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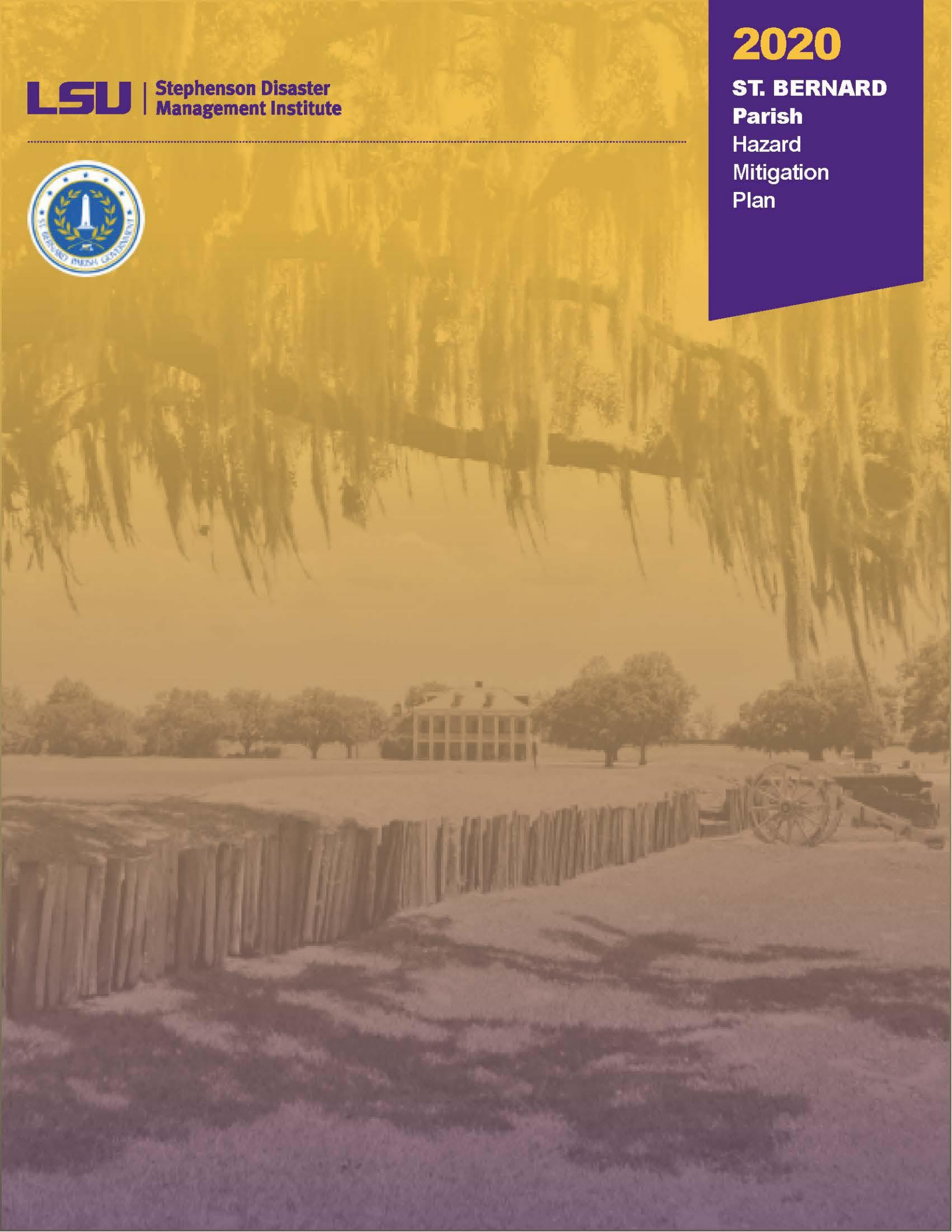
2020

ST. BERNARD Parish Hazard Mitigation Plan



ST. BERNARD PARISH
HAZARD MITIGATION PLAN UPDATE

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St. Bernard Parish

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Special thanks are directed to all of those who assisted in contributing their expertise and feedback on this document, especially the St. Bernard Parish Office of Homeland Security and Emergency Management. These combined efforts have made this project possible. The St. Bernard Parish Steering Committee consists of the following individuals, who are credited in the creation of this document:

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1. Introduction

Hazard Mitigation is defined as sustained actions taken to reduce or eliminate long-term risk from hazards and their effects. Hazard Mitigation Planning is the process through which natural hazards that threaten communities are identified, likely impacts of those hazards are determined, mitigation goals are set, and appropriate strategies that would lessen the impacts are determined, prioritized, and implemented.

In that regard, this plan (a) documents the St. Bernard Parish Hazard Mitigation Plan Update (HMPU) process; (b) identifies natural hazards and risks within the parish; and (c) identifies the parish's hazard mitigation strategy to make St. Bernard Parish less vulnerable and more disaster resilient. It also includes mitigation project scoping to further identify scopes of work, funding sources, and implementation timing requirements of proposed selected mitigation projects. Information in the plan will be used to help guide and coordinate mitigation and local policy decisions affecting future land use.

The St. Bernard Parish Hazard Mitigation Plan is a single jurisdictional plan that covers the unincorporated communities of Arabi, Chalmette, Meraux, Poydras, and Violet, among others. Multi-Jurisdictional requirements are not required nor addressed in this plan update.

The Federal Emergency Management Agency (FEMA), now under the Department of Homeland Security, has made reducing losses from natural disasters one of its primary goals. The Hazard Mitigation Plan (HMP) and subsequent implementation of recommended projects, measures, and policies is the primary means to achieving these goals. Mitigation planning and project implementation has become even more significant in a post-Katrina and Rita environment in south Louisiana.

This Hazard Mitigation Plan is a comprehensive plan for disaster resiliency in St. Bernard Parish. The parish is subject to natural hazards that threaten life and health and have caused extensive property damage. To better understand these hazards and their impacts on people and property, and to identify ways to reduce those impacts, the parish's Office of Homeland Security and Emergency Preparedness undertook this Natural Hazards Mitigation Plan. "Hazard mitigation" does not mean that all hazards are stopped or prevented. It does not suggest complete elimination of the damage or disruption caused by such incidents. Natural forces are powerful and most natural hazards are well beyond our ability to control. Mitigation does not mean quick fixes. It is a long term approach to reduce hazard vulnerability. As defined by FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event.

Every community faces different hazards and every community has different resources and interests to bring to bear on its problems. Because there are many ways to deal with natural hazards and many agencies that can help, there is no one solution for managing or mitigating their effects. Planning is one of the best ways to correct these shortcomings and produce a program of activities that will best mitigate the impact of local hazards and meet other local needs. A well-prepared plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and with other goals and programs, preventing conflicts and reducing the costs of implementing each individual activity.

Under the Disaster Mitigation Act of 2000 (42 USC 5165), a mitigation plan is a requirement for Federal mitigation funds. Therefore, a mitigation plan will both guide the best use of mitigation funding and meet the prerequisite for obtaining such funds from FEMA. FEMA also recognizes plans through its Community Rating

System (CRS), a program that reduces flood insurance premiums in participating communities. This program is further described in Section Three: Capability Assessment.

This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by natural hazards. It fulfills the Federal mitigation planning requirements, qualifies for CRS credit, and provides St. Bernard Parish and its communities with a blueprint for reducing the impacts of these natural hazards on people and property.

Geography and Population

Geography

St. Bernard Parish is located in the southeast portion of Louisiana along the state's Gulf of Mexico coastline. With a large portion of the development found between the east bank of the Mississippi River and the west bank of the Mississippi River- Gulf Outlet Canal, St. Bernard Parish is bordered to the north and northwest by Orleans Parish, to the south and southwest by Plaquemines Parish, and to the east by the Gulf of Mexico. St. Bernard Parish includes a surface area of approximately 2108 square miles (or 1,349,171 acres), of which 96% (1,332,035 acres) is open water and wetlands, while a mere 3% (14,466 acres) is urban development. Below, *Figure 1-1* shows the geographical location of St. Bernard Parish.

Figure 1-1: Location of St. Bernard Parish

The geography of St. Bernard Parish mainly consists of relatively flat floodplains and marshes, canals, and other bodies of water. The primary areas of urban development are concentrated in the northwestern part of the parish between the east bank of the Mississippi River and the Florida Walk and Forty Arpent Canals. Coincidentally, this is also the area with the highest natural elevation in the parish.

Approximately 90% of the total surface area of St. Bernard Parish is located within FEMA's 100-year floodplain (A zone), although a large portion of the populated areas within the parish lie in FEMA's 500-year floodplain (X zone). However, due to the location of St. Bernard Parish in relation to the numerous bayous, marshes, and canals in the area, as well as the Gulf of Mexico, all portions of St. Bernard Parish as susceptible to flooding of varying degrees.

