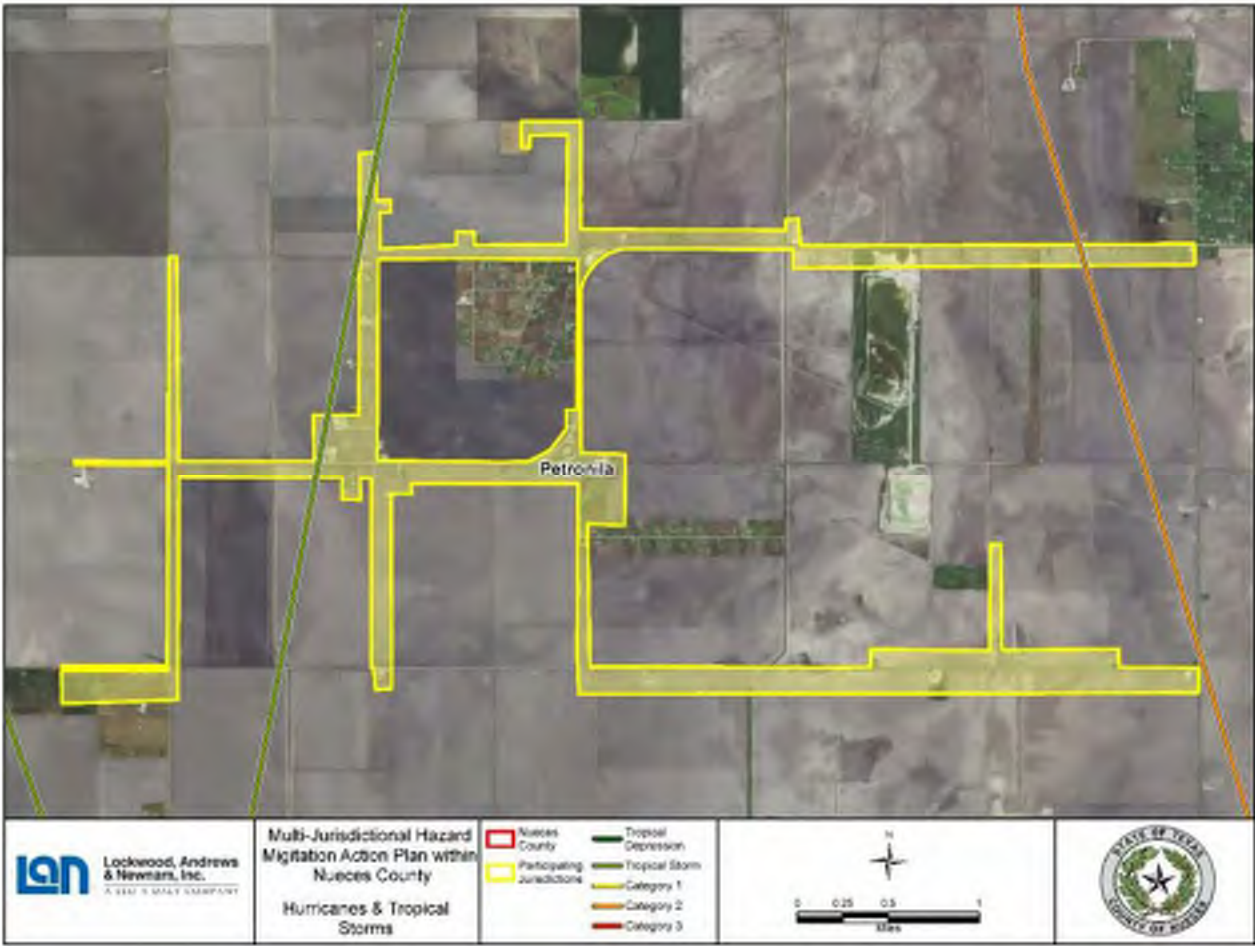
OCCURRENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
3	1	0	2	0

PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
1.7%	0.6%		1.2%	

IMPACT & VULNERABILITY	
Total Population	Land Area (Acres)
114	1167.61
Residential Parcels	Residential Total Improvement Value
38	\$3,201,138
Commercial Parcels	Commercial Total Improvement Value
114	\$3,714,796
Crop Area (Acres)	Crop Value
927	\$227,373
Highway (Miles)	Railroad (Miles)
132.85	84.29



Figure 5-8. Map of Hurricane & Tropical Storms for City of Petronila (1842 – 2016)



# City of Port Aransas Hurricane and Tropical Storms Hazard

LOCATION				
Area at Risk		Designated Catastrophe Area		
City Wide		Seaward and Inland 1		
OCCURRENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
3	2	0	0	1
PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
1.7%	1.2%			0.6%
IMPACT & VULNERABILITY				
Total Population		Land Area (Acres)		
3,955		9004.91		
Residential Parcels		Residential Total Improvement Value		
2768		\$774,306,434		
Commercial Parcels		Commercial Total Improvement Value		
6621		\$413,772,710		
Crop Area (Acres)		Crop Value		
0		\$0		
Highway (Miles)		Railroad (Miles)		
9.58		0.00		

**Figure 5-9. Map of Hurricane & Tropical Storms for City of Port Aransas  
(1842 – 2016)**

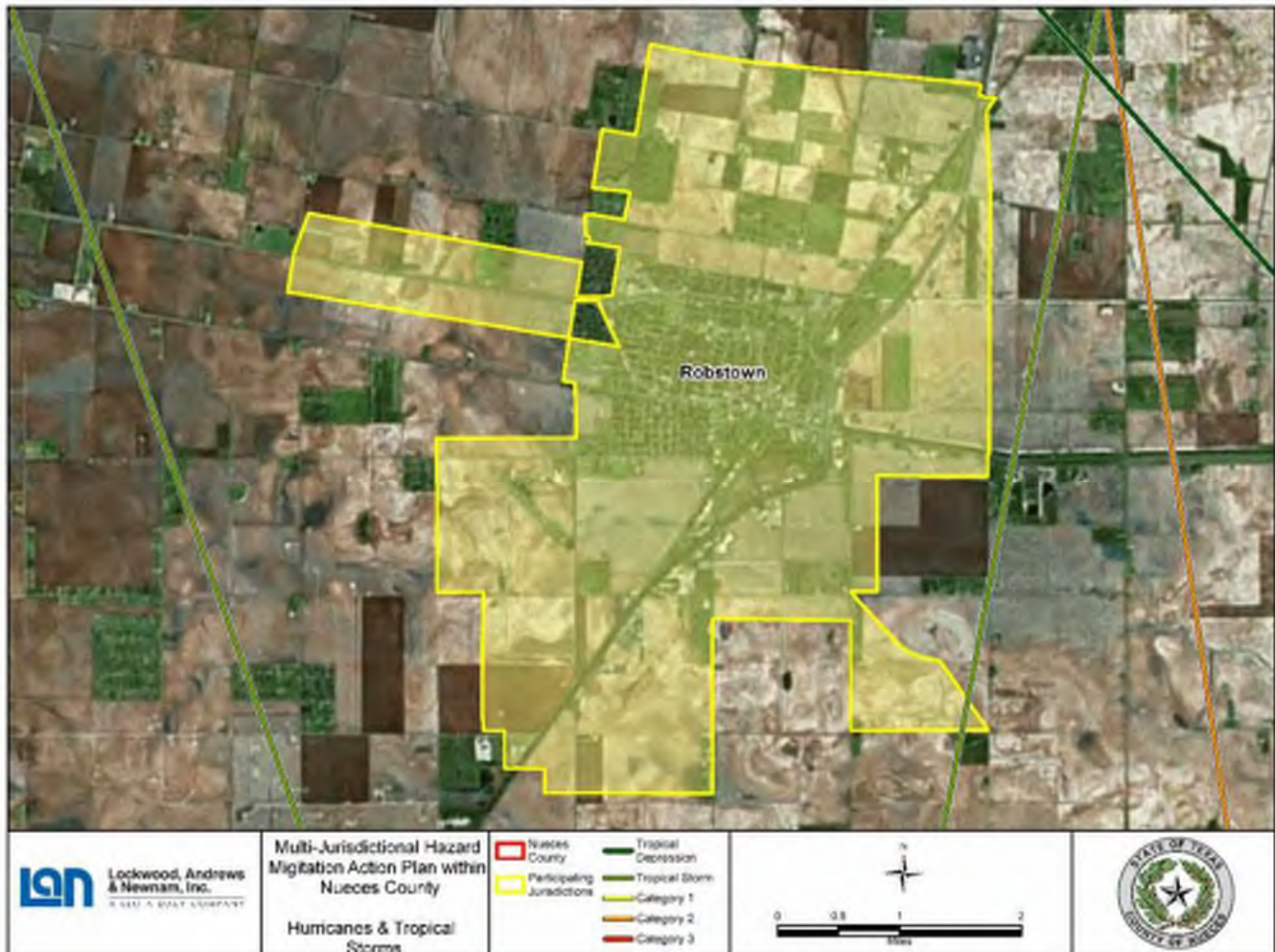




# City of Robstown Hurricane and Tropical Storm Hazard

LOCATION				
Area at Risk		Designated Catastrophe Area		
City Wide		Inland 1 and Inland 2		
OCCURRENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
1	1	0	0	0
PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
0.6%	0.6%			
IMPACT & VULNERABILITY				
Total Population		Land Area (Acres)		
11,576		9921.51		
Residential Parcels		Residential Total Improvement Value		
3188		\$183,445,540		
Commercial Parcels		Commercial Total Improvement Value		
2118		\$151,390,423		
Crop Area (Acres)		Crop Value		
6580		\$1,614,612		
Highway (Miles)		Railroad (Miles)		
42.80		12.46		

**Figure 5-10. Map of Hurricane & Tropical Storms for City of Robstown (1842 – 2016)**



# Port of Corpus Christi Authority Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
Jurisdiction Wide	Inland 1

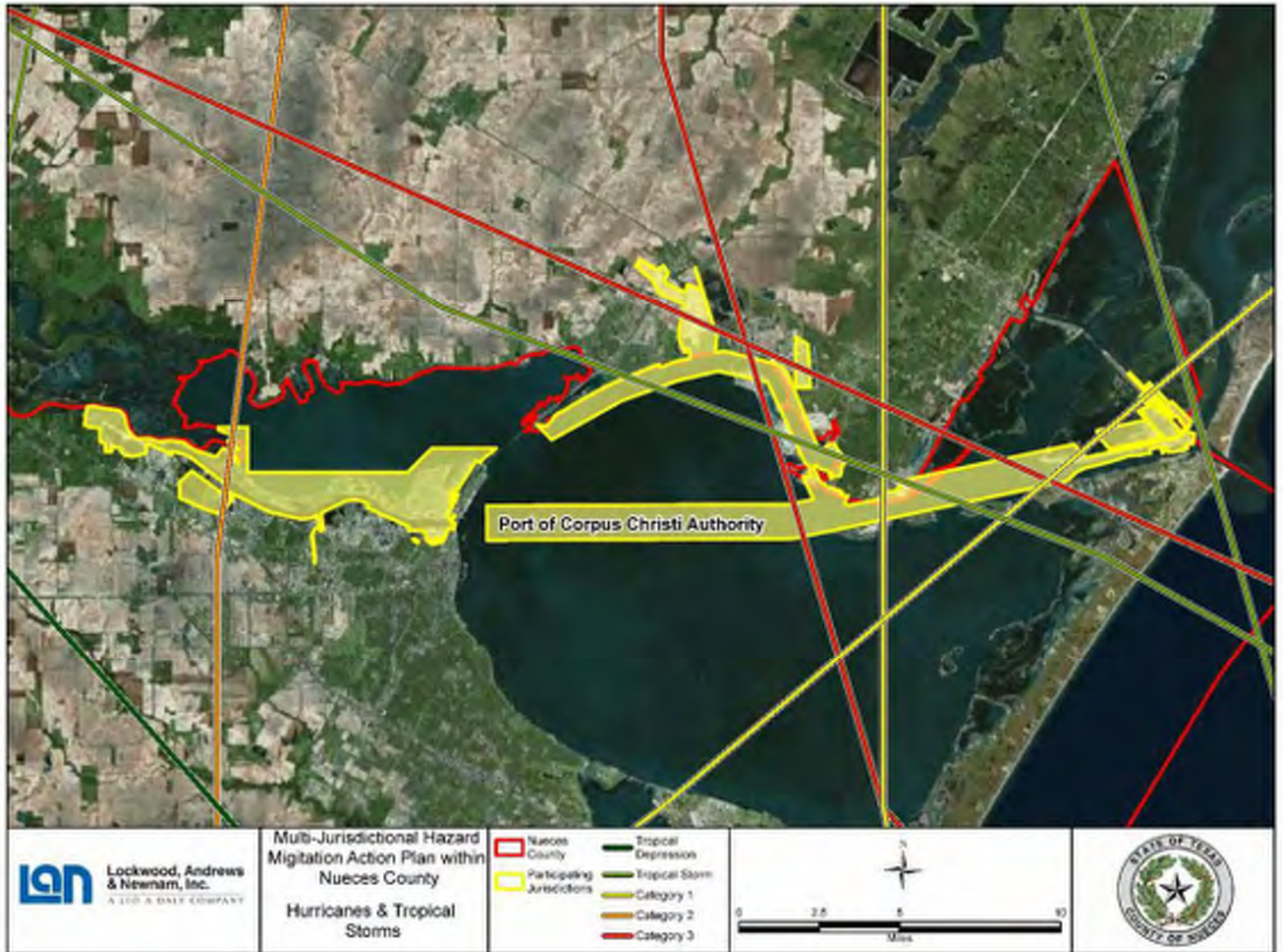
OCCURRENCE	EXTENT			
Total Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
6	1	2	1	2

PROBABILITY				
Future Storms	Tropical Storms & Depressions	Category 1 Hurricanes	Category 2 Hurricanes	Category 3 Hurricanes
3.5%	0.6%	1.2 %	0.6%	1.2%

IMPACT & VULNERABILITY	
Total Population	Land Area (Acres)
Unknown	7,867
Residential Parcels	Residential Total Improvement Value
0	\$0
Commercial Parcels	Commercial Total Improvement Value
245	\$1,704,026,681
Crop Area (Acres)	Crop Value
0	\$0
Highway (Miles)	Railroad (Miles)
0.8	27.4



**Figure 5-11. Map of Hurricane & Tropical Storms for  
Port of Corpus Christi Authority (1842 – 2016)**



## Section 6: Flood

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### Flood Hazard Overview

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#### Description

A flood is the accumulation of water within a body of water, which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream, ocean, lake or other watercourse susceptible to flooding. Flooding is the partial or complete inundation of otherwise normally dry land. Types of flooding include riverine, coastal, and shallow flooding.

#### Location

Sources of flooding in the Nueces County area include coastal flooding, riverine flooding, and flooding resulting from poor drainage, otherwise referred to as localized flooding. FEMA flood maps are the number one resource for defining location of flood hazard for a community. Current effective FEMA flood maps for Nueces County are dated 1981 to 1985. An update to the FEMA Flood Insurance Study (FIS) and Nueces County Flood Insurance Rate Maps for the Gulf Coast began in 2006. Preliminary FIRMS for Nueces County were released on 5/26/2016. The updated FIRMS and FIS are in the process of becoming effective and are currently in the comment phase. The Flood Map project is part of a nation-wide effort to update coastal flood risk data. In Texas, this project includes 17 of 18 coastal counties. New FIS data and modeling will enable coastal counties and communities to make informed decisions regarding land use development, risk identification, and mitigation and recovery as it pertains to reducing hazard risk from flood.

Adoption of updated flood maps in conjunction with development of a new county-wide Hazard Mitigation Plan provides Nueces County and its communities an opportunity to

coordinate and implement these two planning mechanisms into land use policies, regulations, and ordinances, and to alter the built environment to build resiliency to natural hazards over time. Higher regulatory standards may also be considered by communities to be more aligned with the county's regulations, and to more effectively, and responsibly, manage the local National Flood Insurance Program (NFIP).

This report section includes floodplain maps for each participating jurisdiction with the effective 1981/1985 FEMA Flood Insurance Rate Maps (FIRMs) floodplain extents and the proposed floodplain extents which incorporate the latest hydrologic and hydraulic analysis of the area.

### **Extent**

Magnitude of flood hazards is expressed in term of maximum flood depth experienced by the jurisdiction. Generally, homes that are impacted by more than four feet of flood depth are considered by FEMA as a complete loss. Therefore, flood depth combined with number of homes impacted by floods is one measure of a community's vulnerability to flood damage. FEMA flood maps designated Special Flood Hazard Areas that indicate areas of the County that have a 1% annual chance of inundation. A 0.2% annual chance of inundation floodplain has also been designated by FEMA, further detailing the extent of flood hazards in Nueces County.

### **Occurrences**

Flood occurrences in Nueces County are documented in the NCDC Storm Event Database. The NCDC data reports include event details such as property damage, crop damage, injury and death.

**Table 6-1. NCDC flood records 1984 - 2016**

Date	Date (cont.)	Date (cont.)	Date (cont.)	Date (cont.)
10/30/1984	8/23/1999	6/10/2003	9/18/2006	3/21/2015
10/1/1995	3/14/2000	7/18/2003	7/2/2007	3/21/2015
9/20/1996	3/14/2000	9/12/2003	7/2/2007	3/21/2015
10/5/1996	3/14/2000	9/17/2003	7/3/2007	4/22/2015
4/2/1997	11/4/2000	9/18/2003	7/3/2007	4/22/2015
4/2/1997	8/31/2001	9/19/2003	7/4/2007	4/22/2015
4/2/1997	8/31/2001	9/23/2003	7/4/2007	5/12/2015
4/2/1997	9/2/2001	10/24/2003	7/7/2007	5/12/2015
4/3/1997	9/2/2001	4/6/2004	7/25/2007	5/12/2015
4/3/1997	9/9/2001	4/25/2004	9/17/2010	5/15/2015
4/3/1997	11/16/2001	5/13/2004	9/19/2010	5/21/2015
4/3/1997	11/16/2001	6/22/2004	9/19/2010	5/24/2015
4/3/1997	7/31/2002	6/25/2004	9/19/2010	6/17/2015
4/3/1997	8/14/2002	9/2/2004	9/20/2010	9/11/2015
4/3/1997	8/14/2002	7/28/2005	9/20/2010	10/21/2015
5/23/1997	9/16/2002	10/11/2005	4/29/2013	3/1/2016
6/6/1997	9/17/2002	5/31/2006	4/29/2013	3/9/2016
6/21/1997	9/19/2002	6/1/2006	9/15/2013	5/16/2016
10/9/1997	10/28/2002	6/1/2006	9/29/2013	8/30/2016
10/13/1997	10/28/2002	7/5/2006	5/13/2014	
10/18/1998	10/28/2002	7/5/2006	9/27/2014	
10/18/1998	12/9/2002	7/26/2006	10/11/2014	

Additionally, five non-hurricane, flood-related FEMA disaster declarations took place in Nueces County between 1971 and 2017. Disaster declarations are made at the county level without published detail of impacts to each jurisdiction. Consequently, these disasters are not described within the jurisdictional tables. Disaster Declarations are shown in Table 6-2.

**Table 6-2. Nueces County Flood-Related Disaster Declarations**

Disaster Number	Declaration Date	Incident Begin Date	Incident End Date	Public Assistance Grants
313	9/18/1971	9/18/1971	9/18/1971	Information Not Provided
603	9/25/1979	9/25/1979	9/25/1979	Information Not Provided
727	10/30/1984	10/30/1984	10/30/1984	Information Not Provided
1257	10/21/1998	10/17/1998	11/15/1998	\$33,279,674
1425	7/4/2002	6/29/2002	7/31/2002	\$27,960,004
1439	11/5/2002	10/24/2002	11/15/2002	\$57,974,742

**Table 6-2. Nueces County Flood-Related Disaster Declarations Cont.**

Disaster Number	Declaration Date	Incident Begin Date	Incident End Date	Public Assistance Grants
1709	6/29/2007	6/16/2007	8/3/2007	\$25,706,394
4223	5/29/2015	5/04/2015	6/23/2015	\$57,635,747

## Probability

Probability and frequency of return were calculated by dividing the number of flood events in the recorded time period for flood hazard by the overall time period that the resource database has recorded events. Estimated probability of future flood events has been calculated for each participating jurisdiction. The probabilities shown in the jurisdictional tables are based on previous occurrences documented by the NCDC database.

## Impact

Impacts of flooding frequently include damage to people, property, buildings, and infrastructure. Flooding may cause bridge and road closures, service disruptions, and injuries and fatalities. Flood impacts are summarized in the jurisdictional tables. Disaster Declarations at the county level are detailed in Table 6-2.

## Vulnerability

Asset vulnerability to flood for each jurisdiction can be found in the jurisdictional tables below. Major infrastructure is defined at critical utility lines (gas, water, etc.), highway, and rail access.



## **NFIP Participation**

One of the most powerful tools businesses and homeowners have to protect themselves from flooding is flood insurance through the National Flood Insurance Program (NFIP). Nueces County and the participating jurisdictions, with the exception of Petronila, participate in the NFIP.

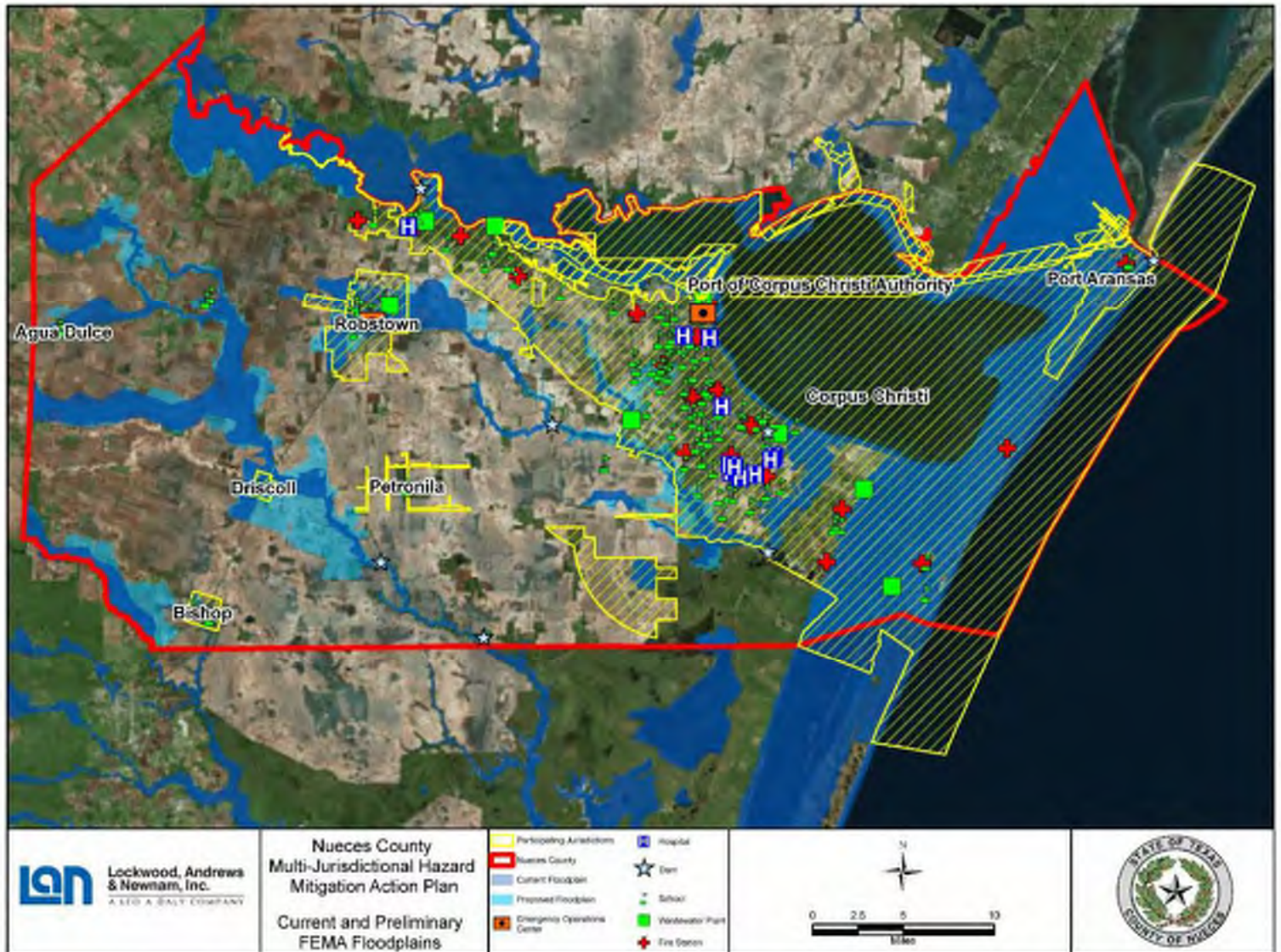
Nueces County and participating jurisdictions have a total of 243 repetitive loss properties, having received a total of \$13,386,740.21 in flood insurance payments. Repetitive Loss properties are properties that have received two or more payments of \$1,000 within a ten year period. Of those 243 repetitive loss properties, 28 are severe repetitive loss properties. Severe repetitive loss properties are properties that have received four NFIP payments of over \$5,000 each. A jurisdictional breakdown of repetitive and severe repetitive loss properties can be found in the summary table for each jurisdiction.

With the exception of Petronila, which does not participate in the NFIP, all participating jurisdictions have developed mitigation actions related to NFIP compliance and maintenance. These mitigation actions can be seen in Section 19. All participating communities identified flooding as a hazard of particular relevance. Consequently, numerous mitigation actions were developed that will help mitigate the impacts of floods. Many of these actions relate to continued compliance with the NFIP and public outreach projects that exceed the NFIP minimum standards. As a whole, the participating jurisdictions recognize the flood mitigation benefits of exceeding the NFIP minimum standards.

# Unincorporated Nueces County Flood Hazard

LOCATION		EXTENT	
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)	
Riverine Localized Coastal	Nueces River Nueces Bay Corpus Christi Bay	6.19	
OCCURENCES			
Number of Floods (Range: 1950-2016)		Risk to Health and Safety (No. Incidences by Type)	
22		2 deaths (10/9/1997 Flash Flood)	
PROBABILITY			
Future Flood Events Likelihood		1 Flood X Years	
33% annual chance		3	
IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
16,873	\$76,164,618,941	9.24	3.31
VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
39	\$1,800,870.55	2	\$407,058.37
Repetitive Loss Structure NFIP Occupancy Status		Number of Repetitive Loss Structures	
Assmd. Condo		1	
Other Residential		1	
Other Nonresidential		1	
Single Family Residential		36	
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
Dam	Belvy Lake Dam	Belvy Lake Dam	
	Gertrude Lubby Lake Dam	Gertrude Lubby Lake Dam	
		Chapman Ranch Lake Dam	

**Figure 6-1. Map of Current and Preliminary FEMA Floodplains  
for Unincorporated Nueces County**



# City of Agua Dulce Flood Hazard

LOCATION		EXTENT
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)
Localized Riverine	Nearby creek	1.5*

\*Video Documentation of 2015 Flood Event: <https://www.youtube.com/watch?v=kyx7IXaO1Lw>

OCCURENCES	
Number of Floods (Range: 1950 - 2016)	Risk to Health and Safety (No. Incidences by Type)
4 (all flash floods)	0 death, 0 injury

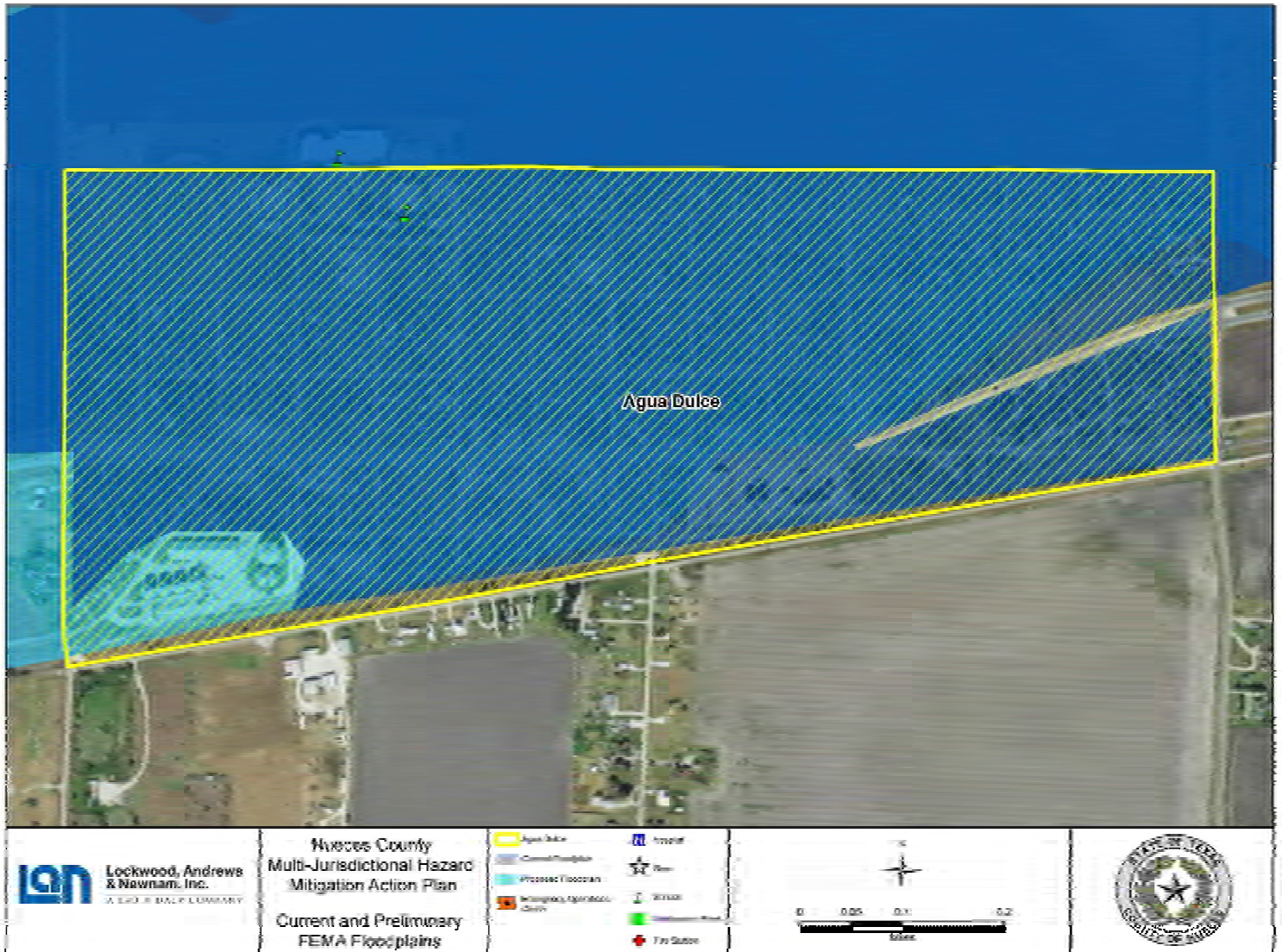
PROBABILITY	
Future Flood Events Likelihood	1 Flood X Years
6% annual chance	16.5 years

IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
547	\$114,757,767	9.24	3.31

VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
0	\$0	0	\$0
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
School	Agua Dulce Elementary School	Agua Dulce Elementary School	
	Agua Dulce High School	Agua Dulce High School	
Designated Shelter/ Emergency Evacuation Center	David Berlanga Community Center	David Berlanga Community Center	



**Figure 6-2. Map of Current and Preliminary FEMA Floodplains  
for City of Agua Dulce**



# City of Bishop Flood Hazard

LOCATION		EXTENT	
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)	
Riverine Localized	Localized Nearby creeks	1	

OCCURENCES	
Number of Floods (Range: 1950 - 2016)	Risk to Health and Safety (No. Incidences by Type)
5	0 death, 0 injury

PROBABILITY	
Future Flood Events Likelihood	1 Flood X Years
7.6% annual chance	13.2 years

IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
1,756	\$1,556,391,434	0	.06

VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
2	\$28,195.18	0	\$0
Repetitive Loss Structure NFIP Occupancy Status		Number of Repetitive Loss Structures	
Single Family Residential		2	
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
No assets in SFHA			

**Figure 6-3. Map of Current and Preliminary FEMA Floodplains  
for City of Bishop**



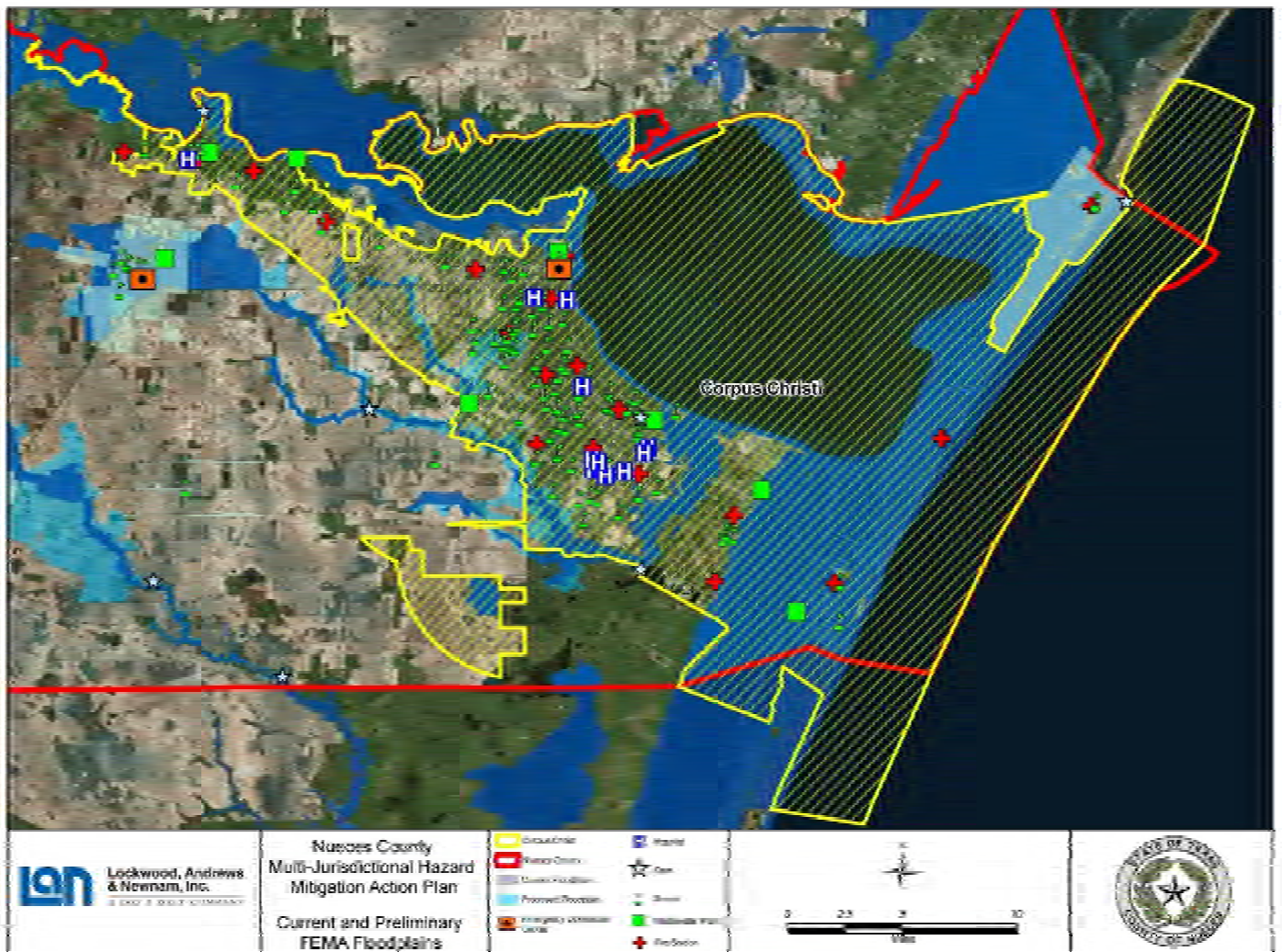
# City of Corpus Christi Flood Hazard

LOCATION		EXTENT	
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)	
Riverine Localized Coastal	Corpus Christi Bay Nueces Bay Oso Bay	10.62	
OCCURENCES			
Number of Floods (Range: 1993-2009)		Risk to Health and Safety (No. Incidences by Type)	
49		Four injuries	
PROBABILITY			
Future Flood Events Likelihood		1 Flood X Years	
74% annual chance		16 months	
IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
115,871	\$2,864,811,240,170	39.8	7.02
VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
171	\$10,258,764.80	25	\$4,573,225.47
Repetitive Loss Structure NFIP Occupancy Status		Number of Repetitive Loss Structures	
2-4 Family Residential		4	
Assmd. Condo		13	
Business Nonresidential		2	
Other Residential		8	
Other Nonresidential		34	
Single Family Residential		135	
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
Dam	Oso Municipal Golf Course Lake Dam	Calallen Reservoir Dam	
Fire Station	Fire Station 15	Fire Station 10 Fire Station 15 Fire Station 16	
	Fire Station 16		



School	Barnes Elementary	Barnes Elementary
		Seashore Middle School Academy
		Jones Elementary
		Seashore Learning Center
		Los Encinos SES
		West Oso Junior High
		Wynn Seale Metropolitan School of Design
		West Oso Elementary
		Dr. ML Garza-Gonzalez Charter School
		Garcia Elementary
		Dr. ML Garza-Gonzalez Accelerated Learning Center
		Mary Grett School
		Cunningham Middle School
Wastewater Treatment Plant	Laguna Wastewater Treatment Plant	Laguna Wastewater Treatment Plant
	Whitecap Wastewater Treatment Plant	
		Greenwood Wastewater Treatment Plan

**Figure 6-4. Map of Current and Preliminary FEMA Floodplains for City of Corpus Christi**



# City of Driscoll Flood Hazard

LOCATION		EXTENT
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)
Riverine Localized	Creek north of the city limits Localized flooding	2*

OCCURENCES	
Number of Floods (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)
0	0 death, 0 injury

PROBABILITY	
Future Flood Events Likelihood	1 Flood X Years
1% annual chance*	100 years*

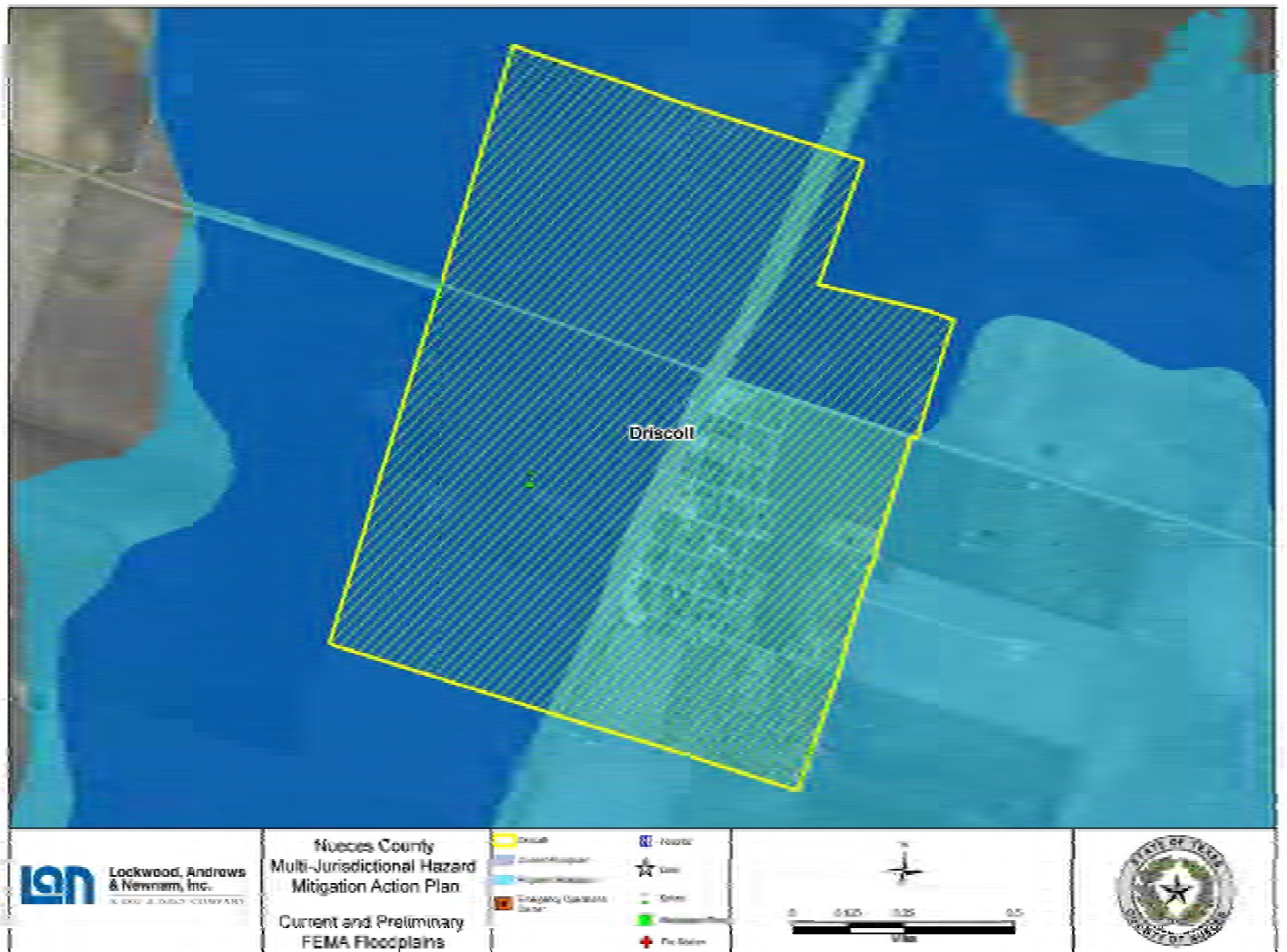
\* Typically sheet flooding. Based upon local expert opinion.

The existing FIS does not include studied floodplain areas. The upcoming FIS will include studied floodplain areas and will provide extent (depth) information.

IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
610	\$394,563,590	0	0.5

VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
0	\$0	0	\$0
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
School	Driscoll Elementary & Middle School	Driscoll Elementary & Middle School	

**Figure 6-5. Map of Current and Preliminary FEMA Floodplains  
for City of Driscoll**



# City of Petronila Flood Hazard

LOCATION		EXTENT	
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)	
Localized	Localized drainage	4	

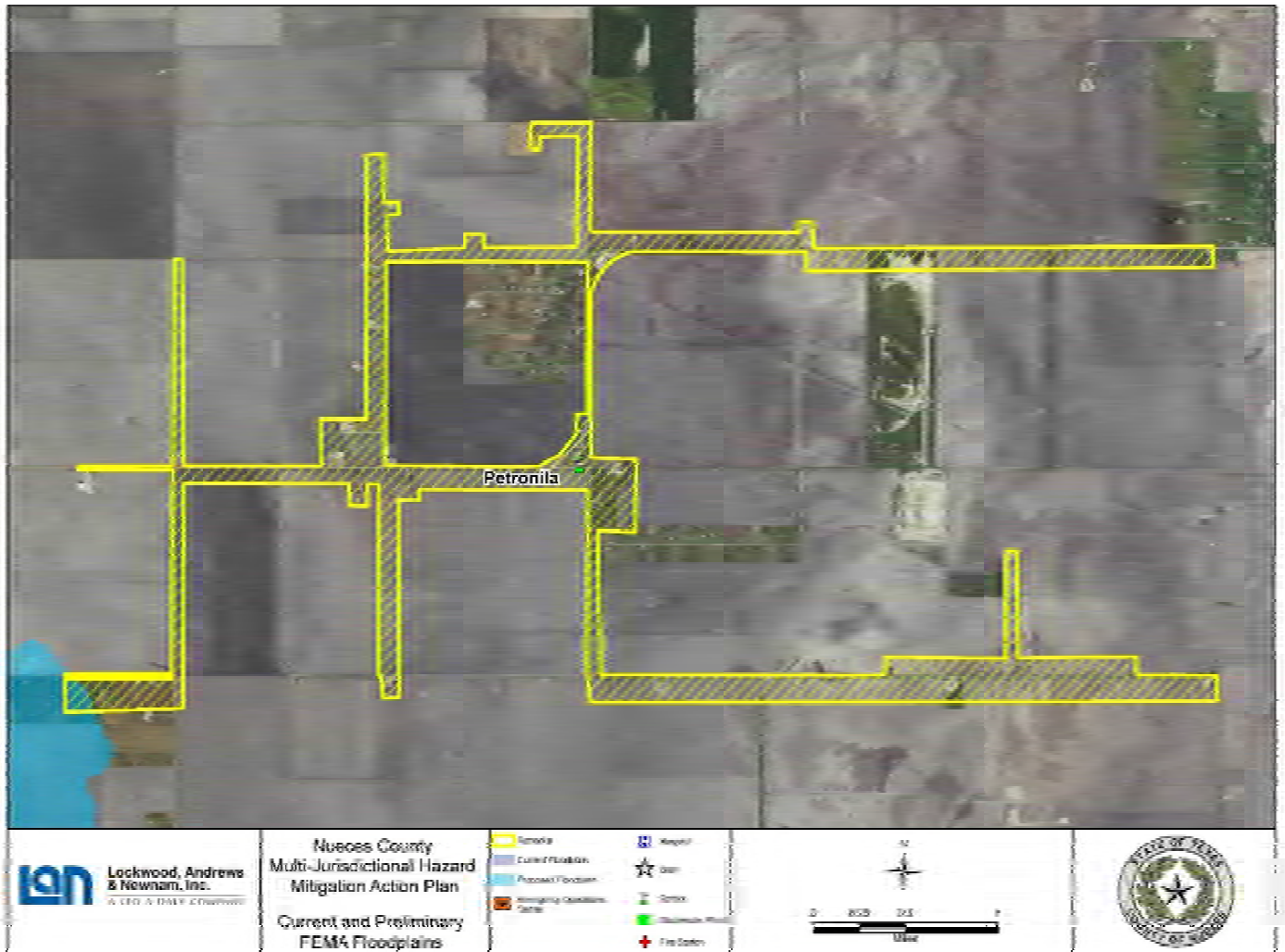
OCCURENCES	
Number of Floods (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)
3 (all flash floods)	0 death, 0 injury

PROBABILITY	
Future Flood Events Likelihood	1 Flood X Years
4.5% annual chance	22 years

IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
159	\$14,345,526	0	0

VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
0	\$0	0	\$0
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
No assets in SFHA			

**Figure 6-6. Map of Current and Preliminary FEMA Floodplains for City of Petronila**



# City of Port Aransas Flood Hazard

LOCATION		EXTENT
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)
Riverine Localized Coastal	Corpus Christi Bay Gulf of Mexico	13 – 1% event*

\*Updated FIRMs and FIS are forthcoming. This extent value comes from the effective 1992 FIRM.

OCCURENCES	
Number of Floods (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)
8 (all flash floods)	0 death, 0 injury

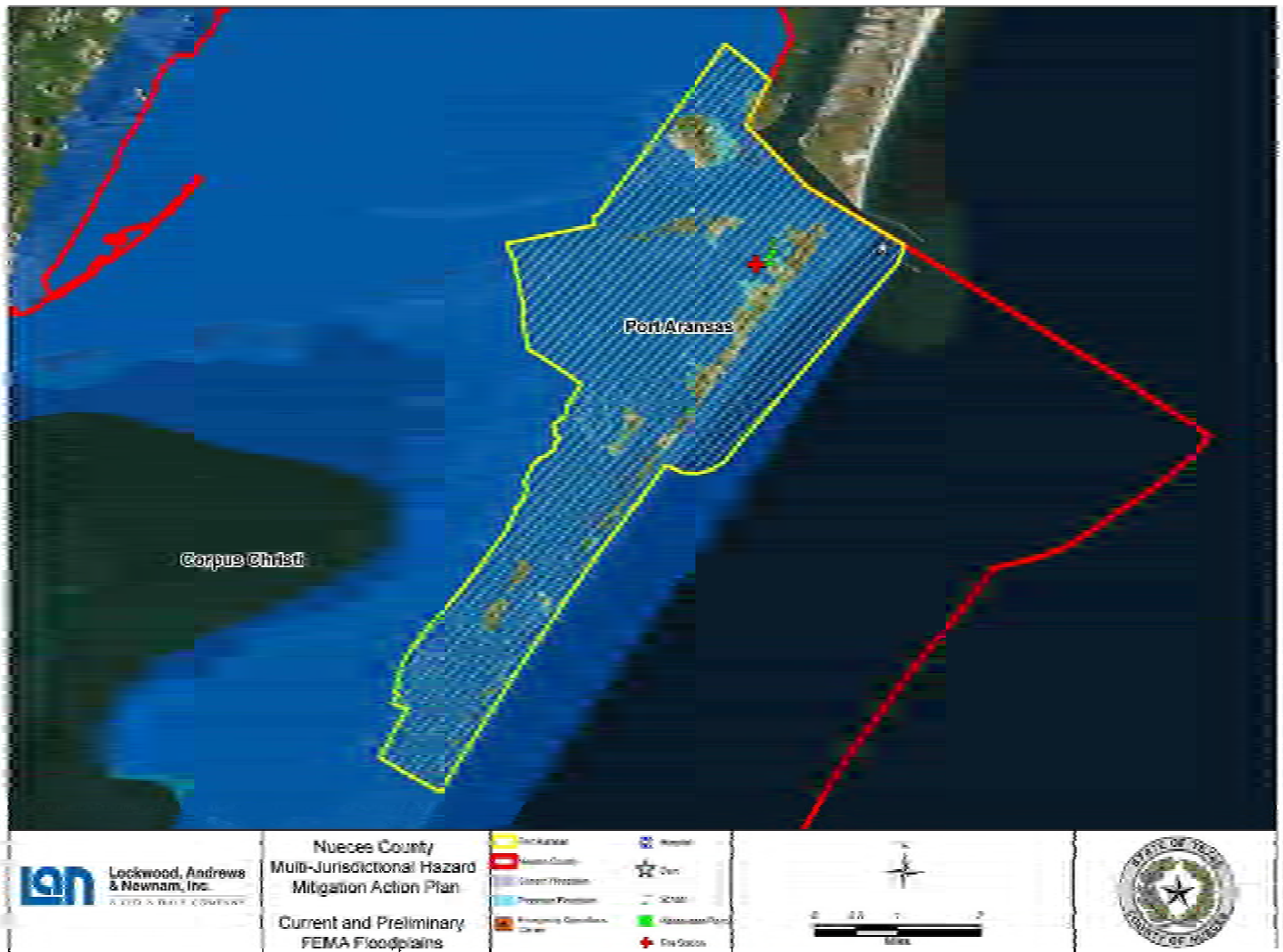
PROBABILITY	
Future Flood Events Likelihood	1 Flood X Years
12% annual chance	8.25 years

IMPACT			
Parcels in SFHA	People at Risk	Highway at Risk (Mile)	Railroad at Risk (Mile)
11,345	\$34,933,446,050	8.56	0

VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
19	\$993,444.31	1	\$122.378.68
Repetitive Loss Structure NFIP Occupancy Status		Number of Repetitive Loss Structures	
2-4 Family Residential		1	
Assmd. Condo		1	
Other Residential		2	
Other Nonresidential		6	
Single Family Residential		10	
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
Dam	South Jetty Dam		
Fire Station	Port Aransas Fire Department	Port Aransas Fire Department	
School		Bundrett Middle School	



**Figure 6-7. Map of Current and Preliminary FEMA Floodplains  
for City of Port Aransas**





# City of Robstown Flood Hazard

LOCATION		EXTENT
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)
Riverine Localized	Localized flooding Nearby creeks	14 – 1% event

\*Updated FIRMs and FIS are forthcoming. This extent value comes from the effective 1986 FIS.

OCCURENCES	
Number of Floods (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)
13 (all flash floods)	0 death, 0 injury

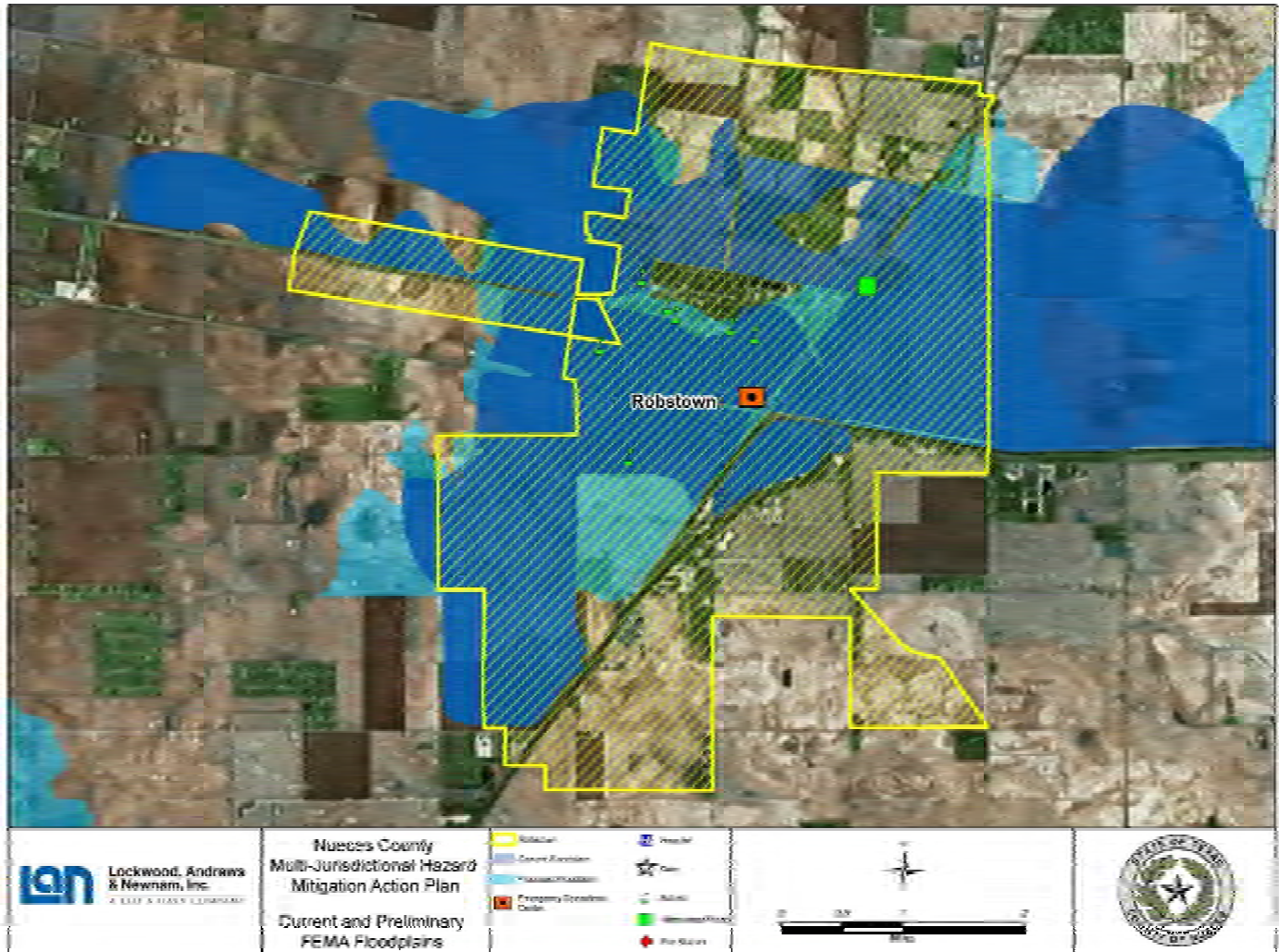
PROBABILITY	
Future Flood Events Likelihood	1 Flood X Years
19.7% annual chance	5 years

IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
5,934	\$3,619,085,359	15.83	3.43

VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
13	\$305,465.37	0	\$0
Repetitive Loss Structure NFIP Occupancy Status		Number of Repetitive Loss Structures	
Other Nonresidential		1	
Single Family Residential		12	
ASSET CLASS	ASSETS IN EFFECTIVE SFHA	ASSETS IN PROPOSED SFHA	
Emergency Operations	Robstown Emergency Operations Center	Robstown Emergency Operations Center	
School	Robstown High School	Robstown High School	
	Robstown Seale Junior High School	Robstown Seale Junior High School	
	Lotspeich Elementary	Lotspeich Elementary	
	San Pedro Elementary	San Pedro Elementary	
		Hattie Martin Early Childhood Center	
		Solomon P Ortiz International	
		Robert Driscoll Jr Elementary	
		Salazar Crossroads Academy	

Wastewater Treatment Plant	Robstown Wastewater Treatment Plan	
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**Figure 6-8. Map of Current and Preliminary FEMA Floodplains  
for City of Robstown**



# Port of Corpus Christi Authority Flood Hazard

LOCATION		EXTENT
Flooding Types	Major Flooding Source	Maximum Flood Depth (Feet)
Coastal	Corpus Christi Bay Nueces Bay	12 – 1% event*

\*Updated FIRMs and FIS are forthcoming. This extent value comes from the effective 1985 FIRM.

OCCURENCES	
Number of Floods (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)
No records*	No records*

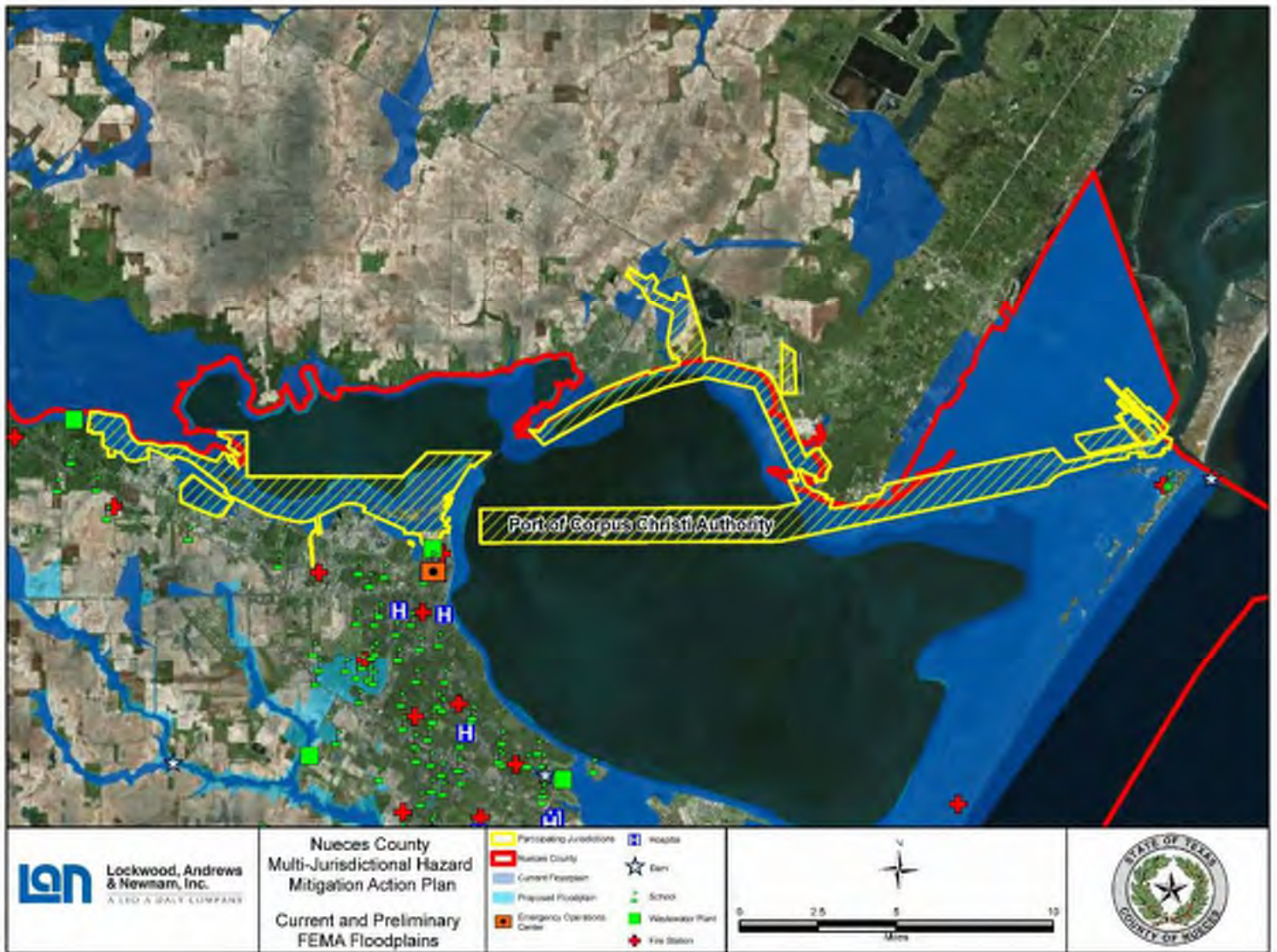
PROBABILITY	
Future Flood Events Likelihood	1 Flood X Months
1% annual chance*	100 years*

\*PCCA owned property is located within Unincorporated Nueces County. Flood event records for the county do not indicate which events impacted PCCA owned property. At a minimum, according to the FEMA floodplain maps of the area there are portions of the jurisdiction that are at risk of the 1% annual chance flood event.

IMPACT			
Parcels in SFHA	Property Value in SFHA	Highway at Risk (Mile)	Railroad at Risk (Mile)
345	\$174,026,681	.8	21.5

VULNERABILITY			
Repetitive Loss Structures (No.)	Repetitive Loss Payments	Severe Repetitive Loss Structures (No.)	Severe Repetitive Loss Payments
0	\$0	0	\$0

**Figure 6-9. Map of Current and Preliminary FEMA Floodplains  
for Port of Corpus Christi Authority Property**





## Section 7: Drought

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## Drought Hazard Overview

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### Description

Droughts can be classified as meteorological, hydrological, agricultural, or socioeconomic droughts. A meteorological drought is a reduction of precipitation from the expected average or typical precipitation patterns. A hydrologic drought occurs when below average rainfall impacts streams, lakes, reservoirs, and groundwater levels. Agricultural droughts are brought on by insufficient moisture in the soil, typically impacting crops. Socioeconomic droughts occur when water demand exceeds supply due to a precipitation-related supply shortfall. Droughts may initiate or exacerbate other hazards, such as extreme heat or wildfires.

### Location

The spatial extent of a drought tends to be relatively large, often stretching across multiple counties. Consequently, the entirety of Nueces County is vulnerable to the impact of a drought. Crops and livestock are vulnerable to drought. The overwhelming majority of agricultural land is found in the western portion of the county, mostly in unincorporated Nueces County. Additional information about agricultural vulnerability can be found in the jurisdictional tables.

### Extent

The Palmer Hydrologic Drought Index is a value calculated monthly by NOAA. The PHDI index takes the balance between environmental water supplies and demands. The index

typically ranges between -6 to +6. Negative numbers indicate a period of drought. Positive numbers indicate wet periods.

**Table 7-1. Drought Extents**

PHDI Value Range	Qualitative Drought Extent
0 - -0.5	Normal
-0.5 – -1.0	Incipient Drought
-1.0 – -2.0	Mild Drought
-2.0 – -3.0	Moderate Drought
-3.0 – -4.0	Severe Drought
< -4.0	Extreme Drought

### Occurrences

Droughts in Nueces County typically occur in the summer months. The months of June through September have the lowest average PHDI. PHDI values for Nueces County come from a NOAA North American Drought Monitoring station (USW00012924) located at the Corpus Christi International Airport.

**Table 7-2. Summary of Nueces County Drought Occurrences**

Severity	Months on Record (1953 – 2016)	Percent of Total Time
Incipient Drought	39	5%
Mild Drought	164	21%
Moderate Drought	113	15%
Severe Drought	63	8%
Extreme Drought	15	2%
Total Months of Drought (PHDI <-1)	357	46%

**Table 7-3. Nueces County Historical PHDI Values (1948 – 2017)**

Months of drought (PHDI <-1) indicated in red												
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1948	-0.05	-0.07	0.61	0.61	-0.17	-0.72	-1.02	-0.84	0.3	-0.4	-0.85	-1.45
1949	-1.51	-1.27	-1.14	0.79	-0.85	-1.44	-0.76	-1.23	-1.17	-0.63	-1.09	-1.14
1950	-1.73	-1.48	-1.63	-1.44	-1.94	-2.31	-2.45	-3.02	-2.94	-3.61	-3.98	-4.18
1951	-4.18	-3.96	-3.49	-3.74	-4.11	-3.77	-4.13	-4.62	-2.73	-2.61	-2.25	-2.51
1952	-2.85	-3.12	-3.09	-2.41	-2.11	-2.56	-1.89	-2.56	-2.25	-2.74	-2.2	-2.21
1953	-2.54	-2.43	-3	-3.5	-3.97	-4.51	-4.84	-2.3	-2.62	-1.98	-1.98	-1.79
1954	-2.05	-2.54	-2.7	-2.34	-2.68	-2.74	-3.15	-3.66	-3.64	-3.28	-3.63	-3.86
1955	-3.81	-3.59	-3.94	-4.49	-4.65	-5.05	-5.06	-5.27	-3.75	-3.47	-3.01	-3.05
1956	-3.13	-3.19	-3.33	-1.28	-0.77	-1.02	-1.14	-1.57	-2.11	-2.27	-2.32	-2.44
1957	-2.81	-2.85	-2.36	-2.16	-1.75	-1.3	-1.96	-2.19	-2.41	-2.89	-1.61	-1.71
1958	3.41	4.17	3.77	3.22	2.45	1.59	1.04	-1.86	-1.21	1.54	1.4	2.07
1959	2.05	2.72	2.32	2.23	2.5	2.97	3.21	3.5	2.7	3.19	2.86	2.57
1960	2.37	2	2.23	2.61	2.31	2.31	2.13	2.75	1.93	3.01	3.1	4.79
1961	4.7	4.31	3.58	3.96	2.97	3.18	3.63	3.3	2.63	1.57	1.11	0.56
1962	-1.79	-2.4	-2.59	-2.78	-3.42	-3.35	-3.81	-4.16	-3.78	-4.34	-4.26	-3.56
1963	-3.52	-3.17	-3.41	-3.93	-4.33	-4.3	-4.51	-4.27	-4.57	-4.49	-4.34	-4.06
1964	-3.69	-3.22	-2.93	-3.47	-3.04	-3.52	-3.3	-3.77	-3.14	-3.41	-3.81	-3.24
1965	-3.16	-1.92	-1.69	-1.84	-1.49	-1.66	-1.77	-1.83	-2.2	-2.44	-2.54	-2.02
1966	-1.55	-1.45	-1.45	1.01	2.04	2.38	2.48	2.46	1.83	1.04	-1.58	-1.93
1967	-1.48	-1.04	-1.45	-2.11	-2.4	-2.97	-3.14	-2.42	2.83	2.85	2.4	2.03
1968	2.09	2.18	2.07	1.84	3.37	4.57	6.04	5.43	5.13	4.72	4.23	3.34
1969	2.52	2.59	2.28	2.32	1.86	0.91	-1.71	-1.79	-2.16	-2.23	-1.06	-0.88
1970	-0.6	-0.74	0.89	0.38	0.6	1.87	2.17	3	3.26	3.11	2.69	1.86
1971	1.05	-1.62	-2.11	-1.89	-1.49	-1.91	-2.35	-1.04	2.09	2.32	1.94	2.22
1972	1.89	2.15	2.07	1.9	2.51	2.51	2.76	2.61	2.97	2.15	2.23	1.67
1973	1.76	1.56	0.99	0.89	-1.08	2.13	2.47	2.92	3.01	4.08	3.39	2.62
1974	2.48	1.64	2.49	1.87	1.86	1.51	0.85	-1.34	-1.38	-1.37	-1.37	-1.53
1975	-1.44	-1.69	-2.24	-2.94	-3.36	-3.68	-2.95	-2.41	-1.91	-2.04	-2.3	-2.27
1976	-2.55	-3.01	-3.45	-2.9	-1.98	-2.39	2.74	2.34	1.69	2.3	3.22	3.27
1977	3.58	3.21	2.93	4.07	3.66	3.54	3.2	2.12	1.1	1.03	0.75	-1.84



**Table 7-3. Nueces County Historical PHDI Values (1948 – 2017) (cont.)**

Months of drought (PHDI <-1) indicated in red												
1978	-1.46	-1.42	-1.67	-1.63	-2.13	1.71	2.67	2.03	2.68	2.48	1.87	1.73
1979	2.39	1.9	1.9	2.42	2.7	2.68	3.15	2.72	3.84	3.2	2.58	2.15
1980	1.76	1.36	0.81	-1.48	-1.48	-2.16	-2.29	2.57	2.62	2.32	2.83	2.29
1981	2.46	2.27	2.59	2.33	3.63	3.61	4.95	5.37	4.16	5.17	4.4	3.86
1982	3.04	4.74	4.12	3.67	3.69	2.87	1.98	1.03	-2.27	-2.55	-1.63	-1.7
1983	-1.74	-1.05	1.21	0.75	0.66	-0.43	1.92	1.77	1.92	1.9	1.65	1.31
1984	2.59	1.89	1.45	0.87	0.57	-1.69	-2.14	-2.6	-2.63	-1.99	-1.75	-1.98
1985	-1.37	-0.76	0.95	1.41	1.31	1.43	1.19	0.92	1.31	1.21	0.91	0.84
1986	0.79	-0.33	-0.74	-1.25	-0.74	-0.81	-1.33	-0.92	-1.44	-1.13	0.8	1.69
1987	1.82	2.92	2.55	2.38	2.55	2.83	3.26	3.06	2.07	1.35	1.11	0.66
1988	-1.42	-1.45	-1.54	-1.99	-2.47	-2.76	-2.76	-3.06	-2.62	-2.66	-3.24	-3.26
1989	-3.04	-2.91	-3.11	-2.57	-3.45	-3.36	-3.52	-3.52	-3.69	-4.16	-4	-3.52
1990	-3.63	-2.73	-1.96	-1.36	-1.79	-2.3	-2.31	-2.83	-3	-3.25	-3.36	-3.45
1991	-3.11	-2.7	-2.55	-2.08	-1.35	-0.57	-1.02	-0.74	1.21	0.76	-0.69	2.32
1992	3.28	3.7	4.38	4.78	5.71	5.16	4.72	4.28	3.66	2.56	3.15	2.61
1993	1.99	1.7	1.96	2.24	3.34	5.22	5.1	4.08	2.96	2.22	1.62	2.27
1994	1.86	1.45	1.99	2.54	2.13	1.96	1.39	0.64	0.83	1.47	0.85	2.57
1995	2.14	1.95	3.13	2.68	2.4	2.18	1.54	1.7	1.27	2.24	2.79	2.28
1996	1.63	0.88	-1.31	-1.17	-1.62	-1.82	-2.24	-0.91	-1.27	-1.86	-2.15	-2.34
1997	-2.4	-2.49	-1.4	2	2.14	1.85	1.26	-1.02	-1.4	1.61	1.87	1.41
1998	1.07	1.21	1.66	1.29	-0.83	-1.54	-2.06	-1.82	-1.18	1.33	1.63	1.29
1999	0.78	-1.1	-0.78	-1.04	-1.23	-0.61	0.75	1.62	1.29	0.76	-1.04	-1.44
2000	-1.87	-2.32	-1.77	-2.1	-1.79	-1.94	-2.53	-2.96	-3.22	-3.36	-2.98	-2.57
2001	-2.21	-2.38	-1.8	-2.29	-2.61	-2.17	-2.16	-1.01	-0.63	-0.72	2.38	2.22
2002	1.61	1.04	0.57	-1.56	-1.57	-1.89	-1.41	-1.9	-1.55	1.26	1.57	1.99
2003	1.75	1.47	1.51	1.12	-1	-1.03	0.55	0.02	0.92	1.09	0.83	-0.43
2004	0.08	0.23	0.09	2.26	2.93	2.86	2.87	1.87	2.21	1.32	0.85	-1.28
2005	-1.58	-1.14	-0.68	-1.15	-1.46	-1.76	-1.82	-2.52	-2.48	-2.45	-1.45	-1.64
2006	-2.08	-2.48	-2.95	-3.58	-3.23	-1.35	2.81	2.13	2.2	1.69	0.77	0.76
2007	1.73	1.04	1.34	1.07	0.8	0.18	4.72	5.4	4.79	3.85	3.07	2.2
2008	2	1.16	0.96	0.83	-1.95	-2.5	1.95	2.58	1.84	1.28	0.57	-1.62

**Table 7-3. Nueces County Historical PHDI Values (1948 – 2017) (cont.)**

Months of drought (PHDI <-1) indicated in red												
2009	-2.05	-2.55	-2.66	-3.28	-3.78	-4.15	-4.51	-4.91	-4.29	-4.22	-3.3	-2.14
2010	-1.46	2.34	2.25	2.3	1.53	2.12	3.66	2.88	4.25	3.51	3.06	2.45
2011	2.97	2.19	1.67	0.9	-1.53	-1.99	-2.54	-3.17	-3.64	-3.76	-4.09	-3.92
2012	-4.11	-3.1	-3.07	-2.95	-2.93	-3.22	-3.3	-3.9	-3.85	-4.39	-4.65	-4.94
2013	-4.72	-4.83	-5.08	-4.94	-5.19	-5.16	-4.68	-4.87	-4.29	-4.33	-3.51	-3.47
2014	-3.39	-3.5	-3.15	-3.53	-3.08	-3.42	-3.64	-3.14	-2.74	-2.27	-1.56	-1.61
2015	-1.22	-1.13	2.21	3.55	6.22	5.63	5.21	4.55	3.6	2.97	2.66	2.01
2016	1.88	1.14	2.31	2.47	2.82	2.46	1.64	1.52	0.92	-1.66	-2.09	-1.91
2017	-2.32											

### Probability

Probability, or frequency of return, was calculated by dividing the number of months of drought in the recorded time period by the overall time period that the resource database has recorded events for that jurisdiction. A drought may cover several jurisdictions; however, a drought event is recorded for the jurisdiction based on the levels of severity and the length in time of each occurrence. Table 7-3 provides a general overview of drought severity, probability, and return interval. Probability for future drought events is defined for the county and each participating jurisdiction in the following sections.

**Table 7-3. Nueces County Drought Probability**

Drought Extent	Estimated Annual Probability	Estimated Return Interval
Incipient Drought	5%	20 years
Mild Drought	21%	5 years
Moderate Drought	15%	7 years
Severe Drought	8%	13 years
Extreme Drought	2%	50 years

### Impact

Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality. There is very low risk of loss of life or damage to structures associated with drought. Droughts may cause water shortages and require regulators to enact water rationing. The impacts of drought tend to be felt most by agriculture and related industries. Droughts can damage crops and pastoral lands and in severe cases, droughts may kill

trees and cause loss of livestock. Dead vegetation from drought can serve as fuel for wildfires.

Crop insurance is purchased by agricultural producers such as farmers and ranchers to protect their investment in the event of natural disaster like drought, hail, or flood. The extent of crop loss due to drought occurrences is difficult to quantify because a drought during a growing season can impact the next two years of crop production. Documentation of agricultural losses due to drought is typically filed by the land owner directly with the policy holder and is not a matter of public record. For this reason, historical crop damages caused by drought is not quantified herein.

Economic impacts of droughts may be complex and far ranging. Water is required to produce many goods and services. If impacts are felt in basal levels of supply chains there is potential for measurable downstream effects. The impacts of a drought may be felt by many interconnected industries and may reach well beyond the temporal or spatial extents of the drought.

The latest major drought on record was the 2011 Texas Drought which had a total direct cost of agricultural loss estimated at \$5.2 billion with an estimated \$3.5 billion in indirect cost for a total of \$8.7 billion in losses state wide. Some of this cost is associated to the decreased park attendance, demanding \$4.6 million just to keep parks open to the public<sup>1</sup>.

## **Vulnerability**

Communities with a greater proportion of crop area may be more vulnerable to the economic impacts of drought. Cropland was calculated by using the 2011 National Land Cover Dataset, published in 2015. This data is the most recent data of its type.

Droughts may potentiate the effects of other hazards. For example, droughts may remove water from vegetation, rendering areas more vulnerable to wildfires. Wildfire hazards are discussed elsewhere in this plan.

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<sup>1</sup> Testimony at TWDB Work Session Meeting (October 21, 2014)

# Unincorporated Nueces County Drought Hazard

LOCATION					
County Wide (Unincorporated)					

OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15

PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%

IMPACT					
Crop and Pasture Damage					
Values of historical crop and pasture damages caused by drought are not available in the public domain by jurisdiction as confirmed by AgriLife and USDA Nueces County Farm Service Agency.					

VULNERABILITY	
Crop and Pasture Land*	
Acres	Percent of Total Jurisdictional Area
312,734.7	73.77%

\*2011 National Land Cover Dataset, Latest Version

# City of Aqua Dulce Drought Hazard

LOCATION					
City Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Values of historical crop and pasture damages caused by drought are not available in the public domain by jurisdiction as confirmed by AgriLife and USDA Nueces County Farm Service Agency.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
2.45			1.12%		

\*2011 National Land Cover Dataset, Latest Version

# City of Bishop Drought Hazard

LOCATION					
City Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Values of historical crop and pasture damages caused by drought are not available in the public domain by jurisdiction as confirmed by AgriLife and USDA Nueces County Farm Service Agency.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
35.57			35.57%		

\*2011 National Land Cover Dataset, Latest Version

# City of Corpus Christi Drought Hazard

LOCATION					
City Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Values of historical crop and pasture damages caused by drought are not available in the public domain by jurisdiction as confirmed by AgriLife and USDA Nueces County Farm Service Agency.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
24632.44			7.64%		

\*2011 National Land Cover Dataset, Latest Version

# City of Driscoll Drought Hazard

LOCATION					
City Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Values of historical crop and pasture damages caused by drought are not available in the public domain by jurisdiction as confirmed by AgriLife and USDA Nueces County Farm Service Agency.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
464.67			62.4%		

\*2011 National Land Cover Dataset, Latest Version



# City of Petronila Drought Hazard

LOCATION					
City Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Values of historical crop and pasture damages caused by drought are not available in the public domain by jurisdiction as confirmed by AgriLife and USDA Nueces County Farm Service Agency.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
926.66			79.36%		

\*2011 National Land Cover Dataset, Latest Version

# City of Port Aransas Drought Hazard

LOCATION					
City Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Not Applicable; City of Port Aransas does not have crop or pasture land within its jurisdiction.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
0			0%		

\*2011 National Land Cover Dataset, Latest Version

Port Aransas lacks crop or pasture lands. However, there are facilities within the jurisdiction that may be vulnerable to drought. Port Aransas has a significant tourism industry. If water restrictions are in place, that may negatively impact the operations of these facilities. While drought is not likely to directly impact tourism, it may lead to indirect economic impacts if drought-related water restrictions lead to facility interruptions.

A human being can only survive a few days without water. When discussing the very young, the very old, or the ill, the timeframe can be even shorter. About 23% of the population of Port Aransas is above the age of 65. About 2.4% of the population is below age 5. In total, 25.5% of the population may be vulnerable to drought based upon age-related characteristics.

# City of Robstown Drought Hazard

LOCATION					
City Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Values of historical crop and pasture damages caused by drought are not available in the public domain by jurisdiction as confirmed by AgriLife and USDA Nueces County Farm Service Agency.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
6580.37			66.32%		

\*2011 National Land Cover Dataset, Latest Version

# Port of Corpus Christi Authority Drought Hazard

LOCATION					
Jurisdiction Wide					
OCCURENCE	EXTENT				
Months of Drought (PHDI <-1) 1953-2016	Magnitude (PHDI Description)				
	Months of Incipient Drought	Months of Mild Drought	Months of Moderate Drought	Months of Severe Drought	Months of Extreme Drought
357	39	164	113	63	15
PROBABILITY					
Annual Chance of Drought (PHDI <-1)	Magnitude (PHDI Description)				
	Annual Chance of Incipient Drought	Annual Chance of Mild Drought	Annual Chance of Moderate Drought	Annual Chance of Severe Drought	Annual Chance of Extreme Drought
46%	5%	21%	15%	8%	2%
IMPACT					
Crop and Pasture Damage					
Not Applicable; PCCA does not have crop or pasture land within its jurisdiction.					
VULNERABILITY					
Crop and Pasture Land*					
Acres			Percent of Total Jurisdictional Area		
0			0%		

While PCCA lacks crop or pasture lands, there are facilities within the jurisdiction that may be vulnerable to drought. Numerous facilities within PCCA use open-air bodies of water in their operations. These facilities may be vulnerable to drought. These facilities include but are not limited to Flint Hills Resources LP, Citgo, Elementis Chromium LP, Valero Refining Co, and Koch Carbon Inc. While the ways in which these facilities use water resources varies, what remains constant is the fact that an interruption in water resources would result in negative economic impacts for these facilities.

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### Windstorms Hazard Overview

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#### Description

A windstorm is a storm with high winds or violent gusts with little or no rain. The windstorm hazard excludes extreme wind events that occur with other wind-related natural hazards such as hurricanes, tropical storms, and tornados which are addressed elsewhere in this plan.

#### Location

Windstorms do not have any specific geographic boundary and can occur throughout the county uniformly. It is assumed that the county planning area including all participating jurisdictions are uniformly exposed to windstorm activity. According to FEMA Wind Zones in the United States, Nueces County is located in Wind Zone III, associated to winds as high as 200 mph.

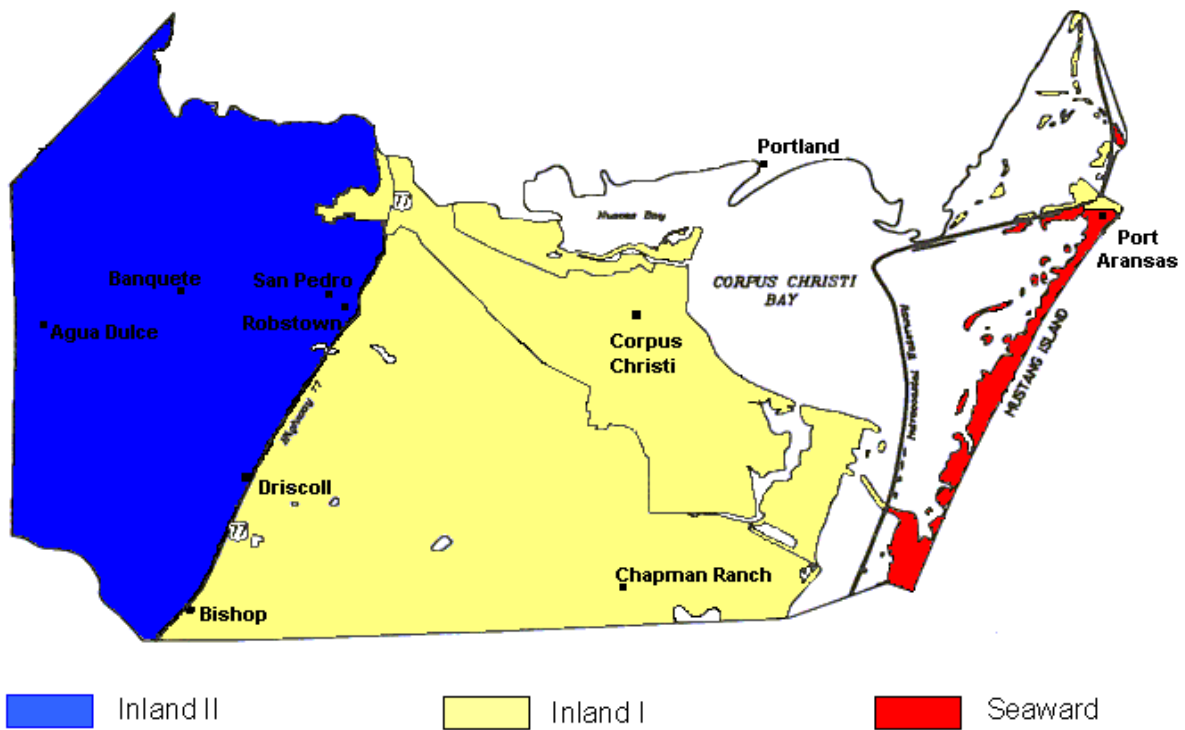
**Figure 8-1. FEMA Wind Zones in the United States**



The Texas Windstorm Insurance Association (TWIA) was established under the Texas Department of Insurance (TDI) by the Texas Legislature in 1971 following Hurricane Celia. TWIA provides windstorm and hail insurance along the Texas seacoast. Recommended design and inspection requirements for structures along the coast have been developed by TDI based on historical damages. Three designated catastrophe areas have been defined for Nueces County. Designated catastrophe areas are established for territories subject to unusually frequent and severe damage resulting from windstorm or hailstorms. Designated catastrophe areas for Nueces County include: Seaward, Inland I, and Inland II. Adopted design wind speeds for these designated catastrophe areas are shown in Figure 8-2 and defined below:

- Seaward: 130 mph 3-second gust design wind speed
- Inland I: 120 mph 3-second gust design wind speed
- Inland II: 110 mph 3-second gust design wind speed

**Figure 8-2. TDI Designated Catastrophe Areas**



### **Extent**

Windstorms extent is defined using the Beaufort Wind Scale. Table 8-1 summarizes the Beaufort Wind Scale.



