Texas Coastal Planning Program: Providing Technical Assistance to Texas Coastal Communities

Contract: 16-066-000-9110

Final Report

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Project Description

The Texas Coast is changing both physically and socially. As coastal populations grow, the use of the coastal natural resources that attract and sustain populations increases. Texas Sea Grant provides subject-matter expertise and academic and industry professional knowledge to address issues of population growth, land development, coastal hazards, and resource management to allow communities and local decision-makers to identify priorities and plan for future generations.

Capacity, funding, and knowledge are common planning obstacles along the Texas coast. This project helped to provide planning capacity, limited the amount of funding needed for planning activities, and educated communities on the importance of planning and how it relates to community resiliency and well-being. Texas Sea Grant supports land-use and environmental planning in Texas coastal communities lacking the planning capacity or knowledge to effectively prepare for coastal environmental hazards or economic development.

With CMP Cycle 20 funding, Texas Sea Grant), in coordination with the Department of Landscape Architecture and Urban Planning at Texas A&M University (1) funded a graduate student coastal planning fellow (research assistant) over the summer of 2016 and throughout the 2016-2017 school year; (2) facilitated two planning workshops, with a final workshop at the end the project period; and (3) developed a draft multi-jurisdictional floodplain management plan for Aransas County which includes the City of Aransas Pass, the Town of Fulton, and the City of Rockport. Activities for community outreach included: (1) engaging county and municipalities in community-level planning projects to address community resilience, and other planning topics; (2) presenting planning work at public meetings; (3) providing communities the opportunity to interact with urban planning and coastal management researchers; and (4) providing education on coastal planning.

The project addressed several gaps in community capacity, including planning principals and methods, financial capacity, and knowledge and understanding. These gaps were addressed by providing community based support in resiliency planning projects, leading community-based planning efforts in coordination with community leadership, helping communities assess and understand risk and vulnerability, and ultimately, becoming more resilient to coastal hazards and climate change.

Texas Sea Grant leveraged existing frameworks of Texas A&M University programs, such as the Master of Urban and Regional Planning Program, to create awareness around coastal planning and environmental impacts, provide a graduate student assistantship opportunity in land use planning and environmental hazards management, and assisted several Texas coastal communities in the creation and adoption of a floodplain management plan.

The research assistant was housed in the Texas Sea Grant office at Texas A&M University – Corpus Christi for the summer internship, which provided access to the communities that were supported with this assistantship. Upon completion of the internship, the student was supported as a research assistant and worked with Texas Sea Grant to complete the final deliverables of this project.

Summary of Work

Task 1 and 2: Hire a Coastal Planning Fellow / Research Assistant

Sea Grant sent out a formal announcement for one graduate student coastal planning fellow. The announcement was distributed through the Masters of Urban Planning program at Texas A&M University's Department of Landscape Architecture and Urban Planning in the Spring of 2016. An interview selection process was used to choose a master's level graduate student to take on the coastal planning fellowship / research assistant opportunity. Interviews were conducted on April 18, 2016 and the final candidate was selected on April 25, 2016.

Task 3: Summer Fellowship

In Summer 2016, the Coastal Planning Fellow and Coastal Planning Specialist worked together to implement a community wide survey in Rockport, Texas, summarize and synthesize the community survey, create a state of the community report, and identify alternative scenarios for future planning in the community and surrounding area. Additional community outreach materials were developed as needed throughout the year-long process.

Task 4: Draft Plan

Texas Sea Grant led the completion of a draft Multi-Jurisdictional Floodplain Management Plan for Aransas County (including the City of Aransas Pass, the Town of Fulton, and the City of Rockport). The coastal planning research assistant/fellow assisted with the development of the draft plan throughout the 2016-2017 school year. During the spring semester of 2017, the research assistant used GIS to develop all of the needed maps for the draft plan. Texas Sea Grant hosted several public meetings to enable local citizens to participate in the development of the draft plan. The draft of chapters 1-5, which made up the background sections of the plan, were completed in December 2016. All maps for the plan were completed in April 2017. A final draft plan was released to the public in April 2017.

Task 5: Project Monitoring and Reporting

The original scope of work included the development of a Floodplain Management Plan for the City of Rockport. However, due to community and leadership buy in and interest, the scope of work was expanded to create a Multi-Jurisidictional Floodplain Management Plan for Aransas County, the City of Rockport, the Town of Fulton, and the City of Aransas Pass.

Texas Sea Grant prepared and submitted all reports, deliverables, and requests for reimbursement as required in the contract, to CMPReceipts@GLO.TEXAS.GOV. A final report is the final deliverable (this document) and summarizes the work completed under each project task and includes the community survey synthesis and alternative scenarios report and the draft plan for the selected community. Additionally, Texas Sea Grant is providing a copy of the research assistant's maps and research findings regarding the quality of the floodplain management plan. Texas Sea Grant is sharing the research findings to document the plan's strengths and identified areas that can be improved in the future.

Appendices

Community Survey Synthesis

THE CITY OF ROCKPORT

COMMUNITY SURVEY SYNTHESIS

Conducted in conjunction with the Aransas County Floodplain Management Planning Process

AUGUST 2016

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TEXAS COASTAL WATERSHED PROGRAM

and the citizens of Rockport for their support on this project.

INTRODUCTION

Texas Sea Grant collaborated with the City of Rockport to conduct a community survey to gather information about the experiences and perceptions of individuals who live, work, and own businesses in Rockport. Specifically, the survey was designed to find out about the experiences and perceptions of these individuals regarding flooding hazards in the city. This data will be used to assist in the development of floodplain management strategies for the city, and in the development of a Floodplain Management Plan for Aransas County. This final report and supplemental data will be made available to the public thought the City of Rockport and Texas Sea Grant.

The survey questions were developed by a team which included representatives from Texas Sea Grant, the City of Rockport, and Mission-Aransas National Estuarine Reserve. A focus group was convened to test the survey and provide local expertise and feedback. Karen Bareford, as the lead researcher for Texas Sea Grant on this project, also received Institutional Review Board/Human Subjects approval from Texas A&M University for the survey. As a part of this review, it was decided that no personal identifying information would be collected from the survey participants. As such, all responses are anonymous.

The survey, conducted on-line via the Survey Monkey site, was officially announced via email distribution on Tuesday, July 5, 2016. The email went to key partners including City of Rockport personnel, the Rockport-Fulton Chamber of Commerce and several other local associates of Texas Sea Grant and the Mission-Aransas National Estuarine Research Reserve. Some of these recipients further disseminated the email to other known Rockport groups and residences. Flyers announcing the survey, its purpose, and how to access the survey were distributed throughout the city. The flyer distribution sites included public institutions, businesses, non-profit organizations, Home Owner Associations and apartment complexes, RV parks, and a local golf course. (A complete listing of flyer distribution sites, a copy of the flyer, and a list of the questions in the survey are included in Appendix 1.) Finally, the survey was posted to the front page of the City of Rockport's website.

The survey was open from July 1-31, 2016. A total of 77 respondents accessed the survey. Respondents were able to leave the survey at any time, and skip any questions they did not wish to answer. Of the 77 respondents, one individual only answered one question (Question 4), and this response was recorded as "not applicable." As such, that survey was removed from the analysis, and the total pool of respondents was reduced to 76. Three additional respondents did not provide answers to any question after question 7. While these surveys are considered "incomplete," they were included in the analysis. The discussion and summary tables for each question identifies the total respondents for that question, and the summary analysis for each question is based on the number of responses to that specific question. It should be noted that the small number of respondents (sample size) for this survey does not allow us to confidently generalized the results to the population of the City of Rockport. However, the results do provide a glimpse into the experiences and perceptions of flooding impacts to the individuals who live, work, and own businesses in the area.

Rockport has a diverse population in terms of residency and employment. This is a coastal community, and many homes are secondary residences that are used on the weekends, and for vacations. RV parks are common throughout the region, and "Winter Texans" are drawn to this area due to the mild temperatures experienced during the winter months. Many of the retirees who have chosen to move to the city are no longer a part of the labor force. In addition, some of the existing

labor force is seasonal, as their work is dependent on the vacationers (tourism) and the seasonal migratory patterns of the birds, fish, and seafood in the area (ecotourism, fishing guides, etc.). Aransas County, where Rockport is located, contains several small towns, and a large amount of unincorporated areas. As such, many people commute between towns and across municipal boundaries for work. One of the goals of this survey was to better understand these different segments of the population.

This document is designed to provide an explanation of the survey results. Key observations are underlined throughout the document. These observations, and any associated recommendations, are then summarized in the final section of this report.

QUESTION 1

1) I _____ in the city of Rockport. (Check all that apply)

- ☐ Live full-time
- ☐ Live part-time
- ☐ Work full-time
- ☐ Work part-time
- ☐ Own a business
- ☐ Other (Please specify below)

This question was intended to capture information about the interests of respondents; do they live, own a business, or work in the City of Rockport. The answers provided to this question will also be used to provide additional insight to responses later in the survey.

All 76 respondents answered this question. The data indicates that 82.9% of the respondents live in the city full-time. Another 7.9% of the residents live in the city part-time.

Table 1: Summary of Responses for Question 1.

Possible Answers	Number of Responses	Percentage of Total Responses
Live full-time	63	82.9%
Live part-time	6	7.9%
Work full-time	12	15.8%
Work part-time	7	9.2%
Own a business	9	11.8%
Other (Please specify)	11	14.5%
Total Reponses:	**76**	--
Respondents who Skipped Question:	**0**	--

All 12 of the respondents who answered that they work full-time in the city, also live full-time in the city. Similarly, all 7 of the respondents who said the work part-time in the city, also live full-time in Rockport. As such, 100 percent of the respondents who said they work in the city, also live full-time in Rockport. The total percentage of respondents who work in the city is quite low, 25%; however, we know that 50.5 % of the population of Rockport is not included in the labor force [(1)]. The City of Rockport has a high number of retirees which, along with seasonal employee's most likely account for the low percentage of survey respondents who work in the city. Further, the low survey response rate was only 1%, which does not allow for these results to be generalized to the city.

Table 2: Survey Responses as a Percentage of Rockport's Population.

2010 Rockport Population:	8,766
Survey Responses:	76
% of population who completed this survey:	1.0%

One additional point of clarification is that none of the residents who live in the city part-time, work in the city (full-time or part-time). This is not surprising, as these people are only here for portions of the year; as such, they may be retired, or have jobs in other areas of the state, or country, and come to Rockport for vacation and holidays.

Seven of the nine respondents who said they own a business in Rockport also live full-time in the city. Of the other two respondents who indicated that they own a business in Rockport, one states in Question 2 that they live in Rockport 12 months a year. Therefore, one of these answers (Question 1 or 2) for this respondent must be an error. The other respondent answered the question with "0 months;" therefore, this individual must live outside the city limits.

The survey was open to anyone, over the age of 18, who wished to participate. Therefore, this question also tried to quantify people who do not technically live or work in Rockport, but are interested in floodplain management issues in the city. This was accomplished through the inclusion of an "other" option, which asks respondents to specify their interest. There were 11 respondents (14.5%) who claimed "other." The short answers following this option included four responses indicating that the people lived or owned second homes outside the city limits; three responses specifying that the individuals own a second home in, or near Rockport; and three responses that were either a mistake, or discussed work activities. (See Appendix 2 for a list of the complete answers provided.)

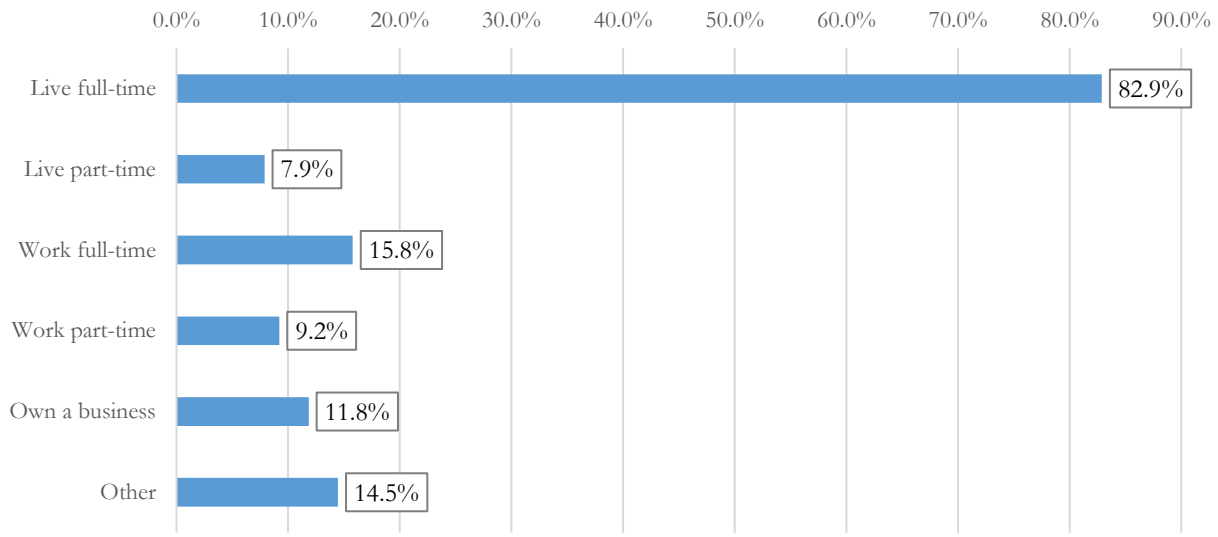


Figure 1: Question 1 Responses.

[1] U.S. Census Data. (2014). Retrieved from http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml

QUESTION 2

2) How many months of the year do you live in Rockport?

Question 2 asks individuals to specify the number of months, per year, they reside in Rockport. The respondents could choose one answer from a dropdown list with responses ranging from 0 months to 12 months. Seven people chose to skip this question. The majority (84.1%) indicated they live in Rockport 12 months out of the year. The other possible answers received two or fewer responses. Of the 69 responses to this question, 58 live in Rockport 12 months a year, while only 11 (14.5%) live in the city 11 months or less each year. Further, only 6 (8.7%) of the respondents live in Rockport for less than 6 months each year.

Table 3: Summary of Responses for Question 2.

Possible Answers	Number of Responses	Percentage of Total Responses
0 months	1	1.45%
1 months	0	0%
2 months	0	0%
3 months	2	2.9%
4 months	2	2.9%
5 months	0	0%
6 months	2	2.9%
7 months	0	0%
8 months	1	1.45%
9 months	2	2.9%
10 months	0	0%
11 months	1	1.45%
12 months	58	84.06%
Total Reponses:	**69**	--
Respondents who Skipped Question:	**7**	--

While seven respondents skipped this question, 4 of the individuals who skipped it indicated in question 1 that they live in the city full-time. If one includes those numbers, that would mean that 62 people, out of 73 (84.9%), live in Rockport 12 months a year.

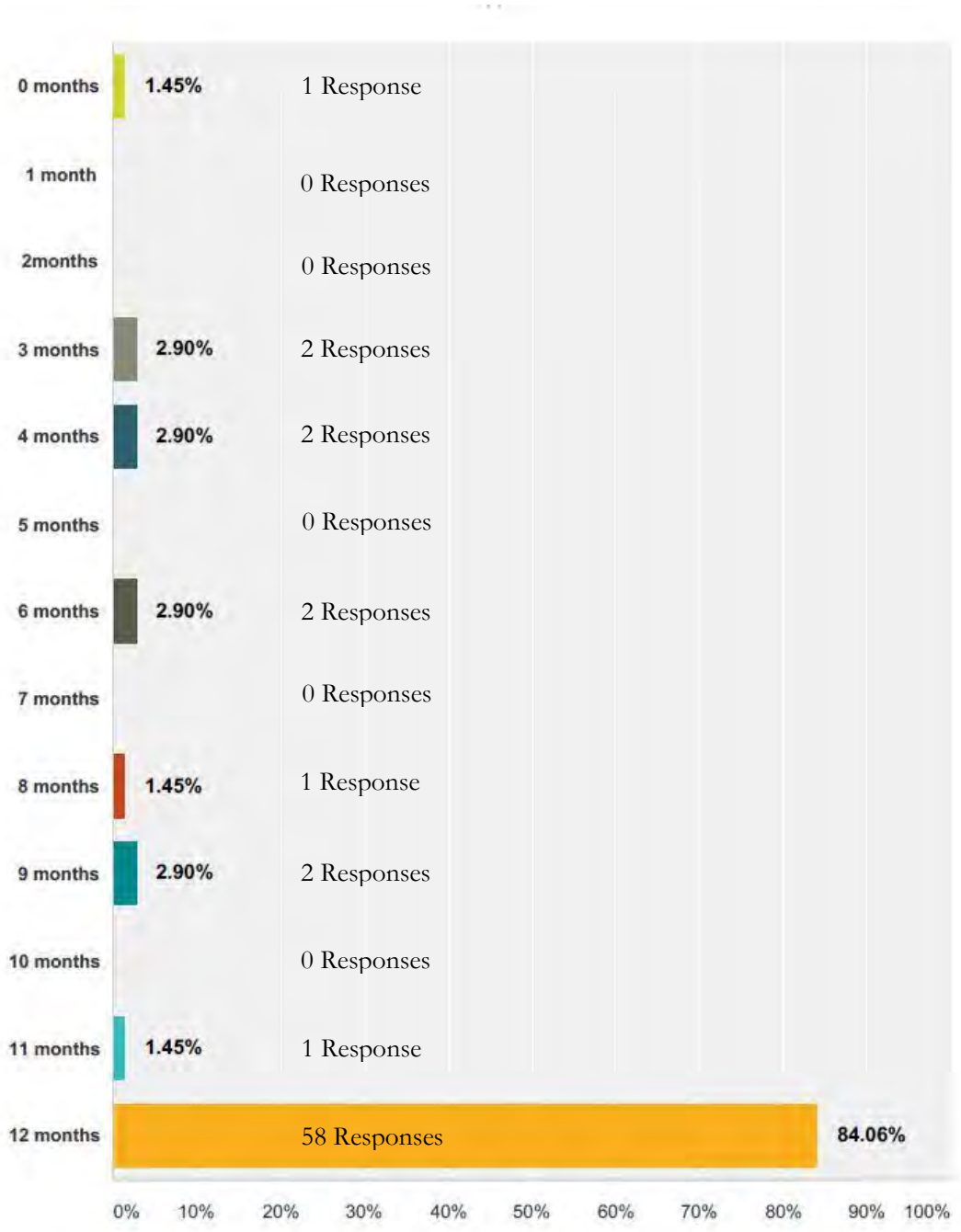


Figure 2: Question 2 Responses. (Graph created using Survey Monkey results.)

QUESTION 3

3) I _____ my home, business, or property in the city of Rockport.

- ◯ Own
- ◯ Rent
- ◯ Not applicable

Question 3 asks respondents to specify whether they own or rent their home, business, or property in Rockport. All 76 respondents answered this question. The majority of individuals (86.8%) indicated that they own their home business or property in Rockport. Of the people who own, 55 live full-time in the city; 5 of those people also own a business in Rockport. An additional 8 respondents who own their homes only live in the city part-time. Three of the individuals that indicated they own live outside the city boundaries; but own a business. For this survey we are assuming that they own the property on which the businesses reside.

Table 4: Summary of Responses for Question 3.

Possible Answers	Number of Responses	Percentage of Total Responses
Own	66	86.8%
Rent	8	10.5%
Not applicable	2	2.6%
Total Reponses:	**76**	--
Respondents who Skipped Question:	**0**	--

Eight respondents (10.5%) indicated that they rent. Six of those people live full-time in the city. The remaining two individuals live outside Rockport; but own a business within the city. As such, this should indicate that these two people rent the land on which the businesses reside. Only 2 people (2.6%) claimed that this question was "not applicable." One of these respondents identified that they live in Aransas County, and do not work or own a business in Rockport, in Question 1. The other person identified in Question 1 that they live, and work, full-time in Rockport; as such it is unclear why this question isn't applicable. The person could live in an RV, live rent free with family, or may have even clicked the wrong button by accident.

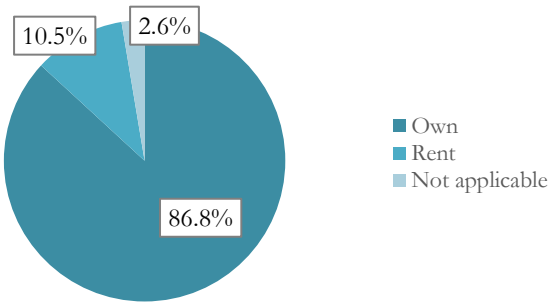


Figure 3: Question 3 Responses.

QUESTION 4

4) Is your home, business, or property in the floodplain?

- ◯ Yes
- ◯ No
- ◯ Not sure
- ◯ Not applicable

Question 4 asks if the respondent's home, business, or property is located in the floodplain. All of the respondents answered this question (76). The majority of the individuals (39.5%) were not sure if their home, business, or property was in the floodplain. The fact that so many individuals were unsure if their property is in the floodplain provides an opportunity for education and outreach, as this is critical information when trying to prepare homes for weather events.

Table 5: Summary of Responses for Question 4.

Possible Answers	Number of Responses	Percentage of Total Responses
Yes	26	33.2%
No	19	25.0%
Not sure	30	39.5%
Not applicable	1	1.3%
Total Reponses:	**76**	--
Respondents who Skipped Question:	**0**	--

Of the respondents who know if their property is in the floodplain (58.5%), 33.2% are within the floodplain while 25.0% are not. One additional responded (1.3%) answered that this question was "not applicable," this is the same individual who answered this way in Question 3, while indicating that they live and work full-time in the city.

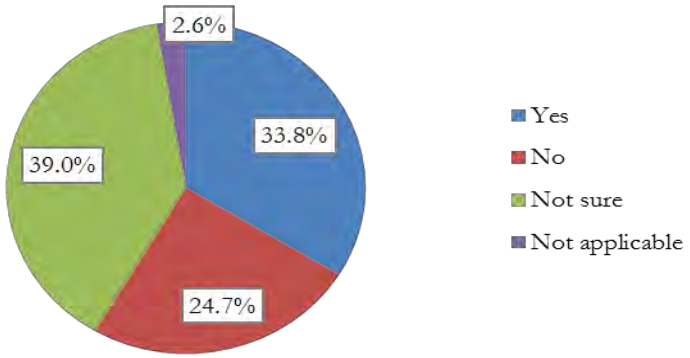


Figure 4: Question 4 Responses.

QUESTION 5

5) Are you aware of any current flood control or management projects in the City of Rockport?

◯ Yes

◯ No

◯ Not sure

(If yes, please specify what projects you are aware of below)

This question attempts to gather information about whether respondents are knowledgeable about ongoing flood control projects in the City of Rockport. The city completed a Master Drainage Plan in 2002, which was updated in early 2016. That plan includes more than $11 million in capital improvement projects designed to enhance drainage and reduce flooding in the area. Table X provides a list of the major drainage projects completed in the last 15 years[(2)].

Table 6: Major Drainage Projects Completed in Rockport in the last 15 years.

Year	Project
2001-2002	**South Rockport east of Highway 35 close to Water Street:** Pump stations and infrastructure were installed to improve outfall drainage. (This is the outfall area for multiple drainage basins.)
2004	**Cherry Street, from Omohundro to SH 35:** A box culvert was installed to improve drainage. (Cherry Street is the outfall for multiple drainage basins.)
2005	**Tule Ditch improvements:** A master planned drainage ditch was constructed to connect the Pearl Street drainage system to Tule Ditch. The project also included erosion control improvements downstream.
2010	**Rockport Country Club:** Storm sewer infrastructure was installed to increase the drainage outfall capacity throughout the golf course, and installed weirs to regulate the water levels.
2011	**Lady Claire Street:** Storm sewer infrastructure was installed on Lady Claire, along with an additional box culvert down Cherry Street to upgrade the outfall for multiple drainage basins.
2012	**Live Oak Learning Center:** The Aransas County Independent School District constructed a drainage ditch through the school property to provide drainage from Griffith Street to the downstream system. (This was a City-planned ditch necessitated by the new school construction.)
2013	**Disaster Recovery Supplemental Grant (DRS) Project 2.1:** A box culvert was installed down First Street) to upgrade the drainage outfall for a large area of South Rockport. This included a major crossing at SH 35; as well as crossings at SH 35 and Second Street, and two crossings of Loop 70 (Church Street).
2016	**Spanish Woods Area Drainage Improvements:** Three master planned drainage crossings were installed to upgrade the infrastructure downstream of multiple drainage basins including Spanish Woods, Chaparral Street, and Mesquite Street. The crossings were on Spanish Woods Drive, Sanctuary Drive, and FM 1781.
2016	**DRS Project 2.2:** Drainage infrastructure was upgraded along 30 blocks in South Rockport from Kossuth Street to SH 35 and from King to Third.
Ongoing	**Ditch clearing** is done throughout the city, as needed, to ensure that water flows efficiently within the drainage ditches.
Ongoing	**Rockport Country Club:** Removal of pond sediment to increase detention capacity and assist in flood control for the country club and the downstream drainage systems. (Done about every 2 years, last completed in 2014-2015.)

72% of respondents to this question (54 people) were not aware of any flood control or management projects within the city. Another 13.3% of respondents (10 people) were unsure if they

[2] Personal communication, Brandi Karl, Urban Engineering; & Art Smith, City of Rockport

knew of any flood control projects. Finally, 14.7% of respondents (11 people) indicated that they were aware of current flood control projects in Rockport. One individual skipped this question.

Table 7: Summary of Responses for Question 5.

Possible Answers	Number of Responses	Percentage of Total Responses
Yes	11	14.7%
No	54	72.0%
Not Sure	10	13.3%
Total Reponses:	**75**	--
Respondents who Skipped Question:	**1**	--

If respondents indicated that they were aware of current flood control projects, they were asked to identify those projects in a short answer box. Only 7 respondents actually specified projects. Two individuals mentioned drainage improvements in South Rockport, while another individual referenced the Water Street work. Both of these projects were completed in 2001-2002. Another person commented on the Bayshore efforts on Key Allegro which is a current effort to address beach erosion. This project has no impact on flooding or drainage issues. Three respondents identified larger, ongoing projects, one of which focuses on Aransas County efforts. The first individual referenced seeing ditches "being cleared for better water flow." Another respondent referenced the city's Master Drainage Plan. Finally, one person wrote about the Aransas County Stormwater Management Program, created in 2008, and the recently updated stormwater management plan. While each of the projects mentioned have, or are occurring in Rockport and Aransas County, the answers show that there is a lack of knowledge about the efforts to improve drainage and reduce flooding in the city. This is an area where the City of Rockport might consider additional outreach efforts in the future. (See Appendix 2 for a list of the complete answers provided.)

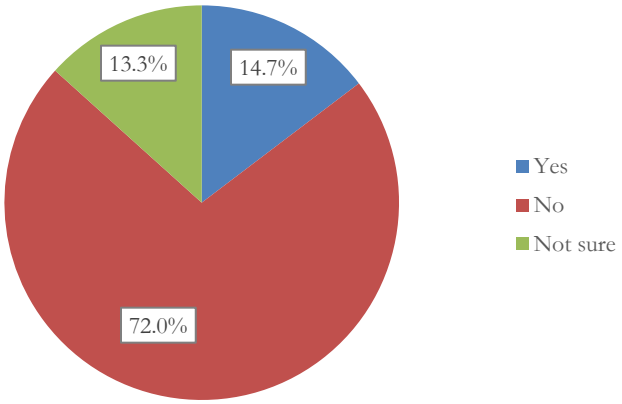


Figure 5: Summary of Responses for Question 5.

QUESTION 6

6) Do you have flood insurance for your home, business, or property? (Check all that apply)

- ☐ Home
- ☐ Business
- ☐ Property
- ☐ None of the above
- ☐ Not sure
- ☐ Not applicable

Questions 6 through 8 relate to flood insurance. If someone owns a home in the floodplain and does not have a mortgage, there is no requirement to have flood insurance. However, federally-backed mortgages, on buildings that are constructed in the high-risk flood area (also known as Special Flood Hazard Areas, these areas are denoted on FEMA Flood Maps using codes which begin with an "A" or "V"), do require flood insurance. In addition many non-federal mortgages and financial assistance programs require flood insurance; some even require insurance on buildings located in moderate to low-risk areas (denoted on FEMA Flood Maps using codes which begin with the letters "X," "B," or "C")[3].

> "Over a 30-year period, a property sitting in a high-risk flood area has a 26 percent chance of flooding"[4].

Question 6 asks if respondents have flood insurance on their home, business, or property. Flood insurance for the home was selected by the majority of respondents (65.8%), followed by those who do not have any insurance (26.3%) (captured by the "none of the above" response). In addition, 10.5% of the respondents carry insurance on their business, and 13.2% carry policies on property.

Table 8: Summary of Responses for Question 6.

Possible Answers	Number of Responses	Percentage of Total Responses
Home	50	65.8%
Business	8	10.5%
Property	10	13.2%
None of the above	20	26.3%
Not Sure	1	1.3%
Not applicable	3	4.0%
Total Reponses:	**76**	--
Respondents who Skipped Question:	**0**	--

14 of the 19 respondents who answered Question 4 by saying they did not live in the floodplain, carry insurance on their homes anyway (73.9%) (the other 5 do not carry insurance). There are eight respondents who state that they carry insurance on their business, of those 5 also carry insurance on

[3] National Flood Insurance Program. (2016). What are flood maps? Retrieved from https://www.floodsmart.gov/floodsmart/pages/understanding_flood_maps/understanding_flood_maps.jsp
[4] Guerra, T. (n.d.). If I Paid Off My Mortgage, Am I Required to Buy Flood Insurance? *San Francisco Gate*. Retrieved from http://homeguides.sfgate.com/paid-off-mortgage-am-required-buy-flood-insurance-52577.html

their home. All of the individuals who indicated that they carry insurance on their property, also answered that they carry insurance on their home. One respondent answered that they carry insurance on their home, business, and property. Finally, 3 individuals answered that this question was not applicable to them, 2 of those stated that they live in the floodplain; therefore, it is suspected that they probably own their homes outright and therefore are not mandated to carry flood insurance. One individual responded to this question by indicating they were unsure whether they carry flood insurance on their home, business, or property. In total, 53 of the 76 respondents to this question (69.7%) identified that they carry at least one flood insurance policy.

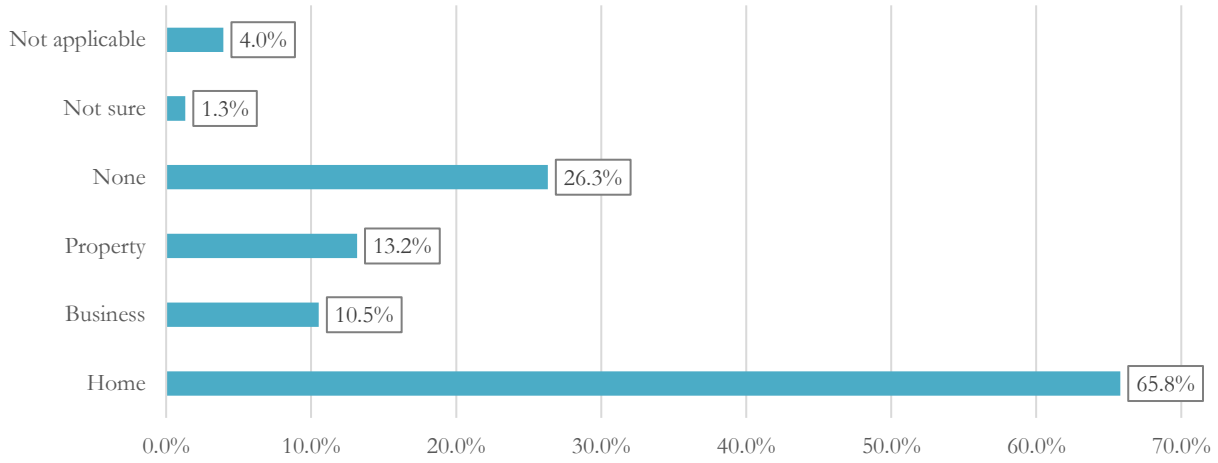


Figure 6: Summary of Responses to Question 6.

QUESTION 7

7) If you have flood insurance, why do you carry it? (Check all that apply)

- ☐ It is required because I live in the floodplain
- ☐ It is required because I have a mortgage
- ☐ It is required because I accepted disaster recovery funds from the government in the past
- ☐ It is not required but I felt it was advantageous
- ☐ Not applicable

Question 7 asks those respondents who stated in Question 6 that they carry flood insurance policies, why they carry said policies. Respondents could select as many reasons that applied to their situation. The first three answers involved situations which require insurance policies. The majority of respondents (22.5%) have flood insurance policies because it is required due to their home, business, or property being located in the floodplain. Another 19.7% have flood insurance policies because it is required due to their mortgage agreement. None of the respondents indicated that they are required to carry flood insurance due to the acceptance of disaster recovery funds in the past. These results show that 42.3% of the survey respondents are required to carry flood insurance. Interestingly, the same percentage of respondents (42.3%) answered that they are not required to carry flood insurance, but do so because they feel it is advantageous. Five respondents chose to skip this question.

Table 9: Summary of Responses for Question 7.

Possible Answers	Number of Responses	Percentage of Total Responses
It is required because I live in the floodplain	16	22.5%
It is required because I have a mortgage	14	19.7%
It is required because I accepted disaster recovery funds from the government in the past	0	0%
It is not required but I felt it was advantageous	30	42.3%
Not applicable	19	26.8%
Total Reponses:	**71**	--
Respondents who Skipped Question:	**5**	--

Further analysis of the responses to the survey revealed several other interesting facts about the respondents. These items have been grouped according to those who carry insurance, and those who do not carry insurance. There are two noteworthy items regarding those respondents who carry insurance. First, only 7 respondents checked the boxes indicating that they are required to carry insurance both because they live in the floodplain, and due to their mortgage. Second, 1 respondent indicated that they are required to have insurance because they live in the floodplain, and that they are not required to carry insurance, but do so because it is advantageous. This person indicated in Question 6 that they carry insurance on both their home and property. Therefore, it is assumed that one of these responses had to do with their home, and the other was relevant to their property.

When looking at the responses of the individuals who indicated that they do not carry insurance the following items were noted. There were 30 people who indicated that they are not required to carry insurance, but do so because they believe it is advantageous. Six of these individuals answered Question 4 by stating that their house, business or property is in the flood zone. The home, business, or property of these individuals could be located within the 500-year flood zone, placing it within a low-risk zone for flooding where insurance is not required. Second, all 19 of the respondents who thought this question did not apply to them, stated in Question 6 that they either did not carry insurance, or that flood insurance was not applicable to them. In addition, 3 of the individuals who skipped this question also indicated in Question 6 that they do not carry flood insurance. By adding those 3 responses to the 19 which answered "not applicable" enables us to estimate that 29.7% (of 74 potential respondents) do not carry flood insurance.

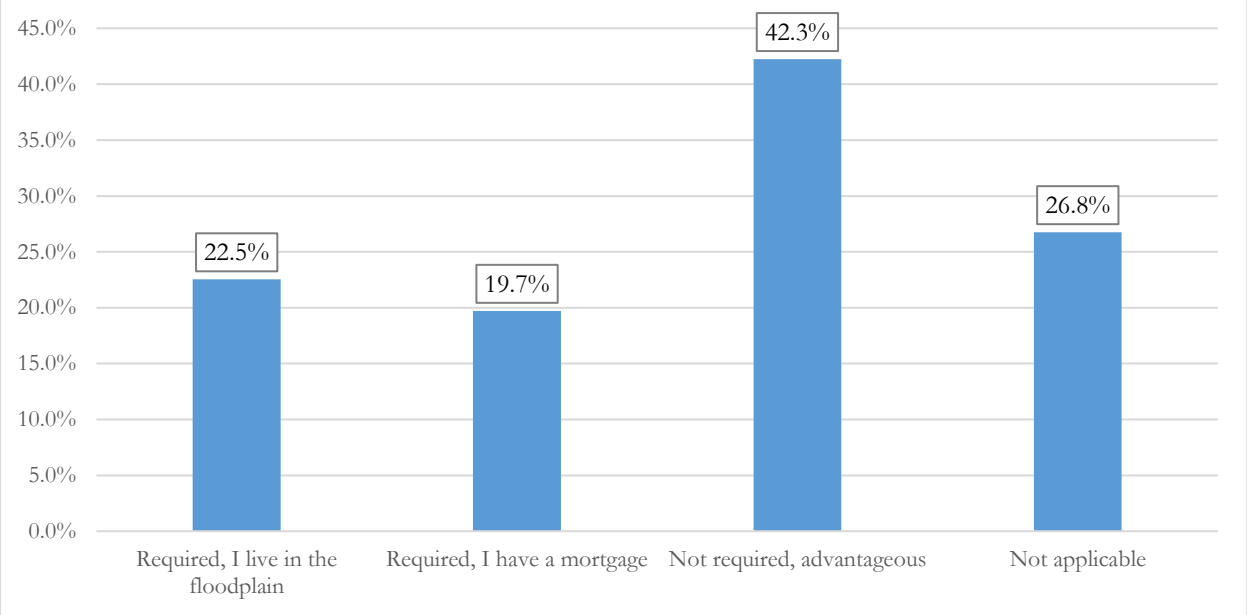


Figure 7: Summary of Responses to Question 7.

QUESTION 8

8) If you do not have flood insurance, why don't you carry it? (Check all that apply)

- ☐ I do not live in the floodplain
- ☐ My home, business, or property is elevated or otherwise protected
- ☐ I rent
- ☐ Insurance is too expensive
- ☐ I don't need it because it never floods
- ☐ I never really considered it
- ☐ Not applicable
- ☐ Other (Please specify below)

Question 8 asks those respondents who stated in Question 6 that they do not carry flood insurance policies, why they made this decision Again, respondents could select as many responses that applied to their situation. The majority of respondents (69.5%) indicated that this question did not apply to them. When considering that almost 30% of the responses to Question 7 indicated that individuals did not carry insurance, it is logical that almost 70% of the responses to this question indicate that people carry insurance.

Table 10: Summary of Responses for Question 8.

Possible Answers	Number of Responses	Percentage of Total Responses
I do not live in the floodplain	3	5.1%
My home, business, or property is elevated or otherwise protected	7	11.9%
I rent	4	6.8%
Insurance is too expensive	9	15.3%
I don't need it because it never floods	0	0.0%
I never really considered it	1	1.7%
Not applicable	41	69.5%
Other (Please specify below)	1	1.7%
Total Reponses:	**59**	--
Respondents who Skipped Question:	**17**	--

The most common reason for not individuals not carrying insurance was because it is too expensive (15.3%). The second most common reason was that the home, business, or property is elevated or otherwise protected (11.9%). Four people (6.8%) indicated that they do not carry insurance because they rent. While 5.1% of the respondents indicated that they do not carry insurance because they do not live in the floodplain. Interestingly, one of these individuals indicated in Question 4 that they were not sure if their home, business, or property was in the floodplain. One person (1.7%) answered that they had never considered the idea of flood insurance. None of the respondents

indicated that they do not need insurance because it never floods. Finally, one individual checked the "other" response, and indicated in the short answer section that they do not have insurance because they "can't afford it." This response can be categorized as "insurance is too expensive" which would raise the percentage of that response to 16.9%.

There were 17 respondents who chose to skip this question. Fourteen of those indicated in Questions 6 & 7 that they carry insurance. By adding those 14 responses to the 41 which answered "not applicable" enables us to estimate that 75.3% (of 73 potential respondents) carry flood insurance.

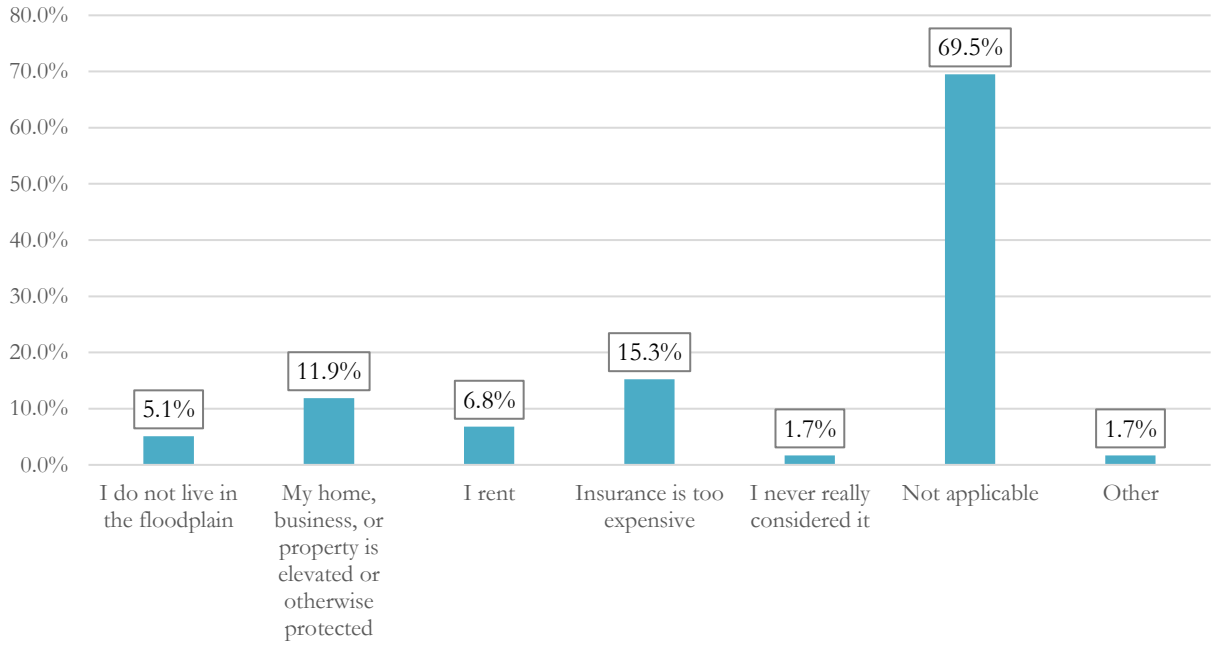


Figure 8: Summary of Responses to Question 8.

QUESTIONS 9 & 10

9) Has your life or property been impacted by high water or flooding in Rockport

- ◯ Never
- ◯ Occasionally
- ◯ Regularly

10) Has your daily work or routine been impacted by, high water or flooding in Rockport?

- ◯ Never
- ◯ Occasionally
- ◯ Regularly

Questions 9 and 10 deal with the impacts of flooding in Rockport on the individuals completing the survey. The focus group, used to test the original survey instrument, requested that these questions be included. The intent of Question 9 was to establish if people had experienced damage to their property; or even to themselves or their families. This might include flooding of, or damage to, their property; as well as possible harm to individuals in the form of physical or emotional impacts. Question 10 was then requested to identify if the daily routines, or schedules, of individuals had been impacted by things like road closures, and changes to local's schedules as a result of flood events.

Table 11: Summary of Responses for Questions 9 & 10.

	Question 9		Question 10	
Possible Answers	**Number of Responses**	**Percentage of Total Responses**	**Number of Responses**	**Percentage of Total Responses**
Never	23	31.5%	16	22.2%
Occasionally	41	56.2%	50	69.4%
Regularly	9	12.3%	6	8.3%
Total Reponses:	**73**	--	**72**	--
Respondents who Skipped Question:	**3**	--	**4**	--

The majority of respondents stated that their life or property (56.2%), and their daily work or routines (69.4%) are occasionally impacted by high water or flooding. Between one quarter and one third of the respondents indicated that high water or flooding has never impacted their lives or properties (31.5%), or their daily routines (22.2%). A small portion of respondents stated that their lives and properties (12.3%), or their daily routines (8.3%) are regularly impacted.

These results show that 68.5% of the respondents' experience impacts to their live and property, at least occasionally, due to flooding in Rockport. Even more concerning is that 77.7% of the respondents' experience impacts to their daily routines, at least occasionally, due to flooding in the

city. This figure confirms the need and importance for the City of Rockport to address floodplain management issues.

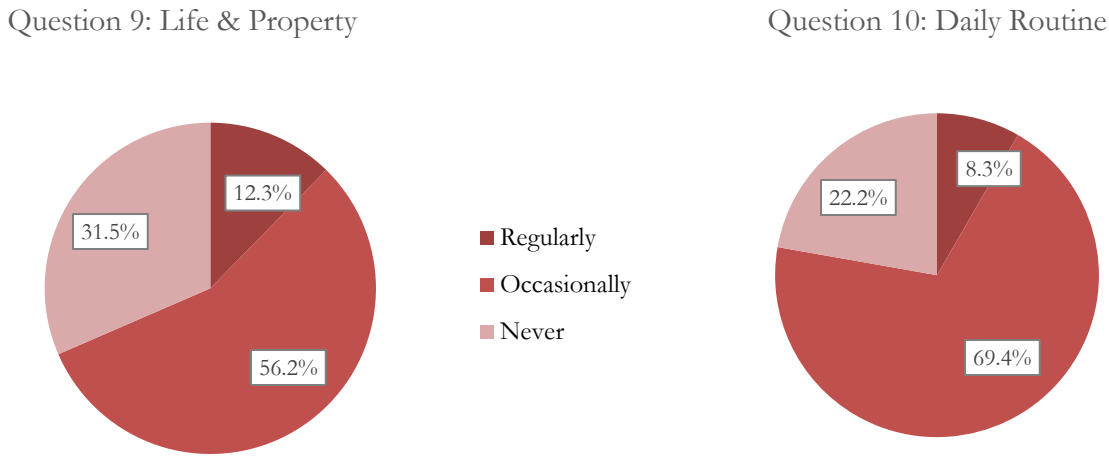


Figure 9: Responses to Questions 9 & 10.

QUESTION 11

11) How concerned are you about the possibility of Rockport being impacted by a flood event?

- ◯ Very concerned
- ◯ Somewhat concerned
- ◯ Mildly concerned
- ◯ Not concerned

Question 11 allows people rate their concern about the possibility of Rockport being impacted by a flood event. Half of the respondents (50%) answered that they are very concerned about potential impacts to Rockport from flooding. Another 40.3% indicated that they are somewhat concerned about potential impacts to the city from flooding. This means that 90.3% of the individuals who answered this question were somewhat or very concerned about the possibility of the City of Rockport being impacted by flooding. Conversely, only 6.9% of respondents were mildly concerned, and 2.8% were not concerned, about a flood event impacting the city. These numbers make another compelling testimony to the need and importance for Rockport to address floodplain management issues.

Table 12: Summary of Responses for Question 11.

Possible Answers	Number of Responses	Percentage of Total Responses
Very Concerned	36	50%
Somewhat Concerned	29	40.3%
Mildly Concerned	5	6.9%
Not Concerned	2	2.8%
Total Reponses:	**72**	--
Respondents who Skipped Question:	**4**	--

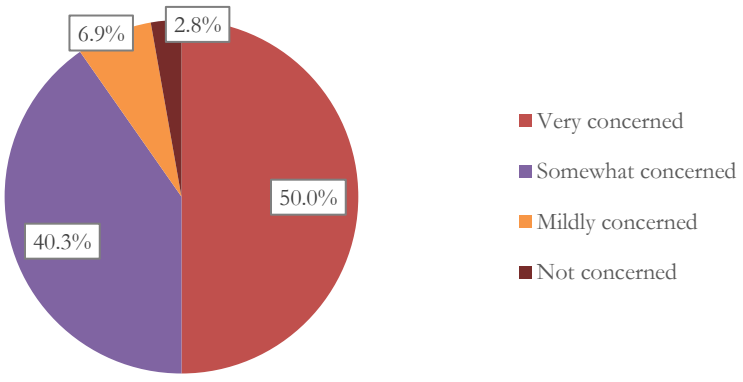


Figure 10: Responses to Question 11.

QUESTION 12

12) Which of the following actions have you taken to protect your home, business, or property from a flood event? (Check all that apply)

- ☐ Purchased flood insurance
- ☐ Fortified my home, business, or property with sandbags
- ☐ Elevated my home or business
- ☐ I have not taken any actions
- ☐ I have taken other actions (Please list below)

Question 12 attempts to identify what actions people have taken to protect their home, business, or property from potential flooding. Respondents were able to select as many answers that apply. The majority of people identified that they have purchased flood insurance (65.8%). In addition, 15.1% of individuals stated that they have fortified their home, business, or property with sandbags, while 13.7% indicated that they elevated their home or business. In addition, 15.1% stated that they "have taken other action(s)." These respondents were then asked to identify the other actions that they have taken. The answers included choosing a home with a higher elevation (3); purchasing or using pumps to move water to other areas (2); placing items higher in the home in order to protect them from potential flooding (2); the use of window coverings or hurricane shutters (2); having an alternative travel route during times of floods (1); and having a drainage plan for their property (1) (See Appendix 2 for detailed responses).

Table 13: Summary of Responses for Question 12.

Possible Answers	Number of Responses	Percentage of Total Responses
Purchased flood insurance	48	65.8%
Fortified my home, business, or property with sandbags	11	15.1%
Elevated my home or business	10	13.7%
I have not taken any actions	17	23.3%
I have taken other actions (Please list below)	11	15.1%
Total Reponses:	**73**	--
Respondents who Skipped Question:	**3**	--

Further analysis of these responses show that 10 people carry insurance and have fortified with sandbags, and that 6 individuals carry insurance and have elevated their home or business. In total, 57 of the respondents have taken some kind of action to protect their home, business, or property. Of those that have taken some action, 23 respondents have taken multiple actions to protect their home, business, or property against flooding.

The converse of all of these actions to protect homes, businesses, and properties is the fact that 23.3% of the respondents indicate that they have not taken any actions to protect against a flood event. Three individuals skipped this question.

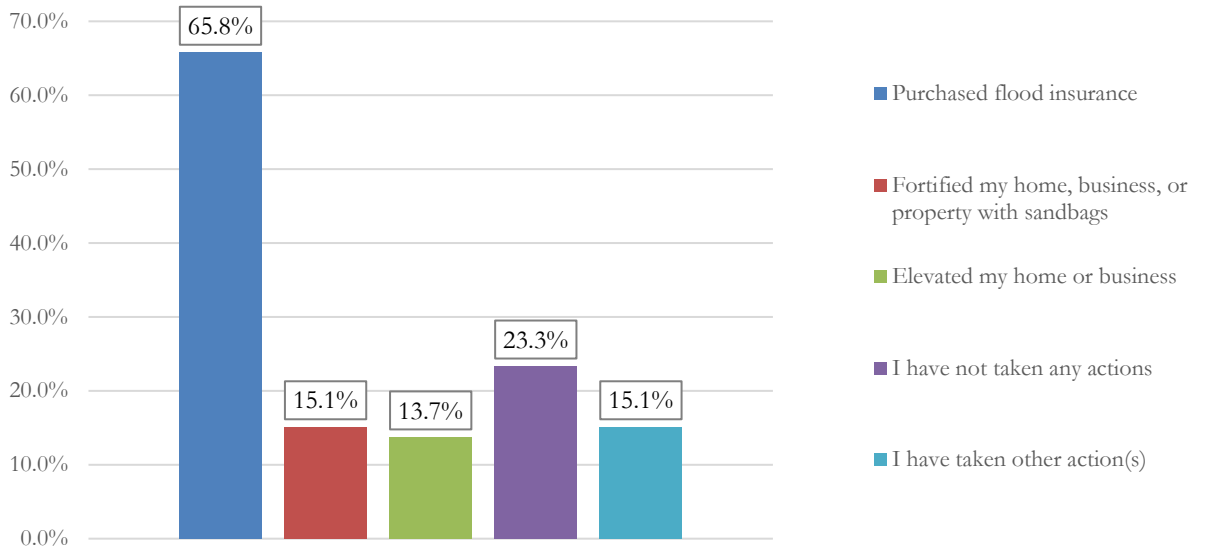


Figure 11: Responses to Question 12.

QUESTION 13

13) What sources have you used to collect information about protecting your home, business, or property from a flood event? (Check all that apply)

- ☐ Governmental agency
- ☐ Schools or Libraries
- ☐ Real-estate agent/Seller/Landlord
- ☐ Faith-based institution
- ☐ Community events
- ☐ TV/Radio news
- ☐ Internet/Social media
- ☐ Friends/Family/Neighbors
- ☐ My involvement in a non-profit or social organization
- ☐ My personal experience with flood events
- ☐ Other sources

Question 13 attempts to find out where respondents have received information about how to protect their home, business, or property from a flood event. Respondents were able to select as many answers that apply to them. Three answers were chosen by more than 40% of the respondents: personal experience (56.5%), Internet/Social media (43.5%), and Government agencies (42%). An additional four options were chosen by more than 15% of the respondents: Family/friends/neighbors (33.3%), Real estate agent/seller/landlord (23.2%), TV/Radio (21.7%), and Community events (18.8). The least selected answers were: through involvement with a non-

Table 14: Summary of Responses for Question 13.

Possible Answers	Number of Responses	Percentage of Total Responses
Governmental agency	29	42.0%
Schools or Libraries	3	4.4%
Real-estate agent/Seller/Landlord	16	23.2%
Faith-based institution	2	2.9%
Community events	13	18.8%
TV/Radio news	15	21.7%
Internet/Social media	30	43.5%
Friends/Family/Neighbors	23	33.3%
My involvement in a non-profit or social organization	5	7.3%
My personal experience with flood events	39	56.5%
Other sources	7	10.1%
Total Reponses:	**69**	--
Respondents who Skipped Question:	**7**	--

profit or social organization (7.3%), Schools or Libraries (4.4%), and finally Faith-based institutions (2.9%). Finally, 10.2% of the respondents said they received information from sources other than the 11 identified. Unfortunately, we do not know what those sources might be.

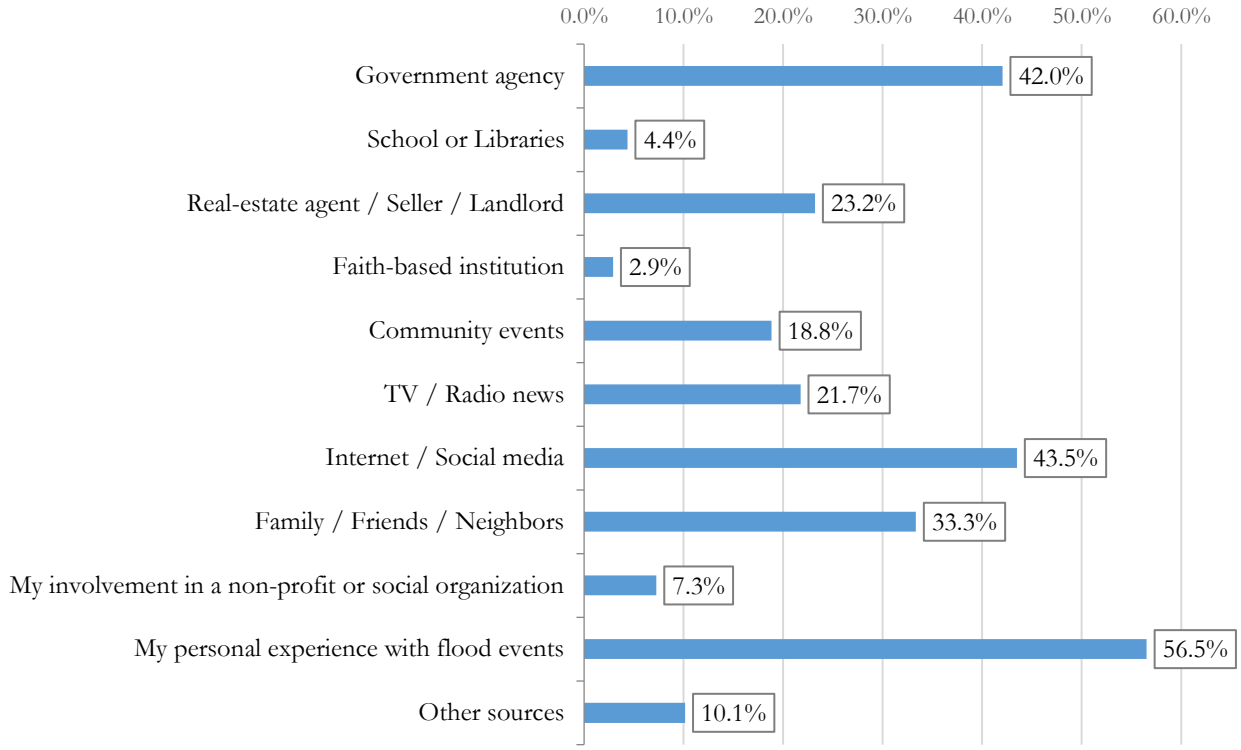


Figure 12: Responses to Question 13.

Further analysis shows that while there were 69 responses to this question (7 individuals skipped this item) only 27 individuals (39.1%) only chose one option. In reality, the majority of people (47 individuals, 68.1%) only chose one to three options (10 individuals (14.5%) chose two options, and 12 individuals (17.4%) chose three options. Fewer individuals (20 for 29.0%) chose four to seven responses (9 individuals (13.0%) chose four options, and five individuals (7.2%) chose five options, four individuals (5.8%) chose six options, and 2 individuals (2.9%) chose seven options. None of the respondents chose more than seven options. Ultimately, the average number of information source options chosen by each respondent was 2.6 options. This means that, on average, each of the respondents go to 2.6 different sources to find information about protecting their home, business, or property from a flood event. This indicates a need for readily accessible information about flooding and flood events for citizens. As such, the city should consider a multi-pronged approach to public education through the floodplain management planning process; as well as, a coordinated long-term approach to providing relevant, timely, information in the future. Starting this education process during the floodplain management planning process will allow city staff, and the citizens, to collaborate on what is most needed, and the best ways to convey that information so that it is most useful to the citizens.

QUESTION 14

14) How would you MOST like to receive time-sensitive warnings and instructions regarding a flood event?

- ◯ TV
- ◯ Radio
- ◯ Cellphone Alerts (similar to Amber Alerts or Silver Alerts)
- ◯ Text Message
- ◯ Email
- ◯ Social media
- ◯ Other (Please list below)

Question 14 seeks to identify which source respondents would most like to see used to deliver time-sensitive warnings and instructions for the City of Rockport in the event of an actual flood. Cellphone alerts (similar to Amber and Silver Alerts) was the most popular choice (49.3%), followed by Text messages (29.6%). Email was chosen by 8.5% of the respondents, while TV, social media, and "other" each received 4.2% of the responses. The idea of receiving notices via the radio was not chosen by any respondents. Each of the three respondents who chose "other" provided information about this response. Two individuals indicated that they would like to receive notices in "all of the above" ways, indicating that they would like to see all of these options utilized. The final respondent wrote "no local way."

Table 15: Summary of Responses for Question 14.

Possible Answers	Number of Responses	Percentage of Total Responses
TV	3	4.2%
Radio	0	0.0%
Cellphone Alerts (similar to Amber, or Silver, Alerts	35	49.3%
Text Message	21	29.6%
Email	6	4.2%
Social Media	3	4.2%
Other	3	4.3%
Total Reponses:	**71**	--
Respondents who Skipped Question:	**5**	--

The demography of the respondents may be related to the responses for this question. Different generations use technology, the internet, and social media in different ways. In addition, different socio-economic groups have dissimilar access to technology and the internet. The results of this question could be heavily biased by the demographics of the respondents that participated in this survey. Therefore, while the results of this survey show a clear preference for cellphone alerts;

further ground-truthing of this data is advisable prior to the city making any final decisions regarding how best to notify citizens about warnings and instructions in the event of a flood.

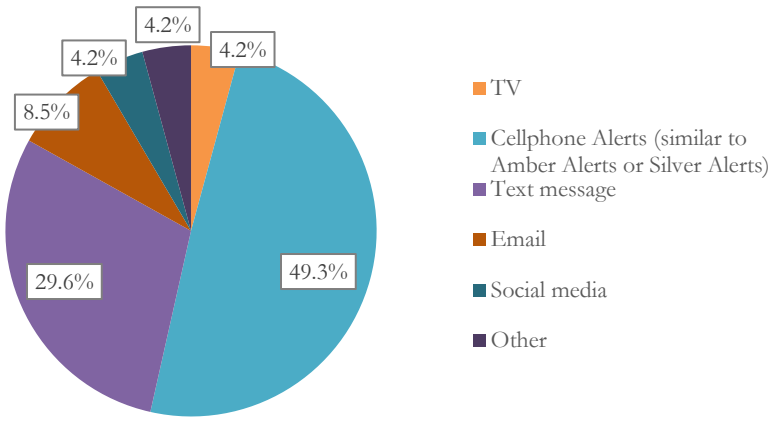


Figure 13: Responses to Question 14.

QUESTION 15

15) When you moved into your home, business, or purchased your property, did you consider the impacts of potential flood events?

- ◯ Yes
- ◯ No
- ◯ Not sure
- ◯ Not applicable

Question 15 asks respondents if they considered the impacts of potential flood events when they moved into their home or business, or when they purchased their property. A large majority (74.3%) responded that they did consider the potential impacts of flooding when they purchased, or moved into, their home, business, or property. Over one fifth of the respondents (21.4%) answered that they did not consider the impacts of flooding. A small percentage (2.9%) were unsure if the considered the potential impacts of flooding when they purchased, or moved into, their home, business, or property. Finally, only 1.4% claimed this question was not applicable to them. It is not known why this individual felt this way; but their home and property are not in the floodplain, yet they still carry insurance because they think it is beneficial. Six individuals skipped this question.

Table 16: Summary of Responses for Question 15.

Possible Answers	Number of Responses	Percentage of Total Responses
Yes	52	74.3%
No	15	21.4%
Not sure	2	2.9%
Not applicable	1	1.4%
Total Reponses:	**70**	--
Respondents who Skipped Question:	**6**	--

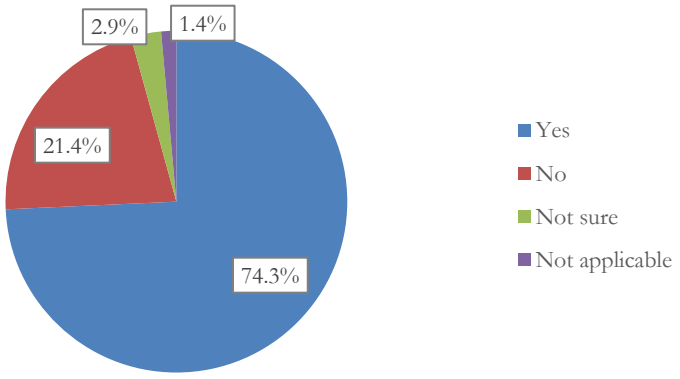


Figure 14: Responses to Question 15.

QUESTION 16

3) If your home, business, or property were designated as "in a high flood hazard area," or received repeated damages from flooding, would you consider a program where a government agency would pay you current market value for it; therefore allowing you relocate to a safer location?

- ◯ Yes
- ◯ No
- ◯ Not sure
- ◯ Not applicable

Question 16 asks respondents if they would support a program which is commonly called a "buyout program." A program like this allows a government agency to pay a landowner current market value for their home, business, or property, after it is designated to be within a "high flood hazard area," or has received repeated damages due to flooding. The owner can use this money received to relocate to a location outside the high flood hazard area. As the frequency of flooding increases throughout the nation, this option may become more popular. It should be recognized that not all communities, or owners, support this program. One potential complication can be that communities within high hazard areas may have very strong, interconnected social systems in which members count on each other for vital tasks like childcare. The loss of these social networks upon relocation can have the potential to leave families, and individuals, unable to successfully function. Any potential buyout program should be scrutinized for potential success, and social implications, in an area prior to implementation. It is vital that this analysis include the impacted communities, and further, decisions should be made, and programs put into place before flooding occurs.

The survey responses show that 43.7% of the respondents would be interested in a buyout program. Another 31% of the individuals indicated that they were unsure if they would support this type of program. Only 12.7% of the individuals who answered this question said they would not support such a program, while an additional 12.7% did not think the question was applicable to them. Five individuals chose to skip this question. These numbers indicate that it would be beneficial for the City of Rockport to work with the community to investigate the potential of a buy-out program.

Table 17: Summary of Responses for Question 16.

Possible Answers	Number of Responses	Percentage of Total Responses
Yes	31	43.7%
No	9	12.7%
Not sure	22	31.0%
Not applicable	9	12.7%
Total Reponses:	**71**	--
Respondents who Skipped Question:	**5**	--

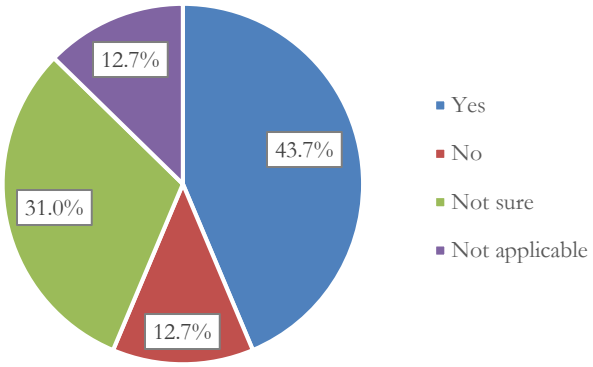


Figure 15: Responses to Question 16.

QUESTION 17

17) Would you support rules regarding how land within a known "high flood hazard area" can be used or zoned, to reduce risks associated with future flood events in Rockport?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

Question 17 asks respondents if they would support potential land use regulations in areas known to have a high hazard of flooding. Communities throughout the nation have implemented rules and regulations on what can be built, or what activities can be performed, in "high flood hazard areas." These efforts are undertaken in order to reduce the risk involved with a potential flood event. Although this question did not give examples of such regulations, it gave respondents the opportunity to express their general support for such measures. Five individuals chose to skip this question. Of the 71 respondents, 43.7% strongly support these types of potential regulations. Another 32.4% somewhat support the potential regulations, which provides 76.1% of the respondents showing some level of support for this option. An additional 12.7% of the respondents were unsure if they would support this type of regulation, while only 11.3% do not support this idea.

Table 18: Summary of Responses for Question 17.

Possible Answers	Number of Responses	Percentage of Total Responses
Strongly support	31	43.7%
Somewhat support	23	32.4%
Do not support	8	11.3%
Not sure	9	12.7%
Total Reponses:	**71**	--
Respondents who Skipped Question:	**5**	--

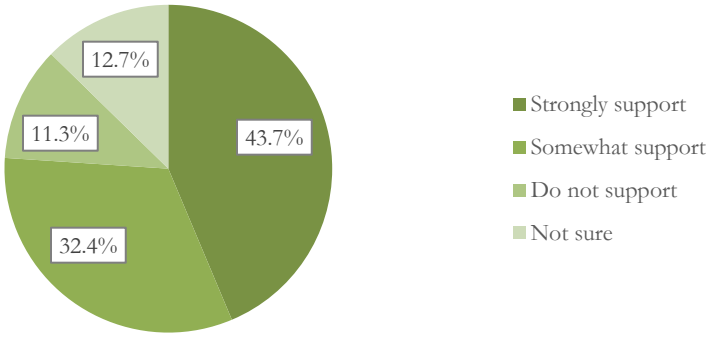


Figure 16: Responses to Question 17.

QUESTIONS 18-25

Questions 18-25 are similar in that each asks respondents to rate their support for different types of potential actions that can reduce the risks associated with future flood events. The questions are listed below (each question uses the same possible responses; as such, these are only listed once):

18) How much you would support **engineered projects such as levees, dams, and bulkheads** designed to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

Q 19: How much would you support **stronger building codes and land use rules** in floodplain areas to reduce the risks associated with flood events?
Q 20: How much would you support **retrofitting infrastructure such as roads and drainage** to reduce the risks associated with flood events?
Q 21: How much would you support **retrofitting critical facilities such as fire stations and hospitals** to reduce the risks associated with flood events?
Q 22: How much would you support r**etrofitting utility infrastructure to reduce the disruption of service** during and after flood events?
Q 23: How much would you support **protecting natural areas, such as wetlands, and their inherent flood-preventing benefits** in effort to reduce the risks associated with flood events?
Q 24: How much would you support **buying vulnerable properties and increasing natural areas** to reduce the risks associated with flood events?
Q 25: How much would you support **better access to information about flood risks and protective actions that individual households can take** to reduce the risk associated with flood events?

Four of the proposed actions had more than 60% of the respondents indicate that they would "strongly support" that alternative (retrofitting infrastructure (Q20) 80.0%, retrofitting utility infrastructure (Q22) 70.0%, better access to information (Q25) 69.6%; and retrofitting critical facilities (Q21) 68.6%). The remaining alternatives all had 40.0% or greater of the respondents indicate that they would "somewhat support" that action (engineered projects (Q18) 54.3%, stronger building codes and land use rules (Q19) 53.6%%, protecting natural areas (Q23) 48.6%, and buying vulnerable properties (Q24) 40.0%).

Interestingly, the four options with the highest percentages of respondents who "strongly support" that action, also have the lowest rate of individuals who are unsure if they would support the alternative. Further, the one action with the lowest rate of respondents who would "strongly support" the alternative was also the option with the highest rate of respondents who would "somewhat support" the alternative (Q24: buying vulnerable properties). Ultimately the percentage of respondents who were unsure if they would support an option, or would not support an option was quite low for all of the alternatives (below 10%).

Table 19: Summary of Responses for Questions 18-25.

Possible Answers	Number of Responses	Percentage of Total Responses
Q 18: Engineered projects such as levees, dams, and bulkheads		
Strongly support	38	54.3%
Somewhat support	24	34.3%
Do not support	6	8.6%
Not sure	2	2.9%
Total Reponses:	**70**	--
Respondents who Skipped Question:	**6**	--
Q 19: Stronger building codes and land use rules		
Strongly support	37	53.6%
Somewhat support	25	36.2%
Do not support	5	7.3%
Not sure	2	2.9%
Total Reponses:	**69**	--
Respondents who Skipped Question:	**7**	--
Q 20: Retrofitting infrastructure such as roads and drainage		
Strongly support	56	80.0%
Somewhat support	11	15.7%
Do not support	2	2.9%
Not sure	1	1.4%
Total Reponses:	**70**	--
Respondents who Skipped Question:	**6**	--
Q 21: Retrofitting critical facilities such as fire stations and hospitals		
Strongly support	48	68.6%
Somewhat support	19	27.1%
Do not support	1	1.4%
Not sure	2	2.9%
Total Reponses:	**70**	--
Respondents who Skipped Question:	**6**	--
Q 22: Retrofitting critical facilities such as fire stations and hospitals		
Strongly support	48	68.6%
Somewhat support	19	27.1%
Do not support	1	1.4%
Not sure	2	2.9%
Total Reponses:	**70**	--
Respondents who Skipped Question:	**6**	--
Q 23: Protecting natural areas, such as wetlands, and their inherent flood-preventing benefits		
Strongly support	34	48.6%
Somewhat support	26	37.1%
Do not support	4	5.7%
Not sure	6	8.6%
Total Reponses:	**70**	--
Respondents who Skipped Question:	**6**	--

Table 19 (continued): Summary of Responses for Questions 18-25.

Possible Answers	Number of Responses	Percentage of Total Responses
Q 24: Buying vulnerable properties and increasing natural areas		
Strongly support	28	40.0%
Somewhat support	30	42.9%
Do not support	7	10.0%
Not sure	5	7.1%
Total Reponses:	**70**	--
Respondents who Skipped Question:	**6**	--
Q 25: Better access to information about flood risks and protective actions		
Strongly support	48	69.6%
Somewhat support	18	26.1%
Do not support	1	1.5%
Not sure	2	2.9%
Total Reponses:	**69**	--
Respondents who Skipped Question:	**7**	--

Figure 17 shows a side-by-side comparison of the potential actions, and their relative support.

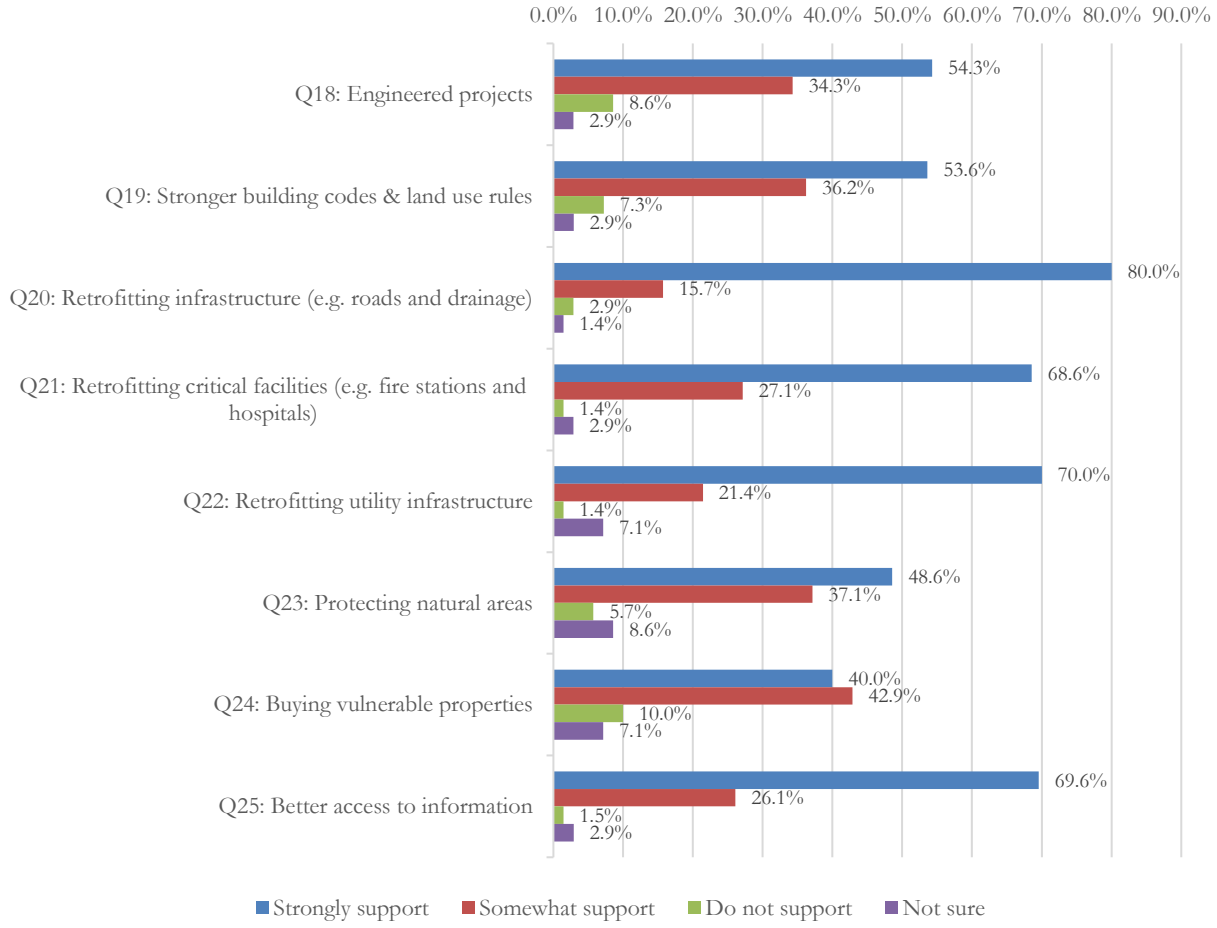


Figure 17: Responses to Questions 18-25.

Another way of looking at the data is to show what percentage of respondents showed some support for the alternatives. This is shown in Table 20, and in Figure 18. All of the responses had more than 80.0% of the respondents showing some support. The alternatives with the highest percentages of support were retrofitting infrastructure (Q20), retrofitting critical facilities (Q21), and better access to information (Q25) all at 95.7%. The next group includes retrofitting utility infrastructure (Q22) 91.4%, stronger building codes and land use rules (Q19) 89.9%, and engineered projects (Q18) 88.6%. The alternatives that ranked lowest in the percentage of respondents showing some level of support were protecting natural areas (Q23) 85.7%, and buying vulnerable properties (Q25) 82.9%. Interestingly, these two alternatives often go hand in hand. These two alternatives also had two of the greatest percentage of respondents who did not support them (8.6% for protecting natural areas, and 7.1% for buying vulnerable areas), or who were unsure if they would support them (5.7% for protecting natural areas and 10.0% for buying vulnerable areas).

Table 20: Total Support for Action Alternatives.

	Strongly Support	Somewhat Support	Total Support
Q18: Engineered projects	54.3%	34.3%	**88.6%**
Q19: Stronger building codes & land use rules	53.6%	36.2%	**89.9%**
Q20: Retrofitting infrastructure (e.g. roads and drainage)	80.0%	15.7%	**95.7%**
Q21: Retrofitting critical facilities (e.g. fire stations and hospitals)	68.6%	27.1%	**95.7%**
Q22: Retrofitting utility infrastructure	70.0%	21.4%	**91.4%**
Q23: Protecting natural areas	48.6%	37.1%	**85.7%**
Q24: Buying vulnerable properties	40.0%	42.9%	**82.9%**
Q25: Better access to information	69.6%	26.1%	**95.7%**

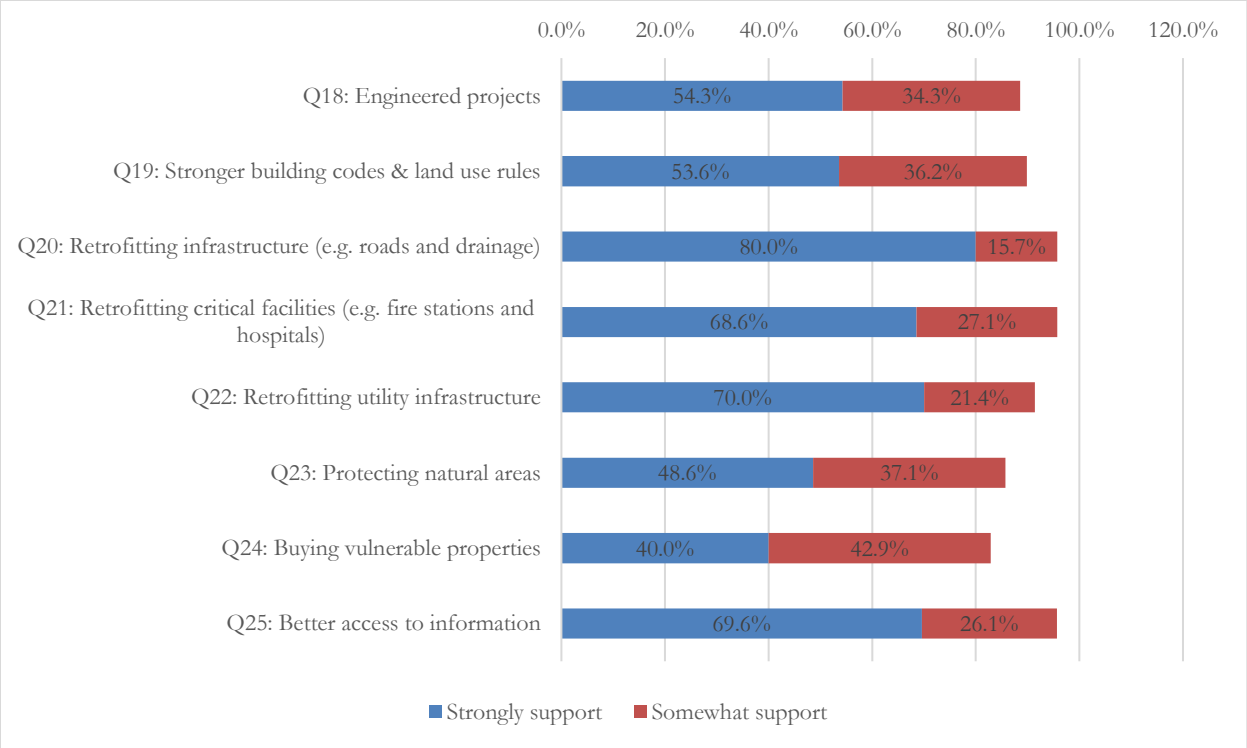


Figure 18: Percentage of Respondents Showing Some Support for Alternatives.

QUESTIONS 26 & 27

26) Are there any other types of actions that you would support to reduce the risks associated with flood events? (Please specify below)

27) Please provide any additional information regarding Rockport's efforts to plan for the long-term management of our floodplains.

These questions provided an opportunity to gather additional information from the respondents that may not have been captured through any of the other questions. Question 26 asks the respondents if there are any additional actions, not already discussed in the survey that they would like to see utilized to reduce the risks of flooding in Rockport. Question 27 offered an opportunity for the respondents to specify any additional information that they think might be beneficial to the long-term process of reducing the risks of flooding in Rockport. The responses to these questions were coded in order to categorize and summarize the information collected. Codes were established for key concepts that were identified in the answers, allowing each response to receive multiple codes. Appendix 3 includes a listing of each response and the codes assigned. Table 21 lists the number of responses for each question that fall under the individual codes.

Table 21: Summary of Coded Responses to Questions 26 & 27.

Q26	Q27	Code	Description of Code
6	7	L	Specific **locations** mentioned
9	3	Eng.	Hard **engineering** or maintenance offered as a solution
6	1	Ed.	Need for **education**/information/community involvement
--	6	Need	Action **needed** soon
3	2	Adv.	**Adverse** effects on one area due to action in another area
1	4	OD	**Over development** perceived as an issue
--	4	B	**Belated** efforts perceived by respondent
1	3	Coord.	Need for **coordination** within the City, and with bordering areas
1	2	Plan	Need for better, or more, **planning**
1	1	PR	Need for **permits**/stricter **regulations**
1	1	Nat.	Need to protect **natural** areas
--	1	OI	**Old Infrastructure**
4	5	NP	Answers that did **not** provide **practical** information

The majority of the responses to Question 26 offered ideas about engineering or maintenance suggestions (9 responses) that would allow for better drainage. Many of the answers also identified specific locations where these activities are needed (6 responses). In addition, a desire for more information and education about flooding, the associated risks, and appropriate actions was expressed (6 responses). The responses for Question 27 showed an express need for action, and that "now is the time to do something" (6 responses) Recommendations included additional engineering or maintenance suggestions (3 responses), and a need for planning (2 responses) and coordination within the city, and with the neighboring communities (3 responses). Again many respondents identified specific locations where action is needed (7 responses). A belief that parts of the city have already been over developed was expressed (4 responses), along with stories of individuals

experiencing negative repercussions from the actions of the city or neighbors (2 responses). Finally, individuals identified that the city's infrastructure is "old and inadequate," that there is a need to protect "natural wetland barriers," and that "stricter new building requirements" are needed in some areas.

SUMMARY OF RECOMENDATIONS

The results detailed in this document summarize the answers provided for each question in the survey. The following is a short summary of the key findings and recurring recommendations. First and foremost, it is critical to understand that response rate for this survey was quite low (1%). While these results offer a snapshot of the thoughts, needs, and wants of the people of Rockport, they cannot be considered a true representation of the population. The project team highly recommends another survey, in addition to significant dialogue with the citizens of Rockport before making any strategic decisions. The development of a floodplain management plan affords an ideal opportunity to initiate that dialogue.

The survey confirmed, though the high percentage of experienced impacts documented in Questions 9 & 10, the levels of concern regarding flooding impacts recorded in the responses to Question 11, and from the responses provided to questions 26 & 27, that there is an express need and desire for the City of Rockport to address floodplain management issues. The responses provided clearly show that the citizens are experiencing impacts, are concerned about this issue, and have strong ideas about what could be done.

The responses to Question 13 and 14 support the need for education and readily accessible information about flooding, flooding hazards, flood events, and possible precautionary actions for citizens. As such, the city should consider a multi-pronged approach to public education through the floodplain management planning process; as well as, a coordinated long-term approach to providing relevant, timely, information in the future. Starting this education process during the floodplain management planning process will allow city staff, and the citizens, to collaborate on what is most needed, and the best ways to convey that information so that it is most useful to the citizens.

Finally, the responses to Questions 18-25 indicate support for the previous recommendations in that they citizens of Rockport showed a greater than 80.0% support rate for all proposed actions. In addition, the answers supported the need for education about the flooding, their associated risks, and the potential actions that the city, and individuals, can take.

APPENDIX 1: SURVEY IMPLEMENTATION

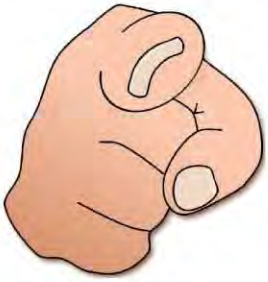
APPENDIX 1.1: Survey Flyer

We Need You

to help the

City of Rockport

become BETTER!



We are working to develop a Floodplain Management Plan for the City. In an effort to include your concerns and local knowledge in the development of this plan, Texas Sea Grant has developed an online survey to gather information about your experiences and perceptions regarding flooding hazards in the City of Rockport. Your participation in this survey will help us to ensure that all segments of the population of Rockport are represented.

If you are ready to help us, please follow the link below to complete the survey before July 31, 2016. *This should not take more than 6-8 minutes of your time.*

If you do not wish to participate in the survey; but would like to provide input regarding the Floodplain Management Planning Process, please contact Karen Bareford, Coastal Planning Specialist with Texas Sea Grant, at (361)825-3225, or karen.bareford@tamu.edu.

http://svy.mk/29aIfcv

IRB NUMBER: IRB2016-0448D
IRB APPROVAL DATE: 07/01/2016
IRB EXPIRATION DATE: 07/01/2017

We Need You

to help the

City of Rockport

become BETTER!

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http://svy.mk/29aIfcv

IRB NUMBER: IRB2016-0448D
IRB APPROVAL DATE: 07/01/2016
IRB EXPIRATION DATE: 07/01/2017

Survey Recruitment Flyer, Page 1.

Lead Researcher: Karen Bareford with Texas Sea Grant

Partners:
- City of Rockport
- Mission-Aransas Reserve

Purpose of this survey: To gather information about your experiences and perceptions regarding flooding hazards in the City of Rockport.

Importance: The data collected from this survey will be used in the development of a Floodplain Management Plan for Rockport which will provide a strategy of programs, goals, and actions to reduce the adverse impact of hazards on the community.

Benefit to you: The hazards associated with potential flooding can affect individuals. These impacts can be personal, through the destruction of property, and even include physical harm to individuals. These impacts can also alter the daily lives of individuals as physical infrastructure and access to critical faculties (including utilities, emergency perceives, and roads) can be affected. All of these impacts have the potential to influence individuals emotionally, financially, their personal comfort, and time. By participating in the survey you are contributing to the process of creating a plan to minimize all of these impacts.

For additional information, or questions, please contact:

Karen Bareford, Ph.D.
Coastal Planning Specialist
Texas Sea Grant College Program
Texas A&M University at Corpus Christi
6300 Ocean Drive
NRC-2800, Unit 5840
Corpus Christi, TX 78412
(361) 825-3225

IRB NUMBER: IRB2016-0448D
IRB APPROVAL DATE: 07/01/2016
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Corpus Christi, TX 78412
(361) 825-3225

IRB NUMBER: IRB2016-0448D
IRB APPROVAL DATE: 07/01/2016
IRB EXPIRATION DATE: 07/01/2017

Survey Recruitment Flyer, Page 2.

APPENDIX 1.2: Distribution List for Informational Flyers

Public Institutions
Aransas County Public Library
Agrilife Extension office
Bay Education Center
Rockport Service Center
Rockport City Hall
University of Texas Marine Science Institute

Businesses
Castaways Thrift Shop
H.E.B.
Pirate Coin Laundry
Speedy Wash Laundromat

Non-profit Organizations
Good Samaritan Office
History Center
Rockport Center for the Arts
Rockport-Fulton Chamber of Commerce
Texas Maritime Museum
The Aquarium at Rockport Harbor
Veterans of Foreign Wars

Home Owners Associations & Apartment Complexes
Bay of Aransas Garden Apartments
Flour Bluff Apartments
Linden Oaks Apartments
Rockport Harbor View Apartments
Rockport Oaks Garden Apartments
Wind Wood Apartments
Oaks at Bentwater Apartments
Oak Harbor Apartments
Fifty Oaks Apartments
Sea Mist Townhomes
Key Allegro Home Owners Association

RV Parks
Ancient Oaks
Beacon RV Park
Blue Lagoons RV Resort
Copano Bay RV Resort
Copano Hideaway RV Park
Country Oaks Mobile Home & RV
Lagoons RV Resort
Rockport Central RV Park
Taylor Oaks RV Park
Woody Acres Resort

Other
Rockport Country Club

APPENDIX 1.3: Survey

City of Rockport Floodplain Management Planning Survey

Project Title: City of Rockport Floodplain Management Planning Survey

You are invited to take part in a research survey being conducted by Karen Bareford, a researcher from Texas Sea Grant College Program at Texas A&M University and funded by the Texas General Land Office. This project is being conducted in order to collect data that will be used to assist in the development of a Floodplain Management Plan for the City of Rockport. The information in this form is provided to help you decide whether or not to take part. If you decide you do not want to participate, there will be no penalty to you, and you will not lose any benefits you normally would have.

Why Is This Study Being Done?
This survey is being done to gather information about the experiences and perceptions of individuals who live, work, and own businesses in Rockport, specifically, the survey is designed to find out about your experience and perceptions regarding flooding hazards in the City

Why Am I Being Asked To Be In This Study?
You are being asked to be in this study because you may live, work, or own a business in Rockport, and are over the age of 18.

How Many People Will Be Asked To Be In This Study?
We would like to capture as many responses as possible to this survey. As such we are casting a very wide net using the city website, email distribution of the link to the survey, and informational flyers that include the link to the survey. We apologize for cross-postings; but need to get as wide a distribution as possible in order to capture the maximum potential responses, to represent as diverse a cross-section of the population as feasible.

What Are the Alternatives to being in this study?
The alternative to taking the survey are to not take the survey. If you would like to provide input regarding the Floodplain Management Planning Process, but do not way to take the survey, please contact Karen Bareford, Coastal Planning Specialist with Texas Sea Grant, at (361)825-3225, or karen.bareford@tamu.edu.

What Will I Be Asked To Do In This Study?
You will be asked to answer questions about your experiences and perceptions regarding flooding hazards in the City of Rockport. The survey will be open through July 31, 2016, and your participation should not take more than 8 minutes.

Are There Any Risks To Me?
The things that you will be doing are no greater risks than you would come across in everyday life.

Are There Any Benefits To Me?
The hazards associated with potential flooding can affect individuals. These impacts can be personal, through the destruction of property, and even include physical harm to individuals. These impacts can also alter the daily lives of individuals as physical infrastructure and access to critical faculties (including utilities, emergency perceives, and roads) can be affected. All of these impacts have the potential to influence individuals emotionally, financially, their personal comfort, and time. By participating in the survey you are contributing to the process of creating a plan to minimize all of these impacts.

IRB NUMBER: IRB2016-0448D
IRB APPROVAL DATE: 07/01/2016
IRB EXPIRATION DATE: 07/01/2017

IRB Approved Survey, Page 1.

Will There Be Any Costs To Me?
Aside from your time, there are no costs for taking part in the study.

Will I Be Paid To Be In This Study?
You will not be paid for being in this study.

Will Information From This Study Be Kept Private?
The records of this study will be kept private. No identifiers linking you to this study will be collected. Research records will be stored securely and only staff affiliated with this research will have access to the raw data.

Information will be stored in computer files protected with a password.

People who have access to the raw data collected include the Lead Researcher and research study personnel. Representatives of regulatory agencies such as the Office of Human Research Protections (OHRP) and entities such as the Texas A&M University Human Subjects Protection Program may access your records to make sure the study is being run correctly and that information is collected properly.

Who may I Contact for More Information?
You may contact the Lead Researcher, Karen Bareford, Ph.D., to tell her about a concern or complaint about this research at (361) 825-3225 or karen.bareford@tamu.edu.

For questions about your rights as a research participant, to provide input regarding research, or if you have questions, complaints, or concerns about the research, you may call the Texas A&M University Human Subjects Protection Program office by phone at 1-979-458-4067, toll free at 1-855-795-8636, or by email at irb@tamu.edu.

What if I Change My Mind About Participating?
This research survey is voluntary and you have the choice whether or not to be in this research study. You may decide to not begin or to stop participating at any time. If you choose not to be in this study or stop being in the study, there will be no negative effects for you.

By completing the survey, you are giving permission for the investigator to use your information for research purposes.

Thank you

Karen Bareford

After reviewing the above information, please click (*appropriate text will be entered according to needs*) to continue to the survey.

(Continue to next page)

IRB Approved Survey, Page 2.

1) I _____ in the city of Rockport. (Check all that apply)

- ☐ Live full-time
- ☐ Live part-time (Number of months you live in Rockport each year _____)
- ☐ Work full-time
- ☐ Work part-time
- ☐ Own a business
- ☐ Other (Please specify below)

2) I _____ my home, business, or property in the city of Rockport.

- ◯ Own
- ◯ Rent
- ◯ Not applicable

3) Is your home, business, or property in the floodplain?

- ◯ Yes
- ◯ No
- ◯ Not sure
- ◯ Not applicable

4) Are you aware of any current flood control or management projects in the City of Rockport?

- ◯ Yes
- ◯ No
- ◯ Not sure

(If yes, please specify what projects you are aware of below)

(Continue to next page)

IRB Approved Survey, Page 3.

5) Do you have flood insurance for your home, business, or property? (Check all that apply)

- ☐ Home
- ☐ Business
- ☐ Property
- ☐ None of the above
- ☐ Not sure
- ☐ Not applicable

6) If you have flood insurance, why do you carry it? (Check all that apply)

- ☐ It is required because I live in the floodplain
- ☐ It is required because I have a mortgage
- ☐ It is required because I accepted disaster recovery funds from the government in the past
- ☐ It is not required but I felt it was advantageous
- ☐ Not applicable

7) If you do not have flood insurance, why don't you carry it? (Check all that apply)

- ☐ I do not live in the floodplain
- ☐ My home, business, or property is elevated or otherwise protected
- ☐ I rent
- ☐ Insurance is too expensive
- ☐ I don't need it because it never floods
- ☐ I never really considered it
- ☐ Not applicable
- ☐ Other (Please specify below)

8) Has your life or property been impacted by high water or flooding in Rockport

- ◯ Never
- ◯ Occasionally
- ◯ Regularly

(Continue to next page)

IRB Approved Survey, Page 4.

9) Has your daily work or routine been impacted by, high water or flooding in Rockport?

- ○ Never
- ○ Occasionally
- ○ Regularly

10) How concerned are you about the possibility of Rockport being impacted by a flood event?

- ○ Very concerned
- ○ Somewhat concerned
- ○ Mildly concerned
- ○ Not concerned

11) Which of the following actions have you taken to protect your home, business, or property from a flood event? (Check all that apply)

- ☐ Purchased flood insurance
- ☐ Fortified my home, business, or property with sandbags
- ☐ Elevated my home or business
- ☐ I have not taken any actions
- ☐ I have taken other actions (Please list below)

(Continue to next page)

IRB Approved Survey, Page 5.

12) What sources have you used to collect information about protecting your home, business, or property from a flood event? (Check all that apply)

- ☐ Governmental agency
- ☐ Schools or Libraries
- ☐ Real-estate agent/Seller/Landlord
- ☐ Faith-based institution
- ☐ Community events
- ☐ TV/Radio news
- ☐ Internet/Social media
- ☐ Friends/Family/Neighbors
- ☐ My involvement in a non-profit or social organization
- ☐ My personal experience with flood events
- ☐ Other sources

13) How would you MOST like to receive time-sensitive warnings and instructions regarding a flood event?

- ◯ TV
- ◯ Radio
- ◯ Cellphone Alerts (similar to Amber Alerts or Silver Alerts)
- ◯ Text Message
- ◯ Email
- ◯ Social media
- ◯ Other (Please list below)

14) When you moved into your home, business, or purchased your property, did you consider the impacts of potential flood events?

- ◯ Yes
- ◯ No
- ◯ Not sure
- ◯ Not applicable

(Continue to next page)

IRB Approved Survey, Page 6.

15) If your home, business, or property were designated as "in a high flood hazard area," or received repeated damages from flooding, would you consider a program where a government agency would pay you current market value for it; therefore allowing you relocate to a safer location?

- ◯ Yes
- ◯ No
- ◯ Not sure
- ◯ Not applicable

16) Would you support rules regarding how land within a known "high flood hazard area" can be used or zoned, to reduce risks associated with future flood events in Rockport?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

The following nine questions will ask you to rate how much you would support different types of actions designed to reduce risks associated with flood events.

17) How much you would support engineered projects such as levees, dams, and bulkheads designed to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

(Continue to next page)

IRB Approved Survey, Page 7.

18) How much you would support stronger building codes and land use rules in floodplain areas to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

19) How much you would support retrofitting infrastructure such as roads and drainage to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

20) How much you would support retrofitting critical facilities such as fire stations and hospitals to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

21) How much you would support retrofitting utility infrastructure to reduce disruption of services during and after flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

(Continue to next page)

IRB Approved Survey, Page 81.

22) How much you would support protection of natural areas, such as wetlands, and their inherent flood-preventing benefits in an effort to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

23) How much you would support buying vulnerable properties and increasing natural areas to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

24) How much you would support better access to information about flood risks and protective actions individual households can take to reduce the risks associated with flood events?

- ◯ Strongly support
- ◯ Somewhat support
- ◯ Do not support
- ◯ Not sure

25) Are there any other types of actions that you would support to reduce the risks associated with flood events? (Please specify below)

26) Please provide any additional information regarding Rockport's efforts to plan for the long-term management of our floodplains.

Thank you for your time!

IRB NUMBER: IRB2016-0448D
IRB APPROVAL DATE: 07/01/2016
IRB EXPIRATION DATE: 07/01/2017

IRB Approved Survey, Page 9.

APPENDIX 2: SHORT ANSWERS RESPONSE FOR QUESTIONS 1, 5, AND 12

APPENDIX 2:1: Short Answer Responses to Question 1

Question 1 asks respondents to identify how much they live or work in the city, and if they own a business. The last option provides an opportunity for respondents to identify another interest in the city by choosing "other." If the respondents choose this option, they are asked to specify their interest. The table below presents the actual responses provided.

Table 22: Short Answer Responses to Question 1.

Actual Responses
Live in Aransas county
P
Live in Fulton
Weekend home owner
live just outside city limits
Former resident
Work from home for the Tx Drought Project
Own 2nd home near airport
Partner in co-op business
I live in Aransas Co outside Rockport
Run an organization

APPENDIX 2:2: Short Answer Responses to Question 5

Question 5 asks respondents if they are you aware of any current flood control or management projects in the City of Rockport. The respondents who respond positively are asked to specify what projects they are knowledgeable about. The table below presents the actual responses provided regarding flood control projects.

Table 23: Short Answer Responses to Question 5.

Actual Responses
Large drains, pipes, valves, ets put in south rockport
There have been some drainage I,proved in South Rockport
I saw ditches being cleared for better water flow
water street
Bayshore on Key Allegro
a master plan
Aransas County established a Storm Water Manage progran in 2008. The City has also recently updated its SW managrmrnt plan.

APPENDIX 2.3: Short Answer Responses to Question 12

Question 12 asks respondents to identify what actions they have taken to protect their home, business, or property from potential flooding. The last option "I have taken other actions" provides a space for additional short answer response and asks the individual to please list these additional actions. The table below presents the actual responses provided, and shows how those answers were categorized.

Table 24: Short Answer Reponses to Question 12.

Actual Responses	Category
Purposely purchased a higher elevation home. Studied storm surge maps.	Elevation
Bought a high volume pump to pump water accross the street where it will drain, the ditch on my side will not drain	Pumps
Keeping things up higher off ground	Elevated storage
Hurricane shutters	Window coverings
Use alternative routes to travel to and from work and my child's daycare during flooding events.	Alternative travel routes
When we get a lot of rain, I clear the floors of my store with most merchandise in case of flooding.	Elevated storage
Created drainage plan for our property	Drainage plan
I have measured the elevation of my homes before buying them.	Elevation
pumps to take water to drainage ditch, that is NOT deep enough so still standing water.	Pumps
Ordinary preparation with window coverings, etc.	Window coverings
Purchased residential propert that was elevated	Elevation

APPENDIX 3: CODED, OPEN-ENDED ANSWERS FOR QUESTIONS 26 AND 27

APPENDIX 3.1: Responses to Question 26

Question 26 asks respondents if there any other types of actions that you would support to reduce the risks associated with flood events in Rockport. The table below presents the actual responses provided, and shows how those answers were categorized.

Table 24: Responses to Question 26.

Codes	Actual Responses
Adv.	Flooding at my home increased after the city "fixed" the problem at other end of street. I have raised my property at my own expense while seeing city trucks dump sand on property owned by person with connections. I feel a tax credit may help in some areas. If I continually flood I should not pay same taxes as someone who does not have to face that problem
Plan/L	Better planning from the city before they undertake redoing streets (downtown area)...some foresight into the repercussions that occur when projects are undertaken
NP	Fix the flood problem in Rockport - period!
Nat./OD/L	I'm very concerned that Aransas County is not doing enough to protect natural wetland barriers and over developing along the bay shore.
NP	No
Eng.	Like the ones up there by Hitchcock,Texas.very large drain canal.
Eng.	Blocking off tidal input, and pumping rain water out.
NP	Use of common sense
Eng.	Frequent cleaning storm water inlets and sewer
Eng./L	South Rockport specifically needs better street drainage
NP	none come to mind
Adv./L	South magnolia is the low point in the bowl. Stop allowing sand by the truckloads to build up lots that used to hold rain water. This water is displaced on existing homes and adding to the flooding. These were wet lands. As more lots are built up, the existing homes absorb the water from their new neighbors. The sump pumps have been useless two years in a row due to high tide from what I have been told. My garage went 12"+ completely underwater. Actually the entire lot at 1311 s magnolia went 6-18" underwater twice in 12 months. My car was flooded inside the cab due to high water parked on the concrete driveway. All the water that used to sit on numerous lots are all being built up 3-4' and now that land doesn't hold it's own water as required by law their water flows to existing homes and flood them. Every owner is responsible for their water run off. The sump pumps are a failure. The discharge is below the high tide.
Ed.	Need more information about resources thst are available.
Eng.	Better drainage ditches, better culverts
Ed./Eng.	Educating local people and businesses about the risks of allowing debris to block natural drainage and storm sewers, and correcting the silting-in that has been allowed to occur in creeks designed for drainage
Coord./Ed./L	More cooperation from city officials and departments in areas, such as downtown, which always flood. Never hear anything from the city before, during or afterwards.
Ed.	Make sure purchasers are aware of the history of the property they are buying. Many people are buying property that was historicaly a lake or swamp.
Eng./PR/Adv.	Increase the depth of road drainage ditches. Permit required for any topography changes to property that could cause flooding to neighbors' properties.

Eng./L	Improve the storm drainage on Magnolia Street, in the Magnolia Park block. Our house flooded during Tropical Storm Bill last year. Also put up road barricades on flooded residential streets. Kids driving trucks fast down our flooded street increased the amount of water that came in.
Ed.	Lots of information. People don't pay attention until they have been bombarded with information or they are faced with the need for it.
Eng.	to general question. This is a location and land use specific issue. For Rockport in general, I would recommend raising the elevation of all bay/water front roads, hardening their shorelines, and adding elevated pumping stations inland to discharge flooded city streets quickly during high rain + high tide events
Ed.	Education as to what products are out there to help people protect their homes and businesses.

APPENDIX 3.2: Responses to Question 27

Question 27 asks respondents if there is any additional information that they would like to provide regarding Rockport's efforts to plan for long-term floodplain management. The table below presents the actual responses provided, and shows how those answers were categorized.

Table 25: Responses to Question 27.

Codes	Actual Responses
Adv./Need	I have seen buildings and developments allowed that will acerbate the problem for the neighbors and neighborhood. All areas need attention, not just the high dollar neighborhoods
OI/B	Infrastructure is so old and inadequate ...I don't know where you begin
B/OD/Need	The entire county seems to be behind as far as drainage and with the increased building that is going on, Now is the time to do something about it
Coord.	Include Fulton and make them have a plan as well.
Ed.	Answering some of these questions may have been easier if examples were provided. In some cases, my level of support may depend on the actual actions taken by the City. Thanks.
Nat./OD/L	I'm very concerned that Aransas County is not doing enough to protect natural wetland barriers and over developing along the bay shore.
NP	Don't build here
Coord.	The City, The County, and The State should work together on our flood problems.
B/OD	This survey and any action that needs to be implemented are way behind, example, newly constructed building and roads allowed to be build below acceptable high water levels.
Plan	Work to reduce insurance costs
NP	I'm sorry to say this, but based on the personal attacks and threats leveled on me when I, as a water policy professional, tried to help local citizens understand groundwater conservation, I'd say it's impossible to get any traction on this issue in Rockport. Good luck.
Plan/PR/L	A good flood management plan for the city would be greatly appreciated. Stricter new building requirements and redesigning Austin St. would greatly help.
NP/Need	Fix downtown
NP	None I can recommend
Eng./L	Drainage ditch maintenance. Some of the drainage to Copano Bay has filled in with trees (follow the ditch along the north edge of the Rockport City Service Center for a prime example).
NP/OD	When they build Key Allegro and Kon Tiki they gave up any efforts to do real management.
B/L/Need	Please act on this as soon as possible. Those of us who live in the downtown area have to deal with this problem a lot, and there are so many associated dangers, like snakes and power lines in water, as well as mosquitoes.
L/Need	Market street and hwy 35 intersection needs to be looked at

Eng./L	Improvement of drainage in downtown area should be high priority.
Eng.	identify inland areas that historically back-up and flood during high rain + high tide events. Install elevated pumping stations and associated discharge systems to more rapidly drain the flooded streets, as opposed to waiting on the tides to recede.
Adv./Need/L	Please help the stores in downtown Rockport. Please be mindful on if the harborfront develops and is built higher than downtown, a bowl type situation would be detrimental to our businesses.
Coord.	Make sure County and City are working together

State of the Community Report and Alternative Scenarios

CITY OF ROCKPORT

STATE OF COMMUNITY REPORT 2016

City of Rockport

State of Community Report 2016

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TAMU-SG-16-202

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CITY OF ROCKPORT, TEXAS

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CITY COUNCIL
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James R. Day
Barbara Gurtner
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PLANNING AND ZONING COMMISSION
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TEXAS COASTAL WATERSHED PROGRAM

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*All photographs throughout this document were donated by Art Smith.

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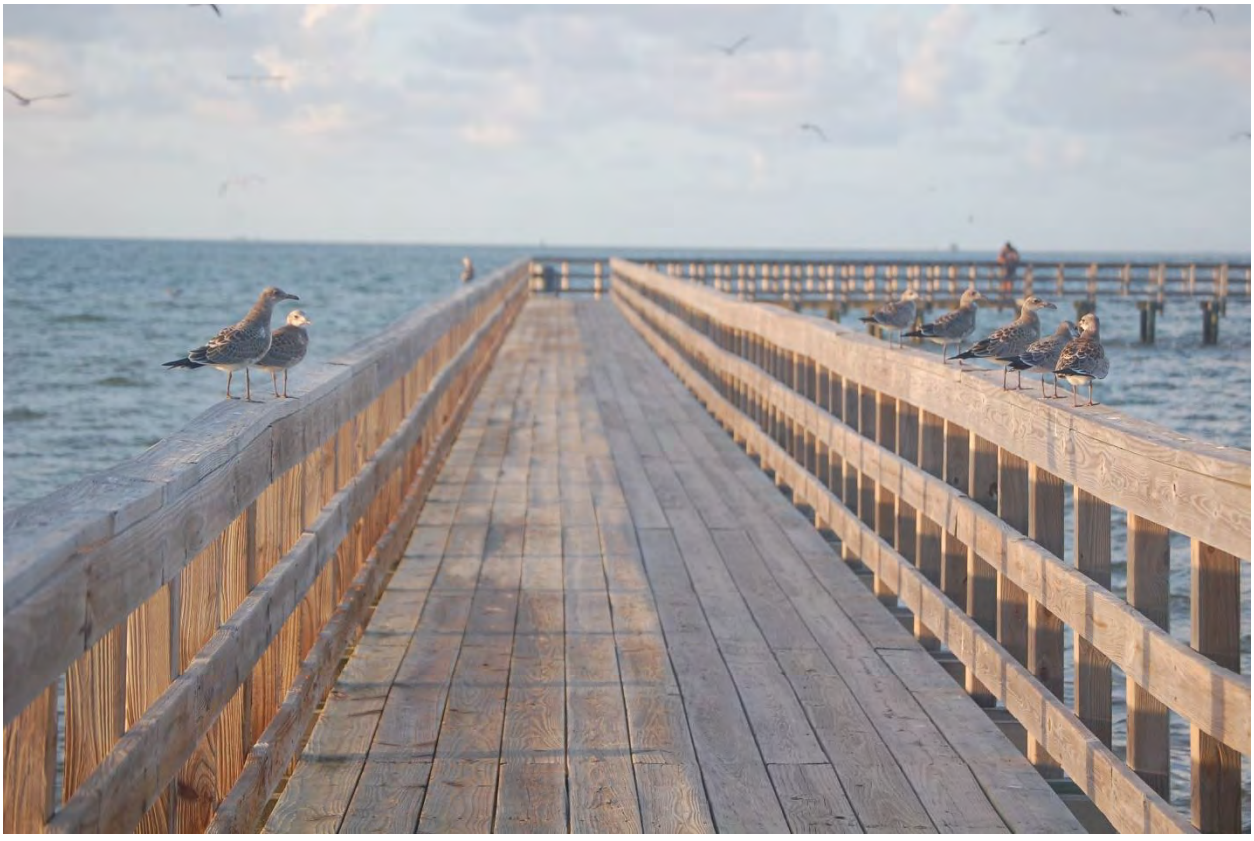
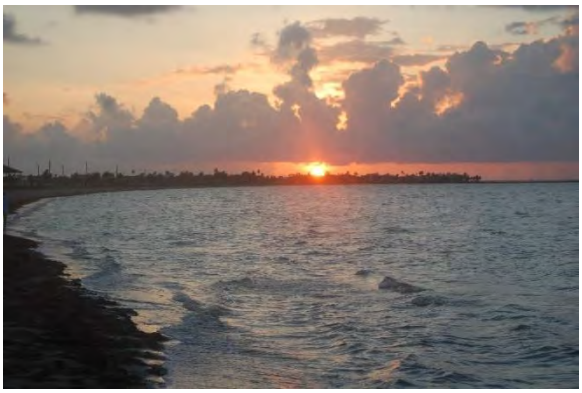


The Rockport State of Community report is presented by the Texas Sea Grant. Information in this report has been compiled from numerous sources, including but not limited to, several federal and state government agencies, local institutions, and the City of Rockport staff. The report is meant to showcase a variety of information about the city in one location, in hopes that further connections and potential opportunities may become apparent. It is important to recognize that the data contained in this report shows a snapshot in time; as such, local conditions may have, and will continue to, evolve.

Rockport is widely known as an intimate, friendly, coastal community with a wealth of outdoor activities such as birdwatching, fishing, and boating. The city also has a strong artistic and cultural identity with its art center, galleries, and downtown museums. For decades, many retirees have been making Rockport home, while "Winter Texans" and other vacationers call the city their second home. The city's population and area are small, but its community facilities and infrastructure have support from Aransas County and the Coastal Bend Region.

Although historically, Rockport's economy has been based on the bays, estuaries, and its access to the Gulf of Mexico, many of its current employees work in the school system, government agencies, and retail stores. Overall, its economic and demographic characteristics are almost identical to Aransas County, and comparable to Texas and the nation. Some areas to note are the number of residents not in the labor force, housing prices, the lack of mortgages, and the number of married couples without children living in the home. The difference between the city's statistics and those of the state or nation are probably due to the number of retired, older, and affluent residents. Families with children are of concern, though, when it comes to income and poverty levels.

Being situated on a peninsula, surrounded by water and wetlands, gives Rockport many advantages; but also presents a few threats. Recreational and economic activities thrive on this environment, and access to water is known to have a positive impact on people's physical and mental health. However, Rockport's water quality and valuable wetlands have the potential of being degraded by communities upstream. All coastal communities share the risk of tropical storms and hurricanes; however, flooding due to heavy rains and extended periods of drought are also common challenges for Rockport. When looking at future growth and development scenarios, it will be important for Rockport to remain aware of these economic and environmental aspects.



CHAPTER 2
CITY PROFILE

The City of Rockport is located in Aransas County, which is part of the Coastal Bend region of Texas. It lies 182 miles southwest of Houston, 180 miles southeast of Austin, and 35 northeast of Corpus Christi. The county is made up of several bays and peninsulas. Live Oak Peninsula is surrounded by Copano Bay to the west and Aransas Bay to the east. Rockport and Fulton, sometimes called twin cities, are the largest incorporated cities on the peninsula, yet there are several unincorporated areas that add to the development of the peninsula and the county.

Rockport has a total area of 15.0 square miles, of which 10.7 square miles is land and 4.3 square miles is water. Like the rest of the county, the land is considered coastal prairie and is generally poorly drained. It has a humid, subtropical climate, with mild winters and warm summers. The coolest month is January with an average temperature of 54.9 degrees and the warmest month is July with an average temperature of 84.0 degrees. The ability to enjoy recreational activities throughout the year brings “Winter Texans” and retirees from more northern cities in the state. In fact, many RV parks and vacation homes are occupied during the winter months as well as the summer months. September on average gets the most rain; March on average gets the least rain; and 36.7 inches is the average amount of rainfall for the year.

Aransas County has a dynamic early history, with its settlements changing rapidly due to storms, war, and economic booms and busts. The development of the port of Corpus Christi and the railroads dramatically altered the economic and population growth within the county and the city of Rockport. Although once known for its cattle-raising and meat-packing companies, Rockport eventually became a hub for fishing, boat-building, and tourism. Today, Rockport is a widely known destination for bird-watchers, duck-hunting, and sport-fishing.

Rockport and its surrounding natural environment offer some unique attractions. In 1937, the Aransas National Wildlife Refuge was established in the northern wetlands of the county and became a protected haven for the endangered Whooping Crane and many other animal species. The refuge is managed by the US Fish and Wildlife Service. The Mission-Aransas National Estuarine Research Reserve is a partnership program between federal and state agencies that conducts and communicates research regarding the coastal ecosystems. The reserve is based in Port Aransas; but does much of its research throughout Aransas County. The Reserve also operates the Bay Education Center in downtown Rockport. The education center is open to the public to learn about the importance of coastal bays and estuaries. Likewise, the Aquarium at Rockport Harbor teaches locals and visitors about marine species, environments, and resources. In 2015, the City of Rockport purchased a 8.86 acre plot of land that is known for its iconic windswept oaks. The trees serve as a rookery for herons and egrets, all of which are also represented in the city’s logo. The city is planning to develop the land as a park in the near future.

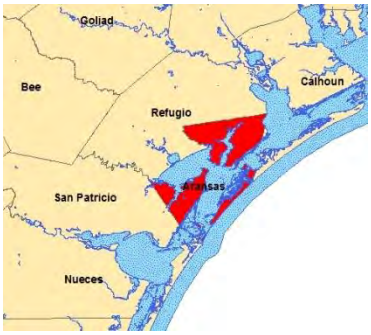
https://tshaonline.org/handbook/online/articles/hca04
https://tshaonline.org/handbook/online/articles/hgr05
http://www.weatherbase.com/weather/weathersummary.php3?s=407714&cityname=Rockport%2C+Texas%2C+United+States+of+America&units=
http://texashighways.com/travel/item/7432-come-around
https://www.fws.gov/refuge/aransas/
http://missionaransas.org/about
https://utmsi.utexas.edu/visit/bay-education-center
http://www.rockportaquarium.com/about-the-aquarium
http://www.cityofrockport.com/ArchiveCenter/ViewFile/Item/1104

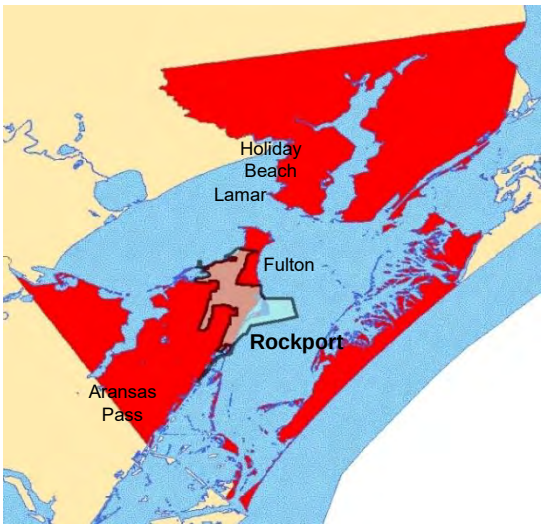
In addition to Rockport's reputation for an abundance of outdoor recreational and educational activities, the city is also widely known for its cultural arts district. Downtown Rockport is host to numerous cultural institutions and art galleries. Proving that there is more to Texas' identity and commerce than cowboys and ranches, the Texas Maritime Museum tells the story of how the Gulf of Mexico and sea-faring folk played a role in early settlements and industries. The Fulton Mansion History Center manages a restored home originally built in 1877 by a prominent Rockport resident and business owner. The home was uncharacteristic of its time in architecture and in amenities, such as flushing toilets and gas lights.

The Rockport Center for the Arts exhibits local, regional, national, and internationally acclaimed artists in both solo and group exhibitions. The building also houses two visual arts classrooms and a pottery studio where a variety of workshops, classes, and seminars are held. The center is complete with a 10,000 square foot Sculpture Garden in the "backyard." The Center for the Arts is more than a building though. It is the basis for a community of artists that has existed since the 19th century and continues to grow. Today there are over 300 artists that reside in Aransas County and over 15 art galleries in downtown Rockport. The community hosts numerous events such as the annual Rockport Art Festival during the July 4th weekend, a Film Festival, and an new oral history project.

In July 2015, the President of the Center for the Arts led an initiative, with other citizens interested in the cultural development of the city, to apply for a Cultural Arts District designation from the Texas Commission on the Arts. In January 2016, the Rockport Heritage District Association submitted a Letter of Intent to the Texas Commission on the Arts to establish a cultural arts district in the Rockport Heritage District, the oldest part of the city.

Rockport has many advantages, from its mild winters to its access to nature and recreational activities to its thriving artist community. These advantages result in the city appearing on many "Best of" and "Top Ten" lists, such as Best Places to Retire and Top Ten Coastal Art Colonies. The city's distinct identity also gives Rockport the nickname "Charm of the Texas Coast."





Maps created using data from: US Census Bureau TIGER Products.

