NUECES COUNTY COASTAL PROJECT AREA FLOOD RISK REPORT - FINAL

Flood Risk Report
Nueces County Coastal Project Area

Portions of HUC-8 watersheds – 12100405 (Aransas Bay), 12110111 (Lower Nueces), 12110201 (North Corpus Christi Bay), 12110202 (South Corpus Christi Bay), 12110203 (North Laguna Madre), Texas

Nueces County, Texas

Report Number 001 09/30/2015

FINAL

FEMA
### Project Area Community List

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<tr>
<td>City of Aransas Pass*</td>
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<td>City of Corpus Christi*</td>
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<tr>
<td>Nueces County Unincorporated Areas*</td>
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<td>City of Port Aransas*</td>
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<td>City of Portland*</td>
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*Community extends beyond project area*
Preface

The Department of Homeland Security (DHS), Federal Emergency Management Agency’s (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides states, tribes, and local communities with flood risk information and tools that they can use to increase their resilience to flooding and better protect their citizens. By pairing accurate floodplain maps with risk assessment tools and planning and outreach support, Risk MAP has transformed traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating flood-related risks.

This Flood Risk Report (FRR) provides non-regulatory information to help local or tribal officials, floodplain managers, planners, emergency managers, and others better understand their flood risk, take steps to mitigate those risks, and communicate those risks to their citizens and local businesses.

Because flood risk often extends beyond community limits, the FRR provides flood risk data for the entire Flood Risk Project as well as for each individual community. This also emphasizes that flood risk reduction activities may impact areas beyond jurisdictional boundaries.

Flood risk is always changing, and there may be other studies, reports, or sources of information available that provide more comprehensive information. The FRR is not intended to be regulatory or the final authoritative source of all flood risk data in the project area. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood risk within the project area.
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FLOOD RISK REPORT

1 Introduction

1.1 About Flood Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over normally dry areas. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Mild flood losses may have little impact on people or property, such as damage to landscaping or the generation of unwanted debris. Severe flooding can destroy buildings, ruin crops, and cause critical injuries or death.

1.1.1 Calculating Flood Risk

It is not enough to simply identify where flooding may occur. Just because one knows where a flood occurs does not mean they know the risk of flooding. The most common method for determining flood risk, also referred to as vulnerability, is to identify the probability of flooding and the consequences of flooding. In other words:

\[ \text{Flood Risk} = \text{Probability} \times \text{Consequences} \]

Probability = the likelihood of occurrence

Consequences = the estimated impacts associated with the occurrence

The probability of a flood is the likelihood that a flood will occur. The probability of flooding can change based on physical, environmental, and/or contributing engineering factors. Factors affecting the probability that a flood will impact an area range from changing weather patterns to the existence of mitigation projects. The ability to assess the probability of a flood and the level of accuracy for that assessment are also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the water body in question.

The consequences of a flood are the estimated impacts associated with the flood occurrence. Consequences relate to humans’ activities within an area and how a flood impacts the natural and built environments.
1.1.2 Flood Risk Products

Through Risk MAP, FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation. The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year. FEMA understands that flood risk is dynamic—that flooding does not stop at a line on a map—and as such, provides the following flood risk products:

**Flood Risk Report (FRR):** The FRR presents key risk analysis data for the Flood Risk Project.

**Flood Risk Map (FRM):** Like the example found in Section 3.1 of this document, the FRM shows a variety of flood risk information in the project area. More information about the data shown on the FRM may be found in Section 2 of this report.

**Flood Risk Database (FRD):** The FRD is in Geographic Information System (GIS) format and houses the flood risk data developed during the course of the flood risk analysis that can be used and updated by the community. After the Flood Risk Project is complete, this data can be used in many ways to visualize and communicate flood risk within the Flood Risk Project.

These Flood Risk Products provide flood risk information at both the Flood Risk Project level and community level (for those portions of each community within the Flood Risk Project). They demonstrate how decisions made within a Flood Risk Project can impact properties downstream, upstream, or both. Community-level information is particularly useful for mitigation planning and emergency management activities, which often occur at a local jurisdiction level.

1.2 Uses of this Report

The goal of this report is to help inform and enable communities and tribes to take action to reduce flood risk. Possible users of this report include:

- Local elected officials
- Floodplain managers
- Community planners
- Emergency managers
- Public works officials
- Other special interests (e.g., watershed conservation groups, environmental awareness organizations, etc.)

State, local, and tribal officials can use the summary information provided in this report, in conjunction with the data in the FRD, to:
Update local hazard mitigation plans. As required by the 2000 Federal Stafford Act, local hazard mitigation plans must be updated at least every five (5) years. Summary information presented in Section 3 of this report and the FRM can be used to identify areas that may need additional focus when updating the risk assessment section of a local hazard mitigation plan. Information found in Section 4 pertains to the different mitigation techniques and programs and can be used to inform decisions related to the mitigation strategy of local plans.

Update community comprehensive plans. Planners can use flood risk information in the development and/or update of comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes may be changed to better provide for appropriate land uses in high-hazard areas.

Update emergency operations and response plans. Emergency managers can identify low-risk areas for potential evacuation and sheltering and can help first responders avoid areas of high-depth flood water. Risk assessment results may reveal vulnerable areas, facilities, and infrastructure for which planning for continuity of operations plans (COOP), continuity of government (COG) plans, and emergency operations plans (EOP) would be essential.

Develop hazard mitigation projects. Local officials (e.g., planners and public works officials) can use flood risk information to re-evaluate and prioritize mitigation actions in local hazard mitigation plans.

Communicate flood risk. Local officials can use the information in this report to communicate with property owners, business owners, and other citizens about flood risks, changes since the last FIRM, and areas of mitigation interest. The report layout allows community information to be extracted in a fact sheet format.

Inform the modification of development standards. Floodplain managers, planners, and public works officials can use information in this report to support the adjustment of development standards for certain locations. For example, heavily developed areas tend to increase floodwater runoff because paved surfaces cannot absorb water, indicating a need to adopt or revise standards that provide for appropriate stormwater retention.

The Flood Risk Database, Flood Risk Map, and Flood Risk Report are “non-regulatory” products. They are available and intended for community use but are neither mandatory nor tied to the regulatory development and insurance requirements of the National Flood Insurance Program (NFIP). They may be used as regulatory products by communities if authorized by state and local enabling authorities.

1.3 Sources of Flood Risk Assessment Data Used

To assess potential community losses, or the consequences portion of the “risk” equation, the following data is typically collected for analysis and inclusion in a Flood Risk Project:

Information about local assets or resources at risk of flooding

Information about the physical features and human activities that contribute to that risk
Information about where the risk is most severe

For most Flood Risk Projects, FEMA uses the following sources of flood risk information to develop this report:

Hazus-estimated flood loss information

New engineering analyses (e.g., coastal, hydrologic, and/or hydraulic modeling) to develop new flood boundaries

Locally supplied data (see Section 7 for a description)

Sources identified during the Discovery process

1.4 Related Resources

For a more comprehensive picture of flood risk, FEMA recommends that state and local officials use the information provided in this report in conjunction with other sources of flood risk data, such as those listed below.

FIRMs and FIS Reports. This information indicates areas with specific flood hazards by identifying the limit and extent of the 1-percent-annual-chance floodplain and the 0.2-percent-annual-chance floodplain. FIRMs and FIS Reports do not identify all floodplains in a Flood Risk Project. The FIS Report includes summary information regarding other frequencies of flooding, as well as flood profiles for riverine sources of flooding. In rural areas and areas for which flood hazard data are not available, the 1-percent-annual-chance floodplain may not be identified. In addition, the 1-percent-annual-chance floodplain may not be identified for flooding sources with very small drainage areas (less than 1 square mile).

Hazus Flood Loss Estimation Reports. Hazus can be used to generate reports, maps and tables on potential flood damage that can occur based on new/proposed mitigation projects or future development patterns and practices. Hazus can also run specialized risk assessments, such as what happens when a dam or levee fails. Flood risk assessment tools are available through other agencies as well, including the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Army Corps of Engineers (USACE). Other existing watershed reports may have a different focus, such as water quality, but may also contain flood risk and risk assessment information. See Section 6 for additional resources.

Flood or multi-hazard mitigation plans. Local hazard mitigation plans include risk assessments that contain flood risk information and mitigation strategies that identify community priorities and actions to reduce flood risk. This report was informed by any existing mitigation plans in the Flood Risk Project.
Hurricane Evacuation Studies. Produced through a joint effort by FEMA, NOAA, and USACE, Hurricane Evacuation Studies provide tools and information to the state and county emergency management offices to help determine who should evacuate during hurricane threats, and when those evacuations should occur. The information can be used to supplement or update hurricane evacuation plans and operational procedures for responding to hurricane threats.

Climate Change and Sea Level Rise Data and Maps. Data and maps showing potential impacts from sea level rise provide a valuable resource for planning and risk communication purposes. By identifying areas that are most susceptible to rising sea levels, short- and long-term strategies can be developed to support coastal communities in their mitigation efforts. Various organizations, including NOAA and State and Local agencies, provide viewers, maps, and/or reports that help highlight low-lying coastal areas that would be inundated based on sea level rise scenarios.

FEMA Map Service Center (MSC). The MSC has useful information, including fly sheets, phone numbers, data, etc. Letters of Map Change are also available through the MSC. The user can view FIRM databases and the National Flood Hazard Layer (NFHL) Database.
2 Flood Risk Analysis

2.1 Overview

Flood hazard identification uses FIRMs, and FIS Reports identify where flooding can occur along with the probability and depth of that flooding. Flood risk assessment is the systematic approach to identifying how flooding impacts the environment. In hazard mitigation planning, flood risk assessments serve as the basis for mitigation strategies and actions by defining the hazard and enabling informed decision making. Fully assessing flood risk requires the following:

- Identifying the flooding source and determining the flood hazard occurrence probability
- Developing a complete profile of the flood hazard including historical occurrence and previous impacts
- Inventorying assets located in the identified flood hazard area
- Estimating potential future flood losses caused by exposure to the flood hazard area

Flood risk analyses are different methods used in flood risk assessment to help quantify and communicate flood risk. Flood risk analysis can be performed on a large scale (state, community) level and on a very small scale (parcel, census block). Advantages of large-scale flood risk analysis, especially at the watershed level, include identifying how actions and development in one community can affect areas up- and downstream. On the parcel or census block level, flood risk analysis can provide actionable data to individual property owners so they can take appropriate mitigation steps.

2.2 Analysis of Risk

The FRR, FRM, and FRD contain a variety of flood risk analysis information and data to help describe and visualize flood risk within the project area. Depending on the scope of the Flood Risk Project for this project area, this information may include some or all of the following elements:

- Changes Since Last FIRM
- Flood Depth and Analysis Grids
- Flood Risk Assessments
- Areas of Mitigation Interest

Flooding impacts non-populated areas too, such as agricultural lands and wildlife habitats.

State and Local Hazard Mitigation Plans are required to have a comprehensive all-hazard risk assessment. The flood risk analyses in the FRR, FRM, and FRD can inform the flood hazard portion of a community's or state's risk assessment. Further, data in the FRD can be used to develop information that meets the requirements for risk assessments as it relates to the hazard of flood in hazard mitigation plans.
2.2.1 Changes Since Last FIRM

The Changes Since Last FIRM (CSLF) dataset, stored in the FRD and shown in Section 3 of this report, illustrates where changes to flood risk may have occurred since the last FIRM was published for the subject area. Communities can use this information to update their mitigation plans, specifically quantifying “what is at risk” and identifying possible mitigation activities.

The CSLF dataset identifies changes in the Special Flood Hazard Area (SFHA) and floodway boundary changes since the previous FIRM was developed. These datasets quantify land area increases and decreases to the SFHA and floodway, as well as areas where the flood zone designation has changed (e.g., Zone A to AE, AE to VE, shaded Zone X protected by levee to Zone AE for de-accredited levees).

The CSLF dataset is created in areas that were previously mapped using digital FIRMs. The CSLF dataset for this project area includes:

**Floodplain and/or Floodway Boundary Changes:** Any changes to the existing floodplain or floodway boundaries are depicted in this dataset

**Floodplain Designation Changes:** This includes changed floodplain designations (e.g., Zone A to Zone AE).

**Additional Change Information:** Within this dataset additional information is provided to help explain the floodplain and floodway boundary changes shown on the FIRM. This information is stored as digital attributes within the CSLF polygons and may include some or all of the following:

- Changes in Topography

Please note that the reasons for the floodplain and floodway changes (also known as Contributing Engineering Factors) are provided to give the user a general sense of what caused the change, as opposed to providing a reason for each and every area of change.

Floodplain maps have evolved considerably from the older paper-based FIRMs to the latest digital products and datasets.

CSLF data can be used to communicate changes in the physical flood hazard area (size, location) as part of the release of new FIRMs. It can also be used in the development or update of hazard mitigation plans to describe changes in hazard as part of the hazard profile.

CSLF data is shown in the FRR, and underlying data is stored in the FRD.
2.2.2 Flood Depth and Analysis Grids

Grids are FEMA datasets provided in the FRD to better describe the risk of the flood hazard. Much like the pixels in a photo or graphic, a grid is made up of square cells, where each grid cell stores a value representing a particular flood characteristic (elevation, depth, velocity, etc.) While the FIRM and FIS Report describe “what” is at risk by identifying the hazard areas, water surface, flood depth, and other analysis grids can help define “how bad” the risk is within those identified areas. These grids are intended to be used by communities for additional analysis, enhanced visualization, and communication of flood risks for hazard mitigation planning and emergency management. The Flood Depth and Analysis Grids provide an alternative way to visualize how a particular flood characteristic (depth, velocity, etc.) vary within the floodplain. Since they are derived from the engineering modeling results, they are typically associated with a particular frequency-based flooding event (e.g., 1-percent-annual-chance event). Grids provided in the FRD for this project area include the following:

Water Surface Elevation Grids (for the calculated flood frequencies included in the FIS Report): This dataset represents the flood elevations calculated for each modeled flood frequency.

Flood Depth Grids (for the calculated flood frequencies included in the FIS Report): Flood Depth Grids are created for each flood frequency calculated during the course of a Flood Risk Project. These grids communicate flood depth as a function of the difference between the calculated water surface elevation and the ground. Five grids will normally be delivered for riverine areas for the standard flood frequencies (10-, 4-, 2-, 1-, and 0.2-percent-annual-chance).

Coastal flood depth grids are created for areas where the dominant wave hazard is overland wave propagation. The grid depicts the difference in elevation between the wave crest elevation, or BFE, and the ground. Coastal areas will typically only receive a depth grid for the 1-percent-annual-chance (base) flood for which overland wave propagation results are produced as a part of the FIS; however, approximate methods may be used to estimate wave crest elevations for other flood frequencies, if desired.
Depth grids form the basis for refined flood risk assessments (as presented in a table in Section 3 of this report) and are used to calculate potential flood losses for display on the FRM and for tabular presentation in this report. Depth grids may also be used for a variety of ad-hoc risk visualization and mitigation initiatives.

**Percent Annual Chance of Flooding Grid:** This is a grid dataset that represents the percent annual chance of flooding for locations along a flooding source. This grid uses the five standard flood frequencies.

**Percent Chance of Flooding over a 30-Year Time Period Grid:** This is a grid dataset that represents the estimated likelihood of flooding at least once within a 30-year period, which is the average lifespan for a home mortgage, for all locations within the extent of the 1-percent-annual-chance and 0.2-percent-annual-chance floodplain.