**Table 8-1. Beaufort Wind Scale**

Force	Wind (Knots)	WMO Classification	Appearance of Wind Effects	
			On the Water	On Land
<b>0</b>	Less than 1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
<b>1</b>	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
<b>2</b>	4-6	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
<b>3</b>	7-10	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
<b>4</b>	11-16	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
<b>5</b>	17-21	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
<b>6</b>	22-27	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
<b>7</b>	28-33	Near Gale	Sea heaps up, waves 13-19 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind
<b>8</b>	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
<b>9</b>	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
<b>10</b>	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"
<b>11</b>	56-63	Violent Storm	Exceptionally high (37-52 ft.) waves, foam patches cover sea, visibility more reduced	
<b>12</b>	64+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	

Source: [www.spc.noaa.gov/faq/tornado/beaufort.html](http://www.spc.noaa.gov/faq/tornado/beaufort.html)

## Occurrences

Windstorms can occur at any time of year but they are typically more common during the spring and early summer. In Nueces County from 1956 – 2016, 69% of all windstorms took place between the months of March and June. According to the National Oceanic and Atmospheric Administration (NOAA) Storm Prediction Center, Nueces County has experienced 209 (recorded) windstorm events over the course of the record period from 9/26/1956 to 3/19/2016 (60 years). Table 8-2 includes a summary of windstorm events from 1950 to 2006, categorizing the events by wind speed. Table 8-3 includes a comprehensive list of all windstorm events on record within Nueces County. Historical windstorm events are mapped for the county and each participating jurisdiction in the following sections.

**Table 8-2. Historical Windstorm Occurrence Summary, 1956-2016**

Number of Events	Extent (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
209	51	94	18	24	7	10	5

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>1</sup>**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated Nueces County	9/26/1956	54	0	0	\$0	\$0
Robstown	10/4/1956	53	0	0	\$0	\$0
Robstown	10/4/1956	60	0	0	\$0	\$0
Unincorporated Nueces County	4/20/1957	68	0	0	\$0	\$0
Robstown	4/27/1957	Unknown	0	0	\$0	\$0
Corpus Christi	6/1/1957	62	0	0	\$0	\$0
Corpus Christi	6/1/1962	52	0	0	\$0	\$0
Corpus Christi	5/31/1964	65	0	0	\$0	\$0
Corpus Christi	2/6/1967	50	0	0	\$0	\$0
Corpus Christi	5/20/1967	50	0	0	\$0	\$0
Unincorporated Nueces County	5/11/1968	61			\$0	\$0
Corpus Christi	11/26/1969	Unknown			\$0	\$0
Unincorporated Nueces County	11/26/1969	67	0	0	\$0	\$0
Corpus Christi	1/6/1970	50			\$0	\$0
Unincorporated Nueces County	1/9/1970	57			\$0	\$0
Corpus Christi	6/1/1970	64	0	0	\$0	\$0
Corpus Christi	5/10/1971	0	0	0	\$0	\$0
Corpus Christi	9/10/1971	60	0	0	\$0	\$0
Corpus Christi	5/2/1972	50	0	0	\$0	\$0
Corpus Christi	6/5/1973	52	0	0	\$0	\$0
Unincorporated Nueces County	5/1/1974	Unknown	0	0	\$0	\$0
Unincorporated Nueces County	5/1/1974	52	0	0	\$0	\$0
Corpus Christi	5/26/1974	54	0	0	\$0	\$0

<sup>1</sup> NOAA

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>2</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	6/10/1975	50	0	0	\$0	\$0
Corpus Christi	6/10/1975	56	0	0	\$0	\$0
Corpus Christi	7/15/1975	Unknown	0	0	\$0	\$0
Port Aransas	8/5/1975	54			\$0	\$0
Corpus Christi	4/21/1979	Unknown	0	0	\$0	\$0
Unincorporated Nueces County	4/21/1979	Unknown	0	0	\$0	\$0
Corpus Christi	4/12/1980	Unknown	0	0	\$0	\$0
Corpus Christi	5/19/1980	Unknown	0	0	\$0	\$0
Corpus Christi	5/21/1980	54	0	0	\$0	\$0
Corpus Christi	5/21/1980	70	0	0	\$0	\$0
Corpus Christi	5/22/1980	Unknown	0	0	\$0	\$0
Corpus Christi	8/10/1980	58	0	0	\$0	\$0
Corpus Christi	8/10/1980	80	0	0	\$0	\$0
Port Aransas	8/10/1980	80	0	0	\$0	\$0
Bishop	7/11/1981	51	0	0	\$0	\$0
Unincorporated Nueces County	10/31/1981	60	0	0	\$0	\$0
Corpus Christi	5/12/1982	Unknown	0	0	\$0	\$0
Corpus Christi	5/12/1982	Unknown	0	0	\$0	\$0
Corpus Christi	5/12/1982	51	0	0	\$0	\$0
Bishop	6/6/1983	Unknown	0	0	\$0	\$0
Corpus Christi	10/7/1984	Unknown	0	0	\$0	\$0
Unincorporated Nueces County	10/7/1984	Unknown	0	0	\$0	\$0
Corpus Christi	5/8/1985	Unknown	0	0	\$0	\$0
Corpus Christi	5/21/1985	52	0	0	\$0	\$0
Corpus Christi	5/17/1986	Unknown	0	0	\$0	\$0

<sup>2</sup> NOAA

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>3</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	8/21/1986	Unknown	0	0	\$0	\$0
Corpus Christi	8/21/1986	Unknown	0	0	\$0	\$0
Port Aransas	8/21/1986	Unknown	0	0	\$0	\$0
Port Aransas	8/21/1986	64	0	0	\$0	\$0
Corpus Christi	2/27/1987	52	0	0	\$0	\$0
Corpus Christi	11/16/1987	52	0	0	\$0	\$0
Corpus Christi	4/29/1988	Unknown	0	0	\$5,000,000	\$0
Port Aransas	4/29/1988	54	0	0	\$5,000,000	\$0
Robstown	4/29/1988	Unknown	0	0	\$4,000,000	\$0
Corpus Christi	6/3/1988	Unknown	0	0	\$0	\$0
Corpus Christi	4/29/1989	Unknown	0	0	\$0	\$0
Unincorporated Nueces County	2/21/1990	50	0	0	\$0	\$0
Corpus Christi	3/28/1991	Unknown	0	0	\$3,000,000	\$0
Corpus Christi	3/28/1991	Unknown	0	0	\$3,000,000	\$0
Corpus Christi	5/8/1991	Unknown	0	0	\$4,000,000	\$0
Corpus Christi	5/8/1991	54	0	0	\$0	\$0
Corpus Christi	5/8/1991	54	0	0	\$0	\$0
Corpus Christi	3/3/1992	Unknown	0	0	\$4,000,000	\$0
Unincorporated Nueces County	3/3/1992	Unknown	0	0	\$4,000,000	\$0
Unincorporated Nueces County	4/17/1992	Unknown	0	0	\$3,000,000	\$0
Corpus Christi	5/5/1993	50	0	0	\$4,000,000	\$0
Corpus Christi	5/5/1993	50	0	0	\$50,000	\$0
Port Aransas	5/10/1993	Unknown	0	0	\$0	\$0
Robstown	5/10/1993	Unknown	0	0	\$0	\$0
Corpus Christi	9/26/1993	Unknown	0	0	\$0	\$5,000

<sup>3</sup> NOAA

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>4</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	4/15/1994	58	0	0	\$5,000	\$5,000
Corpus Christi	4/11/1995	58	0	0	\$3,000,000	\$0
Robstown	5/30/1995	60	0	0	\$30,000	\$0
Corpus Christi	5/11/1996	52	0	0	\$4,000,000	\$0
Bishop	9/20/1996	60	0	0	\$0	\$0
Corpus Christi	11/24/1996	60	0	0	\$0	\$0
Corpus Christi	11/24/1996	60	0	0	\$0	\$0
Unincorporated Nueces County	11/24/1996	70	0	0	\$0	\$0
Unincorporated Nueces County	5/9/1997	50	0	0	\$0	\$0
Port Aransas	5/9/1997	60	0	0	\$0	\$0
Unincorporated Nueces County	6/17/1997	60	0	0	\$0	\$0
Robstown	6/17/1997	50	0	0	\$0	\$100,000
Corpus Christi	2/12/1998	52	0	0	\$0	\$0
Port Aransas	6/15/1998	65	0	0	\$0	\$0
Unincorporated Nueces County	8/14/1998	60	0	0	\$0	\$0
Corpus Christi	3/28/1999	50	0	0	\$5,500,000	\$0
Corpus Christi	5/12/1999	50	0	0	\$0	\$0
Corpus Christi	5/12/1999	59	0	0	\$5,500,000	\$0
Corpus Christi	5/18/1999	50	0	0	\$0	\$0
Corpus Christi	5/18/1999	60	0	0	\$0	\$0
Corpus Christi	3/14/2000	55	0	0	\$0	\$0
Corpus Christi	3/14/2000	65	0	0	\$0	\$0
Corpus Christi	3/14/2000	68	0	0	\$10,000	\$0
Corpus Christi	6/7/2001	60	0	0	\$10,000	\$0

<sup>4</sup> NOAA

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>5</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	9/9/2001	50	0	0	\$0	\$0
Corpus Christi	9/9/2001	50	0	0	\$0	\$0
Corpus Christi	5/17/2002	50	0	0	\$0	\$0
Unincorporated Nueces County	5/17/2002	50	0	0	\$0	\$0
Bishop	5/29/2002	50	0	0	\$0	\$0
Corpus Christi	5/29/2002	52	0	0	\$0	\$0
Corpus Christi	5/29/2002	52	0	0	\$0	\$0
Corpus Christi	5/29/2002	57	0	0	\$0	\$0
Corpus Christi	10/23/2002	59	0	0	\$0	\$0
Corpus Christi	2/15/2003	50	0	0	\$0	\$0
Corpus Christi	2/15/2003	50	0	0		\$0
Corpus Christi	3/26/2003	50	0	0	\$0	\$0
Port Aransas	9/12/2003	50	0	0	\$0	\$0
Port Aransas	10/25/2003	60	0	0	\$0	\$0
Robstown	5/1/2004	52	0	0	\$100,000	\$0
Corpus Christi	3/19/2005	50	0	0	\$0	\$0
Unincorporated Nueces County	3/19/2005	50	0	0	\$0	\$0
Corpus Christi	5/8/2005	52	0	0	\$0	\$0
Corpus Christi	5/8/2005	60	0	0	\$0	\$0
Robstown	5/29/2005	50	0	0	\$0	\$0
Unincorporated Nueces County	11/15/2005	50	0	0	\$0	\$0
Corpus Christi	3/28/2006	51	0	0	\$0	\$0
Bishop	5/14/2006	52	0	0	\$0	\$0
Corpus Christi	5/14/2006	50	0	0	\$0	\$0
Corpus Christi	6/26/2006	50	0	0	\$2,000	\$0
Corpus Christi	6/26/2006	50	0	0	\$2,000	\$0

<sup>5</sup> NOAA

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>6</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated Nueces County	6/26/2006	50	0	0	\$3,000	\$0
Unincorporated Nueces County	6/30/2006	50	0	0	\$45,000	\$0
Unincorporated Nueces County	6/5/2007	65	0	0	\$40,000	\$0
Port Aransas	10/19/2007	54	0	0	\$50,000	\$0
Corpus Christi	3/6/2008	54	0	0	\$50,000	\$0
Bishop	3/10/2008	52			\$10,000	\$0
Corpus Christi	3/10/2008	58	0	0	\$50,000	\$0
Corpus Christi	3/10/2008	59	0	0	\$50,000	\$0
Unincorporated Nueces County	3/18/2008	52	0	0	\$5,000	\$0
Corpus Christi	8/28/2009	50	0	0	\$10,000	\$0
Unincorporated Nueces County	9/10/2009	52			\$10,000	\$0
Robstown	9/10/2009	52			\$10,000	\$0
Unincorporated Nueces County	10/9/2009	56	0	0	\$10,000	\$0
Unincorporated Nueces County	10/26/2009	61	0	0	\$20,000	\$0
Corpus Christi	6/2/2010	56	0	6	\$1,000,000	\$0
Corpus Christi	6/2/2010	58	0	0	\$700,000	\$0
Corpus Christi	6/2/2010	70	0	0	\$100,000	\$0
Corpus Christi	6/2/2010	78	0	0	\$250,000	\$0
Driscoll	6/2/2010	52	0	0	\$100,000	\$0
Corpus Christi	1/9/2011	51	0	0	\$0	\$0
Corpus Christi	1/9/2011	60	0	0	\$500,000	\$0
Corpus Christi	1/9/2011	70	0	0	\$10,000	\$0
Corpus Christi	1/9/2011	78	0	0	\$700,000	\$0
Driscoll	1/9/2011	52	0	0	\$0	\$0

<sup>6</sup> NOAA



**Table 8-3. Historical Windstorm Events, 1956-2016<sup>7</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Robstown	1/9/2011	70	0	0	\$500,000	\$0
Corpus Christi	8/25/2011	78	0	0	\$500,000	\$0
Corpus Christi	9/19/2011	51	0	0	\$1,000	\$0
Corpus Christi	9/19/2011	52	0	0	\$5,000	\$0
Unincorporated Nueces County	9/19/2011	52	0	0	\$10,000	\$0
Unincorporated Nueces County	9/19/2011	52	0	0	\$10,000	\$0
Robstown	9/29/2011	52	0	0	\$10,000	\$0
Unincorporated Nueces County	3/20/2012	50	0	0	\$10,000	\$0
Unincorporated Nueces County	3/20/2012	50	0	0	\$10,000	\$0
Corpus Christi	3/29/2012	50	0	0	\$10,000	\$0
Unincorporated Nueces County	3/29/2012	61	0	0	\$10,000	\$0
Unincorporated Nueces County	4/2/2012	52	0	0	\$10,000	\$0
Corpus Christi	5/8/2012	50	0	0	\$10,000	\$0
Unincorporated Nueces County	5/8/2012	52	0	0	\$10,000	\$0
Corpus Christi	5/10/2012	52			\$30,000	\$0
Corpus Christi	5/10/2012	52	0	0	\$0	\$0
Corpus Christi	5/10/2012	52			\$0	\$0
Corpus Christi	5/10/2012	65	0	0	\$50,000	\$0
Corpus Christi	5/10/2012	70	0	0	\$1,000,000	\$100,000
Corpus Christi	5/10/2012	70	0	0	\$100,000	\$0
Unincorporated Nueces County	5/10/2012	52	0	0	\$10,000	\$0

<sup>7</sup> NOAA

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>8</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Unincorporated Nueces County	5/10/2012	52			\$0	\$0
Unincorporated Nueces County	5/10/2012	70	0	0	\$100,000	\$100,000
Unincorporated Nueces County	5/10/2012	70			\$1,000,000	\$100,000
Robstown	5/10/2012	52	0	0	\$25,000	\$0
Corpus Christi	11/3/2012	53	0	0	\$25,000	\$0
Corpus Christi	11/3/2012	59	0	0	\$0	\$0
Corpus Christi	11/3/2012	61	0	0	\$30,000	\$0
Port Aransas	11/3/2012	53	0	0	\$0	\$0
Corpus Christi	6/7/2013	50	0	0	\$10,000	\$0
Corpus Christi	6/30/2013	50	0	0	\$0	\$0
Unincorporated Nueces County	9/2/2013	50	0	0	\$2,000	\$0
Unincorporated Nueces County	4/4/2014	52	0	0	\$10,000	\$0
Unincorporated Nueces County	4/12/2015	50	0	0	\$0	\$0
Corpus Christi	4/14/2015	51	0	0	\$0	\$0
Corpus Christi	4/14/2015	52	0	0	\$10,000	\$0
Corpus Christi	4/14/2015	54	0	0	\$5,000	\$0
Corpus Christi	4/14/2015	55	0	0	\$500,000	\$0
Driscoll	4/14/2015	56	0	0	\$10,000	\$0
Corpus Christi	4/22/2015	52	0	0	\$10,000	\$0
Unincorporated Nueces County	4/22/2015	61	0	0	\$10,000	\$0
Unincorporated Nueces County	4/22/2015	61	0	0	\$3,000,000	\$0
Corpus Christi	5/12/2015	51	0	0	\$0	\$0
Corpus Christi	5/12/2015	52	0	0	\$100,000	\$0

<sup>8</sup> NOAA

**Table 8-3. Historical Windstorm Events, 1956-2016<sup>9</sup> (cont.)**

Jurisdiction	Date	Extent (Wind Speed in Knots)	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	5/12/2015	57	0	0	\$0	\$0
Bishop	5/15/2015	52	0	0	\$20,000	\$0
Corpus Christi	5/15/2015	51	0	0	\$100,000	\$0
Corpus Christi	5/15/2015	56	0	0	\$100,000	\$0
Corpus Christi	5/24/2015	52	0	0	\$10,000	\$0
Corpus Christi	7/31/2015	50	0	0	\$30,000	\$0
Agua Dulce	3/18/2016	61	0	0	\$20,000	\$0
Bishop	3/18/2016	56	0	0	\$20,000	\$0
Corpus Christi	3/18/2016	59	0	0	\$0	\$0
Corpus Christi	3/18/2016	61	0	0	\$2,000	\$0
Corpus Christi	3/18/2016	68	0	0	\$4,300,000	\$0
Driscoll	3/18/2016	61	0	0	\$100,000	\$0
Driscoll	3/18/2016	61	0	0	\$60,000	\$0
Unincorporated Nueces County	3/18/2016	65	0	0	\$0	\$0
Petronila	3/18/2016	61	0	0	\$25,000	\$0
Robstown	3/18/2016	52	0	0	\$0	\$0
Corpus Christi	3/19/2016	61	0	0	\$10,000	\$0
Unincorporated Nueces County	3/19/2016	55	0	0	\$0	\$0

**Table 8-4 Nueces County Windstorm-Related Disaster Declarations**

Disaster Number	Declaration Date	Incident Begin Date	Incident End Date	Public Assistance Grants
1439	11/5/2002	10/24/2002	11/15/2002	\$57,974,742
1709	6/29/2007	6/16/2007	8/3/2007	\$25,706,394
4223	5/29/2015	5/4/2015	6/23/2015	\$156,797,067

<sup>9</sup> NOAA

## Probability

Probability, or frequency of return, was calculated by dividing the number of windstorm events in the recorded time period by the overall time period that the resource database has recorded events for that jurisdiction. Note, historical events are documented as a function of the path of the storm. A windstorm may travel over several jurisdictions; consequently, the windstorm event is recorded for all jurisdictions through which the windstorm passed. Probability for future windstorm events is defined for the county and each participating jurisdiction in the following sections.

## Impact

Windstorm impacts are documented by the number of deaths, injuries, property damage, and crop damage. Table 8-4 provides a summary of impacts for Nueces County as a whole. Impacts to the county and participating jurisdictions is documented in the following sections.

**Table 8-5. Historical Windstorm Impacts Summary, 1956-2016**

Number of Events	Deaths	Injuries	Property Damage	Crop Damage
209	0	6	\$72,872,000	\$410,000

In addition to the direct, historical impacts in Table 8-5, vulnerable assets and potential maximum impacts are listed in the jurisdictional tables. Because the impacts of windstorms are closely tied to the extent of the event and windstorms are expected to be evenly distributed throughout the planning area, maximum impacts are listed in the jurisdictional tables. Fortunately, it is unlikely that a worst case scenario windstorm would ever take place and maximize damages. Windstorms can cause indirect impacts by damaging power lines and other above-ground utilities. Crop losses and population displacement from housing damage could cause additional economic losses.

## Vulnerability

Windstorms often cross-jurisdictional boundaries; therefore, all existing and future buildings, facilities, and populations in and around Nueces County are exposed to windstorm hazard and are at potential risk of impact. The damage caused by a windstorm is typically a result of high wind velocity and wind-blown debris. Vulnerability of humans and property is difficult to evaluate given that windstorm form at different strengths and in random locations. Property damage is typically most significant for structures of light construction. Three types of structures are more likely to suffer damage: manufactured

homes, homes on crawlspaces (more susceptible to lift), and buildings with large spans, such as shopping malls, gymnasiums, and factories. Vulnerability is defined for the county and participating jurisdictions in the following sections.

# Unincorporated Nueces County Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
County Wide (Unincorporated)	Seaward, Inland 1, and Inland 2

Number of Events	Extent (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
45	10	19	2	8	3	3	0

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
45	0	0	\$11,335,000	\$200,000

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
45	9/26/1956 to 3/19/2016	60	75%

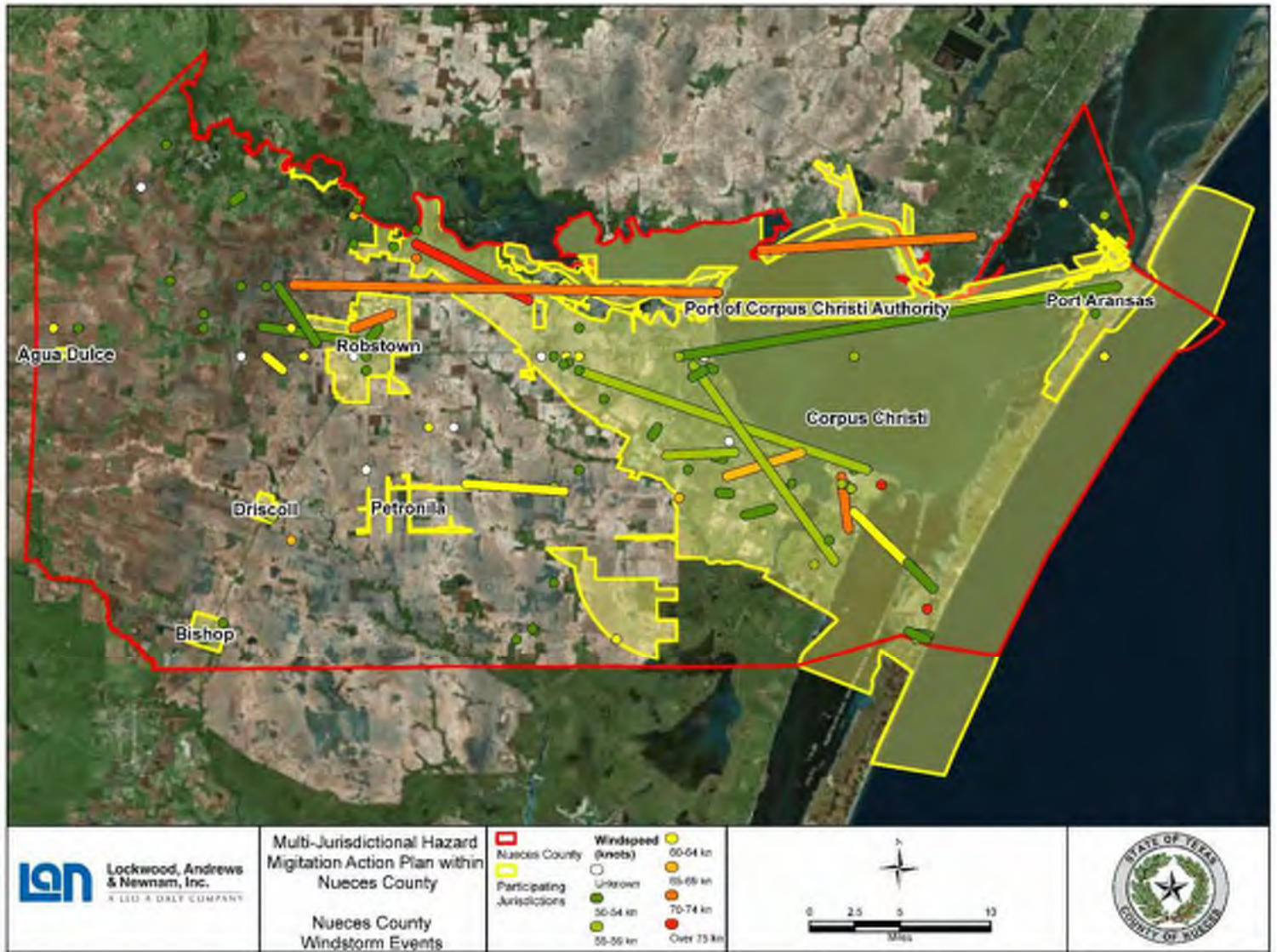
VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
15,274	\$373,034,606	\$487,429,634	345,880.3	\$76,735,126.03

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 8-3. Unincorporated Nueces County Windstorm Events



# City of Agua Dulce Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Inland 2

Number of Events	Extent (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
1	1	0	0	0	0	0	0

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
1	0	0	\$20,000	\$0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
1	3/18/2016	66	1.5%

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
820	\$17,541,361	\$20,711,243	2.45	\$601.78

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 8-4. City of Agua Dulce Windstorm Events



# City of Bishop Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Inland 1 and Inland 2

Number of Events	Extent (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
8	2	5	0	1	0	0	0

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
8	0	0	\$50,000	\$0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
8	7/11/1981 to 3/18/2016	35	22.9%

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
3,150	\$115,889,915	\$99,373,071	539.02	\$132,257.68

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 8-5. City of Bishop Windstorm Events



# City of Corpus Christi Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Seaward, Inland 1, and Inland 2

Number of Events	Extent (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
123	29	57	15	10	3	5	4

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
123	0	6	\$51,447,000	\$110,000

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
123	6/1/1957 to 3/19/2016	59	208.5%

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
324,074	\$7,007,832,685	\$10,238,656,508	24632.44	\$6,044,014.65

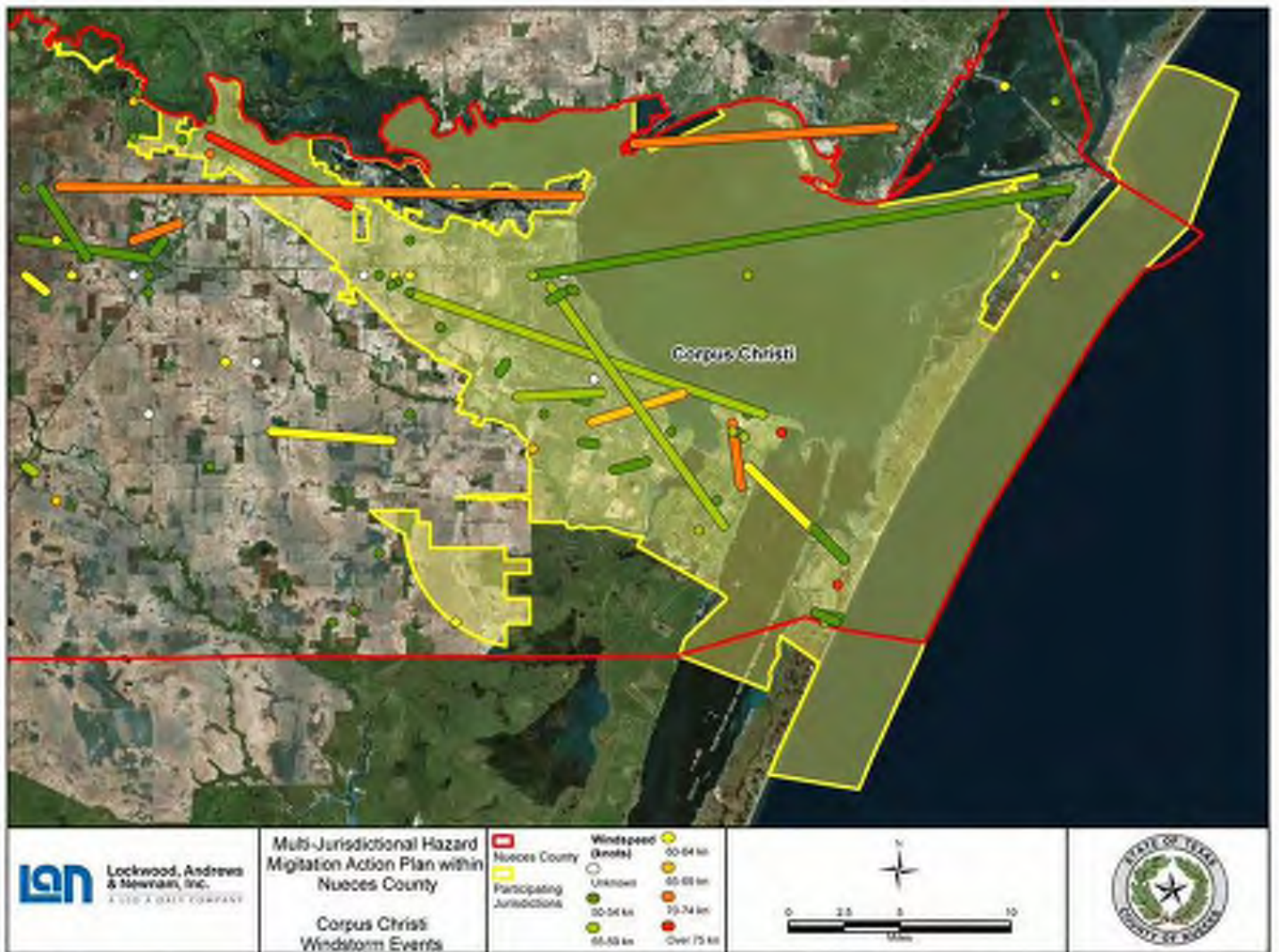
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 8-5. City of Corpus Christi Windstorm Events



# City of Driscoll Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Inland 1 and Inland 2

Number of Events	Extent (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
5	2	2	1	0	0	0	0

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	\$270,000	\$0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
5	6/2/2010 to 3/18/2016	6	83.3%

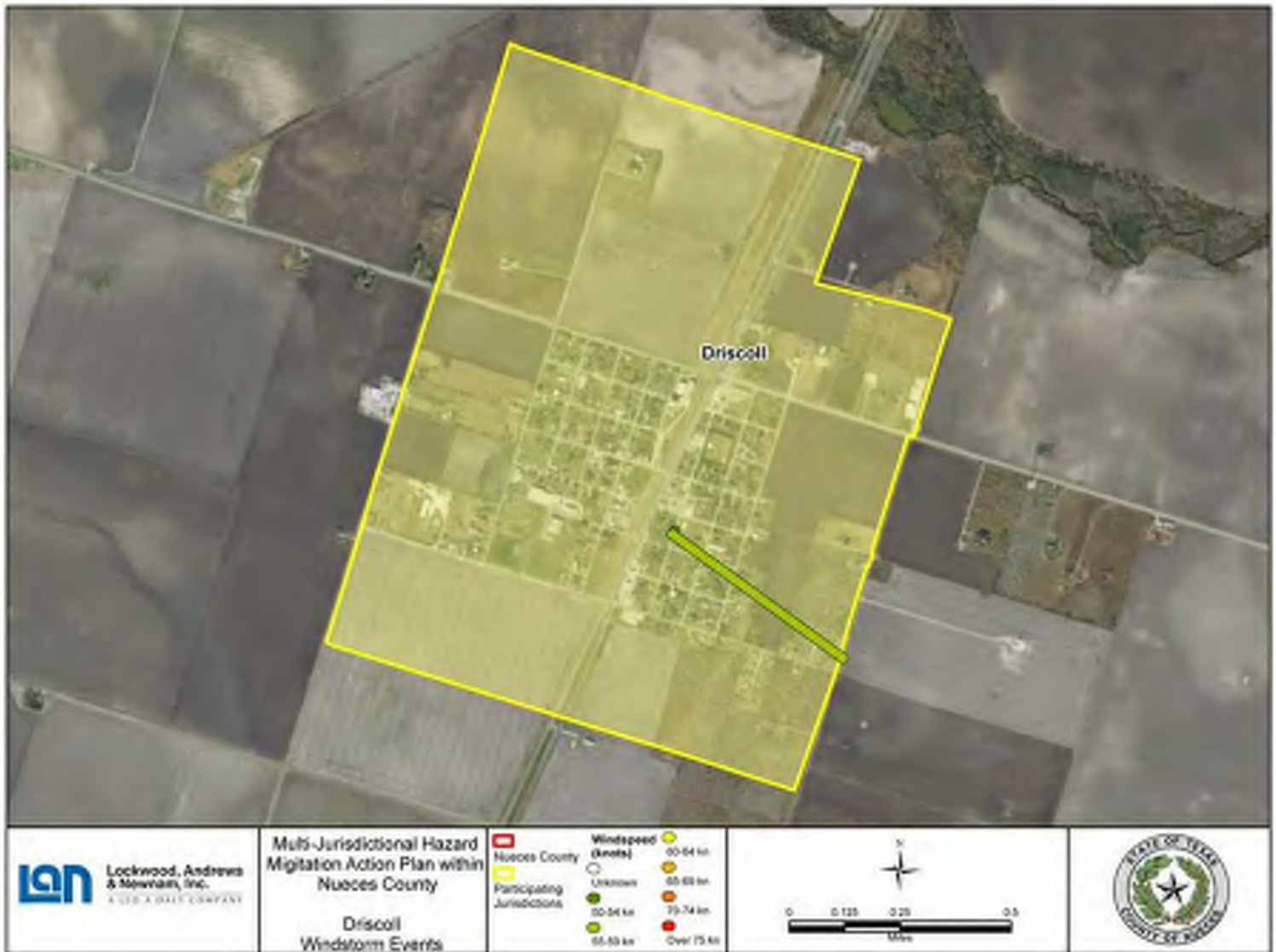
VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
752	\$25,502,273	\$13,255,055	464.67	\$114,014.81

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 8-6. City of Driscoll Windstorm Events



# City of Petronila Windstorms Hazards

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Inland 1

Number of Events	Magnitude (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
1	0	0	0	1	0	0	0

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
1	0	0	\$25,000	\$0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
1	1950-2016*	20*	5%

\*TDEM-suggested time period for a 2016 event

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
114	\$3,714,796	\$3,201,138	926.66	\$227,373.01

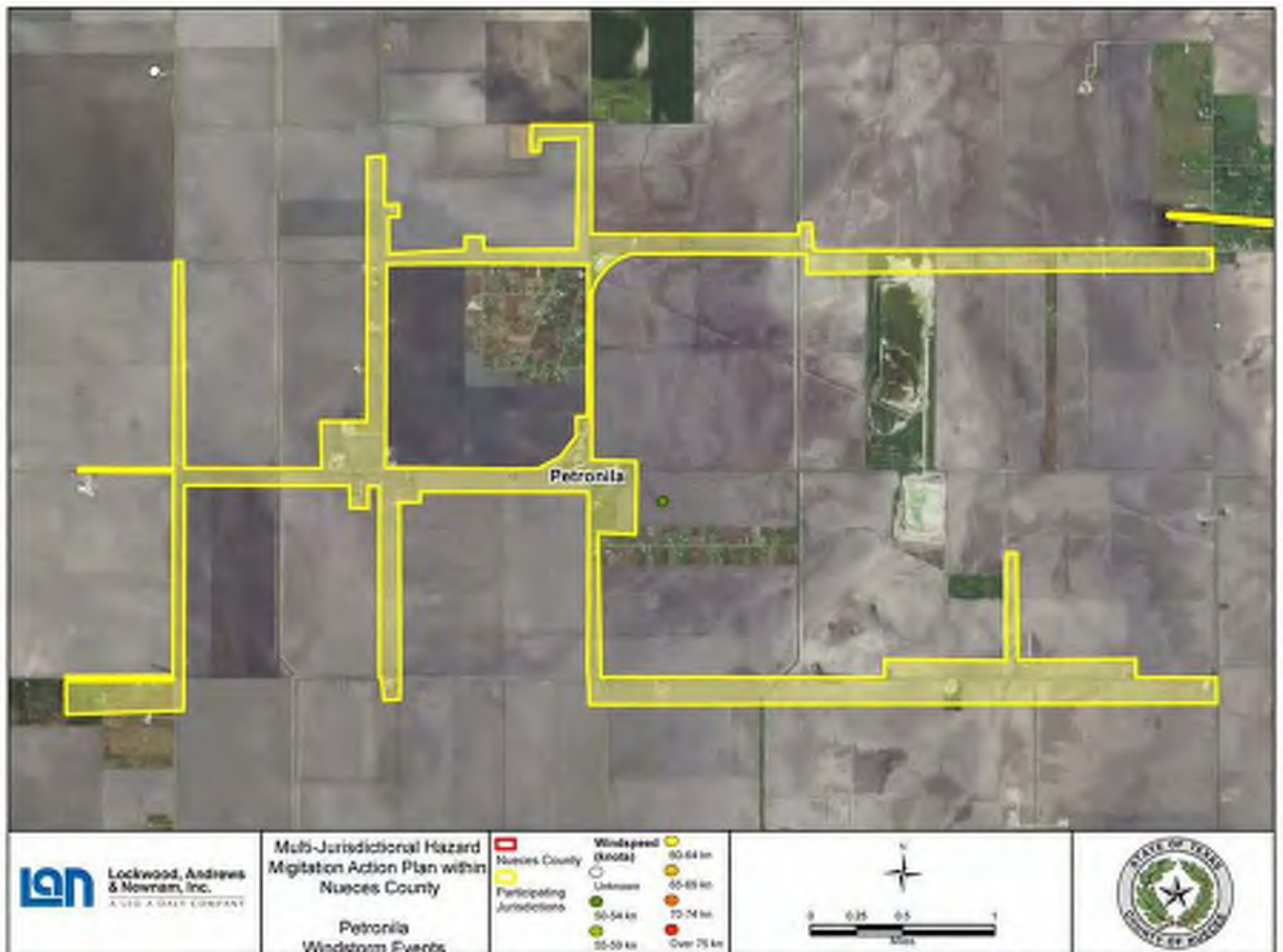
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 8-7. City of Petronila Windstorm Events



# City of Port Aransas Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Seaward and Inland 1

Number of Events	Extent (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
12	2	5	0	3	1	0	1

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
12	0	0	\$5,050,000	\$0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
12	8/5/1975 to 11/3/2012	37	32.4%

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
3,955	\$414,531,219	\$774,547,552	0	\$0

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 8-8. City of Port Aransas Windstorm Events



# City of Robstown Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
City Wide	Inland 1 and Inland 2

Number of Events	Magnitude (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
14	5	6	0	2	0	1	0

Number of Events	Deaths	Injuries	Property Damage	Crop Damage
10	0	0	\$4,675,000	\$100,000

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
10	10/4/1956 to 3/18/2016	60	16.7%

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
11,576	\$151,390,423	\$183,445,540	6580.37	\$1,614,612.05

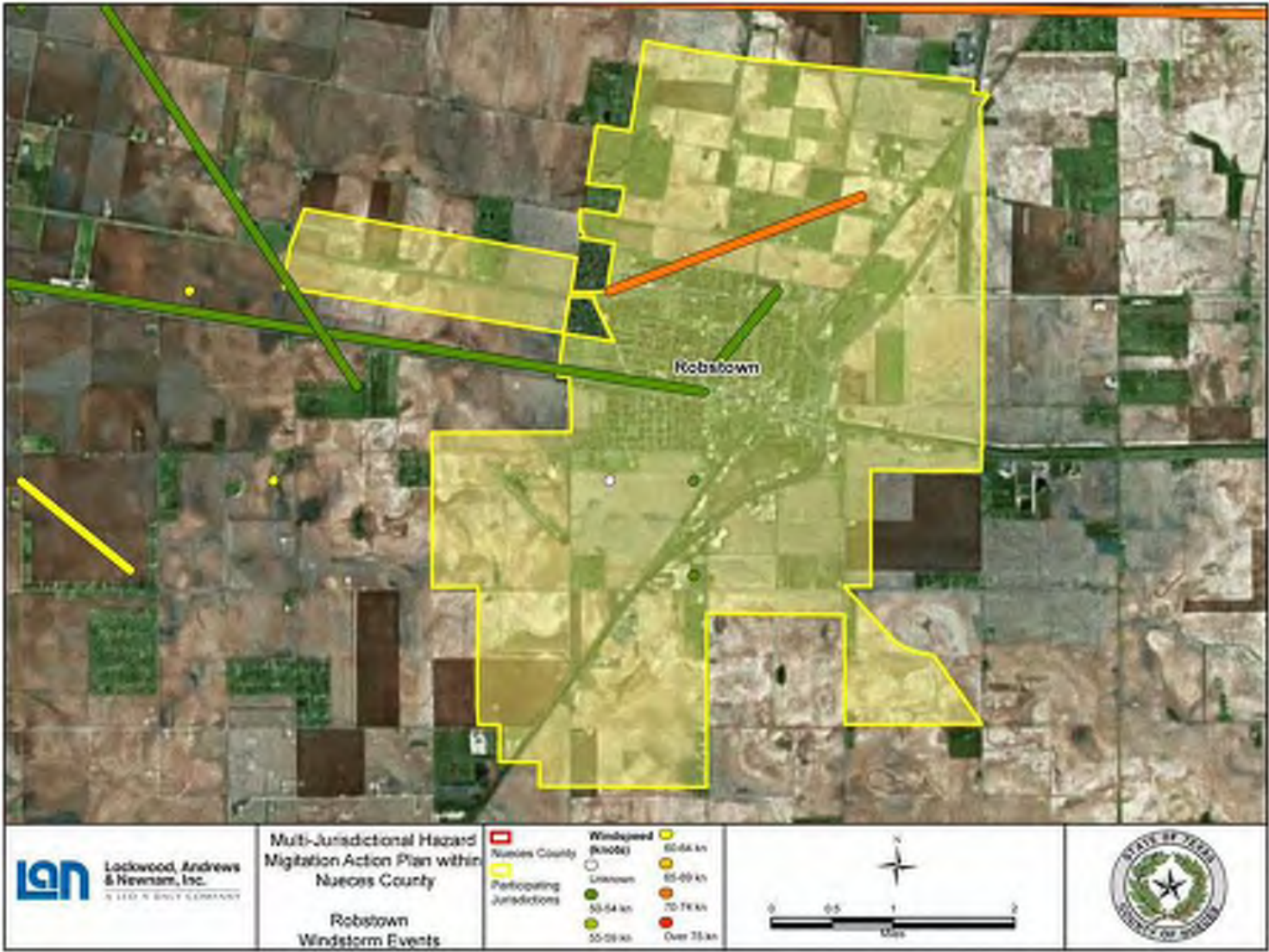
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 8-9. City of Robstown Windstorm Events



# Port of Corpus Christi Authority Windstorms Hazard

LOCATION	
Area at Risk	Designated Catastrophe Area
Jurisdiction Wide	Inland 1

Number of Events	Magnitude (Wind Speed in Knots)						
	Unknown	50-54	55-59	60-64	65-69	70-74	75+
1	0	0	0	0	0	1	0

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
2	0	0	\$1,050,000	\$100,000

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
2	5/10/2012	5	40.0%

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
N/A Industrial Area	\$174,026,681	\$0	0	\$0

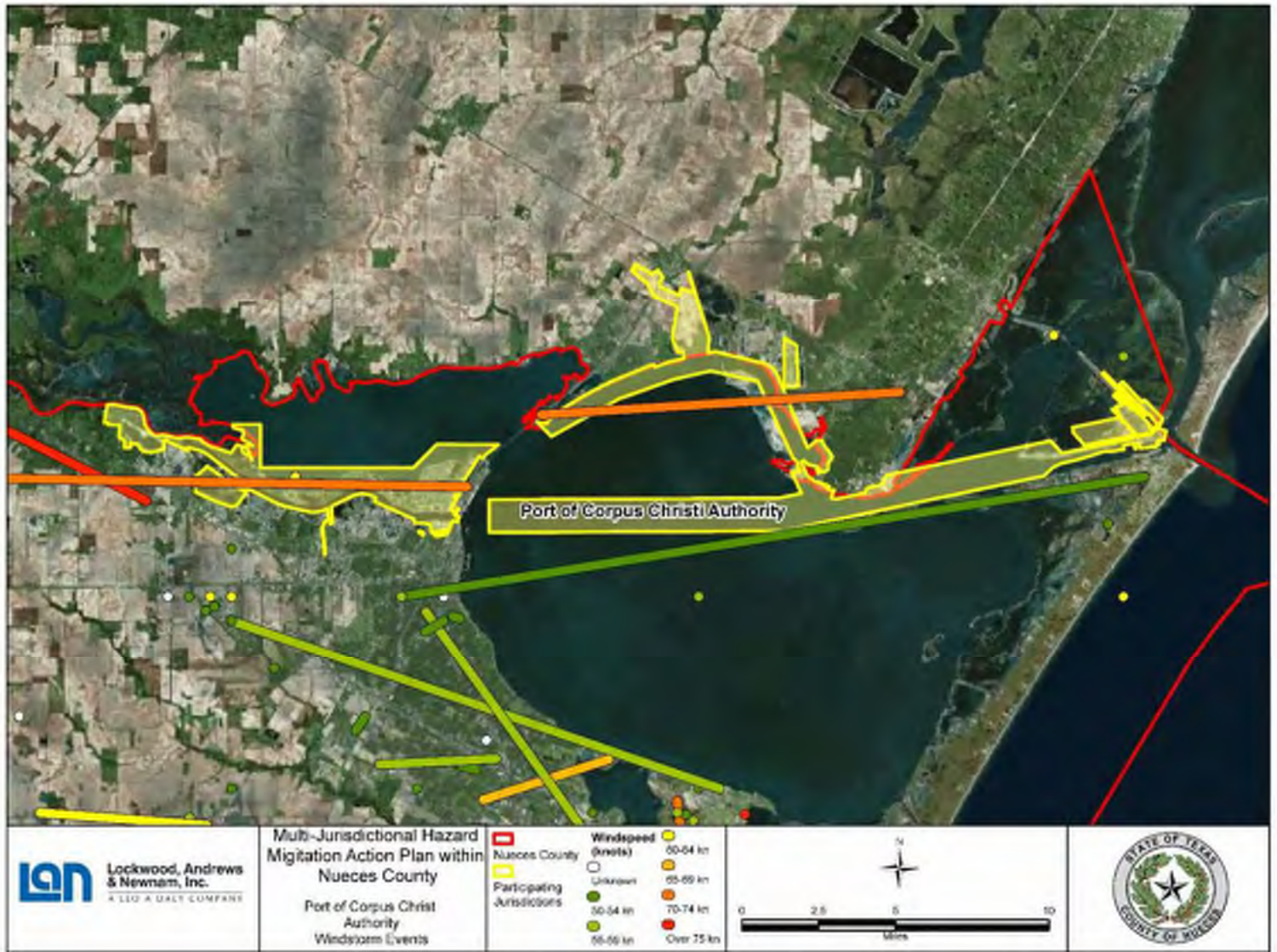
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 8-10. Port of Corpus Christi Authority Windstorm Events





## Section 9: Extreme Heat

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### Extreme Heat Hazard Overview

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#### Description

Extreme heat is the condition whereby temperatures hover ten degrees or more above the average high temperature in a region for an extended period. If extreme heat conditions persist, it may be considered a heat wave.

#### Location

Climate and weather are major drivers of extreme heat. The spatial and temporal ranges at which these forces operate are relatively large scale, putting the entire planning area in risk.

A phenomenon known as heat islanding may mean that urban areas are at slightly higher risk than nearby rural areas. Man-made surfaces such as concrete and asphalt absorb thermal energy from the sun during the day. During night time, this thermal energy is released. This cyclical process ensures that ambient temperature remains high through the city. The heat islanding effect may cause temperatures to be up to 10 degrees higher in urban areas than in surrounding rural areas.

## Extent

Extreme heat is most dangerous in the summer months. Extreme heat is not just a factor of temperature; humidity plays a role as well. An extreme heat event may occur with air temperature as low as 80°F if the relative humidity is over 40%. An 80°F temperature seems low, particularly for Texas in the summer, so people may not be aware of the risk to extreme heat and therefore may not adequately prepared for the effects of extreme heat. Citizens of the planning area, particularly populations vulnerable to extreme heat, should avoid prolonged heat exposure.

**Table 9-1. NOAA's National Weather Service Heat Index, Temperature (F°)**

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

### Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution
  Extreme Caution
  Danger
  Extreme Danger

NOAA's National Weather Service Heat Index table shows how humidity and temperature interact to endanger people who are engaged in strenuous activity or are exposed to the environment without any protection. It should be noted that these risks exist even if the area is not currently experiencing conditions that qualify as an extreme heat event. The normal high temperatures may be enough to endanger human health.

**Table 9-2 – Previous maximum temperatures**

**This is the worst that can be expected in the future.**

Jurisdiction	Date	Temperature	Heat Index
Unincorporated Nueces County	September 2000	109°	137°+
Agua Dulce	September 2000	109°	137°+
Bishop	September 2000	109°	137°+
Corpus Christi	September 2000	109°	137°+
Driscoll	September 2000	109°	137°+
Petronila	September 2000	109°	137°+
Port Aransas	September 2000	109°	137°+
Robstown	August 1983	113°	137°+
Port of Corpus Christi Authority	September 2000	109°	137°+

## Occurrences

Extreme heat events typically occur in summer months during periods of high heat and high humidity. According to the NCDC, five extreme heat events took place in Nueces County from 1950 to 2016. All events are recorded at the county level, though comments may reflect noteworthy events at the municipal level.

**Table 9-3. Previous Occurrences**

Date	Comments
8/31/2000	Corpus Christi International Airport reported a high of 103 degrees, tying the record high temperature for August.
9/1/2000 to 9/5/2000	Corpus Christi reached an all-time high temperature of 109 degrees on 9/5/2000. This date may be the overall hottest day on record in South Texas. Other jurisdictions in South Texas reported all-time highs on the day.
5/10/2006	For a period of about five hours, temperatures climbed into the low-100s ahead of a cold front.
8/1/2011	Temperatures in Nueces County ranged from 100 – 108 degrees. Heat index values were around 110 degrees. The conditions led to the death of a homeless man in Corpus Christi due to dehydration and heat stroke.
9/8/2015	Temperatures were around 90 degrees with a 100 degree heat index. A four year month old Corpus Christi boy was found dead inside a car after about 40 minutes. <sup>1</sup>

<sup>1</sup><http://www.mysanantonio.com/news/local/crime/article/Corpus-Christi-father-indicted-arrested-for-6948457.php>

The state of Texas is generally very hot in the summer. From 1999 – 2016, 247 heat-related deaths were reported by the NCDC in the state of Texas. Remarkably, forty-seven of the heat-related deaths occurred during the evacuation of hurricane Rita.

### **Probability**

The five historical heat events reported by NCDC from 1950 to 2016 suggest that the planning area and all participating jurisdictions can expect a 7.5% annual occurrence of extreme heat events. The expected reoccurrence interval of extreme heat events is about 13.2 years. Extreme heat events are expected to take place in summer months based on previous occurrences which were reported in the months of May through September.

### **Impact**

The risks associated with extreme heat tend to most greatly impact humans. Buildings are not likely to be damaged by extreme heat. The populations most at risk are children, the elderly, those in poor health, and those who spend large portions of their time outside. According to the latest compiled study on heat related deaths by the National Center for Environmental Health, from 1999-2009, the most recent years for which a report of this nature has been compiled, extreme heat exposure led to 7,233 deaths in the United States. The victims of extreme heat tended to be male (69%) and over the age of 65 (39%). The overwhelming majority of deaths (94%) occurred in the summer months of May to September.

Extreme heat can impact agricultural industries in the form of crop or livestock losses. Extreme heat may cause economic impacts related to damage crops and grazing lands caused by reduced productivity of workers.

### **Vulnerability**

Due to the uniformity of extreme heat events across the planning area, jurisdictional variations in vulnerability provide the most informative perspective from which to examine differences in extreme heat within the planning area. Males and those over the age of 65 tend to be the populations most vulnerable to extreme heat hazards. Demographic information regarding these populations follow in the jurisdictional tables. Agricultural assets are also vulnerable to extreme heat. Livestock and crops can be damaged or killed by extreme heat. Information regarding the vulnerability of agricultural assets follows in the jurisdictional tables.

# Unincorporated Nueces County Extreme Heat Hazard

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LOCATION			
County Wide (Unincorporated)			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
15,274	7,542	2,501	1,112
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
31,2734.7	73.77%	\$76,735,126.03	

## City of Agua Dulce Extreme Heat Hazard

---

LOCATION			
City Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
820	387	108	47
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
2.45	1.12%	\$601.78	

# City of Bishop Extreme Heat Hazard

---

LOCATION			
City Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
3,150	1,597	693	241
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
539.02	35.57%	\$132,257.68	



# City of Corpus Christi Extreme Heat Hazard

---

LOCATION			
City Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
324,074	159,120	40,509	17,503
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
24,632.44	7.64%	\$6,044,014.65	

# City of Driscoll Extreme Heat Hazard

---

LOCATION			
City Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
752	340	136	57
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
464.67	62.4%	\$114,014.81	

# City of Petronila Extreme Heat Hazard

---

LOCATION			
City Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
114	68	19	15
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
926.66	79.36%	\$227,373.01	

# City of Port Aransas Extreme Heat Hazard

LOCATION			
City Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
3,955	1,776	910	373
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
0	0%	\$0.00	

# City of Robstown Extreme Heat Hazard

---

LOCATION			
City Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
11,576	5,649	1,505	469
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
6580.37	66.32%	\$1,614,612.05	

# Port of Corpus Christi Authority Extreme Heat Hazard

LOCATION			
Jurisdiction Wide			
VULNERABILITY			
Total Population	Male Population	Total Population Over 65	Male Population Over 65
N/A	N/A	N/A	N/A
Agricultural Area (Acres)	Agricultural Area (Percentage of Jurisdiction)	Agricultural Value	
0	0%	\$0	

The Port of Corpus Christi Authority lacks vulnerable agricultural area or resident populations. However, the Port of Corpus Christi Authority is major regional employer, directly employing 13,770 people. Many of the employment positions expose employees to environmental heat hazards. Additionally, facilities within the Port of Corpus Christi Authority make use of air conditioning equipment. During times of extreme heat, these facilities may put additional burden on air conditioning equipment. Should the air conditioning fail, these facilities may become hazardous and may expose employees to injurious or fatal heat.

## Section 10: Lightning

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### Lightning Hazard Overview

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#### Description

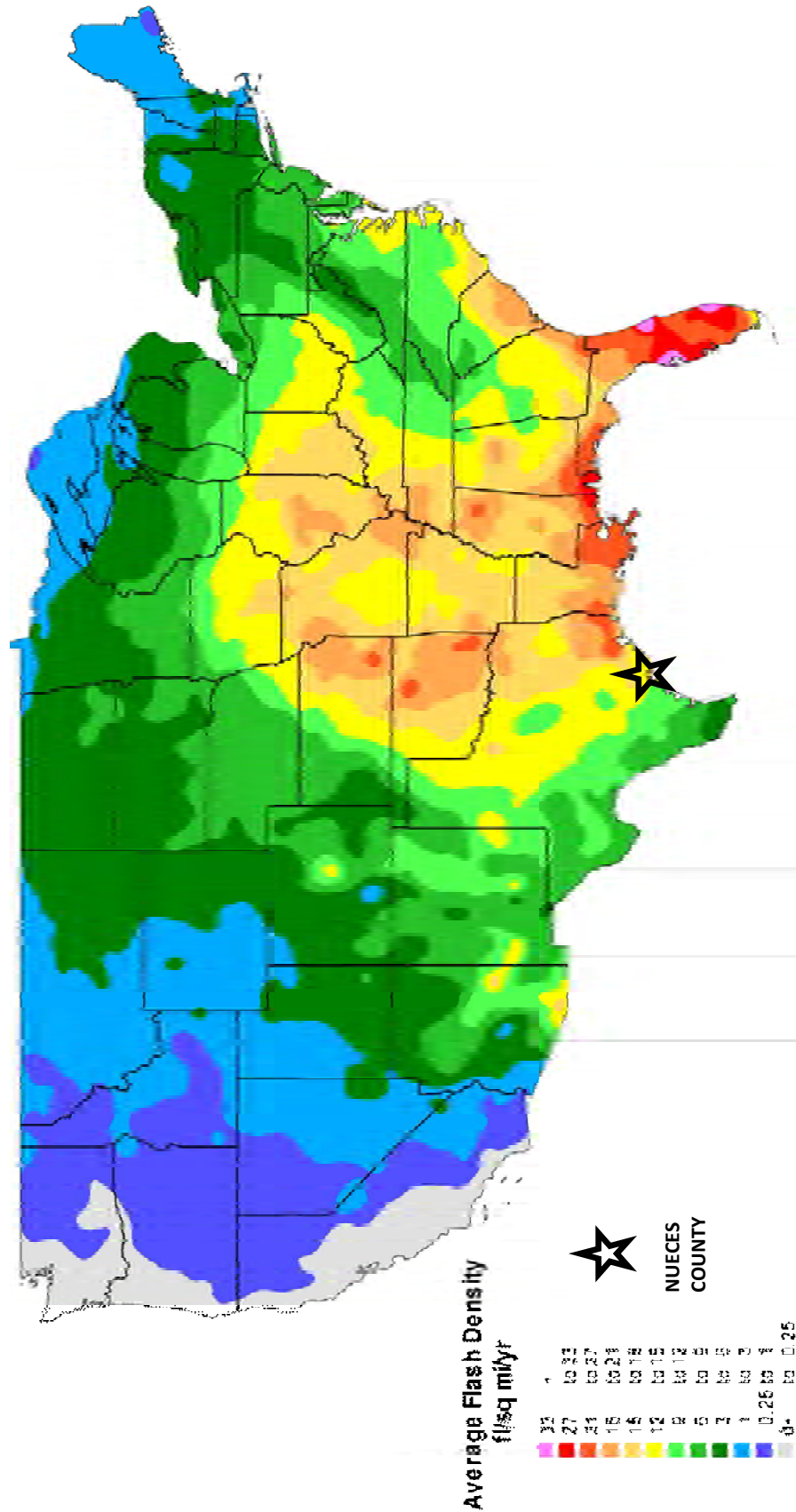
Lightning is a sudden electrostatic discharge during an electrical storm between electrically charged regions of a cloud, between that cloud and another cloud, or between a cloud and the ground.

#### Location

Worldwide, there is predictable spatial variation in the frequency of lightning strikes. However, when examining lightning activity at smaller scales, such as the county or community level, the distribution of lightning events is evenly distributed. Lightning does not have any specific geographic boundary and can occur throughout the county uniformly. It is assumed that the county planning area including all participating jurisdictions are uniformly exposed to lightning activity.



Figure 10-1. Cloud-to-Ground Lightning Incidence in the Continental U.S. (1997-2010)



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## Extent

Lightning extents can be described in terms of the frequency of lightning strikes within a time frame. Lightning Activity Levels (LAL) is one of the metrics used to describe lightning extent.

**Table 10-1. Lightning Activity Levels (LAL)**

LAL Value	Cloud and Storm Description <sup>1</sup>	Strikes per 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.	

All participating jurisdictions are vulnerable to LAL5. The worst lightning extent the planning area and all participating jurisdictions can expect to experience is LAL5.

## Occurrence

NCDC records from 1950 – 2016 show four records of lightning strikes within the planning area. Corpus Christi recorded three events and Port Aransas recorded one event. None of these events recorded any property damage. Unfortunately, the Port Aransas event resulted in the death of a 63-year-old beach goer.

The Port of Corpus Christi Authority website history section recalls a lightning strike on a grain elevator damaging property and killing a night watchman. No estimates for damage

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<sup>1</sup> From <http://www.prh.noaa.gov/hnl/pages/LAL.php>

were provided. The Port of Corpus Christi Authority's website history section covers a date range of 1920 – 2016.

Texas A&M Forest service records show that from 2005 – 2015, one lightning-started fire took place in Nueces County and one lightning-started fire took place in Corpus Christi.

Lightning occurrences are discussed in greater detail in the jurisdictional tables.

### **Probability**

The probability of a lightning strike is calculated by dividing the number of events by the number of years for which records exist. For jurisdictions without records, a probability of 1% will be applied. Because lightning is assumed to take place uniformly within the planning area and the Port of Corpus Christi Authority experienced one event in 96 years, it is assumed that the probability of a lightning strike is similar for other jurisdictions in the planning area.

### **Impact**

Each individual lightning strike has a very small spatial extent. Only the facilities hit by lightning are expected to be damaged. Facility shutdowns are expected to be less than 24 hours. Deaths are possible, but rare. In the 96 years of history provided by the Port of Corpus Christi Authority and the 66 records from NCDC, only two lightning deaths were recorded. Injuries to lightning are also rare. One of the lightning strikes in Corpus Christi in NCDC records was a lightning strike on an occupied truck. The person inside the vehicle was not killed or injured. Another one of the NDCD in Corpus Christi involved three people who were nearly struck by lightning while playing golf. The record indicates that even though they were very close to the lightning strike, “[injuries] were very minor.”

The downstream impacts of a lightning strike have the potential to be damaging. Lightning strikes have the potential to spark wildfires, cause explosions or fires if they hit combustible materials, or damage power infrastructure. Lightning impacts are provided for each jurisdiction as a function of the potential future losses including commercial property value and agricultural value. Commercial property value for each jurisdiction was compiled from the Nueces County Appraisal Role. Agricultural value for each jurisdiction is a function of the total agricultural lands shown in the National Land Cover Database divided by the total agricultural land for the county and multiplied by the total agricultural value for Nueces County from the 2012 Agricultural Census.

### **Vulnerability**

The vulnerabilities to lightning come in the form of assets that may be damaged by a strike or in the form of agricultural land that would be vulnerable to lightning-started wildfires. The Port of Corpus Christi Authority may be a particularly vulnerable jurisdiction. Much of the equipment and facilities within the jurisdiction are quite tall and made of metal.

These assets may be the fastest way for lightning to discharge. Communities with higher concentrations of commercial buildings may be more vulnerable to lightning strikes. Commercial buildings are often taller than residential buildings, particularly single family residential buildings, and may be at greater risk of lightning strikes.

# Unincorporated Nueces County Lightning Hazard

TFS Record Location	
06/01/2006 – Waste oil tank at Valero Bill Greehey Refinery	
08/30/2009 – 1 acre fire caused by lightning, near 7451 Bay Area Drive	

OCCURENCES		
Number of Events (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
2	0 death, 0 injury**	\$0**

\*\* No reported deaths, injuries, or damage.

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
10% annual chance	1 lightning event every 10 years

IMPACT	
Commercial Property Value	Agricultural Value
\$373,034,606	\$76,735,126

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
7836	312,734.7	73.77%

# City of Agua Dulce Lightning Hazard

NCDC Record Location		
No NCDC Records		

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
0	0 death, 0 injury	\$0

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
1% Annual Chance*	1 lightning event every year*

\*Based upon minimum probability of the planning area

IMPACT	
Commercial Property Value	Agricultural Value
\$17,541,361	\$602

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
221	2.45	1.12%

# City of Bishop Lightning Hazard

NCDC Record Location		
No NCDC Records		

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
0	0 death, 0 injury	\$0

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
1% Annual Chance*	1 lightning event every year*

\*Based upon minimum probability of the planning area

IMPACT	
Commercial Property Value	Agricultural Value
\$115,889,915	\$539

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
466	539.02	35.57%



# City of Corpus Christi Lightning Hazard

NCDC/TFS Record Location		
07/10/2004 - Corpus Christi County Club golf course 06/26/2006 – Foundation company truck on McBride Ln 10/5/2008 – 1 acre fired caused by lightning, near Access Road 4		

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
3	0 death, 3 injury	\$0**

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
6.1% Annual Chance	1 lightning event every 16.5 years

IMPACT
Records indicate that at least one occurrence caused damage to a waste oil tank and other pipe facilities; however, no cost estimate of damage was reported.

IMPACT	
Commercial Property Value	Agricultural Value
\$7,148,763,878	\$6,044,014

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
8,464	24,632.44	7.64%

# City of Driscoll Lightning Hazard

NCDC Record Location		
No NCDC Records		

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
0	0 death, 0 injury	\$0

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
1% Annual Chance*	1 lightning event every year*

\*Based upon minimum probability of the planning area

IMPACT	
Commercial Property Value	Agricultural Value
\$25,502,273	\$114,014

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
272	464.67	62.4%

# City of Petronila Lightning Hazard

NCDC Record Location		
No NCDC Records		

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
0	0 death, 0 injury	\$0

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
1% Annual Chance*	1 lightning event every year*

\*Based upon minimum probability of the planning area

IMPACT	
Commercial Property Value	Agricultural Value
\$3,714,796	\$227,373

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
114	926.66	79.36%

# City of Port Aransas Lightning Hazard

NCDC Record Location	
03/15/2009 - Mustang Island Beach	

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
1	1 death, 0 injury	\$0

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
1% Annual Chance	1 lightning event every year

IMPACT	
Commercial Property Value	Agricultural Value
\$413,772,710	\$0

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
6,539	0	0%

# City of Robstown Lightning Hazard

NCDC Record Location		
No NCDC Records		

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
0	0 death, 0 injury	\$0

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
1% Annual Chance*	1 lightning event every year*

\*Based upon minimum probability of the planning area

IMPACT AND VULNERABILITY	
Commercial Property Value	Agricultural Value
\$151,390,423	\$1,614,612

IMPACT AND VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
2118	6580.37	66.32%

# Port of Corpus Christi Authority Lightning Hazard

Historical Record Location
7/27/1968 – Grain elevator

OCCURENCES		
Number of Events (Range: 1950-2016)	Risk to Health and Safety (No. Incidences by Type)	Property Damage
1	1 death, 0 injury	\$3,281,250*

\*2012 Dollars – from CHAMPS report

PROBABILITY	
Future Lightning Event Likelihood	1 Lightning Event X Years
1% Annual Chance*	1 lightning event every year*

\*Based upon minimum probability of the planning area

IMPACT	
Commercial Property Value	Agricultural Value
\$174,026,681	\$0

VULNERABILITY		
Commercial Parcels (No.)	Agricultural Area (Acres)	Agricultural (Percent area of Jurisdiction)
288	0	0

## Section 11: Coastal Erosion

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### Coastal Erosion Hazard Overview

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#### Description

Coastal erosion is the “loss of land, marshes, wetlands, beaches, or other coastal features within the coastal zone because of the actions of wind, waves, tides, storm surges, subsidence, or other forces”<sup>1</sup>. Coastal erosion may result in the temporary redistribution of coastal sediments, or the long-term loss of coastal sediments and sediment accumulation.

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<sup>1</sup> Texas Natural Resources Code, Section 33.601

The United States Geologic Survey (USGS) has identified eleven primary natural process and human activities that cause coastal land loss; these are summarized in Table 11-1. These primary causes for coastal land loss can impact the coast concurrently resulting in sever rates of erosion. Figure 11-1 illustrates how this processes jointly impact the coast.

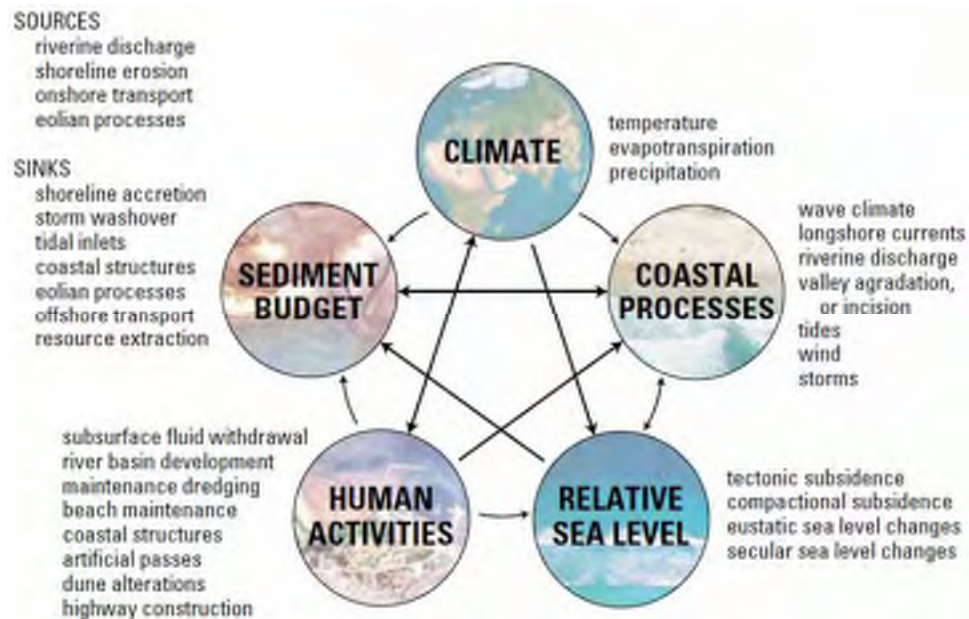
**Table 11-1. USGS Primary Causes of Coastal Land Loss<sup>2</sup>**

Primary Causes of Coastal Land Loss	
Natural Processes	
Agent	Examples
Erosion	waves and currents storms landslides
Sediment Reduction	climate change stream avulsion source depletion
Submergence	land subsidence sea-level rise
Wetland Deterioration	herbivory freezes fires saltwater intrusion
Human Activities	
Agent	Examples
Transportation	boat wakes, altered water circulation
Coastal Construction	sediment deprivation (bluff retention) coastal structures (jetties, groins, seawalls)
River Modification	control and diversion (dams, levees)
Fluid Extraction	water, oil, gas, sulfur
Climate Alteration	global warming and ocean expansion increased frequency and intensity of storms
Excavation	dredging (canal, pipelines, drainage) mineral extraction (sand, shell, heavy mins.)
Wetland Destruction	pollutant discharge traffic failed reclamation burning

<sup>2</sup> Source: <https://pubs.usgs.gov/of/2003/of03-337/landloss.pdf>



**Figure 11-1. USGS Interacting Factors That Influence Coastal Land Loss<sup>3</sup>**



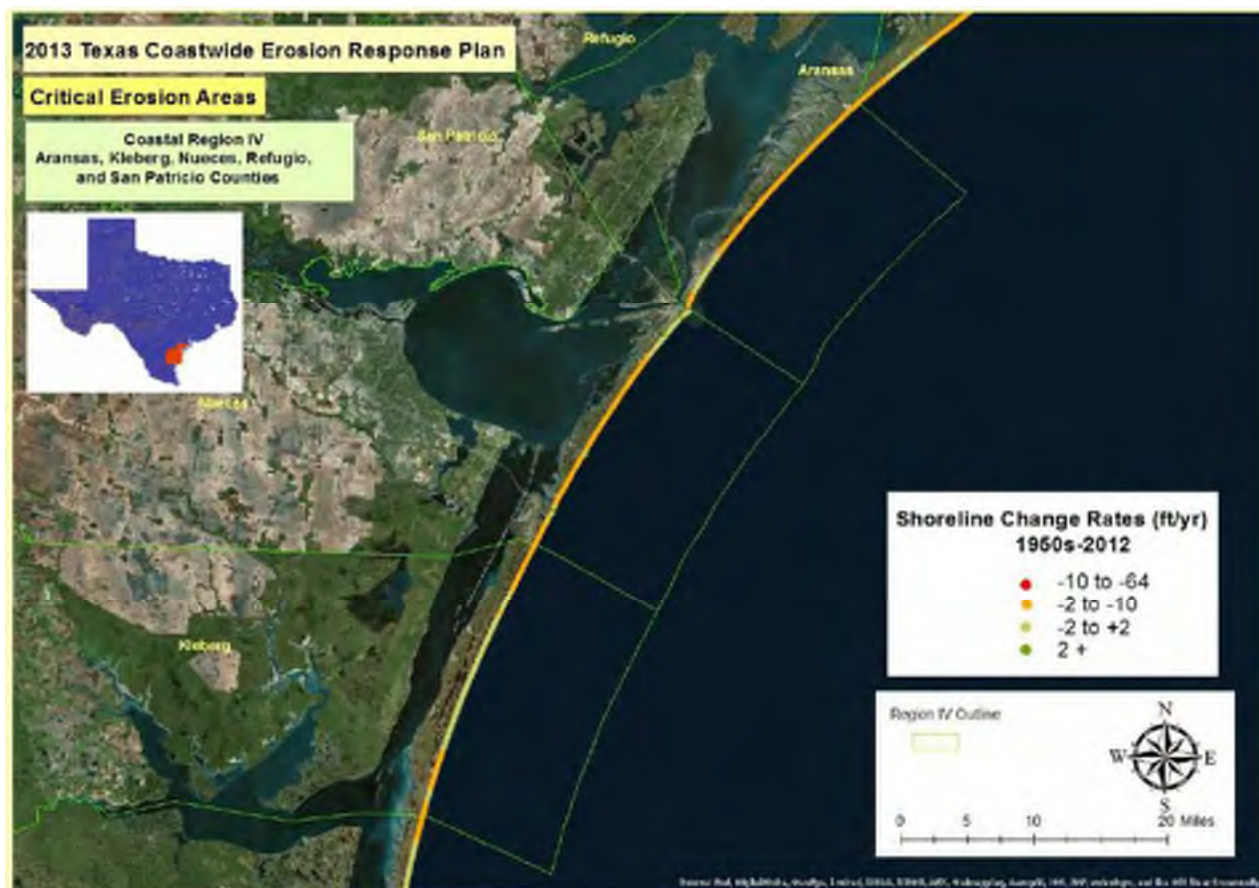
## Location

Nueces County is one of five counties located in Texas' Coastal Region IV as shown in Figure 11-2. The Texas General Land Office defines five regions of the Texas coast in their Texas Coastwide Erosion Response Plan<sup>4</sup>. Coastal erosion in Nueces County impacts the gulf-facing shoreline, Laguna, bays, islands, navigable waterways, channels, harbors, and marinas. The primary impact along the gulf-facing shoreline is erosion which then contributes to deposition within adjacent waterways and channels as sediment is redistributed by wave and tidal currents.

<sup>3</sup> Source: <https://pubs.usgs.gov/of/2003/of03-337/landloss.pdf>

<sup>4</sup> <http://www.glo.texas.gov/coast/coastal-management/forms/files/coastwide-erosion-response-plan.pdf>

**Figure 11-2. Coastal Region IV – Critical Erosion Areas<sup>5</sup>**



### **Gulf-Facing Shoreline**

Nueces County has 20.6 miles of gulf-facing shoreline consisting primarily of low-elevation sandy beaches and dunes along the narrow barrier islands of Mustang Island and the northern end of Padre Island.<sup>6</sup>

### **Laguna, Bays, and Islands**

Behind the barrier islands are 407 miles of additional shorelines along the four bays (Corpus Christi Bay, Nueces Bay, Oso Bay, and Redfish Bay), port facilities, marinas, Upper Laguna Madre, Ward Island, Harbor Island and numerous other large and small islands, including wetlands, estuaries, and the mouth of the Nueces River.<sup>7</sup>

<sup>5</sup> Source: <http://www.glo.texas.gov/coast/coastal-management/forms/files/coastwide-erosion-response-plan.pdf>

<sup>6</sup> Texas Mitigation Plan, 2013

<sup>7</sup> Texas Mitigation Plan, 2013

### Navigable Waterways and Channels

The major navigable waterways within Nueces County are the Corpus Christi Ship Channel, La Quinta Channel, Encinal Channel, Rincon Canal, Aransas Channel, Lydia Ann Channel, Packery Channel, and the Gulf Intracoastal Waterway (GIWW). Some of these waterways are illustrated in Figure 11-3.

**Figure 11-3. Nueces County Navigable Waters<sup>8</sup>**



The Port of Corpus Christi is the eight largest port in the United States in total tonnage<sup>9</sup> and has 143.5 nautical miles of ship channel. A breakdown of the ship channel extent in nautical miles is shown in Table 11-2.

<sup>8</sup> Source: <https://tshaonline.org/handbook/online/articles/hcn05>

<sup>9</sup> U.S. Port Ranking By Cargo Volume, American Association of Port Authorities, October 9, 2015.



**Table 11-2. Port of Corpus Christi – Ship Channel Distance<sup>10</sup>**

FROM	TO	Nautical Miles
Station 210+00 In Gulf of Mexico	Port Aransas Inner Basin	3.9
	La Quinta Junction	12.5
	Harbor Bridge	22.1
	Bulk Terminal	25.5
	West End - Inner Harbor	29.4
	West End - La Quinta Channel	18.4
La Quinta Junction	La Quinta Terminal	5.3
	End of La Quinta Channel	5.9
	Harbor Bridge	9.6
Harbor Bridge	Bulk Terminal	3.4
	West End - Inner Harbor	7.5
TOTAL		143.5

There are numerous named and unnamed small watercraft canal and channel systems located, primarily, along the backside of the barrier islands. A sampling of the named channels include: Mustang Beach Channel, Water Exchange Channel (aka, Fish Pass), Humble Channel, Sinclair Cut, Morris & Cummings Cut, Wilsons Cut, and Atlantic. Unnamed channels include public and private canals for residential and commercial access and development.

### Harbors and Marinas

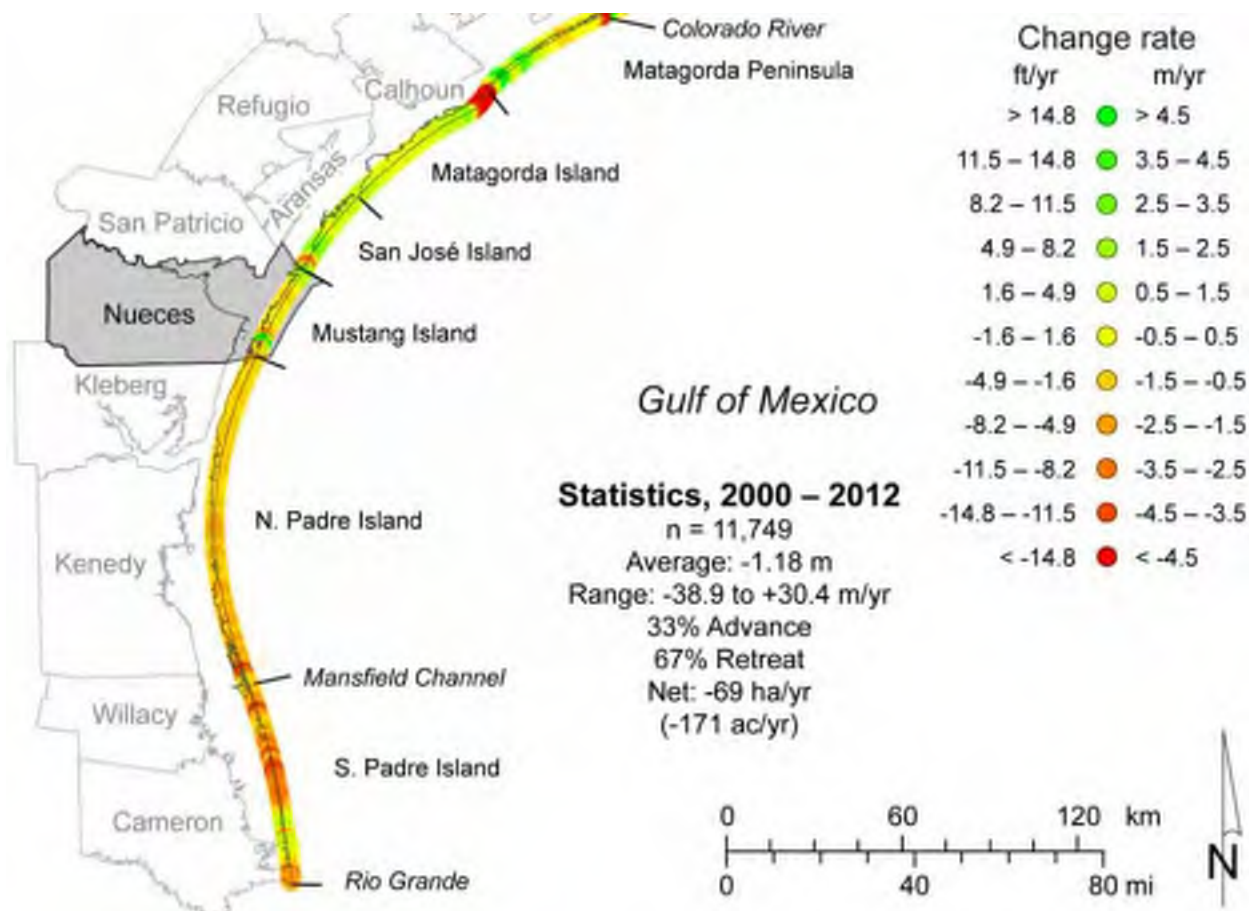
Also located within Nueces County are various harbors and marinas that are also affected by coastal erosion. A sampling of the major harbors and marinas include: Conn Brown Harbor, Port Ingleside, Viola Turning Basin, Dennis Dryer Municipal Harbor, Island Moorings Marina, and Corpus Christi Marina. The Texas Coastwide Erosion Response Plan (updated 2013) identifies the most recent critical erosion areas for the Nueces County Gulf shoreline. Critical coastal erosion areas are coastal eroding areas that the Land Commissioner "finds to be a threat to: public health, safety, or welfare; public beach use or access; general recreation; traffic safety; public property or infrastructure; private commercial or residential property; fish or wildlife habitat; or an area of regional or national importance."<sup>11</sup>

<sup>10</sup> Source: <http://portofcc.com/wp-content/uploads/Rodman-Bay-Map.pdf>

<sup>11</sup> The Texas Administrative Code, §§15.1-15.10, and Texas Natural Resources Code, Subchapter H, Sec. 33.601

Figure 11-4, an excerpt from the Texas Coastwide Response Plan, illustrates the changing rate of the Gulf Coast shoreline. Mustang Island, north of the Packery Channel, is one of the areas along the Texas Gulf Coast undergoing the greatest rates of erosion at more than -8 foot/year.