St. Bernard Parish weather is typically warm and humid. Variations in daily temperature are determined by distance from the Gulf of Mexico and, to a much lesser degree, by differences in elevation. The average annual temperature for the state as a whole is 68ºF. January is typically the coldest month for Louisiana, averaging approximately 54ºF, while July is typically the warmest at an average of 83ºF. Winter months are usually mild with cold spells of short duration. For St Bernard Parish in particular, the summer months are usually quite warm, with an average daily maximum temperature in July and August of 89°F. Winters are typically mild. Snowfall averages less than two inches per year. Average annual rainfall for the area is 62.9 inches. St. Bernard Parish is susceptible to the normal weather dangers, such as tornados and floods, but due to its location within the state and its proximity to the Gulf of Mexico, the parish is extremely susceptible to tropical cyclones. Hurricane season lasts from June 1st to November 30th, with most hurricanes forming in August, September, and October.

Population

The population of St. Bernard Parish is estimated at 47,244 (2019 estimate) with a population percent change from April 1, 2010 – July 1, 2019 of 31.60%.

Table 1-1: St. Bernard Parish Population
(Source: US Census)

	2010 Census	2018 Estimate	2019 Estimate	Percent Change 2010 -2019
Total Population	35,897	46,721	47,244	31.60%
Population Density (Pop/Sq. Mi.)	95.1	-------	-------	-------
Total Households	-------	15,029	-------	-------
Persons Per Household	-------	3.02	-------	-------

Table 1-2: St. Bernard Parish Business Patterns
(Source: US Census, CBP)

Business Description	Number of Establishments	Number of Employees	Annual Payroll ($1,000)
Retail Trade	136	167	40,085
Manufacturing	33	1,431	145,873
Health Care and Social Assistance	60	558	20,652
Mining, Quarrying, Oil and Gas Extraction	3	0-19	___
Transportation and Warehousing	31	581	26,597
Construction	90	635	35,949
Administration/Support and Waste Management/Remediation Services	35	332	13,502
Real Estate and Rental and Leasing	23	50	2,631
Wholesale Trade	26	255	10,159
Other Services (except Public Administration)	57	708	20,957
Accommodation and Food Services	82	1,216	17,758
Financial and Insurance	32	170	7,040
Professional, Scientific, and Technical Services	42	167	6,116
Information	4	38	2,435
Educational Services	6	70	1,285
Arts, Entertainment, and Recreation	10	50	1,552
Utilities	4	39	2,838

Hazard Mitigation

To fully understand hazard mitigation efforts in St. Bernard Parish and throughout Louisiana, it is first crucial to understand how hazard mitigation relates to the broader concept of emergency management. In the early 1980s, the newly-created Federal Emergency Management Agency (FEMA) was charged with developing a structure for how the federal, state, and local governments would respond to disasters. FEMA developed the *four phases of emergency management*, an approach which can be applied to all disasters. The four phases are as follows:

- **Hazard Mitigation**—described by FEMA and the Disaster Mitigation Act of 2000 (DMA 2000) as "any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event." The goal of mitigation is to save lives and reduce property damage. Besides significantly aiding in the obviously desirous goal of saving human lives, mitigation can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities and minimize community disruption, helping communities return to usual daily living in the aftermath of disaster. Examples of mitigation involve a range of activities and actions including the following: land-use planning, adoption and enforcement of building codes, and construction projects (e.g., flood proofing homes through elevation, or acquisition or relocation away from floodplains).

- **Emergency Preparedness**—includes plans and preparations made to save lives and property and to facilitate response operations in advance of a disaster event.

- **Disaster Response**—includes actions taken to provide emergency assistance, save lives, minimize property damage, and speed recovery immediately following a disaster.

- **Disaster Recovery**—includes actions taken to return to a normal or improved operating condition following a disaster.

Figure 1-2 illustrates the basic relationship between these phases of emergency management. While hazard mitigation may occur both before and after a disaster event, it is significantly more effective when implemented before an event occurs. This is one of the key elements of this plan and its overall strategy*:* reduce risk before disaster strikes in order to minimize the need for post-disaster response and recovery.

As *Figure 1-2* demonstrates, mitigation relies on updating in the wake of disaster. This can give the appearance that mitigation is only reactive rather than proactive. In reality, however, post-disaster revision is a vital component of improving mitigation. Each hazardous event affords an opportunity to reduce the consequences of future occurrences.

Unfortunately, this cycle can be painful for a community. For instance, the risks of disasters that could create catastrophic incidents in Louisiana were thought to be relatively well-understood prior to 2005. However, the impact of the 2005 hurricane season on the Gulf Coast region of the United States prompted a new level of planning and engagement related to disaster response, recovery, and hazard mitigation. Hurricanes Katrina and Rita hit three weeks apart and together caused astonishing damage to human life and to property. The two storms highlighted a hurricane season that spawned 28 storms—unparalleled in American history. The 2005 hurricane season confirmed Louisiana's extreme exposure to natural disasters and both the positive effects and the concerns resulting from engineered flood-protection solutions.

Figure 1-2: The Four Phases of Emergency Management and their Relation to Future Hazard Mitigation (Source: Louisiana State Hazard Mitigation Plan 2014)

The catastrophic events of 2005 had profound impacts on emergency management and hazard mitigation throughout Louisiana. As detailed later in this document, significant funding has been made available to the State of Louisiana and its parishes for the purpose of hazard mitigation planning. The storms also raised awareness of the importance of hazard mitigation among decision-makers and the general population, which has been particularly important since natural hazards will likely be increasing in frequency, magnitude, and impact in the coming years due to climate change.

General Strategy

During the last update the Louisiana State Hazard Mitigation Plan, the State Hazard Mitigation Team (SHMT) began a long-term effort to better integrate key components of all plans with hazard mitigation implications

in Louisiana to ensure that the programs, policies, recommendations, and implementation strategies are internally consistent. As each of these documents has been adopted by various agencies within the state, the SHMT has worked to incorporate this information into the decision process.

Part of the ongoing integration process is that the Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) encourages the parishes and the local communities with independent hazard mitigation plans to utilize the same plan format and methodologies as the State Hazard Mitigation Plan in order to create continuity of information from local to state mitigation plans and programs.

The 2020 St. Bernard Parish Hazard Mitigation Plan (HMP) maintains much of the information from the 2015 plan version, but it now reflects the order and methodologies of the 2019 Louisiana State Hazard Mitigation Plan.

The sections of the 2015 St. Bernard HMP were as follows:

- Section One Introduction
- Section Two Hazard Identification and Risk Assessment
- Section Three Capability Assessment
- Section Four Mitigation Strategy
- Appendix A Planning Process
- Appendix B Plan Maintenance
- Appendix C Essential Facilities
- Appendix D Plan Adoption
- Appendix E State Required Worksheets

This plan update also coheres with the Plain Writing Act of 2010, which requires federal agencies to use clear communication that is accessible, consistent, understandable, and useful to the public. While the State of Louisiana and its political subdivisions are not required to meet such standards, the Act aligns with best practices in hazard mitigation. Since successful hazard mitigation relies on full implementation and cooperation at all levels of government and community, a successful hazard mitigation plan must also be easily used at all of these levels. Nevertheless, the St. Bernard Parish Hazard Mitigation Steering Committee was not ignorant or dismissive of the successful analysis and mitigation planning executed in previous plan updates. This plan update remains coherent with those documents, retaining language and content when needed, deleting it when appropriate, and augmenting it when constructive.

2020 Plan Update

This 2020 plan update proceeds with the previous goals of the St. Bernard Parish Hazard Mitigation Plan. The current goals are as follows:

Goal 1: Identify and pursue preventative measures that will reduce future damages from hazards

Goal 2: Enhance public awareness and understanding of disaster preparedness

Goal 3: Reduce repetitive flood losses in the parish

Goal 4: Facilitate sound development and rebuilding in the parish so as to reduce or eliminate the potential impacts of hazards

This plan update makes a number of textual changes throughout, but the most obvious changes are data related and structural edits. First, the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information's (NCEI) Storm Events Database was used in the analysis, which provides historical hazard data from 1950 to 2019. Furthermore, all of the sections were updated to reflect the most current information and the most current vision of the plan update. The most significant changes are the newly developed hazard profiles and risk assessments, as well as the removal of much repetition between sections from the previous plan updates.