### 2.2.3 Flood Risk Assessments

Flood risk assessment results reported in the FRR were developed using a FEMA flood loss estimation tool, Hazus. Hazus ([www.fema.gov/hazus](http://www.fema.gov/hazus)) is a nationally-applicable and standardized risk assessment tool that estimates potential losses from earthquakes, floods, and hurricanes. It uses GIS technology to estimate physical, economic, and social impacts of disasters, Hazus can be used to help individuals and communities graphically visualize the areas where flood risk is highest. Some benefits of using Hazus include the following:

- Outputs that can enhance state and local mitigation plans and help screen for cost-effectiveness in FEMA mitigation grant programs
- Analysis refinement through updating inventory data and integrating data produced using other flood models
- Widely available support documents and networks (Hazus Users Groups)
- Files from the FRD can be imported into Hazus to develop other risk assessment information including:
  - Debris generated after a flood event
  - Dollar loss of the agricultural products in a study region
  - Utility system damages in the region
Vehicle loss in the study region

Damages and functionality of lifelines such as highway and rail bridges, potable water, and wastewater facilities

**Scenario-Based Flood Loss Estimates:**

Scenario-based flood losses have been calculated using Hazus for the 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood events. In this report, these losses are expressed in dollar amounts and are provided for the Flood Risk Project area only, even though results are shown for the entire watershed and at the local jurisdiction level.

Loss estimates are based on best available data, and the methodologies applied result in an approximation of risk. These estimates should be used to understand relative risk from flood and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from approximations and simplifications that are necessary for a comprehensive analysis (e.g., incomplete inventories, demographics, or economic parameters).

Flood loss estimates in this report are being provided at the project and community levels for multiple flood frequencies, and include the following:

**Residential Asset Loss:** These include direct building losses (estimated costs to repair or replace the damage caused to the building) for all classes of residential structures including single family, multi-family, manufactured housing, group housing, and nursing homes. This value also includes content losses.

**Commercial Asset Loss:** These include direct building losses for all classes of commercial buildings including retail, wholesale, repair, professional services, banks, hospitals, entertainment, and parking facilities. This value also includes content and inventory losses.

**Other Asset Loss:** This includes losses for facilities categorized as industrial, agricultural, religious, government, and educational. This value also includes content and inventory losses.

**Business Disruption:** This includes the losses associated with the inability to operate a business due to the damage sustained during the flood. Losses include inventory, income, rental income, wage, and direct output losses, as well as relocation costs.

**Annualized Losses:** Annualized losses are calculated using Hazus by taking losses from multiple events over different frequencies and expressing the long-term average by year. This factors in historic patterns of frequent smaller floods with infrequent but larger events to provide a balanced presentation of flood damage.

Flood risk assessment data can be used in many ways to support local decision making and explanation of flood risk. For mitigation planning purposes, loss data can be used to help meet requirements to develop loss information for the hazard of flood. Also, the FRM can show where flood risk varies by geographic location. For emergency management, risk assessment data can help forecast losses based on predicted events, and resources can be assigned accordingly. Loss information can support floodplain management efforts, including those to adopt higher regulatory standards. Awareness of at-risk essential facilities and infrastructure also encourages mitigation actions to protect citizens from service disruption should flooding occur.
**Loss Ratio:** The loss ratio expresses the scenario losses divided by the total building value for a local jurisdiction and can be a gage to determine overall community resilience as a result of a scenario event. For example, a loss ratio of 5 percent for a given scenario would indicate that a local jurisdiction would be more resilient and recover more easily from a given event, versus a loss ratio of 75 percent which would indicate widespread losses. An annualized loss ratio uses the annualized loss data as a basis for computing the ratio. Loss ratios are not computed for business disruption. These data are presented in the FRR.

**2.2.4 Areas of Mitigation Interest**

Many factors contribute to flooding and flood losses. Some are natural, and some are not. In response to these risks, there has been a focus by the Federal government, State agencies, and local jurisdictions to mitigate properties against the impacts of flood hazards so that future losses and impacts can be reduced. An area identified as an Area of Mitigation Interest (AoMI) is an important element of defining a more comprehensive picture of flood risk and mitigation activity in a watershed, identifying target areas and potential projects for flood hazard mitigation, encouraging local collaboration, and communicating how various mitigation activities can successfully reduce flood risk.

This report and the FRM may include information that focuses on identifying Areas of Mitigation Interest that may be contributing (positively or negatively) to flooding and flood losses in the Flood Risk Project. AoMIs are identified through coordination with local stakeholders; through revised hydrologic and hydraulic and/or coastal analyses; by leveraging other studies or previous flood studies; from community mitigation plans, floodplain management plans, and local surveys; and from the mining of federal government databases (e.g., flood claims, disaster grants, and data from other agencies). Below is a list of the types of Areas of Mitigation Interest that may be identified in this Flood Risk Report, shown on the Flood Risk Map, and stored in the Flood Risk Database:

**Dams**

A dam is a barrier built across a waterway for impounding water. Dams vary from impoundments that are hundreds of feet tall and contain thousands of acre-feet of water (e.g., Hoover Dam) to small dams that are a few feet high and contain only a few acre-feet of water (e.g., small residential pond). “Dry dams,” which are designed to contain water only during floods and do not impound water except for the purposes of flood control, include otherwise dry land behind the dam.

While most modern, large dams are highly engineered structures with components such as impervious cores and emergency spillways, most smaller and older dams are not. State dam safety programs emerged in the 1960s, and the first Federal Guidelines for Dam Safety were not prepared until 1979. By this time, the vast majority of dams in the United States had already been constructed.

Dams vary in size and shape, the amount of water they impound, and their assigned hazard classification.
Reasons dams are considered AoMIs:

- Many older dams were not built to any particular standard and thus may not withstand extreme rainfall events. Older dams in some parts of the country are made out of an assortment of materials. These structures may not have any capacity to release water and could be overtopped, which could result in catastrophic failure.

- Dams may not always be regulated, given that the downstream risk may have changed since the dam was constructed or since the hazard classification was determined. Years after a dam is built, a house, subdivision, or other development may be constructed in the dam failure inundation zone downstream of the dam. Thus, a subsequent dam failure could result in downstream consequences, including property damage and the potential loss of life. Since these dams are not regulated, it is impossible to predict how safe they are.

- A significant dam failure risk is structural deficiencies associated with older dams that are not being adequately addressed today through needed inspection/maintenance practices.

- For larger dams a flood easement may have been obtained on a property upstream or downstream of the dam. However, there may have been buildings constructed in violation of the flood easement.

- When a new dam is constructed, the placement of such a large volume of material in a floodplain area (if that is the dam location) will displace flood waters and can alter how the watercourse flows. This can result in flooding upstream, downstream, or both.

- For many dams, the dam failure inundation zone is not known. Not having knowledge of these risk areas could lead to unprotected development in these zones.

Levees

FEMA defines a levee as “a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.” Levees are sometimes referred to as dikes. Soil used to construct a levee is compacted to make the levee as strong and stable as possible. To protect against erosion and scouring, levees can be covered with everything from grass and gravel to harder surfaces like stone (riprap), asphalt, or concrete.

Similar to dams, levees have not been regulated in terms of safety and design standards until relatively recently. Many older levees were constructed in a variety of ways, from a farmer piling dirt along a stream to prevent nuisance flooding to levees made out of old
mining spoil material. As engineered structures, levees are designed to a certain height and can fail if a flood event is greater than anticipated.

A floodwall is a vertical wall that is built to reduce the flood hazard in a similar manner as a levee. Typically made of concrete or steel, floodwalls often are erected in urban locations where there is not enough room for a levee. Floodwalls are sometimes constructed on a levee crown to increase the levee’s height.

Most new dams and levees are engineered to a certain design standard. If that design is exceeded, they could be overtopped and fail catastrophically, causing more damage than if the levee was not there in the first place. Few levees anywhere in the nation are built to more than a 1-percent-annual-chance flood, and the areas behind them are still at some risk for flooding. In some states, the flooding threat can extend up to 15 miles from a riverbank. Although the probability of flooding may be lower because a levee exists, risk is nonetheless still present. The American Society of Civil Engineers’ publication “So, You Live Behind a Levee!” provides an in-depth explanation of levee and residual risk.

- **Reasons levees are considered AoMIs:**
  - Like dams, many levees in the United States were constructed using unknown techniques and materials. These levees have a higher failure rate than those that have been designed to today’s standards.
  - A levee might not provide the flood risk reduction it once did as a result of flood risk changes over time. Flood risk can change due to a number of factors, including increased flood levels due to climate change or better estimates of flooding, development in the watershed increasing flood levels and settlement of the levee or floodwall, and sedimentation in the levee channel. Increased flood levels mean decreased reduction of the flood hazard. The lack of adequate maintenance over time will also reduce the capability of a levee to contain the flood levels for which it was originally designed.
  - Given enough time, any levee will eventually be overtopped or damaged by a flood that exceeds the levee’s capacity. Still, a widespread public perception of levees is that they will always
provide protection. This perception may lead to not taking mitigation actions such as purchasing flood insurance.

- A levee is a system that can fail due to its weakest point, and therefore maintenance is critical. Many levees in the United States are poorly maintained or not maintained at all. Maintenance also includes maintaining the drainage systems behind the levees so they can keep the protected area dry.

**Coastal Structures**

Coastal structures, such as seawalls and revetments, are typically used to stabilize the shoreline to mitigate or prevent flood and/or erosion losses. Structures, such as jetties, groins and breakwaters, are constructed along naturally dynamic shorelines to alter the physical processes (e.g. sediment transport) for purposes that include reduction of long-term erosion rates, improvements to safe navigation (e.g., into ports), and reduction of erosive wave forces impacting a coast.

- **Reasons coastal structures are considered AoMIs:**
  - Coastal structures may provide flood or erosion protection for one site. However, they may also interrupt the sediment transport process, resulting in accelerated coastal erosion downdrift of the structure.
  - Coastal structures are typically designed to withstand the forces associated with extreme design conditions of waves and water levels. Adequate protection may not be provided if these conditions are exceeded.
  - As with other infrastructure such as roads, bridges, and utilities, regular maintenance of shoreline protection structures is essential to ensure that they continue to provide the intended protection from flooding and erosion.

**Stream Flow Constrictions**

A stream flow constriction occurs when a human-made structure, such as a culvert or bridge, constricts the flow of a river or stream. The results of this constriction can be increased damage potential to the structure, an increase in velocity of flow through the structure, and the creation of significant ponding or backwater upstream of the structure. Regulatory standards regarding the proper opening size for a structure spanning a river or stream are not consistent and may be non-existent. Some local regulations require structures to pass a volume of water that corresponds to a certain size rain event; however, under sizing, these openings can result in flood damage to the structure itself. After a large flood event, it is not uncommon to have numerous bridges and culverts “washed out.”

- **Reasons stream flow constrictions are considered AoMIs:**
  - Stream flow constrictions can back water up on property upstream of the structure if not designed properly.
  - These structures can accelerate the flow through the structure causing downstream erosion if not properly mitigated. This erosion can affect the structure itself, causing undermining and failure.
- If the constriction is a bridge or culvert, it can get washed out causing an area to become isolated and potentially more difficult to evacuate.
- Washed-out culverts and associated debris can wash downstream and cause additional constrictions.

**At-Risk Essential Facilities**

Essential facilities, sometimes called “critical facilities,” are those whose impairment during a flood could cause significant problems to individuals or communities. For example, when a community’s wastewater treatment is flooded and shut down, not only do contaminants escape and flow into the floodwaters, but backflows of sewage can contaminate basements or other areas of the community. Similarly, when a facility such as a hospital is flooded, it can result in a significant hardship on the community not only during the event but long afterwards as well.

- **Reasons at-risk essential facilities are considered AoMIs:**
  - Costly and specialized equipment may be damaged and need to be replaced.
  - Impairments to facilities such as fire stations may result in lengthy delays in responding and a focus on evacuating the facility itself.
  - Critical records and information stored at these facilities may be lost.

**Past Flood Insurance Claims and Individual Assistance/Public Assistance Hotspots**

Assistance provided after flood events (flood insurance in any event and Individual Assistance [IA] or Public Assistance [PA] after declared disasters) occurs in flood affected areas. Understanding geographically where this assistance is being provided may indicate unique flood problems.

Flood insurance claims are not always equally distributed in a community. Although estimates indicate that 20 to 50 percent of structures in identified flood hazard areas have flood insurance, clusters of past claims may indicate where there is a flood problem. However, clusters of past claims and/or areas where there are high payments under FEMA’s IA or PA Programs may indicate areas of significant flood hazard.

- **Reasons past claim hotspots are considered AoMIs:**
  - A past claim hotspot may reflect an area of recent construction (large numbers of flood insurance policies as a result of a large number of mortgages) and an area where the as-built construction is not in accordance with local floodplain management regulations.
  - Sometimes clusters of past claims occur in subdivisions that were constructed before flood protection standards were in place, places with inadequate
stormwater management systems, or in areas that may not have been identified as SFHAs.

- Clusters of IA or PA claims may indicate areas where high flood insurance coverage or other mitigation actions are needed.

Areas of Significant Land Use Change

Development, whether it is a 100-lot subdivision or a single lot big box commercial outlet, can result in large amounts of fill and other material being deposited in flood storage areas, thereby increasing flood hazards downstream.

Additionally, when development occurs, hard surfaces such as parking lots, buildings and driveways do not allow water to absorb into the ground, and more of the rainwater becomes runoff flowing directly into streams. As a result, the “peak flow” in a stream after a storm event will be higher and will occur faster. Without careful planning, major land use changes can affect the impervious area of a site and result in a significant increase in flood risk caused by streams that cannot handle the extra storm water runoff.

Changes in land use in areas vulnerable to coastal flooding may affect the severity of wave hazards. Wave energy dissipates as waves propagate through forested areas or areas with dense development while wave energy can increase in open areas such as agricultural fields or parking lots. Changes in land use can affect wave hazards beyond the immediate area of land use change.

- **Reasons Areas of Significant Land Use Change are considered AoMIs:**
  - Development in areas mapped SFHA reduces flood storage areas, which can make flooding worse at the development site and downstream of it.
  - Impervious surfaces speed up the water flowing in the streams, which can increase erosion and the danger that fast-flowing floodwaters pose to people and buildings.
  - Open areas can allow wave energy to increase while densely developed areas and dense vegetation cover often obstruct waves. These obstructions diminish the wave’s potentially destructive forces in areas inland of the obstructions.
  - Rezoning flood-prone areas to high densities and/or higher intensity uses can result in more people and property at risk of flooding and flood damage.
Key Emergency Routes Overtopped During Frequent Flooding Events

Roads are not always elevated above estimated flood levels, and present a significant flood risk to motorists during flooding events. When alternate routes are available, risks may be reduced, including risks to life and economic loss.

- **Reasons overtopped roads are considered AoMIs:**
  - Such areas, when identified, can be accounted for and incorporated into Emergency Action Plans.
  - Roads may be elevated or reinforced to reduce the risk of overtopping during flood events.

Drainage or Stormwater-Based Flood Hazard Areas, or Areas Not Identified as Floodprone on the FIRM But Known to Be Inundated

Flood hazard areas exist everywhere. While FEMA maps many of these, others are not identified. Many of these areas may be located in communities with existing, older, and often inadequate stormwater management systems or in very rural areas. Other similar areas could be a result of complex or unique drainage characteristics. Even though they are not mapped, awareness of these areas is important so adequate planning and mitigation actions can be performed.

- **Reasons drainage or stormwater-based flood hazard areas or unidentified floodprone locations are considered AoMIs:**
  - So further investigation of such areas can occur and, based on scientific data, appropriate mitigation actions can result (i.e., land use and building standards).
  - To create viable mitigation project applications in order to reduce flood losses.