**Figure 11-4. Gulf Coast Shoreline Change Rate**



The shorelines along Nueces County's bays experience similar rates of erosion. For example, North Beach in Corpus Christi Bay has a history of beach erosion requiring periodic restoration with the most recent occurring in 2001, 2003, and 2016.<sup>12</sup>

<sup>12</sup> Conrad Blucher Institute for Surveying and Science, Texas A&M University – Corpus Christi

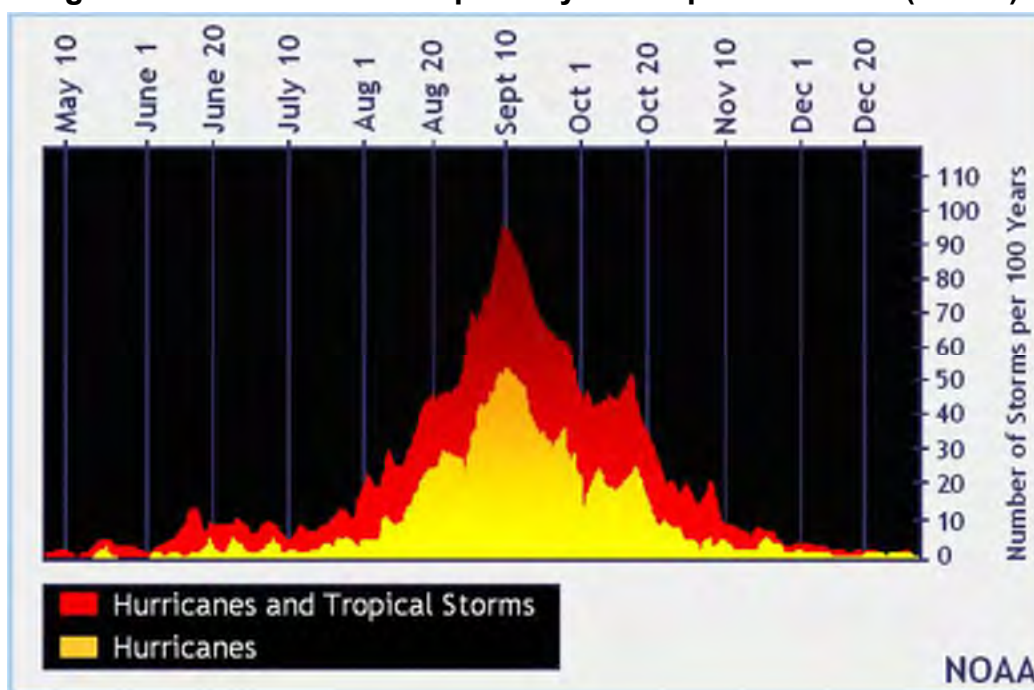
## Occurrences

Coastal erosion is sporadic and episodic, occurring over short and long-term periods and at different rates along the coast line. Coastal erosion is most apparent over a short period due to sporadic and accelerated rates of erosion due to extreme weather events such as hurricanes and other major storm events. Long-term erosion is less apparent due to slower rates of erosion due to seasonal changes such as El Nino, rising sea levels, and other long-term human activities and natural processes such as climate changes.

### Short-Term

The most significant cause of short-term coastal erosion is the effect of tropical storms and hurricanes. Storms and hurricanes that enter the Gulf of Mexico cause coastal erosion within Nueces County regardless of the location that the storm makes landfall. Tropical storms and hurricanes within the Gulf cause increased winds and tidal forces that can extend hundreds of miles from the center of the storm.

**Figure 11-5. Number of Tropical Cyclones per 100 Years (NOAA)**



The latest Texas Coastwide Erosion Response Plan (updated 2013) also addressed short-term coastal erosion indicating that for the period of time from 2000 to 2012 the coastal erosion rate for the Gulf shoreline along Nueces County varied from more than - 8 foot/year of erosion to more than +8 foot/year of accretion (Figure 11-5).

A comparison of the coastal erosion rates based on 2010 Texas GLO data indicates that 6 miles of the 20.6 miles of Nueces County's Gulf-facing shoreline is classified as critical erosion (i.e., greater than -2 feet/year). This accounts for 2.5% of the State total, or 29.1% of Nueces County's total Gulf-facing shoreline as summarized in Table 11-3.

**Table 11-3. Critical Erosion for Nueces County Gulf Coastline<sup>13</sup>**

County	2016*			Amount of Shoreline**				Gulf Coastline**			
	Population	% of All Coastal Counties	% of Corpus Christi & Port Aransas	Gulf		Bay		Critical Erosion			Erosion Rates
								Miles	% of State Total	% of County Total	
Aransas	25,721	0.4%	--	19.0 mi.	5.2%	356 mi.	10.6%	16 mi.	6.8%	84.2%	-2 to -7 ft/yr
<b>Nueces</b>	<b>361,350</b>	<b>5.4%</b>	<b>90.6%</b>	<b>20.6 mi.</b>	<b>5.6%</b>	<b>407 mi.</b>	<b>12.2%</b>	<b>6 mi.</b>	<b>2.5%</b>	<b>29.1%</b>	<b>-2 to -6 ft/yr</b>
Kleberg	31,690	0.5%	--	21.8 mi.	5.9%	222 mi.	6.6%	2 mi.	0.8%	9.2%	-2 to -6 ft/yr
Aransas, Nueces & Kleberg Combined	418,761	6.2%	--	61.4 mi.	16.7%	985 mi.	29.4%	24 mi.	10.1%	39.1%	-2 to -7 ft/yr
<b>TOTAL ALL COASTAL COUNTIES</b>	<b>6,750,128</b>			<b>367.0 mi.</b>		<b>3345 mi.</b>		<b>237 mi.</b>	<b>64.6%</b>		<b>-2 to -50 ft/yr</b>

The bay shorelines also experienced similar short-term erosion. For example, North Beach located in Corpus Christi Bay had an average erosion rate of -2.6 foot/year along the entire beach with a high of -6 foot/year at the southern end<sup>14</sup>. The most recent surveys between 2007 and 2012 indicate that approximately 61% of North Beach in Corpus Christi Bay is eroding, 18% is in transition, and 21% is accreting (see Figure 11-6).

<sup>13</sup> Texas GLO, 2010

<sup>14</sup> Conrad Blucher Institute for Surveying and Science, Texas A&M University – Corpus Christi, 2012 (Latest Data)



Figure 11-6. North Beach Erosion Rates 2007 to 2012<sup>15</sup>



<sup>15</sup> Conrad Blucher Institute for Surveying and Science, Texas A&M University – Corpus Christi, 2012 (Latest Data)



## Long-Term

Long-term Gulf-facing shoreline erosion rate for the beaches of Nueces County have had the lowest average rate of all coastal counties for the last 70 years at -0.92 feet/year<sup>16</sup>. An analysis of the Gulf-facing shoreline erosion rates also indicates that 96.7%, or approximately 19.9 miles, of the Gulf-facing shoreline within Nueces County is eroding compared to the State average of 64%, but that the mean erosion rate for Nueces County was -1.7 feet/year which was about a third of the State mean of -5.9 feet/year. These values are summarized in Table 11-4.

**Table 11-4. Gulf Shoreline Erosion Rate for Nueces County and Texas**

Gulf Shoreline				Mean Gulf Shoreline Change*  (avg. of all transects in FT/YR)	Gulf Shoreline Erosion*								
Location			Length***		Erosion Amount				Rate (FT/YR)				
					%	Length			Max.		Mean		
									Rate	Avg.	Rate	Avg.	
Nueces County	Mustang Island (ICL**)	16.2 mi.	20.6 mi.	-0.4	96.7%	15.7 mi.	19.9 mi.	-4.4	-4.5	-0.4	-1.7		
	North Padre Island (ICL & OCL**)	4.4 mi.		-2.6	96.7%	4.3 mi.		-4.6		-3.0			
Texas Shoreline (1850s to 2000)		367.0 mi.		-2.3	64%	234.9 mi.		-30.2		-5.9			

\* source: Joint Erosion Response Plan for Nueces County and the City of Corpus Christi published in 2012 (<http://www.glo.texas.gov/coast/coastal-management/forms/files/nueces.pdf>)

\*\*ICL = inside Corpus Christi City Limits. OCL = outside Corpus Christi City Limits. Data based on BEG 2007 erosion rates. OCL includes the City of Corpus Christi's Extra Territorial Jurisdiction (ETJ) on North Padre Island that extend into Kleberg County.

\*\*\*Excludes ETJ outside of Nueces County.

Coastal erosion also results in sediment accretion into natural and manmade waterways. One example of this can be seen in 2017 aerial imagery of Fish Pass on Mustang Island which is completely blocked from sediment accretion between State Hwy 361 and the jetties at the Gulf-facing shoreline (see Figure 11-7).

<sup>16</sup> Bureau of Economic Geology, 2007

**Figure 11-7. Sediment Accretion of Fish Pass on Mustang Island (Google 2017)**



### **Probability**

Coastal erosion is a continual process with erosion rates that vary over time. As stated above, the most significant cause of short-term coastal erosion is the effect of tropical storms and hurricanes. The annual probability of the occurrence of tropical storms and hurricane for the county and each participating jurisdiction is summarized in Section 5 of this plan. However, because any tropical storm or hurricane that enters the Gulf has an impact on coastal erosion for the entirety of the Gulf Coast the more representative probability for reoccurrence is summarized in the CEPRA 2015 report which indicates that three hurricanes impact the Texas Gulf Coast every four years.

The Bureau of Economic Geology at the University of Texas at Austin measured coastal shoreline erosion as a historical shoreline change rate based on averages over a 90-year period. The results of this assessment indicate that 96.7% of Nueces County's Gulf-facing shoreline is experiencing a mean erosion rate of -1.7 feet/year.

## Impact

Coastal erosion results in the loss of agricultural, industrial, maritime shipping, commercial and recreational boating, residential land, public parks, wetlands and critical infrastructure. These impacts are experienced directly by the jurisdictions that border the Gulf; the coastal jurisdiction which include: unincorporated Nueces County, the City of Corpus Christi, the City of Port Aransas and the Port of Corpus Christi Authority. Impacts on the remaining jurisdictions are indirect. The Texas GLO's Texas Coastal Resiliency Master Plan, dated March 2017, includes the following statement concerning impacts by coastal erosion, "if left unaddressed, will continue to have adverse impacts on infrastructure, natural resources, economic activities, and the health and safety of residents."

A healthy beach and dune system can reduce damage to property and critical infrastructure by absorbing some of the energy from storm surges and waves. Beach and dune restoration projects to repair damage caused by coastal erosion are a continual economic burden for the coastal jurisdictions. Additionally, loss of coastal property and beaches may reduce property values and reduce tourism along the coast.

Navigable waterways and small watercraft canal and channel systems, including the Gulf Intracoastal Waterway (GIWW), are impacted by sediment accretion. Dredging of major and minor channels to remove excess sediment to restore access for commercial and private ships is a constant economic strain on the coastal jurisdictions. Coastal erosion and accretion has a notable impact on the ports, coastal petrochemical facilities, road infrastructure, and commercial businesses.

The inland jurisdictions, those that do not border the Gulf, may not be impacted directly by coastal erosion but they do experience indirect impacts. Indirect impacts include the economic impact of addressing coastal erosion issues. These costs are redistributed to the community through higher taxes, and increased cost of goods and services. Additionally, inland jurisdictions may rely on the coast for the opportunity of participating in and benefiting from the tourist industry which is directly impacted by the health of the beaches and dune systems.

An example of the costs associated to the maintenance and restoration effort needed for addressing coastal erosion is shown as Table 11-5. This is the latest list of coastal restoration projects identified by the Coastal Erosion Planning and Response Act (CEPRA). Of these nine projects, two have yet to be approved for funding.

**Figure 11-8. Recent Nueces County CEPRA Funded Coastal Erosion Projects**

No.	Project Name	Cost		CEPRA Cycle	Fiscal Year
		Funded	Un-Funded		
1	Mustang & NPI Beach Maintenance Impacts & Best Practices	\$ 100,000	na	8	2014-2015
2	Nueces River Delta Stabilization & Habitat Protection	\$ 322,500	na		
3	McGee Beach Nourishment	\$ 269,000	na		
4	Shamrock Island Habitat Protection & Enhancement Phase 2	na	\$ 1,856,800		
5	Cole Park Shoreline Protection	na	\$ 2,000,000		
6	Indian Point Shoreline Stabilzation & Habitat Protection	\$ 750,000	na	7	2012-2013
7	Nueces Bay Portland Causway March Restoration	\$ 2,914,000	na		
8	Nueces River Delta Stabilization & Habitat Protection	\$ 187,500	na		
9	Corpus Christi Beach Nourishment	\$ 2,340,000	na		
Total		\$ 6,883,000	\$ 3,856,800		
		\$ 10,739,800			

Source: CEPRA 2015 report (<http://www.glo.texas.gov/coast/coastal-management/forms/files/CEPRA-Report-2015.pdf>)

## Vulnerability

Private and public lands, infrastructure, and industry along the coast are directly vulnerable to the impacts of coastal erosion. The navigable waterways and small watercraft canal and channel systems, including the Gulf Intracoastal Waterway (GIWW), are directly vulnerable to the impacts of coastal erosion and accretion. The Texas GLO's Coastal Resiliency Master Plan identified key issues and proposed solutions to address Nueces County's vulnerability to coastal erosion. The resultant list of projects with associated costs are summarized in Table 11-6 and are shown in Figure 11-8.

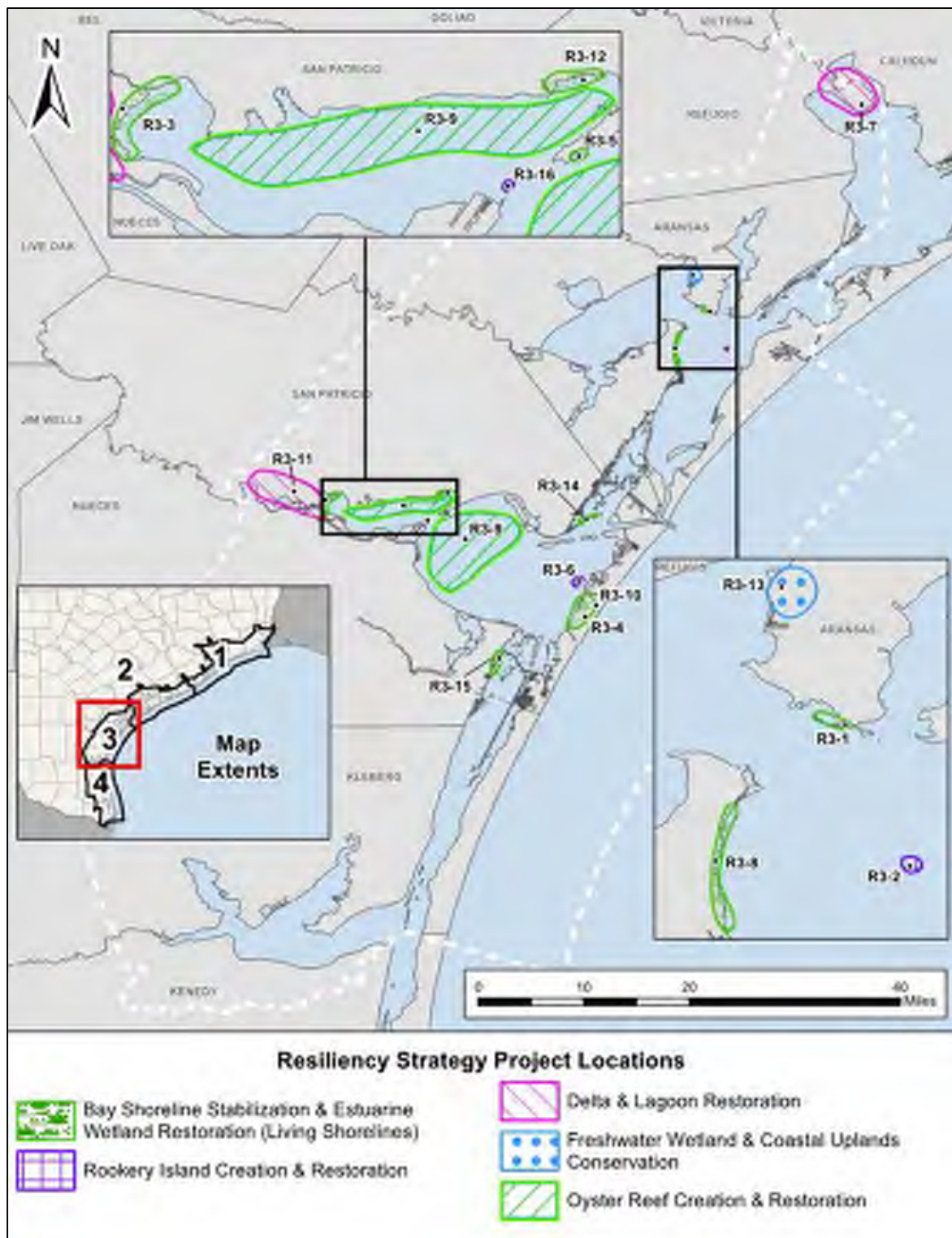
A prominent vulnerable asset within Nueces County is the Corpus Christi Ship Channel Entrance and Jetty Channel. The US Army Corps of Engineers recommended a FY2013 budget of \$4.9M to dredge these areas to remove sedimentation to maintain the channel depth, and recommended an additional \$3.2M to repair levees adjacent to Nueces Bay that were eroded by a storm event and wave action. Specific vulnerable assets are identified for each of the coastal jurisdictions in the following sections.

**Table 11-5. Strategies & Projects to Address Nueces County Coastal Vulnerabilities<sup>17</sup>**

Strategy	ID	Tier 1 Projects	Estimated Cost Range
Bay Shoreline Stabilization and Estuarine Wetland Restoration (Living Shorelines)	R3-3	Nueces River Delta Shoreline Stabilization	\$3M - \$8M
	R3-4	Mustang Island State Park Acquisition	\$3M - \$10M
	R3-5	Indian Point Shoreline Protection	\$0.5M - \$2M
	R3-10	Coastal Bend Gulf Barrier Island Conservation	\$0.5M - \$1.5M
	R3-12	Portland Living Shoreline	\$1M - \$3.5M
	R3-14	Dagger Island Living Shoreline	\$1M - \$2.5M
	R3-15	Flour Bluff Living Shoreline	\$1.5M - \$4.5M
Delta & Lagoon Restoration	R3-11	Nueces County Hydrologic Restoration Study	\$0.5M - \$2.5M
Oyster Reef Creation & Restorations	R3-9	Corpus Christi & Nueces Bays Oyster Reef Restoration	\$1M - \$10M
Rookery Island Creation & Restoration	R3-6	Shamrock Island Restoration - Phase 2	\$6M - \$18M
	R3-16	Causeway Island Rookery Habitat Protection	\$0.5M - \$2M

<sup>17</sup> Texas GLO's Coastal Resiliency Master Plan, March 2017

Figure 11-9. Map of Projects to Address Nueces County Vulnerabilities<sup>18</sup>



<sup>18</sup> Texas GLO's Coastal Resiliency Master Plan, March 2017

# Unincorporated Nueces County Coastal Erosion Hazard

LOCATION	
Gulf-Facing Shoreline	0 Miles
Laguna, Bays, and Islands	169 Miles

EXTENT		
Gulf-Facing Shoreline Change Rate (ft/yr)		
Minimum	Maximum	Average
N/A	N/A	N/A

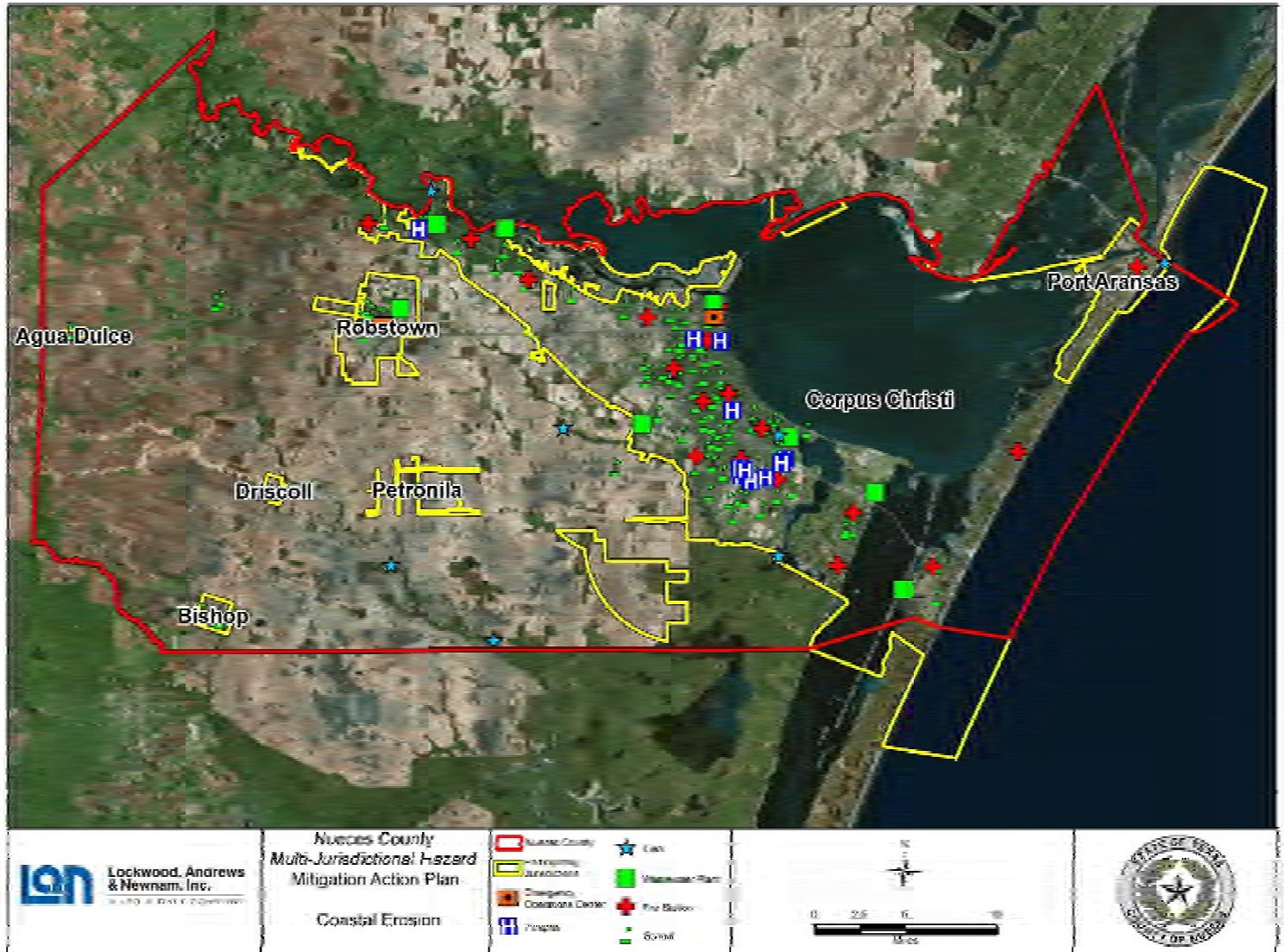
OCCURENCE
Coastal erosion is a continual process. Coastal erosion occurs over short and long-term periods and at different rates along the coast line.

PROBABILITY				
Short-Term Coastal Erosion				
Number of Gulf Tropical Storms & Hurricanes		Time Period Years		Probability
75		100		3 HURRICANES IMPACT THE TEXAS COAST EVERY 4 YEARS
Long-Term Gulf-Facing Coastal Erosion				
Total Gulf-Facing Shoreline Miles	Shoreline Erosion Area %	Future Coastal Erosion Area Miles	Critical Erosion Area %	Future Critical Erosion Area Miles
N/A	96.7%	N/A	29.1%	N/A

IMPACT & VULNERABILITY			
Coastal Property Value		Coastal Crop Land	
Commercial	Residential	Acres	Estimated Value
\$35,252,463	\$2,206,466	827.9	\$203,140.27



Figure 11-10. Nueces County Critical Facilities Proximity to Coast



# City of Agua Dulce Coastal Erosion Hazard

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## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

This is an inland jurisdiction that is not directly impacted by coastal erosion.

# City of Bishop Coastal Erosion Hazard

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LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY
This is an inland jurisdiction that is not directly impacted by coastal erosion.

# City of Corpus Christi Coastal Erosion Hazard

LOCATION	
Gulf-Facing Shoreline	17.6 Miles
Laguna, Bays, and Islands	280 Miles

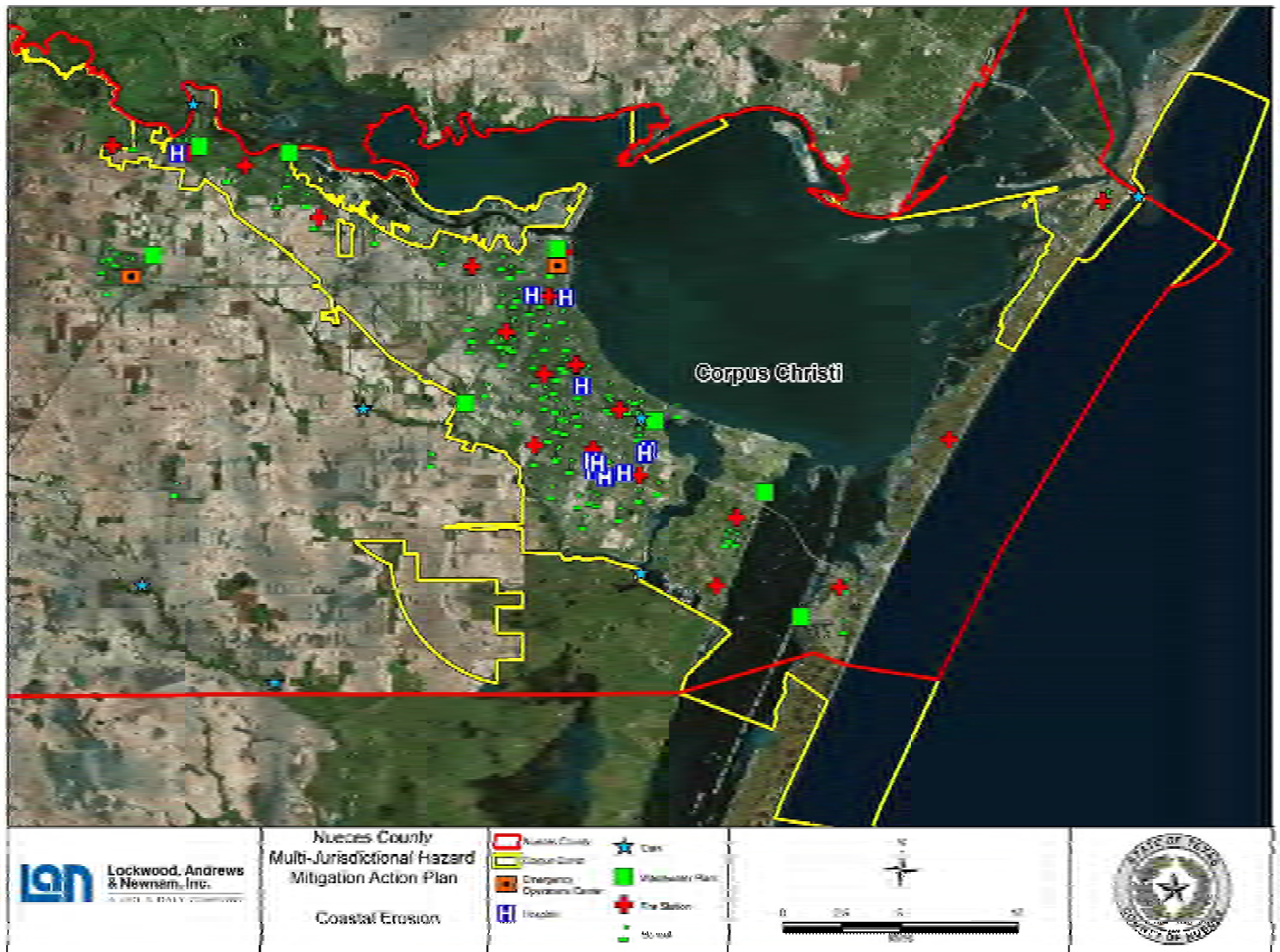
EXTENT		
Gulf-Facing Shoreline Change Rate (ft/yr)		
Minimum	Maximum	Average
- 8	+ 4.9	-1.55

OCCURENCE
Coastal erosion is a continual process. Coastal erosion occurs over short and long-term periods and at different rates along the coast line.

PROBABILITY				
Short-Term Coastal Erosion				
Number of Gulf Tropical Storms & Hurricanes		Time Period Years		Probability
75		100		3 HURRICANES IMPACT THE TEXAS COAST EVERY 4 YEARS
Long-Term Gulf-facing Coastal Erosion				
Total Gulf-Facing Shoreline Miles	Shoreline Erosion Area %	Future Coastal Erosion Area Miles	Critical Erosion Area %	Future Critical Erosion Area Miles
17.6	96.7%	17.0	29.1%	5.1

IMPACT & VULNERABILITY			
Coastal Property Value		Coastal Crop Land	
Commercial	Residential	Acres	Estimated Value
\$324,781,580	\$358,874,057	509.4	\$124,990.53

Figure 11-11. Corpus Christi Critical Facilities Proximity to Coast



# City of Driscoll Coastal Erosion Hazard

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LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY
This is an inland jurisdiction that is not directly impacted by coastal erosion.

# City of Petronila Coastal Erosion Hazard

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## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

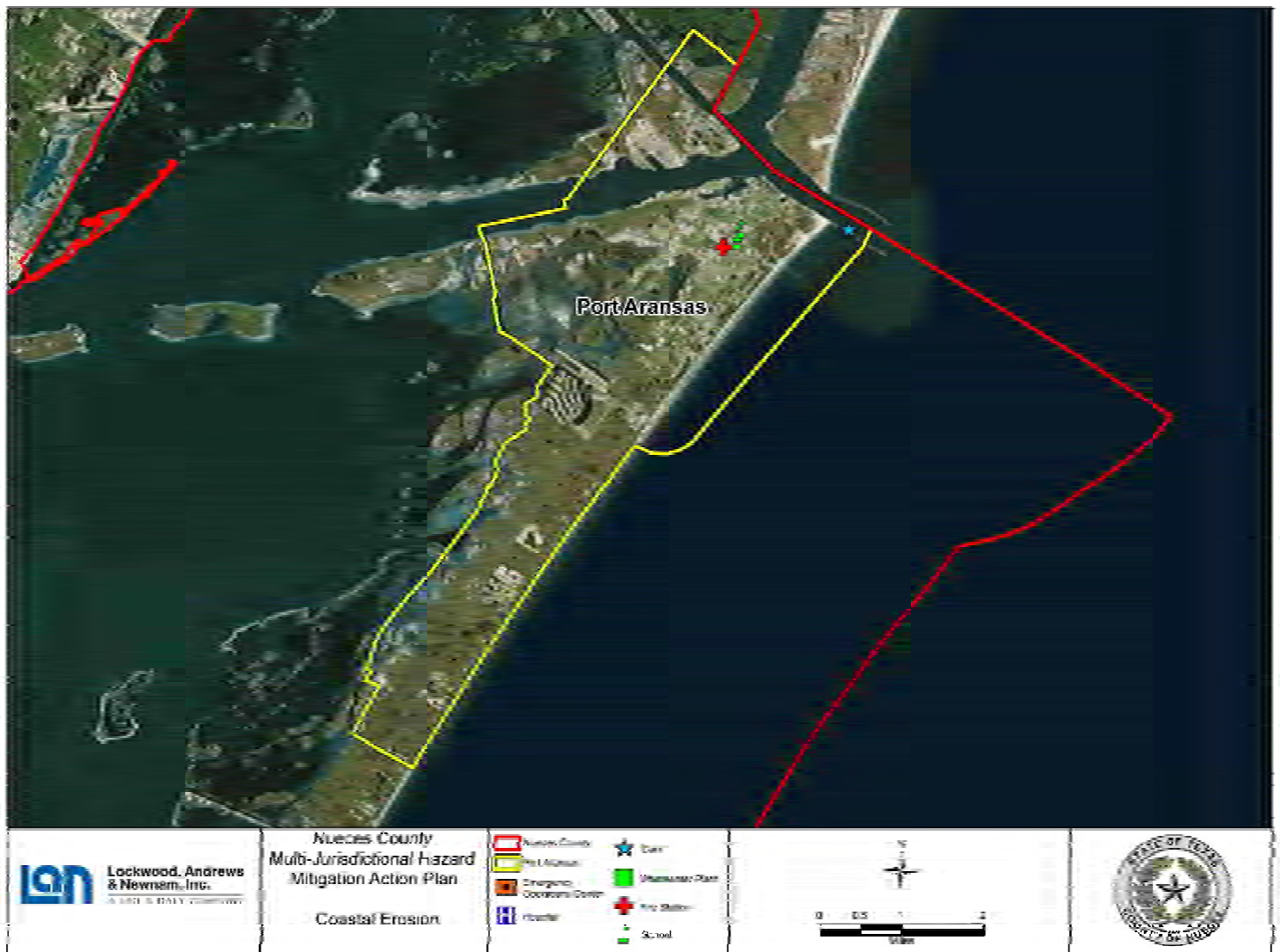
This is an inland jurisdiction that is not directly impacted by coastal erosion.



# City of Port Aransas Coastal Erosion Hazard

LOCATION				
Gulf-Facing Shoreline			3 Miles	
Laguna, Bays, and Islands			16 Miles	
EXTENT				
Gulf-Facing Shoreline Change Rate (ft/yr)				
Minimum		Maximum		Average
+ 1.6		+ 8		+ 4.8
OCCURENCE				
Coastal erosion is a continual process. Coastal erosion occurs over short and long-term periods and at different rates along the coast line.				
PROBABILITY				
Short-Term Gulf-Facing Coastal Erosion				
Number of Gulf Tropical Storms & Hurricanes		Time Period Years		Probability
75		100		3 HURRICANES IMPACT THE TEXAS COAST EVERY 4 YEARS
Long-Term Coastal Erosion				
Total Gulf-Facing Shoreline Miles	Shoreline Erosion Area %	Future Coastal Erosion Area Miles	Critical Erosion Area %	Future Critical Erosion Area Miles
3	96.7%	2.9	29.1%	0.9
IMPACT & VULNERABILITY				
Coastal Property Value		Coastal Crop Land		
Commercial	Residential	Acres		Estimated Value
\$174,026,681	\$0	0		\$0

Figure 11-12. Port Aransas Critical Facilities Proximity to Coast



# City of Robstown Coastal Erosion Hazard

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LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY
This is an inland jurisdiction that is not directly impacted by coastal erosion.

# Port of Corpus Christi Coastal Erosion Hazard

LOCATION	
Gulf-Facing Shoreline	20.6 Miles
Laguna, Bays, and Islands	464 Miles
Navigable Waterways and Channels	36 Miles

EXTENT		
Gulf-Facing Shoreline Change Rate (ft/yr)		
Minimum	Maximum	Average
N/A	N/A	N/A

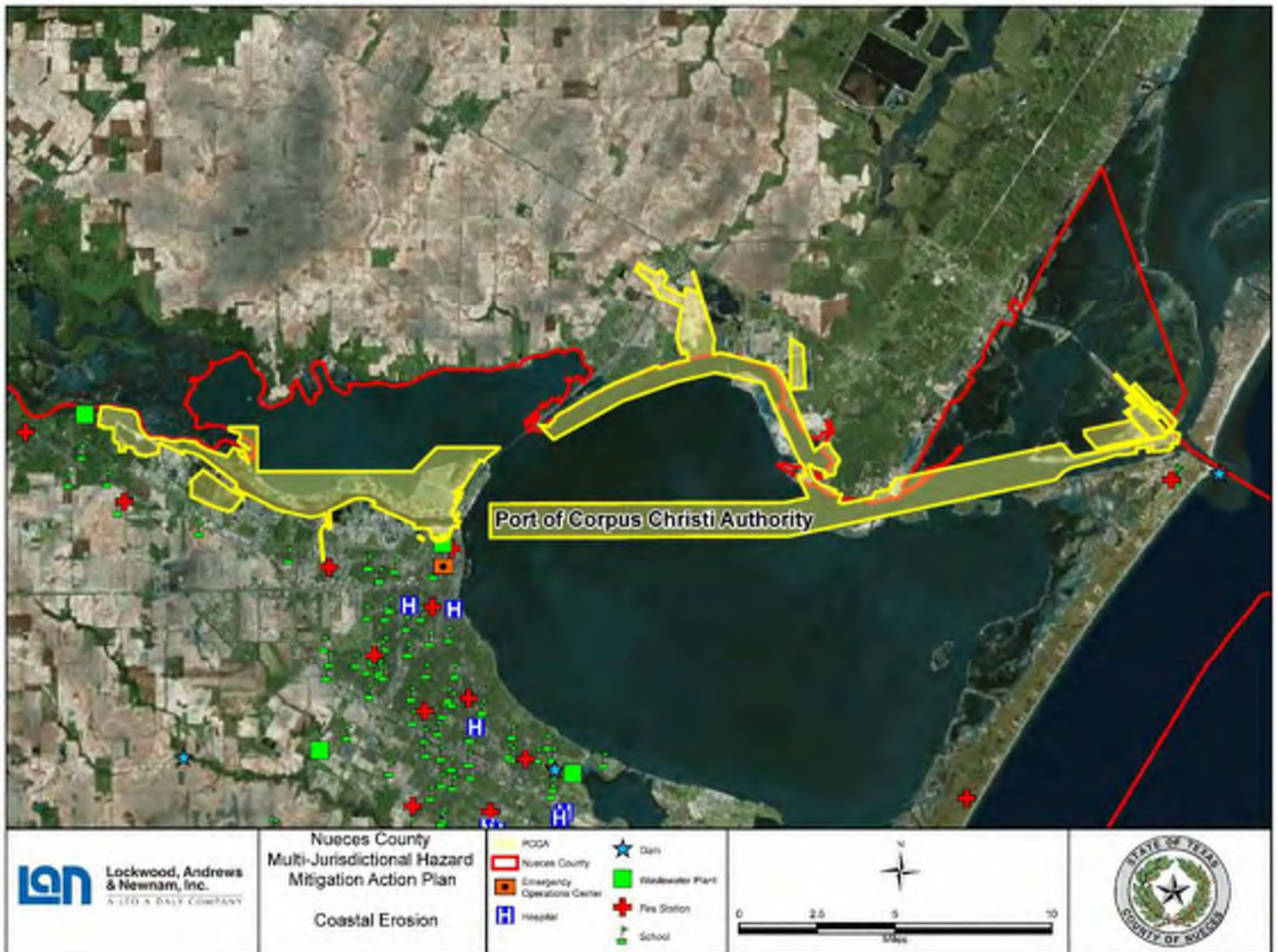
OCCURENCE
Coastal erosion is a continual process. Coastal erosion occurs over short and long-term periods and at different rates along the coast line.

PROBABILITY		
Short-Term Coastal Erosion		
Number of Gulf Tropical Storms & Hurricanes	Time Period Years	Probability
75	100	3 HURRICANES IMPACT THE TEXAS COAST EVERY 4 YEARS

Long-Term Gulf-Facing Coastal Erosion				
Total Gulf-Facing Shoreline Miles	Shoreline Erosion Area %	Future Coastal Erosion Area Miles	Critical Erosion Area %	Future Critical Erosion Area Miles
N/A	96.7%	N/A	29.1%	N/A

IMPACT & VULNERABILITY			
Coastal Property Value		Coastal Crop Land	
Commercial	Residential	Acres	Estimated Value
\$375,704,863	\$461,961,713	1337.3	\$328,130.80
Coastal Critical Facilities			
Name		Description	
Corpus Christi Ship Channel		Navigable Waterway	
La Quinta Channel		Navigable Waterway	
Jewel Fulton Canal		Navigable Waterway	
Rincon Canal		Navigable Waterway	
Intercoastal Waterway		Navigable Waterway	

**Figure 11-13. Port of Corpus Christi Jurisdiction Critical Facilities Proximity to Coast**



## Section 12: Tornado

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### Tornado Hazard Overview

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#### Description

A tornado is a violently rotating column of air extending between, and in contact with, a cloud and the surface of the earth. Tornadoes have wind speeds of 250 miles per hour or more. Damage paths can be in excess of one mile wide and 50 miles long.

#### Location

Tornadoes do not have any specific geographic boundary and can occur throughout the county uniformly. It is assumed that the county planning area including all participating jurisdictions are uniformly exposed to tornado activity. According to FEMA Wind Zones in the United States, Nueces County is located in Wind Zone III, associated to winds as high as 200 mph.



**Figure 12-1. FEMA Wind Zones in the United States**









## Extent

Tornado damage is currently defined using the Enhanced Fujita Scale which took effect on February 1<sup>st</sup>, 2007; the preceding scale was called the Fujita Tornado Damage Scale. The Enhanced Fujita Scale is summarized in Table 12-1. The Enhanced Fujita Scale has 28 Damage Indicators (DI), or types of structures and vegetation, each with a varying number of Degrees of Damage (DoD). Damage Indicators are summarized in Table 12-2. Each Damage Indicator has a unique Degree of Damage Scale. For example, Small Barns and Farm Outbuildings (SBO) Degree of Damage Scale is provided as Table 12-3. For unique Degree of Damage Scales for the remaining Damage Indicators refer to National Oceanic and Atmospheric Administration website (<http://www.spc.noaa.gov/faq/tornado/ef-scale.html>).

Based upon the planning area's location in Wind Zone III, which can see winds up to 200 miles per hour, the most powerful tornado the planning area can expect to experience is an EF5.

**Table 12-1. Enhanced Fujita Scale<sup>1</sup>**

Scale	Wind Speed (mph)	Relative Frequency	Potential Damage	Example of Damage
<b>EF0</b>	65 - 85	56.88%	<b>Minor or no damage.</b> Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.	
<b>EF1</b>	86 - 110	31.07%	<b>Moderate damage.</b> Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.	
<b>EF2</b>	111 - 135	8.80%	<b>Considerable damage.</b> Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.	
<b>EF3</b>	136 - 165	2.51%	<b>Severe damage.</b> Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.	
<b>EF4</b>	166 - 200	0.66%	<b>Extreme damage.</b> Well-constructed and whole frame houses completely leveled; cars and other large objects thrown up to 300 feet and small missiles generated.	
<b>EF5</b>	> 200	0.08%	<b>Total destruction of buildings.</b> Strong-framed, well-built houses leveled off foundations are swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; some cars, trucks and train cars can be thrown approximately 1 mile.	

<sup>1</sup> NOAA

**Table 12-2. Damage Indicators**

Number	Damage Indicator (Abbreviation)	Degrees of Damage (DoD)
1	Small barns, farm outbuildings (SBO)	8
2	One- or two-family residences (FR12)	10
3	Single-wide mobile home (MHSW)	9
4	Double-wide mobile home (MHDW)	12
5	Apt, condo, townhouse (3 stories or less)	6
6	Motel (M)	10
7	Masonry apt. or motel (MAM)	7
8	Small retail bldg. (fast food) (SRB)	8
9	Small professional (doctor office, branch bank) (SPB)	9
10	Strip mall (SM)	9
11	Large shopping mall (LSM)	9
12	Large, isolated ("big box") retail bldg. (LIRB)	7
13	Automobile showroom (ASR)	8
14	Automotive service building (ASB)	8
15	School - 1-story elementary (interior or exterior halls) (ES)	10
16	School - jr. or sr. high school (JHSH)	11
17	Low-rise (1-4 story) bldg. (LRB)	7
18	Mid-rise (5-20 story) bldg. (MRB)	10
19	High-rise (over 20 stories) (HRB)	10
20	Institutional bldg. (hospital, govt. or university) (IB)	11
21	Metal building system (MBS)	8
22	Service station canopy (SSC)	6
23	Warehouse (tilt-up walls or heavy timber) (WHB)	7
24	Transmission line tower (TLT)	6
25	Free-standing tower (FST)	3
26	Free standing pole (light, flag, luminary) (FSP)	3
27	Tree – hardwood (TH)	5
28	Tree – softwood (TS)	5

**Table 12-3. Small Barns and Farm Outbuildings (SBO)**

Degrees of Damage (DoD)	Damage Description	Expected Wind Speed (mph)	Lower Bound Wind Speed (mph)	Upper Bound Wind Speed (mph)
1	Threshold of visible damage	62	53	78
2	Loss of wood or metal roof panels	74	61	91
3	Collapse of doors	83	68	102
4	Major loss of roof panels	90	78	110
5	Uplift or collapse of roof structures	93	77	114
6	Collapse of walls	97	81	119
7	Overturning or sliding of entire structure	99	83	118
8	Total destruction of building	112	94	131

### Occurrences

Tornado producing storms can occur at any time of year and at any time of day, but they are typically more common in the spring months during the late afternoon and evening hours. A smaller high frequency period can emerge in the fall during the brief transition between the warm and cold seasons. According to the National Oceanic and Atmospheric Administration (NOAA) National Centers For Environmental Information Storm Event Database Nueces County has experienced 108 (recorded) tornado events over the course of the record period from 11/1/1950 to 11/30/2016 (66 years). Table 12-4 includes a summary of tornado events from 1950 to 2006 using the Fujita Scale and Table 12-5 summarizes tornado events from 2007 to 2016 using the latest magnitude scale the Enhanced Fujita Scale. Table 12-6 includes a comprehensive list of all tornadoes on record within Nueces County. Historical tornado events are mapped for the county and each participating jurisdiction in the following sections.

**Table 12-4. Historical Tornado Occurrence Summary, 1950-2006**

Number of Events	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
95	8	46	29	11	1	0	0

**Table 12-5. Historical Tornado Occurrence Summary, 2007-2016**

Number of Events	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
13	0	10	3	0	0	0	0

**Table 12-6. Historical Tornado Events, 1950-2016**

Jurisdiction	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	7/28/1953	1015	F0	0	0	\$0	\$0
Nueces Co	8/31/1953	2025	F0	0	0	\$250	\$0
Port Aransas	10/23/1953	1515	F2	0	0	\$25,000	\$0
Robstown	5/11/1955	1030	F0	0	0	\$0	\$0
Robstown	5/11/1955	1030	F1	0	0	\$0	\$0
Robstown	6/22/1955	1515	F0	0	0	\$0	\$0
Nueces Co	10/4/1956	1330	F1	0	0	\$2,500	\$0
Corpus Christi	10/12/1959	1030	F1	0	0	\$25,000	\$0
Corpus Christi	4/26/1960	30	F1	0	0	\$2,500	\$0
Corpus Christi	8/8/1960	1100	F1	0	0	\$2,500	\$0
Nueces Co	10/16/1960	1200	F1	0	0	\$25,000	\$0
Corpus Christi	10/16/1960	1310	F2	0	1	\$250,000	\$0
Corpus Christi	2/5/1961	940	F0	0	0	\$2,500	\$0
Corpus Christi	4/29/1961	1245	F2	0	0	\$25,000	\$0
Bishop	6/18/1961	1500	F2	0	0	\$25,000	\$0
Corpus Christi	6/18/1961	1500	F1	0	0	\$250	\$0
Nueces Co	8/21/1962	1300	F1	0	0	\$2,500	\$0
Robstown	7/17/1964	2344	F0	0	0	\$0	\$0
Nueces Co	3/30/1965	540	F1	0	0	\$25,000	\$0
Corpus Christi	9/22/1967	820	F2	0	0	\$0	\$0
Corpus Christi	9/22/1967	925	F0	0	0	\$0	\$0
Nueces Co	9/22/1967	1129	F0	0	0	\$0	\$0
Nueces Co	9/22/1967	1129	F0	0	0	\$0	\$0
Nueces Co	9/22/1967	1444	F0	0	0	\$0	\$0
Nueces Co	9/22/1967	1445	F0	0	0	\$0	\$0
Corpus Christi	5/7/1968	2245	F0	0	1	\$250	\$0
Corpus Christi	5/9/1968	1220	F0	0	0	\$0	\$0
Corpus Christi	5/9/1968	1230	F2	0	1	\$25,000	\$0

**Table 12-6. Historical Tornado Events, 1950-2016 (cont.)**

Jurisdiction	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	5/9/1968	1245	F1	0	0	\$2,500	\$0
Corpus Christi	5/9/1968	1335	F1	0	0	\$30	\$0
Nueces Co	5/9/1968	1345	F1	0	0	\$25,000	\$0
Nueces Co	5/11/1968	600	F1	0	0	\$0	\$0
Corpus Christi	9/16/1968	1745	F1	0	0	\$25,000	\$0
Nueces Co	5/12/1969	1600	F2	0	0	\$2,500	\$0
Robstown	10/12/1969	1730	F0	0	0	\$0	\$0
Robstown	10/12/1969	1730	F0	0	0	\$0	\$0
Robstown	10/12/1969	1730	F0	0	0	\$0	\$0
Nueces Co	5/22/1970	919		0	0	\$0	\$0
Nueces Co	6/24/1970	1650	F3	1	15	\$250,000	\$0
Corpus Christi	6/25/1970	945	F0	0	0	\$0	\$0
Nueces Co	5/10/1971	1625	F1	0	0	\$0	\$0
Nueces Co	8/6/1971	1200	F1	0	0	\$250	\$0
Nueces Co	8/6/1971	1200	F1	0	0	\$0	\$0
Corpus Christi	4/27/1972	1220	F1	0	0	\$0	\$0
Corpus Christi	4/27/1972	1250	F0	0	0	\$0	\$0
Corpus Christi	6/2/1972	135	F1	0	1	\$2,500	\$0
Corpus Christi	6/13/1973	1220	F0	0	0	\$0	\$0
Corpus Christi	8/13/1973	1005	F0	0	0	\$0	\$0
Nueces Co	8/13/1973	1146	F0	0	0	\$0	\$0
Nueces Co	6/13/1974	1400	F0	0	0	\$0	\$0
Nueces Co	7/13/1974	1256	F0	0	0	\$0	\$0
Corpus Christi	9/21/1974	914	F0	0	0	\$30	\$0
Corpus Christi	9/28/1974	1645	F1	0	0	\$30	\$0
Nueces Co	5/24/1975	1115	F0	0	0	\$0	\$0
Corpus Christi	4/20/1976	755	F1	0	0	\$2,500	\$0
Bishop	4/28/1976	644	F2	0	0	\$2,500	\$0
Corpus Christi	5/7/1976	950	F0	0	0	\$0	\$0
Nueces Co	6/25/1976	1100		0	0	\$0	\$0
Nueces Co	6/25/1976	1125		0	0	\$0	\$0
Corpus Christi	7/8/1976	1136	F1	0	0	\$25,000	\$0
Corpus Christi	7/8/1976	1730	F0	0	0	\$0	\$0
Driscoll	7/14/1976	1345	F1	0	0	\$2,500	\$0
Corpus Christi	8/17/1976	1205		0	0	\$0	\$0
Nueces Co	8/18/1976	1200		0	0	\$0	\$0



**Table 12-6. Historical Tornado Events, 1950-2016 (cont.)**

Jurisdiction	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Corpus Christi	9/7/1976	755		0	0	\$0	\$0
Nueces Co	8/21/1978	1320	F0	0	0	\$0	\$0
Corpus Christi	8/25/1978	900	F0	0	0	\$0	\$0
Bishop	8/9/1980	1530	F1	0	0	\$250,000	\$0
Port Aransas	8/9/1980	2130	F2	0	3	\$2,500,000	\$0
Bishop	8/10/1980	400	F2	0	0	\$2,500,000	\$0
Nueces Co	8/10/1980	1730	F1	0	0	\$0	\$0
Corpus Christi	8/29/1981	1430	F0	0	0	\$2,500	\$0
Nueces Co	8/29/1981	1530	F1	0	0	\$0	\$0
Nueces Co	11/9/1986	1242	F0	0	0	\$0	\$0
Corpus Christi	9/16/1988	1630	F0	0	0	\$0	\$0
Corpus Christi	9/16/1988	2000	F1	0	0	\$250,000	\$0
Corpus Christi	4/17/1992	1255	F0	0	0	\$2,500	\$0
Corpus Christi	4/17/1992	1315	F0	0	0	\$25,000	\$0
Corpus Christi	5/31/1992	1255	F0	0	0	\$25,000	\$0
Port Aransas	6/2/1992	615	F1	0	0	\$25,000	\$0
Robstown	8/25/1992	955	F0	0	0	\$0	\$0
Corpus Christi	6/2/1994	935	F0	0	0	\$0	\$0
Nueces Co	8/5/1994	1325	F0	0	0	\$0	\$0
Nueces Co	9/12/1994	1930		0	0	\$0	\$0
Robstown	8/1/1995	1555	F0	0	0	\$0	\$0
Corpus Christi	8/23/1995	1739	F0	0	0	\$0	\$0
Nueces Co	9/20/1996	1200	F0	0	0	\$0	\$0
Nueces Co	6/17/1997	1645	F1	0	1	\$80,000	\$0
Corpus Christi	9/22/1998	1048	F0	0	0	\$0	\$0
Robstown	10/6/2000	1500	F0	0	0	\$0	\$0
Petronila	12/26/2000	1430	F0	0	0	\$0	\$0
Corpus Christi	10/24/2002	1319	F2	1	20	\$75,000,000	\$0
Corpus Christi	10/24/2002	1441	F1	0	6	\$10,000,000	\$0
Corpus Christi	7/5/2003	215	F0	0	0	\$0	\$0
Nueces Co	9/2/2005	1252	F0	0	0	\$0	\$0
Corpus Christi	7/7/2007	1640	EF0	0	0	\$20,000	\$0
Port Aransas	9/29/2007	1140	EF0	0	0	\$5,000	\$0
Corpus Christi	3/6/2008	1458	EF1	0	0	\$20,000	\$0
Corpus Christi	3/18/2008	1340	EF0	0	0	\$50,000	\$0
Nueces Co	6/2/2010	2215	EF0	0	0	\$0	\$1,000



**Table 12-6. Historical Tornado Events, 1950-2016 (cont.)**

Jurisdiction	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Nueces Co	6/30/2010	1330	EF0	0	0	\$0	\$0
Corpus Christi	1/9/2011	329	EF1	0	0	\$5,000,000	\$0
Corpus Christi	5/8/2012	715	EF0	0	0	\$0	\$0
Corpus Christi	5/10/2012	2120	EF0	0	0	\$100,000	\$0
Nueces Co	6/2/2013	950	EF0	0	0	\$0	\$0
Corpus Christi	5/15/2015	1205	EF0	0	0	\$25,000	\$0
Corpus Christi	5/24/2015	27	EF1	0	0	\$750,000	\$0
Nueces Co	9/26/2015	1415	EF0	0	0	\$0	\$0

### Probability

Probability, or frequency of return, was calculated by dividing the number of tornado events in the recorded time period by the overall time period that the resource database has recorded events for that jurisdiction. Note, historical events are documented as a function of the origin of the touchdown location. A Tornado may travel over several jurisdictions; however, the tornado event is solely recorded for the jurisdiction of the tornado origin. Table 12-7 provides a general overview of tornado severity, probability, impacts, and defining characteristics. Probability for future tornado events is defined for the county and each participating jurisdiction in the following sections.

**Table 12-7. Tornado Severity Defined**

WEAK	STRONG	VIOLENT
69% of all tornadoes Less than 5% of tornado deaths Lifetime 1-10+ minutes Winds less than 110 mph	29% of all tornadoes Nearly 30% of all tornado deaths May last 20 minutes or longer Winds 110 – 205 mph	2% of all tornadoes 70% of all tornado deaths Lifetime can exceed one hour Winds greater than 205 mph

## Impact

Tornado impacts are documented by the number of deaths, injuries, property damage, and crop damage. Table 12-8 provides a summary of impacts for Nueces County as a whole. Impacts to the county and participating jurisdictions is documented in the following sections.

Tornadoes, depending upon extent, can destroy anything they come into contact with. Due to the unpredictable locations of tornado touchdowns, it is difficult to identify assets or populations within jurisdictions that are particularly vulnerable to tornadoes. Due to those two facts, all assets, property, and populations within the planning area are considered vulnerable to tornadoes. Properties within the planning area may experience power outages or other utility failures even if they're not destroyed during a tornado event. Homes destroyed by tornadoes will lead to displaced populations. Crops and commercial property destroyed in tornado events will have negative economic impacts.

**Table 12-8. Historical Tornado Impacts Summary, 1950-2016**

Number of Events	Deaths	Injuries	Property Damage	Crop Damage
108	2	49	\$97,408,590	\$1,000

## Vulnerability

Tornadoes typically cross jurisdictional boundaries; therefore, all existing and future buildings, facilities, and populations in and around Nueces County are exposed to tornado hazard and are at potential risk of impact. The damage caused by a tornado is typically a result of high wind velocity, wind-blown debris, lightning, and large hail. Vulnerability of humans and property is difficult to evaluate given that tornadoes form at different strengths and in random locations. Property damage is typically most significant for structures of light construction. Three types of structures are more likely to suffer damage: manufactured homes, homes on crawlspaces (more susceptible to lift), and buildings with large spans, such as shopping malls, gymnasiums, and factories. Vulnerability is defined for the county and participating jurisdictions in the following sections.

# Unincorporated Nueces County Tornado Hazard

LOCATION							
County Wide (Unincorporated)							

OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
33	6	14	11	1	1	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
4	0	4	0	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
37	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 1.8 YEARS

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
37	1	16	\$413,000

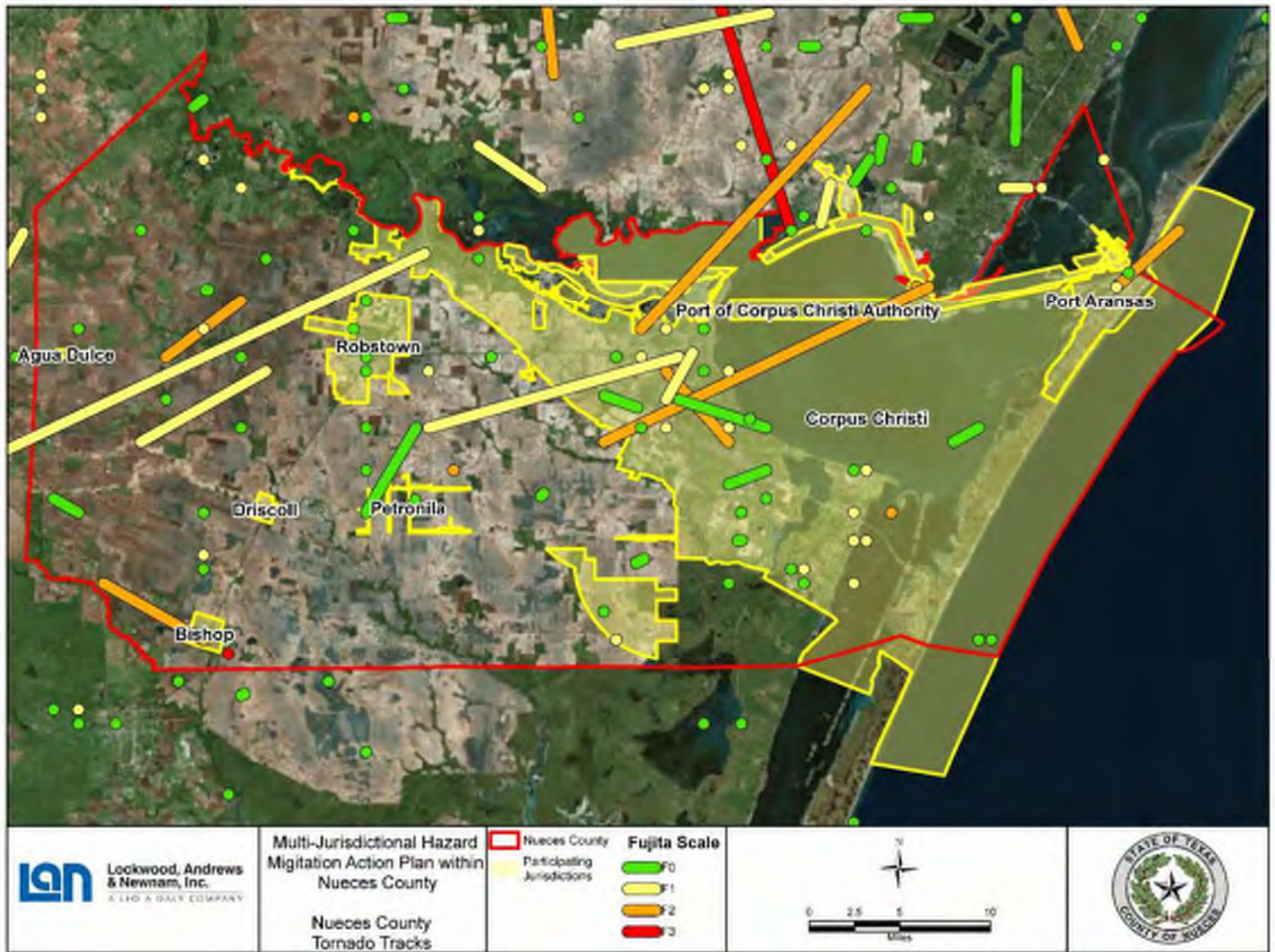
VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
15,274	\$373,034,606	\$487,429,634	345,880.3	\$76,735,126.03

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 12-2. Unincorporated Nueces County Tornado Hazard Map (1950 – 2016)



# City of Agua Dulce Tornado Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
0	0	0	0	0	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
0	0	0	0	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
0	11/1/1950 to 11/30/2016	66	Agua Dulce occupies approx. 0.03% of the planning area. Assuming that the entire planning area is equally vulnerable to tornadoes, Agua Dulce would be expected to experience approx. 0.0004 tornadoes annually or one tornado every 2,500 years.

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
0	0	0	\$0

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
820	\$17,541,361	\$20,711,243	2.45	\$601.78

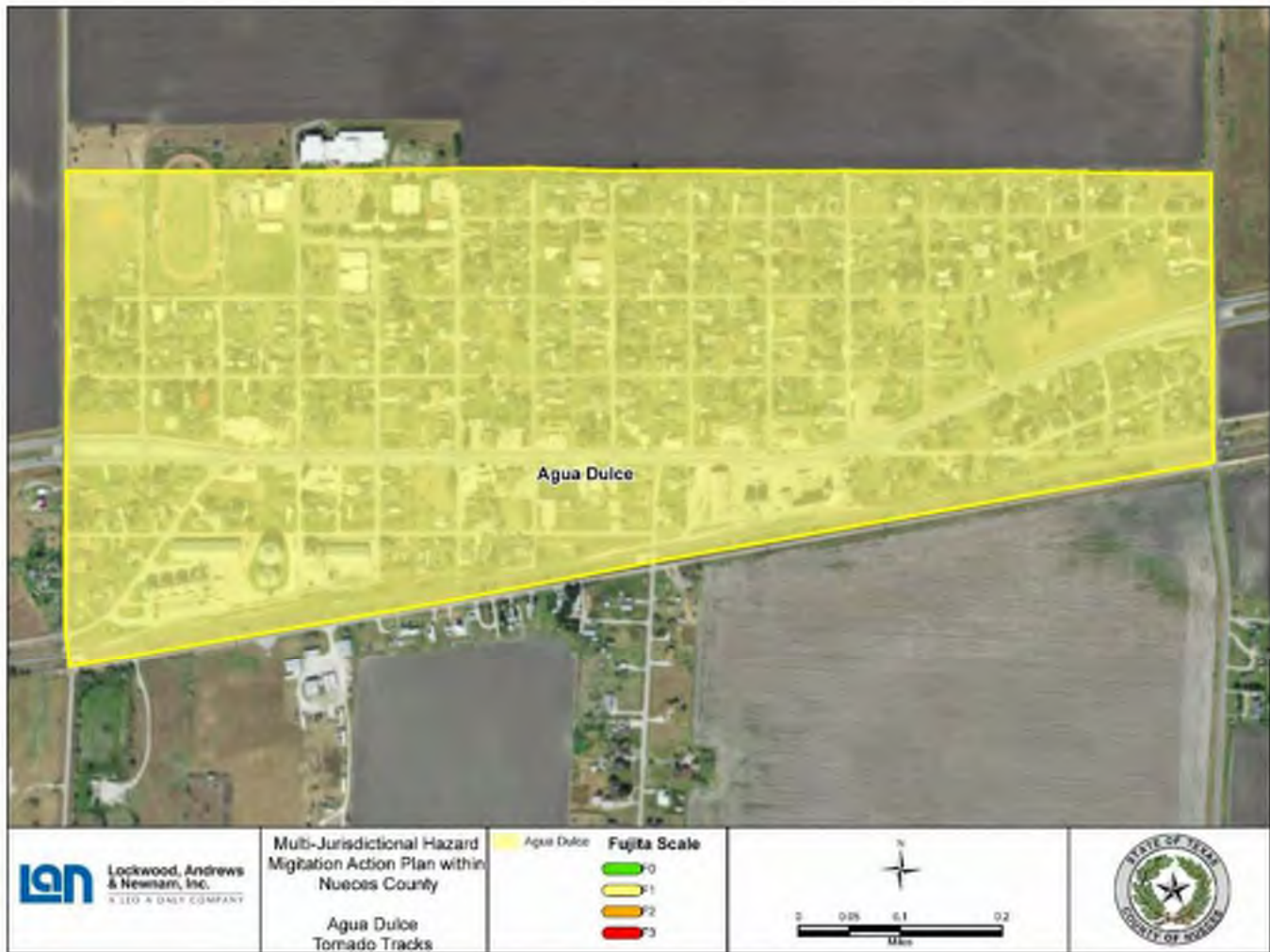
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 12-3. City of Agua Dulce Tornado Hazard Map (1950 – 2016)



# City of Bishop Tornado Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
4	0	0	1	3	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
0	0	0	0	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
4	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 16.5 YEARS

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
37	0	0	\$2,777,500

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
3,150	\$115,889,915	\$99,373,071	539.02	\$132,257.68

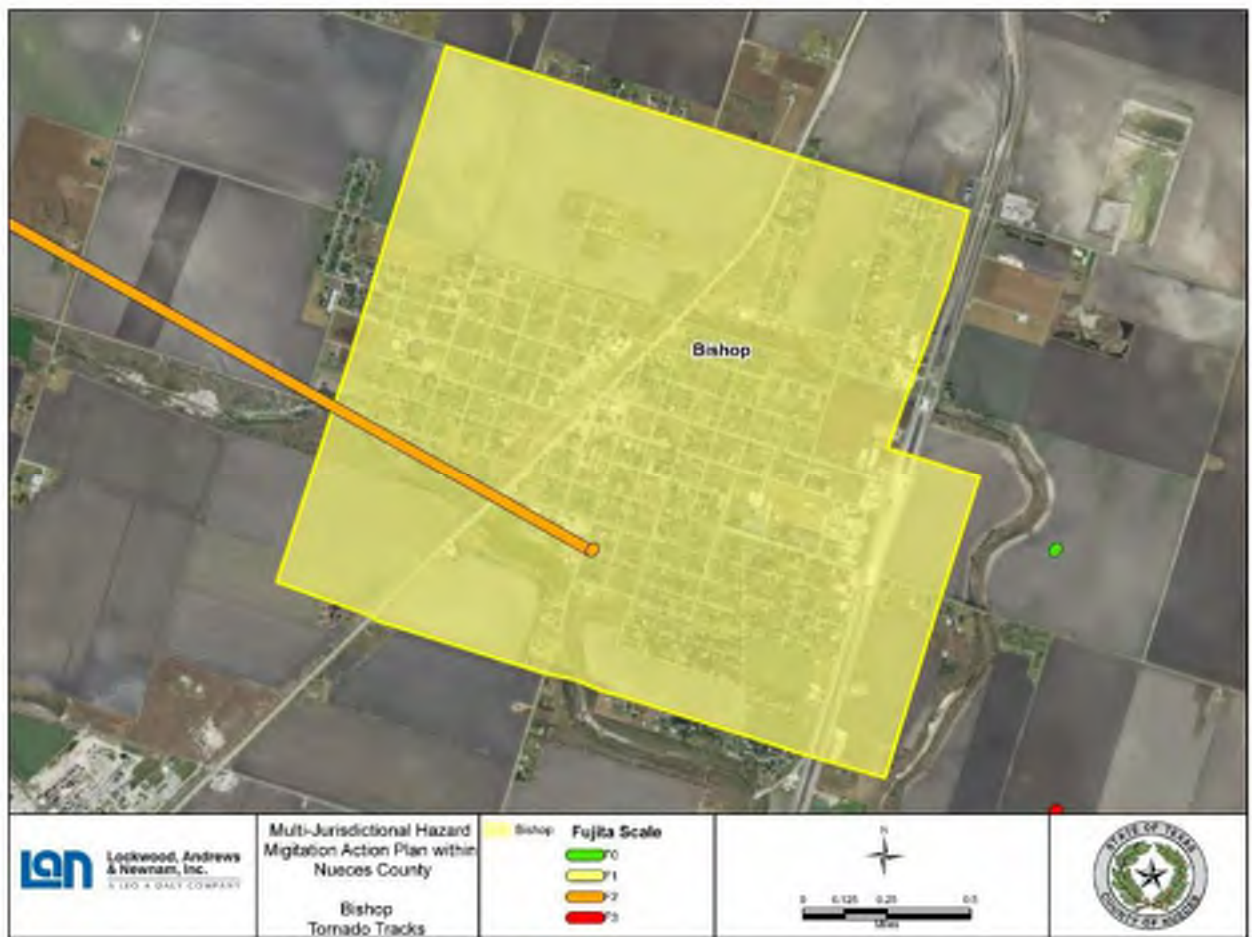
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 12-4. City of Bishop Tornado Hazard Map (1950 – 2016)



# City of Corpus Christi Tornado Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
43	2	22	14	5	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
8	0	5	3	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
51	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 1.3 YEARS

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
51	1	30	\$91,660,590

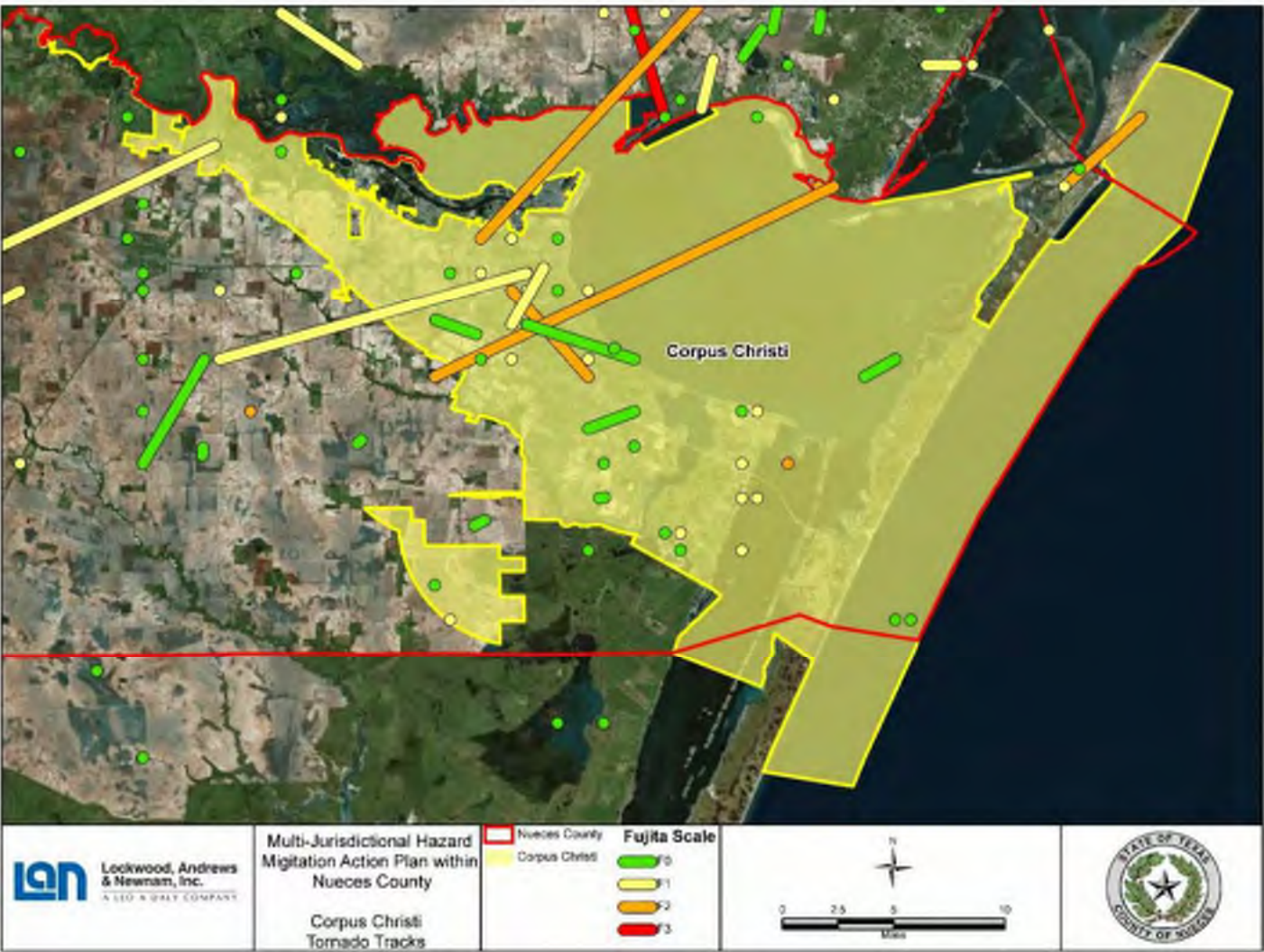
VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
324,074	\$7,007,832,685	\$10,238,656,508	24632.44	\$6,044,014.65

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 12-5. City of Corpus Christi Tornado Hazard Map (1950 – 2016)



# City of Driscoll Tornado Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
1	0	0	1	0	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
0	0	0	0	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
1	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 66 YEARS

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
1	0	0	\$2,500

VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
752	\$25,502,273	\$13,255,055	464.67	\$114,014.81

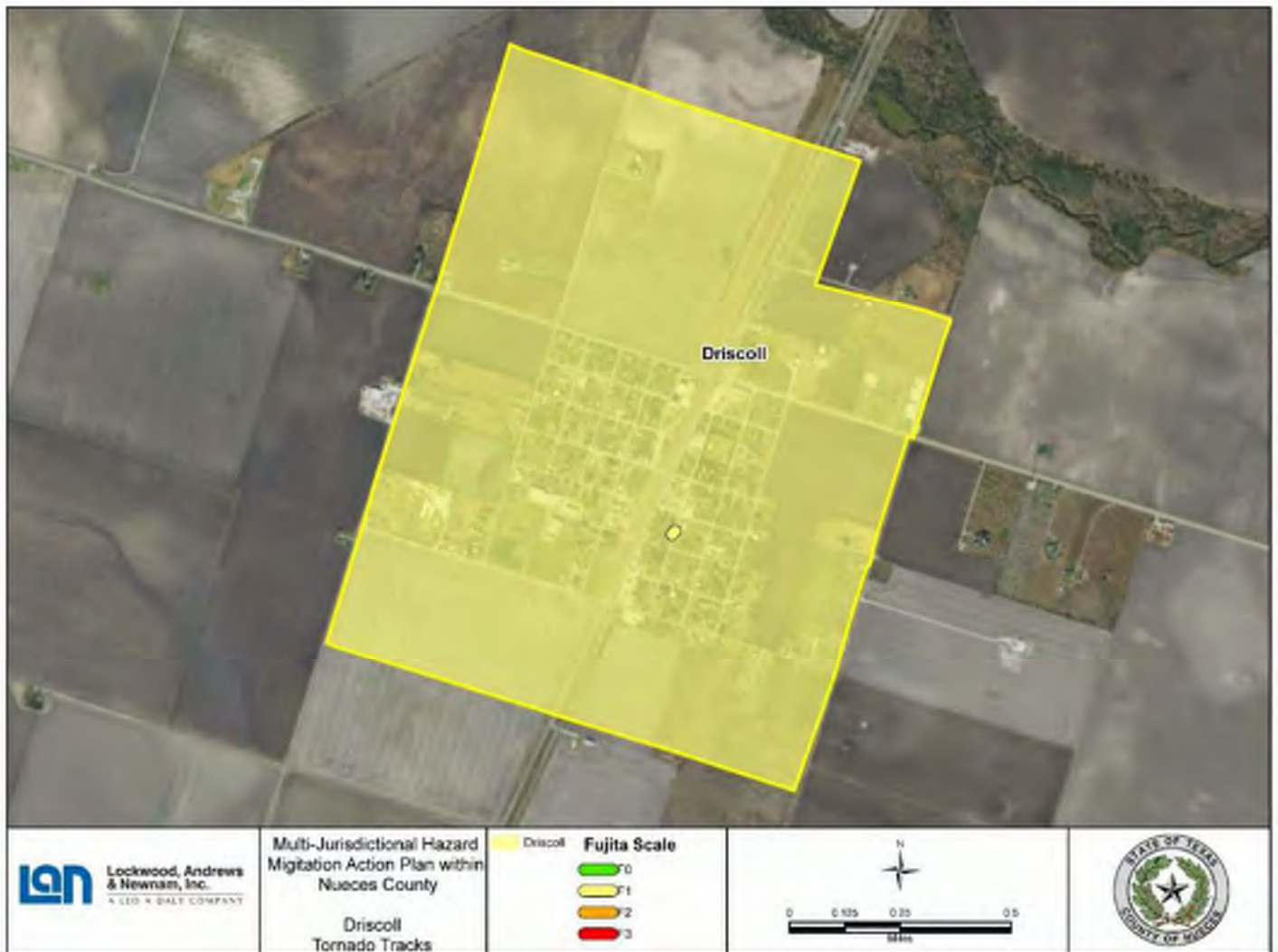
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



**Figure 12-6. City of Driscoll Tornado Hazard Map (1950 – 2016)**



# City of Petronila Tornado Hazard

LOCATION							
City Wide							
OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
0	0	1	0	0	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
0	0	0	0	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
1	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 66 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
1	0	0	\$0	\$0

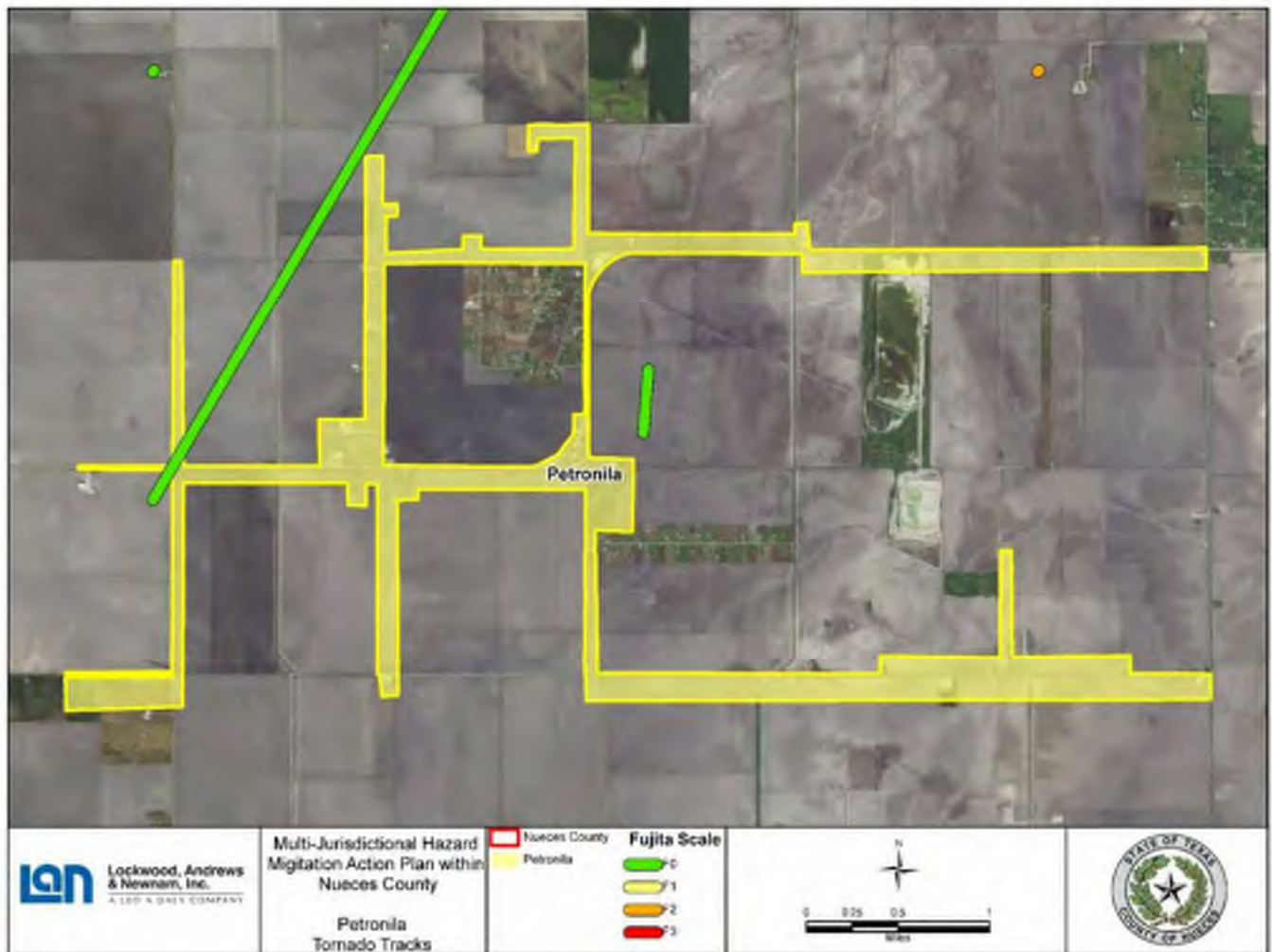
VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
114	\$3,714,796	\$3,201,138	926.66	\$227,373.01

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 12-7. City of Petronila Tornado Hazard Map (1950 – 2016)





# City of Port Aransas Tornado Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
10	7	0	1	2	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
1	0	1	0	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
11	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 6 YEARS

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
11	0	3	\$2,555,000

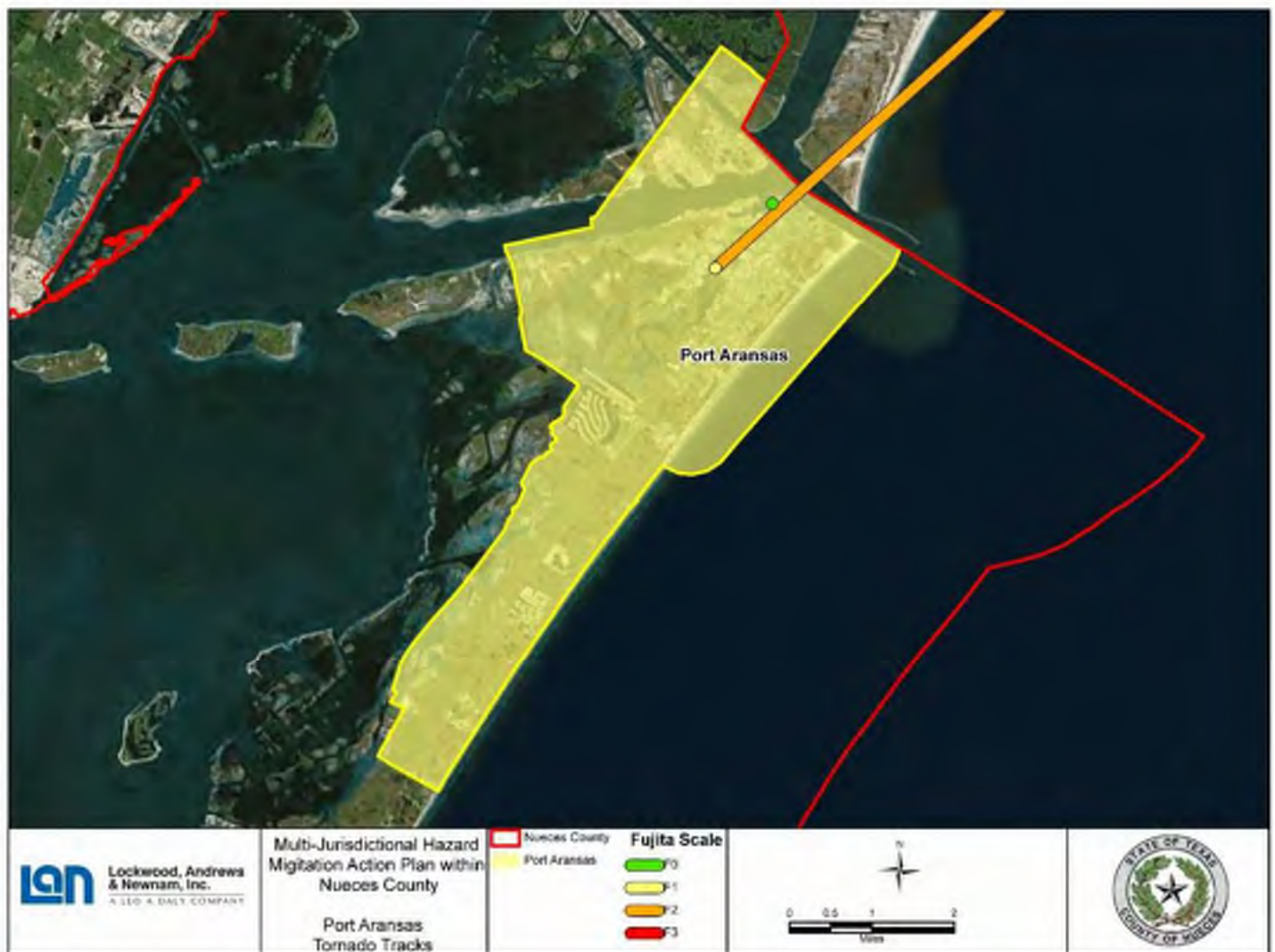
VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
3,955	\$414,531,219	\$774,547,552	0	\$0

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 12-8. City of Port Aransas Tornado Hazard Map (1950 – 2016)



# City of Robstown Tornado Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
10	0	9	1	0	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
0	0	0	0	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
10	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 6.6 YEARS

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
10	0	0	\$0

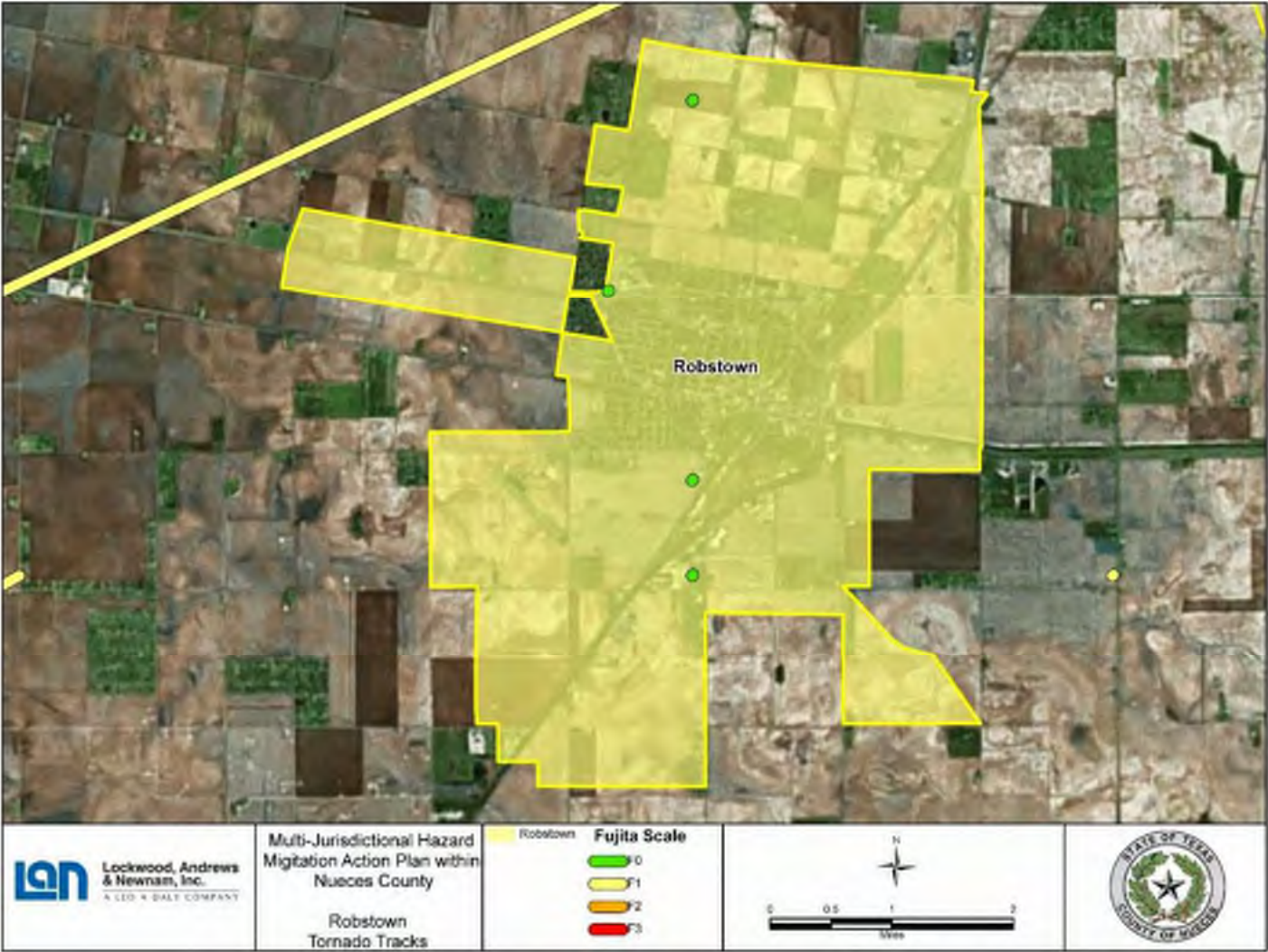
VULNERABILITY				
Population (City)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
11,576	\$151,390,423	\$183,445,540	6580.37	\$1,614,612.05

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

Figure 12-9. City of Robstown Tornado Hazard Map (1950 – 2016)



# Port of Corpus Christi Authority Tornado Hazard

LOCATION							
Jurisdiction Wide							
OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Fujita Scale)						
	N/A	F0	F1	F2	F3	F4	F5
3	0	0	0	3	0	0	0
Number of Events 2007-2016*	Magnitude (Enhanced Fujita Scale)						
	N/A	EF0	EF1	EF2	EF3	EF4	EF5
1	0	0	1	0	0	0	0

\* Fujita Scale replaced with Enhanced Fujita Scale in 2007

The Port of Corpus Christi experienced four of the 51 tornadoes that took place within the City of Corpus Christi from 1950 – 2016.