The 2020 plan update is organized in the exact same format as the 2015 update as illustrated below:

Table 1-3: 2020 Plan Update Crosswalk

Plan Update Crosswalk	
Section 1: Introduction	Section 1: Introduction
Section 2: Hazard Identification and Risk Assessment	Section 2: Hazard Identification and Risk Assessment
Section 3: Capability Assessment	Section 3: Capability Assessment
Section 4: Mitigation Strategy	Section 4: Mitigation Strategy
Appendix A: Planning Process	Appendix A: Planning Process
Appendix B: Plan Maintenance	Appendix B: Plan Maintenance
Appendix C: Essential Facilities	Appendix C: Essential Facilities
Appendix D: Plan Adoptions	Appendix D: Plan Adoptions
Appendix E: State Required Worksheets	Appendix E: State Required Worksheets

Despite numerous changes in this plan update, the plan remains consistent in its emphasis on the few types of hazards that pose the most risk to loss of life, injury, and property in St. Bernard Parish and its communities. The extent of this risk is dictated primarily by its geographic location. Most significantly, St. Bernard Parish remains at high risk of water inundation from various sources, including flooding and tropical cyclone activity. The entire parish is also at high risk of damages from high winds and wind-borne debris caused by various meteorological phenomena. Other hazards threaten the parish and/or its communities, although not to such great degrees and not in such widespread ways. In all cases, the relative social vulnerability of areas threatened and affected plays a significant role in how governmental agencies and their partners (local, parish, state and federal) prepare for and respond to disasters.

Mitigation efforts related to particular hazards are highly individualized by jurisdiction. While St. Bernard is a single jurisdiction plan, they do have multiple communities that are partners in mitigation strategy efforts. Flexibility in response and planning is essential. The most important step forward to improve hazard management capability is to improve coordination and information sharing between the various levels of government regarding hazards.

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2. Hazard Identification and Parish-Wide Risk Assessment

This section assesses the various hazard risks that St. Bernard Parish faces in order to identify a strategy for mitigation. Having identified the categories of hazards, emergencies, disasters, and catastrophes, this section details the major climatological and natural/human-influenced hazards by (1) defining them, (2) explaining how they are measured, (3) describing their geographic extent, (4) surveying their previous occurrences, and (5) evaluating their future likelihood of occurrences.

The table below provides an overview of the hazards that had been previously profiled in the St. Bernard Parish Hazard Mitigation Plan published in 2015, as well as the hazards that were identified in the state's 2019 Hazard Mitigation Plan that were considered to be of high or medium risk for the parish by the state. Those hazards identified as high or medium risk by the state or previously identified as a risk by the parish, have been determined to provide a risk to the parish and will be profiled in this section.

Table 2-1: Hazard Profile Summary.

Hazard	Profiled in Previous Plan	Considered Medium or High Risk in the State's HM Plan	Profiled in the 2020 Update
Coastal Hazards/Subsidence	X		X
Flooding	X	X	X
Sinkholes	X		X
Thunderstorms (Hail, Lightning, & Wind)	X	X	X
Tornadoes	X	X	X
Tropical Cyclones	X	X	X

Prevalent Hazards to the Community

While many of the hazards identified in *Table 2-1* occur in the parish, their occurrence was not merited for further study by the planning committee. The determination was made to focus attention and resources on the most prevalent hazards, which include the hazards previously profiled, along with thunderstorms.

The following hazards have been selected to be included in this risk assessment:

a) Coastal Hazards/Subsidence
b) Flooding
c) Sinkholes
d) Thunderstorms (Hail, Lightning, & Wind)
e) Tornadoes
f) Tropical Cyclones

For analysis purposes, the impact of the critical and prevalent hazards is summarized as follows:

- Flooding from rivers and waterways, rain storms, tropical cyclones, and hurricanes in the following forms:
    a) Riverine
    b) Stormwater
    c) Surge
    d) Backwater flooding (as the result of river flooding and surge)
    e) Coastal
- High wind damage most commonly resulting from hurricanes, thunderstorms, and tornadoes
- Property damage resulting from all profiled natural hazards

The potential destructive power of tropical cyclones was determined to be the most prevalent hazards to the parish. Eighteen of the twenty-five disaster declarations St. Bernard Parish has received resulted from tropical cyclones, which validates this as the most significant hazard. Therefore, the issue of hurricanes will serve as the main focus during the mitigation planning process. Hurricanes present risks from the potential for flooding, primarily resulting from storm surge, and high wind speeds. While storm surge is considered the hazard with the most destructive potential, the risk assessment will also assess non-storm surge flooding as well. Flooding can also occur from non-hurricane events, as flash floods are a common occurrence due to heavy rainfall.

Hurricanes, tropical storms, and heavy storms are fairly common occurrences, and resultant wind damage is of utmost concern. Damage from high winds can include roof damage, destruction of homes and commercial buildings, downed trees and power lines, and damage and disruption to services caused by heavy debris. A wind map for St. Bernard Parish is included in the hurricane risk assessment.

St. Bernard Parish is also susceptible to tornadoes. Tornadoes can spawn from tropical cyclones or severe weather systems that pass through St. Bernard Parish. High winds produced by tornadoes have the potential to destroy residential and commercial buildings, as well as create wind-borne objects from the debris produced by the destruction of the natural and human environment, such as building materials and trees.

Previous Occurrences

Table 2-2 summarizes federal disaster declarations for St. Bernard Parish since 1965. Information includes names, dates, and types of disaster.

Table 2-2: St. Bernard Parish Major Disaster Declarations.

Disaster Number	Year	Declaration
208	9/10/1965	TROPICAL CYCLONE - HURRICANE BETSY
272	8/19/1969	TROPICAL CYCLONE - HURRICANE CAMILLE
374	4/27/1973	SEVERE STORMS & FLOODING
556	5/9/1978	SEVERE STORMS & FLOODING
616	4/9/1980	SEVERE STORMS & FLOODING
679	4/20/1983	SEVERE STORMS & FLOODING
752	11/1/1985	TROPICAL CYCLONE - HURRICANE JUAN

Disaster Number	Year	Declaration
956	8/26/1992	TROPICAL CYCLONE - HURRICANE ANDREW
1049	5/10/1995	SEVERE STORMS AND FLOODING
1246	9/23/1998	TROPICAL CYCLONE - HURRICANE GEORGES/TS FRANCES
1380	6/11/2001	TROPICAL CYCLONE - TROPICAL STORM ALLISON
1435	9/27/2002	TROPICAL CYCLONE - TROPICAL STORM ISIDORE
1437	10/3/2002	TROPICAL CYCLONE - HURRICANE LILI
3172	2/1/2003	LOSS OF SPACE SHUTTLE COLUMBIA
1548	9/15/2004	TROPICAL CYCLONE - HURRICANE IVAN
1601	8/23/2005	TROPICAL CYCLONE - TROPICAL STORM CINDY
1603	8/29/2005	TROPICAL CYCLONE - HURRICANE KATRINA
1607	9/24/2005	TROPICAL CYCLONE - HURRICANE RITA
1786	9/2/2008	TROPICAL CYCLONE - HURRICANE GUSTAV
1792	9/13/2008	TROPICAL CYCLONE - HURRICANE IKE
4041	10/28/2011	TROPICAL CYCLONE - TROPICAL STORM LEE
4080	8/29/2012	TROPICAL CYCLONE - HURRICANE ISAAC
3392	10/6/2017	TROPICAL CYCLONE – TRIPICAL STORM NATE
4458	8/27/2019	TROPICAL CYCLONE -HURRICANE BARRY
4484	3/24/2020	COVID-19 PANDEMIC

Probability of Future Hazard Events

The probability of a hazard event occurring in St. Bernard Parish is estimated in the table on the following page. The percent chance of an event happening during any given year was calculated by posting past events and dividing by the time period. Unless otherwise indicated, the time period used to access probability followed the method used in the State of Louisiana's most current Hazard Mitigation Plan. The primary source for historical data used throughout the plan is the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information's (NCEI) Storm Events Database, which provides historical hazard data from 1950 to 2019. In staying consistent with the state plan, the Storm Events Database was evaluated for the last twenty-five years (1994 – 2019) in order to determine future probability of a hazard occurring. While the 30-year record used by the State was adopted for the purpose of determining the overall probability, in order to assist with determining estimated losses, unless otherwise stated, the full 70-year record was used when Hazus wasn't available to determine losses. This full record was used to provide a more extensive record to determine losses. All assessed damages were adjusted for inflation in order to reflect the equivalent amount of damages with the value of the U.S. dollar today.

The following table shows the annual probability for each hazard occurring across the parish:

Table 2-3: Probability of Future Hazard Reoccurrence.

Hazard	Probability
	St. Bernard Parish
Coastal Hazards/Subsidence	100%
Flooding	56%
Sinkholes	< 1%
Thunderstorms (Hail)	57%
Thunderstorms (High Wind)	80%
Thunderstorms (Lightning)	21%
Tornadoes	30%
Tropical Cyclones	100%

As shown in *Table 2-3*, coastal hazards/subsidence and tropical cyclones have the highest chance of occurrence in the parish (100%). Coastal hazards and tropical cyclones are followed in probability by high winds from thunderstorms (80%), hail (57%), flooding (56%), tornadoes (30%), and lightning (21%). Sinkholes have an annual chance of occurrence in the parish of less than 1%.