Areas of Mitigation Success

Flood mitigation projects are powerful tools to communicate the concepts of mitigation and result in more resilient communities. Multiple agencies have undertaken flood hazard mitigation actions for decades. Both structural measures—those that result in flood control structures—and non-structural measures have been implemented in thousands of communities. An extensive list of mitigation actions can be found in Section 4.

- **Reasons areas of mitigation success are considered AoMIs:**
  - Mitigation successes identify those areas within the community that have experienced a reduction or elimination of flood risk.
Such areas are essential in demonstrating successful loss reduction measures and in educating citizens and officials on available flood hazard mitigation techniques.

- Avoided losses can be calculated and shown.

**Areas of Significant Riverine or Coastal Erosion**

Stream channels are shaped by a number of factors, including: degradation, aggradation, general scour, local scour, deposition, and lateral migration. Streams are constantly progressing towards a state of dynamic equilibrium involving water and sediment.

Coastal shorelines erode in response to wave and water level conditions and other factors. As sea levels rise, erosion is typically exasperated.

- **Reasons why areas of significant riverine or coastal erosion are considered AoMls:**
  - Riverine flood damage assessments generally consider inundation alone
  - Bank erosion caused by within channel flows is not recognized as a significant hazard in Federal floodplain management regulations
  - Riverine and coastal erosion can undercut structures and roads, causing instability and possible collapse.
  - Landslides and mudslides are a result of erosion
  - Approximately one-third of the nation’s streams experience severe erosion problems
  - Erosion of coastal barrier islands can result in breaches, washing out roads and cutting off access routes
  - Erosion often occurs along beaches during storms, especially severe storms that stay offshore for long durations and result in ongoing “battering” of the shoreline from high winds and waves. As the beach erodes, vulnerable properties are placed at even greater risk to coastal flooding from later storm surge, high tides, and wave action.

**Other**

Other types of flood risk areas include drainage or stormwater-based flood hazard areas, or areas known to be inundated during storm events.
3 Flood Risk Analysis Results

The following pages provide summary flood risk results for the Flood Risk Project as follows:

**Flood Risk Map.** Within the Flood Risk Project the FRM displays base data reflecting community boundaries, major roads, and stream lines; potential losses that include both the 2010 Average Annualized Loss (AAL) flood loss study supplemented with new Hazus runs for areas with new or updated flood modeling; new Flood Risk Project areas; and graphics and text that promote access and usage of additional data available through the FRD, FIRM, and National Flood Hazard Layer and viewers (desktop or FEMA website, etc.). This information can be used to assist in Flood Risk Project-level planning as well as for developing mitigation actions within each jurisdiction located within the Flood Risk Project.

**Flood Risk Project Summary.** Within the Flood Risk Project area, summary data for some or all of the following datasets are provided for the entire project area and also on a jurisdiction by jurisdiction basis:

- **Changes Since Last FIRM.** This is a summary of where the floodplain and flood zones have increased or decreased (only analyzed for areas that were previously mapped using digital FIRMs).

- **Flood Depth and Analysis Grids.** A general discussion of the data provided in the FRD, including *coastal, dam, and levee* analysis grids if furnished as part of the project.

- **Flood Risk Assessments.** A loss estimation of potential flood damages using different flood scenarios.

- **Areas of Mitigation Interest.** A description of areas that may benefit from mitigation or additional risk analysis.

The FRM provides a graphical overview of the Flood Risk Project which highlights areas of risk that should be noted, based on potential losses, exposed facilities, etc., based on data found in the FRD. Refer to the data in the FRD to conduct additional analyses.
3.1 Flood Risk Map

The Flood Risk Map for this Flood Risk Project is shown below. In addition to this reduced version of the map, a full size version is available within the FRD.
This page left intentionally blank.
3.2 Nueces County Coastal Project Area Flood Risk Project Area Summary

The Nueces County Coastal Flood Risk Project area is located in eastern Nueces County. It includes the Nueces County portions of Padre Island, Mustang Island, and Corpus Christi Bay. This entire area is included as part of the Corpus Christi Metropolitan Area.

3.2.1 Overview

Nueces County Coastal Project Area, located in Texas, includes the following communities shown in Table 3.1. Population data values reflect the 2010 census.

Table 3.1: Project Area Community Overview

<table>
<thead>
<tr>
<th>Community Name</th>
<th>CID</th>
<th>Total Community Population</th>
<th>Percent of Population in Watershed</th>
<th>Total Community Land Area (sq. mi)</th>
<th>Percent of Land Area in Watershed</th>
<th>NIFP</th>
<th>CRS Rating</th>
<th>Mitigation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Aransas Pass</td>
<td>485453</td>
<td>8,204</td>
<td>&lt;1</td>
<td>10.8</td>
<td>32</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
<tr>
<td>City of Corpus Christi</td>
<td>485464</td>
<td>305,215</td>
<td>98</td>
<td>422.1</td>
<td>96</td>
<td>Y</td>
<td>7</td>
<td>Y</td>
</tr>
<tr>
<td>City of Port Aransas</td>
<td>485498</td>
<td>3,480</td>
<td>100</td>
<td>11.4</td>
<td>96</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
<tr>
<td>City of Portland</td>
<td>480559</td>
<td>15,099</td>
<td>0</td>
<td>10.2</td>
<td>29</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
<tr>
<td>Nueces County Unincorporated Areas</td>
<td>485494</td>
<td>340,223</td>
<td>2</td>
<td>719.2</td>
<td>26</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
</tbody>
</table>

Please note included within the project area is the Corpus Christi Naval Air Station and its satellite fields at Cabaniss and Waldron. Summary data for these areas are not included in this report, but may be included in the FRD.

Community-specific results are provided on subsequent pages. Data provided below and on subsequent pages only includes areas located within the Nueces County Coastal Project Area Flood Risk Project and do not necessarily represent community-wide totals.

Several Communities (Aransas Pass, Portland, Port Aransas) are located in both Nueces County and either Aransas or San Patricio Counties. Additional information about Flood Risk in these communities may be found in the separately published Flood Risk Reports, Map and Database for Aransas County Coastal Project Areas and San Patricio County Coastal Project Areas. Contact FEMA’s MSC to obtain copies of these reports.

Section 2 of the Flood Risk Report (FRR) provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the FRD.
3.2.2 Flood Risk Datasets

As a part of this Flood Risk Project, flood risk datasets were created for inclusion in the Flood Risk Database. Those datasets are summarized for this Flood Risk Project below:

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the Nueces County Coastal Project area were updated due to new engineering analysis performed within the Flood Risk Project. The updated modeling produced new flood zone areas and new base flood elevations in some areas and leveraged recently developed LiDAR-based topographic data for the Flood Risk Project.
  - Also included in this analysis is updated engineering analysis along the Nueces River, Oso Creek and various tributaries of Oso Creek.
  - Floodplains for other streams within the Nueces County Coastal Project area were updated using the LiDAR-based latest topographic data.
  - The data in this section reflects a comparison between the effective FIRM(s) and the new analysis in this study.
  - Table 3.2 below summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the watershed.

Table 3.2: Nueces County Coastal Project Area: Changes Since Last FIRM

<table>
<thead>
<tr>
<th>Area of Interest</th>
<th>Total Area (mi²)</th>
<th>Increase (mi²)</th>
<th>Decrease (mi²)</th>
<th>Net Change (mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SFHA*</td>
<td>177.0</td>
<td>21.4</td>
<td>172.0</td>
<td>-150.6</td>
</tr>
<tr>
<td>Within Floodway*</td>
<td>7.9</td>
<td>6.2</td>
<td>0.4</td>
<td>5.8</td>
</tr>
<tr>
<td>Within CHHA (Zone VE or V)</td>
<td>103.6</td>
<td>42.0</td>
<td>165.2</td>
<td>-123.2</td>
</tr>
</tbody>
</table>

*Although the Flood Risk Database may contain Changes Since Last FIRM information outside of Nueces County Coastal Project Area, the figures in this table only represent information within the Nueces County Coastal Project Area.

Section 2 of this report provides more information regarding the source and methodology used to develop this table.

- One of the main factors for the decrease of SFHAs and CHHAs is that areas of Open Water are no longer considered SFHAs or CHHAs. Large areas of Corpus Christi Bay and the Laguna Madre are now considered Open Water rather than Zone VE. Factoring out open water actually shows a slight increase in SFHAs and CHHAs in the City of Corpus Christi.
- NOTE: Summary in Table 3.2 includes CSLF for Corpus Christi Naval Air Station and its satellite fields.
- Evidence of actual flood losses can be one of the most compelling factors for increasing a community’s flood risk awareness. During this Risk MAP project, FEMA confirmed several areas within this watershed as having mitigation potential and encourages the communities within the watershed to continue working with the State Hazard Mitigation Officer to further identify and mitigate these high-risk areas and
structures. Specific areas within each jurisdiction are detailed within the individual community summaries.

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Multi-frequency flood depth grids (10-, 2-, 1-, and 0.2-percent-annual-chance flood events)
    - Percent annual chance of flooding grids
    - Percent chance of flooding over a 30-year period grids
  - The Nueces County Coastal Project includes grid and flood risk datasets based on three separate analyses. The first analysis is based on stillwater data only, which includes storm surge and setup, and is referred to as the ADCIRC analysis. The ADCIRC data is a beneficial tool because it includes multiple return periods (10%- , 2%- , and 0.2%-annual-chance-events) and allows for development of the probability grids. However, in areas of expected coastal wave effects for each respective return period, the ADCIRC datasets do not reflect the complete risk. The second analysis is a wave height study, which involves overland wave propagation, runup and overtopping as applicable, in addition to the stillwater data, and is referred to as the WHAFIS analysis. The WHAFIS data represents the regulatory coastal flood zones as mapped in the FIRMs, but the analysis only includes the 1%-annual-chance-event.
  - The ADCIRC depth grids are storm surge and setup (stillwater) depths only and do not include wave effects; as a result, these grids reflect depths less than would be expected during a storm event and should be used with an understanding that they do not convey the full flood risk.
  - The WHAFIS depth grid includes the wave height analysis based on the ADCIRC storm surge results and is the basis for the regulatory coastal flood zones. The WHAFIS depth grid data corresponds to the mapped coastal special flood hazard zones on the FIRMs.
  - A recent riverine study was conducted on the flood hazards associated with Oso Creek. Depth grids and probability grids have been developed for this area. These data sets have not been developed for the various tributaries of Oso Creek.
  - A combined ADCIRC – Oso Creek Depth grid for the 1%-annual chance flood is included in the FRD.
  - The 30-year annual chance probability and annual chance probability grids are based either on the ADCIRC storm surge results or on the Oso Creek riverine analysis; since multiple annual chance events must be factored together to populate this content. As a result, it should be understood that these probability grids have the potential to underestimate the level of risk for areas subject to coastal wave action.
  - Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation.
strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Flood Risk Results Information**
  - Nueces County Coastal Project Area flood risk analysis incorporates results from a FEMA-performed Hazus analysis which accounts for newly modeled areas in the Flood Risk Project and newly modeled depths for certain flood events. Potential losses were estimated as well as potential loss ratios for multiple scenarios. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.
  - The Nueces County Coastal Project Area incorporates results from a FEMA-performed HAZUS analysis which accounts for average annualized loss (AAL) within the watershed. These data were entirely superseded for the coastally influenced areas within the Coastal Project Area for Nueces County. FEMA's AAL results are included in the Flood Risk Database for general reference. This previous study was conducted using data from the 2000 census.
  - A HAZUS “Level-2” analysis was performed only for the Coastal Project Area where updated FEMA and USACE engineering analysis resulted in revised flood hazard information. Both the Total Inventory of potential losses and the estimated loss results are calculated only for this project area and not for entire communities. This study is based on data from the 2010 census.
  - Three different datasets have been incorporated into the risk analyses: Storm surge and setup only (ADCIRC) and the ADCIRC storm surge data with full wave analysis (WHAFIS). The ADCIRC and WHAFIS loss results are shown in separate tables and the ADCIRC results should be understood to not include wave effects. Also included is the Oso Creek Riverine Analysis.
    - Specific to the WHAFIS analyses, ONLY the 1%-annual-chance hazard analysis is included in this FRD. This analysis matches the areas of wave run-up shown on the Flood Insurance Rate Maps for this community.
    - Specific to the ADCIRC analyses, multiple return period risk analyses has been performed to include the 10%- , 2%- , 1%- and 0.2%-annual-chance hazard.
    - Specific to the Oso Creek riverine analysis, multiple return period risk analyses has been performed to include the 10%- , 2%- , 1%- and 0.2%-annual-chance hazard.
  - NOTE: Both total inventory and estimated losses are only for the coastal hazard areas of Nueces County. Loss ratio may appear slightly higher than expected because the area being included in the analysis is limited to only the Coastal Project Area. Estimate losses are shown in Tables 3.3 through 3.5.
  - NOTE: Summary below includes potential losses for Corpus Christi Naval Air Station and its satellite fields.
Table 3.3: Nueces County Coastal Project Area: Estimated Potential Losses for Flood Event Scenarios (ADCIRC)

<table>
<thead>
<tr>
<th></th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses¹</td>
<td>Loss Ratio²</td>
<td>Dollar Losses¹</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$37,213,100,000</td>
<td>73%</td>
<td>$166,700,000</td>
<td>&lt; 1%</td>
<td>$423,700,000</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$10,221,700,000</td>
<td>20%</td>
<td>$41,500,000</td>
<td>&lt; 1%</td>
<td>$102,900,000</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$3,419,200,000</td>
<td>7%</td>
<td>$17,900,000</td>
<td>&lt; 1%</td>
<td>$35,100,000</td>
</tr>
<tr>
<td>Total Building/Contents³</td>
<td>$50,854,000,000</td>
<td>100%</td>
<td>$226,100,000</td>
<td>1%</td>
<td>$561,800,000</td>
</tr>
<tr>
<td>Business Disruption⁴</td>
<td>$0</td>
<td>N/A</td>
<td>$3,000,000</td>
<td>N/A</td>
<td>$6,200,000</td>
</tr>
<tr>
<td>TOTAL⁵</td>
<td>$50,854,000,000</td>
<td>100%</td>
<td>$229,100,000</td>
<td>&lt; 1%</td>
<td>$568,800,000</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

¹Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
²Loss ratio = Dollar Losses + Estimated Value. Loss Ratios are rounded to the nearest integer percent.
³Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
⁴Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
⁵Total = Total Building and Contents + Business Disruption

*The figures in this table only represent information within the Nueces County Coastal Project Area*
Table 3.4: Nueces County Coastal Project Area: Estimated Potential Losses for Flood Event Scenarios (Oso Creek)

<table>
<thead>
<tr>
<th></th>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$37,213,100,000</td>
<td>73%</td>
<td>$1,000,000</td>
<td>&lt; 1%</td>
<td>$16,500,000</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$10,221,700,000</td>
<td>20%</td>
<td>$1,400,000</td>
<td>&lt; 1%</td>
<td>$300,000</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$3,419,200,000</td>
<td>7%</td>
<td>$700,000</td>
<td>&lt; 1%</td>
<td>$600,000</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$50,854,000,000</td>
<td>100%</td>
<td>$3,100,000</td>
<td>&lt; 1%</td>
<td>$17,400,000</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>$40,000</td>
<td>N/A</td>
<td>$100,000</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL</td>
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<td>$3,100,000</td>
<td>&lt; 1%</td>
<td>$17,500,000</td>
<td>&lt; 1%</td>
</tr>
</tbody>
</table>

1Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
Table 3.5: Nueces County Coastal Project Area: Estimated Potential Losses for Flood Event Scenarios (WHAFIS)

<table>
<thead>
<tr>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses¹</td>
<td>Loss Ratio²</td>
<td>Dollar Losses¹</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$37,213,100,000</td>
<td>73%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$10,221,700,000</td>
<td>20%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$3,419,200,000</td>
<td>7%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Building/Contents²</td>
<td>$50,854,000,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Business Disruption⁴</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL⁵</td>
<td>$50,854,000,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

¹Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
²Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
³Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
⁴Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
⁵Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
o Please note that the Texas Water Development Board (TWDB) and Texas Natural Resource Information Systems (TNRIS) developed a separate Phase 1 Hurricane Risk Assessment included detailed county-level risk assessments focused on defining hurricane, riverine flood, and coastal flood risks. This study included Nueces County, Texas. For more information about this risk assessment please contact the TWDB and TNRIS.