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http://texasmaritimemuseum.org/
http://www.thc.texas.gov/historic-sites/fulton-mansion-state-historic-site
http://www.rockportartcenter.com/whoweare/are.php
http://txculturaltrust.org/programs/economic-development/rockport/
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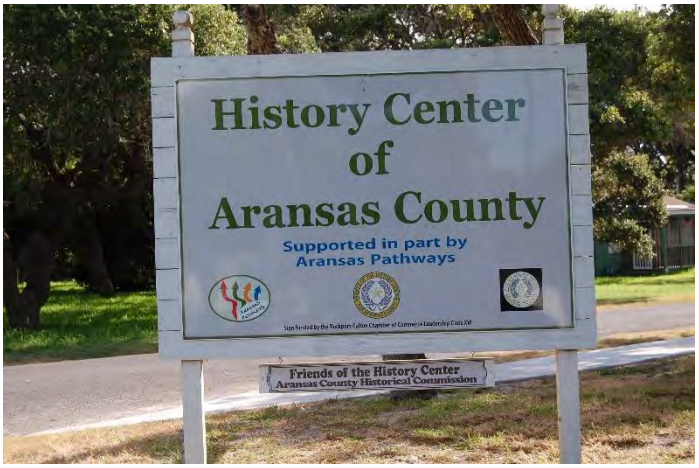
CHAPTER 3
HISTORY



HISTORY

Rockport is the county seat for Aransas County, one of the smallest counties in Texas. The area is located on the east coast of Texas, and is separated from the Gulf of Mexico by San Jose Island, a barrier island, and the Intercoastal Waterway. The city is situated on Live Oak Plantation, a peninsula which extends between Copano and Aransas bays. The City is approximately 35 miles north of Corpus Christi, Texas.

The earliest known inhabitants were the Karankawa Indians, which were documented by Cabeza de Vaca in 1528. Spanish missions were established in the area in the 1700s. The area was originally settled as part of the United States in 1867, as a cattle slaughtering, packing and shipping port. Rockport was incorporated as a Town in 1870, and as a City on May 29, 1871.

The city is named for the rock ledge which underlies it shore. Rockport is a charming fishing village that has been a favorite coastal hideaway for wealthy Texans since the 1800s.

During the 1880s, boat building and fishing began to develop as important industries in Rockport. Tourism and the resort trade also blossomed, particularly after the railroad came into town in 1886.

The shrimping industry developed between 1925 and 1930 and became a major boon for the city in the 1940s. The population of Rockport has grown steadily over the years.

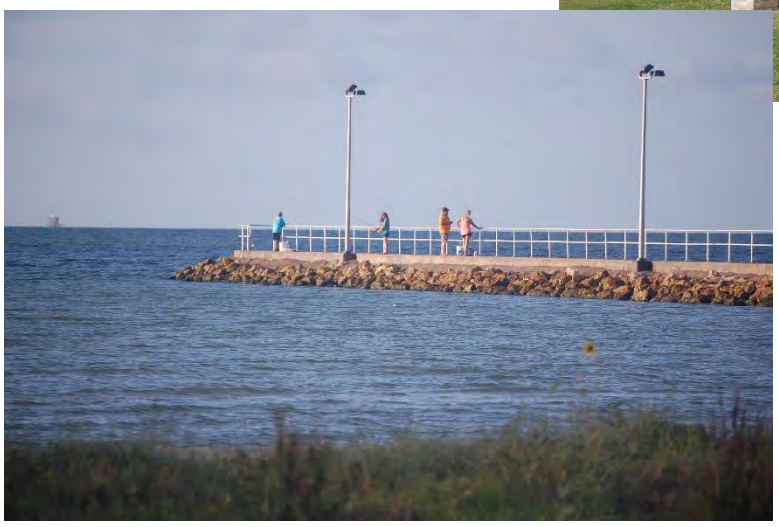
Vacationers swim, fish, watch birds, relax, visit the wildlife refuges, and enjoy many other area attractions.

Rockport, known for its endless recreational possibilities and mild weather, attracts many vacationers annually. Visitors can enjoy the Gulf waters and views, fishing, renowned bird watching, the plethora of parks and wildlife areas, other area museums and attractions. Texas Maritime Museum, Bay Education Center, Rockport Center for the Arts, Fulton Mansion, Aquarium at Rockport Harbor, Connie Hagar Wildlife Sanctuary, and local wildlife refuges draw tourists and "Winter Texans" alike.

Rockport is a wonderful place to live and visit.

http://www.cityofrockport.com/393/History
http://www.rockport-fulton.org/History-of-Rockport-Fulton
http://texasalmanac.com/topics/government/aransas-county
https://tshaonline.org/handbook/online/articles/hgr05

CHAPTER 4
DEMOGRAPHICS



POPULATION

While the City of Rockport has distinct, older, well-established neighborhoods, its' boundaries continue to change over time. This is common with rural and coastal communities. These communities often annex new sub-divisions and also have an extraterritorial jurisdiction that extends beyond the technical city limits. The Rockport extraterritorial jurisdiction is includes unincorporated areas adjacent to the cities corporate boundaries in which the city has limited authority "to promote and protect the general health, safety, and welfare" of the citizens[1].

The US Census Bureau uses the term "census county division" to define collections of data for communities like Rockport. The Census Bureau defines a census county division as: "a relatively permanent statistical area, established cooperatively by the Census Bureau and the state and local governments, used to present census and survey data in those states without well-defined and stable minor civil divisions." Table 4.1 shows the 2010 populations for Rockport, and nearby communities, according to city and census county division levels.

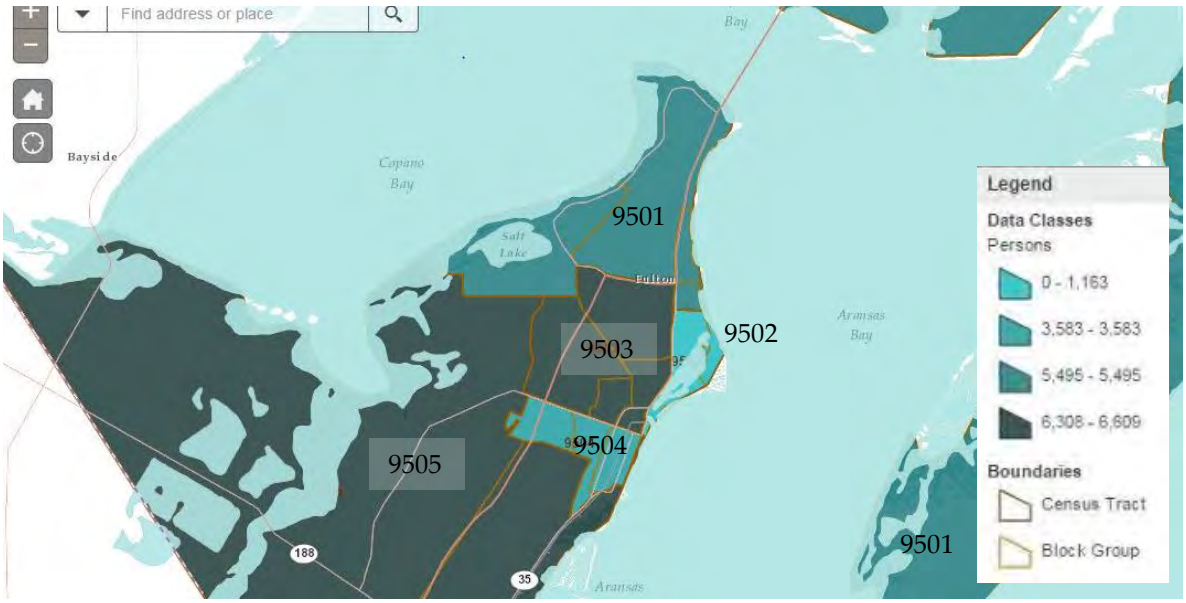
Map 4.1 shows the population of Rockport according to census tracts. Tracts 9502, 9503, and 9504 make up most of the City of Rockport. Tracts 9502 and 9504 are smaller, less populated tracts. Tract 9503 is larger and more populated.

Table 4.1: 2010 Population.

ROCKPORT CITY	8766
ROCKPORT CCD	17663
FULTON TOWN	1358
FULTON CCD	5495
ARANSAS PASS CITY	8204
INGLESIDE CITY	9387
ARANSAS PASS-INGLESIDE CCD	18877

Table created using data from: http://www.census.gov/2010census/.

Map 4.1: 2010 Population by Census Tract.

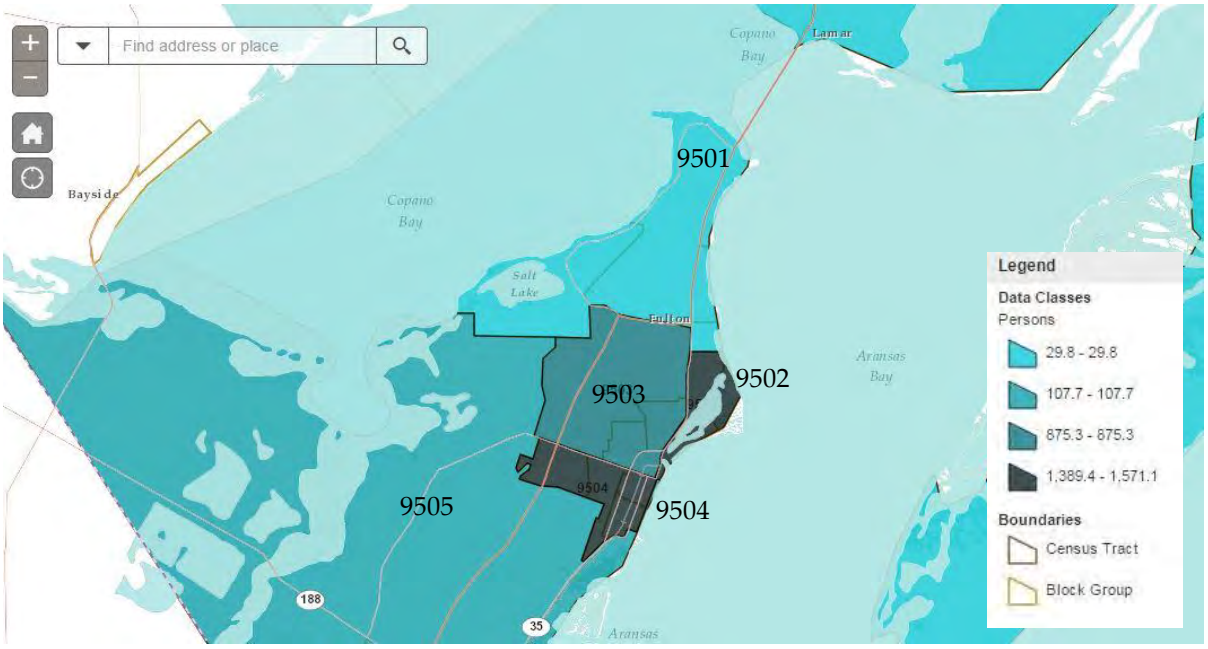


Map created on http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml# using data from: Using data from Census 2010 (4.1).

[1] Texas Local Government Code § 42.001

POPULATION DENSITY & GROWTH

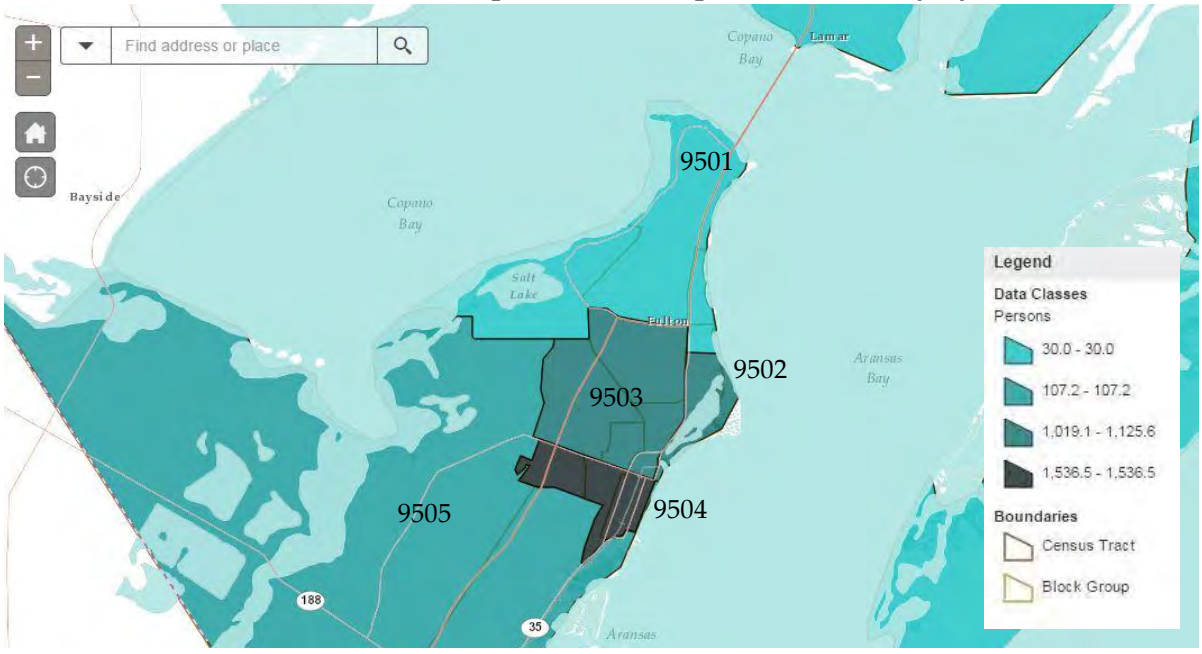
Map 4.2: 2000 Population Density by Census Tract.



Map created on http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml#
using data from: Using data from Census 2000.

Maps 4.2 and 4.3 depict the population of Rockport in 2000 and 2010 by density. The maps show higher concentrations of people in the tracts that make up the majority of the City of Rockport (9502, 9503, 9504). When comparing the population density in 2000 to 2010, we can see that most tracts have experienced growth, with the exception of the smallest tract along the eastern waterfront (9502), where the density has decreased.

Map 4.3: 2010 Population Density by Census Tract.

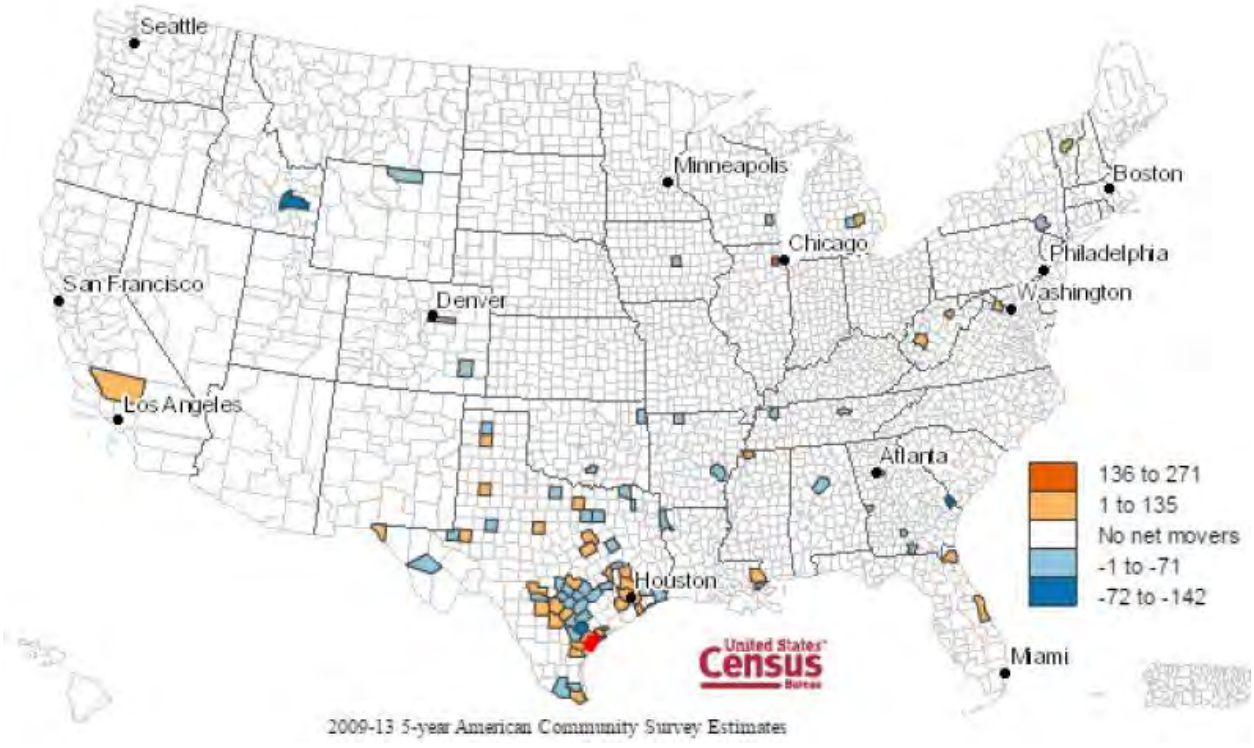


Map created on http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml#
using data from: Using data from Census 2010.

POPULATION MIGRATION

The US Census Bureau collects data on population migration throughout the country. This data looks at the patterns of how people move across borders, like county, or state, lines. Map 4.4 shows the migration data for individuals who moved into, or out of, Aransas County, TX, (American Community Survey, 2009-2013). The blue shades show where people who moved to Aransas County came from. The yellow and orange shades show where people relocated to, when leaving Aransas County. Texas shows a lot of cross-migration, with people moving within the state. The dark blue counties, show large numbers (72-142) of people moving to Aransas County; these include Goliad County, Texas, one county in Idaho, and one county in Georgia. (There was no migration to or from Alaskan counties.)

Map 4.4: Population Migration by County, 2009-2013.



Created on http://flowsmapper.geo.census.gov using data from: 2009-2013 5-year American Community Survey Estimates.

POPULATION PROJECTION

The Texas State Demographer's Office produces population projections based on different scenarios. The Zero Migration Scenario "assumes that in-migration and out-migration are equal (no net migration)," resulting in growth only through natural causes (births and deaths). This scenario creates the lowest projection. The 100% Migration Scenario assumes the trends that occurred throughout the 2000-2010 decade will continue in future decades. The 2000-2010 decade "was characterized by rapid growth throughout many areas of the state… and is likely to be unsustainable over time." Therefore, this scenario is the highest projection estimated.

Figure 4.1 shows the population projections for Aransas County, the Coastal Bend Region, and the State of Texas based on the 2000-2010 decade. The slope of the projected growth rate with 100% migration is not nearly as steep for Aransas County or the Coastal Bend region, in comparison to Texas. In fact, Aransas County has the lowest projected growth rate at its' highest point in 2035 (1.19), compared to the region (1.24) and the state (2.16).

Figure 4.1: Future Population Projections.

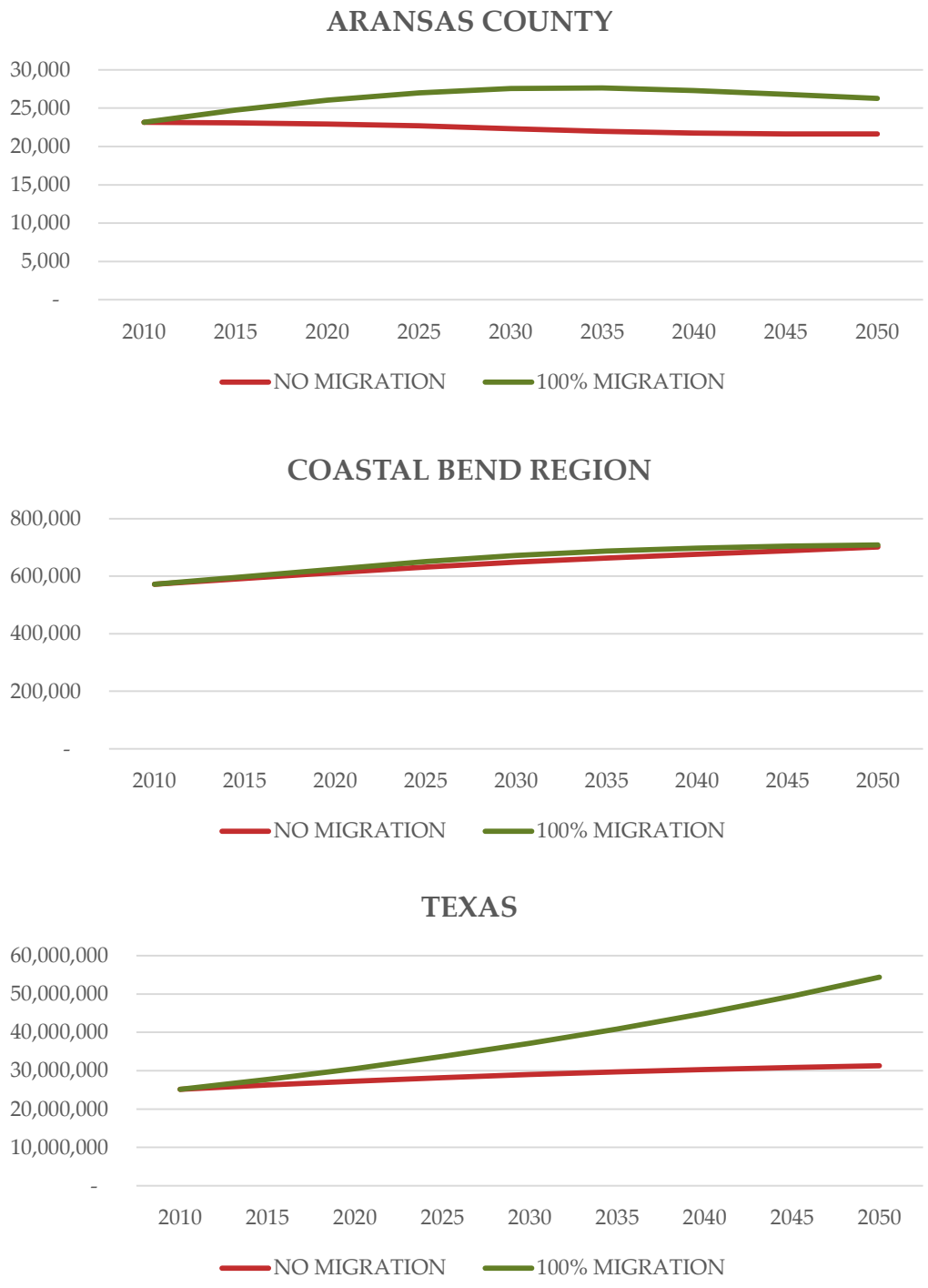


Figure created using data from the Texas State Demographers Office: http://osd.texas.gov/Data/TPEPP/Projections/Tool?fid=175CDFE490DB4F9EB732A1F522547B52.

AGE & GENDER DISTRIBUTION

Gender is evenly distributed in Rockport, and its surrounding communities; however, age has a varied distribution. The age distribution in Rockport is similar to the neighboring town of Fulton, with greater numbers of individual 65 and older, and few numbers of children. In other nearby towns like Aransas Pass and Ingleside, this trend is reversed with fewer people 65 and older, and more children (see Table 4.2).

In Figure 4.2 the distribution of the population of Rockport, Aransas County, and the State of Texas are examined according to age. The City of Rockport is similar to the county in most age groups; but they differ from the distribution at the state level. In Texas, the highest percentage of the population fall between 25 and 54 years old. In the City of Rockport and Aransas County the highest percentage of the population fall between the ages of 45-54 and from 65-84. This may be associated with the popularity of RV parks and vacation-turned-permanent homes that are common in Rockport and the county.

Table 4.2: Gender and Age of Local Communities.

2010 CENSUS	ROCKPORT	FULTON	ARANSAS PASS	INGLESIDE	ARANSAS COUNTY
TOTAL	8766	1358	8204	9387	23,889
MALE	48.3%	47.1%	49.1%	50.0%	49.7%
FEMALE	51.7%	52.9%	50.9%	50.0%	50.3%
UNDER 18	17.9%	15.9%	24.1%	30.5%	19.5%
18 & OVER	82.1%	84.1%	75.9%	69.5%	80.5%
65 & OVER	28.3%	31.1%	17.1%	8.7%	24.2%

Table created using data from http://www.census.gov/2010census/.

Figure 4.2: 2014 Population by Age.

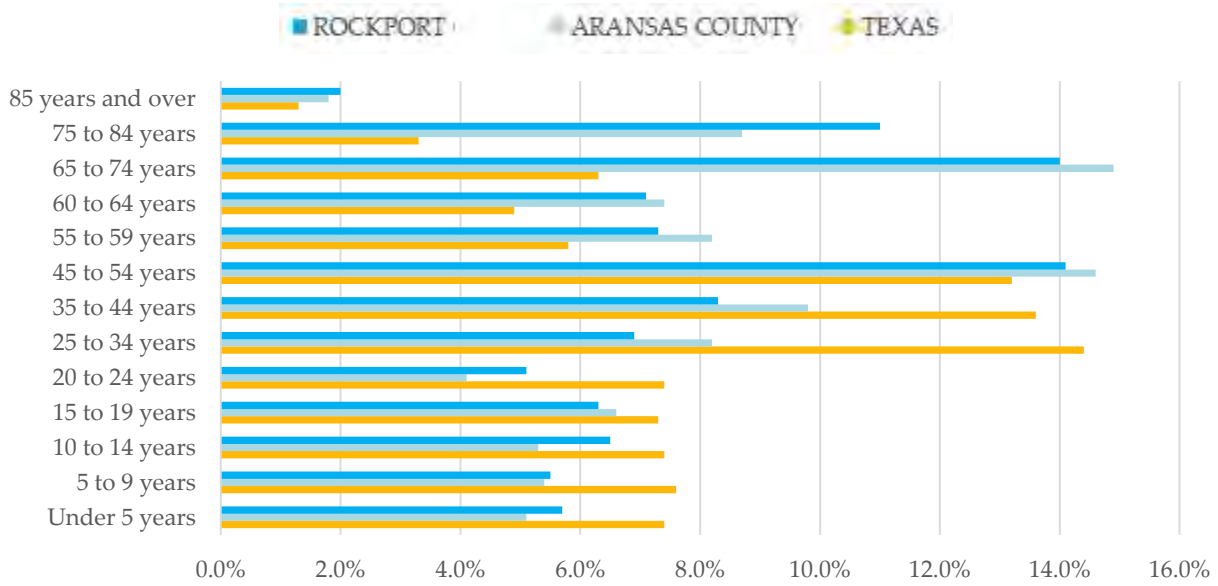


Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

RACE & ETHNICITY DISTRIBUTION

Figure 4.3 shows that the majority of the population of the City of Rockport is White (71.6%). Almost 21% of Rockport's population identifies as Hispanic or Latino (20.8%). The percentages for the Black/African American and Asian groups are very small (2.3% for both). Two races, Native Hawaiian and other Pacific Islander, and American Indian and Alaska Native, do not register in the City of Rockport. (one individual is documented as American Indian and Alaska Native in the City.)

Figure 4.3 goes on to compare the racial and ethnic distribution of the City of Rockport to Aransas County, and the State of Texas. The distributions between Rockport and Aransas County are similar, while the State of Texas has a greater amount of racial and ethnic diversity.

Figure 4.3: 2014 Population by Race and Ethnicity.

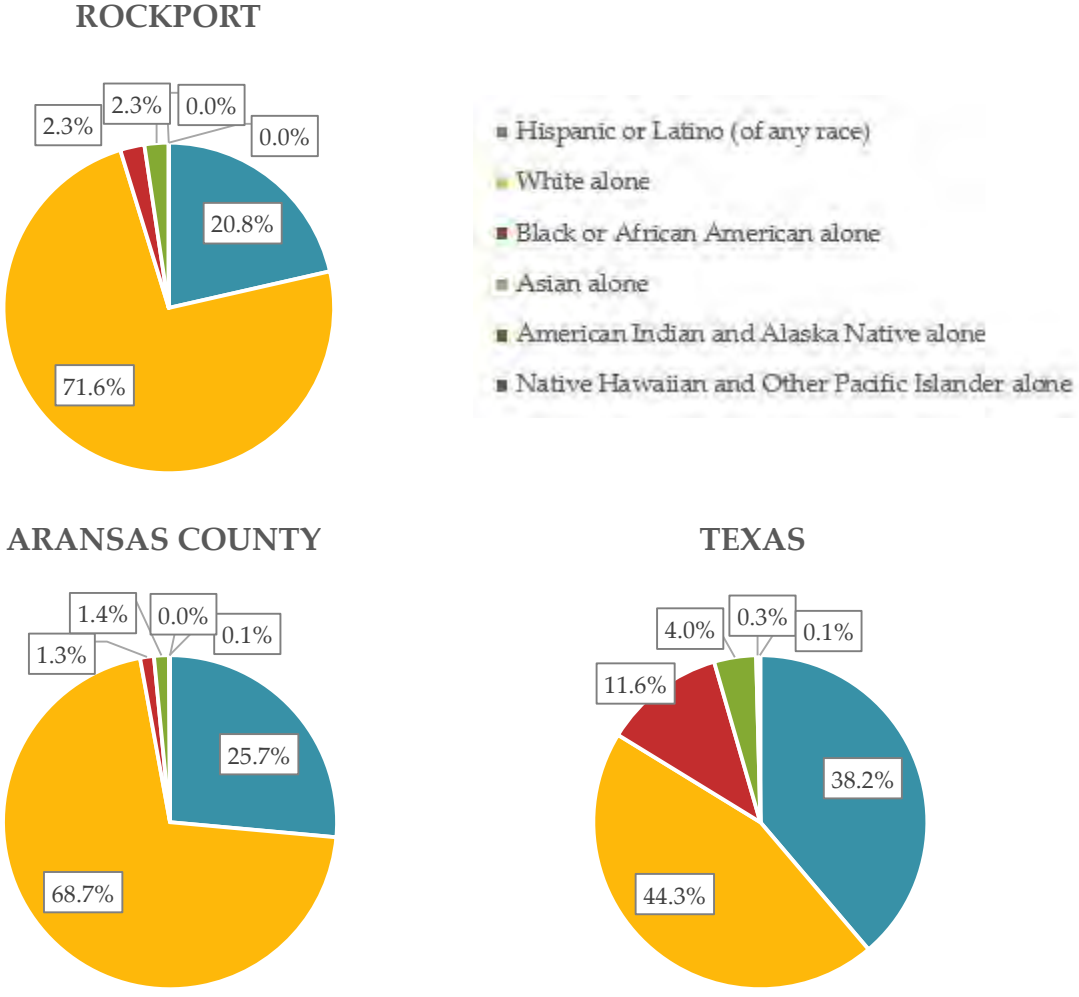


Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

MARITAL STATUS

Figure 4.4 compares the marital status of males and females in the City of Rockport, Aransas County, the State of Texas, and the United States. The percentages for the city and the county are similar; likewise, the state and nation have comparable percentages. A comparison of the percentages of married and single males and females in the City of Rockport and Aransas County, to Texas and the nation shows that the city and county has higher percentages of married males and females. Aransas County shows the greatest difference from Rockport, let alone the state and nation in the percentages of divorced males. The city, county, state, and nation are the most similar in the percentages of divorced females.

Figure 4.4: 2014 Marital Status.

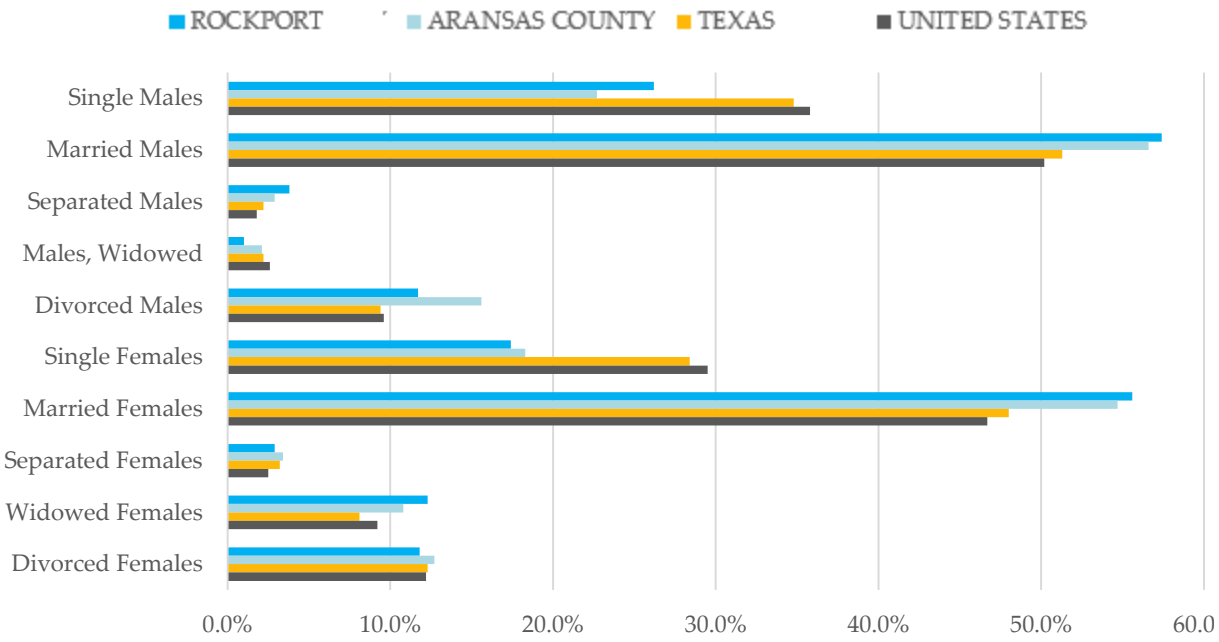


Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

EDUCATION LEVEL

In the City of Rockport, over 30% of residents, who are 25 years and older, have at least some college (see Figure 4.5). This percentage of individuals who have attended some amount of college is higher than is seen in the county, state, or country. Interestingly, there are less people with an Associate's degree in Rockport compared to the county, state, and nation. Interestingly, the Rockport percentages increases again, and are comparable to the state and nation on individuals with a Bachelor's degree, and are above Aransas County and the state for individuals with a Graduate or professional degree (see Figure 4.5).

The education levels can be seen in via geographical distribution according to US Census tracts in Map 4.5, 4.6, and 4.7. The tracts in Rockport show have lower percentage of high school graduates, compared to surrounding tracts (see Map 4.5). However, Maps 4.6 and 4.7 show the same tracts have higher percentages, than the surrounding tracts, for individuals with college degrees.

Figure 4.5: 2014 Education Level of Population 25 Years and Older.

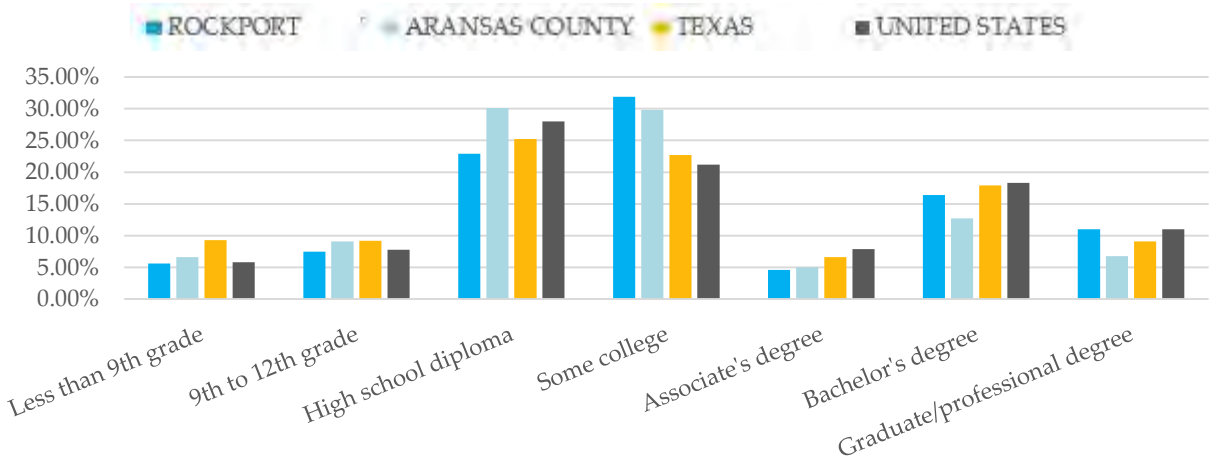
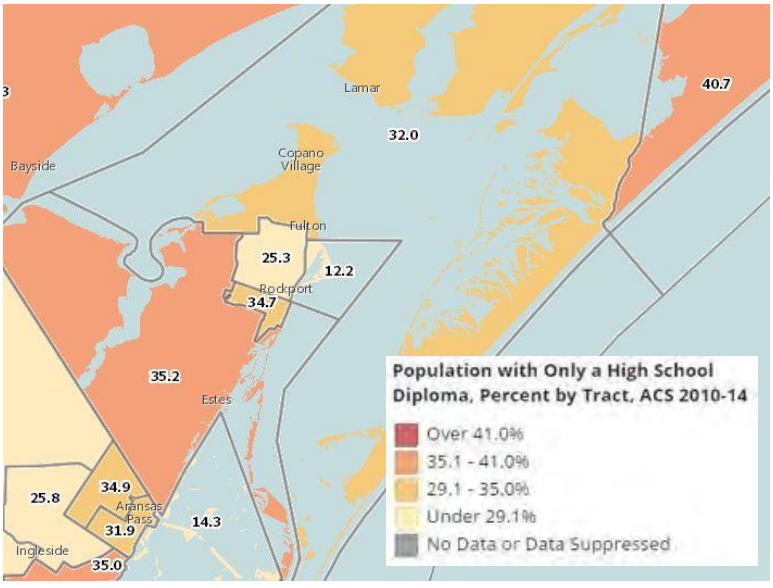


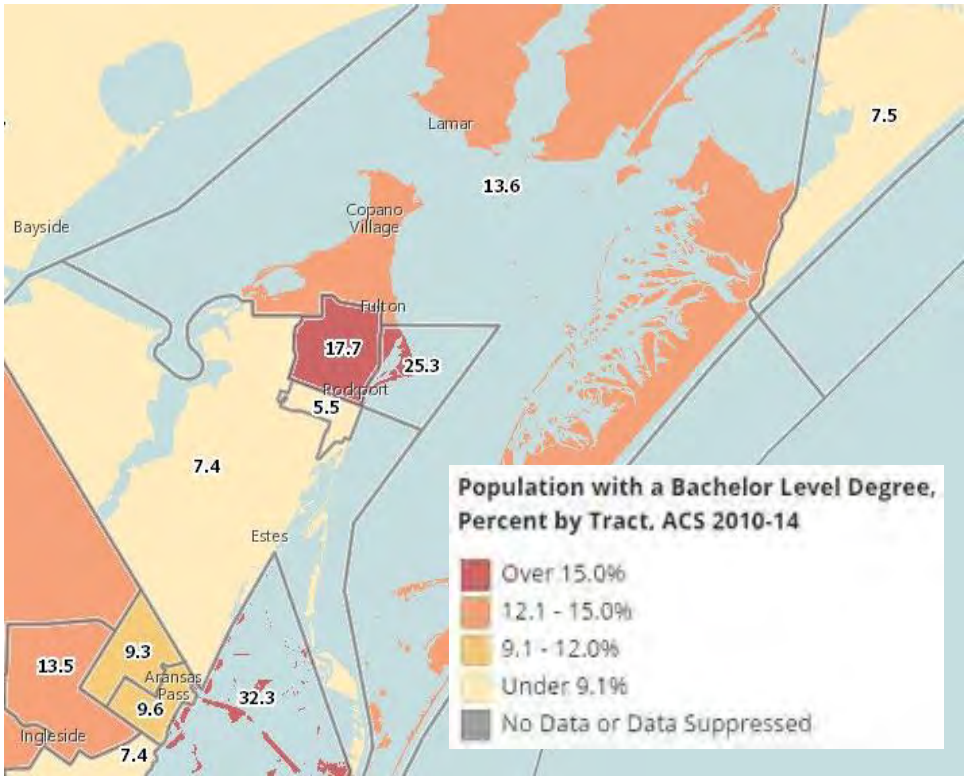
Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

Map 4.5: 2010-2014 Population with High School Diploma.

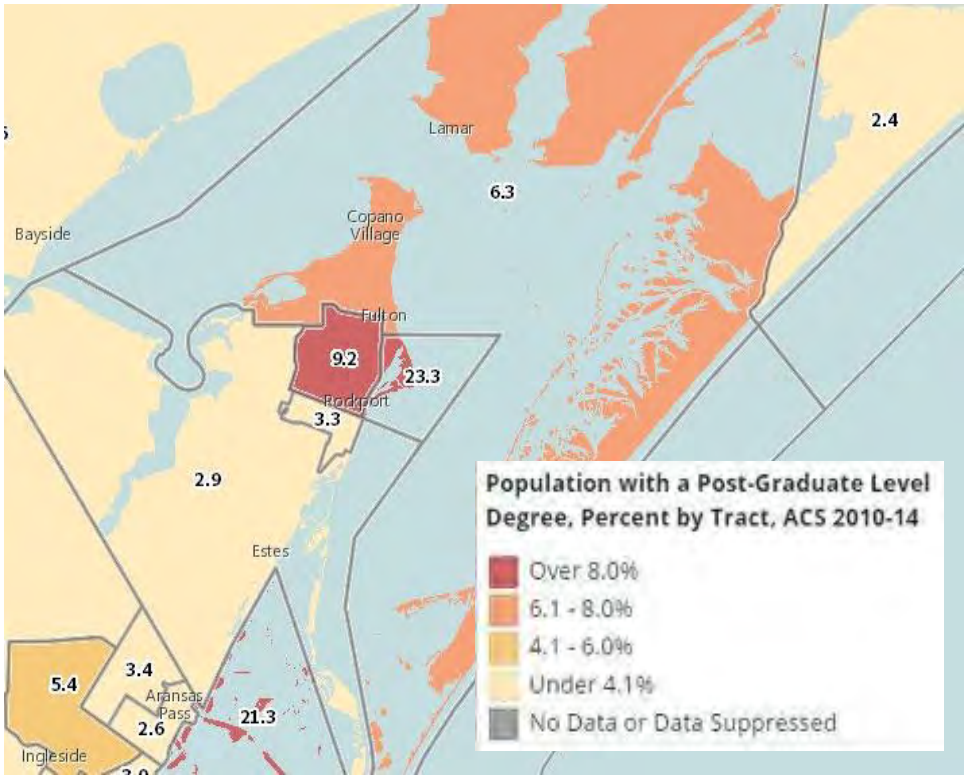


Map created on http://maps.communitycommons.org/viewer/ using data from: 2010-2014 American Community Survey Estimates.

Map 4.6: 2010-2014 Population with Bachelor's Degree.



Map 4.7: 2010-2014 Population with Post Graduate Degree.



Maps created on http://maps.communitycommons.org/viewer/ using data from: 2010-2014 American Community Survey Estimates.

EMPLOYMENT

Table 4.3 shows the percentages of the population, 16 years and older, who are employed, unemployed, and not in the labor force in 2014. The US Census Bureau defines "not in labor force" as "mainly students, housewives, retired workers, seasonal workers interviewed in an off season who were not looking for work, institutionalized people, and people doing only incidental unpaid family work (less than 15 hours during the reference week)." The "not in labor force" category accounts for 50.5% of the population in Rockport, and 49.8% of the population in Aransas county. This group only represents 35.1% of the population in the State of Texas. The higher percentages of individuals who are considered "not in labor force" in the City of Rockport and Aransas County may be due to the fact that they are coastal areas, where much of the employment is seasonal, and many of the residents are retired from the work force. The employment rates are 46.6% for the City of Rockport, 46.9% for Aransas County, and 59.5% for the State of Texas. The unemployment rates are low for all three areas—2.9% for Rockport, 3.2% for Aransas County, and 4.9% for Texas.

Table 4.3: 2014 Employment Status.

EMPLOYMENT STATUS 2014	ROCKPORT TOTALS	ROCKPORT PERCENTAGE	ARANSAS COUNTY PERCENTAGE	TEXAS PERCENTAGE
Employed	3,709	46.6	46.9	59.5
Unemployed	228	2.9	3.2	4.9
Not in Labor Force	4,018	50.5	49.8	35.1

Table created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

HEALTH INSURANCE

Health insurance coverage is critical to accessing health care, and maintaining a healthy and resilient population. Table 4.4 shows what percentages of the population have health insurance, and what types of health insurance, in the City of Rockport, Aransas County, and the State of Texas in 2014. The US Census defines private health insurance as "a plan provided through an employer or a union and coverage purchased directly by an individual from an insurance company or through an exchange." Rockport has a higher portion of people covered by private insurance (59.7%) than in the county (51.2%) and in the state (58.4%). Public coverage includes federal programs such as Medicare, Medicaid, individual state health plans, the Department of Veterans Affairs and the military. The number of Rockport's residents that have public coverage (43%) is similar to the county (44%), and both of these are higher than the state (27.9%). Overall, Rockport has the highest percentage (85.5%) of the three entities for residents who have health insurance, which means more of its population has access to health care.

Table 4.4: 2014 Health Insurance Coverage.

	ROCKPORT TOTALS	ROCKPORT PERCENTAGE	ARANSAS COUNTY PERCENTAGE	TEXAS PERCENTAGE
WITH HEALTH INSURANCE	8,022	85.5	80.3	78.1
Private Insurance	5,594	59.7	51.2	58.4
Public Coverage	4,028	43.0	44.1	27.9
NO HEALTH INSURANCE	1,356	14.5	19.7	21.9

Table created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

INCOME & POVERTY

Figure 4.6 shows the income levels for all households in Rockport, Aransas County, and Texas in 2014. All three entities have the highest percentage of households with an income in the $50,000-$74,999 range. Rockport has more households in the lowest range, less than $10,000, compared to the county or the state. Texas has the highest percentage of households in the highest range, $200,000 or more.

Figure 4.6: 2014 Household Incomes.

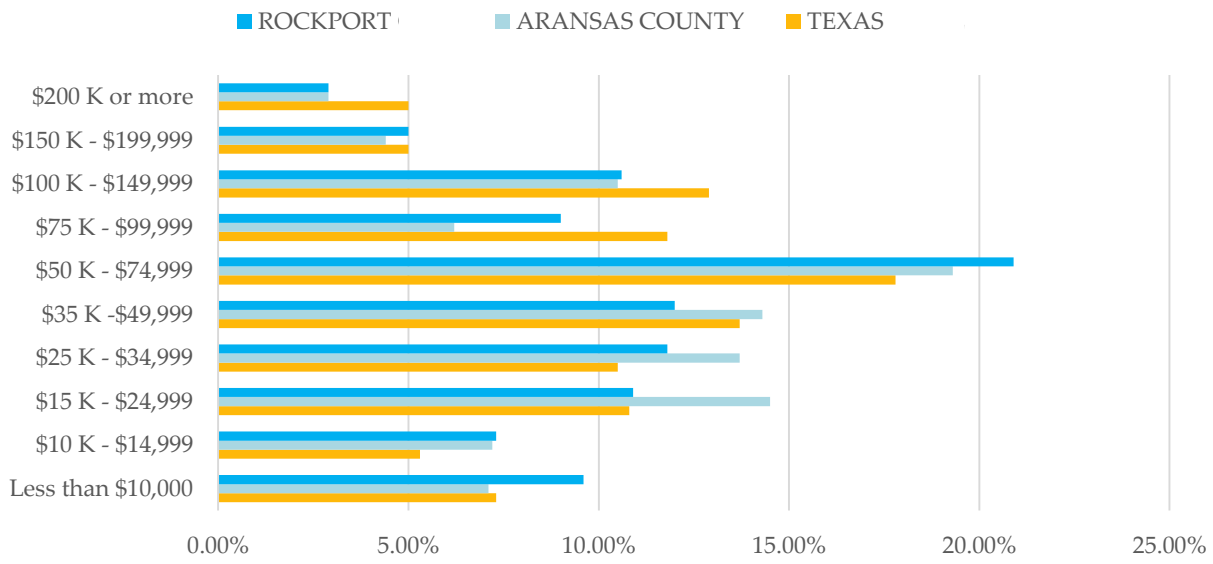


Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

Another way to look at income is by using the median family income and the mean family income. Median income is the amount that divides the income distribution, represented in Figure 4.7, into two equal groups, half having income above that amount, and half having income below that amount. Mean income is the amount obtained by taking an average of all the incomes of all the households. Table 4.5 shows the median and mean family incomes for Rockport, Aransas County, and Texas, in 2014. The median income, shows a more accurate picture of the typical income of a middle class family. The number is more representative of middle class families because the data is not skewed by the incomes of the households that fall into the extreme upper and lower ranges of Figure 4.7. The median family income in Rockport is $60,729. This number is similar to the median family income for Texas ($61,958); but almost $10k higher than Aransas County ($50,257). Much of Aransas County is made up of small towns and unincorporated areas. The City of Rockport may provide a stronger economic base and more employment opportunities for middle class families.

Table 4.5: 2014 Family Income.

	ROCKPORT	ARANSAS COUNTY	TEXAS
Median Family Income	$60,729	$50,257	$61,958
Mean Family Income	$72,581	$69,718	$83,936

Figure 4.7 shows the percentages of households in Rockport, Aransas County, and Texas, that have incomes below the poverty level in 2014. The percentages are higher for Rockport and Aransas County than for Texas in almost all categories. Other items to note are that almost 60% of all families with children under the age of 5 in Rockport and Aransas County have incomes below the poverty level. Even more staggering is the fact that 100% of all the female householder families (women without a spouse who have children living with them), with children under the age of 5 in the City of Rockport have incomes below poverty level.

Figure 4.7: 2014 Household Incomes Below the Poverty Level.

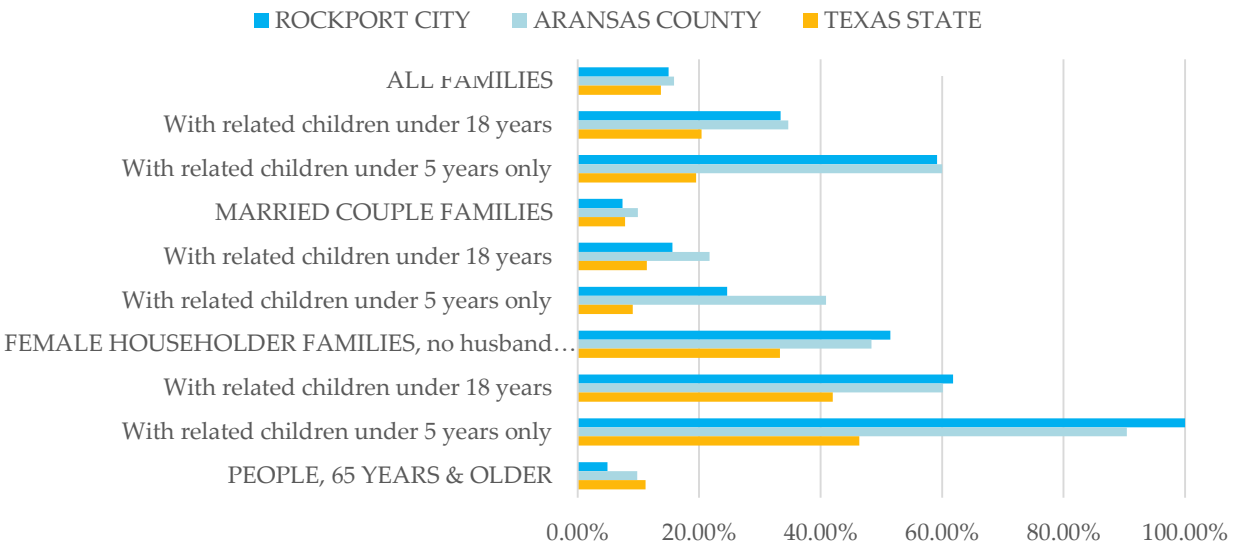


Table and Figure created using data from:
http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

CHAPTER 5
HOUSING

HOUSEHOLD TYPES

The US Census Bureau collects data on household types (people) as well as housing types (structures). Household types are important in terms of community planning and housing stock because the various compositions of people require different types of housing structures, prices, neighborhood facilities and infrastructure. The Census divides households into two main categories, family households and nonfamily households. A family household "contains at least two persons – the householder and at least one other person related to the householder by birth, marriage, or adoption." Therefore, a non-family household contains either just one person, or a number of people not related by birth, marriage, or adoption. The family households are then classified according to whether the family is led by a married couple, a female householder without a spouse, or a male householder without a spouse.

Figure 5.1 shows that Rockport's households are predominately made up of families (66.6%). This includes married couples (55.4%), female householder without a spouse (8.6), and male householder without a spouse (2.6%). The remaining households are nonfamily households (33.4%). As Figure 5.1 shows, the percentages of the population in each of these categories are fairly consistent between the City of Rockport, Aransas County, and the State of Texas.

Figure 5.1: 2014 Household Types.

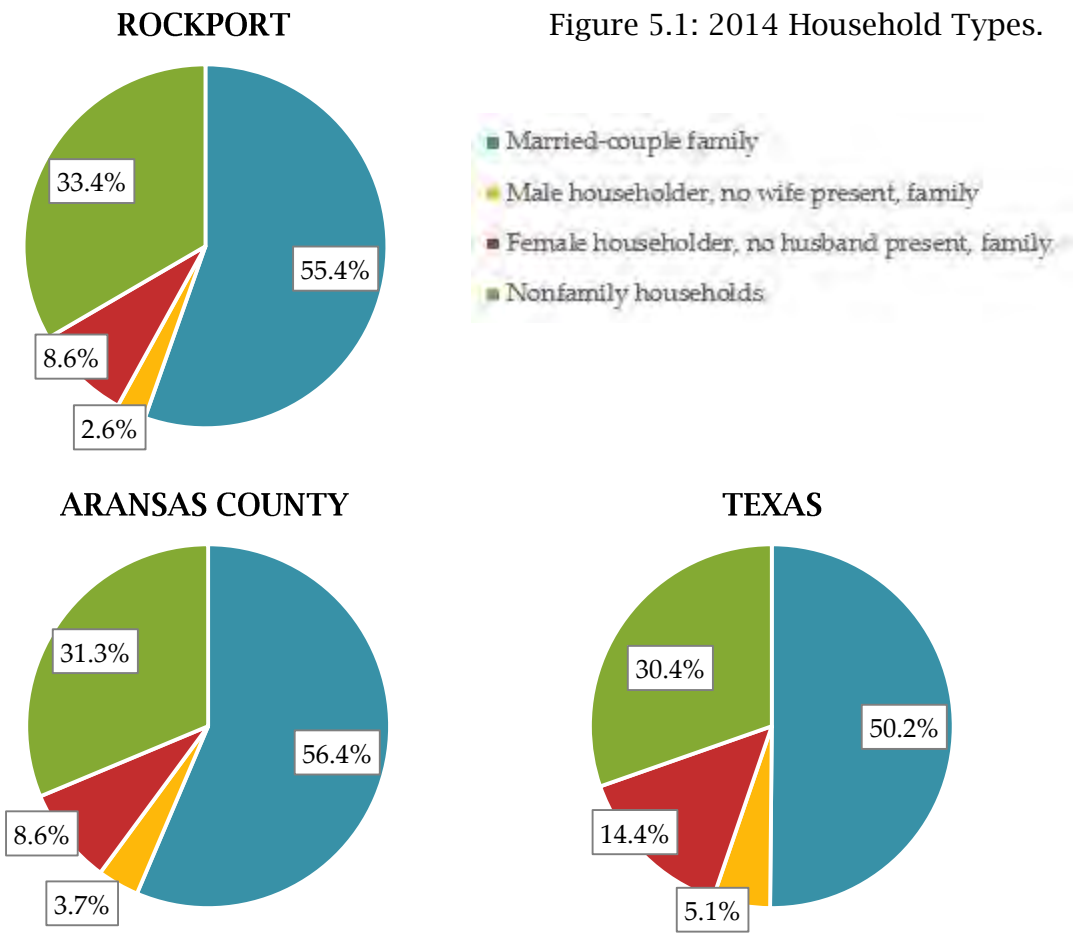
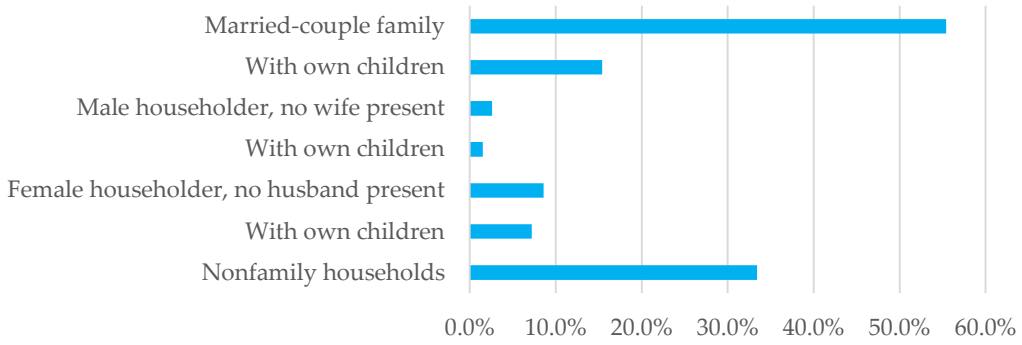


Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

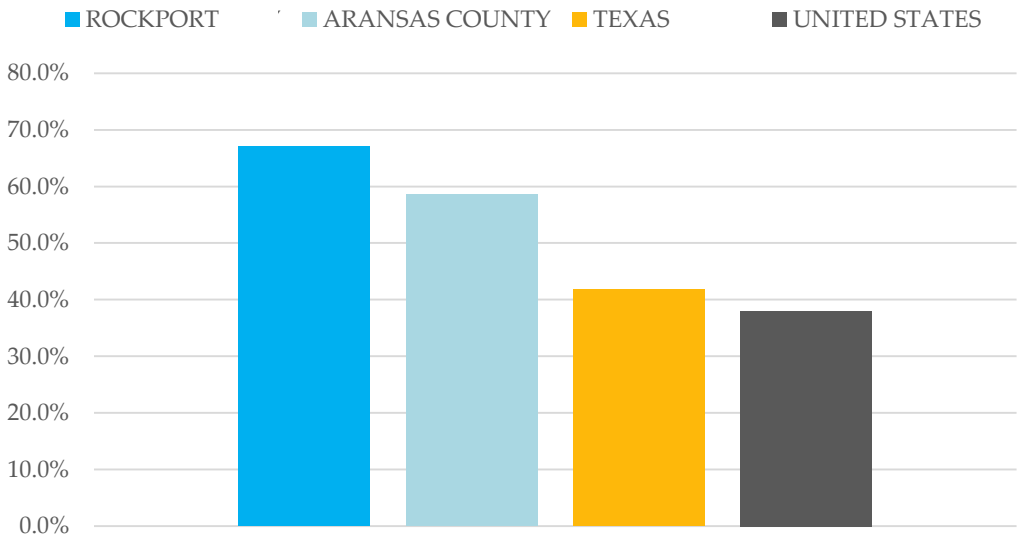
Figure 5.2: 2014 Household Types with Children.



Because the US Census defines a family household as containing two or more persons related by birth, marriage, or adoption, there may not be any children in the household. Figure 5.2 shows the categories previously discussed; but further broken down according to what percentage of household families in Rockport include children. While 55.4% of households consist of married-couples, only 15.4% of the households contain married-couples with children. This indicates that the majority of married couples do not have children living at home. On the other hand, the percentages of households that are led by a man or a woman, without a spouse and without children, are only slightly higher than the corresponding percentages of the same gender, without a spouse, living in homes with children. This indicates that the majority of the family households, without a spouse, include children.

The US Census also provides data on the percentage of grandparents who are responsible for grandchildren. Figure 5.3 shows that 67.1% of the grandparents, in Rockport, are responsible for their grandchildren. This is higher than the percentages for Aransas County (58.6%), Texas (41.8), and the United States (38%).

Figure 5.3: 2014 Grandparents Responsible for Grandchildren.



Figures created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

HOUSING TYPES

Figure 5.4 depict the categories and percentages of housing types for Rockport, Aransas County, and Texas in 2014. The majority of the homes in Rockport are detached single family homes (66.6%). The remaining homes fall into the following categories: 10.1% are mobile homes; 8.0% are in buildings with 5 to 9 units; 7.3% are in buildings with 10, or more, units; 4.6% are in buildings with 2 to 4 units; 1.9% are single units that are attached to another structure; and 1.3% are boats, RVs, or some other structure made to move regularly. The figure also shows the percentages for housing types in Texas, and the United States. Detached single family homes dominate in all three locations. Rockport is comparable to Aransas County and Texas when looking at 1-4 unit housing types. However, there is more variation among the three entities when looking at the other types of structures. In Rockport, Mobile homes make up 10% of all homes, structures with 5-9 units follows that with 8%, and structures with 10 or more units make up a little over 7%. On the county level, mobile homes make up 23% of all homes, and the three types of multi-unit structures each represent about 4% of homes. On the state level, the second largest category, with a little over 14%, is buildings with10 or more units, while mobile homes represent 7.5% of homes.

Figure 5.4: 2014 Housing Types.

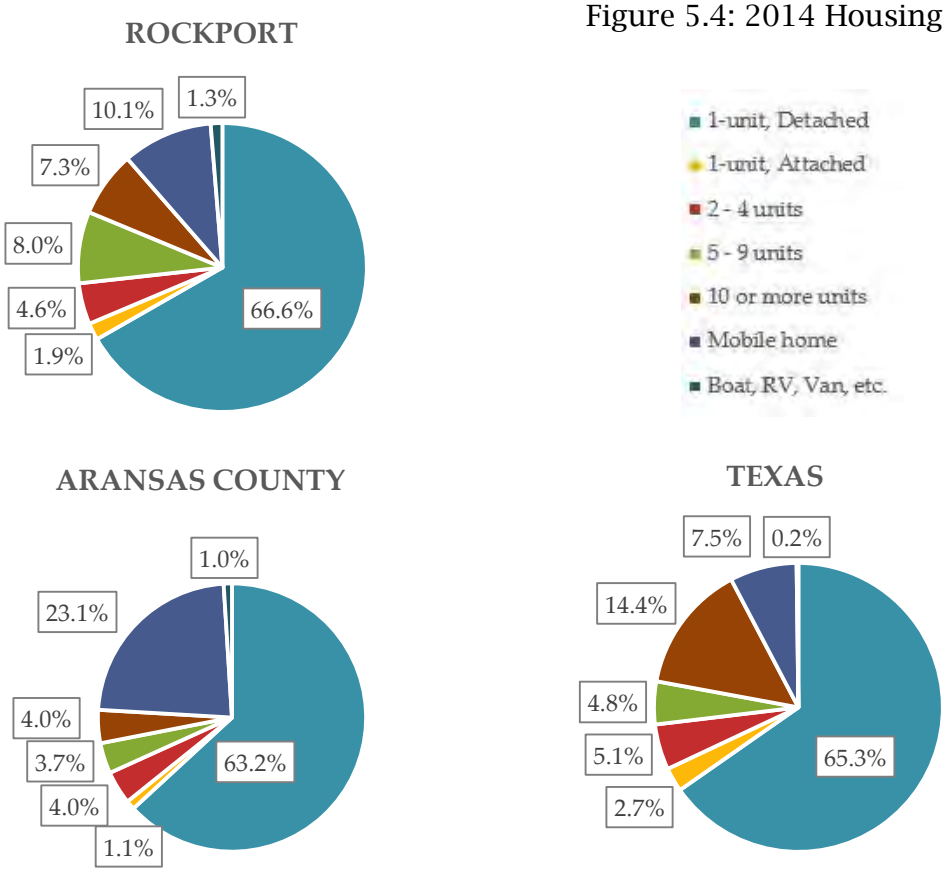


Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

Rockport and the surrounding coastal area are known for secondary/vacation homes, mobile homes, and RV parks due to the availability of year-round recreational activities. However, it is important to note the distinction between mobile homes and RVs. The US Census Bureau states a “Manufactured (mobile) Home is defined as a movable dwelling, 8 feet or more wide and 40 feet or more long… with transportation gear integral to the unit when it leaves the factory… These homes are built in accordance with the U.S. Department of Housing and Urban Development building code.” Whereas “people at transitory locations such as recreational vehicle (RV) parks [and] marinas… [are] counted at the residence where they live and sleep most of the time.” Therefore, although there are a noticeable amount of RV parks in the Rockport area, the RV owners are not considered Rockport residents according to the US Census.

HOUSING AVAILABILITY & AFFORDABILITY

Figure 5.5 shows that in the City of Rockport, 61.5% of the available housing units are occupied, leaving 38.5% unoccupied. These numbers are identical for Aransas County, However, 88.5% of all housing units in the State of Texas are occupied. Figure 5.5 also shows the percentages of owner occupied housing units versus those units which are inhabited by renters. In the City of Rockport 71.4% of housing units are occupied by the owners. This percentage is slightly more for Aransas County (72.3%), and about 10 percentage points less for the State of Texas (62.7%). When looking at housing types in Figure 5.4, Texas has a greater percentage of structures with 10 or more units than the city and the county, which correlates with a greater percentage of tenant-occupied units.

The final section of Figure 5.5 shows the percentage of owner-occupied units with and without mortgages. In the City of Rockport and Aransas County, 62% of the owner occupied housing units do not have mortgages. This is contradictory to what we find in the State of Texas, where 60% of the owner occupied units have a mortgage.

Figure 5.5: 2014 Housing Stock.

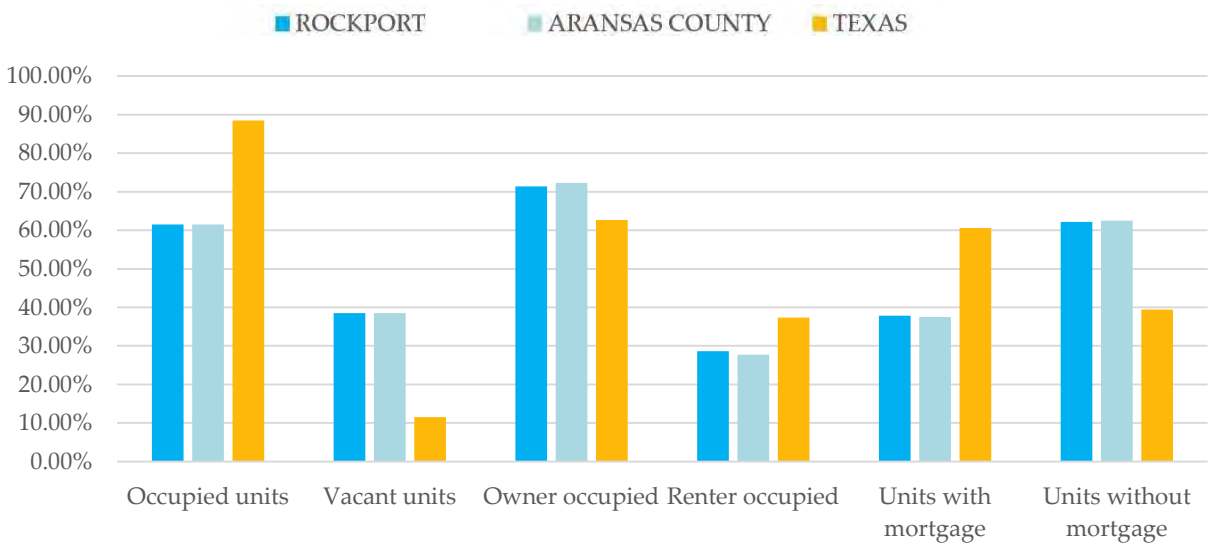


Figure created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

Figure 5.6 shows the values of owner-occupied housing in the City of Rockport, Aransas County, and the State of Texas for 2014. The city has the highest percentages of homes in the $300K to $1m range. This would seem to support the idea that there are a lot of vacation homes, and retirees, in Rockport.

Figure 5.6 2014 Value of Owner-Occupied Housing.

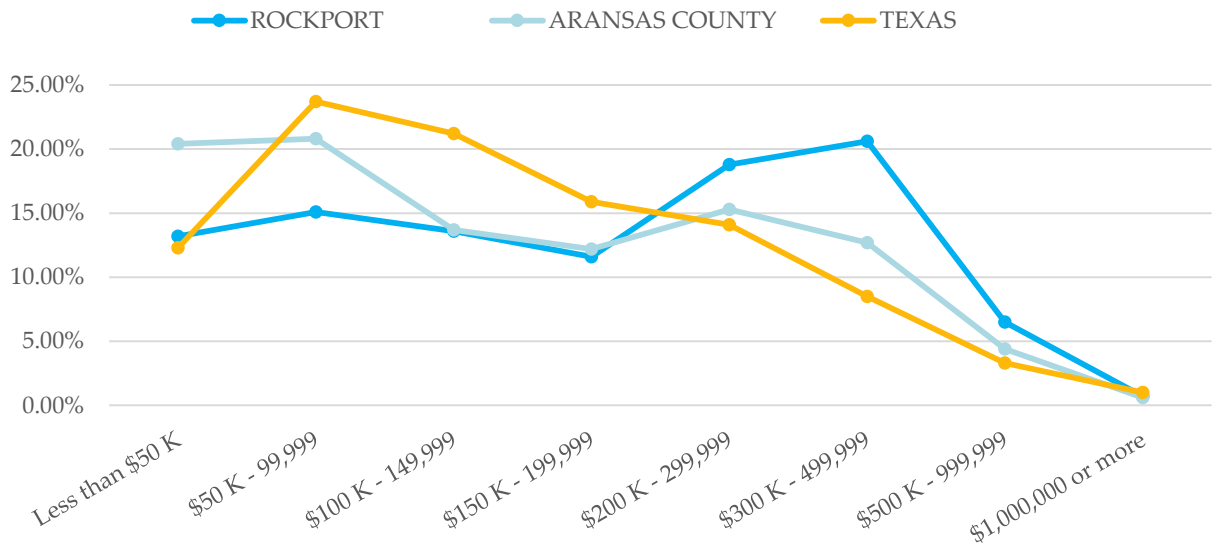
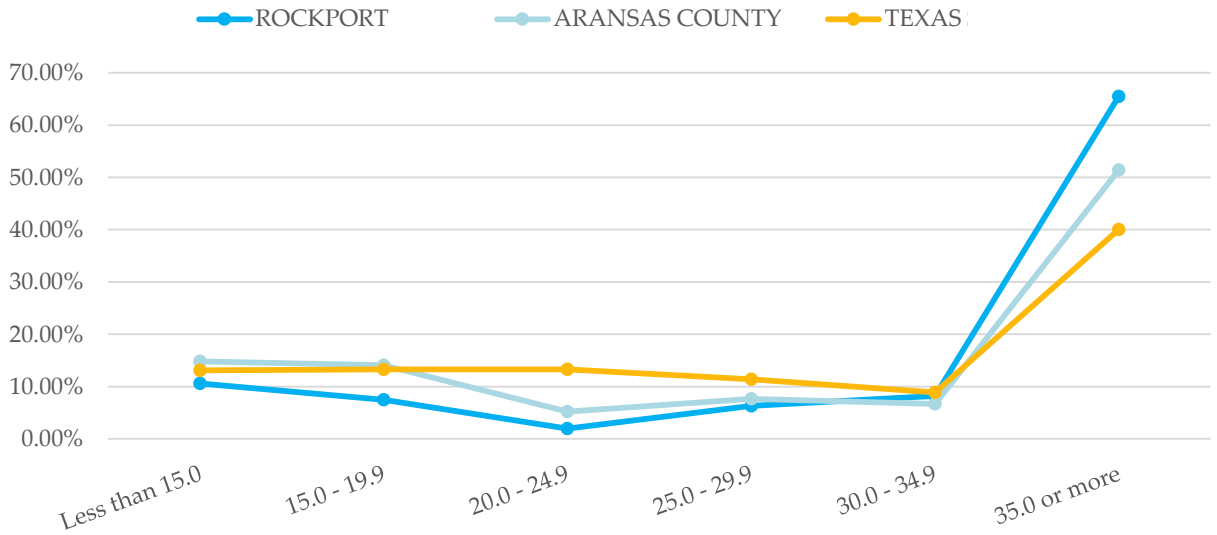


Figure 5.7 shows what percentage of income renters are paying in rent for the City of Rockport, Aransas County, and the State of Texas. These numbers are fairly consistent (below 15%) for renters who pay less than 15% to approximately 35% of their income towards rent. However, when looking at the percentages of individuals who pay more than 35% of their income towards rent, Rockport (65.5%) is higher than Aransas County (51.4%), which is higher than the State of Texas (40%).

Figure 5.7: 2014 Rent as Percentage of Income.

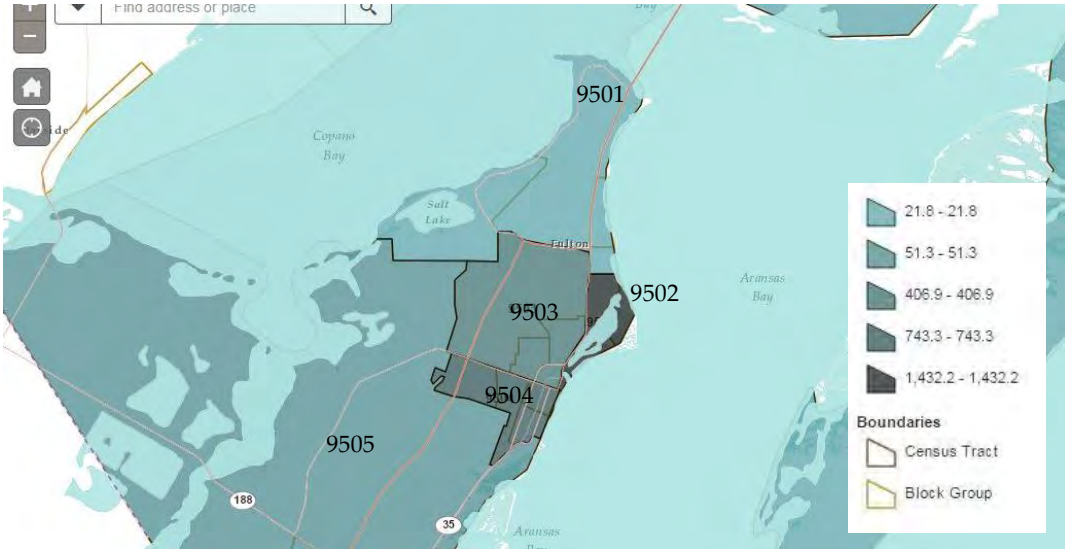


Figures created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

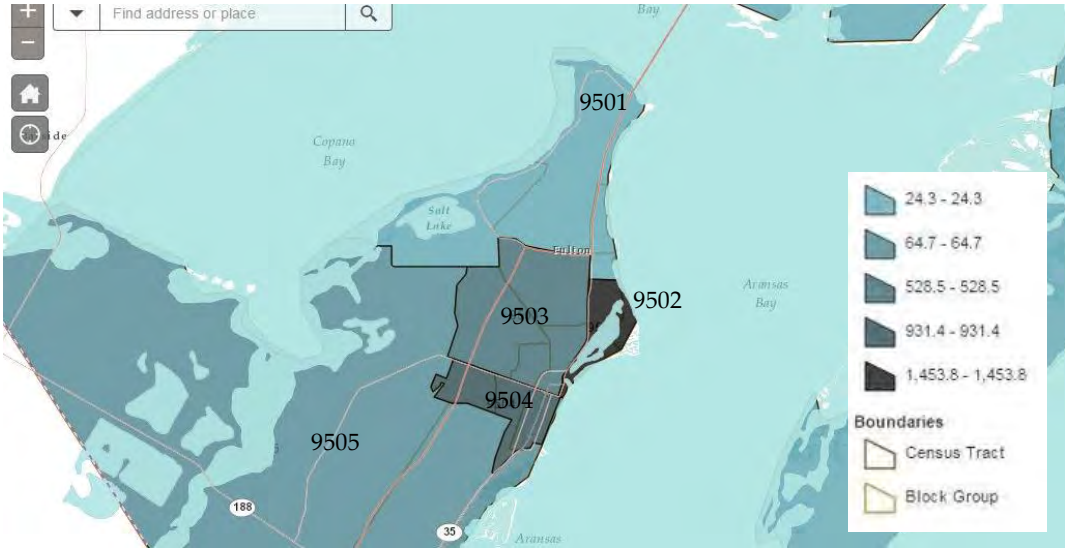
HOUSING DENSITY & GROWTH

Maps 5.1 and 5.2 show housing unit density for Aransas County, according to 2000 and 2010 census tracts. Tracts 9502, 9503, and 9504 make up most of the City of Rockport. Tract 9502 is the smallest tract, along the eastern coast of the peninsula, and has the highest density. This is area is primarily zoned for single family dwellings, has some of the smallest lot sizes in the city, and most of the lots are fully developed. Tract 9504, which has the second highest density, is zoned for a variety of uses, the area is more developed along the coast, and also has small lot sizes. In tract 9503, the lot sizes become larger as you move away from the coast; as such, the land is less developed and less dense. Tracts 9501 and 9505 are largely undeveloped and unincorporated areas of the county, and as a result, have the lowest housing density. Tract 9503 has the highest housing growth rate (30%) and tract 9502, which is already mostly developed, has the lowest housing growth rate (2%).

Map 5.1: Housing Density by Census Tract in 2000.

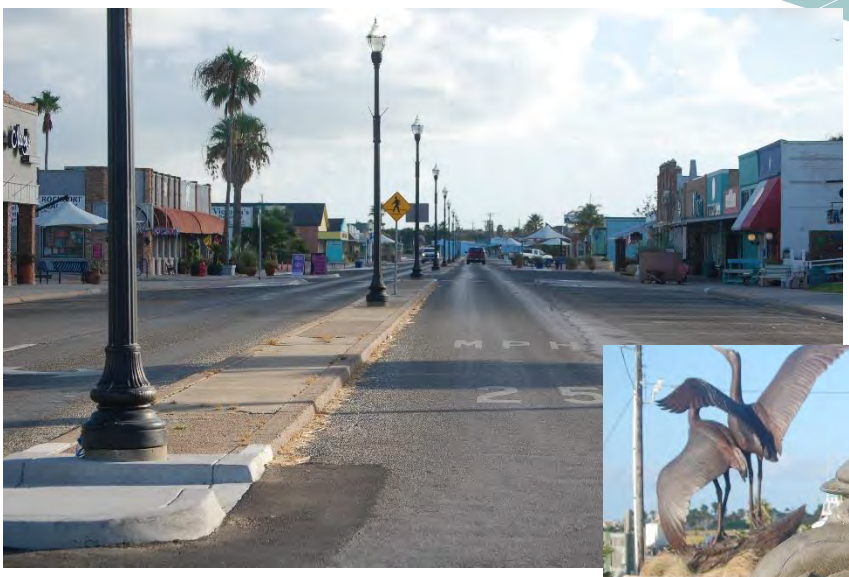


Map 5.2: Housing Density by Census Tract in 2010.



Maps created on: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml# using data from: Census 2000 (map 5.1) and Census 2010 (5.2).

CHAPTER 6
ECONOMY



MAJOR EMPLOYERS

As of 2014 there were 3,709 people employed in Rockport earning an average of $26,513 annually[2]. According to the Rockport-Fulton Chamber of Commerce, the ten major employers in the area are identified in Table 6.1. The largest employer is the Aransas County School District (521 employees). Retail stores (Walmart and H.E.B.) employ 706 people. Three government entities (the City of Rockport, Aransas County, and the State of Texas) employ another 412 individuals. The medical services industry (Care Regional Medical Center, Gulf Pointe Plaza, and Rockport Coastal Care) employ 378 people. The list is rounded out by Wood Group, which is an oilfield/industrial company that employs 181 individuals[3].

Table 6.1: Major Employers in Rockport-Fulton Area.

Employer	Product	Number of Employees in Rockport/Fulton
Aransas County Independent School District	Education	521
Walmart	Retail/Grocery	250
Care Regional Medical Center	Medical Services	210
H.E.B.	Retail/Grocery	185
Wood Group Product Services	Oilfield/Industrial	181
Aransas County	Government	175
City of Rockport	Government	130
State of Texas	Government	107
Gulf Pointe Plaza	Medical Services	93
Rockport Coastal Care Center	Medical Services	75

Table crated using data from: http://www.rockport-fulton.org/Top-10-Employers.

[2] United States Census Bureau. (2014). American Community Survey. Retrieved from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml
[3] Retrieved from: http://www.rockport-fulton.org/Top-10-Employers

INDUSTRY SPECIALIZATION

Due to the relatively small size of Rockport, some economic data is not available through the US Census. Some industries have only one employer and thus the individualized data cannot be disclosed. Therefore, data for Aransas County was analyzed to determine what industries contribute most to the economic base. US Census Bureau used data gathered by the American Community Survey in 2005 and 2014, to determine that Aransas County specialized in three categories: accommodation and food services, retail trade, and construction (these categories have the highest percentage of employees (see Figures 6.1 and 6.2). It is interesting to note that the county employed 17.3% of its workers in the accommodation and food services industry in 2014; during this same year the State of Texas only employed 9.1% of its workers in the same industry. This is likely due to tourism. Industries that provided the lowest percentages of jobs in Aransas County, in 2005 or 2014, were utilities, education, and management companies (see Figures 6.1 and 6.2).

Figure 6.1: 2005 Industry Specialization.

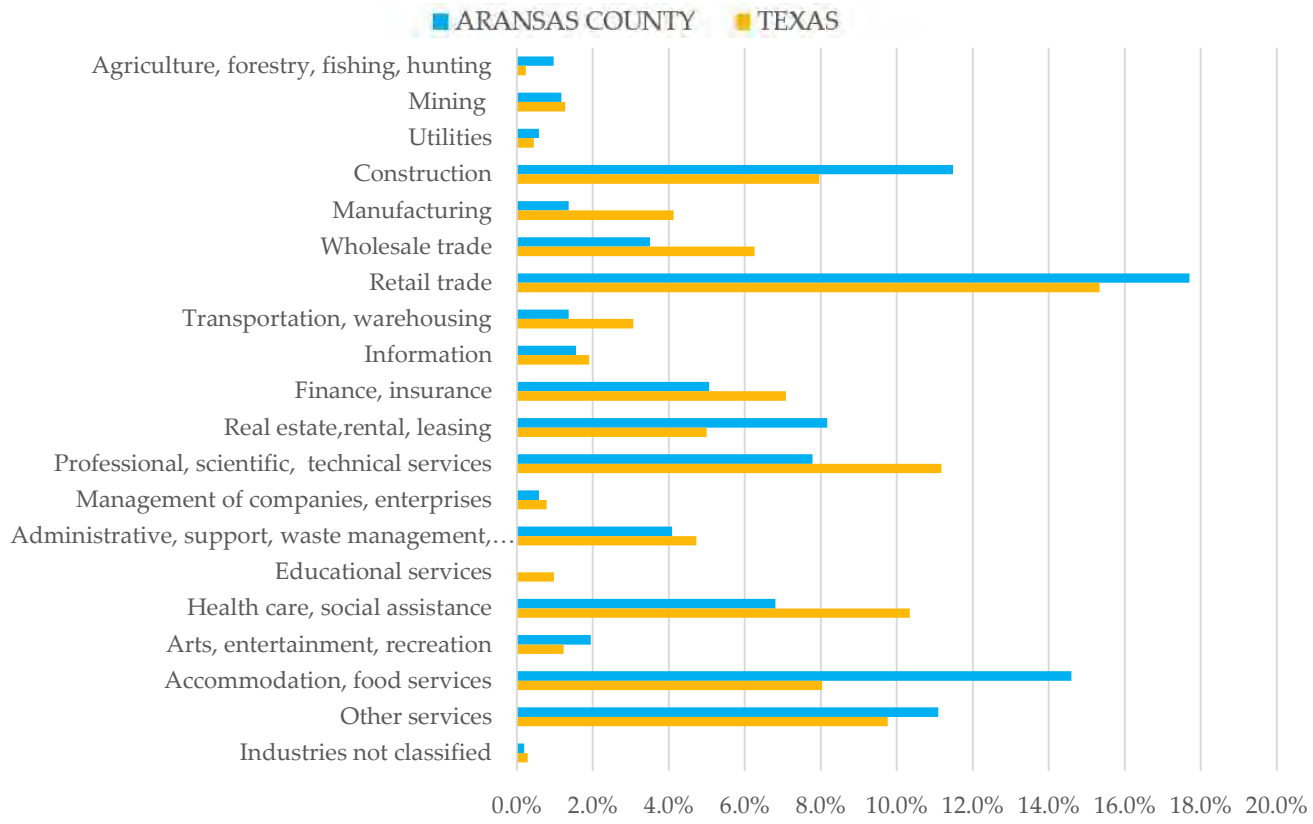
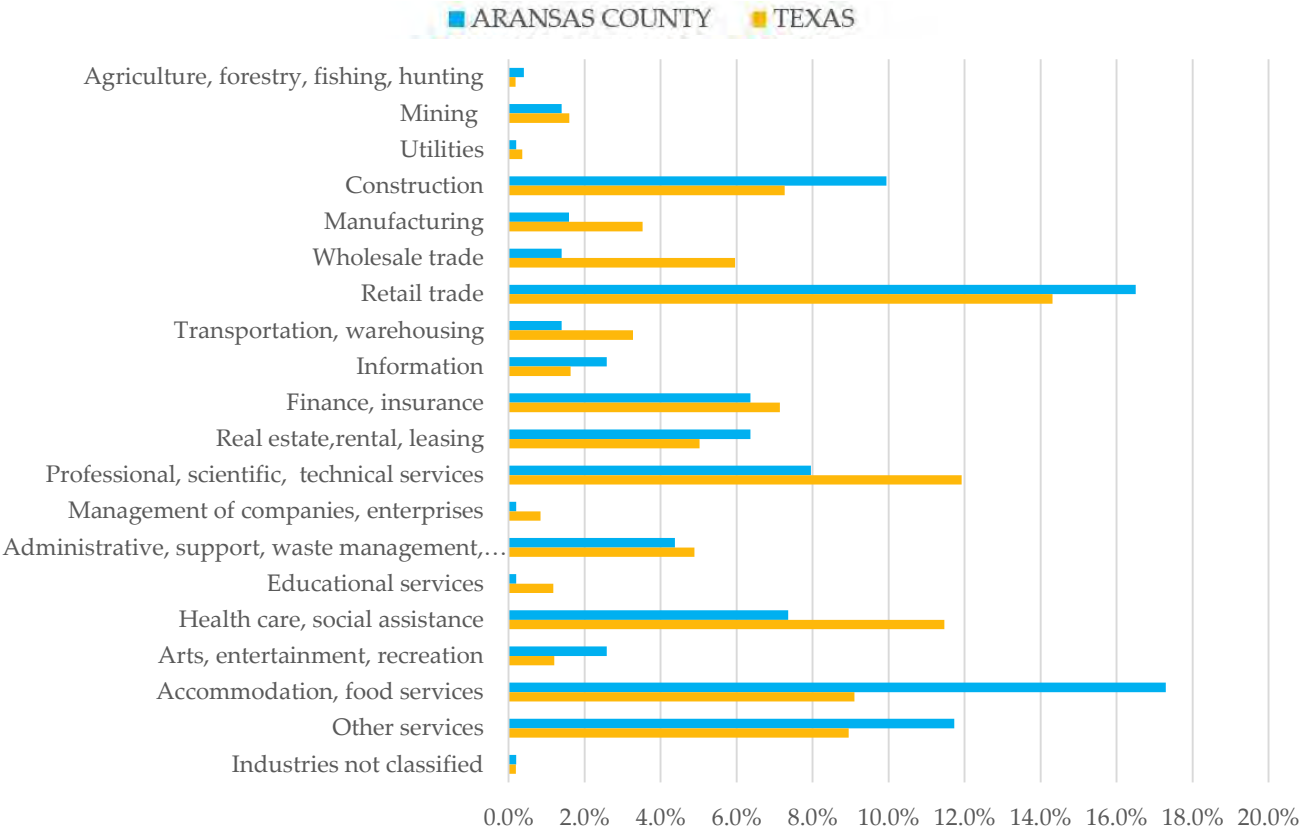


Figure 6.2: 2014 Industry Specialization.



Figures created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

The National Oceanic and Atmospheric Administration (NOAA) generates economic reports for coastal counties throughout the United States. The data focuses on six economic sectors that are dependent upon the oceans (and the Great Lakes). NOAA calls this "Ocean Economy," and the six economic sectors are: living resources, marine construction, ship and boat building, marine transportation, offshore mineral extraction, and tourism and recreation. The ocean economy of Aransas County represents 26% of the total economy of the county. Table 6.2 shows how much the two largest economic sectors contributes to the ocean economy of Aransas County. Please note that the "suppressed data" represents data that are protected by laws in order to protect the privacy of individuals and business. In general, either the number of business, or the number of employers, in these areas are so few, that it is foreseeable that data could be tracked back to specific people or companies. As such, this data has been "suppressed." With this in mind, it is important to note that while data for four of the six economic categories are suppressed, these categories only represent 8.2% of the total ocean economy for Aransas County.

Table 6.2: 2013 Sector Contributions to the Aransas County Ocean Economy.

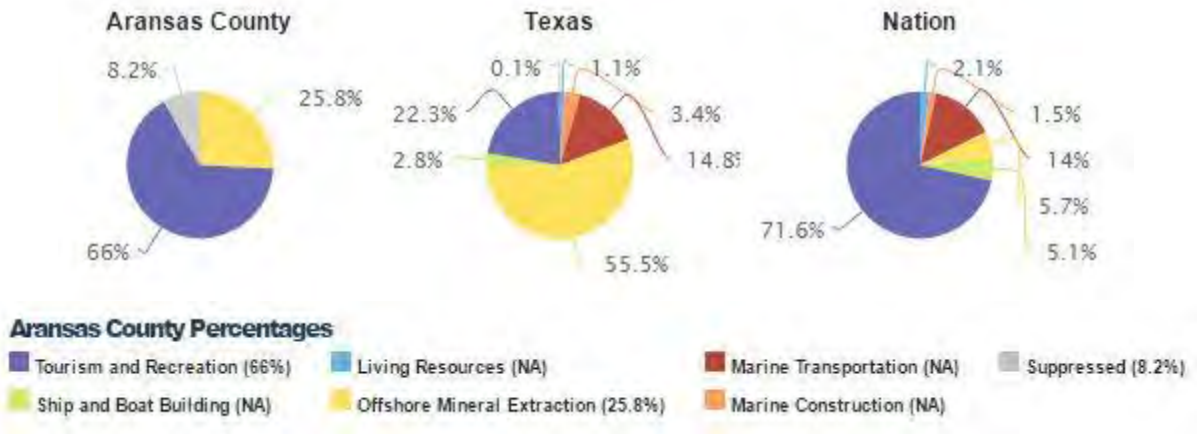
	% of Total Economy	% of Total Ocean Economy	Number Self Employed	Total Employment	Wages % of Total Economy	Total Wages	Wages per Employee
Total Ocean Economy	26	N/A	274	1932	23.8	$50.5 Million	30,500
Living Resources	0	Suppressed	115	Suppressed	Suppressed	Suppressed	Suppressed
Marine Construction	0	Suppressed	Suppressed	Suppressed	Suppressed	Suppressed	Suppressed
Ship & Boat Building	0	Suppressed	Suppressed	Suppressed	Suppressed	Suppressed	Suppressed
Marine Transportation	0	Suppressed	14	Suppressed	Suppressed	Suppressed	Suppressed
Offshore Mineral Extraction	0	25.8	92	520	47.7	$24 Million	$56,000
Tourism & Recreation	0	66	49	1143	39	$19.7 Million	$18,000

Table created using data from:
https://coast.noaa.gov/snapshots/#/process?action=ocean&state=48&county=007&bounds=null.

The NOAA report also compares the contributions of each of the economic sectors to the total ocean economy for Aransas County, the State of Texas, and the US. The first graph in Figure 6.3 shows that 91.8% of the ocean economy for Aransas County is provided by the tourism and recreation sector (66%) and the offshore mineral extraction sector (25.8%). The second graph shows that these numbers are almost reversed for Texas with the major contributing sector being offshore mineral extraction (55.5%) and then the tourism and recreation sector following by contributing 22.3% of the ocean economy.

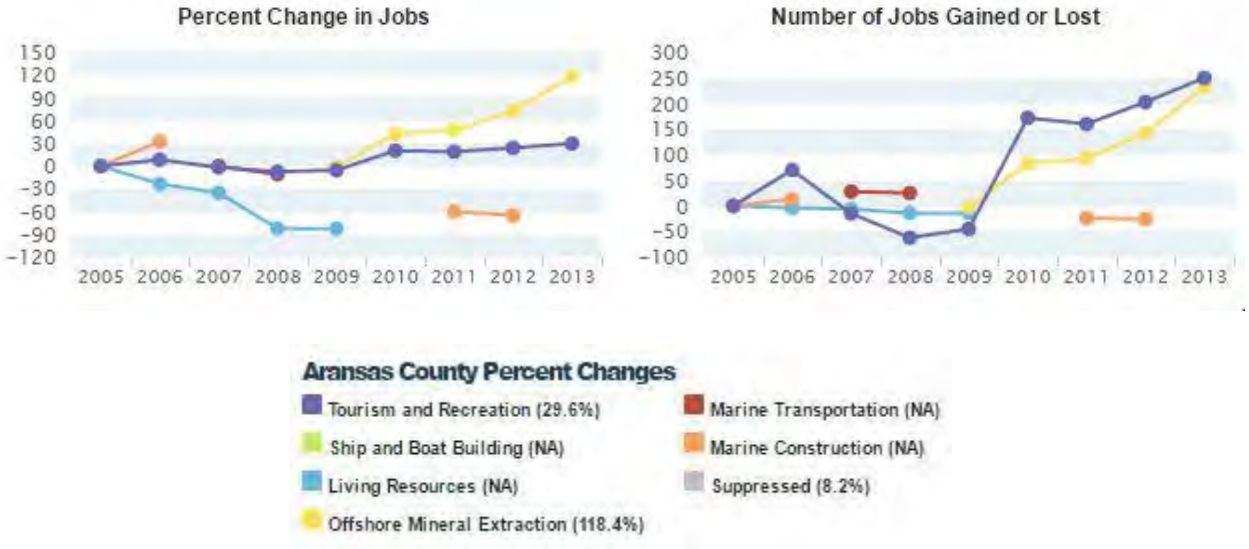
The final graph shows that the majority of the national ocean economy comes from the tourism and recreation sector (71.6%), with the remaining 5 sectors splitting the rest of the contributions to the nation's ocean economy. Considering that Aransas County is a small coastal town, without large industry, it makes sense that tourism and recreation would dominate its ocean economy.

Figure 6.3: 2013 Percentages of Industries within the Ocean Economy.



Finally, NOAA analyzes job growth within the ocean economy and individual sectors from 2005 to 2013. Figure 6.4 shows steady or growing trends, in the later years, in the tourism and recreation, and offshore mineral extraction sectors for Aransas County. The downturn from 2007 to 2009 in the tourism and recreation sector could be attributed to destructive hurricane seasons, and storms such as Hurricanes Ike and Dolly in 2008.

Figure 6.4: Growth in the Aransas County Ocean Economy from 2005 to 2014.



Figures created using data from:
https://coast.noaa.gov/snapshots/#/process?action=ocean&state=48&county=007&bounds=null

LOCATION QUOTIENT

Another way to assess specialization is to look at the location quotient, which quantifies how concentrated an industry is in the local area compared to another larger area. In this case the industry statistics for Aransas County are compared to the State of Texas for the years 2005 and 2014 (see Table 6.3). A location quotient larger than one indicates that an area (Aransas County) has some level of specialization in that category, over the benchmark area (Texas). The highest location quotients indicate strong industries. This data suggests that Agriculture (including forestry, fishing, and hunting) was the most specialized industry in Aransas County in 2005; unfortunately, this industry also appeared to decline significantly by 2014. Also of note is the jump that the "arts, entertainment, and recreation" category made from 2005 (LQ of 1.58) to 2014 (LQ of 2.15). Coincidentally, during this time the City of Rockport dedicated resources to the development of an Arts District. The city also finalized a Cultural Arts Plan in early 2016. Finally, the information industry also grew in prominence from 2005 (LQ of .82) to 2014 (LQ of 1.58). This growth is a trend that is being seen globally. (*Note: This data is only as good as the information the Census Bureau was able to obtain in the years specified. We strongly recommend extensive ground truthing prior to making any substantial policy changes.*)

Table 6.3: Location Quotient for Aransas County, compared to the State of Texas for 2005 and 2014.

Industry	2005 Location Quotient	2014 Location Quotient
Agriculture, forestry, fishing, hunting	4.08	2.17
Accommodation, food services	1.82	1.90
Real estate, rental, leasing	1.64	1.27
Arts, entertainment, recreation	1.58	2.15
Construction	1.44	1.37
Utilities	1.32	0.56
Retail trade	1.15	1.15
Other services	1.14	1.31
Mining	0.92	0.87
Administrative, support, waste management, remediation services	0.86	0.89
Information	0.82	1.58
Management of companies, enterprises	0.74	0.24
Finance, insurance	0.71	0.89
Professional, scientific, technical services	0.70	0.67
Industries not classified	0.69	1.05
Health care, social assistance	0.66	0.64
Wholesale trade	0.56	0.23
Transportation, warehousing	0.44	0.43
Manufacturing	0.33	0.45
Educational services	0.00	0.17

Figures created using data from: http://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

EMPLOYMENT INFLOW & OUTFLOW

Figures 6.5 and 6.6 demonstrate the inflow and outflow of workers in 2005 and 2014. Rockport is one of many smaller coastal communities in the Coastal Bend region of Texas. These communities have boundaries that are often in flux, as development occurs, and areas are annexed. Since these boundaries are ever changing, it is often difficult for citizens to stay informed. As such, this data may not be as reliable as possible. Further, because the small coastal counties sit so close together, the movement of jobs from one small community to another (e.g. from the City of Rockport to Aransas Pass, or from Fulton to Rockport) may not have as much of an economic impact on the individual communities as the loss of a major coastal employer (providing hundreds of jobs) to an area like Houston.

Figure 6.5: 2005 Inflow/Outflow of Jobs.

Figure 6.6: 2005 Inflow/Outflow of Jobs.

Table 6.4 details what we know about the workers who work in Rockport but live elsewhere, and those who live in Rockport but work elsewhere. The number of individuals who come into the City of Rockport to work went up from 2005 to 2014 (from 72.2% to 78.2% of the workforce). The number of people who live in Rockport and work elsewhere also went up (from 70.3% to 79% of the people). It is impossible to know where people are traveling to or from for these jobs; but, because of the cluster of local communities it is likely not far. However, it is worth noting that the trend to commute for work is growing in this area.

Table 6.4: Commuting Workers.

INFLOW/OUTFLOW	2005	2014
Workers Coming In	2059	3242
Percentage of Rockport Jobs	72.2	78.5
Workers Going Out	1883	3361
Percentage of Rockport Residents	70.3	79

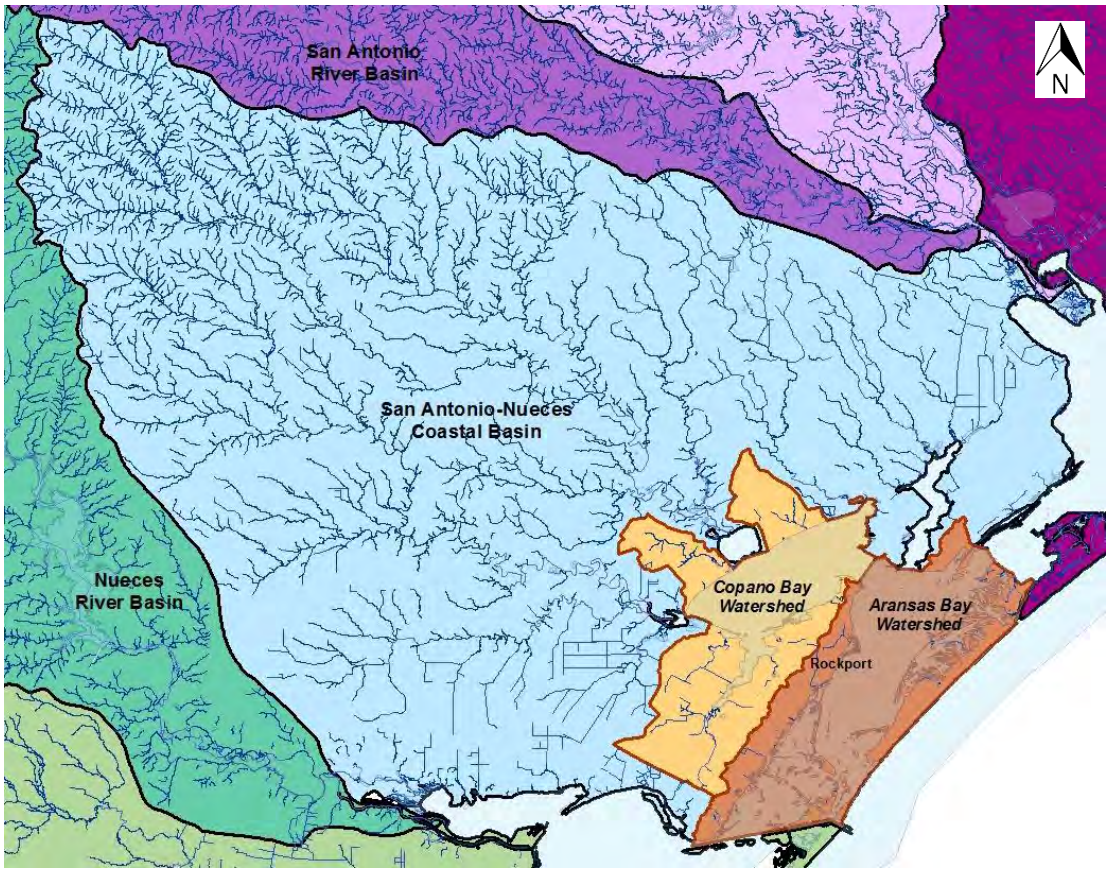
Figures and Table created using data from: http://onthemap.ces.census.gov/.

CHAPTER 7
ENVIRONMENT

WATERSHEDS & AQUIFERS

The quality and amount of water available to the City of Rockport is dependent on several factors. There are two naturally occurring water systems in our environment: aquifers and watersheds (or basins). Aquifers are like reservoirs because they store water; but they are located underground. The water stored in an aquifer is called groundwater. Aquifers are recharged by surface water (lakes, rivers, streams, ponds, and wetlands) which enable water to slowly seep through the ground back into the aquifer. A watershed is an area of land in which all bodies of surface water (including runoff) converge and drain to one outlet. In Texas, there are numerous watersheds; but eventually they all drain into the Gulf of Mexico. Along the coast, rivers converge into coastal basins, which are made up of bays and estuaries. Map 7.1 depicts the major basins and watersheds that surround Rockport. Since so many systems drain into the water that surrounds Live Oak Peninsula and the city, it is important that Rockport be aware of the quality of the water, and the type of pollutants within those systems. Much of Rockport's economy, recreation, and health depends on good water quality.

Map 7.1: Major Watersheds and Basins Affecting Rockport.

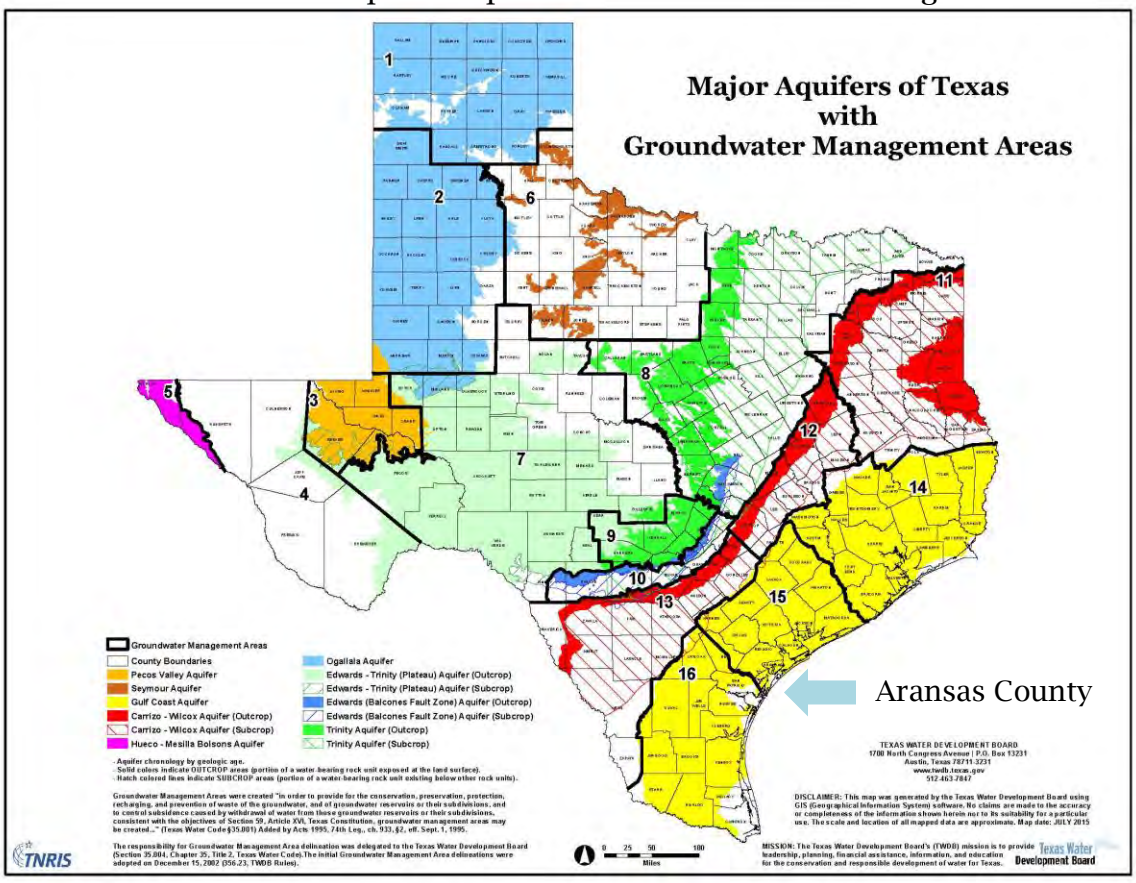


Map created using data from: USDA/NRCS - National Geospatial Management Center - 12 Digit Watershed Boundary Dataset; National Hydrography Dataset; Texas Parks And Wildlife Department Basins; US Census Bureau TIGER Products.

http://texasaquaticscience.org/aquifers-springs-aquatic-science-texas/
http://texasaquaticscience.org/watershed-lan-aquatic-science-texas/

When the amount of groundwater in an aquifer is very low, a region can experience a period of drought. This is usually brought on by an extended period of time with low precipitation, and thus the inability to recharge the aquifers. Many communities implement regulations regarding how and when water can be used for non-essential activities (e.g. watering lawns and washing cars) during droughts. These regulations help to prolong the availability of water to the entire community, and reduce the potentially costly need to purchase additional water from other areas. Some homes utilize wells and pumps which access water directly from the aquifer, and are not part of the municipal water system. Due to their impact on the aquifer, a community may consider regulations based on the spacing or usage of wells and pumps. Some communities have their own Groundwater Conservation District, in addition to a regional Groundwater Management Area that involves numerous counties. Aransas County had a temporary volunteer Groundwater Conservation District for less than a year. The Groundwater Conservation District was voted down in an election on May 7, 2016, and subsequently disbanded. The community can revisit the need for this group in the future. Rockport is included in Groundwater Management Area 15, which includes 13 counties (Aransas, Bee, Calhoun, Colorado, Dewitt, Fayette, Goliad, Jackson, Karnes, Lavaca, Matagorda, Victoria, and Wharton). Map 7.2 shows the Gulf Coast Aquifer in yellow, and Groundwater Management Area 15 in the middle of the aquifer's region.

Map 7.2: Aquifers and Groundwater Management Areas.



Map from : http://www.twdb.texas.gov/mapping/doc/maps/GMAs_Major_Aquifers_8x11.pdf.

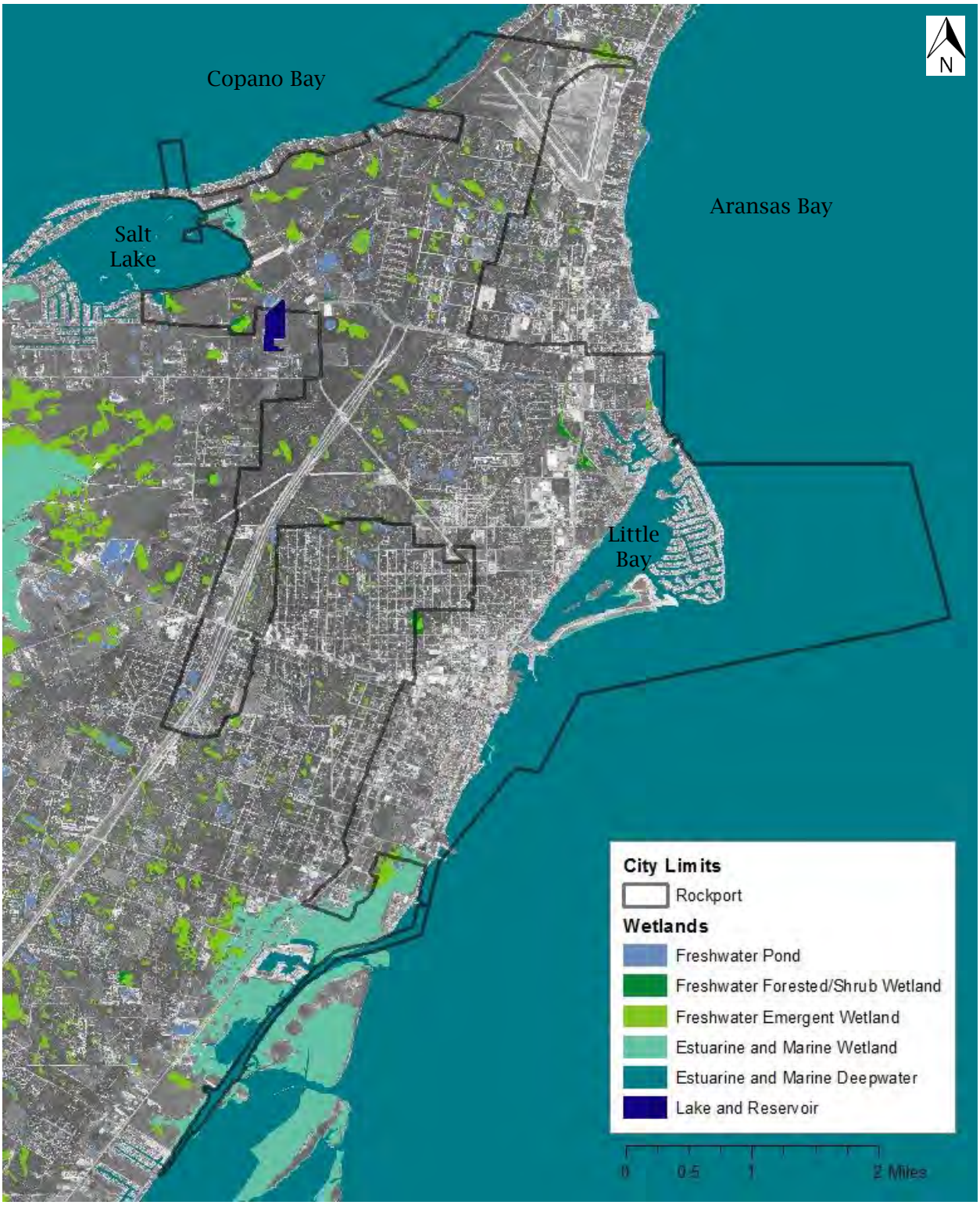
https://www.aransascountytx.gov/groundwatercomm/
http://www.wwnrockport.com/2016/05/letter-to-editor-re-groundwater.html
http://www.wwnrockport.com/2016/05/re-aransas-county-groundwater.html

WETLANDS

The City of Rockport is located on a peninsula surrounded by two bays, Copano Bay and Aransas Bay. There are also two bodies of water that create nooks along the city's coastline, Little Bay and Salt Lake. Within the city limits, there are numerous pockets of freshwater emergent wetlands, freshwater forested/shrub wetlands, and freshwater ponds (see Map 7.3). These wetlands create habitats for many species of birds, fish, and amphibians. The coastal area of the city also includes estuarine wetlands (see Map 7.3). Wetlands are known as "the cradle of life" because they offer critical breeding, resting, feeding, and nursery grounds for a large variety of waterfowl, fisheries, endangered species, birds, and mammals[4]. The economy of Rockport thrives on activities related to its wetlands; such as commercial fishing, shrimping, birdwatching, sport fishing, kayaking, and boating. These activities provide an economic base for the city, and treasured recreational opportunities. Wetlands within and surrounding the city also offer protective benefits. They can store water from heavy rains, allowing it to slowly dissipate back into the soil and groundwater systems, rather than being flushed to other areas. They dissipate wave energy from storms and minimize the inland effects and erosion experienced during storms. Furthermore, as water slowly moves through wetlands the organisms that live there help to filter and break down impurities, excess nutrients, and sediments contained in the runoff from developed and agricultural lands[4]. As Rockport continues to grow and develop, it is important to remember the advantages of its wetlands, and maintain a balance between the built and natural environments.

[4] Randolph, J. (2004). Environmental land use planning and management. Island Press: Washington, D.C.

Map 7.3: Wetlands in and around Rockport.



Map created using data from: US Fish and Wildlife Service - National Wetlands Inventory ; US Census Bureau TIGER Products.

LANDCOVER

Landcover maps use detailed satellite imagery to identify vegetation and habitat types across the United States. This data is important because it can help to identify the distribution of natural habitats. This can in turn be used to develop models which help in long-term planning for habitat conservation and diversity, hydrology, and fire. Land cover maps also allow us to identify agricultural lands, and the location and intensity of current development. This data could be used by the city to help identifies areas they may want to conserve, and areas prime for further development.

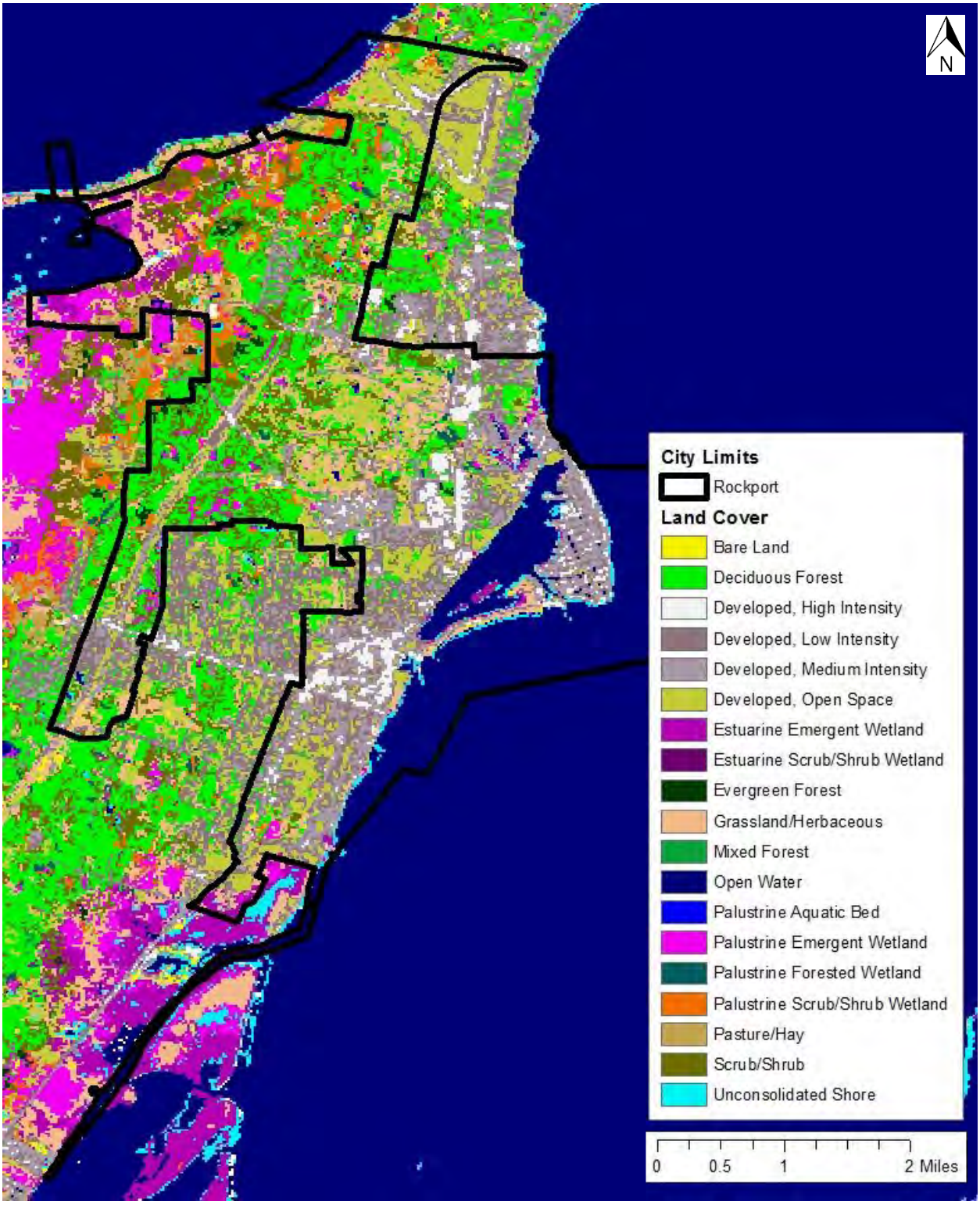
Map 7.4 shows that the city is least developed along State Highway 35, where the land is covered with deciduous forest and scrub/shrub vegetation. On the northwest side of the city, there is a mix of palustrine and estuarine wetlands, grasslands, and herbaceous lands. These habitats surround Salt Lake, and are zoned for large lot, single family housing.

The central region of the city is developed open space, which includes some herbaceous grasslands. A few small palustrine and estuarine wetlands dot this region. The area includes the country club, and is zoned for single family residences. This is not a densely developed region. The northern expanse of the city is also developed open space, which is predominately occupied by the Aransas County Airport.