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
4	11/1/1950 to 11/30/2016	66	1 TORNADO TOUCHDOWNS ESTIMATED EVERY 16.5 YEARS

IMPACT			
Number of Events	Deaths	Injuries	Property Damage
0	0	0	\$51,000

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
N/A Industrial Area	\$174,026,681	\$0	0	\$0

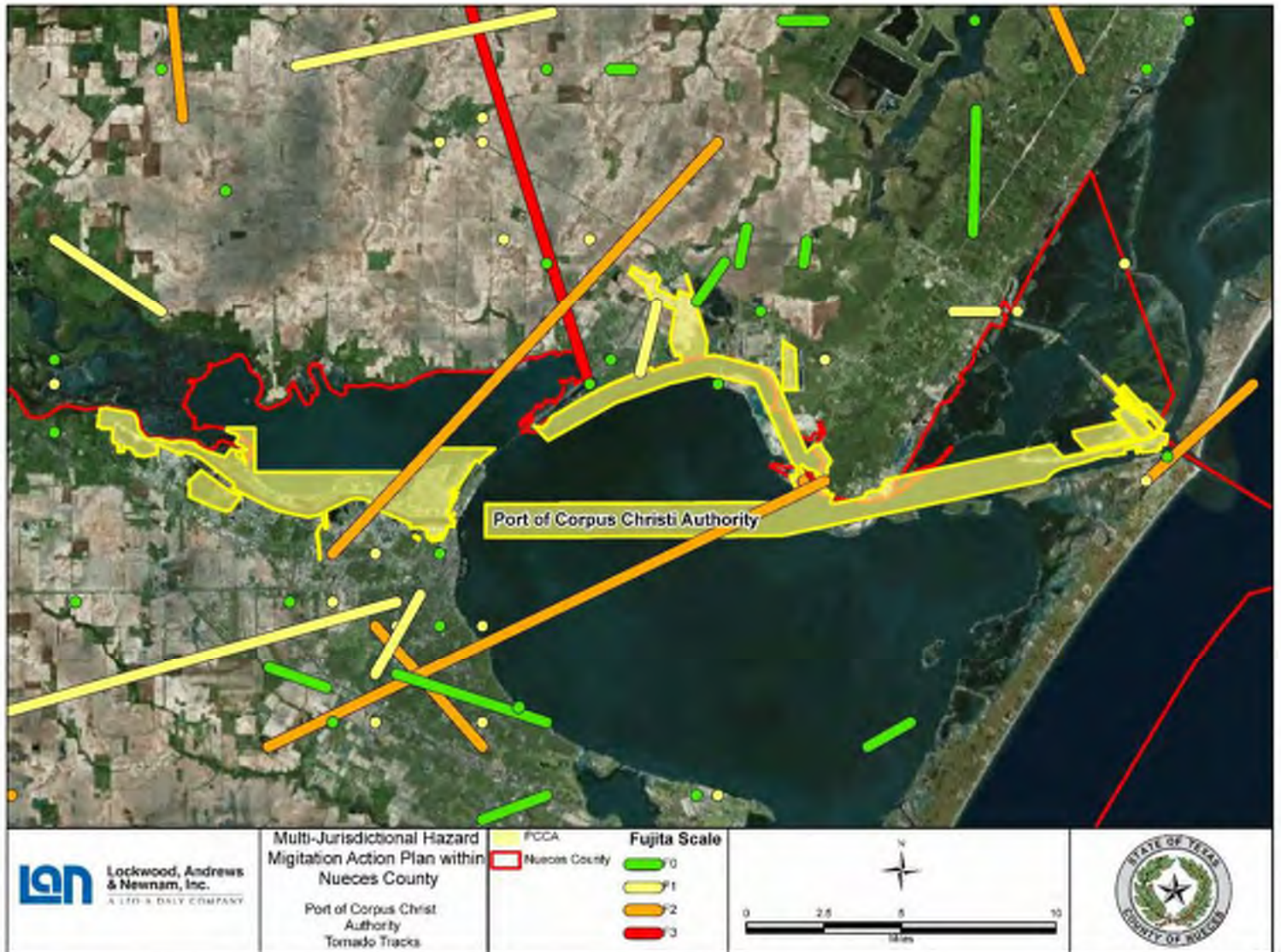
\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



Figure 12-10. Port of Corpus Christi Authority Tornado Hazard Map (1950 – 2016)



## Section 13: Hailstorm

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### Hailstorm Hazard Overview

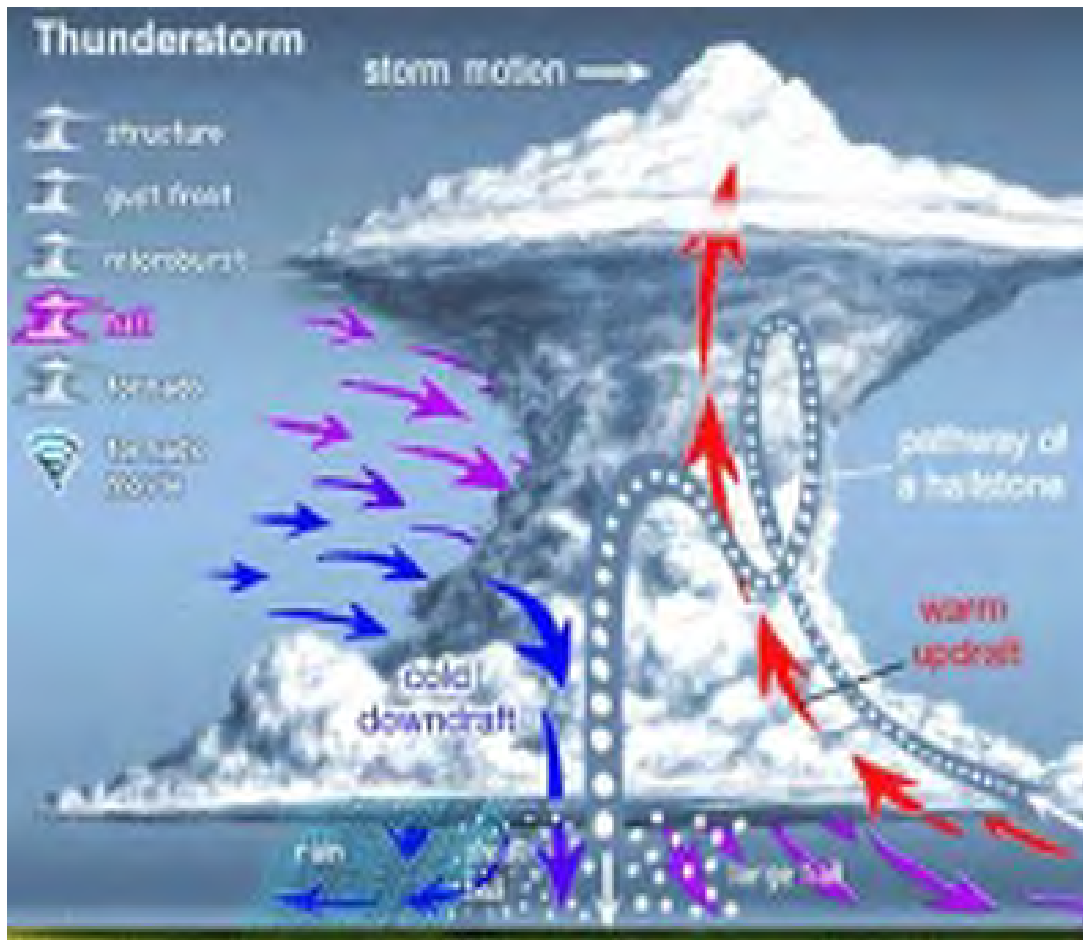
#### Description

Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Nearly all severe thunderstorms produce hail aloft, though it may melt before reaching the ground. Multi-cell thunderstorms produce many hailstones, but not usually large hailstones. In the life cycle of the multi-cell thunderstorm, the mature stage is relatively short so there is not much time for growth of the hailstone. Supercell thunderstorms have sustained updrafts that support large hail formation by repeatedly lifting the hailstones into the very cold air at the top of the thunderstorm cloud. In general hail 2 inches (5 cm), a little larger than golf ball, or larger in diameter is associated with supercells. Non-supercell storms are capable of producing golf ball size hail. In all cases, the hail falls when the thunderstorm's updraft can no longer support the weight of the ice. The stronger the updraft the larger the hailstone can grow<sup>1</sup>.

<sup>1</sup> NOAA



**Figure 13-1: Hail Development within a Thunderstorm**



## Location

Hailstorms do not have any specific geographic boundaries and can occur throughout the county uniformly. It is assumed that the county planning area including all participating jurisdictions are uniformly exposed to damage from hailstorms.

## Extent

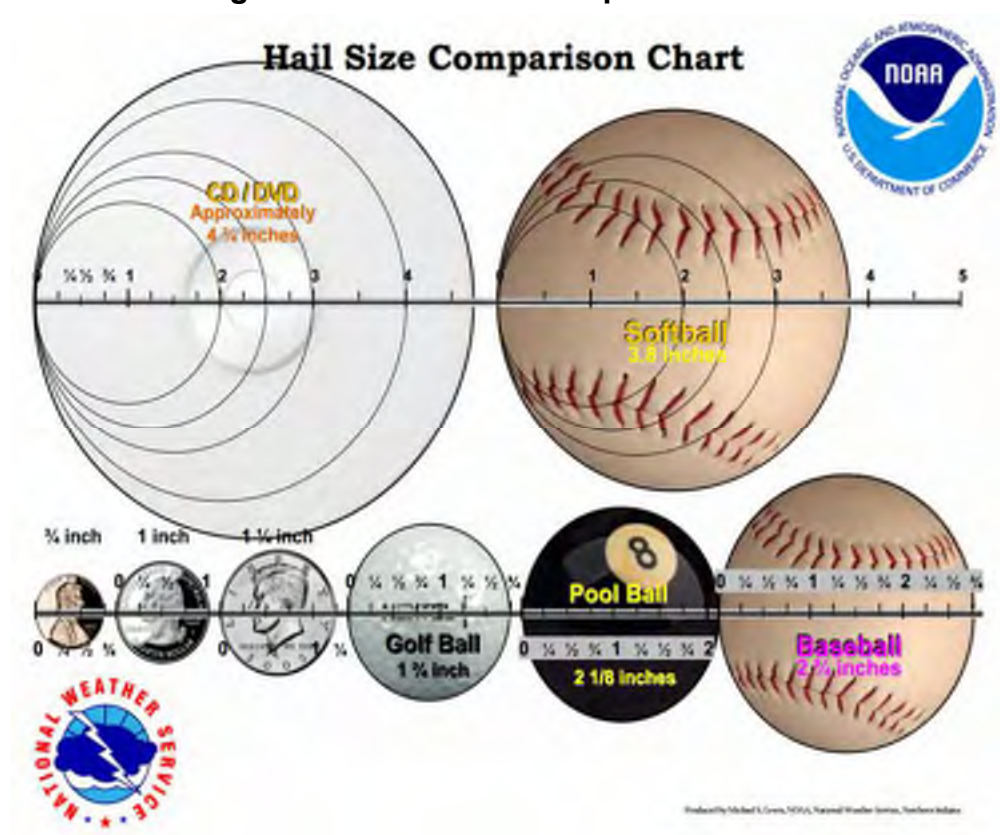
Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail.

Hail has been known to cause injury to humans, and occasionally has been fatal. There have been no recorded fatalities or injuries in the region.

Hail size is estimated by comparing it to a known object. Most hailstorms are made up of a mix of sizes, and only the very largest hail stones pose serious risk to people caught in the open. Hail of quarter size and larger is considered severe. The extent of hailstorm is uniform across the region

Historically, hailstones almost three inches in diameter have fallen in the planning area. For future planning purposes, all participating jurisdictions can expect hailstones up to three inches in diameter.

**Figure 13-2: Hail Size Comparison Chart<sup>2</sup>**



**Table 13-1. Estimating Hail Size<sup>3</sup>**

<sup>2</sup> NOAA

<sup>3</sup> NOAA

Size	Relative Frequency	Potential Damage	Example of Damage
Pea	$\frac{1}{4}$ " Diameter	<b>Virtually no damage.</b> Slight Damage to plants.	
Marble	$\frac{1}{2}$ " Diameter	<b>Virtually no structural damage.</b> Some damage to plants.	
Quarter	1" Diameter	<b>Some severe damage.</b> Dents to vehicles. Extensive damage to crops, plants, minor bodily damage.	
Ping Pong Ball	$1\frac{1}{2}$ " Diameter	<b>Severe damage.</b> Paint damaged on cars; shingle roof damage; limbs broken; extensive damage to crops. Extensive bodily injury.	
Golf Ball	$1\frac{3}{4}$ "	<b>Severe damage.</b> Damage to windows, metal roofs pitted, aircraft pitted, trees damaged, total crop damage.	
Tennis Ball	$2\frac{1}{2}$ "	<b>Extreme Damage</b> Damage to roof tiles, Significant structural damage to buildings, risk of serious bodily injury.	
Baseball	3"	<b>Extreme Damage</b> Cars and airplanes severely damaged, damage to forests, humans and animals seriously in danger.	
Softball	$4\frac{1}{2}$ "	<b>Total Destruction</b> Buildings destroyed, fatalities in humans and animals; cars and airplanes destroyed, forest severely damaged.	

## Occurrences

Hail producing storms can occur at any time of year and at any time of day, but they are typically more common in the spring and summer months during the late afternoon and

evening hours. A smaller high frequency period can emerge in the fall during the brief transition between the warm and cold seasons. According to the National Oceanic and Atmospheric Administration (NOAA) National Centers For Environmental Information Storm Event Database Nueces County has experienced 117 (recorded) hailstorm events over the course of the record period from 03/21/1956 to 04/22/2015 (59 years). Table 13-2 includes a summary of hailstorm events from 1956 to 2015 and Table 13-3 includes a comprehensive list of all hailstorms on record within Nueces County.

**Table 13-2. Historical Hailstorm Occurrence Summary, 1950-2015**

Number of Events	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
118	28	15	42	5	6	19	3

**Table 13-3. Historical Hailstorm Events, 1956-2015**

Date	Time	Magnitude (Size of Hail)	Injuries	Fatalities	Prop Damage	Crop Damage	Jurisdiction
1956-03-21	15:35:00	1.00	0	0	0.00	0.00	Nueces
1957-03-03	15:00:00	1.00	0	0	0.00	0.00	Corpus Christi
1957-04-27	04:30:00	1.50	0	0	0.00	0.00	Robstown
1959-05-10	20:20:00	2.75	0	0	0.00	0.00	Nueces
1961-04-29	12:46:00	0.75	0	0	0.00	0.00	Corpus Christi
1966-03-28	14:45:00	1.00	0	0	0.00	0.00	Nueces
1968-05-17	20:00:00	1.50	0	0	0.00	0.00	Nueces
1969-11-26	22:50:00	1.75	0	0	0.00	0.00	Nueces
1971-05-10	19:50:00	1.75	0	0	0.00	0.00	Nueces
1971-05-11	11:55:00	1.75	0	0	0.00	0.00	Nueces
1973-06-11	16:30:00	1.75	0	0	0.00	0.00	Robstown
1975-05-01	09:00:00	1.50	0	0	0.00	0.00	Corpus Christi
1976-04-07	22:20:00	0.75	0	0	0.00	0.00	Nueces
1977-09-08	15:40:00	1.75	0	0	0.00	0.00	Corpus Christi
1977-09-08	15:40:00	1.75	0	0	0.00	0.00	Corpus Christi

**Table 13-3. Historical Hailstorm Events, 1956-2015 (cont.)**

Date	Time	Magnitude (Size of Hail)	Injuries	Fatalities	Property Damage	Crop Damage	Jurisdiction
1980-05-22	00:15:00	1.75	0	0	0.00	0.00	Corpus Christi
1981-05-29	16:45:00	0.75	0	0	0.00	0.00	Nueces
1985-05-08	20:44:00	0.75	0	0	0.00	0.00	Corpus Christi
1986-10-26	17:53:00	1.75	0	0	0.00	0.00	Corpus Christi
1989-05-17	17:00:00	1.75	0	0	0.00	0.00	Bishop
1992-02-24	15:30:00	0.75	0	0	0.00	0.00	Bishop
1993-05-02	07:37:00	2.50	0	0	\$2,500,000	0.00	Nueces
1994-05-13	17:15:00	0.75	0	0	\$50,000	0.00	Bishop
1994-05-13	17:00:00	1.75	0	0	\$50,000	0.00	Nueces
1995-04-11	00:15:00	0.75	0	0	0.00	0.00	Corpus Christi
1995-04-11	02:00:00	0.75	0	0	0.00	0.00	Port Aransas
1995-12-18	01:45:00	1.00	0	0	0.00	0.00	Nueces
1996-04-05	11:30:00	0.75	0	0	0.00	0.00	Corpus Christi
1996-04-05	11:45:00	0.75	0	0	0.00	0.00	Corpus Christi
1996-05-11	17:00:00	1.00	0	0	0.00	0.00	Corpus Christi
1996-05-11	17:10:00	1.25	0	0	0.00	0.00	Corpus Christi
1996-08-14	15:25:00	0.75	0	0	0.00	0.00	Nueces
1997-05-09	13:20:00	0.75	0	0	0.00	0.00	Corpus Christi
1998-03-07	00:05:00	1.00	0	0	0.00	0.00	Robstown
1998-03-07	00:20:00	1.75	0	0	0.00	0.00	Corpus Christi
1998-04-18	12:32:00	0.75	0	0	0.00	0.00	Corpus Christi
2001-06-07	15:50:00	1.00	0	0	0.00	0.00	Corpus Christi
2001-06-07	16:05:00	1.00	0	0	0.00	0.00	Corpus Christi
2002-05-29	16:18:00	0.75	0	0	0.00	0.00	Corpus Christi
2002-12-12	06:15:00	0.75	0	0	0.00	0.00	Corpus Christi
2002-12-12	06:35:00	0.88	0	0	0.00	0.00	Corpus Christi
2003-03-26	00:25:00	0.75	0	0	0.00	0.00	Robstown
2003-10-25	19:00:00	0.88	0	0	0.00	0.00	Corpus Christi
2004-02-24	11:50:00	1.00	0	0	0.00	0.00	Corpus Christi
2004-02-24	11:04:00	1.00	0	0	0.00	0.00	Nueces
2004-02-24	11:25:00	1.00	0	0	0.00	0.00	Robstown
2004-04-06	09:40:00	0.75	0	0	0.00	0.00	Robstown
2004-05-13	22:38:00	0.88	0	0	0.00	0.00	Corpus Christi
2005-03-20	03:25:00	0.88	0	0	0.00	0.00	Corpus Christi

**Table 13-3. Historical Hailstorm Events, 1956-2015 (cont.)**

Date	Time	Magnitude (Size of Hail)	Injuries	Fatalities	Prop Damage	Crop Damage	Jurisdiction
2005-05-08	18:25:00	0.88	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:19:00	1.00	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:20:00	1.00	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:25:00	1.00	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:28:00	1.00	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:35:00	1.00	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:37:00	1.00	0	0	0.00	0.00	Corpus Christi
2005-05-08	17:55:00	1.00	0	0	0.00	0.00	Robstown
2005-05-08	18:27:00	1.25	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:10:00	1.50	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:30:00	1.50	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:25:00	1.75	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:30:00	1.75	0	0	0.00	0.00	Corpus Christi
2005-05-08	18:40:00	1.75	0	0	0.00	0.00	Corpus Christi
2005-05-29	20:52:00	0.75	0	0	0.00	0.00	Corpus Christi
2005-05-29	20:45:00	1.00	0	0	0.00	0.00	Corpus Christi
2005-05-29	16:13:00	1.00	0	0	0.00	0.00	Nueces
2005-08-31	17:30:00	0.75	0	0	0.00	0.00	Robstown
2006-03-28	16:27:00	0.75	0	0	0.00	0.00	Driscoll
2006-03-28	16:45:00	1.00	0	0	0.00	0.00	Bishop
2006-05-10	15:30:00	1.00	0	0	0.00	0.00	Bishop
2006-05-10	16:35:00	1.00	0	0	0.00	0.00	Nueces
2006-05-10	17:22:00	1.75	0	0	0.00	0.00	Nueces
2006-05-10	15:35:00	2.75	0	0	0.00	0.00	Nueces
2006-05-14	20:00:00	1.00	0	0	0.00	0.00	Corpus Christi
2006-08-30	16:17:00	0.88	0	0	0.00	0.00	Driscoll
2006-12-23	14:30:00	0.88	0	0	0.00	0.00	Robstown
2007-03-13	23:18:00	0.75	0	0	0.00	0.00	Nueces
2007-04-01	03:42:00	0.88	0	0	0.00	0.00	Corpus Christi
2008-02-16	20:56:00	0.88	0	0	0.00	0.00	Robstown
2008-03-06	13:37:00	0.75	0	0	0.00	0.00	Corpus Christi
2008-03-06	13:15:00	1.00	0	0	0.00	0.00	Corpus Christi
2008-03-06	14:50:00	1.00	0	0	0.00	0.00	Nueces
2008-03-10	13:44:00	0.75	0	0	0.00	0.00	Bishop
2009-03-26	15:10:00	0.88	0	0	0.00	0.00	Nueces

**Table 13-3. Historical Hailstorm Events, 1956-2015 (cont.)**

Date	Time	Magnitude (Size of Hail)	Injuries	Fatalities	Prop Damage	Crop Damage	Jurisdiction
2009-05-23	18:00:00	0.75	0	0	0.00	0.00	Corpus Christi
2009-05-23	18:05:00	0.75	0	0	0.00	0.00	Corpus Christi
2009-05-27	12:22:00	0.75	0	0	0.00	0.00	Robstown
2009-06-03	19:27:00	0.88	0	0	0.00	0.00	Corpus Christi
2010-04-17	14:58:00	0.88	0	0	0.00	0.00	Nueces
2011-01-09	03:48:00	1.00	0	0	\$500	0.00	Driscoll
2012-03-29	15:23:00	1.00	0	0	\$100	0.00	Corpus Christi
2012-03-29	16:02:00	1.00	0	0	\$100	0.00	Robstown
2012-03-29	16:10:00	1.00	0	0	\$100	0.00	Robstown
2012-03-29	16:12:00	1.75	0	0	\$5,000	0.00	Robstown
2012-04-16	11:11:00	1.25	0	0	\$5,000	0.00	Corpus Christi
2012-04-16	11:27:00	1.50	0	0	\$5,000	0.00	Corpus Christi
2012-04-20	16:03:00	1.00	0	0	\$100	0.00	Corpus Christi
2012-05-08	13:21:00	0.75	0	0	0.00	0.00	Nueces
2012-05-08	13:52:00	1.00	0	0	\$100	0.00	Corpus Christi
2012-05-10	13:06:00	1.00	0	0	0.00	0.00	Corpus Christi
2012-05-10	13:48:00	1.00	0	0	\$5,000	0.00	Corpus Christi
2012-05-10	13:57:00	1.00	0	0	0.00	0.00	Corpus Christi
2012-05-10	14:12:00	1.00	0	0	0.00	0.00	Corpus Christi
2012-05-10	21:27:00	1.00	0	0	0.00	0.00	Corpus Christi
2012-05-10	13:29:00	1.25	0	0	\$5,000	0.00	Corpus Christi
2012-05-10	14:24:00	1.25	0	0	0.00	0.00	Corpus Christi
2012-05-10	13:16:00	1.75	0	0	0.00	0.00	Corpus Christi
2012-05-15	13:41:00	0.75	0	0	0.00	0.00	Nueces
2012-11-03	21:15:00	0.88	0	0	0.00	0.00	Corpus Christi
2012-11-03	21:30:00	0.88	0	0	0.00	0.00	Corpus Christi
2014-04-04	04:00:00	1.00	0	0	\$500	0.00	Corpus Christi
2014-04-04	04:05:00	1.00	0	0	\$100	0.00	Robstown
2014-04-04	03:28:00	1.75	0	0	\$100	0.00	Nueces
2015-04-17	20:44:00	1.00	0	0	0.00	0.00	Corpus Christi
2015-04-22	13:15:00	0.88	0	0	0.00	0.00	Corpus Christi
2015-04-22	12:30:00	1.00	0	0	0.00	0.00	Nueces
2015-04-22	12:12:00	1.00	0	0	0.00	0.00	Robstown
2015-04-22	12:32:00	1.75	0	0	0.00	0.00	Nueces



## Probability

Probability, or frequency of return, was calculated by dividing the number of hailstorm events in the recorded time period by the overall time period that the resource database has recorded events for that jurisdiction. A hailstorm may travel over several jurisdictions; however, the hailstorm event is solely recorded for the jurisdiction of the hailstorm origin. Table 13-4 provides a general overview of hailstorm severity, probability, impacts, and defining characteristics. Probability for future hailstorm events is defined for the county and each participating jurisdiction in the following sections.

**Table 13-4. Hailstorm Severity Defined**

Minor Damage	Severe Damage	Extreme Damage
36% of all hailstorms.  \$0 to Less than \$100 in damage. No bodily injuries if exposed to the hail.	45% of all hailstorms \$500 to \$50,000 in damages. Minor bodily injuries if exposed to the hail.	17% of all hailstorms \$100,000 to \$5,000,000 in damages. Fatalities possible if exposed to hail.

## Impact

Hailstorm impacts are documented by the number of deaths, injuries, property damage, and crop damage. Table 13-5 provides a summary of impacts for Nueces County as a whole. Impacts to the county and participating jurisdictions is documented in the following sections.

**Table 13-5. Historical Hailstorm Impacts Summary, 1955-2015**

Number of Events	Deaths	Injuries	Property Damage	Crop Damage
118	0	0	\$2,021,600	\$0

## **Vulnerability**

Hailstorms typically cross-jurisdictional boundaries; therefore, all existing and future buildings, facilities, and populations in and around Nueces County are exposed to hail hazard and are at potential risk of impact. The damage caused by a hail is dependent upon the size of the “hail stones” and result in damage to vehicles, buildings, roofs, plants, trees, and especially crops. Vulnerability of humans and property is difficult to evaluate given that hailstorms form at different strengths and in random locations. Property damage is typically most significant for vehicles and structures of light construction. Three types of structures are more likely to suffer damage: manufactured homes and recreational vehicles. Agricultural crops are especially vulnerable to 1” or greater size hail and can lead to total crop failure. Vulnerability is defined for the county and participating jurisdictions in the following sections.

# Unincorporated Nueces County Hailstorm Hazard

LOCATION							
County Wide (Unincorporated)							
OCCURENCE	EXTENT						
Number of Events 1950-2006*	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	11/4"	11/2"	13/4"	23/4"
27	6	2	8	0	1	7	3
PROBABILITY							
Number of Events	Record Time Period		Time Period Years		Probability		
27	3/26/1956 to 4/22/2015		59		1 HAILSTORM ESTIMATED EVERY 2.18 YEARS		
IMPACT							
Number of Events	Deaths		Injuries		Property Damage		Crop Damage
27	0		0		2,050,100		0
VULNERABILITY							
Population (County)*	Property Value**			Crop Land***			
	Commercial		Residential		Acres		Value
15,274	\$373,034,60		\$487,429,634		345,880.3		\$76,735,126.03

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Agua Dulce Hailstorm Hazard

LOCATION							
City Wide							

OCCURENCE	EXPECTED EXTENT*						
Number of Events 1956-2015	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
0	23.7%	12.7%	35.5%	4.2%	5.1%	16.1%	2.5%

\*While the City of Agua Dulce has no recorded hail events, because hailstorms take place in a spatially unpredictable manner, it is expected that Agua Dulce can be impacted by hail events in the same way that the planning area as a whole has been impacted by hail events. A probabilistic distribution of hail extent of based up on historical occurrences in the planning area is presented above.

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
0	3/26/1956 to 4/22/2015	59	.06% annual chance, or one hailstorm every 1666.7 years **

\*\*The city of Agua Dulce occupies approx. 0.03% of the planning area. Probability is based upon an area-weighted proportion of the probability of the planning area experiencing a hail event.

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
0	0	0	\$0	\$0

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
820	\$17,541,361	\$20,711,243	2.45	\$601.78

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Bishop Hailstorm Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1955-2015	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
6	3	0	2	0	0	1	0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
6	3/21/1956 – 4/22/2015	59	1 HAILSTORM EVENT ESTIMATED EVERY 9.83 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
6	0	0	\$50,000	\$0

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
3,150	\$115,889,915	\$99,373,071	539.02	\$132,257.68

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Corpus Christi Hailstorm Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1956-2015	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
65	13	10	24	5	4	9	0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
65	3/21/1956 to 4/22/2015	59	1 HAILSTORM ESTIMATED EVERY .90 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
65		0	\$20,650	\$0

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
324,074	\$7,007,832,685	\$10,238,656,508	24632.44	\$6,044,014.65

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Driscoll Hailstorm Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1956-2015	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
3	1	1	1	0	0	0	0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
3	3/21/1956 to 4/22/1956	59	1 HAILSTORM ESTIMATED EVERY 19.6 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
	0	0	\$500	\$0

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
752	\$25,502,273	\$13,255,055	464.67	\$114,014.81

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



# City of Petronila Hailstorm Hazard

LOCATION							
City Wide							

OCCURENCE	EXPECTED EXTENT*						
Number of Events 1956-2015*	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
0	23.7%	12.7%	35.5%	4.2%	5.1%	16.1%	2.5%

\*While the City of Petronila has no recorded hail events, because hailstorms take place in a spatially unpredictable manner, it is expected that Petronila can be impacted by hail events in the same way that the planning area as a whole has been impacted by hail events. A probabilistic distribution of hail extent of based up on historical occurrences in the planning area is presented above.

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
0	3/26/1956 to 4/22/2015	59	0.3% annual chance, or one hailstorm every 333.3 years **

\*\*The city of Petronila occupies approx. 0.15% of the planning area. Probability is based upon an area-weighted proportion of the probability of the planning area experiencing a hail event.

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
0	0	0	\$0	\$0

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
114	\$3,714,796	\$3,201,138	926.66	\$227,373.01

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Port Aransas Hailstorm Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1956-2015	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
1	1	0	0	0	0	0	0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
1	3/26/1956 to 4/22/2015	56	1 HAILSTORM ESTIMATED EVERY 59 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
1	0	0	\$0	\$0

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
3,955	\$414,531,219	\$774,547,552	0	\$0

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Robstown Hailstorm Hazard

LOCATION							
City Wide							

OCCURENCE	EXTENT						
Number of Events 1956-2015	Magnitude (Size of Hail)						
	¾"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
16	4	2	7	0	1	2	0

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
16	3/21/1956 to 4/22/2015	59	1 HAILSTORM ESTIMATED EVERY 3.6 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
16	0	0	\$5,150	\$0

VULNERABILITY				
Population (County)*	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
11,576	\$151,390,423	\$183,445,540	6580.37	\$1,614,612.05

\*Texas Association of Counties, 2015

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# Port of Corpus Christi Authority Hailstorm Hazard

LOCATION							
Jurisdiction Wide							

OCCURENCE	EXPECTED EXTENT*						
Number of Events 1956-2015	Magnitude (Size of Hail)						
	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2 3/4"
0	23.7%	12.7%	35.5%	4.2%	5.1%	16.1%	2.5%

\*While the City of Petronila has no recorded hail events, because hailstorms take place in a spatially unpredictable manner, it is expected that Petronila can be impacted by hail events in the same way that the planning area as a whole has been impacted by hail events. A probabilistic distribution of hail extent of based up on historical occurrences in the planning area is presented above.

PROBABILITY			
Number of Events	Record Time Period	Time Period Years	Probability
0	3/26/1956 to 4/22/2015	59	6% annual chance, or one hailstorm every 16.7 years **

\*\*The Port of Corpus Christi Authority occupies approx. 3% of the planning area. Probability is based upon an area-weighted proportion of the probability of the planning area experiencing a hail event.

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
0	0	0	\$0	\$0

VULNERABILITY				
Population	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
N/A Industrial Area	\$174,026,681	\$0	0	\$0

\*\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

## Section 14: Expansive Soils

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### Expansive Soils Hazard Overview

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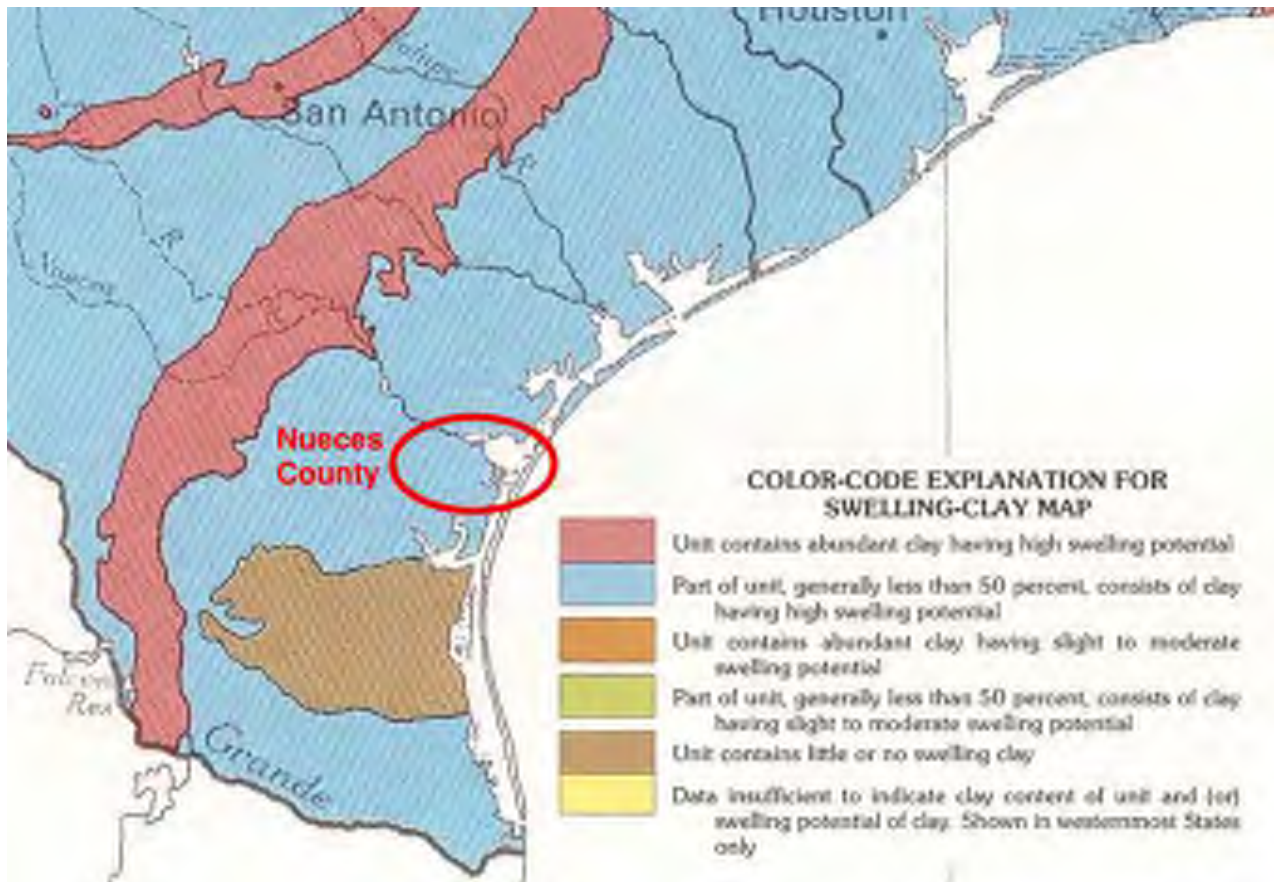
#### Description

Expansive soils contain minerals such as clay that are prone to large volume changes (swelling and shrinking). Soils with a high content of expansive minerals can shrink in drier seasons forming deep cracks. This shrinkage can remove support from buildings or other structures and result in damaging subsidence.

#### Location

Expansive soils with high clay content can expand to as much as 15 times its original volume. The soils in Nueces County, and most of the Texas Gulf Coast, typically contain less than 50 percent of clay soils that have a high swelling potential. Swelling potential in the Texas Gulf Coast is illustrated in Figure 14-1.

**Figure 14-1. Texas Gulf Coast Swelling-Clay Map<sup>1</sup>**



A USDA soil survey for Nueces County indicates that approximately 67% of Nueces County's land surface consists of clay soils as indicated in Table 14-1.

<sup>1</sup> USDA soil survey for Nueces County

**Table 14-1. Nueces County Clay Soil Survey<sup>2</sup>**

Nueces County - Percentage of Clay Soils*				
Symbol	Soil Name	Acres	%	
Ba	Banquete clay	11,896	1.7%	Percentage Excluding Water Surface
Bn	Edroy clay	3,673	0.5%	
Cd	Aransas clay	3,087	0.4%	
Fc	Sinton sandy clay loam	2,184	0.3%	
Lo	Aransas clay	2,809	0.4%	
Ma	Ijam clay loam	4,836	0.7%	
Oc	Calallen sandy clay loam	4,146	0.6%	
Tc	Aransas clay	4,842	0.7%	
Tf	Aransas clay	4,005	0.6%	
VcA	Victoria clay	306,474	43.8%	
VcB	Victoria clay	4,440	0.6%	
Vd2	Monteola clay	3,072	0.4%	
Vt	Victoria clay	13,152	1.9%	
Land Surface	<b>Total Clay Soils</b>	368,615	53%	<b>67%</b>
	Other Soils	180,745	26%	33%
	<b>Total Land Surface</b>	<b>549,360</b>		
Water Surface		150,851	22%	
<b>Total Nueces County</b>		<b>700,211</b>	<b>100%</b>	

## Extent

Section 618.41 of the National Soil Survey Handbook (NSSH), by the USDA's Natural Resources Conservation Service, indicates expansive soils can be measured as a percent of the volume change of an oven-dried soil sample when it changes from moist to dry conditions. This percentage is called the Linear Extensibility Percent (LEP). The LEP is calculated as indicated in Figure 14-2.

<sup>2</sup> USDA Web Soil Survey



**Figure 14-2. Linear Extensibility Percent (LEP) Formula<sup>3</sup>**

$$\text{COLE} = \frac{(\text{moist length}) - (\text{dry length})}{\text{dry length}}$$

COLE = Coefficient Of Linear Extensibility

$$\text{LEP} = \text{COLE} \times 100$$

The higher the LEP percentage the greater the amount the soil will shrink and swell. LEP can be expressed in four Shrink-Swell classifications from Low to Very High as indicated in Table 14-2. The shrinking and swelling of soils with Moderate to Very High LEP can damage building, roads, buried infrastructure such as pipelines, and other structures. High to Very High LEP soils can even damage plant roots. Figure 14-3 graphically illustrates the distribution of soils for Nueces County by LEP Shrink-Swell classifications.

**Table 14-2. Shrink-Swell Classifications<sup>4</sup>**

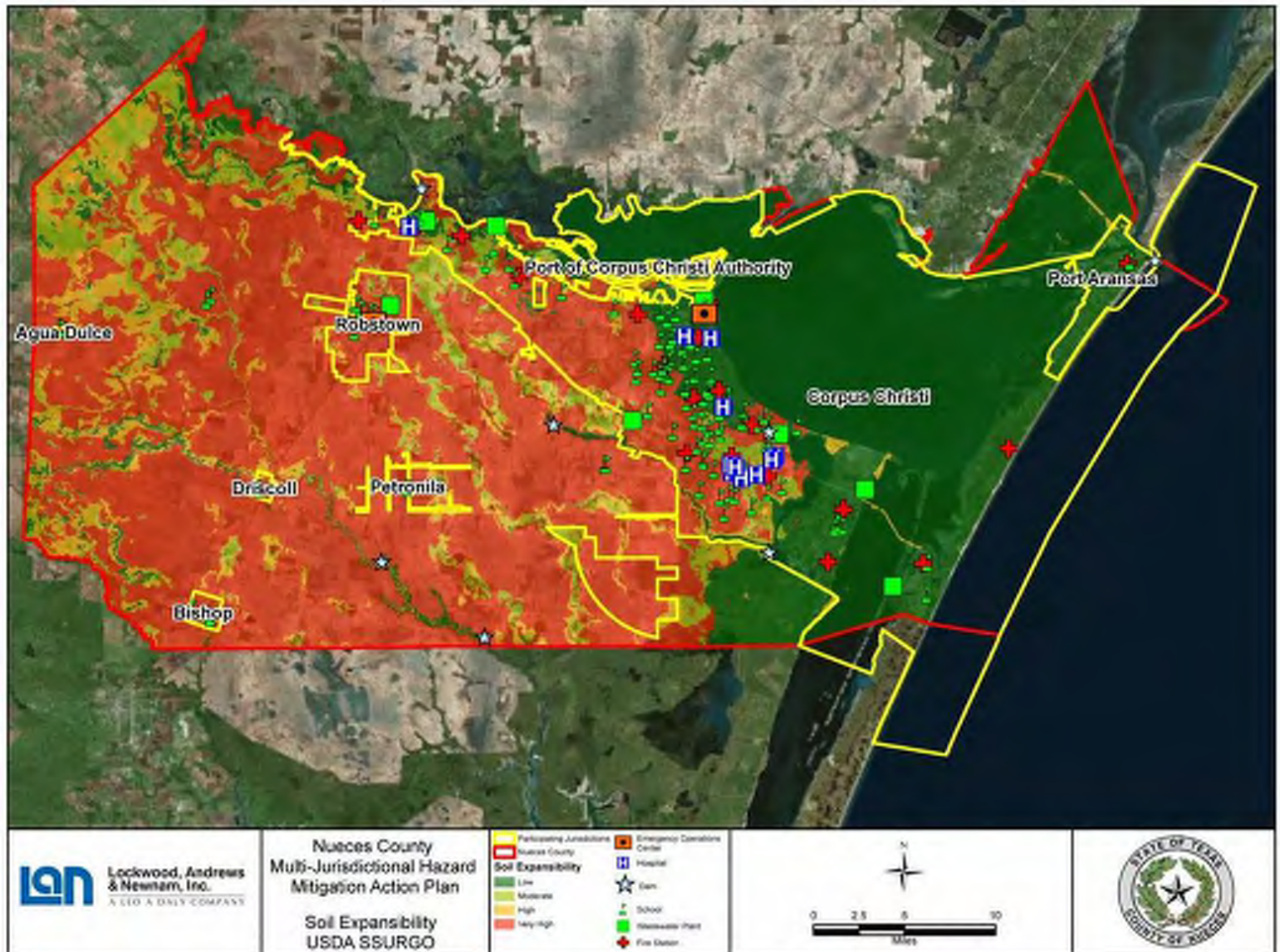
Shrink-Swell Class	Linear Extensibility Percent (LEP)
Low	< 3.0%
Moderate	3.0% - 5.9%
High	6.0% - 8.9%
Very High	≥ 9.0%

Based upon historical data and USGS soil data, all participating jurisdictions can expect a Very High Shrink-Swell Class in the future, corresponding to a Linear Extensibility over 9%.

<sup>3</sup> USDA Web Soil Survey

<sup>4</sup> USDA Web Soil Survey

**Figure 14-3. Soil Distribution by LEP Shrink-Swell Classification**



## Occurrences

Expansive soils are a condition that is native to the soil characteristics for specific geographic locations and “cannot be documented as a time-specific event, except when it leads to structural and infrastructure damage.”<sup>5</sup>

<sup>5</sup> State of Texas Mitigation Plan, 2013

Damage due to expansive soils started to increase significantly in the 1960s when construction materials and foundations for residential homes started changing from pier and beam foundations with flexible sidings like wood to rigid monolithic concrete slab-on-grade foundations with brick and other masonry sidings. The rigid foundations with rigid sidings are less forgiving and are readily damaged by the differential swelling and shrinking cycles of expansive soils.

### Probability

While damage due to expansive soils hazard is common in Nueces County, it is not well documented. Private claims documenting damages exclusively caused by expansive soils are typically not made available in the public domain. Table 14-3 lists the percentage and trend of foundation damage insurance claims made in Texas from 1960 to 2005 and includes forecasted claim percentages for the next five years from 2017 to 2022. The forecasted claim percentages are based on the claim trend from 1960 to 2005 as graphically illustrated in Figure 14-4.

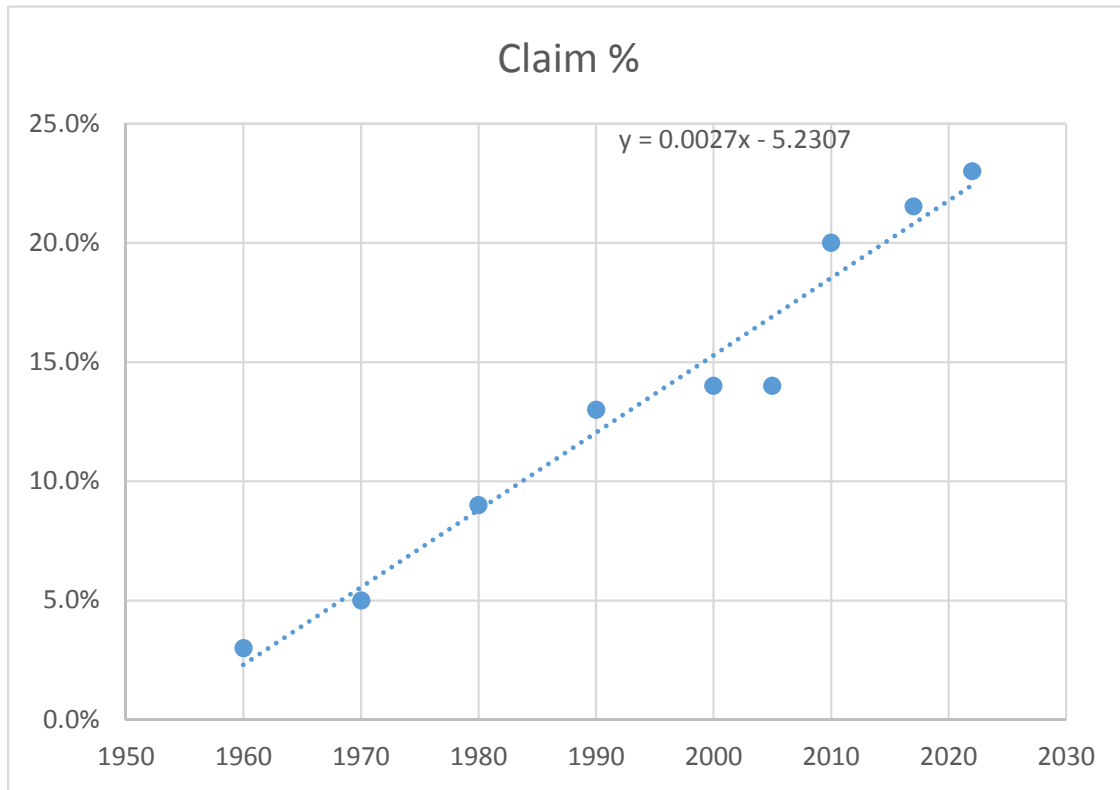
**Table 14-3: Texas Foundation Damage Insurance Claims<sup>6</sup>**

Year	Claim %
1960	3%
1970	5%
1980	9%
1990	13%
2000	14%
2005	14%
2017	21.5%*
2022	23.0%*

\*Forecasted

<sup>6</sup> State of Texas Mitigation Plan, 2013

**Figure 14-4. Texas Foundation Damage Insurance Claims – Trend Chart**

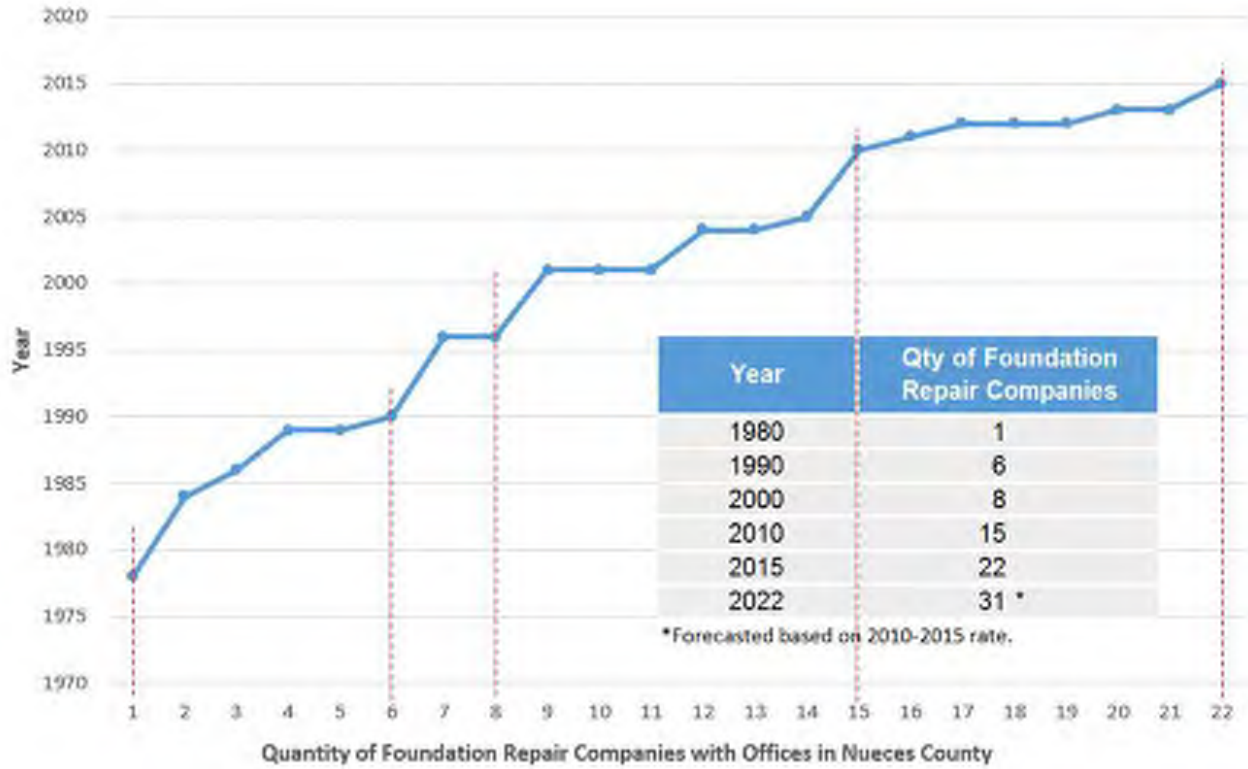


Another indicator of historic impacts and potential future impacts is the accelerated trend of foundation repair companies opening offices in Nueces County. As indicated in Table 14-4 and Figure 14-5, the quantity of building foundation repair companies with offices in Nueces County has increased nearly three-fold in the 15 years, from 8 in the year 2000 to 22 in 2015. The average quantity opening per year nearly doubling to 1.3 per year between 2010 to 2015, compared to the previous period of 0.7 per year between 2001 to 2009.

**Table 14-4. Rate of Foundation Repair Companies Opening in Nueces County**

Year Opened	Duration (Years)	Quantity Opened	Average Quantity Opening / Year
1978 - 2000	23	8	0.3
2001 - 2009	9	6	0.7
<b>2010 - 2015</b>	<b>6</b>	<b>8</b>	<b>1.3</b>
1978 - 2015	38	22	0.6

**Figure 14-5. Trend of Foundation Repair Companies Opening in Nueces County**



**Table 14-5. Foundation Repair Companies Opening Offices in Nueces County**

Company Name		Years in Business*		
		Year Opened	Years in Business	Quantity by Age***
1	Du-West Services**	1978	39	>= 20 Years 8 36%
2	Dawson Foundation Repair Inc.	1984	33	
3	CC Foundation Repair Co.	1986	31	
4	BKB Structural Repairs	1989	28	
5	Coastal Bend Foundation Repair	1989	28	
6	Gulf Coast Foundation Repair**	1990	27	
7	On the Level Foundation Repair	1996	21	
8	Texas Superior Construction & Foundation Repair	1996	21	
9	Bridge Foundation Repair	2001	16	11 - 19 Years 6 27%
10	Leveling and Repair	2001	16	
11	Streem Co. Foundation Repair	2001	16	
12	Area Foundation Repair	2004	13	
13	Eagle Foundation Repair	2004	13	
14	Uretex ICR South Texas	2005	12	
15	KJ Foundation Repair	2010	7	<= 10 Years 8 36%
16	Level One Foundation Repair	2011	6	
17	Crown Foundation Repair**	2012	5	
18	Mammoth Foundation Repair	2012	5	
19	Paramount Foundation Repair	2012	5	
20	Sure Lift Foundation Repair**	2013	4	
21	Wombat Excavations	2013	4	
22	USA Foundation Repair	2015	2****	

\*Based on the Better Business Bureau records.

\*\*Company has a local office/address but is based outside of Nueces County.

\*\*\*Percentage is rounded.

\*\*\*\*Years in business is assumed based on year the BBB opened a profile on the company.

With approximately 67% of Nueces County consisting of expansive clay soils, and the majority of Nueces County having High to Very High expansive soils as graphically illustrated in Figure 14-5, and the assumption that insurance claims for foundation damage in Nueces County follows the State trend, and that the growth of foundation repair companies in Nueces County will continue, it appears highly probable that all of



the Jurisdictions in Nueces County (with the possible exceptions being Port Aransas, and the Flour Bluff and Padre Island communities of Corpus Christi) will experience property damage from expansive soils, which will further increase with anticipated population growth and development.

### **Impact**

Swelling and shrinkage typically varies depending on the amounts of moisture content and clay content. Uneven shrink/swell cycles is what causes damage to building foundations, walls, roadway pavement, sidewalks, underground piping and other structures. Lightweight types of foundations like concrete pavement for roads and concrete slab on grade foundations are particularly susceptible damage from the shrink/swell cycle. Cracked foundations, floors, and basement walls are typical types of damage done by swelling soils.

Private claims documenting damages exclusively caused by expansive soils is not well documented in the public domain. However, as indicated by the increasing trend of insurance claims and accelerated growth of foundation repair companies in Nueces County, varying degrees of future damage to building foundations should be anticipated as well as impacts to roads and buried infrastructure. The expansive soils hazard is not anticipated to impact the health and safety of the Nueces County residents.

Impact can be measured in terms of property damage, when such data is made available.

### **Vulnerability**

Expansive soils primarily represent a threat to buildings and subterranean infrastructure. Crops and people are not typically directly threatened by expansive soils. Vulnerabilities to expansive soils are determined by examining what critical assets and properties are in different areas of soil expansibility.



# Unincorporated Nueces County Expansive Soils Hazard

LOCATION
County-wide, see map

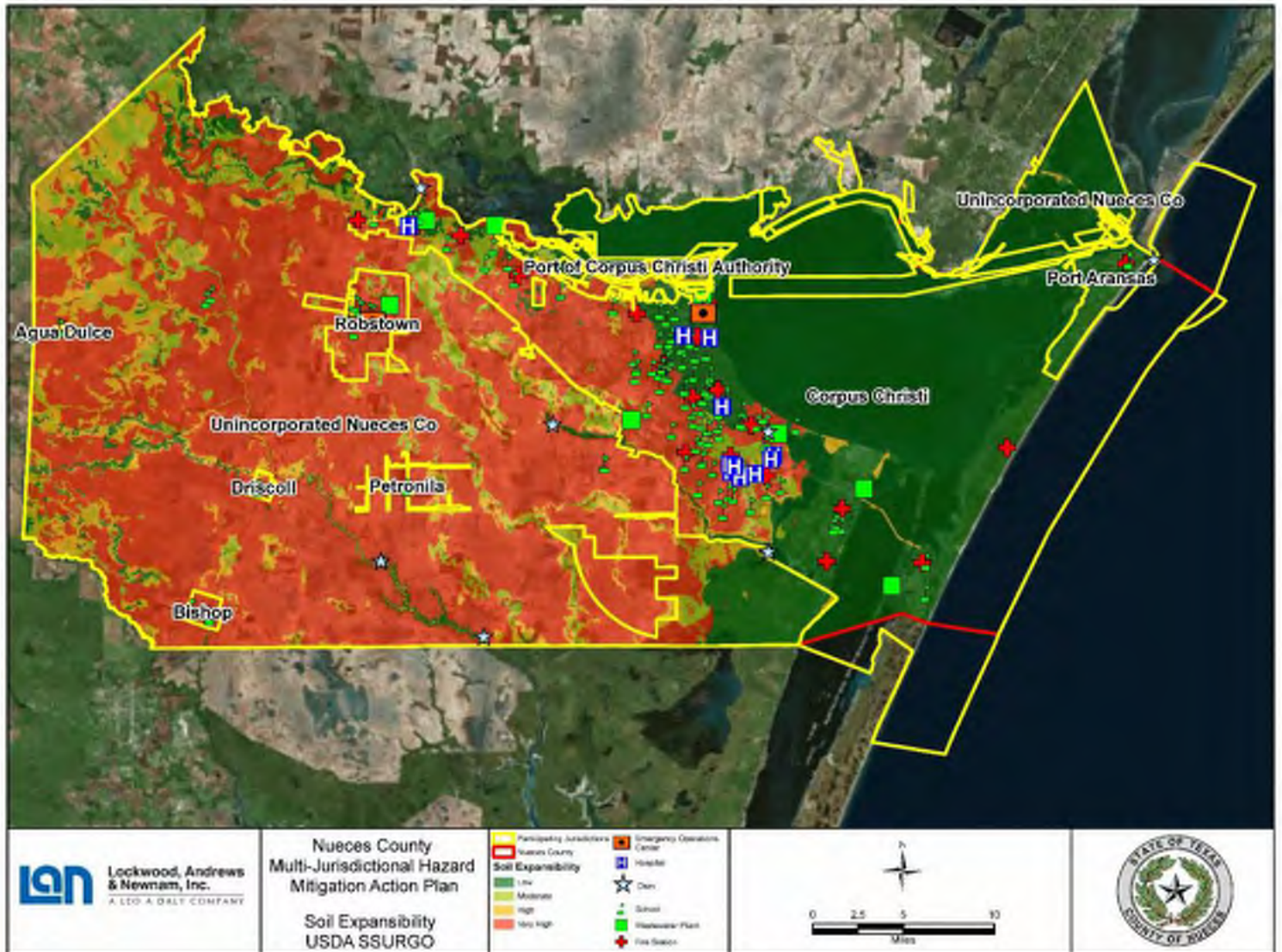
OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$32,623,800	7%	599	7%	\$24,334,700	6%	30,088	8%
MODERATE	\$71,832,400	93%	1,028	93%	\$43,762,100	94%	18,014	92%
HIGH	\$121,204,400		2,848		\$104,723,300		190,274	
VERY HIGH	\$261,769,000		3,924		\$233,561,500		118,361	
<b>TOTAL</b>	<b>\$487,429,600</b>		<b>8,399</b>		<b>\$406,381,600</b>		<b>356,738</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
LOW	DAM	Belvy Lake Dam
		Gertrude Lubby Lake Dam
HIGH	FIRE STATION	Nueces County Emergency Services District 1
VERY HIGH	DAM	Chapman Ranch Lake Dam
	SCHOOL	London ISD London HS
		Banquete ISD Banquete HS
		London ISD London EL
		Banquete ISD Banquete EL
		Banquete ISD Banquete JH

Figure 14-6. Soil Expansibility for Unincorporated Nueces County



# City of Agua Dulce Expansive Soils Hazard

LOCATION
Jurisdiction-wide, see map

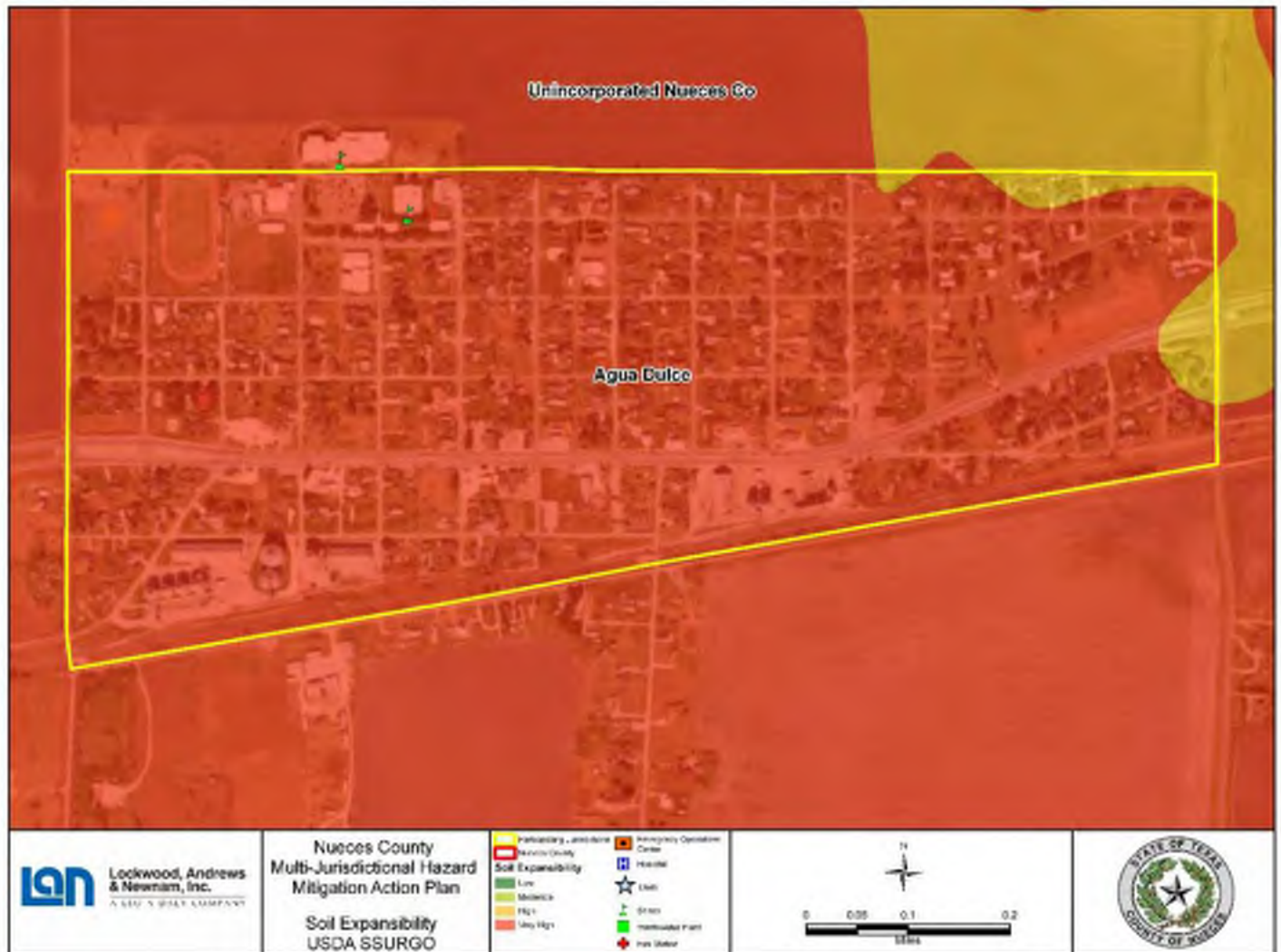
OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$0	0%	0	0%	\$0	0%	0	0%
MODERATE	\$0	100%	0	100%	\$0	100%	0	100%
HIGH	\$1,158,500		5		\$0		0	
VERY HIGH	\$19,552,700		58		\$17,541,400		895	
<b>TOTAL</b>	<b>\$20,711,200</b>		<b>63</b>		<b>\$17,541,400</b>		<b>895</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
VERY HIGH	SCHOOL	Agua Dulce ISD Agua Dulce HS
		Agua Dulce ISD Agua Dulce Elementary School

Figure 14-7. Soil Expansibility for Agua Dulce



# City of Bishop Expansive Soils Hazard

LOCATION	
Jurisdiction-wide, see map	

OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

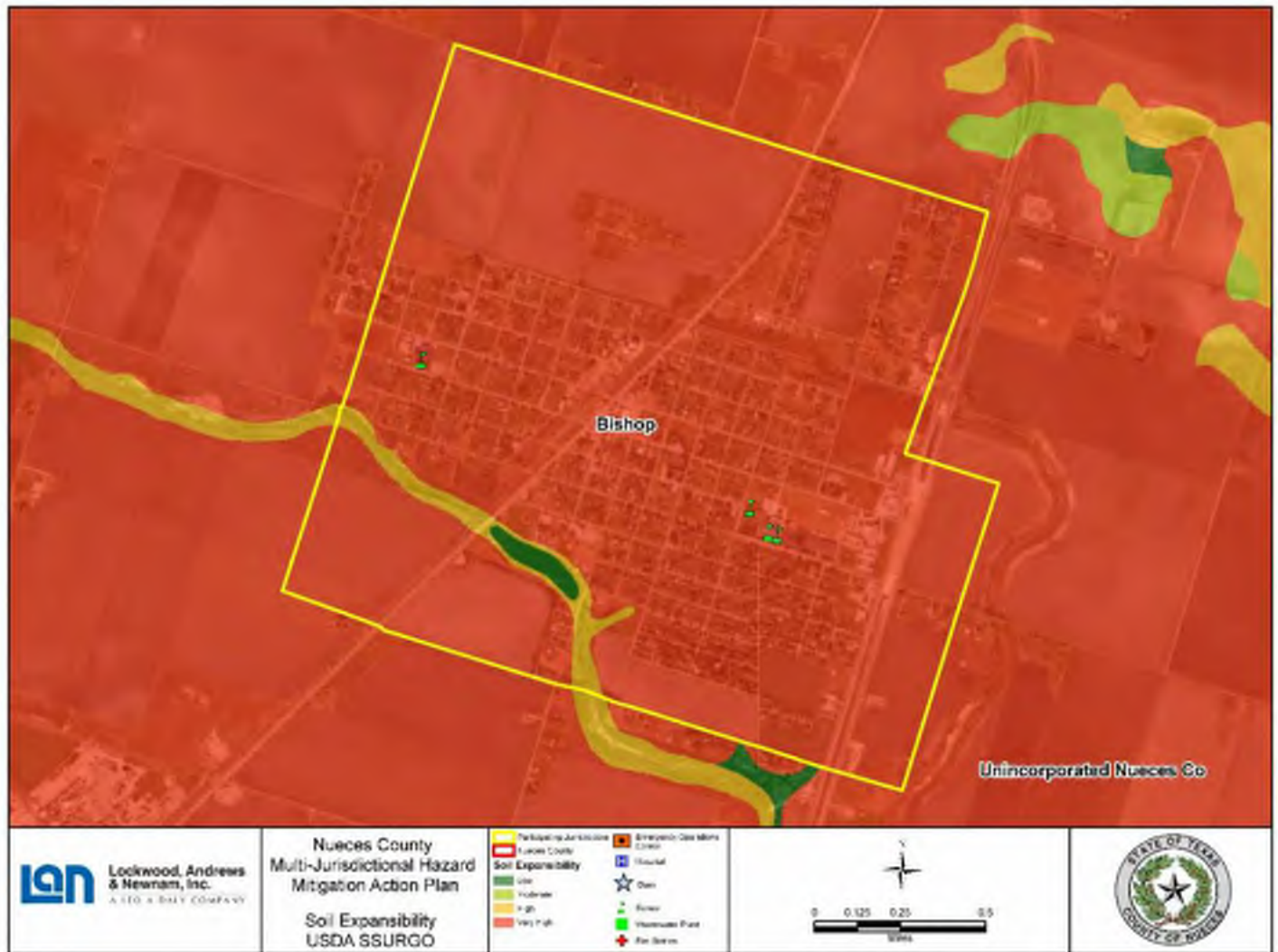
VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$0	0%	0	0%	\$0	0%	7	1%
MODERATE	\$0	100 %	0	100 %	\$0	100 %	0	99%
HIGH	\$1,109,000		22		\$1,705,600		338	
VERY HIGH	\$98,264,100		361		\$114,184,300		784	
<b>TOTAL</b>	<b>\$99,373,100</b>		<b>383</b>		<b>\$115,889,900</b>		<b>1,129</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
VERY HIGH	SCHOOL	Bishop CISD Bishop Pri
		Bishop CISD Bishop EL
		Bishop CISD Bishop HS
		Bishop CISD Lillion E Luehrs JH



### Figure 14-8. Soil Expansibility for City of Bishop



# City of Corpus Christi Expansive Soils Hazard

LOCATION
Jurisdiction-wide, see map

OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$3,924,789,300	38%	8,035	44%	\$2,765,339,300	39%	31,630	30%
MODERATE	\$1,287,620,300	62%	2,374	56%	\$727,346,000	61%	5,240	70%
HIGH	\$529,867,600		1,064		\$640,573,600		40,617	
VERY HIGH	\$4,496,379,300		6,990		\$3,014,746,400		27,514	
<b>TOTAL</b>	<b>\$10,238,656,500</b>		<b>18,463</b>		<b>\$7,148,005,300</b>		<b>105,000</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
LOW	DAM	Barney M Davis Cooling Reservior Dam
	EOC	Nueces County Emergency Operations Center
	FIRE STATION	Nueces County Emergency Services District 2
		Fire Station 3
		Fire Station 1
		Fire Station 8
		Fire Station 7
		Fire Station 13
		Fire Station 15
		Fire Station 16
	HOSPITAL	Christus Spohn Hospital Corpus Christi
		Christus Spohn Hospital Corpus Christi ShoreLine
		Driscoll Children S Hospital

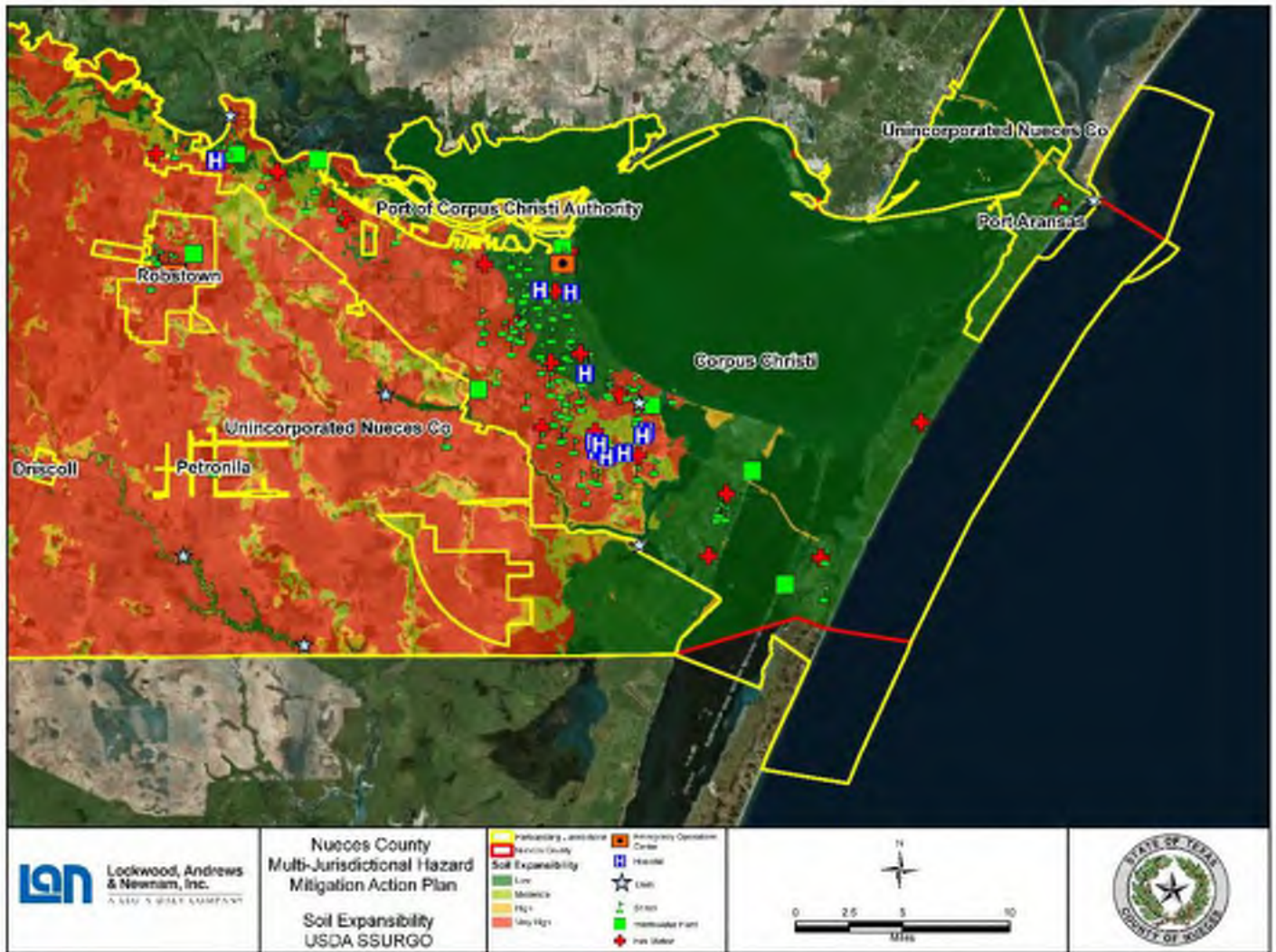


		Dubuis Hospital Of Corpus Christi
		The Corpus Christi Medical Center - Doctors Regional
	SCHOOL	Ray HS
		Seashore Charter Schools Seashore Middle Acad
		Roy Miller HS And Metro School Of Design
		Hamlin Middle
		Seashore Charter Schools Seashore Learning Center
		Flour Bluff ISD Early Childhood Center
		Oak Park Special Emphasis School
		Evans Ses
		Houston EL
		Mary HeLen Berlanga EL
		Crockett EL
		Allen EL
		Shaw Ses
		Collegiate HS
		Driscoll Middle
		Hicks EL
		Flour Bluff ISD Flour Bluff Int
		Zavala EL
		Flour Bluff ISD Flour Bluff Pri
		Corpus Christi Montessori School
		Flour Bluff ISD Flour Bluff JH
		Flour Bluff ISD Flour Bluff EL
		Martin Middle
		Dr M L Garza-Gonzalez Charter School Gcclr Institute Of Technology
		Menger EL
		Fannin EL
		Wilson EL
		Coles HS And Educational Center
		Flour Bluff ISD Flour Bluff HS
		Windsor Park G/T
		Travis EL
		Calk EL
		Harold T Branch Academy For Career & Techn
		King HS
		Baker Middle
MODERATE	FIRE STATION	Fire Station 4
		Fire Station 14
	HOSPITAL	Bayview Behavioral Hospital, A Campus Of Corpus Christi Medical

		South Texas Surgical Hospital
MODERATE	SCHOOL	Carroll HS
		Tuloso-Midway ISD Tuloso-Midway Pri
		Browne Middle
		Moore EL
		Veterans Memorial HS
		Por Vida Academy Cesar E Chavez Academy
		Schanen Estates EL
		Adkins Middle
HIGH	DAM	Oso Municipal Golf Course Lake Dam
	HOSPITAL	Christus Spohn Hospital Corpus Christi South
		Post Acute Medical Specialty Hospital Of Corpus Christi
		The Corpus Christi Medical Center - Bay Area
		The Corpus Christi Medical Center - The Heart Hospital
	SCHOOL	Tuloso-Midway ISD Tuloso-Midway Academic Career Center
		Smith EL
		Barnes EL
VERY HIGH	DAM	Calallen Reservoir Dam
	FIRE STATION	Annaville Fire Department
		Fire Station 6
		Fire Station 9
		Fire Station 10
		Fire Station 11
		Fire Station 2
		Fire Station 12
	HOSPITAL	Corpus Christi Rehabilitation Hospital
		The Corpus Christi Medical Center - Northwest
	WATER PLANT	O. N. Stevens Water Filtration Plant
	SCHOOL	Trinity Charter School Bokenkamp
		South Park Middle
		Calallen ISD Calallen Wood River EL
		Moody HS
		Jones EL
		Grant Middle
		MirELes EL
		Faye Webb EL
		Por Vida Academy Corpus Christi College Prep HS
		Sanders EL
		Montclair EL
		Woodlawn EL

	Los Encinos Ses
	West Oso ISD West Oso JH
	Kaffie Middle
	Wynn Seale Metropolitan School Of Design
	Galvan EL
	Kolda EL
	Kostoryz EL
	West Oso ISD West Oso EL
	Tuloso-Midway ISD Tuloso-Midway Int
	West Oso ISD West Oso HS
	Calallen ISD Calallen East EL
	Richard Milburn Alter HighSchool
	Haas Middle
	Discovery School Of Science And Technology
	West Oso ISD Kennedy EL
	Tuloso-Midway ISD Tuloso-Midway HS
	Early Childhood DevELopment Ctr
	Calallen ISD Calallen Middle
	Meadowbrook EL
	Gibson EL
	Cullen Middle
	Yeager EL
	Dr M L Garza-Gonzalez Charter School Dr M L Garza-Gonzalez Charter School
	Garcia EL
	Dawson EL
	Calallen ISD Calallen Charter HS
	Tuloso-Midway ISD Tuloso-Midway Middle
	Club Estates
	Calallen ISD Magee EL
	Dr M L Garza-Gonzalez Charter School AccELerated Learning Center
	Mary Grett School
	Calallen ISD Calallen HS
	Cunningham Middle