• **Areas of Mitigation Interest**

  o Section 2.2.4 of the FRR provides more information regarding areas of mitigation interest, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

  o A significant factor for the Nueces County Coastal Project area is coastal flooding caused by hurricanes and riverine flooding from Oso Creek and its tributaries. Many past NFIP claims as well as Repetitive / Severe Repetitive Properties are located within the Nueces County Coastal Project Area.

  o To help provide protection from coastal flooding seawalls, levees and other coastal structures are located in the project area.

  o For more information about other areas of mitigation interest, review the additional data inside the FRD, as well as the community specific sections of this report. Table 3-6 provides an overview of identified AoMIs within the Project Area. This does not preclude the identification of other AoMIs by state and local sources.

  **Table 3.6: Nueces County Coastal Project: Areas of Mitigation Interest Summary**

<table>
<thead>
<tr>
<th>Type of Mitigation Interest</th>
<th>Number of Areas</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Risk Essential Facilities</td>
<td>21</td>
<td>Summary information for Nueces County Project Area based on HAZUS inventory data.</td>
</tr>
<tr>
<td>Coastal Structures</td>
<td>7</td>
<td>Summary information for Nueces County Project Area based on levee analysis and Preliminary Flood Insurance Report.</td>
</tr>
<tr>
<td>Non-Accredited Levee</td>
<td>1</td>
<td>Summary information for Nueces County Project Area based on levee analysis and Preliminary Flood Insurance Report.</td>
</tr>
<tr>
<td>Past Claims Hot Spot</td>
<td>209</td>
<td>Summary information for Nueces County Project Area based on NFIP claims and repetitive loss data.</td>
</tr>
</tbody>
</table>
3.2 Communities

The following sections provide an overview of the community’s floodplain management program as of the date of this publication, as well as summarize the flood risk analysis performed for each project area in the Nueces County Coastal Flood Risk Project Area.

3.3.1 City of Aransas Pass Summary (CID 485453)

The following pages include Flood Risk data for the City of Aransas Pass.

3.3.1.1. Overview

The City of Aransas Pass is located in Aransas, Nueces and San Patricio Counties, Texas. For information on this community in areas outside of Nueces County, please refer to the separately published Aransas County and San Patricio County Coastal Project Area Flood Risk Report. The City is located on Redfish Bay, behind several barrier islands. As shown in Table 3.7, only a small fraction of the community is within the Nueces County Coastal Project Area.

Table 3.7: City of Aransas Pass Overview

<table>
<thead>
<tr>
<th>Community Name</th>
<th>CID</th>
<th>Total Community Population</th>
<th>Percent of Population in Watershed</th>
<th>Total Community Land Area (sq. mi)</th>
<th>Percent of Land Area in Watershed</th>
<th>NFIP</th>
<th>CRS Rating</th>
<th>Mitigation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Aransas Pass</td>
<td>485453</td>
<td>8,204</td>
<td>&lt; 1</td>
<td>10.8</td>
<td>32</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
</tbody>
</table>

- Participating in Coastal Bend HMP, which expires on 10/16/2017.
- Past Federal Disaster Declarations for flooding = 18
- National Flood Insurance Program (NFIP) policy coverage (policies/values) = 892 policies totaling approximately $2,327,119,000
- NFIP-recognized repetitive loss properties = 22 (15 residential and 7 commercial).
- NFIP-recognized severe repetitive loss properties = 3 (residential)

Data provided below only includes the areas within the City of Aransas Pass that are located within the Nueces County Coastal Project Area, and do not necessarily represent community-wide totals. Section 2 of the Flood Risk Report (FRR) provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the Flood Risk Database (FRD).

3.3.1.2. Community Analyses and Results

Results for each of the Flood Risk Datasets developed for this Flood Risk Project are summarized below:
• **Changes Since Last FIRM**
  
  o Special Flood Hazard Area (SFHA) boundaries within the City of Aransas Pass were updated due to new engineering analysis performed on coastal flooding from the Gulf of Mexico. The updated modeling produced new flood zone areas and new base flood elevations and leveraged the county’s recently developed LiDAR-based topographic data. Areas with the greatest increase in flood zone area are adjacent to the coastline. Areas with the greatest decrease in flood zone area are located further inland from the coast. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

  o Table 3.8 summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

  o Overall there is a small decrease in SFHAs and CHHAs for areas for the City of Aransas Pass within the Nueces County Coastal Project Area.

  **Table 3.8: City of Aransas Pass: Changes Since Last FIRM Summary**

<table>
<thead>
<tr>
<th>Area of Study</th>
<th>Total Area (mi²)</th>
<th>Increase (mi²)</th>
<th>Decrease (mi²)</th>
<th>Net Change (mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SFHA*</td>
<td>3.4</td>
<td>0.0</td>
<td>0.1</td>
<td>-0.1</td>
</tr>
<tr>
<td>Within Floodway</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Within CHHA* (Zone VE or V)</td>
<td>2.4</td>
<td>0.5</td>
<td>0.7</td>
<td>-0.2</td>
</tr>
</tbody>
</table>

*Although the Flood Risk Database may contain Changes Since Last FIRM information outside of City of Aransas Pass, the figures in this table only represent information within the City of Aransas Pass.

Section 2 of this report provides more information regarding the source and methodology used to develop this table.

• **Flood Depth and Analysis Grids**

  o See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):

    ➢ Multi-frequency flood depth grids (10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood events)

    ➢ Percent annual chance of flooding grids

    ➢ Percent chance of flooding over a 30-year period grids

  o Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

  o Only the ADCIRC and WHAFIS depth grids pertain to the City of Aransas Pass.
• **Hazus Estimated Loss Information**
  
  o Nueces County Coastal Project Area flood risk analysis incorporates results from a FEMA-performed Hazus analysis which accounts for newly modeled areas in the Flood Risk Project and newly modeled depths for certain flood events. Potential losses were estimated as well as potential loss ratios for multiple scenarios. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they likely to occur.
  
  o The Project Area includes results from a FEMA-performed HAZUS analysis which accounts for average annualized loss (AAL) within the watershed. These data were entirely superseded for the coastally influenced areas within the Coastal Project Area for Nueces County. FEMA’s AAL results are included in the Flood Risk Database for general reference. This previous study was conducted using data from the 2000 census.
  
  o A HAZUS “Level-2” analysis was performed only for the Coastal Project Area, including portions of the City of Aransas Pass where updated FEMA and USACE engineering analysis resulted in revised flood hazard information. Both the Total Inventory of potential losses and the estimated loss results are calculated only for this project area and not for entire communities. This study is based on data from the 2010 census.
  
  o Two different datasets have been incorporated into the risk analyses: Storm surge and setup only (ADCIRC) and the ADCIRC storm surge data with full wave analysis (WHAFIS). The ADCIRC and WHAFIS loss results are shown in separate tables and the ADCIRC results should be understood to not include wave effects.
    - Specific to the WHAFIS analyses, ONLY the 1%-annual-chance hazard analysis is included in this FRD. This analysis matches the areas of wave run-up shown on the Flood Insurance Rate Maps for this community.
    - Specific to the ADCIRC analyses, multiple return period risk analyses has been performed to include the 10%-, 2%-, 1%- and 0.2%-annual-chance hazard.
  
  o NOTE: Both total inventory and estimated losses are only for the coastal hazard areas of Nueces County. Loss ratio may appear slightly higher than expected because the area being included in the analysis is limited to only the Coastal Project Area. Estimate losses are shown in Tables 3.9 and 3.10.
  
  o Please note that the Texas Water Development Board (TWDB) and Texas Natural Resource Information Systems (TNRIS) developed a separate Phase 1 Hurricane Risk Assessment included detailed county-level risk assessments focused on defining hurricane, riverine flood, and coastal flood risks. This study included the City of Aransas Pass, Nueces County, Texas. For more information about this risk assessment please contact the TWDB and TNRIS.

• **Areas of Mitigation Interest**
  
  o Section 2.2.4 of the FRR provides more information regarding areas of mitigation interest, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.
  
  o There are no Areas of Mitigation Interest within the City of Aransas Pass that are also within the Nueces County Coastal Project Area.
Table 3.9: City of Aransas Pass: Estimated Potential Losses for Flood Event Scenarios (ADCIRC)

<table>
<thead>
<tr>
<th></th>
<th>Estimated Value</th>
<th>% of Total</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($)/yr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Building/Contents</td>
<td>$600,000</td>
<td>50%</td>
<td>$40,000</td>
<td>5%</td>
<td>$80,000</td>
<td>13%</td>
<td>$200,000</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$300,000</td>
<td>25%</td>
<td>$0</td>
<td>0%</td>
<td>$10,000</td>
<td>3%</td>
<td>$20,000</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$300,000</td>
<td>25%</td>
<td>$0</td>
<td>0%</td>
<td>$10,000</td>
<td>3%</td>
<td>$40,000</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$1,200,000</td>
<td>100%</td>
<td>$40,000</td>
<td>3%</td>
<td>$100,000</td>
<td>8%</td>
<td>$300,000</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$1,200,000</td>
<td>100%</td>
<td>$40,000</td>
<td>3%</td>
<td>$100,000</td>
<td>8%</td>
<td>$300,000</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1. Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2. Loss ratio = Dollar Losses / Estimated Value. Loss Ratios are rounded to the nearest integer percent.
5. Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
### Table 3.10: City of Aransas Pass: Estimated Potential Losses for Flood Event Scenarios (WHAFIS)

<table>
<thead>
<tr>
<th></th>
<th>Estimated Value</th>
<th>% of Total</th>
<th>Dollar Losses&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Loss Ratio&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Dollar Losses&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Loss Ratio&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Dollar Losses&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Loss Ratio&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Dollar Losses&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Loss Ratio&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Building/Contents</td>
<td>$600,000</td>
<td>50%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$200,000</td>
<td>30%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$300,000</td>
<td>25%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$20,000</td>
<td>7%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$300,000</td>
<td>25%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$40,000</td>
<td>13%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Building/Contents&lt;sup&gt;3&lt;/sup&gt;</td>
<td>$1,200,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$300,000</td>
<td>25%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Business Disruption&lt;sup&gt;4&lt;/sup&gt;</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>TOTAL</strong>&lt;sup&gt;5&lt;/sup&gt;</td>
<td>$1,200,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$300,000</td>
<td>25%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

<sup>1</sup>Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.

<sup>2</sup>Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.

<sup>3</sup>Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.

<sup>4</sup>Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.

<sup>5</sup>Total = Total Building and Contents + Business Disruption

*The figures in this table only represent information within the Nueces County Coastal Project Area*
3.3.2 City of Corpus Christi Summary (CID 485464)

The following pages include Flood Risk data for the City of Corpus Christi.

3.3.2.1. Overview

The City of Corpus Christi is the largest community in the project area. Almost the entire City is located in the project area. The City experiences flooding from hurricanes, both in Corpus Christi Bay and on Padre Island from the Gulf of Mexico. At the same time City can experience riverine flooding from Oso Creek and its tributaries, the Nueces River, and other smaller flooding sources. The information in Table 3.11 provides an overview of the City of Corpus Christi as of the date of this publication.

Table 3.11: City of Corpus Christi Overview

<table>
<thead>
<tr>
<th>Community Name</th>
<th>CID</th>
<th>Total Community Population</th>
<th>Percent of Population in Watershed</th>
<th>Total Community Land Area (sq. mi)</th>
<th>Percent of Land Area in Watershed</th>
<th>NFIP</th>
<th>CRS Rating</th>
<th>Mitigation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Corpus Christi</td>
<td>485464</td>
<td>305,215</td>
<td>98</td>
<td>422.1</td>
<td>96</td>
<td>Y</td>
<td>7</td>
<td>Y</td>
</tr>
</tbody>
</table>

- Participating in Coastal Bend HMP, which expires on 10/16/2017.
- Past Federal Disaster Declarations for flooding = 18
- National Flood Insurance Program (NFIP) policy coverage (policies/values) = 20,119 policies totaling approximately $4,858,937,900
- NFIP-recognized repetitive loss properties = 151 (120 residential and 31 commercial).
- NFIP-recognized severe repetitive loss properties = 8 (residential)

Data provided below only includes areas within the City of Corpus Christi that are located within the Nueces County Coastal Project Area and do not necessarily represent community-wide totals. Section 2 of the Flood Risk Report (FRR) provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the Flood Risk Database (FRD).

3.3.2.2. Community Analyses and Results

Results for each of the Flood Risk Datasets developed for this Flood Risk Project are summarized below:

- **Changes Since Last FIRM**
  - Special Flood Hazard Area (SFHA) boundaries within the City of Corpus Christi were updated due to new engineering analysis performed on coastal flooding from the Gulf of Mexico. The updated modeling produced new flood zone areas and new base flood elevations and leveraged the county’s recently developed LiDAR-based topographic data. Areas with the greatest increase in flood zone area are adjacent to the
coastline. Areas with the greatest decrease in flood zone area are located further inland from the coast.

- Also included in this analysis is updated engineering analysis along the Nueces River, Oso Creek, and various tributaries of Oso Creek.
- Floodplains for other streams within the Nueces County Coastal Project area were updated using the LiDAR-based latest topographic data.
- The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
- Table 3.12 summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

Table 3.12: City of Corpus Christi: Changes Since Last FIRM Summary

<table>
<thead>
<tr>
<th>Area of Study</th>
<th>Total Area (mi²)</th>
<th>Increase (mi²)</th>
<th>Decrease (mi²)</th>
<th>Net Change (mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SFHA*</td>
<td>108.9</td>
<td>10.9</td>
<td>163.3</td>
<td>-152.4</td>
</tr>
<tr>
<td>Within Floodway*</td>
<td>4.1</td>
<td>3.1</td>
<td>0.2</td>
<td>2.9</td>
</tr>
<tr>
<td>Within CHHA* (Zone VE or V)</td>
<td>66.2</td>
<td>33.5</td>
<td>161.5</td>
<td>-128.0</td>
</tr>
</tbody>
</table>

*Although the Flood Risk Database may contain Changes Since Last FIRM information outside of City of Corpus Christi, the figures in this table only represent information within the City of Corpus Christi.

Section 2 of this report provides more information regarding the source and methodology used to develop this table.

- One of the main factors for the decrease of SFHAs and CHHAs is that areas of Open Water are no longer considered SFHAs or CHHAs. Large areas of Corpus Christi Bay and the Laguna Madre are now considered Open Water rather than Zone VE. Factoring out open water actually shows a slight increase in SFHAs and CHHAs in the City of Corpus Christi.
- Most increases to the Floodway and SFHAs represent recent modeling of Oso Creek, its tributaries, and the Nueces River based on the latest gage data, modeling techniques and LiDAR-based topographic data.