There are three areas of the city that include high intensity development. One region is located on the north side of the city, where the City of Rockport borders the Town of Fulton. This area includes several hotels, restaurants, a movie theater, and other buildings. South of that area is another patch of high density development that includes several school buildings and a Walmart. Continuing south, the third patch of highly developed land is downtown Rockport. This area contains many public facilities and institutions. Medium and low intensity development spreads out from these three areas of high intensity development.

(*This landcover analysis uses a comparison between the 2006 landcover map (Map 7.4), the 2014 zoning map (Map 11.1), and the current 2016 online Google Earth map. There may be some limitations to the analysis due to the different time periods.*)

Map 7.4: Rockport Landcover.



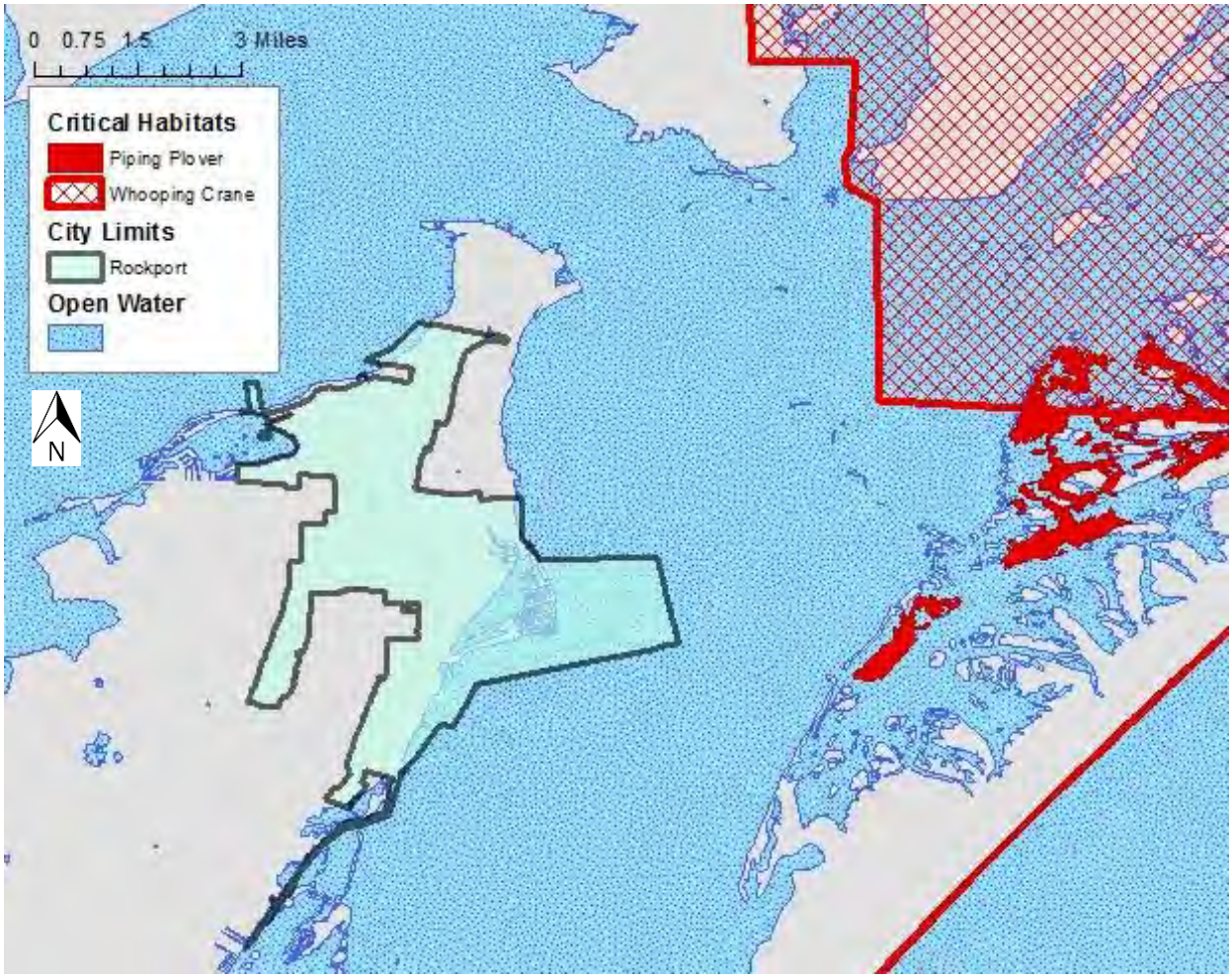
Map created using data from: NOAA's Ocean Service - Coastal Services Center; US Census Bureau TIGER Products.

LISTED SPECIES & CRITICAL HABITATS

Appendix 1 includes a list of the state and federally "listed species" that have been observed in Aransas County. Some of these species are not known to exist in the county any longer; however, if their habitats were restored, it is possible they could return. This list was provided by the Texas Parks and Wildlife Department.

Critical Habitats are defined in the Endangered Species Act as "a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery"[5]. The city of Rockport does not contain any designated critical habitats; however, some critical habitats for whooping cranes and piping plovers have been designated in areas northwest of Rockport, and on the barrier island seaward the city (see Map 7.5).

Map 7.5: Critical Habitats Near Rockport.



Map created using data from: US Fish and Wildlife Service - Critical Habitat; US Census Bureau TIGER Products.

http://tpwd.texas.gov/gis/rtest/
[5] https://www.fws.gov/midwest/endangered/saving/CriticalHabitatFactSheet.html

WILDLIFE

The Rockport area has sustained population of small mammals, reptiles and amphibians, mid-sized predators (e.g. raccoons, opossums, skunks, bobcats, and coyotes) and white-tailed deer. The deer are concentrated along the Highway 35 Bypass, west of the bypass, around the Rockport Country Club, and around Holiday Beach. These concentrations of deer often draw mid-size predators in the spring (fawning season), and in the fall (as the predators prepare for winter). During these times, humans see more of these predators. Occasionally, the incidental take of domestic pets, by the mid-sized predators occurs (usually only during times of prolonged, colder winters, or extreme drought)[6].

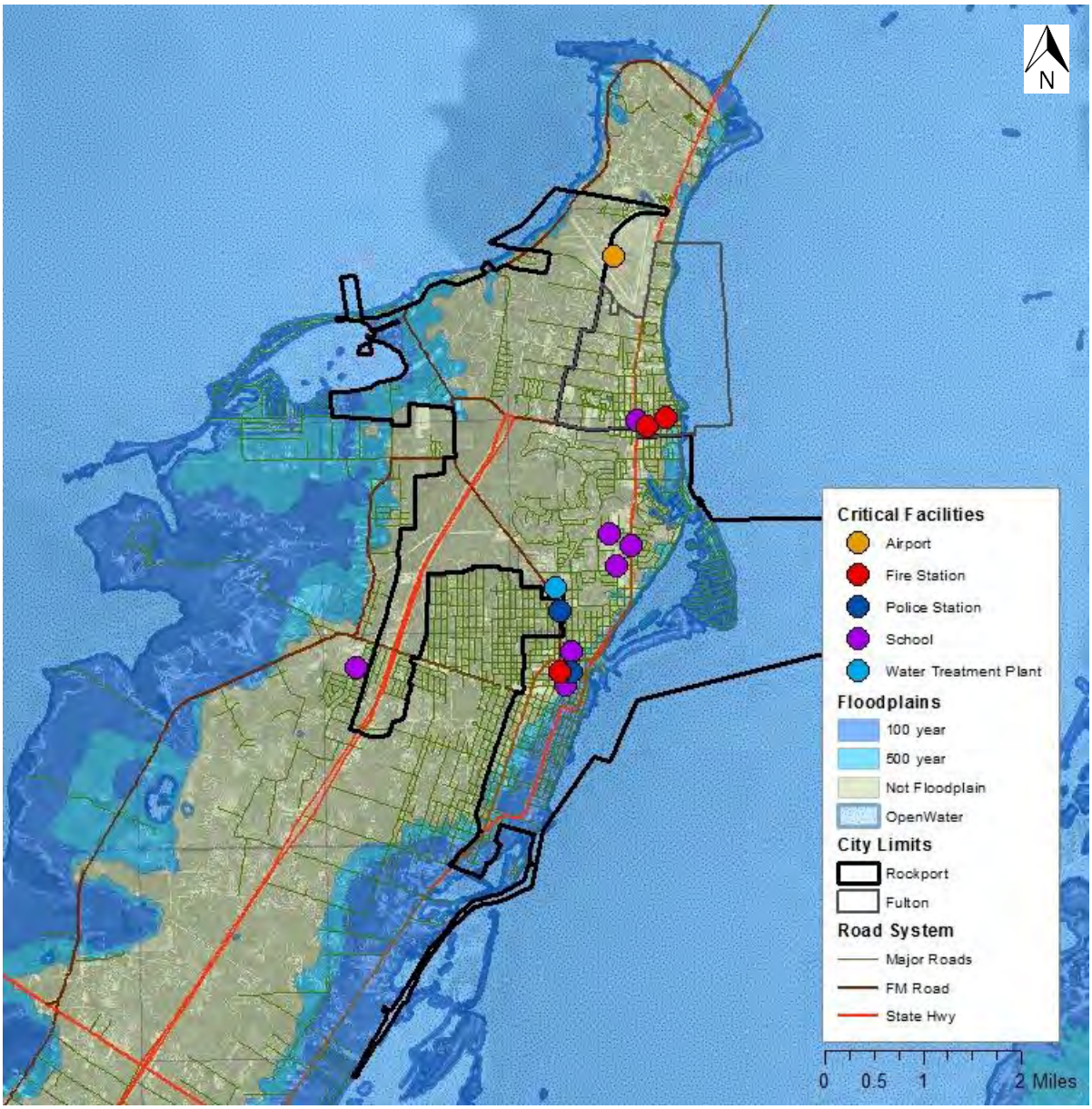
[6] Personal communication, Dustin Windsor, Texas Parks & Wildlife, Aransas County Biologist

CHAPTER 8
HAZARD VULNERABILITY

FLOODPLAINS

Located on a peninsula, the City of Rockport is surrounded by water on three sides, and sits seven feet above sea level. Map 8.1 shows the 100 and 500 year floodplains, along with the community's critical facilities and roads. Community facilities, such as schools, hospitals, fire, and police stations are critical during times of disasters because they provide shelter and response services. These facilities should located outside the floodplains whenever possible. None of Rockport's critical facilities are within the floodplains; however, several facilities are in close proximity. Likewise, utility providers, such as electric companies and water treatment plants, should be protected from the floodplain in order to prevent service disruption during disasters.

Map 8.1: Floodplains and Critical Facilities.



Map created using data from: Federal Emergency Management Agency HAZUS; US Census Bureau TIGER Products; USDA-FSA-APFO Aerial Photography Field Office.

Much of the downtown area and Business Route 35 lie in either the 100 year or 500 year floodplain. This includes Key Allegro, an affluent neighborhood that sits on an island between Aransas Bay and Little Bay, which is entirely in the floodplain. Figure 8.1 utilizes data provided by NOAA to show how much of the area population lives in the floodplain (24%). The figure also shows what percentages of two vulnerable segments of the population live in the floodplain. While three quarters of the population do not live in a floodplain, it is important to consider those that do, especially vulnerable populations, when planning for potential flooding events.

Figure 8.2 shows how much land within the floodplain was developed between 1996 and 2010. The figure also identifies whether that land was natural habitat, or used for agriculture prior to being developed. Development in the floodplain should be scrutinized. Natural habitats provide buffers against flooding. Removing those habitats can cause changes to the hydrological cycle that increase the likelihood of flooding events. These changes can increase damages and put people in harm's way.

Figure 8.1: Population Living in the Floodplain in Rockport 2009-2013.

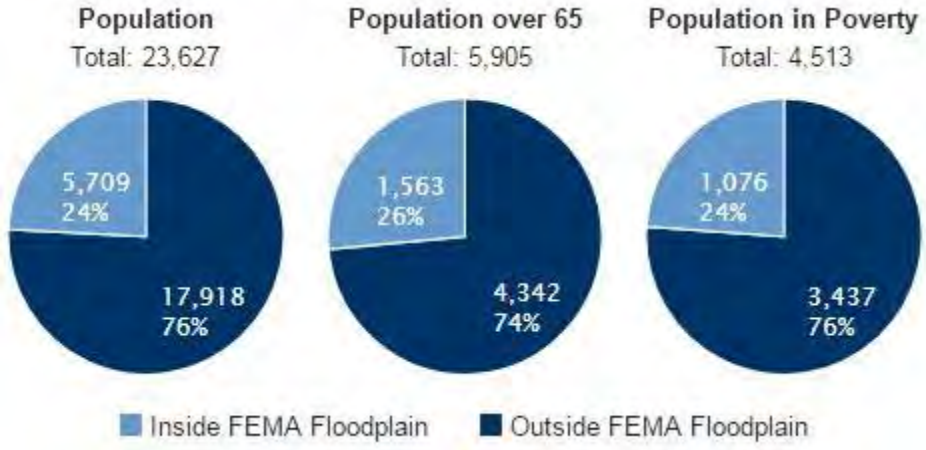
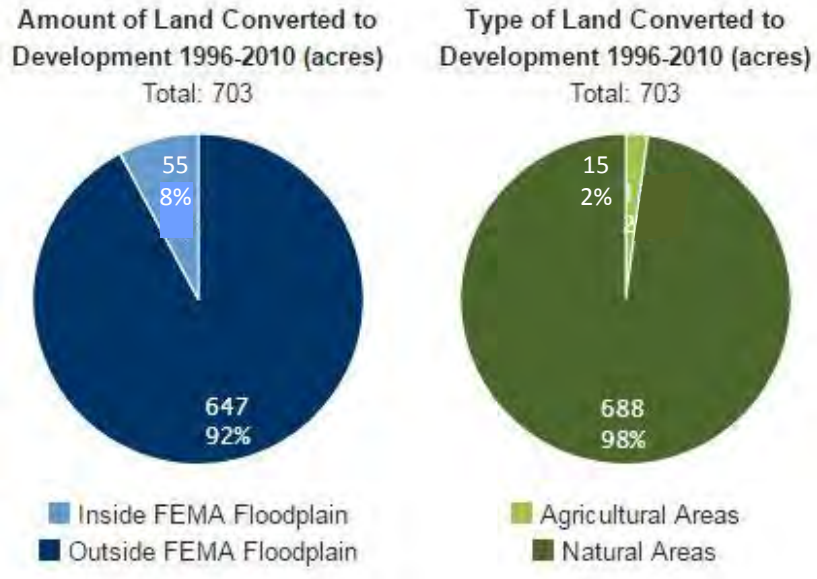


Figure 8.2: Development in the Floodplain in Rockport.



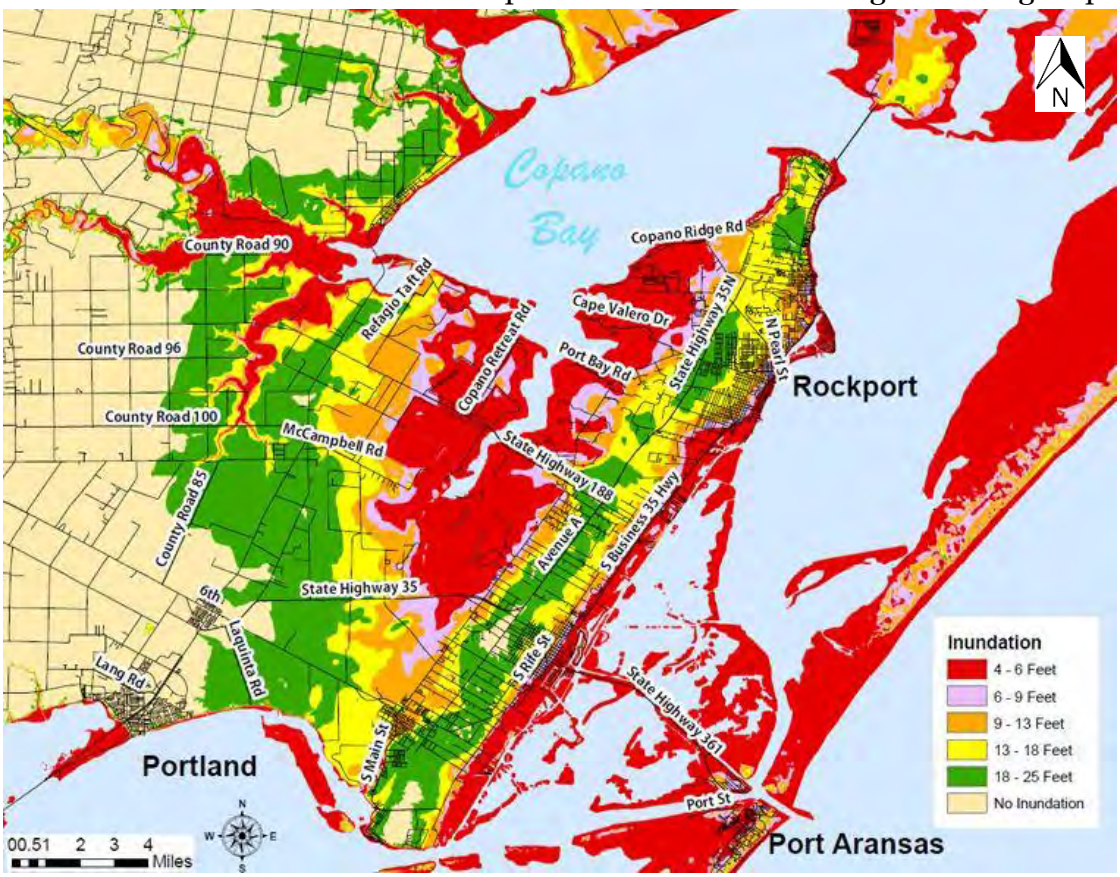
Figures created using data from: https://coast.noaa.gov/digitalcoast/tools/snapshots.html.

STORM SURGE

Storm surge is often the greatest threat to life and property from a hurricane. "Storm surge is the abnormal rise of water generated by a storm, over and above the astronomical tides. Storm surge should not be confused with storm tide, which is defined as the water level rise due to the combination of storm surge and the astronomical tide"[7]. The degree of destruction brought on by Hurricanes Katrina and Ike was largely due to storm surge. Hurricane Sandy was more destructive than many imagined it would be, because of its storm tide.

Storm surge inundation refers to storm surge heights above ground level. For example, if the National Hurricane Center forecasts a storm surge of 20 feet, that means 20 feet above ground. In 2014, the National Hurricane Center started issuing "Experimental Potential Storm Surge Flooding Maps." These maps are based on the forecasted track, intensity, and size of a potential tropical storm or hurricane, while trying to account for the inherent uncertainty of a hurricane track. The maps are meant to shows a reasonable upper bound of potential flooding, of normally dry land, for particular storms. These maps can be used by a community to help prepare for storms in advance of landfall. Map 8.2 is a simplified map which shows what local areas are likely to be inundated during events with 4 to 6 feet of storm surge, up to 18-25 feet of storm surge.

Map 8.2: Potential Storm Surge Flooding Map.



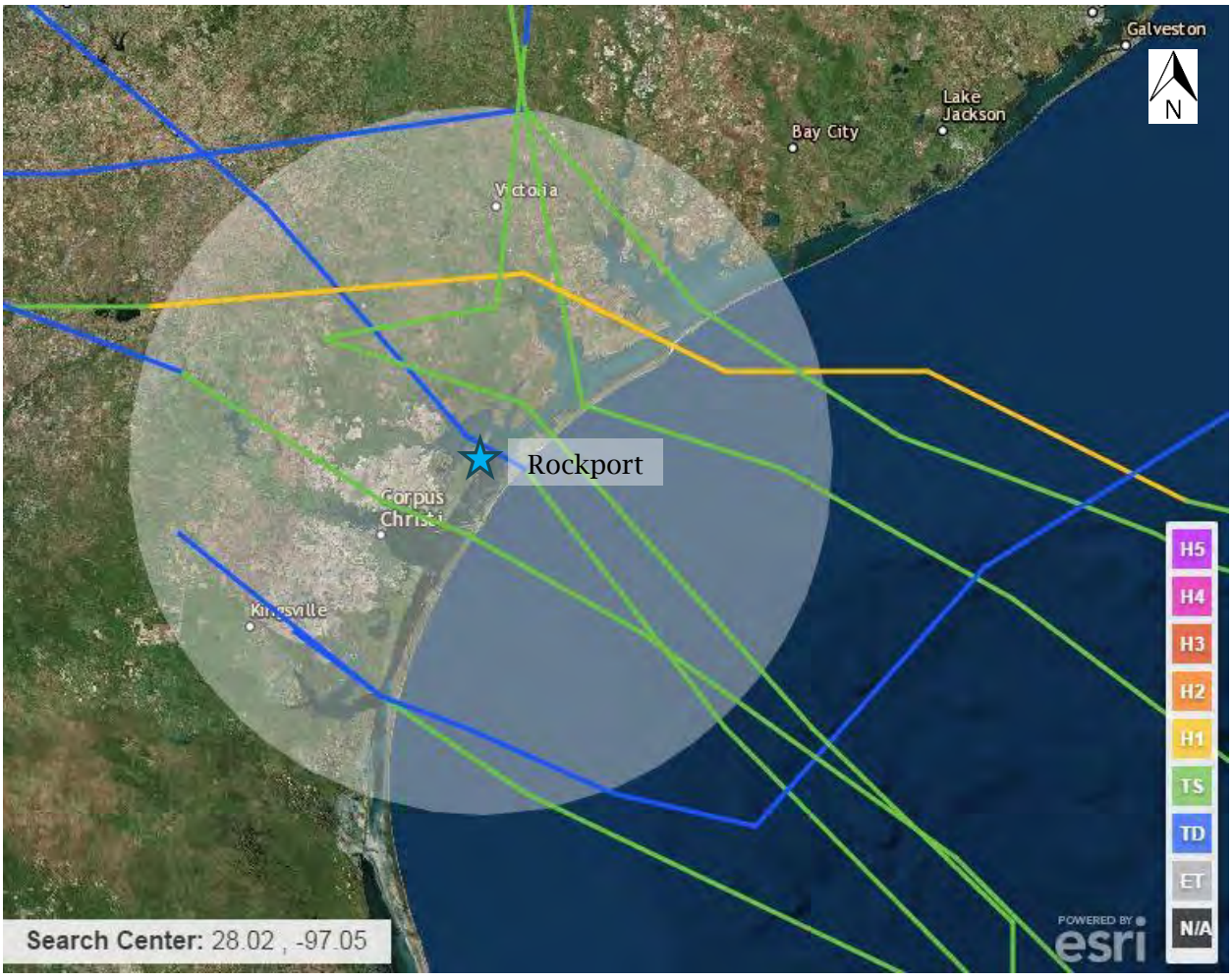
Map from: http://www.srh.noaa.gov/crp/?n=stormsurge.

[7] http://www.nhc.noaa.gov/surge
http://www.nhc.noaa.gov/surge/slosh.php#INUNDATION

STORM HISTORY

Map 8.3 depicts the storm history, within a 65 nautical mile radius around Rockport, from 1998-2015. The only storm to hit the Live Oak Peninsula in that time period was Tropical Storm Erin in 2007. Erin hit the barrier island of San Jose and turned into a Tropical Depression as its center moved directly over Fulton. Hurricane Claudette (2003) was the strongest storm to hit the area. Claudette is depicted by the yellow line in Map 8.3, which indicates it was a Category 1 storm. Its track took it approximately 30 miles north of Rockport. Tropical Storm Bill (2015) was the most recent storm to hit the area. Bill's track is represented by the green line just south of Claudette's yellow line in Map 8.3.

Map 8.3: NOAA Storm History 1998-2015.



Map from: http://coast.noaa.gov/hurricanes.

The only hurricane to make a direct hit on Rockport occurred in 1882—before they began naming storms—and was a Category 1 storm. Hurricane Celia (1970), a Category 3 storm, was the strongest storm to ever occur within a 65 nautical mile radius of Rockport. Celia made landfall in Port Aransas. The storm damage was primarily due to wind, which caused $453.8 million in damages, 15 deaths, and 466 injuries in south Texas.

Data collected on storms depicted in Map 8.3:

- August 22, 1998, Tropical Storm Charley, 60 mph sustained winds, 11 inches of rain, $5 million in damages, 12 deaths in Texas
- September 10, 1998, Tropical Storm Frances, 90 mph sustained winds, 17 inches of rain, $10 million in damages
- August 4, 2002, Tropical Depression Bertha, landfall Griffins Point, 20 mph sustained winds, lasted only 12 hours
- September 7, 2002, Tropical Storm Fay, landfall Port O'Connor, no significant data
- July 15, 2003, Hurricane Claudette, Category 1, landfall Port O'Connor, 75 mph sustained winds, 3-6 feet storm surge, 3-6 inches of rain, $180 million in damages, 1 death
- August 2007, Tropical Storm Erin, 80 mph sustained winds, minimal damages, 9 deaths in Texas
- July 30, 2011, Tropical Storm Don, landfall Bay City, 30 mph sustained winds, 1-2.5 feet storm surge, 2.56 inches of rain, no deaths or damage reported
- June 2015, Tropical Storm Bill, landfall Port O'Connor, 40 mph sustained winds, 1-1.5 feet storm surge, 2-4 inches of rain

In addition to the Tropical Storm and Hurricane events, Rockport and the Coastal Bend region have witnessed significant heavy rain and flooding events in the past decade. Between May 28 and June 2, 2006, the Rockport airport reported 6.77 inches of rain, causing some downtown shops to be flooded. In addition to the flooding, wind gusts up to 55 mph were recorded and produced damage in Rockport. Between September 17 and 21, 2010, heavy rains caused street flooding and road closures in Aransas, San Patricio, Nueces, and Kleberg Counties. The City of Rockport reported 10.95 inches of rain during this time. Very recently, between May 15 and 16, 2016, the region experienced a significant heavy rain event that produced as much as 15 inches of rainfall in some locations. The rainfall caused widespread flooding, and numerous roads and highways were closed due to the high water. Several hundred homes were flooded in Ingleside and Aransas Pass and water rescues occurred in San Patricio and Nueces counties.

http://coast.noaa.gov/hurricanes
http://www.wpc.ncep.noaa.gov/research/txhur.pdf
http://www.srh.noaa.gov/crp/?n=flood-060106
http://www.srh.noaa.gov/crp/?n=sept2010flood
http://www.srh.noaa.gov/crp/?n=flooding_051616

CHAPTER 9
TRANSPORTATION

HIGHWAYS

State Highway 35 is the main highway in the Rockport area. It joins 181 south of Gregory, TX, and leads to Corpus Christi and Interstate Highway 37, which leads to San Antonio, TX. Business 35 starts south of Rockport, in Aransas Pass, and runs to Fulton, just north of Rockport. Loop 70, also known as Church Street, is the main road through downtown Rockport

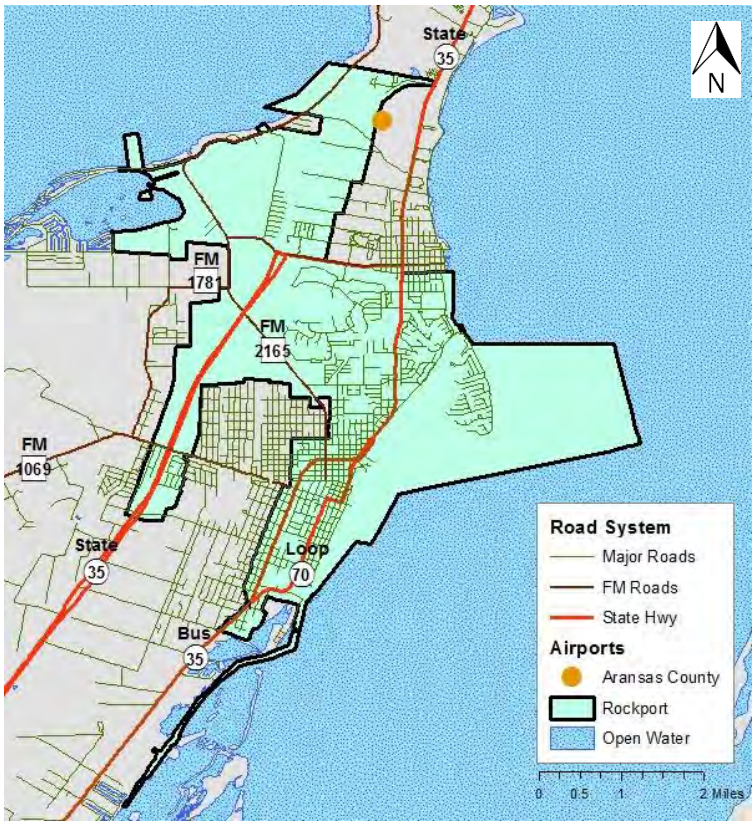
RAILROADS

There is no railroad that runs through the City of Rockport. However, a branch of the Union Pacific freight line goes through Aransas Pass and ends just south of the Rockport city limits.

AIRPORTS

Corpus Christi International Airport is the closest airport that supports major airlines (American, Delta, Southwest, and Continental). The Aransas County Airport is located on the north side of Rockport, and provides general aviation services. According to the Federal Aviation Administration, general aviation is mostly associated with flying clubs, flying training, and agriculture. The Aransas County airport is also utilized by the military, air-taxis, and in emergency situations.

Map 9.1: Transportation.



Map created using data from: US Census Bureau TIGER Products;
Federal Emergency Management Agency HAZUS.

http://www.rockport-fulton.org/Transportation
http://aransascountyairport.com/
https://en.wikipedia.org/wiki/Aransas_County_Airport

HARBORS & WATERWAYS

Harbors: the City of Rockport has two harbors; Rockport Harbor and Cove Harbor. Each harbor provides a variety of services such as docks, boat slips, fish cleaning stations, restrooms, laundry, mailboxes, and access to land transportation. Rockport Harbor is located downtown, while Cove Harbor is located on the south side of the city.

The Gulf Intracoastal Waterway: is a 1,300-mile man-made canal that extends from Brownsville, Texas, to St. Marks, Florida, along the Gulf of Mexico. The Gulf Intercostal Waterway is part of the larger Intracoastal Waterway that continues along the Atlantic seaboard from Key West, Florida, to Boston, Massachusetts. The Texas section of the Gulf Intercostal Waterway is 423 miles long (see Map 9.2). Cargo carried on the waterway reduces congestion on highways and rail lines, and extends the life of those systems. The main products transported on the waterway are crude petroleum, petroleum products, iron and steel, building materials, fertilizers, liquid sulfur, and other bulk products. Commercial fishing fleets can access the Gulf of Mexico via the Gulf Intercostal Waterway. Finally, recreational boating is allowed in the Gulf Intercostal Waterway.

Map 9.2: Gulf Intracoastal Waterway.

Map created from: http://ftp.dot.state.tx.us/pub/txdot-info/library/reports/gov/tpp/giww05.pdf.

http://www.acnd.org/facilities/harbors-rates/2-uncategorised/13-rkpt-hbr-rates
http://www.acnd.org/facilities/harbors-rates/2-uncategorised/26-cove-harbor-amenities
http://www.txdot.gov/inside-txdot/division/transportation-planning/waterway.html
http://www.txdot.gov/inside-txdot/division/maritime/gulf-intracoastal-waterway.html
https://tshaonline.org/handbook/online/articles/rrg04

The Aransas County Navigation District: is responsible for maintaining, and improving, public waterways and public waterfront facilities, such as harbors, boat ramps, fishing piers in the county. The Navigation District has five main facilities under its purview: Rockport Harbor, Fulton Harbor, Cove Harbor, Copano Bay Fishing Pier, and the Rockport Beach.

RURAL PUBLIC TRANSIT

The Rural Economic Assistance League (REAL, Inc.): provides 11 counties in south Texas with a variety of services that focus on the elderly and the disabled. The transportation service is available for medical related office visits, day care, shopping, and job interviews; but, riders must call one day in advance to schedule their trips.

Valley Transit: is a full-service bus company which offers services throughout South Central Texas and Northern Mexico.

Jordan & Jordan: is a charter bus company, based in Rockport.

Two taxi companies: (City Cab and Gulf Coast Taxi) provide service to Rockport and other cities in the area.

The limitations of the public transit system have been acknowledged by the City of Rockport. During the development of a Cultural Arts District Plan (2016), survey results and public meetings showed that the members of the community desire improvements to the public transit system[8].

http://www.acnd.org/
http://www.rockport-fulton.org/Transportation
http://www.realinc.org/
http://www.realinc.org/transportation.php
http://www.valleytransitcompany.com/

[8] City of Rockport. (2016). A Cultural Plan for the Rockport Culture Arts District.

CHAPTER 10
COMMUNITY FACILITIES

COASTAL BEND COUNCIL OF GOVERNMENTS

The Coastal Bend Council of Governments (CBCOG) is a volunteer association of local governments and public and private entities. There are 24 Councils of Government in Texas, which were designed to assist local governments deal with problems and planning needs that are better addressed at a regional level. The Coastal Bend Council of Governments provides information and services in eight program divisions: Administration, Area Agency on Aging, Cities and Counties, Criminal Justice, Economic Development, Emergency Management, Solid Waste and Water Quality, and 9-1-1-Network.

The Coastal Bend Council of Governments is made up of 11 counties (Aransas, Bee, Brooks, Duval, Jim Wells, Kenedy, Kleberg, Live Oak, Nueces, Refugio, and San Patricio), and 32 cities. Map 10.1 shows all of the Texas Council of Governments, and points out the Coastal Bend Council of Governments in the southern tip of the state.

Map 10.1: Texas Association of Regional Councils of Government.

Map from: https://www.txregionalcouncil.org/display.php?page=regions_map.php.

http://www.cbcog98.org/
https://www.txregionalcouncil.org/display.php?page=about_tarc.php

PARKS & RECREATION

The City of Rockport Parks: (see Map 10.2)
Aquatic Park is open year-round. The park contains an 8-lane, heated, 25-yard pool and diving area, a whale shaped zero-depth children's pool with slides and sprays, and a bathhouse. Adjacent to the Aquatic Park is a picnic area with a playground, and two nature trails. The Skate Park is also contained next to this facility.

Skate Park is a 6,000 foot modular park for skateboarders.

Memorial Park is a 100+ acre community park with recreational trails, sporting fields, exercise stations, birding sites and picnic facilities. The park also contains the Rockport Dog Park.

Dog Park is almost two acres of land devoted to off-leash fun for local dogs. It has separate areas for large and small dogs; and provides water, disposal stations, and benches.

Rockport Beach Park offers a pristine shoreline with playgrounds, fishing pier, boat ramp, picnic areas, and a cold water pool. This park is operated by the Aransas County Navigational District.

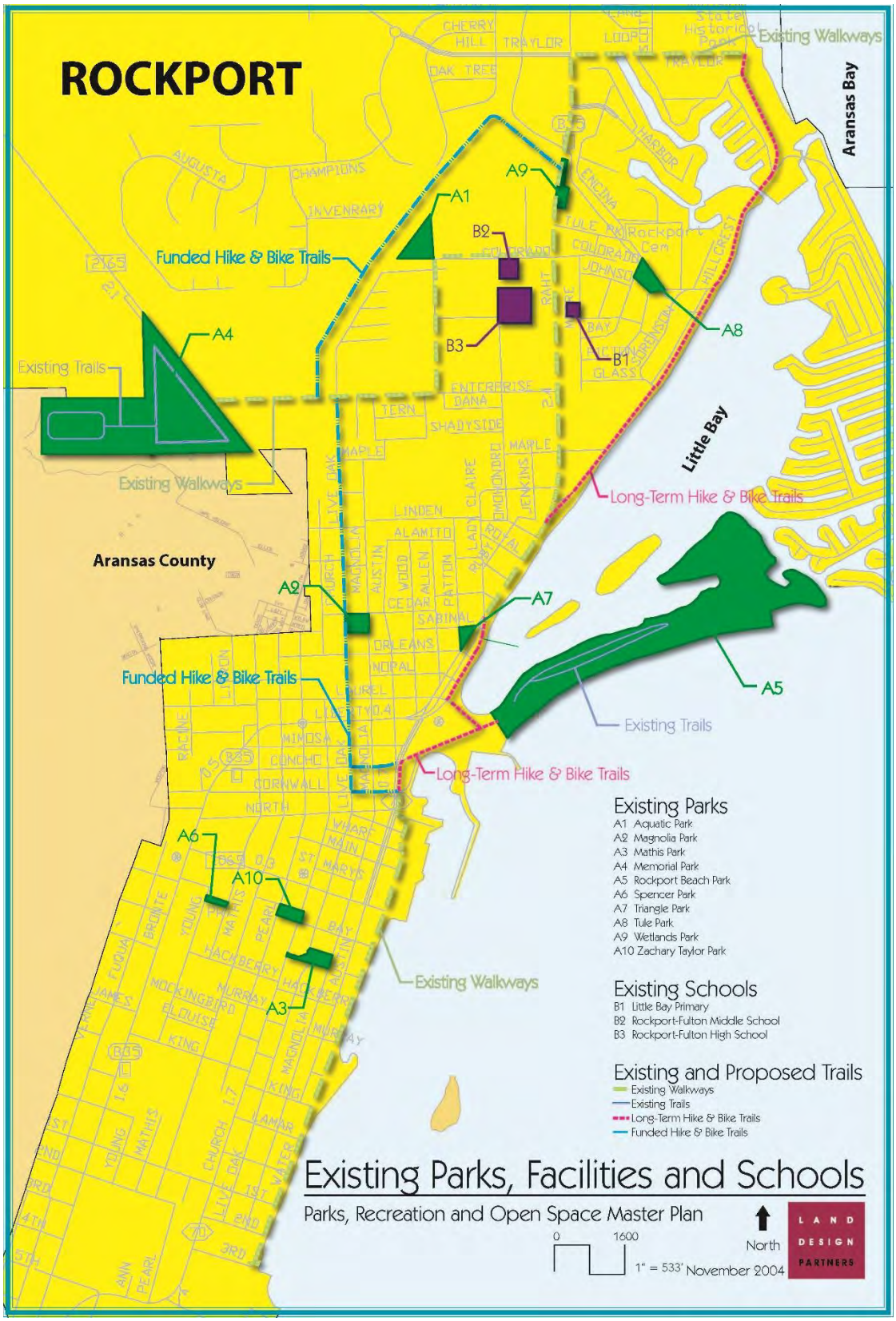
Other Park Facilities:
Rockport is continually expanding its' Hiking and Biking Trails (see Map 10.2). There are several neighborhood parks with recreational and picnic facilities; as well as, ornamental and natural resource parks, located throughout the city.

Goose Island State Park, a 321.4 acre island park, is located north of the City of Rockport. Texas Parks and Wildlife maintains the park, and refers to it as "within Rockport." Swimming is not recommended at the park, due to the terrain and concrete bulkheads along the shoreline. However, hiking, camping, fishing, boating, wildlife observation and photography are all encouraged. There are 101 campsites with water and electricity; 25 walk-in tent sites, without electricity; and a group camping area. There are also restroom facilities with showers. The park also has a 1,620-foot long fishing pier, a regular boat launch, a kayak/canoe launch, and a fish cleaning station.

For additional information about recreational activities in, and around Rockport, please see the Aransas Pathways website (aransaspathways.com).

http://www.cityofrockport.com/116/Area-Parks
http://tpwd.texas.gov/state-parks/goose-island

Map 10.2 Rockport Parks.



Map from: http://www.cityofrockport.com/122/Open-Space-Plans-and-Trails.

WATER, WASTEWATER, & DRAINAGE

The City of Rockport Water Storage and Distribution Department maintains and services over 9000 water connections, over 100 miles of waterlines, three elevated water towers, and two in-ground water tanks. The Wastewater Collection and Treatment Department also maintains and services over 4000 sanitary sewer connections and over 60 miles of sanitary sewer lines. Both departments follow guidelines provided by the Texas Commission on Environmental Quality and the United States Environmental Protection Agency, and run routine inspections on all systems.

For years, large portions of the state of Texas have suffered off and on from drought. Rockport, like most communities, institutes mandatory restrictions on water usage during droughts in order to conserve water, and reduce demands from shared water sources. The mandatory restrictions included a schedule for watering lawns and landscaping. However, property owners with private water wells, or using gray water for these uses, are exempt from restrictions. Rockport's' water comes from the San Patricio Municipal Water District. San Patricio purchases untreated water from the City of Corpus Christi; then treats it, and sells it to the city.

The City of Rockport has a Master Drainage Plan which includes a prioritized list of drainage improvement projects. Funds are allocated to the plan annually. The city received $2 million in disaster relief funding from hurricanes Ike and Dolly. These funds were dedicated to the completion of two Master Drainage Plan projects which helped to ensure that water is flushed offshore rather than being allowed to stand in developed areas. Any future disaster relief funding will also be allocated towards the completion of the prioritized projects in the Master Drainage Plan.

http://www.cityofrockport.com/81/Water-Department
http://www.cityofrockport.com/82/Wastewater-Department
http://www.cityofrockport.com/494/Water-Plan

SCHOOLS & LIBRARIES

The City of Rockport is one of five communities included in the Aransas County Independent School District. The school district is an independent county-wide school system serving a 486 square mile area, and 3,316 students. Other communities in the district are Holiday Beach, Lamar, Fulton, and the northern part of Aransas Pass.

Five schools make up the district: Little Bay Primary School (grades Pre-Kindergarten through Kindergarten), Live Oak 1-3 Learning Center (grades 1-3), Fulton 4-5 Learning Center (grades 4-5), Rockport-Fulton Middle School (grades 6-8), and Rockport-Fulton High School (grades 9-12).

Each school within the district has a library, and all libraries are open during school hours. Aransas County also maintains a Public Library, located in downtown Rockport. The Public Library was established 1956, with the assistance of the Women's Club of Aransas County.

The Education Foundation is a nonprofit organization, founded in August 2001, by an independent group of community, business, and educational leaders. The Education Foundation encourages community support in providing private funds to Aransas County Independent School District staff and students for creative, innovative programs that enhance career and academic education and promote staff excellence.

Sacred Heart is a private, catholic school located in Rockport. It has Montessori classes for 3 to 5 year olds, and traditional classes for Kindergarten to 5th grades.

https://www.acisd.org/index.cfm?p=aboutACISD
http://acedfoundation.org/about-aransas-education-foundation.html
https://www.acplibrary.org/
http://shsrockport.org/school-history

FIRE & POLICE SERVICES

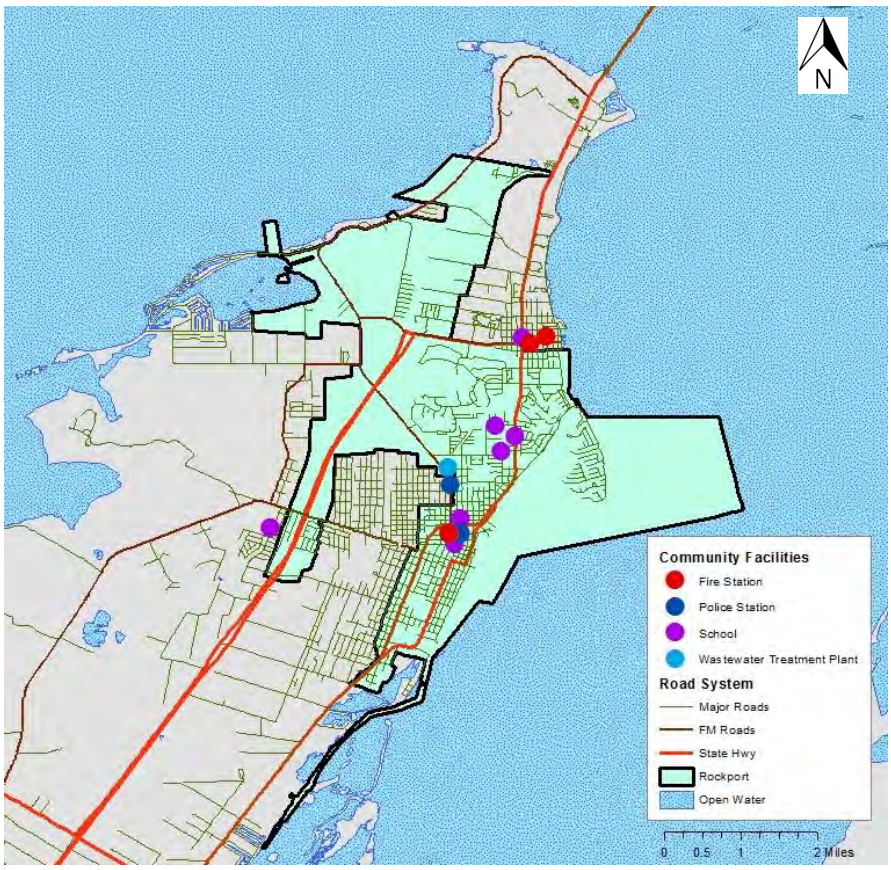
The Rockport Volunteer Fire Department: is a nonprofit organization, independent of the City of Rockport. Regardless, the department receives annual funding through the city's "General Fund." Additional funds are allocated through a monthly surcharge on each utility bill, by Aransas County, and by the Rural Volunteer Fire Department Assessment Program. Like other first responders, the Volunteer Fire Department remains on call 24 hours a day, 7 days a week. The department also works with neighboring cities and towns to provide mutual aid when it is needed.

The City of Rockport has adopted the International Fire Code, 2006 edition; as such, the burning of brush, trash, or other rubbish is prohibited within the city limits without the express permission of the Fire Marshall.

The Rockport Police Department: conducts preventative motor patrols, tactical bike patrols, and seasonal water safety patrols. The department has a "Criminal Investigation Division" which reviews and investigates reports of felony and misdemeanor criminal acts; identifies suspects, both adult and juvenile; and prepares cases for prosecution with the U.S., District, County, and City Attorneys' offices. The Criminal Investigation Division also offers support to victims of crimes.

Map. 10.3 identifies the location of key community facilities.

Map 10.3: Community Facilities.



Map created using data from: Federal Emergency Management Agency HAZUS; US Census Bureau TIGER Products.

http://www.cityofrockport.com/409/Fire
http://www.cityofrockport.com/172/City-Fire-Marshall
http://www.cityofrockport.com/84/Police
http://www.cityofrockport.com/86/Criminal-Investigation-Division

MEDICAL SERVICES

Regional Medical Services:
Christus Spohn Health System provides medical services throughout the Coastal Bend. The system consists of six hospital campuses and six family health centers; as well as a variety of other services. Christus Spohn does not have any facilities in Rockport; however, a few services are located in nearby Aransas Pass.

Care Regional Medical Center is located in Aransas Pass and provides a variety of emergency to specialty services. It has 75 beds, 80 physicians, and 200 employees.

Rockport Urgent Care is managed by Twin Fountains Medical Center. In addition to urgent care, it offers basic services such as physicals, x-rays, pediatrics, and vaccinations/immunizations.

Allegiance Ambulance provides three vehicles for EMS and 911 calls in Aransas County.

Rockport Medical Services:
Rockport has three facilities that serve as nursing homes, adult day care centers, and rehabilitation units: Gulf Pointe Plaza; Rockport Coastal Care Center Inc.; and Oak Crest Nursing Center.

Four companies provide hospice and home health services: AIM Hospice; Cornerstone Home Health; Harbor Hospice; and Sea Crest Home Health.

http://www.christusspohn.org/
http://www.crmctx.com/
http://tfmc.nextcare.com/locations/rockport/
http://members.rockport-fulton.org/list/ql/health-care-11

EVACUATION PROCEDURES

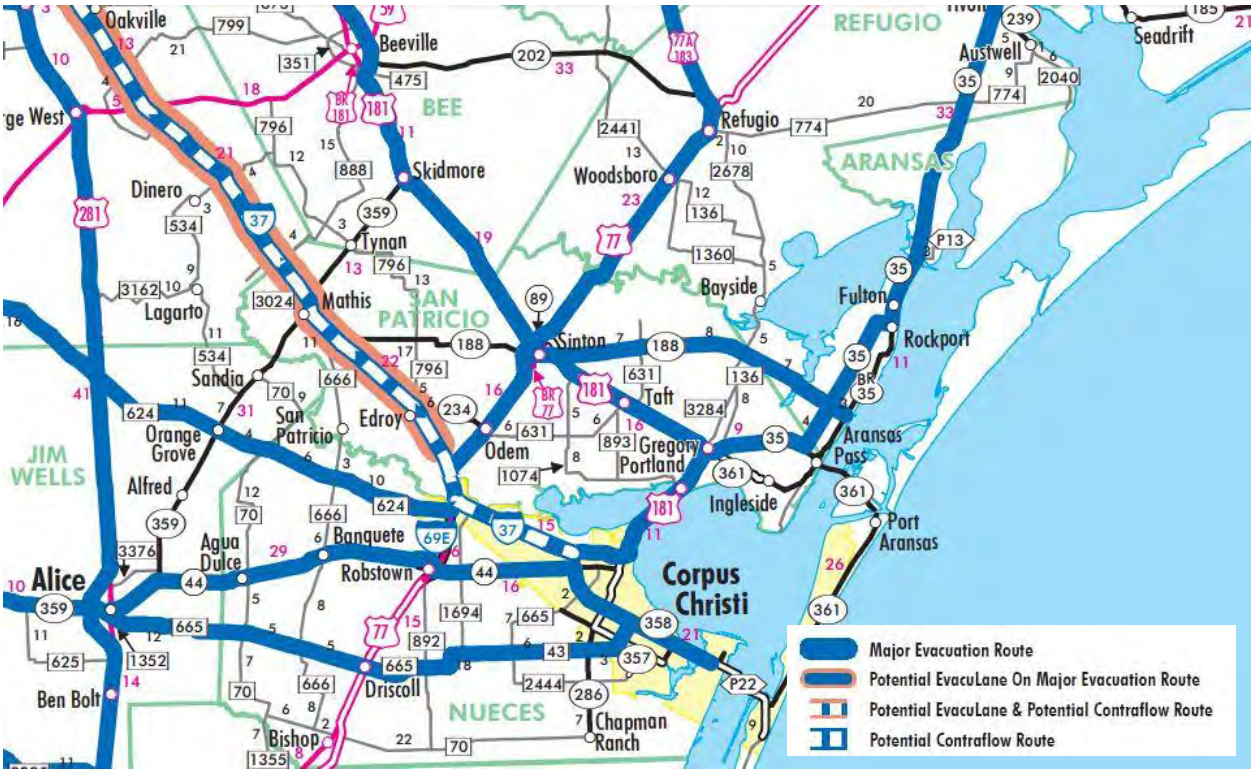
During an emergency, the City of Rockport and Aransas County will implement the "FirstCall Emergency Notification System." The system enables the rapid distribution of information to the community. The information can be delivered as a short voice message via telephone, a text message via cell phones, or an email. Residents must register with the system in order to receive notifications.

The City of Rockport operates a low-power emergency advisory radio station. The station broadcasts 24 hours a day. In the event of an emergency, the 1610 AM emergency advisory radio station will provide public safety information, advisories, and announcements.

The City of Rockport's website will also report information during tropical storm events. The website is based outside of Texas, allowing it to remain operational regardless of the conditions in Rockport. In the event of a mandatory evacuation, selected city staff will relocate to the Austin area and update the website with information.

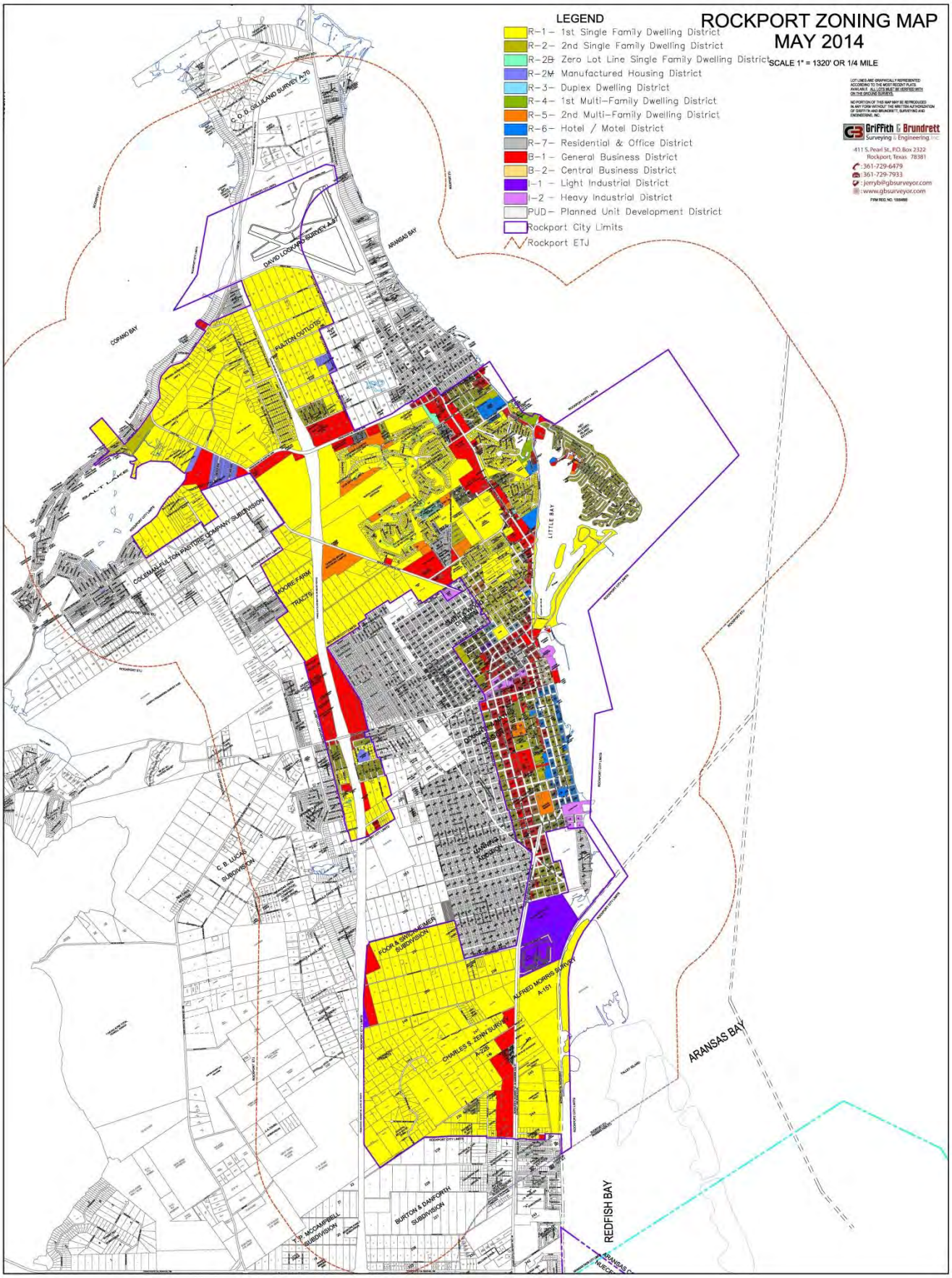
Map 10.4 shows the evacuation routes to be utilized in the event of an imminent storm.

Map 10.4: Hurricane Evacuation Routes.



Map from: http://ftp.dot.state.tx.us/pub/txdot-info/trv/evacuation/corpus.pdf.

CHAPTER 11
LAND USE



Map from: http://www.cityofrockport.com/ArchiveCenter/ViewFile/Item/992.

APPENDICES

APPENDIX 1: Listed Species Observed in Aransas County.

COMMON NAME	SCIENTIFIC NAME	FEDERAL LISTING	STATE LISTING
AMPHIBIANS			
Black-spotted newt	*Notophthalmus meridionalis*		Threatened
Sheep frog	*Hypopachus variolosus*		Threatened
BIRDS			
American Peregrine Falcon	*Falco peregrinus anatum*	Delisted	Threatened
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Delisted	
Brown Pelican	*Pelecanus occidentalis*	Delisted	
Eskimo Curlew	*Numenius borealis*	Endangered	Endangered
Henslow's Sparrow	*Ammodramus henslowii*		
Mountain Plover	*Charadrius montanus*		
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	Endangered	Endangered
Peregrine Falcon	*Falco peregrinus*	Delisted	Threatened
Piping Plover	*Charadrius melodus*	Threatened	Threatened
Red Knot	*Calidris canutus rufa*		
Reddish Egret	*Egretta rufescens*		Threatened
Snowy Plover	*Charadrius alexandrinus*		
Sooty Tern	*Sterna fuscata*		Threatened
Sprague's Pipit	*Anthus spragueii*		
Western Snowy Plover	*Charadrius alexandrinus nivosus*		
White-faced Ibis	*Plegadis chihi*		Threatened
White-tailed Hawk	*Buteo albicaudatus*		Threatened
Whooping Crane	*Grus americana*	Endangered	Endangered
Wood Stork	*Mycteria americana*		Threatened
FISHES			
American eel	*Anguilla rostrata*		
Opossum pipefish	*Microphis brachyurus*		Threatened
Smalltooth sawfish	*Pristis pectinata*	Endangered	Endangered
MAMMALS			
Aransas short-tailed shrew	*Blarina hylophaga plumbea*		
Black bear	*Ursus americanus*		Threatened
Jaguarundi	*Herpailurus yaguarondi*	Endangered	Endangered
Louisiana black bear	*Ursus americanus luteolus*	Delisted	Threatened
Ocelot	*Leopardus pardalis*	Endangered	Endangered
Plains spotted skunk	*Spilogale putorius interrupta*		
Red wolf	*Canis rufus*	Endangered	Endangered
West Indian manatee	*Trichechus manatus*	Endangered	Endangered
White-nosed coati	*Nasua narica*		Threatened

Table created using data from: http://tpwd.texas.gov/gis/rtest/.

APPENDIX 1: Listed Species Once Recorded in Aransas County (continued).

COMMON NAME	SCIENTIFIC NAME	FEDERAL LISTING	STATE LISTING
REPTILES			
Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	Endangered
Green sea turtle	*Chelonia mydas*	Threatened	Threatened
Kemp's Ridley sea turtle	*Lepidochelys kempii*	Endangered	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened	Threatened
Texas diamondback terrapin	*Malaclemys terrapin littoralis*		
Texas horned lizard	*Phrynosoma cornutum*		Threatened
Texas scarlet snake	*Cemophora coccinea lineri*		Threatened
Texas tortoise	*Gopherus berlandieri*		Threatened
Timber rattlesnake	*Crotalus horridus*		Threatened
PLANTS			
Awnless bluestem	*Bothriochloa exaristata*		
Coastal gay-feather	*Liatris bracteata*		
Elmendorf's onion	*Allium elmendorfii*		
Indianola beakrush	*Rhynchospora indianolensis*		
Sand Brazos mint	*Brazoria arenaria*		
Texas peachbush	*Prunus texana*		
Tharp's rhododon	*Rhododon angulatus*		
Threeflower broomweed	*Thurovia triflora*		
Tree dodder	*Cuscuta exaltata*		
Velvet spurge	*Euphorbia innocua*		
Wright's trichocoronis	*Trichocoronis wrightii var. wrightii*		

Table created using data from: http://tpwd.texas.gov/gis/rtest/.

THE CITY OF ROCKPORT

ALTERNATIVE SCENARIOS REPORT

Conducted in conjunction with the Aransas County Floodplain Management Planning Process

September 2016

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Special thanks to:

MISSION • ARANSAS NATIONAL ESTUARINE RESEARCH RESERVE

TEXAS COASTAL WATERSHED PROGRAM

and the citizens of Rockport for their support on this project.

INTRODUCTION

Flooding and hurricane events in Texas over the past decade have shown that now is the time to improve Rockport's approach to flooding and disaster resilience. Aransas County and the City of Rockport have worked with Texas Coastal Watershed Program and Texas Sea Grant since 2015 to begin a local discussion about the needs and opportunities for this area. To this end, the Texas Coastal Watershed Program (TCWP) provided resiliency workshops in August of 2015 and in March of 2016. These workshops—offered to any Texas coastal county—are designed to initiate discussions intended to help support the building of durable, safe, and loved communities.

> Resilience: the ability to become strong, healthy, or successful again after something bad happens.
>
> -Merriam-Webster

The resiliency workshops utilize the Community Heath and Resources Management (CHARM) mapping tool, which was developed by TCWP, to help communities see how today's planning decisions will impact tomorrow's environment and community. The tool has the capacity to track over three dozen indicators, which can be used to assess planning decisions. CHARM, and the data, it generates allows local officials and citizens to digitally map potential development scenarios, and see the probable ramifications with real-time feedback.

As the City of Rockport, and Aransas County, pursue opportunities to better plan for our future, they would like to further engage the community in these discussions. This report is meant to inform the community about possible planning alternatives, and open a dialog about Rockport's future. None of the scenarios contained in this report are perfect. They are meant to showcase some potential opportunities, and allow the community to begin considering the different ideas they contain. It is intended that as a community, Rockport can decide on an "ideal future scenario" that the community supports, and will work to develop over the next 20 years. The scenarios within this document provide a starting point—ideas—that can be cultivated, altered, and transformed into a comprehensive vision of Rockport.

This report includes four alternative scenarios from which to start this discussion. Each of these scenarios map out different potential futures for the city, and surrounding areas of Aransas County. Two of the scenarios were developed by city staff and local citizens at the resiliency workshop in August of 2015. These were ideas created by local representatives and neighbors on how the city could expand and develop over the next 20 years. These scenarios are the "Large Development" scenario which focuses development along the interior core of the peninsula; and the "Maximum Development" scenario which focuses on creating a diverse array of development types, while protecting key natural areas. The other two scenarios were developed by a team of staff from the City of Rockport, Mission-Aransas National Estuarine Research Reserve, TCWP, and Texas Sea Grant. These scenarios are the "Development as Usual" scenario (or the "no change" scenario) which uses recent development history, and current development applications to predict what will occur if the city continues under the existing policies. Finally, the "Minimal Development" Scenario attempts to focus growth outside of flood-prone areas and preserve some key natural areas in order to provide an option for meaningful, constrained growth. The scenarios also offer a different model for expected population growth, assuming a large influx in both "Large" and "Maximum" scenarios, and lower population growth numbers in the "Development as Usual" and "Minimal Development" scenarios.

It is important to note that these scenarios include areas outside of the current City of Rockport boundaries. Unincorporated areas of the county have been periodically annexed and officially added to the City of Rockport city limits. It is anticipated that this will continue as development expands; as such these scenarios look at the city and the surrounding areas where development is expected to occur. Generally, the scenarios anticipate the growth of population, provide options regarding the types of development which could

accommodate that growth, and strategize where those developments could be placed. Growth is going to occur. The questions are: 1) how much growth; and 2) how does the community plan for growth in ways that ensure there will be a community that is safe, durable, and lovable in 2036?

The CHARM mapping tool was utilized to create each of the alternative scenarios. In creating these scenarios, the tool allows the groups to paint (via computer interface) on the existing map of the area with ten colors that represent different types of development. The types of development are defined in Table 1.

Table 1: Development Types.

Type of Development	Description
Town Center Mixed Use	A walkable mix of residences, retail, and offices, with transit options, and a small town feeling. It provides the most equal division between residential (33%), commercial (33%), and business (34%) opportunities. The buildings could be between one and three stories. There could be a mix of multifamily homes and single family homes, with an average of 30 homes per acre. There is a high percentage (85%) of impervious land cover.
Business Throughway	A walkable mix of residences, retail, and offices, with transit options, and an urban feeling. It provides slightly higher commercial (50%) and business (40%) opportunities, and less housing (10%) than the Town Center Mixed Use development. The buildings would be multi-story, possibly higher than three stories. This development would result in 20 homes per acre and 85% impervious land cover.
Low-Rise Residential	A mostly residential development, with transit options, and a small town feeling. The buildings would be between one and three stories, provide a multi-family setting, and 20 homes per acre. Only 4% of the development would be devoted to retail, and there would be no business opportunities. The land cover would be 70% impervious.
Postage Lawns Town Grid	A mostly residential development with a focus on single-family homes and suburban character. There is the possibility of neighborhood retail stores, but only 4% of the development would go to those commercial options. Like the Low-rise Residential, there are no business/office buildings. The availability of lawns provides considerably more pervious land cover; the result would be 35% impervious land cover.
Canal Homes and Condos	Unique to coastal communities, this development places single-family homes along a system of canals as well as streets. It is 96% residential, 2% retail, and 2% business. The buildings may be multi-story and the land cover would be 65% impervious.
Suburb Subdivisions	Highly suburban in character and 100% residential. The buildings are one to two stories and mostly single-family homes. Like the Postage Lawn Town Grid development, there are more lawns, more pervious surfaces, and the land cover is therefore only 38% impervious.
Park and Recreation Facilities	100% natural, publicly-protected, recreational open space. The impervious land cover is minimal (2%) and provides for public services such as parking and bathrooms.
Conservation Areas	100% natural, publicly-protected open space for recreation, agriculture, or wildlife habitats. The public services and roads are much less than in the Park and Recreational developments; the land cover is considered completely pervious.
Ranching and Agriculture	Strictly cultivated for ranching and agriculture. The land cover is only 2% impervious, with limited facilities, homesteads, and roads.
Heavy Industry	Developed land for rail, trucking, shipping, manufacturing, refining, and processing. The buildings are mostly one story, and the land cover is 100% impervious. Although this is an option in the CHARM mapping tool, no developments are considered heavy industry in the included scenarios.

As mentioned previously, the CHARM tool tracks a variety of indicators which can be used to assess planning decisions. Appendix 1 includes a table detailing a variety of these indicators for each of the proposed scenarios. Many of these numbers are discussed in the report for each of the individual scenarios; but not every indicator will be discussed for each scenario.

The remaining sections of this report will describe each of the four alternative scenarios, and discuss the associated implications for the city.

MIMIMAL DEVELOPMENT SCENARIO

The "Minimal Development" scenario is a staff-generated scenario that shows the lowest amount of development and concentrates that development in areas of higher elevation. This scenario is based on recently proposed development, while trying to protect some key natural areas, and offering a bit of constraint and diversity to the types of development. An ongoing area of expansion is along State Highway 35, southwest of the city limits (see Figure 1, page 8). Currently, there are pockets of development along the highway. If growth proceeds according to current land use practices, all these pockets will eventually become connected. This scenario assumes growth will continue in this area according to the current land use practices; and therefore places Business Throughway development along this stretch of the highway. Business Throughway development focuses on commercial and business opportunities, but also provides some residential use. It has an urban feel. Since State Highway 35 is one of the highest points on Live Oak Peninsula this is one of the safest places for development in the area. This Business Throughway immediately transitions into Suburban Subdivisions on both sides of the highway. Suburban Subdivisions focus on single-family homes and other residential uses. This would complement the Business Throughway development, and give the neighborhood residents easy access to stores and restaurants. One key aspect of this scenario is the inclusion of four parks within the Suburban Subdivisions (see Figure 2, page 9). These parks would encompass large sections of freshwater wetlands which act as natural buffers during storms, improve drainage and water quality of storm runoff, and generally prevent the water from flooding developed land.

Further north along State Highway 35, within the city limits of Rockport, an additional Business Throughway development is included. Beyond this smaller section of Business Throughway, where State Highway 35 turns east towards the Rockport-Fulton border, a small Low-Rise Residential neighborhood is also included. This type of development focuses primarily on multi-family residential buildings with a small amount of retail. Finally, there are two areas set aside for conservation in this scenario. The first area sits at the southeastern tip of Rockport's city limits; the second area dominates the eastern shore of Salt Lake. These two areas are critical because they include large areas of estuarine wetlands which provide natural drainage to the entire peninsula (see Figure 3, page 10). Large areas of wetlands are important to conserve because of the multitude of benefits they provide. Wetlands act as natural "sponges," filtering storm water runoff and improving water quality, while helping to prevent flooding in surrounding areas. Wetlands are also biologically important areas for a variety of plants and animals which enhance the productivity of our bays and estuaries.

The combination of Suburban Subdivisions and Low-Rise Residential neighborhoods provide a mix of single-family and multi-family homes. These, along with the Business Throughway and the Parks and Conservation areas, provide a mix of urban, suburban, and small town settings that protect key natural areas which provide natural buffers to aid in water absorption, and minimize flooding.

The "Minimal Development" scenario models a 3% growth rate over 20 years, which increases the population to 34,195, the lowest population growth rate among the scenarios. A total of 5,493 new homes would be built, with 87% existing outside current Rockport city limits. 77% of these new homes would be single-family structures, and 23% would be multi-family buildings (e.g. apartments and condominiums). It is important to note here that no new homes would be built in the floodplains (100-year or 500-year) (see Figure 4, page 11). However, if a Category 5 hurricane hits the area, then 4,861 of the newly built homes (25%) would be impacted by surge inundation (see Figure 5, page 12).

This scenario focuses the proposed development along the areas of highest elevation. A total of 2,337 homes would be built in or adjacent to freshwater wetlands, while no new homes would be in or adjacent to estuarine wetlands (see Figure 6, page11).

The amounts of water usage and impervious land cover are two additional issues that will impact the city as it develops over time, and are important considerations in each of our scenarios. The CHARM model uses these two factors as indicators. Each of the development types are assigned an average amount of water

demand according to national averages in other developments of this style. These usage estimates are calculated for indoor (drinking, cooking, showers, etc.), and outdoor (pools and lawns) consumption. Suburban Subdivisions, which make up a large percentage of the new development in this scenario, have one of the highest amounts of indoor water use per household. In addition, Suburban Subdivisions have the highest amount of outdoor usage. This would result in an overall increase in demand (new demand) for water in Rockport of 72% for indoor usage, and 28% for outdoor usage. This is an important consideration in future water planning for the City of Rockport. The city would need to ensure that it plans for the ability to accommodate for these new usage needs over the next 20 years.

Similarly, each of the development types are assigned an average percentage of impervious surface coverage. This includes things like roads, parking lots, driveways, and building footprints. Impervious surface coverage is important because it reduces the area of open ground available to absorb water. Significant increases in impervious surfaces contribute to high amounts of water runoff during storms, flooding, and the reduced ability to recharge groundwater. The amount of impervious surface created in the course of development is usually mitigated in some way. However, not all of the effects are mitigated, and these unmitigated effects accumulate over time and must also be managed.

Figure 1: Minimal Development, Overview.

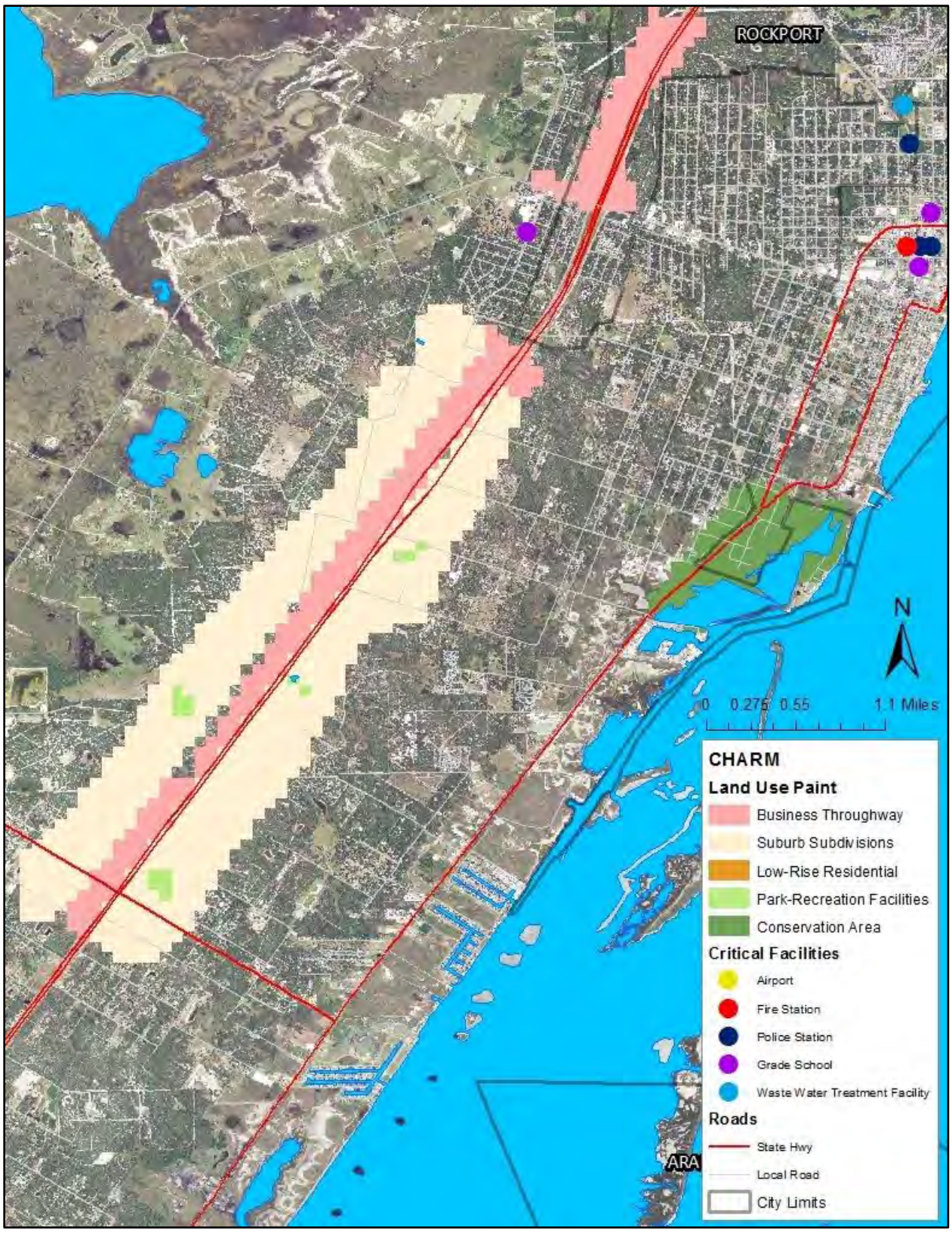

Figure 2: Minimal Development, Parks.

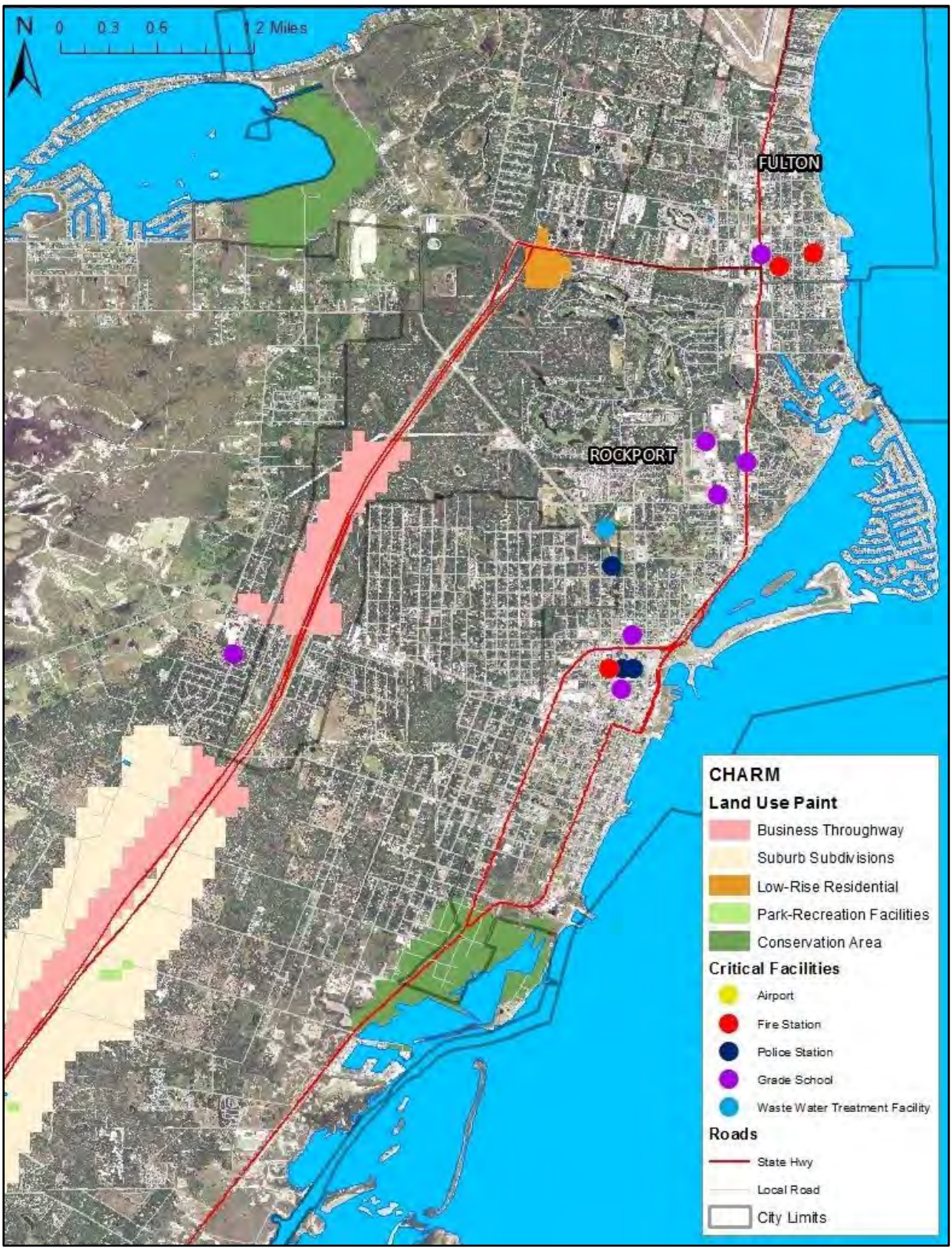

Figure 3: Minimal Development, Conservation Areas.

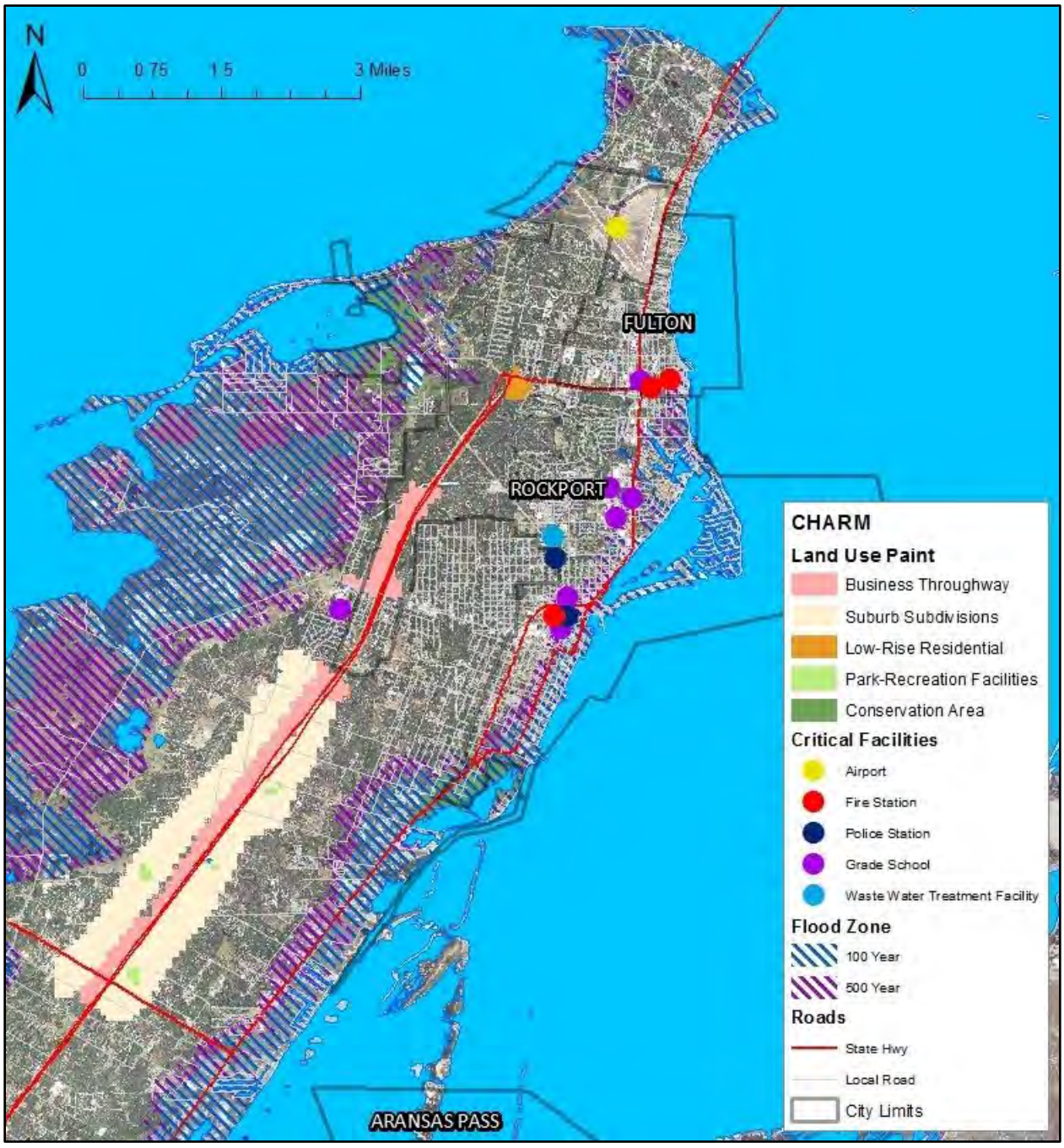

Figure 4: Minimal Development, Flood Zones.

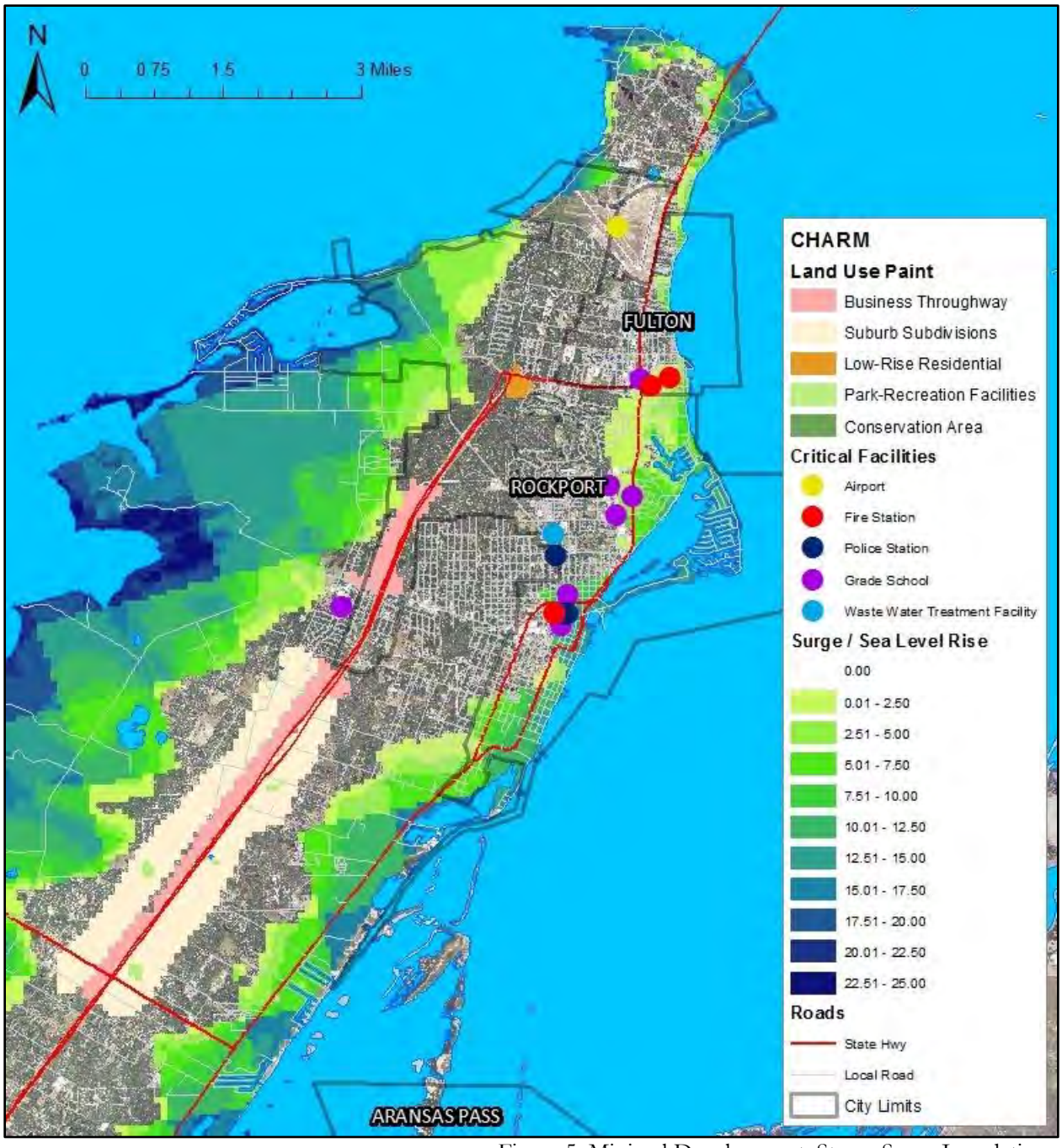

Figure 5: Minimal Development, Storm Surge Inundation.

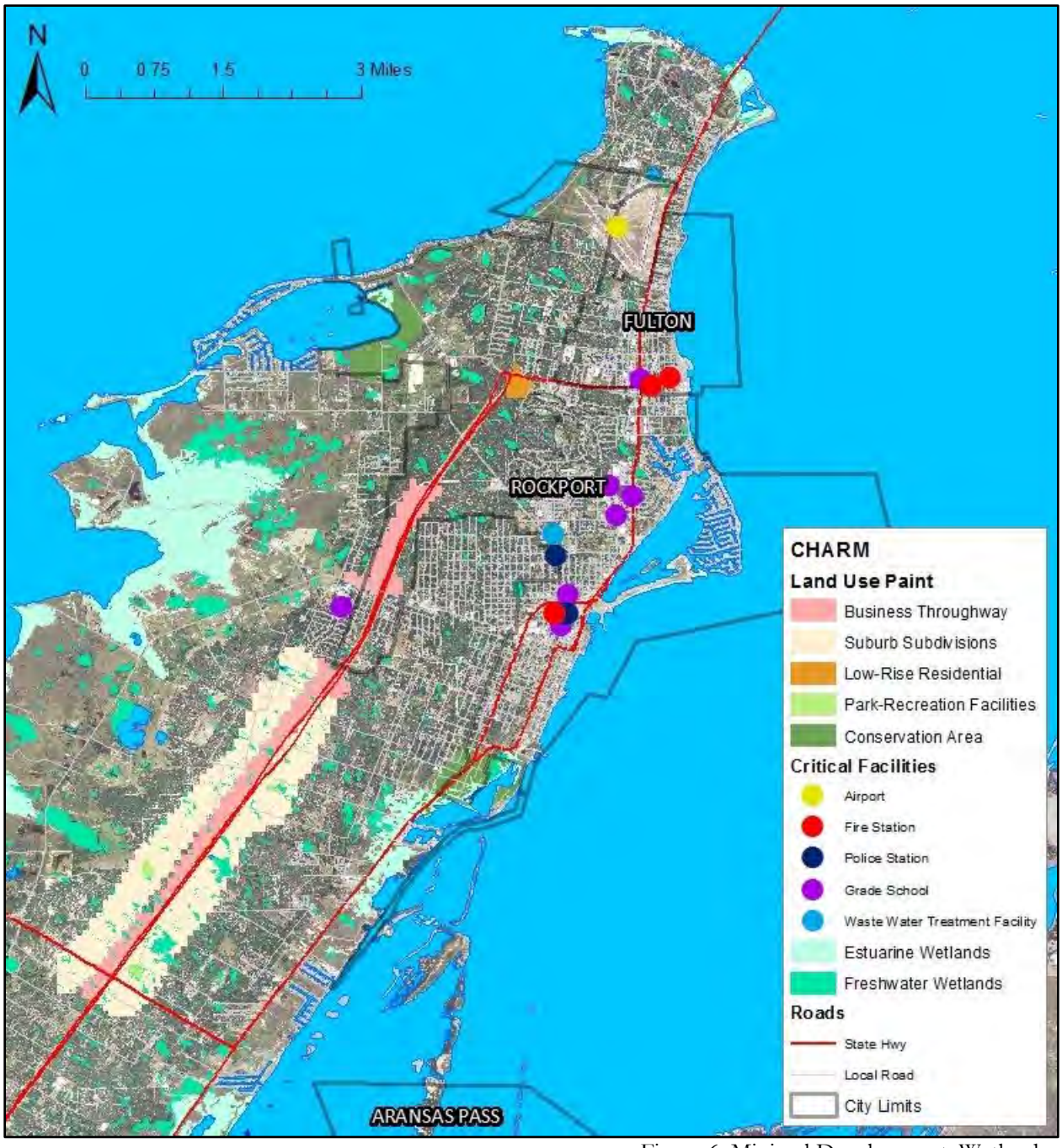

Figure 6: Minimal Development, Wetlands.

DEVELOPMENT AS USUAL SCENARIO

The "Development as Usual" scenario is a staff-generated scenario that accounts for areas where the City of Rockport is already considering annexation and for likely development projects. The main areas where these occur are along State Highway 35, southwest of the city limits (see Figure 7, page 16). Currently, there are pockets of development along the highway. If development proceeds according to current land use practices, all of these pockets will become connected. The scenario shows two bands on either side of the highway for Business Throughway development which then bleed into Suburb Subdivision development. Business Throughway development focuses on commercial and business opportunities, but also provides some residential use. It has a more urban setting compared to the Suburb Subdivision development that would lie beyond. The Suburb Subdivision, in turn, focuses on single-family homes and other residential uses. This would complement the Business Throughway development, and give the neighborhood residents easy access to stores and restaurants. Further north along State Highway 35, within the city limits of Rockport, additional Business Throughway development is included. Suburb Subdivisions are also included where the highway turns east towards the Rockport-Fulton border, and in the southeastern portion of the city along the coast.

Developers have also expressed an interest in building highly dense pockets of development in the northwestern and southeastern sections of the City. To accommodate for this highly dense development, staff chose to equate these projects to the Postage Lawn Town Grid development type from the CHARM tool. This decision was made because the proposed projects in these areas are similar to this type of development in the number of homes per acre, the high amount of residential use and minimal business operations, along with the amount of impervious land cover. Similarly, the Postage Lawn Town Grid "paint" color was used for another potentially highly dense development being considered in a northeastern portion of the city. This scenario also identifies potential Canal Home and Condo development in the southeastern portion of the city. This style of development is 96% residential, and allows for minimal retail and business operations. The focus on various high-density residential developments would accommodate the slightly larger population growth identified in this scenario; while doing so predominately through the use of single-family homes. The area would have a suburban character. In turn, the Business Throughway developments along the highways will focus more on commercial and business options, and have more of an urban feel.

This scenario models a population growth rate of 6% over 20 years, which results in slightly more than twice the existing population (47,264). It includes 11,106 new homes, with 18% of those homes falling within the current Rockport city limits and 82% of the homes being outside the current city limits. Single-family homes would make up 81% of the new housing, with multi-family homes (e.g. apartments and condominiums) making up the other 19%. A very low percentage of homes would be built in the floodplain–3% in the 100-year zone and 5% in the 500-year zone (see Figure 8, page 17). Figure 9 (page 18) shows that the developments along the coast, and portions of the coastal Suburb Subdivision, lie in the flood zones.

Overlap also exists between these homes and existing wetland areas (see Figure 10, page 19). The developments built along the southeastern portion of the city would eliminate 79 acres of estuarine (salt water) wetlands. In addition, 281 acres of freshwater wetlands would be lost on the peninsula due to the development in this scenario. This includes 2,547 new homes in or near estuarine wetlands, and 3,562 new homes in or near freshwater wetlands. In addition to the wetland acres lost, 2,547 acres of woodlands would also be impacted in this scenario. Theses habitats act as natural buffers during storms, absorbing precipitation and helping to prevent the water from flooding developed land. If the city chooses to provide protection to these areas, we could expect a reduction in the negative effects of flooding impacts, improved drainage, and better shoreline stabilization which helps decrease the effects of storm surge and large rain events. Another added benefit to preserving these areas is increased potential for park and recreation areas, enhancing the ability for Rockport residents and visitors to enjoy and appreciate their natural ecosystems. The social value of these systems is important and should be considered alongside the biological benefits of preserving natural habitat.

Figure 11(page 20) shows the areas that have the greatest likelihood of being impacted by surge, if a Category 5 hurricane were to strike in this scenario. As you can see in the map, almost all of the development along Aransas Bay, along the east side of the peninsula, has the potential to be impacted by this surge. In addition, some of the development along Copano Bay, on the western side of the peninsula, also has the potential to be impacted. The number of total future homes (existing and newly developed) at risk to surge inundation would be 5,786 homes (23%).

The amounts of water usage and impervious land cover are additional issues that will impact the city as it develops over time. The CHARM model uses these two factors as indicators. Each of the development types are assigned an average amount of water demand according to national averages in other developments of this style. These usage estimates are calculated for indoor (drinking, cooking, showers, etc.), and outdoor (pools and lawns) consumption. Canal homes and suburban subdivisions, which make up a large percentage of the new development in this scenario, have two of the highest amounts of indoor water use per household. In addition, suburban subdivisions have the highest amount of outdoor usage. This would result in an overall increase in demand (new demand) for water in Rockport of 72% for indoor usage, and 28% for outdoor usage. Like the "Minimal Development" scenario, this is an important consideration for future water planning for the city.

Similarly, each of the development types are assigned an average percentage of impervious surface coverage. This includes things like roads, parking lots, driveways, and building footprints. Impervious surface coverage is important because it reduces the area of open ground available to absorb water. Significant increases in impervious surfaces contribute to high amounts of water runoff during storms, flooding, and the reduced ability to recharge groundwater. The amount of impervious surface created in the course of development is usually mitigated in some way; however, not all of the effects are mitigated, and these unmitigated effects accumulate over time and must also be managed.

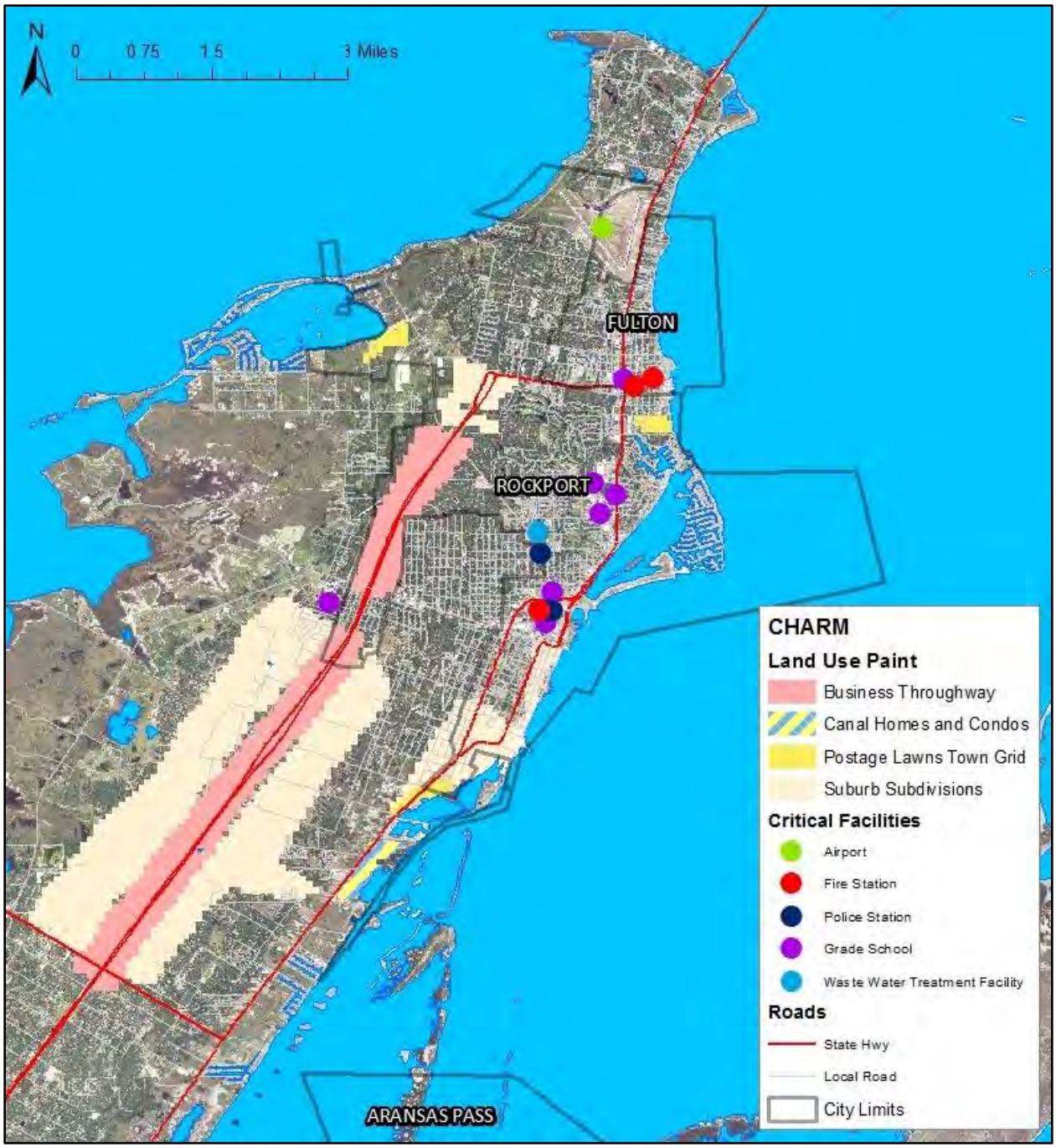

Figure 7: Development as Usual, Overview.

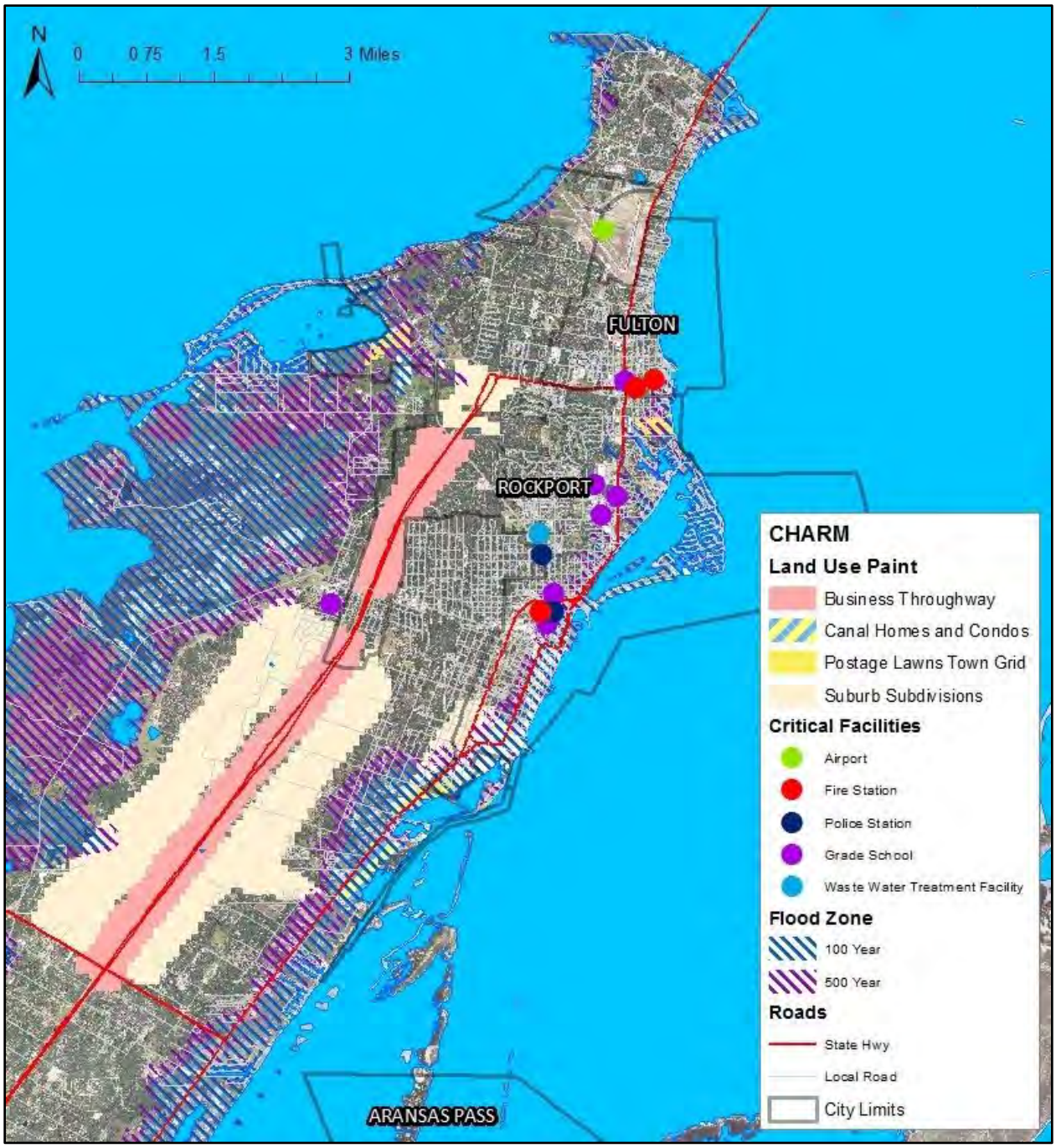

Figure 8: Development as Usual, Flood Zones.

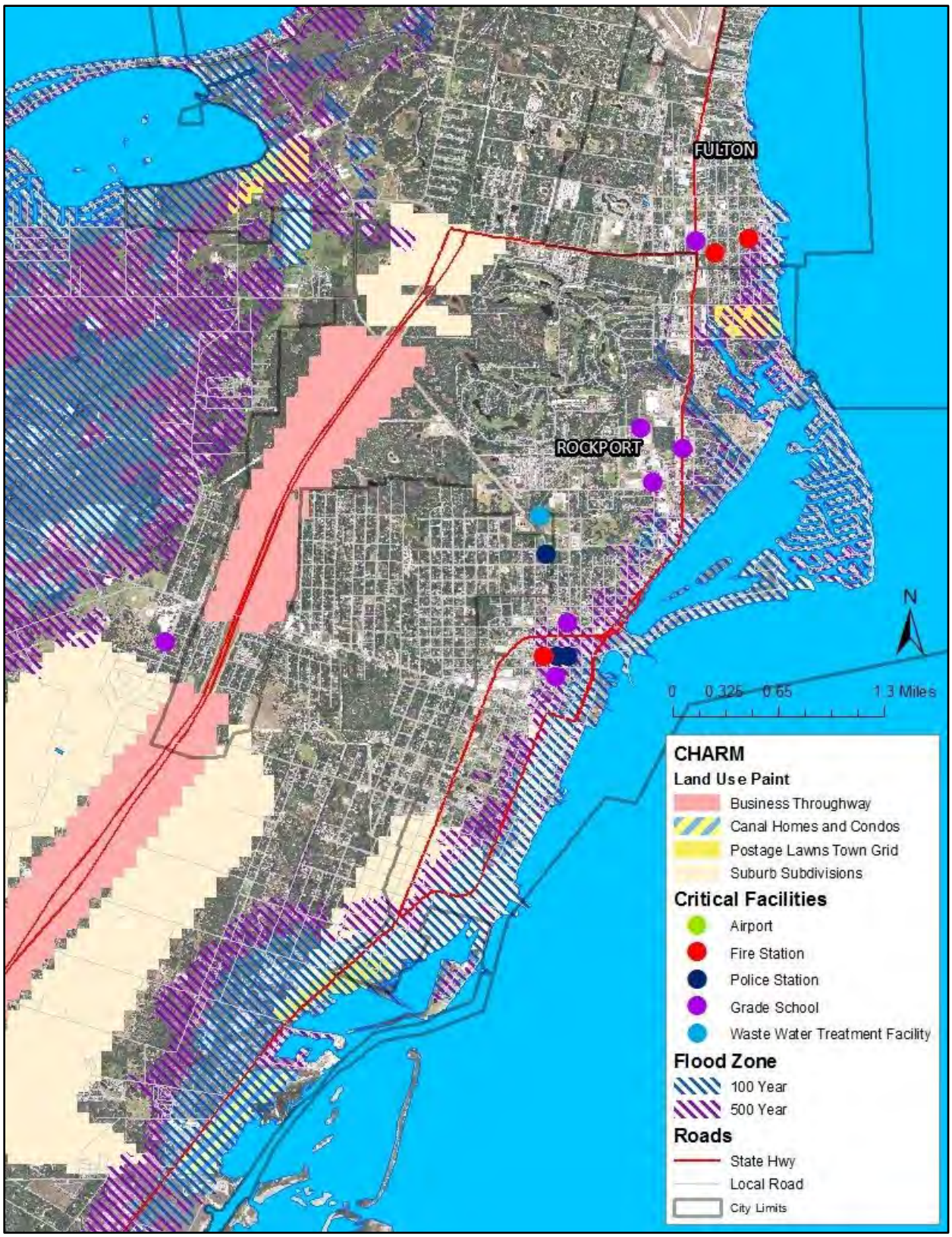

Figure 9: Development as Usual, Coastal Flood Zones.

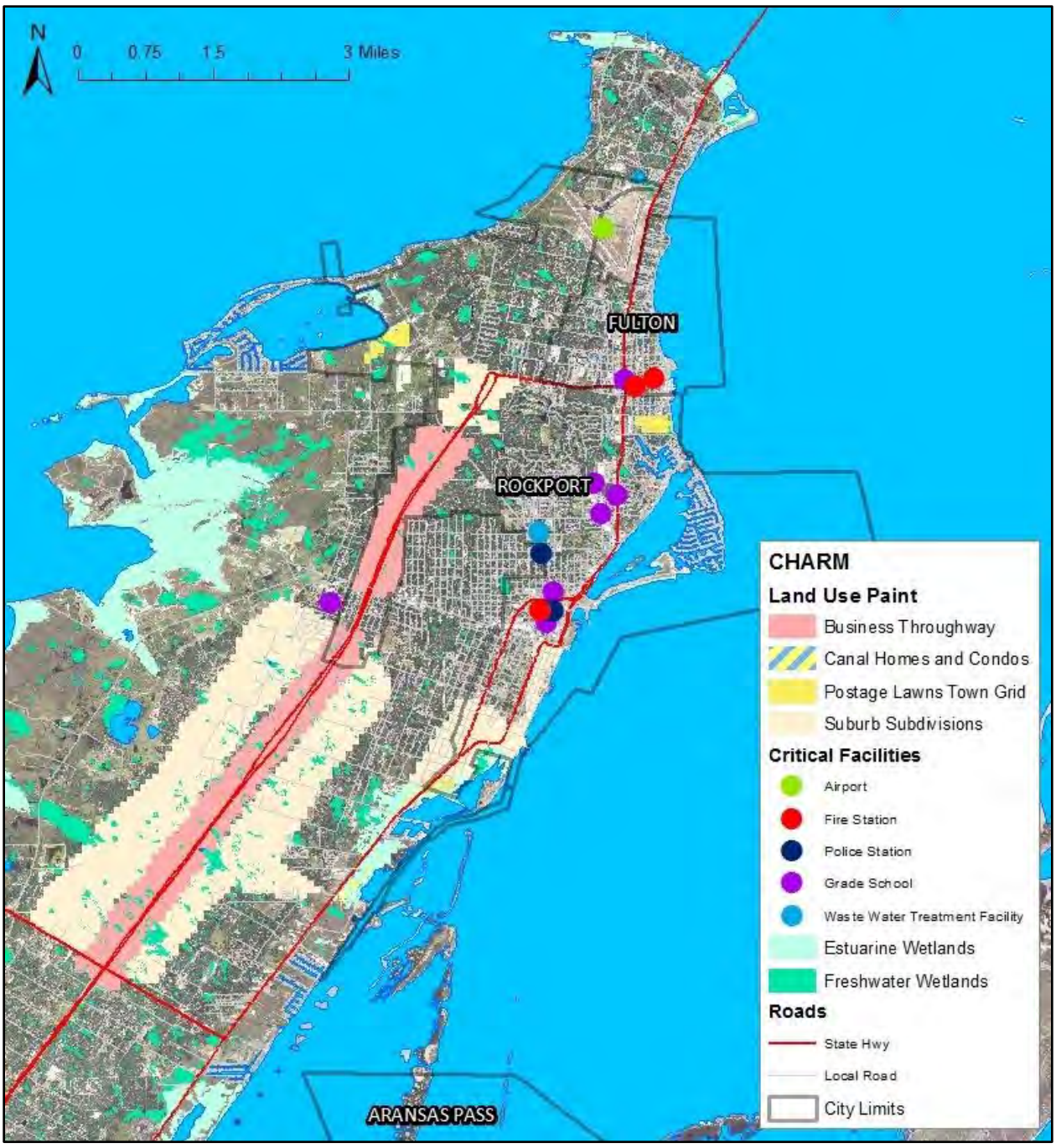

Figure 10: Development as Usual, Wetlands.

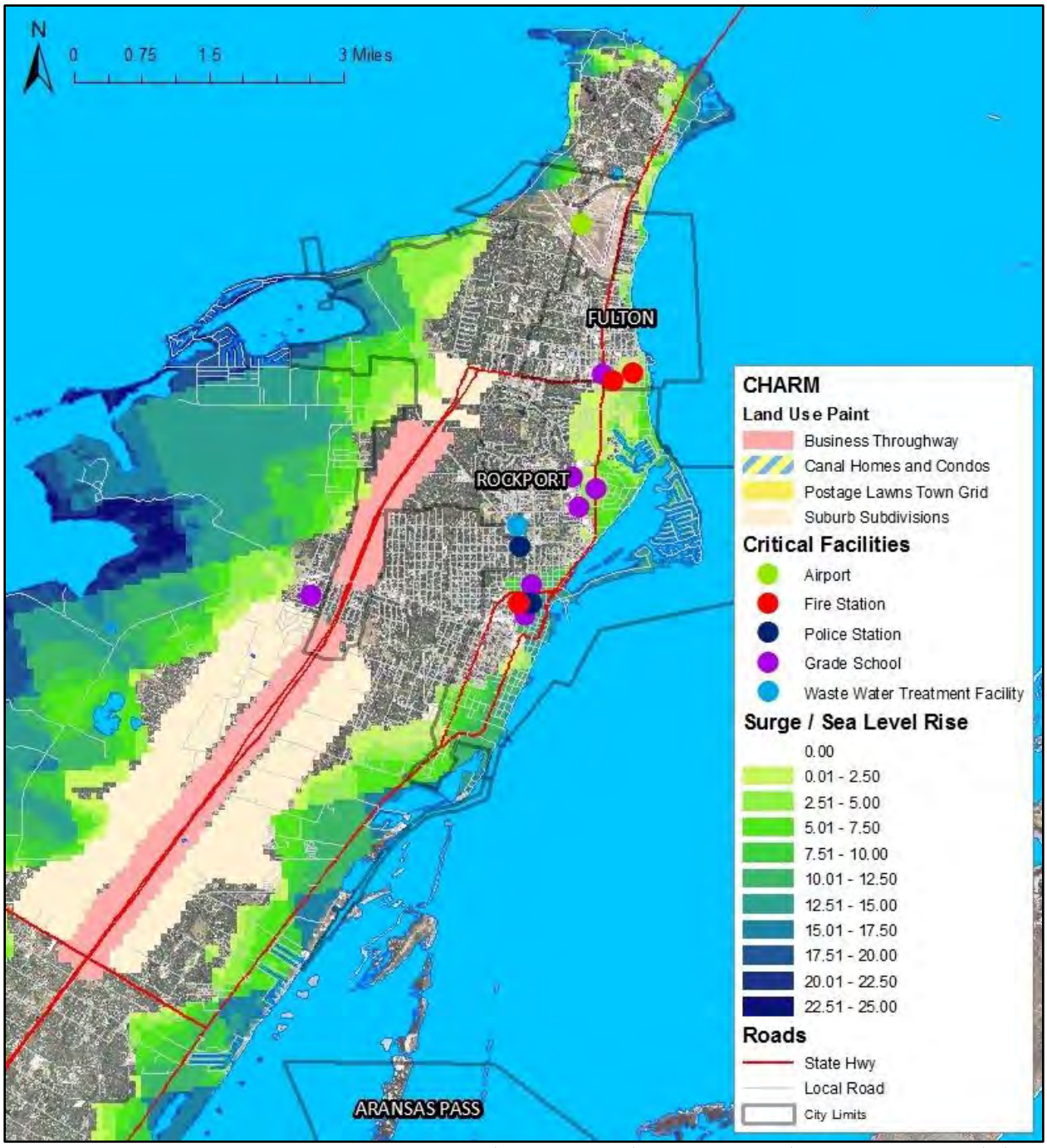

Figure 11: Development as Usual, Storm Surge Inundation.

LARGE DEVELOPMENT SCENARIO

The "Large Development" scenario is a community-generated scenario developed in the 2015 resiliency workshop which also uses the areas surrounding State Highway 35 as a source of development (see Figure 12, page 23). A large Suburb Subdivision is placed on the west side of the highway, south of Rockport's city limits. The Suburb Subdivision focuses on single-family homes. A Town Center Mixed Use development is placed just north of that subdivision, with most of the development occurring within the existing city limits. This will provide a densely built area of residences, retail and offices, which has a small town feel. A Low-rise Residential district lies east of the highway, mostly in a currently unincorporated portion of the county. This development will provide multi-family housing (e.g. apartments and condominiums) with a small amount of retail, and would expand the recent residential development in the area. This area sits between the two southern stretches of the City of Rockport and would be a logical area for annexation. The final development in this scenario is an additional Town Center Mixed Use area located just north of downtown Rockport.

The combination of the Low-Rise Residential and the Suburb Subdivision developments would present a large variety of homes, and help accommodate the relatively larger population growth anticipated in this scenario. The Town Center Mixed Use developments would provide homes as well, but would give equal access to retail shops and business offices. The mixed use developments would likely improve upon and expand the existing downtown area in Rockport, and allow the area to be walkable and transit friendly. The benefits of this type of development include maintaining Rockport's small—coastal—town feel, and maintaining the culture and connectedness of the community.

The "Large Development" scenario presents a 12% growth rate, which increases the population to 71,598 over 20 years. 22,961 new homes would be built, with 23% being located within the current city limits. This scenario provides an almost equal distribution of single-family (56%) and multi-family (44%) homes. This distribution is economically advantageous because multi-family housing is more affordable to the homeowner, while creating greater revenue on the city tax rolls. Likewise, the walkable, transit friendly, mixed use centers can allow for a greater variety of transportation options, possibly reducing the need for people to drive, and thus reduce the number of cars on the roads.

State Highway 35 is one of the highest points on Live Oak Peninsula. As such, development along this stretch would be ideal, given its elevation. However, this scenario focuses the Suburban Subdivision, and the Town Center Mixed Use developments along the western side of the highway. As such, the western most portions of both of these developments fall into the flood zones (see Figure 13, page 24). The development, as designed, would result in an additional 1,443 new homes (6%) falling within the 100-year floodplain, and an additional 4,014 new homes (17%) falling within the 500-year floodplain. These same areas have a high likelihood of being impacted by surge, if a Category 5 hurricane were to strike (see Figure 14, page 25). This scenario would result in an additional 6,740 new homes (32%) falling within the areas most likely to be impacted. The risks to homes and property, as well as the rising costs of flood insurance policies are considerations when developing in the floodplain. The ability of these homes to withstand the effects of flooding, and rebuild or recover following flood events, is another aspect to consider when developing in these areas.

The Suburban Subdivision development is built over a plethora of fresh water wetland areas (see Figure 15, page 26). These areas provide critical hydrologic functions by improving drainage, filtering runoff as it drains into the bay, and in retaining the water so that it does not flood developed areas. In total, this scenario results in in the loss of 422 acres of freshwater wetlands, and 62 acres of estuarine wetlands. This includes 156 new homes in or near estuarine wetlands, and 4,859 new homes in or near freshwater wetlands. If this scenario moved the proposed developments southwesterly, so that they straddle the highway, along with strategically placing a few conservation areas over some of the largest sections of wetlands, it would provide much needed natural buffers, reduce the amount of potential flooding, and help protect the investments made by homeowners, and the city in the future.

The amounts of water usage and impervious land cover are additional issues that will impact the city as it develops over time. Suburban Subdivisions, which make up a large percentage of the new development in this scenario, have one of the highest amounts of indoor water use per household. In addition, Suburban Subdivisions have the highest amount of outdoor usage. This would result in an overall increase in demand (new demand) for water in Rockport of 67% for indoor usage, and 33% for outdoor usage. Potential water demand continues to be an issue of concern.

Similarly, significant increases in impervious surfaces contribute to high amounts of water runoff during storms, flooding, and the reduced ability to recharge groundwater. The amount of impervious surface created in course of development is usually mitigated in some way; however, not all of the effects are mitigated, and these unmitigated effects accumulate over time, and must also be managed.