Figure 14-9. Soil Expansibility for City of Corpus Christi



# City of Driscoll Expansive Soils Hazard

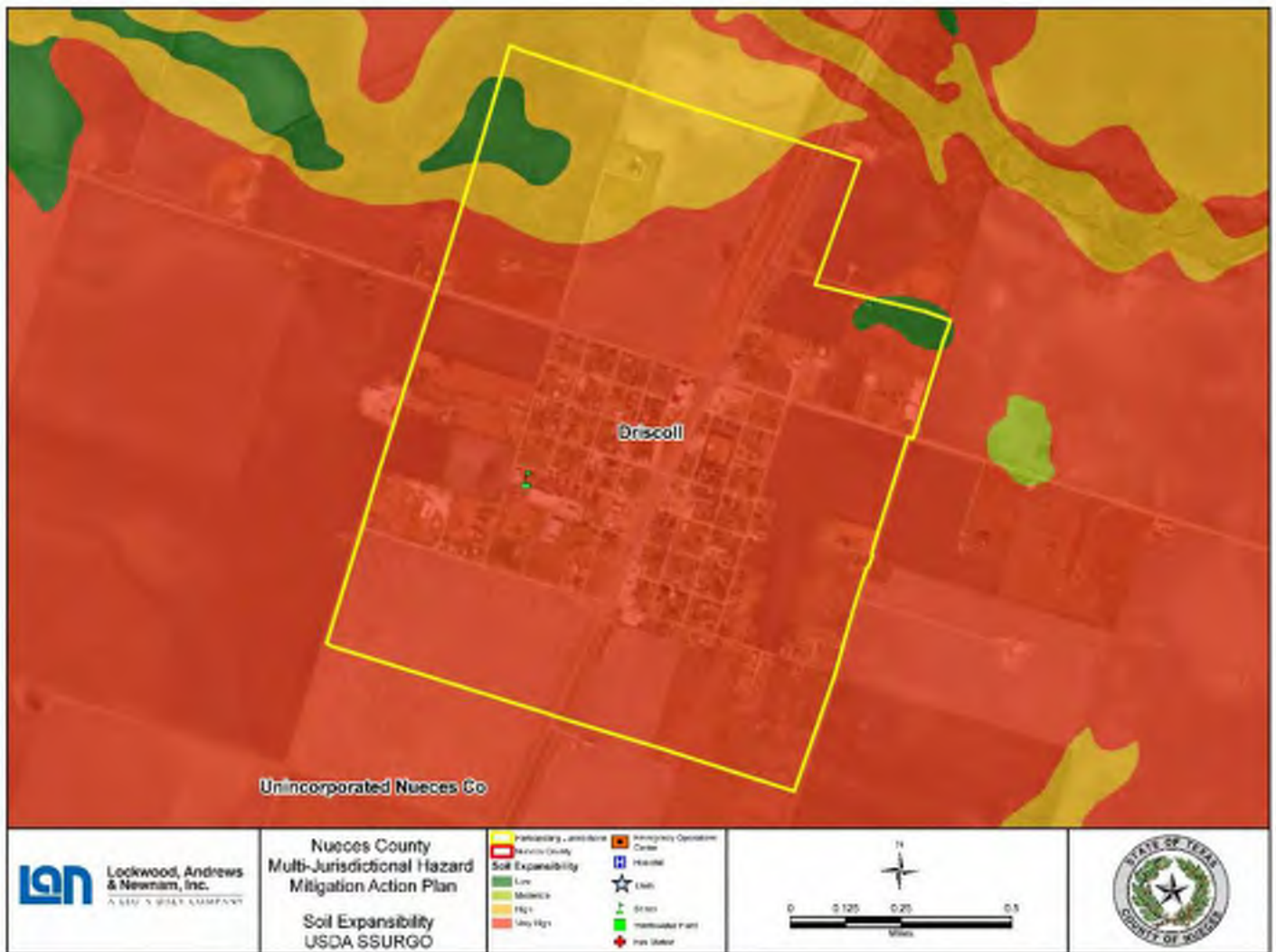
LOCATION	
Jurisdiction-wide, see map	
OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$0	0%	0	0%	\$6,500	0%	15	2%
MODERATE	\$0		0		\$0		0	
HIGH	\$120,200	100%	9	100%	\$0	100%	332	98%
VERY HIGH	\$13,134,900		105		\$25,495,800		383	
<b>TOTAL</b>	<b>\$13,255,100</b>		<b>114</b>		<b>\$25,502,300</b>		<b>730</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
VERY HIGH	SCHOOL	Driscoll ISD Driscoll EL & Middle

**Figure 14-10. Soil Expansibility for City of Driscoll**



# City of Petronila Expansive Soils Hazard

LOCATION	
Jurisdiction-wide, see map	
OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

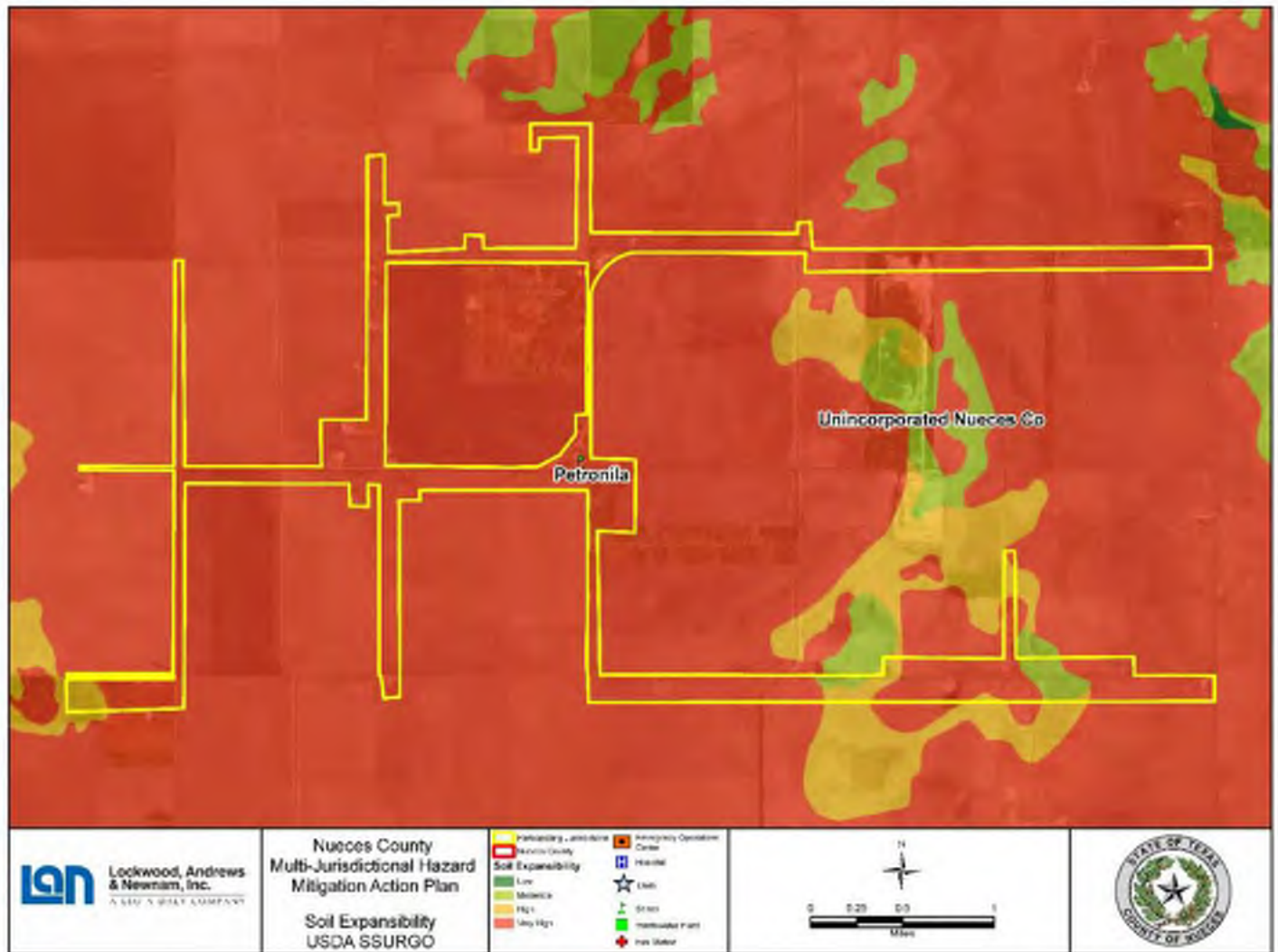
VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$0	0%	0	0%	\$0	0%	0	0%
MODERATE	\$0	100%	0	100%	\$0	100%	984	100%
HIGH	\$0		0		\$453,000		4,423	
VERY HIGH	\$3,201,100		87		\$3,261,800		5,486	
<b>TOTAL</b>	<b>\$3,201,100</b>		<b>87</b>		<b>\$3,714,800</b>		<b>10,892</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
VERY HIGH	SCHOOL	Bishop CISD Petronila EL



Figure 14-11. Soil Expansibility for City of Petronila



# City of Port Aransas Expansive Soils Hazard

LOCATION
Jurisdiction-wide, see map

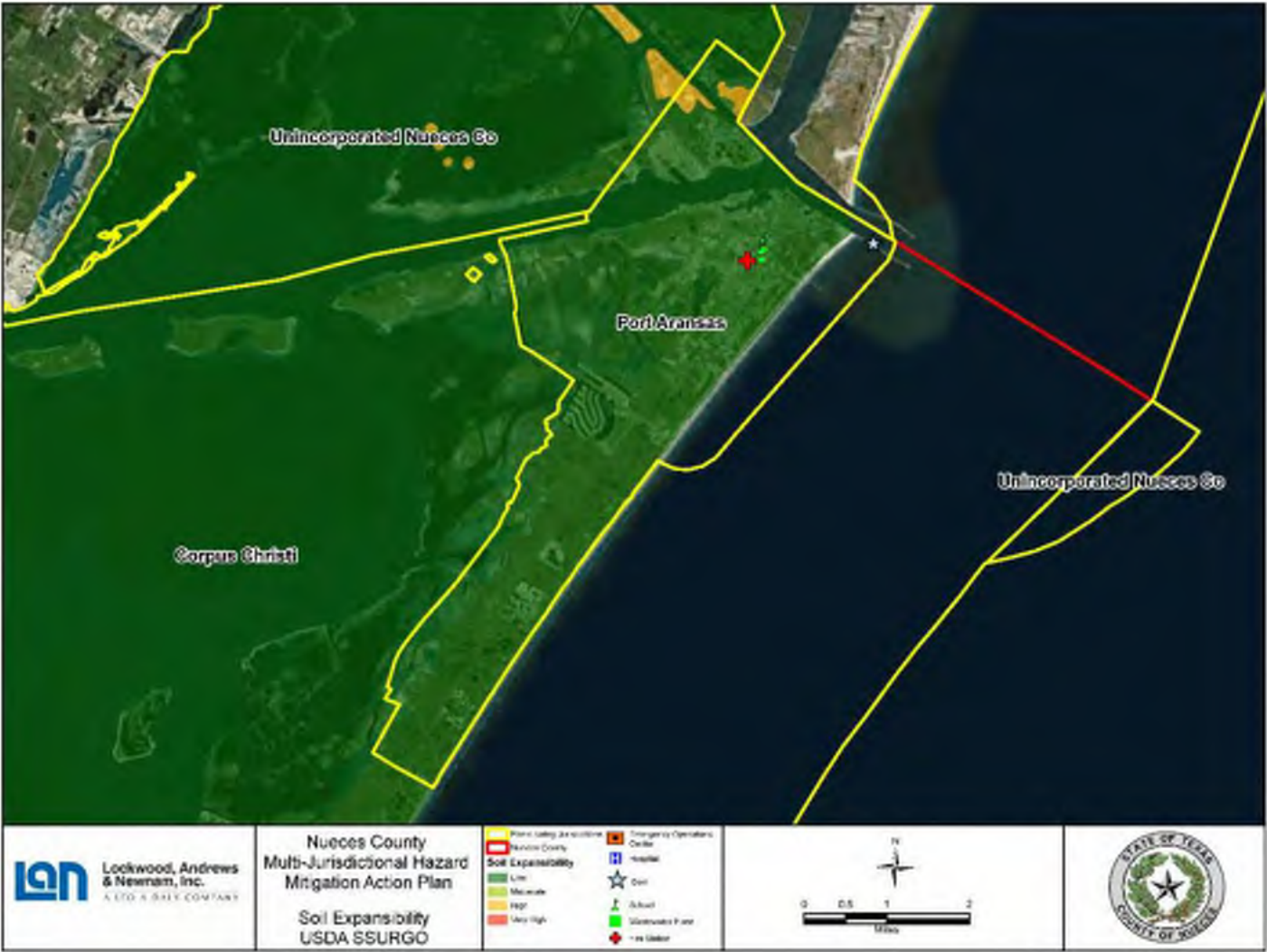
OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$774,547,600	100%	499	100%	\$414,531,200	100%	6,501	94%
MODERATE	\$0	0%	0	0%	\$0	0%	0	6%
HIGH	\$0		0		\$0		422	
VERY HIGH	\$0		0		\$0		0	
<b>TOTAL</b>	<b>\$774,547,600</b>		<b>499</b>		<b>\$414,531,200</b>		<b>6,923</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
LOW	FIRE STATION	Port Aransas Fire Department
	SCHOOL	Port Aransas ISD Port Aransas HS
		Port Aransas ISD Olsen EL
		Port Aransas ISD Brundrett Middle

Figure 14-12. Soil Expansibility for City of Port Aransas



# City of Robstown Expansive Soils Hazard

LOCATION
Jurisdiction-wide, see map

OCCURRENCES	PROBABILITY
Ongoing	Ongoing and likely increasing (see Table 14-3)

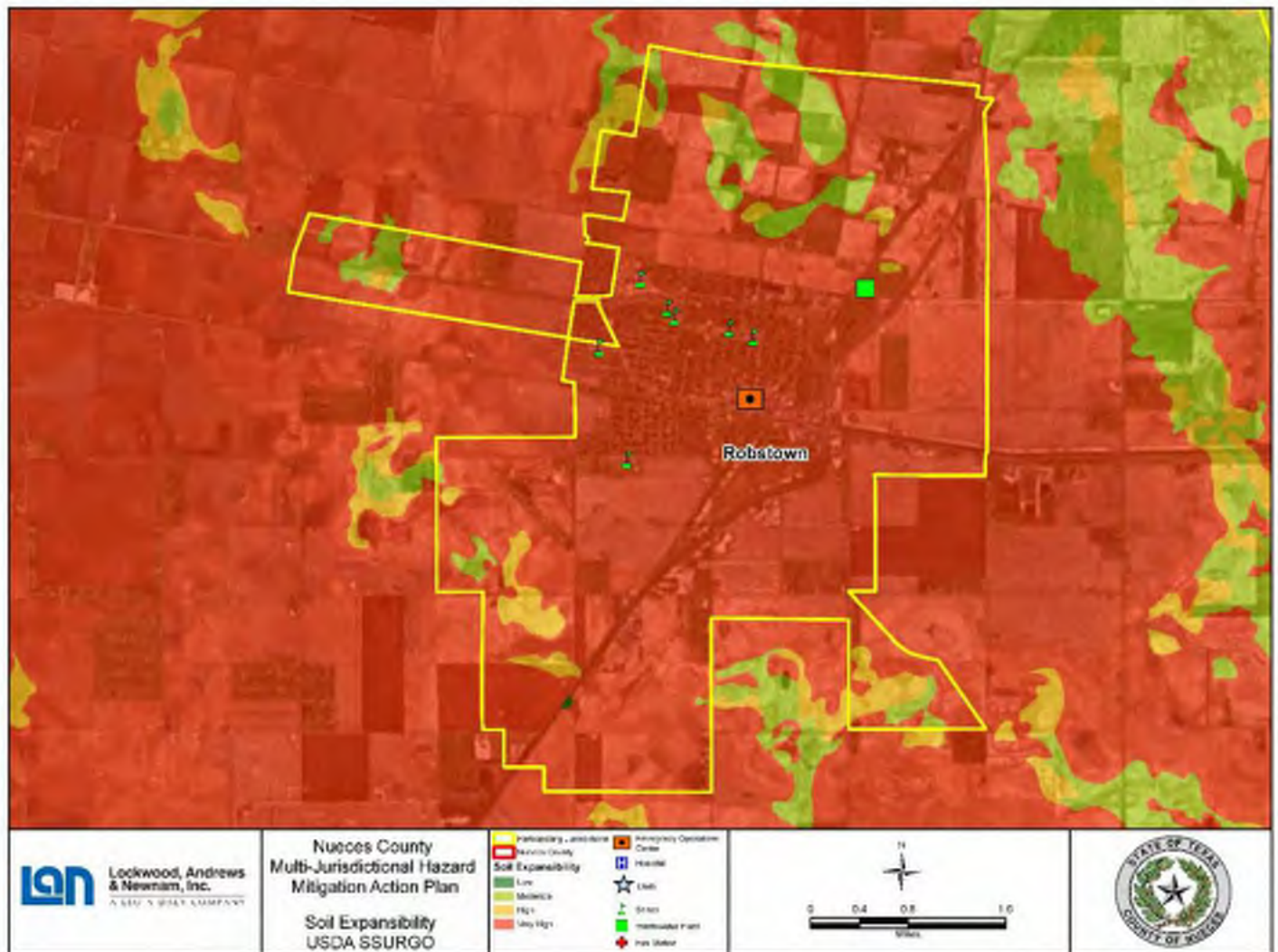
VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$0	0%	0	0%	\$0	0%	18	0%
MODERATE	\$5,571,100	100%	37	100%	\$1,953,000	100%	1,084	100%
HIGH	\$8,007,900		32		\$634,900		2,027	
VERY HIGH	\$169,866,500		634		\$148,802,500		7,109	
<b>TOTAL</b>	<b>\$183,445,500</b>		<b>703</b>		<b>\$151,390,400</b>		<b>10,238</b>	

\*Rounded to nearest \$100.00

VULNERABILITY (CONT.)		
VULNERABLE CRITICAL FACILITIES		
SHRINK-SWELL RISK CLASSIFICATION	ASSET CLASS	ASSET NAME
VERY HIGH	EOC	Robstown Emergency Operations Center
	SCHOOL	Robstown ISD Robstown HS
		Robstown ISD Seale JH
		Robstown ISD Hattie Martin Early Childhood Center
		Robstown ISD Solomon P Ortiz Int
		Robstown ISD Lotspeich EL
		Robstown ISD Robert Driscoll Jr EL
		Robstown ISD San Pedro EL
		Robstown ISD Salazar Crossroads Academy



**Figure 14-13. Soil Expansibility for City of Robstown**

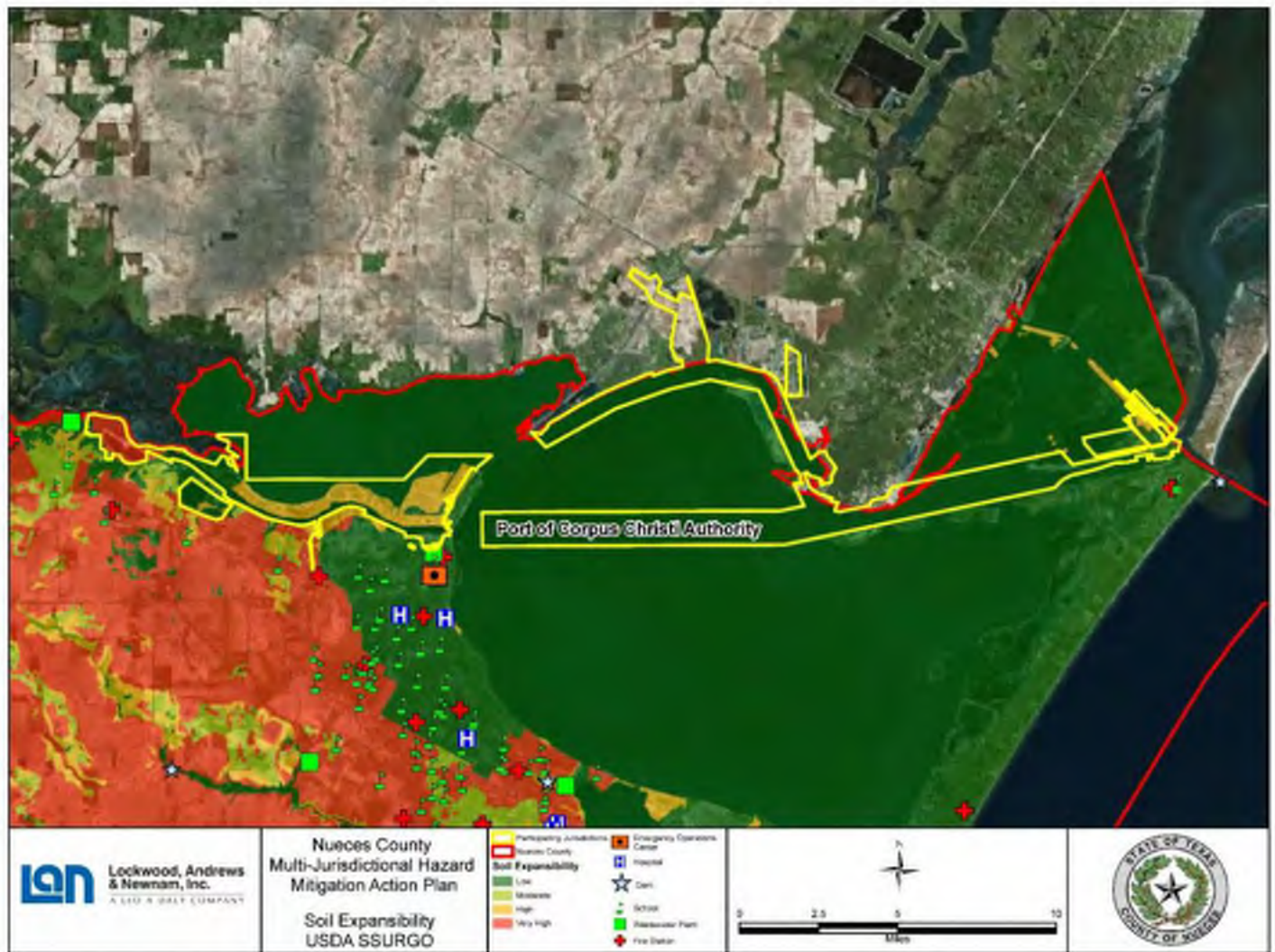


# Port of Corpus Christi Authority Expansive Soils Hazard

LOCATION								
Jurisdiction-wide, see map								
OCCURRENCES					PROBABILITY			
Ongoing					Ongoing and likely increasing (see Table 14-3)			
VULNERABILITY								
VULNERABLE NON-CRITICAL FACILITIES: PROPERTY								
SHRINK-SWELL RISK CLASSIFICATION	RESIDENTIAL				COMMERCIAL			
	VALUE		ACRES		VALUE		ACRES	
	AMOUNT*	%	AMOUNT	%	AMOUNT*	%	AMOUNT	%
LOW	\$0		0		\$96,761,800	56%	919	12%
MODERATE	\$0		0		\$0		51	
HIGH	\$0		0		\$71,545,000	44%	3,642	88%
VERY HIGH	\$0		0		\$5,719,900		2,971	
TOTAL	\$0		0		\$174,026,700		7,583	

\*Rounded to nearest \$100.00

Figure 14-11. Soil Expansibility for Port of Corpus Christi Authority





## Section 15: Dam and Levee Failure

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### Dam and Levee Failure Hazard Overview

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#### Description

A dam is a barrier that is constructed to hold back water. A dam failure is a systematic failure of a dam structure resulting in the uncontrolled release of water, often resulting in floods that could exceed the 100-year flood plain boundaries.<sup>1</sup> A levee is an embankment built to prevent overflow from a body of water. A levee failure is when a levee embankment fails, or is intentionally breached, causing the previously contained water to flood the land behind the levee.

#### Location

##### Dams

There are six dams located within Nueces County as indicated in Tale 15-1, Table 15-2 and Figure 15-1. Locations impacted by dam failure are the areas downstream from the dams. These areas can expect a degree of inundation from flood waters, depending upon the severity of the dam failure. It is also possible that some areas upstream will be impacted by receding water levels, though these impacts are not likely to be damaging. Opportunities for recreation, irrigation, and industrial use may be reduced if reservoir water levels fall beneath their normal levels.

There is a general data deficiency for these small dams. Dam-specific inundation maps do not exist for these dams. This data deficiency includes extent. Without inundation

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<sup>1</sup> The State of Texas Mitigation Plan, Updated 2013

maps, extent cannot be measured. Actions to correct these data deficiencies are proposed in Section 19.

**Table 15-1. List of Dams by Jurisdiction**

Jurisdiction	Dam Name	
Nueces County	1	Belvy Lake Dam
	2	Chapman Ranch Lake Dam
	3	Gertrude Lubby Lake Dam
Corpus Christi	4	Barney M Davis Cooling Reservoir Dam
	5	Calallen Reservoir Dam
	6	Oso Municipal Golf Course Lake Dam

**Table 15-2. List of Dams Located within Nueces County\***

Dam	Hazard Classification ASSUMED***	Primary Purpose	River / Stream	Location		Storage (acre-feet)		Elevation (FT)	Length (FT)	Dam Type	Spillway		Date		Owner	Emergency Action Plan	Drainage Area (Square Miles)
				Latitude	Longitude	Max.	Normal				Type	Width (FT)	Built	Last Inspection			
1 Barney M Davis Cooling Reservoir Dam	Low	Cooling Reservoir	Oso Creek	27.6270	-97.3486	11,400	6,600	20	33,000	Earth	Controlled	80	1973	5/27/88	AEP Central Power & Light Co.	Not Required	0
2 Bely Lake Dam	Low	Irrigation	West Oso Creek	27.7170	-97.5203	426	****	9	275	Earth	None	na	1966	****	****	Not Required	0
3 Calallen Reservoir Dam	Low	Prevent salt water intrusion	Nueces River	27.8836	-97.6253	1,175**	****	5.5*	****	****	****	****	****	****	Corpus Christi	****	****
4 Chapman Ranch Lake Dam	Low	Fish & Wildlife Pond	Petronila	27.5670	-97.5753	380	190	20	1,050	Earth	None	na	1970	1/8/73	John Prince	Not Required	0
5 Gertrude Lubby Lake Dam	Low	Water Supply	Petronila Creek	27.6203	-97.6569	174	****	15	600	Earth	None	na	1969	****	Gertrude Lubby Estate	Not Required	0
6 Oso Municipal Golf Course Lake Dam	Low	Irrigation	Oso Bay	27.7120	-97.3486	58	29	8	265	Earth	None	na	1968	****	Corpus Christi	Not Required	0

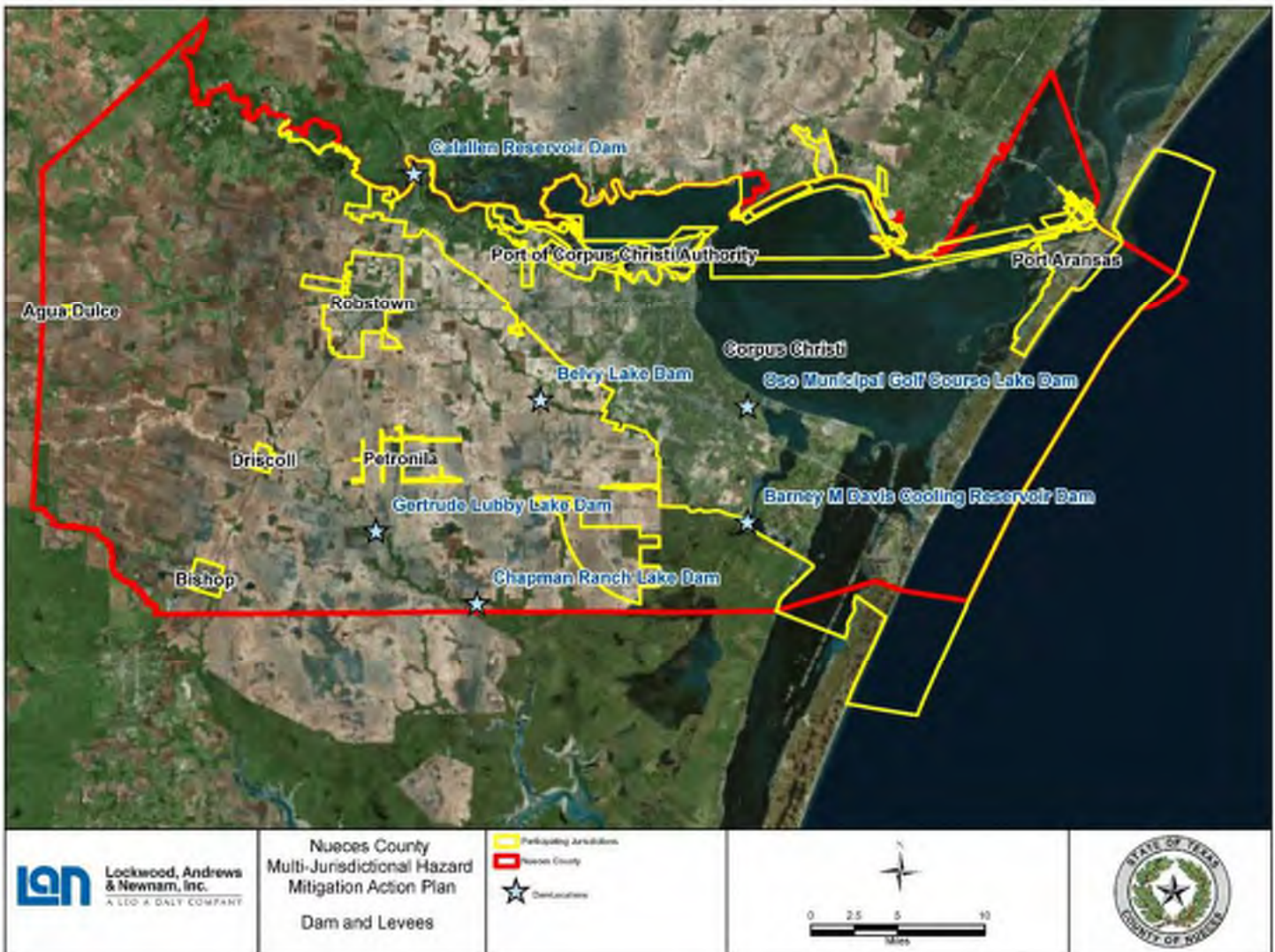
\*Source: The Army Corps of Engineers National Inventory of Dams (NID) does not provide hazard classifications for any of these dams ([http://nid.usace.army.mil/cm\\_apex/f?p=838:12](http://nid.usace.army.mil/cm_apex/f?p=838:12)).

\*\* Source: Coastal Bend Regional Water Plan, dated September 2010 ([http://www.cctexas.com/Assets/Departments/Water/Files/2011Strategies/2011\\_9\\_ModifyExistingReservoirOperatingPolicyAndSafeYieldAnalyses.pdf](http://www.cctexas.com/Assets/Departments/Water/Files/2011Strategies/2011_9_ModifyExistingReservoirOperatingPolicyAndSafeYieldAnalyses.pdf))

\*\*\* These are ASSUMED hazard classifications. The Army Corps of Engineers National Inventory of Dams (NID) does not provide hazard classifications for any of these dams ([http://nid.usace.army.mil/cm\\_apex/f?p=838:12](http://nid.usace.army.mil/cm_apex/f?p=838:12)).

\*\*\*\*No Data in Army Corps of Engineers National Inventory of Dams (NID)

**Figure 15-1: Map of Dams Located within Nueces County**



Note, the City of Corpus Christi owns and operates two other dams and water supply system located outside of Nueces County. These two dams are the primary water sources for all of the jurisdictions within Nueces County, and provide supplementary water to other counties surrounding Nueces County. These water sources are the Lake Corpus Christi Dam, Choke Canyon Dam, and a water supply system that transports water from Lake Texana and the Colorado River called the Mary Rhodes Pipeline. Failure of the dams and pipeline systems, including their various support systems (ex., pump stations, reservoirs, etc.), would have a major impact, particularly if the failure occurred during a prolonged drought.

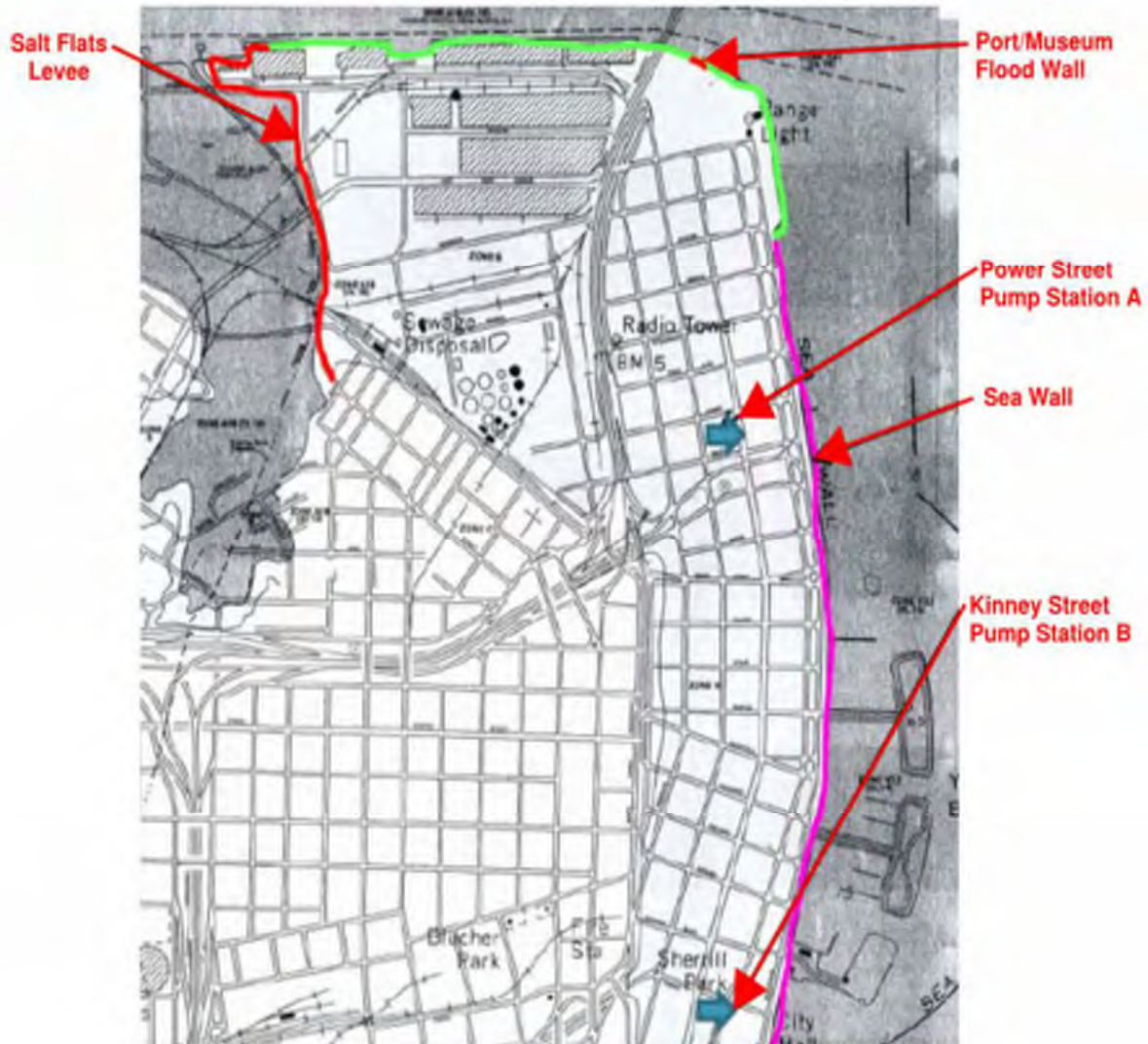


## Levees

Texas does not maintain a database of levees, however the US Army Corps of Engineers does maintain a national levee database but it is not an inclusive list. A search of the national database does not identify any levees within Nueces County; however, there are numerous levees owned and maintained by the City of Corpus Christi, the Port of Corpus Christi Authority, and various refineries and industries.

For example, the City of Corpus Christi owns and maintains the Salt Flats Levee and the Port/Museum Flood Wall which are part of the City's downtown flood protection system (Figure 15-2). The Port of Corpus Christi Authority also has a number of levees. In addition, many of the refineries and industries have constructed levees around their facilities, primarily to contain potential spills, but these levees may also provide some level of protection from hurricane surge waters.

**Figure 15-2. Salt Flats Levee Flood Protection System**



Source: [https://www.floods.org/Files/Conf2014\\_ppts/FS\\_Beitel.pdf](https://www.floods.org/Files/Conf2014_ppts/FS_Beitel.pdf)

## Extent

The Federal Guidelines for Dam Safety (FEMA publication No. 333, dated April 2004) provides guidelines for determining the potential hazard classification for dams with *“the understanding that the failure of any dam or water-retaining structure, no matter how small, could represent a danger to the downstream life and property.”* The guideline establishes three classification levels of Low, Significant and High as indicated in Table 15-3.

**Table 15-3: Dam Hazard Classifications**

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

The Texas Emergency Action Planning website indicates that in 2005 the Texas attorney general ruled that dam hazard classifications are exempt from disclosure under the state's Public Information Act due to Homeland Security concerns.

Dam failures can occur as a collapse or breach of the structure. Dam failures may result from one or more of the following conditions:

- Long periods of rainfall and flooding;
- Insufficient spillway capacity, resulting in embankment overtopping;
- Internal erosion caused by leaking or piping;
- Cathodic corrosion of concrete reinforcement;
- Maintenance problems, including failures in debris removal, repairs, or gate and valve maintenance;
- Poor design or construction;
- Dam failure upstream inundating the downstream dam;
- Erosion caused by wind-driven waves;
- Intentional sabotage;
- Land subsidence; or
- Earthquakes.

A levee is a manmade embankment or structure built along a river, sea or other body of water to protect the adjacent land from flooding. A levee failure is the systematic failure of the levee structure or levee system resulting in the uncontrolled release of water. The more common causes of levee failure include:

- Overtopping;
- Erosion;
- Structural Instability;
- Piping/under seepage; or
- Settlement.<sup>2</sup>

There is no state inspection or safety program, and there is no database for levee systems in Texas<sup>3</sup>. FEMA requires that a levees be certified to meet federal design, construction, maintenance and operation standards to adequately reduce the risk of flooding from a major flood.

A general data deficiency exists for levee hazards. Levee-specific inundation maps and extent data do not exist. Actions are proposed in Section 19 to correct this data deficiency. When this data deficiency is corrected, clearly defined location and extent data can be incorporated into future planning efforts.

The State of Texas Hazard Mitigation Plan (updated 2013) indicates that the “extent for dam inundation is recorded in terms of the area impacted by the number of feet of water and documentation of what is vulnerable and the loss that can occur.” The State plan also indicates that “profiling dam failure continues to be problematic for local mitigation planners. Mitigation’s focus is not on the technical failure of a dam from any particular cause, but on the flood inundation area if there is a breach. The location of the flooding impact is a difficult measurement to identify and many planners express frustration over unavailability of access to dam emergency action plans that may provide the information they need. A 2005 opinion from the Texas Attorney General Office restricts access to those documents for security reasons. TCEQ supports the decision but will continue to work with local emergency management to share information whenever possible.”

## **Occurrences**

### **Dam Failures**

No previous occurrences of dam failure for dams located within any of the jurisdictions is known. However, as noted earlier, the City of Corpus Christi owns and operates two dams located outside of Nueces County. One of these dams, formerly named the La Fruta Dam, previously failed in 1930, but it was subsequently replaced with the Wesley Seale Dam on Lake Corpus Christi located at the intersection of San Patricio, Jim Wells

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<sup>2</sup> Congressional Briefing, FEMA, July 2013

<sup>3</sup> The State of Texas Mitigation Plan, 2013 Update



and Live Oak counties near the City of Mathis. The La Fruta dam was used to maintain a water source for the City of Corpus Christi. While the failure did not kill any humans, the loss of the dam represented the destruction of a \$2.7 million investment. The city defaulted on the bonds used to fund the construction of the dam<sup>4</sup>.

### Levee Failures

There is not a comprehensive database with records of levee failures. Levee repair and maintenance is on-going and costly. For example, in 2012 the US Army Corps of Engineers recommended spending \$3.2M to repair levees located north of the Harbor Causeway (Hwy181) on the east side of the Inner Harbor adjacent to Nueces Bay (see Figure 15-3). These levee had been damages by a storm events and wave action which is a common contributor to levee failure.

**Figure 15-3: Location of Proposed Levee Repair**



<sup>4</sup> <http://archive.caller.com/columnists/murphy-givens/mary-sutherland-la-fruta-and-coopers-alley-0fed4b83-ad4d-4460-e053-0100007f4e7b-359987491.html>

## **Probability**

### **Dam Failures**

There is no history of failures for any of the dams located within Nueces County. It is assumed that a dam failure within Nueces County is unlikely within the next 10 years.

### **Levee Failures**

The probability of a levee failure is possible within the next 5 years based on the history of levee failures due to storm events and wave action since the CEPRA 2015 report indicates that three hurricanes impact the Texas coast every four years, and since the annual probability of a hurricane, tropical storm or tropical depression striking Nueces County is 6.9% as indicated in Section 5 – Hurricane & Tropical Storm of this plan. In addition, the minutes for the August 26, 2015, Corpus Christi Local Levee Partnership (LLPT) indicates that the City of Bishop levee and the City of Corpus Christi's Salt Flats levee system are not certified by FEMA which may indicate a greater risk for failure if these levees do not meet FEMA standards.

## **Impact**

### **Dam Failures**

Dams provide benefits in the form of water for recreation, irrigation, human consumption (after treatment), industrial use, flood control, and hydroelectric power. Most dams contain relatively small volumes of water and do not pose a severe threat to downstream communities, however, a failure of a large dam could be catastrophic.

It is assumed that all six of the dams located in Nueces County have a “Low” hazard classification based on the size, type and location of dams indicated in Figure 15-3 and Figure 15-4. A search for data on these dams resulted in the limited information contained in Figure 15-3.

The six dams are relatively small and are located in rural or semi-rural areas of the County and City of Corpus Christi, with little to no residential or commercial development downstream of the dams so no loss of life is expected. Impacts would be limited to the dam itself and minimal damage to crops and the environment.

Based on this limited data and assumed “Low” hazard classifications the impact of a dam failure in Nueces County is assumed to be low.

If Unincorporated Nueces County or Corpus Christi dams were to fail, impacts are expected to be restricted to surrounding riparian corridors, agricultural areas, and to the dams themselves. Higher capacity dams with more vulnerable assets downstream of

them might cause power outages, destroy large areas of cropland, damage residential property, and displace vulnerable populations. However, due to the capacities, locations, and development surrounding the dams profiled in this Plan, these impacts are not anticipated in Nueces County.

### **Levee Failures**

Failure of the City of Corpus Christi's Salt Flats levee during a 100-year flood event would expose the City's Downtown district (see Figure 15-4) to flooding that might result in property damage and possible injury or loss of life. All of the property located in the Downtown flood zone represents roughly \$1.1B.

Levee failure in Corpus Christi could have significant impacts. Levee failure during a flood event could potentially lead to the inundation of the City's downtown areas. Power and other utility services could be interrupted. Commercial property could be flooded, leading to direct damages and indirect economic impacts over time. While the downtown area of Corpus Christi is not a major residential area, there are still residential property found in the area. Damage to this residential property will lead to displaced populations.

**Figure 15-4: Map of the Downtown Corpus Christi - 100-year Flood Zone**



Failure of the levees adjacent to Nueces Bay would result in flooding of the area the levee was intended to protect, which may damage property but may also result in environmental damage if materials stored behind the levees were to erode into the bay.

### **Vulnerability**

A March 21, 2016, newspaper article in the Corpus Christi Caller-Times indicates that Corpus Christi's downtown is located in a 100-year floodplain and the existing Downtown Flood Protection System does not meet current standards for protection from a 100-year event due to the uncertified Salt Flats Levee system. FEMA requires that all components of the levee be certified as "a freeboard deficient reach" which means that it is not vulnerable to a catastrophic failure. The article indicates a report prepared by one of the City's consultants indicates it would cost between \$75M and \$100M to overhaul the Downtown Flood Protection System to meet a 100-year event.

Vulnerability to dam failure has been examined by looking at the length of highway and railroad infrastructure downstream from the dams. There is a general data deficiency for these small dams. Dam-specific inundation maps do not exist for these dams. Consequently, it is difficult to develop a detailed vulnerability profile. Actions to correct these data deficiencies are proposed in Section 19.

# Unincorporated Nueces County Dam and Levee Failure Hazard

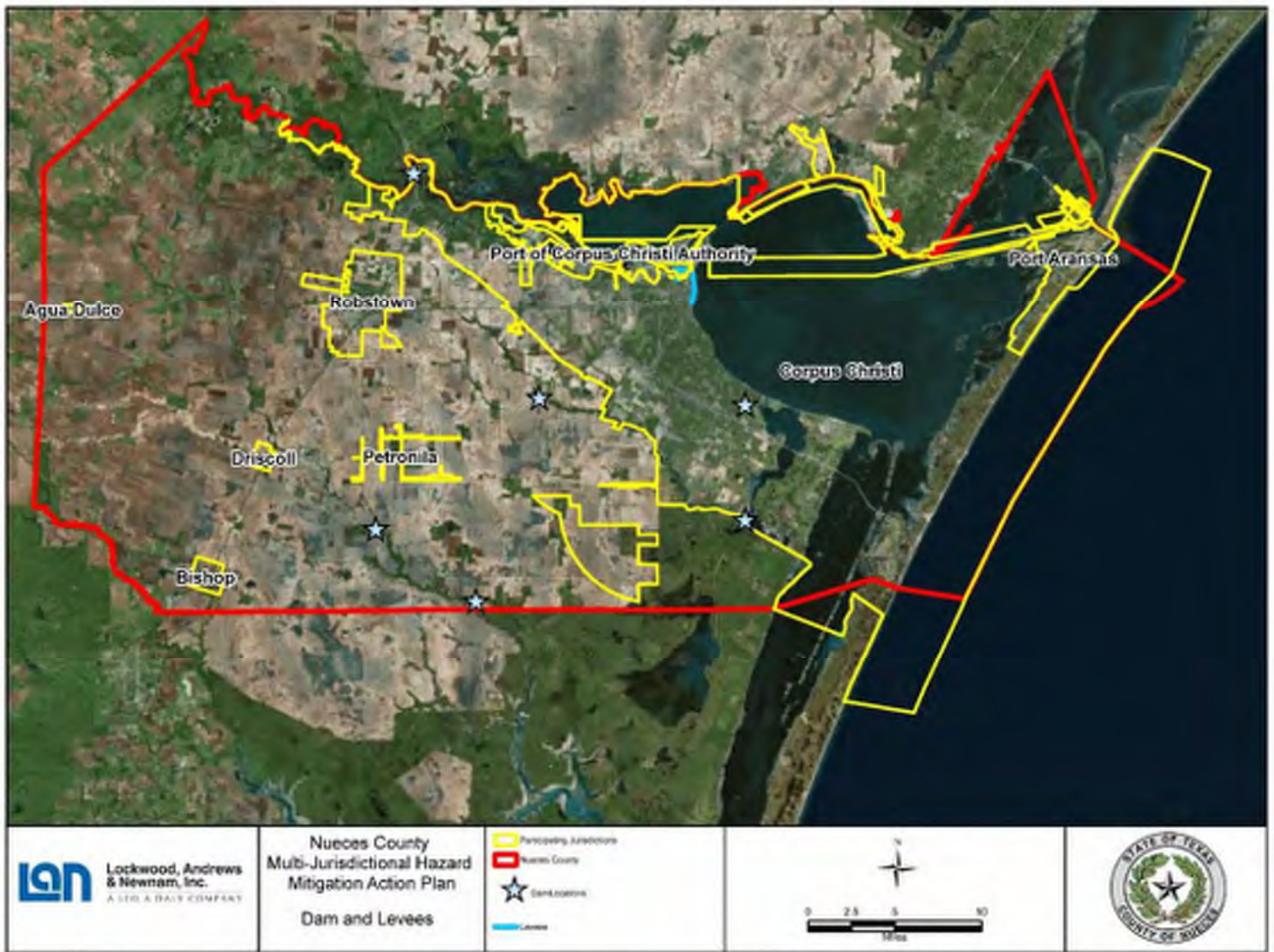
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Location	Extent (defined in Table 15-3)
See Map	Low
Occurrences	Probability
No historical dam failures No levees present	Dam Failure: 1% annual chance in next 10 years
Impact	Vulnerability
Dam failure – damage to dam and agricultural areas Levee failure – no levees present	No major road way, no major highways in downstream from dams

Despite the efforts of the planning team, inundation maps for the dams of Unincorporated Nueces County were not available. The dams in Unincorporated Nueces County, Gertrude Lubby Lake Dam and Chapman Ranch Lake Dam, are in relatively remote areas of the county. Failure of these dams is not expected to endanger critical facilities. Expected damages are restricted to nearby riparian corridors, agricultural areas, and the dams themselves.



Figure 15-5. Unincorporated Nueces County Dam and Levees



## City of Agua Dulce Dam and Levee Failure Hazard

### LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

This jurisdiction does not contain regulated dams or levees.

## City of Bishop Dam and Levee Failure Hazard

### LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

The City of Bishop has at least one levee, according to minutes from the Corpus Christi Local Levee Partnership (LLPT, August 26, 2015). Mapping of the existing levee not available. While the City of Bishop has this levee, it was determined through the risk assessment that the failure of this levee would not impact the jurisdiction.

## City of Corpus Christi Dam and Levee Failure Hazard

Location	Extent (defined in Table 15-3)
See Map	Low
Occurrences	Probability
No historical dam failures Levee repairs recommended in 2012	Dam Failure: 1% annual chance in next 10 years Levee failures: 5% annual chance in next 5 years
Impact	Vulnerability
Dam failure – damage to dam and agricultural areas Levee failure – damage to downtown Corpus Christi	2.5 Miles of highway downstream of dams 0.6 Miles of railroad downstream of dams \$757,124,377 in improved property behind levees

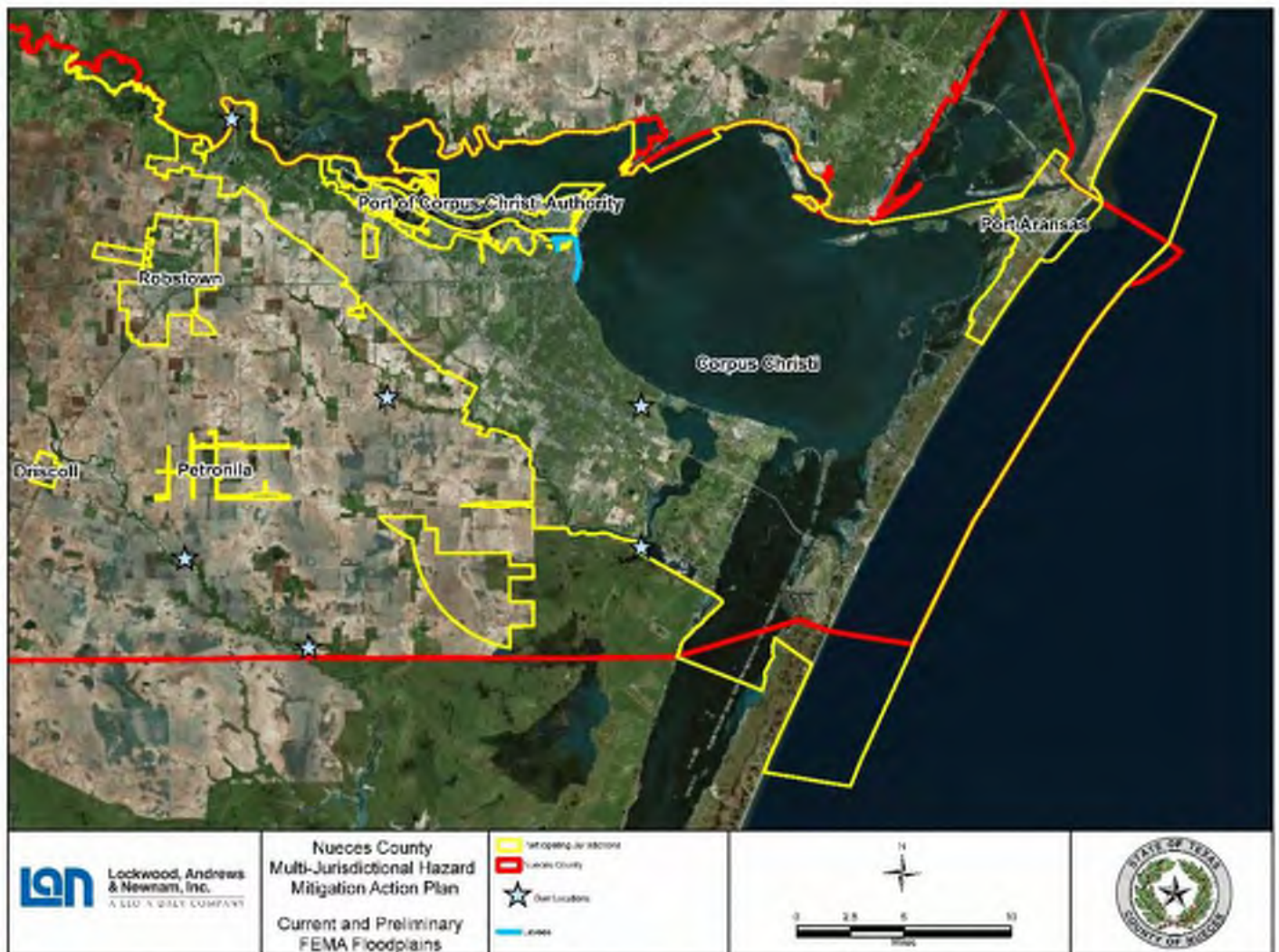
The dam located in central Corpus Christi is the Oso Beach Municipal Golf Course Lake Dam. The dam is an earthen construction dam. The body of water produced by the dam is a decorative feature of a municipal golf course, also used for irrigation. The dam has a maximum capacity of 58 acre feet with an average capacity of 29 acre feet. A roughly 0.2-mile-wide riparian corridor extends from the dam to Oso bay. Should the dam fail, this corridor would be expected to convey water from the dam to the bay. No structures exist within the riparian corridor. Damages from the failure of Oso Beach Municipal Golf Course Lake Dam are expected to be restricted to ecological damage to the riparian corridor and the dam itself.



The dam in the north western portion of Corpus Christi is the Calallen Reservoir Dam. The dam is a rock fill gravity dam. The dam is 195 wide, six feet high, and has a maximum capacity of 1,275 acre feet. Average capacity is 1,175 acre feet. The areas of Nueces County downstream of the Calallen Reservoir Dam are occupied by riparian corridors and open parkland. Residential, water-front development begins about two miles downstream from the dam. These properties are not expected to be impacted by failure of Calallen Reservoir Dam. The damages from a failure of Calallen reservoir dam are expected to be limited to ecological damage riparian corridors, minor damage to park benches or pavilions, and damage to the dam itself. Some portions of Interstate Highway 37 run parallel to the riparian corridor downstream of Calallen reservoir. While this length of highway is listed as a potential vulnerable asset in the jurisdictional table, it is not expected to be destroyed in a dam failure event.

The location of the levee system protecting downtown Corpus Christi is shown in Figure 15-2. Downtown Corpus Christi and two of the City's Pump Stations are protected by the levee system. A levee failure would threaten the area bounded by the three levees. Approximately \$757 million in improved property is protected by the levees. A failure of the levee system would threaten this property.

Figure 15-6. City of Corpus Christi Dam and Levees



## City of Driscoll Dam and Levee Failure Hazard

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LOCATION, EXTENT, OCCURRENCE, PROBAILITY, IMPACT, VULNERABILITY

This jurisdiction does not contain regulated dams or levees.

## City of Petronila Dam and Levee Failure Hazard

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LOCATION, EXTENT, OCCURRENCE, PROBAILITY, IMPACT, VULNERABILITY

This jurisdiction does not contain regulated dams or levees.

## City of Port Aransas Dam and Levee Failure Hazard

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LOCATION, EXTENT, OCCURRENCE, PROBAILITY, IMPACT, VULNERABILITY

This jurisdiction does not contain regulated dams or levees.

## City of Robstown Dam and Levee Failure Hazard

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LOCATION, EXTENT, OCCURRENCE, PROBAILITY, IMPACT, VULNERABILITY

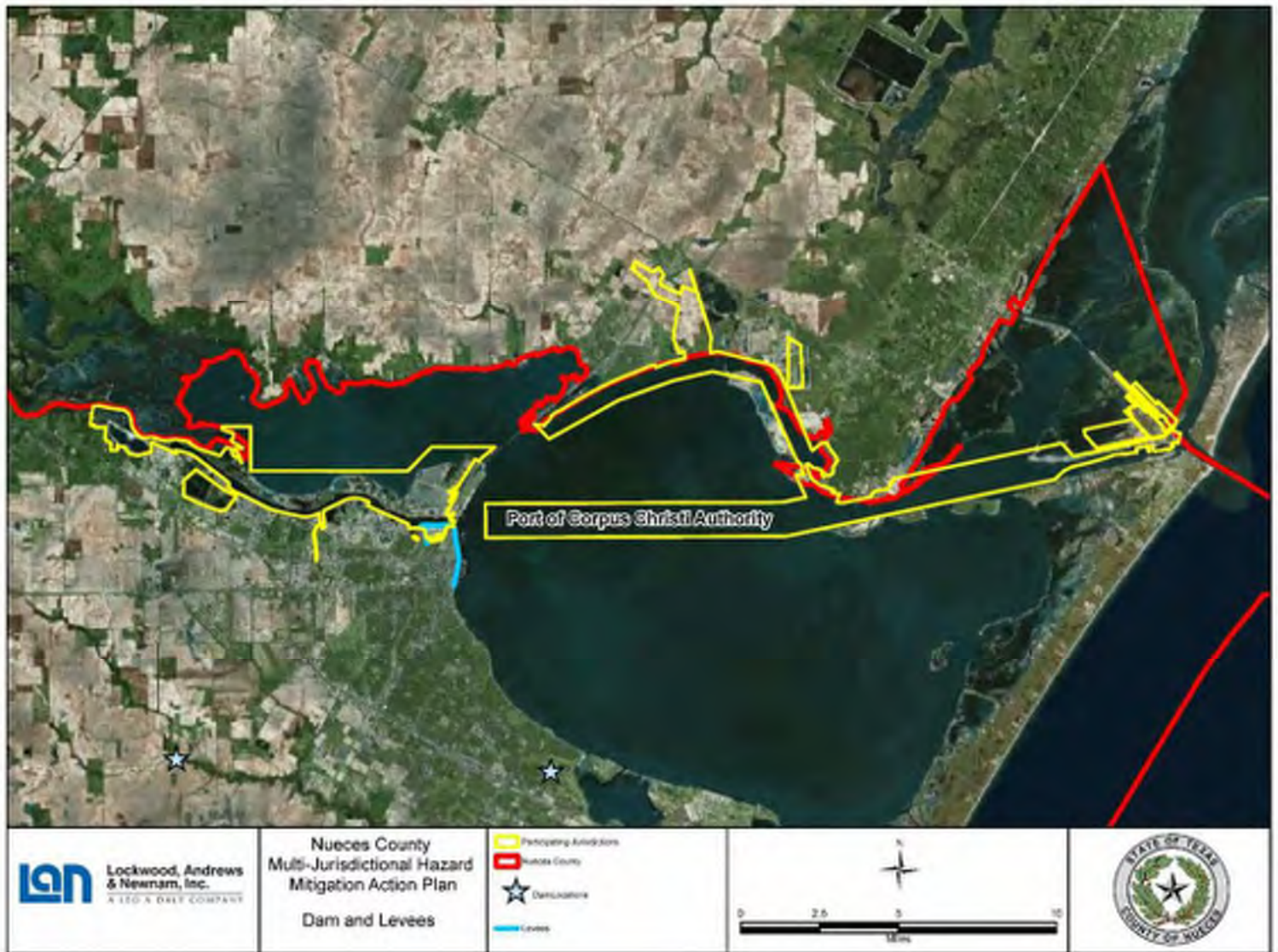
This jurisdiction does not contain regulated dams or levees.

## Port of Corpus Christi Authority Dam and Levee Failure Hazard

Location	Extent (defined in Table 15-3)
See Map	Low
Occurrences	Probability
No dams in jurisdiction Levee repairs recommended in 2012	Levee failure: 5% annual chance in next 5 years
Impact	Vulnerability
Levee failure – damage to downtown southeastern portion of jurisdiction	\$85,613,053 in improved property behind levees



Figure 15-8. Port of Corpus Christi Authority Dam and Levees



## Section 16: Land Subsidence

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### Land Subsidence Hazard Overview

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#### Description

Land subsidence is the decrease in the lands surface elevation due to the loss of subsurface support. Land subsidence can be caused by both natural processes and manmade actions. Land subsidence caused by natural processes typically occurs over a long period of time, usually thousands to millions of years. Short-term land subsidence is generally the result of manmade actions such as: excessive ground-water withdrawal, oil and gas drilling, mining operations, collapse of buried infrastructure like pipelines for water, sewer and storm or the leakage of underground pipes that erode adjacent soils. Subsidence from groundwater withdrawal and oil and gas production usually occur over large areas, while subsidence from collapsed or leaking pipelines is generally localized.

#### Location

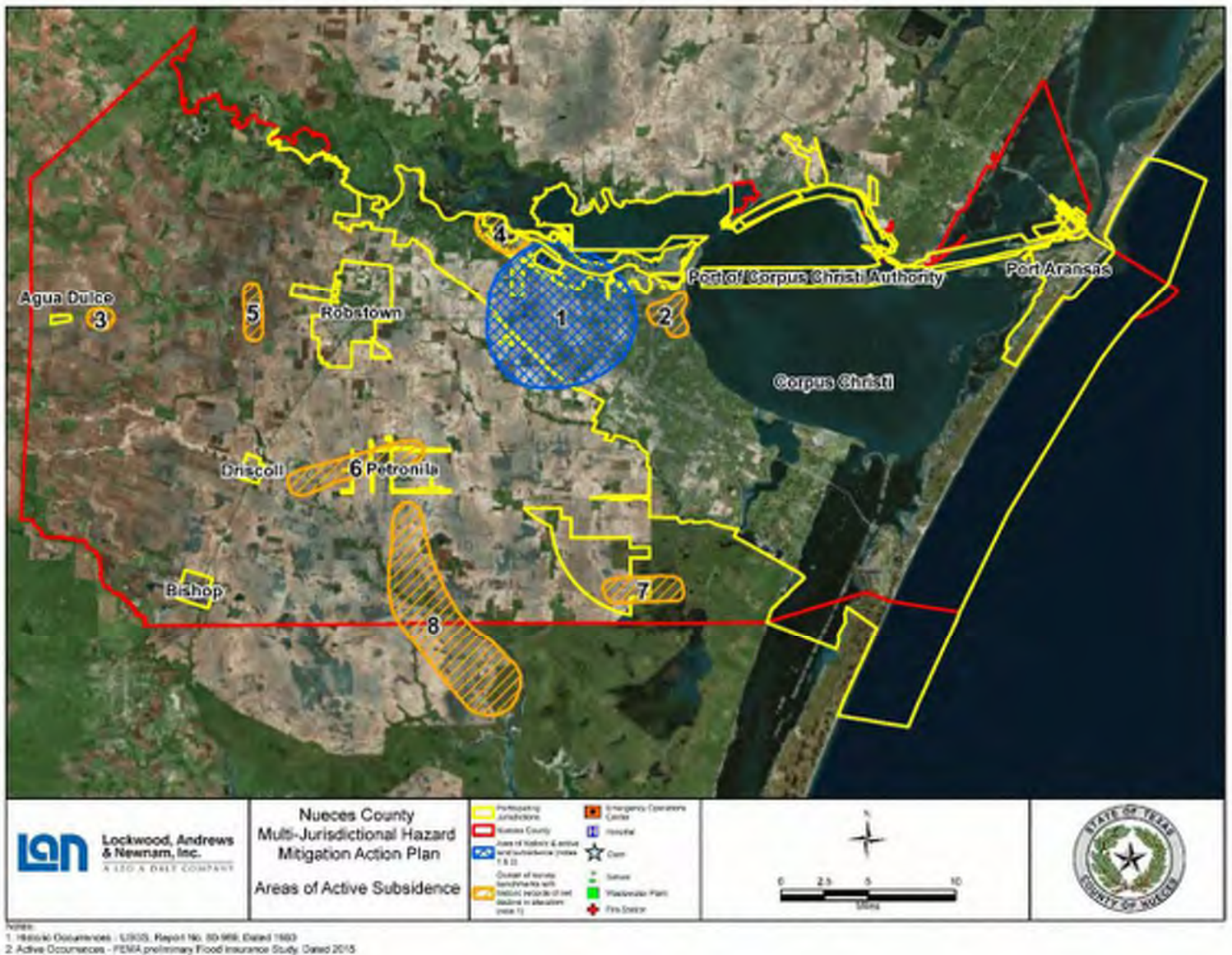
Nueces County is one of the Texas coastal counties at high risk for land subsidence<sup>1</sup>. Figure 16-1 illustrates the areas with the greatest land subsidence potential in Nueces County according to subsidence data from the 2015 Preliminary Flood Insurance Study for Nueces County. There are a total of eight areas within the county which have records of historic land subsidence; Areas No. 2 through No. 8 are no longer active. The only area of active subsidence identified within the county extent is the Saxet Oil and Gas Field, and is located within the City of Corpus Christi; this is shown at Area No. 1.

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<sup>1</sup> The 2013 State of Texas Mitigation Plan identified



**Figure 16-1. Map of Subsidence Areas in Nueces County**

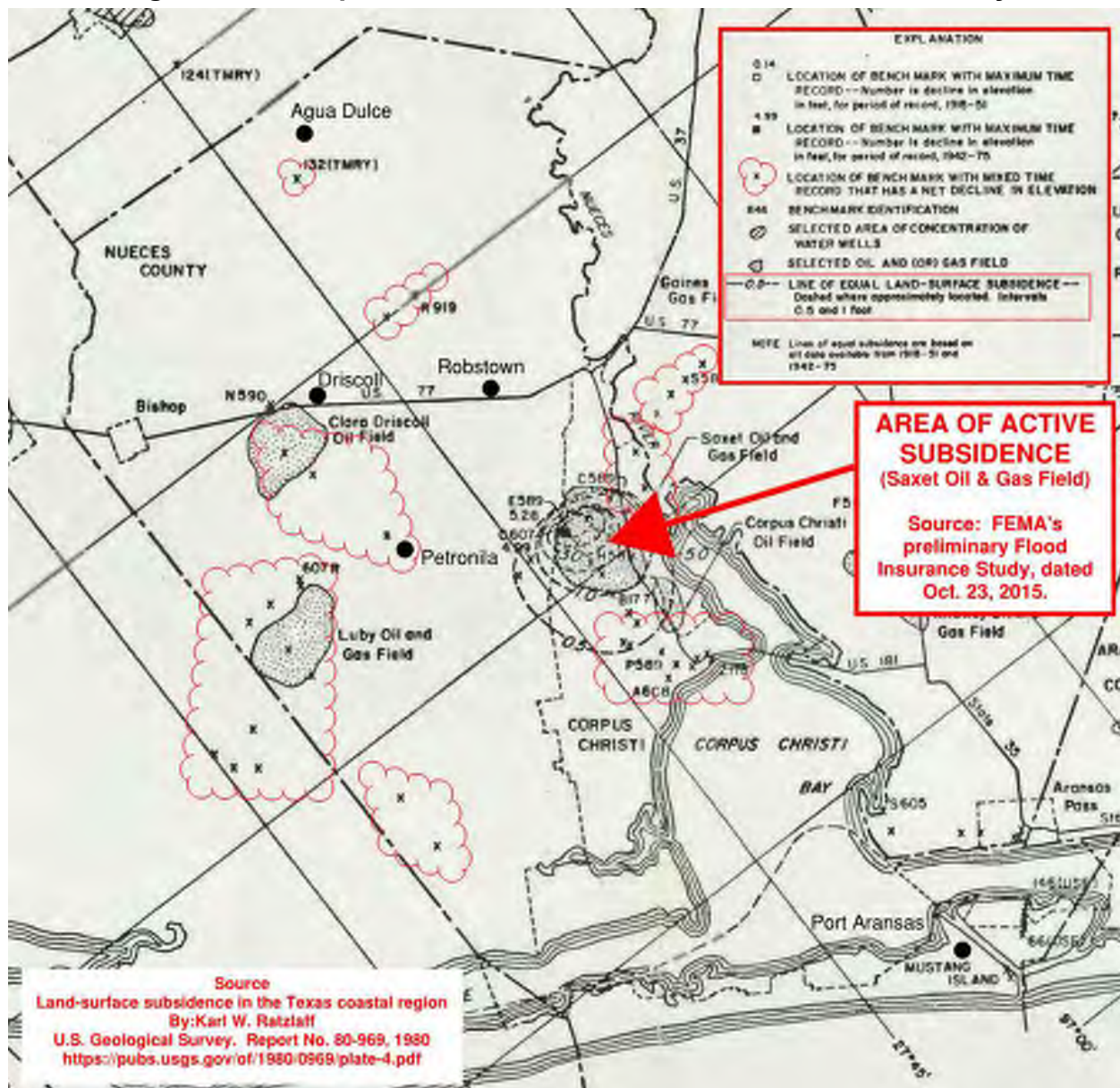


## Extent

Land subsidence extent is determined by the decrease in the lands surface elevation measured in feet. Figure 16-2 includes benchmarks, denoted with an “X”, which indicate areas currently being observed for potential land subsidence.



**Figure 16-2. Map of Historic Subsidence Areas in Nueces County**



Figures 16-1 and 16-2 depict areas of both active and inactive subsidence. The City of Petronila has not experienced active subsidence since 1980. Subsidence is not expected to occur in that area in the next five years. These maps indicate active subsidence only for Nueces County, the City of Corpus Christi, and the Port of Corpus Christi Authority.

## Occurrences

Land subsidence in Nueces County has been historically associated with ground-water withdrawal and oil and gas production. Seven areas of historical subsidence can be seen in Figures 16-1 and 16-2. The greatest period of subsidence in Nueces County took place

from 1942-1975. The greatest loss of elevation experienced in Nueces County, a loss of 5.28 ft., is indicated as the Area of Active Subsidence in Figures 16-1 and 16-2. This area corresponds to the location of the Saxet Oil and Gas Field, suggesting that the subsidence experienced in this area is a result of the removal of subterranean oil, gas, and ground water.

## **Probability**

Unlike other natural hazards that take place as discreet, acute events, land subsidence is a more chronic hazard. A probability presented in terms of the expected number of events per year is not an appropriate method of analysis for land subsidence. An area is either experiencing land subsidence or not. The probability of an area experiencing land subsidence is dependent upon a number of factors. Oil and gas extraction activity appears to be associated with subsidence in the area.

The State of Texas Hazard Mitigation Action Plan reports that land subsidence is generally viewed to be an unlikely event, with one event possible in the next 10 years. The 2012 Coastal Bend Mitigation Action Plan, which includes Nueces County, reports that land subsidence “has been reviewed and is not widespread.” Based upon these reports, with the exception of the area of active subsidence around the Saxet Oil and Gas field, a new land subsidence event is expected no more frequently than once every ten years for all participating jurisdictions.

## **Impact**

Land subsidence in coastal areas can have significant environmental and socio-economic impacts. Land subsidence can cause structural damage to building and transportation systems such as roads and rail; damage buried infrastructure such as pipelines; cause sea level rise along the coast which increases vulnerability of coastal wetlands and beaches to coastal erosion and increased flooding. The impacts of land subsidence can be measured in terms of property damage.

## **Vulnerability**

Land subsidence can damage vulnerable assets by causing damage to buildings, transportation infrastructure and buried pipelines. Vulnerability is included in the jurisdictional tables as a function of property value and critical assets contained within the areas of subsidence.

Land subsidence, and the decrease in elevation associated with it has the potential to increase vulnerability by the following mechanisms:

- Increase saltwater inundation in coastal areas
- Increase the frequency of flooding
- Increase in the extent of flooding

- Damage to fixed infrastructure
- Losses to submerged aquatic vegetation
- Changes to gradients in drainage channels, leading to channel erosion and sediment deposition

In addition to direct impacts like damages to infrastructure, land subsidence may increase the impacts of flooding hazards. Impacts from flooding hazards are discussed in Section 6.

# Unincorporated Nueces County Land Subsidence Hazard

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OCCURRENCE		
Date	Location	Extent
1918 – 1951, 1942 - 1975	Subsidence cluster 5 (see Fig. 16-1)	Unreported
1918 – 1951, 1942 - 1975	Subsidence cluster 6 (see Fig. 16-1)	Unreported
1918 – 1951, 1942 - 1975	Subsidence cluster 7 (see Fig. 16-1)	Unreported
1918 – 1951, 1942 - 1975	Subsidence cluster 8 (see Fig. 16-1)	Unreported

VULNERABILITY	
Property Value	
Commercial	Residential
\$2,282,722	\$9,293,714

# City of Agua Dulce Land Subsidence Hazard

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## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

There are no records of historic or active land subsidence within this jurisdiction.

# City of Bishop Land Subsidence Hazard

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## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

There are no records of historic or active land subsidence within this jurisdiction.

# City of Corpus Christi Land Subsidence Hazard

OCCURRENCE		
Date	Location	Extent
1942 – Present	Subsidence cluster 1 (see Fig. 16-1)	5.28 feet (1942 – 1975)
1918 – 1951, 1942 - 1975	Subsidence cluster 2 (see Fig. 16-1)	Unreported
1918 – 1951, 1942 - 1975	Subsidence cluster 4 (see Fig. 16-1)	Unreported

EXTENT					
FROM	TO	Elevation Change FT	Duration YR	Rate FT/YR	Source
1917	1942	4.05	25	0.162	calculated
1942	1950	1.10	8	0.138	1
1951	1959	1.76	8	0.220	1
1960	1975	2.00	15	0.133	2
1942	1975	5.28	33	0.160	3
1917	1975	9.33	58	0.161	4
<b>2017</b>	<b>2022</b>	<b>0.80</b>	<b>5</b>	<b>0.161</b>	<b>5</b>

- 1 Geothermal Resources of the Texas Gulf Coast Environmental Concerns Arising from the Production and Disposal of Geothermal Waters, by the Bureau of Economic Development, dated 1976
- 2 Land-surface subsidence in the Texas coastal region, by the USGS Report No. 80-969, dated 1980
- 3 Report No. 272 dated November 1982, titled "Land-Surface Subsidence in the Texas Coastal Region" by the Texas Department of Water Resources
- 4 The Impact of Global Warming on Texas: Second Edition, by Jurgen Schmandt, et al, 2011
- 5 Forecasted amount of land subsidence using the average rate from 1917 to 1975, based on FEMA's 2015 preliminary Flood Insurance Study indicating subsidence is currently occurring and should be anticipated.

VULNERABILITY		
Property Value at Risk		
Commercial		Residential
\$2,752,155,876		\$448,772,256
VULNERABLE ASSETS		
Cluster No.*	Asset Type	Description
1	Fire Station	Fire Station 9 - 501 Navigation Blvd. Corpus Christi, Tx 78408
	School	Corpus Christi Isd Gibson El
		Corpus Christi Isd Harold T Branch Academy For Career & Techn
		Tuloso-Midway Isd Tuloso-Midway Academic Career Center
		West Oso Isd Kennedy El



		West Oso Isd West Oso El
		West Oso Isd West Oso H S
2	EOC	Nueces County Emergency Operations Center
	Fire Station	Fire Station 3 - 1401 Morgan Avenue Corpus Christi, Tx 78404
	Hospital	Christus Spohn Hospital Corpus Christi
		Christus Spohn Hospital Corpus Christi Shoreline
		Dubuis Hospital Of Corpus Christi
	School	Corpus Christi Isd Coles H S And Educational Center
		Corpus Christi Isd Evans Ses

\*Reference Figure 16-1

# City of Driscoll Land Subsidence Hazard

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## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

There are no records of historic or active land subsidence within this jurisdiction.

# City of Petronila Land Subsidence Hazard

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## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

There are no records of subsidence after 1980 in the City of Petronila. Land subsidence is not expected to impact this jurisdiction and will not be profiled in this plan.

# City of Port Aransas Land Subsidence Hazard

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## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

There are no records of historic or active land subsidence within this jurisdiction.

# City of Robstown Land Subsidence Hazard

---

## LOCATION, EXTENT, OCCURRENCE, PROBABILITY, IMPACT, VULNERABILITY

There are no records of historic or active land subsidence within this jurisdiction.

# Port of Corpus Christi Authority Land Subsidence Hazard

OCCURRENCE		
Date	Location	Extent
1942 – Present	Subsidence cluster 1 (see Fig. 16-1)	5.28 feet (1942 – 1975)

VULNERABILITY
Property Value at Risk
\$41,969,347*

\*property within subsidence zone 1.

Properties within subsidence zone 1 include AEP Texas Central Company, Buckeye Texas Processing, Bucky's Navigation Inc, City of Corpus Christi, Coastal States Petroleum, Crossbridge LLC, Driscoll Foundation et al, Longhorn Transfer and Storage, M&G Resins USA LLC, Nueces County Navigation District, Port of Corpus Christi Authority, Union Pacific Railroad, and Valero Refining.

The properties are generally industrial facilities with roles in shipping or the hydrocarbon petrochemical processing industry. Land subsidence is most likely to damage these facilities by damaging below-ground or transportation infrastructure.

Land subsidence is not likely to directly impact populations. The Port of Corpus Christi Authority does not have resident populations. However, PCCA is a major employer in the area. Fortunately, in comparison with other natural hazards, the impacts of land subsidence are comparatively slow-acting. Land subsidence is not expected to represent an acute hazard to people or property. Chronic impacts from land subsidence, if they disrupt production or shipping activity in these facilities, may cause economic disturbances in the community.

## Section 17: Wildfire

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## Wildfire Hazard Overview

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### Description

A wildfire is an uncontrolled fire almost exclusively fueled by natural vegetative fuels. Fuel may come in the form of grass, brush, or tress. Wildfire risk increases with high concentrations of connected fuels. Meteorological conditions such as high temperatures, low humidity, droughts, and high wind can also increase wildfire risk. Humans are the most common source of initial ignition in wildfires. Sparks from agricultural, industrial, or automobile activity may start a wildfire. Additional information regarding wildfire can be found in the 2011 Nueces County Community Wildfire Protection Plan.

### Location

Wildfires are most common in areas where wildland and urban areas abut, known as the Wildland Urban Interface (WUI). The areas of Nueces County that feature WUI are the most vulnerable to wildfire. The urban centers of communities lack the concentrations of fuels required to feed wildfires. The rural areas of the planning area lack the degree of human activity that is associated with ignition. Areas where human activity takes place and fuel concentrations and connectivity are sufficient to fuel wildfire are the areas where wildfires are most likely.

### Extent

Risk to wildfire can be measured by using the Keetch-Byram Drought Index (KBDI). KBDI relates weather conditions and expected, potential fire behavior. KBDI is based upon daily water balance, precipitation, and soil moisture. KBDI ranges from 0 to 800. A KBDI score



of 0 indicates no water depletion, while a score of 800 represents absolutely dry conditions.

**Table 17-1. KBDI scores correspond to potential fire behavior as follows**

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

Nueces County has an average KBDI of 64. The maximum KBDI experienced by Nueces County is 264. The minimum KBDI experienced by Nueces County is 7. This is a generally low to moderate level of risk. Because KBDI indicates current conditions, care should be taken to ensure that current KBDI is examined to determine risk. Droughts or extreme weather conditions may drive KBDI up or down in a short time.

Historically, the largest fires in the planning area (excluding controlled, fuel-management burns) are about 1,000 acres in area. In the future, the worst that is expected to occur in any participating jurisdiction is a fire size of 1,000 acres. Some of the smaller jurisdictions are not much larger than 1,000 acres in total area. It is doubtful that they would ever experience a wildfire that completely encompasses the jurisdiction. However, they could still experience a 1,000-acre wildfire that crosses jurisdictional boundaries.

Extent may also be examined in terms of fire intensity. Table 17-2 provides the Texas Forest Service Fire Intensity Rating.

**Table 17-2 – Texas Forest Service Fire Intensity Rating**

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

For future planning purposes, all jurisdictions can expect to experience a fire of Moderate intensity on the Texas Forest Service Fire Intensity rating.

### **Occurrences**

Records from the Texas Forest Service (TFS) from January 2005 to November 2015, the range of dates for which spatial wildfire data is provided, Nueces County experienced 25 wildfires greater or equal to 10 acres, 9 wildfires greater or equal to 100 acres, resulting in a total burned area of 6,345 acres. TFS records indicate that fireworks are the most common known cause of fires in Nueces County, causing 12 fires. Smoking, debris burning, and equipment and motor vehicle operation are the next most common causes of fires in Nueces County, each causing ten fires in the ten year period. A plurality of fires have unknown sources of ignition. Records of occurrence for each jurisdiction are provided in the jurisdictional tables.

A number of other data sources report a wide range of wildfire occurrences. National Climate Data Center (NCDC) records indicate that three wildfires in Nueces County in 2011 and 2013 had a combined damage total of \$260,000. No other damages were reported. Data from the State Fire Marshall indicate that Nueces County experienced 4,105 “outdoor and other” fire events from 2006 – 2010. Online archives of the Corpus

Christi Caller Times from 1998 – 2004 indicate that Corpus Christi experienced 13 fires, Nueces County experienced two fires, and Bishop experienced one fire.

Due to the wide ranging variability in wildfire data, the data provided by the Texas Forest Service is used to calculate jurisdiction-specific hazard probability. This dataset is the only dataset is the most detailed and therefore most suited for analysis at the municipal level.