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Multi-frequency flood depth grids (10-, 2-, 1-, and 0.2-percent-annual-chance flood events)
    - Percent annual chance of flooding grids
    - Percent chance of flooding over a 30-year period grids
  - The Nueces County Coastal Project includes grid and flood risk datasets based on three separate analyses. The first analysis is based on stillwater data only, which
includes storm surge and setup, and is referred to as the ADCIRC analysis. The ADCIRC data is a beneficial tool because it includes multiple return periods (10%-2%-, and 0.2%-annual-chance-events) and allows for development of the probability grids. However, in areas of expected coastal wave effects for each respective return period, the ADCIRC datasets do not reflect the complete risk. The second analysis is a wave height study, which involves overland wave propagation, runup and overtopping as applicable, in addition to the stillwater data, and is referred to as the WHAFIS analysis. The WHAFIS data represents the regulatory coastal flood zones as mapped in the FIRMs, but the analysis only includes the 1%-annual-chance-event.

- The ADCIRC depth grids are storm surge and setup (stillwater) depths only and do not include wave effects; as a result, these grids reflect depths less than would be expected during a storm event and should be used with an understanding that they do not convey the full flood risk.

- The WHAFIS depth grid includes the wave height analysis based on the ADCIRC storm surge results and is the basis for the regulatory coastal flood zones. The WHAFIS depth grid data corresponds to the mapped coastal special flood hazard zones on the FIRMs.

- A recent riverine study was conducted on the flood hazards associated with Oso Creek. Depth grids and probability grids have been developed for this area. These data sets have not been developed for the various tributaries of Oso Creek.

- A combined ADCIRC – Oso Creek Depth grid for the 1%-annual chance flood is included in the FRD.

- The 30-year annual chance probability and annual chance probability grids are based either on the ADCIRC storm surge results or on the Oso Creek riverine analysis; since multiple annual chance events must be factored together to populate this content. As a result, it should be understood that these probability grids have the potential to underestimate the level of risk for areas subject to coastal wave action.

- Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

- **Hazus Estimated Loss Information**

  - Nueces County Coastal Project Area flood risk analysis incorporates results from a FEMA-performed Hazus analysis which accounts for newly modeled areas in the Flood Risk Project and newly modeled depths for certain flood events. Potential losses were estimated as well as potential loss ratios for multiple scenarios. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

  - The Project Area includes results from a FEMA-performed HAZUS analysis which accounts for average annualized loss (AAL) within the watershed. These data were entirely superseded for the coastally influenced areas within the Coastal Project Area for Nueces County. FEMA’s AAL results are included in the Flood Risk Database for general reference. This previous study was conducted using data from the 2000 census.
A HAZUS “Level-2” analysis was performed only for the City of Corpus Christi where updated FEMA and USACE engineering analysis resulted in revised flood hazard information. Both the Total Inventory of potential losses and the estimated loss results are calculated only for this project area and not for entire communities. This study is based on data from the 2010 census.

Three different datasets have been incorporated into the risk analyses: Storm surge and setup only (ADCIRC) and the ADCIRC storm surge data with full wave analysis (WHAFIS). The ADCIRC and WHAFIS loss results are shown in separate tables and the ADCIRC results should be understood to not include wave effects. Also included is the Oso Creek Riverine Analysis.

- Specific to the WHAFIS analyses, ONLY the 1%-annual-chance hazard analysis is included in this FRD. This analysis matches the areas of wave run-up shown on the Flood Insurance Rate Maps for this community.
- Specific to the ADCIRC analyses, multiple return period risk analyses has been performed to include the 10%--, 2%--, 1%- and 0.2%-annual-chance hazard.
- Specific to the Oso Creek riverine analysis, multiple return period risk analyses has been performed to include the 10%--, 2%--, 1%- and 0.2%-annual-chance hazard.

NOTE: Both total inventory and estimated losses are only for the coastal hazard areas of Corpus Christi. Loss ratio may appear slightly higher than expected because the area being included in the analysis is limited to only the Coastal Project Area. Estimate losses are shown in Tables 3.14 through 3.16.

Please note that the Texas Water Development Board (TWDB) and Texas Natural Resource Information Systems (TNRIS) developed a separate Phase 1 Hurricane Risk Assessment included detailed county-level risk assessments focused on defining hurricane, riverine flood, and coastal flood risks. This study included the City of Corpus Christi, Nueces County, Texas. For more information about this risk assessment please contact the TWDB and TNRIS.

**Areas of Mitigation Interest**

- Section 2.2.4 of the FRR provides more information regarding areas of mitigation interest, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

- A significant factor for the City of Corpus Christi is coastal flooding caused by hurricanes and riverine flooding from Oso Creek and its tributaries. Many past NFIP claims as well as Repetitive / Severe Repetitive Properties are located within the City of Corpus Christi.

- To help provide protection from coastal flooding seawalls, levees and other coastal structures are located in the City.
For more information about other areas of mitigation interest, review the additional data inside the FRD, as well as the community specific sections of this report. Table 3.13 provides an overview of identified AoMIs within the Project Area. This does not preclude the identification of other AoMIs by state and local sources.

Table 3.13: City of Corpus Christi: Areas of Mitigation Interest Summary

<table>
<thead>
<tr>
<th>Type of Mitigation Interest</th>
<th>Number of Areas</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Risk Essential Facilities</td>
<td>16</td>
<td>Summary information for Nueces County Project Area based on HAZUS inventory data.</td>
</tr>
<tr>
<td>Coastal Structures</td>
<td>7</td>
<td>Summary information for Nueces County Project Area based on levee analysis and Preliminary Flood Insurance Report.</td>
</tr>
<tr>
<td>Non-Accredited Levee</td>
<td>1</td>
<td>Summary information for Nueces County Project Area based on levee analysis and Preliminary Flood Insurance Report.</td>
</tr>
<tr>
<td>Past Claims Hot Spot</td>
<td>179</td>
<td>Summary information for Nueces County Project Area based on NFIP claims and repetitive loss data.</td>
</tr>
</tbody>
</table>
Table 3.14: City of Corpus Christi: Estimated Potential Losses for Flood Event Scenarios (ADCIRC)

<table>
<thead>
<tr>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$35,976,500,000</td>
<td>74%</td>
<td>$136,200,000</td>
<td>&lt;1%</td>
<td>$331,000,000</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$9,693,400,000</td>
<td>20%</td>
<td>$34,100,000</td>
<td>&lt;1%</td>
<td>$71,600,000</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$3,249,900,000</td>
<td>7%</td>
<td>$14,500,000</td>
<td>&lt;1%</td>
<td>$25,000,000</td>
</tr>
<tr>
<td>Total Building/Contents&lt;sup&gt;3&lt;/sup&gt;</td>
<td>$48,919,800,000</td>
<td>100%</td>
<td>$184,700,000</td>
<td>&lt;1%</td>
<td>$427,600,000</td>
</tr>
<tr>
<td>Business Disruption&lt;sup&gt;4&lt;/sup&gt;</td>
<td>$0</td>
<td>N/A</td>
<td>$2,200,000</td>
<td>N/A</td>
<td>$3,900,000</td>
</tr>
<tr>
<td>TOTAL&lt;sup&gt;5&lt;/sup&gt;</td>
<td>$48,919,800,000</td>
<td>100%</td>
<td>$186,900,000</td>
<td>&lt;1%</td>
<td>$431,500,000</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1 Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2 Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3 Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4 Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5 Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
Table 3.15: City of Corpus Christi: Estimated Potential Losses for Flood Event Scenarios (Oso Creek)

<table>
<thead>
<tr>
<th></th>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses 1</td>
<td>Loss Ratio 1</td>
<td>Dollar Losses 1</td>
<td>Loss Ratio 1</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$35,976,500,000</td>
<td>74%</td>
<td>$0</td>
<td>&lt;1%</td>
<td>$14,900,000</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$9,693,400,000</td>
<td>20%</td>
<td>$200,000</td>
<td>&lt;1%</td>
<td>$200,000</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$3,249,900,000</td>
<td>7%</td>
<td>$300,000</td>
<td>&lt;1%</td>
<td>$300,000</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$48,919,800,000</td>
<td>100%</td>
<td>$500,000</td>
<td>&lt;1%</td>
<td>$15,400,000</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Business Disruption 4</td>
<td></td>
<td></td>
<td>$10,000</td>
<td>N/A</td>
<td>$80,000</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL 5</td>
<td>$48,919,800,000</td>
<td>100%</td>
<td>$500,000</td>
<td>&lt;1%</td>
<td>$15,500,000</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area
Table 3.16: City of Corpus Christi: Estimated Potential Losses for Flood Event Scenarios (WHAFIS)

<table>
<thead>
<tr>
<th></th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
<td>Dollar Losses</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$35,976,500,000</td>
<td>74%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$9,693,400,000</td>
<td>20%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$3,249,900,000</td>
<td>7%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$48,919,800,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$12,100,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$48,919,800,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1 Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2 Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3 Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4 Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5 Total = Total Building and Contents + Business Disruption.

The figures in this table only represent information within the Nueces County Coastal Project Area.
3.3.3 City of Port Aransas Summary (CID 485498)

The following pages include Flood Risk data for the City of Port Aransas.

3.3.3.1 Overview

The City of Port Aransas is located in Aransas and Nueces Counties, Texas. For information on this community in areas outside of Nueces County, please refer to the separately published Aransas County Coastal Project Area Flood Risk Report. The City is located on Mustang Island at along the Corpus Christi Channel. As shown in Table 3.17, almost the entire community is included within the project area.

Table 3.17: City of Port Aransas Overview

<table>
<thead>
<tr>
<th>Community Name</th>
<th>CID</th>
<th>Total Community Population</th>
<th>Percent of Population in Watershed</th>
<th>Total Community Land Area (sq. mi)</th>
<th>Percent of Land Area in Watershed</th>
<th>NFIP</th>
<th>CRS Rating</th>
<th>Mitigation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Port Aransas</td>
<td>485498</td>
<td>3,480</td>
<td>100</td>
<td>11.4</td>
<td>96</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
</tbody>
</table>

- Participating in Coastal Bend HMP, which expires on 10/16/2017.
- Past Federal Disaster Declarations for flooding = 18
- National Flood Insurance Program (NFIP) policy coverage (policies/values) = 4,999 policies totaling approximately $1,064,085,600
- NFIP-recognized repetitive loss properties = 17 (12 residential and 5 commercial).
- NFIP-recognized severe repetitive loss properties = 0 (residential)

Data provided below only includes areas within the City of Port Aransas that are located within the Nueces County Coastal Project Area, and do not necessarily represent community-wide totals. Section 2 of the Flood Risk Report (FRR) provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the Flood Risk Database (FRD).

3.3.3.2 Community Analyses and Results

Results for each of the Flood Risk Datasets developed for this Flood Risk Project are summarized below:

- Changes Since Last FIRM
  - Special Flood Hazard Area (SFHA) boundaries within the City of Port Aransas were updated due to new engineering analysis performed on coastal flooding from the Gulf of Mexico. The updated modeling produced new flood zone areas and new base flood elevations and leveraged the county’s recently developed LiDAR-based topographic data. Areas with the greatest increase in flood zone area are adjacent to the coastline. Areas with the greatest decrease in flood zone area are located further...
inland from the coast. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- Table 3.18 summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

- Overall there is a small decrease in SFHAs for areas for the City of Port Aransas within the Nueces County Coastal Project Area. However CHHAs are increasing.

<table>
<thead>
<tr>
<th>Area of Study</th>
<th>Total Area (mi²)</th>
<th>Increase (mi²)</th>
<th>Decrease (mi²)</th>
<th>Net Change (mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SFHA*</td>
<td>8.4</td>
<td>0.4</td>
<td>1.6</td>
<td>-1.2</td>
</tr>
<tr>
<td>Within Floodway</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Within CHHA* (Zone VE or V)</td>
<td>3.4</td>
<td>1.7</td>
<td>1.4</td>
<td>0.3</td>
</tr>
</tbody>
</table>

*Although the Flood Risk Database may contain Changes Since Last FIRM information outside of City of Aransas Pass, the figures in this table only represent information within the City of Aransas Pass.

Section 2 of this report provides more information regarding the source and methodology used to develop this table.

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Multi-frequency flood depth grids (10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood events)
    - Percent annual chance of flooding grids
    - Percent chance of flooding over a 30-year period grids
  - Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
  - Only the ADCIRC and WHAFIS depth grids pertain to the City of Port Aransas.

- **Hazus Estimated Loss Information**
  - Nueces County Coastal Project Area flood risk analysis incorporates results from a FEMA-performed Hazus analysis which accounts for newly modeled areas in the Flood Risk Project and newly modeled depths for certain flood events. Potential losses were estimated as well as potential loss ratios for multiple scenarios. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.
  - The Project Area includes results from a FEMA-performed HAZUS analysis which accounts for average annualized loss (AAL) within the watershed. These data were
entirely superseded for the coastally influenced areas within the Coastal Project Area for Nueces County. FEMA’s AAL results are included in the Flood Risk Database for general reference. This previous study was conducted using data from the 2000 census.

- A HAZUS “Level-2” analysis was performed only for the Coastal Project Area, including portions of the City of Port Aransas where updated FEMA and USACE engineering analysis resulted in revised flood hazard information. Both the Total Inventory of potential losses and the estimated loss results are calculated only for this project area and not for entire communities. This study is based on data from the 2010 census.

- Two different datasets have been incorporated into the risk analyses: Storm surge and setup only (ADCIRC) and the ADCIRC storm surge data with full wave analysis (WHAFIS). The ADCIRC and WHAFIS loss results are shown in separate tables and the ADCIRC results should be understood to not include wave effects.
  - Specific to the WHAFIS analyses, ONLY the 1%-annual-chance hazard analysis is included in this FRD. This analysis matches the areas of wave run-up shown on the Flood Insurance Rate Maps for this community.
  - Specific to the ADCIRC analyses, multiple return period risk analyses has been performed to include the 10%--, 2%--, 1%- and 0.2%-annual-chance hazard.

- NOTE: Both total inventory and estimated losses are only for the coastal hazard areas of Nueces County. Loss ratio may appear slightly higher than expected because the area being included in the analysis is limited to only the Coastal Project Area. Estimate losses are shown in Tables 3.20 and 3.19.

- Please note that the Texas Water Development Board (TWDB) and Texas Natural Resource Information Systems (TNRIS) developed a separate Phase 1 Hurricane Risk Assessment included detailed county-level risk assessments focused on defining hurricane, riverine flood, and coastal flood risks. This study included the City of Aransas Pass, Nueces County, Texas. For more information about this risk assessment please contact the TWDB and TNRIS.

- **Areas of Mitigation Interest**

  - Section 2.2.4 of the FRR provides more information regarding areas of mitigation interest, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

  - A significant factor for the City of Port Aransas is coastal flooding caused by hurricanes. Many past NFIP claims as well as Repetitive / Severe Repetitive Properties are located within the City of Port Aransas.