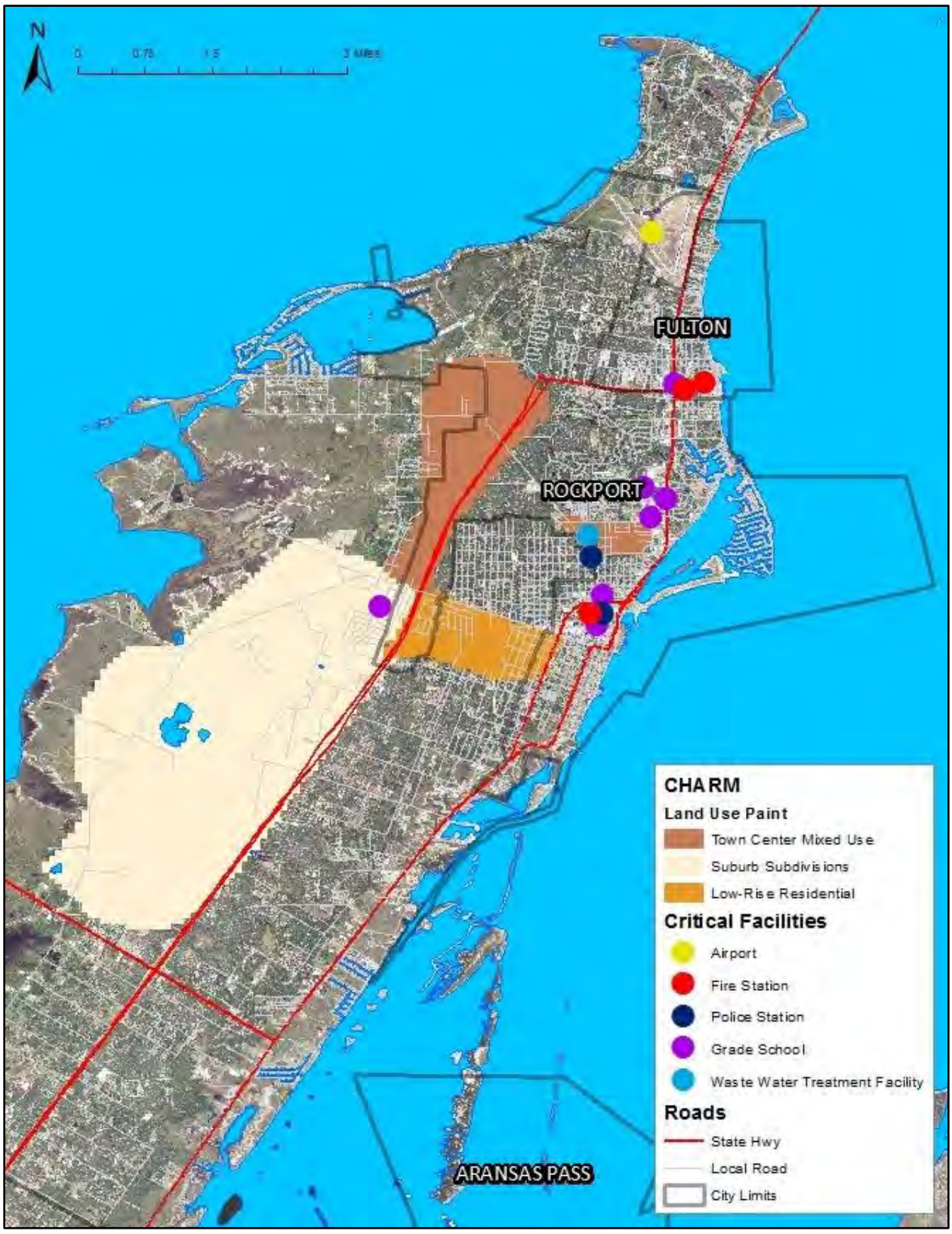

Figure 12: Large Development, Overview.

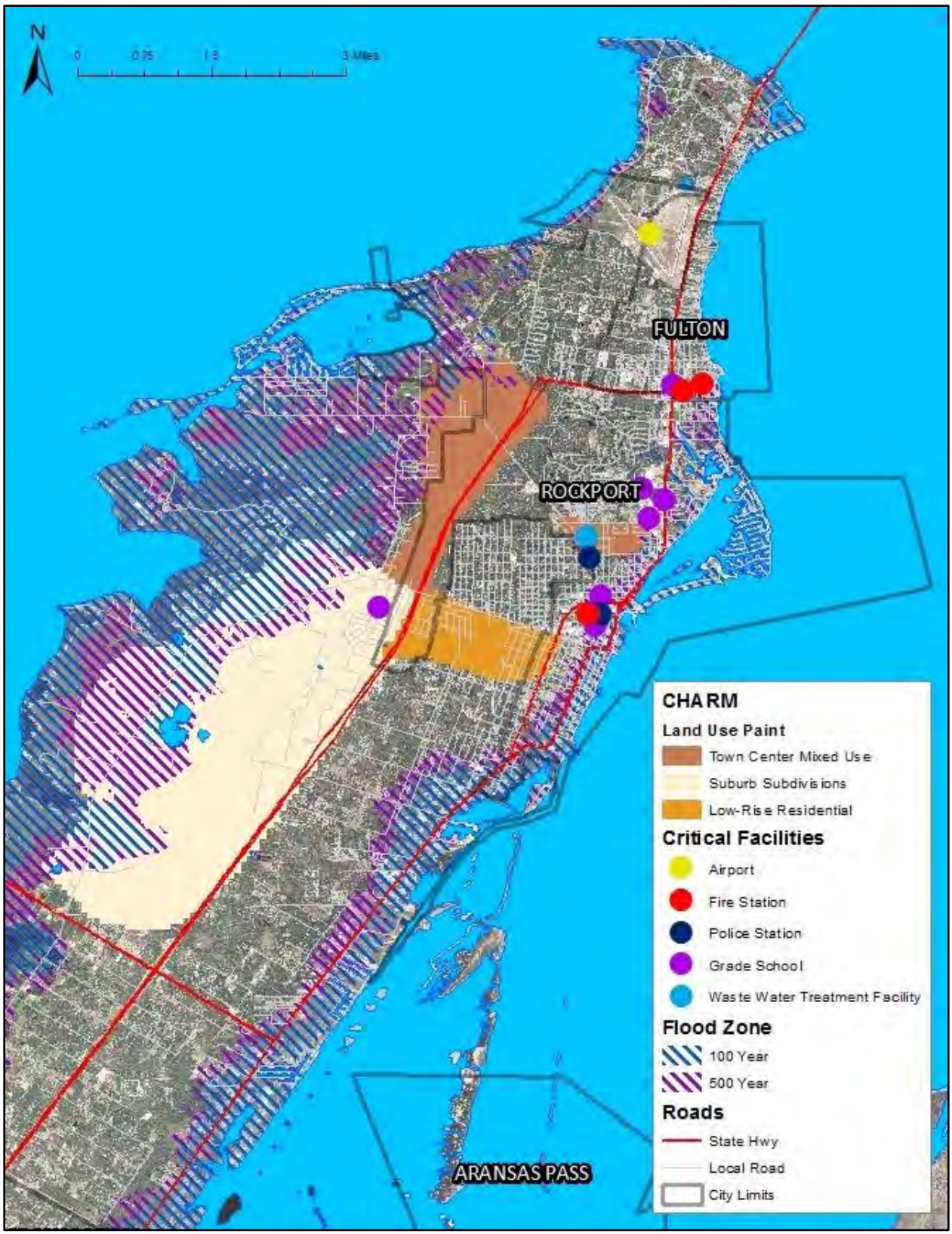

Figure 13: Large Development, Flood Zones.

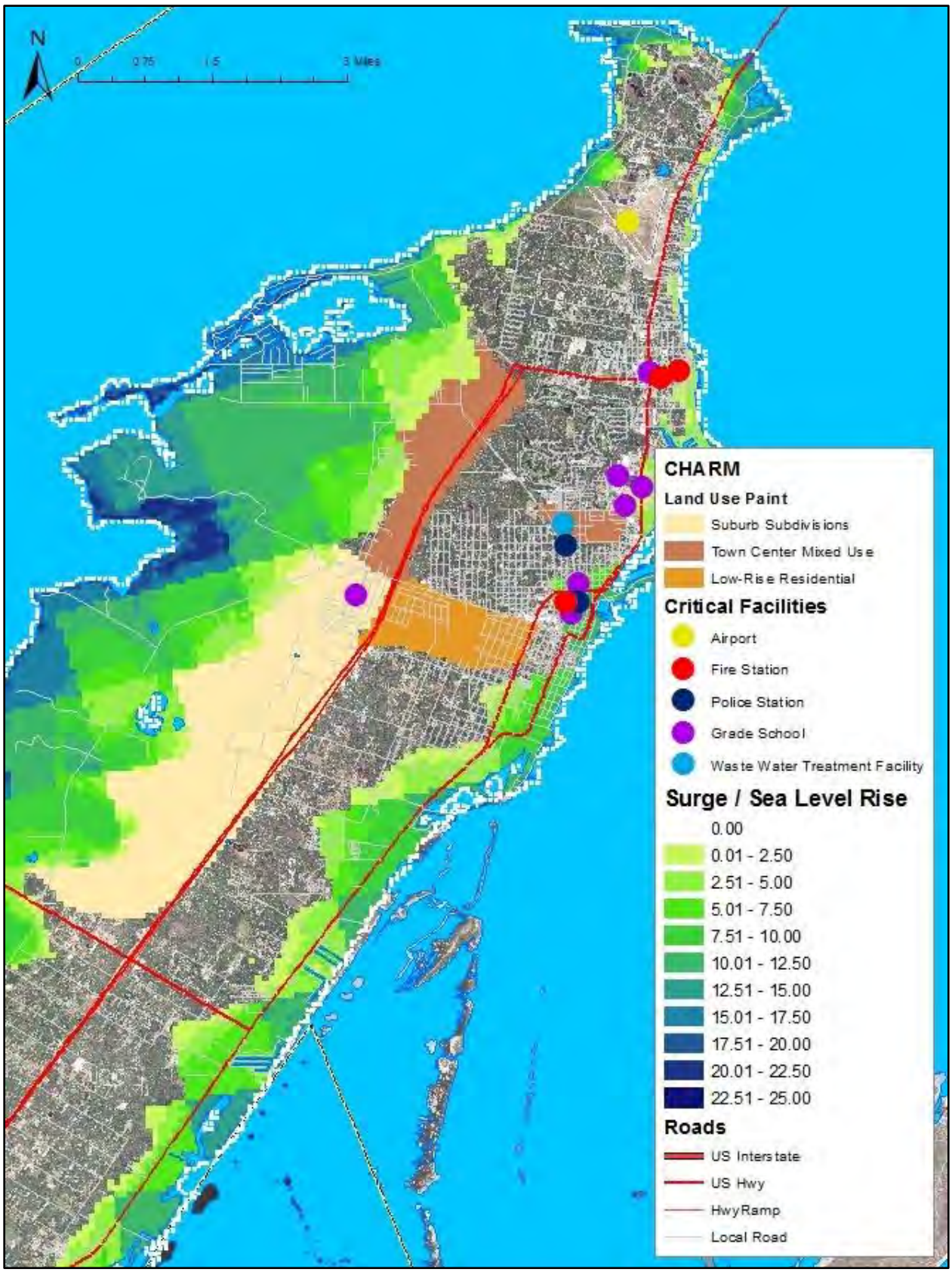

Figure 14: Large Development, Storm Surge Inundation.

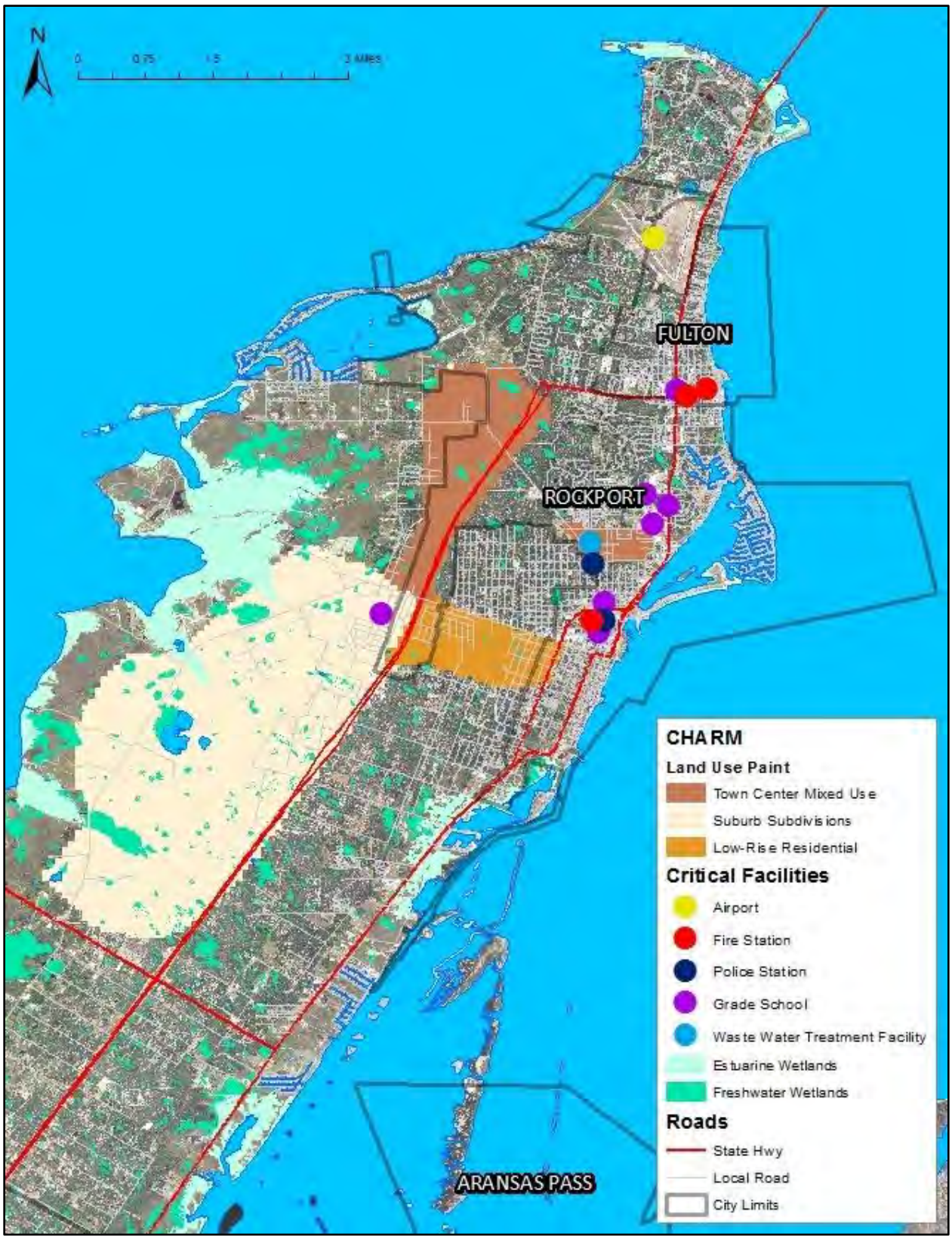

Figure 15: Large Development, Wetlands.

MAXIMUM DVELOPMENT SCENARIO

The "Maximum Development" scenario is a community-generated scenario created in the 2015 resiliency workshop that builds out most of Live Oak Peninsula, and redevelops portions of Rockport and Fulton. In doing this, it utilizes a variety of development types (nine), allowing for a diversity of life style options for the people of Rockport, while accommodating for the increased population expected in this scenario (see Figure 16, page 29). A large portion of the new development is Suburb Subdivision, which is 100% residential. In addition, sizeable patches of Postage Lawn Town Grid construction are located along the coast of Rockport, Fulton, the unincorporated area north of Fulton, and in the unincorporated region between the two southern stretches of Rockport. This development provides smaller lots (approximately one eighth of an acre in comparison to the quarter acre lots in Suburb Subdivision); but also includes a small percentage of neighborhood retail space. Canal Homes and Condo developments are located around Salt Lake, on Key Allegro, and along the southeastern coast of the peninsula, just south of the Rockport city limits. This type of development is even denser than the Postage Lawn Town Grid with approximately 10.8 units per acre. The development focuses on single-family homes (96%); but also offers a small amount of retail shop space (2%), and business establishments (2%).

Stretches of Business Throughway development are located along Business 35 in Fulton, Rockport, and south of Rockport. Other major roads such as Market Street and Corpus Christi Street also include Business Throughway development. These urbanized zones would allow more business and commercial buildings along with a small amount of residential use. In this scenario, some areas have been redeveloped or rezoned, such as downtown Rockport and a neighborhood just north of downtown. The downtown area is designated as Town Center Mixed Use, while the neighborhood just north is designated as Low-Rise Residential. In implementing these changes, these two area would evolve into a more densely developed mix of homes, businesses, and retail shops, which provide a small town character. This also allows for the larger population growth expected in this scenario to take up a smaller "footprint" than would be possible with the larger lot sizes utilized in suburban areas. The culture and small town feel can also be maintained through these planning strategies.

This scenario also includes areas for parks and recreation facilities and for conservation. Six park areas are designated, including the existing Rockport Beach and Memorial Park. The peninsula south of Salt Lake that juts into Copano Bay, two currently undeveloped areas within the Postage Lawn Town Grid developments, and a small area within the Town Center Mixed Use redevelopment area of downtown are also included. A large Conservation Area lies at the southeastern tip of Rockport's city limits and preserves critical wetland areas that improve drainage, serve as valuable migratory bird habitat, and enhance shoreline stability. This area also serves as an important natural space for residents and visitors, allowing appreciation of our coastal resources and a connection to the area's natural systems. Finally, the scenario includes a large area of Ranching and Agriculture along the southwest portion of the peninsula, west of the Suburban Subdivision, and south of the Canal Homes along Salt Lake.

This "Maximum Development" scenario models the highest growth rate (20%), and results in a population of 105,336 in 20 years. It provides 36,802 new homes (12,862 homes within the current city limits of Rockport). Single-family residences make up 85% of the new homes, while multi-family residences make up 15%. This scenario would result in 2,958 new homes (17%) being located in the 100-year flood zone, and 5,315 (14%) being located in the 500-year zone (see Figure 17, page 30). The majority of these homes are located on the coastal edge of the peninsula, or along the western most edge of the Suburb Subdivision development, closer to Copano Bay. In addition, the Business Throughway development along Business 35 south of Rockport and all of the Canal Homes and Condos throughout the county are within the flood zones. These same areas—approximately 18,193 new homes (36%)—would have a high likelihood of being impacted by surge inundation if the area were hit by a Category 5 hurricane (see Figure 18, page 31).

In this scenario, the largest area of Suburb Subdivision is built to avoid a large area of wetlands on the western side of the peninsula (see Figure 19, page 32). In addition, other patches of wetlands are protected by designating them for parks and conservation. This includes the conservation area in the southeastern tip of the city, Rockport Beach, the peninsula south of Salt Lake that juts into Copano Bay, and the two currently undeveloped areas within the Postage Lawn Town Grid developments. Regardless of these efforts to protect critical natural buffers, this scenario still has the greatest impacts, according to the indicators. It is important to understand that due to the maximum levels of development created (much greater than any of the other scenarios), it is logical that this scenario will have the highest impacts. This includes 1,305 new homes in or near estuarine wetlands, and 6, 363 new homes in or near freshwater wetlands. Ultimately, development is going to continue. However, the conservation of the largest unaltered areas of wetlands can provide critical buffers to development, and reduce the impacts of flooding. In addition, if development is going to be allowed to occur in areas which include wetlands, then additional regulations requiring minimal levels of freeboard would also help to protect these homes.

The amounts of water usage and impervious land cover are additional issues that will impact the city as it develops over time. Suburban Subdivisions, which make up a large percentage of the new development in this scenario, has one of the highest amounts of indoor water use per household. In addition, suburban subdivisions have the highest amount of outdoor usage. This would result in an overall increase in demand (new demand) for water in Rockport of 70% for indoor usage, and 30% for outdoor usage. Increases in suburban subdivision or other densely populated neighborhood are important factors in future water planning for the city. Similarly, significant increases in impervious surfaces contribute to high amounts of water runoff during storms, flooding, and the reduced ability to recharge groundwater. The amount of impervious surface created in course of development is usually mitigated in some way; however, not all of the effects are mitigated, and these unmitigated effects accumulate over time, and must also be managed.

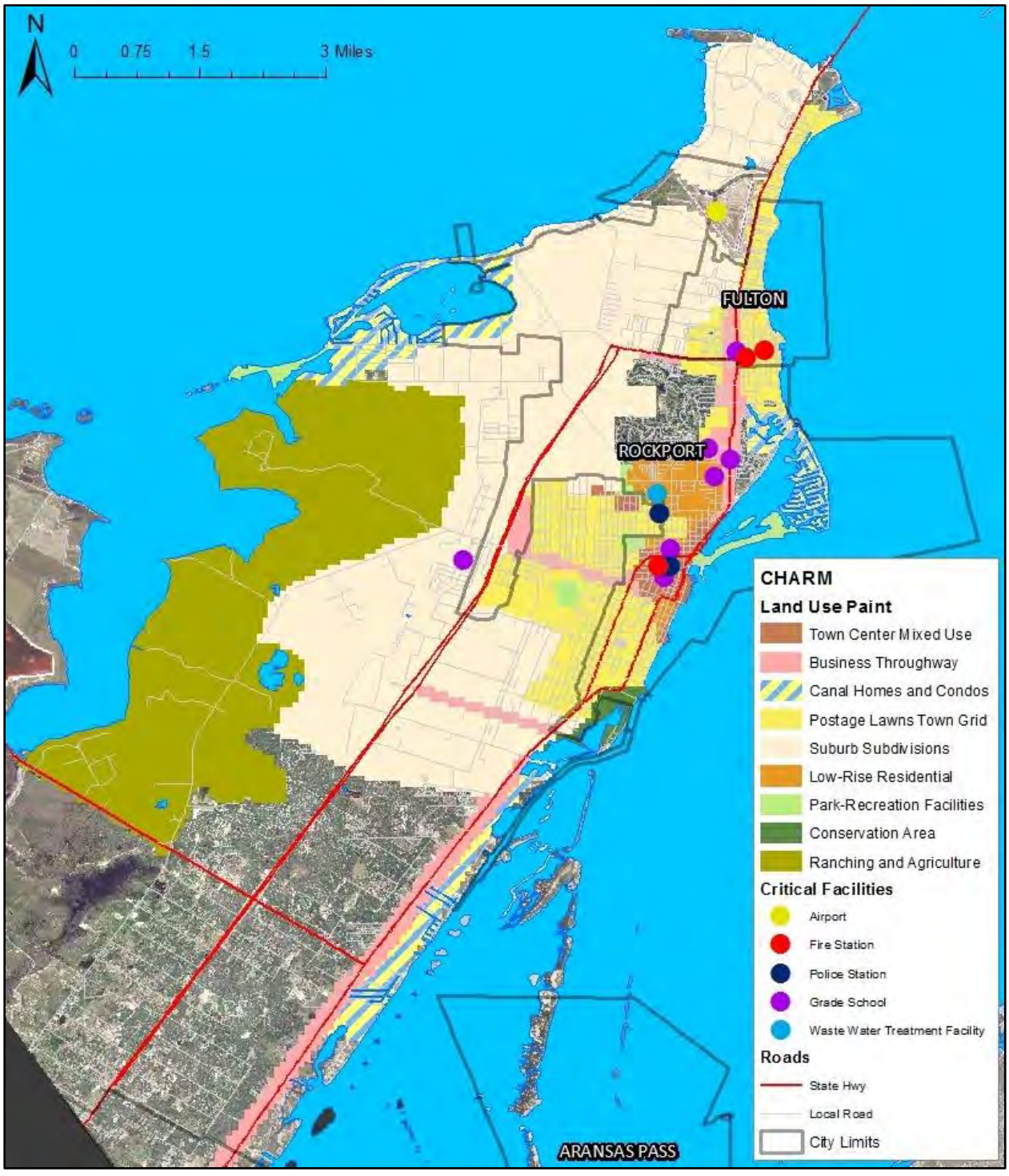

Figure 16: Maximum Development, Overview.

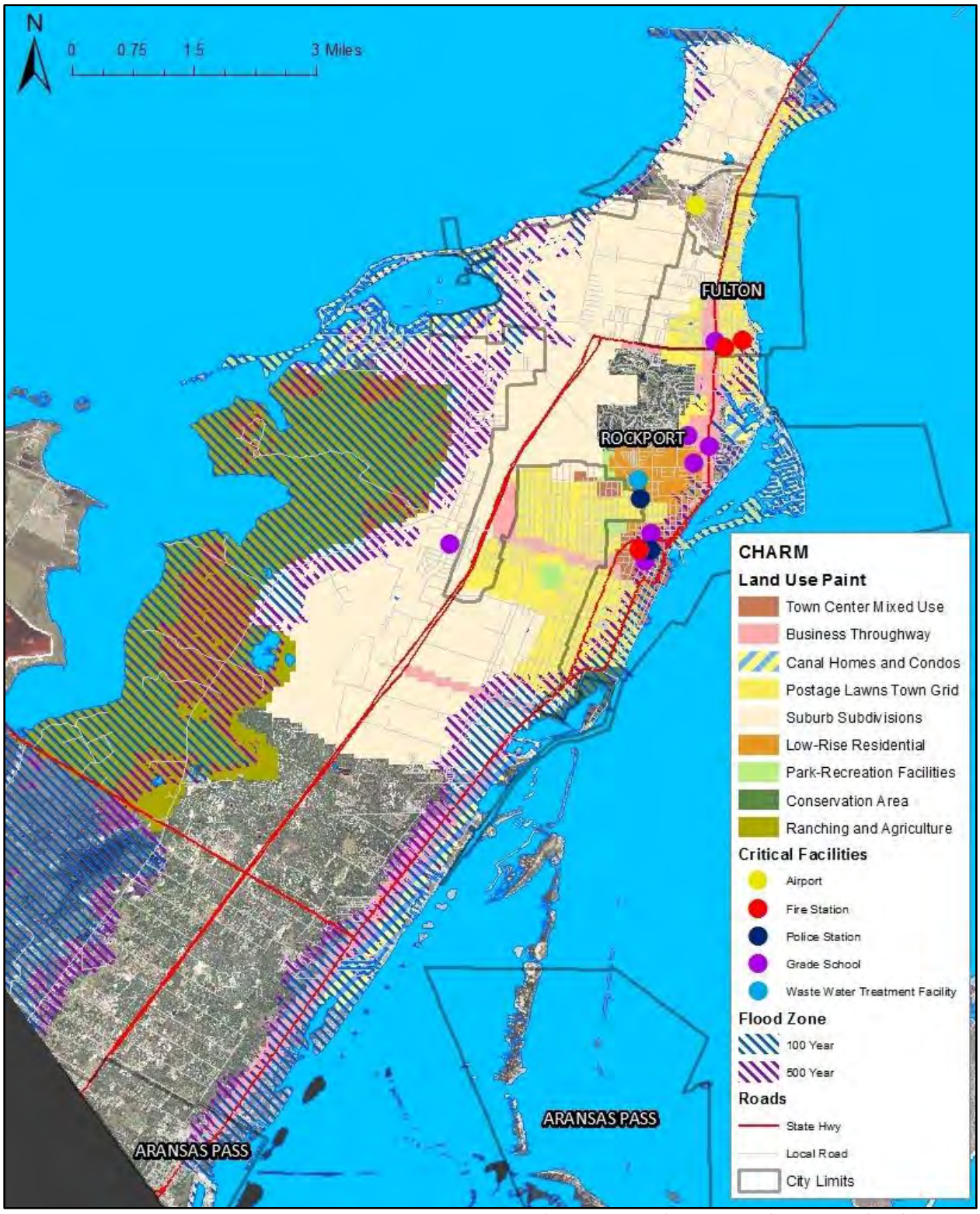

Figure 17: Maximum Development, Flood Zones.

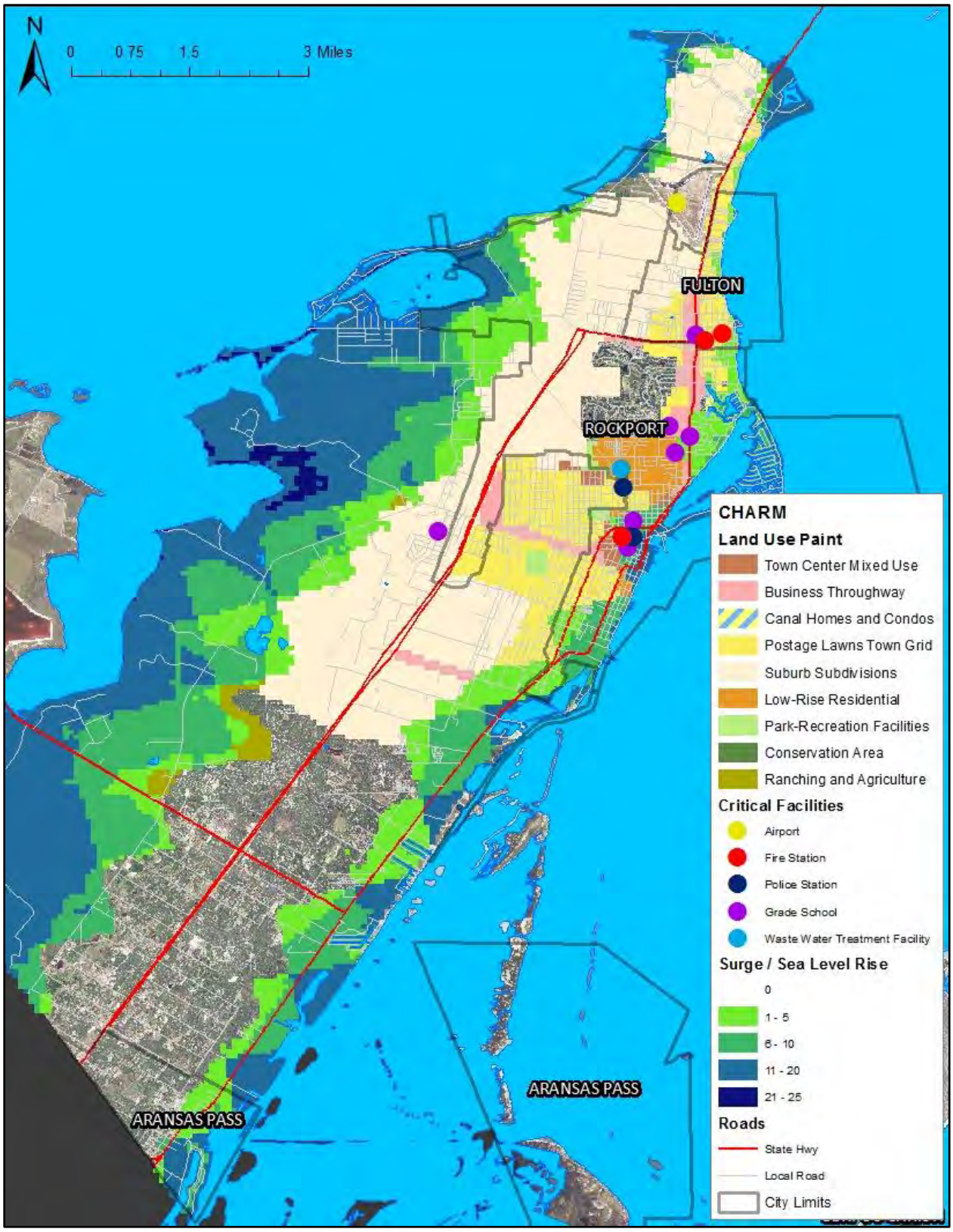

Figure 18: Maximum Development, Storm Surge Inundation.

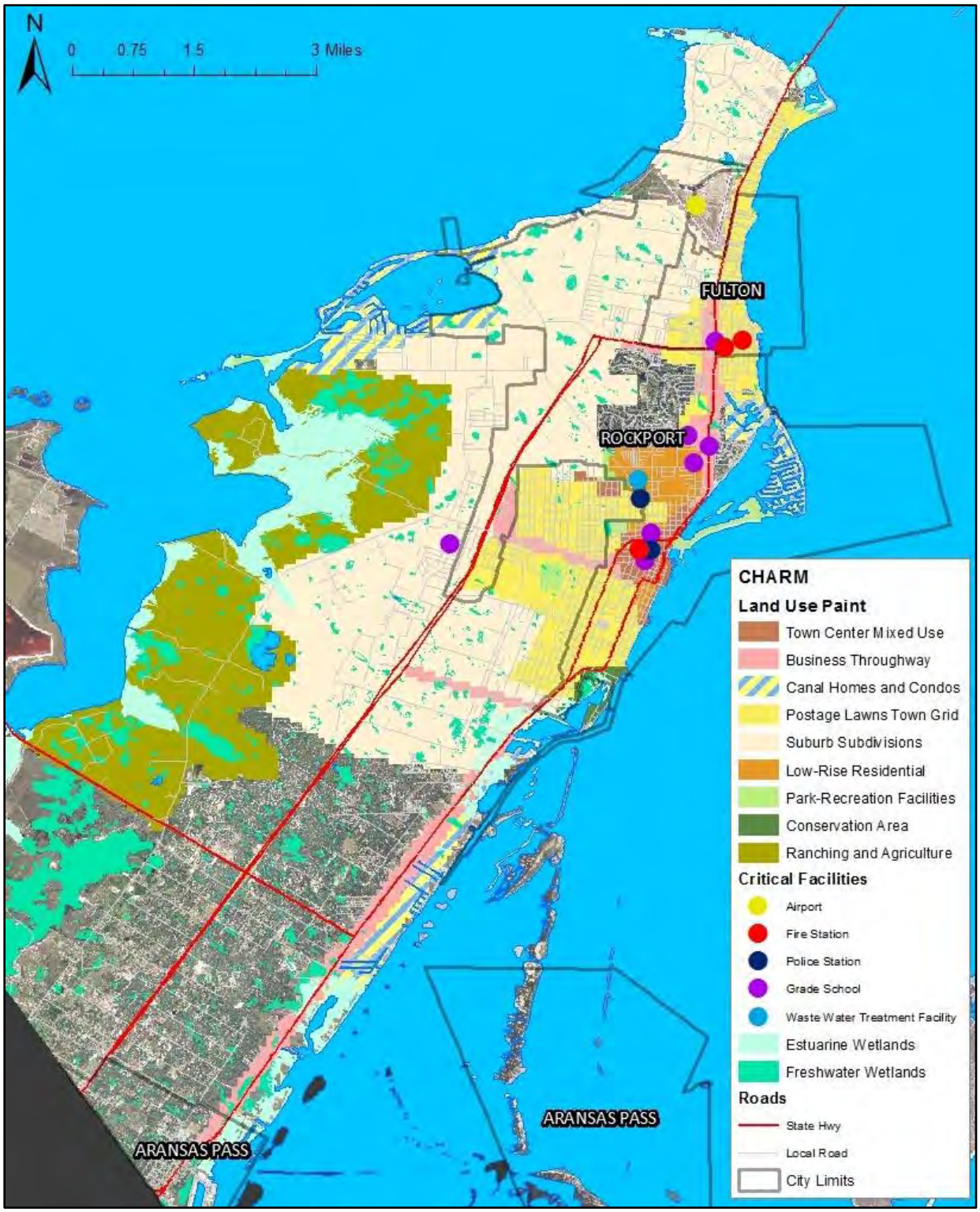

Figure 19: Maximum Development, Wetlands.

CONCLUSION

The CHARM mapping tool helps people visualize how today's planning decisions will affect tomorrow's environment and communities. The tool, and the data it generates, allows local officials and citizens to digitally map potential development scenarios, and see the probable ramifications with real-time feedback. As the City of Rockport and, Aransas County-pursue opportunities to better plan for the future, it is important to provide opportunities for community feedback in these decisions.

This report was deigned to inform citizens about the impacts of and ideas for possible planning alternatives, and open a dialog about what the community envisions for the future of Rockport. None of these scenarios are ideal; but, they are meant to showcase some potential opportunities. Reviewing these enables the community to begin examining and considering the impacts of the scenarios and the diversity of options they contain. As with any development, the community must assess the costs and benefits to all choices. The hope is that the citizens of Rockport can decide on an "ideal future scenario" that the community supports, and will work to develop over the next 20 years. The scenarios within this document provide a starting point—ideas that can be cultivated, altered, and transformed into a vision of Rockport's future.

The project staff would like to encourage the community to ask questions and actively participate in this discussion. The development decisions made now will affect the entire community for generations to come. It is important to evaluate what works, and what doesn't work, for the community at large. How will the Live Oak Peninsula look like in 20 years? Acting collaboratively, the citizens of this area have the ability to create a durable and safe future for Rockport. This effort can create a community that its citizens love and want to call home.

APPENDIX 1: SCENARIO INDICATORS

	Minimal Development	Development as Usual	Large Development	Maximum Development
Population				
Today	21,414	21,414	21,414	21,414
Future Scenario	34,195	47,264	71,598	105,336
Growth Rate	3%	6%	12%	20%
Homes (County Wide)				
Existing	13,741	13,741	13,741	13,741
New	5,493	11,106	22,961	36,802
Total Future	19,234	24,848	36,703	50,544
Homes (in Rockport)				
Existing	6,172	6,172	6,172	6,172
New	711	2,031	5,336	12,862
% of New county wide	13%	18%	23%	35%
Total Future	6,882	8,202	11,508	19,033
Homes (Not in Rockport)				
Existing	6,129	6,129	6,129	6,129
New	4,782	9,075	17,625	22,561
% of New county wide	87%	82%	77%	61%
Total Future	10,910	15,204	23,754	28,689
New Homes by Type (County Wide)				
Single-Family	4,257	8,990	12,902	31,278
% of Total new	77%	81%	56%	85%
Multi-Family	1,236	2,116	10,060	5,524
% of Total new	23%	19%	44%	15%
New Homes by Flood Zone (County Wide)				
Out	100%	92%	76%	68%
500 yr	0	5%	17%	14%
100 yr	0	3%	6%	17%
Total Homes in 100 yr Flood Zone (County Wide)				
Today	2,958	2,958	2,958	2,958
Future	2,958	3,295	4,401	9,313

	Minimal Development	Development as Usual	Large Development	Maximum Development
Total Homes in 500 yr Flood Zone (County Wide)				
Today	1,723	1,723	1,723	1,723
Future	1,723	2,248	5,737	7,038
Flood Depth of New Homes (100 yr Flood)				
0-3 ft	928	86	508	1846
3-6 ft	466	55	160	1,220
6-10 ft	21	0	1	90
10+ ft	0	0	0	8
Flood Depth of Total Future Homes (100 yr Flood)				
0-3 ft	928	1,014	1,436	2,774
3-6 ft	466	502	607	1,667
6-10 ft	21	21	21	110
10+ ft	0	0	0	8
Total Future Homes by Sea Level Rise (3 ft Assumption)				
Above	96%	97%	98%	97%
Below	4%	3%	2%	3%
Surge Risk to Homes (Category 5 Hurricane)				
Today Above	8,880	8,880	8,880	8,880
Today Surge	4,861	4,861	4,861	4,861
Future Above	14,373	19,062	25,101	32,351
Future Surge	4,861	5,786	11,602	18,193
% of Total future homes	25%	23%	32%	36%
New Homes by Surge Depth (Category 5 Hurricane)				
0-5 ft	0	520	3,205	4,659
5-10 ft	0	216	2,934	3,354
10-20 ft	0	189	601	5,248
20+ ft	0	0	0	72
Total Future Homes by Surge Depth (Category 5 Hurricane)				
0-5 ft	1,603	2,123	4,808	6,262
5-10 ft	1,781	1,997	4,715	5,135
10-20 ft	1,446	1,634	2,047	6,693
20+ ft	32	32	32	104

	Minimal Development	Development as Usual	Large Development	Maximum Development
Fire Stations by Surge Impact (Category 5 Hurricane)				
No Surge	2	2	2	2
Moderate	0	0	0	0
Major	0	0	0	0
Severe	1	1	1	1
Police Stations by Surge Impact (Category 5 Hurricane)				
No Surge	1	1	1	1
Moderate	0	0	0	0
Major	0	0	0	0
Severe	2	2	2	2
Grade Schools by Surge Impact (Category 5 Hurricane)				
No Surge	4	4	4	4
Moderate	1	1	1	1
Major	0	0	0	0
Severe	2	2	2	2
New Homes in or Near Wetlands				
Estuarine	0	2,547	156	1,305
Freshwater	2,337	3,562	4,859	6,363
Sum of New homes in or near wetlands	2,337	6,109	5,015	7,668
% of Total new homes	43%	55%	22%	21%
Wetlands Impacted				
Estuarine acres	129	79	62	1,965
Freshwater acres	177	281	422	1,336
Woodlands Impacted				
Woodland acres	1,229	2,547	2,162	4,005
New Demand for Domestic Water (Average Daily Household Use in Gallons)				
Kitchen/Bath/Laundry	116	116	109	114
Kitchen/Bath/Laundry (% increase)	72%	72%	67%	72%
Lawns and Pools	298	302	220	269
Lawns and Pools (% increase)	28%	28%	33%	30%

	Minimal Development	Development as Usual	Large Development	Maximum Development
Impervious Land Cover (ILC)				
Existing ILC	6%	6%	6%	12%
New ILC	3%	3%	9%	14%
Not ILC (Pervious Land Cover)	90%	86%	84%	74%
% of Total new homes	43%	55%	22%	21%

Draft Final Plan

ARANSAS COUNTY MULTI-JURISDICTIONAL FLOODPLAIN MANAGEMENT PLAN

Draft

2017

VOLUME I
MANAGEMENT & ADMINISTRATION

ARANSAS COUNTY MULTI-JURISDICTIONAL FLOODPLAIN MANAGEMENT PLAN

2017

INCLUDES:
Aransas County, Texas
City of Aransas Pass, Texas
Town of Fulton, Texas
City of Rockport, Texas

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Special thanks are given to the Texas General Land Office for funding, Texas Sea Grant for development, and Mission-Aransas National Estuarine Research Reserve and the Texas Coastal Watershed Program for their guidance and expertise given to this plan.

Jurisdictional Officials

County Judge C.H. "Burt" Mills, Jr., Aransas County
Mayor Adan Chapa, City of Aransas Pass
Mayor Charles J. Wax, City of Rockport
Mayor Jimmy Kendrick, Town of Fulton

Floodplain Management Plan Executive Committee

De McLallen
Charles J. Wax
Jimmy Kendrick
Randy Hunter
Malcolm Dieckow
Patrick McKelvey
David Reid
K.C. Kimbrough
Russel Cole
Dudley McDaniel
Matt Olenick
Amanda Torres
Fernando Quintanilla
Katherine Comeaux

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CHAPTER 1: INTRODUCTION

PROJECT OVERVIEW
This plan documents flood risk and mitigation alternatives in the following four jurisdictions:

- Aransas County, Texas
- The City of Aransas Pass, Texas
- The Town of Fulton, Texas
- The City of Rockport, Texas

In 2016, these governmental entities joined together to develop a multi-jurisdictional floodplain management plan to serve two purposes:

1. To minimize flood risk in their communities; and
2. To enable residents to receive the greatest reductions possible on flood insurance premiums through the National Flood Insurance Program's Community Rating System. (The City of Rockport and Aransas County are currently in the process of entering the Community Rating System. The City of Aransas Pass and the Town of Fulton have expressed interest in joining in the future.)

This plan was developed in cooperation with several stakeholders and support groups, including Texas Sea Grant, Texas A&M AgriLife Extension Service, the Texas Coastal Watershed Program, the University of Texas Marine Sciences Institute, and the Mission-Aransas National Estuarine Research Reserve.

This plan is guided by the Federal Emergency Management Agency's National Flood Insurance Program, Community Rating System Coordinator's Manual (2013). The manual suggests 10 steps for the Floodplain Management Planning process. These recommended steps are included in the following chapters of the Aransas County Multi-Jurisdictional Floodplain Management Plan:

Step 1: Organize to Prepare the Plan (Chapter 2)
Step 2: Involve the Public (Chapter 3)
Step 3: Coordinate (Chapter 4)
Step 4: Assess the Hazard (Chapter 5)
Step 5: Assess the Problem (Chapter 5)
Step 6: Set Goals (Chapter 6)
Step 7: Review Possible Activities (Chapter 7)
Step 8: Draft Action Plan (Chapter 8)
Step 9: Adopt Plan (Chapter 9)
Step 10: Implement, Evaluate, & Revise (Chapter 10)

The process to document and discuss the unique flood risks in these jurisdictions during plan development relied on a rigorous public participation process. The enclosed plan of action aims to minimize the associated risks from flooding in this area and bring relevant results and meaningful roadmaps to adaptation for these jurisdictions. This plan mobilized community leaders, stakeholders, and citizens to proactively plan for floodplain management.

This plan is the first floodplain management plan in this area, and as such this is a foundational document. What is included in the plan sets the groundwork for how floodplain management will be addressed in Aransas County in future years. There remains much to learn; however, this document provides essential guidance for the next five years, which will provide the base from which these communities can make informed decisions about how best to direct their time and resources in the future.

PLANNING AREA DESCRIPTION

Aransas County is located along the Texas Gulf of Mexico coastline, approximately 200 miles southwest of Houston, in part of a region known as the "Coastal Bend." Aransas County is predominately made up of peninsulas, islands, and bays. The terrain is primarily coastal prairie and marshes, with an elevation range from sea level to 50 feet. There are 252 square miles of land in the county, and 276 square miles of water.

Aransas County has three incorporated communities: the City of Aransas Pass, the Town of Fulton, and the City of Rockport. Much of the county is unincorporated, yet some 'un-official' communities exist (e.g.: Holiday Beach, Lamar, Estes, City-by-the-Sea, Bahia Bay, and Palm Harbor). Map 1.1 (see back of plan) shows the planning area.

Aransas Pass is named for the pass between Mustang and San Jose islands (Guthrie, 2010), and sits where Live Oak Peninsula meets the mainland. The City of Aransas Pass straddles three counties: Aransas County; San Patricio County, and Nueces County. Fulton sits at the northern tip of Live Oak Peninsula, and has coastline along the eastern side. The town was named for George Ware Fulton, a prominent developer in the 1800s. Fulton is the smallest incorporated community in Aransas County, both in size and population. Rockport, the county seat, stretches across the center of Live Oak Peninsula with coastline on both sides. Rockport has a reputation for its cultural arts district. To briefly demonstrate the socioeconomic makeup of these communities, Table 1.1 shows select demographic indicators for each of the jurisdictions.

Table 1.1: Select Demographic Indicators from 2010-2014 (United States Census Bureau [USCB], n.d.).

	Population	% 65 or older	% Ethnic Majority (Caucasian)	% Living in Poverty	Median Household Income
Aransas County (Unincorporated)	4,789	25.4	89.3	21.1	42,247
Aransas Pass	8,530	17.6	93	23.6	39,040
Fulton	1,541	31.8	83.1	7.4	41,464
Rockport	10,490	27.0	86.7	20.4	47,887
Planning Area Total (Total)	25,350	25.45	88.03	18.13	42,659.5

The communities of Rockport and Fulton were founded in the late 1800s and became important focal points in the regional cattle industry. In the early 1900s, fishing and shipbuilding became prosperous and became part of the area's identity. Oil was discovered in Aransas County in 1936, bringing industrial changes and increased interest in general shipping activities, peaking in the 1950s. In the 1990s, tourism began to grow as a leading industry in the county, and maintains a critical economic base for the area today. Rockport and Fulton are generally known as bedroom, retiree communities, although both communities are widely diverse. Bird watching, sport-fishing, and recreational boating contribute significantly to the current economy.

Table 1.2 shows select flooding indicators for each of the jurisdictions included in this plan.

Table 1.2: Select General Flooding Indicators (Source: Federal Emergency Management Agency [FEMA], FEMA Flood Maps Service Center, n.d; FEMA, Policy & Claim Statistics for Flood Insurance, 2016).

	% Land in 100-year Flood zone	% Land in 500-year Flood zone	Repetitive Loss Properties	NFIP Policies in Force
Aransas County (Unincorporated)	36	16	27	4,338
Aransas Pass	31.66	7.47	45	863
Fulton	4.68	1.85	0	136
Rockport	16.62	10.25	22	2,407
Planning Area Total (Total)	--	--	94	7,744

CHAPTER 2: ORGANIZATION (STEP 1)

PROCESS COORDINATION (Step 1.a)
As a multi-jurisdictional plan, this process includes the involvement of four separate jurisdictional bodies. A team of representatives from the planning departments of each area was identified to lead the plan development process. This team ensures that the outcomes of this plan will seamlessly integrate with each of the community planning endeavors in their jurisdictions. Table 2.1 identifies the representatives coordinating the floodplain management planning process.

Table 2.1: Community Representatives Leading the Floodplain Management Planning Process.

Entity	Name
Aransas County	Diana Espinosa
City of Aransas Pass	Katherine Comeaux
Town of Fulton	Matt Olenick
City of Rockport	Amanda Torres

MULTI-JURISDICTIONAL EXECUTIVE PLANNING COMMITTEE (Step 1.b)
A Multi-Jurisdictional Executive Planning Committee was created to help assist in the development of this plan. The Aransas County Stormwater Management Advisory Committee serves as the core of the Multi-Jurisdictional Executive Planning Committee (see Box 2.1). In order to broaden the scope of the committee, the county officially added two additional public representatives to the Stormwater Management Advisory Committee. In addition, each municipality identified two staff members and a public representative to serve on the Multi-Jurisdictional Executive Planning Committee to ensure adequate local representation. These additional members were identified in the resolutions passed by each jurisdiction (see Table 2.2 for a listing of all representatives). It should be noted that some of the representatives identified by the municipalities to serve on the Multi-Jurisdictional Executive Planning Committee already serve on the Aransas County Stormwater Management Advisory Committee; as such, some names are listed twice.

The Committee has discussed the Aransas County Multi-Jurisdictional Floodplain Management Plan at every meeting since August, 2016. Table 2.3 shows the date of each meeting, and what was discussed. The meeting agendas and minutes can be found in Volume II, Chapter 1.

SUB-COMMITTEES
Each of the municipalities formed a "Planning Sub-Committee" composed of city staff and public representatives to facilitate the planning process, those committees are listed below. A list of all Sub-Committee meetings can be found in Volume II, Chapter 2.

Aransas Pass Planning Sub-Committee

- Katherine Comeaux, City Planner - Chair
- Randall Freeze, Public Representative - Vice-Chair
- Dale Wells, Building Official
- Fernando Quintanilla, Public Works Director
- Lynn Pearce, Emergency Management Coordinator
- Sylvia Carrillo, City Manager
- Richard (Sandy) Kubek, Public Representative
- Lisa Barker, Public Representative
- Elizabeth Dorris, Public Representative
- Pat Fenton, Public Representative
- Shirley Gallagher, Public Representative
- Carol Salinas, Public Representative
- Kathleen Sweatt, Public Representative
- Cynthia Vasquez, Public Representative

Fulton Planning Sub-Committee

- Rick McLester, Police Chief - Chair
- Bob Loflin – Vice - Chair
- Jan Hill, Secretary
- Matt Olenick, Floodplain Manger
- Fayenell Harrell, Planning & Zoning Board
- Tim Brown, Planning & Zoning Board
- Les Cole, Town Council
- Larry Pahmiyer, Town Council
- Carol Thompson, Town Council
- Russel Cole, Public Representative
- Rickey Mclester, Public Representative
- Jackie Mundine, Public Representative
- Larry Pearce, Public Representative
- Donna Townsend, Public Representative

Rockport Planning Sub-Committee

- Amanda Torres, Community Planner - Chair
- Brian Olsen, Public Representative - Vice-Chair
- Mike Donoho, Director of Public Works & Building Development
- Art Smith, Assistant Public Works Director
- Frank Truitt, Building Official
- Mary Bellinger, Assistant to Building Director
- Kevin Carruth, City Manager
- Ruth Davis, Public Representative
- Diana Severino-Saxon, Public Representative
- Edward Bellion, Public Representative
- Kent Howard, Public Representative
- Graham Wilson, Public Representative
- Shawn Johnson, Public Representative

Table 2.2: Membership on the Multi-Jurisdictional Executive Planning Committee.

Member	Representation
De McLallen	Public Representative—County Stormwater Management Advisory Committee
Brian Olsen	Aransas County Commissioner—County Stormwater Management Advisory Committee
Charles J. Wax	Mayor, City of Rockport—County Stormwater Management Advisory Committee
Jimmy Kendrick	Mayor, Town of Fulton—County Stormwater Management Advisory Committee
Randy Hunter	City of Aransas Pass—County Stormwater Management Advisory Committee
Malcolm Dieckow	Aransas County Navigational District—County Stormwater Management Advisory Committee
Patrick McKelvey	Public Representative—County Stormwater Management Advisory Committee
David Reid	Aransas County Road & Bridge—County Stormwater Management Advisory Committee (Staff, non-voting member)
Aransas County Additions to the Stormwater Management Advisory Committee	
K.C. Kimbrough	Public Representative
Russel Cole	Public Representative
Aransas Pass Representatives on the Multi-Jurisdictional Executive Planning Committee	
Fernando Quintanilla	Director of Public Works
Katherine Comeaux	City Planner
Randy Hunter	Public Representative
Fulton Representatives on the Multi-Jurisdictional Executive Planning Committee	
Jimmy Kendrick	Mayor
Matt Olenick	Floodplain Manager
Russel Cole	Public Representative
Rockport Representatives on the Multi-Jurisdictional Executive Planning Committee	
Charles J. Wax	Mayor
Amanda Torres	Community Planner
Dudley McDaniel	Public Representative

Table 2.3: Multi-Jurisdictional Executive Planning Committee Meetings.

Date	Topic
August 1, 2016	Discussion regarding the development of the Multi-Jurisdictional Executive Planning Committee
September 12, 2016	Agreement to serve as the Multi-Jurisdictional Executive Planning Committee
October 3, 2016	Review of the Assessing the Hazards (Step 4)
November 7, 2016	Review of the Assessment of the Problem (Step 5)
December 5, 2016	Committee receives complete draft of chapters 1-5
January 9, 2017	Review of potential Goals (Step 6)
February 6, 2018	Review of possible Activities (Step 7)
March 5, 2019	Review of Draft Action Plan (Step 8)
April 3, 2017	Review of Draft Chapters 6-9 (Steps 6-10)
May 1, 2017	Review of final draft plan

Box 2.1: Aransas County Stormwater Management Advisory Committee.

In 2008, Aransas County formed the Stormwater Management Advisory Committee to manage the county efforts to develop a Stormwater Management Plan. The committee reports to the Commissioners Court, and was constituted pursuant to the Texas Open Meetings Act, with one representative from each of the political entities in the county, and two public representatives. Each political representative serves two year terms, and the public representatives serve one year terms. These terms are sequential until such time as the individual no longer serving the political entity, or resigns from their seat on the committee. Upon vacancy of any position, new appointments must be approved by the Aransas County Commissioners Court.

RESOLUTIONS (Step 1.c)

The governing bodies of each of the jurisdictions involved with the Aransas County Multi-Jurisdictional Floodplain Management Plan have adopted resolutions to formalize their commitment to this process. Table 2.4 provides a list of when the resolutions were passed. The actual resolutions can be seen in Volume II, Chapter 3.

Table 2.4: Formal Recognition of Planning Process.

Jurisdiction	Governing Body	Date of Resolution
Aransas County	Aransas County Commissioners Court	September 26, 2016
City of Aransas Pass	Aransas Pass City Council	October 3, 2016
Town of Fulton	Fulton Town Council	October 18, 2016
City of Rockport	Rockport City Council	October 25, 2016

CHAPTER 3: INVOLVING THE PUBLIC (STEP 2)

The public is a valuable asset to any planning process. Involving the public allows them to provide input and critical knowledge, discuss alternatives, and hopefully become champions of the resulting plan. When actively involved in the planning process, the public often gains a sense of "ownership" over the plan, and is therefore dedicated to its implementation. Examples of the public are: residents and business owners from the floodplain area, developers, major employers, non-profit organizations, academic institutions, and civic groups (Federal Emergency Management Agency [FEMA], 2013). Strategies for involving the public are: including them in the planning committee, holding public meetings, and providing various means for information gathering and dissemination, such as questionnaires, webcasts, and brochures (FEMA, 2013).

ARANSAS COUNTY MULTI-JURISDICTIONAL FLOODPLAIN MANAGEMENT PLAN PUBLIC WORKSHOPS (Step 2.b & 2.c)

Aransas County Multi-Jurisdictional Floodplain Management Plan Development Process Planning Kickoff Workshop

October 27, 2016 – Aransas Pass, Texas

The workshop began with presentations introducing the Community Rating System and the role of the Floodplain Management Plan, along with a description of the various steps in the planning process—including what has been accomplished, and what to expect in the upcoming steps. Participants then circulated among various stations designed to capture local knowledge for inclusion into the plan. Stations included labeling localized areas of flooding on paper maps, and discussing the intersection of flood risk with public health, the economy and tax base, and critical facilities and infrastructure. The flyer, agenda, and notes from this meeting can be found in Volume II, Chapter 4.

October Public Workshop (Photo: Annita West).

Aransas County Multi-Jurisdictional Floodplain Management Plan Draft Action Plan Development Public Workshop

January 19, 2017 – Fulton, Texas

The meeting started with a presentation that provided a brief overview of the first five chapters of the draft plan. This included a description of the public involvement and community coordination that had already taken place, and a summary of known flood hazards and non-flood related hazards that are relevant to Aransas County. The participants then broke into small groups (approximately 6-10 people) and visited four stations designed to spur discussion and collect information about possible flood mitigation strategies. These stations covered specific action items under each of the four goals approved by the Stormwater Management Advisory Committee. The flyer, agenda, and notes from this meeting can be found in Volume II, Chapter 4.

Aransas County Multi-Jurisdictional Floodplain Management Plan Final Draft Public Workshop
May 25, 2017 – Rockport, Texas
Summary information will be added after workshop

OTHER PUBLIC ENGAGEMENT OPPORTUNITIES (Step 2.d)

PUBLIC ENGAGEMENT OPPORTUNITIES SPECIFIC TO INDIVIDUAL JURISDICTIONS
The City of Rockport engaged in the following public engagement opportunities related to floodplain management prior to the decision to include the entire county, and multiple jurisdictions. These opportunities became a cornerstone on which the plan was built.

City of Rockport
City of Rockport Floodplain Management Planning Survey (Step 2.d)
Summer 2016
In July 2016, Texas Sea Grant partnered with the Mission-Aransas National Estuarine Research Reserve and the City of Rockport to create a survey regarding flooding issues and floodplain management for the City of Rockport. The survey was administered through the website "Survey Monkey," and the web-link was posted on the city's website and distributed through emails and flyers. The survey was live from July 1-31, 2016. The response rate for the survey was low; but, the results were compiled in a Community Survey Synthesis report in August 2016, and discussed in the City of Rockport Floodplain Management Plan Development Process Planning Kickoff Workshop on September 1, 2016. The survey and the associated flyers can be found in Volume II, Chapter 5.

City of Rockport Floodplain Management Plan Development Process Planning Kickoff Workshop (Step 2.b)
September 1, 2016
This Kickoff Meeting was specific to the City of Rockport, as the information disseminated was mainly relevant to that municipality. The workshop began with a presentation about floodplain management plans, the process involved, and the benefits to a community. An additional presentation summarized data that was collected during the creation of a State of Community Report, the Community Survey Synthesis report, and an Alternative Scenarios Report during the summer of 2016. The rest of the workshop allowed the attendees to circulate among different tables and discuss alternative scenarios which help to identify future opportunities for development in the area, and the possible impacts of that development. The flyer, agenda, and notes from this meeting can be found in Volume II, Chapter 5.

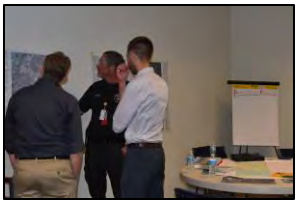
CHAPTER 4: COORDINATION (STEP 3)

REVIEW OF EXISTING STUDIES, PLANS, AND PLANNING MECHANISMS (Step 3.a)
Flooding, like any other natural hazard, is a topic of interest and concern for many governmental departments and agencies on a local, state, and federal level, as well as non-governmental organizations, non-profit organizations, academics, business owners, and residents. Part of the process and mission of a Floodplain Management Plan is to coordinate the different entities that study and contend with flooding events and floodplain management. Step 3 in the Community Rating System Floodplain Management Planning process focuses on this coordination. Several activities can award Community Rating System points to the jurisdictions involved in a multi-jurisdictional plan. However, one activity is required before any points are awarded - a review "of existing studies, reports, and technical information and of the community's needs, goals, and plans for the area" (FEMA, 2013).

Texas A&M University's Community Engagement and Risk Communication program has been helping Texas coastal communities to increase resiliency for several years. As a part of this effort they developed an Evaluative Framework for each community that they work with that documents, evaluates, and determines the overlap between a community's departments, capabilities, plans, and priorities, and the studies conducted in and around the community. In July 2016, the program created an Evaluative Framework for the City of Rockport and Aransas County. This document has been used as the review that the Community Rating System requires in Step 3 of the Floodplain Management Planning process to coordinate the different entities that study and contend with flooding events and floodplain management (Volume II, Chapter 6). Table 4.1 identifies the Studies, Plans, and Planning Mechanisms that may be referenced throughout the Floodplain Management Plan.

COORDINATION WITH OTHER COMMUNITIES AND AGENCIES (Step 3.b)
Other activities that are encouraged in Step 3 of the Floodplain Management Planning process involve "coordinating with agencies and organizations outside the community's governmental structure" (FEMA, 2013). Examples of agencies and organizations are: local homebuilder associations, local environmental groups, local water conservation districts, State National Flood Insurance Program Coordinator, State Emergency Management agency, National Weather Service, United States Fish and Wildlife Service, and National Oceanic and Atmospheric Administration. Activities include: detailed documentation of contact with agencies, asking for data, asking about agencies' endeavors that may affect the floodplain, and requesting that agencies be involved in the planning process (FEMA, 2013). Volume II, Chapter 7 provides a detailed documentation of agencies, individual contact names, dates, and general content given or received during the interactions. Most of the agencies and organizations contacted are identified in Table 4.2.

In total, 28 agencies and more than 50 people were contacted. The value of these in-person and virtual meetings and conversations clearly brings benefit to the project. Teamwork and continued networking allow for a cohesive approach to fulfilling the community vision of becoming more resilient and prepared. These contacts represent a small portion of the true number of side conversations, quick phone calls or emails, and demonstrate the project team's commitment to remaining connected and in touch with one another. Through these collaborative efforts we leverage and build our capacity and in turn develop a synergy that brings even greater value to the project.



October Public Workshop (Photo: Annita West).

Table 4.1: Studies, Plans, and Planning Mechanisms Reviewed.

Studies, Plans, and Planning Mechanisms	Date
Texas	
Statewide Long-Range Transportation Plan 2035. TxDOT	2015
Regional	
Coastal Bend COG Mitigation Action Plan	2011
Regional Public Transportation Plan 2011 for the Coastal Bend Region. CC MPO; Transportation Coordination Network of the Coastal Bend	2011
Aransas County	
FEMA Flood Insurance Study: Aransas County, Texas and Incorporated Areas	2016
Aransas County Floodplain Management & Watershed Protection Order	2016
Aransas County Stormwater Master Plan & Management Manual	2012
Capital Improvement Program	2011
Aransas County Subdivision Regulations	2009
Aransas County Emergency Management Plan	2016
Coastal Bend Mitigation Action Plan	n.d.
Aransas Pass	
Capital Improvements Program. City of Aransas Pass.	2016/2017
Code of Ordinances. Part II. Chapter 5 Buildings and Construction. Article VIII. Flood Damage. City of Aransas Pass.	n.d.
Code of Ordinances. Part II. Chapter 5.5 Landscaping. Sec. 5.5-4. Reduction of Landscaping. City of Aransas Pass.	2012
Code of Ordinances. Part II. Chapter 5 Buildings and Construction. Article VIII. Flood Damage. City of Aransas Pass.	n.d.
Zoning Map. City of Aransas Pass	2014
Aransas Pass Coastal Resilience Plan	2016
Fulton	
Flood Prevention Ordinance. Ordinance No. 270	2016
Planning and Capacity Building Study	2004
TCDP Drainage and Water Improvements Study	2004
City of Rockport Drainage Master Plan	2001
Storm Drainage Design Manual for the City of Rockport, Texas	2000
Rockport	
A Cultural Plan for the Rockport Cultural Arts District. City of Rockport	2015
A Vision for the Heritage District and Downtown Rockport. Halff Associates	2006
Annual Budget and Capital Improvements Program. City of Rockport	2015/2016
Comprehensive Plan. City of Rockport	1999
Floodplain Ordinance. Ordinance No. 1658. City of Rockport	n.d.
Future Land Use Plan w/ETJ. City of Rockport	n.d.
Heritage District Zoning Overlay Code. City of Rockport	2012
Master Drainage Plan. City of Rockport.	2016
Rockport Land Use Study. Texas Sea Grant	2012
Stormwater Ordinance. Ordinance No. 1663. City of Rockport	n.d.
Subdivision Ordinance. Ordinance No. 1663. City of Rockport	n.d.
Tree and Landscape Ordinance. Ordinance No. 1349. City of Rockport	n.d.

Studies, Plans, and Planning Mechanisms	Date
Rockport (continued)	
Zoning Map. City of Rockport	2014
Zoning Ordinance. Ordinance No. 1027. City of Rockport	n.d.

Table 4.2: Summary of Coordination between Planners, Jurisdictions, and Other Agencies.

Agency/Organization	Invited to participate in the FMP process	Phone or In-person Meeting	Other Information/Data Provided
Aransas County Navigation District	Yes	Email	N/A
Coastal Bend Council of Governments	Yes	In-person	Organized previous Hazard Mitigation Plan
APA – Texas Chapter – Coastal Bend Section	Yes	In-person	N/A
Environmental Committee for Water Issues (Rockport)	Yes	In-person	N/A
FEMA	No	Phone and Email	NFIP Claims Data / Misc. Guidance
ISO	No	Phone and Email	Misc. Guidance
Naismith Engineering	Yes	E-mail	N/A
LAN Consulting Group	Yes	In person	Contracted to Develop County HMP
National Weather Service	Yes	In-person	Past storms and possible future storms.
NOAA's Office for Coastal Management	No	Phone and In-person	Discussed FMP process, gained feedback, and tools
Port Aransas City Council	No	In-person	Possibilities discussed for future collaboration
Rockport-Fulton Chamber of Commerce	Yes	Email and In-person	Diane Probst attended Rockport Kickoff
Rockport Heritage District Board	Yes	Email	N/A
Rockport Planning & Zoning Commission	Yes	In-person	N/A
Santa Rosa County	No	Phone	Advice regarding the FMP process
Texas A&M AgriLife Extension	Yes	In-person	Ginger Easton-Smith attended Rockport Kickoff
Texas General Land Office (GLO)	Yes	In-person	Funding, and GIS data
Texas Parks and Wildlife	Yes	In-person	Wildlife habitats
Texas Water Development Board	Yes	E-mail	N/A
University of Texas Marine Sciences Institute	Yes	In-person	Project Assistance
Texas Sea Grant	Yes	In-person	Project Assistance
Texas Coastal Watershed Program	Yes	In-person	Project Assistance
Urban Engineering	Yes	In-person	Flood control projects
US Army Corps of Engineers	Yes	Phone and E-mail	N/A

CHAPTER 5: ASSESSING THE HAZARDS AND THE PROBLEMS (STEPS 4 & 5)

INTRODUCTION

This chapter goes into depth assessing the hazards that face Aransas County, and identifying the potential challenges that may occur because of those hazards. The first section of the chapter profiles the three general types of flooding hazards that occur in the planning area. A description of each type of flooding is provided, along with information on historical events, and the likelihood of future effects. The last part of this section details the vulnerability of the county to flooding, types of impacts that can be expected from future flooding, and describes the benefits of the county's natural areas in offsetting these possible impacts. The second section of the Chapter provides specific information about the Special Flood Hazard Areas (SFHA), the vulnerable critical facilities and infrastructure, historical flood insurance data, future development and land use initiatives, and other local knowledge of flood concerns for each jurisdictional area. The final section of the chapter details the natural hazards, other than flooding, which have the potential to impact Aransas County. Each hazard includes a description, a list of known historical occurrences (including magnitude and severity), and a statement of future probability.

KNOWN HIGH FLOODING HAZARDS (Step 4.a)

Flooding refers to a general and temporary condition of partial or complete inundation of normally dry land. Three types of flooding occur in the planning area: 1) Coastal Flooding; 2) Flash Flooding; and 3) Riverine Flooding. A description of each type of flooding is provided, along with information on historical events, and the likelihood of future effects. The end of this section will detail the vulnerability of the county to flooding, and the types of impacts that can be expected from future flooding.

Types of Flooding Hazards (Step 4.a.2)

Coastal Flooding (Storm Surge)

The principal type of flood posing the greatest risk in terms of potential impacts to the planning area, due to geographic location and topography, is coastal flooding. Coastal flooding refers to irregular tidal water and wave action that temporarily inundates areas near land-ocean boundaries.

National Oceanic and Atmospheric Administration (NOAA) outlines the following causes for this type of coastal flooding (Storm Surge and Coastal Inundation, n.d.):

- Severe weather events create meteorological conditions that drive up the water level, creating a storm surge. These conditions include strong winds and low atmospheric pressure that can be caused by tropical cyclones (such as hurricanes), by mid-latitude extratropical storms (such as Nor'easters), or by any severe weather conditions.
- Large waves, whether driven by local winds or swell from distant storms, raise average coastal water levels and can cause large damaging waves to reach land.
- High tide levels are caused by normal variations in the astronomical tide cycle. When a severe storm hits during high tide, the risk of flooding increases significantly.
- Depending on the storm event, flooding from storm surge may be combined with river flooding from rain in the upland watershed, thus increasing the flood severity. It is important to note that coastal flooding is different from river flooding, which is generally caused by severe precipitation.
- Other larger scale regional and ocean scale variations, caused by seasonal heating and cooling and ocean dynamics, can contribute to high water levels.

Historical Events (Step 4.a.3)
Table 5.1 identifies the historic storm surge levels, for Aransas County, by storm. This list does not include all tropical cyclones to affect Aransas County; rather, it references the storms for which storm surge data in the area is available.

Table 5.1: Aransas County Storm Surge Events.

Storm Name	Date	Storm Surge Elevation in Aransas County (ft)
1919 Storm	(September 2 – 15, 1919)	11.1 - 16
1942 Storm	(August 21-31, 1942)	3.4
1945 Storm	(August 24 – 29, 1945)	3.7
Hurricane Carla	(September 11, 1961)	7.5 -10.3
Hurricane Beulah	(September 5 – 22, 1967)	6.0-6.5
Hurricane Celia	(July 30 – August 5, 1970)	9.2 – 11.4
Hurricane Gilbert	(September 16 – 17,1988)	3.7

(FEMA, Flood Insurance Study: Aransas County, Texas, 2016)

Frequency (Step 4.a.3)
With seven events causing storm surge damage in Aransas County over the past 97 years, the probability of storm surge damage occurring is approximately 7.2% per year.

Flash Flooding
Flash floods result from convective precipitation usually due to intense thunderstorms or sudden release from an upstream impoundment created behind a dam, landslide, or levee. Flash floods are distinguished from a regular flood by a timescale less than six hours. Flooding from excessive rainfall in coastal Texas usually occurs between July and October.

Historical Events (Step 4.a.3)
Table 5.2 uses data mined from NOAA's National Centers for Environmental Data (NCED) to identify the historic flash flooding events between January, 1996 and August 1, 2015 for the planning area.

While the NCDC database does not contain flooding events prior to 1996, The State of Texas Hazard Mitigation Plan does reference a flash flood event on September 18-20, 1979 that impacted the area. This event reported 18 inches in 24 hours at Aransas Pass, and 13 inches at Rockport. One of the worst events in recent history was Tropical Storm Bill, which came through the area on June 16-17, 2015. This event resulted in 12 inches of rain in Aransas Pass, and the City of Rockport recorded 4 inches of rain in a two-hour period (D. Reid, personal communication, November 10, 2016).

Frequency (Step 4.a.3)
With 28 events reported by the NCED over the past 19 years, the area can expect approximately 1.47 flash flood events per year.

Flash Flooding in Aransas Pass, June 2015 (Photo: Kristi)

Table 5.2: Aransas County Flash Flooding Events (National Oceanic and Atmospheric Administration, National Centers for Environmental Data [NOAA-NCED], n.d.).

Start Date	Location	Property Damage	Local Rainfall Amount
04/03/1997	Rockport	N/A	8-12 in
10/09/1997	Countywide	$0	8-22 in
10/13/1997	Countywide	$0	8-22 in
09/16/1998	Rockport	$0	N/A
09/17/1998	Holiday Beach	$0	N/A
10/18/1997	Fulton	$0	N/A
10/18/1997	Rockport	$0	N/A
10/06/1997	Rockport	$0	N/A
08/23/1999	Rockport	$0	N/A
03/14/2000	Rockport	$0	7 in
11/04/2000	Rockport	$0	5.71 in
08/31/2001	Countywide	$0	N/A
10/28/2002	Countywide	$0	N/A
10/28/2002	South Central	$0	N/A
10/28/2002	Countywide	$0	N/A
05/08/2004	Countywide	$127,000	7 in
05/13/2005	Countywide	$0	4.81 in
03/06/2005	North Portion	$0	5.96 in
09/11/2005	Rockport	$0	2-3 in
05/29/2006	Rockport	$0	N/A
06/01/2006	Rockport	$0	4-6 in
07/05/2006	Rockport	$1,500,000	5-8 in
07/04/2007	Aransas Refuge	$0	4-10 in
11/19/2009	Airport	$0	4-8 in
01/15/2010	Rockport	$0	2-4 in
09/19/2010	Rockport	$0	7 in
09/20/2010	Rockport	$0	7 in
09/29/2013	Rockport	$0	2-3 in
03/21/2015	Rockport	$0	1.23 in
04/14/2015	Rockport	$0	2.65 in
09/11/2015	Rockport	$0	3.14 in
05/22/2015	Rockport	$0	.44 in
06/17/2015	Rockport	$100,000	4.36 in

Riverine Flooding

Riverine floods, slower in nature, occur when water from sustained rainfall or rapid snow melt overflows a waterway once the volume of water exceeds the capacity of the waterway.

Historical Events (Step 4.a.3)

Despite being located on Copono Bay, which is the confluence point of the Aransas River, Chiltipin Creek, Copano Creek, and Mission River, riverine flooding has not caused historical flood damage in the county. The National Weather Service (NWS) does not maintain stream gauges in the county, however there are two gauges just northwest of the county. The following tables indicate the historic crests for Copano Creek near the City of Refugio and the historic crests for the Mission River at Refugio. Each of these rivers have different flood categories or stages, which are indicated with corresponding separate tables.

Table 5.3: Flood Categories for Copano Creek near Refugio (National Weather Service [NWS], Advanced Hydrologic Prediction Service, 2016).

Major Flood Stage:	17 feet
Moderate Flood Stage:	14 feet
Flood Stage:	12 feet
Action Stage:	5 feet

Table 5.4: Historic Crests of Copano Creek near Refugio (NWS, Advanced Hydrologic Prediction Service, 2016).

Crest Rank	Feet	Date
1	21.00	09/12/1971
2	18.60	12/31/1996
3	17.26	07/08/2007
4	17.00	12/31/1997
5	14.75	05/17/2004
6	14.28	11/23/2009
7	14.14	09/22/2010
8	14.12	05/18/2016
9	14.02	07/04/2007
10	12.32	06/18/2015
11	12.27	04/10/2004
12	12.13	01/16/2010
13	12.00	12/31/1998

Table 5.5: Flood Categories for Mission River at Refugio (NWS, Advanced Hydrologic Prediction Service, 2016).

Major Flood Stage:	30 feet
Moderate Flood Stage:	26 feet
Flood Stage:	23 feet
Action Stage:	20 feet

Table 5.6: Historic Crests of Mission River at Refugio (NWS, Advanced Hydrologic Prediction Service, 2016).

Crest Rank	Feet	Date
1	38.25	09/12/1971
2	36.50	09/21/1967
3	34.85	07/01/1990
4	33.30	07/07/1942
5	32.30	05/17/1938
6	32.30	08/01/1914
7	30.80	10/19/1998
8	29.95	07/06/2007
9	29.10	12/23/1992
10	28.52	05/15/2004
11	28.38	04/08/2004
12	28.18	04/05/1997
13	27.61	05/07/1966
14	26.53	06/18/1981
15	25.89	06/14/1981
16	25.86	06/23/1993
17	25.33	05/05/1981
18	25.22	03/20/1997
19	25.07	09/21/2010
20	24.95	07/08/1981
21	24.93	02/11/1993
22	24.80	04/19/1992
23	24.16	04/12/1985

Frequency (Step 4.a.3)
Riverine flooding has caused minimal damage in Aransas County. However, riverine flooding has occurred just northwest of Aransas County several times in the past. While the chance of these events impacting Aransas County is minimal, it is best to be aware of all possible local impacts.

- For Copano Creek near Refugio, NWS reported 13 flood stage events or higher over a 45 year period. This indicates a 28% chance that a flood stage event will occur any given year.

- For Mission River near Refugio, NWS reported 23 flood stage events or higher over a 102 year period. This indicates a 23% chance that a flood stage event will occur any given year.

Risk and Warning Time
Warning time for coastal flooding is often made available to the public well in advance, as the development of storm systems are tracked for days before land fall. Flash flooding, caused predominantly by heavy rainfall, is also closely monitored by the NWS. Watches are issued by the NWS to officials and the public in a diligent manner, with projections coming, usually, more than a day before an event is expected to occur. These notices, when correctly used by the public, can reduce some of the risks associated with this type of flooding. As the advancing weather patterns get closer—usually within a 24-hour period—warnings are issued in those areas where there is a high confidence that a significant weather event will occur. These warnings allow people to further protect themselves, and to take action before the weather event occurs.

Vulnerability & Impacts (Step 5.a)
Flood vulnerability can be understood as "the extent to which a system is susceptible to floods due to exposure…in conjunction with its ability (or inability) to cope, recover, or basically adapt" (Balica, Stefania, & Nigel G. Wright, 2009). The planning area, given its low elevation and proximity to the Gulf Coast, is particularly susceptible to coastal flooding and flash flooding. A review of historical events, as discussed in the previous section of this plan, suggests that the area has a 7% annual chance of coastal flooding from storm surge and a 100% annual chance of flash flooding.

While flooding will occur in the future, the impacts of different flooding events may be highly variable. After a thorough analysis of historical events, and an assessment of current conditions, the planning team and local stakeholders identified the following local impacts that flooding could have in their communities.

Description of Potential Future Impacts (Step 5.b)
Life Safety & the need for Warning & Evacuation (Step 5.b.1)
In a major coastal storm event, coastal flooding can critically impact evacuation routes exiting the Aransas County area (see Map 5.1, in back of plan). Of particular concern are FM 188—a major evacuation route—which crosses Port Bay in the center of the map. This area can be affected by storm surge and high tidal influence. Similarly, State Highway 35 Bypass and Business converge to cross Aransas and Copano Bays. The Texas Department of Transportation is currently constructing a new, taller bridge crossing for this corridor, but it is possible the bridge could be affected in a major hurricane or coastal storm event.

Other non-major transportation corridors that could be affected are:
- FM 136 near Egery Flats and Copano Bay along the Aransas County/Refugio County line
- State Highway 361 in Aransas Pass
- State Highway 35 Business

Both State Highway 361 and State Highway 35 Business in Aransas Pass, known in the municipality as Commercial Street and Wheeler Avenue respectively, are prone to flooding, particularly in heavy rain storm

events. The portion of State Highway 35 Business that enters Aransas Pass from Gregory is located in a Special Flood Hazard Area.

Aransas County uses a variety of methods to notify its residents of flooding hazards. Primarily, the county, the City of Rockport, and the City of Aransas Pass use Code Red, an emergency notification system that sends voice or text messages to residents about any issue of public concern. There is also an emergency notification radio station, 1610 AM, which sends out community emergency messages. HAMM radio usage has become popular in the area with Aransas Pass spearheading the movement. In severe emergency events, local police authorities typically drive around neighborhoods informing people of evacuations and other public safety concerns using public address systems.

The County Emergency Operations Center has a strategic partnership with the Rockport-Fulton Chamber of Commerce to release important emergency messages via email blasts and social media accounts. The county has two Public Information Officers that also release information to local media when the Emergency Operations Center is activated. The City of Aransas Pass has a designated Public Information Officer that releases information to the public. Finally, the City of Aransas Pass, the Aransas Pass Police Department, and the Aransas Pass Fire Departments have a very active social media presence through which they often notify residents of hazardous events.

Public Health (including mold) (Step 5.b.2)
While flooding can have severe impacts to life and safety during a severe weather event, the aftermath—once the waters recede—can be just as damaging. Flood waters pose a serious hazard to public health, and this can be manifest in the following ways.

- Flood waters entering residences and businesses can cause costly damages such as ruining possessions and merchandise. Furthermore, the residual water in these places can cause the growth of mold and mildew.
- Flood waters can result in pools of standing water. These pools can become havens for mosquito larvae and other toxic parasites that can harm animals and humans.
- Powerful flood waters can cause downed power lines, and generally increase the chance of electrocution in flooded areas.
- Dead animal carcasses and general trash can accumulate, creating hazardous waste areas.
- Tanks holding oil and chemical contaminants can be damaged; resulting in oil spills, displaced tanks, and other increased chances of chemical pollution.
- Septic systems can be seriously impacted by the flooding of their drain fields. This can result in reduced efficiency of the septic system, as well as potential groundwater contamination.
- Shallow wells can be infiltrated by rising flood waters, impacting anyone who use these wells as their primary, or only, source of drinking water.
- Waters can infiltrate large jurisdictional wastewater systems. The increase in water intake through wastewater lines can overwhelm wastewater treatment plants, resulting in potential sewage spillage.
- "Flash-flooding is the leading cause of weather-related deaths in the U.S." (Flood Safety, 2016). Texas leads nationally in flood-related fatalities with 76% of these deaths being vehicle-related (Flood Safety, 2016).

Economy and Major Employers/Tax Base (Step 5.b.4)
Table 5.7 identifies the top 10 major employers in Aransas County. Many of these employers are affiliated with governmental entities; therefore, their normal operations may not cease because of flooding. An additional large governmental entity—not listed in this table—is the City of Aransas Pass, which has approximately 120 employees. Two of the identified 'top 10 employers,' Wal-Mart and H.E.B., are major retailers that would provide assistance during an emergency event. Three employers—Care Regional Medical Center, Gulf Pointe Plaza and Rockport Coastal Care Center—are in the health service industry, and will

likely be evacuated in a severe flooding or storm event. Although none of these health services companies are located in the Federal Emergency Management Agency (FEMA)-designated floodplain, the area around Rockport Coastal Care Center has been susceptible to localized flooding. Wood Group Production Services is a support company to the oilfield industry that would likely extend past the boundaries of Aransas County and therefore would also not be impacted by flooding, unless it was the result of a catastrophic storm.

Table 5.7: Major Employers in Aransas County (Rockport-Fulton Chamber of Commerce, n.d.).

Organization	Industry	# Employed
Aransas County Independent School District	Education	521
Wal-Mart	Retail	250
Care Regional Medical Center	Hospital	210
H.E.B.	Retail grocer	185
Wood Group Production Services	Oilfield & Industrial	181
Aransas County	Government	175
City of Rockport	Government	130
State of Texas	Government	107
Gulf Pointe Plaza	Health Service	93
Rockport Coastal Care Center	Health Service	75

There are a variety of other businesses in the county that would be impacted by flooding. Lexington Place Nursing Home in Aransas Pass and Oak Crest Nursing Home in Rockport would likely be effected. The Oak Crest Nursing home has been impacted by flooding multiple times. There are many large automobile dealerships in Aransas Pass, such as Aransas Autoplex, Commercial Motor Company, and Allen Samuels Chrysler Dodge Jeep, that could be severely impacted by damaged inventory and general loss of revenue. Home improvement stores, such as Lowe's, McCoy's, and Ace Hardware, may see increased revenues after a flooding event due to the need for supplies to repair and rehabilitate structures. Businesses connected to the marine industry, such as those located on Cove Harbor, would be adversely affected by coastal flooding. Furthermore, many Aransas County residents commute to industries located in Corpus Christi and its outer fringes. A large regional flooding event could shut down these industries, as well as, the thoroughfares leading to them. These closures would negatively impact the incomes of hundreds of local residents.

According to the U.S. Census Bureau, the top two industries in Aransas County are 'accommodation and food services' with 87 establishments and 1,099 employees, and 'retail trade' with 83 establishments and 1,024 employees (United States Census Bureau, 2014). These sectors are reflective of the strong tourism-driven economy of the county. Sales tax revenues have steadily increased since 2010 with $1.2 million in revenue received in 2015 in Aransas County alone. In 2015, the Town of Fulton had $227,000 in sales tax revenue, the City of Aransas Pass had nearly $1.9 million in revenue, and the City of Rockport had nearly $2.4 million in revenue (State of Texas, n.d.). A serious flooding or storm event could cause devastating impact to this imperative revenue source by deterring tourists from visiting the area. Additionally, hotel occupancy tax revenues would also go down, reducing another important source of governmental income. A large amount of Aransas County, and its municipalities', ad valorem tax base is connected to residences along its coastline; as such, ad valorem tax revenues could potentially be devastated by large scale flooding events due to damaged properties and delays in future development.

Protection from Natural Areas (Step 5.d)

Aransas County is unique in that it is made up of mostly peninsulas, islands, and bays, along the Gulf of Mexico. There are three peninsulas, Live Oak, Blackjack, and Lamar; and six bays, Aransas, Copano, Redfish, Mesquite, Port, and St Charles. The largest island is the barrier island San Jose. Elevation spans from sea level to 50 feet, and the soil ranges from sand to silt, to loam, and to clay. The low elevation and soil types generally lead to high inundation and slow drainage from tides and storms. A variety of vegetation, wetlands, and ecosystems also thrive in these conditions; which can provide natural, beneficial functions for stormwater and floodplain management.

NOAA developed a dataset specific to coastal area landcover, through the Coastal Change Analysis Program. The Coastal Change Analysis Program landcover categories include, but are not limited to, urban developed areas, forested land, grasslands, palustrine areas, and estuarine areas. The numerous landcover categories within Aransas County can be seen in the Map 5.2 Series (see back of plan). When comparing this landcover map with the floodplain map (Map 5.3, see back of plan), one can see that much of the floodplains overlap with the palustrine and estuarine wetlands. This natural overlap is a great advantage to the county and its residents. Wetlands naturally mitigate flooding by absorbing stormwater and reducing its rate of flow. The soil and vegetation in wetlands give stormwater a place to infiltrate and be stored before it is released back into streams, rivers, and bays (Texas Parks and Wildlife Department, 2000). This slow, gradual process regulates the velocity of stormwater and flooding, and lessens the destructive force that would be discharged into developed communities.

Wetlands are not the only natural landscape in the area that provides flood mitigation. Although the forested land in Aransas County does not overlap much with the floodplain, it can prevent rainfall from turning into runoff in more elevated areas, which would then travel downstream to the floodplain. Forests provide a canopy of vegetation that intercepts and catches rainfall before it hits the ground. Trees also establish a dense root system that provides permeability to soil. The permeability allows more water to infiltrate the ground and keeps the soil from "crusting" (Aransas County, 2012). This allows more water to enter, and be stored, in the soil; thus reducing runoff and flooding.

The functions, advantages, and value of natural areas are recognized in the Aransas County Stormwater Master Plan and Management Manual (SMPMM) (2012). This document was created by four engineering firms, under the oversight of the Aransas County Stormwater Management Advisory Council. The council included representatives from the Aransas County Commissioners' Court, the City of Rockport City Council, the Town of Fulton Town Council, the Aransas County Navigation District Commissioners, a representative appointed by Aransas Pass City Council, and two private citizens. The SMPMM provides "an integrated approach to stormwater management including not only drainage and flood control but also integrating water quality and ecological considerations" (Aransas County, 2012, p.13). The manual goes into great depth regarding natural and ecological resources, habitats, and endangered species; it explains the existing regulations and institutional agreements; and it analyzes current projects, best management practices, and future recommendations.

The local areas named in the SMPMM that provide natural benefits to stormwater and flood management are: the Aransas National Wildlife Refuge, Goose Island State Park, Deadman Island/Long Reef, Tule Creek West, and several "Blue Corridors." Blue Corridors are characterized as interconnections between natural depressions, swales, marshes, and other drainage paths that bring water to receiving waterways and bays (Aransas County, 2012). These corridors do not always contain water, but naturally fill, infiltrate, and move water along during storms. Blue Corridors are not currently protected by any regulations or institutions, but the SMPMM strongly recommends that they be utilized as a best management practice.

Several legislative acts are named in the SMPMM: the Clean Water Act, the Rivers and Harbors Act, the Coastal Zone Management Act, the Federal Endangered Species Act, the Migratory Bird Treaty Act, the Aransas County Floodplain Management and Watershed Protection Order, and the City of Rockport Stormwater Ordinance and Tree Ordinance. These legislative acts contribute to the protection of natural and ecological areas that exist in Aransas County. Several additional projects and programs also contribute to the protection of natural areas. These include, but are not limited to, the National Urban Runoff Program, Mission-Aransas National Estuary Research Reserve, Redfish Bay State Scientific Area, the Coastal Bend Bays Plan, Aransas Pathways, the Aransas County Site Development and Construction Guidelines, Port Bay Mitigation Bank, The Aransas Project, Save Cedar Bayou, Inc, and the Little Bay Water Exchange Study.

Special Hazards Associated with Less Frequent Flooding

There are special hazards that can be related to local flooding which provide greater risks. Table 5.8 lists those special hazards, and identifies whether they are relevant in this planning area. The hazards which are relevant are addressed in section three of this chapter "Non-Flood Related Hazards."

Table 5.8: Special Hazards Associated with Less Frequent Flooding.

Flood-related special hazards	Relevant to Planning Area
Uncertain flow paths	No
Closed basin	No
Ice jams	No
Land subsidence	Yes
Mudflow hazards	No
Coastal erosion	Yes
Tsunamis	No

JURISDICTION SPECIFIC INFORMATION

This section provides specific information about the Special Flood Hazard Areas (SFHA), the vulnerable critical facilities and infrastructure, historical flood insurance data, future development and land use initiatives, and other local knowledge of flood concerns for each jurisdictional area.

Aransas County

Special Flood Hazard Areas (100-year floodplain) (Step 4.a.1)

The SFHA are defined by FEMA as: "the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies" (FEMA, 2016). The SFHA is the same as the 100-year floodplain, which is known to have a 1% annual chance of flooding. This can also be interpreted that over the span of an average 30-year mortgage, the property will have a 26% chance of flooding. Map 5.3 (see back of plan) shows the SFHA for Aransas County.

Other Potential Flooding Hazards

500-year Floodplains (Step 4.b)

The 500-year floodplains are moderate flood hazard areas known to have a .2% annual chance of flooding. These areas are known to flood, only at a much less frequent rate of the 100-year floodplains (the SFHA). Map 5.4 (see back of plan) shows the location of areas in Aransas County that would be inundated during 100-year and 500-year flooding events.

Coastal Flood Zones (Step 4.b.d)

Coastal flooding is caused by irregular tidal water and wave action that temporarily inundates areas near land-ocean boundaries. According to FEMA, V Zones are "areas along coasts subject to inundation by the 1-percent-annual-chance flood event [100-year floodplain] with additional hazards associated with storm-induced waves" (FEMA, 2017). The coastal flood zones for Aransas County are shown on Map 5.5 (see back of plan). The zone identified as "AE" on this map is synonymous with the SFHA (the 100-year floodplain or the area with a 1% annual chance of flooding. This area is significant because the FIRM maps also include the Base Flood Elevations. The area marked as "VE" on this map are the areas which are exposed to additional hazards due to waves that would accompany a storm or large tidal event.

Localized Flooding (Step 4.a)
Map 5.6 (see back of plan) identifies areas in Aransas County that are specifically prone to flooding. These areas were identified by County Employees and local residents. Some of these areas are not located in the SFHA, and many of them are related to surface flooding.

Critical Facilities & Infrastructure (Step 5.b.3)
Critical facilities and infrastructure are the components of a community that enable modern amenities. These include, but are not limited to, things like roads, bridges, utilities, water, sewage, police and fire stations, medical services, post offices, and schools. These facilities are an integral component of emergency services, as well as the ability of a community to recover after a flood, or any disaster; and therefore, should not be located in high hazard (including flood) areas.

Table 5.9 identifies the critical governmental facilities in Aransas County. Out of seven facilities, three are in an area above the 500-year floodplain; the Aransas County Service Center located on FM 2165, the Aransas County Environmental Health office located on Airport Rd, and the Aransas County Airport located on John D. Wendell. Four of the facilities are located in the 500-year floodplain. Most county critical facilities are located in higher elevations, decreasing the chance that they may be affected by flooding. The Map 5.7 series (see back of plan) shows the location of critical governmental facilities in Aransas County.

Table 5.9: Aransas County Governmental Critical Facilities.

Critical Facility	Location	In SFHA?
Aransas County Courthouse & Jail	301 N. Live Oak	No; 500-year floodplain
Aransas County Service Center (includes EOC)	1931 FM 2165	No
Aransas County Sheriff's Office	714 E. Concho	No; 500-year floodplain
Aransas County Tax Office	319 N. Church St	No; 500-year floodplain
Aransas County Appraisal District	601 S. Church St	No; 500-year floodplain
Aransas County Environmental Health	880 Airport	No
Aransas County Airport	421 John D. Wendell	No

Table 5.10 identifies the critical facilities for the Aransas County Independent School District. All of the facilities are located in areas above the 500-year floodplain; however, two facilities—the one located on Omonhundro, and the facility on N. Live Oak—are in close proximity to the 500-year floodplain boundary. Regardless, the location of these facilities decrease the likelihood that they will be affected by flooding. The Map 5.7 Series (see back of plan) shows the location of each of critical facilities for the Aransas County Independent School District.

Table 5.10: Aransas County Independent School District Critical Facilities.

Critical Facility	Location	In SFHA?
Administrative Office	1700 Omohundro, Rockport	No
Little Bay Primary School	2000 Hwy 35 N., Rockport	No
Live Oak Learning Center	31 Griffith Dr., Rockport	No
Fulton Learning Center	314 N. 6th St, Fulton	No
Rockport-Fulton Middle School	1701 Colorado Avenue, Rockport	No
Rockport-Fulton High School	1801 Omohundro, Rockport	No
Operations Office	619 N. Live Oak	No
Transportation Office	1502 Sonny Watkins	No

Table 5.11 identifies 23 additional critical facilities, located within Aransas County or one of the associated jurisdictions (Aransas Pass, Fulton, or Rockport), that are not county buildings or schools. Seventeen of these facilities are in an area above the 500-year floodplain. Five facilities are located in the 100-year floodplain, and one facility was in the 500-year floodplain. Most of these critical facilities are located in higher elevations,

decreasing the chance that those places should be affected by flooding. The Map 5.8 Series (see back of plan) shows the location of each of critical facilities that are located within the Aransas County boundary; but are not associated with any local governmental entities.

Table 5.11: Other Critical Facilities in the County; but Not Affiliated with any Local Governmental Entities.

Critical Facility	Location	In SFHA?
TxDOT Rockport Office	1401 FM 3036, Rockport	No
U.S. Post Office – Rockport	1550 FM 2165, Rockport	No
U.S. Post Office – Fulton	301 Cactus, Fulton	No
U.S. Post Office – Aransas Pass	634 S. Commercial, Aransas Pass	No
Lamar Volunteer Fire Department Substation	302 Bois D' Arc, Rockport	No
AEP Service Center	2120 Hwy 35, Aransas Pass	No
AEP Power Substation – Aransas Pass	State Highway 35 Business, Rockport	**Yes; 100-year Floodplain**
AEP Power Substation – Aransas Pass	510 S. Euclid, Aransas Pass	No
AEP Power Substation – Aransas Pass	2051 SH 188, Aransas Pass	No
AEP Power Substation – Rockport	1941 FM 2165, Aransas Pass	No
AEP Power Substation – Rockport	Eller Lane, Rockport	No
AEP Power Substation - Lamar	7561 Highway 35 N., Rockport	**Yes; 100-year Floodplain**
Care Regional Medical Center	1711 W. Wheeler, Aransas Pass	No
Allegiance Ambulance	400 Enterprise, Rockport	No
Coastal Care EMS	1121 W. Market St, Rockport	No
Rockport Harbor	911 Navigation Circle, Rockport	**Yes; 100-year Floodplain**
Cove Harbor	Cove Harbor Drive, Rockport	No; 500-year floodplain
Fulton Harbor	Fulton Beach Rd, Fulton	**Yes; 100-year Floodplain**
San Patricio County Navigation District Marina	426 East Ransom, Aransas Pass	**Yes; 100-year Floodplain**
Rockport Coastal Care Center	1004 Young Street, Rockport	No
Oak Crest Nursing Center	1902 FM 3036, Rockport	No
Gulf Pointe Plaza	1008 Enterprise Blvd, Rockport	No
Lexington Place Nursing Home	1661 W. Yoakum Ave, Aransas Pass	No

Review of Damaged Buildings/Flood Insurance Claims (Step 5.c)

Tables 5.12-5.14 show statistics about flood insurance policies and claims in Aransas County.

Table 5.12 shows the total number of flood insurance policies that existed in the county as of November 30, 2016. Policies in force indicates the number of policies that were being actively maintained, or were up to date on all payments. Premium indicates the amount of money paid by property owners in the county to maintain the policies in force. Insurance in force indicates the total amount that would have to be paid out if every policy in the county had to be paid out at full value at that time.

Table 5.12: Flood Insurance Policies in Aransas County, According to Location (as of November 30, 2016) (Source: FEMA, official communication, December 2016).

Location of Policies	Policies in Force	Premium	Insurance in Force
Special Flood Hazard Area (100-year Floodplain)	1,375	$1,032,171	$290,434,400
Within or above the 500-year Floodplain (Preferred Risk Policies)	2,098	$770,868	$591,067,000

Table 5.13 is similar to Table 5.12 in that it shows the total number of flood insurance policies that existed in the county as of December 15, 2016 but is categorized by the type of structures protected. This table includes the number of closed paid losses, which indicates the number of claims that have been paid and closed out by FEMA as of December 15, 2016. The following column indicates to total amount of money that was paid on those closed paid claims. Finally, adjustment expenses indicates the amount of money that the insurance companies incurred investigating and adjusting the claims that have been paid and closed.

Table 5.13: Flood Insurance Policies in Aransas County, According to Structure Type (as of December 15, 2016) (Source: FEMA, official communication, December 2016).

Type of Structure	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Single Family Home	3,448	$1,803,375	$968,119,300	564	$3,523,814.46	$224,800.18
Buildings with 2-4 Units	145	$61,964	$23,669,000	9	$55,928.07	$3,750.00
All Other Residential	462	$152,810	$57,723,500	36	$474,507.45	$22,560.98
Non-Residential	210	$260,553	$50,262,200	46	$372,362.70	$18,955.00
Total	**4,265**	**$2,278,702**	**$1,099,774,000**	**655**	**$4,426,611.00**	**$270,065.00**

Flood Insurance Rate Maps (FIRM) are an "Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community" (FEMA, 2017). These maps are what determine NFIP premiums. Buildings that were "constructed or substantially improved on or before December 31, 1974, or before the effective date of the initial Flood Insurance Rate Maps of the community, whichever is later are considered Pre-FIRM" (FEMA, 2013). According to the FEMA Community Status Book Report (2017), all of the participating jurisdictions had initial FIRMs identified in 1971. Buildings that were constructed, or substantially improved, after this date are considered Post-FIRM. This is important because Pre-FIRM structures usually did not account for flood risks; however, Post-FIRM structures were required to meet all the NFIP minimum requirements. Table 5.14 shows the historical claim data (as of December 2016) for Aransas County according to whether the structures are Pre-FIRM or Post-FIRM.

Table 5.14: Flood Insurance Claims in Aransas County, According to Time of Construction (Pre-FIRM or Post-FIRM) (Source: FEMA, official communication, December 2016).

	Paid Claims	Paid Losses
Pre-FIRM	502	$3,405,546
Post-FIRM	151	$1,018,066

Development (Current & Future) (Step 5.e)

Aransas County staff identified seven areas of the unincorporated county that may experience development over the next five to ten years. These areas are described below.

- Holiday Beach Area, north of Northview Drive and East of Highway 35: This area is adjacent to the preexisting unincorporated community of Holiday Beach. Development could have an adverse impact on flood risk in these preexisting communities, and attention to this concern should be considered if this development materializes in the future.
- East of Goose Island State Park: Development in this area would place structures on the front line of future storm surge. Strong code enforcement and buildings standards could mitigate this risk, should development materialize. This area is also located at the bottom of a watershed. Upstream development adjacent to this area may exacerbate flood risk.
- South West of Rattlesnake Point Road: This area is one of the most vulnerable to flooding, and would be adjacent to existing development to its immediate northwest. If this development were to occur, alterations to the floodplain should be minimal, with limited risk increases for existing development. Code enforcement and building regulations for development in this area can greatly reduce flood risk for this development, provided they are stringent and enforced.

- Southwest of Rattlesnake Point Road and Carol Lane: This area is located on the fridge on the 500-year floodplain. If this development were to occur, existing development in the surrounding areas should not be significantly impacted in terms of floodplain alterations.
- Northwest of Road 1069 and Port Bay Road: This is in a highly vulnerable area to flooding, but is located in a very rural area of the county.
- South of Road 1069 and Highway 188: This is in a highly vulnerable area to flooding, but is located in a very rural area of the county.
- Islands of Rockport, near Highway 35 and Highway 188: This area is highly vulnerable to storm surge, and is likely to see the development of luxury homes. Code enforcement and building regulations could greatly reduce flood risk for this area, provided they are stringent, and enforced.

Repetitive Loss Areas (Step 4.a)
The Federal Emergency Management Agency tracks properties which flood regularly. These properties are termed "Repetitive Flood Loss Properties" and are defined as "any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978" (FEMA, 2005). As of November 23, 2016, there were 27 repetitive loss properties listed in the unincorporated areas of Aransas County (FEMA, personal communication, November 23, 2016). Severe repetitive losses include residential structures (single family homes and units with two to four units) that have flood insurance through the NFIP, and have "incurred flood damage for which: a.) 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or b) at least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss" (FEMA, 2017). The Severe Repetitive Loss Grant Program makes funding available to state and local governments to help mitigate future losses by buying out these properties for conversion to open space, or to help elevate these structures. Map 5.9 (see back of plan) shows areas of severe repetitive loss concentrations in Aransas County. The information about these properties has been generalized, in accordance with the protocols required to maintain the privacy of property owners.

Aransas Pass
Special Flood Hazard Areas (100-year floodplain) (Step 4.a.1)
The Special Flood Hazard Areas are defined by FEMA as: "the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies" (FEMA, 2016). The SFHA is the same as the 100-year floodplain, which is known to have a 1% annual chance of flooding. This can also be interpreted that over the span of an average 30-year mortgage, the property will have a 26% chance of flooding. Map 5.10 (see back of plan) shows the SFHA for Aransas Pass.

Other Potential Flooding Hazards
500-year Floodplains (Step 4.b)
The 500-year floodplains are moderate flood hazard areas known to have a .2% annual chance of flooding. These areas are known to flood, only at a much less frequent rate of the 100-year floodplains (the SFHA). Map 5.11 (see back of plan) shows the location of areas in Aransas Pass that would be inundated during 100-year and 500-year flooding events.

Coastal Flood Zones (Step 4.b.d)
Coastal flooding is caused by irregular tidal water and wave action that temporarily inundates areas near land-ocean boundaries. According to FEMA, V Zones are "areas along coasts subject to inundation by the 1-percent-annual-chance flood event [100-year floodplain] with additional hazards associated with storm-

induced waves" (FEMA, 2017). The coastal flood zones for Aransas Pass are shown on Map 5.12 (see back of plan). The zone identified as "AE" on this map is synonymous with the SFHA (the 100-year floodplain or the area with a 1% annual chance of flooding. This area is significant because the FIRM maps also include the Base Flood Elevations. The area marked as "VE" on this map are the areas which are exposed to additional hazards due to waves that would accompany a storm or large tidal event.

Localized Flooding (Step 4.a)
Map 5.13 (see back of plan) identifies areas in Aransas Pass that are specifically prone to flooding. These areas were identified by county employees and local residents. Some of these areas are not located in the SFHA, and many of them are related to surface flooding.

Critical Facilities & Infrastructure (Step 5.b.3)
Critical facilities and infrastructure are the components of a community that enable modern amenities. These include, but are not limited to, things like roads, bridges, utilities, water, sewage, police and fire stations, medical services, post offices, and schools. These facilities are an integral component of emergency services, as well as the ability of a community to recover after a flood, or any disaster; and therefore, should not be located in high hazard (including flood) areas.

Table 5.15 identifies the seven critical governmental facilities in the City of Aransas Pass. Six facilities are in an area above the 500-year floodplain, while Conn Brown Harbor sits in the 100-year floodplain. Most city critical facilities are located in higher elevations, decreasing the chance that they may be affected by flooding. Map 5.14 (see back of plan) shows the location of the critical governmental facilities in the City of Aransas Pass.

Table 5.15: City of Aransas Pass Critical Facilities.

Critical Facility	Location	In SFHA?
City Hall/Fire Department/ Police Department	600 W. Cleveland	No
Public Works Service Center	601 N. Avenue A	No
Wastewater Treatment Plant	1000 E. Ransom	No
Water Tower	1845 W Wheeler	No
Water Tower	1909 S Commercial	No
Water Tower	S Euclid & E Wilson	No
Conn Brown Harbor	Huff Street	**Yes; 100-year Floodplain**

The City of Aransas Pass manages 23 wastewater lift stations, nine of which are in the 100-year floodplain. There are also numerous privately owned and managed lift stations which the location of are unknown. As such, it is not known if these private lift stations are located within the floodplains.

Table 5.16 identifies eight critical facilities for the Aransas Pass Independent School District. All eight facilities are in an area above the 500-year floodplain. Since these facilities are located at higher elevations, the chance of them being affected by flooding is low. Map 5.15 (see back of plan) shows the location of the critical facilities for the Aransas Pass Independent School District.

Table 5.16: Aransas Pass Independent School District Critical Facilities.

Critical Facility	Location	In SFHA?
Administrative Office	2300 McMullen Lane	No
Faulk Early Childhood	430 S. 8th	No
Kieberger Elementary	748 W. Goodnight	No
Charlie Marshall Elementary	2300 McMullen Lane	No
AC Blunt Middle School	2103 Demory Ln	No
Aransas Pass High School	450 S Avenue A	No
Walter Noble Alternative School	701 W. Wheeler	No
Maintenance & Transportation Office	808 W. Yoakum	No

Review of Damaged Buildings/Flood Insurance Claims (Step 5.c)

Tables 5.17-5.19 show statistics about flood insurance policies and claims in Aransas Pass. Table 5.17 shows the total number of flood insurance policies that existed in the county as of November 30, 2016. Policies in force indicates the number of policies that were being actively maintained, or were up to date on all payments. Premium indicates the amount of money paid by property owners in the county to maintain the policies in force. Insurance in force indicates the total amount that would have to be paid out if every policy in the city had to be paid out at full value at that time.

Table 5.17: Flood Insurance Policies in Aransas Pass, According to Location (as of November 30, 2016) (Source: FEMA, official communication, December 2016).

Location of Policies	Policies in Force	Premium	Insurance in Force
Special Flood Hazard Area (100-year Floodplain)	122	$161,088	$31,732,100
Within or above the 500-year Floodplain (Preferred Risk Policies)	652	$246,344	$181,936,000

Table 5.18 is similar to Table 5.17 in that it shows the total number of flood insurance policies that existed in the city as of December 15, 2016 but is categorized by the type of structures protected. This table includes the number of closed paid losses, which indicates the number of claims that have been paid and closed out by FEMA as of December 15, 2016. The following column indicates to total amount of money that was paid on those closed paid claims. Finally, adjustment expenses indicates the amount of money that the insurance companies incurred investigating and adjusting the claims that have been paid and closed.

Table 5.18: Flood Insurance Policies in Aransas Pass, According to Structure Type (as of December 15, 2016) (Source: FEMA, official communication, December 2016).

Type of Structure	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Single Family	707	$360,228	$189,787,700	264	$2,946,179.89	$152,449.05
Buildings with 2-4 Units	43	$16,375	$10,861,600	7	$22,836.50	$1,815.00
All Other Residential	29	$12,130	$4,679,100	6	$15,923.13	$1,460.00
Non-Residential	49	$99,672	$15,850,500	138	$2,453,409.89	$82,936.49
Total	**828**	**$488,405**	**$221,178,900**	**415**	**$5,456,347.00**	**$238,660.00**

Flood Insurance Rate Maps (FIRM) are an "Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community" (FEMA, 2017). These maps are what determine NFIP premiums. Buildings that were "constructed or substantially improved on or before December 31, 1974, or before the effective date of the initial Flood Insurance Rate Maps of the community, whichever is later are considered Pre-FIRM" (FEMA, 2013). According to the FEMA Community Status Book Report (2017), all of the participating jurisdictions had initial FIRMs identified in 1971. Buildings that were constructed, or substantially improved, after this date are considered Post-FIRM. This is important because Pre-FIRM structures usually did not account for flood risks; however, Post-FIRM structures were required to meet all the NFIP minimum requirements. Table 5.19 shows the historical claim data (as of December 2016) for Aransas Pass according to whether the structures are Pre-FIRM or Post-FIRM.

Table 5.19: Flood Insurance Claims in Aransas Pass, According to Time of Construction (Pre-FIRM or Post-FIRM) (Source: FEMA, official communication, December 2016).

	Paid Claims	Paid Losses
Pre-FIRM	366	$4,237,869
Post-FIRM	48	$1,187,363

Development (Current & Future) (Step 5.e)
Aransas Pass staff identified five areas of the city that may experience development over the next five to ten years. These areas are described below.

- South Avenue A, south of Hwy 35 Business/Wheeler Avenue: A large single-family residential subdivision is currently being developed along this corridor. Although this is outside of the Special Flood Hazard Area, this area can be susceptible to localized flooding given small low-lying depressions in the land.
- North Avenue A and Hwy 35 Bypass, north of Wheeler Avenue: A business park and other commercial developments are slated for development in this area. This area has some of the highest elevations in the city and is outside of the Special Flood Hazard Area. However, it can be susceptible to some localized flooding.
- Wheeler Avenue/Hwy 35 Business, west of Avenue A: This commercial corridor has several business developments planned along the thoroughfare. While it is outside of the Special Flood Hazard Area, the area has had problems with localized flooding along intersections.
- South Saunders Street, north of Mooney Lane: Single-family residences are being developed in this area
- Conn Brown Harbor, north of Hwy 361: This area has long been considered by developers for mixed-use commercial and residential development. Although most of the harbor has high elevation outside of the Special Flood Hazard Area, the outer fringes are in both the 100-year and 500-year floodplain.

Repetitive Loss Areas (Step 4.a)
The Federal Emergency Management Agency tracks properties which flood regularly. These properties are termed "Repetitive Flood Loss Properties" and are defined as "any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978" (FEMA, 2005). As of November 23, 2016, there were 45 repetitive loss properties listed in Aransas Pass (FEMA, personal communication, November 23, 2016). Severe repetitive losses include residential structures (single family homes and units with two to four units) that have flood insurance through the NFIP, and have "incurred flood damage for which: a.) 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or b) at least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss" (FEMA, 2017). The Severe Repetitive Loss Grant Program makes funding available to state and local governments to help mitigate future losses by buying out these properties for conversion to open space, or to help elevate these structures. Map 5.16 (see back of plan) shows areas of severe repetitive loss concentrations in Aransas Pass. The information about these properties has been generalized, in accordance with the protocols required to maintain the privacy of property owners.

Fulton

Special Flood Hazard Areas (100-year floodplain) (Step 4.a.1)

The Special Flood Hazard Areas are defined by FEMA as: "the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies" (FEMA, 2016). The SFHA is the same as the 100-year floodplain, which is known to have a 1% annual chance of flooding. This can also be interpreted that over the span of an average 30-year mortgage, the property will have a 26% chance of flooding. Map 5.17 (see back of plan) shows the SFHA for Fulton.

Other Potential Flooding Hazards

500-year Floodplains (Step 4.b)

The 500-year floodplains are moderate flood hazard areas known to have a .2% annual chance of flooding. These areas are known to flood, only at a much less frequent rate of the 100-year floodplains (the SFHA). Map 5.18 (see back of plan) shows the location of areas in Fulton that would be inundated during 100-year and 500-year flooding events.

Coastal Flood Zones (Step 4.b.d)

Coastal flooding is caused by irregular tidal water and wave action that temporarily inundates areas near land-ocean boundaries. According to FEMA, V Zones are "areas along coasts subject to inundation by the 1-percent-annual-chance flood event [100-year floodplain] with additional hazards associated with storm-induced waves" (FEMA, 2017). The coastal flood zones for Fulton are shown on Map 5.19 (see back of plan). The zone identified as "AE" on this map is synonymous with the SFHA (the 100-year floodplain or the area with a 1% annual chance of flooding. This area is significant because the FIRM maps also include the Base Flood Elevations. The area marked as "VE" on this map are the areas which are exposed to additional hazards due to waves that would accompany a storm or large tidal event.

Localized Flooding (Step 4.a)

Map 5.20 (see back of plan) identifies areas in Fulton that are specifically prone to flooding. These areas were identified by county employees and local residents. Some of these areas are not located in the SFHA, and many of them are related to surface flooding.

Critical Facilities & Infrastructure (Step 5.b.3)

Critical facilities and infrastructure are the components of a community that enable modern amenities. These include, but are not limited to, things like roads, bridges, utilities, water, sewage, police and fire stations, medical services, post offices, and schools. These facilities are an integral component of emergency services, as well as the ability of a community to recover after a flood, or any disaster; and therefore, should not be located in high hazard (including flood) areas.

Table 5.20 identifies three governmental critical facilities in the Town of Fulton. All three facilities are in areas above the 500-year floodplain, and have low chances of being affected by flooding. Map 5.21 (see back of plan) shows the location of the governmental critical facilities for the Town of Fulton.

Table 5.20: Town of Fulton Critical Facilities.

Critical Facility	Location	In SFHA?
City Hall/ Police Department	209 N 7th	No
Fulton Volunteer Fire Department Central Station	701 Cactus	No
City Operations Office	301 N. 9th St	No

There are also four wastewater lift stations managed by the Town of Fulton, none of which are in the 100-year floodplain.

Review of Damaged Buildings/Flood Insurance Claims (Step 5.c)

Tables 5.21-5.23 show statistics about flood insurance policies and claims in Fulton. Table 5.21 shows the total number of flood insurance policies that existed in the county as of November 30, 2016. Policies in force indicates the number of policies that were being actively maintained, or were up to date on all payments. Premium indicates the amount of money paid by property owners in the county to maintain the policies in force. Insurance in force indicates the total amount that would have to be paid out if every policy in the town had to be paid out at full value at that time.

Table 5.21: Flood Insurance Policies in Fulton, According to Location (as of November 30, 2016) (Source: FEMA, official communication, December 2016).

	Policies in Force	Premium	Insurance in Force
Special Flood Hazard Area (100-year Floodplain)	1	$4,890	$300,000
Within or above the 500-year Floodplain (Preferred Risk Policies)	176	$76,000	$50,952,000

Table 5.22 is similar to Table 5.21 in that it shows the total number of flood insurance policies that existed in the town as of December 15, 2016 but is categorized by the type of structures protected. This table includes the number of closed paid losses, which indicates the number of claims that have been paid and closed out by FEMA as of December 15, 2016. The following column indicates to total amount of money that was paid on those closed paid claims. Finally, adjustment expenses indicates the amount of money that the insurance companies incurred investigating and adjusting the claims that have been paid and closed.

Table 5.22: Flood Insurance Policies in Fulton, According to Structure Type (as of December 15, 2016) (Source: FEMA, official communication, December 2016).

Type of Structure	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Single Family	143	$48,458	$39,470,000	2	$2,734.40	$450.00
Buildings with 2-4 Units	0	$0	$0	0	$0.00	$0.00
All Other Residential	1	$155	$32,000	0	$0.00	$0.00
Non-Residential	16	$29,277	$6,689,500	0	$0.00	$0.00
Total	**160**	**$77,890**	**$46,191,500**	**2**	**$2,734.40**	**$450.00**

Flood Insurance Rate Maps (FIRM) are an "Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community" (FEMA, 2017). These maps are what determine NFIP premiums. Buildings that were "constructed or substantially improved on or before December 31, 1974, or before the effective date of the initial Flood Insurance Rate Maps of the community, whichever is later are considered Pre-FIRM" (FEMA, 2013). According to the FEMA Community Status Book Report (2017), all of the participating jurisdictions had initial FIRMs identified in 1971. Buildings that were constructed, or substantially improved, after this date are considered Post-FIRM. This is important because Pre-FIRM structures usually did not account for flood risks; however, Post-FIRM structures were required to meet all the NFIP minimum requirements. Table 5.23 shows the historical claim data (as of December 2016) for Futon according to whether the structures are Pre-FIRM or Post-FIRM.

Table 5.23: Flood Insurance Claims in Fulton, According to Time of Construction (Pre-FIRM or Post-FIRM) (Source: FEMA, official communication, December 2016).

	Paid Claims	Paid Losses
Pre-FIRM	2	$2,734
Post-FIRM	0	$0

Development (Current & Future) (Step 5.e)
Town of Fulton almost fully developed. There is no room for expansion within the commercial areas, and only a few scattered lots throughout the community that could be developed as single family residential units. None of these lots are in a Special Flood Hazard Area.

Repetitive Loss Areas (Step 4.a)
The Federal Emergency Management Agency tracks properties which flood regularly. These properties are termed "Repetitive Flood Loss Properties" and are defined as "any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978" (FEMA, 2005). As of November 23, 2016, there were no repetitive loss properties listed in the Town of Fulton (FEMA, personal communication, November 23, 2016). Severe repetitive losses include residential structures (single family homes and units with two to four units) that have flood insurance through the NFIP, and have "incurred flood damage for which: a.) 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or b) at least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss" (FEMA, 2017). The Severe Repetitive Loss Grant Program makes funding available to state and local governments to help mitigate future losses by buying out these properties for conversion to open space, or to help elevate these structures. The Town of Fulton does not have any severe repetitive losses.

Rockport
Special Flood Hazard Areas (100-year floodplain) (Step 4.a.1)
The Special Flood Hazard Areas are defined by FEMA as: "the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies" (FEMA, 2016). The SFHA is the same as the 100-year floodplain, which is known to have a 1% annual chance of flooding. This can also be interpreted that over the span of an average 30-year mortgage, the property will have a 26% chance of flooding. Map 5.22 (see back of plan) shows the SFHA for Rockport.

Other Potential Flooding Hazards
500-year Floodplains (Step 4.b)
The 500-year floodplains are moderate flood hazard areas known to have a .2% annual chance of flooding. These areas are known to flood, only at a much less frequent rate of the 100-year floodplains (the SFHA). Map 5.23 (see back of plan) shows the location of areas in Rockport that would be inundated during 100-year and 500-year flooding events.