**Table 17-3 Historical Wildfire Occurrences (TFS and NCDC records) \***

Start Date	Area Burned (Acres)	Cause of wildfire
1/1/2012	0.00	Unknown Cause
1/3/2012	0.00	Unknown Cause
1/16/2012	0.00	Unknown Cause
2/2/2012	0.00	Unknown Cause
3/28/2012	1000.00	Origin traceable to smoking
7/18/2012	5.00	Unknown Cause
7/31/2012	15.00	Unknown Cause
8/26/2012	0.25	Unknown Cause
9/3/2012	10.00	Brush pile burning
9/3/2012	10.00	Unknown Cause
9/10/2012	2.00	Power Lines
9/12/2012	2.00	Playing with matches
9/13/2012	10.00	Unknown Cause
10/12/2012	5.00	Unknown Cause
10/26/2012	2.00	Power Lines
11/20/2012	1.00	Power Lines
11/24/2012	1.00	Playing with matches
12/20/2012	40.00	Unknown Cause
2/13/2013	0.25	Unknown Cause
2/25/2013	1.00	Unknown Cause
2/25/2013	0.10	Unknown Cause
2/27/2013	0.50	Unsafe burning of household trash
3/4/2013	0.10	Unknown Cause

**Table 17-3 Historical Wildfire Occurrences (TFS and NCDC records) (cont.)\***

Start Date	Area Burned (Acres)	Cause of wildfire
3/11/2013	0.10	Unknown Cause
3/12/2013	0.10	Unknown Cause
3/24/2013	0.10	Unknown Cause
3/25/2013	Unspecified	High winds downed power lines
8/5/2013	1.00	Unknown Cause
8/17/2013	0.25	Unknown Cause
8/23/2013	0.25	Unknown Cause
12/14/2013	800.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
1/15/2014	7.00	Unknown Cause
1/28/2014	0.25	Unknown Cause
2/14/2014	1.00	Unknown Cause
2/14/2014	1.00	Unknown Cause
1/15/2015	1.00	Unknown Cause
1/21/2015	0.20	Warming or cooking
2/19/2015	1.00	Playing with matches
2/21/2015	0.10	Warming or cooking
6/15/2015	0.15	Unknown Cause
7/4/2015	1.00	Fireworks
7/12/2015	1.00	Unknown Cause
8/3/2015	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
8/9/2015	1.00	Unknown Cause
8/15/2015	1.00	Unknown Cause
8/30/2015	0.20	Brush pile burning
8/30/2015	0.50	Unknown Cause
9/12/2015	0.20	Power Lines
10/1/2015	1.00	Brush pile burning
11/9/2015	0.10	Unknown Cause
11/21/2015	2.00	Warming or cooking

\*There are too many wildfire occurrences to list here; additional records from 2005 through 2011 are included as Appendix F

**Table 17-4 Historical Occurrences Listed in Nueces County Community Wildfire Protection Plan (2009)**

Fire Department	2009 Records
Corpus Christi Fire Department	301
Naval Air Station Corpus Christi Fire Department	--
Nueces County Emergency Services Department 1	91
Nueces County Emergency Services Department 2	50
Nueces County Emergency Services Department 3	83
Nueces County Emergency Services Department 4	29
Nueces County Emergency Services Department 5	--
Port Aransas Fire Department	19
Robstown Fire Department	59
Refinery Terminal Fire Company	--
Total recorded wildfire incidents	632

## Probability

Hazard probability or reoccurrence intervals are calculated based upon the number of historical events during the period of examination. For example, if four wildfires were to have taken place during a 50 year reporting period, the reoccurrence interval would be about 13 years, or an 8% annual chance of wildfire. Probabilities are shown below in the jurisdictional tables.

## Impact

The impact of wildfire is described in terms of property exposure. Data from the Nueces County Appraisal District and the Texas A&M Forest Service are examined to determine residential and commercial property exposure to high wildfire risk areas. The Texas A&M Forest Service data are described in greater detail in the Vulnerability section.

## **Vulnerability**

Vulnerability and impact to wildfire is discussed in terms of asset exposure to “high” to “very high” wildfire threat. The wildfire threat data comes from the Texas A&M Forest Service and is a unitless index ranging from 1 to 7. The Forest Service assigns the qualitative descriptions of Low, Moderate, High, and Very High to index scores of 1, 3, 5, and 7, respectively. For the purposes of this analysis, assets in areas of wildfire threat index values 5, 6, and 7 are considered to be at risk.

Only two of the assets described in Section 4 are located in high wildfire threat areas. The two assets are the Seashore Learning Center Charter School and Fire Station 16, both located in Corpus Christi.

It should be noted that the wildfire threat index is a model. Wildfires have taken place outside of areas of high risk. Conversely, there are areas of high risk that have never experienced a wildfire. When interpreting wildfire risk exposure as described by the wildfire threat model, it is important to realize that no model will ever completely capture the variability of the real world.

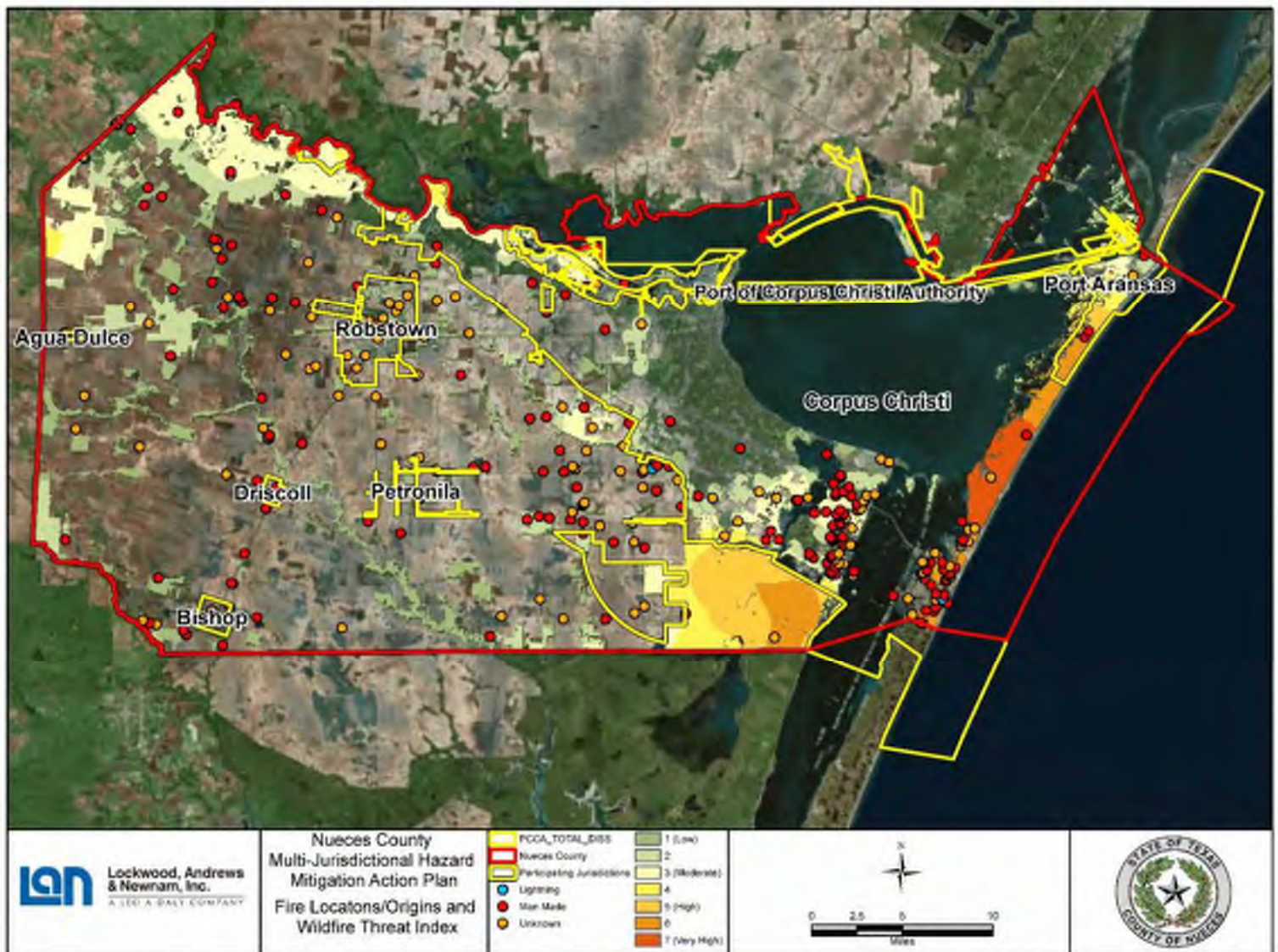
Pastoral and crop lands have the potential to be impacted by wildfire. Crops and pastures can become fuel for wildfires. Wildfires that do not pose a direct threat to human lives or safety can still be damaging due to their impacts on economies dependent upon crop or livestock production. The 2011 National Land Cover Database (NLCD) dataset was used to calculate pasture and crop area by jurisdiction. The 2011 NLCD data, released in 2015, is the most up-to-date data of its type. Pasture and crop area, combined into the term “Agricultural Area,” are outlined in the jurisdictional tables.

# Unincorporated Nueces County Wildfire Hazard

LOCATION			
County Wide (Unincorporated)			
EXTENT			
Top-3 Sources of Ignition (excludes unknown)	Total Burned Acreage	Maximum Single Fire Acreage	
Fireworks Smoking Debris Burning	6,345	3,000	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
166	0 deaths, 0 injuries	\$260,000	
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
1660% annual chance		1 fire every 22 days	
IMPACT			
Residential Property Risk		Commercial Property Risk	
\$0		\$0	
VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
15,274	73.77%	0	0



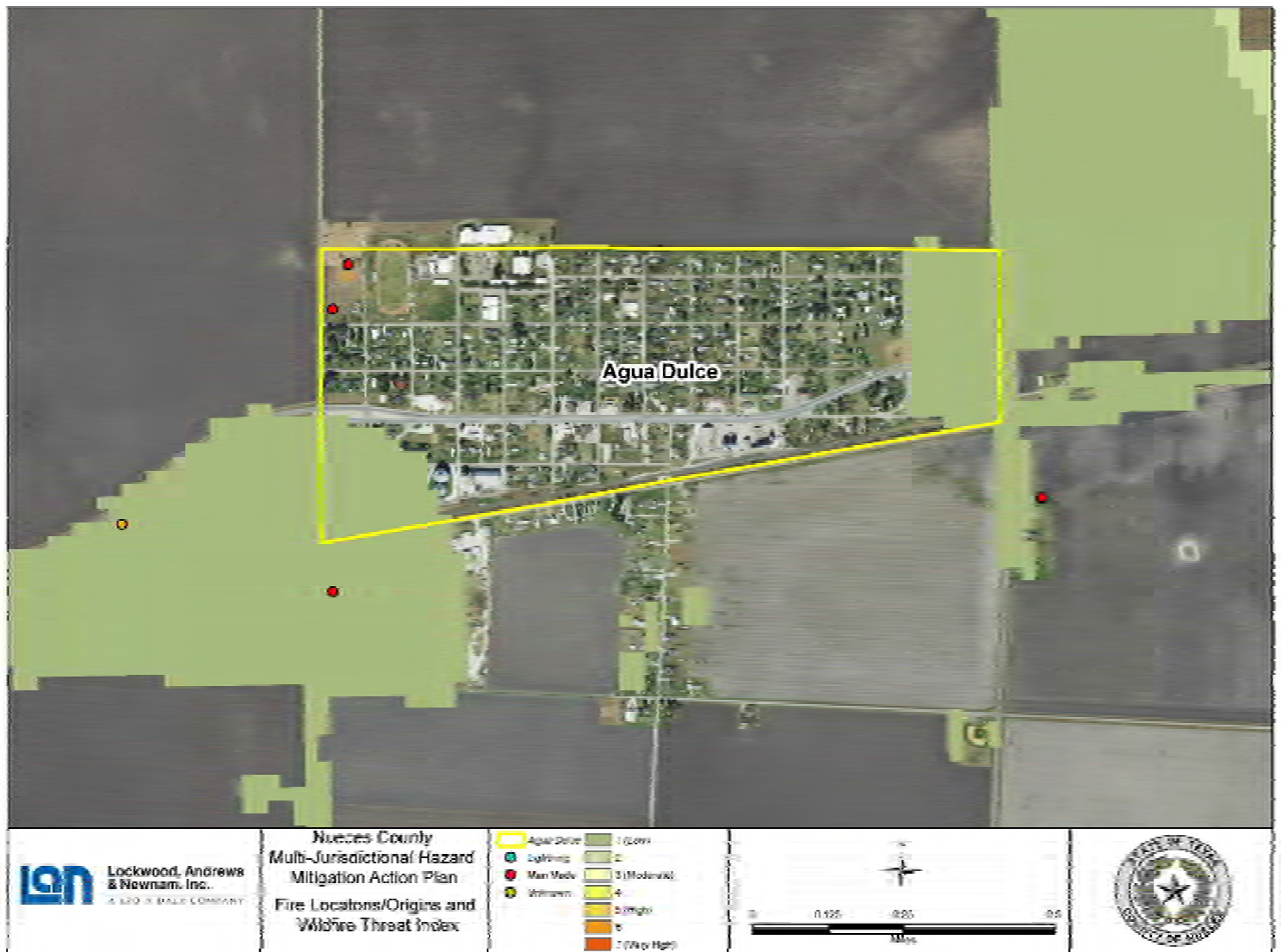
**Figure 17-1. Fire Locations / Origins and Wildfire Threat Index for Unincorporated Nueces County**



# City of Agua Dulce Wildfire Hazard

LOCATION			
City Wide			
EXTENT			
Sources of Ignition	Total Burned Acreage	Maximum Single Fire Acreage	
Farm Equipment Debris Burning	14	10	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
2	0 deaths, 0 injuries	\$0	
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
20% annual chance		1 fire every 5 years	
IMPACT			
Residential Property Risk		Commercial Property Risk	
\$0		\$0	
VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
820	1.12%	0	0

**Figure 17-2. Fire Locations / Origins and Wildfire Threat Index for City of Agua Dulce**



# City of Bishop Wildfire Hazard

LOCATION			
City Wide			
EXTENT			
Sources of Ignition	Total Burned Acreage	Maximum Single Fire Acreage	
Smoking – 2 Landscaping Equipment - 1	2.5	2	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
3	0 deaths, 0 injuries	\$0	
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
30% annual chance		1 fire every 40 months	
IMPACT			
Residential Property Risk		Commercial Property Risk	
\$0		\$0	
VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
3,150	35.57%	0	0



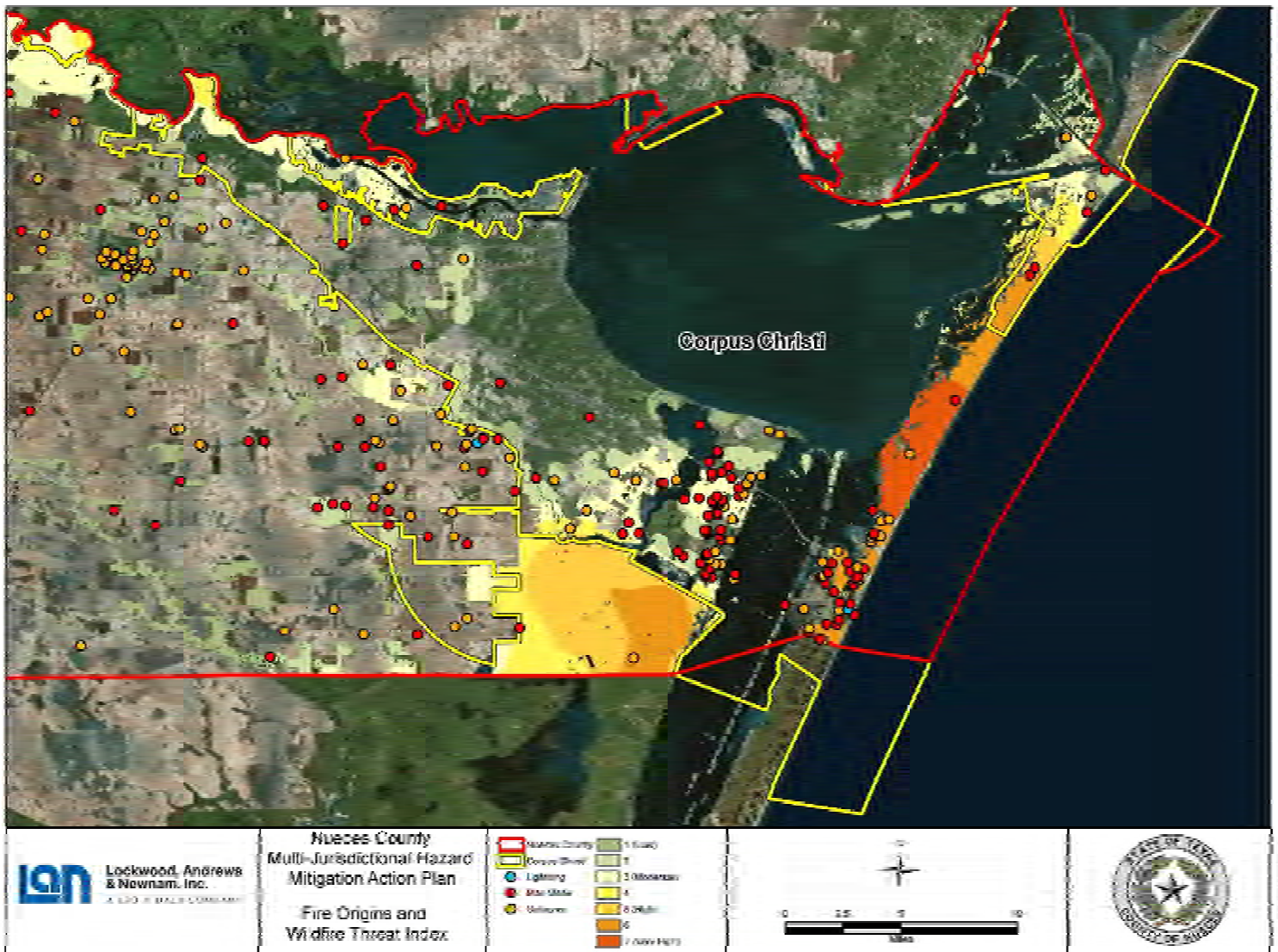
**Figure 17-3. Fire Locations / Origins and Wildfire Threat Index for City of Bishop**



# City of Corpus Christi Wildfire Hazard

LOCATION			
City Wide			
EXTENT			
Top-3 Sources of Ignition (excludes unknown)	Total Burned Acreage		Maximum Single Fire Acreage
Power Lines Children Playing with Matches Other Incendiaries	6,323		1,000
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)		Property Damage
182	0 deaths, 0 injuries		\$0
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
1820% annual chance		1 fire every 20 days	
IMPACT			
Residential Property Risk		Commercial Property Risk	
\$124,962,516		\$106,530,505	
VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
324,074	7.64%	12.44	0

**Figure 17-4. Fire Locations / Origins and Wildfire Threat Index for City of Corpus Christi**

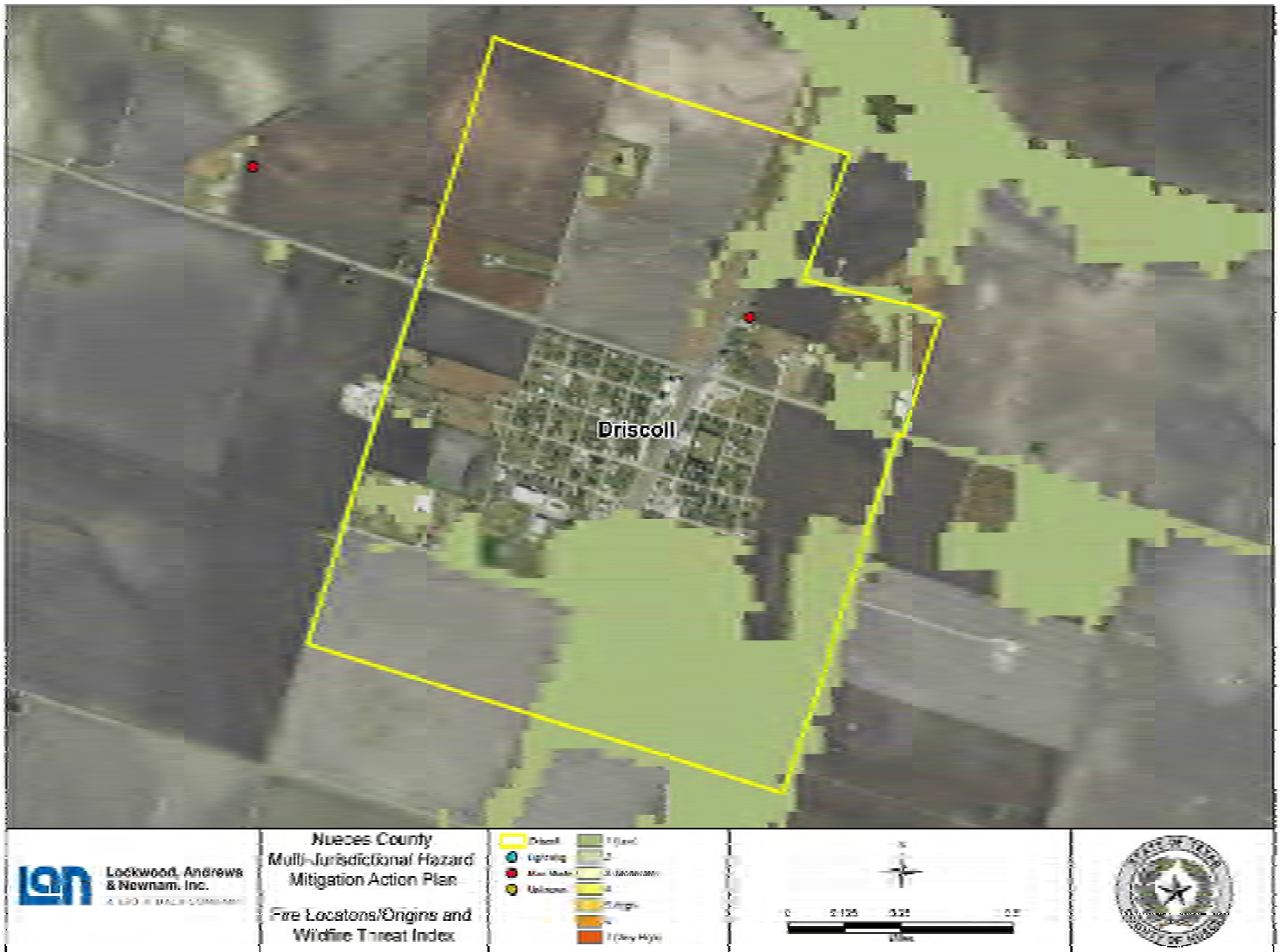




# City of Driscoll Wildfire Hazard

LOCATION			
City Wide			
EXTENT			
Sources of Ignition	Total Burned Acreage	Maximum Single Fire Acreage	
Smoking	1	1	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
1	0 deaths, 0 injuries	\$0	
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
10% annual chance		1 fire every 10 years	
IMPACT			
Residential Property Risk		Commercial Property Risk	
\$0		\$0	
VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
752	62.4%	0	0

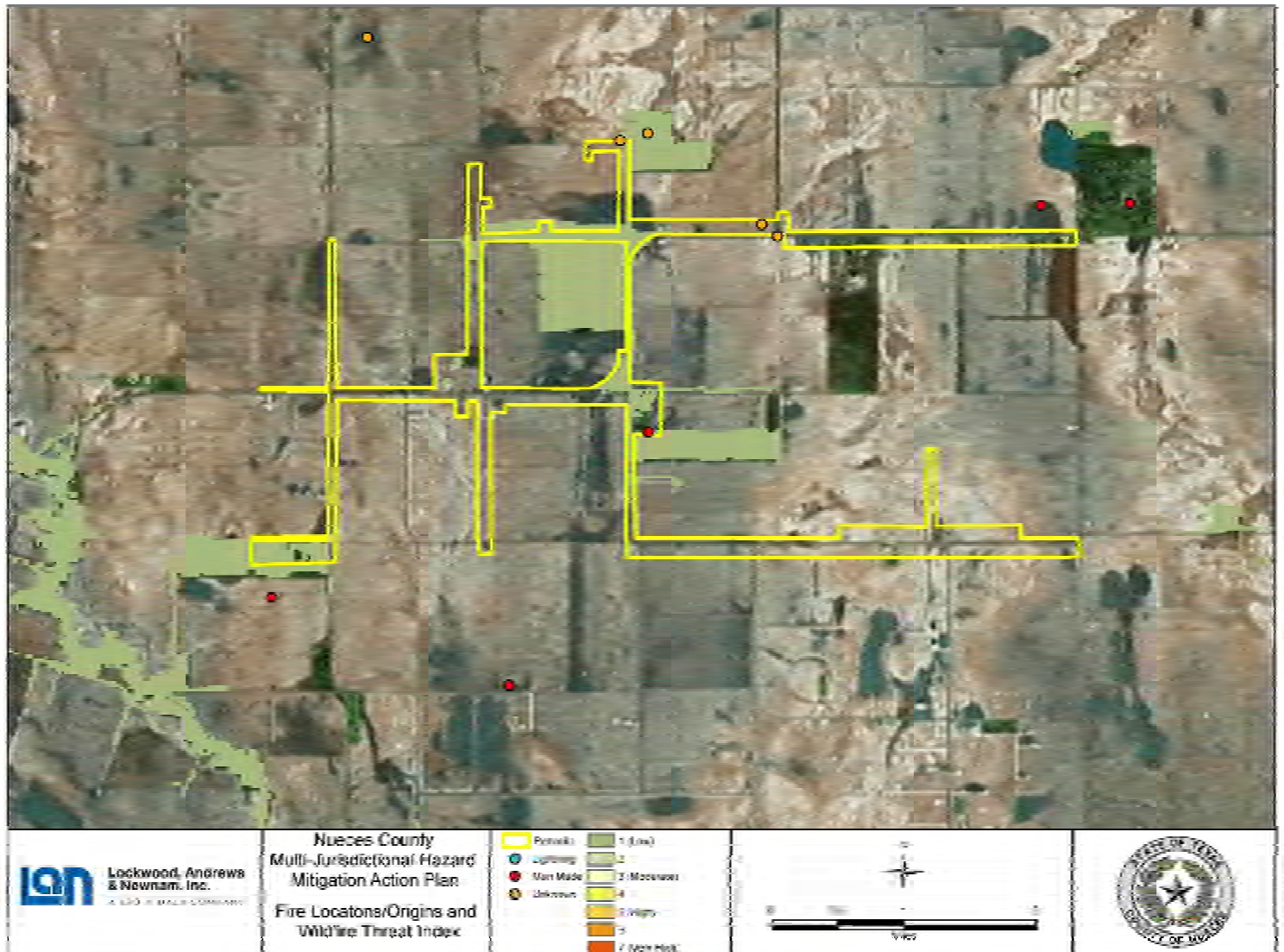
**Figure 17-5. Fire Locations / Origins and Wildfire Threat Index for City of Driscoll**



# City of Petronila Wildfire Hazard

LOCATION			
City Wide			
EXTENT			
Sources of Ignition	Total Burned Acreage	Maximum Single Fire Acreage	
Unknown Construction Debris Burning	.75	.5	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
2	0 deaths, 0 injuries	\$0	
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
20% annual chance		1 fire every 5 years	
IMPACT			
Residential Property Risk		Commercial Property Risk	
\$0		\$0	
VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
114	79.36%	0	0

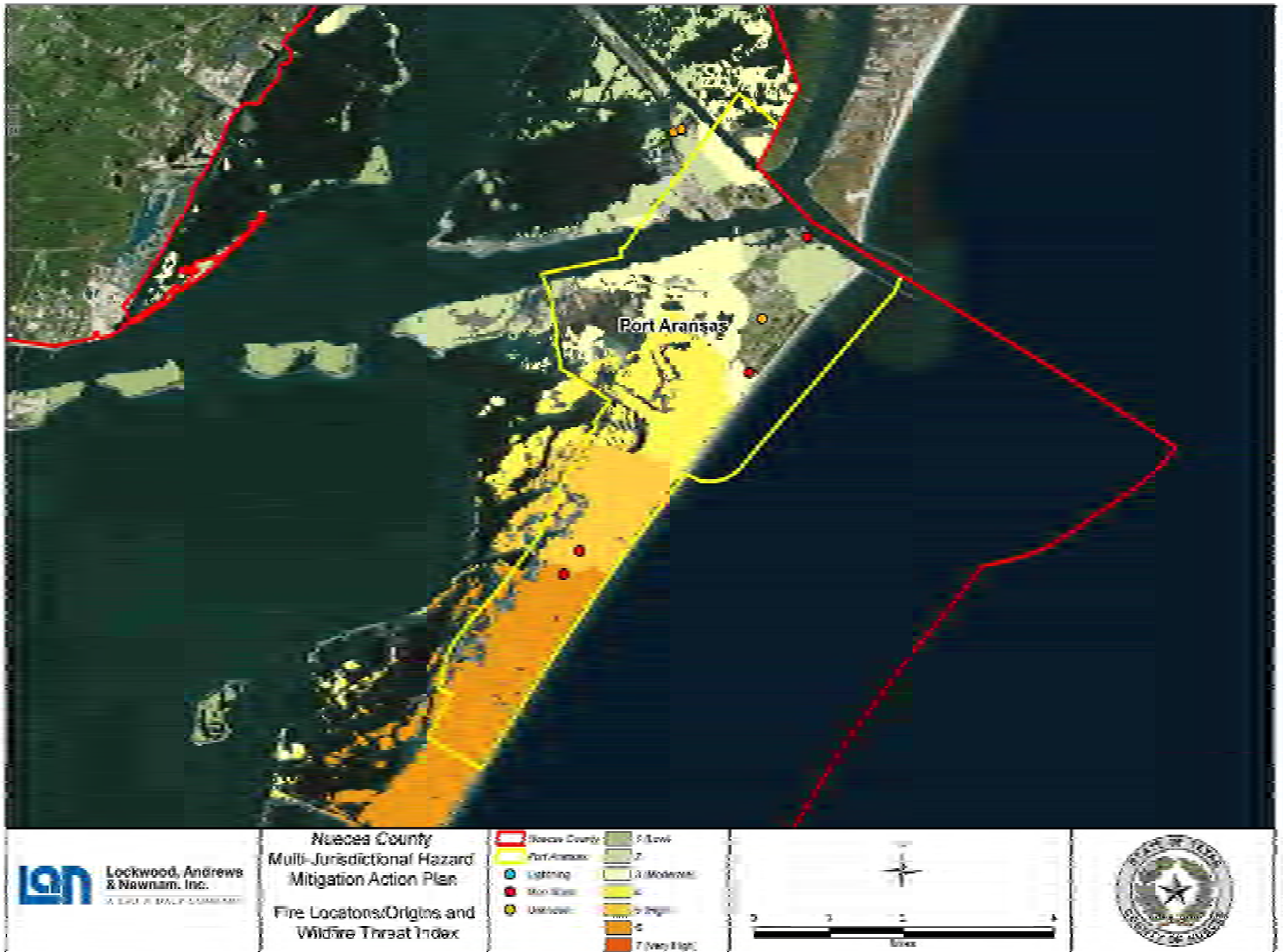
**Figure 17-6. Fire Locations / Origins and Wildfire Threat Index for City of Petronila**



# City of Port Aransas Wildfire Hazard

LOCATION			
City Wide			
EXTENT			
Sources of Ignition	Total Burned Acreage	Maximum Single Fire Acreage	
Vehicular Activity – 3 Power Lines – 1 Unknown - 1	55	30	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
5	0 deaths, 0 injuries	\$0	
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
50% annual chance		1 fire every 2 years	
IMPACT			
Residential Property Risk		Commercial Property Risk	
\$1,96,921,937		\$42,651,525	
VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
3,955	0%	2.92	0

**Figure 17-7. Fire Locations / Origins and Wildfire Threat Index for City of Port Aransas**

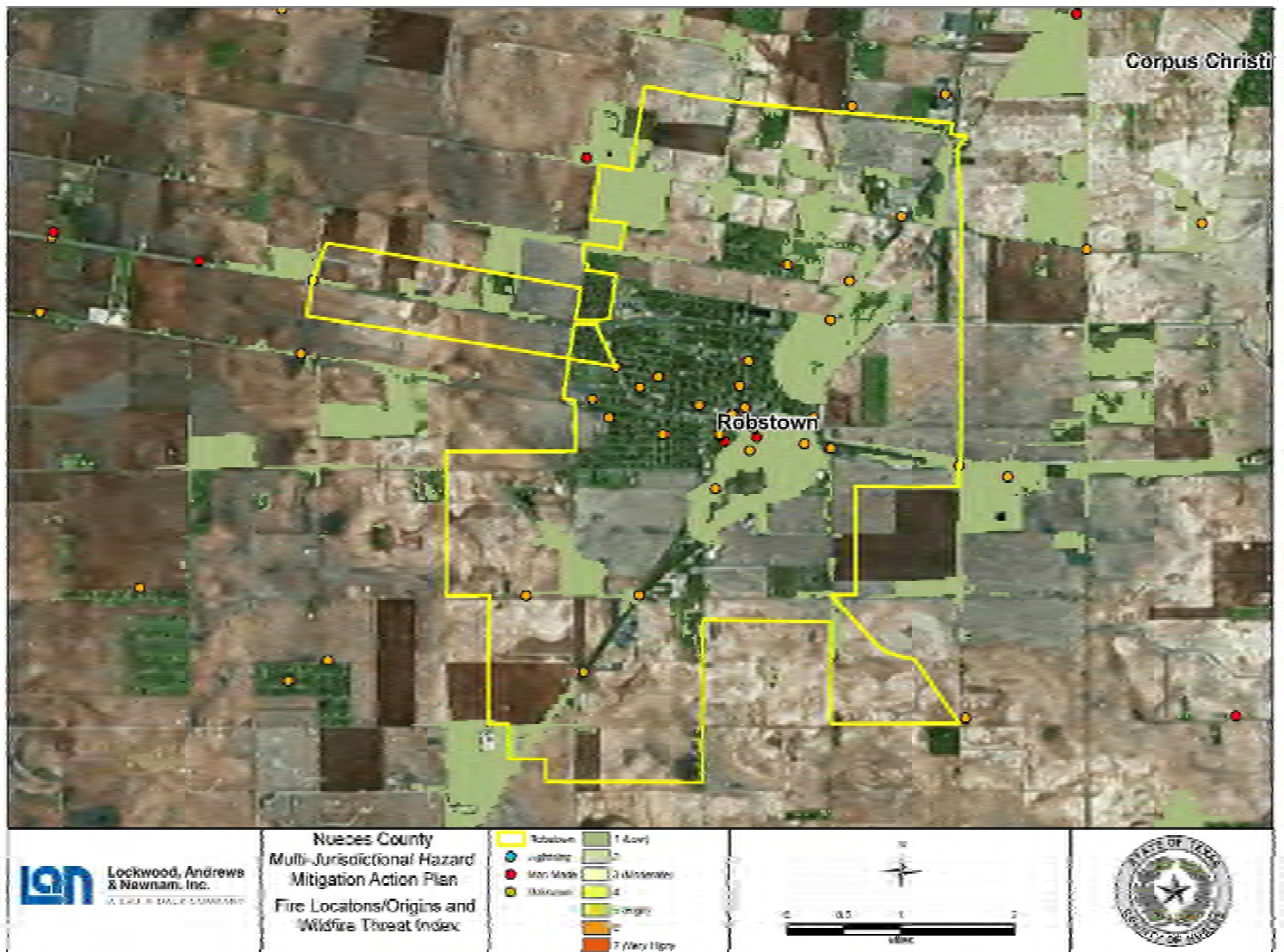


# City of Robstown Wildfire Hazard

LOCATION			
City Wide			
EXTENT			
Sources of Ignition	Total Burned Acreage	Maximum Single Fire Acreage	
Unknown – 51 fires Fireworks – 1 fire Farm Equipment – 1 fire Debris Burning – 1 fire	70	60	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
54	0 deaths, 0 injuries	\$0	
PROBABILITY			
Future Wildfire Events Likelihood		Reoccurrence Interval	
540% annual chance		1 fire every 68 days	
IMPACT AND VULNERABILITY			
Residential Property Risk		Commercial Property Risk	
\$0		\$0	
IMPACT AND VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
11,576	66.32%	0	0



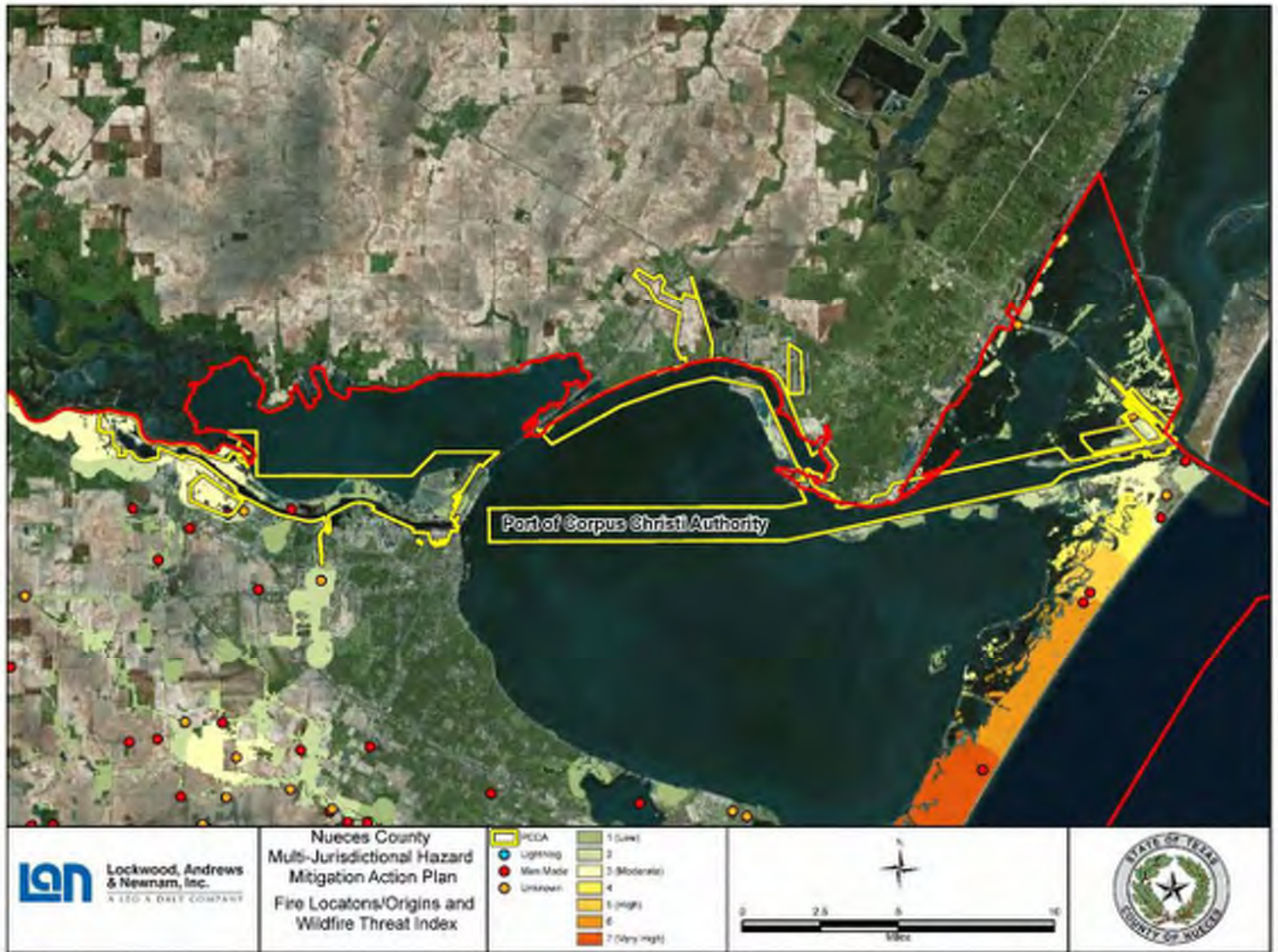
**Figure 17-8. Fire Locations / Origins and Wildfire Threat Index for City of Robstown**



# Port of Corpus Christi Authority Wildfire Hazard

LOCATION			
Jurisdiction Wide			
EXTENT			
Sources of Ignition	Total Burned Acreage	Maximum Single Fire Acreage	
Various Welding equipment Landscaping equipment	225	100	
OCCURENCES			
Number of Fires (Range: 2005-2015)	Risk to Health and Safety (No. Incidences by Type)	Property Damage	
4	0 deaths, 0 injuries	\$0	
PROBABILITY			
Future Wildfire Events Likelihood	Reoccurrence Interval		
40% annual chance	1 fire every 2.5 years		
IMPACT AND VULNERABILITY			
Residential Property Risk	Commercial Property Risk		
\$0	\$0		
IMPACT AND VULNERABILITY			
People at Risk	Agricultural Area (%)	Highway at Risk (Mile)	Railroad at Risk (Mile)
Industrial Area; No Residents; Staff & Visitors Only	7.64%	0	0

**Figure 17-9. Fire Locations / Origins and Wildfire Threat Index for Port of Corpus Christi Authority**



## Section 18: Severe Winter Storms

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### Severe Winter Storms Hazard Overview

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#### Description

A severe winter storm event is defined as a storm with snow, ice, or freezing rain. Severe winter storms are rare for the Texas Coastal area. Severe winter storms may include snowstorms, blizzards, cold waves and ice storms. Snowstorms include four or more inches of snow in a 12-hour period. Blizzards are characterized by low temperatures and strong winds in excess of 35 mph with large amounts of drifting snow. A cold wave is a winter cold front with a drastic drop in temperature. An ice storm occurs when rain falls out of the warm and moist upper layers of the atmosphere into a cold and dry layer near the ground.<sup>1</sup>

#### Location

Winter storms vary in location, intensity and duration but are considered rare occurrences in Nueces County and participating jurisdictions. It is assumed that all of the jurisdictions are uniformly exposed to winter storm events; therefore, all areas of the county are equally exposed.

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<sup>1</sup> State of Texas Mitigation Plan Update 2013



## Extent

Table 18–1 below displays the magnitude of severe winter storms. The wind–chill factor is further described in Figure 18–1. This is an index developed by the National Weather Service, although the chart is not applicable when temperatures are over 50° or winds are calm.

**Table 18-1. Extent Scale - Winter Weather Alerts**

<b>Winter weather advisory</b>	This alert may be issued for a variety of severe conditions. Weather advisories may be announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
<b>Winter storm watch</b>	Severe winter weather conditions may affect your area (freezing rain, sleet or heavy snow may occur separately or in combination).
<b>Winter storm warning</b>	Severe winter weather conditions are imminent.
<b>Freezing rain or freezing drizzle</b>	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.
<b>Sleet</b>	Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.
<b>Blizzard warning</b>	Sustained wind speeds of at least 35 mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
<b>Frost/freeze warning</b>	Below freezing temperatures are expected and may cause significant damage to plants, crops and fruit trees.
<b>Wind chill</b>	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind–chill factor.

**Table 18-2 Historical Extents\***

Jurisdiction	Temperature (°F)	Snowfall (inches)
Unincorporated Nueces County	12°	0"
Agua Dulce	15°*	Unreported
Bishop	19°	4"
Corpus Christi	13°	4.4"
Driscoll	15°*	Unreported
Petronila	15°*	Unreported
Port Aransas	15°*	Unreported
Robstown	14°	5.1"
Port of Corpus Christi Authority	15°*	Unreported

\*Records are limited by the presence of a National Weather Service weather station within the jurisdiction. Marked records are interpolated estimates.

Wind chill temperature is a measure of how cold the wind makes real air temperature feel to the human body, similar to the heat index for extreme heat (Figure 18–2). Since wind can dramatically accelerate heat loss from the body, a blustery 30° day would feel just as cold as a calm day with 0° temperatures. The Coast Bend Region has never experienced a blizzard, but based on previous occurrences, Coastal Bend counties have been subject to winter storm watches, warnings, freezing rain, sleet, snow and wind chill.

Based upon historical data, the worst that can be expected in the future in the planning area is six inches of snow and 10° Fahrenheit. Wind chill factors would further lower the apparent temperature, potentially as low as -19 degrees.

Table 18-3. Wind Chill Chart<sup>2</sup>

		Temperature (°F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times

30 minutes

10 minutes

5 minutes

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V<sup>0.16</sup>) + 0.4275T(V<sup>0.16</sup>)

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

## Occurrences

Sever winter storm events in Nueces County are rare. January is the month when snow, sleet or freezing rain is most likely to be observed; yet, winter weather conditions can occur at any time during the winter and early spring months. Table 18-3 shows historical occurrences for the area since 1950 as well as the type of event and the amount of damage provided by the National Climatic Data Center (NCDC). Although there have been relatively few storms, it is likely that a number of occurrences have gone unreported. Additionally, historical winter storm information, as provided by the NCDC, shows winter storm activity across a multi-county forecast area for each event. In some instances within the Coastal Bend study area, a single record could consist of up to 12 counties. Therefore, an appropriate percentage of the total property and crop damage reported for the entire forecast area has been allocated to each participating county impacted by each event.

<sup>2</sup> NOAA



**Table 18-4. Historical Winter Storm Events by Jurisdiction (NCDC, 1950-2016)**

JURISDICTION	NUMBER OF REPORTED EVENTS	TYPES OF EVENTS	DEATHS	INJURIES	PROPERTY DAMAGE (2009 DOLLARS)	CROP DAMAGE (2009 DOLLARS)
Nueces County	2	Winter Weather	0	0	Negligible	Negligible
Nueces County	1	Frost/Freeze	0	0	Negligible	Negligible
Nueces County	1	Ice Storm	0	0	Negligible	Negligible
Nueces County	1	Snow Storm	0	0	Negligible	Negligible
<b>TOTALS<sup>1</sup></b>	<b>5</b>		<b>0</b>	<b>0</b>	<b>Negligible</b>	<b>Negligible</b>

### Probability

Hazard probability or reoccurrence intervals are calculated based upon the number of historical events during the period of examination. For example, if five winter Storms were to have taken place during a 66 year reporting period, the reoccurrence interval would be about 13 years, or a 7.5% annual chance of a winter storm. Because it is likely that more winter storms have occurred than are reported in the NCDC, the probability for winter storms occurring along the Coastal Bend Region is occasional, meaning an event is possible in the next five years.

### Impact

Winter storms are associated with freezing or frozen precipitation such as freezing rain, sleet, snow and the combined effects of winter precipitation and strong winds. Wind chill is a function of temperature and wind. Low wind chill is a product of high winds and freezing temperatures. The leading cause of death during winter storms is transportation accidents. Hypothermia and frostbite are other dangers from very cold winter temperatures.

Historical evidence shows that most of the area has a low risk of winter storm activity; however, past reported property damages indicate that, while winter events (typically consisting of snow and ice) do occur, their economic impacts are typically not severe across the entire study area. All buildings and facilities are considered to be exposed to this hazard and could potentially be impacted because it cannot be predicted where a winter storm event may cause damage or disruption. The agricultural industry in the Coast Bend Area is not usually effected by winter storms as crops are not usually planted during the winter months.

### Vulnerability

Table 18-4 shows potential annualized property losses for each jurisdiction based on past reports of property and crop damages in each jurisdiction (NCDC, 1950–2016) and exposure values. “Negligible” indicates that the annualized expected property losses are less than \$5,000.

**Table 18-5. Potential Annualized Losses by Jurisdiction (Severe Winter Storm)**

JURISDICTION	TOTAL EXPOSURE	ANNUALIZED LOSS (AL)	ANNUALIZED LOSS RATIO(ALR)
Nueces County	\$860,464,240	Negligible	0.00%
Agua Dulce	\$38,252,604	Negligible	0.00%
Bishop	\$215,262,986	Negligible	0.00%
Corpus Christi	\$17,246,489,193	Negligible	0.00%
Driscoll	\$38,757,328	Negligible	0.00%
Petronila	\$6,915,934	Negligible	0.00%
Port Aransas	\$1,189,078,	Negligible	0.00%
Robstown	\$334,835,963	Negligible	0.00%
Port of Corpus Christi	\$174,026,681	Negligible	0.00%
<b>TOTALS FOR STUDY AREA *</b>	<b>\$20,104,083,700</b>	<b>\$0</b>	<b>0.00%</b>

\*Totals for the study area may include values less than \$5,000 for dollar amounts that are classified as “Negligible” in the table.

# Unincorporated Nueces County Severe Winter Storms Hazard

LOCATION				
County Wide (Unincorporated)				
OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1
PROBABILITY				
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability	
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS	
IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible
VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
15,274	\$373,034,606	\$487,429,634	312,735	\$50,663,070

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Agua Dulce Severe Winter Storms Hazard

LOCATION				
City Wide				
OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1
PROBABILITY				
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability	
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS	
IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible
VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
820	\$17,541,361	\$20,711,243	3	\$486

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Bishop Severe Winter Storms Hazard

LOCATION				
City Wide				

OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1

PROBABILITY			
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible

VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
3,150	\$115,889,915	\$99,373,071	539	\$87,318

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Corpus Christi Severe Winter Storms Hazard

LOCATION				
City Wide				
OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1
PROBABILITY				
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability	
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS	
IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible
VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
324,074	\$7,007,832,685	\$10,238,656,508	24,632	\$3,990,384

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Driscoll Severe Winter Storms Hazard

LOCATION				
City Wide				

OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1

PROBABILITY			
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible

VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
752	\$25,502,273	\$13,255,055	465	\$75,330

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)



# City of Petronila Severe Winter Storms Hazard

LOCATION				
City Wide				
OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1
PROBABILITY				
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability	
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS	
IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible
VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
114	\$3,714,796	\$3,201,138	927	\$150,174

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Port Aransas Severe Winter Storms Hazard

LOCATION				
City Wide				
OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1
PROBABILITY				
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability	
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS	
IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible
VULNERABILITY				
Population	Property Value**		Crop Land***	
	Commercial	Residential	Acres	Value
3,995	\$414,531,219	\$774,547,552	0	\$0

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# City of Robstown Severe Winter Storms Hazard

LOCATION				
City Wide				

OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1

PROBABILITY			
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible

VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
11,576	\$151,390,423	\$183,445,540	6580	\$1,065,960

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

# Port of Corpus Christi Authority Severe Winter Storms Hazard

LOCATION				
Jurisdiction Wide				

OCCURENCE	EXTENT			
Number of Events 1950-2006*	Magnitude (Size of Hail)			
	Frost/Freeze	Winter Weather	Ice Storm	Snow
5	1	2	1	1

PROBABILITY			
Number of Events 1950-2006*	Record Time Period	Time Period Years	Probability
5	3/26/1956 to 4/22/2015	66	1 EXTREME WINTER EVENT ESTIMATED EVERY 13 YEARS

IMPACT				
Number of Events	Deaths	Injuries	Property Damage	Crop Damage
5	0	0	Negligible	Negligible

VULNERABILITY				
Population	Property Value*		Crop Land**	
	Commercial	Residential	Acres	Value
N/A	\$174,026,681	\$0	0	\$0

\*Nueces County Appraisal District, Reappraisal Plan 2015-2016

\*\*Census of Agriculture, 2012 (The latest Agriculture Census published 2012)

## Section 19: Mitigation Strategy

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### Mitigation Strategy

The Planning Team reviewed the goals and objectives from the 2012 Coastal Bend Mitigation Action Plan. Mitigation actions, new and old, are prioritized to reflect overall mitigation strategy, which is to reduce and eliminate the long-term risk of loss of life and property damage from the full range of disasters affecting the planning area. Each mitigation action is presented by jurisdiction in the section below. Each mitigation action included is in priority order (high, moderate, low), by best estimate of cost, if applicable, by potential funding source and identify which department or agency will administer the action and the action timeline.

Each jurisdiction has multiple authorities to implement the mitigation strategy. Authority includes, but is not limited to, local planning and zoning, public works efforts, emergency management, tax authority, annual operation budgets, building codes and ordinances. As detailed in Section 6 of the report, the participating jurisdictions, with the exception of Petronila, participate in the NFIP. The City of Petronila does not participate in the NFIP because the city's jurisdiction is primarily limited to the ROW limits within the town center; the surrounding developed and agricultural parcels are part of the county. General hazard mitigation goals for the participating jurisdictions are defined below.

The participating communities used very similar methods for ranking their mitigation actions. The Port of Corpus Christi Authority scored each action with a 1-5 score for the following criteria: Life & Safety, Property Protection, Technical Feasibility, Political Feasibility, Legality, Environmental Impacts, Social Impacts, Administrative Feasibility, the presence of a Local Champion for the action, and finally if the action supported other

community objectives. A raw score was added for the ten criteria and was used to rank the actions. Unincorporated Nueces County and the Cities of Bishop, Driscoll, Petronila, and Agua Dulce used the same method but rated low or no cost actions higher due to the ease of implementation. The City of Corpus Christi used three primary factors to rank actions: benefits to public safety, cost, and economic impact.

## **Goal 1**

Protect public health and safety

### **Objective 1.1**

Implement mitigation actions that will assist in protecting lives and property by making homes, businesses, public facilities, and infrastructure more resistant to high-risk hazards.

### **Objective 1.2**

Maximize the utilization of the latest technology to provide adequate warning, communication, and mitigation of hazard events.

### **Objective 1.3**

Reduce the danger to, and enhance protection of, high risk areas during hazard events.

### **Objective 1.4**

Ensure that public and private facilities and infrastructure meet established building codes and enforce the codes to address any deficiencies.

## **Goal 2**

Protect new and existing properties.

### **Objective 2.1**

Reduce repetitive losses to the National Flood Insurance Program (NFIP).

### **Objective 2.2**

Use the most cost-effective approach to protect existing buildings and public infrastructure from hazards.

### **Objective 2.3**

Review existing ordinances, building codes, and safety procedures and enforce regulatory measures to ensure they protect lives and property.

## **Goal 3**

Build and support partnerships to enhance mitigation to continuously become less vulnerable to hazards.

### **Objective 3.1**

Build and support local partnerships to continuously become less vulnerable to hazards.

### **Objective 3.2**

Build a cadre of committed volunteers to safeguard the community before, during, and after a disaster.

### Objective 3.3

Build hazard mitigation concerns into planning and budgeting processes.

## Goal 4

Leverage outside funds for investment in hazard mitigation.

### Objective 4.1

Maximize the use of outside sources of funding to help communities with local match requirements for implementing hazard mitigation actions to reduce risk.

### Objective 4.2

Maximize participation of property owners in protecting their properties.

### Objective 4.3

Maximize insurance coverage to provide financial protection against hazard events.

### Objective 4.4

Prioritize mitigation projects based on cost-effectiveness, starting with those sites facing the greatest threat to life, health and property.

## Goal 5

Increase the understanding of residents for the need for mitigation, and steps they can take to protect people and properties.

### Objective 5.1

Heighten public awareness of the full range of natural and man-made hazards they face.

### Objective 5.2

Educate the public on actions they can take to prevent or reduce the loss of life or property from all hazards.

### Objective 5.3

Publicize and encourage the adoption of appropriate hazard mitigation measures.



# City of Corpus Christi Mitigation Actions

<b><u>Problem Statement:</u></b> Seawall along Corpus Christi Bay is in need of continuous maintenance and restoration	
Corpus Christi Action # 1	
<b>Proposed Action</b>	Seawall Capital Improvement Projects for routine maintenance and restoration.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Sewall in Corpus Christi
<b>Risk Reduction Benefit:</b>	Providing routine repairs help to defer major structural reconstruction efforts
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods, Dam/Levee Failure.
<b>Effect on new/existing buildings:</b>	The effect of maintaining and restoring the seawall in Corpus Christi will protect existing buildings along the seawall and any new buildings being built from Hurricanes and Tropical Storms and Floods.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$5,500,000
<b>Potential Funding Sources:</b>	CIP Project Funding and a sales tax adjustment
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Development Services
<b>Implementation Schedule:</b>	4-10 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Capital Improvements Plan	
<b>ADDITIONAL CONSIDERATIONS:</b>  The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	

**Problem Statement:** Restoration of the bulkhead along the south shoreline between the Corpus Christi Natural History and Science Museum and the USACE property.

**Corpus Christi Action # 2**

<b>Proposed Action</b>	Construction of a new bulkhead in Corpus Christi Bay along the south side shoreline of Corpus Christi.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	South Side Shoreline in Corpus Christi
<b>Risk Reduction Benefit:</b>	Construct a new bulkhead along the south shoreline of the Science and History Museum eastward across the United State Army Corps of Engineers (USACE) property terminating at the northwest corner of the recently constructed bulkhead in front of the South Texas Art Museum. The low-lying areas on the USACE property and the Port of Corpus Christi Authority would be filled to an elevation approximately the same as that in front of the Art Museum. Area paving could be constructed between the new bulkhead and existing floodwall.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods, Dam/Levee Failure, Coastal Erosion
<b>Effect on new/existing buildings:</b>	Deter coastal erosion and mitigation potential flooding of existing properties situation at the northern section of downtown
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$10,500,000
<b>Potential Funding Sources:</b>	Sales Tax Proceeds
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Development Services

<b>Implementation Schedule:</b>	4-10 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Capital Improvements Plan	
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	

**Problem Statement:** Improvements to the Salt Flats Levee System is needed to avoid a potential total failure doing a catastrophic event.

**Corpus Christi Action # 3**

<b>Proposed Action</b>	Make improvements to the Salt Flat Levee System.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Salt Flat Levee System in Corpus Christi
<b>Risk Reduction Benefit:</b>	The Salt Flat Levee System is an integral component of the downtown flood protection system. The levee requires improvements and continued maintenance to ensure that the system will function as originally designed. Additional studies are underway and improvements are planned that would be sufficient to be certified by FEMA as a freeboard deficient reach. This means that although the system would not afford the level of protection required to prevent overtopping in a 100-year event, it would not be vulnerable to a catastrophic failure.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods, Dam/Levee Failure.
<b>Effect on new/existing buildings:</b>	Improvements on the Salt Flat Levee system will help mitigate flooding of existing buildings situated in downtown Corpus Christi. Failure to achieve FEMA certification would greatly impact the City of Corpus Christi and downtown business insurance costs.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$3,000,000
<b>Potential Funding Sources:</b>	Certificates of Obligation
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Development Services
<b>Implementation Schedule:</b>	2-3 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	

Capital Improvements Plan
<b>ADDITIONAL CONSIDERATIONS:</b> <p>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p>
<p>Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5</p>

**Problem Statement:** Power Street Pump Station needs to be updated to handle at least a 100-year storm event.

**Corpus Christi Action #4**

<b>Proposed Action</b>	Make improvements to Power Street Pump Station.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Power Street Pump Station in Corpus Christi
<b>Risk Reduction Benefit:</b>	The Power Street pump station was originally constructed in 1947 as part of the bay front protection. It has 3 pumps with diesel powered motors. The Kinney Street pump station was also constructed in 1947. The pump station was reconstructed in 2009. It has 5 pumps with electric motors that are dependent on the 3 generators inside. One redundant pump is located on site. The downtown flood protection system relies on these two pump stations to remove all water from the area during a significant storm event. Preliminary studies have indicated that the pumping capacity would not be adequate to handle rainfall, inflow and wave overtopping during a 100-year storm event. Planned 2D modeling will help to better define the demands that would be placed on the system during significant storm events. This project would enhance the reliability and capacity of the downtown storm system.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods, Dam/Levee Failure.
<b>Effect on new/existing buildings:</b>	This project will improve operational efficiencies, save money on electrical costs, and help keep the downtown area from flooding during heavy rain conditions.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$5,500,000
<b>Potential Funding Sources:</b>	Certificates of Obligations

<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Development Services
<b>Implementation Schedule:</b>	2-3 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Capital Improvements Plan	
<b>ADDITIONAL CONSIDERATIONS:</b> <p>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p>	
<p>Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5</p>	



**Problem Statement: Stormwater Masterplan Needs Updating**

**Corpus Christi Action # 5**

**Proposed Action**

Update the Corpus Christi Stormwater Master Plan.

**BACKGROUND INFORMATION**

**Site and Location:**

City of Corpus Christi

**Risk Reduction Benefit:**

The Corpus Christi City Council approved the Storm Water Capital Improvement Program (CIP) for FY99-00 on July 20, 1999 (Ordinance No. 023703). Included were separate projects for drainage studies in specific areas of the City. The need to integrate these individual drainage studies into a consistent, uniform analysis became evident and was approved in Storm Water CIP for FY00-01, (Ordinance No. 024130). The City's use of master plans that date back to 1946, 1961, 1970, 1982, and 1988 resulted in the use of inconsistent criteria without an adopted level of protection policy. The separate projects are integrated into the FY00-01 Storm Water CIP as a Storm Water Master Plan Project. The Development of a comprehensive, updated, consistent Storm Water Master Plan based on an adopted Storm Water Criteria and Design Manual is necessary to respond to development, environmental issues and to better define and prioritize on going and future drainage capital improvement projects. The purposes of this project is as follows:

- a. Establish drainage criteria that reflects input from the different segments of the community (elected officials, developers, engineers, citizens, planning and zoning) and in the consensus process identify a "level of protection" for the City to be adopted as a standard for the City
- b. Adopt a drainage criteria and design procedure for designers to use in capital improvement projects and in the subdivision platting process of residential and commercial development
- c. Establish policy statements or guidelines that are responsive to storm water quality, storm water pollution prevention requirements, development issues for use in future street and drainage project design
- d. Develop a master plan to implement the drainage criteria established to include updates of the existing areas and production of new master plan for other areas. The master plan will include the inventory of all outfalls and data necessary for

	the design process and will utilize criteria and reflects the characteristics of each master plan
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans and Regulations
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods
<b>Effect on new/existing buildings:</b>	Prioritization of major drainage improvements considering level of service and return on investment could greatly impact the operating budget and will help eliminate the flooding that impacts all of Corpus Christi.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$4,084,900
<b>Potential Funding Sources:</b>	Bonds
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Storm Water Department
<b>Implementation Schedule:</b>	2-3 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Stormwater Master Plan	
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	

**Problem Statement: Need to Excavate Drainage Master Channel 31**

**Corpus Christi Action #6**

**Proposed Action**

Excavate silt and debris in Drainage Master Channel 31 caused by the erosion on sides and bottom of the Drainage Master Channel 31.

**BACKGROUND INFORMATION**

**Site and Location:**

Drainage Master Channel 31 in Corpus Christi

**Risk Reduction Benefit:**

Master Channel 31 was constructed in various phases in conjunction with the development in the area. The side slopes and bottom are severely eroded resulting in poor drainage and encroachment of ditch outside of the City right-of-way. This project will provide critical improvements to restore and improve the drainage profile and include erosion control measures such as side slope stabilization, soil treatment, vegetative cover and other best management practices. This project is planned in multiple phases as funding allows.

**Type of Action:**

Local Plans and Regulations  
Structure and Infrastructure  
Natural Systems Protection  
Education and Awareness

Structure and Infrastructure

**MITIGATION ACTION DETAILS**

**Hazard(s) Addressed:**

Hurricanes, Floods

**Effect on new/existing buildings:**

The effect of making improvements to Drainage Master Channel 31 will regain the carrying capacity of the channel and help eliminate flooding of existing buildings that occurs in the area of Corpus Christi this channel is supposed to help.

**Priority (High, Moderate, Low):**

High

**Estimated Cost:**

\$2,819,800

**Potential Funding Sources:**

Bonds

<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Stormwater Department
<b>Implementation Schedule:</b>	3-4 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Capital Improvements Plan	
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	

<b><u>Problem Statement:</u> Improvements are needed on the side slopes for Schanen Ditch</b>	
<b>Corpus Christi Action #7</b>	
<b>Proposed Action</b>	Improvements to side slopes on Schanen Ditch to eliminate erosion problems.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Schanen Drainage Ditch in Corpus Christi
<b>Risk Reduction Benefit:</b>	The existing profile of Schanen Ditch exceeds the recommended slope of 4:1 and maximum of 3:1. This is resulting in major slope stabilization failure in multiple areas near the Yorktown Bridge. Work to improve this ditch will include excavation/backfill to widen and create 3:1 side slopes with stabilization matting, new culvert and outfalls, riprap and ditch bottom improvements, seeding, irrigation adjustments, traffic controls, dewatering and other miscellaneous items. Construction of Phase 1 of this project has been recently completed and future phases will be completed to the extent that funding allows.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods
<b>Effect on new/existing buildings:</b>	Restoration of channels and ditches is critical to avoid potential "washouts" that may result in encroachment, flooding and undermining of adjacent public/private structures including streets, bridges, utility lines, buildings, and homes.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$2,756,100
<b>Potential Funding Sources:</b>	Bonds
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Stormwater Department
<b>Implementation Schedule:</b>	3-4 Years

INCORPORATION INTO EXISTING PLANS AND PROCEDURES
Capital Improvements Plan
<p><b>ADDITIONAL CONSIDERATIONS:</b></p> <p>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p>
<p>Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5</p>

<b><u>Problem Statement:</u></b> Excavation of La Volla Creek needed to increase the creek's carrying capacity.	
<b>Corpus Christi Action # 8</b>	
<b>Proposed Action</b>	La Volla Creek Channel Excavation (Phase 1)
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	La Volla Creek in Corpus Christi
<b>Risk Reduction Benefit:</b>	This project will involve the improvement of La Volla Creek that crosses SH 357 (Saratoga Blvd). The project will provide 100-year capacity for conveyance to the Oso Creek. Phase 1 Channel improvements include the removal of vegetation from the channel North of Saratoga Boulevard and channel widening South of Saratoga Boulevard.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods, Dam/Levee Failure.
<b>Effect on new/existing buildings:</b>	Restoration of channels and ditches is critical to avoid potential "washouts" that may result in encroachment, flooding and undermining of adjacent public/private structures including streets, bridges, utility lines, buildings, and homes.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$4,152,800
<b>Potential Funding Sources:</b>	Bonds
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Stormwater Department
	1-2 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Capital Improvements Plan	
<b>ADDITIONAL CONSIDERATIONS:</b>  The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	



Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

**Problem Statement: Outdated FEMA Flood Insurance Rate Maps****Corpus Christi Action #9****Proposed Action**

Participate in the FEMA Flood Map Modernization Process.

**BACKGROUND INFORMATION****Site and Location:**

City of Corpus Christi

**Risk Reduction Benefit:**

The Federal Emergency Management Agency's Multi-Hazard Flood Map Modernization Program will update and digitize flood hazard maps across the nation. Most the City of Corpus Christi's FIRMs are nearly 20 years old. It is in the interest of the City and its residents for the maps, which determine flood insurance premiums, to be accurate and up-to-date. Other planning and hazard mitigation benefits are expected to accrue as well.

The City of Corpus Christi is currently working through the appeals process of the map modernization

**Type of Action:**

Local Plans and Regulations  
Structure and Infrastructure  
Natural Systems Protection  
Education and Awareness

Local Plans and Regulations

**MITIGATION ACTION DETAILS****Hazard(s) Addressed:**

Floods

**Effect on new/existing buildings:**

Increased participation in available flood insurance.

**Priority (High, Moderate, Low):**

High

**Estimated Cost:**

Low Cost Staff Time

**Potential Funding Sources:**

Local Budget

**Lead Agency/Department Responsible:**

Corpus Christi Development Services

1-2 Years

**INCORPORATION INTO EXISTING PLANS AND PROCEDURES**

Capital Improvements Plan

**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

<b><u>Problem Statement:</u> Improve CRS Rating</b>	
<b>Corpus Christi Action #10</b>	
<b>Proposed Action</b>	Improve the City's CRS rating from a Class 7 to a Class 5.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	<p>Corpus Christi has participated in the CRS program since 1991 and is currently rated as a Class 7 community, entitling its residents to a 15% discount on flood insurance premiums. This project is intended to improve its rating to a Class 5, thereby increasing the premium discount by an additional 10% for Special Flood Hazard Areas (SFHAs).</p> <p>Other actions identified in this Mitigation Plan will have a direct bearing on fulfilling CRS requirements to qualify for the higher classification. This activity includes a comprehensive review of eligible activity requirements, identification of additional potential actions, monitoring completion of previously identified actions, and completing the application process.</p>
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans and Regulations
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Floods
<b>Effect on new/existing buildings:</b>	Increased participation in available flood insurance.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	Low Cost Staff Time
<b>Potential Funding Sources:</b>	Local Budget
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Development Services
	1-2 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
CRS Program, Floodplain Regulations, and Stormwater Regulations	

**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

**Problem Statement:** Surface water reservoir needed in the upper reaches of the Nueces River.

**Corpus Christi Action #11**

**Proposed Action**

Build the Catulla Reservoir in the upper reaches of the Nueces River which would include a pipeline to divert water directly into Choke Canyon Reservoir.

**BACKGROUND INFORMATION**

**Site and Location:**

Upper Reaches of Nueces River

**Risk Reduction Benefit:**

The Corps of Engineers studied the Cotulla Reservoir site, located in the upper Nueces Basin, in the 1960's. The recent Nueces River Basin Reconnaissance Study identified a potentially down-sized version of this project, including a pipeline to divert water directly into Choke Canyon Reservoir. In addition to the flood damage reduction potential for Lake Corpus Christi and the lower river basin, this project would enhance the regional water supply by increasing water storage capacity, and reducing losses associated with downstream evaporation across an 81 mile braided reach.

During Phase 1 of the Feasibility Study, existing data will be reviewed to estimate the flood damage reduction potential of the project:

a. A preliminary hydrologic analysis to determine the portion of the volume of historical lower- basin floods that originate upstream of Cotulla will be performed.

b. A review of existing map information of the Nueces River for a 25-mile reach downstream of the proposed reservoir to identify areas that could benefit from the potential flood damage reduction potential of the reservoir will be performed.

c. Data from FEMA and other agencies on historical flood damages will be summarized. (Phase 2) Depending on the findings of the flood damage analyses, a daily flow flood model may need to be developed to evaluate the downstream flood damage reduction potential in terms of magnitude and frequency for the Cotulla Diversion Project.

**Type of Action:**

Local Plans and Regulations  
Structure and Infrastructure  
Natural Systems Protection  
Education and Awareness

Structure and Infrastructure

MITIGATION ACTION DETAILS	
<b>Hazard(s) Addressed:</b>	Floods, Drought
<b>Effect on new/existing buildings:</b>	Mitigate life-threatening hazards to buildings within the upper reaches of the Nueces River, while providing for a source of surface water to avoid disruption to essential utilities, eliminate the risk of potential economic losses.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$445,000
<b>Potential Funding Sources:</b>	USACE will cover 50% and Non-Federal Sponsors will cover the remaining 50%.
<b>Lead Agency/Department Responsible:</b>	City of Corpus Christi
	Summer of 2018
INCORPORATION INTO EXISTING PLANS AND PROCEDURES	
Nueces River Basin Reconnaissance Study	
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	



**Problem Statement:** The is needing a secure, sustainable alternate source of fresh water.

**Corpus Christi Action #12**

<b>Proposed Action</b>	Implementation of a Desalination Program
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	The City of Corpus Christi's Desalination Program is a progressive and proactive step to begin determining the feasibility of developing a drought proof future water supply using brackish groundwater and seawater. The City of Corpus Christi has secured grant funds from the US Bureau of Reclamation (Reclamation) to assist with this project and will have expert technical resources with Reclamation providing their experience and guidance. The City has already secured \$400,000 in grant funding for this project from Reclamation. This program will provide the City with the reliability, security, sustainability and availability of brackish groundwater and seawater as possible future water sources.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Drought
<b>Effect on new/existing buildings:</b>	The desalination program can be a secure source of freshwater to avoid disruption to essential utilities, eliminate the risk of potential economic losses.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$2,859,400
<b>Potential Funding Sources:</b>	Water operation funds, raw water supply fund and bureau of Reclamation grant.
<b>Lead Agency/Department Responsible:</b>	City of Corpus Christi
	1-2 Years

INCORPORATION INTO EXISTING PLANS AND PROCEDURES
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

<b><u>Problem Statement:</u></b> There is a need to secure the integrity of the Wesley Seale Dam system	
<b>Corpus Christi Action #13</b>	
<b>Proposed Action</b>	Make improvements to the instrumentation system at Wesley Seale Dam.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Wesley Seale Dam in Corpus Christi
<b>Risk Reduction Benefit:</b>	This project provides for improvements to the original instrumentation system including annual safety inspection, integration with O.N. Stevens WTP process controls, The Howell-Bunger Valve, the downstream sluice gates, and the dewatering system, in response to previous inspections and priority investment recommendations into the system. This project will protect the integrity of the Wesley Seale Dam system (1957), to provide for proper inspection and updated regulatory reports per TCEQ.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Floods; Drought
<b>Effect on new/existing buildings:</b>	This project will ensure the City can provide reservoir supplies to its customers and other downstream water right-holders and will secure the structural integrity of the dam through established dam safety protocols.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	\$5,850,600
<b>Potential Funding Sources:</b>	Revenue Bond
<b>Lead Agency/Department Responsible:</b>	City of Corpus Christi Water Department
	3-4 Years

INCORPORATION INTO EXISTING PLANS AND PROCEDURES
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

<b><u>Problem Statement:</u> Having Up-to-date Building Codes</b>	
<b>Corpus Christi Action #14</b>	
<b>Proposed Action</b>	Maintain and adopt most current building codes.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	<p>The City of Corpus Christi has adopted, with local amendments, the Building Codes effective September 1, 2016, The International Code Council (ICC), 2015 editions of the International Building Code, Existing Building Code, Energy Conservation Code, Fuel Gas Code, Mechanical Code, Plumbing Code, and Residential Code for One- and Two-Family Dwellings and the National Fire Prevention Association (NFPA) National Electric Code.</p> <p>The International Building Codes are always being updated to provide better protection by utilizing the best construction practices. The City of Corpus Christi will be periodically updating the codes with code cycles that become available.</p>
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans Regulations
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Flood, Windstorm, Coastal Erosion, Hail Storm, Tornado, Expansive Sols, Land Subsidence.
<b>Effect on new/existing buildings:</b>	By maintaining the most update building codes, the city is requiring that construction adhere to the most stringent codes, thus helping to reduce potential loses if exposed to a hazard.
<b>Priority (High, Moderate, Low):</b>	High
<b>Estimated Cost:</b>	Low Cost/ Staff Time
<b>Potential Funding Sources:</b>	Local Budget
<b>Lead Agency/Department Responsible:</b>	City of Corpus Christi Water Department

	2-3 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	

**Problem Statement:** Leakage on the side gates of Wesley Seale Dam spillway.

**Corpus Christi Action #15**

**Proposed Action**

Make improvements to the side seals on the Wesley Seale Dam Spillway to maintain the spillway's integrity.

**BACKGROUND INFORMATION**

**Site and Location:**

Wesley Seale Dam in Corpus Christi

**Risk Reduction Benefit:**

The Wesley Seale Dam has 60 crest gates located in two separate spillways: the south spillway includes 27 gates and the north spillway includes 33 gates. Over the years, leakage from the side seals has increased and it has become significant at several of the gates. The water flow from the excessive leakage damages the concrete and encourages algae and other vegetative growth and leads to corrosion issues on the gates, metal appurtenances and reinforcing steel. This project provides for the necessary improvements including seal replacement, miscellaneous structural repairs and application of a protective coating system for the Dam.

**Type of Action:**

Local Plans and Regulations  
Structure and Infrastructure  
Natural Systems Protection  
Education and Awareness

Structure and Infrastructure

**MITIGATION ACTION DETAILS**

**Hazard(s) Addressed:**

Floods, Dam Failure

**Effect on new/existing buildings:**

This project will increase the service life of the structure and prevent future corrosion, subsequent section loss and connection deterioration which will potentially lower the probability of increased flooding.

**Priority (High, Moderate, Low):**

High

**Estimated Cost:**

\$22,800,000

**Potential Funding Sources:**

Revenue Bond

**Lead Agency/Department Responsible:**

City of Corpus Christi Water Department



	4-10 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	

**Problem Statement:** Need to build a flood wall along Corpus Christi Bay at the Science and Natural History Museum to help eliminate flooding in the downtown Corpus Christi area.

**Corpus Christi Action #16**

<b>Proposed Action</b>	Build a floodwall along Corpus Christi Bay at the Science and Natural History Museum.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Corpus Christi Bay near the Science and Natural History Museum in Corpus Christi
<b>Risk Reduction Benefit:</b>	Recommendation to construct a new floodwall (or a coastal structure) that would follow a “hypotenuse” alignment between the existing Promenade and the USACE Bulkhead. The project would also backfill the triangle to make it function more like a coastal structure. This would also provide additional land area for future use.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods, Dam/Levee Failure.
<b>Effect on new/existing buildings:</b>	The effect of building a flood wall will help eliminate flooding of existing buildings that occurs in the downtown area of Corpus Christi.
<b>Priority (High, Moderate, Low):</b>	Moderate
	\$3,5000,000
<b>Potential Funding Sources:</b>	Certificates of Obligation
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Development Services
<b>Implementation Schedule:</b>	4-5 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Capital Improvements Plan	

**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

<b><u>Problem Statement:</u> Erosion of sides and bottom Drainage Master Channel 31</b>	
<b>Corpus Christi Action #17</b>	
<b>Proposed Action</b>	Make improvements to the erosion on sides and bottom of Drainage Master Channel 31.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Drainage Master Channel 31 in Corpus Christi
<b>Risk Reduction Benefit:</b>	Master Channel 31 was constructed in various phases in conjunction with the development in the area. The side slopes and bottom are severely eroded resulting in poor drainage and encroachment of ditch outside of the City right-of-way. This project will provide critical improvements to restore and improve the drainage profile and include erosion control measures such as side slope stabilization, soil treatment, vegetative cover and other best management practices. This project is planned in multiple phases as funding allows.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods
<b>Effect on new/existing buildings:</b>	The effect of making improvements to Drainage Master Channel 31 will regain the carrying capacity of the channel and help eliminate flooding of existing buildings that occurs in the area of Corpus Christi this channel is supposed to help.
<b>Priority (High, Moderate, Low):</b>	High
	\$3,000,000
<b>Potential Funding Sources:</b>	Certificates of Obligation
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Engineering and Development Services
<b>Implementation Schedule:</b>	2-3 Years

INCORPORATION INTO EXISTING PLANS AND PROCEDURES
Capital Improvements Plan
<p><b>ADDITIONAL CONSIDERATIONS:</b></p> <p>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p>
<p>Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5</p>

<b><u>Problem Statement:</u></b> Maintaining adequate drainage capacity as new development occurs throughout the city.	
Corpus Christi Action #18	
<b>Proposed Action</b>	Utilize the city adopted “Developer Agreement” that the can use with developers to help cover the cost of installing over-sized stormwater drainage.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	Under the platting ordinance, the City of Corpus Christi participates with developers on utility construction for over-sized main stormwater lines. These funds may also be used to address development drainage concerns. This project will provide for the City's share of such projects, as necessary, up to the approved amount.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods
<b>Effect on new/existing buildings:</b>	The effect of making improvements to Drainage Master Channel 31 will regain the carrying capacity of the channel and help eliminate flooding of existing buildings that occurs in the area of Corpus Christi this channel is supposed to help.
<b>Priority (High, Moderate, Low):</b>	Moderate
	\$3,100,000
<b>Potential Funding Sources:</b>	Bonds
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Storm Water Department and Development Services
<b>Implementation Schedule:</b>	4-5 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Stormwater Master Plan and Regulations	

**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5



**Problem Statement:** Assessment and Repairs of all stormwater outfalls in Corpus Christi that drain into Corpus Christi Bay.

**Corpus Christi Action #19**

<b>Proposed Action</b>	Complete an assessment of the needed repairs and improvements on all 8 major and 100 minor stormwater outfalls that drain into Corpus Christi Bay.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	There are eight major storm water outfalls and more than 100 other outfalls that allow runoff to drain into Corpus Christi Bay. In 2003, 13.5 miles of these outfall structures were inspected and improvements and repairs were made to four outfalls. The purpose of this current project is to provide an updated assessment, which may include the Brawner/proctor and Gollihar outfalls and other outfalls, pending results of the initial assessment, and providing recommendations for repairs, improvements, and rehabilitation as necessary.
<b>Type of Action:</b>  Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Structure and Infrastructure
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Floods
<b>Effect on new/existing buildings:</b>	Restoration of the storm water conveyance systems is critical to avoid potential “washouts” that may result in encroachment, flooding and undermining of adjacent public/private structures including streets, bridges, utility lines, buildings, and homes.
<b>Priority (High, Moderate, Low):</b>	Moderate
	\$2,447,200
<b>Potential Funding Sources:</b>	Bonds

<b>Lead Agency/Department Responsible:</b>	Corpus Christi Storm Water Department and Engineering Department
<b>Implementation Schedule:</b>	2-3 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Stormwater Master Plan	
<b>ADDITIONAL CONSIDERATIONS:</b> <p>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p>	
<p>Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5</p>	

**Problem Statement:** Constrictions along Oso Creek, east of La Volla Creek are causing base flood elevations to increase upstream.

**Corpus Christi Action #20**

**Proposed Action**

Complete a feasibility study of Oso Creek at the confluence of La Volla Creek to determine if any construction projects will help the creek conveyance capacity during high flow events.

**BACKGROUND INFORMATION**

**Site and Location:**

Oso Creek in Corpus Christi

**Risk Reduction Benefit:**

The drainage profiles of Oso Creek east of the La Volla Creek confluence show several constrictions that impact the base flood elevations upstream. This project will investigate the feasibility of the construction of additional creek conveyance capacity for high flow events. If the investigation shows a significant potential to impact the base flood elevation, then construction will be completed in those areas.

**Type of Action:**

Local Plans and Regulations  
Structure and Infrastructure  
Natural Systems Protection  
Education and Awareness

Structure and Infrastructure

**MITIGATION ACTION DETAILS**

**Hazard(s) Addressed:**

Hurricanes, Floods

**Effect on new/existing buildings:**

Restoration of the storm water conveyance of Oso Creek is critical to avoid potential rising surface water elevations that would result in encroachment flooding and undermining of adjacent public/private structures including streets, bridges, utility lines, buildings, and homes.