  - For more information about other areas of mitigation interest, review the additional data inside the FRD, as well as the community specific sections of this report. Table 3.19 provides an overview of identified AoMIs within the Project Area. This does not preclude the identification of other AoMIs by state and local sources.
Table 3.19: City of Port Aransas: Areas of Mitigation Interest Summary

<table>
<thead>
<tr>
<th>Type of Mitigation Interest</th>
<th>Number of Areas</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Risk Essential Facilities</td>
<td>4</td>
<td>Summary information for Nueces County Project Area based on HAZUS inventory data.</td>
</tr>
<tr>
<td>Past Claims Hot Spot</td>
<td>27</td>
<td>Summary information for Nueces County Project Area based on NFIP claims and repetitive loss data.</td>
</tr>
</tbody>
</table>
Table 3.20: City of Port Aransas: Estimated Potential Losses for Flood Event Scenarios (ADCIRC)

<table>
<thead>
<tr>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses</td>
<td>Loss Ratio²</td>
<td>Dollar Losses</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$959,800,000</td>
<td>73%</td>
<td>$28,900,000</td>
<td>3%</td>
<td>$87,500,000</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$290,500,000</td>
<td>22%</td>
<td>$6,600,000</td>
<td>2%</td>
<td>$29,900,000</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$60,900,000</td>
<td>5%</td>
<td>$1,400,000</td>
<td>2%</td>
<td>$6,600,000</td>
</tr>
<tr>
<td>Total Building/Contents³</td>
<td>$1,311,200,000</td>
<td>100%</td>
<td>$37,000,000</td>
<td>3%</td>
<td>$124,000,000</td>
</tr>
<tr>
<td>Business Disruption⁴</td>
<td>$0</td>
<td>N/A</td>
<td>$600,000</td>
<td>N/A</td>
<td>$1,800,000</td>
</tr>
<tr>
<td>TOTAL⁴</td>
<td>$1,311,200,000</td>
<td>100%</td>
<td>$37,600,000</td>
<td>3%</td>
<td>$125,800,000</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

¹Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
²Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
³Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
⁴Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
⁵Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
Table 3.21: City of Port Aransas: Estimated Potential Losses for Flood Event Scenarios (WHAFIS)

<table>
<thead>
<tr>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses 1</td>
<td>Loss Ratio 1</td>
<td>Dollar Losses 1</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$959,800,000</td>
<td>73%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$290,500,000</td>
<td>22%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$60,900,000</td>
<td>5%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$1,311,200,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$1,311,200,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2Loss ratio = Dollar Losses + Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
3.3.4 City of Portland Summary (CID 480559)
The following pages include Flood Risk data for the City of Portland.

3.4.3.1 Overview
The City of Portland is located in Nueces and San Patricio Counties, Texas. For information on this community in areas outside of Nueces County, please refer to the separately published San Patricio County Coastal Project Area Flood Risk Report. The City is located on the north shore of Corpus Christi Bay, at the entrance to Nueces Bay. The developed areas of the City of Portland are located within San Patricio County.

Table 3.22: City of Portland Overview

<table>
<thead>
<tr>
<th>Community Name</th>
<th>CID</th>
<th>Total Community Population</th>
<th>Percent of Population in Watershed</th>
<th>Total Community Land Area (sq. mi)</th>
<th>Percent of Land Area in Watershed</th>
<th>NFIP</th>
<th>CRS Rating</th>
<th>Mitigation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Portland</td>
<td>480559</td>
<td>15,099</td>
<td>0</td>
<td>10.2</td>
<td>29</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
</tbody>
</table>

- Participating in Coastal Bend HMP, which expires on 10/16/2017.
- Past Federal Disaster Declarations for flooding = 18
- National Flood Insurance Program (NFIP) policy coverage (policies/values) = 1,006 policies totaling approximately $298,378,700
- NFIP-recognized repetitive loss properties = 8 (7 residential and 1 commercial).
- NFIP-recognized severe repetitive loss properties = 1 (residential)

Data provided below only includes areas within the City of Portland that are located within the Nueces County Coastal Project Area, and do not necessarily represent community-wide totals. Section 2 of the Flood Risk Report (FRR) provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the Flood Risk Database (FRD).

3.4.3.2 Community Analyses and Results
Results for each of the Flood Risk Datasets developed for this Flood Risk Project are summarized below:

- Changes Since Last FIRM
  - Special Flood Hazard Area (SFHA) boundaries within the City of Portland were updated due to new engineering analysis performed on coastal flooding from the Gulf of Mexico. The updated modeling produced new flood zone areas and new base flood elevations and leveraged the county’s recently developed LiDAR-based topographic data. Areas with the greatest increase in flood zone area are adjacent to the
coastline. Areas with the greatest decrease in flood zone area are located further inland from the coast. The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.

- Table 3.23 summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.
- Overall there is a small decrease in SFHAs and CHHAs for areas for the City of Portland within the Nueces County Coastal Project Area.

Table 3.23: City of Portland: Changes Since Last FIRM Summary

<table>
<thead>
<tr>
<th>Area of Study</th>
<th>Total Area (mi²)</th>
<th>Increase (mi²)</th>
<th>Decrease (mi²)</th>
<th>Net Change (mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SFHA*</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>-0.1</td>
</tr>
<tr>
<td>Within Floodway</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Within CHHA* (Zone VE or V)</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
<td>-0.1</td>
</tr>
</tbody>
</table>

*Although the Flood Risk Database may contain Changes Since Last FIRM information outside of City of Aransas Pass, the figures in this table only represent information within the City of Aransas Pass.

Section 2 of this report provides more information regarding the source and methodology used to develop this table.

- **Flood Depth and Analysis Grids**
  - See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
    - Multi-frequency flood depth grids (10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood events)
    - Percent annual chance of flooding grids
    - Percent chance of flooding over a 30-year period grids
  - Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.
  - Only the ADCIRC and WHAFIS depth grids pertain to the City of Portland.

- **Hazus Estimated Loss Information**
  - Nueces County Coastal Project Area flood risk analysis incorporates results from a FEMA-performed Hazus analysis which accounts for newly modeled areas in the Flood Risk Project and newly modeled depths for certain flood events. Potential losses were estimated as well as potential loss ratios for multiple scenarios. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.
The Project Area includes results from a FEMA-performed HAZUS analysis which accounts for average annualized loss (AAL) within the watershed. These data were entirely superseded for the coastally influenced areas within the Coastal Project Area for Nueces County. FEMA’s AAL results are included in the Flood Risk Database for general reference. This previous study was conducted using data from the 2000 census.

A HAZUS “Level-2” analysis was performed only for the Coastal Project Area, including portions of the City of Portland where updated FEMA and USACE engineering analysis resulted in revised flood hazard information. Both the Total Inventory of potential losses and the estimated loss results are calculated only for this project area and not for entire communities. This study is based on data from the 2010 census.

Two different datasets have been incorporated into the risk analyses: Storm surge and setup only (ADCIRC) and the ADCIRC storm surge data with full wave analysis (WHAFIS). The ADCIRC and WHAFIS loss results are shown in separate tables and the ADCIRC results should be understood to not include wave effects.

- Specific to the WHAFIS analyses, ONLY the 1%-annual-chance hazard analysis is included in this FRD. This analysis matches the areas of wave run-up shown on the Flood Insurance Rate Maps for this community.
- Specific to the ADCIRC analyses, multiple return period risk analyses has been performed to include the 10%--, 2%--, 1%- and 0.2%-annual-chance hazard.

There is no identifiable exposure for the portions of the City of Portland that are within the Nueces County Coastal Project Area. As a result estimate losses shown in Tables 3.24 and 3.25 show values of $0.00. This does not preclude losses for the City of Portland identified in the San Patricio County Coastal Project Area.

Please note that the Texas Water Development Board (TWDB) and Texas Natural Resource Information Systems (TNRIS) developed a separate Phase 1 Hurricane Risk Assessment included detailed county-level risk assessments focused on defining hurricane, riverine flood, and coastal flood risks. This study included the City of Portland, Nueces County, Texas. For more information about this risk assessment please contact the TWDB and TNRIS.

**Areas of Mitigation Interest**

- Section 2.2.4 of the FRR provides more information regarding areas of mitigation interest, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.
- There are no Areas of Mitigation Interest within the City of Aransas Pass that are also in the Nueces County Coastal Project Area.
### Table 3.24: City of Portland: Estimated Potential Losses for Flood Event Scenarios (ADCIRC)

<table>
<thead>
<tr>
<th></th>
<th>Estimated Value</th>
<th>% of Total</th>
<th>10% (10-yr)</th>
<th>Loss Ratio</th>
<th>2% (50-yr)</th>
<th>Loss Ratio</th>
<th>1% (100-yr)</th>
<th>Loss Ratio</th>
<th>0.2% (500-yr)</th>
<th>Loss Ratio</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
<td>0%</td>
<td>$0</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1. Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2. Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
5. Total = Total Building and Contents + Business Disruption

*The figures in this table only represent information within the Nueces County Coastal Project Area.*
Table 3.25: City of Portland: Estimated Potential Losses for Flood Event Scenarios (WHAFIS)

<table>
<thead>
<tr>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
<td>Dollar Losses</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$0</td>
<td>0%</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$0</td>
<td>0%</td>
<td>N/A</td>
<td>N/A</td>
<td>$0</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1 Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2 Loss ratio = Dollar Losses / Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3 Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4 Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5 Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
3.3.5 Nueces County Unincorporated Areas Summary (CID 485494)

The following pages include Flood Risk data for the Unincorporated Areas of Nueces County.

3.3.5.1. Overview

Only a quarter of the unincorporated areas of Nueces County are within the project area. This includes open water areas of Redfish Bay and the Laguna Madre. Most of the remaining county areas are agricultural lands, and are not developed. This area experiences flooding from hurricanes, both in Corpus Christi Bay and on Padre Island from the Gulf of Mexico. At the same time inland areas can experience riverine flooding from Oso Creek and its tributaries, the Nueces River and other smaller flooding sources. The information in Table 3.26 provides an overview of the Nueces County Unincorporated Areas as of the date of this publication.

Table 3.26: Nueces County Unincorporated Areas Overview

<table>
<thead>
<tr>
<th>Community Name</th>
<th>CID</th>
<th>Total Community Population</th>
<th>Percent of Population in Watershed</th>
<th>Total Community Land Area (sq. mi)</th>
<th>Percent of Land Area in Watershed</th>
<th>NFIP</th>
<th>CRS Rating</th>
<th>Mitigation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nueces County Unincorporated Areas</td>
<td>485494</td>
<td>340,223</td>
<td>2</td>
<td>719.2</td>
<td>26</td>
<td>Y</td>
<td>N/A</td>
<td>Y</td>
</tr>
</tbody>
</table>

- Participating in Coastal Bend HMP, which expires on 10/16/2017.
- Past Federal Disaster Declarations for flooding = 18
- National Flood Insurance Program (NFIP) policy coverage (policies/values) = 4,674 policies totaling approximately $1,351,442,900
- NFIP-recognized repetitive loss properties = 35 (35 residential and 0 commercial).
- NFIP-recognized severe repetitive loss properties = 2 (residential)

Data provided below only includes areas within the unincorporated areas of Nueces County that are located within the Nueces County Coastal Project Area and do not necessarily represent community-wide totals. Section 2 of the Flood Risk Report (FRR) provides more information regarding the source and methodology used to develop the information presented below. Datasets used toward the generation of results of this project are described in Section 7 of the FRR and are found in the Flood Risk Database (FRD).

3.3.5.2. Community Analyses and Results

Results for each of the Flood Risk Datasets developed for this Flood Risk Project are summarized below:
**Changes Since Last FIRM**

- Special Flood Hazard Area (SFHA) boundaries within the unincorporated areas of Nueces County were updated due to new engineering analysis performed on coastal flooding from the Gulf of Mexico. The updated modeling produced new flood zone areas and new base flood elevations and leveraged the county’s recently developed LiDAR-based topographic data. Areas with the greatest increase in flood zone area are adjacent to the coastline. Areas with the greatest decrease in flood zone area are located further inland from the coast.
- Also included in this analysis is updated engineering analysis along the Nueces River, Oso Creek and various tributaries of Oso Creek.
- Floodplains for other streams within the Nueces County Coastal Project area were updated using the LiDAR-based latest topographic data.
- The data in this section reflects the comparison between the effective FIRM and the new analysis in this study.
- Table 3.27 summarizes the increases, decreases, and net change of SFHAs and Coastal High Hazard Areas (CHHAs) for the community.

<table>
<thead>
<tr>
<th>Area of Study</th>
<th>Total Area (mi²)</th>
<th>Increase (mi²)</th>
<th>Decrease (mi²)</th>
<th>Net Change (mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SFHA*</td>
<td>55.2</td>
<td>9.7</td>
<td>6.7</td>
<td>3.0</td>
</tr>
<tr>
<td>Within Floodway*</td>
<td>3.6</td>
<td>3.0</td>
<td>0.1</td>
<td>2.9</td>
</tr>
<tr>
<td>Within CHHA* (Zone VE or V)</td>
<td>31.6</td>
<td>6.3</td>
<td>1.3</td>
<td>5.0</td>
</tr>
</tbody>
</table>

*Although the Flood Risk Database may contain Changes Since Last FIRM information outside of City of Corpus Christi, the figures in this table only represent information within the City of Corpus Christi.

Section 2 of this report provides more information regarding the source and methodology used to develop this table.

- Most increases to the Floodway and SFHAs represent recent modeling of Oso Creek, its tributaries, and the Nueces River based on the latest gage data, modeling techniques and LiDAR-based topographic data.

**Flood Depth and Analysis Grids**

- See the FRD for the following depth and analysis grid data (Section 2 of the FRR provides general information regarding the development of and potential uses for this data):
  - Multi-frequency flood depth grids (10-, 2-, 1-, and 0.2-percent-annual-chance flood events)
  - Percent annual chance of flooding grids
  - Percent chance of flooding over a 30-year period grids
The Nueces County Coastal Project includes grid and flood risk datasets based on three separate analyses. The first analysis is based on stillwater data only, which includes storm surge and setup, and is referred to as the ADCIRC analysis. The ADCIRC data is a beneficial tool because it includes multiple return periods (10%-., 2%-, and 0.2%-annual-chance-events) and allows for development of the probability grids. However, in areas of expected coastal wave effects for each respective return period, the ADCIRC datasets do not reflect the complete risk. The second analysis is a wave height study, which involves overland wave propagation, runup and overtopping as applicable, in addition to the stillwater data, and is referred to as the WHAFIS analysis. The WHAFIS data represents the regulatory coastal flood zones as mapped in the FIRMs, but the analysis only includes the 1%-annual-chance-event.

The ADCIRC depth grids are storm surge and setup (stillwater) depths only and do not include wave effects; as a result, these grids reflect depths less than would be expected during a storm event and should be used with an understanding that they do not convey the full flood risk.

The WHAFIS depth grid includes the wave height analysis based on the ADCIRC storm surge results and is the basis for the regulatory coastal flood zones. The WHAFIS depth grid data corresponds to the mapped coastal special flood hazard zones on the FIRMs.

A recent riverine study was conducted on the flood hazards associated with Oso Creek. Depth grids and probability grids have been developed for this area. These data sets have not been developed for the various tributaries of Oso Creek.

A combined ADCIRC – Oso Creek Depth grid for the 1%-annual-chance flood is included in the FRD.

The 30-year annual chance probability and annual chance probability grids are based either on the ADCIRC storm surge results or on the Oso Creek riverine analysis; since multiple annual chance events must be factored together to populate this content. As a result, it should be understood that these probability grids have the potential to underestimate the level of risk for areas subject to coastal wave action.

Additional information and data layers provided within the FRD should be used to further isolate these and other areas where flood mitigation potential is high. The FRD includes data which may be helpful in planning and implementing mitigation strategies. Properties located in areas expected to experience some depth of water should seriously consider mitigation options for implementation.

**Hazus Estimated Loss Information**

The Nueces County Coastal Project Area flood risk analysis incorporates results from a FEMA-performed Hazus analysis which accounts for newly modeled areas in the Flood Risk Project and newly modeled depths for certain flood events. Potential losses were estimated as well as potential loss ratios for multiple scenarios. Additional information and data layers provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

The Project Area also includes results from a FEMA-performed HAZUS analysis which accounts for average annualized loss (AAL) within the watershed. These data were entirely superseded for the coastally influenced areas within the Coastal Project Area for Nueces County. FEMA’s AAL results are included in the Flood Risk
Database for general reference. This previous study was conducted using data from the 2000 census.