Inventory of Assets for the Entire Parish

As part of the Risk Assessment, the planning team identified essential facilities throughout the parish. Several methods were used to assist in identifying all essential facilities, including field data collected by the Louisiana Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) on critical infrastructure from a previous hazard mitigation project.

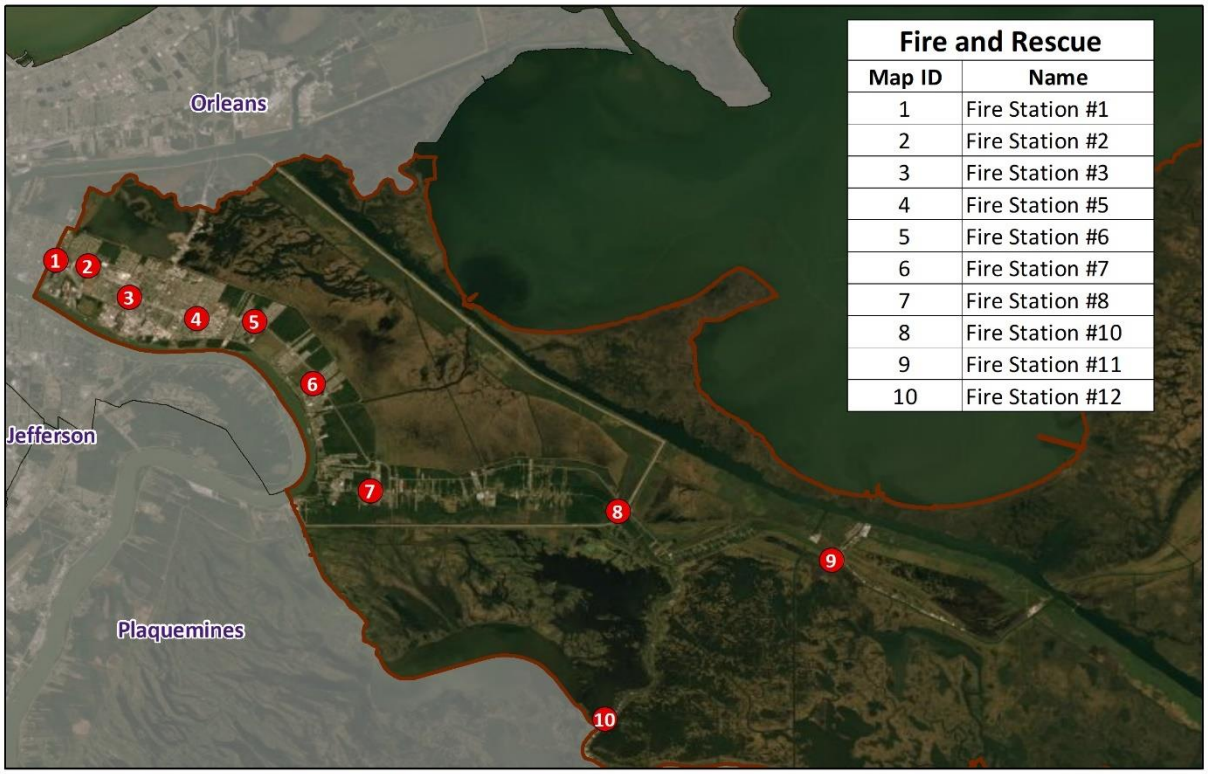
Within the entire planning area, there is an estimated value of $3,681,095,000 in structures throughout the parish. The table below provides the total estimated value for each type of structure by occupancy.

Table 2-4: Estimated Total of Potential Losses throughout St. Bernard Parish.

Occupancy	St. Bernard Parish
Agricultural	$8,759,000
Commercial	$646,044,000
Government	$15,932,000
Industrial	$133,490,000
Religion	$74,759,000
Residential	$2,741,825,000
Education	$60,286,000
Total	**$3,681,095,000**

Essential Facilities of the Parish

The following figures show the locations and names of the essential facilities within the parish:



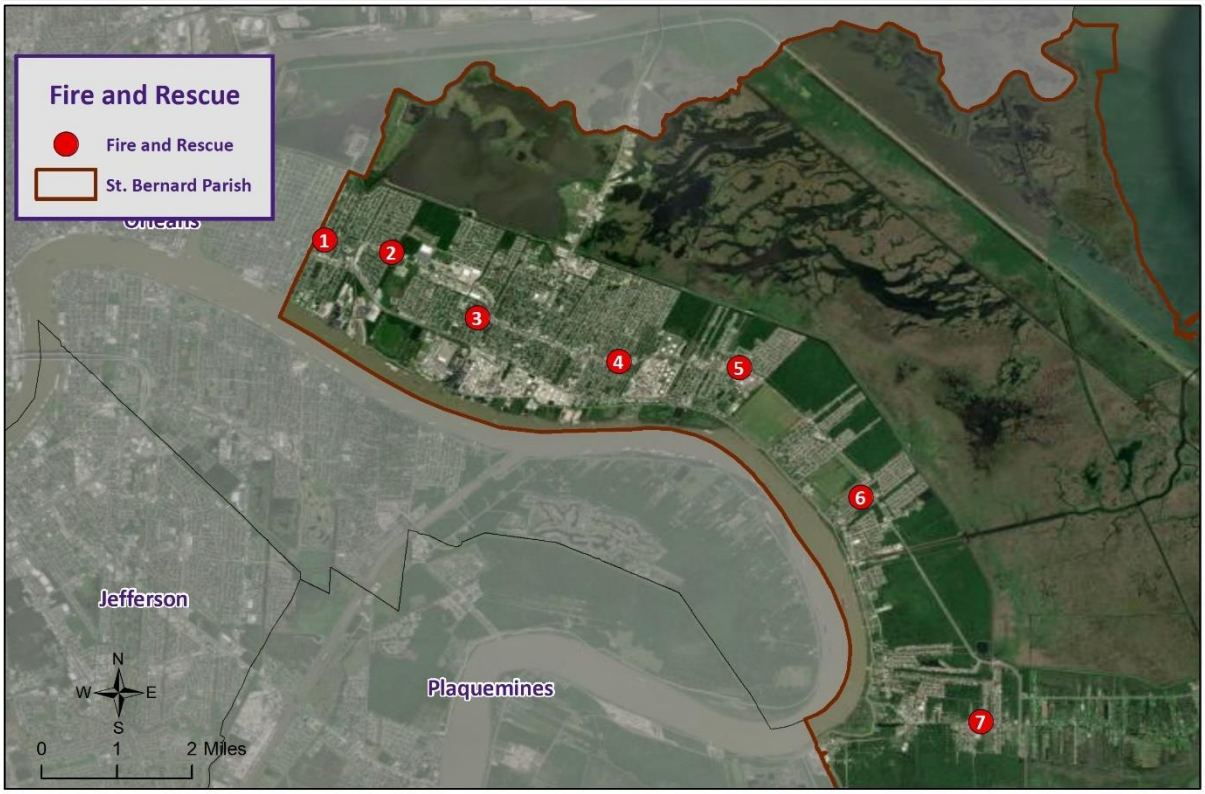
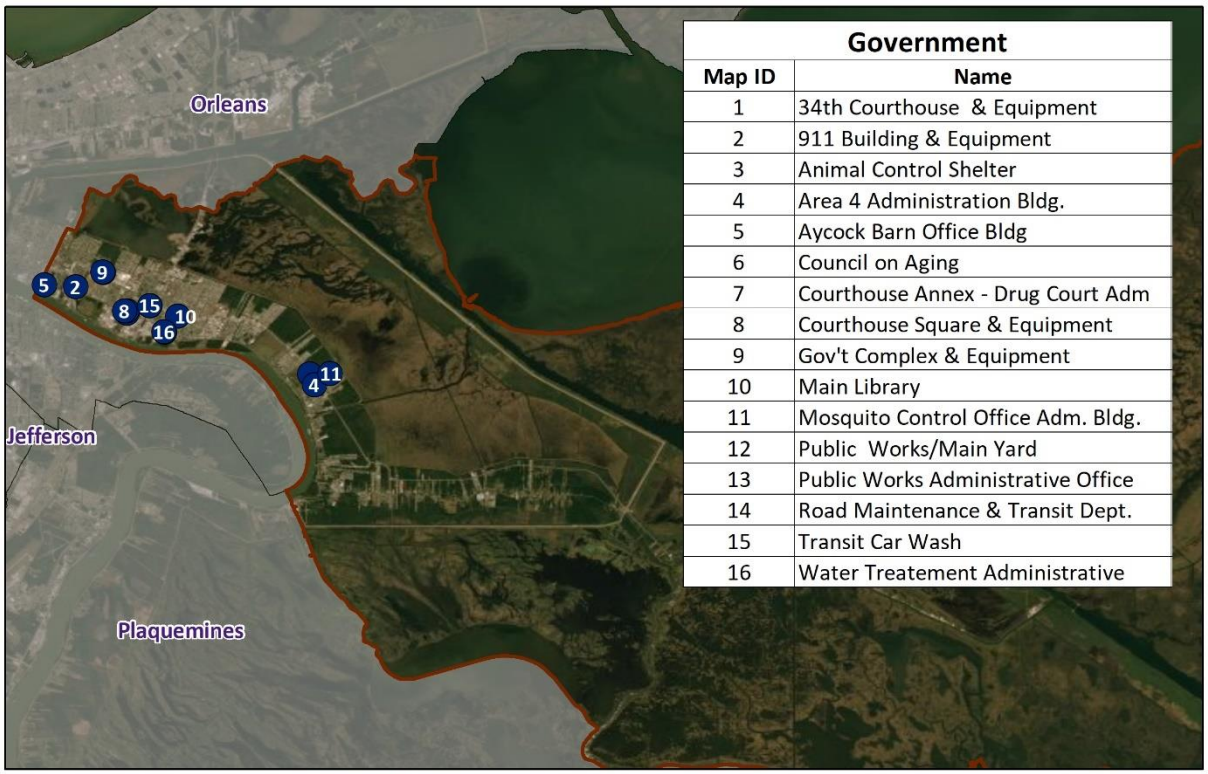