**Priority (High, Moderate, Low):**

Moderate

\$4,715,400

**Potential Funding Sources:**

Bonds

**Lead Agency/Department Responsible:**

Corpus Christi Storm Water Department and Engineering Department

**Implementation Schedule:**

4-5 Years

INCORPORATION INTO EXISTING PLANS AND PROCEDURES
Stormwater Master Plan
<p><b>ADDITIONAL CONSIDERATIONS:</b></p> <p>The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)</p> <p>Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5</p>

<b><u>Problem Statement:</u> Enhancing BCEGS Rating</b>	
<b>Corpus Christi Action #21</b>	
<b>Proposed Action</b>	Have ISO conduct another assessment to see if the City has done enough improvements to its building department to gain a better BCEGS rating.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	Insurance Services Office, Inc. (ISO) is an independent organization that administers the Building Code Effectiveness Grading Schedule (BCEGS) to assess "the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards." The grading can influence the cost of insurance coverage in the community. Since its last assessment, the City of Corpus Christi has adopted the 2015 International Building Code and the 2016 International Residential Code for One and Two Family Dwellings, among others, and should be eligible for an improved grade. This activity includes scheduling a re-assessment and compiling the necessary documentation.
<b>Type of Action:</b>  Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans and Regulations
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Flood, Windstorm, Coastal Erosion, Hail Storm, Tornado, Expansive Sols, Land Subsidence.
<b>Effect on new/existing buildings:</b>	Public participation in available insurance discount options on Homeowners insurance policies.
<b>Priority (High, Moderate, Low):</b>	Moderate
	Low Cost/ Staff Time
<b>Potential Funding Sources:</b>	Local Budget
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Development Services

<b>Implementation Schedule:</b>	1-2 Years
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Building Code Regulations; CRS; Floodplain Regulations	
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)	
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5	

**Problem Statement: Hazard Risk to the General Population of the City of Corpus Christi****Corpus Christi Action #22**

<b>Proposed Action</b>	Implement a multi-hazard public awareness program.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	<p>The City of Corpus Christi has seen multiple hazards occur within the years past. Most residents are heavily informed of what to do during heavy rains, tropical storms and hurricanes. However, there are multiple hazards that are not as frequent. The City will be working towards creating and disseminating a pamphlet(s) that will cover what to do before, during and after the following hazards:</p> <p>Extreme Heat, Lightning, Hailstorm, Hurricane and Tropical Storms, Windstorms, Tornados, Drought, Flood, Dam/Levee Failure, Coastal Erosion, Expansive Soils, Land Subsidence and Wildfires</p>
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Education and Awareness
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Hurricanes, Flood, Windstorm, Extreme Heat, Lightning, Coastal Erosion, Hail Storm, Tornado, Expansive Sols, Dam Failure, Land Subsidence, Wildfire.
<b>Effect on new/existing buildings:</b>	Homeowners will know what types of mitigations actions they can do to protect their lives and properties from the hazard risks.
<b>Priority (High, Moderate, Low):</b>	Moderate
<b>Estimated Cost:</b>	Low Cost/Staff Time
<b>Potential Funding Sources:</b>	Local Budget
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Development Services and Office of Emergency Management
<b>Implementation Schedule:</b>	Create Year 1, Review and Administer Annually



INCORPORATION INTO EXISTING PLANS AND PROCEDURES
CRS
<b>ADDITIONAL CONSIDERATIONS:</b> The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)
Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

**Problem Statement:** City needs to have an assessment done of vulnerabilities that include: Coastal Erosion; Expansive Soils; Land Subsidence; Wildfires

**Corpus Christi Action #23**

<b>Proposed Action</b>	Map and assess the vulnerabilities the city may face for Coastal Erosion, Expansive Soils, Land Subsidence, and Wildfires
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**BACKGROUND INFORMATION**

<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	<p>Improve data and mapping on specific risks for coastal erosion, expansive soils, land subsidence and wildfires.</p> <p>Use GIS to identify and map erosion areas, riparian landslides, expansive soils and wildfires. Develop and maintain a database to track vulnerability and indicate where critical structures and any development is located in relation to the hazardous areas.</p>
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans and Regulations

**MITIGATION ACTION DETAILS**

<b>Hazard(s) Addressed:</b>	Coastal Erosion, Expansive Soils, Land Subsidence, Wildfires
<b>Effect on new/existing buildings:</b>	By identifying the hazards, the city can provide advice as to previous hazards for future construction or preservation purposes.
<b>Priority (High, Moderate, Low):</b>	Moderate
	Low Cost/Staff time
<b>Potential Funding Sources:</b>	Local Budget
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Development Services and GIS
<b>Implementation Schedule:</b>	1-2 Years

**INCORPORATION INTO EXISTING PLANS AND PROCEDURES**

Building Codes
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**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

<b><u>Problem Statement:</u> Coastal Erosion Cole Park</b>	
<b>Corpus Christi Action #24</b>	
<b>Proposed Action</b>	Installation of groins and/or breakwaters to the areas behind the bulkhead to retrofit the areas that are eroding.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	Cole Park in Corpus Christi
<b>Risk Reduction Benefit:</b>	Coastal Erosion in Corpus Christi Bay is a serious issue. Prevention of further erosion of the shoreline at Cole Park, which is along Corpus Christi Bay through the installation of groins and/or breakwaters. Cole Park is a high use park with the city. The area behind the bulkhead is eroding and needs to be retrofitted.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Natural Systems Protection
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Coastal Erosion
<b>Effect on new/existing buildings:</b>	
<b>Priority (High, Moderate, Low):</b>	Moderate
	\$500,000 - \$1,000,000
<b>Potential Funding Sources:</b>	Potential funding from the Coastal Erosion Planning and Response Program (CEPRA) and the Texas Parks and Wildlife Outdoor Recreation Grant Program
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Parks Department
<b>Implementation Schedule:</b>	24-30 Months
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	

**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

<b><u>Problem Statement:</u></b> Commercial structures within the city that are exposed to the threat of lightning.	
Corpus Christi Action #25	
<b>Proposed Action</b>	Adopt a local lightning ordinance for non-residential structures that are over 50' in height.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	Currently, the City of Corpus Christi does not have an ordinance that requires lightning protection for commercial structures; but, instead provides guidelines if property owners choose to add the protection. The City of Corpus Christi will be considering adopting local language that would require commercial structures over 50 feet to have adequate lightning protection.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans and Regulations
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Lightning
<b>Effect on new/existing buildings:</b>	By adopting this type of higher standard in the city building codes, we are adding additional protection that can possibly reduce the risk for damages.
<b>Priority (High, Moderate, Low):</b>	Moderate
	Low Costs/Staff Time
<b>Potential Funding Sources:</b>	Local Budget
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Development Services
<b>Implementation Schedule:</b>	12-18 Months
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Building Codes	

**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5



**Problem Statement:** The effects that extreme heat has on people and pets who live in habitable structures that do not have air conditioning.

**Corpus Christi Action #26**

<b>Proposed Action</b>	Adopt a local ordinance requiring all habitable structures to have air conditioning.
<b>BACKGROUND INFORMATION</b>	
<b>Site and Location:</b>	City of Corpus Christi
<b>Risk Reduction Benefit:</b>	The International Building Codes do not require a habitable space to be air conditioned, but instead requires for it to be heated. The City of Corpus Christi will be considering adopting language that would require all habitable spaces to have adequate air condition to reduce the effects that extreme heat has on the city's population.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans and Regulations
<b>MITIGATION ACTION DETAILS</b>	
<b>Hazard(s) Addressed:</b>	Extreme Heat
<b>Effect on new/existing buildings:</b>	By requiring habitable spaces to be air conditioned, it will provide for added protection for the building occupant in the event of an extreme heat event.
<b>Priority (High, Moderate, Low):</b>	Moderate
	Low Costs/Staff Time
<b>Potential Funding Sources:</b>	Local Budget
<b>Lead Agency/Department Responsible:</b>	Corpus Christi Development Services
<b>Implementation Schedule:</b>	12-24 Months
<b>INCORPORATION INTO EXISTING PLANS AND PROCEDURES</b>	
Building Codes	

**ADDITIONAL CONSIDERATIONS:**

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

**Problem Statement:** Design and implement a dam breach study for dams in Unincorporated Nueces County

**Corpus Christi Action # 27**

<b>Proposed Action</b>	Design and implement a dam breach study for dams in Corpus Christi.
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#### BACKGROUND INFORMATION

<b>Site and Location:</b>	Barney M Davis Cooling Reservoir Dam, Calallen Reservoir Dam, Oso Municipal Golf Course Lake Dam
<b>Risk Reduction Benefit:</b>	Better hazard-related information will improve the disaster resilience of the community.
<b>Type of Action:</b> Local Plans and Regulations Structure and Infrastructure Natural Systems Protection Education and Awareness	Local Plans and Regulations Natural Systems Protection

#### MITIGATION ACTION DETAILS

<b>Hazard(s) Addressed:</b>	Dam Failure
<b>Effect on new/existing buildings:</b>	New and existing buildings will benefit from improved hazard information
<b>Priority (High, Moderate, Low):</b>	Low
<b>Estimated Cost:</b>	\$200,000
<b>Potential Funding Sources:</b>	HMGP
<b>Lead Agency/Department Responsible:</b>	Nueces County Public Works Department
<b>Implementation Schedule:</b>	4 Years

#### INCORPORATION INTO EXISTING PLANS AND PROCEDURES

Petronila Creek Water Restoration and Protection Plan

#### ADDITIONAL CONSIDERATIONS:

The following STAPLEE criteria were evaluated on a scale of 1 to 5 indicating the extent to which this action satisfies each consideration. (1= Does Not Satisfy 3 = Moderately Satisfies 5 = Strongly Satisfies)

Socially Acceptable = 5; Technically Feasible =5; Administratively Possible =5; Politically Acceptable =5; Legal =5; Economically Sound =5; and Environmentally Sound =5

## Section 20: Plan Maintenance

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### Plan Maintenance Procedures

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The following is an explanation of how the Planning Team will implement the Hazard Mitigation Action Plan, and continue to evaluate and enhance it over time. In order to ensure that the Plan remains current and relevant, the following plan maintenance procedures will be addressed:

- Ensure the mitigation strategy remains current and is implemented according to Plan procedures
- Secure and maintain an ongoing mitigation program throughout the community
- Integrate short and long-term mitigation objectives into community officials' daily roles and responsibilities
- Continued Public Involvement and maintain momentum by routine engagement of the Plan's progress

### Monitoring and Evaluation

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Periodic tracking of the Plan is required to ensure that the goals, objectives, and mitigation action plans are implemented over time. Revisions may be necessary to ensure that the Plan is in full compliance with federal regulations and state statutes. This section outlines the procedures for completing such revisions, updates, and Plan review. Table 20-1 indicates the department or title responsible for this action.

**Table 20-1. Team Members Responsible for Plan Maintenance**

JURISDICTION / ENTITY	TITLE
Unincorporated Nueces County	Emergency Management Coordinator
City of Agua Dulce	Mayor
City of Bishop	Mayor
City of Corpus Christi	Floodplain Manager
City of Driscoll	Mayor
City of Petronila	Mayor
City of Port Aransas	Emergency Management Coordinator
City of Robstown	Fire Chief/Emergency Management Coordinator
Port of Corpus Christi Authority	Public Safety Director/Manager of Emergency Management

### **Monitoring**

The Multi-Jurisdictional HMAP planning team representing each participating jurisdiction will convene a meeting annually to monitor the plan and track the status of each jurisdiction's identified mitigation actions over the 5-year cycle of the Plan. Nueces County as coordinating entity will make arrangements to bring the team together. Mitigation Actions will be assigned to team members in advance of the meetings to prepare status reports to share with the team. Mitigation action status updates will include continued feasibility for implementation and funding.

### **Evaluation**

Each jurisdiction will evaluate changes in risk, determine whether the implementation of mitigation actions is on schedule, or if there are any implementation issues such as changes in stated purposes or goals that affect mitigation priorities in each participating jurisdictions' respective department or organization. The Plan Maintenance group will meet on an annual basis to identify any needed changes in the Plan based upon their evaluation activities.

## **Updating**

Annual reports submitted by the designated Team member from each community evaluating the Plan will be used to keep the Plan updated.

## **Five Year Review**

The Plan will be thoroughly reviewed by the appointed Planning Team at the end of three years from the approval date to determine whether there have been any significant changes in the area that may necessitate changes in the types of mitigation actions proposed. Nueces County, as coordinating entity, will make arrangements to bring the team together and begin the update process 2 years prior to plan expiration. New flood studies and new development in flood-prone areas, an increased exposure to hazards, disaster declarations, the increase or decrease in capability to address hazards, and changes to federal or state regulations are examples of factors that may affect the content of the Plan.

The Plan review provides the Planning Team an opportunity to evaluate those actions that have been successful and to explore documenting potential losses avoided due to the implementation of specific mitigation measures. The Plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented as assigned. It is recommended that the Planning Team meet to review the Plan at the end of three years as grant funds may be necessary for the development of a five-year update. Due to the timelines for grant cycles, it is wise to begin planning grant options in advance of the five-year deadline. Following the review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and Plan amendment process outlined herein. Upon completion of the review and update/amendment process, the revised Plan will be submitted to TDEM for final review and approval in coordination with FEMA.

## **Incorporating the Plan into Other Planning Mechanisms**

The County and participating entities will work to integrate the hazard mitigation strategies into other planning mechanisms. The Planning Team will ensure that future growth, disaster recovery, historic preservation, flood response plans, and other planning mechanisms will be consistent with the goals of the Plan.

Key Planning Team members from the participating jurisdictions, will meet annually, and more often if warranted, to ensure mitigation actions prioritized as high to moderate are tracked and monitored based on federal Disaster Declarations, HMGP and PDM funding cycles, and other non-federal funding sources that would help communities meet the local HMA match.

The potential funding sources listed for each identified action may be used when the Planning Team member begins to seek funds to implement actions. An implementation time period, or a specific implementation date, has been assigned to each action as an

incentive for completing each task and gauging whether actions are implemented in a timely manner.

Existing plans for the participating jurisdictions will be reviewed in light of the Plan, and Team Members will incorporate any mitigation policies and actions into these plans as appropriate. Table 20-1 indicates Planning Team member roles for incorporating actions, method of incorporation, and approving authority. Table 20-2 identifies planning mechanisms available for the participating jurisdictions and provides examples of how the Plan will be incorporated into current efforts.

**Table 20-2. Planning Mechanisms and Method to Incorporate Into the Plan**

EXISTING PLANNING MECHANISM	METHOD OF USE IN HAZARD MITIGATION PLAN
<b>Annual Budget</b>	Funding mitigation projects and local match requirements
<b>Emergency Planning and Emergency Operations Plan</b>	Identifying hazards and assessing vulnerabilities
<b>Mutual Aid Agreements</b>	Assessing vulnerabilities/needs
<b>Floodplain Ordinance/ Stormwater Management</b>	Mitigation strategies; higher regulatory considerations
<b>Land Use Maps and New Flood Studies</b>	Assessing vulnerabilities and flood risk; development trends; long-term growth
<b>Critical Facilities</b>	Location and protection
<b>Building and Zoning Codes</b>	Development trends; future growth
<b>State Hazard Mitigation Plan</b>	Risk analysis

It will be the responsibility of each participating jurisdiction to determine department or title of personnel responsible for implementation of mitigation strategies and implementation procedures.

All jurisdictions will comply with local and state requirements while incorporating this Plan into existing planning mechanisms. A list of planning mechanisms available to the jurisdictions can be found in Appendix A. The mitigation actions in Section 19 describe the planning mechanisms into which the mitigation actions will be integrated. In the



process of integrating the mitigation actions into new and existing planning mechanisms, the participating jurisdictions will:

- Nueces County – Actions will be presented to Commissioner’s Court by the responsible department. Upon approval by Commissioner’s Court, approved actions will be acted upon and/or integrated into existing planning mechanisms.
- City of Agua Dulce – Actions will be presented to City Council by the responsible department. Upon approval by City Council, approved actions will be acted upon and/or integrated into existing planning mechanisms.
- City of Bishop– Actions will be presented to City Council by the responsible department. Upon approval by City Council, approved actions will be acted upon and/or integrated into existing planning mechanisms.
- City of Corpus Christi – Actions will be presented to City Council by the responsible department. Upon approval by City Council, approved actions will be acted upon and/or integrated into existing planning mechanisms.
- City of Driscoll – Actions will be presented to City Council by the responsible department. Upon approval by City Council, approved actions will be acted upon and/or integrated into existing planning mechanisms.
- City of Petronila – Actions will be presented to City Council by the responsible department. Upon approval by City Council, approved actions will be acted upon and/or integrated into existing planning mechanisms.
- City of Robstown – Actions will be presented to City Council by the responsible department. Upon approval by City Council, approved actions will be acted upon and/or integrated into existing planning mechanisms.
- Port of Corpus Christi Authority - Actions will be presented to the Port Commission by the responsible department. Upon approval by the Port Commission, approved actions will be acted upon and/or integrated into existing planning mechanisms.

## Expansion of Capabilities

Planning Mechanism	Expansive Capabilities
<b>All Participating Jurisdictions</b>	
City Staff	All participating jurisdictions have city or county staff. While the number and involvement of these staff members in the planning process varies, all participating jurisdictions benefit from the presence of staff members. Staff are involved in the planning process and the implementation of mitigation actions. Staff will be able to help planning team members, serve as stakeholders, and coordinate the monitoring and maintenance process of this Plan.
Annual Budget Review	All participating jurisdictions have an annual budget review. Jurisdictions will incorporate the Plan while conducting their annual budget reviews. High priority mitigation actions will be reviewed and may potentially receive funds to
<b>Unincorporated Nueces County</b>	
Stormwater Management Plan	The Plan will be consulted when updating and maintaining the County's stormwater management plan. Both documents share the goal of reducing damage and minimizing the negative impacts of development on stormwater.
Emergency Operations Plan	The Plan will be consulted when updating and maintaining the County's Emergency Operations Plan. Both documents share the goal of public safety. Many of the mitigation actions in this Plan relate to emergency operations and must be integrated.
Capital Improvement Plan	Many of the mitigation actions found in this Plan will be enacted through capital improvement projects. Consequently, the County's Capital Improvement Plan must consult the Plan for hazard mitigation projects that could be incorporated into the Capital Improvement Plan. Prioritization should be given to high priority actions.

Unincorporated Nueces County (cont.)		
Wildfire Protection Plan		Several of the mitigation actions defined in this Plan relate to wildfire mitigation. When updating the Community Wildfire Protection Plan, this Plan should be consulted. Likewise, when planning or executing any of the wildfire mitigation actions in this Plan, the Community Wildfire Protection Plan should be consulted. Both plans have the ultimate goal of reducing the loss of property and life from wildfire hazards.
Floodplain Order		The Plan will be used in updating the floodplain order and ensuring sound floodplain management. The goals of both documents are to reduce vulnerability to flooding hazards. The Plan will be consulted for NFIP compliance, flood risk, and extent. Information from this Plan will be reviewed for inclusion in other documents, including the floodplain order.
City of Agua Dulce		
Emergency Plan	Operations	The City is part of the Nueces County Emergency Operations Plan. The Plan will be consulted when updating and maintaining the County's Emergency Operations Plan. Both documents share the goal of public safety. Many of the mitigation actions in this Plan relate to emergency operations and must be integrated.
Wildfire Protection Plan		Several of the mitigation actions defined in this Plan relate to wildfire mitigation. When updating the Community Wildfire Protection Plan, this Plan should be consulted. Likewise, when planning or executing any of the wildfire mitigation actions in this Plan, the Community Wildfire Protection Plan should be consulted. Both plans have the ultimate goal of reducing the loss of property and life from wildfire hazards.

City of Bishop	
Stormwater Management Plan	The Plan will be consulted when updating and maintaining the City's stormwater management plan. Both documents share the goal of reducing damage and minimizing the negative impacts of development on stormwater.
Emergency Operations Plan	The City is part of the Nueces County Emergency Operations Plan. The Plan will be consulted when updating and maintaining the County's Emergency Operations Plan. Both documents share the goal of public safety. Many of the mitigation actions in this Plan relate to emergency operations and must be integrated.
Capital Improvements Plan	Many of the mitigation actions found in this Plan will be enacted through capital improvement projects. Consequently, the City's Capital Improvement Plan must consult the Plan for hazard mitigation projects that could be incorporated into the Capital Improvement Plan. Prioritization should be given to high priority actions.
Floodplain Management Plan	The Plan will be used in updating the floodplain management plan and ensuring sound floodplain management. The goals of both documents are to reduce vulnerability to flooding hazards. The Plan will be consulted for NFIP compliance, flood risk, and extent. Information from this Plan will be reviewed for inclusion in other documents, including the floodplain management plan.
Wildfire Protection Plan	Several of the mitigation actions defined in this Plan relate to wildfire mitigation. When updating the Community Wildfire Protection Plan, this Plan should be consulted. Likewise, when planning or executing any of the wildfire mitigation actions in this Plan, the Community Wildfire Protection Plan should be consulted. Both plans have the ultimate goal of reducing the loss of property and life from wildfire hazards.

City of Corpus Christi	
Comprehensive/Master Plan	The Plan will be consulted when updating the Comprehensive/Master Plan. It is important to ensure that development occurs in a manner that does not increase hazard risk. The Plan includes information regarding the location, extent, and probability of many natural hazards. By incorporating this information into the Comprehensive/Master Plan, development can be guided in a hazard-resilient manner.
Stormwater Management Plan	The Plan will be consulted when updating and maintaining the City's stormwater management plan. Both documents share the goal of reducing damage and minimizing the negative impacts of development on stormwater.
Emergency Operations Plan	The City is part of the Nueces County Emergency Operations Plan. The Plan will be consulted when updating and maintaining the County's Emergency Operations Plan. Both documents share the goal of public safety. Many of the mitigation actions in this Plan relate to emergency operations and must be integrated.
Capital Improvements Plan	Many of the mitigation actions found in this Plan will be enacted through capital improvement projects. Consequently, the City's Capital Improvement Plan must consult the Plan for hazard mitigation projects that could be incorporated into the Capital Improvement Plan. Prioritization should be given to high priority actions.
Stormwater Ordinance	The Plan will be consulted when updating and maintaining the City's stormwater ordinance. Both documents share the goal of reducing damage and minimizing the negative impacts of development on stormwater.

### City of Corpus Christi (cont.)

NFIP Community Rating System	The Plan includes information regarding the location, extent, and probability of flooding hazards. This information can and should be used in the City's Community Rating System (CRS) program. One of the major goals of the CRS program is to go above the minimum standards of the NFIP. Many of the mitigation actions identified in this Plan involve exceeding the minimum standards of the NFIP. By incorporating this Plan into the City's CRS program, the goals of flooding hazard reduction can be met.
Floodplain Ordinance	The Plan will be used in updating the floodplain ordinance and ensuring sound floodplain management. The goals of both documents are to reduce vulnerability to flooding hazards. The Plan will be consulted for NFIP compliance, flood risk, and extent. Information from this Plan will be reviewed for inclusion in other documents, including the floodplain ordinance.

### City of Petronila

Emergency Operations Plan	The City is part of the Nueces County Emergency Operations Plan. The Plan will be consulted when updating and maintaining the County's Emergency Operations Plan. Both documents share the goal of public safety. Many of the mitigation actions in this Plan relate to emergency operations and must be integrated.
Wildfire Protection Plan	Several of the mitigation actions defined in this Plan relate to wildfire mitigation. When updating the Community Wildfire Protection Plan, this Plan should be consulted. Likewise, when planning or executing any of the wildfire mitigation actions in this Plan, the Community Wildfire Protection Plan should be consulted. Both plans have the ultimate goal of reducing the loss of property and life from wildfire hazards.

City of Robstown		
Comprehensive/Master Plan		The Plan will be consulted when updating the Comprehensive/Master Plan. It is important to ensure that development occurs in a manner that does not increase hazard risk. The Plan includes information regarding the location, extent, and probability of many natural hazards. By incorporating this information into the Comprehensive/Master Plan, development can be guided in a hazard-resilient manner.
Emergency Plan	Operations	The City is part of the Nueces County Emergency Operations Plan. The Plan will be consulted when updating and maintaining the County's Emergency Operations Plan. Both documents share the goal of public safety. Many of the mitigation actions in this Plan relate to emergency operations and must be integrated.
Capital Plan	Improvements	Many of the mitigation actions found in this Plan will be enacted through capital improvement projects. Consequently, the City's Capital Improvement Plan must consult the Plan for hazard mitigation projects that could be incorporated into the Capital Improvement Plan. Prioritization should be given to high priority actions.
Wildfire Protection Plan		Several of the mitigation actions defined in this Plan relate to wildfire mitigation. When updating the Community Wildfire Protection Plan, this Plan should be consulted. Likewise, when planning or executing any of the wildfire mitigation actions in this Plan, the Community Wildfire Protection Plan should be consulted. Both plans have the ultimate goal of reducing the loss of property and life from wildfire hazards.



Port of Corpus Christi Authority		
Comprehensive Plan	Master Plan	The Plan will be consulted when updating the Comprehensive/Master Plan. It is important to ensure that development occurs in a manner that does not increase hazard risk. The Plan includes information regarding the location, extent, and probability of many natural hazards. By incorporating this information into the Comprehensive/Master Plan, development can be guided in a hazard-resilient manner.
Emergency Action Plan		The Plan will be consulted when updating and maintaining the PCCA's Emergency Action Plan. Both documents share the goal of public safety. Many of the mitigation actions in this Plan relate to emergency operations and must be integrated.
Stormwater Management Program		The Plan will be consulted when updating and maintaining the PCCA's stormwater management program. Both documents share the goal of reducing damage and minimizing the negative impacts of development on stormwater.
Capital Plan	Improvements	Many of the mitigation actions found in this Plan will be enacted through capital improvement projects. Consequently, the PCCA's Capital Improvement Plan must consult the Plan for hazard mitigation projects that could be incorporated into the Capital Improvement Plan. Prioritization should be given to high priority actions.

## Continued Public Involvement

Input from the stakeholders and public was an integral part of the preparation of this Plan and will continue as the Plan grows and changes. This Plan will be posted on the Nueces County website where local officials and the public will be invited to provide ongoing feedback. The task of notifying stakeholders and community members on an annual basis will be held with the identified Nueces County Planning Team members tasked with updates and annual Plan review. The Planning Team will have the added task of maintaining the Plan as a part of their job description. Media such as the local newspaper and radio stations will be used to notify the public of any maintenance or periodic review activities taking place. Public participation will be sought during the implementation, monitoring, and evaluation phases of the plan.

## Appendix A: Capability Assessment

## Local Capability Assessment Survey

**Jurisdiction and/or Dept.:** Nueces County

**Name and Title:** EMC Boyce

**1. PLANNING AND REGULATORY CAPABILITY** - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction. Please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Comments
Comprehensive / Master Plan			None
Stormwater Management Plan / Ordinance	<b>X</b>		Master Draining plan
Emergency Operations Plan	<b>X</b>		As part of the Nueces County Emergency Management Plan
Capital Improvements Plan	<b>X</b>		
Floodplain Management Plan	<b>X</b>		
Economic Development Plan	<b>X</b>		Regional
Transportation Plan	<b>X</b>		Part of Regional Transportation Agency
Continuity of Operations Plan	<b>X</b>		As part of the Nueces County Emergency Management Plan
Wildfire Protection Plan	<b>X</b>		
Planning / Regulatory Tool	In Place	Under Development	Comments
Stormwater Ordinance			No
NFIP Community Rating System (CRS Program)			NA
Floodplain Ordinance	<b>X</b>		Order
Building Code (include name/year under Comments)			No
Zoning Ordinance			No

## Local Capability Assessment Survey

Acquisition of Land for Open Space/Recreation Use			No
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### 2. ADMINISTRATIVE AND TECHNICAL CAPABILITY - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources

Staff / Personnel Resources	Yes	No	Comments
Maintenance program to reduce risk (tree trimming, clearing drainage systems)	X		Ongoing maintenance.
Mutual Aid Agreements (between neighboring jurisdictions)	X		Nueces County Mutual Aid Agreement, Coastal Bend Council of Governments Master Mutual Aid Agreement
Mitigation Planning Committee	X		
Community Planner		X	No
Staff Engineer	X		
Emergency manager	X		
Floodplain manager	X		
Personnel skilled in Geographic Information Systems (GIS)	X		
Warning Systems/outdoor siren, reverse 911, other	X		Reverse Alert/Reverse 911 through MetroCom
Grant Writer	X		
Hazard Data/historical disaster data	X		Historical records and memory of officials/residents.
Chief Bulding Official			No

### 3. FISCAL CAPABILITY - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources *for hazard mitigation purposes*

Financial Resources	Yes	No	Comments
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### Local Capability Assessment Survey

Capital Improvement Programming		<b>X</b>	
Community Development Block Grants (CDBG)	<b>X</b>		
Stormwater Utility Fees		<b>X</b>	
Development Impact Fees		<b>X</b>	
Authority to levy taxes for specific purposes	<b>X</b>		
Other: _____			

**4. EDUCATION AND OUTREACH** - Please identify any education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information such as school programs, StormReady, FireWise programs, environmental protection, evacuation plan, emergency preparedness, public education programs.

Will circulate information to residents via website and facebook. Ongoing Emergency/Hurricane Preparedness activity and outreach year round.

**5. PREVIOUS MITIGATION ACTIVITIES** - Please list any previous mitigation activities (e.g. structural and/or planning projects or grants) that have been or will be implemented for your community. Please include the title of the project or grant along with any start or completion dates and the department or agency responsible.

Part of the Coastal Bend HMAP 2007 & 2012.

## Local Capability Assessment Survey

**Jurisdiction and/or Dept.:** Auga Dulce, Tx

**Name and Title:** MayorHoward/EMC Boyce

**1. PLANNING AND REGULATORY CAPABILITY** - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction. Please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Comments
Comprehensive / Master Plan			None
Stormwater Management Plan / Ordinance			No ordinance or current storm water system
Emergency Operations Plan	<b>X</b>		As part of the Nueces County Emergency Management Plan
Capital Improvements Plan			None
Floodplain Management Plan			None
Economic Development Plan			None
Transportation Plan			Part of Regional Transportation Agency routes.
Continuity of Operations Plan	<b>X</b>		As part of the Nueces County Emergency Management Plan
Wildfire Protection Plan	<b>X</b>		As part of the Nueces County Plan
Planning / Regulatory Tool	In Place	Under Development	Comments
Stormwater Ordinance			No
NFIP Community Rating System (CRS Program)			NA
Floodplain Ordinance			No
Building Code (include name/year under Comments)			No
Zoning Ordinance			No

## Local Capability Assessment Survey

Acquisition of Land for Open Space/Recreation Use			No
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### 2. ADMINISTRATIVE AND TECHNICAL CAPABILITY - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources

Staff / Personnel Resources	Yes	No	Comments
Maintenance program to reduce risk (tree trimming, clearing drainage systems)	X		Ongoing maintenance.
Mutual Aid Agreements (between neighboring jurisdictions)	X		ESD 5 as part of the Nueces County Mutual Aid Agreement
Mitigation Planning Committee	X		
Community Planner		X	No
Staff Engineer	X		Contract service.
Emergency manager	X		As part of the Nueces County Emergency Management Plan
Floodplain manager			No
Personnel skilled in Geographic Information Systems (GIS)			No
Warning Systems/outdoor siren, reverse 911, other	X		Reverse Alert/Reverse 911 through MetroCom
Grant Writer			No
Hazard Data/historical disaster data	X		Historical records and memory of officials/residents.
Chief Bulding Official			No

### 3. FISCAL CAPABILITY - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources *for hazard mitigation purposes*

Financial Resources	Yes	No	Comments
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### Local Capability Assessment Survey

Capital Improvement Programming		<b>X</b>	
Community Development Block Grants (CDBG)		<b>X</b>	
Stormwater Utility Fees		<b>X</b>	
Development Impact Fees		<b>X</b>	
Authority to levy taxes for specific purposes		<b>X</b>	
Other: _____			

**4. EDUCATION AND OUTREACH** - Please identify any education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information such as school programs, StormReady, FireWise programs, environmental protection, evacuation plan, emergency preparedness, public education programs.

Will circulate information to residents via email.

**5. PREVIOUS MITIGATION ACTIVITIES** - Please list any previous mitigation activities (e.g. structural and/or planning projects or grants) that have been or will be implemented for your community. Please include the title of the project or grant along with any start or completion dates and the department or agency responsible.

Part of the Coastal Bend HMAP 2007 & 2012.



## Local Capability Assessment Survey

**Jurisdiction and/or Dept.:** Bishop, Tx  
**Name and Title:** City Secretary Contreras/EMC  
Boyce

**1. PLANNING AND REGULATORY CAPABILITY** - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction. Please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Comments
Comprehensive / Master Plan	X		
Stormwater Management Plan / Ordinance	X		Part of master plan
Emergency Operations Plan	X		As part of the Nueces County Emergency Management Plan
Capital Improvements Plan	X		
Floodplain Management Plan	X		
Economic Development Plan	X		Regional Economic Development Plan
Transportation Plan			Part of Regional Transportation Agency routes.
Continuity of Operations Plan	X		As part of the Nueces County Emergency Management Plan
Wildfire Protection Plan	X		As part of the Nueces County Plan
Planning / Regulatory Tool	In Place	Under Development	Comments
Stormwater Ordinance	X		
NFIP Community Rating System (CRS Program)			NA
Floodplain Ordinance	X		
Building Code (include name/year under Comments)	X		ICC 2004
Zoning Ordinance	X		

## Local Capability Assessment Survey

Acquisition of Land for Open Space/Recreation Use			No
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### 2. ADMINISTRATIVE AND TECHNICAL CAPABILITY - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources

Staff / Personnel Resources	Yes	No	Comments
Maintenance program to reduce risk (tree trimming, clearing drainage systems)	X		Ongoing maintenance.
Mutual Aid Agreements (between neighboring jurisdictions)	X		ESD 3 as part of the Nueces County Mutual Aid Agreement
Mitigation Planning Committee	X		
Community Planner		X	No
Staff Engineer	X		Contract service.
Emergency manager	X		As part of the Nueces County Emergency Management Plan
Floodplain manager	X		
Personnel skilled in Geographic Information Systems (GIS)		X	
Warning Systems/outdoor siren, reverse 911, other	X		Reverse Alert/Reverse 911 through MetroCom
Grant Writer	X		
Hazard Data/historical disaster data	X		Historical records and memory of officials/residents.
Chief Bulding Official	X		

### 3. FISCAL CAPABILITY - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources *for hazard mitigation purposes*

Financial Resources	Yes	No	Comments
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### Local Capability Assessment Survey

Capital Improvement Programming		<b>X</b>	
Community Development Block Grants (CDBG)	<b>X</b>		
Stormwater Utility Fees		<b>X</b>	
Development Impact Fees		<b>X</b>	
Authority to levy taxes for specific purposes	<b>X</b>		
Other: _____			

**4. EDUCATION AND OUTREACH** - Please identify any education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information such as school programs, StormReady, FireWise programs, environmental protection, evacuation plan, emergency preparedness, public education programs.

Will circulate information to residents via email.

**5. PREVIOUS MITIGATION ACTIVITIES** - Please list any previous mitigation activities (e.g. structural and/or planning projects or grants) that have been or will be implemented for your community. Please include the title of the project or grant along with any start or completion dates and the department or agency responsible.

Part of the Coastal Bend HMAP 2007 & 2012.

## Local Capability Assessment Survey

Jurisdiction and/or Dept.: City of Corpus Christi

Yvette Dodd, Floodplain

Name and Title: Manager

**1. PLANNING AND REGULATORY CAPABILITY** - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction. Please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Comments
Comprehensive / Master Plan	X		
Stormwater Management Plan / Ordinance	X		
Emergency Operations Plan	X		
Capital Improvements Plan	X		
Floodplain Management Plan		X	
Economic Development Plan	X		
Transportation Plan	X		
Continuity of Operations Plan	X		
Wildfire Protection Plan		X	
Planning / Regulatory Tool	In Place	Under Development	Comments
Stormwater Ordinance	X		
NFIP Community Rating System (CRS Program)	X		
Floodplain Ordinance	X		
Building Code (include name/year under Comments)	X		2015 IRC AND IBC
Zoning Ordinance	X		
Acquisition of Land for Open Space/Recreation Use		X	

## Local Capability Assessment Survey

**2. ADMINISTRATIVE AND TECHNICAL CAPABILITY** - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources

Staff / Personnel Resources	Yes	No	Comments
Maintenance program to reduce risk (tree trimming, clearing drainage systems)	X		
Mutual Aid Agreements (between neighboring jurisdictions)	X		
Mitigation Planning Committee		X	
Community Planner	X		
Staff Engineer	X		
Emergency manager	X		
Floodplain manager	X		
Personnel skilled in Geographic Information Systems (GIS)	X		
Warning Systems/outdoor siren, reverse 911, other	X		
Grant Writer		X	
Hazard Data/historical disaster data		X	
Chief Building Official	X		

**3. FISCAL CAPABILITY** - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources *for hazard mitigation purposes*

Financial Resources	Yes	No	Comments
Capital Improvement Programming	X		
Community Development Block Grants (CDBG)	X		

## Local Capability Assessment Survey

Stormwater Utility Fees	X		
Development Impact Fees		X	
Authority to levy taxes for specific purposes	X		
Other: _____			

**4. EDUCATION AND OUTREACH** - Please identify any education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information such as school programs, StormReady, FireWise programs, environmental protection, evacuation plan, emergency preparedness, public education programs.

Storm Ready, Reverse alert, Public Broadcasting, Website, Facebook, Twitter, School Outreach

**5. PREVIOUS MITIGATION ACTIVITIES** - Please list any previous mitigation activities (e.g. structural and/or planning projects or grants) that have been or will be implemented for your community. Please include the title of the project or grant along with any start or completion dates and the department or agency responsible.

See Attached

## Local Capability Assessment Survey

**Jurisdiction and/or Dept.:** Petronila, Tx

**Name and Title:** Mayor Burkhardt/EMC Boyce

**1. PLANNING AND REGULATORY CAPABILITY** - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction. Please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Comments
Comprehensive / Master Plan			None
Stormwater Management Plan / Ordinance			No ordinance or current storm water system
Emergency Operations Plan	<b>X</b>		As part of the Nueces County Emergency Management Plan
Capital Improvements Plan			None
Floodplain Management Plan			None
Economic Development Plan			None
Transportation Plan			Part of Regional Transportation Agency routes.
Continuity of Operations Plan	<b>X</b>		As part of the Nueces County Emergency Management Plan
Wildfire Protection Plan	<b>X</b>		As part of the Nueces County Plan
Planning / Regulatory Tool	In Place	Under Development	Comments
Stormwater Ordinance			No
NFIP Community Rating System (CRS Program)			NA
Floodplain Ordinance			No
Building Code (include name/year under Comments)			No

### Local Capability Assessment Survey

Zoning Ordinance			No
Acquisition of Land for Open Space/Recreation Use			No

### 2. ADMINISTRATIVE AND TECHNICAL CAPABILITY - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources

Staff / Personnel Resources	Yes	No	Comments
Maintenance program to reduce risk (tree trimming, clearing drainage systems)		X	
Mutual Aid Agreements (between neighboring jurisdictions)	X		ESD 3 as part of the Nueces County Mutual Aid Agreement
Mitigation Planning Committee	X		
Community Planner		X	No
Staff Engineer		X	No
Emergency manager	X		As part of the Nueces County Emergency Management Plan
Floodplain manager			No
Personnel skilled in Geographic Information Systems (GIS)			No
Warning Systems/outdoor siren, reverse 911, other	X		Reverse Alert/Reverse 911 through MetroCom
Grant Writer			No
Hazard Data/historical disaster data	X		Historical records and memory of officials/residents.
Chief Bulding Official			No

### 3. FISCAL CAPABILITY - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources *for hazard mitigation purposes*



### Local Capability Assessment Survey

Financial Resources	Yes	No	Comments
Capital Improvement Programming		X	
Community Development Block Grants (CDBG)		X	
Stormwater Utility Fees		X	
Development Impact Fees		X	
Authority to levy taxes for specific purposes		X	
Other: _____			

**4. EDUCATION AND OUTREACH** - Please identify any education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information such as school programs, StormReady, FireWise programs, environmental protection, evacuation plan, emergency preparedness, public education programs.

Will circulate information to residents via email.

**5. PREVIOUS MITIGATION ACTIVITIES** - Please list any previous mitigation activities (e.g. structural and/or planning projects or grants) that have been or will be implemented for your community. Please include the title of the project or grant along with any start or completion dates and the department or agency responsible.

Part of the Coastal Bend HMAP 2007 & 2012.

## Local Capability Assessment Survey

**Jurisdiction and/or Dept.:** City of Robstown

**Name and Title:** Ricardo Gonzalez, EMC

**1. PLANNING AND REGULATORY CAPABILITY** -Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction. Please provide additional comments or explanations in the space provided or with attachments.

Planning / Regulatory Tool	In Place	Under Development	Comments
Comprehensive / Master Plan	<b>x</b>		
Stormwater Management Plan / Ordinance		<b>x</b>	
Emergency Operations Plan	<b>x</b>		
Capital Improvements Plan	<b>x</b>		
Floodplain Management Plan			
Economic Development Plan	<b>x</b>		
Transportation Plan	<b>x</b>		
Continuity of Operations Plan			
Wildfire Protection Plan	<b>x</b>		Under Nueces County
Planning / Regulatory Tool	In Place	Under Development	Comments
Stormwater Ordinance			
NFIP Community Rating System (CRS Program)		<b>x</b>	
Floodplain Ordinance	<b>x</b>		Ordinance No. 785
Building Code (include name/year under Comments)	<b>x</b>		International Building Codes 2012
Zoning Ordinance	<b>x</b>		
Acquisition of Land for Open Space/Recreation Use	<b>x</b>		Main Street Properties

## Local Capability Assessment Survey

**2. ADMINISTRATIVE AND TECHNICAL CAPABILITY** -Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources

Staff / Personnel Resources	Yes	No	Comments
Maintenance program to reduce risk (tree trimming, clearing drainage systems)	x		Robstown Utility Systems has a tree trimming program
Mutual Aid Agreements (between neighboring jurisdictions)	x		Corpus Christi, Annaville, Bluntzer, Bishop, Driscoll, Petronilla
Mitigation Planning Committee	x		Ricardo Gonzalez, Javier Zapata, Herman Rodriguez, Beatriz Charo
Community Planner		x	
Staff Engineer		x	
Emergency manager	x		
Floodplain manager		x	City Inspector is designated as the Floodplain Administrator
Personnel skilled in Geographic Information Systems (GIS)		x	
Warning Systems/outdoor siren, reverse 911, other	x		
Grant Writer	x		
Hazard Data/historical disaster data			
Chief Bulding Official	x		

**3. FISCAL CAPABILITY** - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial resources *for hazard mitigation purposes*

Financial Resources	Yes	No	Comments
Capital Improvement Programming			
Community Development Block Grants (CDBG)	x		

### Local Capability Assessment Survey

Stormwater Utility Fees			
Development Impact Fees			
Authority to levy taxes for specific purposes			
Other: _____			

**4. EDUCATION AND OUTREACH** - Please identify any education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information such as school programs, StormReady, FireWise programs, environmental protection, evacuation plan, emergency preparedness, public education programs.

Evacuation Annex E, Annual Evacuation Drill, Annual Hurricane Conference (Local), Participate in Nueces County Wildfire Plan

**5. PREVIOUS MITIGATION ACTIVITIES** - Please list any previous mitigation activities (e.g. structural and/or planning projects or grants) that have been or will be implemented for your community. Please include the title of the project or grant along with any start or completion dates and the department or agency responsible.

Fire Department Emergency Generator- Hazard Mitigation Grant Program, completed 2/2009  
Wastewater Generator- Hazard Mitigation Grant Program, completed 7/2009  
Emergency Shutters, Hazard Mitigation Grant Program, completed 1/2009

## Local Capability Assessment Survey

**Jurisdiction and/or Dept.:** Port of Corpus Christi Authority

**Name and Title:** Tom Mylett, Director of Port Security

### 1. PLANNING AND REGULATORY CAPABILITY · Please indicate whether the following planning or regulatory tools (plans,

Planning / Regulatory Tool	In Place	Under Development	Comments
Comprehensive / Master Plan	Yes	N/A	Bulk Terminal Master Plan, Strategic Plan and associated Strategic Action Plans
Stormwater Management Plan / Ordinance	Yes	N/A	Storm Water Management Program - Rev. 1 01/23/2012 and Storm Water Pollution Prevention Program - Rev. 5 11/01/11
Emergency Operations Plan	Yes	N/A	Emergency Action Plan Effective Date 01/1/14
Capital Improvements Plan	Yes	N/A	Annual Capital Improvements Plan Ten Year Capital Improvements Plan Bulk Terminal Master Plan La Quinta Security Plan Fire Water Pressurization Study Rail Master Plan Corpus Christi Metro Transportation Plan (Participant in MPO)
Floodplain Management Plan	Yes	N/A	Covered by City and County FMPs. Design to one year above the flood plain.
Economic Development Plan	Yes	N/A	Coastal Bend Council of Governments Regional Economic Development Plan
Transportation Plan	Yes	N/A	Metropolitan Planning Organization
Continuity of Operations Plan	No	Yes	In progress
Wildfire Protection Plan	Yes	N/A	Nueces County Community Wildfire Protection Plan- Nueces County OEM
Planning / Regulatory Tool	In Place	Under Development	Comments
Stormwater Ordinance	Yes	N/A	City ordinances where applicable.
NFIP Community Rating System (CRS Program)	Yes	N/A	Corpus Christi only
Floodplain Ordinance	Yes	N/A	Cities and Counties
Building Code (include name/year under Comments)	Yes	N/A	2015 International Codes: International Code Council (ICC) 2015 - International Building Code (IBC) - Existing Building Code - Energy Conservation Code - Fuel Gas Code - Mechanical Code - Plumbing Code - National Fire Prevention Association (NFPA) National Electric Code
Zoning Ordinance	Yes	N/A	City ordinances where applicable.
Acquisition of Land for Open Space/Recreation Use	Yes	N/A	Strategic Action Plan - Be an Environmental Leader; Public Fishing Area; La Quinta Buffer Areas

### 2. ADMINISTRATIVE AND TECHNICAL CAPABILITY · Please indicate whether your jurisdiction maintains the following staff

Staff / Personnel Resources	Yes	No	Comments
Maintenance program to reduce risk (tree trimming, clearing drainage systems)	Yes	N/A	Maintenance Department
Mutual Aid Agreements (between neighboring jurisdictions)	N/A	No	All cities and counties are party to regional master mutual aid agreement. Port of Corpus Christi Authority is currently not a party.
Mitigation Planning Committee	Yes	N/A	Established in support of current planning effort
Community Planner	N/A	No	
Staff Engineer	Yes	N/A	Engineering Department
Emergency manager	Yes	N/A	Emergency Management Department
Floodplain manager		No	Covered by City and County FMs
Personnel skilled in Geographic Information Systems (GIS)	Yes	N/A	Environmental Planning & Compliance Department

### Local Capability Assessment Survey

Warning Systems/outdoor siren, reverse 911, other	<b>Yes</b>	<b>N/A</b>	Outdoor warning siren at Bulk Terminal facility, Reverse Alert (Everbridge)
Grant Writer	<b>Yes</b>	<b>N/A</b>	Finance Department
Hazard Data/historical disaster data	<b>Yes</b>	<b>N/A</b>	Risk Management Department. Data available for past five years only.
Chief Building Official	<b>Yes</b>	<b>N/A</b>	David L. Krams, P.E.

#### 3. FISCAL CAPABILITY - Please indicate whether your jurisdiction has access to or is eligible to use the following local financial

Financial Resources	Yes	No	Comments
Capital Improvement Programming	<b>Yes</b>	<b>N/A</b>	
Community Development Block Grants (CDBG)	<b>N/A</b>	<b>No</b>	Not eligible
Stormwater Utility Fees	<b>N/A</b>	<b>No</b>	
Development Impact Fees	<b>N/A</b>	<b>No</b>	
Authority to levy taxes for specific purposes	<b>Yes</b>	<b>N/A</b>	Authority however do not currently levy (have never in history of organization- 90 years)
Other: Authority to level fees (tariffs) for specific purposes	<b>Yes</b>	<b>N/A</b>	

#### 4. EDUCATION AND OUTREACH - Please identify any education and outreach programs and methods already in place that

Conduct extensive training through multiple venues under the Environmental Management System and Storm Water Compliance Programs.

#### 5. PREVIOUS MITIGATION ACTIVITIES - Please list any previous mitigation activities (e.g. structural and/or planning projects

Storm Water Upgrades - upgrades to existing systems (JFC, Sigmar, North Bank) to improve runoff, installation of gate valves; Nueces River Fishing Area Drainage Improvements; Green Design Guidelines and Environmental Checklists for Construction and Design; Fire Boat Addition and Construction of New Fire Boat; Dock Facility; Fire Fighting Capability Evaluation

## Appendix B: Public Survey

Overview .....	1
Public Survey Results .....	2

### Overview

Nueces County prepared a public survey with questions for the public concerning their opinions regarding natural hazards. The survey was made available on the Nueces County website. Survey results are depicted on the following pages, showing the percentage of responses for each answer. For questions that did not provide a multiple-choice answer, or that required an explanation, comments are summarized where similar.

**Figure B-1: Screen Shot of Public Survey Link on Nueces County Website**

Public Survey for Multi-Jurisdictional Hazard Mitigation Action Plan within Nueces County

Nobody knows more about the natural hazards that affect them than the people who live and work in Nueces County and its municipalities. Public input and collaboration are important components to a successful multi-jurisdictional Hazard Mitigation Action Plan. Please use this survey to raise concerns and ensure that your voice is heard. Please be as detailed as possible in your responses.

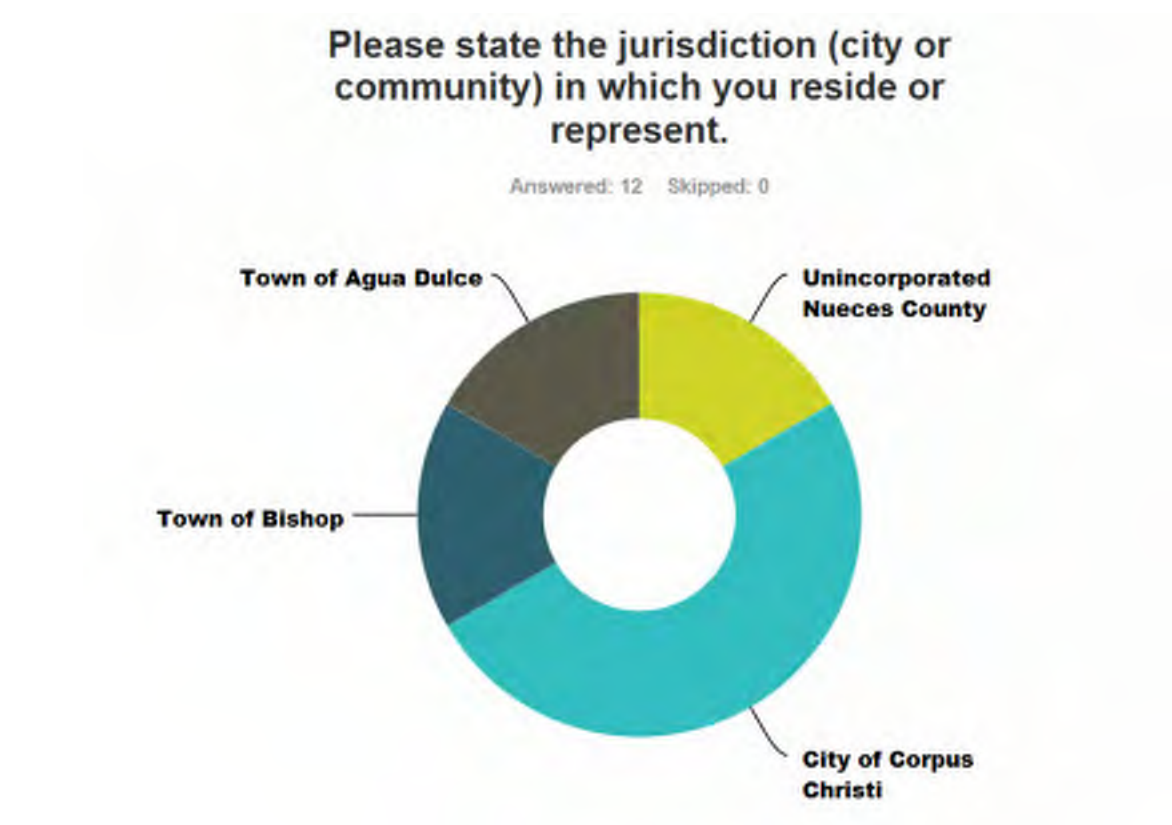
To fill out this survey online, please visit <https://www.surveymonkey.com/r/multihazard>

1. Please state the jurisdiction (city or community) in which you reside or represent.

- ☐ Unincorporated Nueces County
- ☐ City of Corpus Christi
- ☐ City of Robstown
- ☐ City of Port Aransas
- ☐ Town of Bishop
- ☐ Town of Driscoll

# Public Survey Questions & Results

## Question #1:



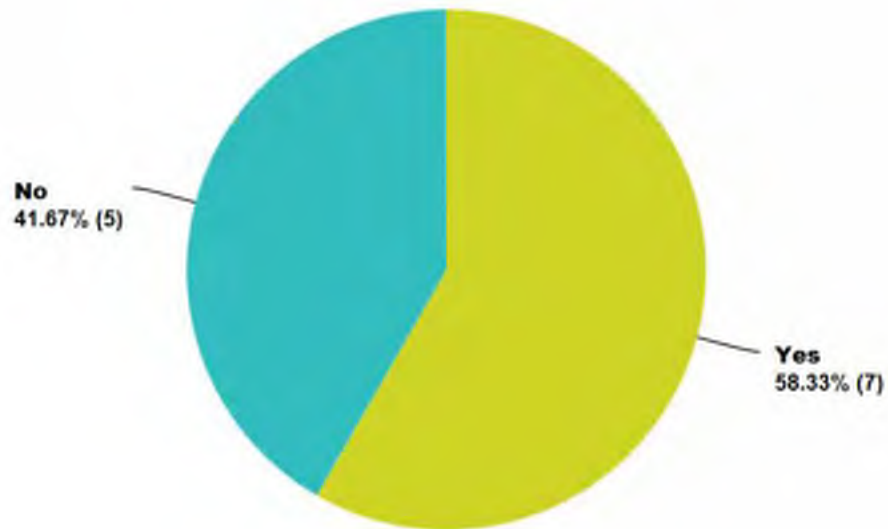
Answer Options	Response Percent	Response Count
Unincorporated Nueces County	16.7%	2
City of Corpus Christi	50.0%	6
City of Robstown	0.0%	0
City of Port Aransas	0.0%	0
Town of Bishop	16.7%	2
Town of Driscoll	0.0%	0
Town of Agua Dulce	16.7%	2
Town of Petronila	0.0%	0
Port of Corpus Christi Authority	0.0%	0
Other (please specify)	0.0%	0



## Question #2

### Have you ever experienced or been impacted by a natural disaster?

Answered: 12 Skipped: 0



Answer Options	Response Percent	Response Count
Yes	58.3%	7
No	41.7%	5
If you answered Yes, please describe:		5

If “yes”, please explain:

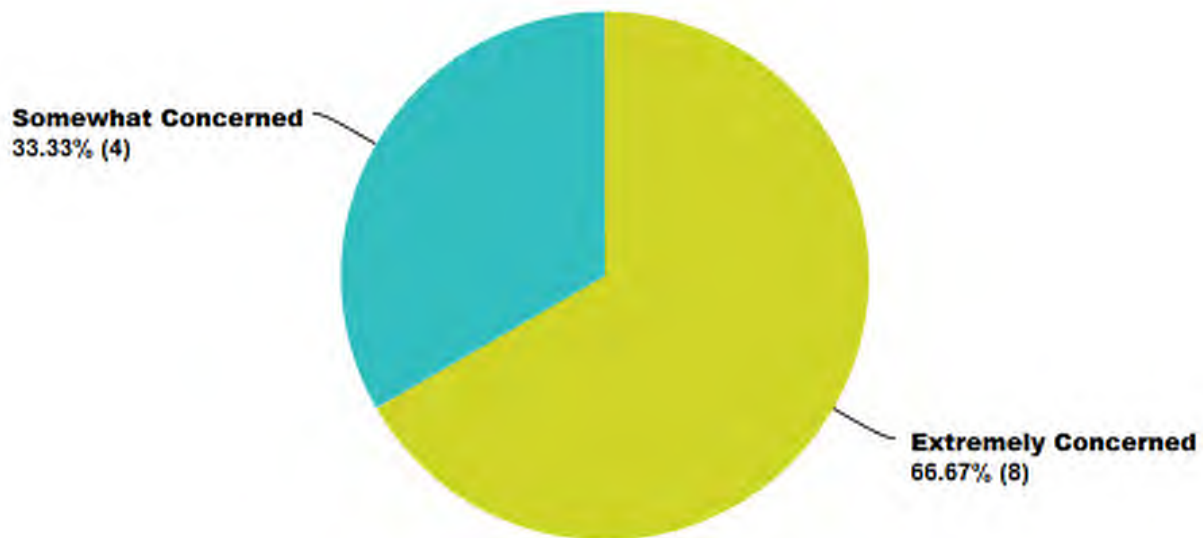
Number	If you answered Yes, please describe:
1	Tornado and flooding in Austin, Texas
2	Hurricane Celia and Carla and other minor hurricanes. H1N1 Pandemic
3	Hurricane Allen
4	Flooding, strong winds, tornadoes, drought hurricanes, extreme temperature
5	Every time it rains a significant amount the neighborhood goes underwater

### Question #3

---

**How concerned are you about the possibility of your community being impacted by a natural disaster?**

Answered: 12 Skipped: 0

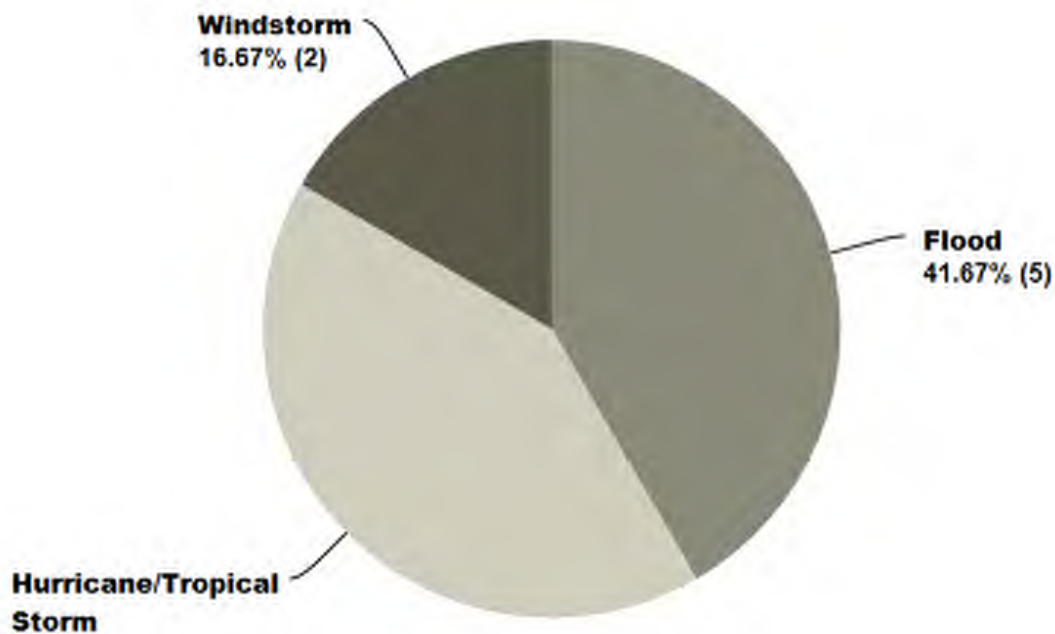


Answer Options	Response Percent	Response Count
Extremely Concerned	66.7%	8
Somewhat Concerned	33.3%	4
Not Concerned	0.0%	0
<b>answered question</b>		<b>12</b>
<b>skipped question</b>		<b>0</b>

#### Question #4

Please select the natural hazard you think presents the **HIGHEST** threat to your neighborhood.

Answered: 12 Skipped: 0

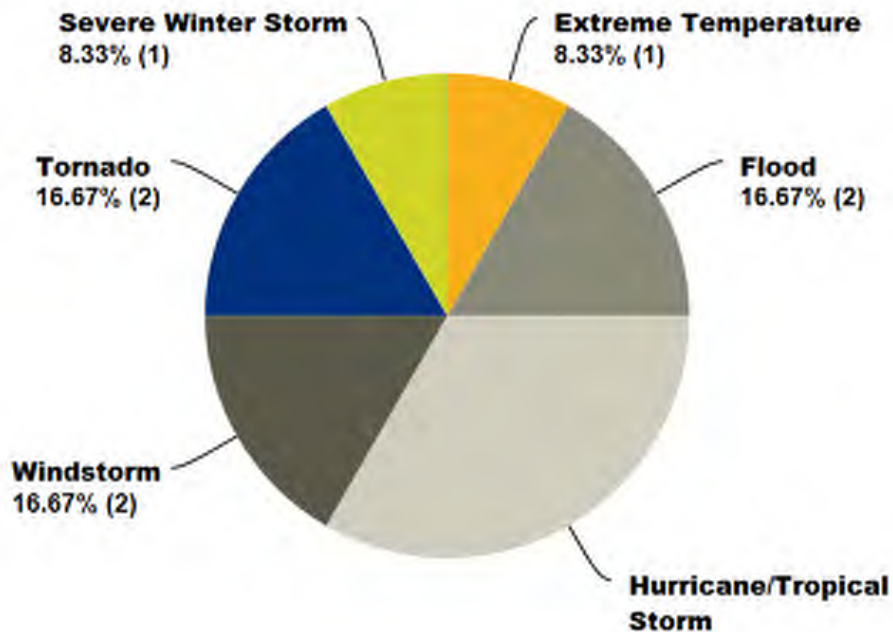


Answer Options	Response Percent	Response Count
Severe Wind	0.0%	0
Drought	0.0%	0
Extreme Temperature	0.0%	0
Flood	41.7%	5
Hailstorm	0.0%	0
Hurricane/Tropical Storm	41.7%	5
Windstorm	16.7%	2
Lightning	0.0%	0
Tornado	0.0%	0
Wildfire	0.0%	0
Severe Winter Storm	0.0%	0
Earthquake	0.0%	0

Question #5

Please select the natural hazard you think represents the **SECOND HIGHEST** threat to your neighborhood

Answered: 12 Skipped: 0

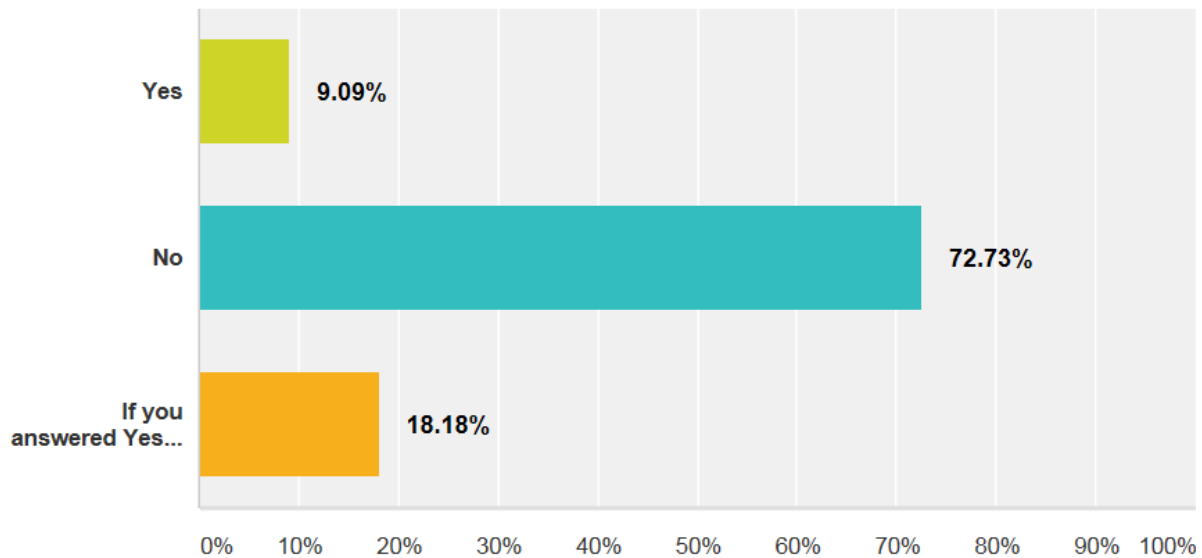


Answer Options	Response Percent	Response Count
Severe Wind	0.0%	0
Drought	0.0%	0
Extreme Temperature	8.3%	1
Flood	16.7%	2
Hailstorm	0.0%	0
Hurricane/Tropical Storm	33.3%	4
Windstorm	16.7%	2
Lightning	0.0%	0
Tornado	16.7%	2
Wildfire	0.0%	0
Severe Winter Storm	8.3%	1
Earthquake	0.0%	0

## Question #6

**Is there another natural hazard not listed above that you think represents a wide-scale threat to your neighborhood? If yes, please explain:**

Answered: 11 Skipped: 1



Answer Options	Response Percent	Response Count
Yes	9.1%	1
No	72.7%	8
If you answered Yes, please describe.	18.2%	2

If yes, please explain:

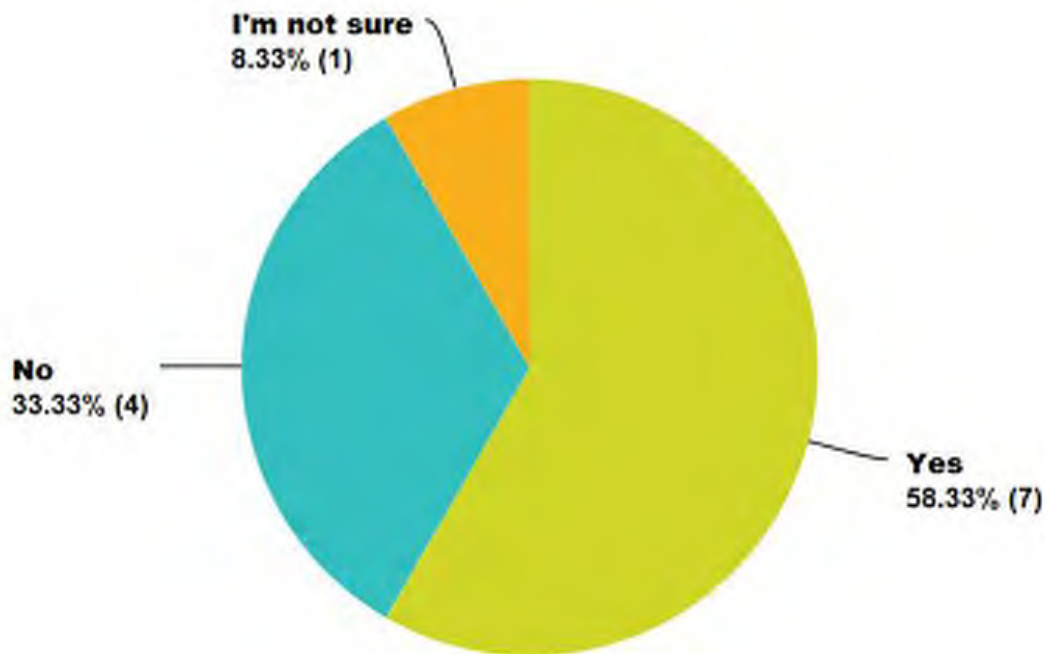
Number	If you answered Yes, please describe.
1	Brush fires no hydrant
2	Water contamination My lack of proper drainage

## Question #7

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### Is your home located in a floodplain?

Answered: 12 Skipped: 0



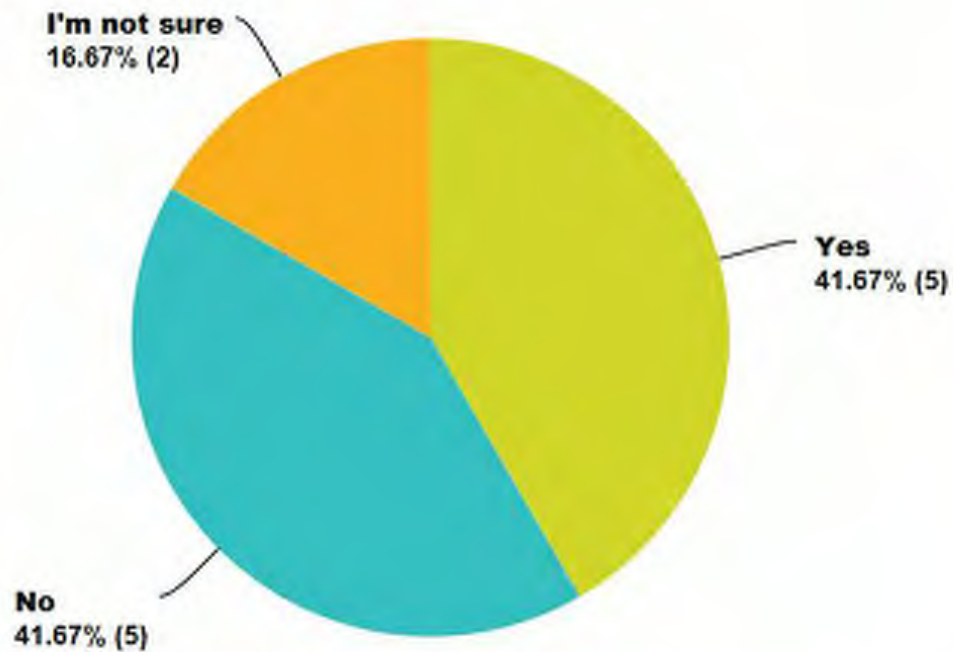
Answer Options	Response Percent	Response Count
Yes	58.3%	7
No	33.3%	4
I'm not sure	8.3%	1

## Question #8

---

### Do you have flood insurance?

Answered: 12 Skipped: 0

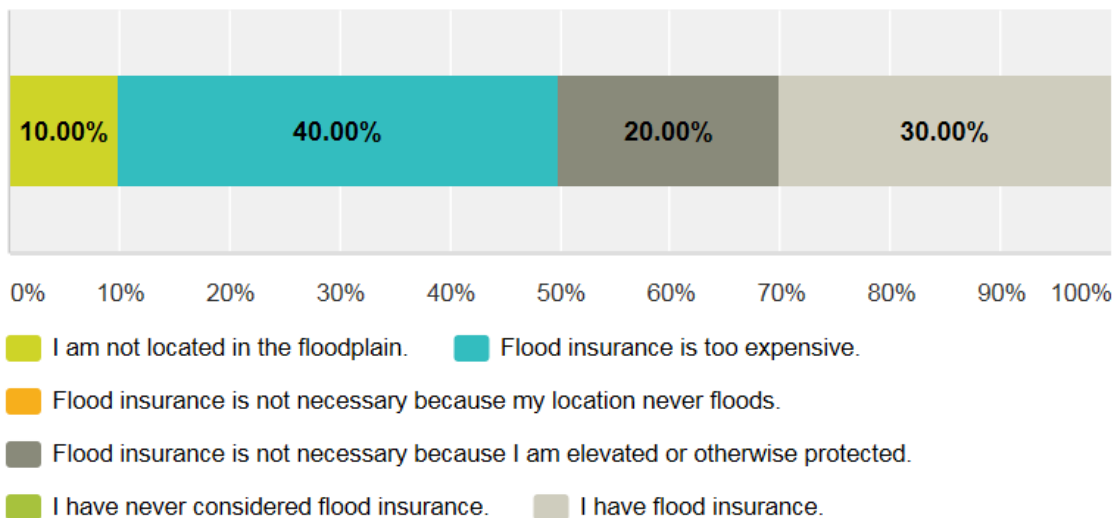


Answer Options	Response Percent	Response Count
Yes	41.7%	5
No	41.7%	5
I'm not sure	16.7%	2

## Question #9

### If you do not have flood insurance, why not?

Answered: 10 Skipped: 2



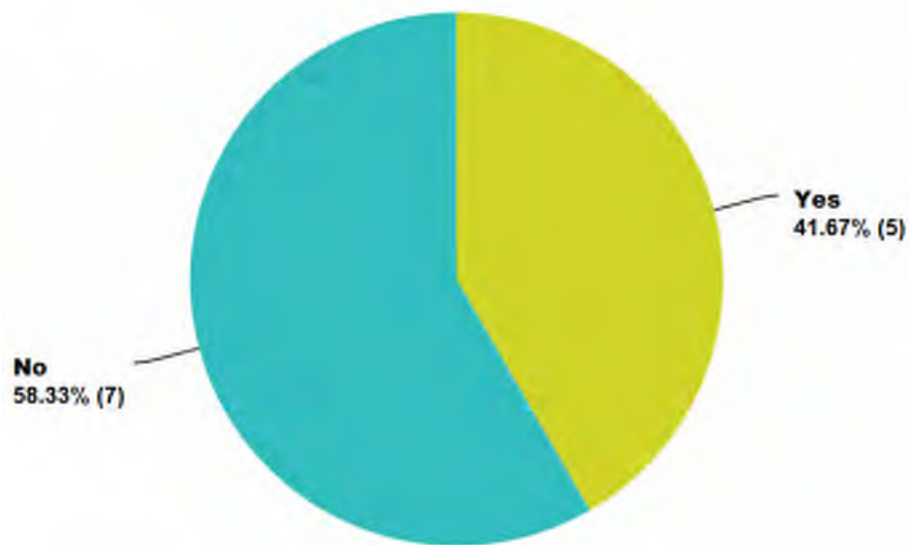
Answer Options	Response Percent	Response Count
I am not located in the floodplain.	10.0%	1
Flood insurance is too expensive.	40.0%	4
Flood insurance is not necessary because my location never floods.	0.0%	0
Flood insurance is not necessary because I am elevated or otherwise protected.	20.0%	2
I have never considered flood insurance.	0.0%	0
I have flood insurance.	30.0%	3



## Question #10

Have you taken any actions to make your home or neighborhood more resistant to natural hazards?

Answered: 12 Skipped: 0



Answer Options	Response Percent	Response Count
Yes	41.7%	5
No	58.3%	7
If you answered Yes, please describe:		2

What have you done?

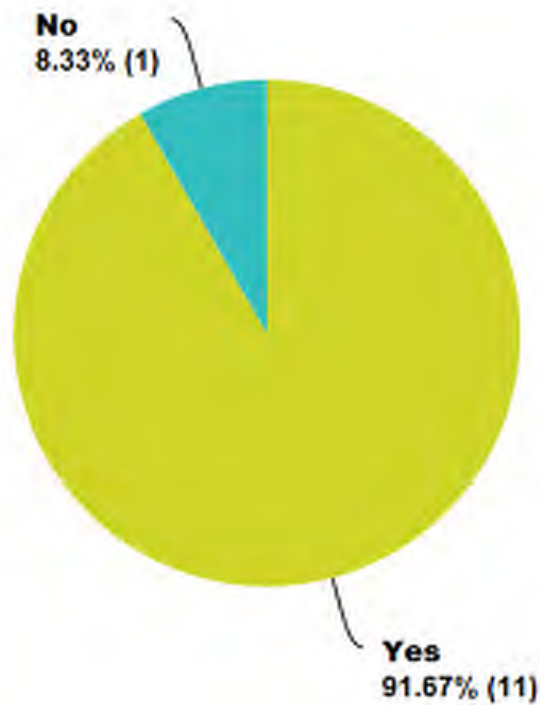
Number	If you answered Yes, please describe:
1	Windows
2	Applied for FEMA grant but was denied Grant through Nueces County That was reallocated

Question #11

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**Are you interested in making your home or neighborhood more resistant to natural hazards?**

Answered: 12 Skipped: 0

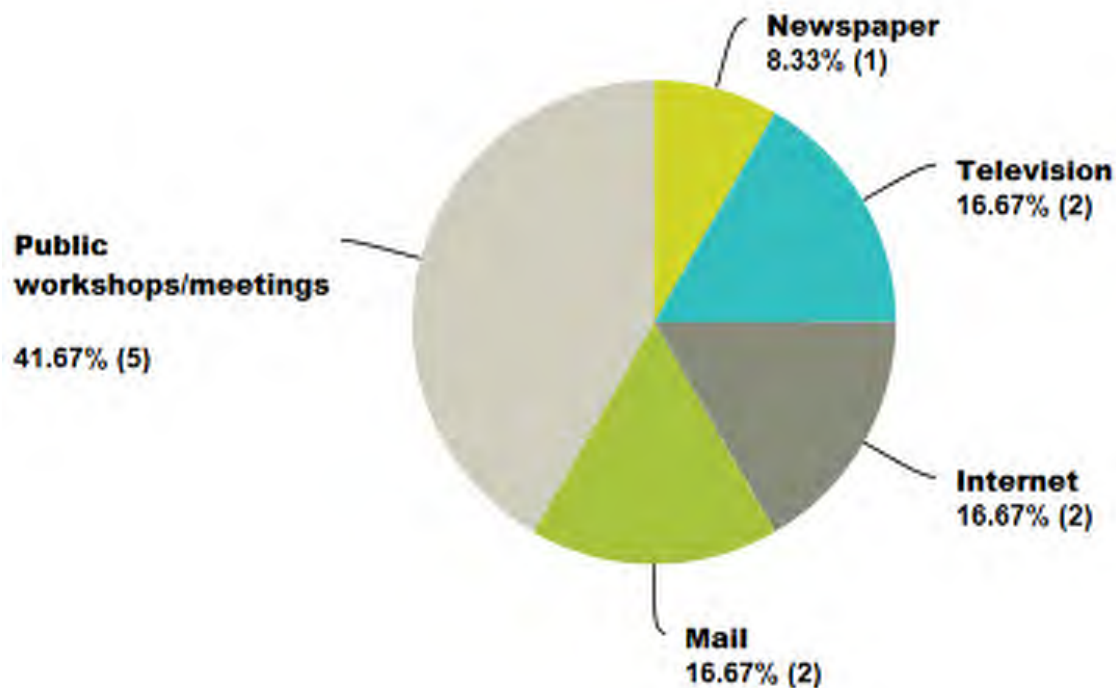


Answer Options	Response Percent	Response Count
Yes	91.7%	11
No	8.3%	1

Question #12

What is the most effective way for you to receive information about how to make your home and neighborhood more resistant to natural hazards?

Answered: 12 Skipped: 0

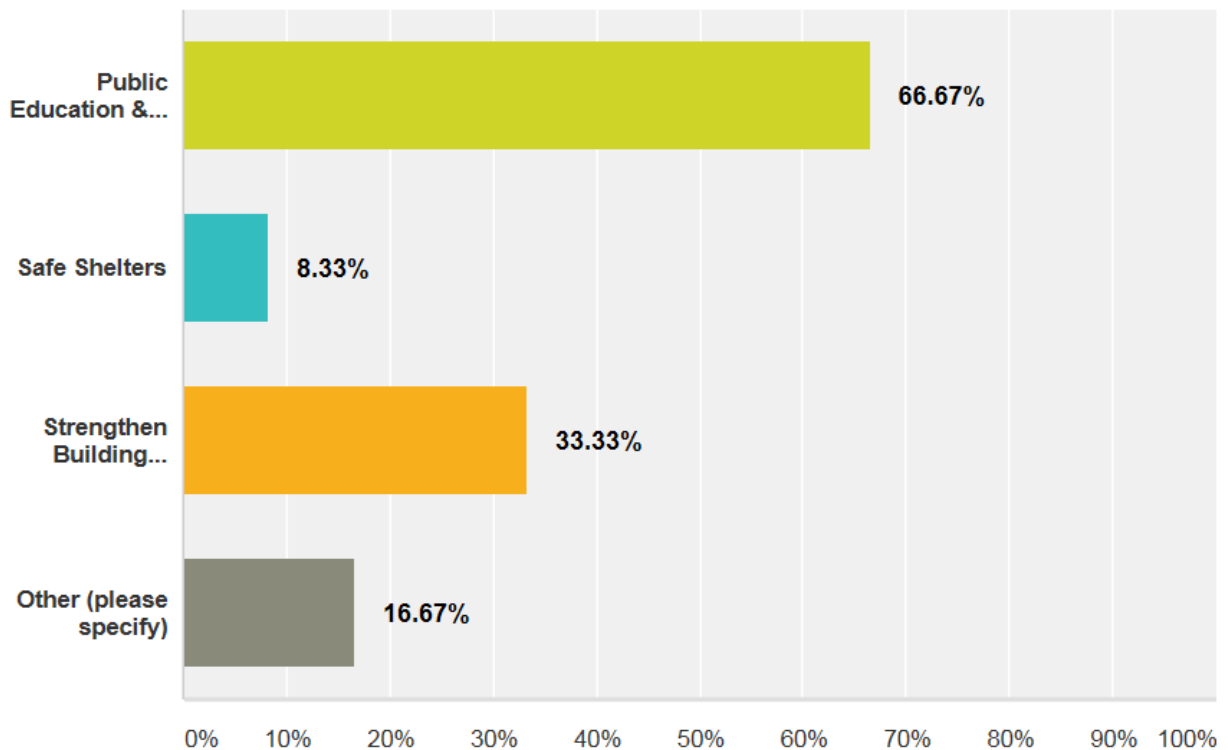


Answer Options	Response Percent	Response Count
Newspaper	8.3%	1
Television	16.7%	2
Radio	0.0%	0
Internet	16.7%	2
Mail	16.7%	2
Public workshops/meetings	41.7%	5
School meetings	0.0%	0

### Question #13

**In your opinion, what are some steps your local government could take to reduce or eliminate the risk of future natural hazard damages in your neighborhood?**

Answered: 12 Skipped: 0



Answer Options	Response Percent	Response Count
Public Education & Awareness	66.7%	8
Safe Shelters	8.3%	1
Strengthen Building Codes/Requirements	33.3%	4
Other (please specify)	16.7%	2

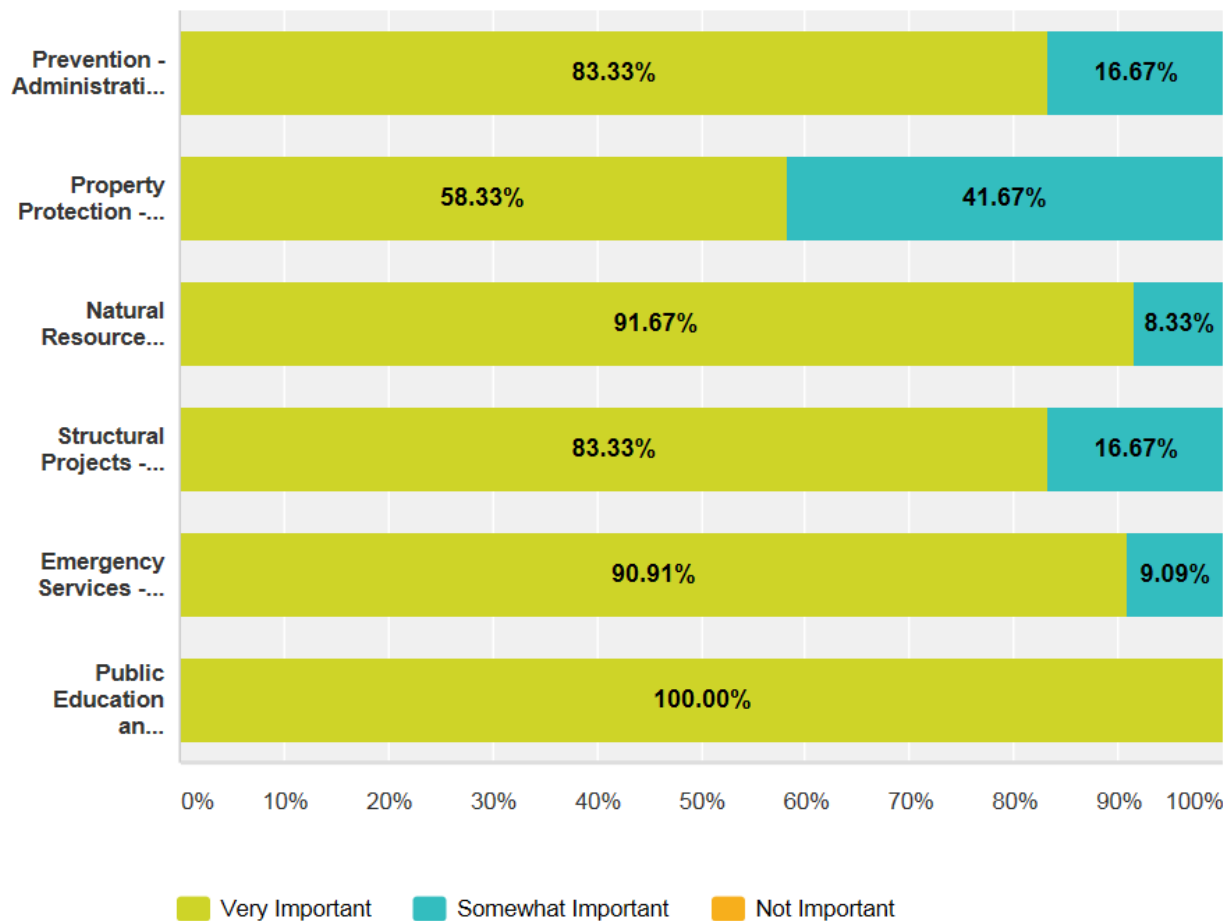
What other issues regarding the reduction of risk and loss associated with natural hazards or disasters in the community do you find important?