- A HAZUS “Level-2” analysis was performed only for the Coastal Project Area where updated FEMA and USACE engineering analysis resulted in revised flood hazard information. Both the Total Inventory of potential losses and the estimated loss results are calculated only for this project area and not for entire communities. This study is based on data from the 2010 census.

- Three different datasets have been incorporated into the risk analyses: Storm surge and setup only (ADCIRC) and the ADCIRC storm surge data with full wave analysis (WHAFIS). The ADCIRC and WHAFIS loss results are shown in separate tables and the ADCIRC results should be understood to not include wave effects. Also included is the Oso Creek Riverine Analysis.
  - Specific to the WHAFIS analyses, ONLY the 1%-annual-chance hazard analysis is included in this FRD. This analysis matches the areas of wave run-up shown on the Flood Insurance Rate Maps for this community.
  - Specific to the ADCIRC analyses, multiple return period risk analyses has been performed to include the 10%-., 2%-., 1%- and 0.2%-annual-chance hazard.
  - Specific to the Oso Creek riverine analysis, multiple return period risk analyses has been performed to include the 10%-., 2%-., 1%- and 0.2%-annual-chance hazard.

- NOTE: Both total inventory and estimated losses are only for the coastal hazard areas of the Nueces County Unincorporated Areas. Loss ratio may appear slightly higher than expected because the area being included in the analysis is limited to only the Coastal Project Area. Estimate losses are shown in Tables 3.29 through 3.31.

- Please note that the Texas Water Development Board (TWDB) and Texas Natural Resource Information Systems (TNRIS) developed a separate Phase 1 Hurricane Risk Assessment included detailed county-level risk assessments focused on defining hurricane, riverine flood, and coastal flood risks. This study included Nueces County, Texas. For more information about this risk assessment please contact the TWDB and TNRIS.

**Areas of Mitigation Interest**

- Section 2.2.4 of the FRR provides more information regarding areas of mitigation interest, how they are defined for this analysis, and potential mitigation actions that could be considered for each type.

- For more information about other areas of mitigation interest, review the additional data inside the FRD, as well as the community specific sections of this report. Table 3.28 provides and overview of identified AoMIs within the Project Area. This does not preclude the identification of other AoMIs by state and local sources.
Table 3.28: Nueces County Unincorporated Areas: Areas of Mitigation Interest Summary

<table>
<thead>
<tr>
<th>Type of Mitigation Interest</th>
<th>Number of Areas</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>At Risk Essential Facilities</td>
<td>1</td>
<td>Summary information for Nueces County Project Area based on HAZUS inventory data.</td>
</tr>
<tr>
<td>Past Claims Hot Spot</td>
<td>3</td>
<td>Summary information for Nueces County Project Area based on NFIP claims and repetitive loss data.</td>
</tr>
</tbody>
</table>
Table 3.29: Nueces County Unincorporated Areas: Estimated Potential Losses for Flood Event Scenarios (ADCIRC)

<table>
<thead>
<tr>
<th></th>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses¹</td>
<td>Loss Ratio¹</td>
<td>Dollar Losses¹</td>
<td>Loss Ratio¹</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$184,900,000</td>
<td>39%</td>
<td>$1,300,000</td>
<td>1%</td>
<td>$4,600,000</td>
<td>2%</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$213,500,000</td>
<td>45%</td>
<td>$700,000</td>
<td>&lt; 1%</td>
<td>$1,400,000</td>
<td>1%</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$73,900,000</td>
<td>16%</td>
<td>$2,000,000</td>
<td>3%</td>
<td>$3,500,000</td>
<td>5%</td>
</tr>
<tr>
<td>Total Building/Contents²</td>
<td>$472,300,000</td>
<td>100%</td>
<td>$4,000,000</td>
<td>1%</td>
<td>$9,400,000</td>
<td>2%</td>
</tr>
<tr>
<td>Business Disruption⁴</td>
<td>$0</td>
<td>N/A</td>
<td>$300,000</td>
<td>N/A</td>
<td>$400,000</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL⁴</td>
<td>$472,300,000</td>
<td>100%</td>
<td>$4,300,000</td>
<td>1%</td>
<td>$9,800,000</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

¹Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
²Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
³Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
⁴Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
⁵Total = Total Building and Contents + Business Disruption.

The figures in this table only represent information within the Nueces County Coastal Project Area.
Table 3.30: Nueces County Unincorporated Areas: Estimated Potential Losses for Flood Event Scenarios (Oso Creek)

<table>
<thead>
<tr>
<th></th>
<th>Estimated Value</th>
<th>% of Total</th>
<th>10% (10-yr)</th>
<th>Loss Ratio</th>
<th>2% (50-yr)</th>
<th>Loss Ratio</th>
<th>1% (100-yr)</th>
<th>Loss Ratio</th>
<th>0.2% (500-yr)</th>
<th>Loss Ratio</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Building/Contents</td>
<td>$184,900,000</td>
<td>39%</td>
<td>$1,000,000</td>
<td>1%</td>
<td>$1,600,000</td>
<td>1%</td>
<td>$2,800,000</td>
<td>2%</td>
<td>$2,500,000</td>
<td>1%</td>
<td>$100,000</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$213,500,000</td>
<td>45%</td>
<td>$1,200,000</td>
<td>1%</td>
<td>$100,000</td>
<td>&lt; 1%</td>
<td>$1,800,000</td>
<td>1%</td>
<td>$300,000</td>
<td>&lt; 1%</td>
<td>$10,000</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$73,900,000</td>
<td>16%</td>
<td>$400,000</td>
<td>1%</td>
<td>$300,000</td>
<td>&lt; 1%</td>
<td>$500,000</td>
<td>1%</td>
<td>$500,000</td>
<td>1%</td>
<td>$20,000</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$472,300,000</td>
<td>100%</td>
<td>$2,600,000</td>
<td>1%</td>
<td>$2,000,000</td>
<td>&lt; 1%</td>
<td>$5,000,000</td>
<td>1%</td>
<td>$3,300,000</td>
<td>1%</td>
<td>$200,000</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>$30,000</td>
<td>N/A</td>
<td>$30,000</td>
<td>N/A</td>
<td>$70,000</td>
<td>N/A</td>
<td>$60,000</td>
<td>N/A</td>
<td>$0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$472,300,000</td>
<td>100%</td>
<td>$2,600,000</td>
<td>1%</td>
<td>$2,000,000</td>
<td>&lt; 1%</td>
<td>$5,100,000</td>
<td>1%</td>
<td>$3,400,000</td>
<td>1%</td>
<td>$200,000</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1 Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2 Loss ratio = Dollar Losses ÷ Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3 Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4 Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5 Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
Table 3.31: Nueces County Unincorporated Areas: Estimated Potential Losses for Flood Event Scenarios (WHAFIS)

<table>
<thead>
<tr>
<th>Estimated Potential Losses for Flood Event Scenarios</th>
<th>Total Inventory</th>
<th>10% (10-yr)</th>
<th>2% (50-yr)</th>
<th>1% (100-yr)</th>
<th>0.2% (500-yr)</th>
<th>Annualized ($/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated Value</td>
<td>% of Total</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
<td>Dollar Losses</td>
<td>Loss Ratio</td>
</tr>
<tr>
<td>Residential Building/Contents</td>
<td>$184,900,000</td>
<td>39%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Commercial Building/Contents</td>
<td>$213,500,000</td>
<td>45%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Other Building/Contents</td>
<td>$73,900,000</td>
<td>16%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Building/Contents</td>
<td>$614,800,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Business Disruption</td>
<td>$0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>$472,300,000</td>
<td>100%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: Hazus analysis results stored as the Flood Risk Assessment Dataset in the Flood Risk Database.

1 Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over $100,000.
2 Loss ratio = Dollar Losses / Estimated Value. Loss Ratios are rounded to the nearest integer percent.
3 Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
4 Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
5 Total = Total Building and Contents + Business Disruption

The figures in this table only represent information within the Nueces County Coastal Project Area.
4 Actions to Reduce Flood Risk

In order to fully leverage the Flood Risk Datasets and Products created for this Flood Risk Project, local stakeholders should consider many different flood risk mitigation tactics, including, but not limited the items shown in the sub-sections below.

4.1 Types of Mitigation Actions

Mitigation provides a critical foundation on which to reduce loss of life and property by avoiding or lessening the impact of hazard events. This creates safer communities and facilitates resiliency by enabling communities to return to normal function as quickly as possible after a hazard event. Once a community understands its flood risk, it is in a better position to identify potential mitigation actions that can reduce the risk to its people and property.

The mitigation plan requirements in 44 CFR Part 201 encourage communities to understand their vulnerability to hazards and take actions to minimize vulnerability and promote resilience. Flood mitigation actions generally fall into the following categories:

4.1.1 Preventative Measures

Preventative measures are intended to keep flood hazards from getting worse. They can reduce future vulnerability to flooding, especially in areas where development has not yet occurred or where capital improvements have not been substantial. Examples include:

- Comprehensive land use planning
- Zoning regulations
- Subdivision regulations
- Open space preservation
- Building codes
- Floodplain development regulations
- Stormwater management
- Purchase development rights or conservation easements

NFIP's CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions meeting the three goals of the CRS: to reduce flood losses, to facilitate accurate insurance rating, and to promote the awareness of flood insurance.

For CRS participating communities, flood insurance premium rates are discounted in increments of 5%; i.e., a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount. (A Class 10 is not participating in the CRS and receives no discount.)
Participation in the NFIP Community Rating System (CRS)

4.1.2 Property Protection Measures

Property protection measures protect existing buildings by modifying the building to withstand floods, erosion, and waves or by removing buildings from hazardous locations. Examples include:

- Building relocation
- Acquisition and clearance
- Building elevation
- Barrier installation
- Building retrofit

4.1.3 Natural Resource Protection Activities

Natural resource protection activities reduce the impact of floods by preserving or restoring natural areas such as floodplains, wetlands, and dunes and their natural functions. Examples include:

- Wetland protection
- Habitat protection
- Erosion and sedimentation control
- Best management practices (BMP)
- Prevention of stream dumping activities (anti-litter campaigns)
- Improved forestry practices such as reforesting or selective timbering (extraction)
- Beach Nourishment
- Dune Construction

Dune protection measures such as walkovers, sand fencing, and vegetation

4.1.4 Structural Mitigation Projects

Structural mitigation projects lessen the impact of floods by modifying the environmental natural progression of the flooding event. Structural protection such as upgrading dams/levees for already existing development and critical facilities may be a realistic alternative. However, citizens should be made aware of their residual risk. Examples include:

- Reservoirs, retention, and detention basins
- Levees and floodwalls
- Channel modifications
Channel maintenance
Seawalls, revetments, and bulkheads
Groins, offshore breakwaters, and jetties

4.1.5 Public Education and Awareness Activities
Public education and awareness activities advise residents, business owners, potential property buyers, and visitors about floods, hazardous areas, and mitigation techniques they can use to reduce the flood risk to themselves and their property. Examples include:

Readily available and readable updated maps
Outreach projects
Libraries
Technical assistance
Real estate disclosure
Environmental education
Risk information via the nightly news

4.1.6 Emergency Service Measures
Although not typically considered a mitigation technique, emergency service measures minimize the impact of flooding on people and property. These are actions commonly taken immediately prior to, during, or in response to a hazard event. Examples include:

Hazard warning system
Emergency response plan
COOP and COG planning
Critical facilities protection
Health and safety maintenance
Post flood recovery planning

In Section 3, specific Areas of Mitigation Interest were identified. Table 4.1 below identifies possible mitigation actions for each AoMI to consider.
### Table 4-1. Mitigation Actions for Areas of Mitigation Interest

<table>
<thead>
<tr>
<th>AoMI</th>
<th>Possible Actions to Reduce Flood Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dams</strong></td>
<td>• Engineering assessment&lt;br&gt;• Dam upgrades and strengthening&lt;br&gt;• Emergency Action Plan&lt;br&gt;• Dam removal&lt;br&gt;• Easement creation in impoundment and downstream inundation areas</td>
</tr>
<tr>
<td><strong>Levees (accredited and non-accredited) and significant levee-like structures</strong></td>
<td>• Generally same as dams above&lt;br&gt;• Purchase of flood insurance for at-risk structures</td>
</tr>
<tr>
<td><strong>Coastal Structures</strong>&lt;br&gt;• Jetties&lt;br&gt;• Groins&lt;br&gt;• Seawalls&lt;br&gt;• Other structures</td>
<td>• Increase coastal setbacks for construction&lt;br&gt;• Habitat restoration programs&lt;br&gt;• Wetland restoration and mitigation banking programs&lt;br&gt;• Engineering assessment&lt;br&gt;• Structure upgrades and strengthening&lt;br&gt;• Emergency Action Plan&lt;br&gt;• Structure removal</td>
</tr>
<tr>
<td><strong>Stream Flow Constrictions (Undersized culverts or bridge openings)</strong></td>
<td>• Engineering analysis&lt;br&gt;• Replacement of structure pre- and post-disaster</td>
</tr>
<tr>
<td><strong>Past Flood Insurance Claims and IA/PA Hot Spots</strong></td>
<td>• Acquisition&lt;br&gt;• Elevation&lt;br&gt;• Relocation&lt;br&gt;• Floodproofing</td>
</tr>
<tr>
<td><strong>Significant Land Use Changes</strong></td>
<td>• Higher regulatory standard&lt;br&gt;• Stormwater BMPs&lt;br&gt;• Transfer of Development rights&lt;br&gt;• Compensatory storage and equal conveyance standards</td>
</tr>
<tr>
<td><strong>Key Emergency Routes Overtopped During Frequent Flooding Events</strong></td>
<td>• Elevation&lt;br&gt;• Creation of alternate routes&lt;br&gt;• Design as low water crossing</td>
</tr>
</tbody>
</table>
### Possible Actions to Reduce Flood Risk

<table>
<thead>
<tr>
<th>AoMI</th>
<th>Possible Actions to Reduce Flood Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas of Significant Riverine or Coastal Erosion</td>
<td>• Relocation of buildings and infrastructure</td>
</tr>
<tr>
<td></td>
<td>• Regulations and planning</td>
</tr>
<tr>
<td></td>
<td>• Natural vegetation</td>
</tr>
<tr>
<td></td>
<td>• Erosion Control Structures</td>
</tr>
<tr>
<td></td>
<td>• Building Setbacks</td>
</tr>
<tr>
<td></td>
<td>• Beach Nourishment</td>
</tr>
<tr>
<td></td>
<td>• Dune Construction</td>
</tr>
<tr>
<td></td>
<td>• Dune Protection Activities</td>
</tr>
<tr>
<td>Drainage or Stormwater-Based Flood Hazard Areas, or Areas Not Identified as Floodprone on the FIRM but Known to be Inundated</td>
<td>• Identification of all flood hazard areas</td>
</tr>
<tr>
<td>Areas of Mitigation Success</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### 4.2 Identifying Specific Actions for Your Community

As many mitigation actions are possible to lessen the impact of floods, how can a community decide which ones are appropriate to implement? There are many ways to identify specific actions most appropriate for a community. Some factors to consider may include the following:

- **Site characteristics.** Does the site present unique challenges (e.g., significant slopes or erosion potential)?

- **Flood characteristics.** Are the flood waters affecting the site fast or slow moving? Are there wave hazards? Is there debris associated with the flow? How deep is the flooding?

- **Social acceptance.** Will the mitigation action be acceptable to the public? Does it cause social or cultural problems?

- **Technical feasibility.** Is the mitigation action technically feasible (e.g., making a building watertight to a reasonable depth)?

- **Administrative feasibility.** Is there administrative capability to implement the mitigation action?