Figure 2-1: Fire and Rescue Facilities in St. Bernard Parish.



Government	
Map ID	Name
1	34th Courthouse & Equipment
2	911 Building & Equipment
3	Animal Control Shelter
4	Area 4 Administration Bldg.
5	Aycock Barn Office Bldg
6	Council on Aging
7	Courthouse Annex - Drug Court Adm
8	Courthouse Square & Equipment
9	Gov't Complex & Equipment
10	Main Library
11	Mosquito Control Office Adm. Bldg.
12	Public Works/Main Yard
13	Public Works Administrative Office
14	Road Maintenance & Transit Dept.
15	Transit Car Wash
16	Water Treatement Administrative

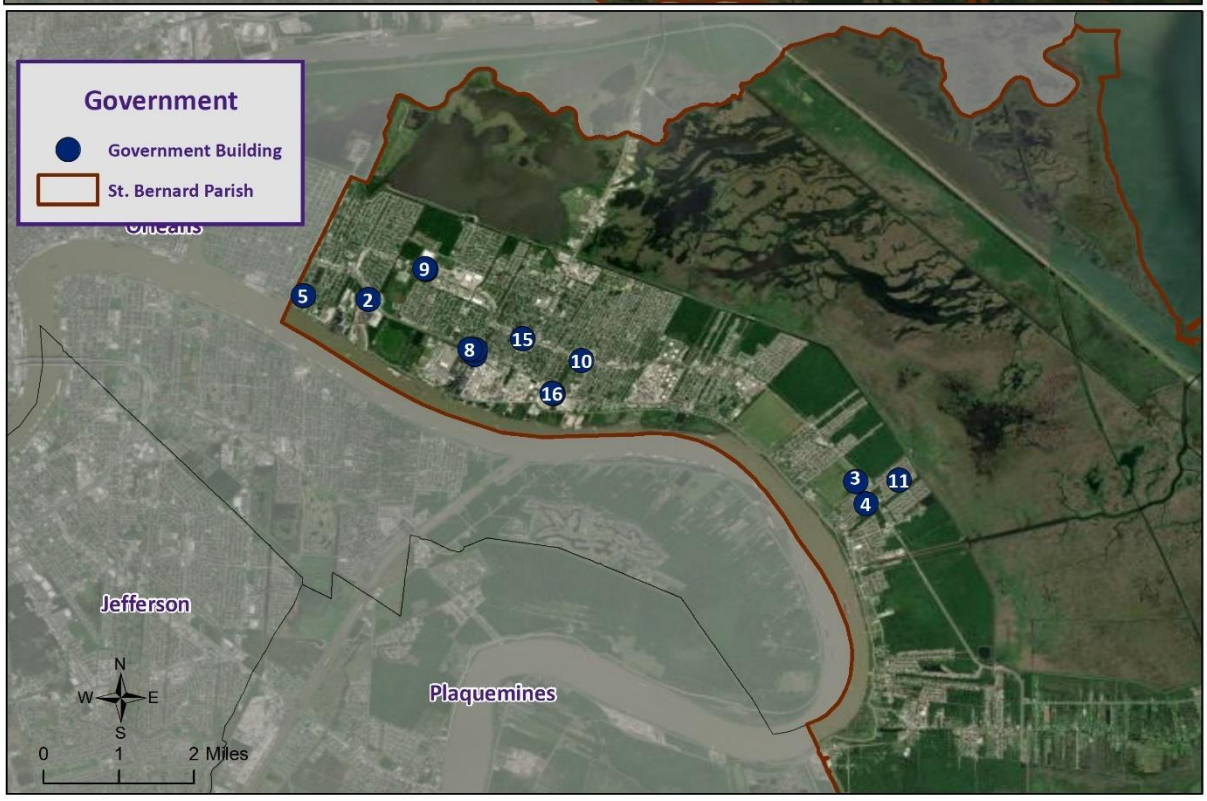


Figure 2-2: Government Buildings in St. Bernard Parish.

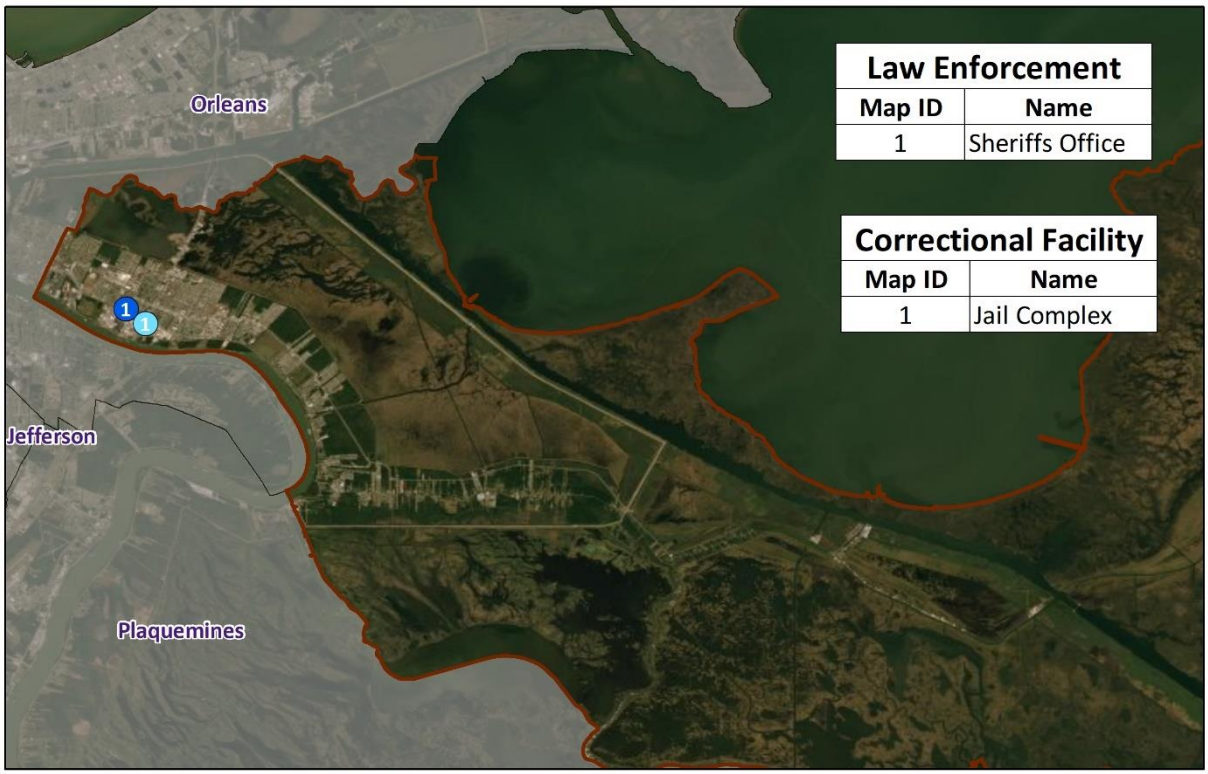


Figure 2-3: Law Enforcement and Correction Facilities in St. Bernard Parish.