Coastal Flood Zones (Step 4.b.d)
Coastal flooding is caused by irregular tidal water and wave action that temporarily inundates areas near land-ocean boundaries. According to FEMA, V Zones are "areas along coasts subject to inundation by the 1-percent-annual-chance flood event [100-year floodplain] with additional hazards associated with storm-induced waves" (FEMA, 2017). The coastal flood zones for Rockport are shown on Map 5.24 (see back of plan). The zone identified as "AE" on this map is synonymous with the SFHA (the 100-year floodplain or the

area with a 1% annual chance of flooding. This area is significant because the FIRM maps also include the Base Flood Elevations. The area marked as "VE" on this map are the areas which are exposed to additional hazards due to waves that would accompany a storm or large tidal event.

Localized Flooding (Step 4.a)
Map 5.25(see back of plan) identifies areas in Rockport that are specifically prone to flooding. These areas were identified by county employees and local residents. Some of these areas are not located in the SFHA, and many of them are related to surface flooding.

Critical Facilities & Infrastructure (Step 5.b.3)
Critical facilities and infrastructure are the components of a community that enable modern amenities. These include, but are not limited to, things like roads, bridges, utilities, water, sewage, police and fire stations, medical services, post offices, and schools. These facilities are an integral component of emergency services, as well as the ability of a community to recover after a flood, or any disaster; and therefore, should not be located in high hazard (including flood) areas.

Table 5.24 identifies the critical governmental facilities in the City of Rockport. Out of twelve facilities, ten are in an area above the 500-year floodplain. Two of the facilities are located in, or within close proximity of, the 500-year floodplain: City Hall and the Fire Department substation at 119 Freeze Lane. Most City critical facilities are located at higher elevations and thus should not be affected by flooding. Map 5.26 (see back of plan) shows the location of the governmental critical facilities in the City of Rockport.

Table 5.24: City of Rockport Critical Facilities.

Critical Facility	Location	In SFHA?
City Hall	622 E. Market	0.2% Annual Chance
Public Works Service Center	2751 S.H. 35 Bypass	No
Wastewater Treatment Plant	1401 N. Pearl	No
Information Technology/ Public Works Annex	402 E Laurel	No
Rockport Volunteer Fire Department Substation	119 Freeze Lane	0.2% Annual Chance
Rockport Volunteer Fire Department Substation	1608 West Terrace Blvd	No
Rockport Volunteer Fire Department Substation	902 Henderson	No
Rockport Volunteer Fire Department Central Station	212 Gagon	No
Critical Facility	**Location**	**In SFHA?**
Water Tower	2751 S.H. 35 Bypass	No
Water Tower	901 Palmetto	No
Water Tower	1303 S Kossuth	No
Compressed Natural Gas Station	1995 Stadium Drive	No

There are also over 40 wastewater lift stations managed by the City of Rockport, 17 of which are in the 100-year floodplain. There are also many privately owned and managed lift stations that may or may not be in the floodplain.

Review of Damaged Buildings/Flood Insurance Claims (Step 5.c)
Tables 5.25-5.27 show statistics about flood insurance policies and claims in Rockport. Table 5.25 shows the total number of flood insurance policies that existed in the county as of November 30, 2016. Policies in force indicates the number of policies that were being actively maintained, or were up to date on all payments. Premium indicates the amount of money paid by property owners in the county to maintain the policies in force. Insurance in force indicates the total amount that would have to be paid out if every policy in the city had to be paid out at full value at that time.

Table 5.25: Flood Insurance Policies in Rockport, According to Location (as of November 30, 2016) (Source: FEMA, official communication, December 2016).

	Policies in Force	Premium	Insurance in Force
Special Flood Hazard Area (100-year Floodplain)	560	$448,205	$117,851,900
Within or above the 500-year Floodplain (Preferred Risk Policies)	1,497	$617,151	$449,018,000

Table 5.26 is similar to Table 5.25 in that it shows the total number of flood insurance policies that existed in the city as of December 15, 2016 but is categorized by the type of structures protected. This table includes the number of closed paid losses, which indicates the number of claims that have been paid and closed out by FEMA as of December 15, 2016. The following column indicates to total amount of money that was paid on those closed paid claims. Finally, adjustment expenses indicates the amount of money that the insurance companies incurred investigating and adjusting the claims that have been paid and closed.

Table 5.26: Flood Insurance Policies in Rockport, According to Structure Type (as of December 15, 2016) (Source: FEMA, official communication, December 2016).

Type of Structure	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Single Family	1,771	$791,333	$503,062,000	195	$1,665,981.58	$96,286.33
Buildings with 2-4 Units	60	$30,949	$10,518,500	7	$29,594.98	$3,710.00
All Other Residential	455	$149,966	$79,762,600	14	$37,508.01	$3,255.00
Non-Residential	165	$340,029	$66,455,000	133	$884,839.00	$51,622.83
Total	**2,451**	**$1,312,277**	**$659,798,100**	**349**	**$2,617,922.00**	**$154,873.00**

Flood Insurance Rate Maps (FIRM) are an "Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community" (FEMA, 2017). These maps are what determine NFIP premiums. Buildings that were "constructed or substantially improved on or before December 31, 1974, or before the effective date of the initial Flood Insurance Rate Maps of the community, whichever is later are considered Pre-FIRM" (FEMA, 2013). According to the FEMA Community Status Book Report (2017), all of the participating jurisdictions had initial FIRMs identified in 1971. Buildings that were constructed, or substantially improved, after this date are considered Post-FIRM. This is important because Pre-FIRM structures usually did not account for flood risks; however, Post-FIRM structures were required to meet all the NFIP minimum requirements. Table 5.27 shows the historical claim data (as of December 2016) for Rockport according to whether the structures are Pre-FIRM or Post-FIRM.

Table 5.27: Flood Insurance Claims in Rockport, According to Time of Construction (Pre-FIRM or Post-FIRM) (Source: FEMA, official communication, December 2016).

	Paid Claims	Paid Losses
Pre-FIRM	295	$1,991,576
Post-FIRM	52	$648,342

Development (Current & Future) (Step 5.e)

Rockport staff identified three areas of the city that may experience development over the next five to ten years. These areas are described below.

- South Rockport, south of FM 1069/Market Street and east of State Highway 35 Business: This area has become increasingly popular for single-family residence development. However, given its proximity to the bay and location in the Special Flood Hazard Area, this area is also very prone to flooding.
- Salt Lake, east of Loop 1781: This area adjacent to a privately-owned lake and access to Copano Bay has current and future development for recreational vehicle parks. While most of the area is outside of the Special Flood Hazard Area, the land most adjacent to the lake is in the 100-year floodplain. Furthermore, a large portion of the area's drainage channels flow in this direction, which make the area more susceptible to localized flooding.
- Highway 35 Bypass: There has been interest in developing both residential and commercial developments along this corridor. This area is not located in the Special Flood Hazard Area but can be susceptible to local flooding due to various scattered depressions in the land.

Repetitive Loss Areas (Step 4.a)
The Federal Emergency Management Agency tracks properties which flood regularly. These properties are termed "Repetitive Flood Loss Properties" and are defined as "any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978" (FEMA, 2005). As of November 23, 2016, there were 22 repetitive loss properties listed in the City of Rockport (FEMA, personal communication, November 23, 2016). Severe repetitive losses include residential structures (single family homes and units with two to four units) that have flood insurance through the NFIP, and have "incurred flood damage for which: a.) 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or b) at least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss" (FEMA, 2017). The Severe Repetitive Loss Grant Program makes funding available to state and local governments to help mitigate future losses by buying out these properties for conversion to open space, or to help elevate these structures. Map 5.27 (see back of plan) shows areas of severe repetitive loss concentrations in Rockport. The information about these properties has been generalized, in accordance with the protocols required to maintain the privacy of property owners.

NON-FLOOD RELATED HAZARDS (Step 4.d; with 5.a. & 5.b woven in)
In addition to flooding, the Texas State Hazard Mitigation Plan (Texas Division of Emergency Management, 2010) identifies a variety of other natural hazards that impact the State of Texas. This section describes those hazards which have the potential to impact Aransas County. Due to the county's location on the coast, Sea Level Rise has been added. Each hazard includes a description, a list of known historical occurrences (including magnitude and severity), and a statement of future probability.

Coastal Erosion (Step 4.d & 4.b.1.c)
Coastal erosion refers to the movement of sediments such as those on beaches or shorelines by forces involving wave or wind action. The effects of coastal erosion can include a less stable shoreline and can wear away or remove large portions of land over time. Tidal movement and wave action due to wind are nearly constant along the coastline, and can compromise shoreline stability. Water moving at higher speeds has the capacity to carry and move much greater sizes and amounts of sediment; therefore, more active locations when considering the movement of water have the potential to influence the coastline to a greater degree. Boat wakes are another source of water movement that should be considered when examining how to stabilize shoreline or shoreline structures.

Historical Occurrences
Coastal erosion is a serious issue that has affected Aransas County. Recently, a county task force was formed to address coastal resiliency issues and gather project information for six projects impacted by erosion (Aransas County, 2016). One project of immediate concern is shoreline stabilization along Bay Shore Drive in Key Allegro. Existing erosion control infrastructure has failed along the perimeter of the subdivision, and work has been in process to mitigate the issue by constructing rock revetments along the shoreline (Aransas County, 2016). Shell Ridge Road and Fulton Beach Road are also in need of shoreline stabilization (Aransas County, 2016).

Other areas affected by coastal erosion are Copano Bay, Cedar Bayou, Cove Harbor, and Little Bay (Aransas County, 2016). The ecosystems of the local bay systems are being affected by continuous sedimentation, which has greatly impacted the bird habitats supported by those ecosystems. In 2016, Aransas County submitted applications for RESTORE Act funding to dredge and stabilize these areas in order to preserve these vital habitats (Aransas County, 2016).

Probability
The aforementioned erosion occurrences have been an ongoing issue for many years. While difficult to quantify, there is likely to be a very high probability that coastal erosion will continue to be a hazard of concern to Aransas County.

Vulnerability and Impacts (Step 5.b)
The most vulnerable areas include Copano Bay, Cedar Bayou, Cove Harbor, Key Allegro, and Little Bay. Homes in these areas also have a disproportionately higher property value than most other homes in the planning area.

Summary of Hazard (Step 5.a)
Local governments, stakeholders, and various state agencies have identified this hazard as one of concern for Aransas County. These groups will continue to study the problem, and identify mitigation actions to reduce the impact of coastal erosion in the area. While erosion will likely continue on a stable, incremental basis, immediate risk to persons and property are limited.

Dam or Levee Failure (Step 4.d, 4.b.1.a, & 4.b.1.b)
Dam failure, as a hazard, is described as a structural failure of a water impounding structure. Structural failure can occur during extreme conditions, which include but are not limited to:

- Reservoir inflows in excess of design flows
- Flood pools higher than previously attained
- Unexpected drop in pool level
- Pool near maximum level and rising
- Excessive rainfall or snowmelt
- Large discharge through spillway
- Erosion, landslide, seepage, settlement, and cracks in the dam or area

The US Army Corps of Engineers National Inventory of Dams lists one dam in Aransas County (identified in Table 5.28); however, since this dam is not classified as a high hazard dam, the dam does not have an emergency action plan. (Step 4.b.1.b)

Table 5.28: Inventory of Dams in Aransas County.

Name	Tailing Ponds Dam 1
Owner	Sherwin Alumina LP
Year Completed	1971
Inspection Date	10/12/2010
Storage	6,400 acre-feet

Additional Dams in this database which are located near Aransas County are identified in Table 5.29. (Step 4.b.1.b)

Table 5.29: Inventory of Dams near Aransas County.

Name	**Tailing Ponds Dam 2**	**Facility 204 #3 Bed**	**Mission River Oaks Lake Dam**
Owner	Sherwin alumina lP	Reynolds metals co.	C Marshall
County	San Patricio	San Patricio	Refugio
State	Texas	Texas	Texas
River	Off chart-Port Bay	N/A	Off chart-Mission River
Year Completed	1971	N/A	1981
Inspection Date	10/12/2010	N/A	9/8/1981
Storage	6,400	14,646	88

Local officials have confirmed that should these dams fail, people and property in the planning area would not be at risk.

Historical Occurrences
There have been no known occurrences of dam or levee failure impacts to people and property in the planning area.

Probability
Given no historical records of failure, the probability of this event occurring any given year is less than 1%.

Vulnerability and Impacts (Step 5.b)
Should dams or levees in the surrounding area fail, no impact to people and property would be sustained.

Summary of Hazard (Step 4.b.1.a & 5.a)
With no high hazard dams being located in the Aransas County, risk is limited. While high hazard dams do exist northwest of the county, their failure should pose little to limited impacts within the county itself. While there are no FEMA certified levees in the planning area, a berm located in Aransas Pass is a point of concern. Development has actually occurred on the berm, potentially reducing the berms structural integrity. Local officials have identified that flooding coming from the western side of the peninsula could cause the berm to actually prevent water from draining out of the city. Further studies are needed to address the full risk potential of this structure in Aransas Pass.

Drought (Step 4.d)
Drought is generally defined as a condition of moisture levels significantly below normal for an extended period of time over a large area that adversely affects plants, animal life, and humans. Drought conditions can also be defined in terms of meteorological, hydrological, agricultural, and socioeconomic factors. Prolonged lack of precipitation within a watershed depletes water bodies that have the potential to negatively affect downstream ecosystems such as estuaries.

Historical Occurrences
Six intense droughts have occurred in the area between 1959 and 2015, as indicated by the Palmer Drought Severity Index (National Drought Mitigation Center, 2016). On average, each drought lasted for approximately 22 months. The shortest drought period occurred in 2006 for one month, and the longest drought period occurred from 1986 to 1991 for 63 months (National Drought Mitigation Center, 2016).

Table 5.30: Coastal Bend Historical Drought Periods, 1959-2015 (National Drought Mitigation Center, 2016).

Drought Start Date	Drought End Date	Duration (months)
6/1/2011	4/1/2012	10
1/1/2009	11/1/2009	10
4/1/2006	5/1/2006	1
5/1/1996	3/1/1997	10
3/1/1986	6/1/1991	63
6/1/1964	8/1/1967	38

Probability
There have been 132 recorded months of drought in the Coastal Bend area for the time period between 1959 and 2016 (672 months). This suggests that for any given month, there is a 19.6% chance of drought occurring in the Coastal Bend area.

Vulnerability and Impacts (Step 5.b)
Negative impacts of drought are primarily economic and environmental. With Aransas County lacking a significant crop and livestock presence, the planning area has a low exposure to this hazard. Aside from agricultural impacts, other losses related to drought include increased costs of fire suppression and damage to roads and structural foundations due to the shrink dynamic of expansive soils during excessively dry conditions.

Summary of Hazard (Step 5.a)
While drought is a significant concern in terms of regional economic impacts due to agricultural impacts, drought poses little risk to the planning area. While there are agricultural areas in the western and northern unincorporated areas of the county, the industry is relatively small compared to surrounding counties.

Earthquakes (Step 4.d)
An earthquake is the result of a sudden release of energy in the Earth's tectonic plates that creates seismic waves. The seismic activity of an area refers to the frequency, type, and size of earthquakes experienced over a period of time. Earthquakes are measured by magnitude and intensity. Magnitude is measured by the Richter Scale, a base-10 logarithmic scale, which uses seismographs around the world to measure the amount of energy released by an earthquake. Intensity is measured by the Modified Mercalli Intensity Scale, which determines the intensity of an earthquake by comparing actual damage against damage patterns of earthquakes with known intensities. Figure 5.1 shows the fault lines in the region.

Historical Occurrences
For the time period between 1950 and 2016, the USGS reported no record of earthquakes having occurred within a 50-mile radius around Aransas County

Probability
Given no reported events between 1950 and 2016, the annual probability of an earthquake occurring is less than 1%.

Vulnerability and Impacts (Step 5.b)
A damaging earthquake event is unlikely; and therefore, most structures in the county are not built to earthquake standards. As such, damages to existing and future development would likely be minor in nature.

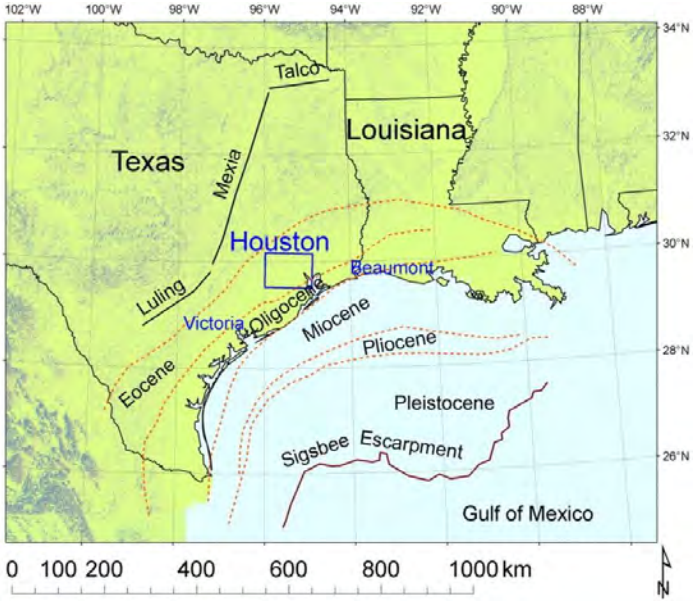


Figure 5.1: Regional Fault Lines (Image: USGS).

Summary of Hazard (Step 5.a)
While there is a lack of recorded historical occurrences, the planning area is located near the Oligocene and Miocene fault lines. As such, this hazard does pose some risk to the entire Texas Gulf Coast; therefore, the unstudied and undefined impact potential should be studied further.

Expansive Soils and Land Subsidence (Step 4.d)
Geologic hazards along the Texas coast can include expansion and contraction of soils (termed 'expansive soils') and the ongoing threat of land subsidence. Both geologic hazards can result in property and infrastructure damage, and can even include large-scale loss of land over time. Expansive soils are defined as "soils and soft rock that tend to swell or shrink due to changes in moisture content" that can decrease the stability of the land and in turn affect structures or surfaces covering the land (FEMA, n.d., pg. 22). Temperature and water levels also influence how soils expand or contract. Land subsidence can be described as "the loss of surface elevation due to the removal of subsurface support, [which] ranges from broad, regional lowering of the land surface to localized collapse" (FEMA, n.d., pg. 8). Subsidence is an issue along many low-lying regions of the coast. Subsidence can occur in wetland habitats from the gradual erosion and lack of sediment input into a system.

Historical Occurrences
There is no historical data regarding expansive soils or land subsidence in Aransas County.
Probability
Since there is no historical record of the occurrence of expansive soil or land subsidence, the probability for these hazards cannot be determined.

Vulnerability and Impacts (Step 5.b)
The entire planning area is theoretically vulnerable to structural damage as a result of shrinking and expanding soils and land subsidence; however, there is no data available to determine damage estimates for this hazard. It is advised that a licensed professional be consulted for a full analysis of soil conditions so that proper precautions can be taken prior to any construction being performed in the county.

Summary of Hazard (Step 5.a)

While a number studies exists which profile soil types and conditions in the area, a lack of historical recorded occurrences of expansive soils and land subsidence make the areas risk to these hazards difficult to assess. Soil profiles suggest that Aransas County does have characteristics conducive to expansion and subsidence. Attention to this hazard and the impacts on local infrastructure and floodplain modification should be overserved over time.

Extreme Heat (Step 4.d)
Extreme heat is often associated with periods of drought, but can also be characterized by long periods of high temperatures in combination with high humidity. During these conditions, the human body has difficulties cooling through the normal method of the evaporation of perspiration. Health risks arise when a person is overexposed to heat. Extreme heat can also cause people to overuse air conditioners, which can lead to power failures. For the planning area, the months with the highest temperatures are May, June, July, August, and September. The NWS is responsible for issuing Heat Advisories and Excessive Heat Warnings. Heat Advisories are issued when heat index values are greater than, or equal to, 110 degrees Fahrenheit. Excessive Heat Warnings are issued when heat index values are greater than, or equal to, 115 degrees Fahrenheit.

Historical Occurrences
According to the Corpus Christi office of the NWS, "approximately three heat advisories for temperatures over 110 degrees Fahrenheit are issued a year in the Corpus Christi area or 34 in a ten-year period of 2005-2015" (P. Zabel, personal communication, December 21, 2015). However, there is some variability in the number of advisories actually issued each year. For example, in 2007 and 2008, there were no advisories issued in the area, while in 2014, nine advisories were issued (P. Zabel, personal communication, December 21, 2015).

Probability
Considering 34 heat advisories over a ten-year period, annual extreme heat events are a near certainty in Aransas County.

Vulnerability and Impacts (Step 5.b)
Those at greatest risk for heat-related illness include infants and children up to four years of age, people 65 years of age and older, people who are overweight, and people who are ill or on certain medications. To determine jurisdictions within the planning area with populations that may be more vulnerable to extreme heat, demographic data was obtained from the 2010 Census on numbers of people in each jurisdiction under age 5 and over age 65. Data was not available for the under age 4 demographic, overweight individuals, and those on certain medications.

Heat-related illness or death is generally the greatest concern resulting from extreme heat events. Although historically no heat-related deaths are known, the potential exists. Area elder care facilities, senior housing facilities, and childcare facilities are vulnerable to extreme temperatures. Most notably, power failure during an extreme heat event could shut down these facilities' HVAC systems if back-up power capabilities were not available.

Another type of infrastructure damage that can occur as a result of extreme heat is road damage. When asphalt is exposed to prolonged extreme heat, it can cause buckling of asphalt-paved roads, driveways, and parking lots.

Summary of Hazard (Step 5.a)
While the geographic location of the planning area does predispose residents and infrastructure to extreme heat events, historical impacts have been limited. Local energy providers maintain emergency operations plans to address power outages, which are critical mitigation actions to maintain the areas air conditioning.

Hailstorms (Step 4.d)

Hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere causing them to freeze. The raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow. (NOAA, Severe Weather 101 – Hail, n.d)

Hailstorms in Texas cause damage to property, crops, and the environment and kill and injure livestock. In the United States, hail causes more than $1 billion in damage to property and crops each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury to humans, occasionally fatal injury.

Historical Occurrences

Data collected from NOAA's, NCED shows that there were 13 hail storm events that occurred between 1996 and 2015 (NOAA-NCED, n.d.). These events are summarized in Table 5.31. The total cost of damages was $15,000, which were all incurred during the May 15, 2012 hail storm event. In this event, scattered thunderstorms in the Coastal Bend region resulted in golf-ball sized hail which impacted southwest Rockport.

Table 5.31: Aransas County Historical Hail Events, 1996-2015 (NOAA-NCED, n.d.).

Hail Event Date	Location	Size of Hail (inches)	Cost of Damages
1/31/1998	Rockport	0.75	$0
1/31/1998	Rockport	0.75	$0
3/7/1998	Rockport	1.00	$0
3/18/2000	Rockport	1.00	$0
3/18/2000	Rockport	0.75	$0
3/26/2003	Rockport	1.00	$0
5/8/2005	Rockport	0.75	$0
5/8/2005	Rockport	0.75	$0
3/13/2007	Rockport	1.00	$0
6/3/2009	Cardwell	1.75	$0
5/15/2012	Rockport	1.75	$10,000
5/15/2012	Rockport	1.00	$5,000
12/4/2012	Cardwell	0.88	$0

Probability

With 13 historical hail events occurring over the 20-year period between 1996 and 2015, the annual probability of this event occurring in Aransas County is 65.0%.

Vulnerability and Impacts (Step 5.b)

In general, assets in the planning area that are vulnerable to hail damage include people, crops, vehicles, and built structures. Most buildings are privately insured, which supports most property owners in recovering from hail damage.

Summary of Hazard (Step 5.a)
While hail does pose a risk to the planning area, principally in terms of damage to property and infrastructure, insurance and building standards have historically proved to be important mitigation actions to address this hazard.

Hurricanes and Tropical Storms (Step 4.d)
According to NOAA's NWS, hurricanes are storms that reach a sustained surface wind speed of 64 knots or more (equivalent to 74 miles per hour or greater). Hurricane season in the Gulf of Mexico runs from June 1 to November 30. Warmer gulf waters provide more favorable conditions for hurricane development, therefore later summer storms are often stronger than early season hurricanes. Atmospheric conditions, including moisture in the air and wind movement can help strengthen or decrease the intensity of a storm. Wind shear or dry air, for example, can cause a storm to weaken as it moves through the Gulf.

Historical Occurrences
Since 1850, NOAA has recorded 38 hurricanes and tropical storms within a 65-nautical mile radius of Aransas County (Source: NOAA, Historical Hurricane Tracks, 2016). Figure 5.2 shows a map of these events.

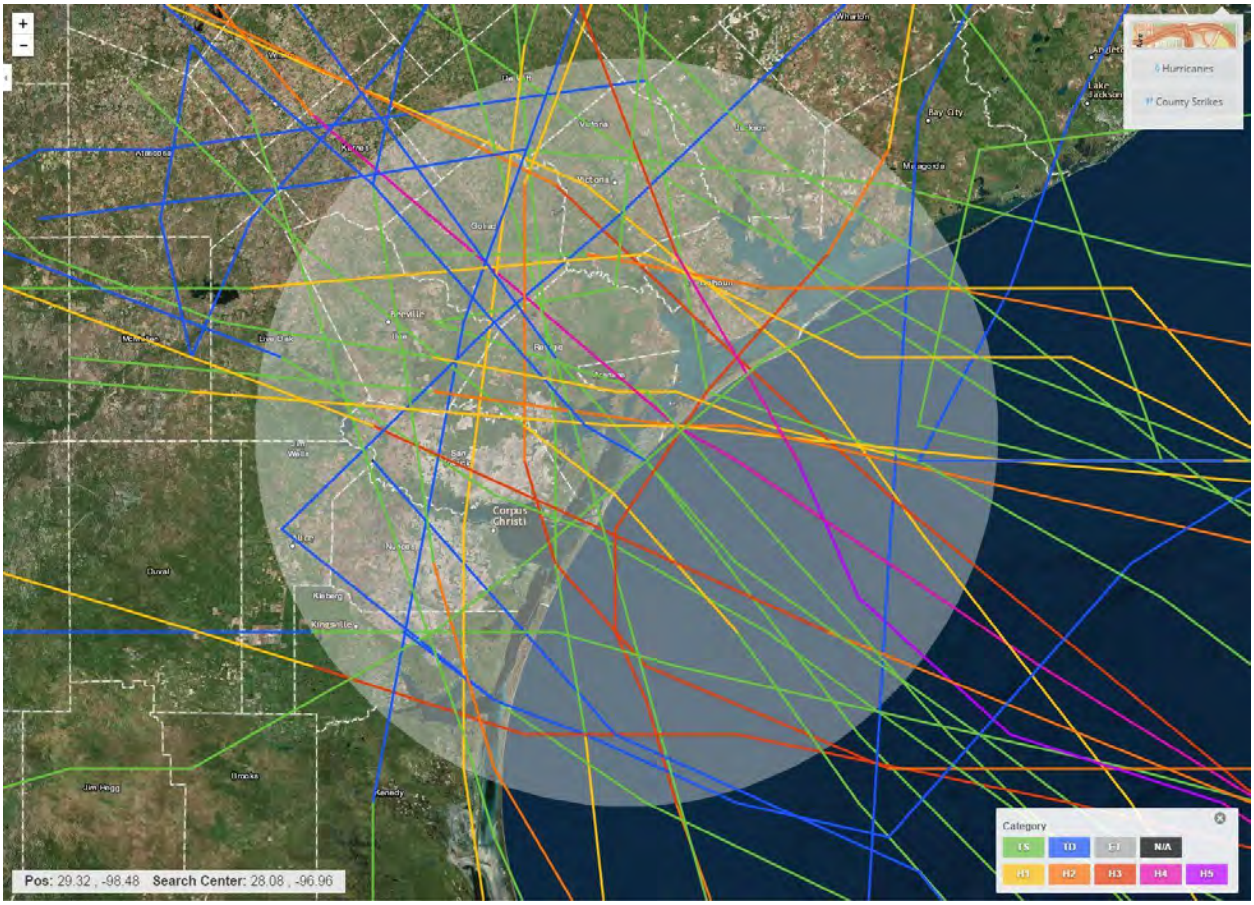


Figure 5.2: Historic Hurricane and Tropical Storm Paths, 1850-2016
(Source: NOAA, Historical Hurricane Tracks, 2016).

The following narratives about significant tropical storms and hurricanes that have impacted the Aransas County area were pulled directly from the FEMA Flood Insurance Study: Aransas County, Texas and Incorporated Areas (2016).

1919 Storm (September 2 - 15, 1919
Prior to Hurricane Carla (1961), the 1919 Storm was considered the largest known hurricane to strike the Texas Coast. Maximum sustained wind velocity recorded at the City of Corpus Christi was 80 miles per hour. Surge elevations of up to 16 feet were recorded as the storm surge swept across the barrier islands and through the passes, piling water upon the landward shores of Corpus Christi and Nueces Bays. Highest recorded surge elevations along the coast were approximately 11.1 feet. Surges of 6.6 feet or greater were experienced along almost the entire Texas Coast. The City of Port Aransas on the north end of Mustang Island was entirely destroyed. The Corpus Christi Beach, or North Beach as it was known, was swept clean of all but three badly battered buildings. The storm left 350 people dead, and the damages exceeded $20 million.

1942 Storm (August 21-31, 1942)
The eye of the storm moved across Matagorda Island on August 30 and passed over the City of Seadrift as it moved inland. The peak hurricane surges recorded on the open coast were 11.8 feet at the City of Freeport, 6.2 feet at the City of Galveston, 5.0 feet at the Town of High Island, 3.4 feet at the City of Port Aransas, and 5.5 feet at the Town of Sabine. Corpus Christi Bay had maximum tides of about 2 feet and a depressed tide of -1.4 feet as the winds shifted and blew gulfward across the bay. This big storm killed eight people, resulted in approximately $11.5 million in property damages, and caused an additional $15 million in crop damage (Reference 10).

1945 Storm (August 24 - 29, 1945)
The storm the eye passed just north of the Village of Port O'Connor, across Matagorda Bay, and struck the City of Palacios on the morning of August 27 as it moved inland towards the City of Bay City. The storm was unusual in the coastal path it maintained, thereby raking essentially the entire Texas Coast, and also because of its slow forward movement, traveling at less than 5 miles per hour. The area between the City of Port Aransas and the mouth of the Colorado River received the maximum force of the hurricane. The maximum storm surge varied considerably along the coast with about 3.2 feet at the City of Corpus Christi, 6.6 feet at the Town of Olivia, 7 feet at the City of Palacios, 3.7 feet at the City of Port Aransas, 3 feet recorded at the City of Port Isabel, 14.5 feet at the City of Port Lavaca, and 8 feet at the Village of Port O'Connor. Maximum wind velocities were estimated at 85 miles per hour at the City of Palacios, 100 to 125 miles per hour at the City of Port Aransas, 76 miles per hour at the City of Port Isabel, and 135 miles per hour at the Town of Olivia, the City of Port Lavaca, the Village of Port O'Connor, and the City of Seadrift. The storm caused extensive beach erosion throughout the affected area and severely eroded the western Matagorda Bay shores. Several miles of the shore receded 50 feet as a result of the storm. The storm killed three people, injured 25, and caused damages exceeding $20 million.

Hurricane Carla (September 11, 1961)
Carla moved inland over the Village of Port O'Connor northward through the Cities of Port Lavaca and Point Comfort. Maximum sustained wind velocities at the City of Port Lavaca were estimated at 115 miles per hour with gusts estimated at more than 170 miles per hour. High-water marks indicate surge heights reached elevations of up to 22 feet at the City of Port Lavaca, 7.5 feet at the City of Rockport, and 10.3 feet along the eastern Aransas County line near the Aransas County National Wildlife Refuge, as the storm swept across the barrier islands and piled water upon the landward shores of Matagorda Bay. Highest recorded surge elevations along the open coast were approximately 12.3 feet. This hurricane also spawned a rash of 26 tornadoes which took several lives in Texas and caused extensive damage. Although rainfall accompanying the hurricane was heavy in several local areas, the total volume of precipitation was not unusually high. Approximately 1,700,000 acres of Texas

coastal land, including entire communities, were inundated, 32 people were killed, and damage from wind and surge was estimated at $408 million. Normal activities were disrupted for several weeks. Damages from hurricane flooding were estimated to be $78.7 million, and total damages were $149.3 million for the five county Matagorda Bay study area.

Hurricane Beulah (September 5 - 22, 1967)
Beulah moved inland just east of the City of Brownsville. Torrential rains fell on south Texas and northeastern Mexico. Storm rainfall amounts ranged from 10 to 20 inches over much of the area. The total rainfall exceeded 30 inches in some areas. The storm surge reached 20 feet along lower sections of Padre Island, 6.0 to 6.5 feet in the City of Rockport and the Town of Fulton. An amazing 115 tornadoes were spawned by the system, the most ever known to be generated by a tropical system. Most of the tornadoes were confined to the entire coast of Texas. Although considerable damage resulted from strong wind and high tides, the majority of the destruction was due to torrential rains and resultant flooding. Some damage was also caused by hurricane connected tornadoes.

Hurricane Fern (September 9 –13, 1971)
Fern slowly paralleled the Texas Coast while a hurricane and made landfall as a tropical storm on September 11. Large amounts of rain fell primarily along the Coastal Bend causing the worst flooding since Hurricane Beulah, especially near the City of Beeville which experienced 26 inches of rain. Amounts in excess of 15 inches deluged Bee, Refugio, and San Patricio counties. Hurricane Fern brought tides about 2 to 3 feet above normal to the area.

Hurricane Celia (July 30 – August 5, 1970)
When Celia was located about 30 miles east-southeast of the City of Corpus Christi, the storm had regained strength with highest winds estimated at 115 miles per hour. The storm continued to intensify as it moved inland across Mustang Island and into Corpus Christi Bay at a forward speed of 17 miles per hour. The anemometer at the weather station in the City of Aransas Pass was blown away after measuring wind gusts of 150 miles per hour. Subsequent peak gusts were estimated to have reached 180 miles per hour. Maximum gusts of 160 miles per hour were recorded at the City of Corpus Christi National Weather Service Office. The metropolitan area of the City of Corpus Christi; the Cities of Robstown, Port Aransas, and Aransas Pass; and the small towns along Corpus Christi Bay suffered the most damage. Although considerable damage resulted from storm surge, the majority of the destruction resulted from high winds. A surge of 9.2 feet was recorded on the Gulf Beach at the City of Port Aransas, and a surge of 11.4 feet was recorded on the south side of the City of Aransas Pass. At the City of Corpus Christi, the stillwater surge elevation ranged from 3.9 to 5.6 feet. Celia's flood waters rose to 4.3 feet at the Town of Lamar, 5.2 feet at the Town of Fulton, and 8.4 feet south of the City of Rockport. Hurricane surge waters eroded beaches and roads and stalled communications and utility systems over much of the coastal communities. Celia was among the costliest storm in the state's history, having caused an estimated total damage of $470 million. Wind damage accounted for $440 million of this total. There were 13 people killed and over 450 injured. More than 9,000 homes were destroyed, while 14,000 other homes were damaged. In addition, 250 businesses and 300 farm buildings were damaged or destroyed.

Hurricane Gilbert (September 16 - 17, 1988)
Even though Gilbert struck south of the border in northeast Mexico, gusty winds and 29 tornadoes were seen with the system in Texas. Gusts to 83 mph were measured near the City of Brownsville. Heavy rains fell along the Texas Coast causing flooding and damage to the area. South Padre Island was flooded by its storm surge. This hurricane had high-water

> marks at approximately 3.7 feet near the City of Port Aransas. Damages totaled $50 million and 3 people perished due to tornadoes.

Probability
NOAA has recorded 38 hurricanes and tropical storms within a 65-nautical mile radius of Aransas County during the 166-year period between 1850 and 2016. As such, the probability of a hurricane or tropical storm occurring in this area any given year is 23%.

Vulnerability and Impacts (Step 5.b)
The effects of a hurricane would greatly impact various sectors of the community in a catastrophic way. Dependent on the intensity of the storm, storm surge flooding could envelope the entire county. Utility infrastructure will be inundated as in times past. Both residential and commercial structures could be severely damaged or destroyed. Vulnerable populations such as elderly, handicapped or low-income people could have difficulty evacuating the community. Local harbors, beaches, and other popular water-sport destinations could be inundated with storm debris or damaged.

Summary of Hazard (Step 5.a)
Hurricanes are a principal hazard of concern to the area. Given a remarkably high annual probability of 29%, a particular hurricane and associated storm surge could be catastrophic. Many of the flood mitigation actions identified during this planning process, if implemented, could greatly reduce the risk of hurricane and storm surge impacts in the county.

Severe Winter Storms (Step 4.d)
Winter storms in South Texas are generally either associated with cold fronts moving through the area, or with hard freezes related with precipitation events during the winter months. In general, the number of annual freeze events in the region is decreasing but winter storms can still have harmful effects. According to the NWS, freezing precipitation occurs every three to four years in nearby Corpus Christi, although only nine were termed 'significant ice storms' since 1924 (NWS, Significant Corpus Christi Ice Storms, n.d.).

Historical Occurrences
For the time period between 1996 and 2015, the NWS Station in Corpus Christi has recorded reported seven winter related hazard events. These events occurred in 1996, 1997, 2004, 2007, 2010, 2011, and 2014 (J. Metz, personal communication, March 24, 2017). Three of the most notable events are profiled below.

South Texas Snowfall (December 24-25, 2004)

> Christmas 2004 will be remembered for the historic snow event that blanketed a large portion of South Texas. Total snowfall accumulations of 4 inches or more occurred over many areas of South Texas during this period. Heavier amounts from 6 to 12 inches were quite common further inland stretching from Duval County northeastward into Victoria and Calhoun Counties. Officially, 4.4 inches of snow were reported at the Corpus Christi International Airport. This broke the previous 24-hour snowfall record of 4.3 inches set back on February 14, 1895. … This was the second white Christmas ever recorded in Corpus Christi. The other white Christmas occurred back in 1918 when 0.1 inch was reported. (NWS, South Texas White Christmas 2004, n.d.)

South Texas Ice Storm (February 3-4, 2011)

> South Texas experienced frigid temperatures and prolonged hard freezes between Tuesday morning February 1st and Saturday morning February 5th, 2011. A large dome of arctic air plunged southward across South Texas on Tuesday morning February 1st behind a strong cold front. Arctic high pressure continued to push further south across South Texas between Wednesday February 2nd and Friday February 4th. As a result, widespread record low

> temperatures occurred between February 2nd and 5th. Most areas averaged between the middle 20s to middle 30s during this entire period. The duration of freezing temperatures for this event was quite remarkable. … Ice accumulations … were significant across much of South Texas. … This amount of ice produced very dangerous driving conditions. As a result, state and local officials closed many of the main roads, highways and bridges across South Texas. Numerous accidents along with multiple injuries were reported…Corpus Christi Fire Department units responded to 75 incidents in a three hour period. (NWS, South Texas Ice Storm, n.d.)

South Texas Icing Event (January 23-44, 2014)

> During the afternoon on January 23rd, 2014, a strong Arctic cold front moved through South Texas. Temperatures ahead of the front were in the 60s and 70s. Temperatures dropped around 20 degrees in 3 hours and around 30 degrees in 6 hours after the front had passed. Maximum wind gusts behind the front across most of South Texas averaged between 35 and 40 mph. Bob Hall Pier recorded a peak wind gust of 49 mph … during the evening of the 23rd.Overrunning moisture along with an upper level disturbance aided in the development of precipitation behind the cold front. As temperatures plummeted into the 30s, a wintry mix of precipitation began to develop as early as 800 PM CST on the 23rd across the northern Brush Country. As the Arctic air mass became more entrenched across South Texas during the late evening and overnight hours, freezing rain and freezing drizzle sometimes mixed with sleet became the more dominant precipitation type across much of South Texas. The wintry precipitation ended around 900 AM CST on the 24th along the coast. Ice accumulations averaged from less than 1⁄10" to ~ 1⁄8" for most of South Texas except for portions along the Middle Texas Coast where no ice accumulation occurred since the temperatures within this area remained just above freezing. (NWS, South Texas Icing Event, n.d.)

Probability

Seven events have occurred in the last 20-year period; however, through the historical record at Corpus Christi, winter events occur during 30% of winters (J. Metz, personal communication, March 24, 2017).

Vulnerability and Impacts (Step 5.b)

Winter storms tend to make driving more treacherous and can impact the response of emergency vehicles. The probability of utility and infrastructure failure increases during winter storms due to freezing rain accumulation on utility poles and power lines. Secondary effects from loss of power could include burst water pipes in homes. Public safety hazards also include the risk of electrocution from downed power lines. Elderly populations, and small children are considered particularly vulnerable to the impacts of winter storms and extreme cold events.

Summary of Hazard (Step 5.a)

While rare events, severe winter storms do have the ability to cripple areas of south Texas. This risk is increased by the unfamiliarity of residents with the events, and the lack of local capacity to respond and address hazardous road conditions.

Sea Level Rise (Step 4.d & 4.c)

Sea level rise is a relatively small and gradual change, but can have great impacts on the low-lying areas along our coastline. It becomes very important when looking at marsh migration and the changes in habitat types along shorelines; as small increases in water level can change the composition of coastal habitats. This process has implications for shoreline stability and can negatively impact properties located in low lying areas. Small increases in sea level can exacerbate flood risk, as drainage becomes more difficult with higher average sea levels. As average temperatures become warmer, water expands – on a global scale this small change can have

large-scale impacts. Given the topography and proximity of this area to the Gulf of Mexico, sea level rise should be taken into consideration in future planning efforts.

Historical Occurrences

For the purposes of this report, historical patterns and trends utilize data collected as mean sea level readings from the Rockport, Texas tide gauge. NOAA maintains tide gauges at 37 different locations along the coast of Texas, but only the Rockport gauge is located on Live Oak Peninsula.

Figure 5.3 shows the monthly mean sea level trends for Rockport from 1900 to 2020. The graph shows an increase from -0.58 meters per year in 1900 to a projected 0.06 meters per year for 2020 (NOAA, Tides and Currents, n.d.). The monthly mean sea level with the average seasonal cycle removed is overlaid upon the linear trend lines. This trend line also models the upward increase of sea levels with more fluctuation. Most recent data shows that relative sea levels have reached above 0.15 meters with the highest fluctuations nearing 0.30 meters in 2010 (NOAA, Tides and Currents, n.d.).

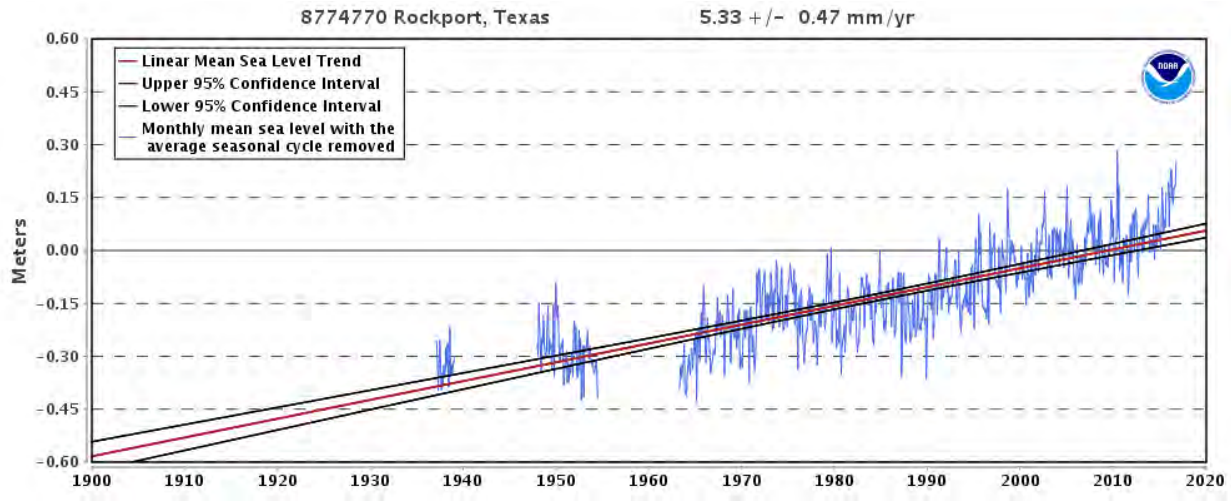


Figure 5.3: Mean Sea Level Trend for Rockport, Texas, 1900-2020 (NOAA, Tides and Currents, n.d.).

Probability

Unlike the other hazards profiled in this risk assessment, the probability for sea level rise is not measured by specific events but by the assessment of relative sea level at numerous locations. A steady increase in the relative sea level trend indicates a very high probability of occurrence.

Vulnerability and Impacts (Step 5.b)

Vulnerability and impacts will be similar to those of coastal flooding. Property owners along the coastline are highly susceptible to property loss due to rising sea levels. Populations that are low-income and living in the affected areas may have difficulty finding new residences and thus become displaced. The local economy, which is highly dependent on water-related tourism, would be impacted by receding shorelines. Infrastructure located in this area will most likely be inundated by new sea levels and thus require costly relocation.

Summary of Hazard (Step 5.a)

While studies suggest sea level rise will continue in the area at a slow, gradual rate, local officials and residents are exploring the potential impacts this hazard could have in the community, and possible mitigation actions. Modeling suggests that should sea level rise between 1 and 3 feet in the planning area, there would be limited land inundation impacts. Secondary impacts of sea level rise, such as the impacts to the local fishing and shipping industries, as well as, exacerbating hurricane storm surge risk, are important risk factors associated with this hazard.

Tornado (Step 4.d)
NOAA defines a tornado as "a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground" (NOAA, Severe Weather 101 – Tornado Basics, n.d.). Tornados are typically associated with a supercell thunderstorm. (High winds not associated with tornados—windstorms—are discussed later in this section.)

Historical Occurrences:
According to NOAA's NCED 15 tornado or funnel cloud events were recorded from 1967 to 2015 (NOAA-NCED, n.d.) (See Table 5.32). Most of these tornados were related to tropical disturbances from the Gulf of Mexico.

Table 5.32: Tornado/Funnel Cloud Events Affecting Aransas County, 1967-2015 (NOAA-NCED, n.d.).

Event Date	Location	Cost of Property Damage	Cost of Crop Damage
9/20/1967	Aransas County	$250,000	$0
5/11/1968	Aransas County	$2,500	$0
4/15/1973	Aransas County	$0	$0
6/13/1973	Aransas County	$2,500	$0
9/11/1978	Aransas County	$0	$0
8/22/1999	Rockport	$0	$0
9/11/2007	Rockport	$0	$0
8/30/2009	Rockport	$10,000	$0
6/2/2010	Rockport	$250,000	$0
6/30/2010	Lamar	$0	$0
7/1/2010	Rockport	$5,000	$0
7/8/2010	Holiday Beach	$0	$0
5/10/2012	Near Holiday Beach	$2,000	$0

Two of these tornado incidents (September 20, 1967 and June 2, 2010) caused damages of $250,000 (NOAA-NCED, n.d.). The event on September 20, 1967 also resulted in three injuries. The June 2, 2010 event was the result of a thunderstorm system that produced both tornadoes and hailstorms; one tornado was rated as an EF-2, and impacted southwest Rockport, damaging homes, vehicles, and trees (NOAA-NCED, n.d.).

Probability:
Fifteen tornado or funnel cloud events occurred within a 48-year time span, indicating a 31.25% percent chance of a tornado in any given year. Therefore, there is a high probability that Aransas County will experience another tornado event in the next five years.

Vulnerability and Impacts (Step 5.b)
Any tornado rated an EF2, or greater is considered "significant" (Edwards, 2016). Based on information from the NOAA Storm Prediction Center, a EF2 tornado would tear roofs off well-constructed houses, foundations of frame homes would shift, mobile homes would be completely destroyed, large trees would snap or be uprooted, light objects would become missiles, and cars would be lifted off the ground. In addition, several factors impact the severity of damage done by a tornado (including: wind speed, time on the ground, length/width of the cell, population density, building density, age and construction of buildings, and time of day).

Summary of Hazard (Step 5.a)
While relatively rare events, tornados have occurred in Aransas County, and will likely occur in the future. The participating government entities in this plan all maintain warning sirens, which are tested and activated for tornado protection. Safe rooms and basements are virtually non-existent in the planning area. Given the wide range of impact potential, tornado damage vary from minimal to catastrophic.

Wildfires (Step 4.d)
Wildfires, caused by both natural and anthropogenic sources, can have negative impacts on the natural environment, as well as, property and infrastructure. Natural causes of fires are generally due to lightning strikes, but the potential list for anthropogenic ignitions is quite long. Human-caused fires can be intentional or accidental, and include campfires, smoking, vehicle or machine-based—including railroad sparks and chains dragged from moving vehicles—the burning of debris or trash, to name a few. Prescribed burns, used in management of open lands and spaces is an example of beneficial and intentional burning that can help control invasive species and maintain grassland ecosystem health.

Historical Occurrences:
According to the Texas A&M Forest Service, Wildfire Risk Assessment Portal (2017), 272 wildfires were ignited in Aransas County from 2005 to 2015, see Figure 5.4. These fires burned a total 6,229 acres. 2011 had the largest number of fires (89 ignitions), followed by 2014 (58 ignitions); however, 2009 had the largest amount of land burned (5,017 acres). After 2009, 2008 had the most land burned (326 acres) (Texas A&M Forest Service, 2017).

The area burned in 2009 included a fire on April, 5th, 2009, which caused $200,000 in property damage in the county. According to reports, "one commercial building, one unoccupied mobile home, one barn, one garage, five goose neck trailers, and seven vehicles were destroyed" (Texas A&M Forest Service, 2016)

Probability
Over an 11-year timeframe, 272 wildfires were ignited (2005 to 2015); therefore, it is likely that a wildfire event will occur in any given year, with a recurrence interval of 24.7 events per year.

Vulnerability and Impacts (Step 5.b)
Areas that are most vulnerable to wildfire are agricultural areas where land is burned, rural areas where trash and debris are burned, and the wildland urban interface areas. The wildland urban interface is defined by the Texas A&M Forest Service (2017) as "the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels." The Texas A&M Forest Service further estimates that 63% of the population of Aransas County lives within the wildland urban interface.

Summary of Hazard (Step 5.a)
Wildfire poses a larger threat to the unincorporated communities in the county. Planning and development regulations can and should be utilized to reduce the potential impact of this hazard.

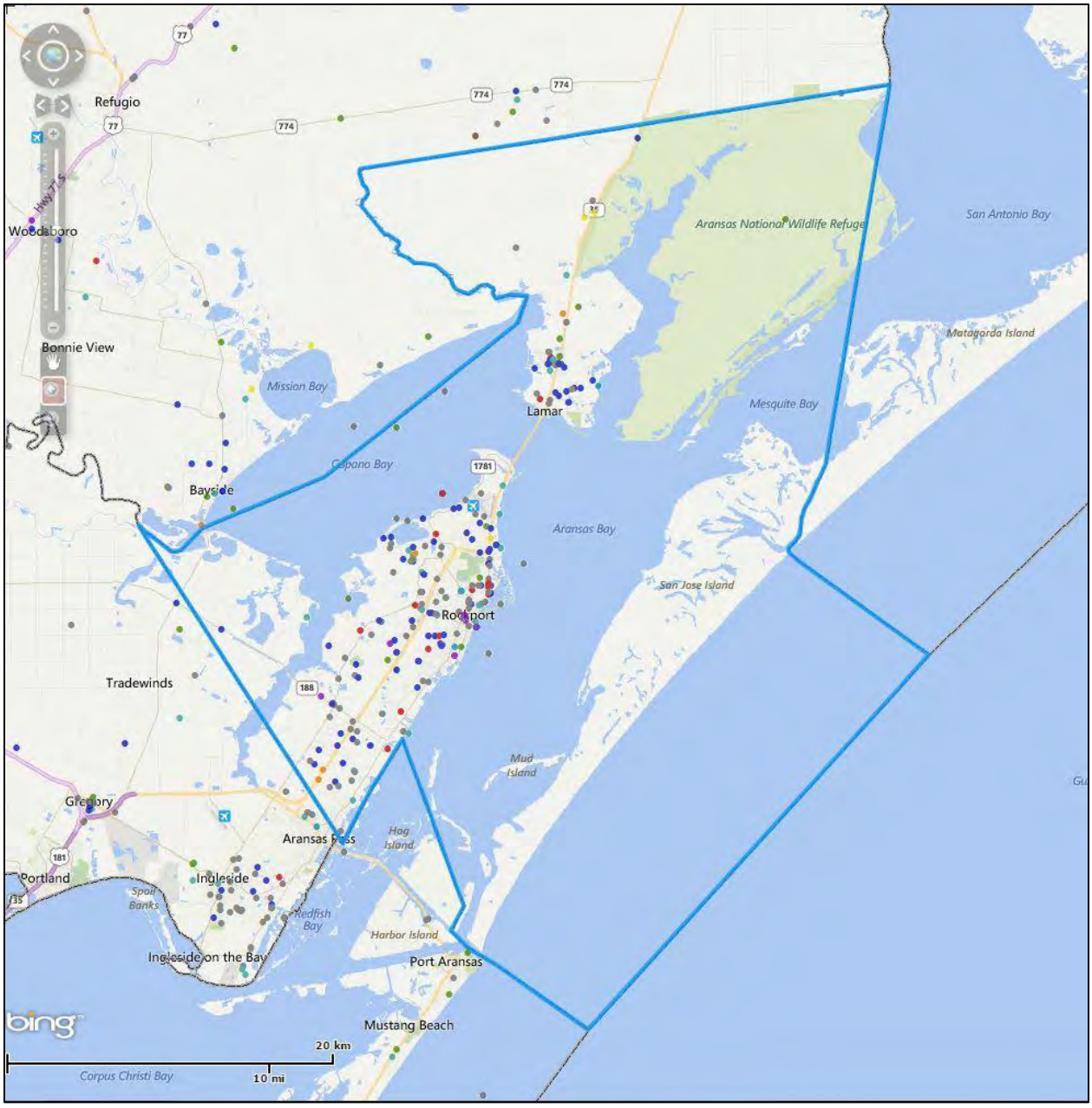


Figure 5.4: Aransas County Wildfires, 2005-2015 (Texas A&M Forest Service, 2017).

Windstorms (Step 4.d)

Along the Texas coast, winds are common and have seasonal patterns in prevailing wind directions. Wind is caused by a simple pressure difference, and moves from high to low pressure. The speeds of these winds are dictated by the magnitude of those pressure differences. The effects from the heating and cooling of land versus water has an impact on our seasonal wind patterns, as the land heating more rapidly than water during a warm summer day brings south winds from the Gulf of Mexico. Windstorms however are characterized by high winds that have the potential for extensive damage, and are generally associated with thunderstorm activity. Storm cells that develop along fronts or during other weather events favorable for storm formation can be sources of these windstorms that can damage property, uproot large trees, or impact powerlines.

Historical Occurrences

Table 5.33 identifies 30 thunderstorm wind events on record for Aransas County between 1956 and 2015 (NOAA-NCED, n.d.). The costliest wind event occurred on January 9, 2011 when a severe storm system resulted in wind damage throughout South Texas. At least three homes were damaged in Rockport during this event, and several trees were uprooted (NOAA-NCED, n.d.).

Table 5.33: Thunderstorm Wind Events affecting Aransas County, 1956-2015 (NOAA-NCED, n.d.).

Event Date	Location	Cost of Property Damage	Cost of Crop Damage
8/20/1956	Not Specified	$0	$0
5/10/1968	Not Specified	$0	$0
5/13/1980	Not Specified	$0	$0
10/31/1981	Not Specified	$0	$0
3/23/1983	Not Specified	$0	$0
5/20/1985	Not Specified	$0	$0
5/20/1985	Not Specified	$0	$0
5/17/1986	Not Specified	$0	$0
8/21/1986	Not Specified	$0	$0
8/21/1986	Not Specified	$0	$0
6/29/1991	Rockport	$0	$0
1/31/1998	Rockport	$0	$0
10/6/1998	Rockport	$0	$0
5/18/1999	Rockport	$0	$0
5/18/1999	Lamar	$0	$0
3/14/2000	Rockport	$0	$0
9/19/2002	Central Portion	$0	$0
10/28/2002	Rockport	$0	$0
6/13/2003	Rockport	$0	$0
5/8/2005	Rockport	$0	$0
3/13/2007	Rockport	$10,000	$0
10/25/2009	Rockport	$20,000	$0
6/21/2010	Rockport	$20,000	$0
1/9/2011	Rockport	$400,000	$0
5/10/2012	Fulton	$100,000	$0
5/10/2012	Holiday Beach	$250,000	$0
12/4/2012	Aransas National Wildlife Refuge	$0	$0
Event Date	**Location**	**Cost of Property Damage**	**Cost of Crop Damage**
4/17/2015	Rockport	$100,000	$0
5/24/2015	Rockport	$5,000	$0

Probability:

Thirty thunderstorm wind events occurred within a fifty-nine-year time span, indicating a 50.84% percent chance of a future occurrence in any given year.

Vulnerability and Impacts (Step 5.b)
Windstorm is primarily a public safety and economic concern. Windstorms can cause damage to structures and power lines, which in turn create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles, and can harm people that are not adequately sheltered.

Campers, construction trailers, mobile homes, barns, and sheds—and their occupants—are particularly vulnerable. Additionally, older homes which have not been maintained may be more susceptible to damage during windstorms.

Summary of Hazard (Step 5.a)
Severe wind events pose a risk to property damage, both directly and as a result of flying debris, in the planning area. Tree maintenance ordinances, and programs such as Tree City USA, can provide assistance in mitigating the impacts of high winds in the planning area. Rockport is the only jurisdiction currently participating in Tree City USA (Arbor Day Foundation, 2016).

CHAPTER 6: GOALS AND REVIEW OF POSSIBLE ACTIVITIES (STEPS 6 & 7)

PURPOSE

In 2016, the jurisdictions committed to the development of this plan to serve two purposes:

1. To minimize flood risk in their communities; and
2. To enable residents to receive the greatest reductions possible on flood insurance premiums through the National Flood Insurance Program's Community Rating System. (The City of Rockport and Aransas County are currently in the process of entering the Community Rating System. The City of Aransas Pass and the Town of Fulton have expressed interest in joining in the future.)

GOALS

The development of goals provides direction and context to how these communities will go about minimizing flood risk. The following goals and objectives were developed through research on the possible activities which resulted in a list of more than 50 possible actions that could be implemented to reduce flood risk. Those actions were then grouped into four categories, which lead to the creation of the four goals. Extensive outreach, including a public workshop, multiple meetings with staff, the Multi-Jurisdictional Executive Planning Committee, and various Sub-Committees, and specific feedback from more than 30 individuals provided vital information about each possible action, and how it might be utilized to achieve each goal (see Volume II, Chapter 4 for the public workshop notes, and Volume II, Chapter 8 for a complete summary of all the information compiled regarding possible Floodplain Management Plan (FMP) actions). This information provided direction that enabled the staff and the Multi-Jurisdictional Executive Planning Committee to identify the objectives which were achievable, and could create the largest possible impact on flood risk in the next 5 years. Each of these possible actions are summarized in the next section.

Goals are overriding statements of what the jurisdictions plan to do in the future. Objectives are specific targets that will contribute to the attainment of each goal. The Action Plan, presented in the next chapter, will provide details/specific information regarding how the objectives will be met.

The following goals and objectives were approved by the Multi-Jurisdictional Executive Planning Committee and set the context for the Action Plan; as well as for the future review and revisions of this plan.

Goal 1: Protect existing resources through regulatory standards.
- Objective 1.1: Investigate the adoption of any further floodplain regulations that would strengthen floodplain management in each of the entities.
- Objective 1.2: Research "low impact development."
- Objective 1.3: Utilize the Community Rating System (CRS) to incentivize higher floodplain management standards.

Goal 2: Protect property through mitigative measures.
- Objective 2.1: Develop a prioritized list of natural areas and repetitive loss properties that would be best suited for purchase, in order to create and preserve natural areas to mitigate future flooding.

Goal 3: Create a coordinated flood preparedness and response strategy.
- Objective 3.1: Create a comprehensive Public Information Plan.
- Objective 3.2: Assess the needs for floodproofing of critical facilities located in the Special Flood Hazard Areas (SFHA).

Goal 4: Create a coordinated infrastructure plan for all jurisdictions.
- Objective 4.1: Create a county-wide, prioritized, master plan of all flood related projects.

POSSIBLE ACTIVITIES

The CRS coordinators manual identifies six categories of floodplain management activities. Table 6.1 identifies these categories and the goal that they are captured within in this plan.

Table 6.1: CRS Categories and Associated Goals.

CRS Categories	Goal captured within
Preventative	1
Property Protection	2
Natural Resource Protection	2
Emergency Services	3
Structural Projects	4
Public Information	3

The remainder of this section summarizes the information collected regarding the identified possible actions. For a complete summary, please see Volume II, Chapter 4 for the public workshop notes from the January 19, 2017 goal setting workshop, and Volume II, Chapter 8 for the Summary of Information Complied Regarding Possible FMP Actions document.

Goal 1: Protect existing resources through regulatory standards.

Preventative Activities

When it comes to preventative activities, the county and the associated municipalities have made significant improvements over the last several years. Each jurisdiction participates, and has committed to continue participation, in the National Flood Insurance Program. An important component of this is the recent update to the Flood Insurance Rate Maps for the area. The City of Rockport and the City of Aransas Pass each have comprehensive plans that have not been updated in over twenty years. The Aransas County Stormwater Management Advisory Committee—which serves as the basis for the Multi-Jurisdictional Executive Planning Committee for this plan—has existed for nine years, and provides significant intergovernmental communication between the jurisdictions and different governmental departments. This committee has overseen the analysis of drainage in 26 watersheds that impact the county. The committee has identified the need to integrate all of the data they have collected into one county-wide, prioritized, master plan of needed flood related projects. This group has also initiated efforts for the county to enter into the National Flood Insurance Program's Community Rating System. The City of Rockport is already in the process of joining the Community Rating System. The City of Aransas Pass and Town of Fulton are interested in joining the Community Rating System in the future. One challenge that the county faces in addressing flood risk is the inability to implement higher building standards and zoning regulations within its jurisdiction. Zoning, as defined by *A Guide to Urban Planning in Texas Communities*, is regulations that govern the use of land, and the location, size, and height of buildings. It divides a jurisdiction into multiple districts, with each district containing a distinct set of regulations that are uniformly applied to all property within the district (American Planning Association Texas Chapter, 2013). In Texas, municipalities are given zoning authority to regulate land uses within its jurisdictions. However, counties do not have that same authority. The Texas Local Government Code, Title 7 only allows county zoning authority in specific recreation areas specifically outlined in Subtitle B. The county does have the authority to regulate subdivision platting, housing, businesses and occupations, explosives and weapons, alarm systems and other miscellaneous areas. Municipalities in Texas have the authority to regulate zoning, subdivisions, comprehensive plans, housing, businesses, signs, nuisances, and other miscellaneous items (as per Subtitle A of Title 7).

Goal 2: Protect property through mitigative measures.

Property Protection

One of the most effective ways to address properties which are prone to flooding is to buy the property from the residents and convert it into a natural area that can accommodate flooding, thereby removing any buildings or facilities that could be impacted by a flood event. There have not been any such buy-outs in Aransas County; however, the potential value of this type of activity is understood. As such further investigation into repetitive loss properties, and possible funding options will be investigated. Additional actions can be taken by individual property owners, including elevating their buildings and retrofitting their property to higher standards; however, the county cannot require property owners to take any of these actions.

Natural Resource Protection

The long-term preservation of natural lands to safeguard the beneficial flood defense functions they provide is an important and vital way of protecting against flood risks. However, this option must be weighed against the cultural and economic needs of a community. People are drawn to Aransas County because of the coastal nature of the area. People come to this area because they want to be on and near the water. This has resulted in the development of many natural areas along the coast. However, the citizens and visitors also value nature and the community has succeeded in preserving large swaths of natural habitat where individuals can walk, paddle, and passively enjoy nature. Local land trusts, such as Aransas First, have been essential in the protection of critical natural areas. In 2010, Aransas County approved a venue tax to fund Aransas Pathways; a project devoted to preserving areas of natural and historic value in the community. This project has led to the creation of several birding spots, kayak launches, and hike/bike trails throughout the county. Efforts like these are important to the community and attempts will be made to identify other critical areas that should be protected, and to locate funding opportunities to support those actions.

Goal 3: Create a coordinated flood preparedness and response strategy.

Emergency Services

Many of the potential activities included in this category are included in the existing Aransas County Emergency Management Plan. This plan (available by contacting the county) is updated every five years. As a part of this plan, the county has an established Emergency Operations Center, and a secondary, more secure location also identified. The county has a contract with Gardner Environmental which when specifies that when activated, Gardner will pre-stage the supplies that would be needed post disaster in areas close to, but outside the perimeters of the potential area of impact. This then allows those supplies to be delivered as soon as possible after an event. This includes all the necessary emergency response supplies (including, but not limited to: generators, fuel, chainsaws, ATV's trucks, water tanks, etc.) needed for the continuity of critical community services. If local resources prove to be inadequate, assistance will be requested from the Mutual Aid Coordinator, who can identify if any regional resources are available for support. If regional resources are inadequate, assistance will be requested from the State via the Disaster District Committee Chairperson in Corpus Christi. Due to the location and elevation of the county, there is no sheltering in Aransas County, all residents must leave the area. As such, when the National Weather Service warns of impending storms the Emergency Management Plan specifies actions for how citizens and vulnerable populations are to be notified and assisted in evacuation.

Public Information

The Aransas County Emergency Management Plan includes a plan for how citizens will be notified, and assisted, before, during, and after emergencies—this includes evacuation. One area identified for improvement is the overall provision of information about natural hazards and risks to the public. The development of a Public Information Plan that integrates general public awareness and education about hazards and risks with the exiting process for notifying citizens about specific emergencies has been identified as a priority action in this plan (see Chapter 7).

Goal 4: Create a coordinated infrastructure plan for all jurisdictions.

Structural Projects

Structural projects are often built as a way to keep water out of, or away from, particular areas. This is often done via the construction of fortified levies or dams, by diverting or channelizing water, or through the development or building of structures like bridges. Most of these types of projects are designed and built by engineers, and are often maintained by public works departments. Aransas County does not have any dams or levees, and there are no rivers or streams in the county. However, there are eight bridges in the county, and three of those will need to be replaced in approximately 10 to 12 years. (Aransas Pass has one additional bridge that is not located within Aransas County, the Dale Miller Bridge.) In an effort to direct water flow, the county and the included municipalities use drainage canals and ditches to move water away from homes and developed areas, towards the local bays. Most of these drainage ways, and other flood related structural projects, have been engineered not only to move water in times of flooding, but to also facilitate as much infiltration as possible when flooding is not a concern. It is recommended that as the communities work to develop a county-wide, prioritized, master plan of needed flood related projects, they also include a section for a drainage maintenance plan, which would document all the annual maintenance needs for the drainage ways and other flood related structural projects, and prioritize future infrastructural improvements.

CHAPTER 7: DRAFT ACTION PLAN (STEP 8)

The Multi-Jurisdictional Executive Planning Committee recommends the following activities to maximize the reduction in flood risks in the next five years. These activities have been identified due to their ability to provide vital information about how the county and the associated municipalities can best expend staff time, and finite resources in order to provide the largest decrease in risk to county residents.

Most of these projects require the collection of additional information that will be vital in directing future floodplain management actions. The collection and analysis of this information will allow the community leaders to make more informed, long-term decisions, on how to best direct the use of funds and resources in the future, along with the identification of possible funding opportunities.

The actions are proposed given current staffing levels and workloads, while also considering the operating budgets and the funds that can be leveraged by each entity. In some actions, grants have previously been awarded to complete the work. Assuming consistent local representation and funding, and no major disasters, the following actions should be able to be achieved within the next five years—or prior to the next full update of this plan.

Proposed actions are also prioritized given the amount of financial and labor resources available to complete the project. High priority is given to actions that already have a funding source, staff capability to complete, and community support. Medium priority is given to actions that have staff capability to complete and community support, but are subject to annual operating fund or grant availability. Low priority is given to actions that have community support, but are subject to staff and fund availability.

GOAL 1: PROTECT EXISTING RESOURCES THROUGH REGULATORY STANDARDS

Objective 1.1: Investigate the adoption of any further floodplain regulations that would strengthen floodplain management in each of the plan jurisdictions. Aransas County and the participating municipalities already have standards that exceed National Flood Insurance Program (NFIP) standards. Maintaining the regulatory and long-term planning tools at the jurisdictions' disposal, and strengthening these tools where appropriate, will help keep flood insurance premiums as low as possible and residents safe.

Action 1.1.a: Evaluate current floodplain management regulations in other coastal towns, cities, and counties in order to identify potential areas of improvement for Aransas County jurisdictions.

Timeframe: Years 1-2
Deliverable: Summary report that identifies floodplain standards used in other locations (as deemed appropriate), and assesses the potential opportunities for improvement in Aransas County (and associated municipalities) over time.
Office(s) of Primary Responsibility: Aransas County, Floodplain Administrator; City of Rockport, Community Planner; City of Aransas Pass, Floodplain Manager and Director of Public Works; and Town of Fulton, Supervisor of Sewer and Streets
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Preventive

Action 1.1.b: Using the information collected in Action 1.1.a, create a plan for how, and when, to integrate potential improvements into existing county and municipality regulations.

Timeframe: Years 3-5
Deliverable: A recommended plan of action will be provided to the county and each municipality that identifies potential improvements that can be made to local regulations to strengthen floodplain management in the

area. This plan will provide the best possible assessment for when and how these improvements might be made.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass Floodplain Manager and Director of Public Works; and Town of Fulton Supervisor of Sewer and Streets
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Preventive

Action 1.1.c: Create a coordinated development flow-chart for Aransas County, the Town of Fulton, and the City of Rockport floodplain managers. This document will provide information about who to contact for questions regarding development within the Fulton and Rockport extraterritorial jurisdictions (ETJ).

Timeframe: Year 1
Deliverable: A flowchart which clearly identifies the appropriate positions—within the town, city, and county—to contact for information about development questions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; and Town of Fulton Supervisor of Building Codes and Facilities
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Action 1.1.d: Incorporate higher floodplain management standards into City of Aransas Pass comprehensive plan update.

Timeframe: Years 2-3
Deliverable: A completed comprehensive plan update for Aransas Pass, which incorporates higher floodplain management standards.
Office(s) of Primary Responsibility: City of Aransas Pass City Planner; and Aransas Pass Comprehensive Plan consultant (GrantWorks)
Budget: Staff time (operating funds); Texas Department of Agriculture Community Development Block Grant funds ($55,000 has been awarded and the city will provide $21,745 in matching funds, for a total of $76,754).
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Action 1.1.e: Incorporate higher floodplain management standards into City of Rockport comprehensive plan update.

Timeframe: Years 2-3
Deliverable: A completed comprehensive plan update for Rockport, which incorporates higher floodplain management standards.
Office(s) of Primary Responsibility: City of Rockport Public Works Director; Plan consultant (not yet identified)
Budget: Staff time (operating funds); potential grant funding
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Action 1.1.f: Incorporate higher floodplain management standards into Aransas County Hazard Mitigation Action Plan update.

Timeframe: Years 2-3

Deliverable: A completed Hazard Mitigation Action Plan update for the county, which incorporates higher floodplain management standards.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; Town of Fulton Supervisor of Sewer and Streets and Supervisor of Building Codes and Facilities; City of Aransas Pass Emergency Management Coordinator and City Planner; and Plan consultant (Lockwood, Andrews & Newnam, Inc.)
Budget: FEMA Flood Mitigation Assistance funds (grant pending FEMA release of funds)
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Objective 1.2: Research low impact development. Collect information about low impact development, including how it has been used, implemented, promoted, and regulated; so that the community can analyze this style of development as a possible educational or development tool in the future.

Action 1.2.a: Collect best practices methods on low impact development from towns, cities, and counties of similar characteristics.

Timeframe: Years 3-5
Deliverable: A summary document which explains low impact development; details and options about how it has been used, implemented, promoted, and regulated; and provides specific, comparable examples where each of these things has been done well.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner and Building Official; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Preventive; with possible application in Property Protection; Natural Resource Protection; Structural Projects; and Public Information

Action 1.2.b: Partner with Mission-Aransas National Estuarine Research Reserve to host a low impact development workshop. This workshop will be based on the data compiled in action 1.2.a, and will be designed to educate decision-makers and citizens about low impact development and possible options regarding how it could be used in Aransas County.

Timeframe: Years 2-3
Deliverable: In coordination with Mission-Aransas National Estuarine Research Reserve, prepare for and host at least one workshop to educate local decision-makers and concerned citizens about low impact development, and possible options regarding how it could be utilized in Aransas County.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Environmental Specialist; City of Aransas Pass City Planner; and Town of Fulton Mayor; Mission-Aransas National Estuarine Research Reserve Coastal Training Coordinator
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Preventive and Public Information; with possible application in Property Protection and Structural Projects

Objective 1.3: Utilize the Community Rating System (CRS) to incentivize higher floodplain management standards. FEMA's CRS allows participating communities to earn a class rating by implementing standards higher that those outlined by the NFIP; which then leads to discounts to flood insurance premiums for residents.

Action 1.3.a: Complete process of entry into CRS for the City of Rockport.

Timeframe: Year 1
Deliverable: Final notification from Insurance Services Organization (ISO)/FEMA regarding entry into the CRS, and determination of Rockport's CRS Classification.
Office(s) of Primary Responsibility: City of Rockport Mayor
Budget: $60,000 (funds committed)
Priority: High
CRS Categories Addressed: Preventive with possible application in Property Protection and Public Information

Action 1.3.b: Complete process of entry into CRS for Aransas County.

Timeframe: Years 1-2
Deliverable: Final notification from ISO/FEMA regarding entry into the CRS, and determination of Aransas County's CRS Classification.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator
Budget: $45,000 from Gulf of Mexico Alliance grant
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection and Public Information

Action 1.3.c: Investigate whether CRS is viable for the City of Aransas Pass and the Town of Fulton.

Timeframe: Years 2-4
Deliverable: Letters of intent from Aransas Pass and Fulton which detail if, and when each municipality intends on initiating the process of joining the CRS.
Office(s) of Primary Responsibility: City of Aransas Pass City Planner and City Manager; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

GOAL 2: PROTECTING PROPERTY THROUGH MITIGATIVE MEASURES
Objective 2.1: Develop a prioritized list of natural areas and repetitive loss properties that would be best suited for purchase, in order to create and preserve natural areas to mitigate future flooding. This initiative would also require an investigation of potential funding opportunities to support the purchase of private lands for restoration and protection.

Action 2.1.a: Evaluate list of repetitive loss properties for opportunities to partner with property owners regarding potential mitigation actions.

Timeframe: Years 1-2
Deliverable: A summary document which identifies and prioritizes the repetitive loss properties within the county for possible buy out or other mitigation actions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; City of Aransas Pass Floodplain Manager
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection and Natural Resource Protection

Action 2.1.b: Evaluate areas in the floodplain viable for open space preservation.

Timeframe: Years 3-5
Deliverable: A summary document which identifies and prioritizes the undeveloped areas in the county for possible preservation or other mitigation actions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection and Natural Resource Protection

Action 2.1.c: Investigate grant opportunities for property buyouts, open space preservation, or other flood mitigation measures. Using the information gained in actions 2.1.a and 2.1.b, investigate possible funding opportunities to pursue the highest priority projects.

Timeframe: Years 3-5
Deliverable: A summary document which summarizes grant opportunities to support the purchase of repetitive loss properties and undeveloped land in order to provide restoration, preservation, and possibly other mitigative actions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner and Floodplain Manager; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection and Natural Resource Protection

Action 2.1.d: Investigate potential partnerships with local non-profit organizations to purchase high priority areas for public parkland/open space preservation (organizations include, but are not limited to: Aransas Pathways, Aransas First, Coastal Bend Bays & Estuaries, and The Nature Conservancy). Using the information gained in action 2.1.b, network with local non-profit organizations to investigate possible partnerships to facilitate the purchase of undeveloped land for preservation.

Timeframe: Years 3-5
Deliverable: A summary document which records the attempts to network with local non-profit organizations. This document will also provide a plan for future work that will guide future efforts to purchase and preserve the agreed upon undeveloped areas.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner and Parks and Leisure Director; City of Aransas Pass City Planner; Town of Fulton Mayor.
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Property Protection and Natural Resource Protection

GOAL 3: CREATE A COORDINATED FLOOD PREPAREDNESS AND RESPONSE STRATEGY
Objective 3.1: Create a comprehensive Public Information Plan. This process will involve developing a public flood awareness and education campaign, creating a flood response plan for local building departments, communicating flood risk to susceptible areas, and promoting the State of Texas Emergency Assistance Registry to vulnerable populations. (The City of Rockport received a $45,000 "Small Communities Grant" from the Gulf of Mexico Alliance (GOMA) to produce a multi-jurisdictional Public Information Plan by August 2018.)

Action 3.1.a: Attend public events to promote and sign-up vulnerable populations to the State of Texas Emergency Assistance Registry.

Timeframe: Years 1-5 (throughout entire plan timeframe)
Deliverable: A summary spreadsheet that identifies the events attended and tallies the number of people registered per event, quarterly, and annually.
Office(s) of Primary Responsibility: Aransas County Emergency Management Coordinator; City of Rockport Mayor and City Manager; City of Aransas Pass City Planner; Town of Fulton Chief of Police
Budget: Staff time (operating funds) and $5,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.b: Develop a joint floodplain management and awareness website with all jurisdictions.

Timeframe: Years 1-2
Deliverable: A final, live website that provides educational information about floodplain management and awareness to local residents, businesses, and visitors.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass Floodplain Manager; Town of Fulton Chief of Police and Supervisor of Building Codes and Facilities; Website consultant (not yet selected)
Budget: Staff time (operating funds) and $8,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.c: Publish informational flood articles in city and county newsletters.

Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: Copies of all articles published, along with a summary document that identifies the articles published, location of publication, and dates.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Relations; City of Aransas Pass Floodplain Manager and City Planner; Town of Fulton Town Secretary
Budget: Staff time (operating funds) and $2,500 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.d: Partner with local media outlets to publish and distribute flood literature. This will most likely take the form of brochures, flyers, etc.

Timeframe: Years 1-2 (Products will be completed in years 1-2; then distributed throughout the plan timeframe)
Deliverable: Copies of all materials created, along with a summary document that identifies each item and the locations where it is distributed.
Office(s) of Primary Responsibility: Aransas County Emergency Management Coordinator; City of Rockport Community Relations and Community Planner; City of Aransas Pass City Planner and Emergency Management Coordinator; Town of Fulton Town Secretary; local media outlets (e.g. the Rockport Pilot, the Wonderful Women's Network, etc.)
Budget: Staff time (operating funds) and $2,500 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.e: Develop and install educational signage regarding flood safety to be located along low areas of roadways likely to flood.

Timeframe: Years 1-2
Deliverable: A summary document that provides image(s) of the signs and identifies each location where the signs were installed.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; City of Aransas Pass Public Works Director; Town of Fulton Supervisor of Sewer and Streets
Budget: Staff time (operating funds) and $7,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.f: Create a flood response plan that develops public information projects to be disseminated before, during, and after a flood event.

Timeframe: Years 1-2
Deliverable: A flood response plan that will identify outreach projects that can be utilized to give the public information on flood protection, rebuilding after a flood event, grant information, etc.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass Building Official and Floodplain Manager; Town of Fulton Supervisor of Building Codes and Facilities
Budget: Staff time (operating funds)
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.g: Host workshops with property owners concerned about flooding to discuss flood risk and possible mitigation actions.

Timeframe: Years 1-2
Deliverable: Summary report that describes a minimum of two public workshops designed for local property owners to learn about and discuss flood risk and possible mitigation actions that they can use to minimize the risks to their property. This document will include, at a minimum, information about the location of the meeting, the number of attendees, the agenda, a copy of any PowerPoint presentations made, and any key results or outcomes.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport City Manager and Community Planner; City of Aransas Pass City Planner; Town of Fulton Supervisor of Sewer and Streets
Budget: Staff time (operating funds) and $5,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.h: Send informational mailers to repetitive loss property owners about buyouts and other mitigation options.

Timeframe: Years 1-2
Deliverable: A copy of the information sent, and a summary of any responses received.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner
Budget: Staff time (operating funds) and $5,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information, Property Protection, Natural Resource Protection

Objective 3.2: Assess the needs for floodproofing of critical facilities located in the SFHA. This would include a detailed assessment of needs, options, and funding opportunities available to support any identified needed improvements.

Action 3.2.a: Determine whether any lift stations and pump stations need generators.

Timeframe: Year 1
Deliverable: A summary document which identifies the lift and pump stations within the county, identifies the number, condition, location, and possible range of transport of existing generators, and details any additional needs for generators.
Office(s) of Primary Responsibility: City of Rockport Public Works Director and Utilities Director; City of Aransas Pass Public Works Director; Town of Fulton Supervisor of Sewer and Streets and Supervisor of Building Codes and Facilities
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Emergency Services

Action 3.2.b: Establish best management practices for floodproofing and mitigating historic buildings in Aransas County.

Timeframe: Years 3-5
Deliverable: A final report which documents recommendations for the best management practices for floodproofing and mitigating historic buildings in Aransas County, and for how those recommendations should be formalized within the municipalities.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner; Town of Fulton Mayor; and the Aransas County Historical Commission
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection

GOAL 4: CREATE A COORDINATED INFRASTRUCTURE PLAN FOR ALL JURISDICTIONS
Objective 4.1: Create a county-wide, prioritized, master plan of all flood related projects. This master plan will include a list of all projects currently underway, and all needed projects. In addition, the plan would include a section on maintenance which will document and prioritize all ongoing and expected maintenance needs for the existing drainage improvements.

Action 4.1.a: Work across jurisdictions to coordinate drainage/stormwater projects that impact the same watershed or sub-watersheds while working to create a county-wide, prioritized, master plan of all flood related projects.

Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: A flood management master plan for Aransas County that identifies, prioritizes, and coordinates all flood related projects among the participating jurisdictions, and is adopted by the Aransas County Stormwater Management Advisory Committee.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Mayor; City of Aransas Pass Public Works Director; Town of Fulton Mayor
Budget: Operating and capital funds
Priority: Medium
CRS Categories Addressed: Preventive and Structural Projects

Action 4.1.b: Each jurisdiction will continue ongoing maintenance of drainage pipes, culverts, and swales until the county-wide master plan is approved and implementation can begin.

Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: Annual report which summarizes the maintenance activities over the previous year for each jurisdiction.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; City of Aransas Pass Public Works Director; Town of Fulton Mayor
Budget: Operating and capital improvement funds
Priority: High
CRS Categories Addressed: Preventive, and Structural Projects

Action 4.1.c: Continue to use county resiliency group to investigate potential funding options for erosion protection and habitat restoration.

Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: Annual report which summarizes the activities of the county resiliency group over the previous year.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Mayor; City of Aransas Pass Public Works Director and City Planner; Town of Fulton Mayor; Resiliency consultant (Aaron Horine, Mott MacDonald)
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Preventive, Natural Resource Protection, and Structural Projects

CHAPTER 8: ADOPT THE PLAN (STEP 9)

Because this is a multi-jurisdictional plan, the plan will be adopted by each of the participating communities. The Aransas County Multi-Jurisdictional Floodplain Management Plan Committee will first review the plan and, if approved, make a motion to recommend that each jurisdiction adopt the plan.

Upon this recommendation, the plan will be brought before each jurisdictional sub-committee for approval. In Aransas County and the Town of Fulton, the designated sub-committee is also the final authority for approving such master plans. Therefore, in those cases, the plan will only need the review and approval of the Aransas County Commissioners' Court and the Town of Fulton Town Council.

However, in the cases of the City of Rockport and the City of Aransas Pass, the jurisdictional sub-committees are their Planning & Zoning Commissions. For these cities, the plan will need the review of their Planning & Zoning Commissions and then will be recommended for approval by each entities' City Councils.

An item recommending adoption of the Aransas County Multi-Jurisdictional Floodplain Management Plan was placed on the Aransas County Stormwater and Floodplain Management Committee agenda at its <insert date> meeting. A copy of those meeting minutes is located in Volume II, Chapter 9.

An item adopting the Aransas County Multi-Jurisdictional Floodplain Management Plan was placed on the Aransas County Commissioners' Court agenda at its <insert date> meeting. A copy of Resolution XX-XX adopting the plan is located in Volume II, Chapter 9.

An item adopting the Aransas County Multi-Jurisdictional Floodplain Management Plan was placed on the Town of Fulton Town Council agenda at its <insert date> meeting. A copy of Resolution XX-XX adopting the plan is located in Volume II, Chapter 9.

An item recommending adoption of the Aransas County Multi-Jurisdictional Floodplain Management Plan was placed on the City of Aransas Pass Planning & Zoning Commission agenda at its <insert date> meeting. A copy of those meeting minutes is located in Volume II, Chapter 9.

An item adopting the Aransas County Multi-Jurisdictional Floodplain Management Plan was placed on the City of Aransas Pass City Council agenda at its <insert date> meeting. A copy of Ordinance XX-XX adopting the plan is located in Volume II, Chapter 9.

An item recommending adoption of the Aransas County Multi-Jurisdictional Floodplain Management Plan was placed on the City of Rockport Planning & Zoning Commission agenda at its <insert date> meeting. A copy of those meeting minutes is located in Volume II, Chapter 9.

An item adopting the Aransas County Multi-Jurisdictional Floodplain Management Plan was placed on the City of Rockport City Council agenda at its <insert date> meeting. A copy of Ordinance XX-XX adopting the plan is located in Volume II, Chapter 9.

CHAPTER 9: IMPLEMENT, EVALUATE, & REVISE (STEP 10)

The Aransas County Stormwater Management Committee will continue to be charged with the annual evaluation and five-year revision of this Multi-Jurisdictional Floodplain Management Plan. Each jurisdiction has identified one position which is responsible for reporting to the Aransas County Stormwater Management Committee on a quarterly (at a minimum) and annual basis regarding progress on the implementation of each action item (see Table 9.1). This group will also prepare an annual evaluation report for presentation to the Committee in August, prior to annual Community Rating System recertification in October. This report will consist of the following elements:

- A review of each action item in the plan,
- A description of the items implemented and not implemented in the evaluation period; and
- Recommended changes to the action plan.

Once these elements are approved by the Aransas County Stormwater Management Committee, the report will be submitted to the governing bodies of each participating jurisdiction; as well as released to the media and made available to the public. These items, including minutes of the committee meeting, will be included in the CRS recertification submittal.

Table 9.1: Community Representatives Responsible for Reporting to the Aransas County Stormwater Management Committee Regarding the Implementation of Action Items.

Entity	Name
Aransas County	Floodplain Administrator
City of Aransas Pass	City Planner
Town of Fulton	Mayor
City of Rockport	Mayor

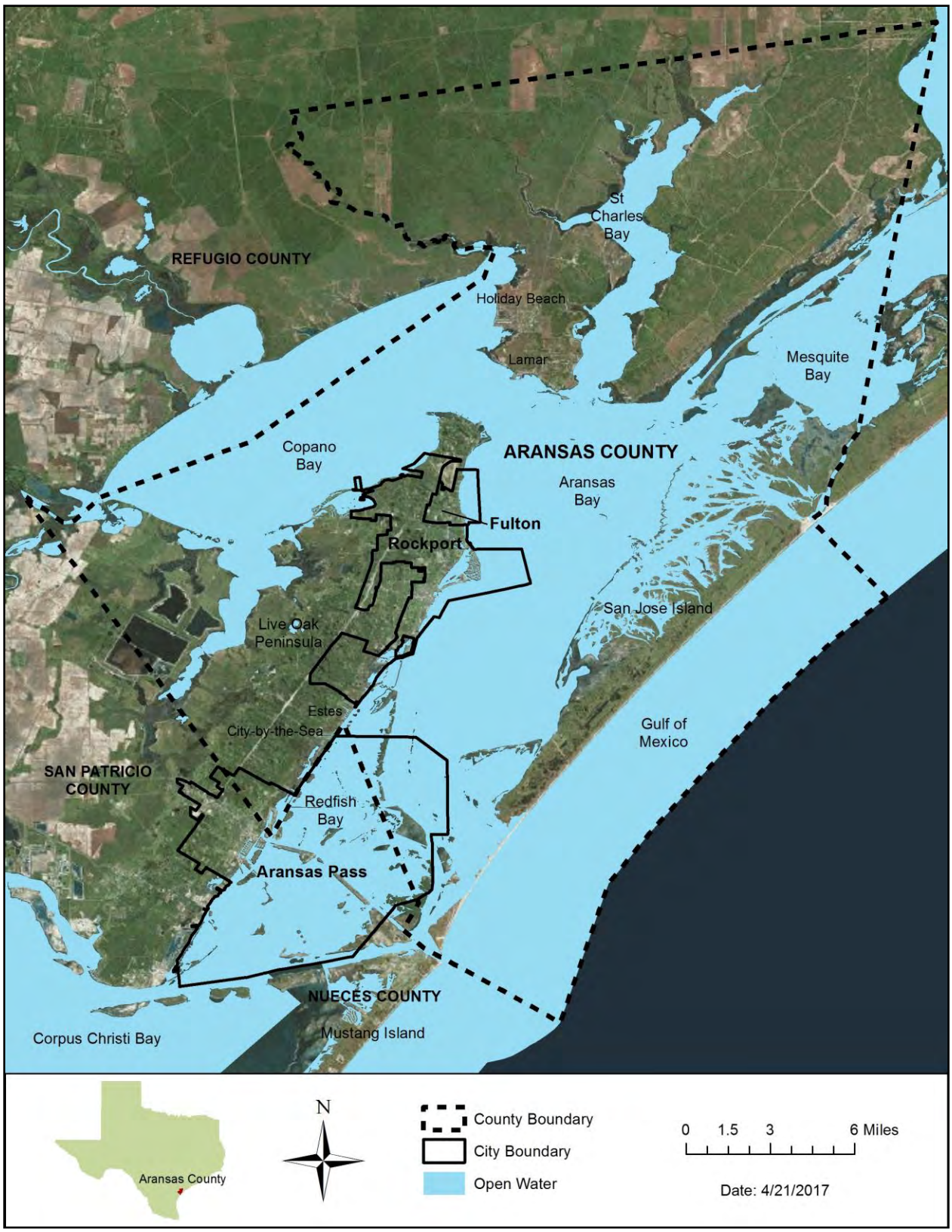
In year three, jurisdictional staff will begin the process for the plan's five-year update. This update will reevaluate the goals of the plan, to ensure they still represent the needs of the community, and will analyze potential future actions in order to develop a new action plan for the next five years. The five-year update will account for the accomplishments achieved through the implementation of this plan, and for any changes to flooding patterns, hazards, land use changes, or development during this time.

The five-year update of the plan will follow the procedure as outlined in the CRS Coordinator's Manual. A copy of the plan update will be submitted prior to October of the fifth year of implementation.

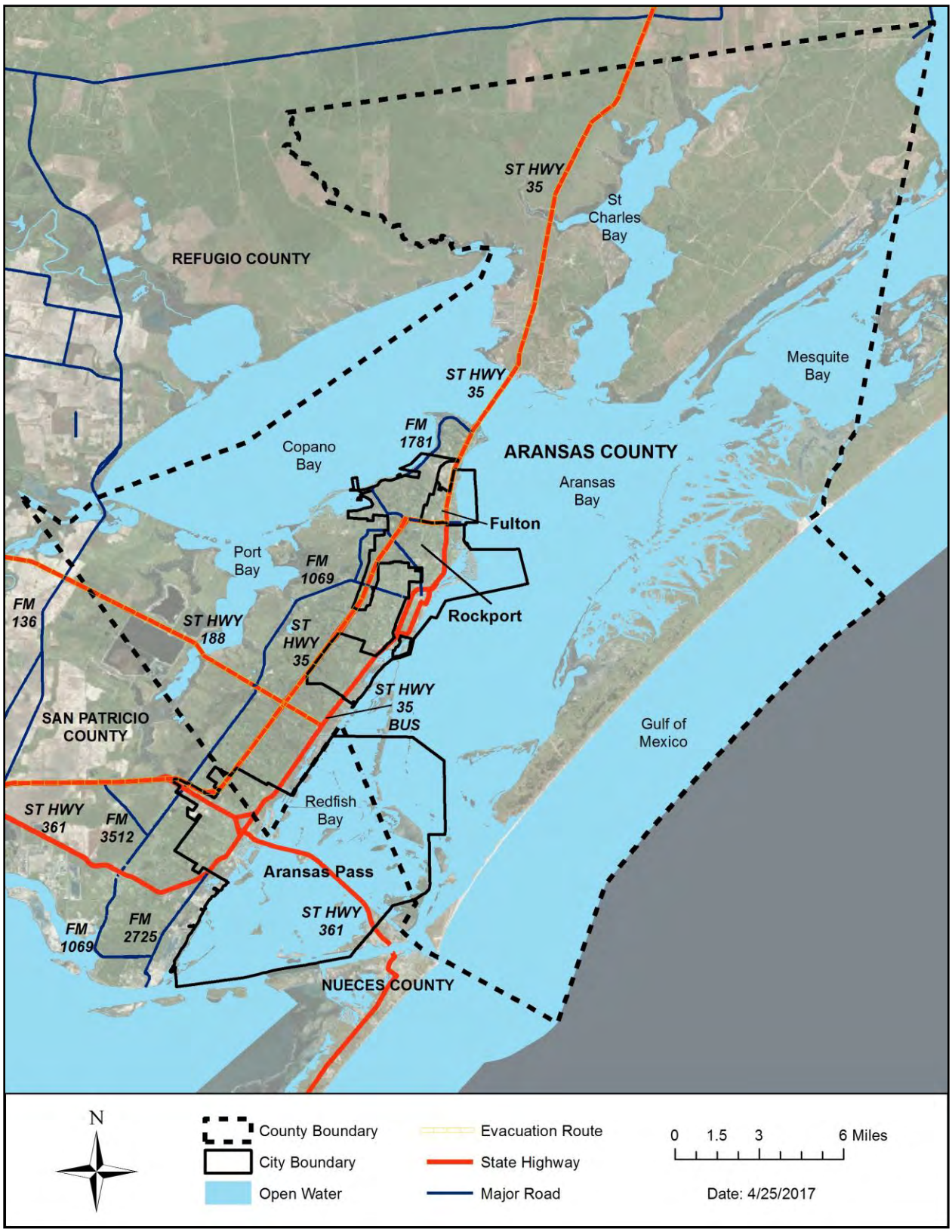
LIST OF ACRONYMS

COG	Council of Government
CRS	Community Rating System
EOC	Emergency Operations Center
ETJ	Extra Territorial Jurisdiction
FEMA	Federal Emergency Management Agency
FMP	Floodplain Management Plan
GLO	General Land Office
GOMA	Gulf of Mexico Alliance
ISO	Stormwater Master Plan and Management Manual
NCED	National Centers for Environmental Data
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
SFHA	Special Flood Hazard Area
SMPMM	Stormwater Master Plan and Management Manual
TxDOT	Texas Department of Transportation

MAPS

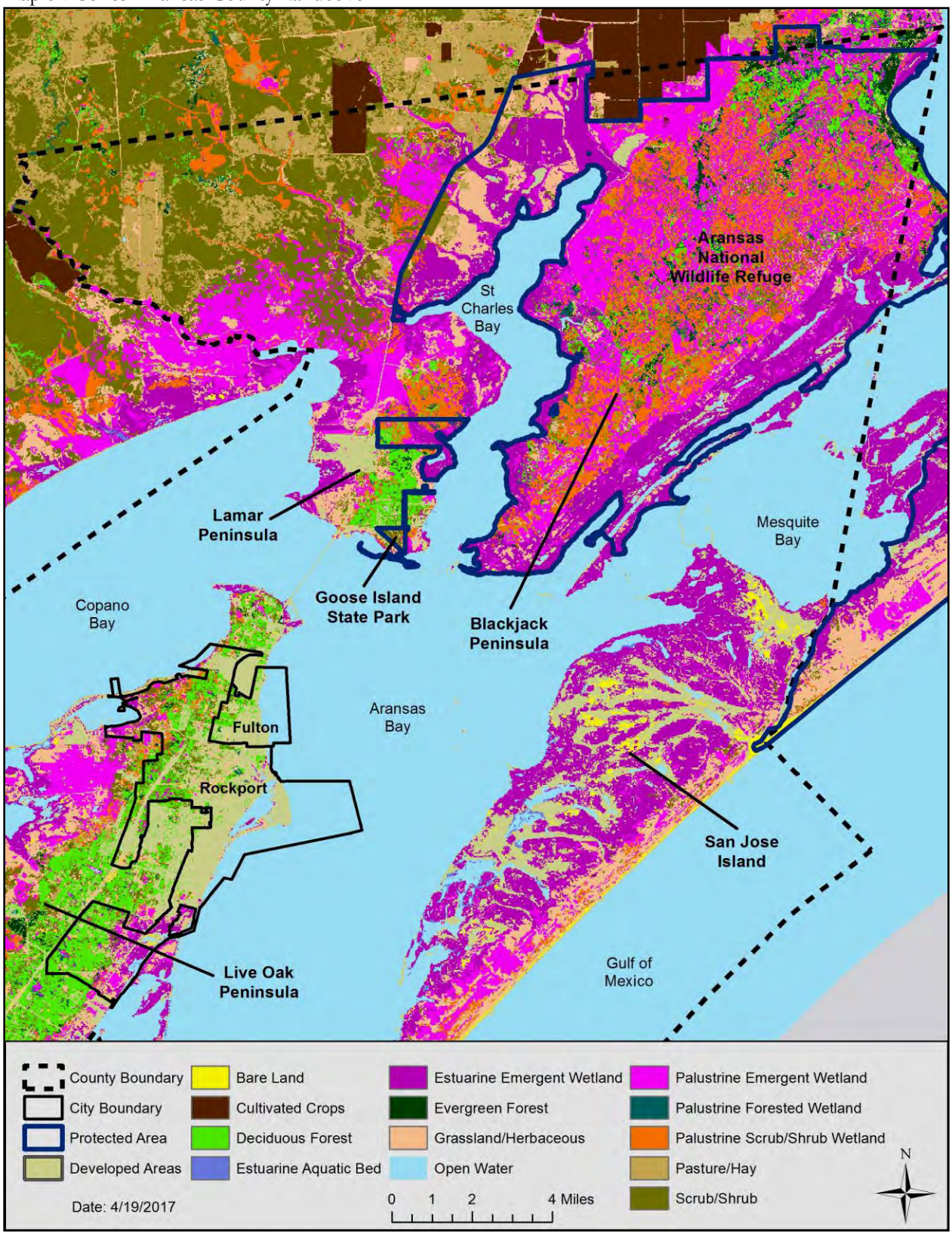


Map 1.1: Planning Area.

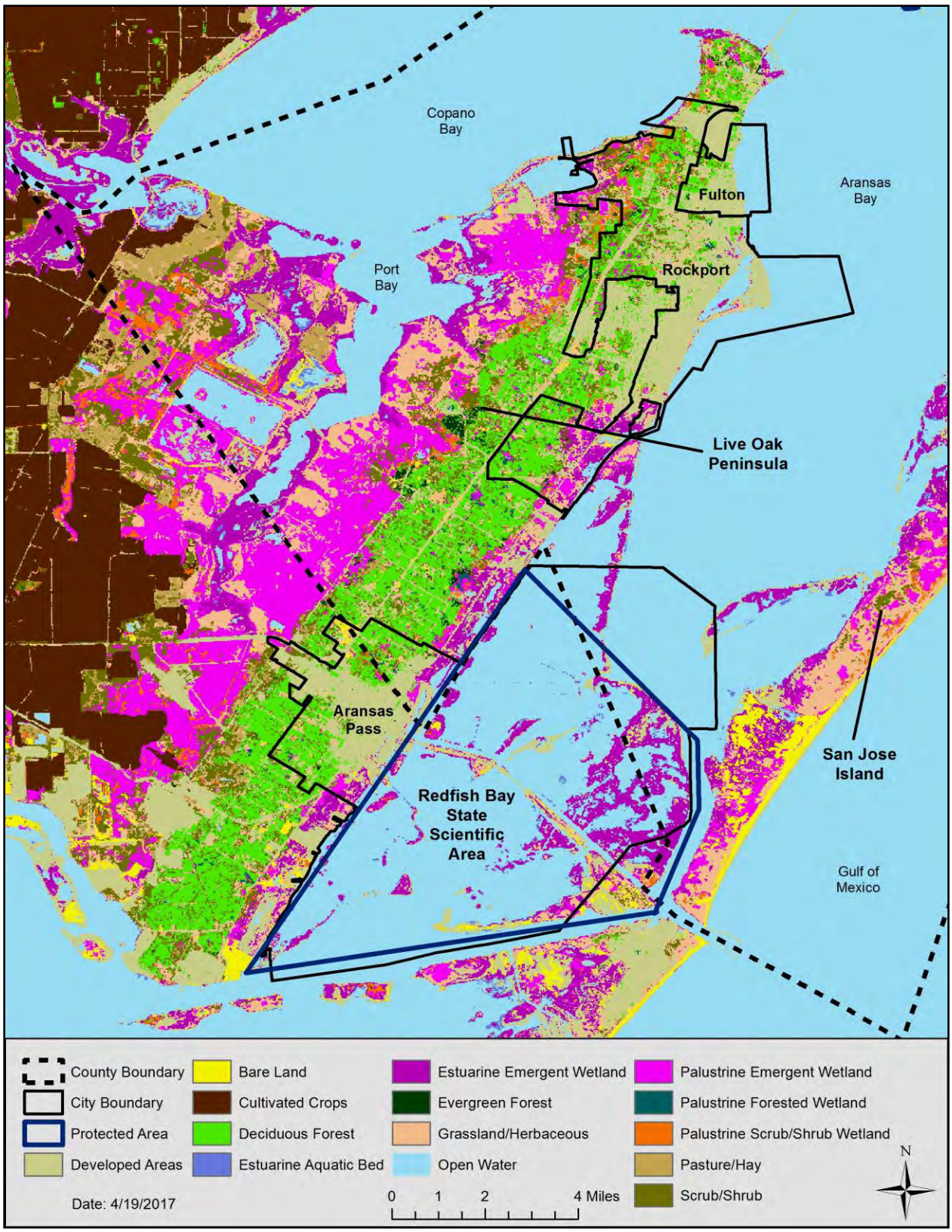


Map 5.1: Texas Department of Transportation, Evacuation Routes.

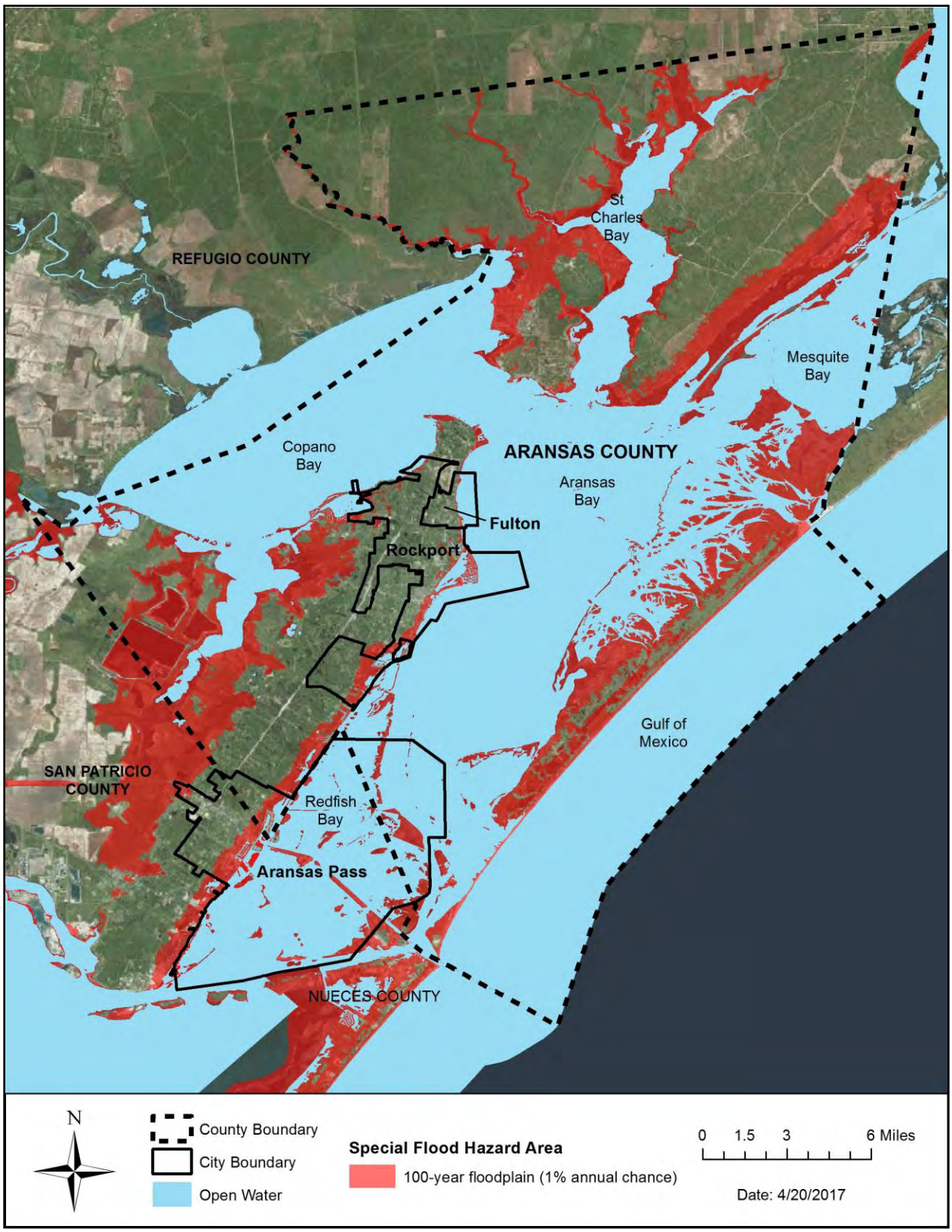
Map 5.2 Series: Aransas County Landcover.



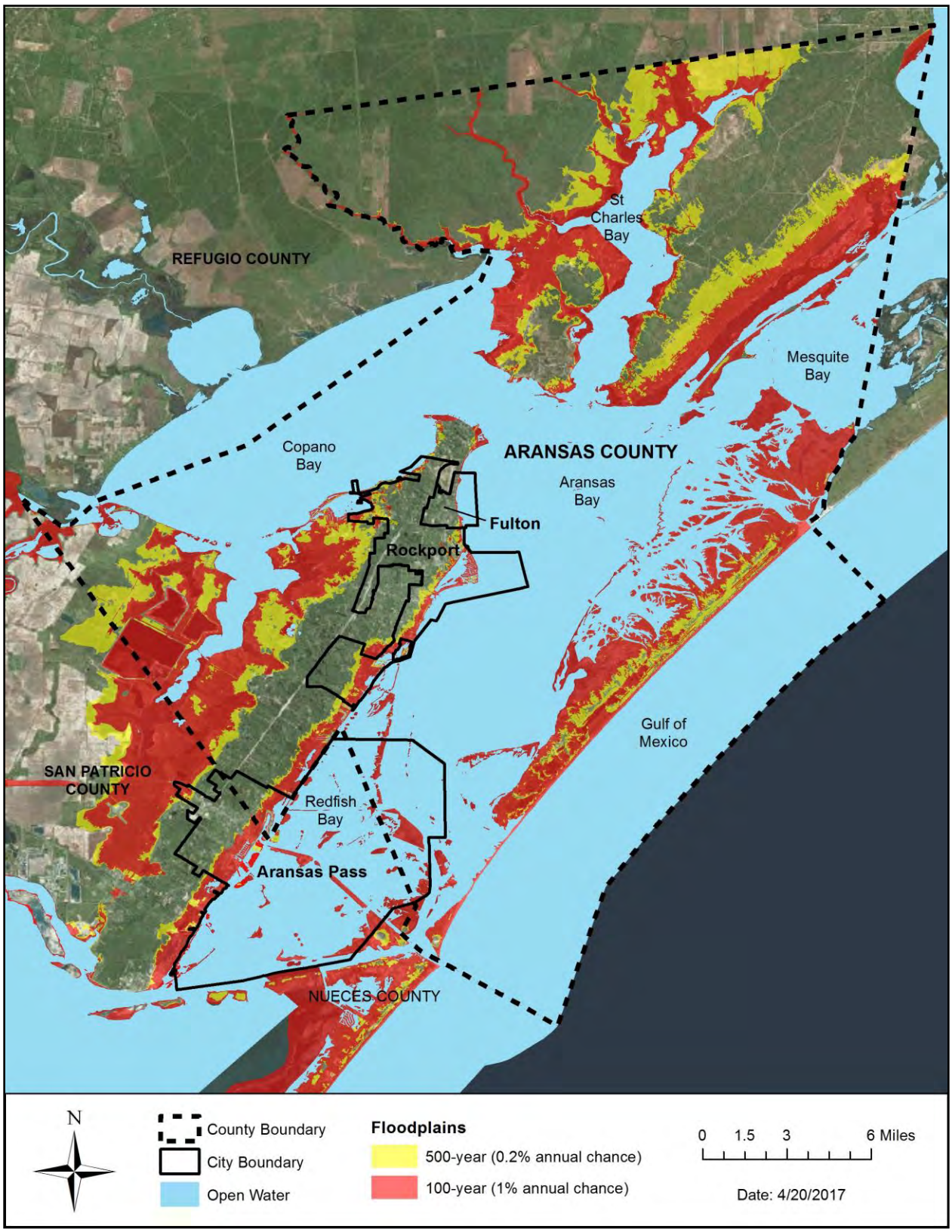
Map 5.2.a: Aransas County Landcover—Northern Region



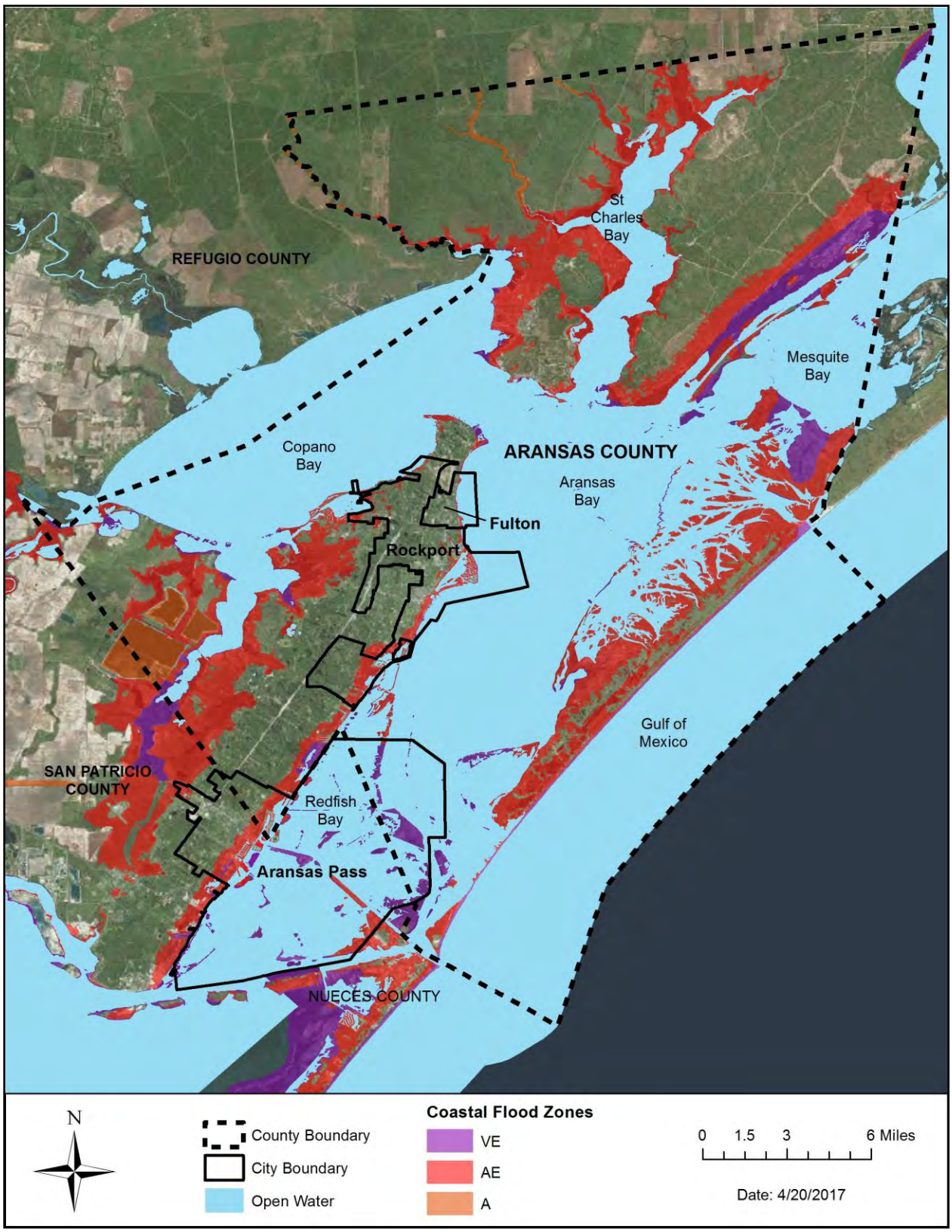
Map 5.2.b: Aransas County Landcover—Southern Region



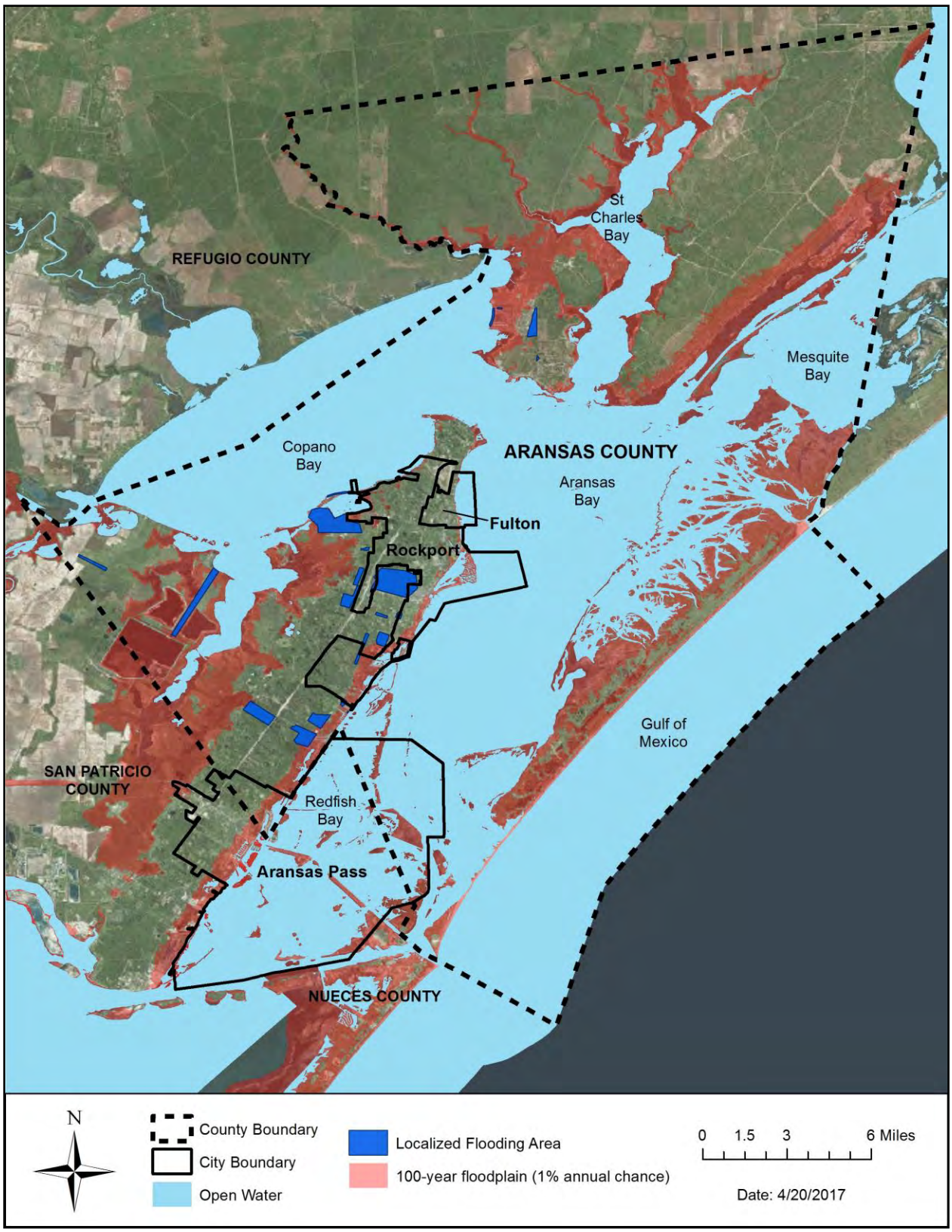
Map 5.3: Aransas County Special Flood Hazard Areas.



Map 5.4: Aransas County Floodplains.