- **Legal.** Does the mitigation action meet all applicable codes, regulations, and laws? Public officials may have a legal responsibility to act and inform citizens if a known hazard has been identified.

Refer to FEMA Mitigation Planning How To Guide #3 (FEMA 386-3) “Developing the Mitigation Plan - Identifying Mitigation Actions and Implementation Strategies” for more information on how to identify specific mitigation actions to address hazard risk in your community.

FEMA in collaboration with the American Planning Association has released the publication, “Integrating Hazard Mitigation into Local Planning.” This guide explains how hazard mitigation can be incorporated into several different types of local planning programs. For more information, go to [www.planning.org](http://www.planning.org) or [http://www.fema.gov/library](http://www.fema.gov/library).
**Economic.** Is the mitigation action affordable? Is it eligible under grant or other funding programs? Can it be completed within existing budgets?

**Environmental.** Does the mitigation action cause adverse impacts on the environment or can they be mitigated? Is it the most appropriate action among the possible alternatives?

Your local Hazard Mitigation Plan is a valuable place to identify and prioritize possible mitigation actions. The plan includes a mitigation strategy with mitigation actions that were developed through a public and open process. You can then add to or modify those actions based on what is learned during the course of the Risk MAP project and the information provided within this FRR.

### 4.3 Mitigation Programs and Assistance

Not all mitigation activities require funding (e.g., local policy actions such as strengthening a flood damage prevention ordinance), and those that do are not limited to outside funding sources (e.g., inclusion in local capital improvements plan, etc.). For those mitigation actions that require assistance through funding or technical expertise, several State and Federal agencies have flood hazard mitigation grant programs and offer technical assistance. These programs may be funded at different levels over time or may be activated under special circumstances such as after a presidential disaster declaration.

#### 4.3.1 FEMA Mitigation Programs and Assistance

FEMA awards many mitigation grants each year to states and communities to undertake mitigation projects to prevent future loss of life and property resulting from hazard impacts, including flooding. The FEMA Hazard Mitigation Assistance (HMA) programs provide grants for mitigation through the programs listed in Table 4.2 below.
### Table 4-2. FEMA Hazard Mitigation Assistance Programs

<table>
<thead>
<tr>
<th>Mitigation Grant Program</th>
<th>Authorization</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Mitigation Grant Program (HMGP)</td>
<td>Robert T. Stafford Disaster Relief and Emergency Assistance Act</td>
<td>Activated after a presidential disaster declaration; provides funds on a sliding scale formula based on a percentage of the total federal assistance for a disaster for long-term mitigation measures to reduce vulnerability to natural hazards</td>
</tr>
<tr>
<td>Flood Mitigation Assistance (FMA)</td>
<td>National Flood Insurance Reform Act</td>
<td>Reduce or eliminate claims against the NFIP</td>
</tr>
<tr>
<td>Pre-Disaster Mitigation (PDM)</td>
<td>Disaster Mitigation Act</td>
<td>National competitive program focused on mitigation project and planning activities that address multiple natural hazards</td>
</tr>
<tr>
<td>Repetitive Flood Claims (RFC)</td>
<td>Bunning-Bereuter-Blumenerauer Flood Insurance Reform Act</td>
<td>Reduce flood claims against the NFIP through flood mitigation; properties must be currently NFIP insured and have had at least one NFIP claim</td>
</tr>
<tr>
<td>Severe Repetitive Loss (SRL)</td>
<td>Bunning-Bereuter-Blumenerauer Flood Insurance Reform Act</td>
<td>Reduce or eliminate the long-term risk of flood damage to SRL residential structures currently insured under the NFIP</td>
</tr>
</tbody>
</table>

The HMGP and PDM programs offer funding for mitigation planning and project activities that address multiple natural hazard events. The FMA, RFC, and SRL programs focus funding efforts on reducing claims against the NFIP. Funding under the HMA programs is subject to availability of annual appropriations, and HMGP funding is also subject to the amount of FEMA disaster recovery assistance provided under a presidential major disaster declaration.

FEMA’s HMA grants are awarded to eligible states, tribes, and territories (applicant) that, in turn, provide sub-grants to local governments and communities (sub-applicant). The applicant selects and prioritizes sub-applications developed and submitted to them by sub-applicants and submits them to FEMA for funding consideration. Prospective sub-applicants should consult the office designated as their applicant for further information regarding specific program and application requirements. Contact information for the FEMA Regional Offices and State Hazard Mitigation Officers (SHMO) is available on the FEMA website [www.fema.gov](http://www.fema.gov).

### 4.3.2 Additional Mitigation Programs and Assistance

Several additional agencies including USACE, Natural Resource Conservation Service (NRCS), U.S. Geological Survey (USGS), NOAA, and others have specialists on staff and can offer further information on flood hazard mitigation.
The State NFIP Coordinator and SHMO are state-level sources of information and assistance, which vary among different states.
## 5 Acronyms and Definitions

### 5.1 Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAL</td>
<td>Average Annualized Loss</td>
</tr>
<tr>
<td>ALR</td>
<td>Annualized Loss Ratio</td>
</tr>
<tr>
<td>AoMI</td>
<td>Areas of Mitigation Interest</td>
</tr>
<tr>
<td>BCA</td>
<td>Benefit-Cost Analysis</td>
</tr>
<tr>
<td>BFE</td>
<td>Base Flood Elevation</td>
</tr>
<tr>
<td>BMP</td>
<td>Best Management Practices</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CID</td>
<td>Community Identification Number</td>
</tr>
<tr>
<td>COG</td>
<td>Continuity of Government Plan</td>
</tr>
<tr>
<td>COOP</td>
<td>Continuity of Operations Plan</td>
</tr>
<tr>
<td>CRS</td>
<td>Community Rating System</td>
</tr>
<tr>
<td>CSLF</td>
<td>Changes Since Last FIRM</td>
</tr>
<tr>
<td>DHS</td>
<td>Department of Homeland Security</td>
</tr>
<tr>
<td>DMA 2000</td>
<td>Disaster Mitigation Act of 2000</td>
</tr>
<tr>
<td>EOP</td>
<td>Emergency Operations Plan</td>
</tr>
<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
</tr>
<tr>
<td>FIRM</td>
<td>Flood Insurance Rate Map</td>
</tr>
<tr>
<td>FIS</td>
<td>Flood Insurance Study</td>
</tr>
<tr>
<td>FMA</td>
<td>Flood Mitigation Assistance</td>
</tr>
<tr>
<td>FRD</td>
<td>Flood Risk Database</td>
</tr>
<tr>
<td>FRM</td>
<td>Flood Risk Map</td>
</tr>
<tr>
<td>FRR</td>
<td>Flood Risk Report</td>
</tr>
<tr>
<td>FY</td>
<td>Fiscal Year</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>HMA</td>
<td>Hazard Mitigation Assistance</td>
</tr>
<tr>
<td>HMGP</td>
<td>Hazard Mitigation Grant Program</td>
</tr>
<tr>
<td>IA</td>
<td>Individual Assistance</td>
</tr>
</tbody>
</table>
5.2 Definitions

0.2-percent-annual-chance flood – The flood elevation that has a 0.2-percent chance of being equaled or exceeded each year. Sometimes referred to as the 500-year flood.

1-percent-annual-chance flood – The flood elevation that has a 1-percent chance of being equaled or exceeded each year. Sometimes referred to as the 100-year flood.

Accredited Levee System – A levee system that FEMA has shown on a FIRM that is recognized as reducing the flood hazards posed by a 1-percent-annual-chance or greater flood. This determination is based on the submittal of data and documentation as required by 44CFR65.10 of the NFIP regulations. The area landward of an accredited levee system is shown as Zone X (shaded) on the FIRM except for areas of residual flooding, such as ponding areas, which are shown as Special Flood Hazard Area (SFHA).

Annualized Loss Ratio (ALR) – Expresses the annualized loss as a fraction of the value of the local inventory (total value/annualized loss).

Average Annualized Loss (AAL) – The estimated long-term weighted average value of losses to property in any single year in a specified geographic area.

Base Flood Elevation (BFE) – Elevation of the 1-percent-annual-chance flood. This elevation is the basis of the insurance and floodplain management requirements of the NFIP.

Berm – A small levee, typically built from earth.
Cfs – Cubic feet per second, the unit by which discharges are measured (a cubic foot of water is about 7.5 gallons).

Coastal High Hazard Area (CHHA) – Portion of the SFHA extending from offshore to the inland limit of a primary frontal dune along an open coast or any other area subject to high velocity wave action from storms or seismic sources.

Consequence (of flood) – The estimated damages associated with a given flood occurrence.

Crest – The peak stage or elevation reached or expected to be reached by the floodwaters of a specific flood at a given location.

Dam – An artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water.

Design flood event – The greater of the following two flood events: (1) the base flood, affecting those areas identified as SFHAs on a community’s FIRM; or (2) the flood corresponding to the area designated as a flood hazard area on a community’s flood hazard map or otherwise legally designated.

Erosion – Process by which floodwaters lower the ground surface in an area by removing upper layers of soil.

Essential facilities – Facilities that, if damaged, would present an immediate threat to life, public health, and safety. As categorized in Hazus, essential facilities include hospitals, emergency operations centers, police stations, fire stations, and schools.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters or (2) the unusual and rapid accumulation or runoff of surface waters from any source.

Flood Insurance Rate Map (FIRM) – An official map of a community, on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community. See also Digital Flood Insurance Rate Map.

Flood Insurance Study (FIS) Report – Contains an examination, evaluation, and determination of the flood hazards of a community, and if appropriate, the corresponding water-surface elevations.

Flood risk – Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of flooding. This is sometimes referred to as flood vulnerability.

Flood vulnerability – Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of flooding. This is sometimes referred to as flood risk.

Flood-borne debris impact – Floodwater moving at a moderate or high velocity can carry flood-borne debris that can impact buildings and damage walls and foundations.
**Floodwall** – A long, narrow concrete or masonry wall built to protect land from flooding.

**Floodway (regulatory)** – The channel of a river or other watercourse and that portion of the adjacent floodplain that must remain unobstructed to permit passage of the base flood without cumulatively increasing the water surface elevation more than a designated height (usually 1 foot).

**Floodway fringe** – The portion of the SFHA that is outside of the floodway.

**Freeboard** – A factor of safety usually expressed in feet above a flood level for purposes of flood plain management. “Freeboard” tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed (44CFR§59.1).

**Hazus** – A GIS-based risk assessment methodology and software application created by FEMA and the National Institute of Building Sciences for analyzing potential losses from floods, hurricane winds and storm surge, and earthquakes.

**High velocity flow** – Typically comprised of floodwaters moving faster than 5 feet per second.

**Levee** – A human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding. (44CFR§59.1)

**Loss ratio** – Expresses loss as a fraction of the value of the local inventory (total value/loss).

**Mudflow** – Mudslide (i.e., mudflow) describes a condition where there is a river, flow or inundation of liquid mud down a hillside usually as a result of a dual condition of loss of brush cover, and the subsequent accumulation of water on the ground preceded by a period of unusually heavy or sustained rain. A mudslide (i.e., mudflow) may occur as a distinct phenomenon while a landslide is in progress, and will be recognized as such by the Administrator only if the mudflow, and not the landslide, is the proximate cause of damage that occurs. (44CFR§59.1)

**Non-Accredited Levee System** – A levee system that does not meet the requirements spelled out in the NFIP regulations at Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44CFR65.10), Mapping of Areas Protected by Levee Systems, and is not shown on a FIRM as reducing the flood hazard posed by a 1-percent-annual-chance flood.

**Primary frontal dune (PFD)** – A continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the primary frontal dune occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope.

**Probability (of flood)** – The likelihood that a flood will occur in a given area.
**Provisionally Accredited Levee (PAL)** – A designation for a levee system that FEMA has previously accredited with reducing the flood hazards associated with a 1-percent-annual-chance or greater flood on an effective FIRM, and for which FEMA is awaiting data and/or documentation that will demonstrate the levee system’s compliance with the NFIP regulatory criteria cited at 44CFR65.10.

**Risk MAP** – Risk Mapping, Assessment, and Planning, a FEMA strategy to work collaboratively with state, local, and tribal entities to deliver quality flood data that increases public awareness and leads to action that reduces risk to life and property.

**Riverine** – Of, or produced by, a river. Riverine floodplains have readily identifiable channels.

**Special Flood Hazard Area (SFHA)** – Portion of the floodplain subject to inundation by the 1-percent-annual or base flood.

**Stafford Act** – Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-707, signed into law November 23, 1988; amended the Disaster Relief Act of 1974, PL 93-288. This Act constitutes the statutory authority for most federal disaster response activities especially as they pertain to FEMA and FEMA programs.

**Stillwater** – Projected elevation that flood waters would assume referenced to National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or other datum, in the absence of waves resulting from wind or seismic effects.

**Stream Flow Constrictions** – A point where a human-made structure constricts the flow of a river or stream.
6 Additional Resources

ASCE 7 – National design standard issued by the American Society of Civil Engineers (ASCE), *Minimum Design Loads for Buildings and Other Structures*, which gives current requirements for dead, live, soil, flood, wind, snow, rain, ice, and earthquake loads, and their combinations, suitable for inclusion in building codes and other documents.

ASCE 24-05 – National design standard issued by the ASCE, *Flood Resistant Design and Construction*, which outlines the requirements for flood resistant design and construction of structures in flood hazard areas.


FEMA, [www.fema.gov](http://www.fema.gov)


FEMA Publications – available at [www.fema.gov](http://www.fema.gov)


USGS. *USGS National Assessment of Shoreline Change Project*,
http://coastal.er.usgs.gov/shoreline-change/
7 Data Used to Develop Flood Risk Products

GIS base map information was acquired from the following sources:

- Federal Emergency Management Agency (FEMA)
- Texas Natural Resources Information Systems (TNRIS)
- U.S. Census Bureau
- U.S. Geological Survey
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, National Cartography and Geospatial Center

Corporate limits, roads, and hydrographic features were obtained from FEMA’s most recent countywide FIRM updates.

Coastal Engineering study information was developed by FEMA from Coastal Surge data provided by the USACE. Riverine data was developed by FEMA based on needs previously provided by the City of Corpus Christi and Nueces County Unincorporated Areas. Photos shown on the Flood Risk Map were taken from as part of FEMA’s field survey efforts for the updated engineering analysis.

Hazard Mitigation Plan information was provided by Coastal Bend Hazard Mitigation Plan and FEMA.

Flood Insurance Claim, Policy, and additional Mitigation Plan information were acquired from FEMA.

Census Information
Census information collected from FEMA’s HAZUS version 2.2 software products. Census data used in the HAZUS Analysis for estimated losses was based on the 2000 census. Population data reported for each community is based on the 2010 census. As such there may be minor discrepancies in the FRD when comparing census blocks to communities to arrive at total population.

HUC-8 Boundary
HUC boundaries were provided by the NRCS.

Hillshade
Hillshade, also known as Shaded Relief is shown on the background of the Flood Risk Map. Hillshade is a cartographic process of 3-D visualization of the terrain on maps and charts that implements graded shadows created by light shining from the north-west direction. These data was created based on the most recent LiDAR data for Nueces County. This data layer is called a “Hillshade” in the Flood Risk Database.

Changes Since Last FIRM (CSLF)
CSLF are provided both for the project area, only as summarized in this Flood Risk Report, and as a complete countywide product as developed for the most recent map revision of the Flood Insurance Rate Map (FIRM).
General Building Stock
General Building Stock represents the total economic inventory for a community (i.e. an estimate of the replacement dollar cost for all buildings and their content). These data come from the Census information in Hazus version 2.2. For this report, no updates or changes were made to the default General Building Stock data provided by Hazus.