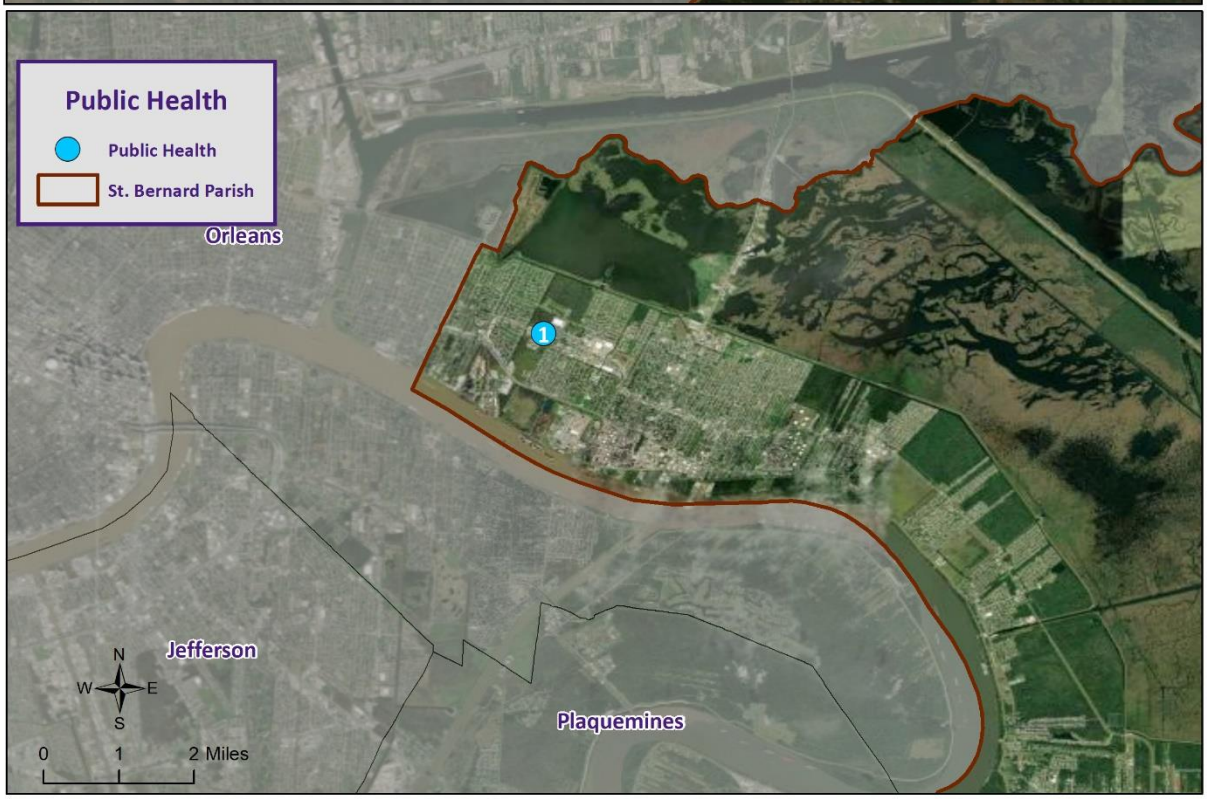
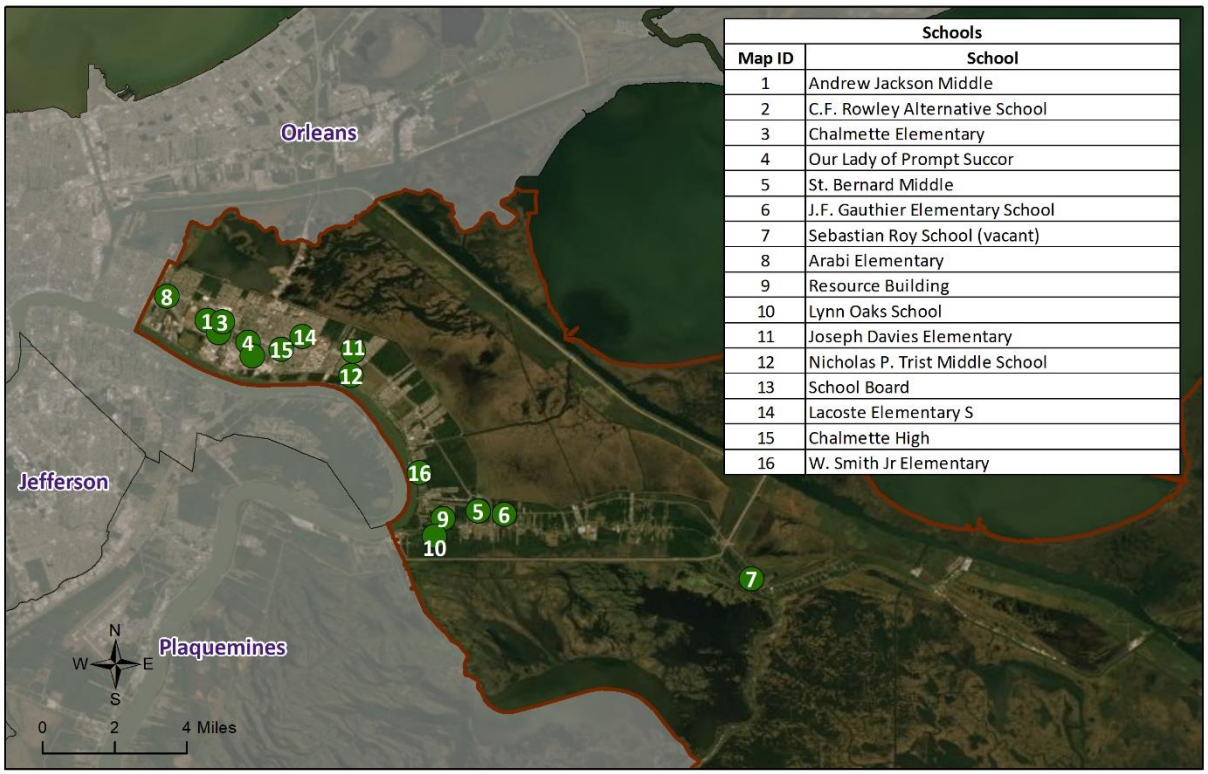


Figure 2-4: Emergency Medical Services in St. Bernard Parish.



Schools	
Map ID	School
1	Andrew Jackson Middle
2	C.F. Rowley Alternative School
3	Chalmette Elementary
4	Our Lady of Prompt Succor
5	St. Bernard Middle
6	J.F. Gauthier Elementary School
7	Sebastian Roy School (vacant)
8	Arabi Elementary
9	Resource Building
10	Lynn Oaks School
11	Joseph Davies Elementary
12	Nicholas P. Trist Middle School
13	School Board
14	Lacoste Elementary S
15	Chalmette High
16	W. Smith Jr Elementary

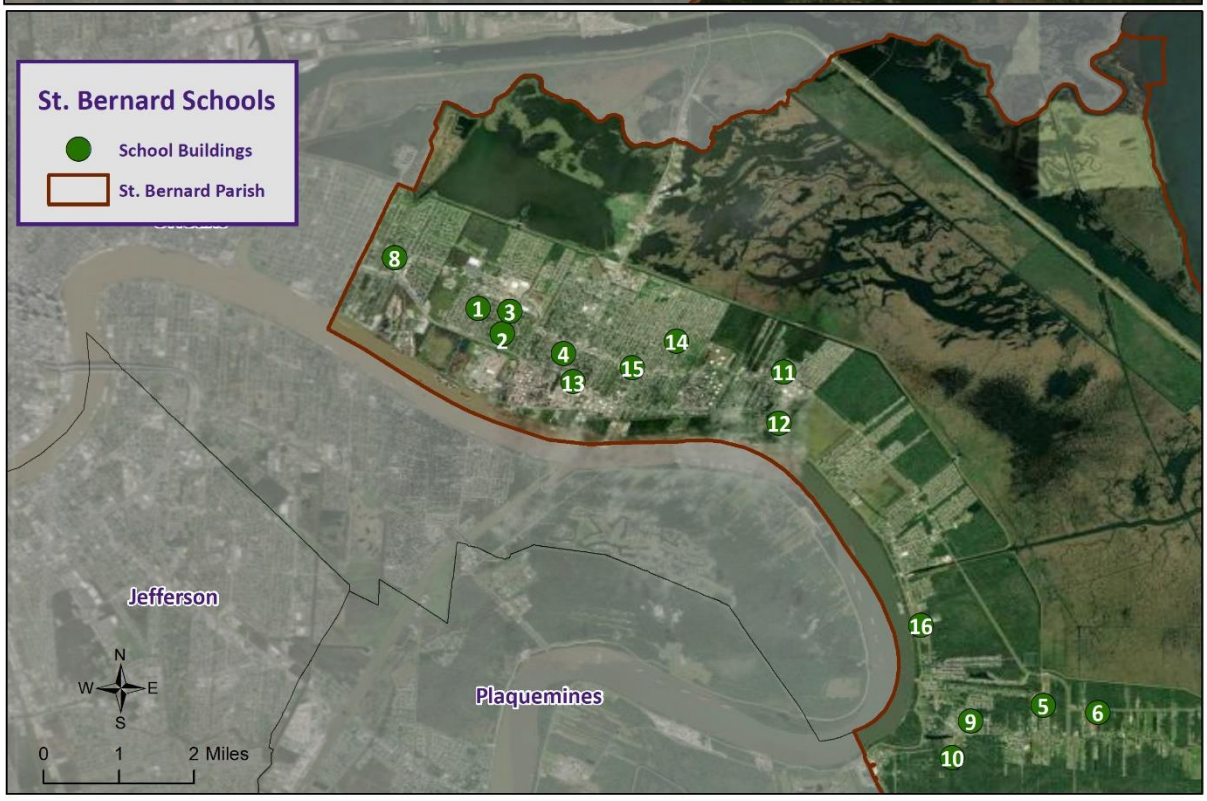


Figure 2-5: School Facilities in St. Bernard Parish.