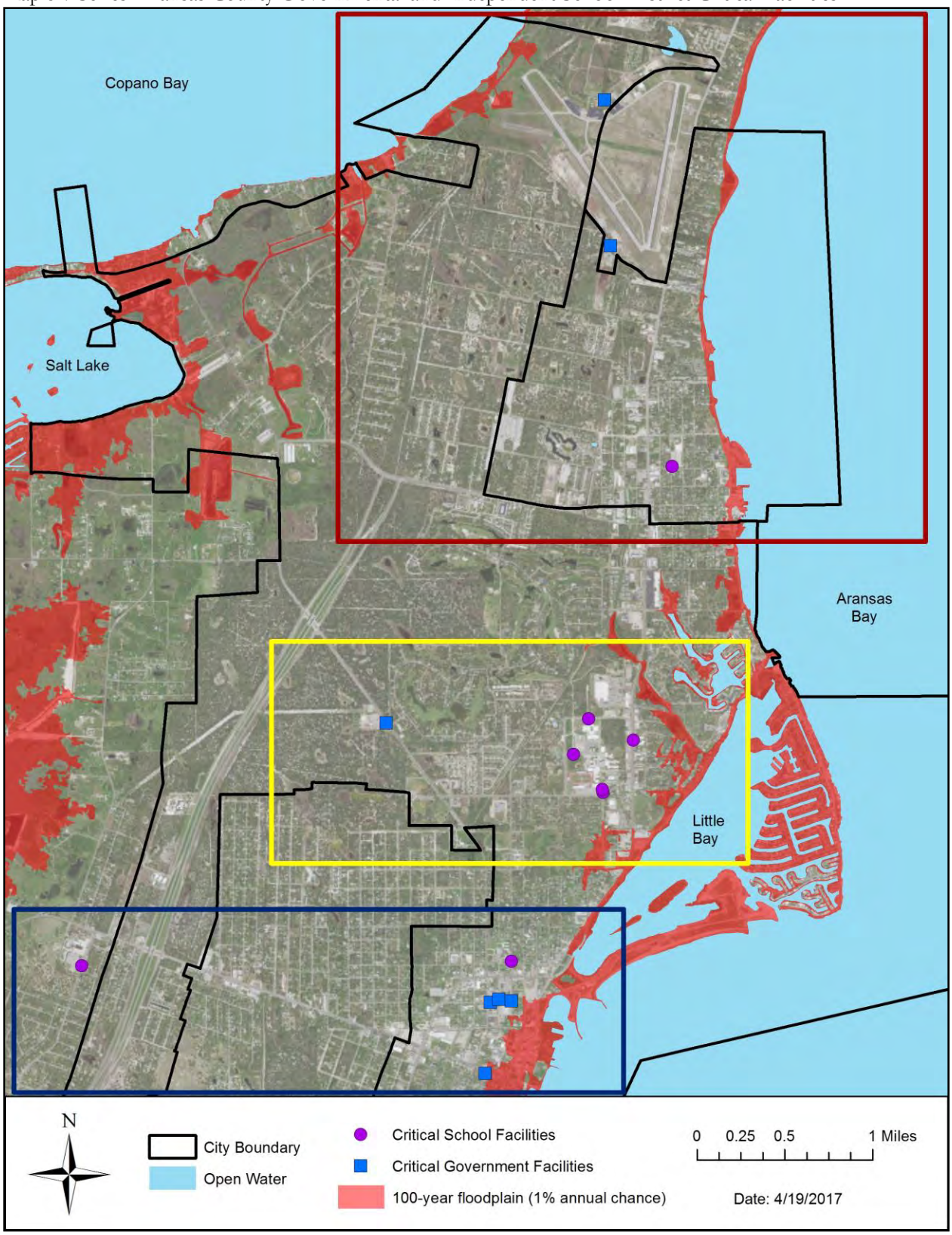


Map 5.5: Aransas County Coastal Flood Zones.

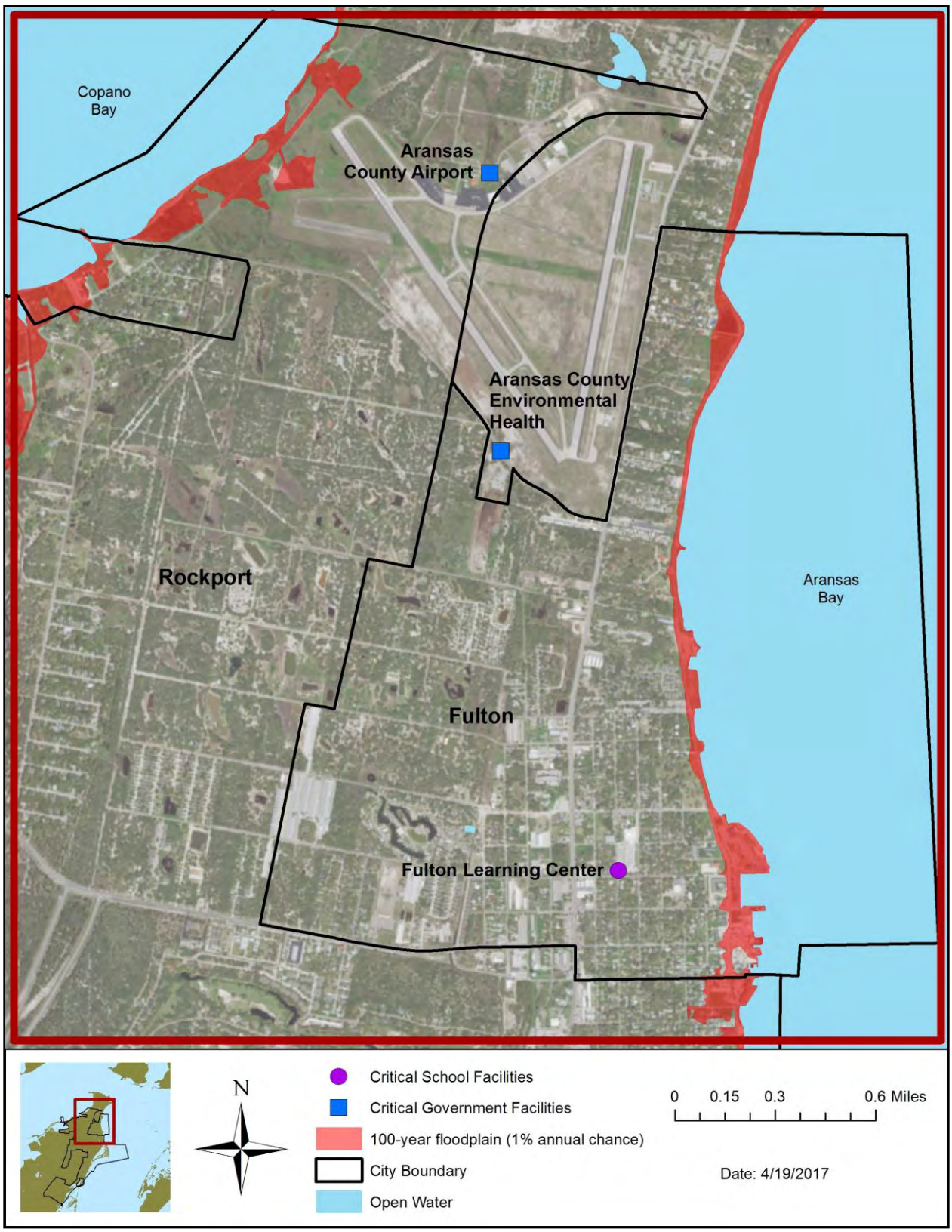


Map 5.6: Localized Flooding in Aransas County.

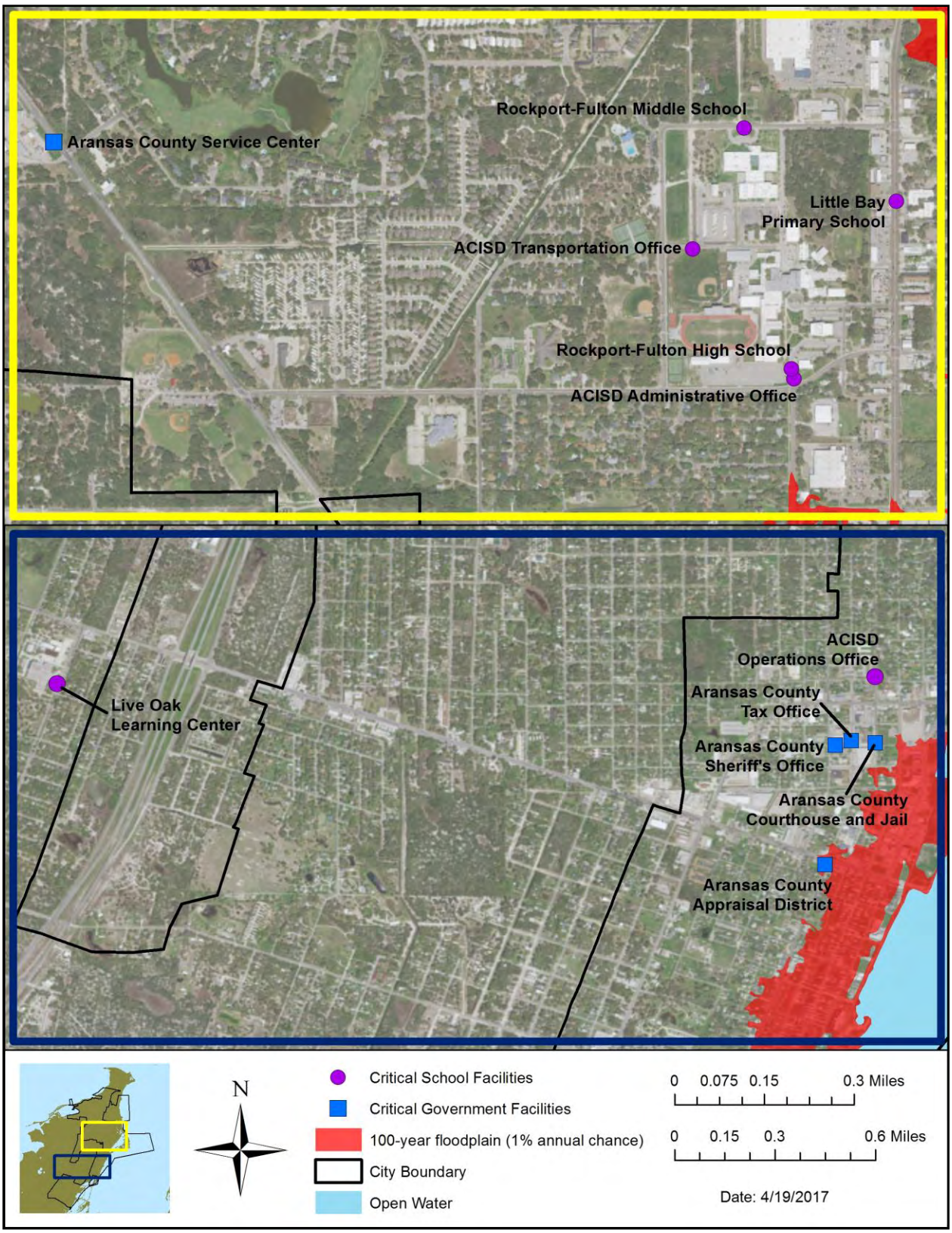
Map 5.7 Series: Aransas County Governmental and Independent School District Critical Facilities.



Map 5.7.a: Locator Map: Aransas County Governmental and Independent School District Critical Facilities.

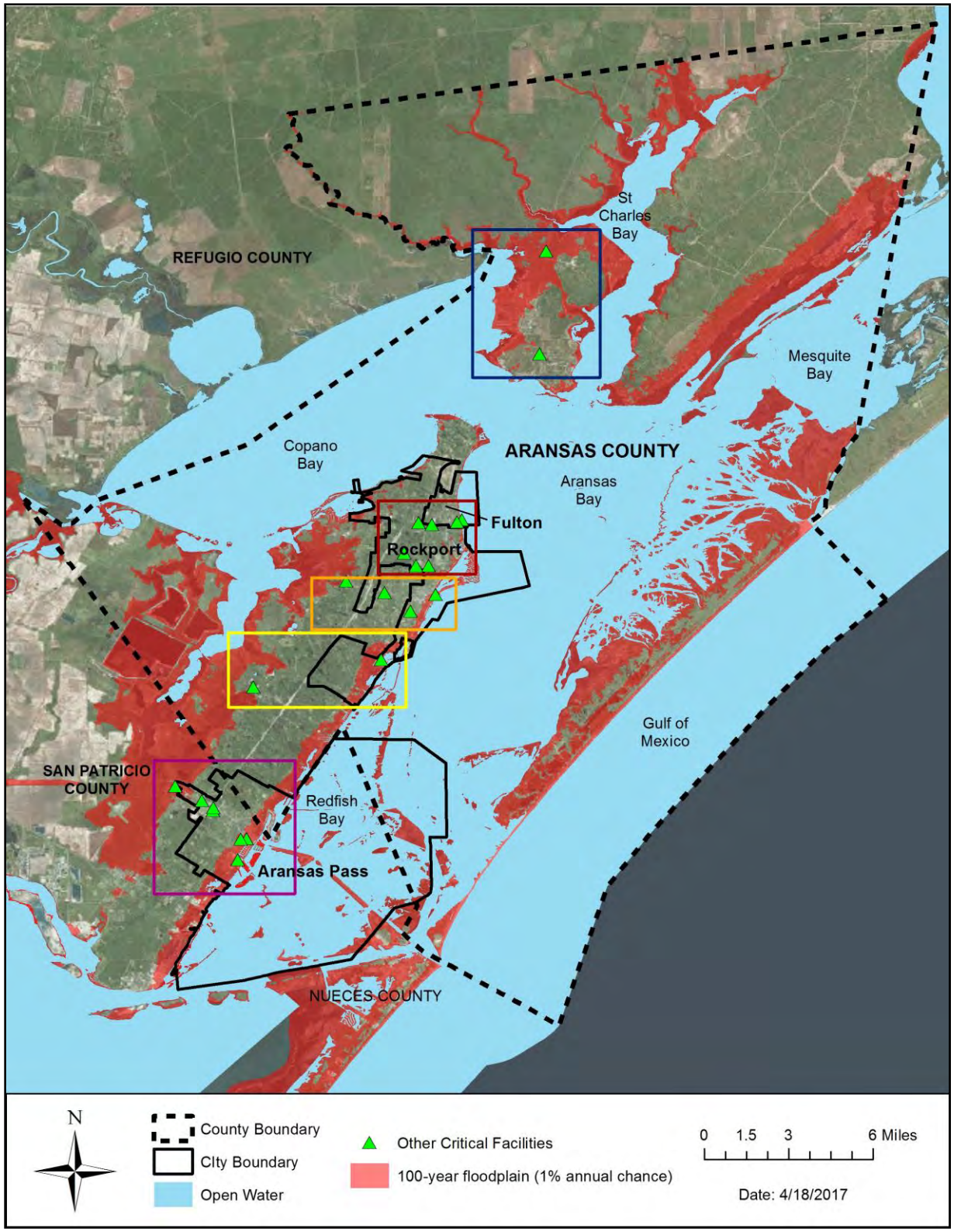


Map 5.7.b: Northern Region: Aransas County Governmental and Independent School District Critical Facilities.

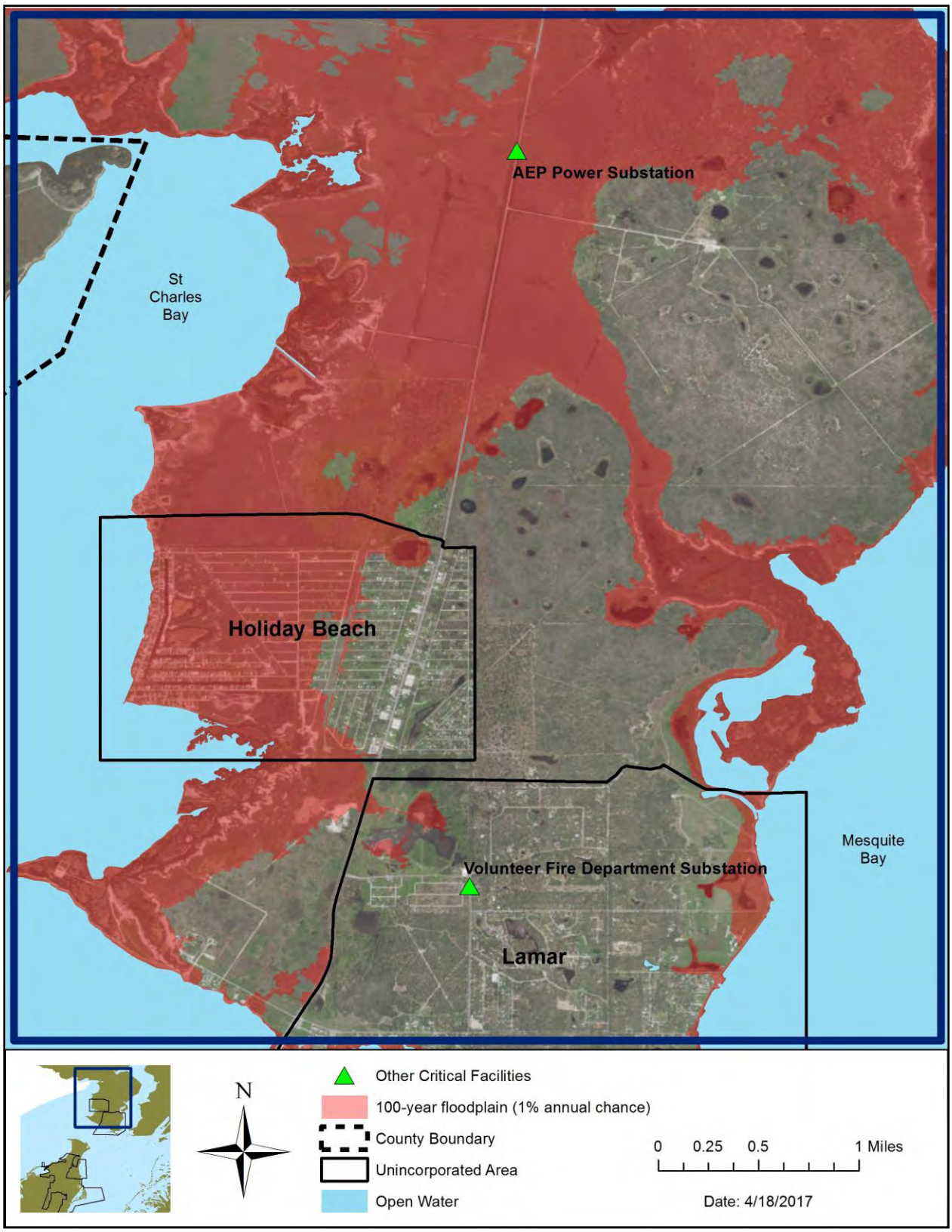


Map 5.7.c: Central and Southern Rockport Regions: Aransas County Governmental and Independent School District Critical Facilities.

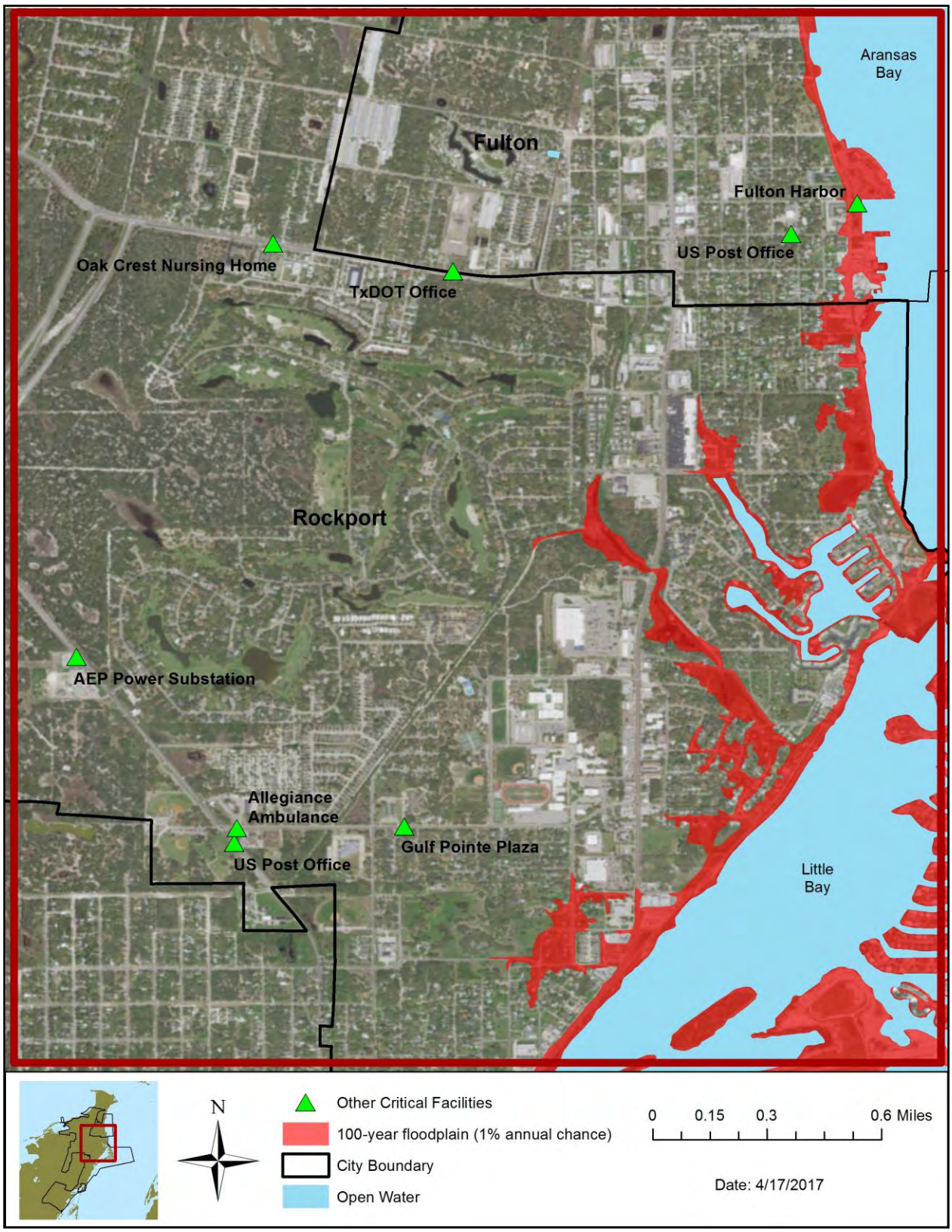
Map 5.8 Series: Other Critical Facilities in the County; but not Affiliated with County Government or Schools.



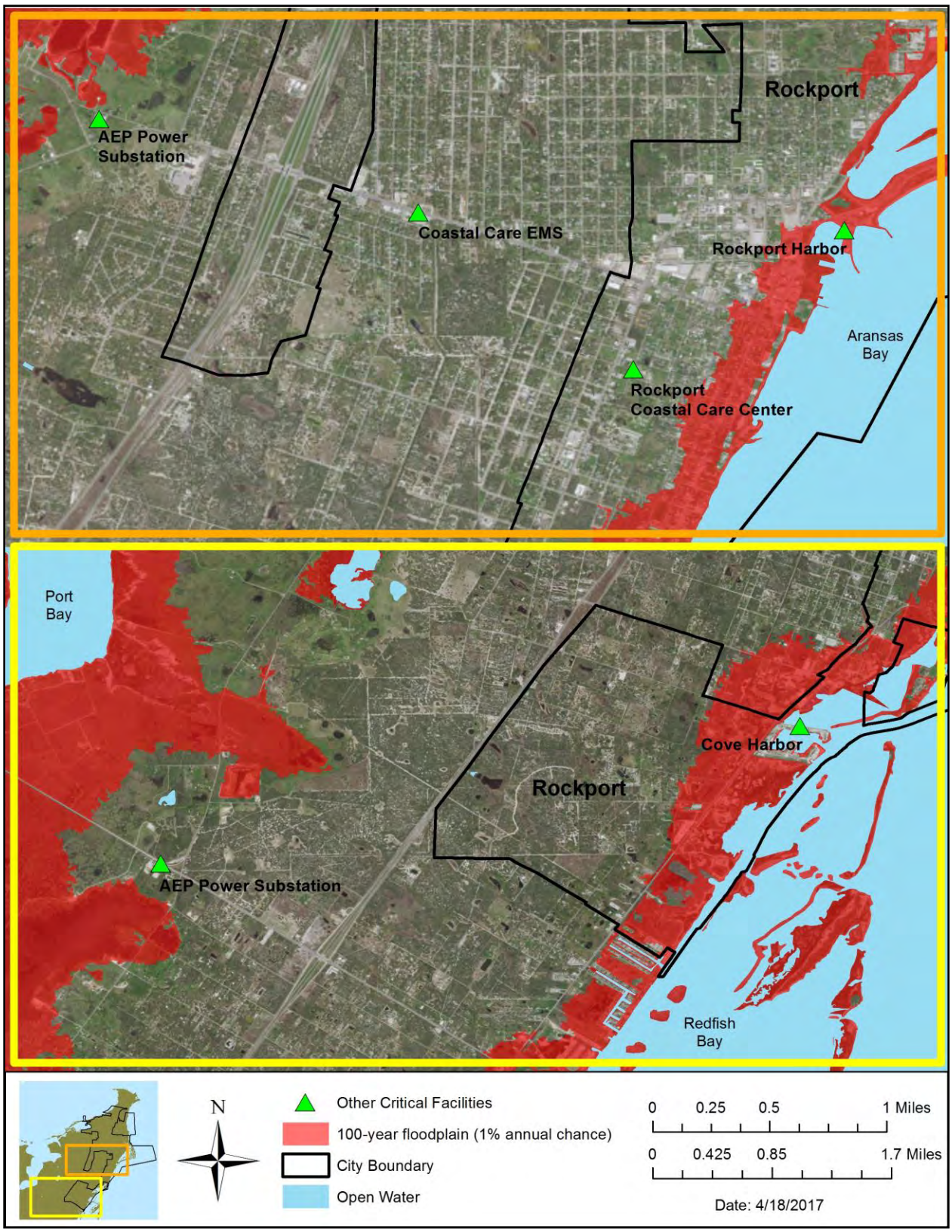
Map 5.8.a: Locator Map: Other Critical Facilities in the County; but not Affiliated with County Government or Schools.



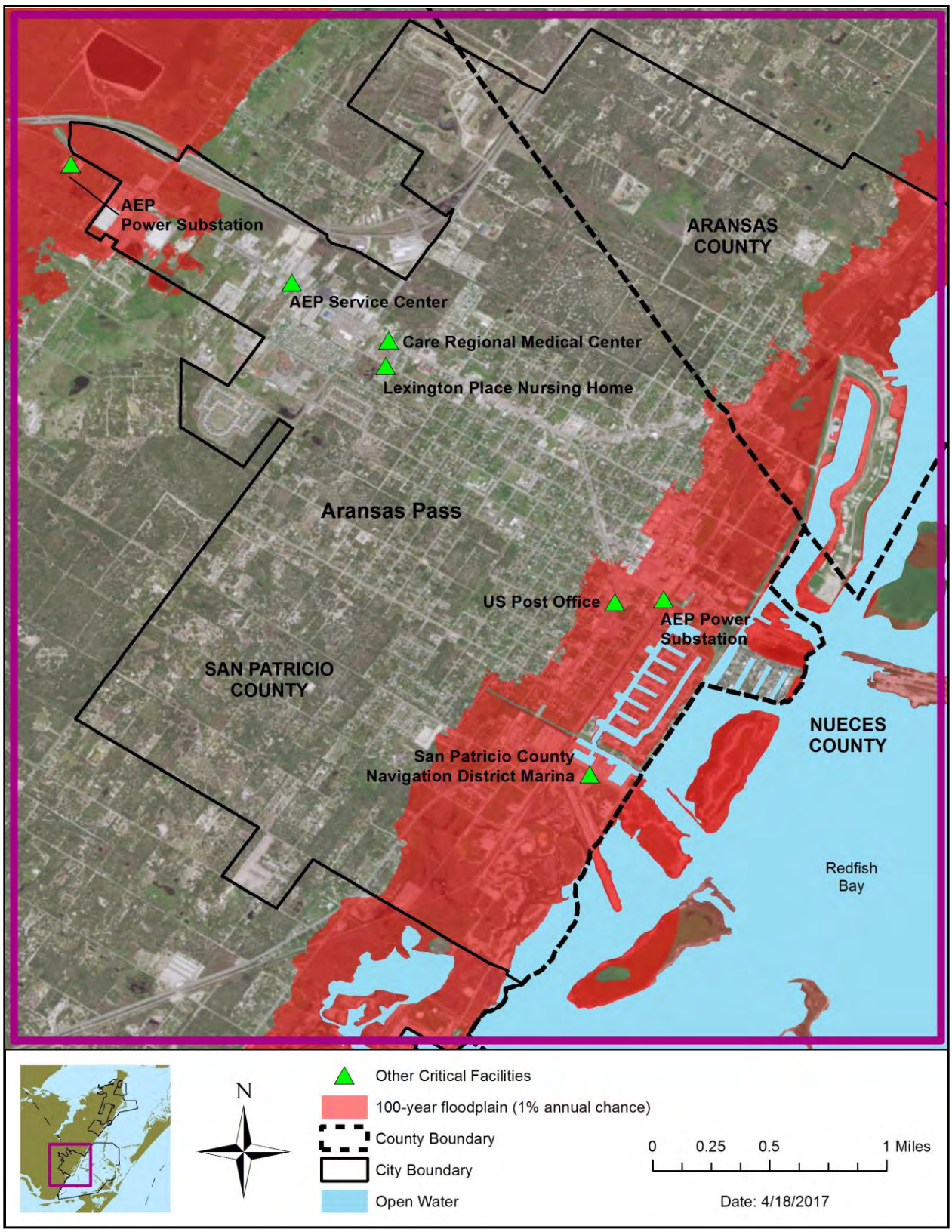
Map 5.8.b: Northern-most Region: Other Critical Facilities in the County; but not Affiliated with County Government or Schools.



Map 5.8.c: Northern Rockport and Fulton Region: Other Critical Facilities in the County; but not Affiliated with County Government or Schools.



Map 5.8.d: Central and Southern Rockport Region: Other Critical Facilities in the County; but not Affiliated with County Government or Schools.



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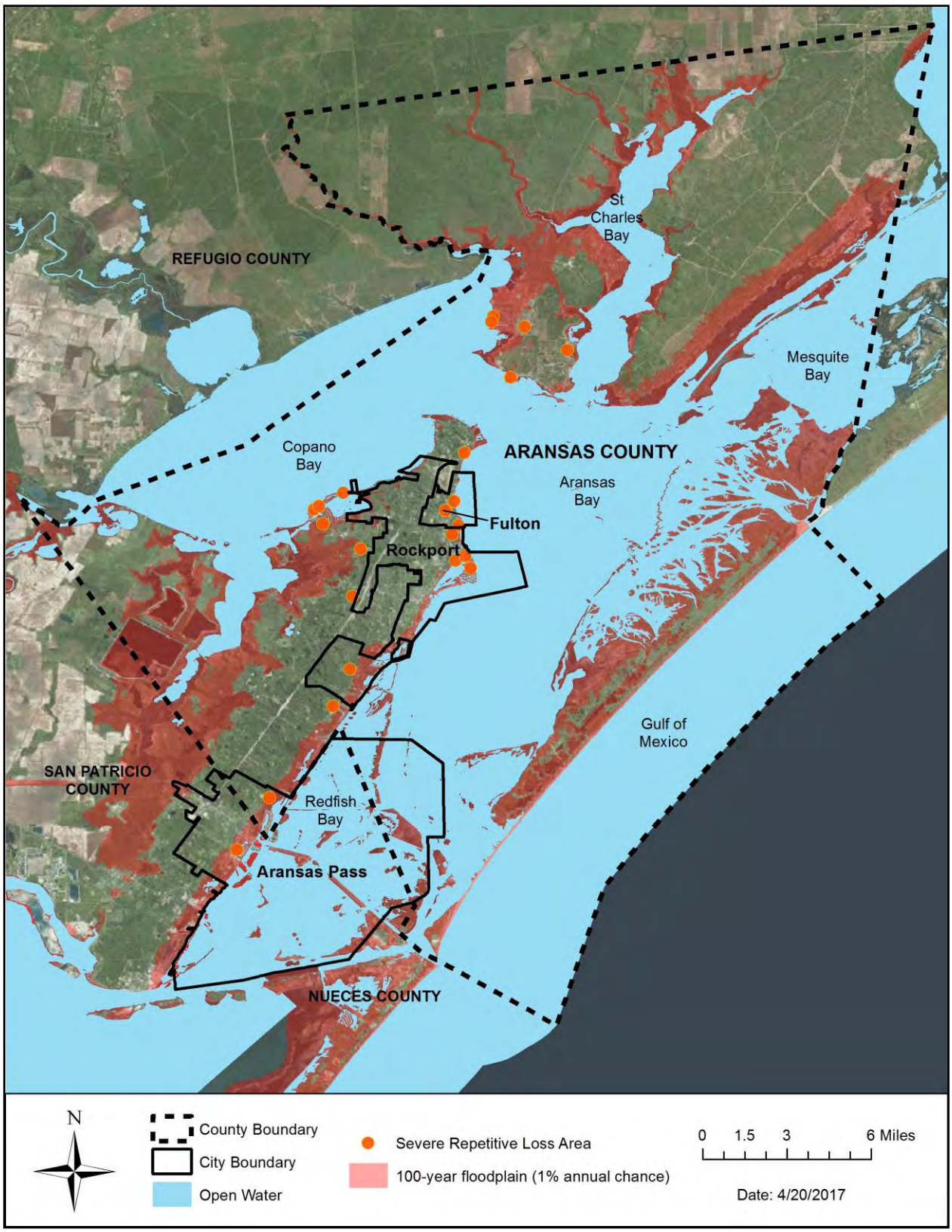

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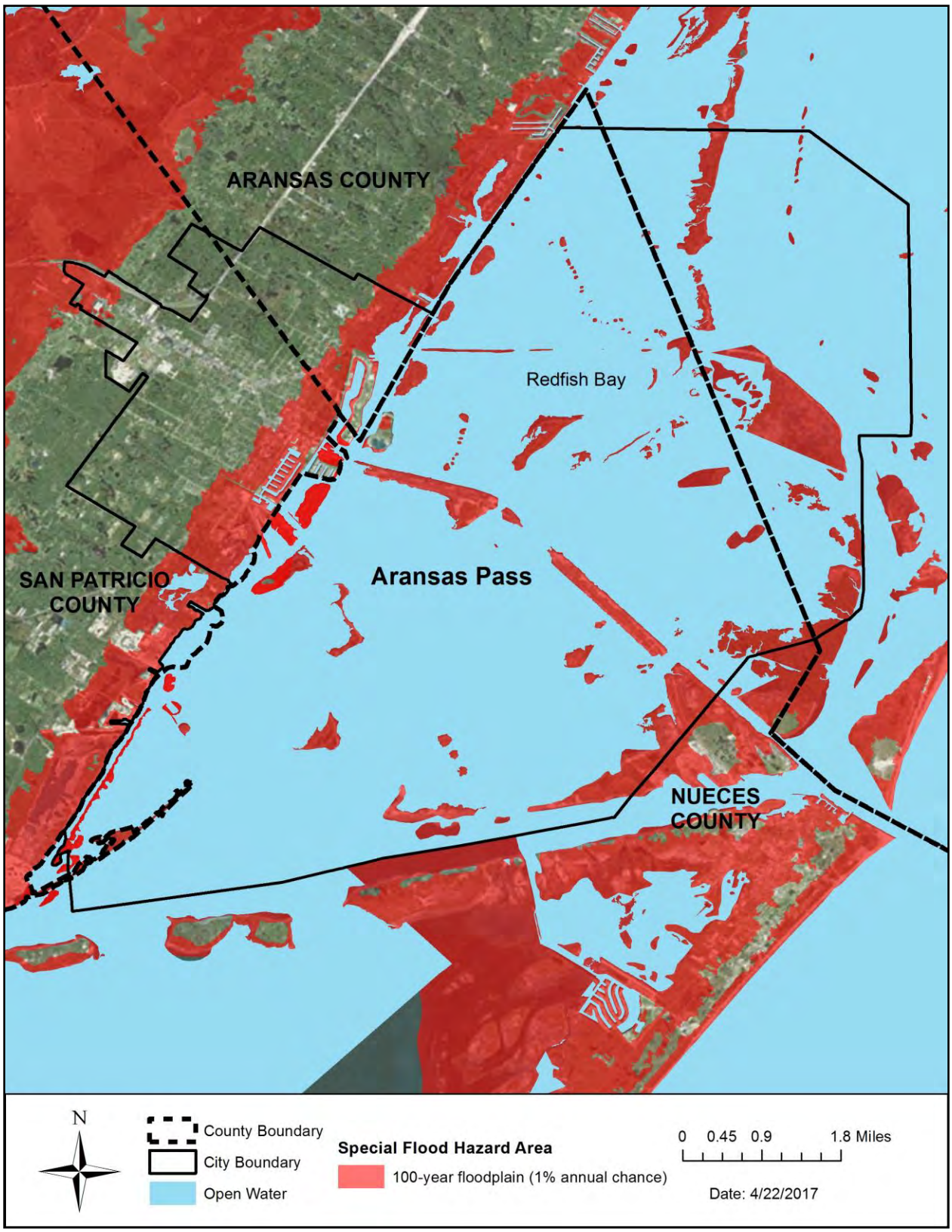

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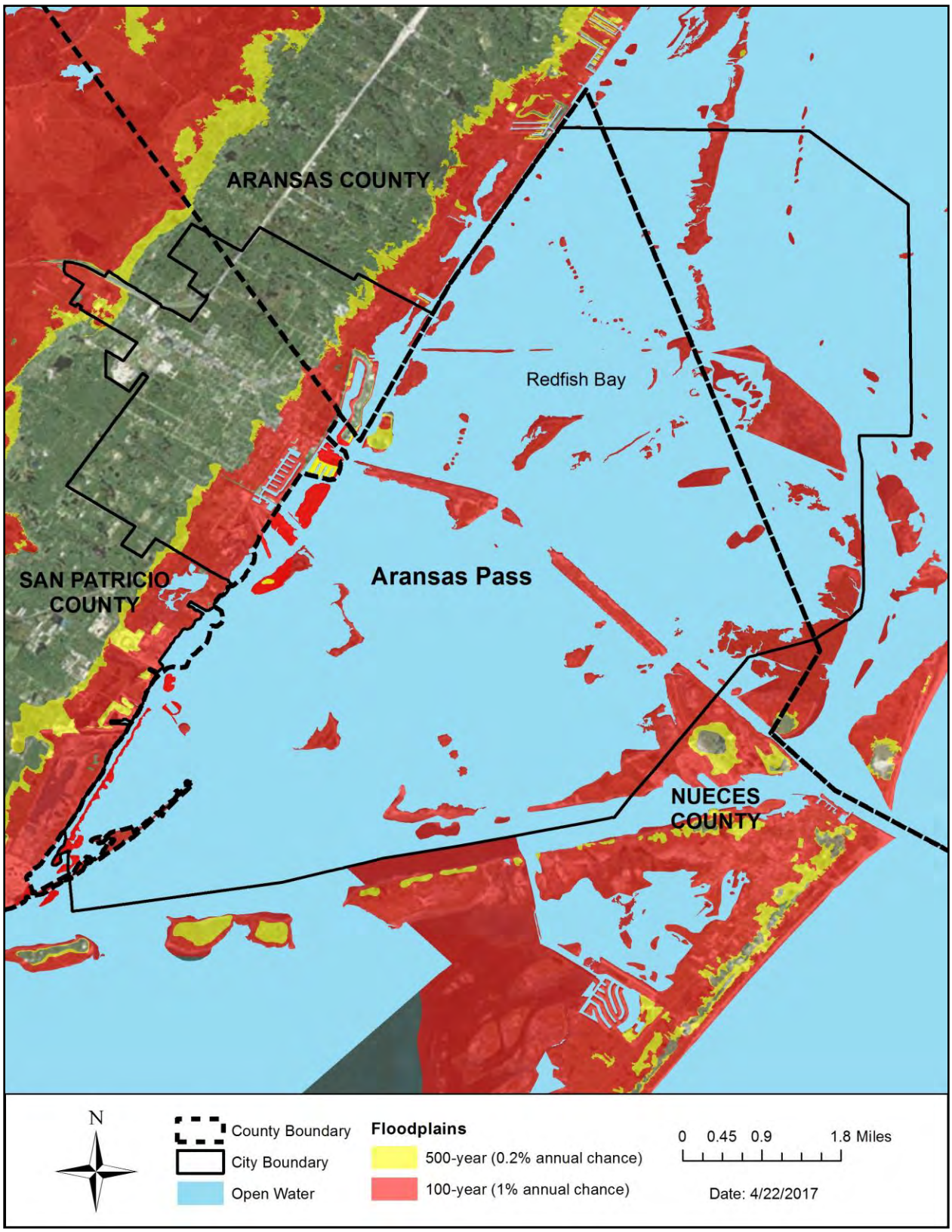

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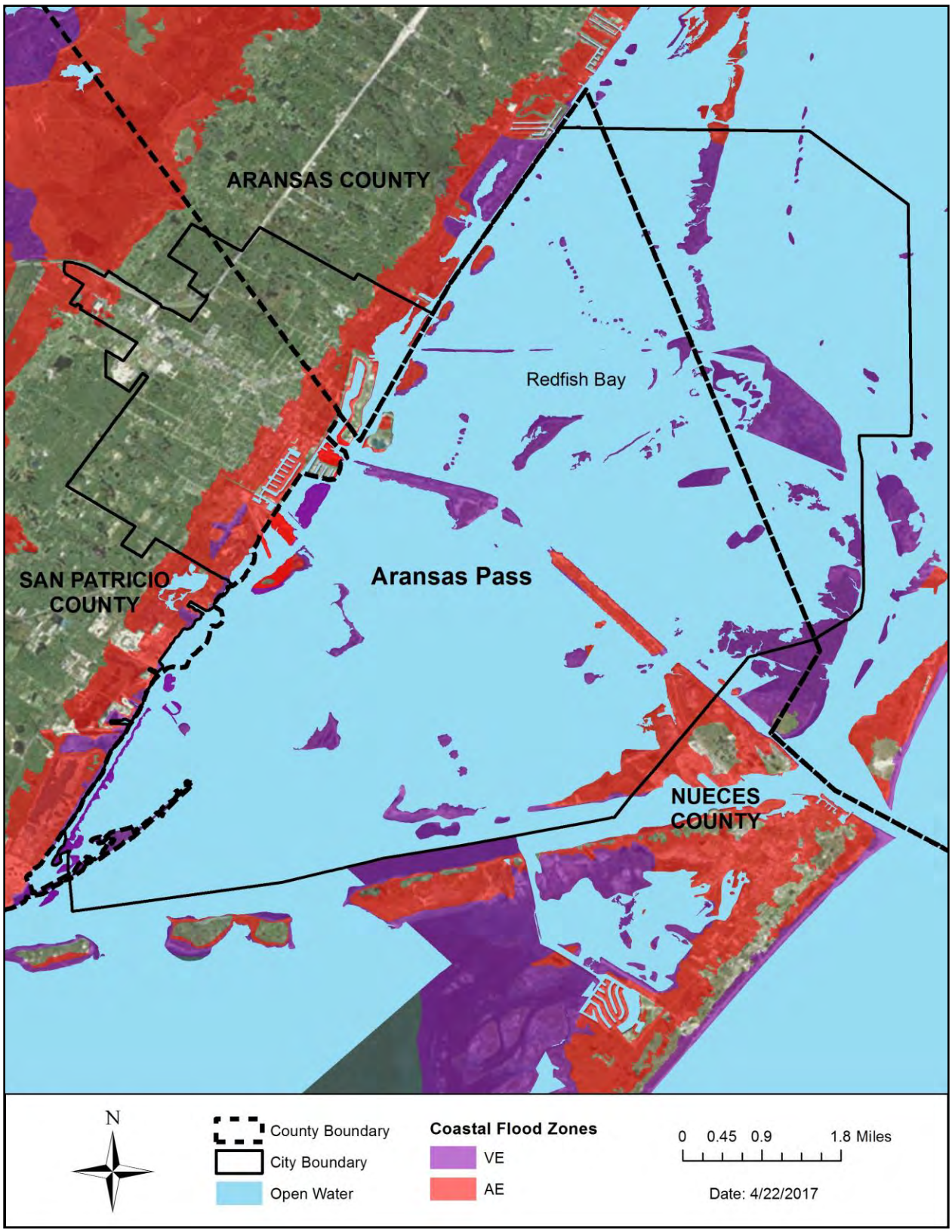

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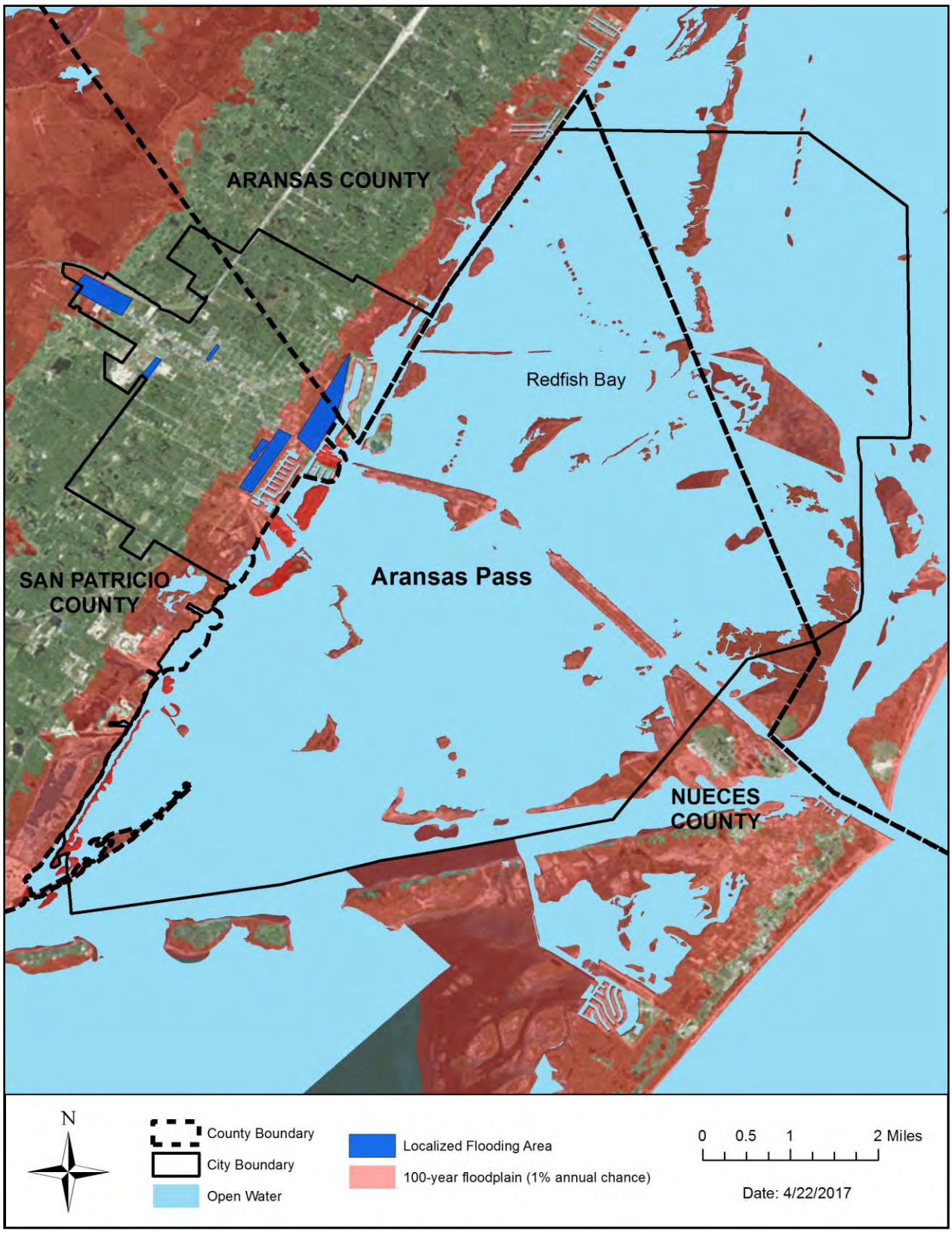
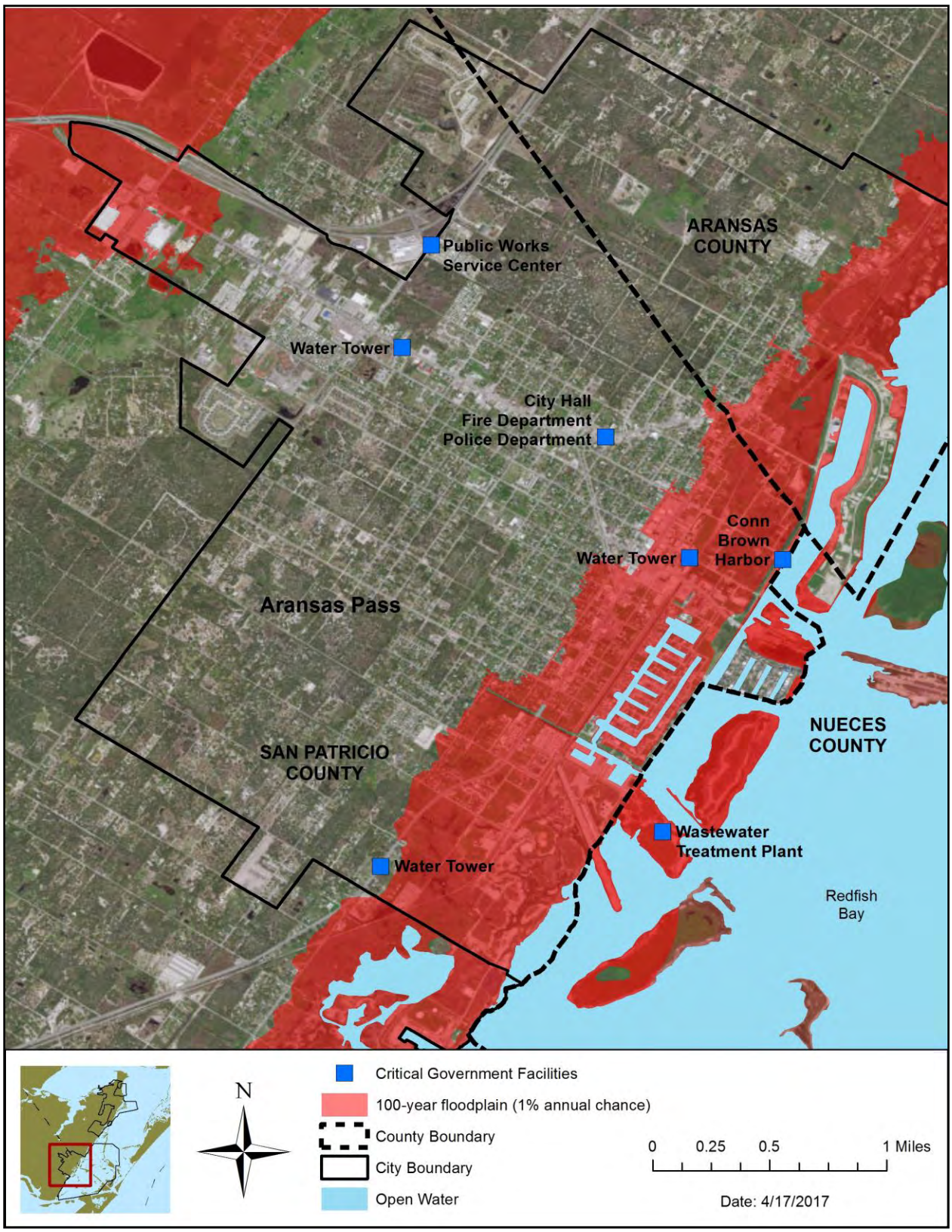
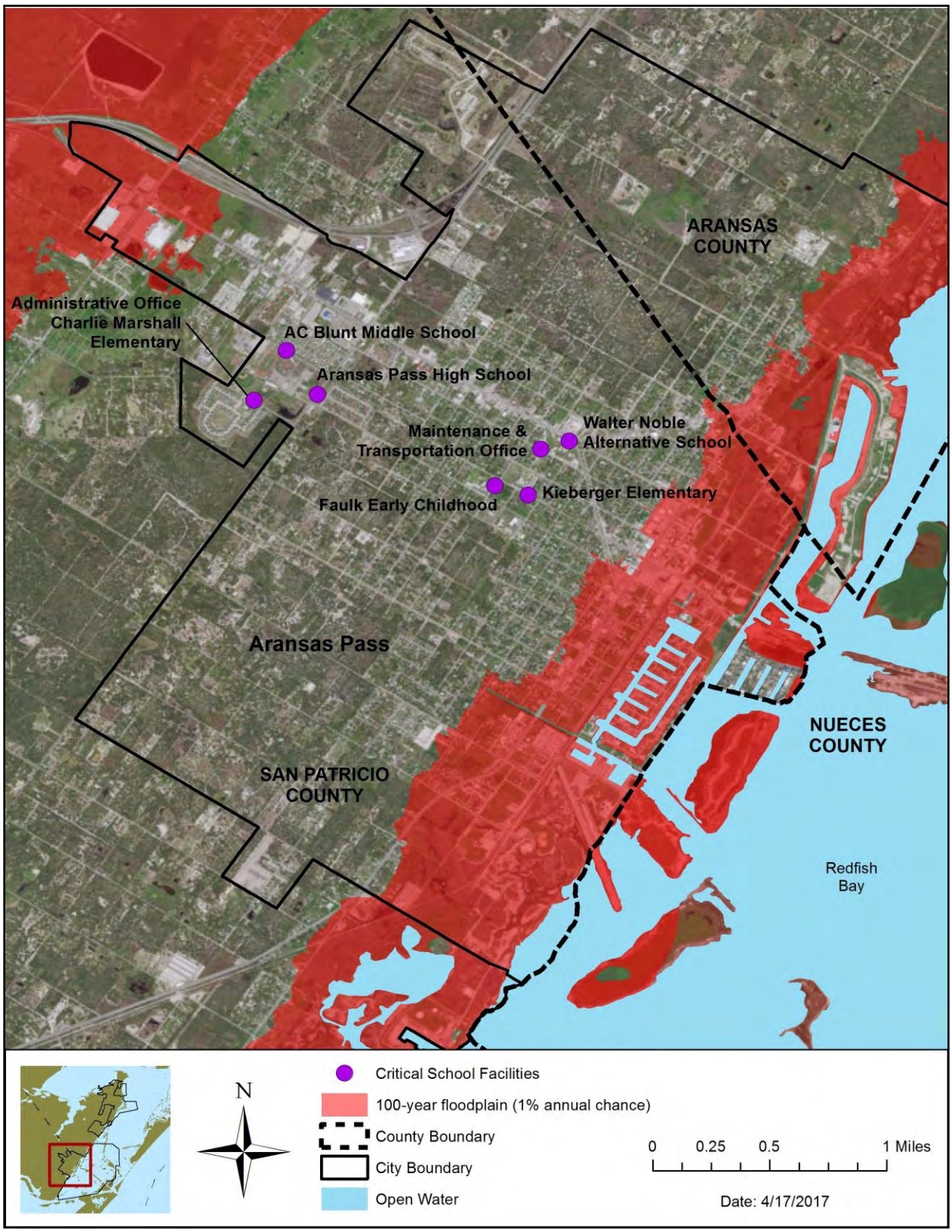


Map 5.13: Localized Flooding in Aransas Pass.



Map 5.14: Aransas Pass Governmental Critical Facilities.



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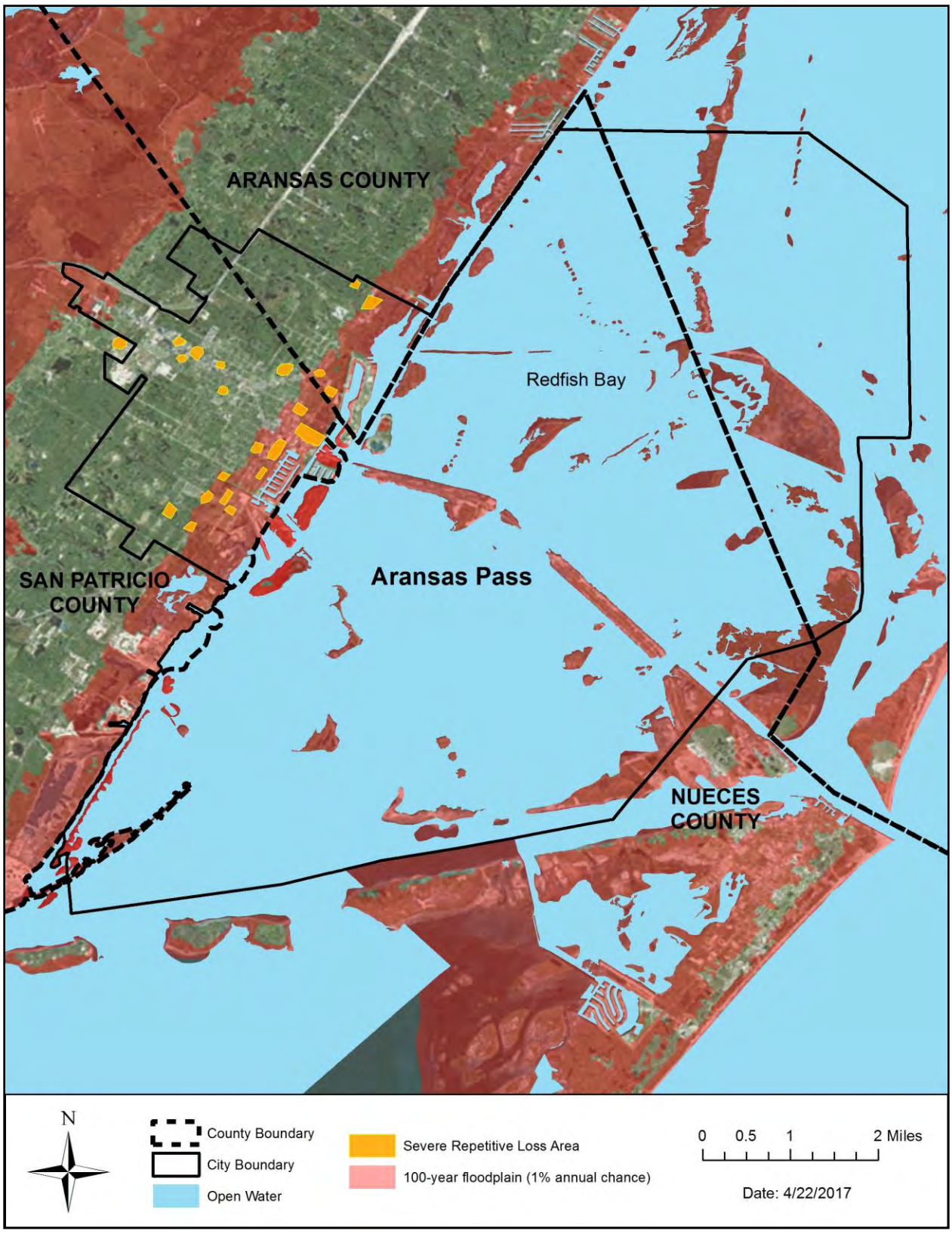

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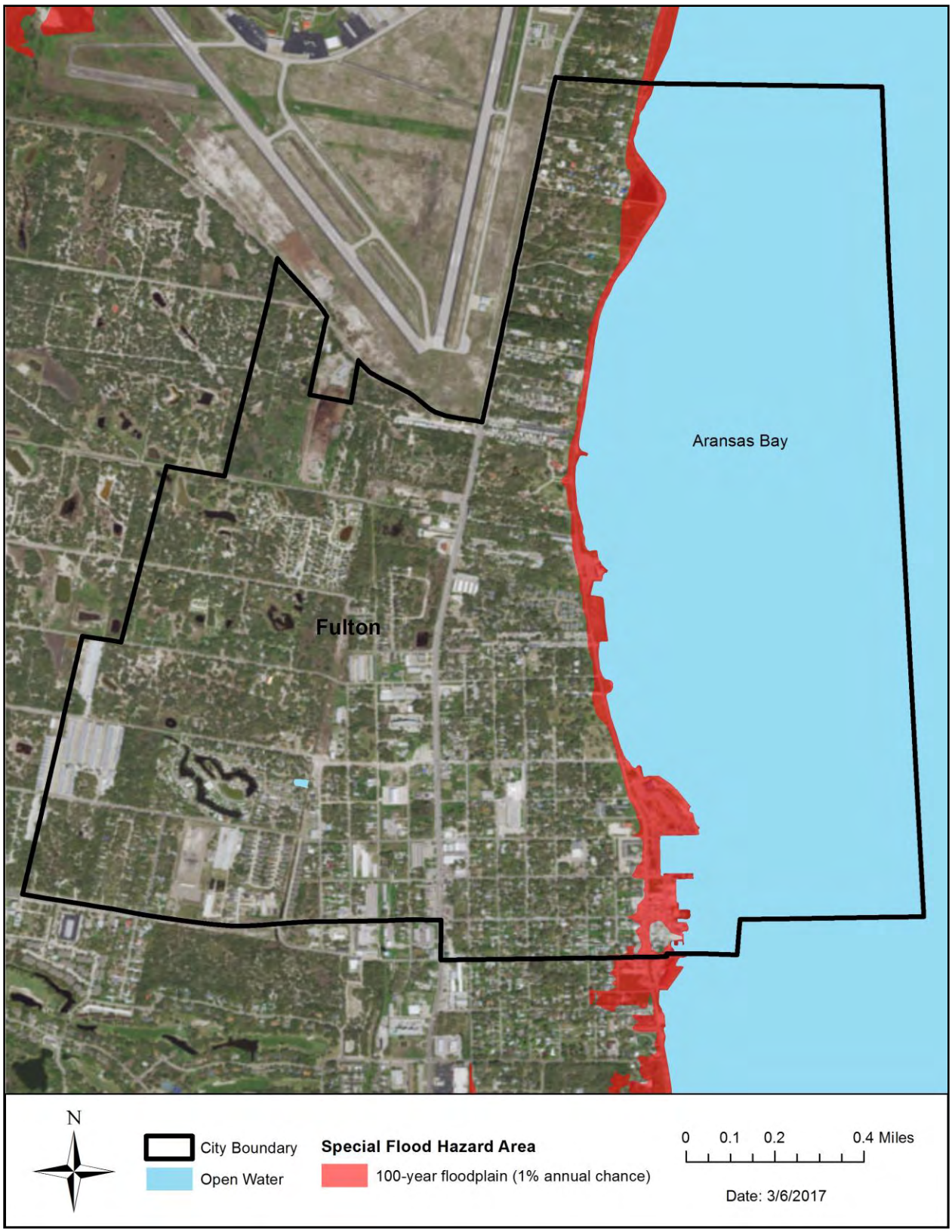

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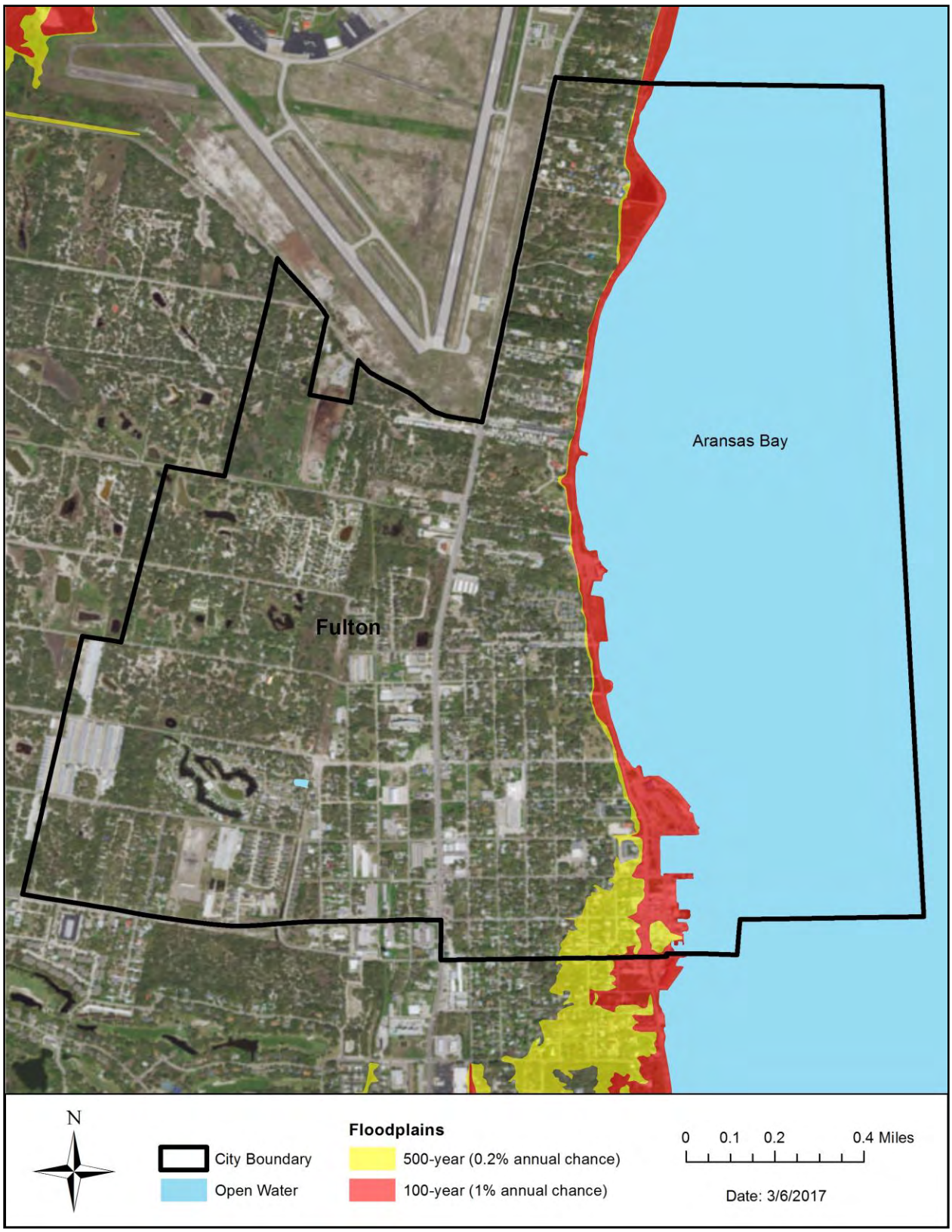

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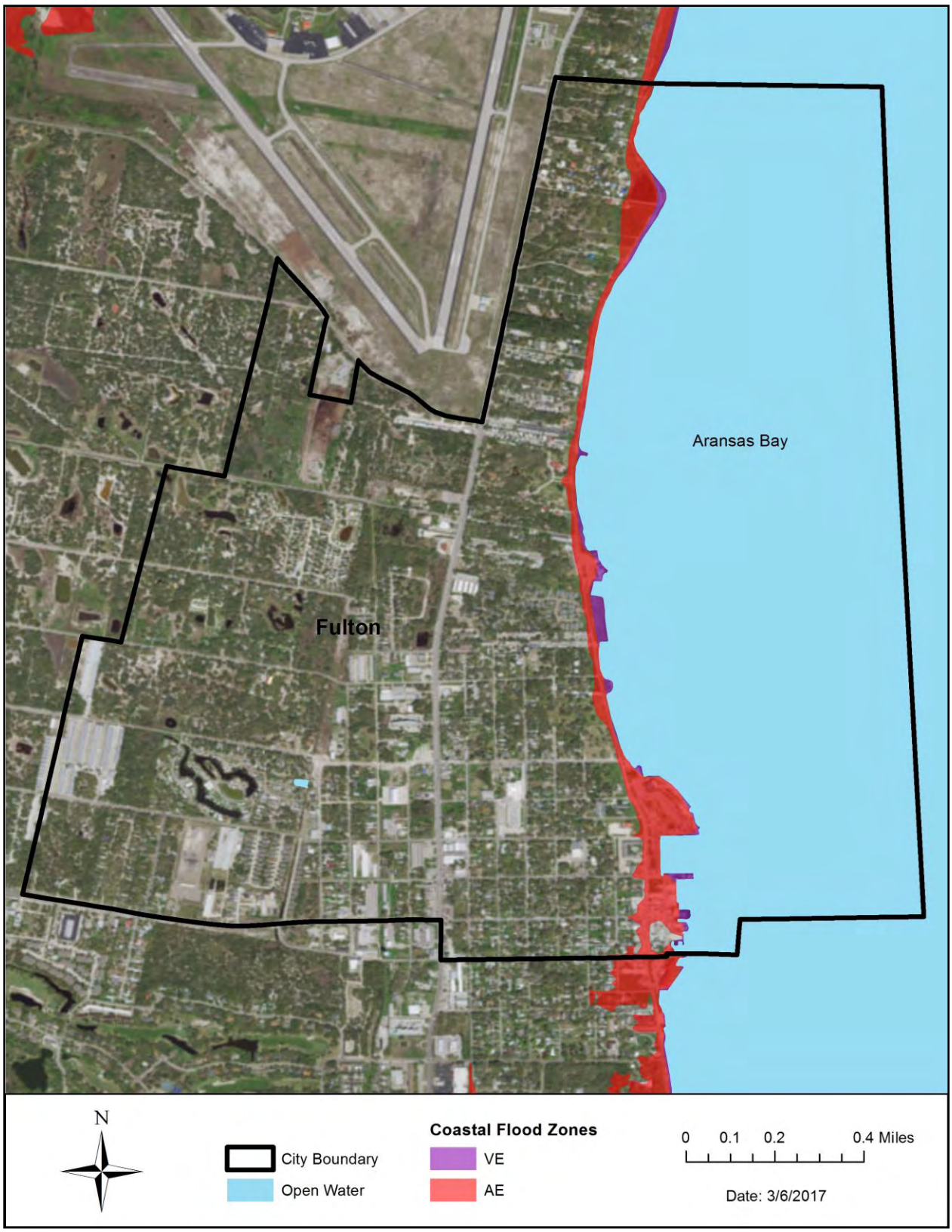

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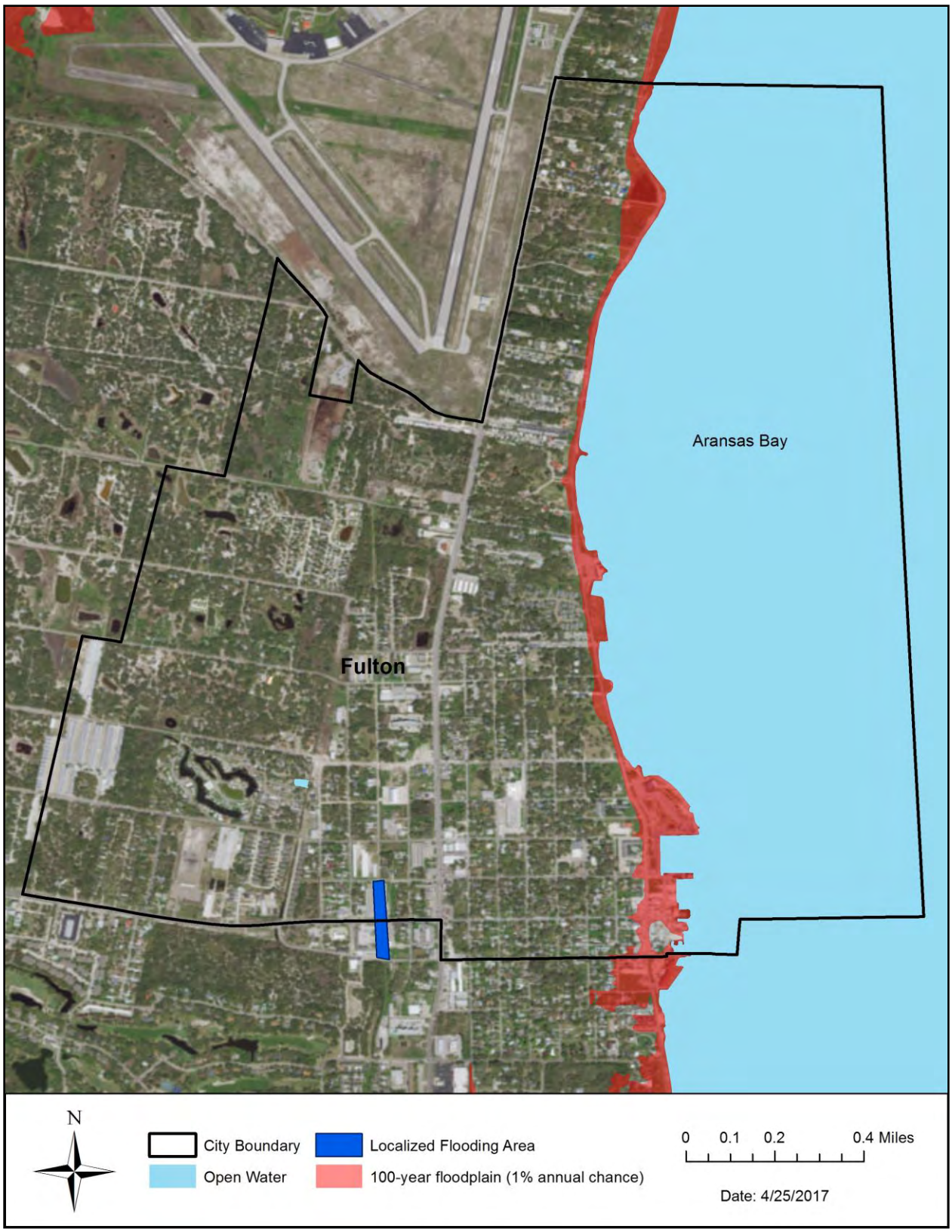
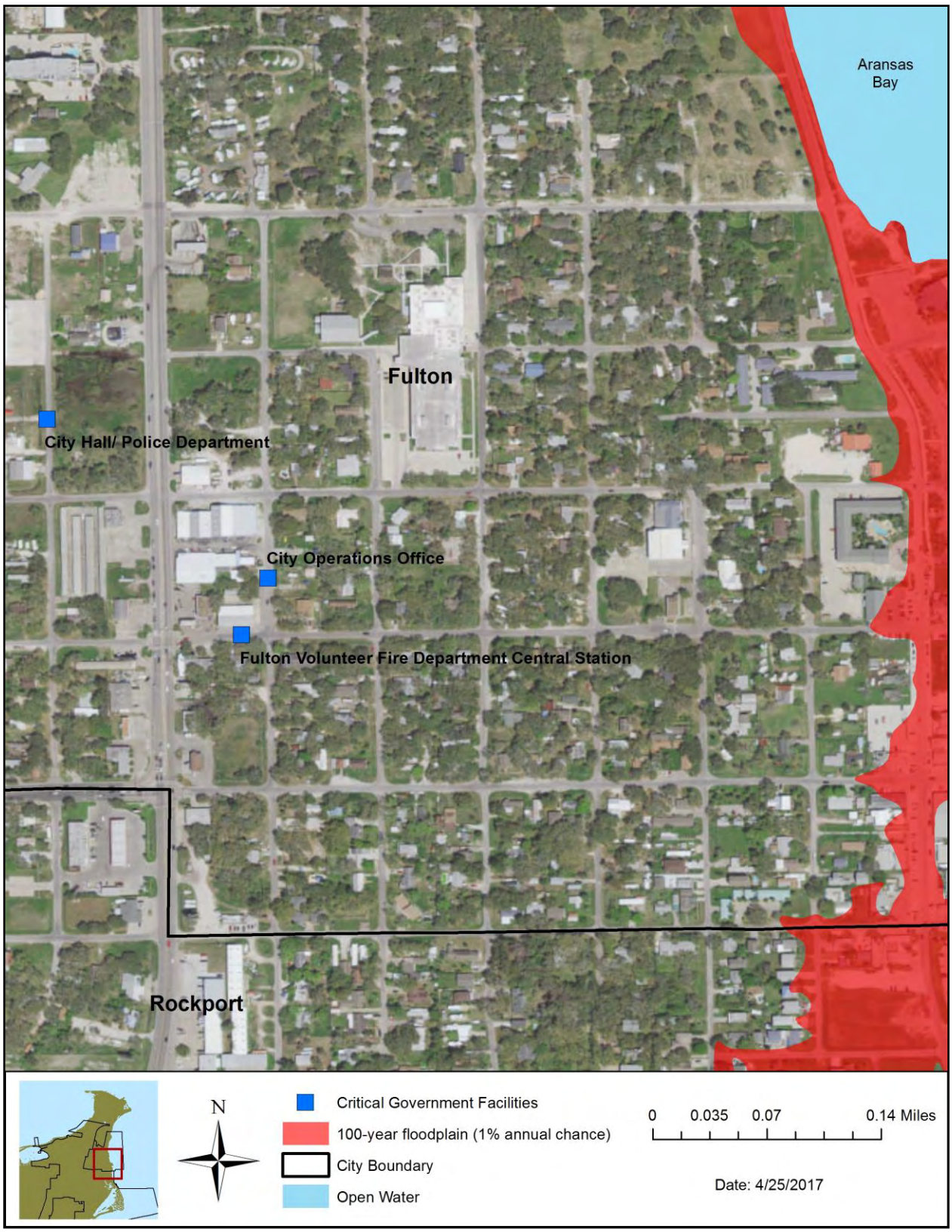


Map 5.20: Localized Flooding in Fulton.



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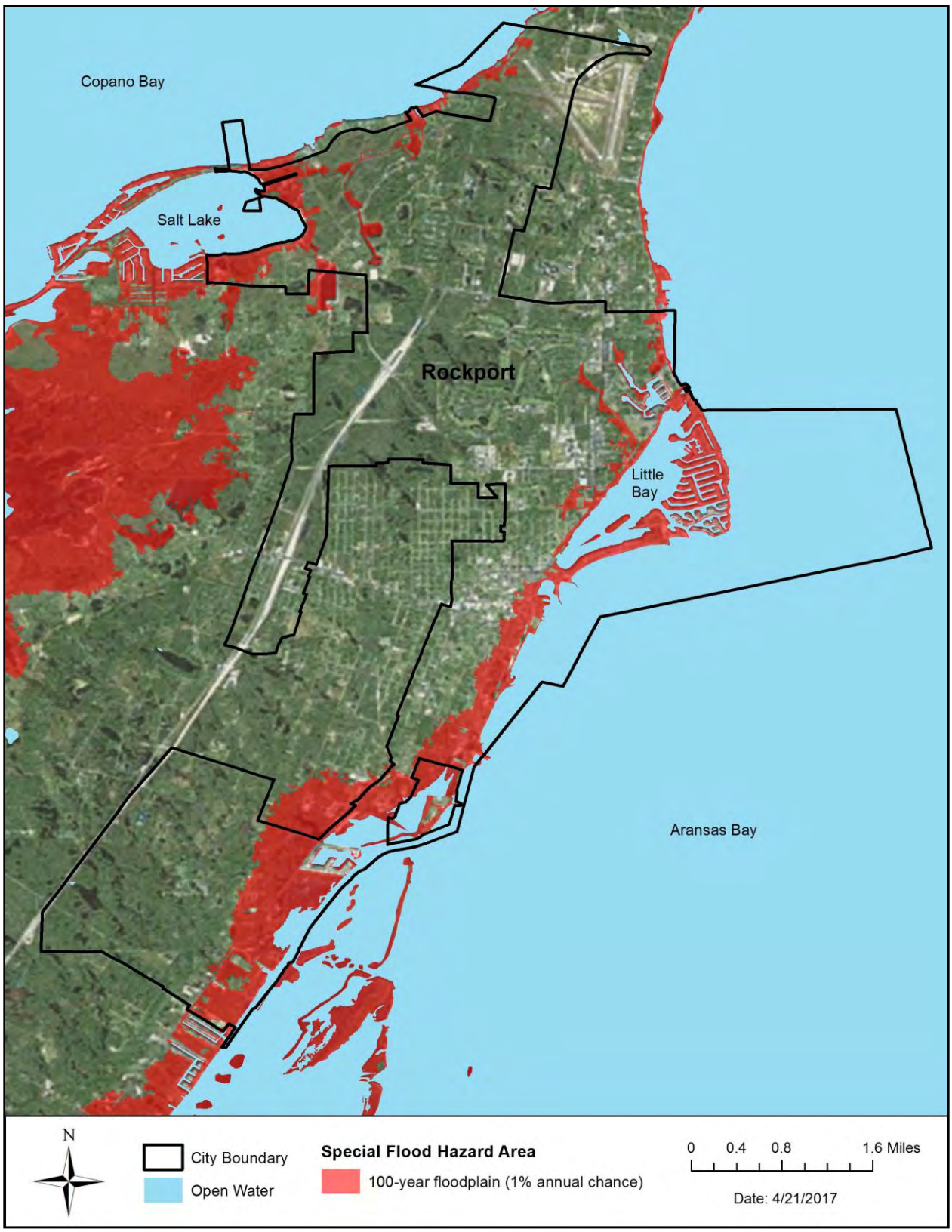
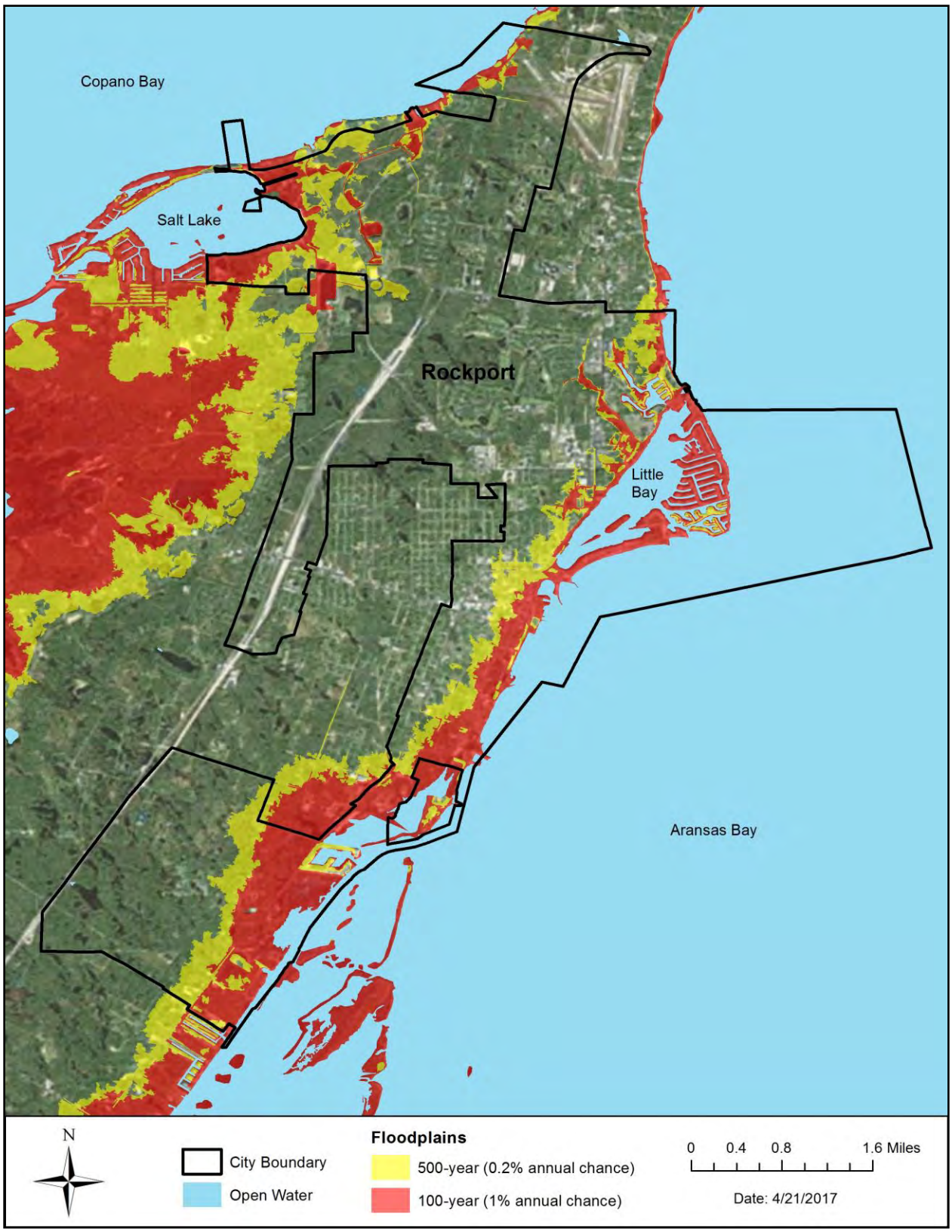


Map 5.22: Rockport Special Flood Hazard Areas.



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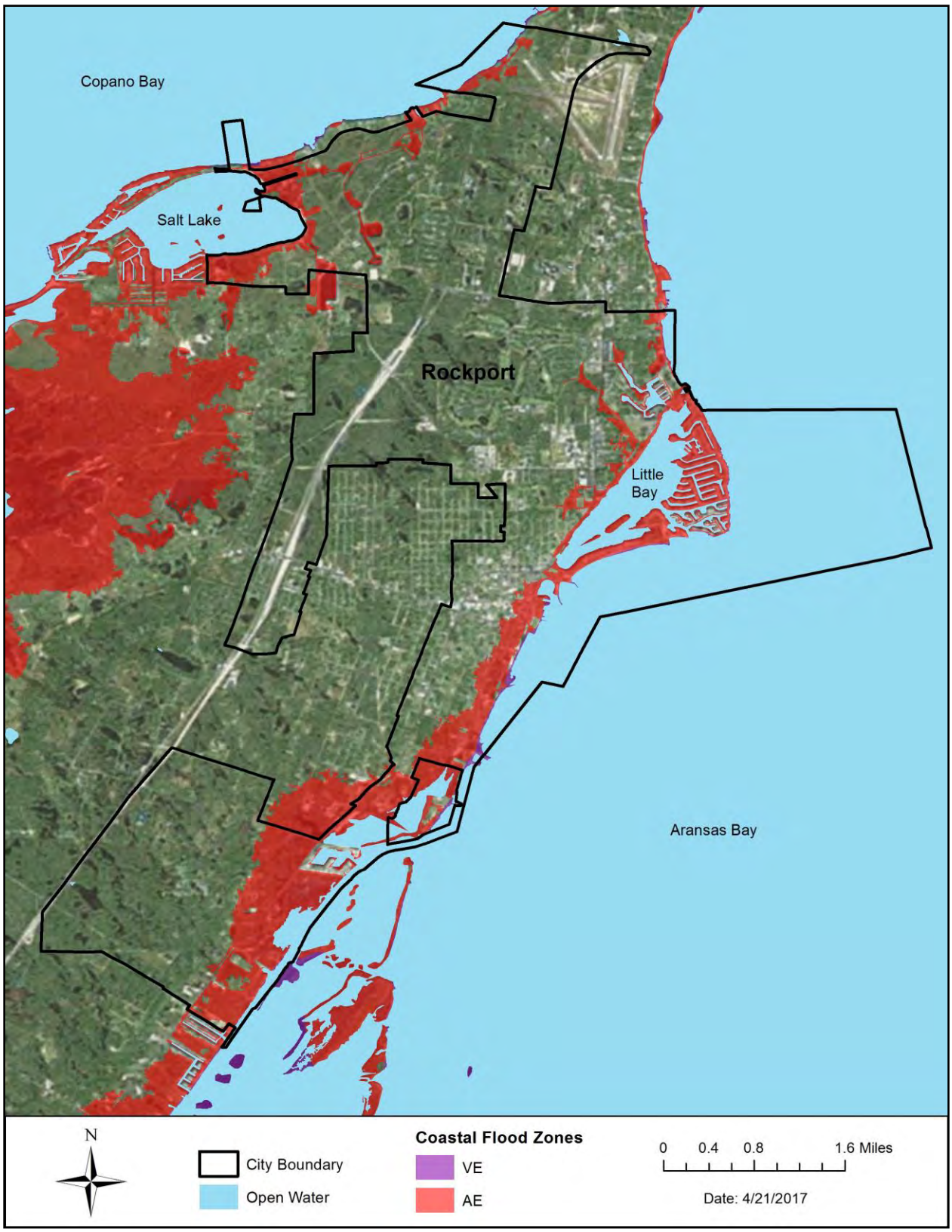

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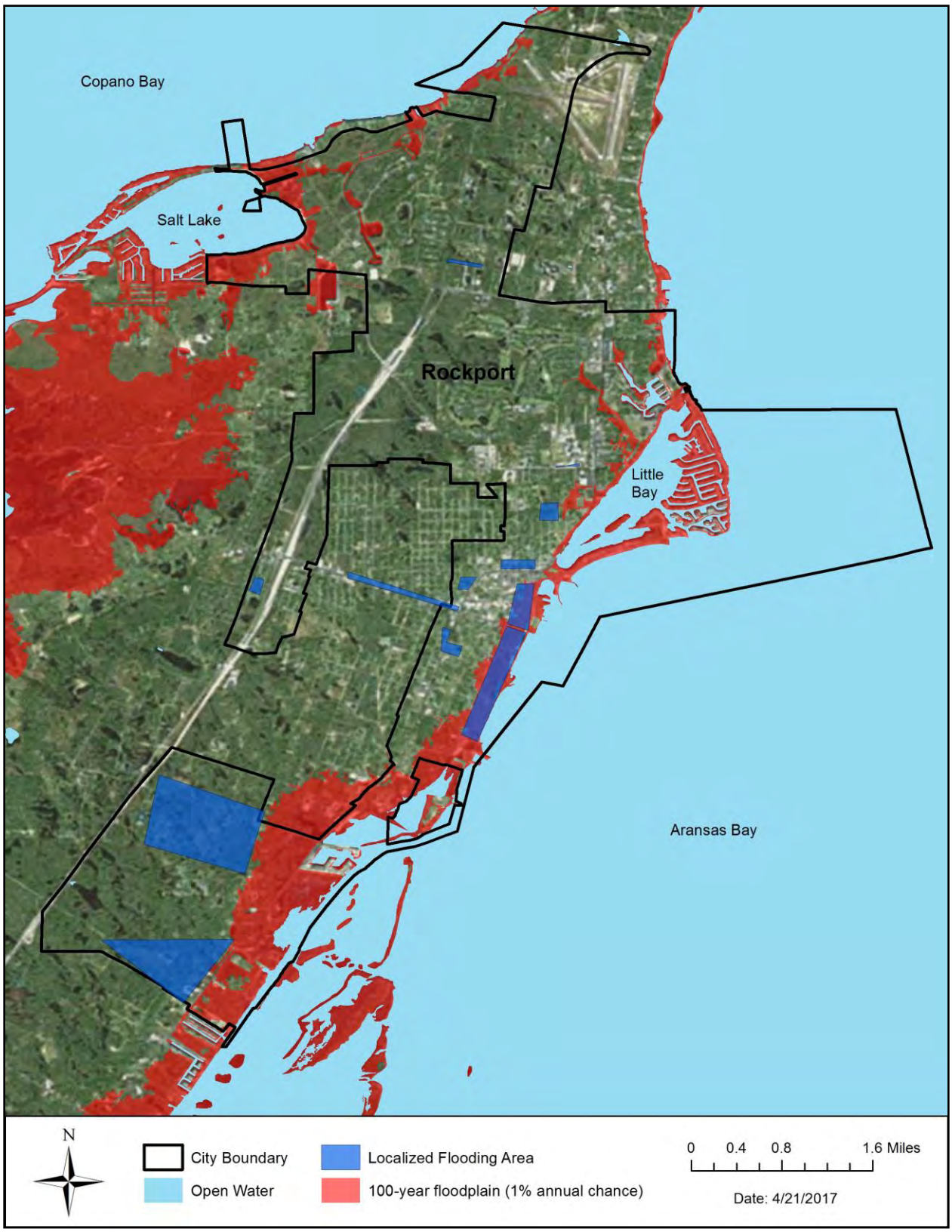
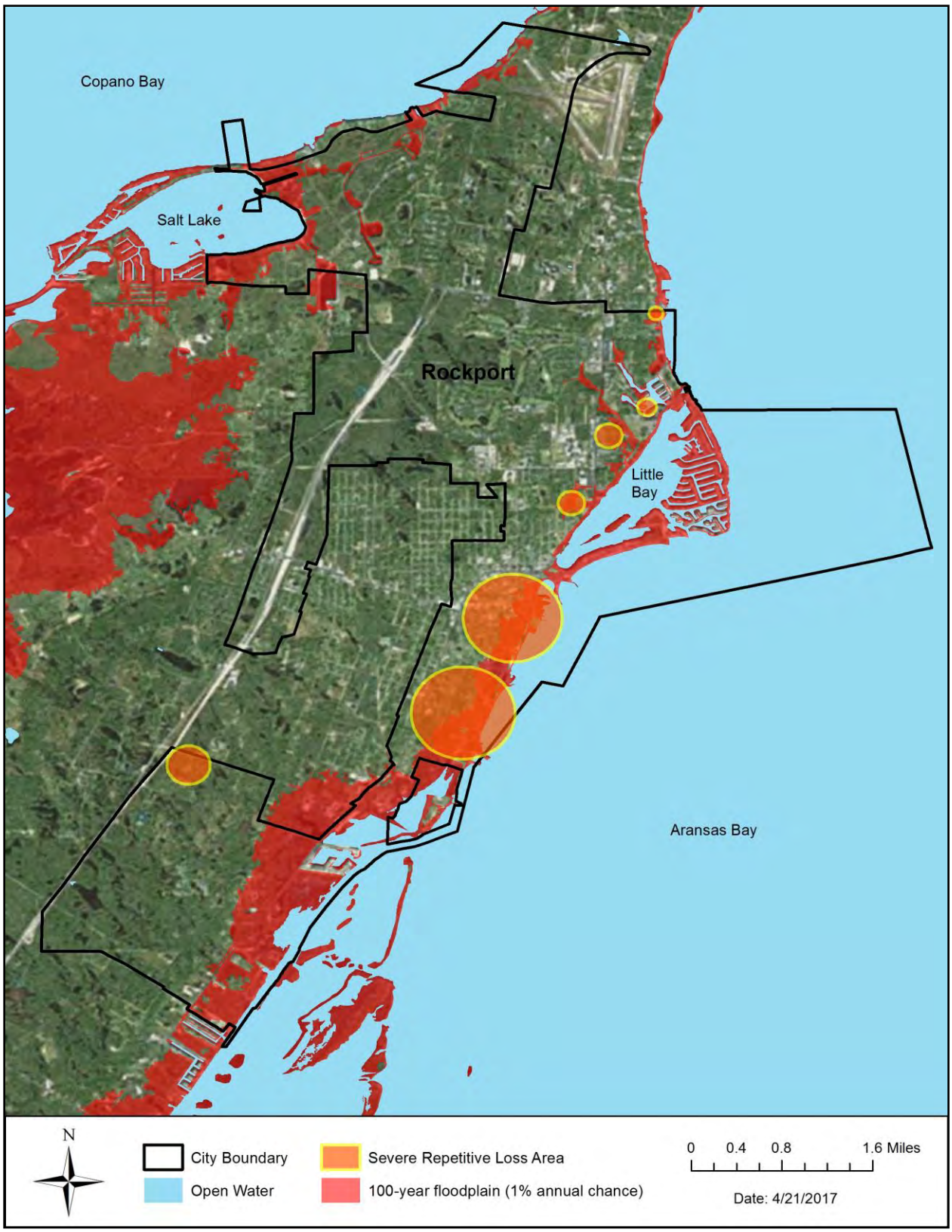


Map 5.25: Localized Flooding in Rockport.

Map 5.26: Rockport Governmental Critical Facilities.



Map 5.27: Severe Repetitive Loss Areas in Rockport.

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Maps

ARANSAS COUNTY MULTI-JURISDICTIONAL FLOODPLAIN MANAGEMENT PLAN

2017

MAPS

ARANSAS COUNTY MULTI-JURISDICTIONAL FLOODPLAIN MANAGEMENT PLAN

2017

INCLUDES:
Aransas County, Texas
City of Aransas Pass, Texas
Town of Fulton, Texas
City of Rockport, Texas

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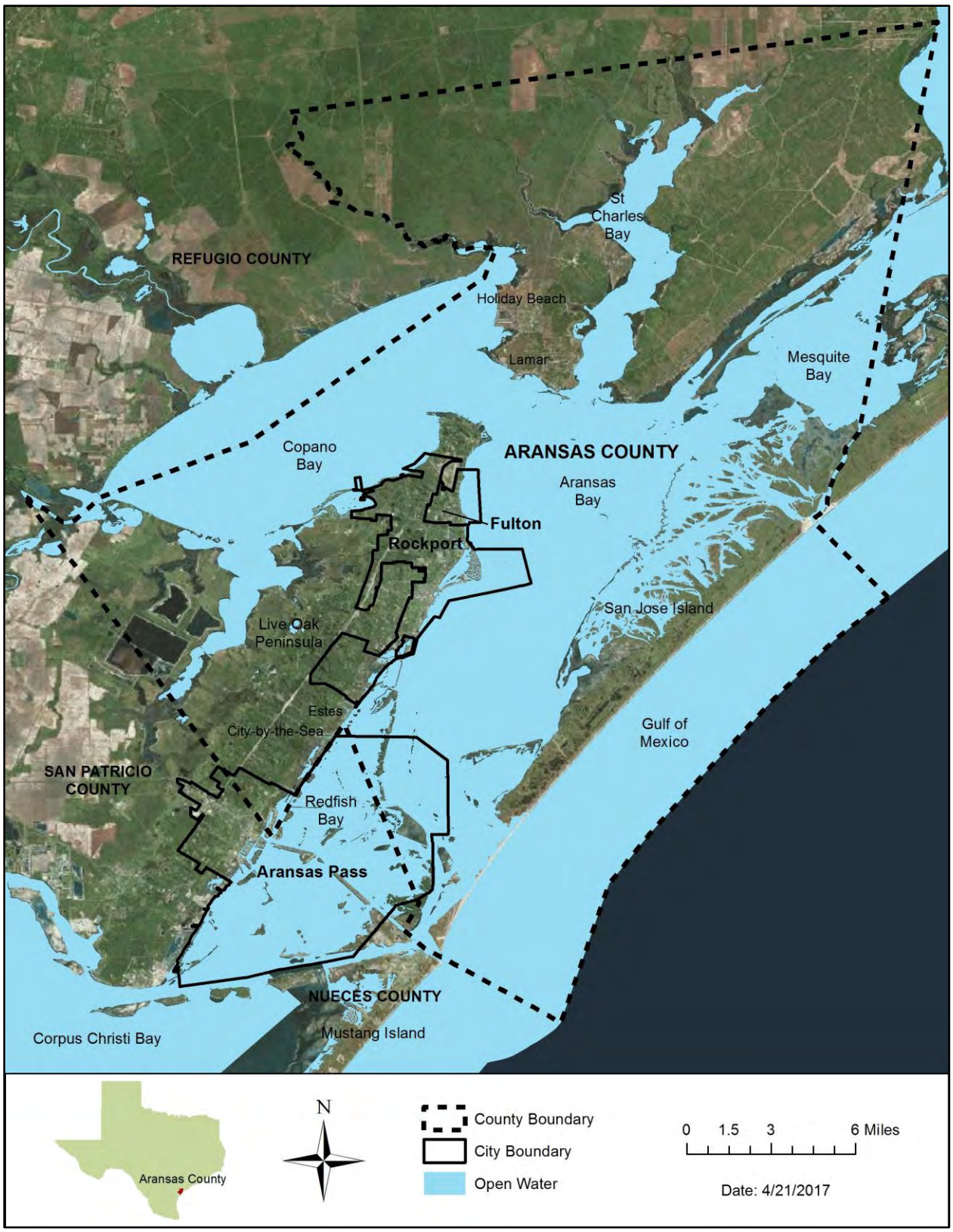

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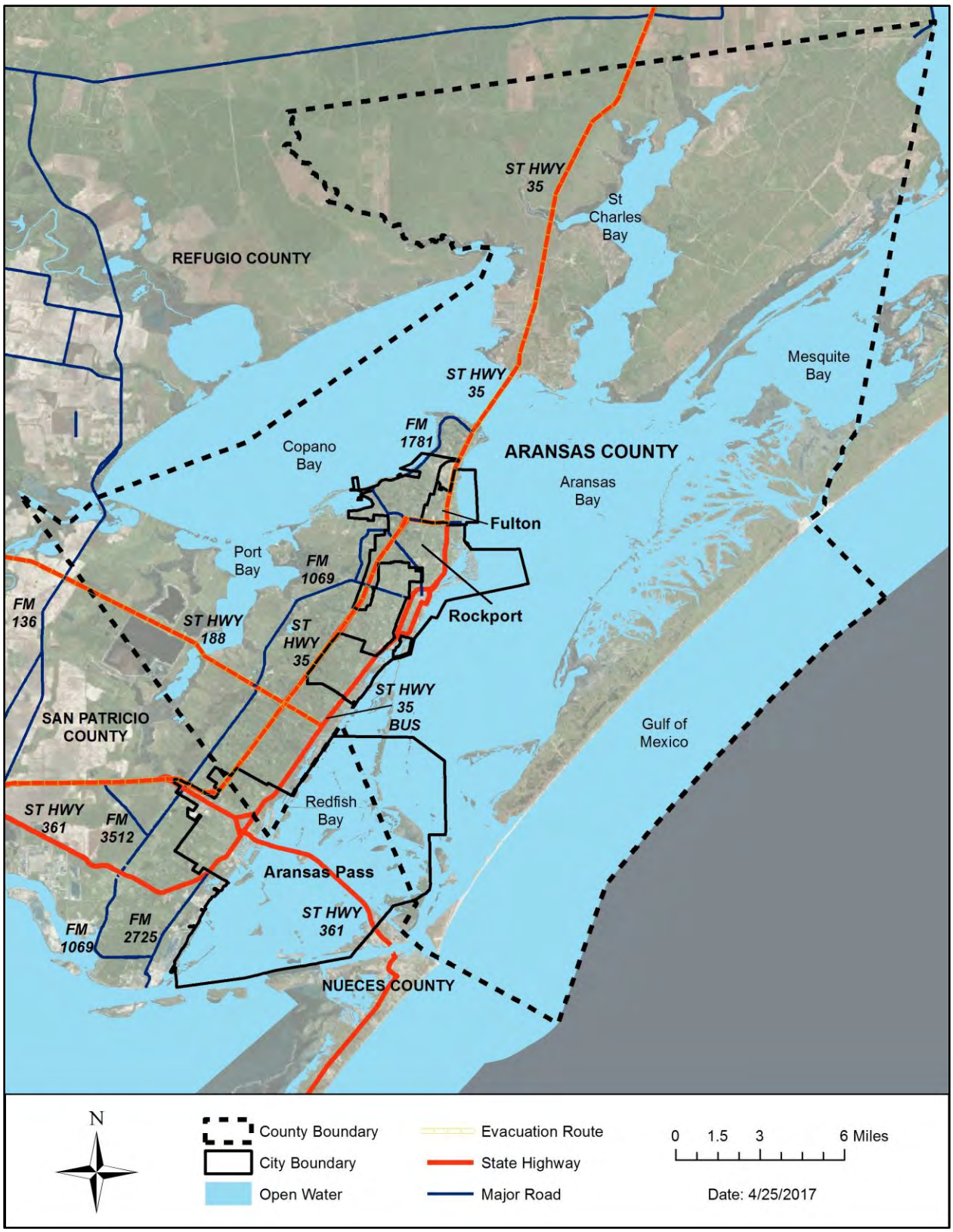

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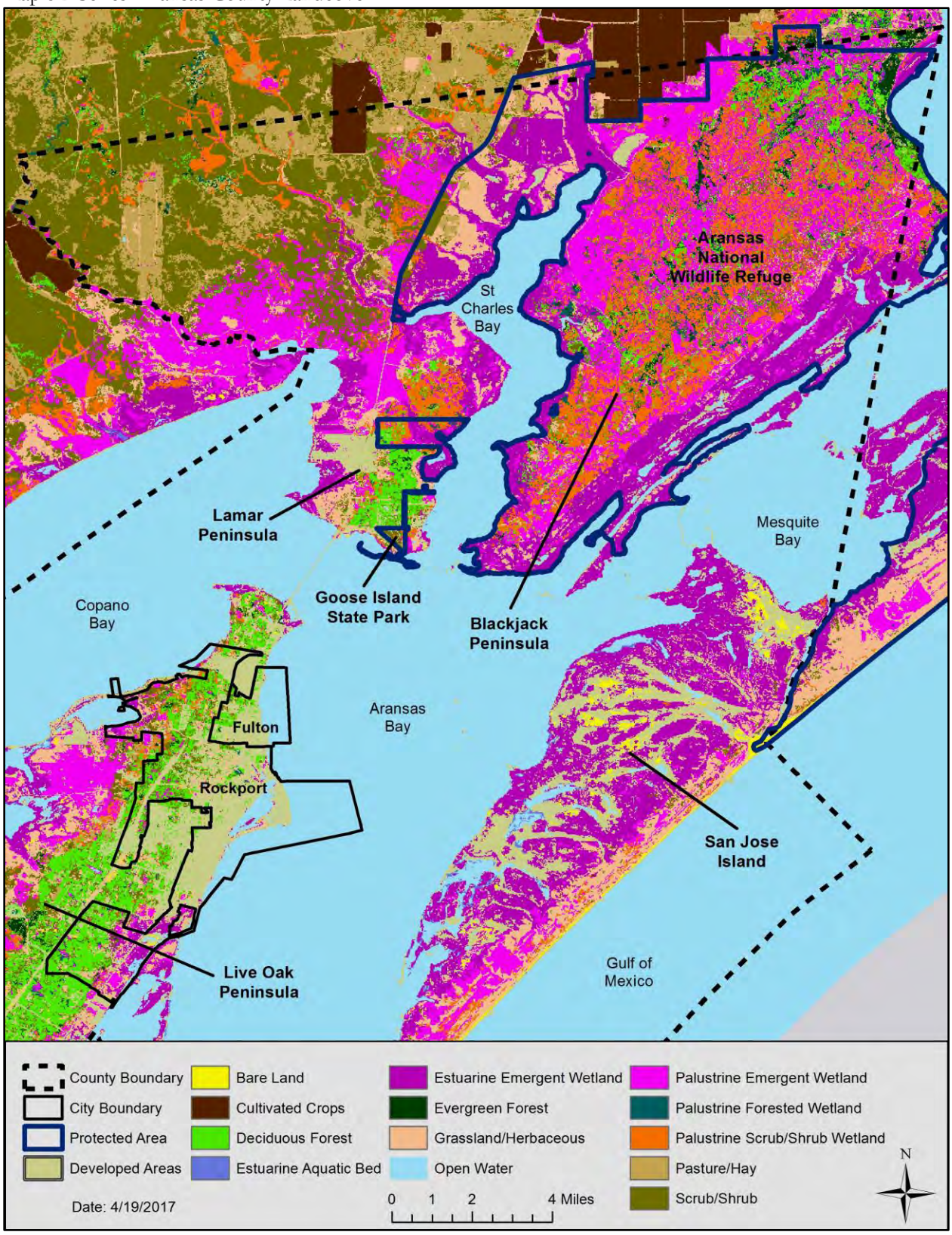

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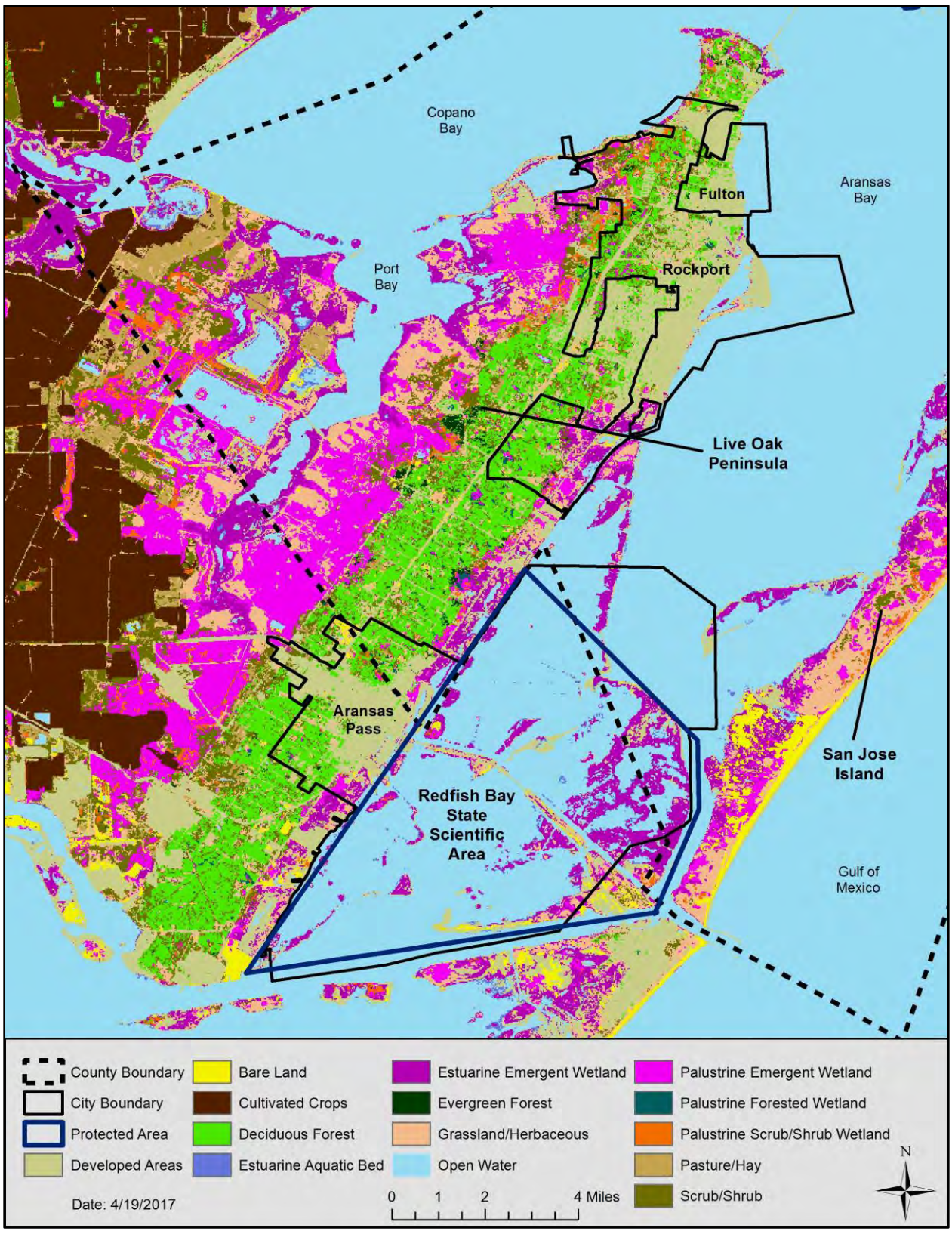

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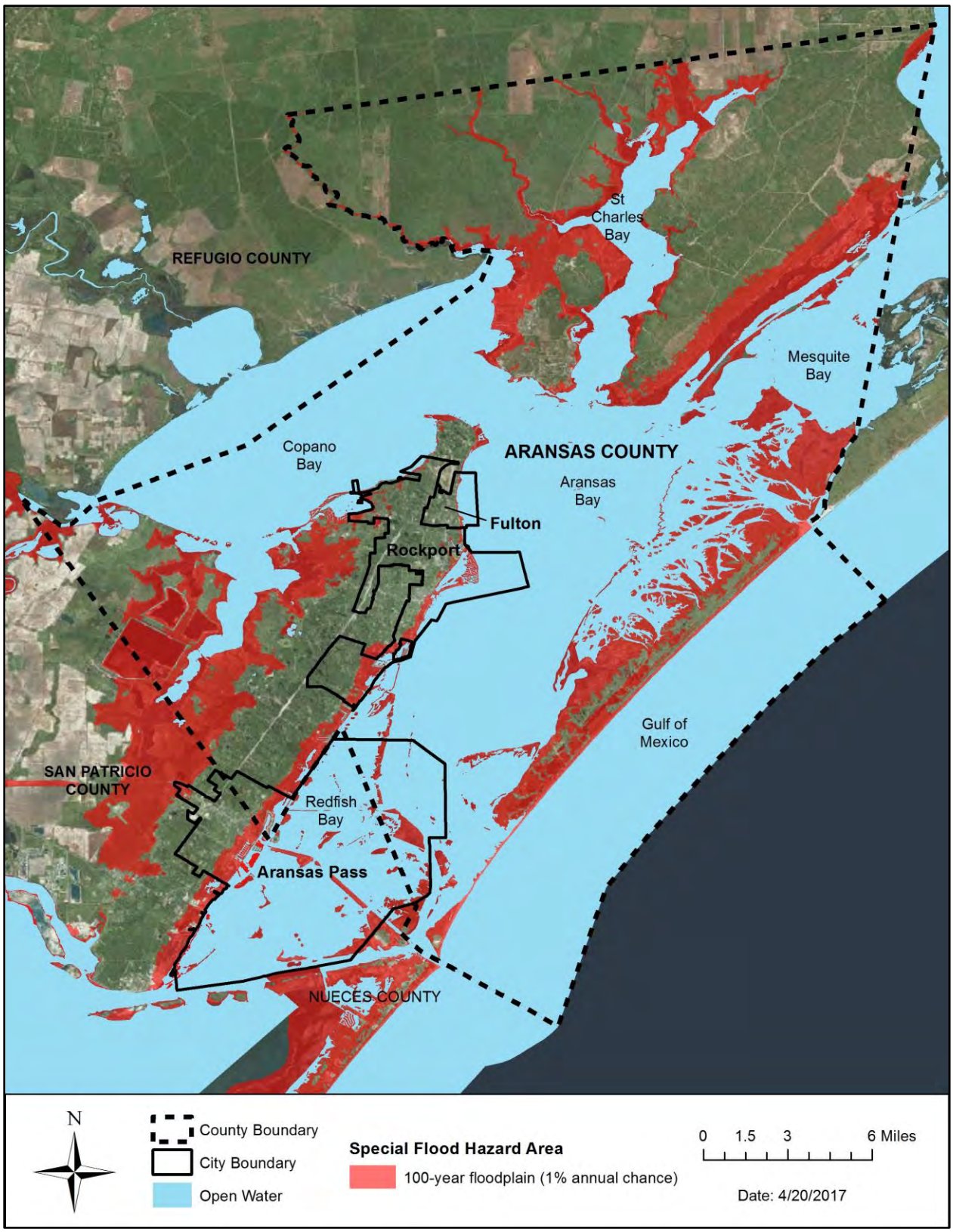

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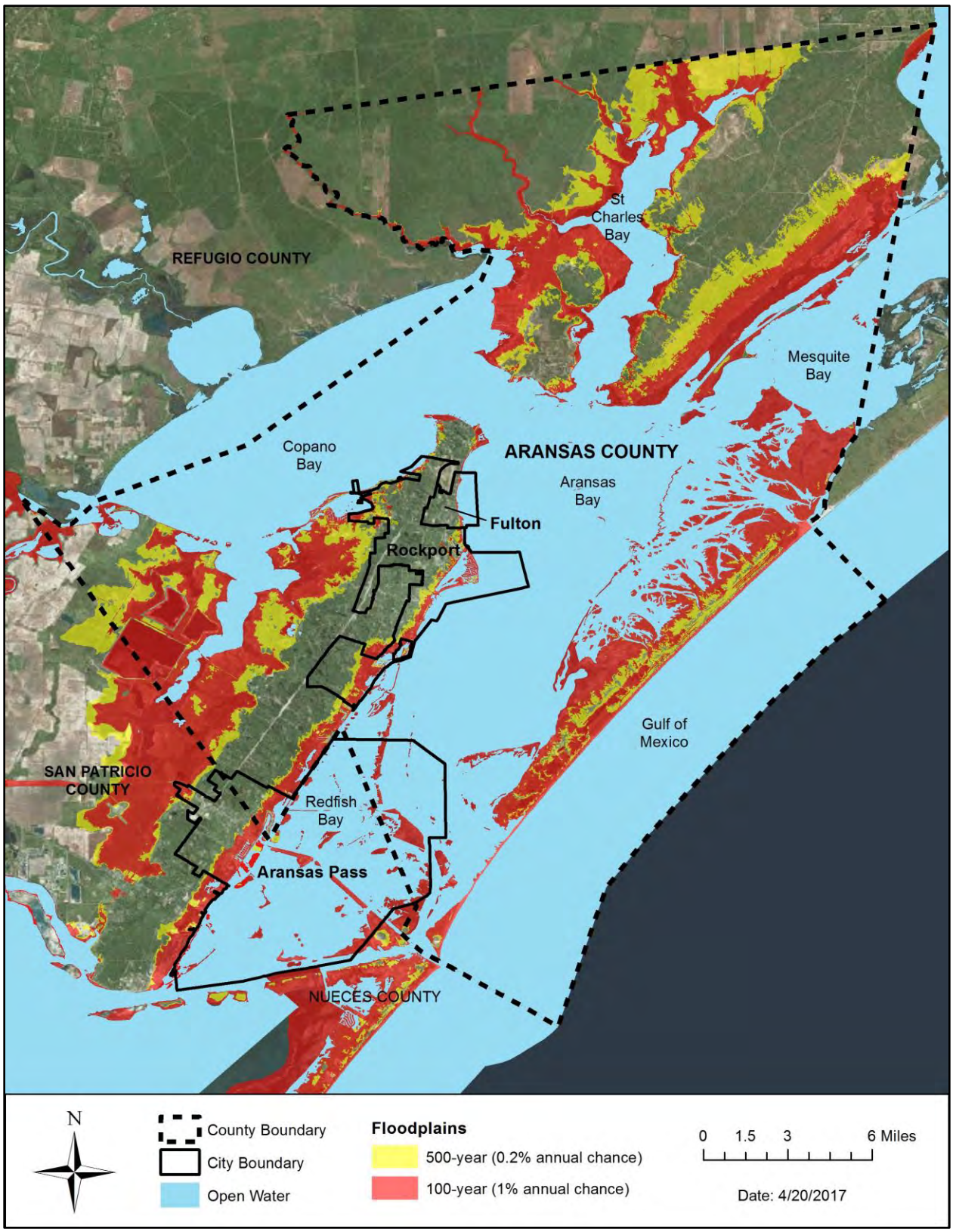