Number	Response Text
1	Resources available to the public
2	Citizens Corp so neighbors can help each other as resources will be difficult to reach everyone in a timely manner.
3	Having a plan in place is important
4	Awareness of the possibility
5	Public information & educational material distribution
6	Help from local government
7	Safety precautions on industrial row
8	Reduction and flood and windstorm insurance costs

Question #15

**A number of community-wide activities can reduce the risk from natural hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each one is for your community to consider pursuing.**

Answered: 12 Skipped: 0



Answer Options	Very Important	Somewhat Important	Not Important	Response Count
Prevention - Administrative or regulatory actions that influence the way land is used	10	2	0	12

developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.				
<b>Property Protection</b> - Actions that involve the modification of existing buildings to protect them from a hazard or removal from the area. Examples include acquisition, relocation, elevation and structural retrofits.	7	5	0	12
<b>Natural Resource Protection</b> - Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include floodplain protection, habitat preservation, and riparian buffers.	11	1	0	12
<b>Structural Projects</b> - Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, seawalls, detention/retention basins, channel modification, retaining walls and storm sewers.	10	2	0	12
<b>Emergency Services</b> - Actions that protect people and property during and immediately after an event. Examples include warning systems, evacuation planning, and protection of critical emergency facilities or systems.	10	1	0	11
<b>Public Education and Awareness</b> - Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, library materials and demo events.	12	0	0	12

Question #16

---

**Do you have any other comments,  
questions, or concerns?**

Answered: 4 Skipped: 8

Answer Options	Response Count
	4

Number	Response Text
1	Invite citizens to participate in exercises and drills that would impact their communities. Hands on is an efficient way to learn how to help in disasters.
2	none
3	We have limited drainage, no fire hydrants, no medical emergency clinics, no drinking water in some areas,
4	FEMA and Nueces county failed to provide assistance for the last three major disasters we had. The reason they failed to provide assistance is because we had flood and wind insurance. But the flood and wind insurance would only cover a small percentage of our loss which exceeded \$20,000 +.



Question #17

**If you would like to receive additional updates and notifications related to the multi-jurisdictional Hazard Mitigation Action Plan, please enter your email address below.**

Answered: 7   Skipped: 5

Answer Options	Response Count
	7*

\* Personal emails were omitted from these results for privacy.

## Appendix C: Meeting Documentation

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# Public Announcements

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## Nueces County Multi-Jurisdictional Hazard Mitigation Action Plan

### PUBLIC SERVICE ANNOUNCEMENT

11/19/2016

Nueces County is sponsoring the development of a **Multi-Jurisdictional Mitigation Action Plan, or Plan**. Mitigation is defined by the Federal Emergency Management Agency (FEMA) as *actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects*. The goal of the Plan is to address natural hazards that could potentially affect the county-wide area. The purpose of the mitigation plan is twofold: to protect people and structures and to minimize the costs of disaster response and recovery.

Plan participants include unincorporated Nueces County, the Cities of Agua Dulce, Bishop, Corpus Christi, Donnell, Pecosita, Port Aransas, and Robstown, as well as the Port of Corpus Christi Authority. Upon FEMA approval and Plan adoption, the County and participating jurisdictions become eligible to apply for certain FEMA grant funding under the Hazard Mitigation Assistance (HMA) program. These grant funds may be used to identify and implement mitigation projects to reduce risk from natural hazards such as flood, tornado, and wildfire.

HMA grant funding may be available for critical projects such as buyouts and structural elevation of repetitive flood loss structures, drainage projects, and hardening critical facilities to minimize future damage from natural disasters that affect the planning area. Funds from these federal grant programs may be awarded to local governments to implement mitigation projects identified as part of a FEMA-approved Mitigation Action Plan.

Nueces County has secured the services of LAN Engineering to assist in project development. LAN has professional expertise in floodplain management, stormwater engineering, grant application and management, and disaster and mitigation planning.

The hazard mitigation planning process involves multiple steps to analyze past and future hazard events that impact the area, and how these hazard risks and events affect people, buildings, and critical infrastructure. Another key component of the risk assessment will be to assess the potential future impact of hazards based upon the current and projected development trends and plans for Nueces County and participating jurisdictions.

Public participation is critical to the success of the mitigation planning process. The general public will be invited to participate in the hazard mitigation planning process from beginning to end. The County will encourage public input through meeting announcements, information disseminated on the website, social media, and through a public survey posted to the County's website. Public meetings will be used to solicit input, participation, and feedback from all interested attendees. These public meetings can help further define the hazards and actions to be taken to reduce hazard risk and protect people and property.

Nueces County will seek to ensure that the general public, businesses and other stakeholders remain aware of the planning process and are given an opportunity to participate and comment. This includes making components of the Draft plan available for public review and comment in advance of any formal

FOR IMMEDIATE RELEASE  
Contact: Janine Ellington  
LAN Engineering  
(713) 821-0264  
December 19, 2016

### **FEMA Hazard Mitigation Plan Public Meet January 4, 2017**

Nueces County will hold a public meeting on **Wednesday, January 4, 2017** to gather public input for a FEMA Mitigation Action Plan, or *Plan*. Plan participants include unincorporated Nueces County, the Cities of Agua Dulce, Bishop, Corpus Christi, Driscoll, Petronila, Port Aransas, and Robstown, as well as the Port of Corpus Christi Authority. The meeting is **from 3:00 -5:00 p.m. at Nueces County Commissioner's Court Chambers, 901 Leopard, Corpus Christi, TX 78401**. The public, area businesses and organizations located throughout the planning area are invited and encouraged to attend.

Under the Disaster Mitigation Act of 2000, the Federal Emergency Management Agency (FEMA) requires communities to develop a mitigation plan to minimize or eliminate the long-term risk to human life and property from known hazards. *Mitigation* is defined by FEMA as sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects. Hazards that may pose a risk and potentially result in a disaster include drought, flood, hurricane, tornado, wildfire, and other high hazards.

Communities with a FEMA-approved Plan are eligible for certain grant funding under the Hazard Mitigation Assistance (HMA) program to fund critical projects such as Buyouts and Structural Elevation of repetitive flood loss structures, drainage projects, and hardening critical facilities to minimize future damage from natural disasters that affect the County planning area.

The purpose of the public meeting is to provide a project overview from LAN, consultant to the project, and solicit information from citizens. Public input will help the Planning Team to identify and analyze potential hazards affecting residents and recommend possible actions to reduce their impact throughout Nueces County and the planning area.

Detailed information about the planning process can be obtained by contacting Janine Ellington, Project Manager, at (713) or [jeellington@lan-inc.com](mailto:jeellington@lan-inc.com).

FOR IMMEDIATE RELEASE  
Contact: Janine Ellington  
LAN Engineering  
(713) 821-0264  
January 3, 2017

### **FEMA Hazard Mitigation Action Plan Public Announcement & Kickoff January 4, 2017**

A public meeting on **Wednesday, January 4, 2017** to gather public input for a FEMA Mitigation Action Plan, or *Plan*. The Multi-Jurisdictional Plan participants include unincorporated areas of Nueces County, the Cities of Agua Dulce, Bishop, Corpus Christi, Driscoll, Petronila, Port Aransas, and Robstown, as well as the Port of Corpus Christi Authority. The meeting is at **3p.m. at Nueces County Commissioner's Court, 901 Leopard Street, Corpus Christi, TX 78401**. The public, area businesses and organizations located throughout the planning area are invited and encouraged to attend.

Under the Disaster Mitigation Act of 2000, the Federal Emergency Management Agency (FEMA) requires communities to develop a mitigation plan to minimize or eliminate the long-term risk to human life and property from known hazards. *Mitigation* is defined by FEMA as sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects. Hazards that may pose a risk and potentially result in a disaster include drought, flood, hurricane, tornado, wildfire, and other high hazards.

Communities with a FEMA-approved Plan are eligible for certain grant funding under the Hazard Mitigation Assistance (HMA) program to fund critical projects such as Buyouts and Structural Elevation of repetitive flood loss structures, drainage projects, and hardening critical facilities to minimize future damage from natural disasters that affect the County planning area.

The purpose of the public meeting is to provide a project overview from LAN, consultant to the project, and solicit information from citizens. Public input will help the Planning Team to identify and analyze potential hazards affecting residents and recommend possible actions to reduce their impact throughout Nueces County and the planning area.

Detailed information about the planning process can be obtained by contacting Janine Ellington, Project Manager, at (713) or [jeellington@lan-inc.com](mailto:jeellington@lan-inc.com)

# Kickoff Planning Meeting Invitation, January 4, 2017

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## NUECES COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN KICKOFF MEETING INVITE

Nueces County is sponsoring a Kickoff meeting in conjunction with the development of a Multi-Jurisdictional FEMA Mitigation Action Plan, or *Plan*. Participating project partners forming the core Planning Team include unincorporated Nueces County, the Cities of Agua Dulce, Bishop, Corpus Christi, Driscoll, Petronila, Port Aransas, and Robstown, as well as the Port of Corpus Christi Authority. The goal of the Plan is to minimize or eliminate the long-term risk to human life and property from known hazards. Upon FEMA approval of the Plan, Nueces County, and the participating entities listed above will be eligible for certain FEMA Hazard Mitigation Assistance (HMA) grant funds to implement cost-effective mitigation projects in their local jurisdiction and Nueces County. LAN Engineering, project consultant, will be facilitating the meeting.

Please make every effort to attend this important meeting. Strong leadership from Planning Team Members throughout the planning process is critical; therefore, key department personnel and community officials from both Nueces County and the participating jurisdictions are required to attend workshops, assess hazard risk, create mitigation strategies, involve the public, and adopt the local Plan.

A public meeting to provide outreach and an overview of the project to the general public will be held on:

**DATE:** Wednesday, January 4, 2017  
**TIME:** 3:00 – 5:00 p.m.  
**LOCATION:** Nueces County Commissioner's Court Chambers  
901 Leopard  
Corpus Christi, TX


If you have questions or will not be able to attend, please contact:

Janine Ellington by phone at (713) 821-0264 or by email at [jeellington@lan-inc.com](mailto:jeellington@lan-inc.com) or

Christopher Boyce by email at [Christopher.boyce@nuecesco.com](mailto:Christopher.boyce@nuecesco.com)



# Kickoff Meeting Sign-In Sheets, January 4, 2017

 Nueces County Multijurisdictional Mitigation Planning Team Kickoff Workshop, Corpus Christi, TX January 4, 2017				
Name	Title	Agency	Phone	Email
John Howard	Mayer	City of Aransas County	361-701-0007	jhoward@aransascounty.com
Sharon Bailey Lewis	ETS Specialist	City of Corpus Christi	361-406-4066	SharonLewis@corpuschristi.com
Patricia Longoria			361-244-0439	PatriciaLongoria@corpuschristi.com
Andrae Longoria			361-8443-7007	AndraeLongoria@corpuschristi.com
Chris Phelan			361-688-0649	ChrisPhelan@corpuschristi.com
Christopher Barea	Emc	Nueces County	888-0517	
Hannah Chipman	Commer. H. & L. Specialist	Nueces County	361-880-0248	HannahChipman@nuecescounty.com
Dan Kozang	CHIEF OF POLICE	ACCA	361-915-0118	Dan@accatexas.com
Seinel Carter	emad.	SOS	361-825-2877	SeinelCarter@SOS.texas.gov
Billy Delgado	PMIC	City of Corpus Christi	361-1100	Billy@corpuschristi.com
Brandi Fisher	DC	TxDOT-THRU	42-5711	brandi.fisher@txdot.org
Nicole Boyer	Planning	City of Port Aransas	361-749-4111	nboyer@cityofportaransas.com
Yvette Dadd	FPA	City of Corpus Christi	361-826-2140	YvetteDadd@corpuschristi.com
Eric Garrison	capt	Port of Corpus Christi	361-695-6955	eric.garrison@portofcorpuschristi.com
Sarah Garza	Dir of Env. & Planning	Port of Corpus Christi	361-695-6955	sarah@portofcorpuschristi.com



**Nueces County Multijurisdictional Mitigation Action Plan**  
**Kickoff Meeting, Corpus Christi, TX**  
**PUBLIC MEETING**  
**January 4, 2017**

Name			Email
Tom Tagliabue	City of Corpus Christi	361/8243850	tomtagliabue@gmail.com
Laraine Fain		254/236/3777	laraine.fain@gmail.com
Antwan Henderson		361/426/2194	ANTWANHENDERSON@MAIL.DS
Paul Alvarez Jr		361/726/8246	Paula1936@gmail.com
Paul Therman		202-730-5607	
Eric Cisneros		361-885-6196	eric@pccs.com
Yvette Dodd		361-826-3340	yvette.dodd@nccs.com
Edward Hernandez		361-387-5445	Edward.Hernandez@nccs.com
Scott Cross		361-960-6502	scott.cross@nccs.co.rr
Sharon Bailey Lewis	City	361-4066	SharonL@nccs.com
RJ Thomas	OBCC	5239447	rj@cbogea.org



# Kickoff Meeting PowerPoint Presentation, January 4, 2017

**Multi-Jurisdictional Hazard Mitigation Action Plan**  
Achieving Goals of a Multi-Jurisdictional Plan  
Partner Jurisdictions:  
Nueces County, Cities of Agua Dulce, Bishop, Corpus Christi, Driscoll, Petronilla, Port Aransas, and Robstown, & the Port of Corpus Christi Authority

**Planning Purpose**  
Under the Disaster Mitigation Act of 2000, communities are required to implement a Mitigation Action Plan (MAP) or Plan to:  
• Prevent or reduce future losses to lives and property  
• Identify cost-effective mitigation measures  
• Build partnerships by involving stakeholders and the public  
• Leverage FEMA funding

**MAP Planning Process**  
1. Community Organization  
2. Develop Mitigation Strategy  
3. Review and Adopt the Plan  
4. Build Up Planning Team  
5. Conduct a Risk Assessment  
6. Implement, Monitor, Evaluate the Plan  
7. Identify Hazards or Risks  
8. Create a Safe and Resilient Community

**Phase I - Organize**  
• **Planning Area:** Unincorporated areas Nueces County, Cities of Corpus Christi, Agua Dulce, Bishop, Corpus Christi, Driscoll, Petronilla, Port Aransas, and Robstown, & the Port of Corpus Christi Authority.  
• **Planning Team:** Key officials from each participating entity  
• **Stakeholders:** Local businesses, neighboring jurisdictions, Hospital and Utility Districts, ISD's, general public

**Phase II – Capability Assessment**  
Capability Assessment  
• Describes each community's existing authorities, policies, programs, and resources that can help accomplish hazard mitigation  
• Identify opportunities to integrate the MAP into other plans, programs, policies  
• Identify mitigation measures already in place or underway  
• Complete one Assessment per jurisdiction

**Phase III – Hazard/Risk Analysis**  
• **Identify Natural Hazards for Plan**  
• **Risk Analysis** – Profile hazards by reviewing historical occurrences, extent or magnitude, probability of future occurrences, impact on people and property. This involves inventory of assets, critical facilities, estimating losses  
• **Local reporting of disaster events** helpful to accurately analyze hazard risk

**Natural Hazards Recognized for Texas**  
• Floods  
• Hurricanes/Tropical Storms  
• Wildfire  
• Tornado  
• Drought  
• Coastal Erosion  
• Dam/Levee Failure  
• Earthquake  
• Expensive Soils  
• Extreme Heat  
• Hailstorms  
• Land Subsidence  
• Extreme Winter Storm  
• Windstorms  
• Lightning

**Other Hazards**  
**Technological**  
• Dam failure  
• Pipeline rupture  
• Hazardous materials  
**Human-caused**  
• Chemical spills  
• Cyber attack  
• Terrorism  
• Infectious disease  
**Climate Change**  
• In and of itself not a hazard but may change the characteristics of the hazards that currently affect the planning area

**Suggested Hazards to Include:**  
A community should consider those hazards with a medium to high risk that affect the planning area. Keep in mind that mitigation actions are required for each natural hazard included in the Plan.  
**High:** Floods, Hurricanes, Coastal Erosion, Windstorms  
**Medium:** Tornado, Wildfire, Extreme Heat, Land Subsidence, Drought  
**Low:** Hail, Extreme Winter Storm, Earthquake, Infectious disease

**Phase III – Mitigation Strategy**  
**Mitigation Actions/Goals**  
• Once opportunities/capabilities have been assessed, hazards analyzed, risks addressed, mitigation actions (projects) are developed to reduce the threat to known hazards. There are 3 main components - mitigation goals, mitigation actions, and an action plan for implementation. This is the heart of the Plan.  
**Types of Actions**  
• Local Plans and Regulations, Structural and Infrastructure, Natural Systems Protection, Education and Awareness

**Local Plans and Regulations**  
These include actions that pertain to government authorities, policies or codes that influence the way land and buildings are developed and built. Ex: modifying the local flood damage prevention ordinance to adopt higher regulatory standards for reducing flood risk, adopting more stringent building codes to strengthen construction against tornado or hurricane

**Structure and Infrastructure**  
These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures, as well as critical facilities or public buildings. Ex: shutters or shutter-proof glass in critical facilities to mitigate against hail or tornado (also mitigates terrorism); buyouts; improve stormwater/drainage capacity; floodproofing

<p><b>Natural Systems Protection</b></p> <p>These are actions that minimize damage and losses and also preserve or restore the functions of natural systems. Ex: sediment and erosion control or wetlands restoration projects; requiring permeable driveways and surfaces to reduce runoff and promote groundwater recharge; enhance landscaping ordinances to reduce water usage; preserve floodplains as open space</p> <p>13</p>	<p><b>Education and Awareness</b></p> <p>These are actions to inform and educate the public about hazards and potential ways to mitigate them. Ex: posting hazard maps on a website or mailing information about a hazard to property owners in a hazard-prone area; educating residents on water-saving techniques; increase awareness of extreme temperature risk and safety measures</p> <p>14</p>	<p><b>Number of Mitigation Actions</b></p> <p>Each jurisdiction must identify and analyze a comprehensive range of specific projects to reduce the impacts of the identified hazards, or vulnerabilities identified in the risk analysis</p> <ul style="list-style-type: none"> <li>General rule is two actions, or projects, per community for each identified <b>physical</b> hazard</li> <li>You may develop mitigation actions for Technological, Human-caused, and Climate Change, and non-mitigation actions for preparedness or emergency response, but these but will not be counted towards the required actions</li> <li>You may also use actions identified in the previous OERI plan if they are still viable projects</li> </ul> <p>15</p>
<p><b>Phase IV – Adoption/Implementation</b></p> <ul style="list-style-type: none"> <li>Each community/entity must adopt the Plan upon FEMA approval</li> <li>How will you implement, monitor progress, and maintain the Plan?</li> <li>How will you implement the Plan into other planning mechanisms?</li> <li>Who (department or title) will be responsible for each mitigation project?</li> <li>Reconvene Planning Team each year to determine any changes, additional mitigation actions to add</li> <li>Approved Plan may be amended anytime but must be formally updated every 5 years</li> </ul> <p>16</p>	<p><b>Hazard Mitigation Assistance (HMA) Grant Programs</b></p> <p>HMAF is triggered by a federally declared disaster declaration and assists in implementing any other hazard mitigation measures following a major disaster. Any community, state or FEMA approved LHA can apply for HMAF actions when the disaster did not occur in their community. <a href="https://www.fema.gov/hazard-mitigation-assistance-grant-programs">https://www.fema.gov/hazard-mitigation-assistance-grant-programs</a></p> <p>HMA provides funds for hazard mitigation planning and projects on an annual basis. HMA is currently open. <a href="https://www.fema.gov/hazard-mitigation-assistance-grant-programs">https://www.fema.gov/hazard-mitigation-assistance-grant-programs</a></p> <p>HMA provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP). <a href="https://www.fema.gov/hazard-mitigation-assistance-grant-programs">https://www.fema.gov/hazard-mitigation-assistance-grant-programs</a></p> <p>17</p>	<p><b>Ongoing Public Outreach</b></p> <ul style="list-style-type: none"> <li>Ensure citizens understand what the community is doing on their behalf, and provide a chance for input</li> <li>Document through meetings, social media, public notices, interactive websites how the public was invited to participate</li> <li>A public survey link is provided to Planning Team members to post to their website at: <a href="https://www.surveymonkey.com/NuecesCo">https://www.surveymonkey.com/NuecesCo</a></li> </ul> <p>18</p>
<p><b>Roles/Responsibilities</b></p> <p><b>LAN</b></p> <ul style="list-style-type: none"> <li>Provide technical assistance</li> <li>Planning guidance</li> <li>State and federal compliance</li> </ul> <p><b>Data Collection and Analysis</b></p> <ul style="list-style-type: none"> <li>Risk assessment</li> <li>Capability Assessment</li> <li>Summarize results/findings</li> </ul> <p><b>Facilitate Meetings and Webinars</b></p> <ul style="list-style-type: none"> <li>Provide handouts</li> </ul> <p><b>Prepare Draft and Final MAP</b></p> <p><b>Process FEMA approval of the Plan</b></p> <p>19</p>	<p><b>Roles/Responsibilities</b></p> <p><b>Planning Team members</b></p> <ul style="list-style-type: none"> <li>Active participation during the planning process and meet all Plan deadlines (expedited timeline)</li> <li>Provide meeting locations and attend all meetings (two planning meetings, one webinar)</li> <li>Provide available local GIS/historical data</li> <li>Actively promote public participation and outreach</li> <li>Develop mitigation actions</li> <li>Review Draft plan and provide feedback</li> <li>Plan adoption</li> <li>Plan maintenance, updates, and monitoring</li> </ul> <p>20</p>	<p><b>Next Steps</b></p> <p><b>Before you leave today:</b></p> <ul style="list-style-type: none"> <li>Confirm hazard list</li> <li>Complete Capability Assessment or take back to your community for completion by 5/14/2017</li> </ul> <p><b>Ongoing:</b></p> <ul style="list-style-type: none"> <li>Post public survey link to your website</li> <li>Continue public outreach efforts through civic meetings, public notices, other methods to engage the public</li> <li>Begin discussing mitigation actions with other key community officials, departments</li> <li>Ensure one key person attends each meeting if you are unable to attend</li> </ul> <p>21</p>
<p><b>Estimated Timeline</b></p> <p><b>January 4, 2017</b></p> <ul style="list-style-type: none"> <li>Kickoff and Public meeting</li> </ul> <p><b>March-April, 2017</b></p> <ul style="list-style-type: none"> <li>Complete draft Risk Assessment</li> <li>Planning Team Risk Assessment webinar</li> </ul> <p><b>April, 2017</b></p> <ul style="list-style-type: none"> <li>Mitigation Workshop and Public meeting</li> </ul> <p><b>May, 2017</b></p> <ul style="list-style-type: none"> <li>Submit Draft to Planning Team, TDEM</li> </ul> <p><b>August-September, 2017</b></p> <ul style="list-style-type: none"> <li>Complete TDEM edits, submit plan to FEMA for approval</li> </ul> <p>22</p>	<p><b>Contact</b></p> <p>Janine E. Ellington, CFM Project Manager <a href="mailto:jellington@lan-inc.com">jellington@lan-inc.com</a> Ph. 713-821-0264</p> <p>2025 Briarcliff Drive, Suite 400 Houston, TX 77062 www.lan-inc.com</p> <p>23</p>	<p><b>Thank You</b></p> <p>LAN   LIAISON AND NUCES COUNTY 2025 Briarcliff Drive, Suite 400 Houston, TX 77062 www.lan-inc.com</p> <p>24</p>





### Phase III – Hazard/Risk Analysis

- **Identify Natural Hazards for Plan**
- **Risk Analysis** – Profile hazards by reviewing historical occurrences, extent or magnitude, probability of future occurrences, impact on people and property. This involves inventory of assets, critical facilities, estimating losses
- **Local reporting of disaster events** helpful to accurately analyze hazard risk

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### Natural Hazards Recognized for Texas

- Floods
- Hurricanes/Tropical Storms
- Wildfire
- Tornado
- Drought
- Coastal Erosion
- Dam/Levee Failure
- Earthquake
- Expansive Soils
- Extreme Heat
- Hailstorms
- Land Subsidence
- Extreme Winter Storm
- Windstorms
- Lightning

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### Other Hazards

- Technological**
  - Dam failure
  - Pipeline rupture
  - Hazardous materials
- Human-caused**
  - Chemical spills
  - Cyber attack
  - Terrorism
  - Infectious disease
- Climate Change**
  - In and of itself not a hazard but may change the characteristics of the hazards that currently affect the planning area

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### Phase IV – Mitigation Strategy

#### Mitigation Actions/Goals

- Once opportunities/abilities have been assessed, hazards analyzed, risks addressed, mitigation actions (projects) are developed to reduce the threat to known hazards. There are 3 main components – mitigation goals, mitigation actions, and an action plan for implementation. This is the heart of the Plan

#### Types of Actions

- Local Plans and Regulations, Structural and Infrastructure, Natural Systems Protection, Education and Awareness

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### Number of Mitigation Actions

Each jurisdiction must identify and analyze a comprehensive range of specific projects to reduce the impacts of the identified hazards, or vulnerabilities identified in the risk analysis

- General rule is two actions, or projects, per community for each identified **natural** hazard
- You may develop mitigation actions for Technological, Human-caused, and Climate Change, and non-mitigation actions for preparedness or emergency response, but these but will not be counted towards the required actions
- You may also use actions identified in the previous plan if they are still viable projects

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### Phase V – Adoption/Implementation

- Each community/entity must adopt the Plan upon FEMA approval
- How will you implement, monitor progress, and maintain the Plan?
- How will you implement the Plan into other planning mechanisms?
- Who (department or title) will be responsible for each mitigation project?
- Reconvene Planning Team each year to determine any changes, additional mitigation actions to add
- Approved Plan may be amended anytime but must be formally updated every 5 years

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### Ongoing Public Outreach

- Ensure citizens understand what the community is doing on their behalf, and provide a chance for input
- Document through meetings, social media, public notices, interactive websites how the public was invited to participate

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### Roles/Responsibilities

#### Planning Team members

- Active participation during the planning process and meet all Plan deadlines (expedited timeline)
- Provide meeting locations and attend all meetings (two planning meetings, one webinar)
- Provide available local (dis)historical data
- Actively promote public participation and outreach
- Develop mitigation actions
- Review Draft plan and provide feedback
- Plan adoption
- Plan maintenance, updates, and monitoring

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### Contact

Janine E. Ellington, CFM  
Project Manager  
[jeellington@lan-inc.com](mailto:jeellington@lan-inc.com)  
Ph. 713-821-0254

2425 Broadway Drive, Suite 400  
Houston, TX 77002  
[www.lan-inc.com](http://www.lan-inc.com)

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# Thank You

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A LANCOR COMPANY

## Webinar Meeting, March 3, 2017

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Participant	Community
Danielle Hale	PCCA
Tak Makino	LAN
Christopher Boyce	Nueces County
Janine Ellington	LAN
Scott Harris	LAN
Tom Mylett	PCCA
Yvette Dodd	Corpus Christi
Rick Adams	Port Aransas
Ricardo Gonzalez	Robstown

# HMAP Natural Hazards Ranking Sheet

## Nueces County Multi-Jurisdictional Hazard Mitigation Action Plan Natural Hazards Ranking Sheet

**NOTE:** This is not a technical exercise. Results will be compiled and included in the Risk Assessment Overview of the Plan. The hazard ranking is based on your experience as a community official or resident of the Nueces County area. Place a mark in the appropriate column and row indicating level of risk. Consider frequency of occurrence of each hazard as well as the potential impact when ranking the hazards.

Hazard	Not Applicable (N/A)	Low (L)	Moderate (M)	High (H)
Floods				
Hurricane/Tropical Storm				
Wildfire				
Tornado				
Drought				
Coastal Erosion				
Dam/Levee Failure				
Earthquakes				
Expansive Soils				
Extreme Heat				
Hailstorm				
Land Subsidence				
Severe Winter Storm				
Windstorms				
Lightening				

Hazard Ranking

January 2017

## Mitigation Action Workshop, March 29, 2017

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Participant	Community
Ricardo Gonzalez	Robstown
John Montalvo	LAN
Laura Casset	LAN
Danielle Hale	PCCA
Christopher Boyce	Nueces County
Tak Makino	LAN
Yvette Dodd	Corpus Christi
Scott Harris	LAN
Nicole Boyer	Port Aransas
Janine Ellington	LAN
Billy Delgado	Corpus Christi
Rick Adams	Port Aransas

## Appendix D: Critical Facilities

NUECES COUNTY CRITICAL FACILITIES		
Type	Title	Address
Emergency Operation Center(s)	NUECES COUNTY OFFICE OF EMERGENCY MANAGEMENT	901 LEOPARD ST. CORPUS CHRISTI, TEXAS 78401
EMS Station	NUECES COUNTY EMERGENCY SERVICES DISTRICT 6	
Designated Shelters / Evacuation Centers	ROBSTOWN RICHARD M. BORCHARD REGIONAL FAIRGROUNDS	1213 TERRY SHAMSIE BLVD. ROBSTOWN, TEXAS 78380
Hospital(s)	NUECES COUNTY HALO FLIGHT	1843 FARM TO MARKET ROAD 665, CORPUS CHRISTI 78411
County Courthouse	NUECES COUNTY COURTHOUSE	901 LEOPARD ST. CORPUS CHRISTI, TEXAS 78401
Fire Stations	NUECES COUNTY EMERGENCY SERVICES DISTRICT 1 BANQUETTE FIRE STATION/ NC EMERGENCY SERVICE DISTRICT #4 BLUNTZER FIRE STATION/ NC EMERGENCY SERVICE DISTRICT #4 ANNVILLE FIRE STATION #2/ NC ESD #1 ANNVILLE FIRE STATION #3/ NC ESD #1	5241 CO RD 73 ROBSTOWN, TEXAS 78380 SH44 AND 2ND ST. BANQUETTE, TEXAS 78339 666 AND FM 624, NUECES COUNTY, TEXAS 78380 5242 CR 73, ROBSTOWN, TEXAS 78380 3879 CR 61, ROBSTOWN, TEXAS 78380
Airport	BISHOP MUNICIPAL AIRPORT NUECES COUNTY AIRPORT	CR 77 AND FM 3354, BISHOP, TEXAS 78343 3983 WINGS DR, ROBSTOWN, TX 78380
Community Centers	BANQUETTE COMMUNITY CENTER	4359 4TH ST. BANQUETTE, TEXAS 78339
Schools	LONDON ISD LONDON H S LONDON ISD LONDON EL AGUA DULCE INDEPENDENT SCHOOL DISTRICT-SCHOOL BISHOP INDEPENDENT SCHOOL DISTRICT-SCHOOL CAMPUS DRISCOLL INDEPENDENT SCHOOL DISTRICT-SCHOOL CAMPUS BISHOP CONSOLIDATED INDEPENDENT SCHOOL DISTRICT-CAMPUS BANQUETTE INDEPENDENT SCHOOL DISTRICT- SCHOOL CAMPUS	1306 FM 43 CORPUS CHRISTI, TEXAS 78415 1306 FM 43 CORPUS CHRISTI, TEXAS 78415 1 LONGHORN DR. AGUA DULCE, TEXAS 78330 719 E. 6TH ST. BISHOP, TEXAS 78343 410 WEST AVE. DRISCOLL, TEXAS 78351 2391 COUNTY ROAD 47, PETRONILA, TEXAS 78380 4339 4TH ST. BANQUETTE, TEXAS 78339

CITY OF AGUA DULCE CRITICAL FACILITIES		
Type	Title	Address
Designated Shelters / Evacuation Centers	ROBSTOWN RICHARD M. BORCHARD REGIONAL FAIRGROUNDS	1213 TERRY SHAMSIE BLVD. ROBSTOWN, TEXAS 78380
Police Station(s)	AGUA DULCE CONSTABLE PCT. 5/ COUNTY JUSTICE OF THE PEACE	1514 2ND ST. AGUA DULCE, TEXAS 78330
City Hall	AGUA DULCE CITY HALL	1514 2ND ST. AGUA DULCE, TEXAS 78330
Fire Stations	AGUA DULCE FIRE STATION/ NC EMERGENCY SERVICE	1510 2ND ST. AGUA DULCE, TEXAS 78330
Community Centers	AGUA DULCE COMMUNITY CENTER	1513 2ND ST. AGUA DULCE, TEXAS 78330
Wastewater Treatment Plant	CITY OF AGUA DULCE WASTEWATER TREATMENT PLANT	
Schools	AGUA DULCE INDEPENDENT SCHOOL DISTRICT-SCHOOL	1 LONGHORN DR. AGUA DULCE, TEXAS 78330
County Building	CONSTABLE 5	1514 2ND ST AGUA DULCE, TEXAS 78410



CITY OF BISHOP CRITICAL FACILITIES		
Type	Title	Address
Police Station(s)	BISHOP POLICE DEPARTMENT	115 S. ASH. BISHOP, TEXAS 78343
City Hall	BISHOP CITY HALL	203 E. MAIN ST. BISHOP, TEXAS 78343
Fire Stations	BISHOP FIRE STATION/ NC EMERGENCY SERVICE DISTRICT #3	2015 SOUTH PACIFIC, BISHOP, TEXAS 78343
Airport	BISHOP MUNICIPAL AIRPORT	CR 77 AND FM 3354, BISHOP, TEXAS 78343
Community Centers	BISHOP COMMUNITY CENTER	102 W JOYCE ST. BISHOP, TEXAS 78343
Wastewater Treatment Plant	CITY OF BISHOP WASTEWATER TREATMENT PLANT	US HWY 77 Bypass
Schools	BISHOP INDEPENDENT SCHOOL DISTRICT-SCHOOL CAMPUS	719 E. 6TH ST. BISHOP, TEXAS 78343
	BISHOP CISD BISHOP EL	200 S FIR BISHOP, Texas 78343
	BISHOP CISD BISHOP H S	100 BADGER LN BISHOP, Texas 78343
	BISHOP CISD BISHOP PRI	705 W MAIN ST BISHOP, Texas 78343
	BISHOP CISD LILLION E LUEHRS J H	717 E SIXTH ST BISHOP, Texas 78343

CITY OF CORPUS CHRISTI CRITICAL FACILITIES		
Type	Title	Address
Emergency Operation Center(s)	Nueces County Emergency Operations Center	901 LEOPARD STREET CORPUS CHRISTI, TEXAS 78401-3606
Designated Shelters / Evacuation Centers	Shelter agreements are not for shelter in place; they are used post disaster and can be an area of last refuge if needed. Shelter agreements include the following ISD's: CCISD, Calallen, Tuloso Midway, Flour Bluff and West Oso	
	CALALLEN HIGH SCHOOL	4001 WILDCAT DRIVE CORPUS CHRISTI, TX 78410
	DEL MAR COLLEGE	101 BALDWIN, COLES BUILDING, CORPUS CHRISTI, Texas 78404
	TULOSO MIDWAY HIGH SCHOOL	2653 MCKINZIE CORPUS CHRISTI, TX 78410
	TULOSO MIDWAY	3125 DEER RUN CORPUS CHRISTI, TX 78410
County Building	CONSTABLE 2	10110 COMPTON RD CORPUS CHRISTI, TX 78418
	MCKINZIE JAIL ANNEX	745 N PADRE ISLAND DR CORPUS CHRISTI, TEXAS 78406
	RECORDS MANAGEMENT	611 PALM ST CORPUS CHRISTI, TEXAS 78408
	BEHAVIORAL HEALTH CENTER	1630 BROWNLEE BLVD CORPUS CHRISTI , TX 78404
	CITY/COUNTY PUBLIC HEALTH	1702 HORNE RD CORPUS CHRISTI, TX 78416
	MEDICAL EXAMINER	2610 HOSPITAL BLVD CORPUS CHRISTI, TX 78405
	CENTRAL GARAGE	201 CORN PRODUCTS RD CORPUS CHRISTI, TX 78409
Community Center	HILLTOP COMMUNITY CENTER	11425 LEOPARD ST CORPUS CHRISTI, TX 78410
Hospital(s)	BAYVIEW BEHAVIORAL HOSPITAL, A CAMPUS OF CORPUS CHRISTI MEDICAL	6629 WOOLRIDGE ROAD CORPUS CHRIST, TEXAS 78414
	CHRISTUS SPOHN HOSPITAL CORPUS CHRISTI	2606 HOSPITAL BOULEVARD CORPUS CHRISTI, TEXAS 784051818
	CHRISTUS SPOHN HOSPITAL CORPUS CHRISTI SHORELINE	600 ELIZABETH STREET CORPUS CHRISTI, TEXAS 75038
	CHRISTUS SPOHN HOSPITAL CORPUS CHRISTI SOUTH	5950 SARATOGA BOULEVARD CORPUS CHRISTI, TEXAS 78404
	CORPUS CHRISTI REHABILITATION HOSPITAL	5727 ESPLANADE DRIVE CORPUS CHRISTI, TEXAS 78414
	DRISCOLL CHILDREN S HOSPITAL	3533 SOUTH ALAMEDA CORPUS CHRISTI, TEXAS 78411
	DUBUIS HOSPITAL OF CORPUS CHRISTI	600 ELIZABETH STREET 3RD FLOOR CORPUS CHRISTI, TEXAS 75038.

CITY OF CORPUS CHRISTI CRITICAL FACILITIES (CONT.)		
Type	Title	Address
Hospital(s) (cont.)	POST ACUTE MEDICAL SPECIALTY HOSPITAL OF CORPUS CHRISTI	6226 SARATOGA BOULEVARD CORPUS CHRISTI, TEXAS 78414-3421
	SOUTH TEXAS SURGICAL HOSPITAL	6130 PARKWAY DRIVE CORPUS CHRISTI, TEXAS 78413
	THE CORPUS CHRISTI MEDICAL CENTER - BAY AREA	7101 SOUTH PADRE ISLAND DRIVE CORPUS CHRISTI, TEXAS 78412-4913
	THE CORPUS CHRISTI MEDICAL CENTER - DOCTORS REGIONAL	3315 SOUTH ALAMEDA CORPUS CHRISTI, TEXAS 78411-1820
	THE CORPUS CHRISTI MEDICAL CENTER - NORTHWEST	13725 NORTHWEST BLVD CORPUS CHRISTI, TEXAS 78410
	THE CORPUS CHRISTI MEDICAL CENTER - THE HEART HOSPITAL	7002 WILLIAMS DRIVE CORPUS CHRISTI, TEXAS 78412-4912
City Hall	CITY OF CORPUS CHRISTI	1201 LEOPARD STREET CORPUS CHRISTI, TX 78401
Fire Stations	FIRE STATION 1	514 BELDEN ST CORPUS CHRISTI, TX 78401
	FIRE STATION 2	13421 LEOPARD ST. CORPUS CHRISTI, TX 78410
	FIRE STATION 3	1401 MORGAN AVENUE CORPUS CHRISTI, TX 78404
	FIRE STATION 4	2338 RODD FIELD RD CORPUS CHRISTI, TX 78414
	FIRE STATION 5	2406 LEOPARD STREET, STE 200 CORPUS CHRISTI, TX 78408
	FIRE STATION 6	6713 WEBER RD CORPUS CHRISTI, TX 78413
	FIRE STATION 7	3750 S STAPLES ST. CORPUS CHRISTI, TX 78411
	FIRE STATION 8	4645 KOSTORYZ RD. CORPUS CHRISTI, TX 78415
	FIRE STATION 9	501 NAVIGATION BLVD. CORPUS CHRISTI, TX 78408
	FIRE STATION 10	1550 HORNE RD. CORPUS CHRISTI, TX 78416
	FIRE STATION 11	910 AIRLINE RD. CORPUS CHRISTI, TX 78412
	FIRE STATION 12	2120 RAND MORGAN RD. CORPUS CHRISTI, TX 78410
	FIRE STATION 13	1802 WALDRON RD. CORPUS CHRISTI, TX 78418
	FIRE STATION 14	5901 S STAPLES ST. CORPUS CHRISTI, TX 78413

CITY OF CORPUS CHRISTI CRITICAL FACILITIES (CONT.)		
Type	Title	Address
Fire Stations (cont.)	FIRE STATION 15	14202 COMMODORE ST. CORPUS CHRISTI, TX 78418
	FIRE STATION 16	8185 TEXAS 361 CORPUS CHRISTI, TX 78373
	FIRE STATION 17	6869 YORKTOWN CORPUS CHRISTI, TX 78414
	ANNAVILLE FIRE DEPARTMENT	11551 LEOPARD ST CORPUS CHRISTI, TEXAS 78410
	NUECES COUNTY EMERGENCY SERVICES DISTRICT 2	337 YORKTOWN BLVD CORPUS CHRISTI, TEXAS 78418
Water Treatment Plant	O. N. STEVENS WATER FILTRATION PLANT	13014 HEARN RD CORPUS CHRISTI, TEXAS 78410-4412
	ALLISON WASTEWATER TREATMENT PLANT	4001 ALLISON DR CORPUS CHRISTI, TEXAS 78410
	BROADWAY WASTEWATER TREATMENT PLANT	1402 W BROADWAY ST CORPUS CHRISTI, TEXAS 78401
	GREENWOOD WASTEWATER TREATMENT PLANT	6541 GREENWOOD DR CORPUS CHRISTI, TEXAS 78415
	LAGUNA WASTEWATER TREATMENT PLANT	201 JESTER ST CORPUS CHRISTI, TEXAS 78469
	OSO PLANT WASTEWATER TREATMENT PLANT	501 NILE DR CORPUS CHRISTI, TEXAS 78412
	WHITECAP WASTEWATER TREATMENT PLANT	13409 WHITECAP BLVD CORPUS CHRISTI, TEXAS 78469
Power Generating Stations	Barney M. Davis Energy Center	4301 WALDRON RD, CORPUS CHRISTI, TX 78418
Police Station(s)	POLICE STATION	321 JOHN SARTAIN CORPUS CHRISTI, TX 78401
	CALLEN POLICE SUBSTAION	1925 TULOSO RD, CORPUS CHRISTI, TX 78410
Schools	CORPUS CHRISTI ISD ADKINS MIDDLE	2402 ENNIS JOSLIN RD CORPUS CHRISTI, TEXAS 78414
	CORPUS CHRISTI ISD ALLEN EL	1414 18TH ST CORPUS CHRISTI, TEXAS 78404
	CORPUS CHRISTI ISD BAKER MIDDLE	3445 PECAN CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD BARNES EL	2829 OSO PKWY CORPUS CHRISTI, TEXAS 78414
Schools (cont.)	CORPUS CHRISTI ISD BROWNE MIDDLE	4301 SCHANEN BLVD CORPUS CHRISTI, TEXAS 78413
	CORPUS CHRISTI ISD CALK EL	4621 MARIE CORPUS CHRISTI, TEXAS 78411

CITY OF CORPUS CHRISTI CRITICAL FACILITIES (CONT.)		
Type	Title	Address
Schools (cont.)	CORPUS CHRISTI ISD CARROLL H S	5301 WEBER RD CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD CLUB ESTATES	5222 MERGANSER CORPUS CHRISTI, TEXAS 78413
	CORPUS CHRISTI ISD COLES H S AND EDUCATIONAL CENTER	924 WINNEBAGO CORPUS CHRISTI, TEXAS 78401
	CORPUS CHRISTI ISD COLLEGIATE H S	101 BALDWIN, COLES BUILDING, ROOM 201 CORPUS CHRISTI, TEXAS 78404
	CORPUS CHRISTI ISD CROCKETT EL	2625 BELTON ST CORPUS CHRISTI, TEXAS 78416
	CORPUS CHRISTI ISD CULLEN MIDDLE	5225 GREELY CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD CUNNINGHAM MIDDLE	4321 PRESCOTT CORPUS CHRISTI, TEXAS 78416
	CORPUS CHRISTI ISD DAWSON EL	6821 SANDERS CORPUS CHRISTI, TEXAS 78413
	CORPUS CHRISTI ISD DRISCOLL MIDDLE	3501 KENWOOD CORPUS CHRISTI, TEXAS 78408
	CORPUS CHRISTI ISD EARLY CHILDHOOD DEVELOPMENT CTR	6300 OCEAN DR CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD EVANS SES	1315 COMANCHE CORPUS CHRISTI, TEXAS 78401
	CORPUS CHRISTI ISD FANNIN EL	2730 GOLLIHAR CORPUS CHRISTI, TEXAS 78415
	CORPUS CHRISTI ISD FAYE WEBB EL	6953 BOARDWALK CORPUS CHRISTI, TEXAS 78414
	CORPUS CHRISTI ISD GALVAN EL	3126 MASTERSON CORPUS CHRISTI, TEXAS 78415
	CORPUS CHRISTI ISD GARCIA EL	4401 GREENWOOD CORPUS CHRISTI, TEXAS 78416
	CORPUS CHRISTI ISD GIBSON EL	5723 HAMPSHIRE CORPUS CHRISTI, TEXAS 78408
	CORPUS CHRISTI ISD GRANT MIDDLE	4350 AARON DR CORPUS CHRISTI, TEXAS 78413
	CORPUS CHRISTI ISD HAAS MIDDLE	6630 MCARDLE RD CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD HAMLIN MIDDLE	3900 HAMLIN DR CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD HAROLD T BRANCH ACADEMY FOR CAREER & TECHN	3902 MORGAN AVE CORPUS CHRISTI, TEXAS 78405
	CORPUS CHRISTI ISD HICKS EL	3602 MCARDLE CORPUS CHRISTI, TEXAS 78415

CITY OF CORPUS CHRISTI CRITICAL FACILITIES (CONT.)		
Type	Title	Address
Schools (cont.)	CORPUS CHRISTI ISD HOUSTON EL	363 NORTON ST CORPUS CHRISTI, TEXAS 78415
	CORPUS CHRISTI ISD JONES EL	7533 LIPES CORPUS CHRISTI, TEXAS 78413
	CORPUS CHRISTI ISD KAFFIE MIDDLE	5922 BROCKHAMPTON CORPUS CHRISTI, TEXAS 78414
	CORPUS CHRISTI ISD KING H S	5225 GOLLIHAR RD CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD KOLDA EL	3730 RODD FIELD RD CORPUS CHRISTI, TEXAS 78414
	CORPUS CHRISTI ISD KOSTORYZ EL	3602 PANAMA CORPUS CHRISTI, TEXAS 78415
	CORPUS CHRISTI ISD LOS ENCINOS SES	1826 FRIO CORPUS CHRISTI, TEXAS 78417
	CORPUS CHRISTI ISD MARTIN MIDDLE	3502 GREENWOOD CORPUS CHRISTI, TEXAS 78416
	CORPUS CHRISTI ISD MARY GRETT SCHOOL	4402 CASTENON CORPUS CHRISTI, TEXAS 78416
	CORPUS CHRISTI ISD MARY HELEN BERLANGA EL	4120 CARROLL LN CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD MEADOWBROOK EL	901 MEADOWBROOK CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD MENDER EL	2401 S ALAMEDA CORPUS CHRISTI, TEXAS 78404
	CORPUS CHRISTI ISD MIRELES EL	7658 CIMARRON CORPUS CHRISTI, TEXAS 78414
	CORPUS CHRISTI ISD MONTCLAIR EL	5241 KENTNER CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD MOODY H S	1818 TROJAN DR CORPUS CHRISTI, TEXAS 78416
	CORPUS CHRISTI ISD MOORE EL	6121 DURANT CORPUS CHRISTI, TEXAS 78414
	CORPUS CHRISTI ISD OAK PARK SPECIAL EMPHASIS SCHOOL	3801 LEOPARD CORPUS CHRISTI, TEXAS 78408
	CORPUS CHRISTI ISD RAY H S	1002 TEXAN TRL CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD ROY MILLER H S AND METRO SCHOOL OF DESIGN	1 BATTLIN BUC BLVD CORPUS CHRISTI, TEXAS 78408
	CORPUS CHRISTI ISD SANDERS EL	4102 REPUBLIC CORPUS CHRISTI, TEXAS 78413
	CORPUS CHRISTI ISD SCHANEN ESTATES EL	5717 KILLARMET CORPUS CHRISTI, TEXAS 78413

CITY OF CORPUS CHRISTI CRITICAL FACILITIES (CONT.)		
Type	Title	Address
Schools (cont.)	CORPUS CHRISTI ISD SHAW SES	2920 SOLEDAD CORPUS CHRISTI, TEXAS 78405
	CORPUS CHRISTI ISD SMITH EL	6902 WILLIAMS CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD SOUTH PARK MIDDLE	3001 MCARDLE CORPUS CHRISTI, TEXAS 78415
	CORPUS CHRISTI ISD TRAVIS EL	3210 CHURCHILL DR CORPUS CHRISTI, TEXAS 78415
	CORPUS CHRISTI ISD VETERANS MEMORIAL H S	3750 CIMMARRON BLVD CORPUS CHRISTI, TEXAS 78414
	CORPUS CHRISTI ISD WILSON EL	3925 FT WORTH CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD WINDSOR PARK G/T	4525 S ALAMEDA CORPUS CHRISTI, TEXAS 78412
	CORPUS CHRISTI ISD WOODLAWN EL	1110 WOODLAWN CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD WYNN SEALE METROPOLITAN SCHOOL OF DESIGN	1707 AYERS CORPUS CHRISTI, TEXAS 78404
	CORPUS CHRISTI ISD YEAGER EL	5414 TRIPOLI CORPUS CHRISTI, TEXAS 78411
	CORPUS CHRISTI ISD ZAVALA EL	3125 RUTH CORPUS CHRISTI, TEXAS 78405
	CORPUS CHRISTI MONTESSORI SCHOOL	822 AYERS ST CORPUS CHRISTI, TEXAS 78404
	TULOSO MIDWAY HIGH SCHOOL	2653 MCKINZIE CORPUS CHRISTI, TX 78410
	TULOSO MIDWAY MIDDLE SCH	9768 LA BRANCH CORPUS CHRISTI, TX 78410
	TULSO MIDWAY INTERMEDIATE SCHOOL	1921 OVERLAND TRAIL CORPUS CHRISTI, TX 78410
	TULOSO MIDWAY PRIMARY SCHOOL	3125 DEER RUN CORPUS CHRISTI, TX 78410
	CALLEN HIGH SCHOOL	4001 WILDCAT DRIVE CORPUS CHRISTI, TX 78410
	CALLEN MIDDLE SCHOOL	4602 CORNETT CORPUS CHRISTI, TX 78410
	CALLEN EAST ELEMENTARY	3709 LOTT AVE CORPUS CHRISTI, TX 78410
	WOOD RIVER ELEMENTARY	15118 DRY CREEK CORPUS CHRISTI, TX 78410
	MAGEE ELEMENTARY	4201 CALLEN DRIVE CORPUS CHRISTI, TX 78410

CITY OF CORPUS CHRISTI CRITICAL FACILITIES (CONT.)		
Type	Title	Address
Schools (cont.)	WEST OSO HIGH SCHOOL	754 FLATO ROAD CORPUS CHRISTI, TX 78405
	WEST OSO JUNIOR HIGH	5202 BEAR LANE CORPUS CHRISTI, TX 78405
	WEST OSO ELEMENTARY	1526 CLIGG MAUS DR CORPUS CHRISTI, TX 78416
	JOHN F. KENNEDY ELEMENTARY	1102 VILLARREAL CORPUS CHRISTI, TX 78416
	FLOUR BLUFF HIGH SCHOOL	2505 WALDRON RD CORPUS CHRISTI, TX 78418
	FLOUR BLUFF JUNIOR HIGH	2505 WALDRON RD CORPUS CHRISTI, TX 78418
	FLOUR BLUFF INTERMEDIATE	377 HUSTLIN HORNET CORPUS CHRISTI, TX 78418
	FLOUR BLUFF ELEMENTARY	2505 WALDRON RD CORPUS CHRISTI, TX 78418
	FLOUR BLUFF PRIMARY	2505 WALDRON RD CORPUS CHRISTI, TX 78418
	FLOUR BLUFF EARLY CHILDHOOD CENTER	2505 WALDRON RD CORPUS CHRISTI, TX 78418

CITY OF DRISCOLL CRITICAL FACILITIES		
Type	Title	Address
Designated Shelters / Evacuation Centers	ROBSTOWN RICHARD M. BORCHARD REGIONAL FAIRGROUNDS	1213 TERRY SHAMSIE BLVD. ROBSTWON, TEXAS 78380
Police Station(s)	DRISCOLL POLICE DEPARTMENT	210 W. MAIN ST. DRISCOLL, TEXAS 78351
City Hall	DRISCOLL CITY HALL	210 W. MAIN ST. DRISCOLL, TEXAS 78351
Fire Stations	DRISCOLL FIRE STATION/ NC EMERGENCY SERVICE DISTRICT #3	322 MAIN ST. DRISCOLL, TEXAS 78351
Airport	BISHOP MUNICIPAL AIRPORT	CR 77 AND FM 3354, BISHOP, TEXAS 78343
Community Centers	DRISCOLL COMMUNITY CENTER	200 E. 7TH ST. DRISCOLL, TEXAS 78351
Wastewater Treatment Plant	CITY OF DRISCOLL WASTEWATER TREATMENT PLANT	County RD 79
Schools	DRISCOLL INDEPENDENT SCHOOL DISTRICT-SCHOOL CAMPUS	410 WEST AVE. DRISCOLL, TEXAS 78351



CITY OF PORT ARANSAS CRITICAL FACILITIES		
Type	Title	Address
Fire Stations	NUECES COUNTY EMERGENCY SERVICES DISTRICT 1	5241 CO RD 73 ROBSTOWN, TEXAS 78380
Wastewater Treatment Plant	CITY OF PORT ARANSAS WASTEWATER TREATMENT PLANT	
Schools	PORT ARANSAS ISD BRUNDRETT MIDDLE	100 STA ST PORT ARANSAS, Texas 78373
	PORT ARANSAS ISD OLSEN EL	100 STA ST PORT ARANSAS, Texas 78373
	PORT ARANSAS ISD PORT ARANSAS H S	100 STATION ST PORT ARANSAS, Texas 78373
County Building	CONSTABLE 4	705 WEST AVE A PORT ARANSAS 78373

CITY OF ROBSTOWN CRITICAL FACILITIES		
Type	Title	Address
Emergency Operation Center(s)	ROBSTOWN EMERGENCY OPERATIONS CENTER	430 EAST MAIN AVENUE ROBSTOWN, TEXAS 78380-3354
Designated Shelters / Evacuation Centers	ROBSTOWN RICHARD M. BORCHARD REGIONAL FAIRGROUNDS	1213 TERRY SHAMSIE BLVD. ROBSTOWN, TEXAS 78380
Fire Stations	NUECES COUNTY EMERGENCY SERVICES DISTRICT 1 ANNVILLE FIRE STATION #2/ NC ESD #1 ANNVILLE FIRE STATION #3/ NC ESD #1	5241 CO RD 73 ROBSTOWN, TEXAS 78380 5242 CR 73, ROBSTOWN, TEXAS 78380 3879 CR 61, ROBSTOWN, TEXAS 78380
Water Treatment Plant	NUECES CO WATER DIST #3	
Wastewater Treatment Plant	ROBSTOWN WASTEWATER TREATMENT PLANT	US HWY 77 N BUS (RBST)
Community Center	ROBSTOWN COMMUNITY CENTER	415 MAINER RD ROBSTOWN, TEXAS 78380
Library	KEACH FAMILY LIBRARY	1000 TERRY SHAMSIE BOULEVARD ROBSTOWN, TX 78380
County Building	CONSTABLE 5	710 E MAIN ST ROBSTOWN, TEXAS 78380
	ANIMAL CONTROL	4540 FM 892 ROBSTOWN, TEXAS 78380
	COMMUNITY SERVICES/KITCHEN	415 MAINER RD ROBSTOWN, TEXAS 78380
	SOCIAL SERVICES	103 N 6TH ST ROBSTOWN, TEXAS 78380
Schools	ROBSTOWN ISD HATTIE MARTIN EARLY CHILDHOOD CENTER	701 N FIRST ST ROBSTOWN, TEXAS 78380
	ROBSTOWN ISD LOTSPEICH EL	1000 RUBEN CHAVEZ RD ROBSTOWN, TEXAS 78380
	ROBSTOWN ISD ROBERT DRISCOLL JR EL	122 W AVE H ROBSTOWN, TEXAS 78380
	ROBSTOWN ISD ROBSTOWN H S	609 HWY 44 ROBSTOWN, TEXAS 78380
	ROBSTOWN ISD SALAZAR CROSSROADS ACADEMY	400 W LIGUSTRUM ROBSTOWN, TEXAS 78380
	ROBSTOWN ISD SAN PEDRO EL	800 W AVE D ROBSTOWN, TEXAS 78380
	ROBSTOWN ISD SEALE J H	401 E AVE G ROBSTOWN, TEXAS 78380
	ROBSTOWN ISD SOLOMON P ORTIZ INT	208 E AVE H ROBSTOWN, TEXAS 78380

CITY OF PETRONILA CRITICAL FACILITIES		
Type	Title	Address
Fire Stations	PETRONILA FIRE STATION/ NC EMERGENCY SERVICE DISTRICT #3	FM 665 AND CR 22, PETRONILA, TEXAS 78380
Schools	BISHOP CONSOLIDATED INDEPENDENT SCHOOL DISTRICT-CAMPUS	2391 COUNTY ROAD 47, PETRONILA, TEXAS 78380

PORT OF CORPUS CHRISTI AUTHORITY CRITICAL FACILITIES		
Type	Title	Address
Emergency Operation Center(s)	PORT OF CORPUS CHRISTI AUTHORITY EOC	1002 E. PORT AVE., CORPUS CHRISTI TX
Police Stations	WILLIAM D. DODGE III SECURITY COMMAND CENTER	1002 E. PORT AVE., CORPUS CHRISTI TX
Fire Stations	REFINERY TERMINAL FIRE COMPANY	1001 MC BRIDE LANE, CORPUS CHRISTI TX 78407
Power Generating Stations	NUECES BAY ENERGY CENTER	NAVIGATION BLVD, CORPUS CHRISTI, TX 78402
Convention Center / Cruise Terminal	CONGRESSMAN SOLOMON P. ORTIZ INTERNATIONAL CENTER	402 HARBOR DR., CORPUS CHRISTI TX 78401
Marine Traffic	HARBOR MASTER'S OFFICE	1305 N. SHORELINE BLVD., CORPUS CHRISTI TX 78401
Administration	RUBEN BONILLA CENTER FOR GLOBAL TRADE	222 POWER ST., CORPUS CHRISTI TX 78401
Power Generating Stations	NUECES BAY ENERGY CENTER	NAVIGATION BLVD, CORPUS CHRISTI, TX 78402

## Appendix E: Wildfire Occurrences

Start Date	Area Burned (Acres)	Cause of Wildfire*
1/13/2005	5.00	Unsafe burning of household trash
1/17/2005	3.00	Unsafe burning of household trash
1/23/2005	5.00	Brush pile burning
12/31/2005	0.06	Unknown Cause
1/1/2006	10.00	Farm equipment (hay balers, tractors, etc.)
1/2/2006	0.06	Unknown Cause
1/3/2006	0.06	Unknown Cause
1/5/2006	1.00	Unknown Cause
1/6/2006	1.00	Right-of-ways; utility co.'s and highways
1/6/2006	1.50	Unknown Cause
1/16/2006	72.00	Unknown Cause
1/17/2006	5.00	Unknown Cause
1/20/2006	10.00	Power Lines
1/24/2006	2.00	Unknown Cause
1/27/2006	0.50	Spite
2/5/2006	70.00	Oil field equipment (pump jacks, faulty electric lines, etc.)
2/7/2006	0.10	Unknown Cause
2/8/2006	0.10	Unknown Cause
2/10/2006	0.06	Unknown Cause
2/10/2006	0.06	Unknown Cause
2/13/2006	0.06	Unknown Cause
2/15/2006	1.00	Unknown Cause
2/16/2006	1.00	Origin traceable to trains
2/17/2006	1.00	Unknown Cause
2/20/2006	1.00	Unknown Cause
3/6/2006	3.00	Unknown Cause
3/8/2006	0.06	Unknown Cause
3/9/2006	0.25	Unknown Cause
3/9/2006	0.06	Unknown Cause

Start Date	Area Burned (Acres)	Cause of Wildfire*
3/10/2006	0.06	Unknown Cause
3/12/2006	5.00	Unknown Cause
3/13/2006	2.00	Unknown Cause
3/18/2006	200.00	Unknown Cause
3/19/2006	0.06	Unknown Cause
3/21/2006	0.00	Warming or cooking
3/21/2006	1.00	Brush pile burning
3/28/2006	1.00	Unsafe burning of household trash
3/31/2006	1.00	Unknown Cause
4/4/2006	2.00	Unknown Cause
4/8/2006	1.00	Playing with matches
4/10/2006	3.00	Power Lines
4/13/2006	2.00	Origin traceable to smoking
4/16/2006	1.00	Unknown Cause
4/19/2006	1.00	Power Lines
4/21/2006	0.50	Unknown Cause
4/26/2006	0.50	Construction debris (boards, panels, cardboard, etc.)
4/28/2006	1.00	Unknown Cause
5/1/2006	0.50	Welding equipment use (fence-building, equipment modification, etc.)
5/3/2006	1.00	Burning leaves and garden spots
5/16/2006	0.10	Unknown Cause
5/19/2006	3.00	Unknown Cause
5/21/2006	0.50	Unknown Cause
5/21/2006	0.50	Unknown Cause
5/22/2006	1.00	Unknown Cause
5/25/2006	1.00	Amusement
6/8/2006	0.50	Power Lines
6/13/2006	1.00	Playing with matches
6/16/2006	0.05	Unknown Cause
6/16/2006	60.00	Unknown Cause
6/28/2006	0.50	Unknown Cause

Start Date	Area Burned (Acres)	Cause of Wildfire*
7/6/2006	1.00	Power Lines
7/14/2006	0.50	Unknown Cause
7/16/2006	40.00	Bush hogs, lawn mowers, weed eaters, etc.
7/22/2006	0.50	Unknown Cause
7/31/2006	0.10	Power Lines
8/6/2006	0.50	Unknown Cause
8/16/2006	0.50	Farm equipment (hay balers, tractors, etc.)
8/21/2006	0.00	Power Lines
8/31/2006	0.00	Unknown Cause
9/5/2006	15.00	Unknown Cause
10/8/2006	0.50	Unknown Cause
12/30/2006	50.00	Unknown Cause
1/1/2007	1.00	Unknown Cause
1/25/2007	1.00	Unknown Cause
3/24/2007	2.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
4/13/2007	3.00	Power Lines
5/3/2007	1.00	Power Lines
5/4/2007	1.00	Playing with matches
5/7/2007	2.00	Unknown Cause
6/10/2007	50.00	Unknown Cause
12/26/2007	100.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
12/29/2007	800.00	Fireworks
12/31/2007	200.00	Fireworks
1/1/2008	5.00	Fireworks
1/1/2008	10.00	Fireworks
1/1/2008	40.00	Fireworks
1/2/2008	30.00	Fireworks
1/3/2008	400.00	Farm equipment (hay balers, tractors, etc.)
1/3/2008	6.00	Fireworks
1/9/2008	1.00	Power Lines
1/10/2008	2.00	Welding equipment use (fence-building, equipment modification, etc.)

Start Date	Area Burned (Acres)	Cause of Wildfire*
1/11/2008	1.00	Unknown Cause
1/13/2008	2.00	Unsafe burning of household trash
1/15/2008	1.00	Warming or cooking
1/30/2008	5.00	Unknown Cause
2/1/2008	2.00	Unknown Cause
2/6/2008	3000.00	Prescribed burning (forest brush control/hazard reduction, grassland brush control)
2/6/2008	5.00	Unknown Cause
2/6/2008	2.00	Welding equipment use (fence-building, equipment modification, etc.)
2/7/2008	2.00	Unknown Cause
2/7/2008	2.00	Unsafe burning of household trash
2/10/2008	1.00	Unknown Cause
2/14/2008	2.00	Unknown Cause
2/22/2008	1.00	Unknown Cause
2/23/2008	1.00	Unknown Cause
2/23/2008	0.50	Unknown Cause
2/26/2008	100.00	Unknown Cause
2/26/2008	5.00	Welding equipment use (fence-building, equipment modification, etc.)
2/26/2008	20.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
2/27/2008	100.00	Bush hogs, lawn mowers, weed eaters, etc.
2/28/2008	5.00	Welding equipment use (fence-building, equipment modification, etc.)
2/29/2008	2.00	Unknown Cause
3/1/2008	1.00	Power Lines
3/5/2008	1.00	Unknown Cause
3/16/2008	2.00	Power Lines
3/19/2008	5.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
3/21/2008	100.00	Unknown Cause
3/26/2008	1.00	Power Lines
4/15/2008	3.00	Brush pile burning
5/8/2008	1.00	Power Lines
5/27/2008	4.00	Unknown Cause

Start Date	Area Burned (Acres)	Cause of Wildfire*
5/30/2008	5.00	Unknown Cause
6/6/2008	20.00	Power Lines
6/9/2008	2.00	Power Lines
6/10/2008	1.00	Unknown Cause
6/27/2008	30.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
7/21/2008	50.00	Power Lines
8/15/2008	2.00	Unknown Cause
9/2/2008	0.25	Unknown Cause
9/19/2008	0.50	Unknown Cause
9/24/2008	2.00	Farm equipment (hay balers, tractors, etc.)
10/5/2008	1.00	Origin traceable to lightning
11/5/2008	2.00	Playing with matches
11/5/2008	2.00	Welding equipment use (fence-building, equipment modification, etc.)
11/24/2008	1.00	Origin traceable to smoking
11/24/2008	0.50	Unknown Cause
11/28/2008	10.00	Origin traceable to smoking
12/4/2008	25.00	Warming or cooking
12/6/2008	0.50	Unknown Cause
12/13/2008	1000.00	Unknown Cause
12/28/2008	1.00	Fireworks
12/28/2008	1.00	Fireworks
12/29/2008	1.00	Fireworks
12/30/2008	3.00	Unknown Cause
1/1/2009	0.50	Fireworks
1/1/2009	0.00	Unknown Cause
1/2/2009	0.00	Unknown Cause
1/3/2009	0.50	Origin traceable to smoking
1/7/2009	2.00	Unknown Cause
1/10/2009	1.00	Unknown Cause
1/10/2009	1.00	Origin traceable to smoking
1/10/2009	0.00	Unknown Cause



Start Date	Area Burned (Acres)	Cause of Wildfire*
1/12/2009	0.00	Unknown Cause
1/15/2009	1.00	Unknown Cause
1/15/2009	1.00	Playing with matches
1/18/2009	0.25	Unknown Cause
1/19/2009	2.00	Origin traceable to smoking
1/20/2009	3.00	Unsafe burning of household trash
1/21/2009	0.25	Construction debris (boards, panels, cardboard, etc.)
1/24/2009	1000.00	Unknown Cause
1/25/2009	1.00	Unknown Cause
1/25/2009	0.50	Unknown Cause
1/27/2009	1.00	Unknown Cause
1/29/2009	0.50	Origin traceable to smoking
1/29/2009	1.00	Bush hogs, lawn mowers, weed eaters, etc.
2/3/2009	100.00	Farm equipment (hay balers, tractors, etc.)
2/3/2009	0.50	Unknown Cause
2/3/2009	0.10	Unknown Cause
2/5/2009	5.00	Origin traceable to smoking
2/6/2009	0.50	Origin traceable to smoking
2/9/2009	70.00	Unknown Cause
2/9/2009	50.00	Unknown Cause
2/11/2009	1.00	Power Lines
2/11/2009	1.00	Power Lines
2/11/2009	1.00	Origin traceable to smoking
2/20/2009	0.50	Warming or cooking
2/20/2009	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
3/1/2009	0.25	Unknown Cause
3/1/2009	0.25	Bush hogs, lawn mowers, weed eaters, etc.
3/1/2009	2.00	Unsafe burning of household trash
3/1/2009	60.00	Brush pile burning
3/2/2009	0.25	Origin traceable to smoking
3/3/2009	3.00	Farm equipment (hay balers, tractors, etc.)

Start Date	Area Burned (Acres)	Cause of Wildfire*
3/7/2009	0.30	Origin traceable to smoking
3/9/2009	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
3/18/2009	1.00	Playing with matches
3/21/2009	1.00	Playing with matches
3/21/2009	5.00	Playing with matches
3/26/2009	20.00	Power Lines
3/29/2009	1.00	Unknown Cause
4/1/2009	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
4/2/2009	40.00	Unknown Cause
4/2/2009	40.00	Power Lines
4/3/2009	1.00	Unknown Cause
4/3/2009	20.00	Unknown Cause
4/18/2009	3.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
4/20/2009	3.00	Unknown Cause
4/22/2009	15.00	Unknown Cause
4/26/2009	7.00	Unknown Cause
4/28/2009	5.00	Unknown Cause
4/29/2009	0.50	Power Lines
5/3/2009	26.00	Playing with matches
5/15/2009	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
5/15/2009	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
5/15/2009	7.00	Unknown Cause
5/15/2009	5.00	Unknown Cause
5/25/2009	0.50	Playing with matches
5/29/2009	0.50	Power Lines
6/28/2009	1.00	Unknown Cause
6/30/2009	0.50	Unknown Cause
7/4/2009	2.00	Unknown Cause
7/16/2009	0.50	Burning leaves and garden spots
7/21/2009	100.00	Playing with matches
8/4/2009	0.50	Unknown Cause

Start Date	Area Burned (Acres)	Cause of Wildfire*
8/8/2009	2.00	Unknown Cause
8/18/2009	1.00	Playing with matches
8/24/2009	1.00	Unknown Cause
8/30/2009	1.00	Origin traceable to lightning
9/18/2009	0.50	Playing with matches
9/18/2009	0.50	Playing with matches
10/16/2009	1.00	Power Lines
10/17/2009	0.50	Playing with matches
10/18/2009	0.50	Power Lines
10/31/2009	1.00	Unknown Cause
11/5/2009	1.00	Unknown Cause
11/13/2009	1.00	Unknown Cause
11/14/2009	5.00	Unknown Cause
12/23/2009	3.00	Playing with matches
1/1/2010	0.00	Unknown Cause
1/8/2010	1.00	Unknown Cause
1/9/2010	1.00	Unknown Cause
1/17/2010	0.00	Unknown Cause
1/19/2010	0.00	Unknown Cause
1/19/2010	0.00	Unknown Cause
1/20/2010	0.00	Unknown Cause
2/12/2010	0.00	Unknown Cause
2/15/2010	1.00	Playing with matches
3/7/2010	1.00	Playing with matches
3/9/2010	0.00	Unknown Cause
3/14/2010	0.00	Unknown Cause
3/17/2010	1.00	Playing with matches
3/23/2010	2.00	Unknown Cause
3/28/2010	0.50	Playing with matches
3/30/2010	0.20	Unknown Cause
4/7/2010	0.10	Warming or cooking

Start Date	Area Burned (Acres)	Cause of Wildfire*
4/22/2010	1.00	Unknown Cause
4/26/2010	0.00	Unknown Cause
4/26/2010	0.00	Unknown Cause
5/5/2010	0.50	Origin traceable to smoking
5/9/2010	0.50	Unknown Cause
5/10/2010	0.00	Unknown Cause
5/10/2010	0.00	Unknown Cause
5/10/2010	0.00	Unknown Cause
5/10/2010	0.00	Unknown Cause
5/12/2010	0.00	Unknown Cause
5/12/2010	0.00	Farm equipment (hay balers, tractors, etc.)
6/5/2010	0.50	Unknown Cause
6/16/2010	0.50	Unknown Cause
6/16/2010	0.50	Power Lines
7/4/2010	0.10	Fireworks
7/12/2010	0.10	Brush pile burning
7/17/2010	0.10	Power Lines
7/18/2010	1.00	Power Lines
8/8/2010	0.50	Unknown Cause
8/21/2010	0.50	Unknown Cause
10/16/2010	1.00	Power Lines
10/22/2010	2.00	Power Lines
10/29/2010	0.50	Power Lines
10/29/2010	0.50	Trash dumps
12/11/2010	75.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
12/31/2010	1.00	Fireworks
1/1/2011	1.00	Fireworks
1/1/2011	1.00	Fireworks
1/1/2011	1.00	Fireworks
1/1/2011	1.00	Fireworks
1/1/2011	1.00	Fireworks

Start Date	Area Burned (Acres)	Cause of Wildfire*
1/1/2011	0.00	Unknown Cause
1/1/2011	0.00	Unknown Cause
2/8/2011	1.00	Unknown Cause
2/12/2011	15.00	Unknown Cause
2/12/2011	0.00	Unknown Cause
2/13/2011	2.00	Playing with matches
2/13/2011	3.00	Unknown Cause
2/13/2011	0.00	Unknown Cause
2/16/2011	1.00	Playing with matches
2/17/2011	0.00	Unknown Cause
2/19/2011	0.00	Unknown Cause
3/10/2011	0.00	Unknown Cause
3/10/2011	0.00	Unknown Cause
3/12/2011	3.00	Unknown Cause
3/19/2011	0.00	Unknown Cause
3/19/2011	1.00	Unknown Cause
4/5/2011	2.00	Unknown Cause
4/5/2011	0.00	Unknown Cause
4/11/2011	0.00	Unknown Cause
4/28/2011	0.50	Unknown Cause
4/29/2011	0.50	Unknown Cause
4/29/2011	0.50	Unknown Cause
4/30/2011	2.00	Unknown Cause
5/3/2011	0.50	Unknown Cause
5/3/2011	25.00	Unknown Cause
5/3/2011	1.00	Unknown Cause
5/4/2011	0.00	Unknown Cause
5/5/2011	2.00	Unknown Cause
5/19/2011	1.00	Unknown Cause
6/3/2011	0.00	Unknown Cause
6/4/2011	3.00	Playing with matches

Start Date	Area Burned (Acres)	Cause of Wildfire*
6/6/2011	0.00	Unknown Cause
6/14/2011	4.00	Trash dumps
6/15/2011	1.00	Trash dumps
6/26/2011	0.00	Unknown Cause
6/27/2011	8.00	Unsafe burning of household trash
6/29/2011	1.00	Unknown Cause
6/29/2011	0.00	Unknown Cause
6/29/2011	0.00	Unknown Cause
6/29/2011	500.00	Unknown Cause
6/29/2011	500.00	Origin traceable to smoking
7/3/2011	0.50	Unknown Cause
7/7/2011	50.00	Unknown Cause
7/7/2011	0.25	Unknown Cause
7/9/2011	0.00	Unknown Cause
7/9/2011	0.00	Unknown Cause
7/11/2011	0.25	Unknown Cause
7/11/2011	3.00	Welding equipment use (fence-building, equipment modification, etc.)
7/12/2011	0.00	Unknown Cause
7/16/2011	0.25	Unknown Cause
7/24/2011	100.00	Unknown Cause
7/29/2011	4.00	Unknown Cause
8/2/2011	2.00	Unknown Cause
8/5/2011	1.00	Unknown Cause
8/8/2011	2.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
8/11/2011	12.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
8/12/2011	2.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
8/15/2011	5.00	Pasture and field burning (including grass, crop residues)
8/16/2011	40.00	Unsafe burning of household trash
8/17/2011	6.00	Unsafe burning of household trash
8/19/2011	2.00	Unknown Cause
8/19/2011	0.00	Unknown Cause

Start Date	Area Burned (Acres)	Cause of Wildfire*
8/20/2011	0.00	Unsafe burning of household trash
8/21/2011	7.00	Farm equipment (hay balers, tractors, etc.)
8/21/2011	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
8/21/2011	0.50	Unknown Cause
8/22/2011	0.50	Farm equipment (hay balers, tractors, etc.)
8/23/2011	5.00	Unsafe burning of household trash
8/29/2011	0.25	Unknown Cause
9/3/2011	0.00	Unknown Cause
9/3/2011	4.00	Trash dumps
9/4/2011	2.00	Trash dumps
9/4/2011	2.00	Trash dumps
9/5/2011	0.00	Construction debris (boards, panels, cardboard, etc.)
9/8/2011	1.00	Unsafe burning of household trash
9/8/2011	2.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
9/9/2011	0.50	Unknown Cause
9/13/2011	2.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
9/26/2011	2.00	Origin traceable to smoking
10/5/2011	1000.00	Origin traceable to smoking
10/15/2011	5.00	Unknown Cause
10/16/2011	5.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
11/4/2011	Unspecified	Unspecified
1/1/2012	0.00	Unknown Cause
1/3/2012	0.00	Unknown Cause
1/16/2012	0.00	Unknown Cause
2/2/2012	0.00	Unknown Cause
3/28/2012	1000.00	Origin traceable to smoking
7/18/2012	5.00	Unknown Cause
7/31/2012	15.00	Unknown Cause
8/26/2012	0.25	Unknown Cause
9/3/2012	10.00	Brush pile burning
9/3/2012	10.00	Unknown Cause

Start Date	Area Burned (Acres)	Cause of Wildfire*
9/10/2012	2.00	Power Lines
9/12/2012	2.00	Playing with matches
9/13/2012	10.00	Unknown Cause
10/12/2012	5.00	Unknown Cause
10/26/2012	2.00	Power Lines
11/20/2012	1.00	Power Lines
11/24/2012	1.00	Playing with matches
12/20/2012	40.00	Unknown Cause
2/13/2013	0.25	Unknown Cause
2/25/2013	1.00	Unknown Cause
2/25/2013	0.10	Unknown Cause
2/27/2013	0.50	Unsafe burning of household trash
3/4/2013	0.10	Unknown Cause
3/11/2013	0.10	Unknown Cause
3/12/2013	0.10	Unknown Cause
3/24/2013	0.10	Unknown Cause
3/25/2013	Unspecified	High winds downed power lines
8/5/2013	1.00	Unknown Cause
8/17/2013	0.25	Unknown Cause
8/23/2013	0.25	Unknown Cause
12/14/2013	800.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
1/15/2014	7.00	Unknown Cause
1/28/2014	0.25	Unknown Cause
2/14/2014	1.00	Unknown Cause
2/14/2014	1.00	Unknown Cause
1/15/2015	1.00	Unknown Cause
1/21/2015	0.20	Warming or cooking
2/19/2015	1.00	Playing with matches
2/21/2015	0.10	Warming or cooking
6/15/2015	0.15	Unknown Cause
7/4/2015	1.00	Fireworks



Start Date	Area Burned (Acres)	Cause of Wildfire*
7/12/2015	1.00	Unknown Cause
8/3/2015	1.00	Vehicles (catalytic converters, faulty mufflers, dragging metal)
8/9/2015	1.00	Unknown Cause
8/15/2015	1.00	Unknown Cause
8/30/2015	0.20	Brush pile burning
8/30/2015	0.50	Unknown Cause
9/12/2015	0.20	Power Lines
10/1/2015	1.00	Brush pile burning
11/9/2015	0.10	Unknown Cause
11/21/2015	2.00	Warming or cooking

\*Fire data is reported by fire departments. Wildfires of unknown origin may have initially been reported as “Unknown Cause” or “Unknown Cause.” They have been recoded to “unknown cause.”

## Appendix F: Adoption Resolution

## Appendix G: Plan Maintenance Tools

# Nueces County MAP

## Meetings and Public Involvement Activities

[illegible]

## Plan Evaluation Checklist

Goal/Objective	Address Current Needs?	
	Yes	No
<b>Goal 1: Minimize loss of life, in jury, damage to property, the economy, and natural systems</b>		
• Objective 1.1: Protect the life, health and safety of residents		
• Objective 1.2: Protect existing/new critical facilities and infrastructure		
• Objective 1.3: Provide protection for future/existing developments		
• Objective 1.4: Provide backup power to critical facilities/infrastructure		
• Objective 1.5: Minimize impacts from all hazards		
<b>Goal 2: Maintain and enhance emergency management/mitigation capabilities</b>		
• Objective 2.1: Update/develop plans, studies, and mapping for all hazards		
• Objective 2.2: Incorporate/improve hazard mitigation strategies into ordinances, plans and policies		
• Objective 2.3: Conduct/develop drills/training for all hazards		
• Objective 2.4: Implement and maintain the Nueces County Multi-Jurisdictional Hazard Mitigation Plan		
• Objective 2.5: Participate in programs that promote hazard mitigation strategies		
• Objective 2.6: Build, obtain, and maintain critical facilities and equipment		
<b>Goal 3: Maintain public education and awareness activities</b>		
• Objective 3.1: Expand public outreach campaigns for all hazards		
• Objective 3.2: Promote disaster preparedness planning for families		

Planning Considerations	Address Current Needs?	
	Yes	No
Has the nature or magnitude of the risks identified in the plan changed? If yes, comment below.		
Are the resources adequate for implementing the plan? If no, comment below		
Have there been any implementation problems such as technical, political, legal or coordination issues with other agencies for the mitigation actions identified? If yes, reference action by selecting "Delayed" on the Project Implementation worksheet with a comment describing issue in implementation		
Should personnel/agency changes be made to the Galveston County Multi-Jurisdiction Hazard Mitigation Committee? If yes, complete the mitigation planning team worksheet.		
Have there been changes to the participating communities' capabilities that improve or impair the progress of the mitigation strategies identified in the plan? If yes, please comment below.		

## Mitigation Planning Team Worksheet

Use this worksheet to identify partner organizations to invite to participate on the planning team. Some organizations do not need to be involved in every decision of the planning process but are stakeholders that require outreach and involvement during the planning process. Revise the list of general partners below to reflect the organizations in your community. Mark which organizations will be invited to participate on the planning team and which will be involved through stakeholder outreach activities.

**Planning Team** – The core group responsible for making decisions, guiding the planning process, and agreeing upon the final contents of the plan.

**Stakeholders** – Individuals or groups that affect or can be affected by a mitigation action or policy.

Partner Organizations	Planning Team	Stakeholder	Notes
<b>Local Agencies</b>			
Building Code Enforcement			
City Management/County Administration			
Emergency Management			
Fire Department/District			
Floodplain Administration			
Geographic Information Systems			
Parks and Recreation			
Planning/Community Development			
Public Works			
Stormwater Management			
Transportation (Roads and Bridges)			
City Council/Board of Commissioners			
Planning Commission			
Planning/Community Development			
Regional/Metropolitan Planning Organization(s)			
City/County Attorney's Office			
Economic Development Agency			
Local Emergency Planning Committee			
Police/Sherriff's Department			
Sanitation Department			
Tax Assessor's Office			
<b>Special Districts and Authorities</b>			
Airport, Seaport Authorities			
Fire Control District			
Flood Control District			
School District(s)			

Transit Authority			
Utility District			
Partner Organizations	Planning Team	Stakeholder	Notes
<b>Non-Governmental Organizations</b>			
American Red Cross			
Chamber of Commerce			
Community/Faith-Based Organizations			
Environmental Organizations			
Homeowners Associations			
Neighborhood/Community Organizations			
Utility Companies			
<b>State Agencies</b>			
State Emergency Management Agency			
State Dam Safety			
State Department of Transportation			
State Fire and Forestry Agency			
State Geological Survey			
State Water Resources Agency			
State National Flood Insurance Program Coordinator			
State Planning Office			
<b>Federal Agencies</b>			
Federal Emergency Management Agency			
Land Management Agencies (USFS/NPS/BLM)			
National Weather Service			
US Army Corps of Engineers			
US Department of Housing and Urban Development			
US Department of Transportation			
US Environmental Protection Agency			
US Geological Survey			
<b>Other</b>			
Tribal Officials			
Colleges/Universities			
Land Developers and Real Estate Agencies			
Major Employers and Businesses			
Professional Associations			
Neighboring Jurisdictions			

Note: Multi-jurisdictional planning teams require at least one representative for each participating jurisdiction. This worksheet can be used by each jurisdiction to identify their local sub-team.

## Mitigation Action Implementation Worksheet

Jurisdiction Name:

Date:

Reference Mitigation Action Number	In Progress	Delayed*	No Longer Required	Completed	Completion Date	Comment



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Milpitas  
Orange  
Sacramento

#### Florida

Miami  
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