Future Development Trends

St. Bernard Parish experienced a decline in population and housing between the years of 2000 and 2010, decreasing from a population of 67,229 with 26,790 housing units in 2000 to a population of 35,897 with 16,794 housing units in 2010 after an extremely destructive hurricane event. Both population and housing units have started to rebound this past decade rising in population to 46,721 with 17,121 housing units in 2018. The future population and number of buildings can be estimated using U.S. Census Bureau housing and population data. The following tables show population and housing unit estimates from 2000 to 2019:

Table 2-5: Population Growth Rate for St. Bernard Parish.

Total Population	St. Bernard Parish
1-Apr-00	67,229
1-Apr-10	35,897
1-Jul-18	46,721
Population Growth between 2000 – 2010	-46.6%
Average Annual Growth Rate between 2000 – 2010	-4.7%
Population Growth between 2010 – 2018	30.2%
Average Annual Growth Rate between 2010 – 2014	3.77%

Table 2-6: Housing Growth Rate for St. Bernard Parish.

Total Housing Units	St. Bernard Parish
1-Apr-00	26,790
1-Apr-10	16,794
1-Jul-18	17,172
Housing Growth between 2000 – 2010	-37.3%
Average Annual Growth Rate between 2000 – 2010	-3.7%
Housing Growth between 2010 – 2014	2.3%
Average Annual Growth Rate between 2010 – 2014	0.3%

Population of St. Bernard Parish increased tremendously from 2010 to 2018, and housing numbers also continued to increase steadily since the last update to the St. Bernard Parish Hazard Mitigation Plan. However, initiatives such as active floodplain management have restricted the development of flood prone areas, particularly coastal flood zones, to continue supporting and encouraging safer communities within St. Bernard Parish. Strict enforcement of building codes for all new development is an additional step taken by the parish in its effort to decrease its vulnerability and increase the resiliency of the parish against natural hazards. Several flooding mitigation projects have also been undertaken, such as the construction of floodwalls and floodgates in the more flood prone areas of the parish.

Future Hazard Impacts

Hazard impacts were estimated for five years and ten years in the future (2025 and 2030). Yearly population and housing growth rates were applied to parish inventory assets for composite flood and tropical cyclones. Based on a review of available information, it is assumed that population and housing units will continue to grow within St. Bernard Parish from the present through 2030. A summary of estimated future impacts is shown in the table below. Dollar values are expressed in future costs and assume an annual rate of inflation of 1.02%.

Table 2-7: Estimated Future Impacts, 2018-2028.
(Source: Hazus, US Census Bureau)

Hazard / Impact	Total in Parish (2018)	Hazard Area (2018)	Hazard Area (2025)	Hazard Area (2030)
Flood Damage				
Structures	17,172	4,503	4,534	4,557
Value of Structures	$3,681,095,000	$965,265,822.63	$1,043,607,089.93	$1,103,428,582
# of People	48,482	12,251	15,873	19,099
Tropical Cyclone				
Structures	17,172	17,172	17,293	17,379
Value of Structures	$3,681,095,000	$3,681,095,000	$3,979,853,788.10	$4,207,986,381
# of People	46,721	46,721	60,533	72,833

Land Use

The St. Bernard Parish Land Use table is provided on the below. Residential, commercial, and industrial areas account for only 3% of the parish's land use. Water areas is the is the largest category accounting for 901,212 acres (65%) of parish land. At 430,823 acres, wetlands account for 31% of parish lands, while 1,717 acres of forested areas account for 1% of parish lands. The parish also consists of 953 acres of agricultural areas, accounting for less than 1% of all parish lands.

Table 2-8: St. Bernard Parish Land Use.
(Source: USGS Land Use Map)

Land Use	Acres	Percentage
Agricultural Land, Cropland, and Pasture	953	< 1%
Wetlands	430,823	31%
Forest Land (Not including forested wetlands)	1,717	1%
Urban/Development	14,466	3%
Water	901,212	65%

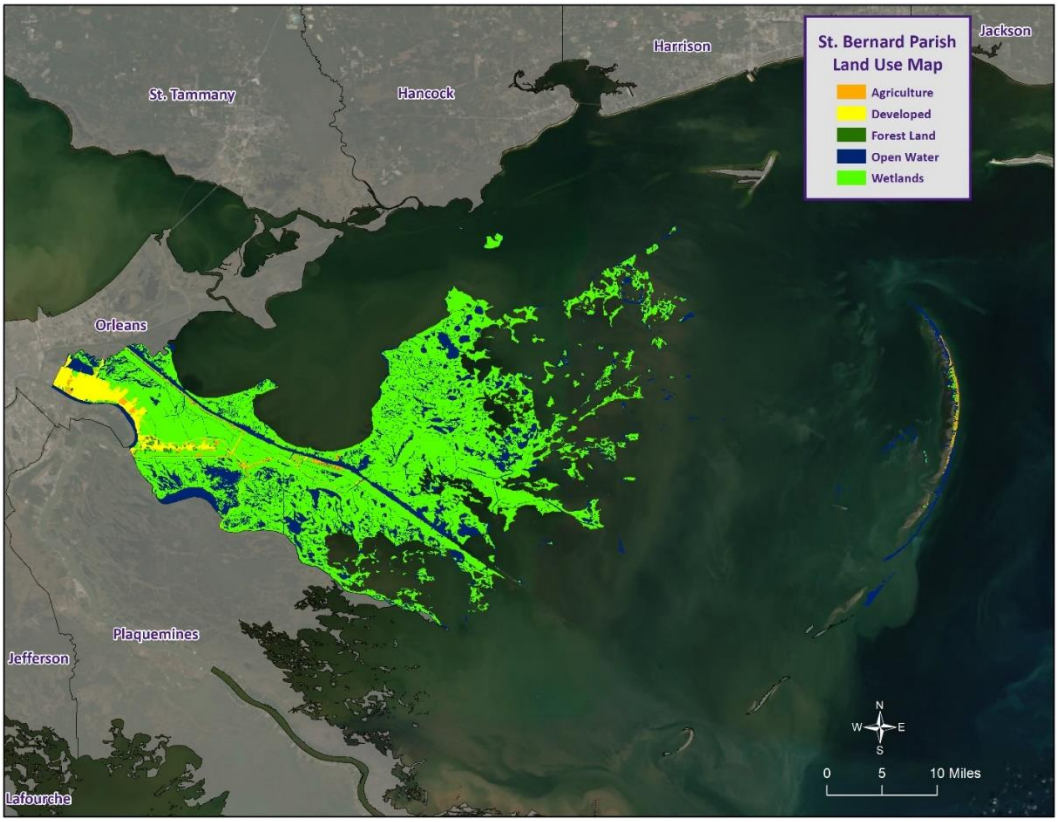


Figure 2-6: St. Bernard Parish Land Use Map.
(Source: USGS Land Use Map)

Assessing Vulnerability Overview

The purpose of assessing vulnerability is to quantify and/or qualify exposure and determine how various threats and hazards impact life, property, the environment, and critical operations in St. Bernard Parish. Vulnerability can be defined as the manifestation of the inherent states of the system (e.g., physical, technical, organizational, cultural) that can be exploited to adversely affect (cause harm or damage to) that system. For example, identifying areas in the parish that suffer disproportional damages from flooding compared with other areas, or overall exposure of an entire town to flooding. Identifying and understanding vulnerability to each threat and hazard provides a strong foundation for developing and pursuing mitigation actions.

The Vulnerability Assessment section for each hazard builds upon the information provided in the Risk Assessment by assessing the potential impact and amount of damage that each hazard has on the parish and each jurisdiction location. To complete the assessment, best available data were collected from a variety of sources, including local, state, and federal agencies, and multiple analyses were performed qualitatively and quantitatively. The estimates provided in the Vulnerability Assessment should be used to understand relative risk from each hazard and the potential losses that may be incurred; however, uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning specific hazards and their effects on the built environment, as well as incomplete datasets from approximations and simplifications that are necessary to provide a meaningful and complete analysis. Further, most datasets used in this assessment contain relatively short periods of records, which increases the uncertainty of any statistically-based analysis.