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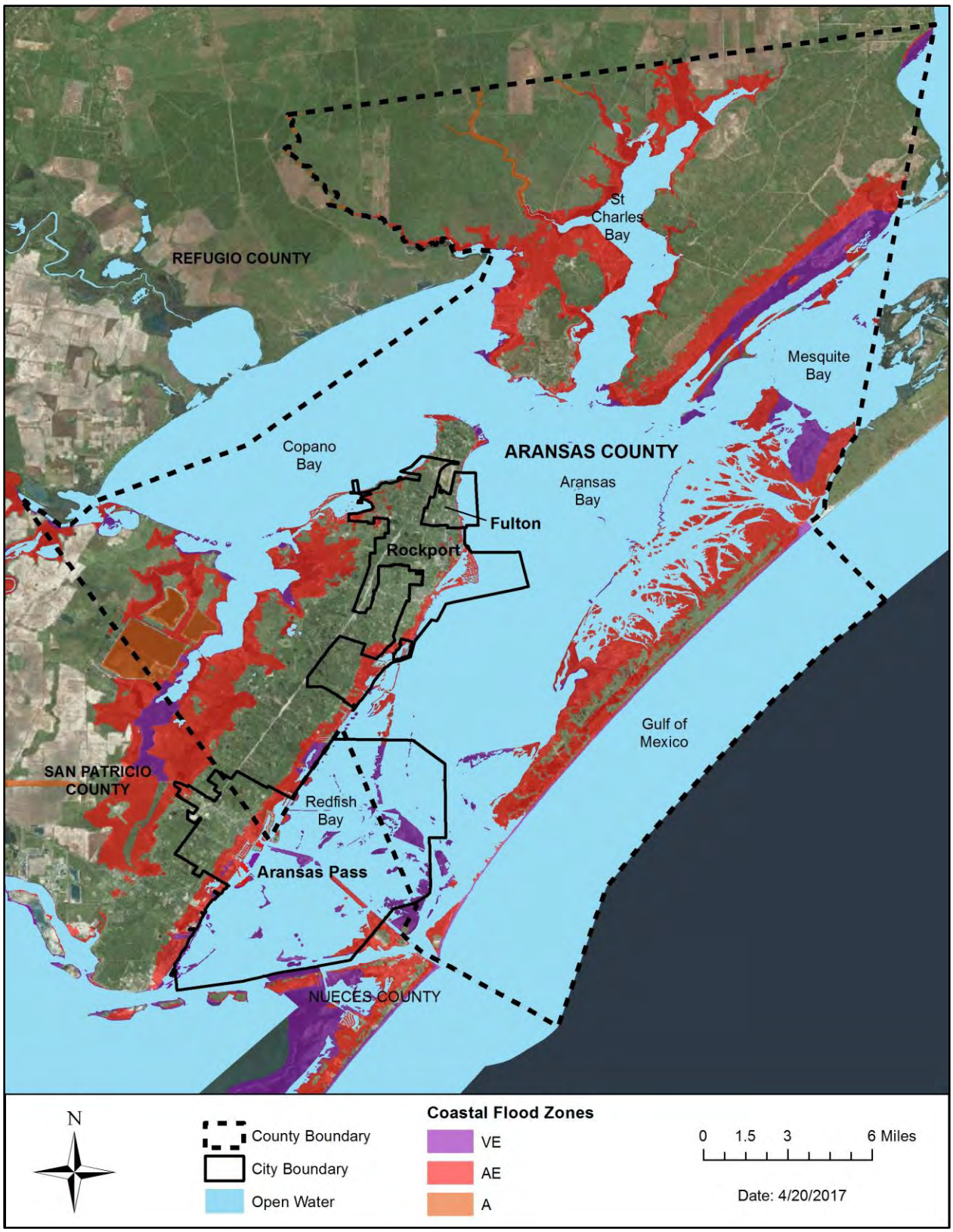

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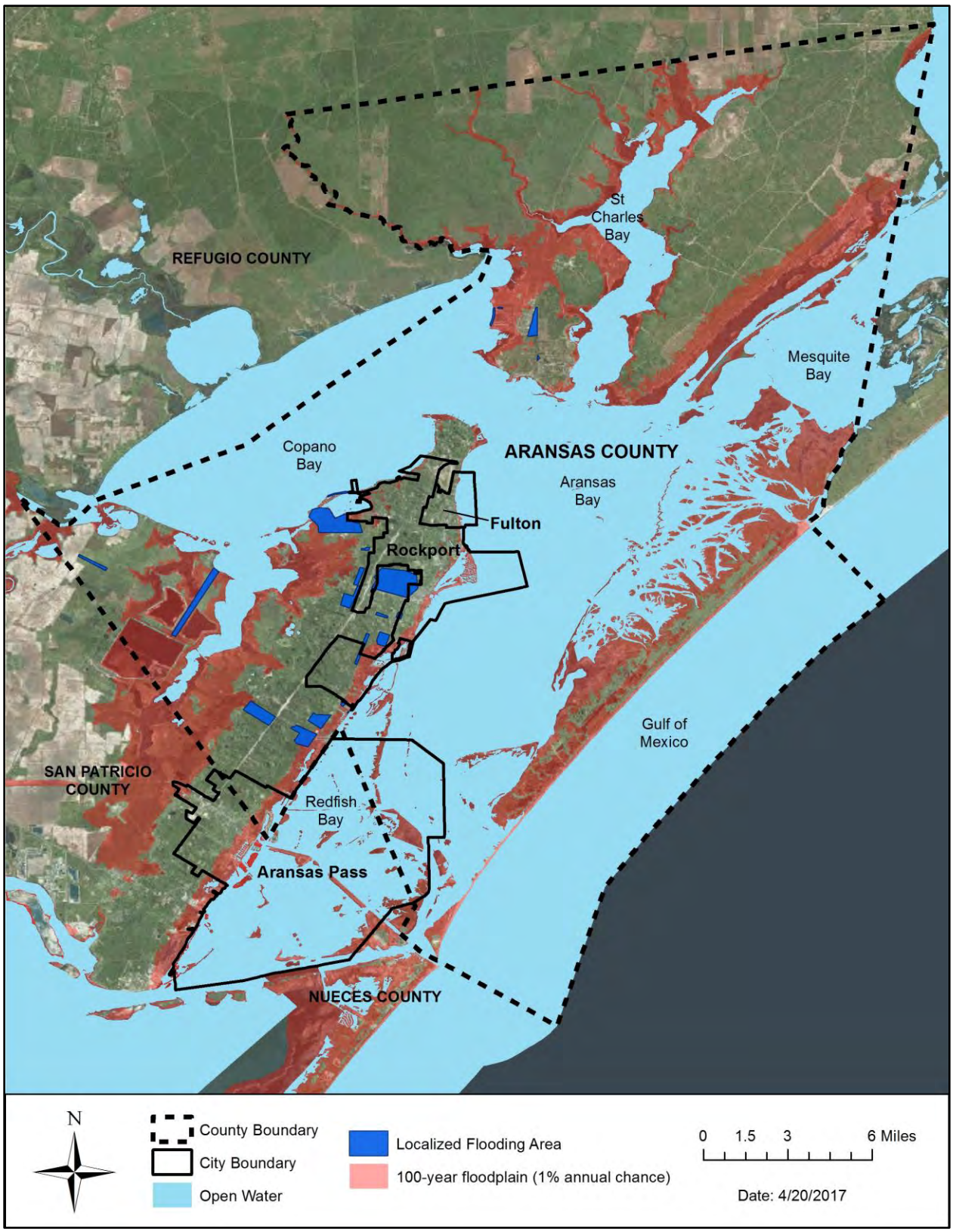

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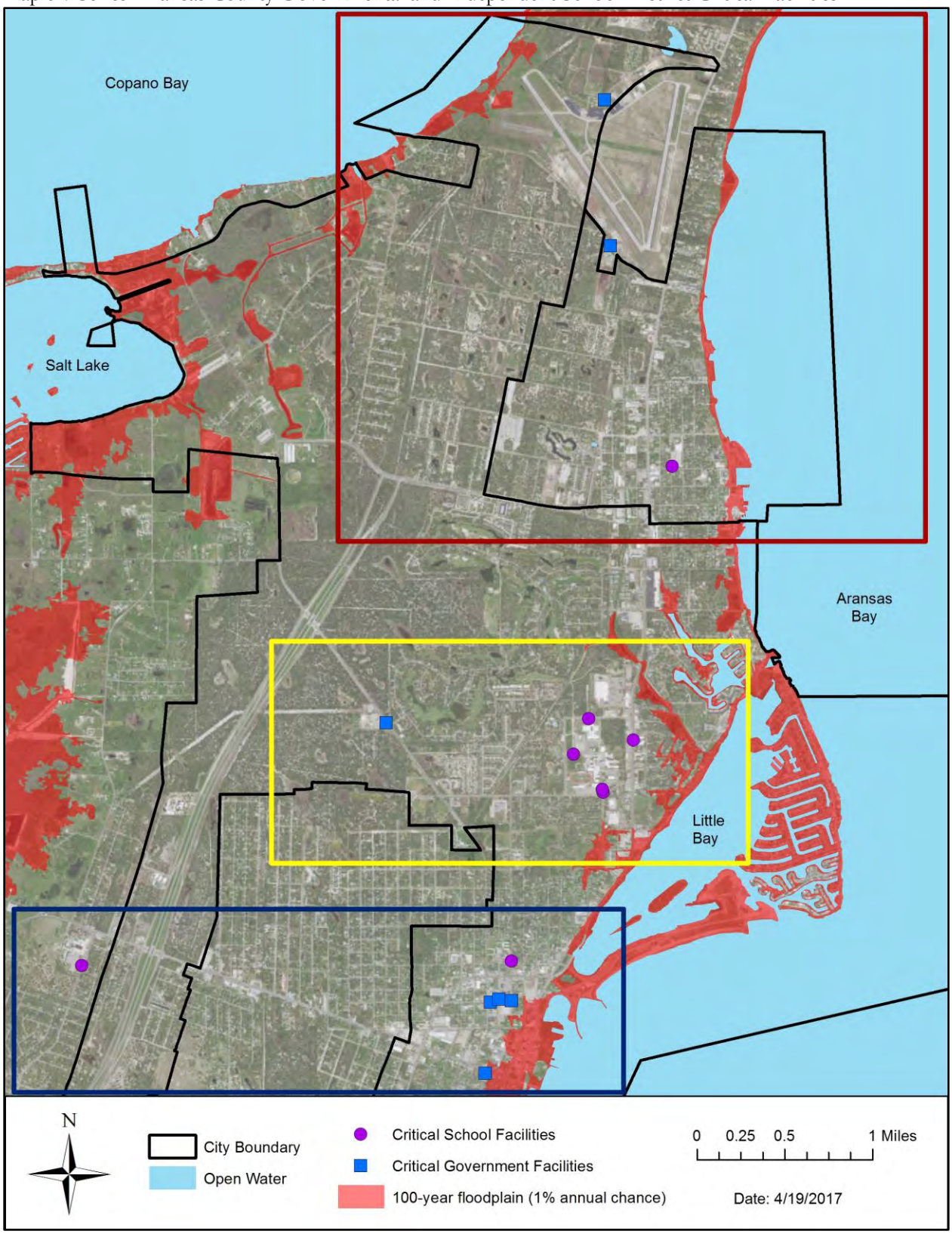

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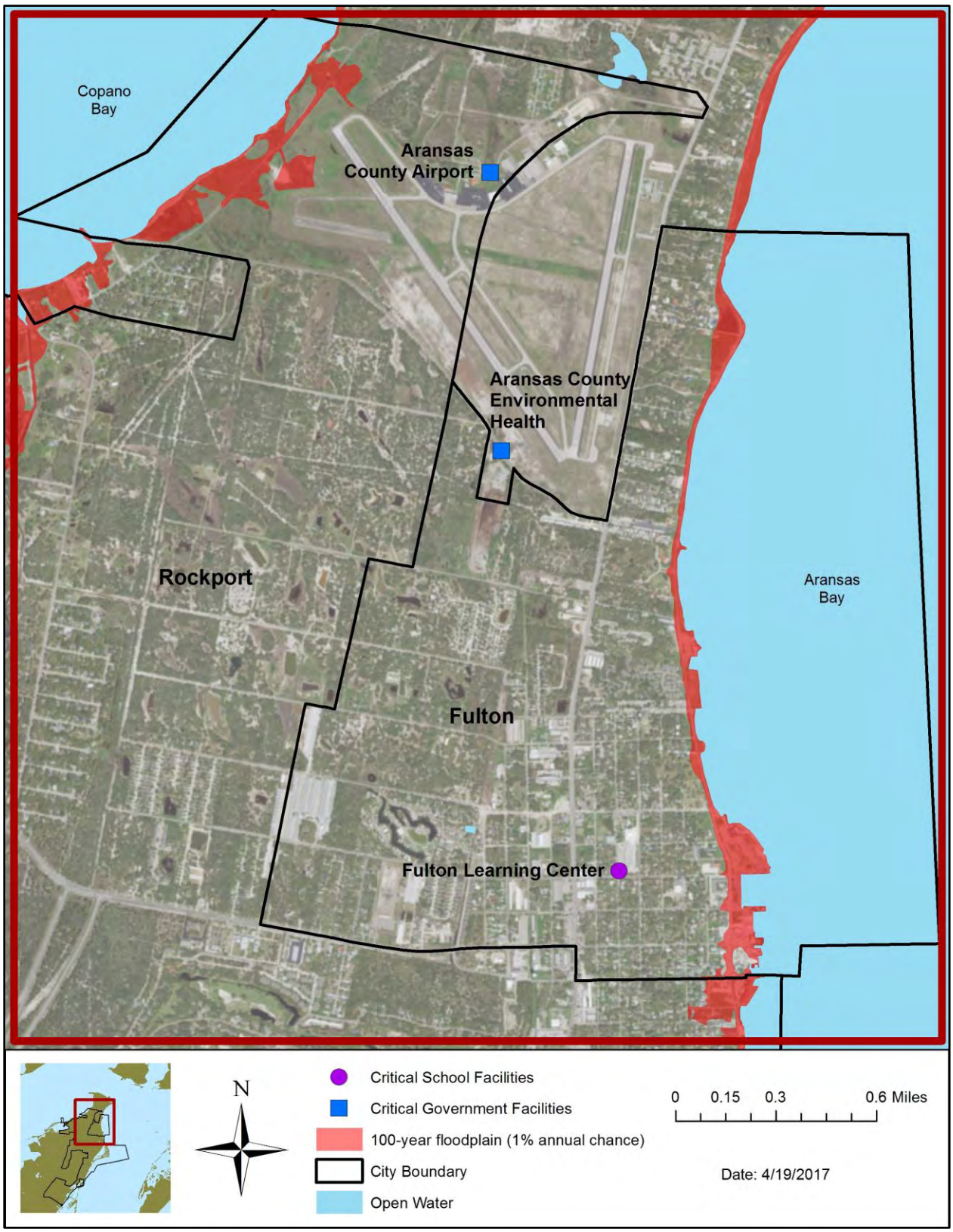

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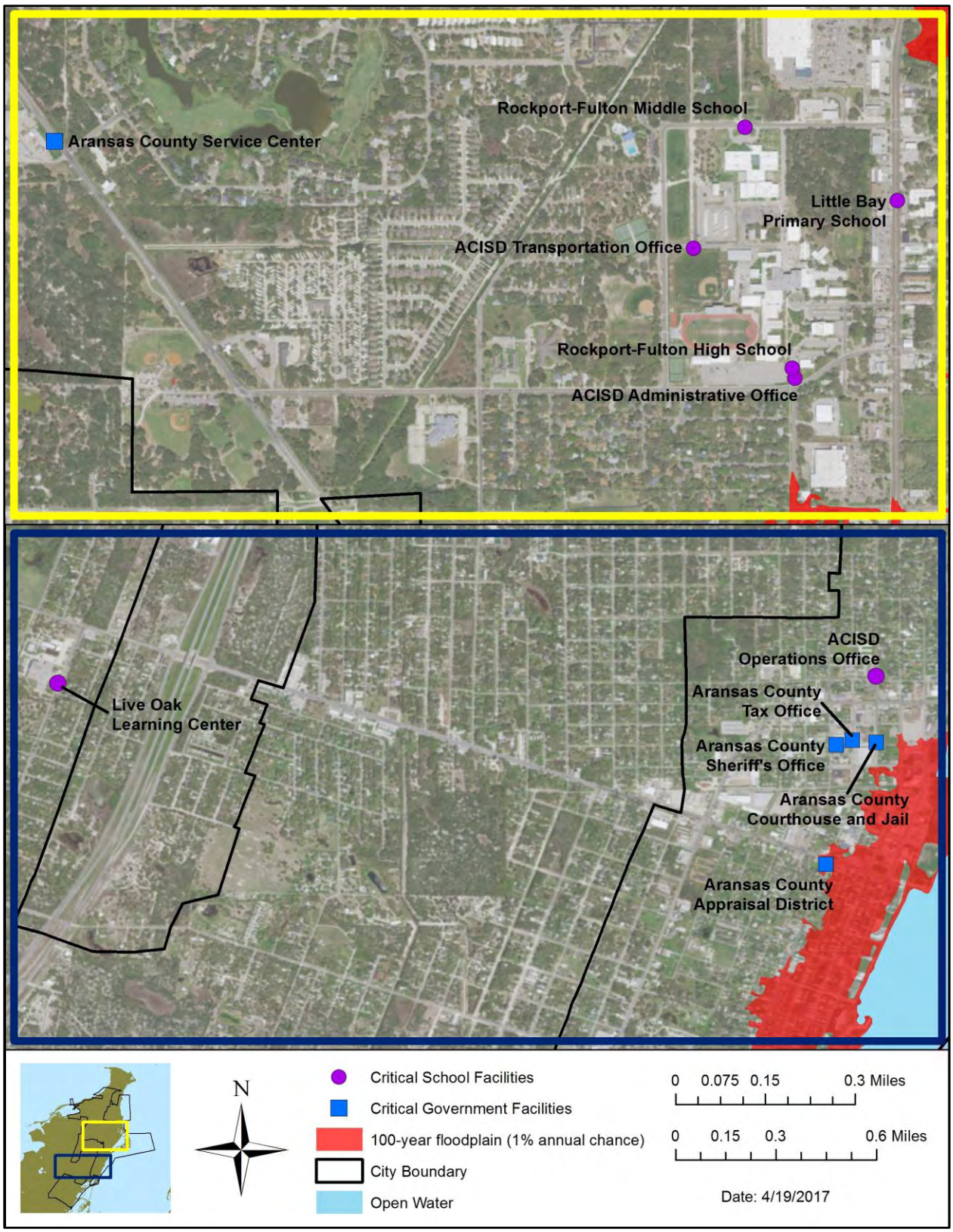

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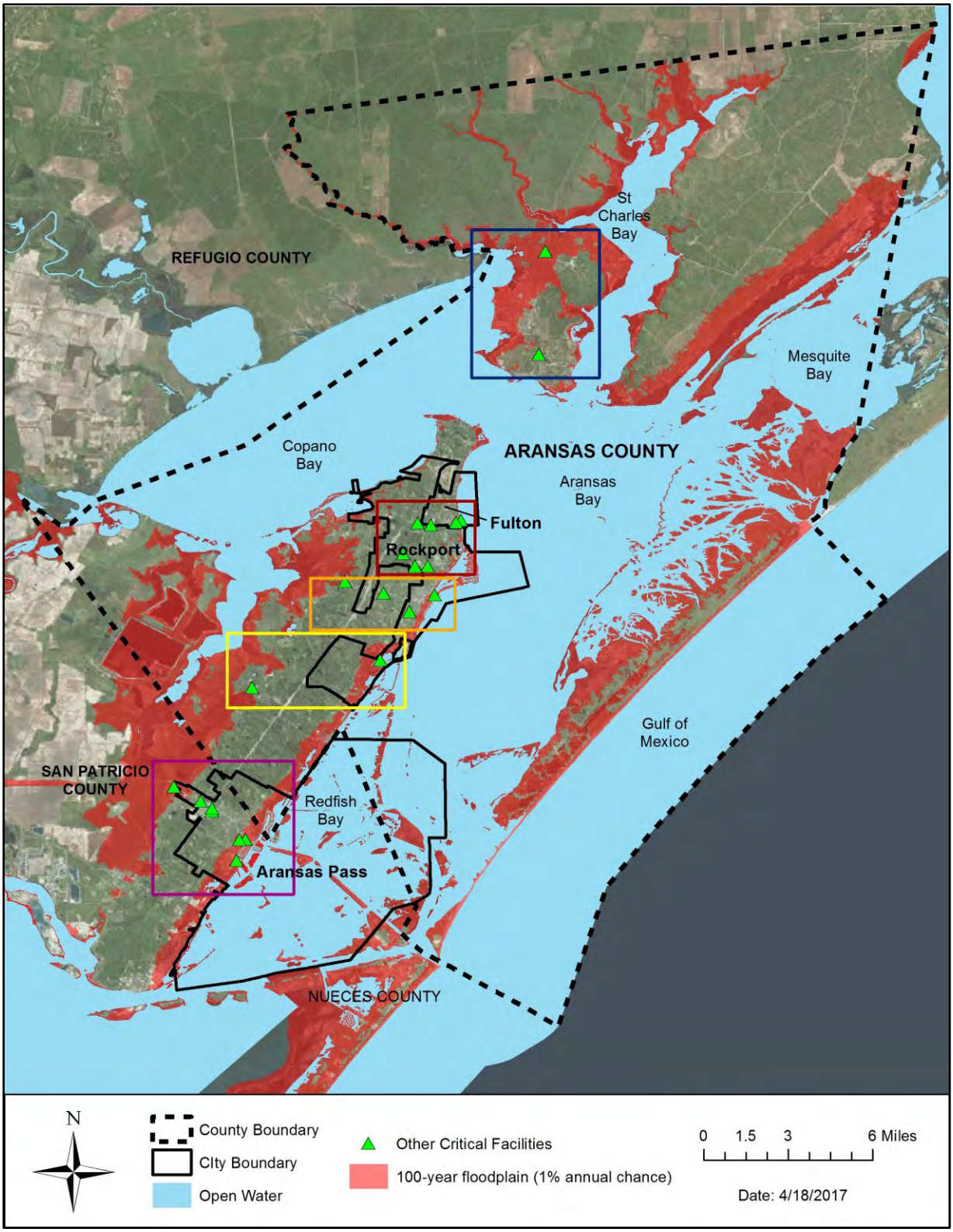

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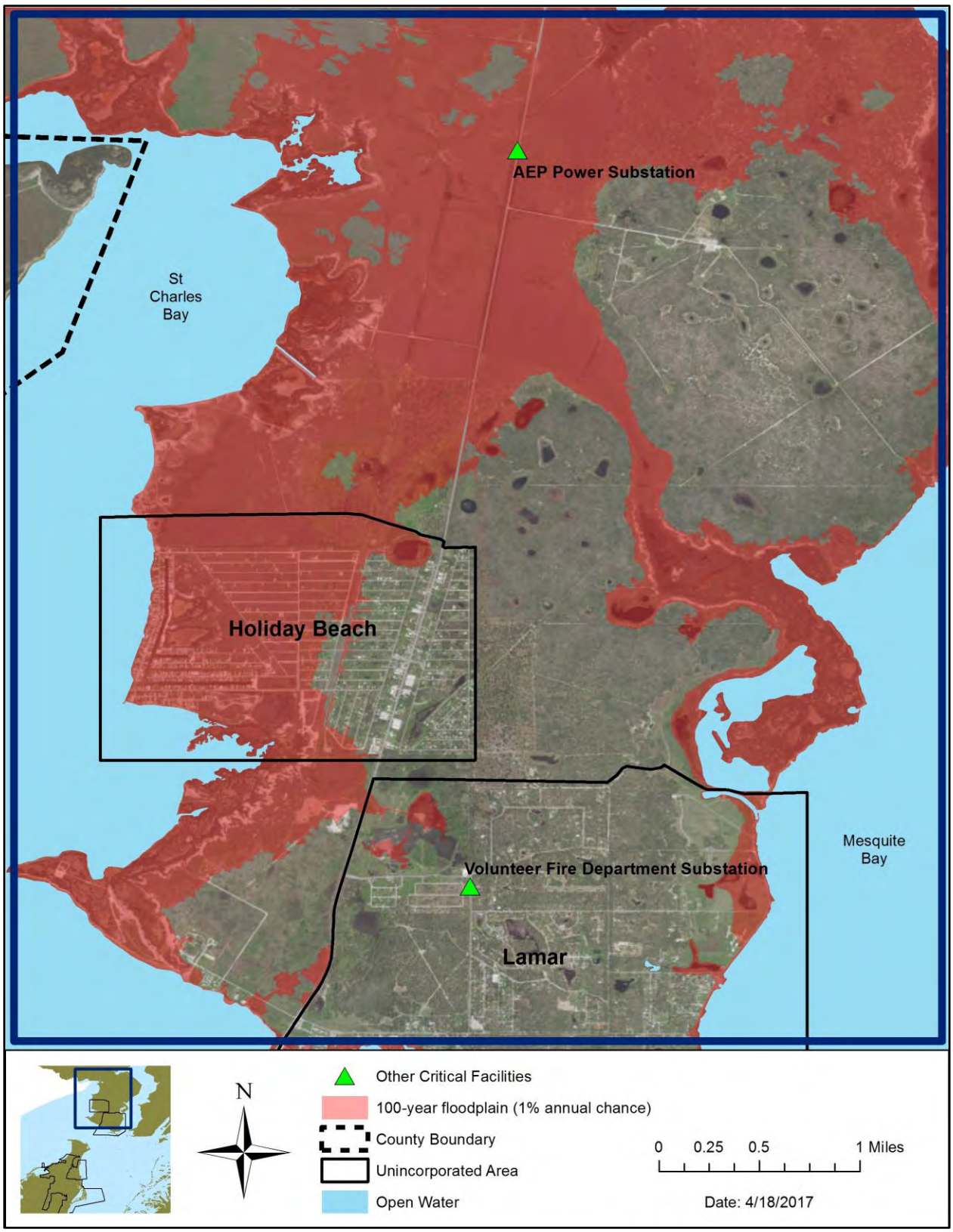

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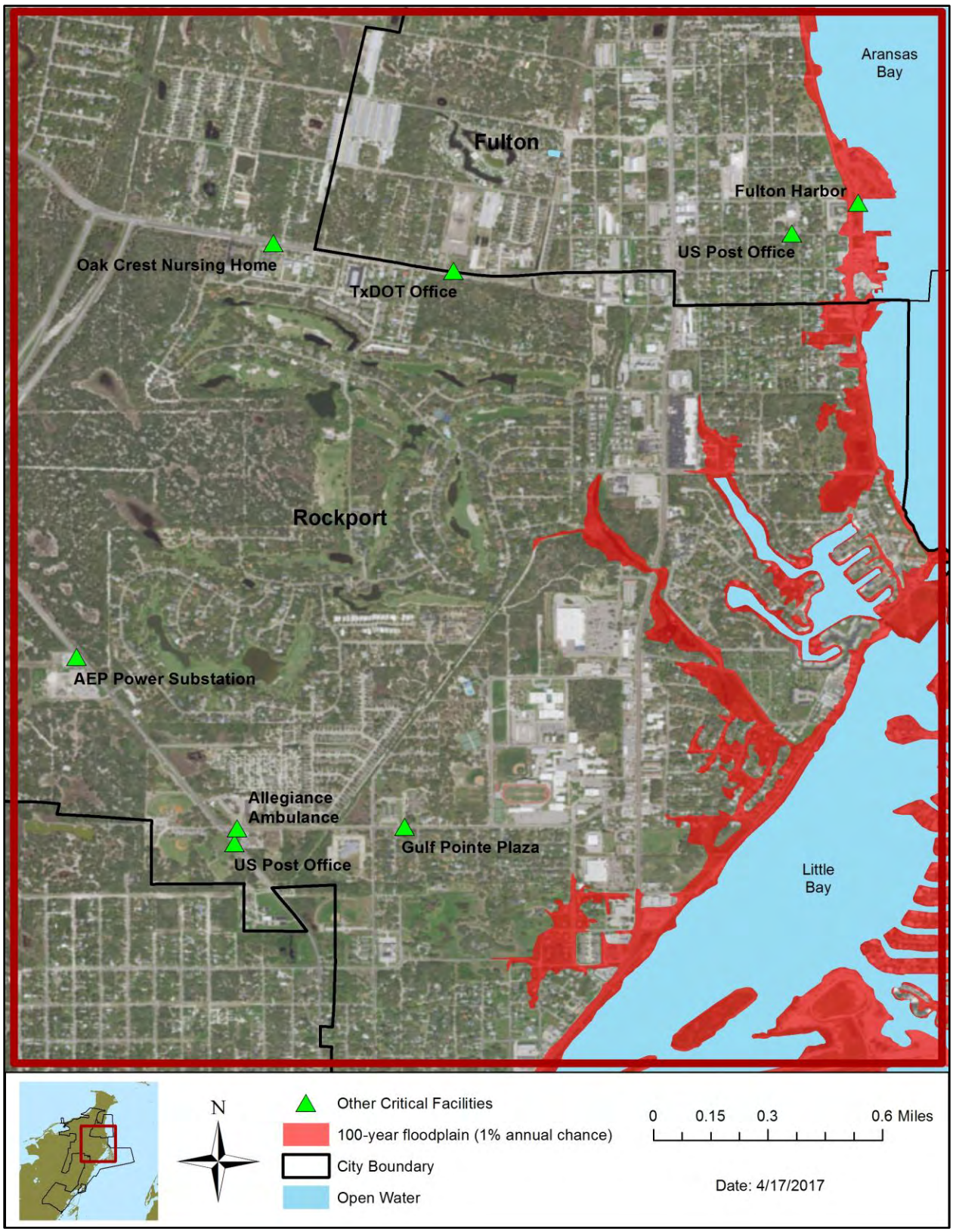

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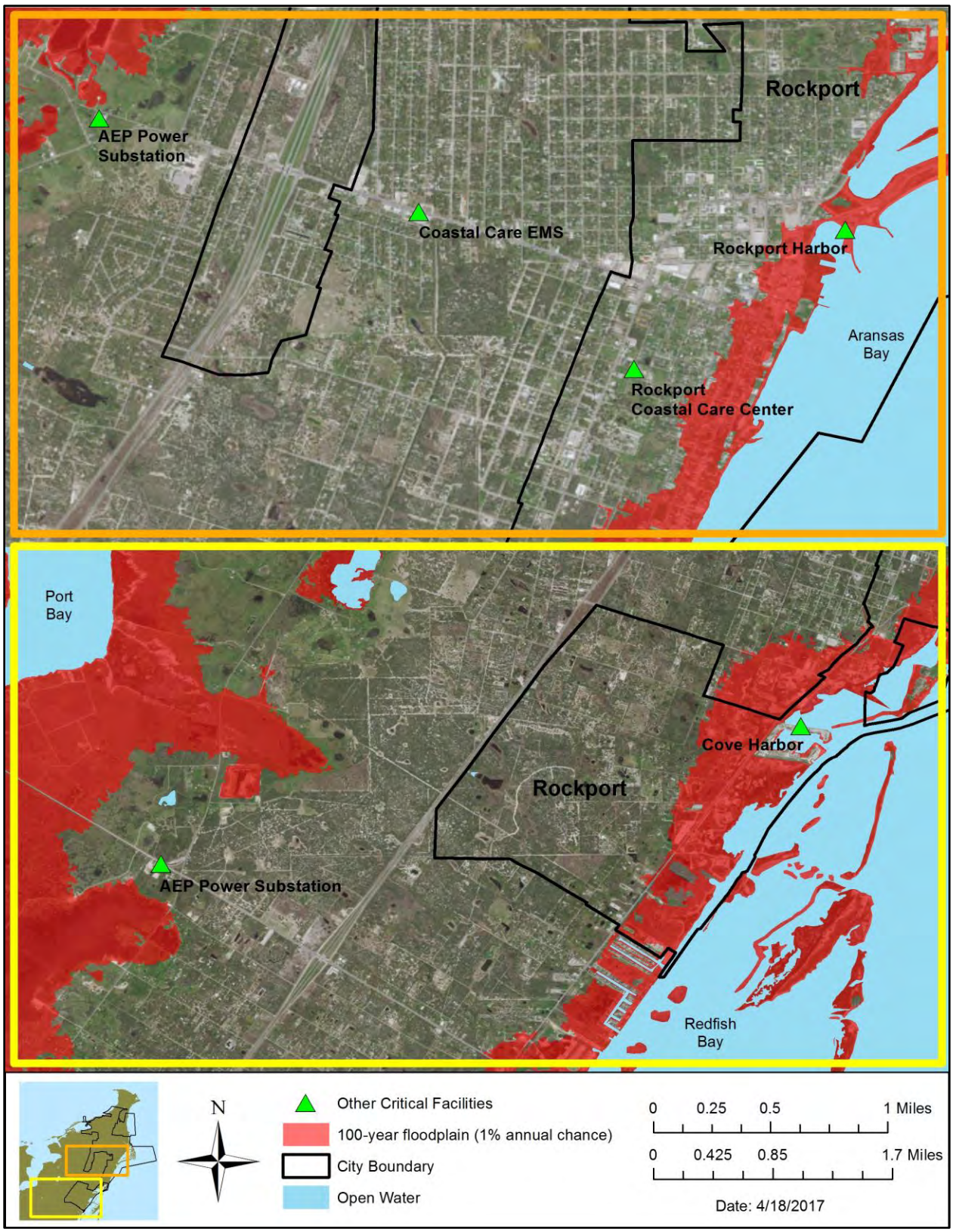

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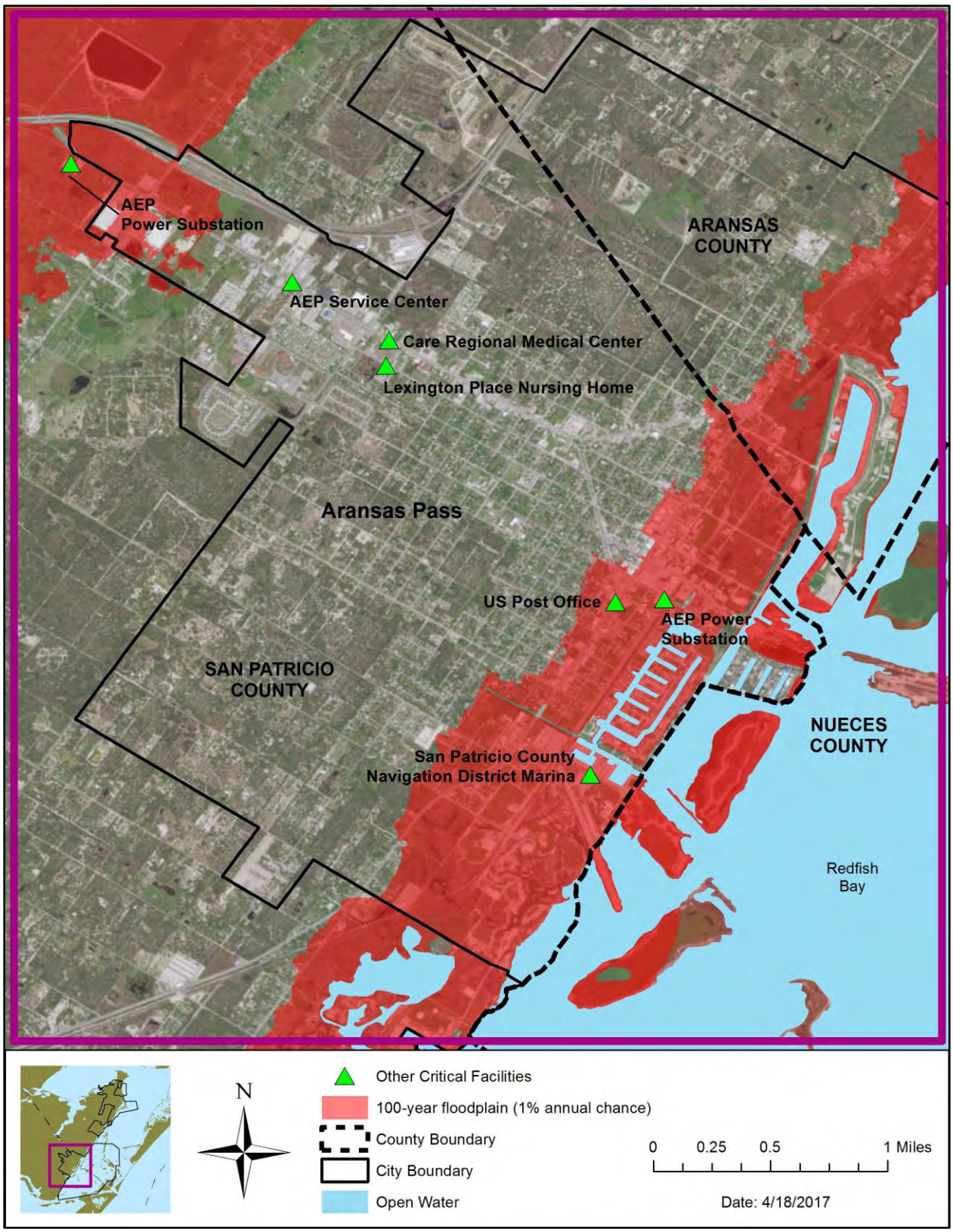

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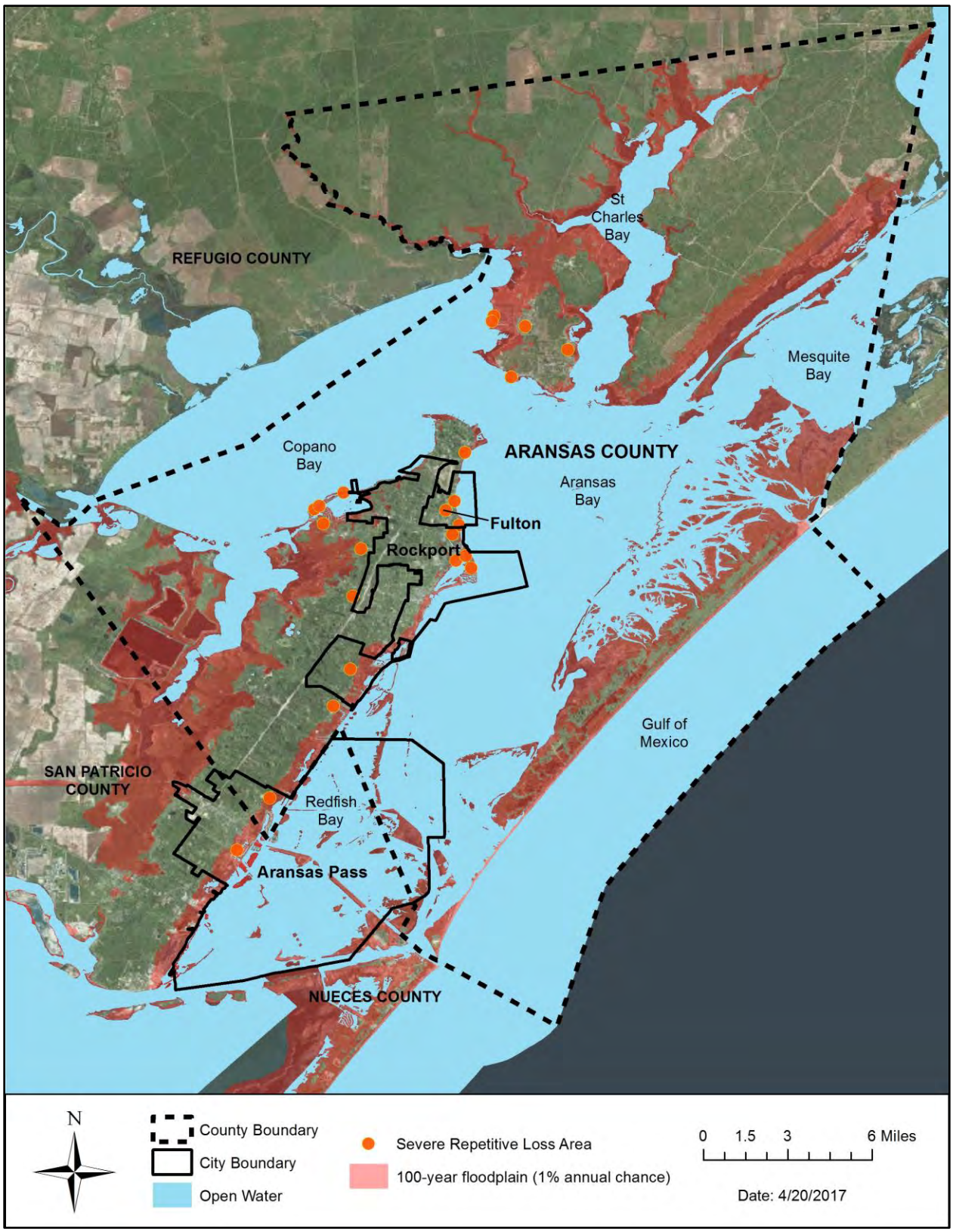

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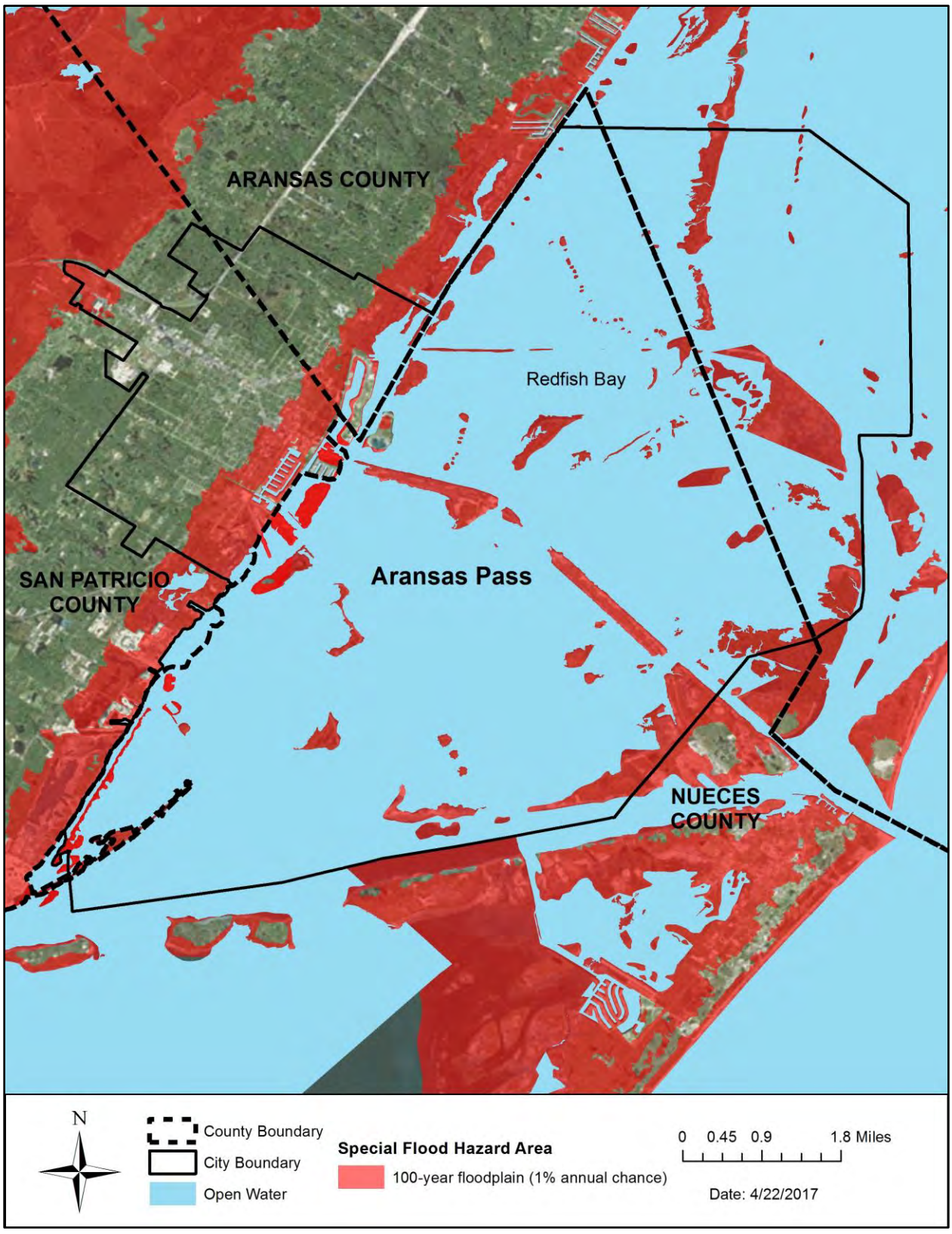

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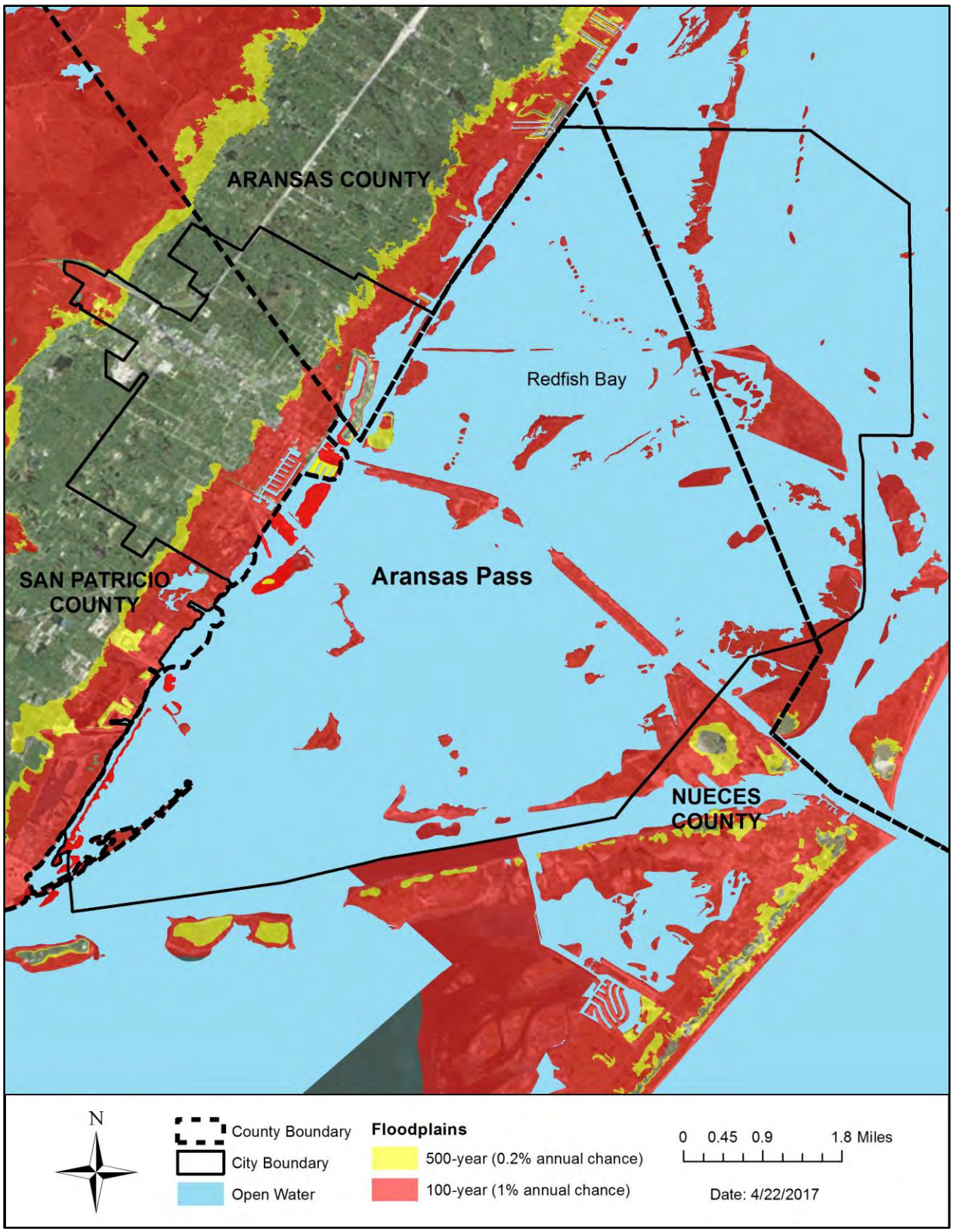
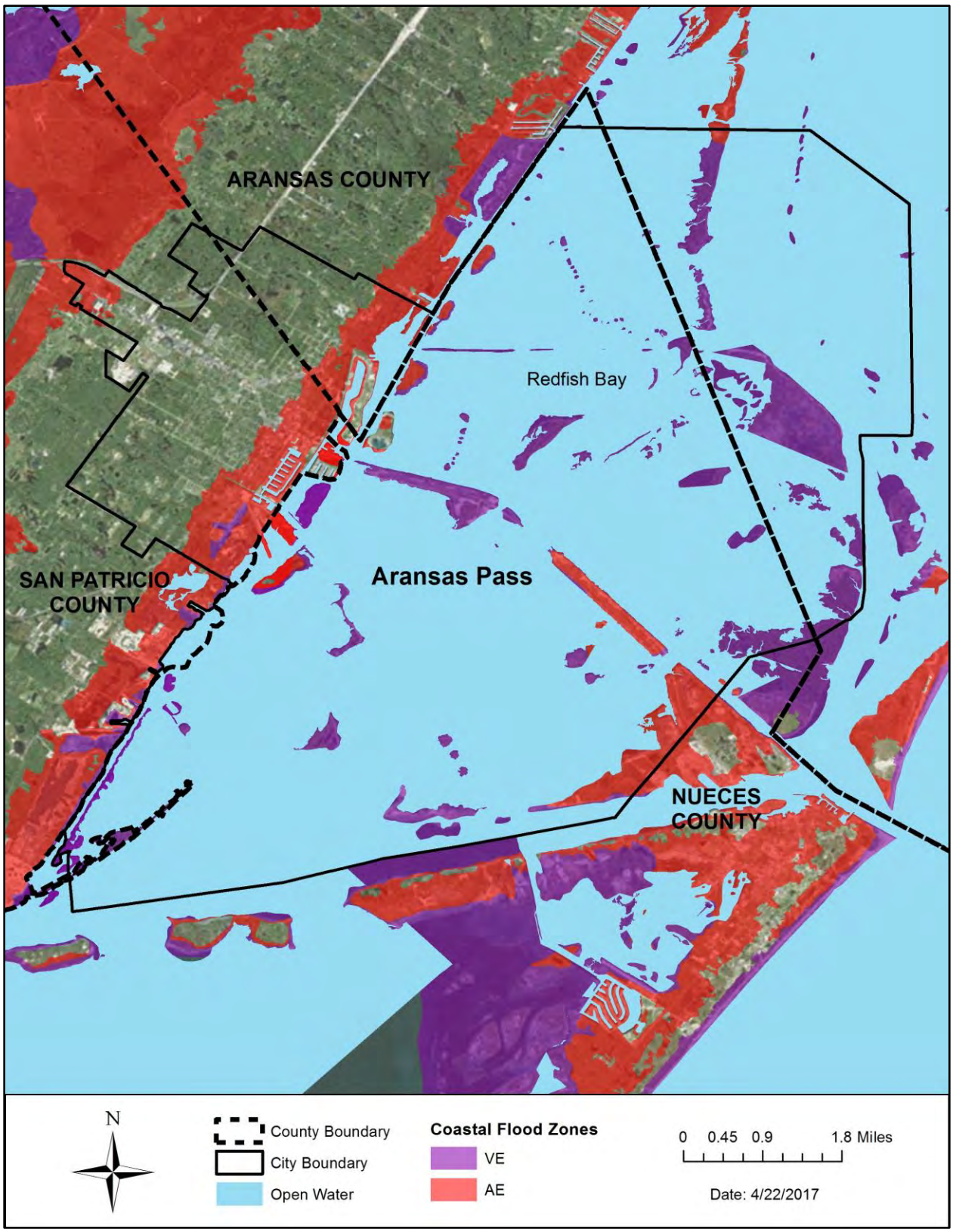
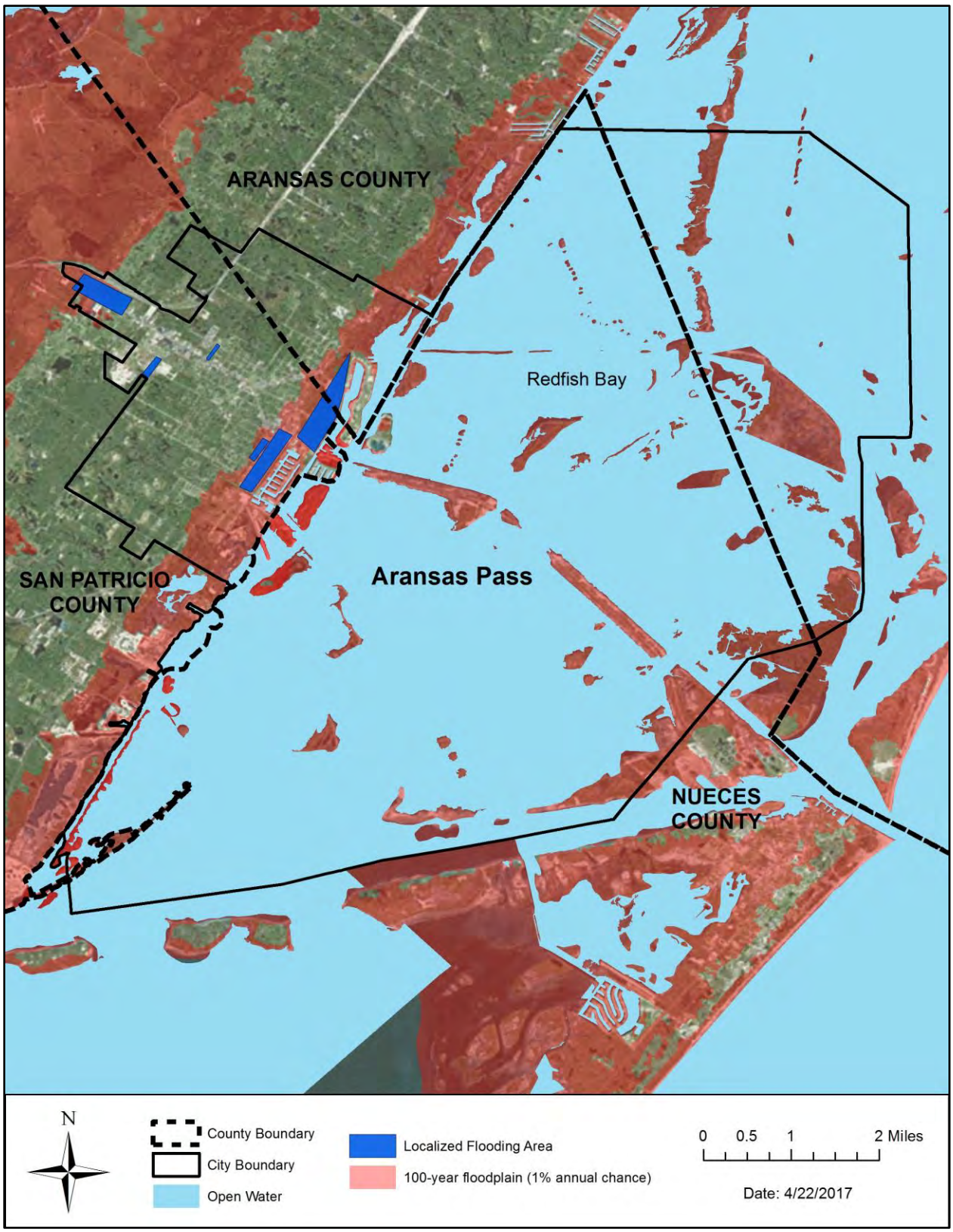


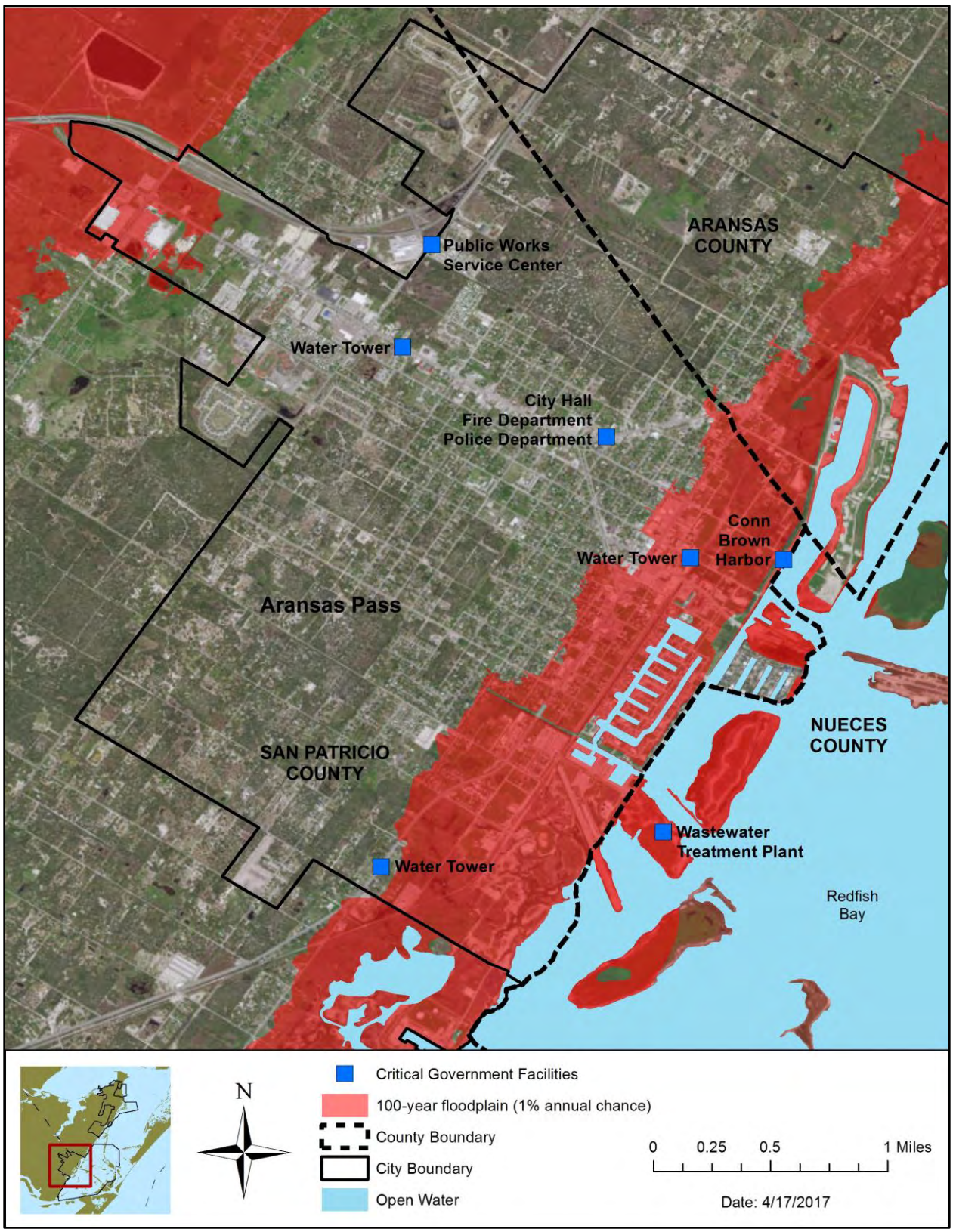
Map 5.11: Aransas Pass Floodplains.



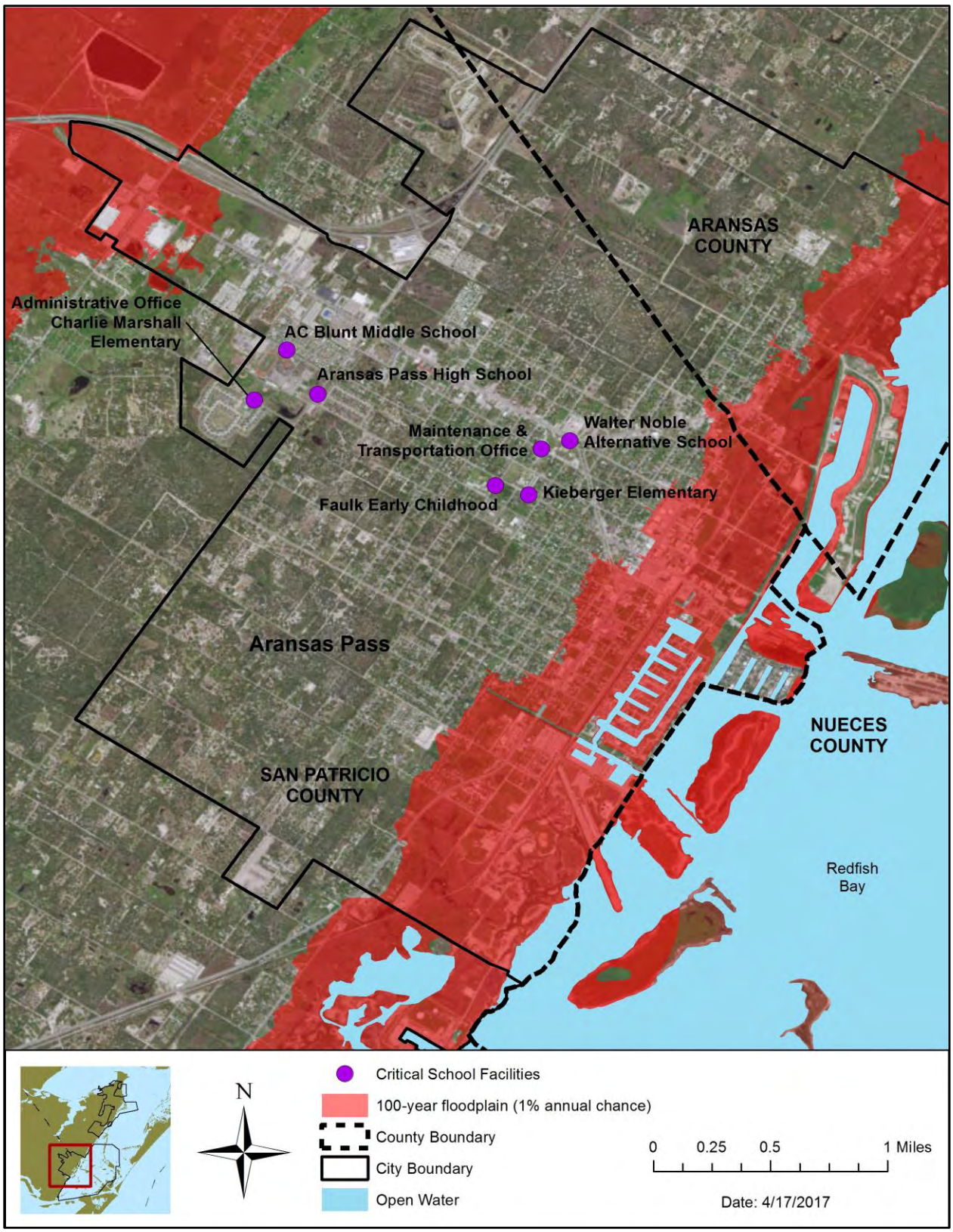
Map 5.12: Aransas Pass Coastal Flood Zones.



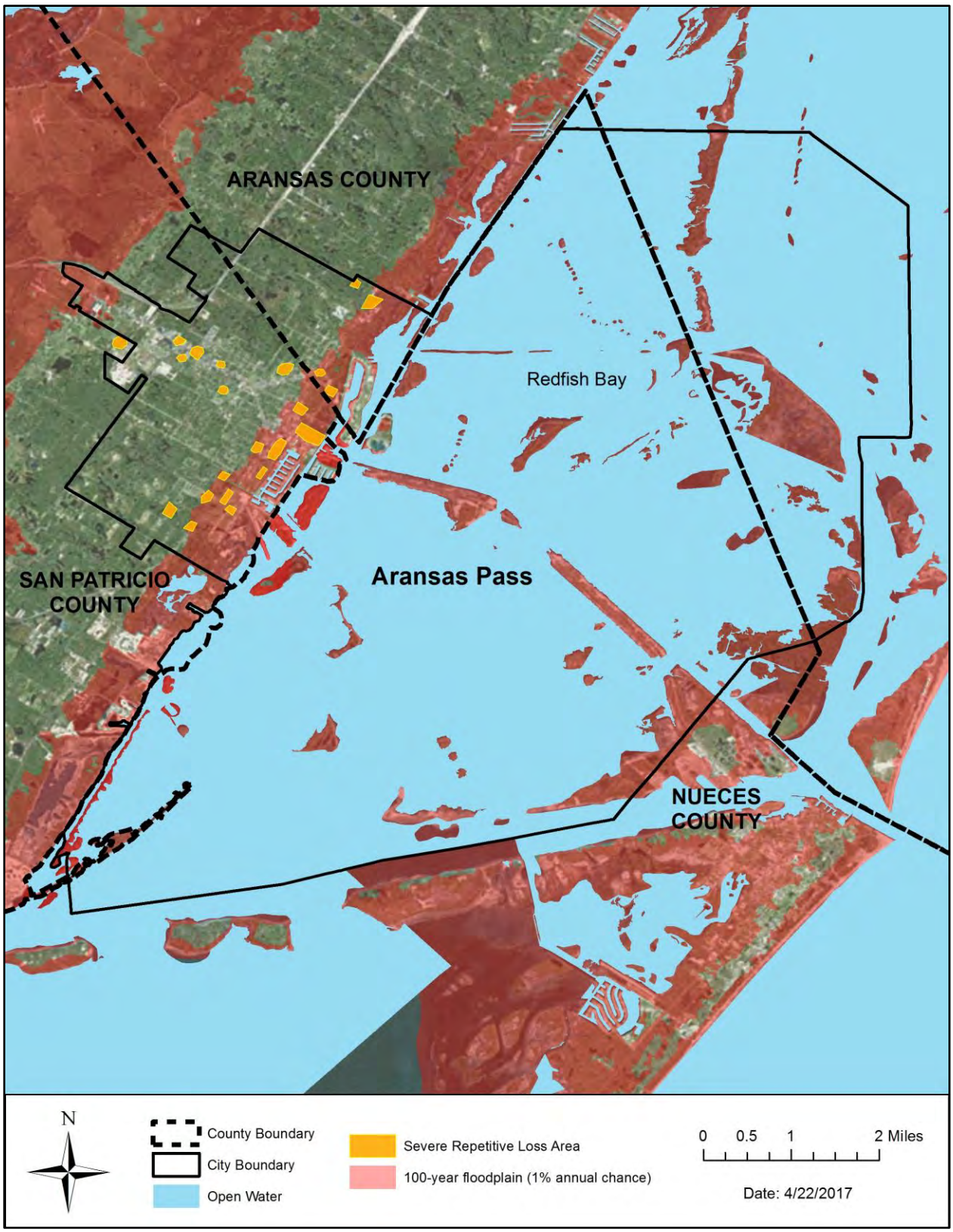
Map 5.13: Localized Flooding in Aransas Pass.



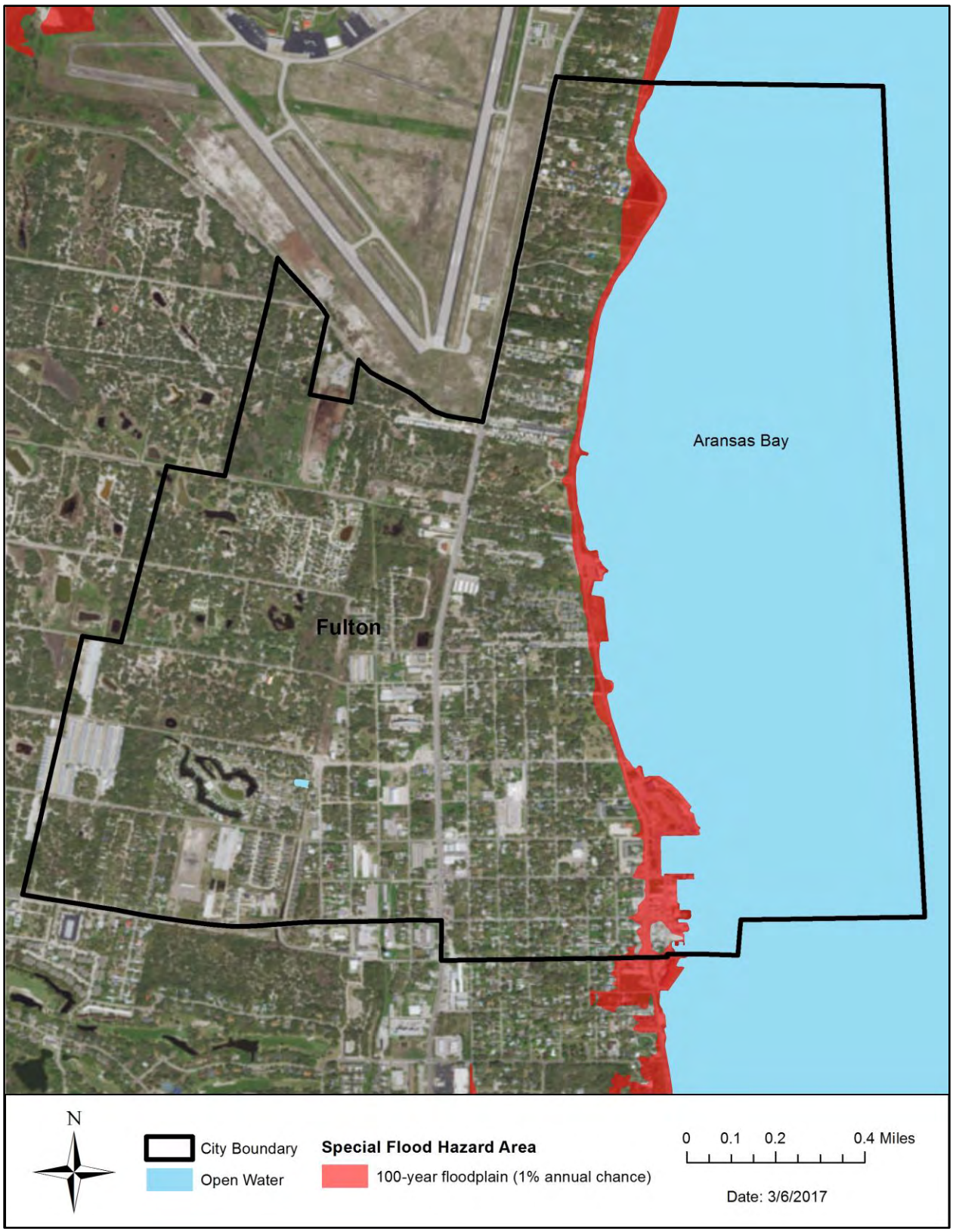
Map 5.14: Aransas Pass Governmental Critical Facilities.



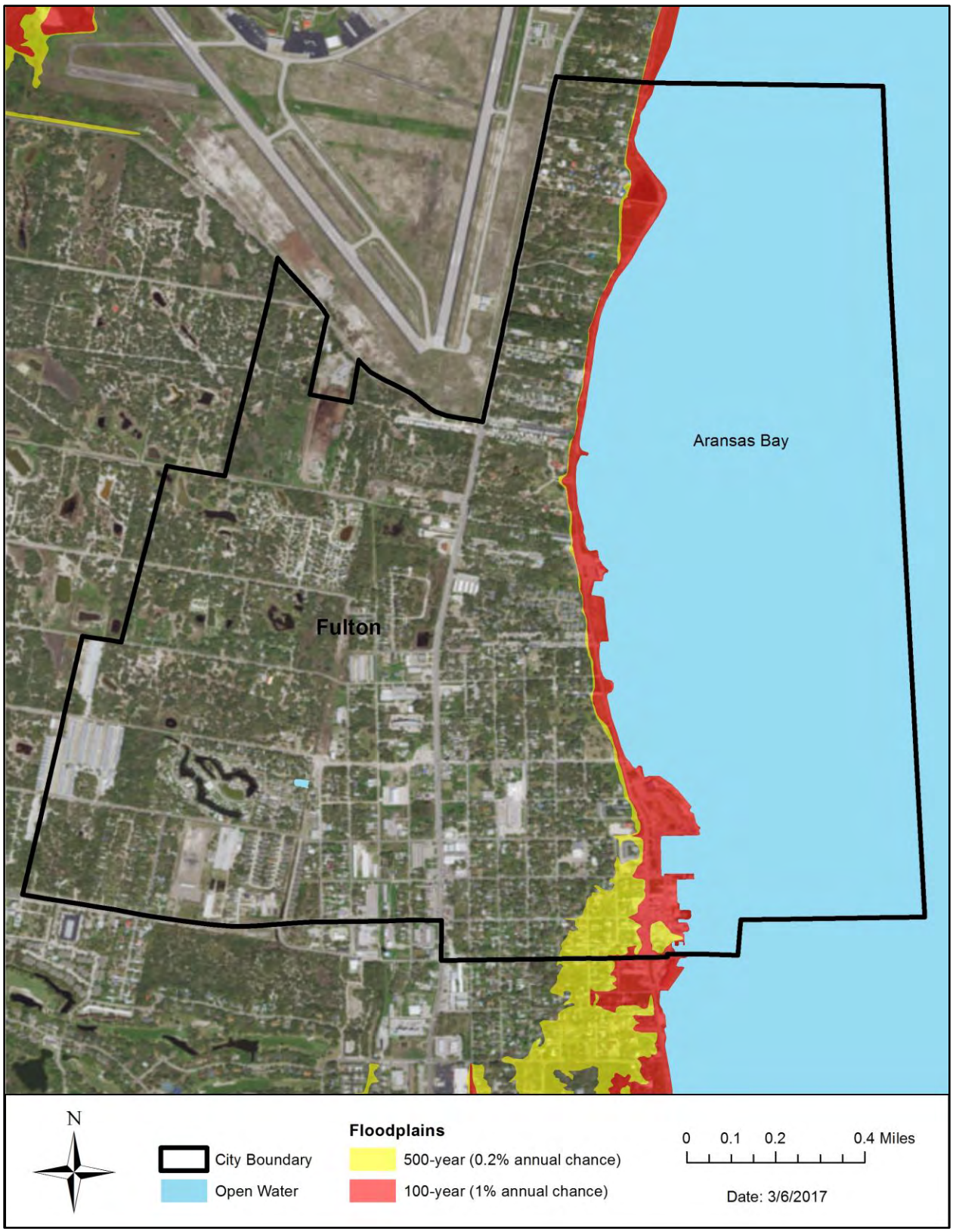
Map 5.15: Aransas Pass Independent School District Critical Facilities.



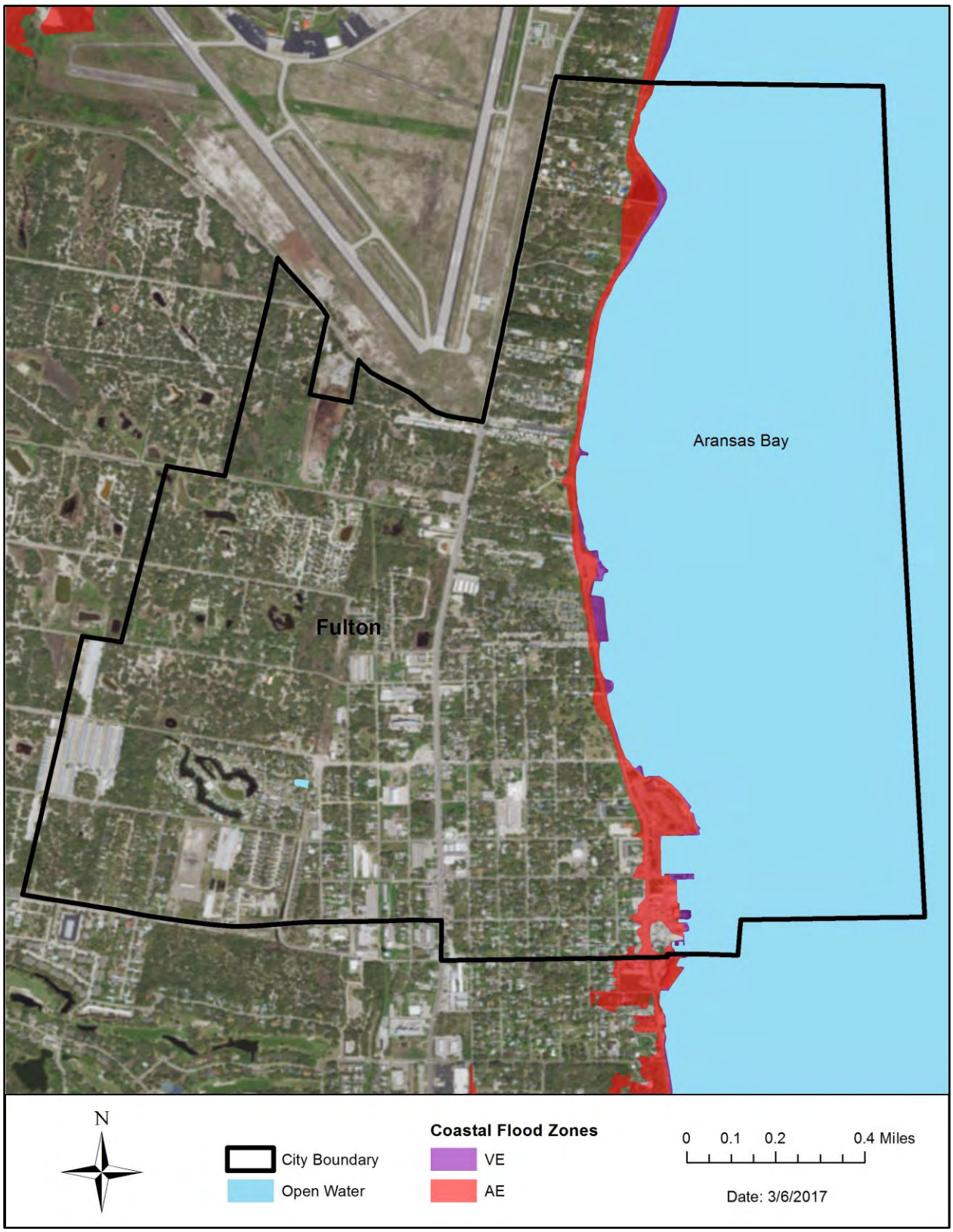
Map 5.16: Severe Repetitive Loss Areas in Aransas Pass.



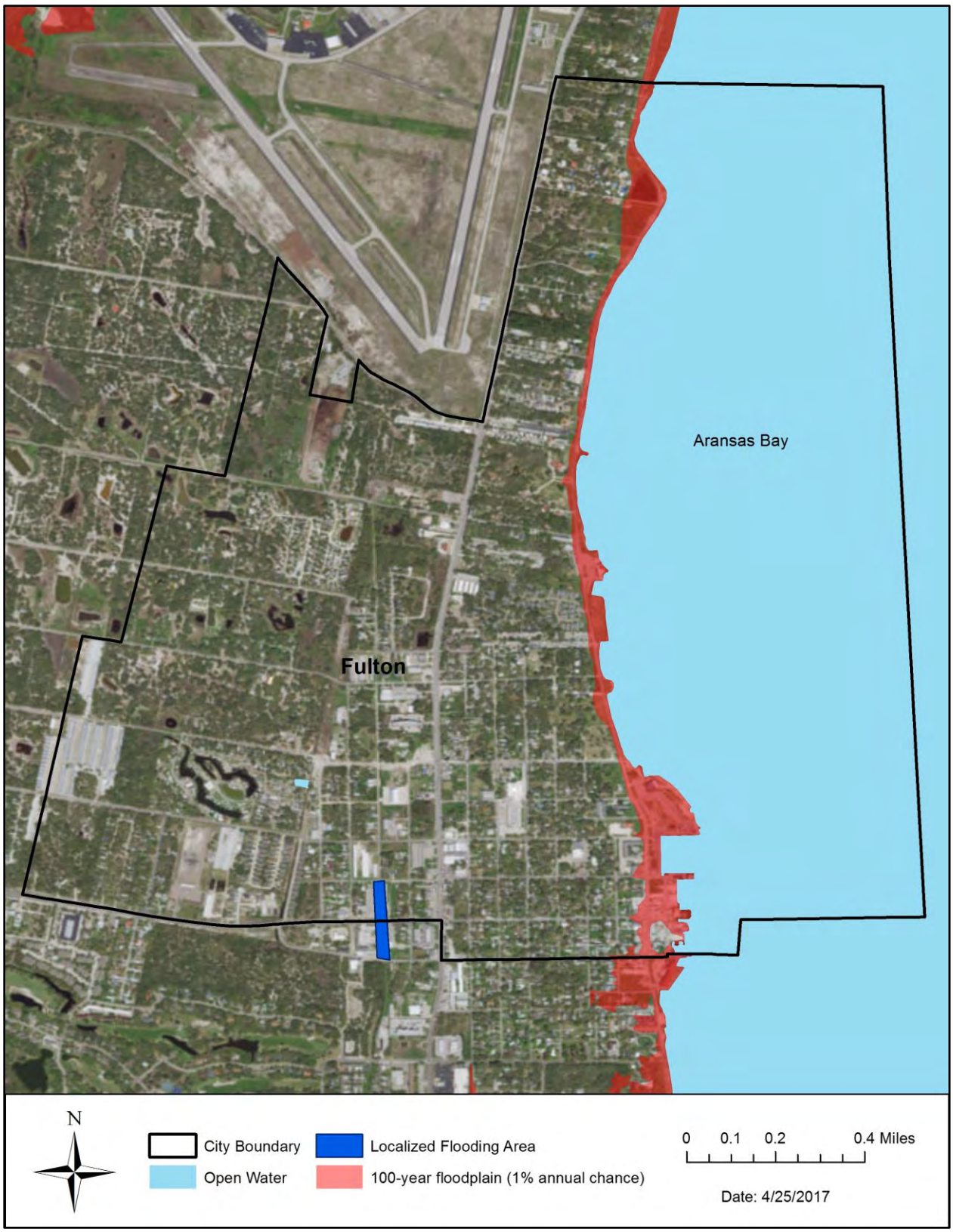
Map 5.17: Fulton Special Flood Hazard Areas.



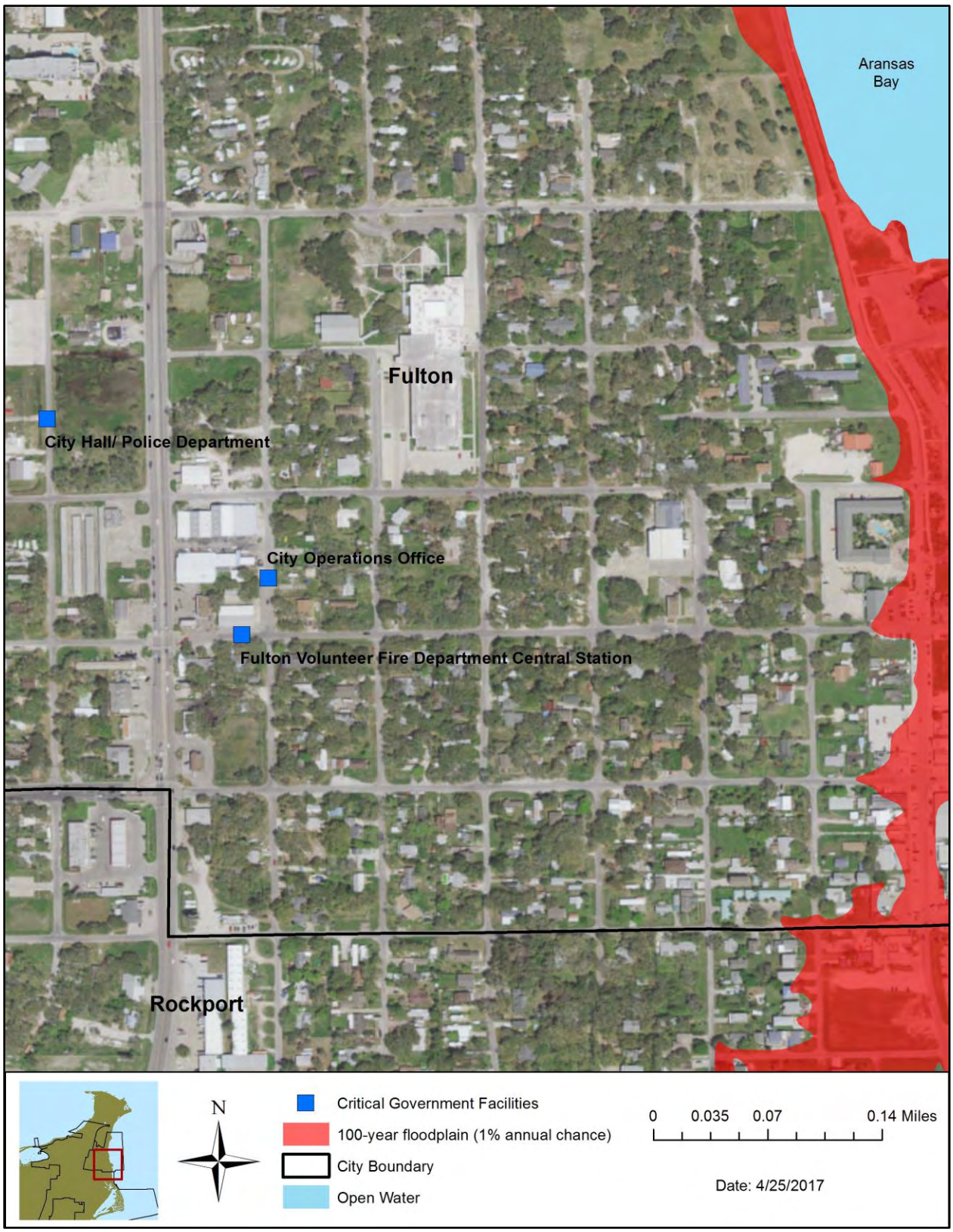
Map 5.18: Fulton Floodplains.



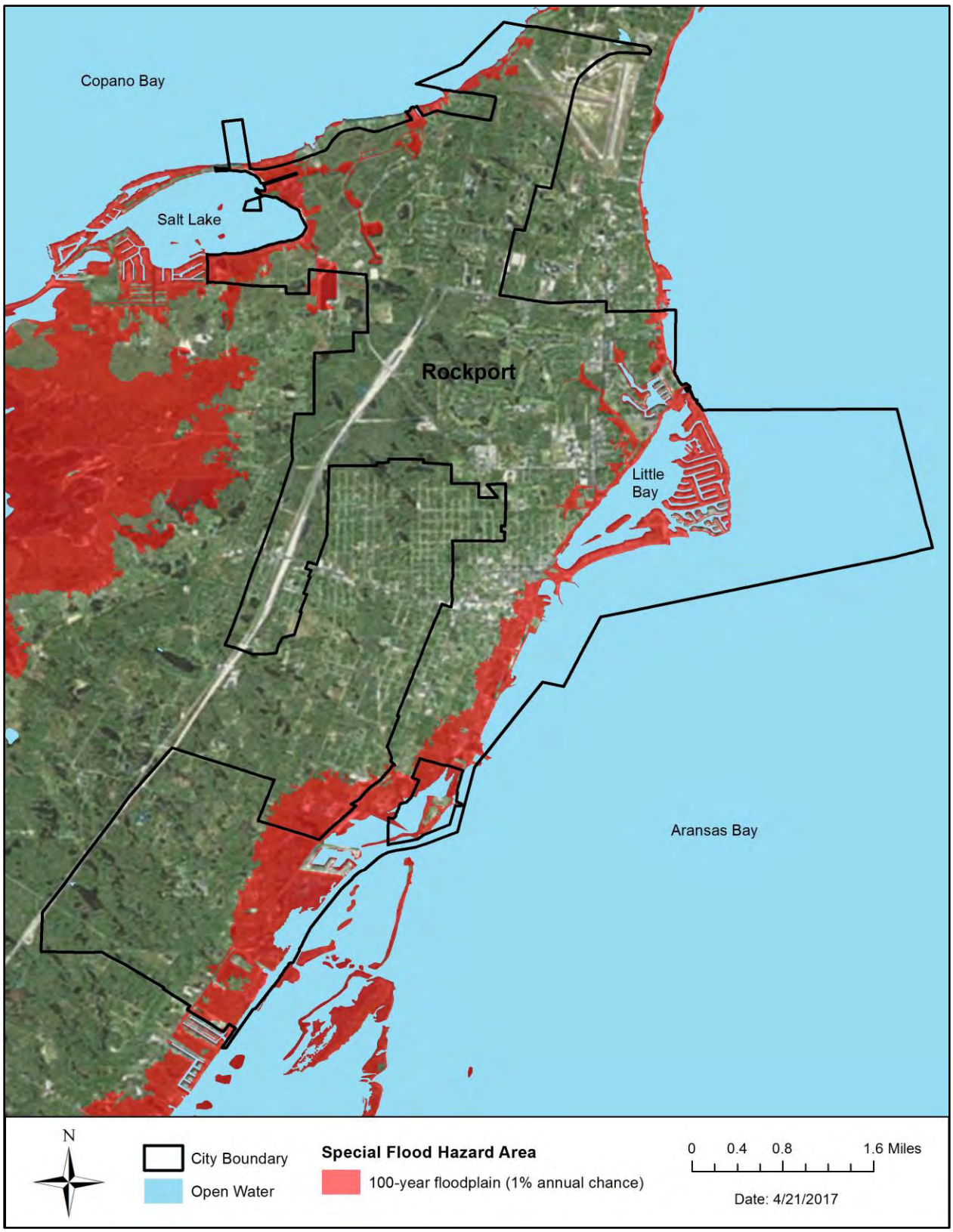
Map 5.19: Fulton Coastal Flood Zones.



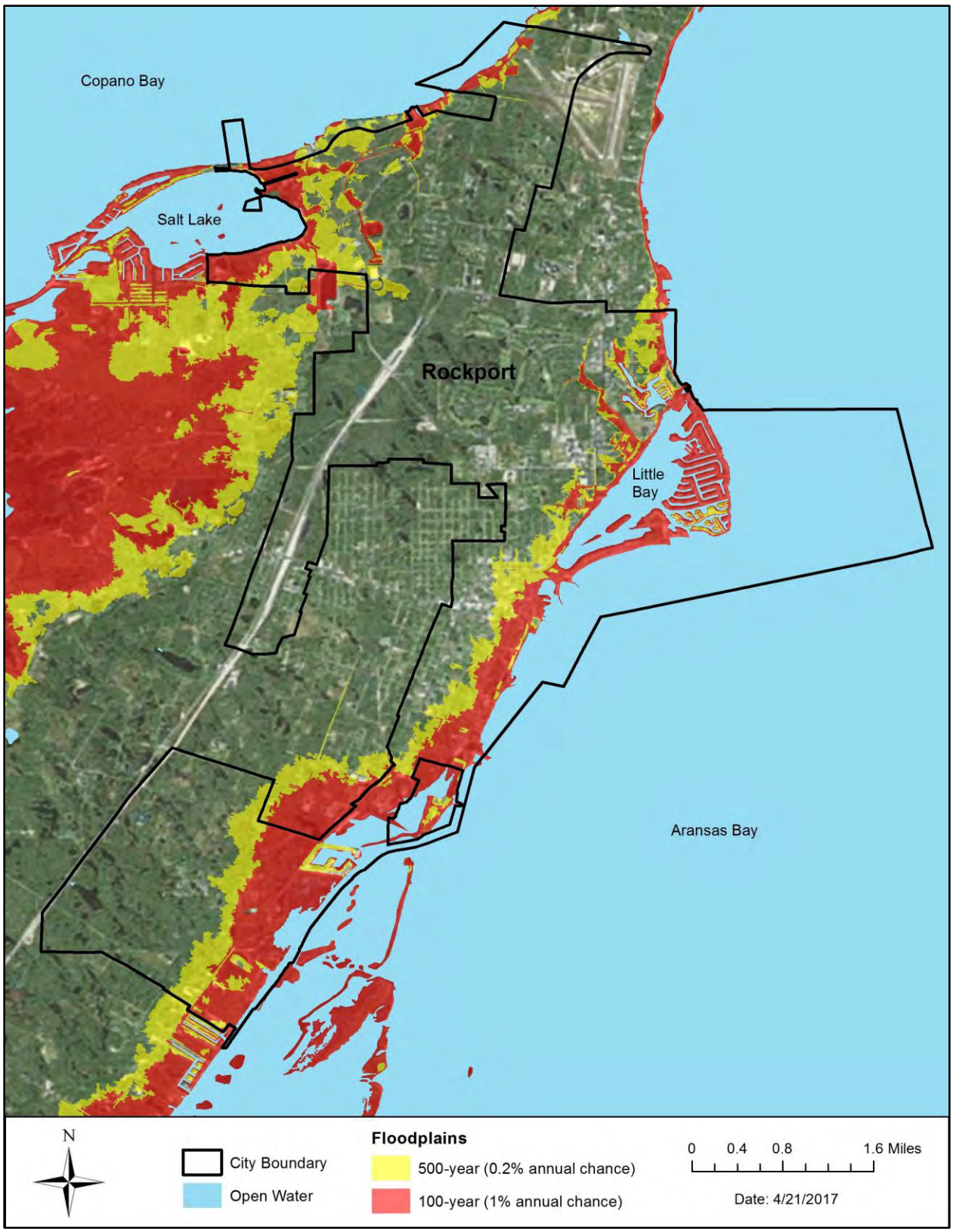
Map 5.20: Localized Flooding in Fulton.



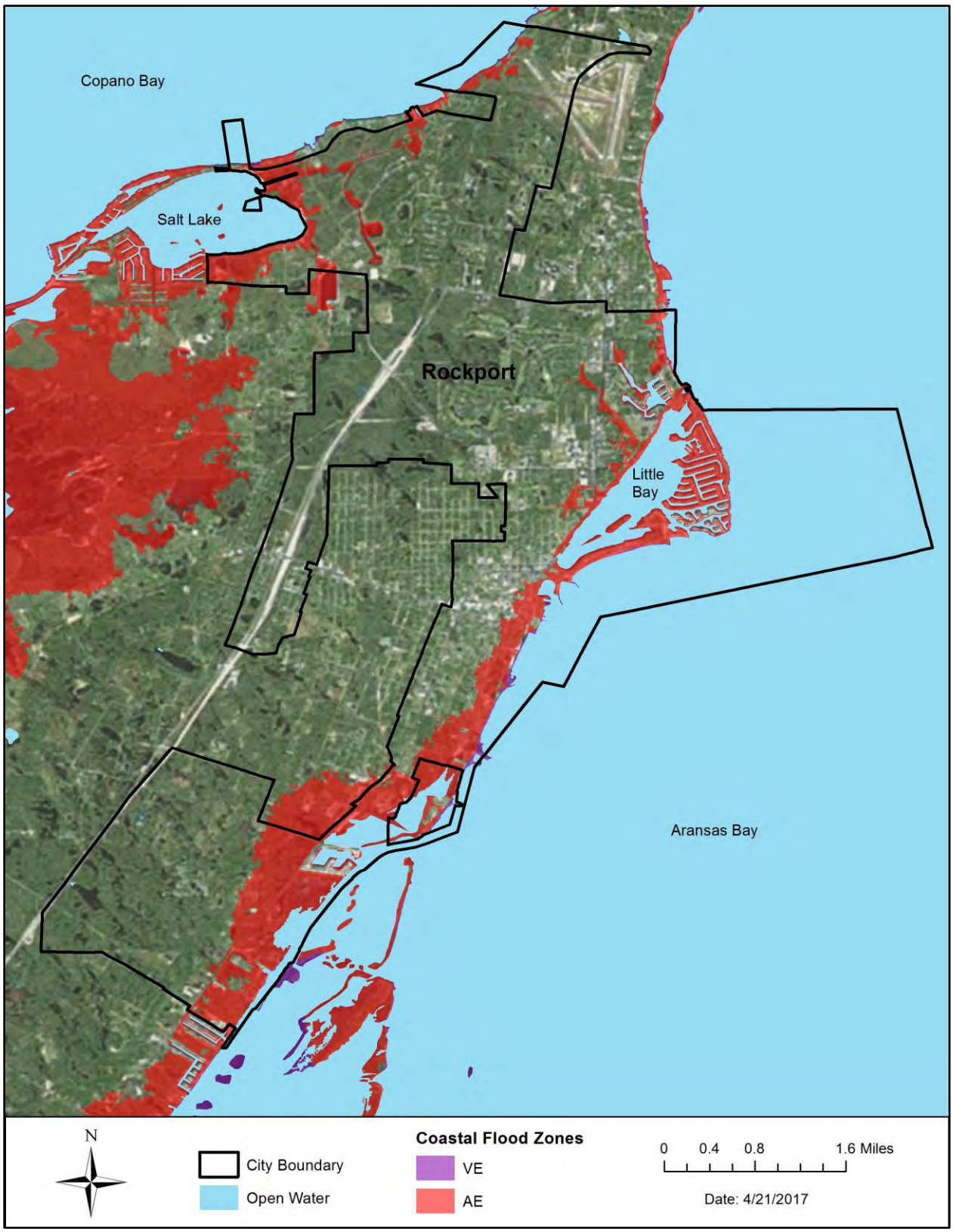
Map 5.21: Fulton Governmental Critical Facilities.



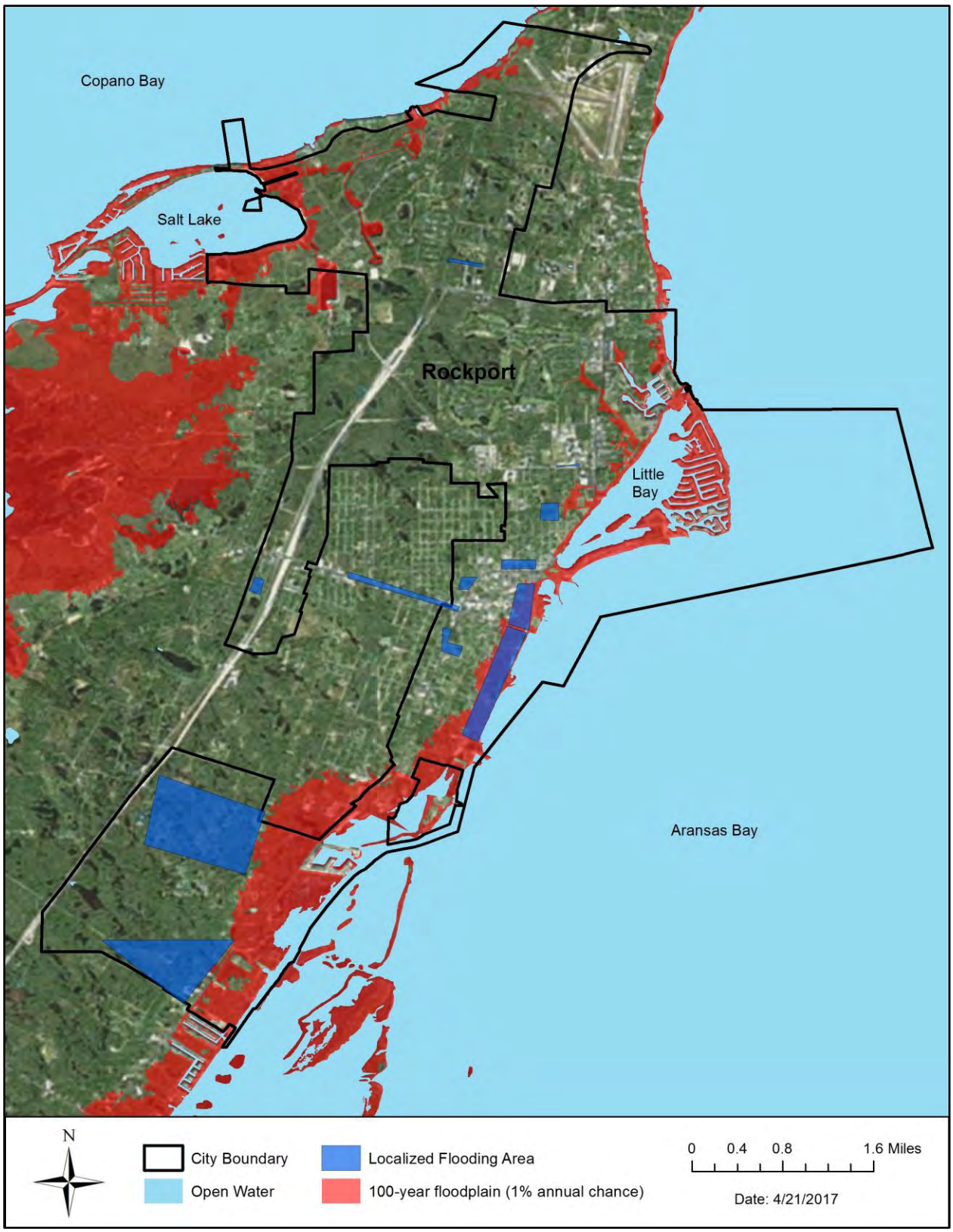
Map 5.22: Rockport Special Flood Hazard Areas.



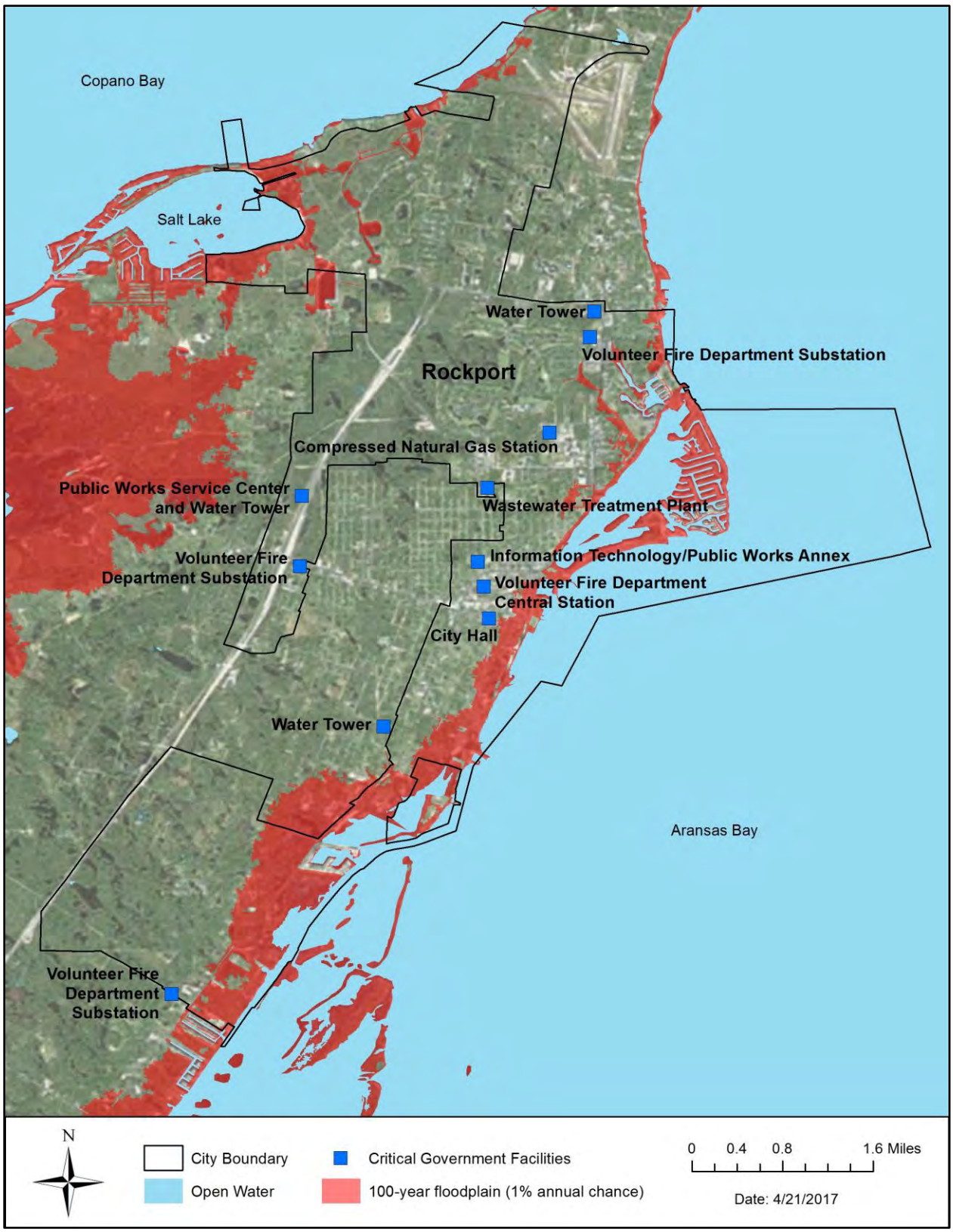
Map 5.23: Rockport Floodplains.



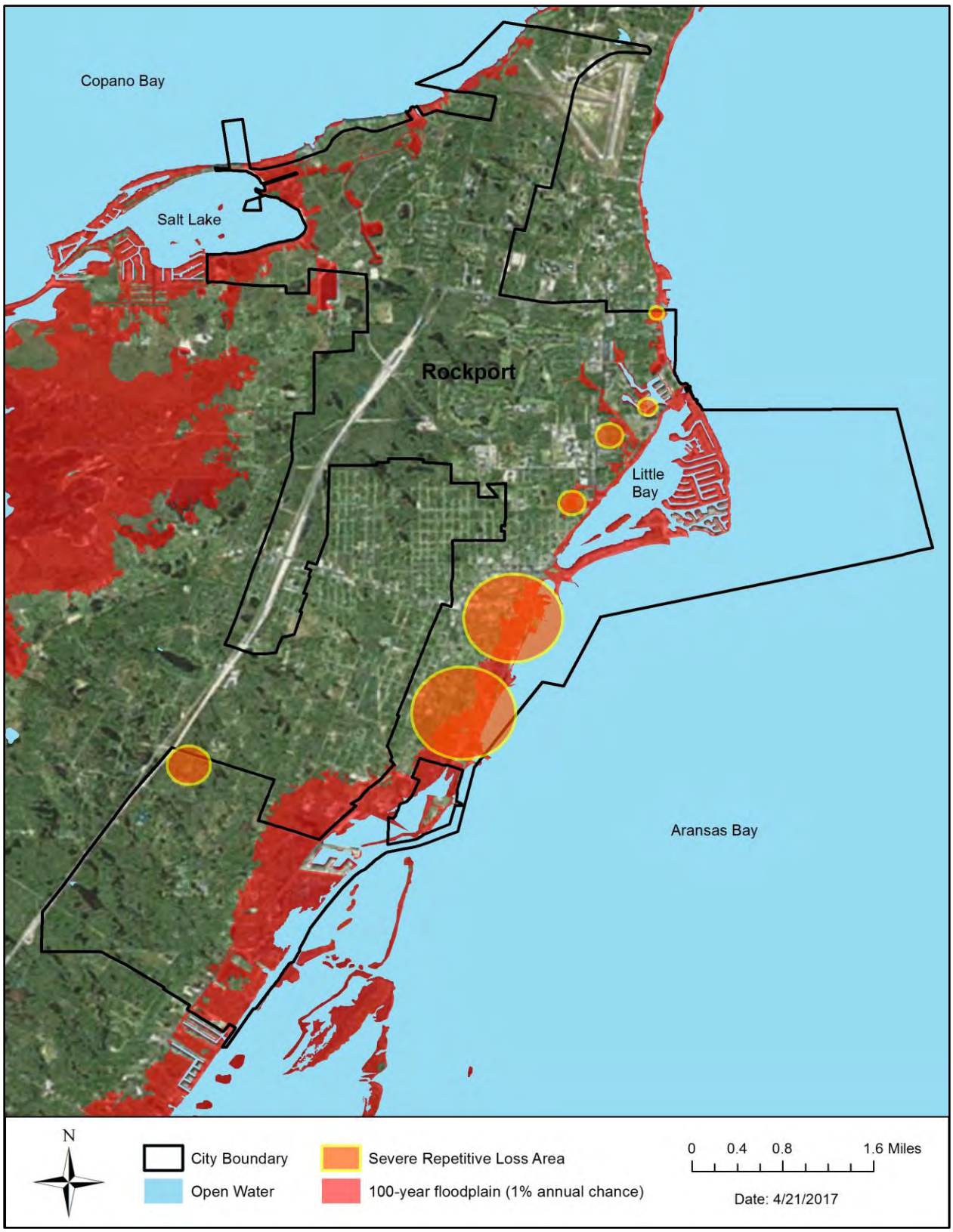
Map 5.24: Rockport Coastal Flood Zones.



Map 5.25: Localized Flooding in Rockport.



Map 5.26: Rockport Governmental Critical Facilities.



Map 5.27: Severe Repetitive Loss Areas in Rockport.

Graduate Student Research Paper: An Assessment of a Coastal Community's Floodplain Management Plan, Its Strengths and Opportunities for Improvement

An Assessment of a Coastal Community's Floodplain Management Plan, Its Strengths and Opportunities for Improvement

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Abstract

The Disaster Mitigation Act (DMA) of 2000 promoted the concept of planning for disasters, and mitigating vulnerability to hazards, by incentivizing plans with federal funding. The FEMA guidelines for a hazard mitigation plan align closely with those that the Community Rating System (CRS) uses for a floodplain management plan (FMP). There have been several studies conducted to evaluate hazard mitigation and floodplain management plans, each with their own set of indicators for a *good* plan. The Center for Sustainable Community Design and The Center for the Study of Natural Hazards and Disasters formulated a plan quality protocol specifically to evaluate an FMP. This study will start by using the plan quality protocol to assess one coastal community's FMP. Then a longer narrative analysis will show how the FMP meets certain fundamental aspects of the CRS guidelines. Overall, the study shows that the community's FMP scored below the midpoint according to the plan quality protocol and presents significant opportunities for improvement according to the CRS guidelines. However, the assessment of this particular FMP matches the trends indicated by a study of 60 plans using the same plan quality protocol. This could be due to the community's low capacity for planning activities. However, by showcasing the primary strengths of the plan and the opportunities for improvement, this study will provide examples for other communities to consider when preparing or updating their plans.

Keywords: hazard mitigation, floodplain management, Community Rating System, plan quality, coastal community

The evolution of disaster planning in the United States has lasted over a century. Today, community planners, emergency managers, and elected officials are most familiar with the Disaster Mitigation Act (DMA) of 2000. This act promoted the concept of planning for disasters, and mitigating the vulnerability to hazards, by incentivizing plans with federal funding. The Department of Homeland Security reported that by 2011, the Federal Emergency Management Agency (FEMA) approved hazard mitigation plans for every state and over 26,000 local jurisdictions in the country (as cited in Lyles, Berke, & Smith 2014). During the decade after the DMA was passed, several studies evaluated the quality of hazard mitigation plans. Two studies (Berke, Smith, & Lyles 2012; Lyles et al. 2014) found that both state and local mitigation plans scored low to moderate overall. Similarly, Peacock et al (2009) studied local hazard mitigation plans for coastal zone communities in Texas and results revealed that "the average plan quality score (PQS) was only 41.6 on a 100 point scale" (p. 86). The number of plans assessed in these three studies covered a wide range – the highest number of plans was 175, from the Lyles et al. 2014 study, and the lowest number of plans was 12, from the 2009 Peacock et al. study. The research presented in this report involves only one local mitigation plan, yet takes a more thorough and explanatory approach to the plan's evaluation. The goal is not so much to provide statistics on trends in plan quality, but to share one plan's strengths and demonstrate opportunities for improvement. I will begin this report with a brief history of disaster planning and an explanation of the guiding principles for hazard mitigation and floodplain management plans. Then, I will take a deeper look into a coastal community in Texas and the floodplain management plan they created. A plan quality protocol, developed by The Center for Sustainable Community Design and The Center for the Study of Natural Hazards and Disasters, will be used to assess the coastal community's floodplain management plan. Guidelines

provided by the Community Rating System will also be used to assess three specific sections within the community's plan. The analyses presented in this study will provide examples, and a direction in which other communities, with similar characteristics, can go during their plan preparation.

Disaster Relief and Hazard Mitigation History

Throughout the 1800s and early 1900s, Congress passed over 100 legislative acts related to specific disaster events or individual types of disasters (Block n.d.). The majority of these acts provided disaster relief and reconstruction projects. Likewise, the Disaster Relief Act of 1950, which authorized the "Presidential Declaration of Disaster," (Edwards 2014; Boyd, Hokanson, Johnson, Schwab, & Topping 2014) focused on post-disaster assistance. The Robert T. Stafford Act of 1988 was the first legislation that incorporated all phases or categories of disaster management – mitigation, preparedness, response, and recovery. It also created a protocol whereby federal assistance is only granted when local and state governmental resources are insufficient (Boyd, Hokanson, Johnson, Schwab & Topping 2014). The Disaster Mitigation Act (DMA) of 2000 amended the Stafford Act, by linking mitigation to recovery, whereby a state or local government must create a multi-hazard mitigation plan in order to obtain any federal funds for recovery (Lyles, et al. 2014).

Looking at the previous two centuries of disaster legislation shows that, historically, mitigation was not strongly supported. The connections between hazard vulnerability, the built environment, and the natural environment were not widely recognized and communities considered it difficult to plan for an event in the distant future, which may or may not occur (North Carolina Division of Emergency Management 1998; Boyd et al. 2014). However, the

frequency and magnitude of disasters has been growing in recent decades (Masterson et al. 2014). As such, the DMA was enacted in order "to reduce escalating disaster costs," by moving away from reactive, post-disaster projects, and promoting pre-disaster mitigation strategies (Lyles et al. 2014).

Hazard Mitigation Planning and Guidelines

An event is only designated a *disaster* as it affects a given populated area and its built environment (Masterson et al. 2014). Before it impacts a community, the event is considered a *hazard* which the community can mitigate by developing an on-going plan and specific policies. FEMA states in its Local Mitigation Plan Review Guide (2011, p. 5):

> Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards (44 CFR 201.2). Hazard mitigation activities may be implemented prior to, during, or after an event. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.

FEMA oversees the approval of hazard mitigation plans (HMPs) and decides if funding will be granted with the plan's approval. FEMA (2013) does not require any particular set of mitigative actions to be a part of a community's plan, because there is no *one-size-fits-all* strategy. Communities have a range of geographical extents and topographical features, and thus are susceptible to different types of hazards. Demographic qualities, population size, and governmental structure vary, as well as planning capacity (FEMA 2011). In order to acknowledge this diversity, FEMA presents guidelines for the planning process and a minimum of requirements. The FEMA guidelines include: documentation of the planning process, assessment of hazards and risk factors, description of mitigation action plan, and a plan maintenance procedure. Documentation of the planning process pertains to: identifying the

planning area, who is leading the planning process, how the public participated, any other plans and studies reviewed, and the official adoption of the plan. An assessment of the hazards and risk factors can be divided into two parts. One part defines the hazards affecting the community, in terms of history, frequency, extent, and probability. The second part of the assessment explains the vulnerability of the population and the built environment, and estimates the potential losses to life, property, and economy. The description of the mitigation action plan provides the goals, the actions, and responsible parties laid out by the planning team relative to the information gathered by the other elements of the planning process. The plan maintenance procedure prescribes the schedule and the methods by which the plan will be monitored, evaluated, and updated.

In many ways, the guidelines for the HMP process align closely with those that the National Flood Insurance Program (NFIP) outlines for a floodplain management plan (FMP), as part of the Community Rating System. In 1990, the NFIP approved the Community Rating System (CRS), which recognizes efforts above the program's minimum requirements and matches those efforts with reduced flood insurance premiums. The *CRS Coordinator's Manual* (hereafter referred to as CRS Manual) explains hazard mitigation as it pertains to only flood hazards, and prescribes the relationship between completing numerous "activities" and receiving discount flood insurance rates (FEMA 2013). The CRS Manual outlines the "Floodplain Management Planning" activity with ten steps (FEMA 2013), illustrated in Figure 1. The FMP is evaluated according to these ten steps, and receives various points based on how well the steps are completed. The points align with the discount rates for flood insurance; the more points earned, the greater the discount received.

Figure 1 Ten Steps for Floodplain Management Planning Under the Community Rating System

Paraphrased from the *CRS Coordinator's Manual* (FEMA 2013)

Methodology and Plan Quality Evaluation

Several studies have evaluated Hazard Mitigation Plans (HMPs) of varying scales, before and after the DMA of 2000. Berke et al. (2012) evaluated state HMPs in coastal regions throughout the country. Horney et al. (2012) compared the quality of HMPs from rural counties to urban counties. Masterson et al (2014) looked at 12 Texas coastal plans, from a regional level to a city level. Peacock et al (2009) also evaluated 12 mitigation plans of different scales, from communities in the coastal zone of Texas. Generally, the studies showed that plans rarely scored above the midpoint on a whole, and there was much variation throughout the scoring of individual principles. Some researchers developed a protocol more stringent than the FEMA guidelines for HMPs, because the plans were already approved by FEMA and the researchers wanted to investigate if and how the plans went beyond the minimum requirements to be approved (Peacock et al 2009; Masterson et al 2014).

The Center for Sustainable Community Design and The Center for the Study of Natural Hazards and Disasters formulated a plan quality protocol specifically for CRS FMPs (Berke, Smith, Salvesen, & Lyles 2011). The protocol and its scoring are rather rigorous and do not represent how the CRS awards points for plans. However, because the protocol is comprehensive in nature, it can provide substantial information for upgrading plans and achieving more CRS points. Six key principles were established for the protocol. The principles and their definitions can be seen in Table 1, along with the CRS steps to which they align. The protocol's terminology is slightly different from the CRS Manual's terminology. Also, since there are six *principles* and ten *steps*, some of the principles are used more than once. For example, Intergovernmental coordination (Principle 5) is used for both Organize to prepare the plan (Step 1) and Coordinate (Step 3). Likewise, Fact base (Principle 2) is used for Assess the

Hazard and the Problem (Steps 4 and 5) and Review possible activities (Step 7). Each of the six *principles* is further broken down into groups of numerous *items*. The items are used like a checklist to measure each principle and are added up to provide the protocol score. Each item is measured either on a binary scale or on an ordinal scale. The binary scale assigns a 0 when the item is *not included*, or a 1 when the item is *included*. The ordinal scale denotes a 0 when the item is *not included;* a 1 when the item is *included with a brief description*; and a 2 when the item includes a "*clear and detailed narrative description* [emphasis added], with lists, table, figures, and maps where applicable" (Berke et al. 2011, p. 16).

The study presented here will start by using the plan quality protocol devised by The Center for Sustainable Community Design and The Center for the Study of Natural Hazards and Disasters. Scores and short summaries will demonstrate how well the example FMP completed each of the CRS steps, according to the protocol. Then, this study will provide a longer narrative analysis of how the plan meets three of CRS steps – Steps 4 and 5, Assess the hazard and the problem and Step 8, Draft an action plan. The analysis of these three steps is deeper because, although all the steps contribute to the success of the plan, Steps 4, 5, and 8 are vitally connected. As the Local Mitigation Plan Review Guide (FEMA 2011, p. 24) states, "the hazard mitigation actions are based on the identified hazard vulnerabilities… This is the heart of the mitigation plan, and is essential to leading communities to reduce their risk." After the evaluation of the CRS steps, the primary strengths of the coastal community's plan and several opportunities for improvement to the plan will be showcased as examples for similar communities to consider when preparing their plans.

Table 1. CRS Steps and Respective Plan Quality Principles

CRS Step		Plan Quality Principle		Principle Definition	Groups of Items
Step 1	Organize to Prepare the Plan	**Principle 5**	Intergovernmental Coordination	recognition of state and local organizations acting together in plan process and implementation	2b-2d : Planning Process and Committee
Step 2	Involve the Public	**Principle 6**	Participation	recognition of formal and informal actors preparing the plan	2a : Public Engagement Techniques
Step 3	Coordinate	**Principle 5**	Intergovernmental Coordination	recognition of state and local organizations acting together in plan process and implementation	3a : Organizational Involvement 3b : Plan Integration
Step 4	Assess the Hazard	**Principle 2**	Fact Base	foundation for hazard identification prioritization, and mitigation policies	4a : Hazard Identification 4b : Flood Hazard Assessment 4c : Risk Assessment 4d : Vulnerability Assessment
Step 5	Assess the Problem				
Step 6	Set Goals	**Principle 1**	Goals	future desired conditions that reflect the public values	5 : Goals
Step 7	Review Possible Activities	**Principle 2**	Fact Base	foundation for hazard identification, prioritization, and mitigation policies	6a-6c : Capability Assessment
Step 8	Draft an Action Plan	**Principle 3**	Policy Framework	general guide to decisions about development and assurance that goals can be achieved	7a-7f : Proposed Actions
Step 9	Adopt the Plan	**Principle 4**	Implementation, Monitoring, and Evaluation	the assignment of organizational responsibilities, timelines, funds, and performance metrics	1 : Plan Basics
Step 10	Implement, Evaluate, and Revise				8a-8b : Monitoring and Evaluating

Paraphrased from *An Evaluation of Floodplain Management Planning Under the Community Rating System* (Berke et al. 2011)

The Planning Area and its Planning Capacity

Aransas County is one of the smallest counties in Texas, with respect to geographic extent and population size. It sits on the coast of the Gulf of Mexico, and belongs to the Coastal Bend region. The county is made up of mostly unincorporated areas, and has only three incorporated communities – Fulton, Rockport, and Aransas Pass. Fulton, designated a town, is the smallest community. Rockport, centrally located, is the county seat. Aransas Pass crosses into two counties in addition to Aransas County – San Patricio and Nueces.

Typical to less densely populated areas, the Aransas County jurisdictions do not have a large planning capacity, in staff time or in funds. As a result, the jurisdictions have not prepared or updated comprehensive plans or multi-hazard mitigation plans. Other planning mechanisms such as ordinances, capital improvement programs, and drainage plans, are often delegated to individual governmental positions within each jurisdiction and do not require much oversight or coordination between positions and projects. However, the planning staff, elected officials, and other stakeholders have recognized the need for regional floodplain management and flood mitigation, because the whole planning area is located on the coast and is mostly made up of peninsulas, islands, and bays (see Figure 2). The Texas State General Land Office (GLO) also recognized that flood mitigation could improve community resilience, and as such, provided funding and staff, namely a coastal planning specialist and an intern, to initiate and assist in a floodplain management plan. Since September 2016, the community has been preparing a multi-jurisdictional floodplain management plan, in accordance with the Community Rating System.

Creating a multi-jurisdictional hazard mitigation plan is often complicated because of the effort involved in coordinating numerous communities and compiling the data needed for multiple hazards. However, the floodplain management plan being developed for Aransas

County and its municipalities, referred to as the Aransas County Floodplain Management Plan (ACFMP), is less cumbersome due its relatively small number of jurisdictions and its focus on flooding as one hazard. This presents an advantage also considering the GLO grant to develop the plan covers only one year of support, and it often takes much longer to prepare a larger multi-jurisdictional and/or multi-hazard plan.

The jurisdictions consider the FMP a starting point for planning activities, and not just a means for discount insurance rates. At this point, only Rockport and the County intend to join the Community Rating System in the fall of 2017. The timeframe between the adoption of the ACFMP and the application to the CRS can allow these two jurisdictions to gather more information and amend the plan to receive additional points. The City of Aransas Pass is considering joining the CRS sometime in the future. Other future planning endeavors include updating the Coastal Bend regional multi-hazard mitigation plan and the comprehensive plans for the individual jurisdictions.

Plan Quality Assessment

The Aransas County Floodplain Management Plan was assessed using the CRS plan quality protocol devised by Berke et al in 2011. The ACFMP scored below the 50% mark, which coincides with the overall findings from the 60 plans evaluated in the respective 2011 study by Berke et al. The full assessment and scoring can be seen in Appendix 1, but the scores for each step are summarized in Table 2. Descriptive summaries of each step's assessment according to the protocol follows the table.

Figure 2. Map of Planning Area

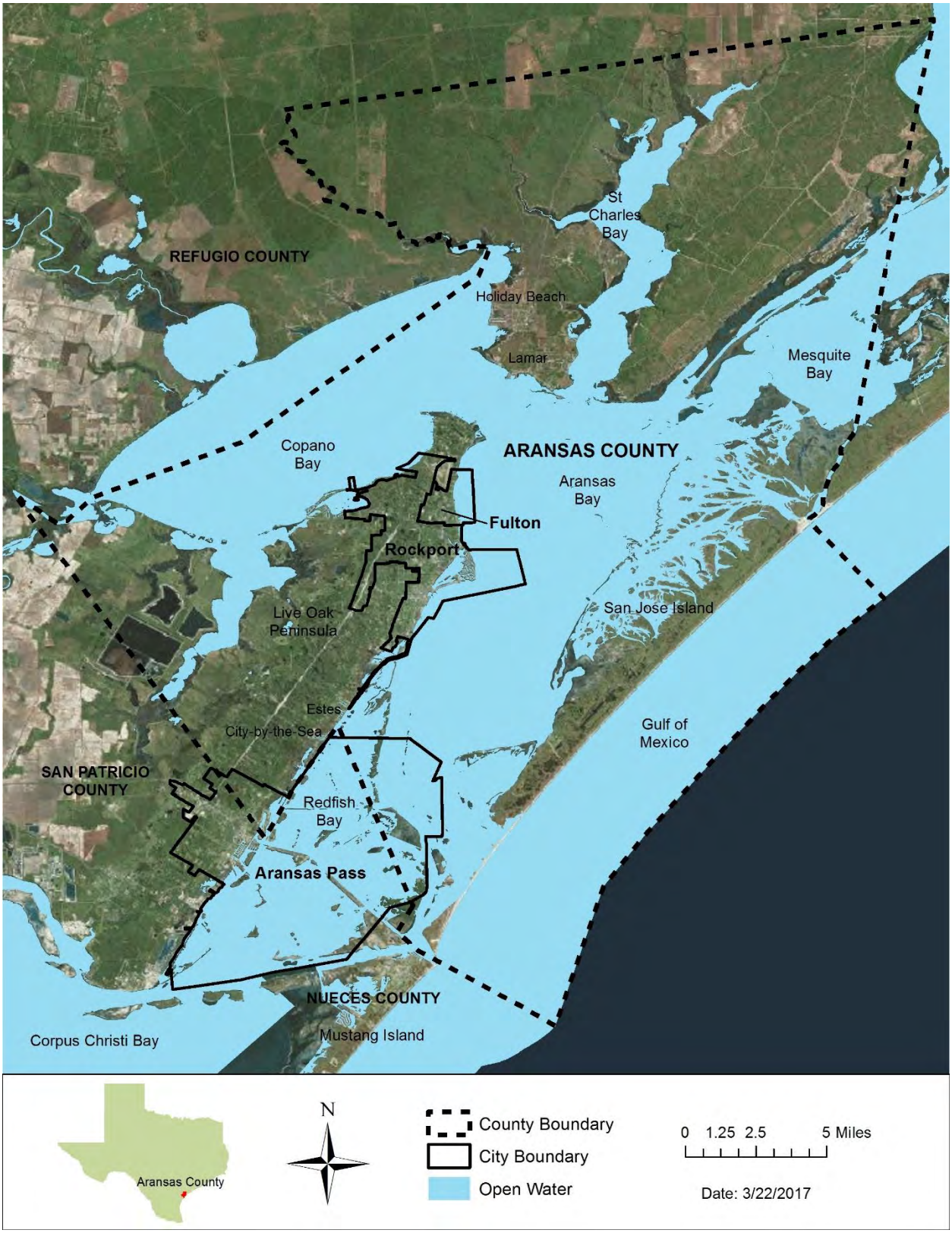

Table 2. Summary of ACFMP Scores Using the Plan Quality Protocol

CRS STEPS AND GROUPS OF PROTOCOL ITEMS	PLAN SCORE	POTENTIAL SCORE
STEP 1: ORGANIZE TO PREPARE THE PLAN		
Formal Recognition and Documentation of Process	3	3
Organizational Roles	2	4
Planning Committee Participants	6	43
STEP 1 TOTAL	**11**	**50**
STEP 2: INVOLVE THE PUBLIC		
Public Engagement Techniques	4	9
STEP 2 TOTAL	**4**	**9**
STEP 3: COORDINATE		
Organizational Involvement	17	43
Plan Integration	6	28
STEP 3 TOTAL	**23**	**71**
STEP 4: ASSESS THE HAZARD		
All Hazards Identification	15	19
Flood Hazard Assessment	9	14
Hazard Prioritization	0	2
STEP 4 TOTAL	**24**	**35**
STEP 5: ASSESS THE PROBLEM		
Risk Assessment	1	12
Vulnerability Assessment	16	30
Jurisdiction-Specific Information	3	6
STEP 5 TOTAL	**20**	**48**
STEP 6: GOALS		
General	1	2
Coordination	3	4
Hazard Loss	2	7
Overarching Vision	1	3
STEP 6 TOTAL	**7**	**16**
STEP 7: REVIEW POSSIBLE ACTIVITIES		
General	1	3
Funding	1	8
Possible Activities	52	144
STEP 7 TOTAL	**54**	**155**
STEP 8: DRAFT AN ACTION PLAN		
Chosen Activities and Implementation Items	72	360
STEP 8 TOTAL	**72**	**360**
STEP 9: ADOPT THE PLAN		
Plan Basics	3	3
STEP 9 TOTAL	**3**	**3**
STEP 10: IMPLEMENT, EVALUATE, AND REVISE		
Monitoring Implementation	0	8
Monitoring Plan	3	6
STEP 10 TOTAL	**3**	**14**
OVERALL TOTAL	**221**	**761**
PERCENT TOTAL	**29%**	**100%**

Step 1 Organize to prepare the plan

The first step in the CRS FMP process is Organize to prepare the plan. The intention of this step is to determine who is leading the planning process, if a formal committee will be involved, and to recognize the process and/or the committee by a governing body. Intergovernmental coordination (Principle 5) from the plan quality protocol uses three groups of items to assess CRS Step 1. Some items are scored on the 0,1 binary scale and some items are scored on the 0-2 ordinal scale. The ACFMP received one point for the first item, with the statement "The governing bodies of each of the jurisdictions involved with the Aransas County Multi-Jurisdictional Floodplain Management Plan have adopted resolutions to formalize their commitment to this process" (p. 12). The ACFMP scored two points for a thorough documentation of the planning process, including who participated in the planning team, the planning committee, and a record of the respective meetings. The protocol also asks for a description of why the participants were involved in the process and how they showed developmental support. The ACFMP does not give a thorough description for these two items, and received only one point for each item. The third group of items for Intergovernmental coordination (Principle 5) involves a list of 43 possible agencies or representatives that could participate in the planning team/committee. These agencies and representatives range from governmental departments to environmental groups to developers and other private businesses. The participants in the ACFMP team and committee represent six out of the 43 possible agencies. The lack of diversity in this inter-organizational participation led to the low overall score of 11 points out of a potential 50 points, for Step 1 Organize to prepare the plan.

Step 2 Involve the public

Public participation should be integral to any planning process. The book *Planning for Community Resilience* (Masterson et al. 2014, p. 34) lists several benefits to community involvement; two are "increasing public awareness and understanding of vulnerabilities" and "informing development, prioritization, and implementation of mitigation projects." The ACFMP planning team held four public meetings which explained the Community Rating System, the ten FMP steps, and a variety of information gathered during the planning process. Two of those four meetings also gave the public the opportunity to share their perspective on flood issues, community assets, and mitigation priorities. Drafts of the ACFMP became available on a website as chapters were written. Furthermore, roughly one-third of the advisory committee members were asked to participate as representatives of the public. These engagement techniques are clearly part of the approach advocated by Masterson et al. Yet, the plan quality protocol lists nine items under its Public participation techniques (Principle 6). Therefore, the ACFMP scored four points, out of a possible nine points for Step 2 Involve the public.

Step 3 Coordinate

Although Coordinate (Step 3) is a singular word, this CRS step actually calls for two components. The first component is a review of current plans, technical reports, and existing studies, in order to ensure that the FMP coordinates with other community goals and projects. The second component is initiating a relationship with groups and organizations outside of the local jurisdictional governments. Peacock et al. (2009, p. 29) explains "Rarely will one agency or jurisdiction have the resource capacity to ensure comprehensive hazard or environmental

management" so coordination among multiple organizations can bolster a greater planning capacity.

The plan quality protocol uses Intergovernmental coordination (Principle 5) and two corresponding groups of items to assess CRS Step 3 Coordinate. The first group of items lists the same 43 possible agencies and representatives that could be pursued for the FMP advisory committee, such as state and federal agencies, business groups, and non-profit organizations. Of the 43 agencies, the ACFMP team contacted 17, and documented some of the outcomes from those contacts.

The second group of items in the protocol pertains to 14 types of plans that could be reviewed during the FMP process, such as land use plans, disaster recovery plans, and stormwater management plans. The evaluation protocol proposes that there may be different degrees of plan integration in the FMP process, and uses the 0-2 ordinal scale, ranging from *not present* to addressed *in detail*. Of the 14 plans listed in the protocol, five are mentioned in the ACFMP, and only the emergency operations plan is addressed in detail. Nonetheless, there is a list of several ordinances and other plans within the planning area, such as a cultural arts district plan and a coastal resilience plan. As stated earlier in this paper, the planning area does not have a large planning capacity. Therefore, it is understandable that many of the plans proposed by the protocol are not reviewed in the ACFMP and most plans or planning mechanisms are not addressed in detail. In conclusion, the ACFMP scored 23 points out of a potential 71 points for CRS Step 3 Coordinate.

Steps 4 and 5 Assess the hazard and the problem

In this section of the paper, I will give a brief summary of the ACFMP chapter for Assess the hazard and the problem (Steps 4 and 5), according to the protocol items. The ACFMP

chapter is substantially developed, but there is some variation among the individual protocol items. This variation was also found in the plans evaluated in the 2011 study conducted by Berke et al, using the plan quality protocol. Because of the extensive information for Steps 4 and 5 in the ACFMP, a deeper analysis of the information is provided in a subsequent section of this report, *Further Assessment of the Internal Plan Quality*. The deeper analysis will explain why the CRS Manual asks for certain types of data and will present specific examples of that data from the ACFMP.

Assess the hazard and the problem (CRS Steps 4 and 5) are two parts of the Fact base (Principle 5) from the plan quality protocol. Berke et al. (2012, p. 140) describe the fact base as "the empirical foundation to ensure that key hazard problems are identified and prioritized and mitigation policy making is well informed." The fact base should be built on extensive data and information. By involving the public, reviewing other plans, and coordinating with various agencies, information specific to the planning area can be included in the assessment of the hazards and impacts.

According to the plan quality protocol, a potential score of 35 can be achieved for the hazard assessment (Step 4) and the ACFMP scored 24 points. The protocol gives 1 point for each non-flooding hazard identified, such as earthquakes and tornados. The ACFMP identified 15 out of 19 non-flooding hazards. Flooding hazards are scored on the 0-2 ordinal scale, where 0 represents *not* mentioned, 1 represents *mentioned*, and 2 represents *addressed in detail*. All seven of the flooding hazards are mentioned in the ACFMP and two flooding hazards are addressed in detail. The inclusion of numerous maps of flood hazard areas illustrates most significant detail.

Assess the problem (Step 5) can receive a potential score of 48, and the ACFMP received 20 points. The protocol breaks down the *problem* into 2 groups of items – *vulnerability* and *risk* – which are scored on the 0-2 ordinal scale. The ACFMP addresses most of the vulnerability assessment items to some degree. Yet, out of the six risk assessment items, five are not mentioned and one is not addressed in detail. Berke et al. proposed in their 2011 plan quality study (p. 22):

> This finding is not surprising, considering that describing the physical characteristics of a hazard and [an] inventory [of] assets in hazard areas is easier than assessing the risk to a community. Risk assessment is more daunting since it requires that probabilities of various magnitudes of hazard events be combined with [the] likely extent of loss.

Step 6 Goals

The CRS description of Goals is significantly brief compared to plan quality approach to Goals (Principle 2). The main points made in the CRS Manual (2013, p. 510.18) are that the goals should be relevant to "other community goals" and "must address all flood-related problems identified in Step 5." The plan quality protocol breaks down its principle into four groups of items, which are scored on the binary 0,1 scale. One specific protocol item asks if *objectives* are included with respect to the goals. The plan quality study conducted by Berke et al. (2011, p. 18) specifies that objectives should be "measureable" such as "number of homes relocated from the floodplain," but the study found that most plans had "action milestones" such as finishing a project. The objectives stated in the ACFMP are of the latter nature, and examples of the projects to be finished are the development of other plans, and the investigation of regulations and best practices.

The protocol principle for Goals also includes a group of items that applies to the overall vision for the goals, with respect to resilience, sustainability, and no adverse impacts. The ACFMP does not use the word *vision* but it does use the word *purpose*. The purpose is broken

down into two points – to minimize flood risk and to enable reductions for residents' flood insurance premiums. I have interpreted the minimization of flood risk as a vision for increasing resilience; thereby giving one point out of three possible points for an overall vision to the plan.

Checklists are used for two other groups of items, Coordination and Hazard loss. The items within these checklists illustrate possible themes for goals, such as state-local coordination, protect public safety, and reduce impacts on environment and natural resources. The ACFMP goals relate to five out of the 11 potential themes that the protocol suggests. The overall plan score for Goals (Step 6) is seven out of a possible 16.

Step 7 Review possible activities

The plan quality protocol uses the terms *Capability assessment* instead of Review possible activities for CRS Step 7. Berke et al. explain in their plan quality study that "A capability assessment consists of three key elements, including funding, evaluation of existing capabilities, and review of possible [mitigation] activities" (2011, p. 23). The protocol organizes the capability assessment into three groups of items. The first group of items applies to the general sense of the plan's approach towards: an evaluation of existing capabilities, a review of all possible activities, and recommendations for activities. The ACFMP provides a description of some of the existing activities in the planning area, but it is inconsistent in explaining whether these activities are effective in their implementation. The plan recommends some activities from its review of possible activities, but it does not review as many activities as the protocol uses in its list of possible activities. Of the 73 potential activities listed in the protocol, 37 are mentioned in the ACFMP. Examples of actions reviewed in the plan are preservation of open space, floodproofing, and drainage systems/storm sewers. Examples of actions not reviewed in the plan are land use change, density bonuses, and post-disaster recovery organization. The second group

of items in the protocol uses the 0-2 ordinal scale to gauge the review of each individual activity; the ACFMP addresses in detail only 15 out of the 37 activities it reviews. The third group of protocol items pertains to funding, and also uses the 0-2 ordinal scale. The plan discusses some local funding sources, but does not discuss state/federal grants, current funding amounts, or a prioritization of activities for funding. The overall ACFMP score for the protocol's Capability assessment is 55 out of potential 155.

Step 8 Draft an action plan

Draft an action plan (Step 8) corresponds to the protocol's Policy framework (Principle 3). The Policy framework identifies the same 73 possible activities listed in the protocol's Capability assessment explained above. The ACFMP includes 18 out of the 73 activities for its draft action plan. However, some of the activities chosen were not reviewed in the Capability assessment, such as erosion/sediment control, technical assistance for developers, and signage indicating hazardous areas.

Under the Policy framework, the protocol provides a checklist of five items for each action: present, cost, funding source, responsible agency, and timetable. The protocol does not gauge the plan's explanation of each action or item. For each item established in the draft action plan, the FMP receives one point. The ACFMP established a funding source, a responsible agency, and a timetable for each action present. Costs were not given for any action. The plan scored an overall 72 points, out of a potential 360 points, for Draft an action plan (Step 8). In a subsequent section of this paper, *Further Assessment of the Internal Plan Quality*, the types of actions chosen, and their prescribed funding, responsible agencies, and timetables, will be explained and evaluated to a greater degree, according to the CRS guidelines.

An item added by the ACFMP, but not designated by either the protocol or the CRS Manual, is a *deliverable* for each action. Since many of the actions involve research, evaluations, and program development, these deliverables consist of reports, subsequent plans, and new standards. Because the deliverables do not present hard numbers to measure the plan's progress, they may illustrate what Berke et al. refer to as *action milestones* in the goals section of their 2011 plan quality study.

Step 9 Adopt the plan

In order to Adopt the plan (Step 9), the CRS Manual states "Adopted means that there is a resolution or other formal document that is voted on by the community's governing body" (2013, p. 510.25). The plan quality protocol breaks down the CRS step into four items – adopted, date, multi-hazard, and multi-jurisdictional; and gives one point for each item covered in the plan. Because the ACFMP is only a floodplain management plan, the multi-hazard item is not applicable. The ACFMP will be voted on by the Aransas County Commissioners' Court and each municipality's City Council in July 2017, so the plan receives three points for three applicable items in the plan quality protocol.

Step 10 Implement, evaluate, and revise

For Step 10 Implement, evaluate, and revise, the 2013 CRS Manual focuses on who evaluates the plan's progress, and how and when the plan will be evaluated and revised. The plan will receive more CRS points if the same committee carries out the evaluation and revisions, and if the committee meets more than once a year. The revision should include new data and information related to hazardous areas, impacts, development, and completed projects and activities. Goals and actions should be updated if necessary based on the new data and information.

The plan quality protocol establishes similar methods for its Implementation, monitoring, and evaluation (Principle 4). However, it suggests other specific methods as well, such as identifying criteria, indicators, and benchmarks by which the plan will be monitored and assessing obstacles to implementation. Four items within the protocol principle Implementation, monitoring, and evaluation are rated on the 0-2 ordinal scale, and six items are rated on the 0,1 binary scale. The ACFMP received three out of 14 potential points for CRS Step 10 Implement, evaluate, and revise.

Further Assessment of the Internal Plan Quality

In *Urban Land Use Planning*, Berke, Godschalk, Kaiser, & Rodriguez (2006) discuss two overarching concepts under which all the plan quality principles fall: internal plan quality and external plan quality. In a hazard mitigation or a floodplain management plan, internal plan quality would apply to the principles for the assessment of hazards and vulnerability, and the goals and actions that come from those assessments. The external plan quality would apply to the principles for public participation, coordination of agencies and relevant plans, and the implementation program. In this section of the study, the Aransas County Floodplain Management Plan will be further assessed for its internal plan quality. Instead of using the previous principles used in *Urban Land Use Planning* by Berke et al. (2006) and in the plan quality protocol (Berke et al. 2011), this assessment will use the CRS guidelines specific to the steps that align with internal plan quality: Steps 4 and 5, Assess the hazard and Assess the problem, and Step 8 Draft an action plan. These three steps merit further assessment considering that "the heart of the mitigation plan addresses the policies and actions [Step 8] that should be

undertaken in an area, given a jurisdiction's hazard exposure [Step 4], vulnerabilities, and risks [Step 5]" (Peacock et al. 2009, p. 89).

Steps 4 Assess the hazard

In a floodplain management plan, the hazard assessment (Step 4) identifies a potential or a historical account of a hazard, detailing the sources, causes, frequency, and extent of flooding for any and every jurisdiction participating in the plan. The hazard assessment may also include non-flooding hazards for more CRS points. The ACFMP addresses all natural hazards that are included in the Texas State Hazard Mitigation Plan and other types of flood hazards not included in the Texas State Hazard Mitigation Plan. Table 3 shows the types of hazards included in the ACFMP and various kinds of information and data that were or could have been discussed in the hazard assessment.

Flooding and Non-Flooding Hazards. The initial definition and description of each type of hazard in the ACFMP exhibits what the CRS guidelines suggest for Step 4. Some hazards are explained in depth as they pertain to the planning area. The plan generally provides consistent data related to historical hazard events, specifically the dates and numbers of events, and the resulting probability of future events. Tables in the plan clearly present this information for storm surge, flash floods, riverine flooding, drought, hailstorms, windstorms, and tornados. The durations of certain hazards, namely hurricanes and drought, can be derived from the dates given. There are also lengthy narratives describing individual tropical storms, hurricanes, and winter storms. Some hazards have relatively low probability or are ongoing issues, thus have no specific events to record. Most of the hazards discussed tend to strike regionally, so it may be unnecessary to name each jurisdiction affected by each hazard. Yet, a jurisdiction is identified whenever the overall cost of damage is listed. Each jurisdiction also is represented with separate

maps for 1% floodplains, 0.2% floodplains, and coastal A and V floodplains (see Appendix 2). Maps are emphasized in both HMP and CRS guidelines, as they are an easy way to illustrate locations and sources. Providing a map for each jurisdiction is a marked strength of the ACFMP, in addition to its documentation of each hazard probability.

The ACFMP lacks data and information, pertaining to certain hazards, that could illustrate measurements of the extent of a hazard. Extent is also known as magnitude or strength, and examples of extent are depth, velocity/speed, and various scientific scales (FEMA 2011). The flash flood data in the plan covers recorded inches of rainfall in several areas throughout the planning area. However, it does not cover the resulting depth or velocity flood water, which is significant because flood water travels and accumulates in a very different pattern from rainfall. It is also worth noting how flash floods have or have not aligned with the established floodplain maps, because there could be differences between the types of flooding in terms of scope and location. Wind speeds and surge heights are given for hurricanes; yet an improvement would be to specify the Saffir-Simpson Hurricane Scale rating for each storm, as it is a commonly recognized scientific scale. The plan indicates that the National Drought Mitigation Center measures drought by the Palmer Drought Severity Index, but does not classify the historical drought periods in the planning area according to this index. Likewise, the Enhanced Fujita Tornado Scale, another recognized hazard rating, could have been used to assess historical tornado events. Although the tornado scale pertains to damage, damage information is needed for the problem assessment (Step 5). Finally, an account of all Presidential Disaster Declarations would also indicate the extent and the impacts of many disaster events. In fact, these declarations are stated in the Community Education and Risk Communication Evaluative Framework, which is one of the studies listed in the plan coordination section (Step 3) of the

ACFMP, but the declaration information is not stated in the assessment of the hazards and the impacts (Steps 4 and 5).

The ACFMP also has a section for a hazard it calls *localized flooding.* In this section, the plan states, "some of these areas are not located in the SFHA [special flood hazard area], and many of them are related to surface flooding" (2017, p.35). The 2013 CRS Manual asks for "areas not mapped on the FIRM [flood insurance rate map]" and "other surface flooding" (p. 510.14). In the ACFMP map appendix, there are maps that illustrate areas of localized flooding for each jurisdiction. However, the plan does not assess this hazard in any other terms, such as cause, frequency, and depth (see Table 3).

Areas of Repetitive Loss. The CRS and the HMP guidelines both require an assessment of areas of repetitive loss. The ACFMP uses FEMA definitions for the terms *repetitive loss properties* and *severe repetitive losses* to explain the significance of documenting the relevant data. The plan provides the number of repetitive loss properties for each jurisdiction, but does not locate them in accordance with FEMA's policy (2015, p. 1): "From a community perspective, it is not fair to single out those properties that happen to be on FEMA's list. All properties with the same exposure to repeated flood damage should be addressed. Therefore, the CRS requirement is for the community to map its repetitive loss AREAS" [emphasis included]. The ACFMP does not map the areas with respect to repetitive loss properties though. Instead, the plan includes a map of *severe repetitive loss areas* for each jurisdiction.

Less Frequent Flood Hazards and Areas Likely to Get Worse. The above analysis recounts how the hazard information of the ACFMP fits the guidelines for both the CRS floodplain management planning activity and the FEMA hazard mitigation plan. However, in the 2013 CRS Manual, FEMA recommends other flood-related information and data pertaining

to “less-frequent flood hazards” (p. 510.14) and areas “likely to get worse” (p. 510.14), such as dams, coastal erosion, and sea level rise. Dam and levee failures were determined not to be a likely hazard in Aransas County as a whole, but further studies were recommended for a berm in the City of Aransas Pass. Although land subsidence and expansive soils are known to be issues along other coastal areas, the ACFMP specifies that this planning area has no history with them. The plan explains in detail the sites throughout the county that have had issues with coastal erosion, but coastal erosion is not explained in terms of how it relates to flood hazards. The connection between sea level rise and flooding is established by the statement “Small increases in sea level can exacerbate flood risk as drainage becomes more difficult with higher average sea levels” (ACFMP p. 50). Data is also provided for sea level rise trends in the planning area and the probability notes that it will likely get worse.

Table 3. Hazard Information and Data that Was or Could Have Been Discussed in the ACFMP

TYPES OF HAZARDS	source / location	cause	frequency	probability	duration	scope / distance	depth	velocity / speed	precipitation amount / size	temperature	warning time	scientific scale
coastal flooding	✓	✓	✓	✓	■	■	✓	■	■	NA	✓	NA
flash flooding	■	✓	✓	✓	■	■	■	■	✓	NA	✓	NA
riverine flooding	✓	✓	✓	✓	NA	NA	✓	NA	NA	NA	✓	NA
localized flooding	✓	■	■	■	■	■	■	■	■	NA	■	NA
hurricanes/ tropical storms	✓	✓	✓	✓	✓	■	✓	✓	■	■	✓	■
coastal erosion	✓	✓	NA	✓	✓	■	NA	■	NA	NA	NA	NA
dam/levee failure	✓	✓	NA	✓	NA	NA	NA	NA	NA	NA	NA	NA
sea level rise	✓	✓	NA	✓	NA	■	✓	✓	NA	NA	NA	NA
drought	✓	✓	✓	✓	✓	■	NA	■	NA	■	NA	■
earthquake	✓	✓	NA	✓	NA	NA	NA	NA	NA	NA	NA	✓
expansive soils/ landsubsidence	✓	✓	NA	✓	NA	NA	NA	NA	NA	NA	NA	NA
extreme heat	✓	✓	✓	✓	■	NA	NA	■	NA	✓	NA	NA
hailstorms	✓	✓	✓	✓	■	NA	NA	■	✓	■	■	NA
severe winter storms	✓	✓	✓	✓	✓	NA	✓	✓	NA	✓	✓	NA
tornado	✓	✓	✓	✓	■	■	NA	■	■	■	■	■
wildfire	✓	✓	✓	✓	■	✓	NA	■	NA	■	■	NA
windstorms	✓	✓	✓	✓	■	■	NA	■	■	■	■	NA

✓ was discussed in ACFMP ■ could have been discussed in ACFMP NA not applicable to hazard

Steps 5 Assess the problem

The CRS Manual (FEMA 2013, p. 510.16) states "A floodplain is only a *problem* [emphasis added] area if human development (the built environment) gets in the way of, or exacerbates, the natural flooding process." The problem assessment (Step 5) is a record of the impacts from flooding and a summary of the overall vulnerability of the community. The Local Mitigation Plan Review Guide defines impact as "the consequence or effect of the hazard on… people, structures, facilities, systems, capabilities and/or activities that have value to the community" (FEMA 2011, p. 20). The ACFMP addresses some of the impacts and vulnerability respective to the whole planning area, and some respective to the individual jurisdictions.

County-wide Assessment of Flood-related Problems. According to the CRS guidelines, three of the flood-related topics used to Assess the problem (Step 5), are life safety, public health, and the economy/major employers. The ACFMP assesses these three topics from a county-wide perspective. The section on life safety specifies which roads in the planning area could be and have been affected by flooding, and determines that some evacuation routes could be interrupted by flood events. Methods of disseminating warning times and emergency information are explained in detail, but accounts of effectiveness are not covered. It is also common in an FMP to report the number of deaths and injuries for historical disaster events. The ACFMP accounts for these numbers for some of the non-flooding hazards, but not for the flood hazards. Disaster recovery is not reviewed historically or explained in terms of programs and funding available. The ACFMP lists numerous potential impacts to public health, including water contamination, mold, and increased insect breeding, caused by floods and stagnant floodwater. In addition, the plan provides a table of major employers in Aransas County, notes how some organizations or businesses could be disrupted by a flood event, and how some

companies could actually provide emergency services. Finally, a discussion of industries, predominant in the planning area due to its coastal location, explains how the related tax base could be greatly impacted by flooding.

Another flood-related topic that should be included in the problem assessment (CRS Step 5) pertains to natural areas and habitats. A regional map of landcover types is provided in the ACFMP appendix of maps. The plan also specifies of how certain landcover types yield natural floodplain functions; the wetlands explanation (ACFMP p. 25) follows:

> When comparing this landcover map with the floodplain map, one can see that much of the floodplains overlap with the palustrine and estuarine wetlands. This natural overlap is a great advantage to the county and its residents. Wetlands naturally mitigate flooding by absorbing stormwater and reducing its rate of flow. The soil and vegetation in wetlands give stormwater a place to infiltrate and be stored before it is released back into streams, rivers, and bays (Texas Parks and Wildlife Department, 2000). This slow, gradual process regulates the velocity of stormwater and flooding, and lessens the destructive force that would be discharged into developed communities...

The plan also reviews the 2012 Aransas County *Stormwater Master Plan and Management Manual* (SMPMM). This manual surveys existing regulations, projects, and institutional agreements, and recommends areas and methods for drainage and flood/stormwater control. Reviewing the SMPMM and explaining landcover types is a good start to assessing the natural areas within the planning area. However, a more complete analysis of the actual regulations, projects, and recommendations from the SMPMM would provide information that could assist in Review possible activities (Step 7) and Draft an action plan (Step 8).

Jurisdiction-specific Assessment of Flood-related Problems. For the problem assessment (Step 5), the CRS guidelines also feature certain topics that relate specifically to the built environment – critical facilities/infrastructure, potentially affected buildings, historically affected buildings, flood insurance policies/claims, and future development. The ACFMP divides the information and data for these topics according to each jurisdiction.

Tables provide information for critical facilities, their addresses, and whether they exist in the 1% or 0.2% floodplains, or in minimal risk areas. Maps for these facilities also illustrate their spatial relation to the 1% floodplain. Critical facilities identified for each jurisdiction include, but are not limited to:

- government buildings
- emergency services
- health care providers
- power stations
- water towers
- harbors
- schools

Data related to potentially and historically affected buildings, and flood insurance policies and claims is also exhibited in tables for each jurisdiction. The CRS Manual suggests the types of buildings could be classified as residential, commercial, and industrial; the plan quality protocol suggests private versus public buildings. Another distinction could be the age and building code for each structure. In one table, the ACFMP uses residential and non-residential structures to organize existing policies, cost estimates, claims closed and costs paid out. Another table organizes insurance policies, premiums, and costs by 1% and 0.2% floodplains. The final table gives numbers for paid claims and losses according to construction during pre-FIRM and post-FIRM (flood insurance rate maps) time periods. Nonetheless, the data for affected buildings and flood insurance is substantially documented.

Future development is a topic that is called for in both Assess the hazard (Step 4) and Assess the problem (Step 5). The distinction between what information is needed for each assessment is somewhat unclear in the CRS Manual, and the ACFMP only refers to Step 5 when documenting information. There is one discussion of development for each jurisdiction. Although these areas are not mapped, the specific locations of potential development are noted in

the text and their vulnerability to flooding is quite detailed. Due to the extent of these development descriptions, they stand out as another strength in the ACFMP.

The CRS guidelines for both the hazard and the problem assessments (Steps 4 and 5) also call for information and data related to population and demographics. The plan quality protocol also advocates an assessment of population trends and socially vulnerable populations (e.g., racial/ethnic minorities, non-English speakers, disabled persons, and low-income households). The ACFMP does not address the topic of population and demographics in the text or with a map, but the planning team could retrieve information and data from the Census Bureau.

To finalize the problem assessment (Step 5), CRS Manual requires "an overall summary of [each] jurisdiction's vulnerability…" (FEMA 2013, p. 510.16). On the one hand, the ACFMP provides a brief but adequate summary of vulnerability for each non-flood related hazard, relevant to the whole planning area. On the other hand, the summary of flood vulnerability primarily restates the probability for coastal and flash floods instead of completing a risk assessment. There is ample data for development issues, repetitive loss areas, critical facilities, and flood insurance for each jurisdiction, yet as the Local Mitigation Plan Review Guide states, "FEMA looks at the quality of the information in the risk assessment, not the quantity of information…" (FEMA 2011, p. 18). The HMP guidelines go on to explain that the summary should yield key issues and statements that lead to the drafting of mitigation actions (Step 8). In addition, because the data and key issues may vary from jurisdiction to jurisdiction, it would be advantageous to define flood-related problems relevant to each jurisdiction, instead of summarizing for the whole planning area.

Step 8 Draft an Action Plan

FEMA explains that the draft action plan (Step 8) restates the goals (Step 6) and "selects and specifies those activities [from Step 7 that are] appropriate to the community's resources, hazards, and vulnerable properties" (2013, p. 510.22). The list of goals, objectives, and actions from the ACFMP can be found in Appendix 3. In this section of the report, I will assess the ACFMP based on how it meets the criteria most significant to a multi-jurisdictional plan of its scope. The CRS will credit the plan with more points according to how well the criteria are addressed. The criteria are paraphrased from the CRS Manual (FEMA 2013, p. 510.23):

- Number of categories represented in the action plan.
- With a multi-jurisdictional plan, action items must represent two categories for each jurisdiction.
- Actions that are prepared for implementation with a responsible party, a timeframe, and a funding source.
- Actions that are prioritized.

Number of Categories Represented by Actions. The CRS Manual names six categories of actions that pertain to Review possible activities (Step 7) and Draft an action plan (Step 8). A plan receives more points incrementally for more categories represented in the action plan. For example, if two categories are represented, the plan will receive ten points; if three categories are represented, the plan will receive 20 points. In addition, if the plan is multi-jurisdictional, actions from two categories should be represented for each jurisdiction. The categories are as follows:

- Preventative measures, e.g. building codes and open space preservation
- Property protection, e.g. relocation and flood insurance
- Natural resource protection, e.g. wetland protection and erosion control
- Emergency services, e.g. hazard response operations and post-disaster mitigation
- Structural flood control projects, e.g. levees and channel modifications
- Public information, e.g. real estate disclosures and environmental education

The ACFMP includes actions from all six categories, utilizing the highest number of categories possible from the CRS guidelines. The category with the most actions is preventative (14 actions) and the category with the least actions is emergency services (1 action). Most actions pertain to the whole planning area. The only actions that are jurisdiction-specific relate to comprehensive plan updates and CRS participation. These two actions fall into only one out of the six categories, because they are largely considered preventive measures. While it may seem appropriate to generalize actions for a relatively small planning area such as Aransas County, the lack of jurisdiction-specific actions may not qualify the ACFMP for the points applicable to a multi-jurisdictional plan.

Preparation for Implementation. Another criterion for more points according to the CRS guidelines is to identify a timeframe, responsible party, and funding source, for each action. The actions in the ACFMP are labeled according to which year, or between which years, they are expected to be implemented, such as *Year 1*, or *Years 3-5*. The ACFMP uses the term *budget* instead of *funding*, and designates "staff time (operating funds)" for most actions (pp. 61-69). The responsible party for the actions is predominantly local governmental staff also. In the long run, utilizing staff and operating funds for numerous actions may be overtaxing to the small local government departments, and the implementation of actions may not occur by the 5-year update. Many communities with low planning capacity, like Aransas County and its municipalities, face issues with available funding and people for implementation.

The actions under Objective 3.1 Create a Comprehensive Public Information Plan (ACFMP p. 65) stand out from the other actions in the plan, because they involve a discrete funding source, separate from staff operating funds – $45,000 Small Communities Grant from the Gulf of Mexico Alliance. Examples of actions that utilize personnel outside of the local

government are: Action 1.2.b. Partner with Mission-Aransas National Estuarine Research Reserve to host a low impact development workshop, and Action 4.1.c Partner with the county resiliency group to investigate potential funding options for erosion protection and habitat restoration.

Prioritization of Actions. In addition to identifying the timeframe, responsible party, and funding source, each action should be ranked with a priority level. The CRS Manual prefers that the planning team prioritize the actions based on "the benefits that would result from the mitigation actions and projects versus the cost of those actions" (FEMA 2013, p. 510.23). However, the ACFMP provides a priority level (high, medium, and low) based on funding source, staff capability, and community support. These priority criteria fit better with Review possible activities (Step 7), where the CRS guidelines ask for a description of the pros and cons of each activity, based on the capacity of the community to fund and implement each potential action. Therefore, the ACFMP may not receive points for its prioritization of actions in the action plan (Step 8).

Harmony between the Draft Action Plan and other CRS Steps. The CRS guidelines do not specifically address points granted for the harmony between steps throughout the plan. However, because all the steps are supposed to lead up to Draft an action plan (Step 8), I am addressing how the actions in Step 8 align with elements from some of the other seven steps.

Although the ACFMP does not exemplify what the CRS guidelines promote in terms of coordination with other planning mechanisms, or with other agencies (Step 3), the draft action plan does contain one objective that embodies that coordination. Objective 4.1 Create a County-Wide, Prioritized, Master Plan of All Flood Related Projects (ACFMP p. 68) aims to evaluate ongoing stormwater projects and maintenance, continue work with a resiliency group invested in

coastal erosion and habitat restoration, and develop a large master plan for related projects throughout the planning area.

The hazard and vulnerability assessments (Steps 4 and 5) should provide information that will lead to choosing community-appropriate activities for the draft action plan (Step 8). However, many of the activities in the ACFMP only mitigate issues for an average community affected by flooding. Instead of selecting specific floodplain regulations, establishing standards for low impact development and floodproofing, or providing details on how acquisition and relocation work, these methods of flood mitigation will be investigated, evaluated, and used to create future plans and programs, as stated in the ACFMP action plan. Moreover, the actions do not address some issues specifically mentioned in the problem assessment (Step 5), such as the vulnerability to highways and nursing homes, and determining the sources and solutions to localized flooding. On the contrary, there are other issues covered in the action plan that are not addressed in the problem assessment, such as vulnerability of historic buildings. Table 4 demonstrates the discrepancies between the draft action plan (Step 8) and the problem assessment (Step 5).

Table 4. Discrepancies between the Problem Assessment (Step 5) and the Draft Action Plan (Step 8) in the ACFMP

PROBLEMS STATED IN STEP 5	**APPLICABLE PLACEMENT IN STEP 8**
Highways / evacuation routes	Goal 3 Coordinated Preparedness/Response Plan
Public health / disaster aftermath	Goal 3 Coordinated Preparedness/Response Plan
Healthcare center / nursing homes subject to localized flooding	Goal 3 Coordinated Preparedness/Response Plan
Natural areas not protected	Objective 1.2 Low Impact Development
	Objective 2.1 Prioritize Natural Areas for Purchase
Critical facilities	
in the 500 year floodplain	Goal 1 Regulatory Standards
in the 100 year floodplain	Objective 3.2 Floodproofing Critical Facilities
Future development	Goal 1 Regulatory Standards
Localized flooding	Goal 4 Coordinated Infrastructure Plan
Aransas Pass berm	Goal 1 Regulatory Standards
	Goal 3 Coordinated Preparedness/Response Plan
Sea level rise	Goal 1 Regulatory Standards
	Goal 2 Protect Property
PROBLEMS *NOT* STATED IN STEP 5	**WHERE THE PROBLEM WAS STATED IN STEP 8**
Updates needed for Comprehensive Plans or Hazard Mitigation Plans	Objective 1.1 Evaluate Floodplain Regulations
Historic buildings	Action 3.2.b Floodproofing Historic Buildings
Watershed / sub-watershed protection	Action 4.1.a Coordinate Multi-Jurisdictional Drainage/Stormwater/Flood-related Projects

Discussion

This section of the study will pull out the primary assets and strengths within the Aransas County Floodplain Management Plan. It also analyzes where the plan shows gaps and opportunities for improvement. The discussion will provide examples for communities preparing their own plans, or for communities updating previous plans. Because the ACFMP may be the most intensive and thorough planning effort for this planning area, it created a solid foundation upon which future plans can be built. Floodplain management plans and multi-

hazard mitigation plans both require 5-year updates to continue receiving financial incentives from NFIP and FEMA. These updates can provide more data or new data, strengthen coordination between agencies or planning goals, and revise or generate new actions.

Assets and Strengths

Four elements within a plan seem rather basic, but can give it more authority. Two of these elements are creating a formal resolution for the planning process and legally adopting the plan itself. The third element – involvement of elected officials, members of the planning department and other governmental departments – also provides backbone to the plan that will ensure its implementation. The fourth element is simply a thorough documentation of the whole planning process. The foremost asset of the ACFMP is fulfilling these four elements.

According the plan quality protocol (Berke et al, 2011) a plan's fact base provides an assessment of the hazards, the community's vulnerability, and its capabilities. Although the ACFMP could develop its fact base further, some of its strengths are found within the CRS steps that establish the fact base assessments. The hazard assessment (Step 4), according to the plan quality protocol, received an overall score of 69%, which is largely due to the number of hazards assessed. All seven of the flooding hazards, and 15 out of 19 non-flooding hazards, were evaluated to some degree. The ACFMP exhibited fundamental data for any hazard mitigation plan, such as dates, frequencies, probabilities, and locations. Because people generally relate better to visual displays of data, the extensive number of maps is a predominant asset to the ACFMP.

The second component of the fact base, the vulnerability assessment (Step 5), accounts for the vulnerability of the planning area and requires a significant amount of information. Impacts to the tax base, roads, and public health are well explained in this assessment.

Numerous tables visually and successfully present the data for critical facilities, affected buildings, flood insurance policies and claims. Development within the planning area, which often contributes to flooding in many communities, is also discussed in detail and further adds value to the fact base assessment.

The items for effective implementation are defined in the ACFMP steps for Draft an action plan (Step 8) and Implement, evaluate, and revise (Step 10). Although the CRS manual strongly advocates for these items in Steps 8 and 10, the plan quality study found that the majority of plans in their research did not document the items (Berke et al. 2011). Step 8 designates a funding source, responsible party, timetable, and priority level for each action chosen. Step 10 specifies governmental positions that will prepare an evaluation report. The ACFMP also goes one step further by prescribing a *deliverable* for each action in Step 8. These deliverables can provide information necessary for updating the plan with concrete, action-oriented goals and objectives, even though the deliverables are not measurable indicators of implementation, as suggested by the plan quality study.

The two most resourceful objectives and respective actions, exemplified in the Draft action plan (Step 8) of the ACFMP, are Objectives 3.1 and 4.1. Objective 3.1 utilizes funding from a state grant, rather than relying on undefined staff operating funds. It also provides a plan for public dissemination of flood information already researched, rather than requiring time for research and evaluation of potential activities. Objective 4.1 involves extensive coordination between all the jurisdictions, existing relationships with resiliency groups, and multiple planning goals for stormwater and floodplain management, drainage and erosion projects, and habitat restoration. The CRS guidelines identify this level of coordination as one of its primary intentions for a floodplain management plan.

Opportunities for Improvement

Flood Hazard Assessment. As previously stated in this paper, the hazard identification section of the ACFMP addresses most of the natural hazards listed in the plan quality protocol, to some degree. Yet, the assessment of the flood hazards specifically could be more complete and systematic. Table 3 (shown previously in this paper) illustrates which measures of extent could be added to the plan. Localized flooding, in particular, has no indications of extent, other than locations displayed on a map for each jurisdiction. The discussions of coastal flooding, coastal floodplain zones, storm surge, and tropical storms are broken up throughout the hazard assessment section, whereas grouping these discussions together would simplify and clarify their interconnectedness. The plan could also describe how the multiple bays, peninsulas, and barrier islands that make up the planning area could increase or decrease surge conditions. Furthermore, the plan could provide an explanation of the relationship between flood hazards and flood-related conditions resulting from coastal erosion, drought, wildfire, tornados, severe storms, and the general topography of the area.

Figure 3 shows a concise table from the *Tulsa County Multi-Hazard Mitigation Plan* for the relationships between flood hazards and flood-related conditions. Figure 4 demonstrates how the *Baltimore Disaster Preparedness and Planning Project* showcases historical flood events, the relationships between types of flooding, and several measures of extent and impact. The Baltimore plan also explains the Saffir-Simpson Scale for hurricanes (see Figure 5), then classifies each tropical storm that occurred in the region according to that scale.

Flood Problem Assessment. The ACFMP provides extensive jurisdiction-specific data suggested by the CRS manual and the plan quality protocol, for the assessment of the flood problem. However, additional information regarding the flood impacts, vulnerability, and risk to

the community, could form a more complete assessment. One major vulnerability/risk factor that the ACFMP does not cover is the human factor. The Baltimore flood event table (see Figure 4) demonstrates how the number of deaths and injuries could be included in the history of flood events.

Figure 3. Table of Flood-related Conditions from the Tulsa County Multi-Hazard Mitigation Plan (2015, p. 29).

Factor	Effect
Precipitation Rate	As the rate of precipitation increases, the ground's infiltration rate is exceeded. This is the dominant factor in flash flooding events, and can overwhelm any or all of the following factors.
Training Echoes	Storm cells that follow each other (much like box cars on a train) can repeatedly deposit large amounts of water on the same watershed, overwhelming its ability to handle runoff.
Slope of Watershed	Steeper topography (hills, canyons, etc.) will move runoff into waterways more quickly, resulting in a quicker, flashier response to precipitation.
Shape of Watershed	Longer, narrower watersheds will tend to "meter out" runoff so that water arrives from down shed (nearer to the mouth of the stream) areas faster than from up shed areas. In watersheds that are more square or circular than elongated, runoff tends to arrive in the main stem at the same time, intensifying the response. This factor becomes more significant with larger watersheds.
Saturation of Soils	Saturated or near-saturated soils can greatly reduce the rate at which water can soak into the ground. This can increase runoff dramatically.
Hardened Soils	Extremely dry soils can develop a pavement or "crust" that can be resistant to infiltration. This is especially true in areas of recent wildfire, where plant oils or resins may cause the soil to be even more water-resistant.
Urbanization	The urban environment usually intensifies the response to heavy precipitation. The two dominant urban factors are: 1) increased pavement coverage, which prevents infiltration and dramatically increases runoff; and 2) Urban systems are designed to remove water from streets and byways as quickly as possible. This accelerates the natural response to precipitation by placing runoff in waterways much more quickly.
Low-water crossings	The vast majority of flash flood related deaths occur in vehicles. Many of these deaths occur at low-water crossings where the driver is unaware of the depth of the water or the consequences of driving into it.

Figure 4. Combined Flood Events and Extent from The Baltimore Disaster Preparedness and Planning Project (2013, p. 52)

Dates	Type	Location	Description	Cost
9/1/1952	Coastal, Flash, River	Regional	Hurricane Able cause major flooding and washed out the B&O Railroad in Baltimore. 11 barges were torn loose from their moorings in the harbor, and 21 vehicles were swept into the harbor.	$500,000
10/15/1954	Coastal, Flash, River	Regional	Hurricane Hazel killed 6 people in Maryland and dropped 5-6 inches of rain in 8 hours. Heavy winds caused 6 foot storm surge.	$28,000,000 in Maryland
8/13/1955	Coastal, Flash, River	Regional	Hurricane Connie caused wide-spread flooding throughout Maryland with 10 inches of rain in 72 hours and killed 16 people.	$33,900,000 in Baltimore City
8/1/1971 to 8/2/1971	Flash	Baltimore City and Baltimore County	Between 5 and 12.5 inches of rain over 8 hours. 16 deaths attributed to flooding. Storm closed major highways in the region, left 20,000 residents without power, and displaced hundreds.	Est. $1,000,000
6/23/1972	Coastal, Flash, River	Regional	Tropical Storm Agnes killed 21 throughout Maryland and dropped 8 inches of rain in one day.	$110,000,000 in Maryland, $3.5 Billion nationwide
9/22/1975 to 9/26/1975	Flash	Regional	The remnants of Hurricane Eloise stalled and combined with other storm systems, dropping 14 inches of rain in Westminster, MD between Sept. 22 and 26. 17 deaths attributed to flooding	Est. $300,000,000 throughout Mid-Atlantic
9/6/1979	Flash	Regional	Tropical Storm David spawned 8 tornadoes and multiple flash floods in the Baltimore area and killed 15 nationwide.	$320,000,000 nationwide
9/19/2003	Coastal, Flash	Regional	Hurricane Isabel caused extensive flash floods as well as a storm surge of 8 feet in Baltimore City. 15 businesses and 570 homes sustained major damage, and 100 structures collapsed. 8 deaths are attributed to the storm throughout Maryland.	$4,900,000 in Baltimore City, $945,000,000 nationwide
7/7/2004	Flash	Mt Washington along the Jones Fall	21 vehicles lost in water, 54 911 calls for flooded basements	Unknown

Figure 5. Saffir-Simpson Scale from the Baltimore Disaster Preparedness and Planning Project (2013, p. 59)

Table 3–4 Saffir-Simpson Scale

Category	Wind Speed	Storm Surge	Expected Damage
1	74-95 mph	4-5 ft.	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days
2	96-110 mph	6-8 ft.	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129 mph	9-12 ft.	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	131-156 mph	13-18 ft.	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months
5	>157 mph	>18 ft.	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Derived from NOAA National Hurricane Center: Saffir-Simpson Scale (http://www.nhc.noaa.gov/aboutsshws.php) and Understanding Your Risks, FEMA 386-2, 2-23

The website *mitigationguide.org* also gives a review of strategies that could account for the risk to human lives (retrieved on May 26, 2017):

- Identify concentrations of residents and employees to help target preparedness, response, and mitigation actions.
- Identify the types of visiting populations and their likely locations to assess potential problems.
- Identify locations and concentrations of access and functional needs populations to develop mitigation actions that will best assist them.
- Consider demographics of projected population growth to predict vulnerability.
- Identify locations that provide health or social services that are critical to disaster recovery.

As such, a map illustrating the general population density with respect to the floodplain would be a valuable addition to the ACFMP's numerous other maps. Another map or table could account

for socially vulnerable groups of people. Race, ethnicity, gender, age, household composition, education and income level can contribute to social vulnerability before a hazard strikes; thereby influencing the capacity of relevant populations to prepare for, cope with, and recover from the impacts of a disaster (Highfield, Peacock & Van Zandt 2014). The *visiting population,* suggested by *mitigationguide.org*, is particularly significant to the ACFMP planning area, and other coastal planning areas, due to the influx of vacationers, second-home owners, and migrant workers during specific times of the year. Data for these visiting populations and relevant maps would also be worth including in the problem assessment.

The final but perhaps foremost item that should be added to the flood problem assessment in the ACFMP is a narrative summary of vulnerability and risk for each jurisdiction within the plan, as recommended by the CRS Manual (FEMA 2013, p. 510.16). A clear summary of flood problems would help each jurisdiction understand their greatest risks, and clarify their connection to the goals and actions. The *Maricopa County Multi-Jurisdictional Hazard Mitigation Plan* (2015, p. 195) gives a narrative summary for its entire planning area, but the summary is a good example for how the ACFMP could use its given data to write summaries for each of its jurisdictions.

> In summary, $535.6 million in critical and non-critical MJPT identified assets are exposed to high hazard flood areas for the planning area. An additional $14.5 billion of Census 2010 residential structures are located in high hazard flood areas for the planning area. Regarding human vulnerability, a total population of 104,120 people, or 2.73% of the total 2010 Census population, is potentially exposed to a high hazard flood area for the planning area. Based on the historic record, multiple deaths and injuries are plausible and a substantial portion of the exposed population is subject to displacement depending on the event magnitude.
> It is duly noted that the exposure numbers presented above represent a comprehensive evaluation of the county as a whole. It is unlikely that a storm event would occur that would flood all of the delineated high flood hazard areas at the same time. Accordingly, actual event based losses and exposure are likely to be only a fraction of those summarized above.

Reviewing and Drafting Activities. The plan quality protocol assessment of the ACFMP determined that the plan does not adequately incorporate other planning documents into the FMP planning process. The *Local Mitigation Plan Review Guide* explains that "Incorporate [emphasis included] means to reference or include information from other existing sources to form the content of the mitigation plan" (FEMA 2011, p. 17). The information from other planning documents should indicate what activities are currently working and why other activities are reviewed or chosen by the community. Although the ACFMP lists existing ordinances, capital improvement plans, subdivision regulations, and other documents, the plan does not outline how these documents relate to the review and drafting of future floodplain management activities (Steps 7 and 8). The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan provides an example for how current and potential regulations could be outlined for a planning area. The plan includes a table defining the NFIP standards and a matrix (see Figure 7) that specifies which Mecklenburg jurisdictions implement which standards and where higher standards could be implemented.

The CRS guidelines promote "a wide range of activities to ensure that all possible measures are explored, not just the traditional approaches of flood control, acquisition, and regulation of land use" (FEMA 2013, p. 510.18). The book *Planning for Community Resilience* (Masterson et al. 2014, p. 160) includes a study of hazard mitigation plans for 124 jurisdictions in the coastal zone of Texas, and found that a limited amount of mitigation strategies was being used in these jurisdictions, even though "the strategies and policies described in this chapter are all regular tools city and regional planners use."

Figure 7. Higher NFIP Standards from Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan (2014, p. 7.12)

REGULATION	Mecklenburg County	Charlotte	Cornelius	Davidson	Huntersville	Matthews	Mint Hill	Pineville
Parking Lots Must be Elevated	✓	✓	✓	✓	✓	✓	✓	✓
Dry land Access	✓	✓	✓	✓	✓	✓	✓	✓
Community Floodplains (Future Conditions)	✓	✓			✓	✓	✓	✓
Wider Floodways	✓	✓			✓	✓	✓	✓
Critical Facilities Located Out of 500-year Floodplain	✓	✓	✓	✓	✓	✓	✓	✓
Levee Restrictions	✓	✓	✓	✓	✓	✓	✓	✓
Higher floor elevation requirement (freeboard)	✓	✓		✓		✓	✓	✓
Cumulative Substantial/Damage Improvement	✓	✓			✓	✓	✓	✓
Below Flood Level Basements Not Allowed on Filled Lots	✓	✓	✓	✓	✓	✓	✓	✓
No Development In FEMA Floodplain	✓	✓				✓	✓	✓

Although I previously stated that the activities under Objective 3.1 Create a Comprehensive Public Information Plan in the ACFMP stand out in terms of an established funding source outside of local government funds, these kinds of educational programs are not the strongest actions in terms of hazard avoidance (Berke et al. 2011). In their paper, Lyles et al. present a table (see Figure 8) describing land-use strategies, which are more effective in that they move new development out of hazard-prone areas (2014, p. 795). Many of these land-use tools are listed in the 2011 CRS plan quality protocol developed by Berke et al., and are the protocol items for which the ACFMP did not receive points. In the plan quality study that uses the protocol, Berke et al. also emphasize future-oriented land use strategies for mitigation because "floodplains are dynamic systems, growth rates and the makeup of residents are not static, and local capabilities to address flood risk change over time" (2011, p. 40).

Figure 8. Land Use Strategies for Hazard Mitigation, from Do planners matter? Examining factors driving incorporation of land use approaches into hazard mitigation plans (Lyles et al. 2014, p. 795).

Land use approach	Description
Development regulations	
Permitted land use	Provision regulating the types of land use (e.g. residential, commercial, industrial, open space, etc.) permitted in areas of community; may be tied to zoning code.
Density of land use	Provision regulating the density of land use (e.g. units per acre); may be tied to zoning code.
Subdivision regulations	Provision controlling the subdivision of parcels into developable units and governing the design of new development (e.g. site stormwater management).
Zoning overlays	Provision related to using zoning overlays that restrict permitted land use or density of land use in hazardous areas; may be special hazard zones or sensitive open space protection zones.
Setbacks or buffer zones	Provision requiring setbacks or buffers around hazardous areas (e.g. riparian buffers and ocean setbacks).
Cluster development	Provision requiring clustering of development away from hazardous areas, such as through conservation subdivisions.
Density transfer provisions	
Density transfer	Provision for transferring development rights to control density; may be transfer of development rights or purchase of development rights.
Financial incentives and penalties	
Density bonuses	Density bonuses such as ability to develop with greater density in return for dedication or donation of land in areas subject to hazards.
Tax abatement	Tax breaks offered to property owners and developers who use mitigation methods for new development.
Special study	Provision requiring impact fees or special study fees on development in hazardous areas; may indicate fees required to cover costs of structural protection.
Land use analysis and permitting process	
Land suitability	Hazards are one of the criteria used in analysing and determining the suitability of land for development.
Site review	Provision requiring addressing hazard mitigation in process of reviewing site proposals for development.
Public facility locations	
Site public facilities	Provision related to siting public facilities out of hazardous areas in order to maintain critical services during and after hazard events.
Post-disaster reconstruction decisions	
Development moratorium	Provision imposing a moratorium on development for a set period of time after a hazard event.
Post-disaster land use change	Provision related to changing land use regulations following a hazard event; may include redefining allowable land uses after a hazard event.
Post-disaster capital Improvements	Provision related to adjusting capital improvements to public facilities following a hazard event.

External Plan Quality. The hazard assessment, the vulnerability assessment, and the mitigation action plan (CRS Steps 4, 5, and 8) were evaluated to a greater extent in this study, due to their relationship as parts of the *internal plan quality*. Berke, et al (2006) explain in *Urban Land Use Planning* that, internal plan quality relates to the content of the plan – the data identified and assessed, the vision for the future, and the actions that carry out the vision. The *external plan quality* relates to "how well the plan fits the local situation" as a result of the scope of the plan, the interconnectedness of actions, the participation of local actors, and the understanding of the plan (Berke, et al 2006, p. 72). At this point, it is difficult to assess if the ACFMP fits its planning area. The analysis of the first three steps of the plan, Organize to prepare the plan (Step 1), Involve the public (Step 2), and Coordinate (Step 3), shows that more participants could have played a part in the planning process. Population demographics, especially socially vulnerable groups, was pointed out as a gap in data for the hazard vulnerability assessment; yet the omission of this topic also reflects who was considered to participate in the planning process. After I could not find documentation in the ACFMP for how the public was notified about the public meetings, I discussed the subject with a couple of planning team members. Both members stated that they emailed a select group of contacts and assumed that those contacts continued the outreach. I asked if methods such as distributing flyers at libraries or churches were used, and one member commented that that idea was not considered.

Goal 3 in the ACFMP, Create a coordinated flood preparedness and response strategy, involves extensive public information dissemination. Having a variety of methods of dissemination, including non-traditional methods, will increase the success of this strategy. Masterson, et al (2014, p. 102) found that the literature suggests minority populations "are less

trusting of authorities when it comes to heeding warnings and are more dependent on social networks." Therefore, disseminating information through trusted leaders within their neighborhood groups or church organizations may be better than sending out mailers and newsletters or posting on governmental websites. Likewise, holding public meetings in governmental buildings, as was the case with all four previous meetings, may discourage attendance from minority groups. Future public meetings could also be held in churches or other community centers. Furthermore, accommodating for language barriers, such as non-English speakers and the hearing-impaired, would be beneficial for public meetings and information plans.

Because many of the actions drafted in Step 8 of the ACFMP consist of investigations into future land use changes and regulations, there is the opportunity to generate other types of targeted outreach as those investigations proceed. Two actions require research into floodplain management regulations and low impact development currently utilized in other communities with similar characteristics. It is given that the similar characteristics would include topographical features and the built environment; but the characteristics should also recognize the demographics of the people who own property in the floodplain. Adopting certain regulations and practices, or a hasty timeline for implementation and compliance, may be economically unfeasible for some property owners (Highfield, et al 2014). Owners of undeveloped or underdeveloped land, such as private developers and farmers, are invested in particular land uses and would be affected by zoning changes (Berke, et al 2006). In addition, buy-out and relocation programs would disproportionately affect low-income groups, multi-generational families, and renters, if not enough appropriate housing is located outside of the

floodplain. Inviting various community members to discuss the impacts of future actions will help determine which actions will better fit the community.

Focus groups are a worthwhile approach to inviting key community members to participate in the planning process. Focus group meetings are different from public meetings in that they involve less attendees, the attendees share common sets of characteristics and are asked targeted questions. The questions and answers can lead to discussions and are intended to assess specific situations, such as the pros and cons of different mitigative actions. There are several ways the planning team can identify key actors and demographic groups. The method of starting with an action in mind and then figuring out who would be affected by that particular action is called *backwards mapping* (Berke et al, 2006, p. 459). Several spatial mapping tools can also be accessed through the internet. Masterson, et al (2014, p. 102) recommend these tools:

- The US Census Bureau Center for Economic Studies developed *OnTheMap* to evaluate primary industries and employment patterns. http://onthemap.ces.census.gov
- The Texas Planning Atlas covers numerous indices for social vulnerability for coastal communities in Texas. http://texasatlas.arch.tamu.edu/
- *Digital Coast*, NOAA Coastal Services, displays maps on hazard vulnerability, natural vulnerability, and social vulnerability. http://csc.noaa.gov/digitalcoast/dataregistry/#/
- NOAA's *State of the Coast* provides information for coastal communities, economy, ecosystems, and climate. http://stateofthecoast.noaa.gov/population/welcome.html

Conclusion

There have been several studies conducted to evaluate hazard mitigation and floodplain management plans, each with their own set of indicators for a *good* plan. Although those studies analyzed numerous plans to determine trends in plan quality, the study here assessed one particular floodplain management plan to provide an in-depth example of plan strengths and opportunities for improvement. The Community Rating System guidelines and the plan quality protocol developed by The Center for Sustainable Community Design and The Center for the

Study of Natural Hazards and Disasters were utilized in a systematic manner to assess elements of the Aransas County Floodplain Management Plan. The ACFMP follows trends indicated by the 2011 study of 60 plans evaluated by Berke et al., working with the plan quality protocol, such as substantial hazard identification and development of a public information plan. However, some of the problematic trends are: lack of public participation, lack of coordination with other plans and organizations, incomplete risk assessment, and a need for land-use-based, disaster-avoidance actions. Several factors could contribute to these trends found in the ACFMP, and other community plans. The county and its municipalities do not have a strong capacity for planning efforts. The jurisdictions may face a lack of knowledge, in their community and from their planning team, about of flood-related issues and floodplain management activities. Berke et al. (2011) also suggest that the CRS program itself could adopt more rigorous guidelines and requirements to compel communities to create stronger plans. Despite its similarity to other plans in the plan quality study, the ACFMP stands out from the trends by including all the necessary elements of the action plan (timeframe, responsible parties, funding source, and prioritization) and exhibits a new element, *deliverable*. Regardless of all these findings, planning is always a process, learning is a part of that process, and there are always opportunities for improvement.

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APPENDIX 1: **COMMUNITY RATING SYSTEM (CRS) PLAN QUALITY PROTOCOL**

Part 1: Plan Basics			
		Code	**Comments**
Coding Categories: 0 = not present 1 = present			
1.1	Adopted	1	
1.2	Date	1	May 2017
1.3	Multi-Hazard Mitigation Plan	0	**N/A**
1.4	Multi-jurisdictional	1	3 municipalities and the County

Part 2: Planning Process			
		Code	**Comments**
Coding Categories: 0 = not present 1 = present			
2A - Public Engagement Techniques			
2A.1	Citizen Advisory Committee	1	"Executive Planning Committee" 10 staff/officials, 5 public representatives
2A.2	Identifying Emergency Organizations Post-Event	0	
2A.3	Information Distribution	0	
2A.4	Public Comments & Recommendations	1	1st meeting = no "public" attendees (out of 20) 2nd meeting ~ half of the total 26 attendees
2A.5	Public Meetings	1	
2A.6	Public Notice (Add/Article in Local Paper)	0	Rockport meeting, not Multi-jurisdictional meetings
2A.7	Public Notice (Legal)	0	
2A.8	Targeted Outreach	0	Not documented
2A.9	Website	1	
2B - Planning Process/Committee			
2B.1	Formally Created/Recognized by Governing Board	1	
Coding Categories: 0 = not present 1 = mentioned, but not detailed 2 = mentioned and detailed			
2C - Develop and Update Plan			
2C.1	Documents Planning Process	2	
2D - Organizational Roles			
2D.1	Support Plan Development	1	Somewhat documented in a table for Step 3
2D.2	Why Involved	1	Only the committee

Part 3: Inter-Organizational Coordination			
	Code		Comments
Coding Categories: 0 = not present 1 = present			
3A – Participating Agencies			
	Planning Committee	**Organizational Involvement**	Sub-committees
3A.1 Budget/Revenue/Finance Agency	0	0	
3A.2 Building Department & Permit Office	0	0	1
3A.3 Business Groups	0	0	
3A.4 Consultant	0	1	
3A.5 Developers/Homebuilders	0	0	
3A.6 Disaster Volunteer Groups	0	0	
3A.7 Economic Development	0	0	
3A.8 Emergency Management Agency	0	0	1
3A.9 Environmental Groups	0	1	
3A.10 Executive's Office	1	0	1
3A.11 Federal Other Agency	0	1	
3A.12 FEMA	0	1 (ISO)	
3A.13 Fire Department/EMS	0	0	
3A.14 Housing Agency	0	0	
3A.15 HUD	0	0	
3A.16 Legislative Body	1	0	
3A.17 Media	0	1	
3A.18 Neighborhood Groups	0	0	
3A.19 NFIP Coordinator/ Floodplain Management Office	1	1	
3A.20 NOAA/NWS	0	1	
3A.21 Other Local Jurisdictions (Adjacent to Community)	0	0	
3A.22 Other Local Jurisdictions (Not Adjacent to Community)	0	0	
3A.23 Parks/Land Conservation/ Environment Agency	0	1	
3A.24 Planning/Community Development Agency	0	1	1
3A.25 Police Department	0	1	1
3A.26 Professional Associations/ Organizations (ASFPM, APA, etc.)	0	0	
3A.27 Public Health Agency	0	0	
3A.28 Public Safety	0	0	
3A.29 Public Works	1	1	

3A.30	Regional Planning Government/Organization	0	1 (CBCOG)	
3A.31	School District	0	0	
3A.32	State Coastal Department/Agency	0	1	
3A.33	State Emergency Management Department	0	0	
3A.34	State Natural Resources/ Environment Department/ Agency	0	0	
3A.35	State Other Department/Agency	0	0	
3A.36	State Planning Department/Agency	0	0	
3A.37	State Sea Grant	0	1	
3A.38	State Transportation Department/Agency	0	0	
3A.39	Transportation Agency	1	0	
3A.40	Unaffiliated Individuals	1	1	
3A.41	USACE	0	1	
3A.42	Utilities	0	0	
3A.43	Water/Sewerage District	0	1	

Coding Categories:
0 = not present
1 = mentioned, but not detailed
2 = mentioned and detailed

3B - Plan Integration			
3B.1	Adjacent Jurisdiction Hazard Plans	0	
3B.2	Climate Change Plan	0	
3B.3	Comprehensive Land Use Plan Overall	1	Mentions only 1 municipality has a comp plan in Step 3.
3B.4	Comprehensive Land Use Plan Fact Base	0	
3B.5	Comprehensive Land Use Plan Goals	0	
3B.6	Comprehensive Land Use Plan Monitoring and Implementation	0	But mentions in Step 8 that 2 comp plans need updates
3B.7	Comprehensive Land Use Plan Strategy and Policies	0	
3B.8	Disaster Recovery Plan	0	
3B.9	Emergency Operations Plan	2	Listing of Emer.Op.Plan And Haz.Mit.Plan are inconsistent
3B.10	Habitat Conservation Plan	0	
3B.11	Local Hazard Mitigation Plan	1	
3B.12	Project Plans	1	Drainage
3B.13	State Hazard Mitigation Plan	1	only for hazard identification
3B.14	Stormwater Management Plan	0	

Part 4: Hazard Identification/Risk Assessment		
	Code	**Comments**
Coding Categories: 0 = not present 1 = present		
4A - Hazard ID		
4A.1 Climate Change	0	
4A.2 Coastal Erosion	1	
4A.3 Dam/Levee Failure	1	
4A.4 Drought	1	
4A.5 Earthquakes	1	
4A.6 Extreme Temperatures (Cold)	0	
4A.7 Extreme Temperatures (Heat)	1	
4A.8 Fire	1	
4A.9 Floods (Drainage/Localized Unmapped)	1	
4A.10 Floods (Riverine / Flash Flooding / Mapped Floodplain)	1	
4A.11 Floods (Tide/Surge)	1	
4A.12 Hurricanes/Coastal Storms	1	
4A.13 Landslides	0	N/A
4A.14 Man Made/Technological	0	
4A.15 Mudslides/Debris Flows	0	N/A
4A.16 Other	1	Hailstorms
4A.17 Sea Level Rise	1	
4A.18 Severe Storms	0	
4A.19 Subsidence/Sinkholes	1	And expansive soils
4A.20 Tornadoes	1	
4A.21 Tsunamis	0	N/A
4A.22 Volcanoes	0	N/A
4A.23 Winter Storms	1	
4B - Hazard Prioritization		
4B.1 Factors Used	0	Mentions “high known” flood hazards but no prioritization. Also, some other hazards relate to flooding issues, and these factors are not used.
4B.1 Prioritization Classification Used	0	
Coding Categories: 0 = not present 1 = mentioned, but not detailed 2 = mentioned and detailed		
4C - Hazard Assessment – Floods		
4C.1 Delineates Future Riverine/Coastal Conditions	1	Future development and its impacts are discussed.
4C.2 Delineates Likelihood of Flood Events	1	Not detailed, only probability determined by # of events/years
4C.3 Delineates Location and Boundaries of Localized Hazardous Areas	2	Per jurisdiction

4C.4	Delineates Location and Boundaries of Mapped Floodplains	2	Per jurisdiction
4C.5	Delineates Magnitude and Severity of Flood Hazards	1	Not specific enough to planning area or individual jurisdictions (mostly regional). Mostly gives definitions of types. Description of coastal flooding is somewhat inconsistent.
4C.6	Describes Separate Characteristics of Flood Hazards	1	
4C.7	Includes Information of Previous Flood Events	1	
4D - Risk Assessment			
4D.1	Documentation/Estimation of Losses Avoided	0	Not "avoided"
4D.2	HAZUS Software	0	
4D.3	Loss Estimations for Private Structures	1	"Insurance in force" may apply to this. But there is no distinction between private and public. Therefore, I gave one point for the two items.
4D.4	Loss Estimations for Public Structures	0	
4D.5	Multi-Hazard Risk Assessment	0	
4D.6	Systematic Risk Assessment	0	
4E - Vulnerability Assessment			
4E.1	Critical Facilities	2	
4E.2	Development Trends	1	No maps
4E.3	Economy/Tax Base	2	Good narrative, but a map with relation to floodplain could have been better
4E.4	Environmental Assets	1	Explains environmental assets as an economic risk, but does not explain how they could be damaged by flood events. Good narrative on preventative benefits, but not much on vulnerability of natural areas
4E.5	Flood Insurance Claims	1	
4E.6	Infrastructure	2	
4E.7	Land Use Trends	0	
4E.8	Natural Floodplain Functions	1	
4E.9	Population Trends	0	
4E.10	Private Property	1	Only states residential property versus "non-residential" and no distinction about how different *types* of flooding would affect either
4E.11	Public Property	1	
4E.12	Public Safety	2	
4E.13	Repetitive Loss Properties	1	Repetitive Loss definitions and map but no narratives about ensuing Issues
4E.14	Socially Vulnerable Populations	0	
4E.15	Structures	1	Just totals, but not what's in floodplain?
4F - Jurisdiction-Specific Information in Multi-Jurisdictional Plan			
4F.1	Hazards ID and Assessment	1	Maps only, no narrative
4F.2	Risk Assessment	1	Just # of policies
4F.3	Vulnerability Assessment	1	A lot of data for each jurisdiction, but no summaries on what are the issues specific to each jurisdiction – what needs to be prioritized in the Action Plan

Part 5: Goals		
	Code	**Comments**
Coding Categories: 0 = not present 1 = present		
5A – General		
5A.1 Objectives (Linked to the Goals)	1	No measurable indicators
5A.2 Jurisdiction-Specific Goals (Multi-Jurisdictional Plan)	0	
5B – Coordination		
5B.1 Educate Public/Local Officials	1	
5B.2 Increase Information Availability	1	
5B.3 Local Coordination	1	
5B.4 State-Local Coordination	0	
5C - Hazard Loss		
5C.1 Distributes Hazards Management Costs Equitably	0	
5C.2 Minimize Fiscal Impacts of Disasters	0	Only to increase NFIP discount
5C.3 Protect Public Safety	1	
5C.4 Reduce Damage to Private Property	0	
5C.5 Reduce Damage to Property in General	1	
5C.6 Reduce Damage to Public Property	0	
5C.7 Reduce Impacts on Environment and Natural Resources	0	Goal says to use natural resources as mitigation
5D - Overarching Vision		
5D.1 Increase Resilience	1	“Minimize flood risk” ??
5D.2 No Adverse Impact	0	
5D.3 Promote Sustainability	0	

Part 6: Capability Assessment		
	Code	**Comments**
Coding Categories: 0 = not present 1 = present		
6A – General		
6A.1 Evaluates the **Effectiveness** of Current Regulatory and Preventative Standards and Programs	0	
6A.2 Include Discussion of All Possible Mitigation Actions	1	Although does not discuss specific land use/ development management tools
6A.3 Recommends Actions for Implementation	1	
Coding Categories: 0 = not present 1 = mentioned, but not detailed 2 = mentioned and detailed		
6B – Funding		
6B.1 Identifies Criteria for Prioritizing Projects to Receive Funding	0	Funding is not really addressed in the "Possible Activities"
6B.2 Identifies Current Funding Amounts	0	Not current or potential amounts
6B.3 Identifies Funding Available from State and Federal Grants	0	
6B.4 Identifies Local Funding Sources	1	Mentions some for natural areas protection
6C - Local		
6C.1 – Preventative		
6C.1.a Building Codes	1	
6C.1.b Building Design Change	0	
6C.1.c Cluster Development	0	
6C.1.d Comprehensive Plan Modifications	1	Doesn't explain when was last update, or what coordinates / conflicts with FMP
6C.1.e Density Bonuses	0	
6C.1.f Density Transfer Provisions	0	
6C.1.g Development Moratorium	0	
6C.1.h Documents Future Riverine/ Coastal Conditions	0	
6C.1.i Drainage System Maintenance	2	
6C.1.j Dune and Beach Maintenance	0	
6C.1.k Floodplain Management Regulations	1	
6C.1.l Freeboard Requirement	0	
6C.1.m Hazards Included in Land Suitability Analysis	0	
6C.1.n Land Use Change	0	
6C.1.o Post-Disaster Capital Improvements Adjustments	0	5/30

6C.1.p Preservation of Open Space	2	But not which areas would be good
6C.1.q Setbacks or Buffer Zones	0	
6C.1.r Site Review	1	"parcel specific" ??
6C.1.s Special Study / Impact Fees Assessment	0	
6C.1.t Stormwater Management Regulations	2	
6C.1.u Subdivision Regulations	0	
6C.1.v Tax Abatement	0	
6C.1.w Update Floodplain Mapping Criteria/Data	2	
6C.1.x Vegetation and Debris Removal	2	
6C.1.y Zoning	0	9/20
6C.2 – Property Protection		
6C.2.a Acquisition	1	
6C.2.b Adjustment of Public Infrastructure	1	
6C.2.c Berm/Floodwall	1	Not as a possibility, only that AP has a berm
6C.2.d Capital Improvements Plan	1	
6C.2.e Elevation of Structures	1	
6C.2.f Encourage Purchase of Flood Insurance	1	
6C.2.g Flood Proofing	1	
6C.2.h Retrofit of Existing Public Facilities	1	
6C.2.i Sewer Backup Protection	1	
6C.2.j Site Public Facilities	1	
6C.2.k Structure Relocation	1	
6C.2.l Sump Pump Failure Protection	0	
6C.2.m Voluntary Retrofitting of Private Structures	0	11/26
6C.3 – Natural Resource Protection		
6C.3.a Best Management Practices	1	1/13
6C.3.b Coastal Barrier Protection	0	
6C.3.c Dumping Regulations	0	
6C.3.d Dunes Protection	0	
6C.3.e Erosion and Sediment Control	0	
6C.3.f River Restoration	0	N/A
6C.3.g Wetlands Protection	0	Not specifically wetlands
6C.4 – Emergency Services		
6C.4.a Communications and Utilities	2	
6C.4.b Disaster Recovery Plan	0	
6C.4.c Disaster Warning System	1	Conflicting info on effectiveness and updates to the systems and plans
6C.4.d Emergency Plans	1	
6C.4.e Emergency Response Capability	2	
6C.4.f Evacuation	2	
6C.4.g Flood Detection	0	
6C.4.h Health and Safety Maintenance	2	11/21

6C.4.i Recovery Organizations/ Committee	0	
6C.4.j Sandbagging	0	Seems to be some confusion between response and recovery in regard to shelters
6C.4.k Sheltering	1	
6C.5 – Structural Projects		
6C.5.a Beach Nourishment	0	8/18
6C.5.b Channel Modifications	1	
6C.5.c Culverts	2	
6C.5.d Detention/Retention Basins	2	
6C.5.e Diversions	0	
6C.5.f Drainage Systems/Storm Sewers	2	
6C.5.g Dredging	0	
6C.5.h Levees/ Bulkheads/ Floodwalls/Seawalls	1	Only mentions AP berm which does not mitigate floods
6C.5.i Reservoirs	0	
6C.6 – Public Information Activities		
6C.6.a Educational Awareness Programs	2	
6C.6.b Library	0	
6C.6.c Map Information	2	
6C.6.d Outreach Projects	2	
6C.6.e Post Signs Indicating Hazardous Areas	0	
6C.6.f Real Estate Hazard Disclosure	1	Presented only as a question, no pros/cons, or current effectiveness
6C.6.g Technical Assistance for Developers Public	0	
6C.6.h Website	0	7/16

Part 7: Proposed Actions THE ACTION PLAN						
Coding Categories: 0 = not present 1 = present						
		Present	**Cost**	**Funding Source**	**Responsible Agency**	**Timetable**
7A – Preventative						
7A.1	Building Codes	0				
7A.2	Buildings Design Change	0				
7A.3	Cluster Development	0				
7A.4	Comprehensive Plan Modifications	1	0	State/fed	1	1
7A.5	Density Bonuses	0				
7A.6	Density Transfer Provisions	0				
7A.7	Development Moratorium	0				
7A.8	Documents Future Riverine/ Coastal Conditions	0				
7A.9	Drainage System Maintenance	1	0	Local govt	Local govt	1
7A.10	Dune and Beach Maintenance	0				
7A.11	Floodplain Management Regulations	1		Local govt	Local govt	1
7A.12	Freeboard Requirement	0				
7A.13	Hazards included in Land Suitability Analysis	0				
7A.14	Land Use Change	0				
7A.15	Post-Disaster Capital Improvements Adjustments	0				
7A.16	Preservation of Open Space	1		Local govt	Local govt	1
7A.17	Setbacks or Buffer Zones	0				
7A.18	Site Review	0				
7A.19	Special Study / Impact Fees Assessment	0				
7A.20	Stormwater Management Regulations	0				
7A.21	Subdivision Regulations	0				
7A.22	Tax Abatement	0				
7A.23	Update Floodplain Mapping Criteria/Data	0				
7A.24	Vegetation Debris Removal	1		CIP	Local govt	1
7A.25	Zoning	0				20/125
7B - Property Protection						
7B.1	Acquisition	1		Local govt	Local govt	1
7B.2	Adjustment of Public Infrastructure	0				
7B.3	Berm/Floodwall	0				
7B.4	Capital Improvement Plan	Not listed as a separate action				
7B.5	Elevation of Structures	0				
7B.6	Encourage Purchase of Flood Insurance	1		Local govt	Local govt	1

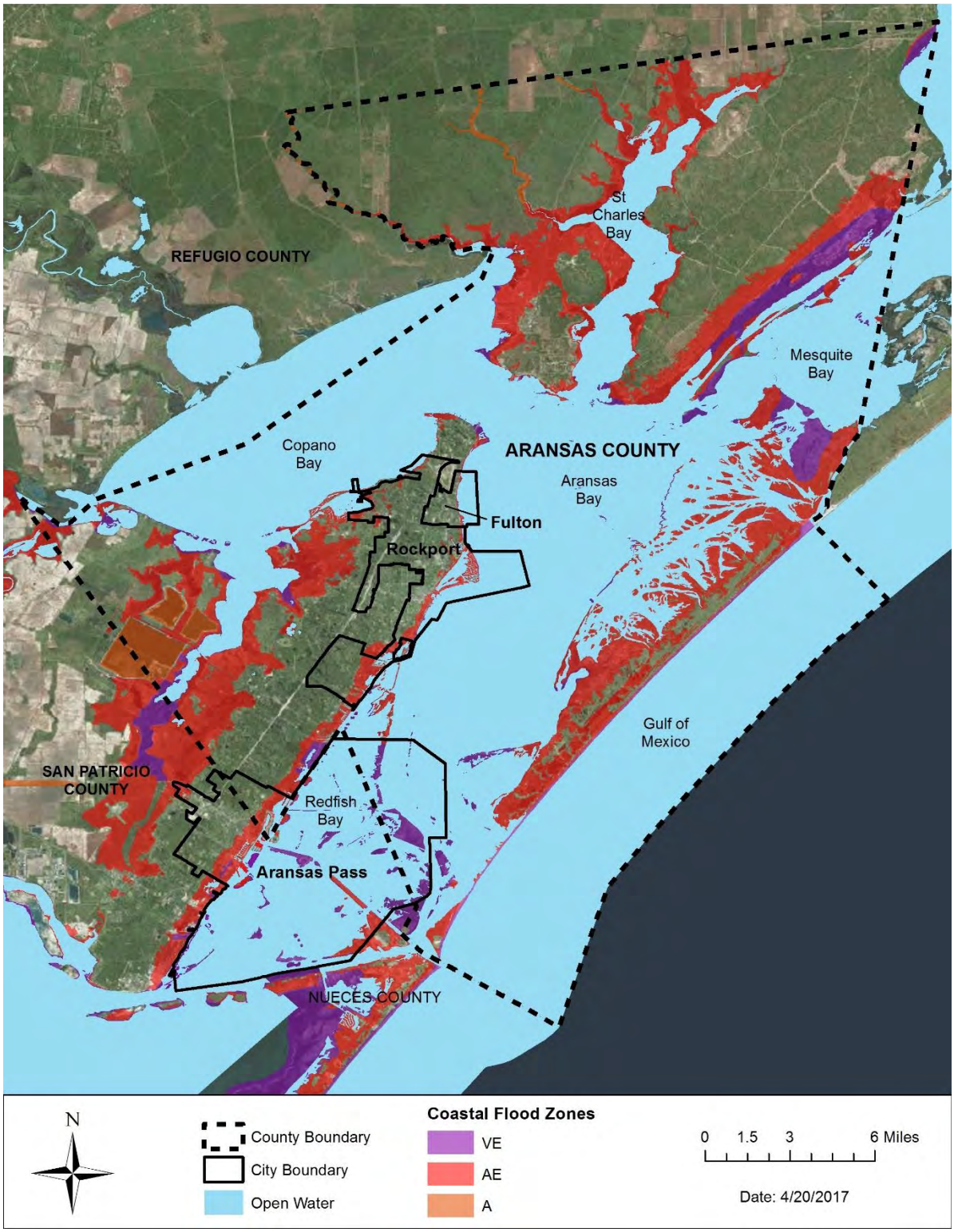
		Present	Cost	Funding Source	Responsible Agency	Timetable
7B.7	Flood Proofing	1		Local govt	Local govt	1
7B.8	Retrofit of Existing Public Facilities	0				
7B.9	Sewer Backup Protection	0				
7B.10	Site Public Facilities	0				
7B.11	Structure Relocation	0				
7B.12	Sump Pump Failure Protection	0				
7B.13	Voluntary Retrofitting of Private Structures	0				12/65
7C - Natural Resource Protection						
7C.1	Best Management Practices	1		Local govt	Local govt	**1**
7C.2	Coastal Barrier Protection	0				
7C.3	Dumping Regulations	0				
7C.4	Dunes Protection	0				
7C.5	Erosion and Sediment Control	1		Local govt	Local govt	1
7C.6	River Restoration	N/A				
7C.7	Wetlands Protection	0				8/30
7D - Emergency Services						
7D.1	Communications and Utilities	0				
7D.2	Disaster Recovery Plan	0				
7D.3	Disaster Warning System	0				
7D.4	Emergency Plans	0				
7D.5	Emergency Response Capability	0				
7D.6	Evacuation	0				
7D.7	Flood Detection	0				
7D.8	Health and Safety Maintenance	0				
7D.9	Recovery Organizations / Committee	0				
7D.10	Sandbagging	0				
7D.11	Sheltering	0				0/55
7E - Structural Projects						
7E.1	Beach Nourishment	0				
7E.2	Channel Modifications	0				
7E.3	Culverts	1		Local govt	Local govt	1
7E.4	Detention/Retention Basins	0				
7E.5	Diversions	0				
7E.6	Drainage Systems/Storm Sewers	1		Local govt	Local govt	1
7E.7	Dredging	0				
7E.8	Levees / Bulkheads / Seawalls/ Floodwalls	0				
7E.9	Reservoirs	0				8/45
7F - Public Information Activities						
7F.1	Educational Awareness Programs	1		GOMA grant	Local govt	1
7E.2	Library	0				
7E.3	Map Information	1		GOMA	Local govt	1

		Present	Cost	Funding Source	Responsible Agency	Timetable
7E.4	Outreach Projects	1		GOMA	Local govt	1
7E.5	Post Signs Indicating Hazardous Areas	1		GOMA grant	Local govt	1
7E.6	Real Estate Hazard Disclosure	0				
7E.7	Technical Assistance for Developers/Public	1		GOMA grant	Local govt	1
7E.8	Website	1		GOMA	Local govt	24/40

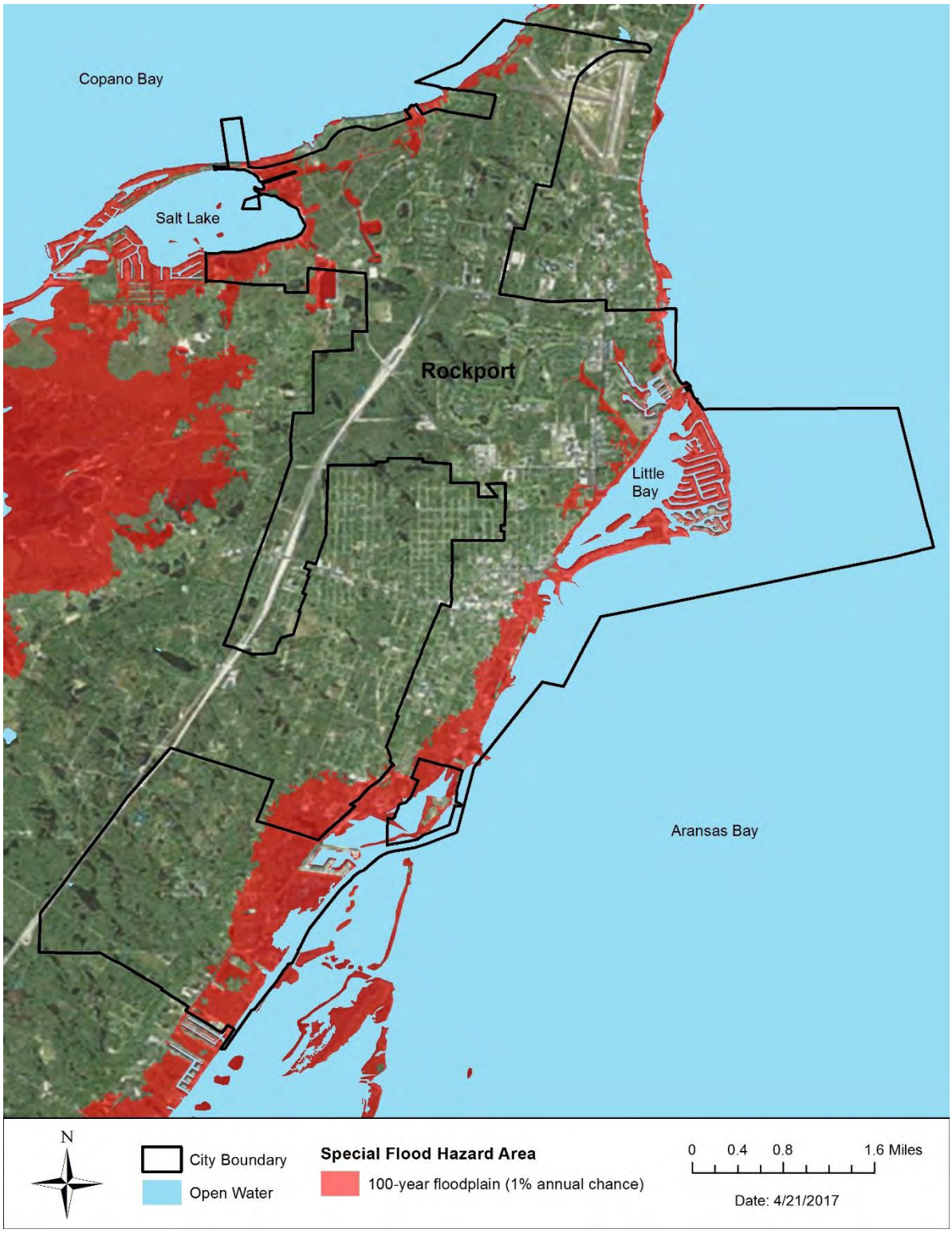
Part 8: Plan Maintenance			
		Code	**Comments**
Coding Categories: 0 = not present 1 = mentioned, but not detailed 2 = mentioned and detailed			
8A - Monitoring Implementation			
8A.1	Conflict Management / Dispute Resolution	0	
8A.2	Identifies Obstacles	0	
8A.3	Tracking Losses Post Disaster Event	0	
8A.4	Tracking Use of Post-Disaster Funds	0	
Coding Categories: 0 = not present 1 = present			
8B - Monitoring Plan			
8B.1	Annual Evaluation Report	1	
8B.2	Evaluation Report Prepared by Original Planning Committee/ Successor Committee	1	*For* - not *By*
8B.3	Identifies Criteria	0	
8B.4	Identifies Parties	1	
8B.5	Indicators/Benchmarks	0	*Deliverables* may count as these?
8B.6	Public Involvement	0	Only *made available to the public*, not involvement of the public in monitoring or revising actions

APPENDIX 2: **ARANSAS COUNTY MULTI-JURISDICTIONAL FLOODPLAIN MANAGEMENT PLAN SAMPLE MAPS**

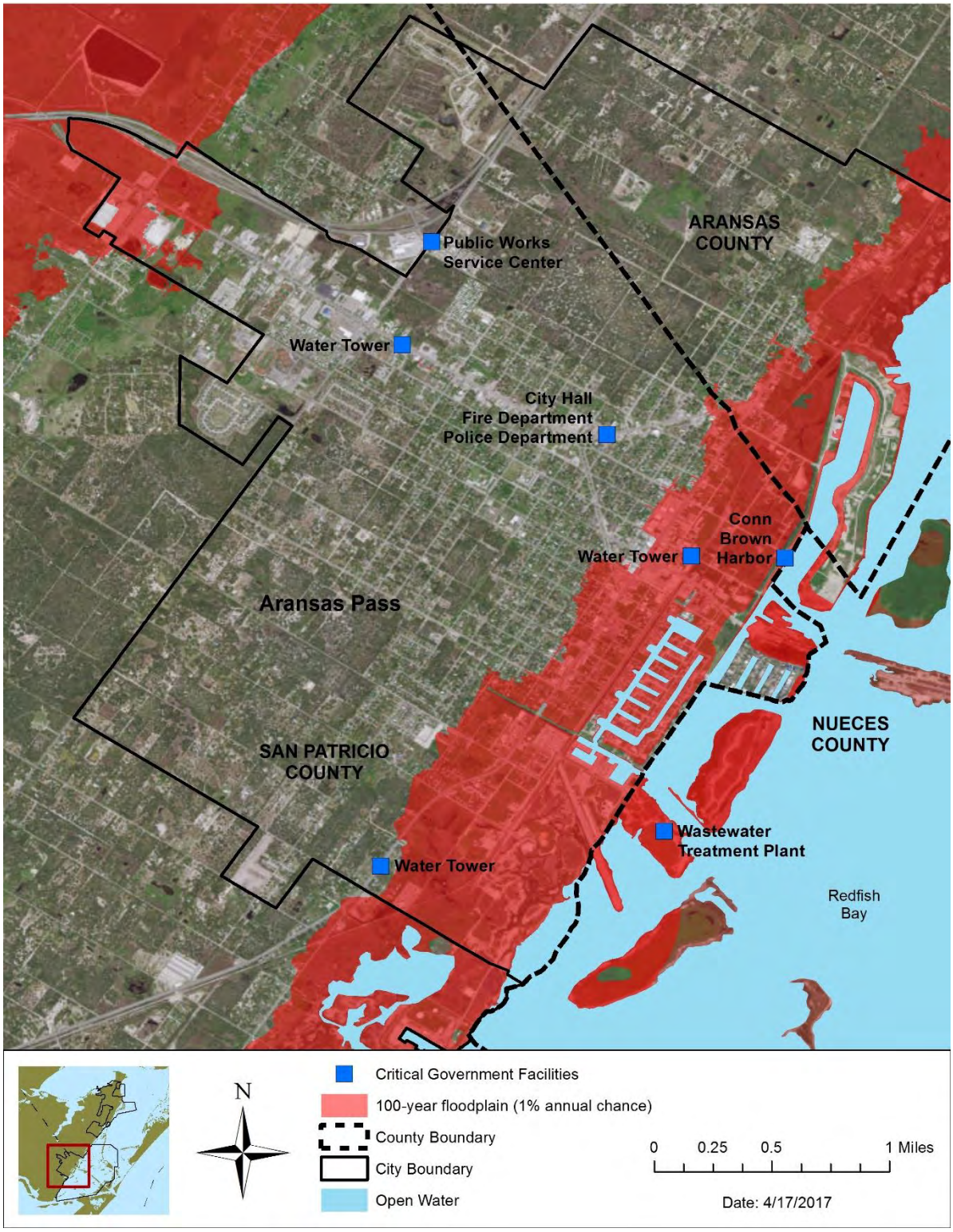
County Coastal Flood Zones



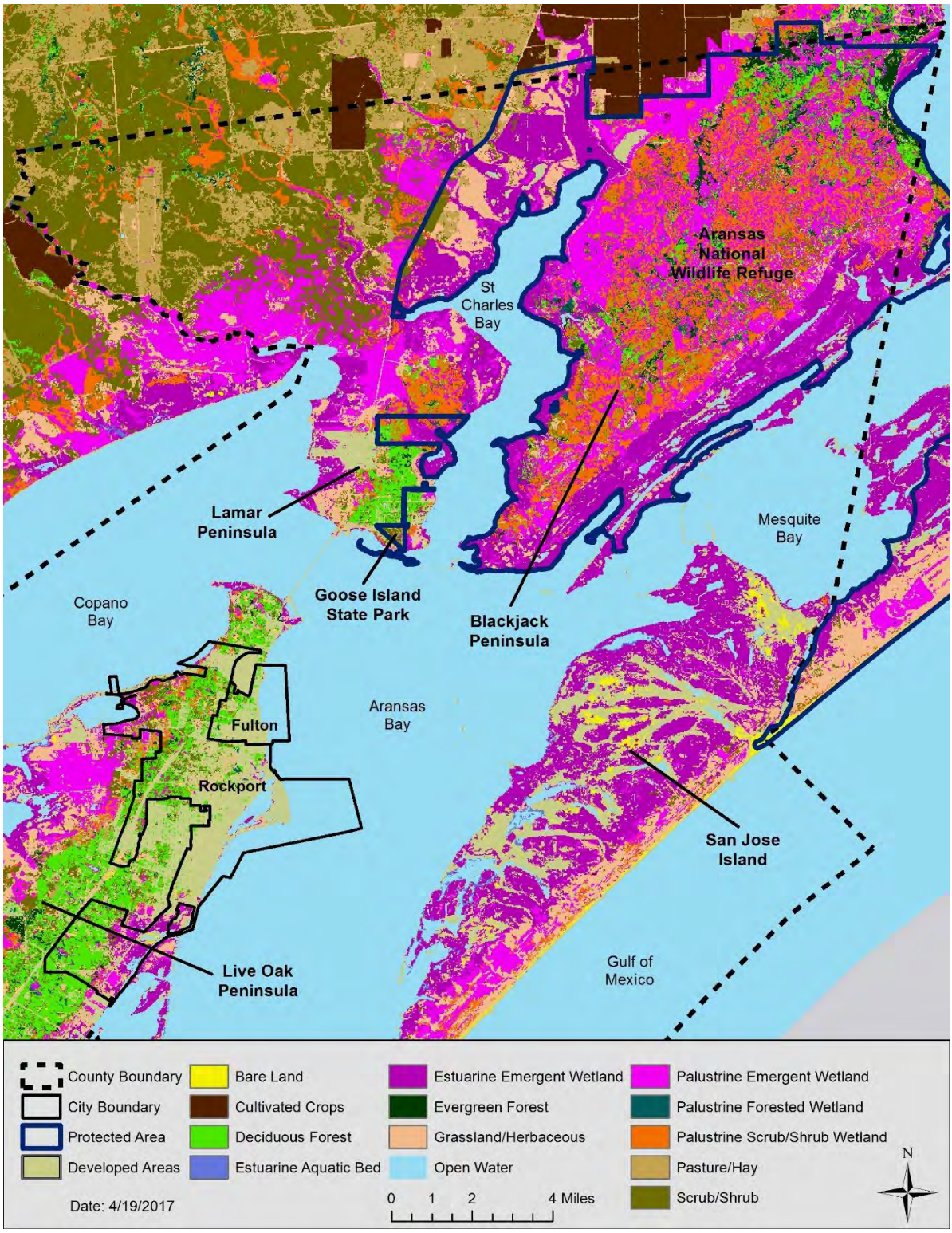
Rockport Special Flood Hazard Area (1% Annual Chance Floodplain)



Aransas Pass Critical Government Facilities



Landcover – Northern Extent



APPENDIX 3: **ARANSAS COUNTY MULTI-JURISDICTIONAL FLOODPLAIN MANAGEMENT PLAN ACTION PLAN**

GOAL 1: PROTECT EXISTING RESOURCES THROUGH REGULATORY STANDARDS

Objective 1.1: Investigate the adoption of any further floodplain regulations that would strengthen floodplain management in each of the plan jurisdictions.

Aransas County and the participating municipalities already have standards that exceed National Flood Insurance Program (NFIP) standards. Maintaining the regulatory and long-term planning tools at the jurisdictions' disposal, and strengthening these tools where appropriate, will help keep flood insurance premiums as low as possible and residents safe.

Action 1.1.a: Evaluate current floodplain management regulations in other coastal towns, cities, and counties in order to identify potential areas of improvement for Aransas County jurisdictions.
Timeframe: Years 1-2
Deliverable: Summary report that identifies floodplain standards used in other locations (as deemed appropriate), and assesses the potential opportunities for improvement in Aransas County (and associated municipalities) over time.
Office(s) of Primary Responsibility: Aransas County, Floodplain Administrator; City of Rockport, Community Planner; City of Aransas Pass, Floodplain Manager and Director of Public Works; and Town of Fulton, Supervisor of Sewer and Streets
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Preventive

Action 1.1.b: Using the information collected in Action 1.1.a, create a plan for how, and when, to integrate potential improvements into existing county and municipality regulations.
Timeframe: Years 3-5
Deliverable: A recommended plan of action will be provided to the county and each municipality that identifies potential improvements that can be made to local regulations to strengthen floodplain management in the Aransas County Multi-Jurisdictional Flood Plain Management Plan 2017 62 area. This plan will provide the best possible assessment for when and how these improvements might be made.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass Floodplain Manager and Director of Public Works; and Town of Fulton Supervisor of Sewer and Streets
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Preventive

Action 1.1.c: Create a coordinated development flow-chart for Aransas County, the Town of Fulton, and the City of Rockport floodplain managers. This document will provide information about who to contact for questions regarding development within the Fulton and Rockport extraterritorial jurisdictions (ETJ).
Timeframe: Year 1
Deliverable: A flowchart which clearly identifies the appropriate positions—within the town, city, and county— to contact for information about development questions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; and Town of Fulton Supervisor of Building Codes and Facilities
Budget: Staff time (operating funds)

Priority: Medium
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Action 1.1.d: Incorporate higher floodplain management standards into City of Aransas Pass comprehensive plan update.
Timeframe: Years 2-3
Deliverable: A completed comprehensive plan update for Aransas Pass, which incorporates higher floodplain management standards.
Office(s) of Primary Responsibility: City of Aransas Pass City Planner; and Aransas Pass Comprehensive Plan consultant (GrantWorks)
Budget: Staff time (operating funds); Texas Department of Agriculture Community Development Block Grant funds ($55,000 has been awarded and the city will provide $21,745 in matching funds, for a total of $76,754).
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Action 1.1.e: Incorporate higher floodplain management standards into City of Rockport comprehensive plan update.
Timeframe: Years 2-3
Deliverable: A completed comprehensive plan update for Rockport, which incorporates higher floodplain management standards.
Office(s) of Primary Responsibility: City of Rockport Public Works Director; Plan consultant (not yet identified)
Budget: Staff time (operating funds); potential grant funding
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Action 1.1.f: Incorporate higher floodplain management standards into Aransas County Hazard Mitigation Action Plan update.
Timeframe: Years 2-3
Deliverable: A completed Hazard Mitigation Action Plan update for the county, which incorporates higher floodplain management standards.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; Town of Fulton Supervisor of Sewer and Streets and Supervisor of Building Codes and Facilities; City of Aransas Pass Emergency Management Coordinator and City Planner; and Plan consultant (Lockwood, Andrews & Newnam, Inc.)
Budget: FEMA Flood Mitigation Assistance funds (grant pending FEMA release of funds)
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

Objective 1.2: Research low impact development.
Collect information about low impact development, including how it has been used, implemented, promoted, and regulated; so that the community can analyze this style of development as a possible educational or development tool in the future.

Action 1.2.a: Collect best practices methods on low impact development from towns, cities, and counties of similar characteristics.
Timeframe: Years 3-5
Deliverable: A summary document which explains low impact development; details and options about how it has been used, implemented, promoted, and regulated; and provides specific, comparable examples where each of these things has been done well.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner and Building Official; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Preventive; with possible application in Property Protection; Natural Resource Protection; Structural Projects; and Public Information

Action 1.2.b: Partner with Mission-Aransas National Estuarine Research Reserve to host a low impact development workshop. This workshop will be based on the data compiled in action 1.2.a, and will be designed to educate decision-makers and citizens about low impact development and possible options regarding how it could be used in Aransas County.
Timeframe: Years 2-3
Deliverable: In coordination with Mission-Aransas National Estuarine Research Reserve, prepare for and host at least one workshop to educate local decision-makers and concerned citizens about low impact development, and possible options regarding how it could be utilized in Aransas County. Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Environmental Specialist; City of Aransas Pass City Planner; and Town of Fulton Mayor; Mission-Aransas National Estuarine Research Reserve Coastal Training Coordinator
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Preventive and Public Information; with possible application in Property Protection and Structural Projects

Objective 1.3: Utilize the Community Rating System (CRS) to incentivize higher floodplain management standards.
FEMA's CRS allows participating communities to earn a class rating by implementing standards higher that those outlined by the NFIP; which then leads to discounts to flood insurance premiums for residents.

Action 1.3.a: Complete process of entry into CRS for the City of Rockport.
Timeframe: Year 1
Deliverable: Final notification from Insurance Services Organization (ISO)/FEMA regarding entry into the CRS, and determination of Rockport's CRS Classification.
Office(s) of Primary Responsibility: City of Rockport Mayor
Budget: $60,000 (funds committed)
Priority: High
CRS Categories Addressed: Preventive with possible application in Property Protection and Public Information

Action 1.3.b: Complete process of entry into CRS for Aransas County.
Timeframe: Years 1-2

Deliverable: Final notification from ISO/FEMA regarding entry into the CRS, and determination of Aransas County's CRS Classification.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator
Budget: $45,000 from Gulf of Mexico Alliance grant
Priority: High
CRS Categories Addressed: Preventive; with possible application in Property Protection and Public Information

Action 1.3.c: Investigate whether CRS is viable for the City of Aransas Pass and the Town of Fulton.
Timeframe: Years 2-4
Deliverable: Letters of intent from Aransas Pass and Fulton which detail if, and when each municipality intends on initiating the process of joining the CRS.
Office(s) of Primary Responsibility: City of Aransas Pass City Planner and City Manager; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Preventive; with possible application in Property Protection; Structural Projects; and Public Information

GOAL 2: PROTECTING PROPERTY THROUGH MITIGATIVE MEASURES

Objective 2.1: Develop a prioritized list of natural areas and repetitive loss properties that would be best suited for purchase, in order to create and preserve natural areas to mitigate future flooding.
This initiative would also require an investigation of potential funding opportunities to support the purchase of private lands for restoration and protection.

Action 2.1.a: Evaluate list of repetitive loss properties for opportunities to partner with property owners regarding potential mitigation actions.
Timeframe: Years 1-2
Deliverable: A summary document which identifies and prioritizes the repetitive loss properties within the county for possible buy out or other mitigation actions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; City of Aransas Pass Floodplain Manager
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection and Natural Resource Protection

Action 2.1.b: Evaluate areas in the floodplain viable for open space preservation.
Timeframe: Years 3-5
Deliverable: A summary document which identifies and prioritizes the undeveloped areas in the county for possible preservation or other mitigation actions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection and Natural Resource Protection

Action 2.1.c: Investigate grant opportunities for property buyouts, open space preservation, or other flood mitigation measures. Using the information gained in actions 2.1.a and 2.1.b, investigate possible funding opportunities to pursue the highest priority projects.
Timeframe: Years 3-5
Deliverable: A summary document which summarizes grant opportunities to support the purchase of repetitive loss properties and undeveloped land in order to provide restoration, preservation, and possibly other mitigative actions.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner and Floodplain Manager; and Town of Fulton Mayor
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection and Natural Resource Protection

Action 2.1.d: Investigate potential partnerships with local non-profit organizations to purchase high priority areas for public parkland/open space preservation (organizations include, but are not limited to: Aransas Pathways, Aransas First, Coastal Bend Bays & Estuaries, and The Nature Conservancy). Using the information gained in action 2.1.b, network with local non-profit organizations to investigate possible partnerships to facilitate the purchase of undeveloped land for preservation.
Timeframe: Years 3-5
Deliverable: A summary document which records the attempts to network with local non-profit organizations. This document will also provide a plan for future work that will guide future efforts to purchase and preserve the agreed upon undeveloped areas.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner and Parks and Leisure Director; City of Aransas Pass City Planner; Town of Fulton Mayor.
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Property Protection and Natural Resource Protection

<u>GOAL 3: CREATE A COORDINATED FLOOD PREPAREDNESS AND RESPONSE STRATEGY</u>
Objective 3.1: Create a comprehensive Public Information Plan.
This process will involve developing a public flood awareness and education campaign, creating a flood response plan for local building departments, communicating flood risk to susceptible areas, and promoting the State of Texas Emergency Assistance Registry to vulnerable populations. (The City of Rockport received a $45,000 “Small Communities Grant” from the Gulf of Mexico Alliance (GOMA) to produce a multi-jurisdictional Public Information Plan by August 2018.)

Action 3.1.a: Attend public events to promote and sign-up vulnerable populations to the State of Texas Emergency Assistance Registry.
Timeframe: Years 1-5 (throughout entire plan timeframe)
Deliverable: A summary spreadsheet that identifies the events attended and tallies the number of people registered per event, quarterly, and annually.
Office(s) of Primary Responsibility: Aransas County Emergency Management Coordinator; City of Rockport Mayor and City Manager; City of Aransas Pass City Planner; Town of Fulton Chief of Police
Budget: Staff time (operating funds) and $5,000 of the GOMA award
Priority: High

CRS Categories Addressed: Public Information

Action 3.1.b: Develop a joint floodplain management and awareness website with all jurisdictions.
Timeframe: Years 1-2
Deliverable: A final, live website that provides educational information about floodplain management and awareness to local residents, businesses, and visitors.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass Floodplain Manager; Town of Fulton Chief of Police and Supervisor of Building Codes and Facilities; Website consultant (not yet selected)
Budget: Staff time (operating funds) and $8,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.c: Publish informational flood articles in city and county newsletters.
Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: Copies of all articles published, along with a summary document that identifies the articles published, location of publication, and dates.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Relations; City of Aransas Pass Floodplain Manager and City Planner; Town of Fulton Town Secretary
Budget: Staff time (operating funds) and $2,500 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.d: Partner with local media outlets to publish and distribute flood literature. This will most likely take the form of brochures, flyers, etc.
Timeframe: Years 1-2 (Products will be completed in years 1-2; then distributed throughout the plan timeframe)
Deliverable: Copies of all materials created, along with a summary document that identifies each item and the locations where it is distributed.
Office(s) of Primary Responsibility: Aransas County Emergency Management Coordinator; City of Rockport Community Relations and Community Planner; City of Aransas Pass City Planner and Emergency Management Coordinator; Town of Fulton Town Secretary; local media outlets (e.g. the Rockport Pilot, the Wonderful Women's Network, etc.)
Budget: Staff time (operating funds) and $2,500 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.e: Develop and install educational signage regarding flood safety to be located along low areas of roadways likely to flood.
Timeframe: Years 1-2
Deliverable: A summary document that provides image(s) of the signs and identifies each location where the signs were installed.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; City of Aransas Pass Public Works Director; Town of Fulton Supervisor of Sewer and Streets
Budget: Staff time (operating funds) and $7,000 of the GOMA award
Priority: High

CRS Categories Addressed: Public Information

Action 3.1.f: Create a flood response plan that develops public information projects to be disseminated before, during, and after a flood event.
Timeframe: Years 1-2
Deliverable: A flood response plan that will identify outreach projects that can be utilized to give the public information on flood protection, rebuilding after a flood event, grant information, etc.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass Building Official and Floodplain Manager; Town of Fulton Supervisor of Building Codes and Facilities
Budget: Staff time (operating funds)
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.g: Host workshops with property owners concerned about flooding to discuss flood risk and possible mitigation actions.
Timeframe: Years 1-2
Deliverable: Summary report that describes a minimum of two public workshops designed for local property owners to learn about and discuss flood risk and possible mitigation actions that they can use to minimize the risks to their property. This document will include, at a minimum, information about the location of the meeting, the number of attendees, the agenda, a copy of any PowerPoint presentations made, and any key results or outcomes.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport City Manager and Community Planner; City of Aransas Pass City Planner; Town of Fulton Supervisor of Sewer and Streets
Budget: Staff time (operating funds) and $5,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information

Action 3.1.h: Send informational mailers to repetitive loss property owners about buyouts and other mitigation options.
Timeframe: Years 1-
Deliverable: A copy of the information sent, and a summary of any responses received.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner
Budget: Staff time (operating funds) and $5,000 of the GOMA award
Priority: High
CRS Categories Addressed: Public Information, Property Protection, Natural Resource Protection

Objective 3.2: Assess the needs for floodproofing of critical facilities located in the SFHA.
This would include a detailed assessment of needs, options, and funding opportunities available to support any identified needed improvements.

Action 3.2.a: Determine whether any lift stations and pump stations need generators.
Timeframe: Year 1
Deliverable: A summary document which identifies the lift and pump stations within the county, identifies the number, condition, location, and possible range of transport of existing generators, and details any additional needs for generators.

Office(s) of Primary Responsibility: City of Rockport Public Works Director and Utilities Director; City of Aransas Pass Public Works Director; Town of Fulton Supervisor of Sewer and Streets and Supervisor of Building Codes and Facilities
Budget: Staff time (operating funds)
Priority: Low
CRS Categories Addressed: Emergency Services

Action 3.2.b: Establish best management practices for floodproofing and mitigating historic buildings in Aransas County.
Timeframe: Years 3-5
Deliverable: A final report which documents recommendations for the best management practices for floodproofing and mitigating historic buildings in Aransas County, and for how those recommendations should be formalized within the municipalities.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Community Planner; City of Aransas Pass City Planner; Town of Fulton Mayor; and the Aransas County Historical Commission
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Property Protection

GOAL 4: CREATE A COORDINATED INFRASTRUCTURE PLAN FOR ALL JURISDICTIONS

Objective 4.1: Create a county-wide, prioritized, master plan of all flood related projects.
This master plan will include a list of all projects currently underway, and all needed projects. In addition, the plan would include a section on maintenance which will document and prioritize all ongoing and expected maintenance needs for the existing drainage improvements.

Action 4.1.a: Work across jurisdictions to coordinate drainage/stormwater projects that impact the same watershed or sub-watersheds while working to create a county-wide, prioritized, master plan of all flood related projects.
Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: A flood management master plan for Aransas County that identifies, prioritizes, and coordinates all flood related projects among the participating jurisdictions, and is adopted by the Aransas County Stormwater Management Advisory Committee.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Mayor; City of Aransas Pass Public Works Director; Town of Fulton Mayor
Budget: Operating and capital funds
Priority: Medium
CRS Categories Addressed: Preventive and Structural Projects

Action 4.1.b: Each jurisdiction will continue ongoing maintenance of drainage pipes, culverts, and swales until the county-wide master plan is approved and implementation can begin.
Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: Annual report which summarizes the maintenance activities over the previous year for each jurisdiction.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Public Works Director; City of Aransas Pass Public Works Director; Town of Fulton Mayor
Budget: Operating and capital improvement funds

Priority: High
CRS Categories Addressed: Preventive, and Structural Projects

Action 4.1.c: Continue to use county resiliency group to investigate potential funding options for erosion protection and habitat restoration.
Timeframe: Years 1-5 (throughout plan timeframe)
Deliverable: Annual report which summarizes the activities of the county resiliency group over the previous year.
Office(s) of Primary Responsibility: Aransas County Floodplain Administrator; City of Rockport Mayor; City of Aransas Pass Public Works Director and City Planner; Town of Fulton Mayor; Resiliency consultant (Aaron Horine, Mott MacDonald)
Budget: Staff time (operating funds)
Priority: Medium
CRS Categories Addressed: Preventive, Natural Resource Protection, and Structural Projects