Quantitative Methodology

The quantitative methodology consists of utilizing a detailed GIS-based approach informed through the development of comprehensive hazard and infrastructure databases. This data-centric approach forms the foundation for our quantitative vulnerability assessment. GIS technology allowed for the identification and analysis of potentially at-risk community assets such as people and infrastructure. This analysis was completed for hazards that can be spatially defined in a meaningful manner (i.e., hazards with an official and scientifically determined geographic extent) and for which GIS data were readily available.

Qualitative Methodology

The qualitative assessment relies less on technology, but more on historical and anecdotal data regarding expected hazard impacts. The qualitative assessment completed for St. Bernard Parish is based on the Priority Risk Index (PRI). The purpose of the PRI is to prioritize all potential hazards, and then group them into three categories of high, moderate, or low risk to identify and prioritize mitigation opportunities. The PRI is a good practice to use when prioritizing hazards because it provides a standardized numerical value for hazards to be compared. PRI scores were calculated using five categories:

- Probability
- Impact
- Spatial Extent
- Warning Time
- Duration

Each degree of risk is assigned a value (1-4) and a weighting factor. To calculate the Risk Factor for a given hazard, the assigned risk value for each category is multiplied by the weighted factor, and the sum of all six categories is totaled together to determine the final Risk Factor. The highest possible Risk Factor is 4.0.

Risk Factor = [(Probability * 0.25) + (Impact * 0.25) + (Spatial Extent * 0.20) + (Warning Time *0.15) + (Duration * 0.15)]

Priority Risk Index and Hazard Risk

Hazard risk is determined by calculating the Risk Factor for each hazard impacting St. Bernard Parish. A summary of the PRI is found in the following table. The conclusions drawn from the qualitative and quantitative assessments are fitted into three categories based on High, Moderate, or Low designations. Hazards identified as high risk have risk factors of 2.5 or greater. Risk Factors ranging from 2.0 to 2.4 are deemed moderate risk hazards. Hazards with Risk Factors less than 2.0 are considered low risk.

Table 2-9: Summary of the Priority Risk Index.

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	25%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	1	25%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than a week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	15%
	12 to 24 hours	Self-explanatory	2	
	6 to 12 hours	Self-explanatory	3	
	Less than 6 hours	Self-explanatory	4	
Duration	Less than 6 hours	Self-explanatory	1	15%
	Less than 24 hours	Self-explanatory	2	
	Less than one week	Self-explanatory	3	
	More than one week	Self-explanatory	4	

Table 2-10: Associated Risk Factor with PRI Value Range.

Risk Factor	PRI Range
High Risk	2.5 to 4.0
Moderate Risk	2.0 to 2.4
Low Risk	0 to 1.9

Table 2-11: Risk Assessment for St. Bernard Parish.

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	Overall Risk
Coastal Hazards	4	2	4	1	3	2.9
Flooding	3	4	3	4	3	3.4
Sinkholes	1	1	1	4	2	1.6
Thunderstorms (Hail)	3	2	2	3	1	2.25
Thunderstorms (High Winds)	3	2	3	3	1	2.45
Thunderstorms (Lightning)	3	2	3	3	1	2.45
Tornadoes	3	3	2	4	3	2.95
Tropical Cyclones	4	4	4	1	4	3.55

Hazard Identification

Coastal Hazards/Subsidence

Coastal land loss is the loss of land (especially beach, shoreline, or dune material) by natural and/or human influences. Coastal land loss occurs through various means, including erosion, subsidence (the sinking of land over time as a result of natural and/or human-caused actions), saltwater intrusion, coastal storms, littoral drift, changing currents, manmade canals, rates of accretion, and sea level rise. The effects of these processes are difficult to differentiate because of their complexity and because they often occur simultaneously, with one influencing each of the others.

Some of the worst recent contributors to coastal land loss in the state are the tropical cyclones of the past decade. Two storms that stand out in this regard are Hurricanes Katrina and Rita. These powerful cyclones completely covered large tracts of land in a very brief period, permanently altering the landscape. The disastrous legacy of these storms concentrated already ongoing efforts to combat coastal land loss. Consistent with the 2014 State Hazard Mitigation Plan Update, coastal land loss is considered in terms of two of the most dominant factors: sea level rise and subsidence.

Sea level rise and subsidence impact Louisiana in a similar manner—again making it difficult to separate impacts. Together, rising sea level and subsidence—known together as relative sea level rise—can accelerate coastal erosion and wetland loss, exacerbate flooding, and increase the extent and frequency of storm impacts. According to NOAA, global sea level rise refers to the upward trend currently observed in the average global sea level. Local sea level rise is the level that the sea rises relative to a specific location (or, benchmark) at the coastline. The most prominent causes of sea level rise are thermal expansion, tectonic actions (such as sea floor spreading), and the melting of the Earth's glacial ice caps.

The current U.S. Environmental Protection Agency (EPA) estimate of global sea level rise is 10–12 in. per century, while future sea level rise could be within the range of 1–4 ft. by 2100. According to the U.S. Geological Survey (USGS), the Mississippi Delta plain is subject to the highest rate of relative sea level rise of any region in the nation largely due to rapid geologic subsidence.

Subsidence results from a number of factors including:

- Compaction/consolidation of shallow strata caused by the weight of sediment deposits, soil oxidation, and aquifer draw-down (shallow component)
- Gas/oil/resource extraction (shallow & intermediate component)
- Consolidation of deeper strata (intermediate components)
- Tectonic effects (deep component)

For the most part, subsidence is a slow-acting process with effects that are not as evident as hazards associated with discrete events. Although the impacts of subsidence can be readily seen in coastal parishes over the course of decades, subsidence is a "creeping" hazard. The highest rate of subsidence is occurring at the Mississippi River Delta (estimated at greater than 3.5 ft./century). Subsidence rates tend to decrease inland, and they also vary across the coast.

Overall, subsidence creates three distinct problems in Louisiana:

- By lowering elevations in coastal Louisiana, subsidence accelerates the effects of saltwater intrusion and other factors that contribute to land loss.
- By lowering elevations, subsidence may make structures more vulnerable to flooding.
- By destabilizing elevations, subsidence undermines the accuracy of surveying benchmarks (including those affecting levee heights, coastal restoration programs, surge modeling, BFEs, and other engineering inputs), which can contribute to additional flooding problems if construction occurs at lower elevations than anticipated or planned.

Saltwater intrusion is one of the major causes of subsidence and marshland loss. Saltwater intrusion refers to the movement of saltwater into freshwater aquifers, or to the encroachment of saline water into freshwater estuaries. This intrusion flows into streams discharging into the Gulf of Mexico as well as the marsh areas, subsequently into freshwater streams. Intrusion of saltwater causes the loss of fresh and intermediate vegetation, which results in rapid erosion of marsh soils and the ultimate conversion of the area to open water.

Location

Historic areas of coastal land loss and gain (*Figure 2-7*) and subsidence rates (*Figure 2-8)* have been quantified for St. Bernard Parish using data from the U.S. Geologic Survey and Louisiana Coastal Protection and Restoration Authority (CPRA). Since 1932, the average annual land loss in Louisiana is 35 mi^2, while the average annual land gain has been 3 mi^2 for a net loss of 32 mi^2 per year. Land loss is occurring throughout the entire area of St. Bernard Parish. Portions of the Mississippi River Gulf Outlet Canal area of the parish are experiencing new land gain through sedimentation deposits, but land loss is dominating the parish. (*Figure 2-7*). Additionally, subsidence is also occurring throughout St. Bernard Parish (*Figure 2-8*).

Previous Occurrences / Extent

Coastal land loss is an ongoing process, including discrete (hurricanes) and continuous (subsidence, sea level rise) processes. While historic flood loss data undoubtedly include the effects of coastal land loss, specific previous occurrences have not been identified as a source of direct disaster damage in Louisiana. Rather, the effects of the underlying flood or hurricane storm surge hazard are recorded. Land loss is a significant hazard, however, and assessment of the added flood impacts caused by land loss is quantified in the following sections. The southwestern portion of St. Bernard Parish can expect to experience subsidence rates of approximately 35 mm annually while the remainder of the parish can expect subsidence rates of approximately 10 mm annually.

Frequency / Probability

Subsidence, sea level rise, and coastal land loss are ongoing hazards. Based on historical subsidence rates and land loss/gain trends, the probability of future land loss in Louisiana is 100% certain, but actual rates of subsidence and land loss/gain vary along the coast based on various meteorological, geological, and human-influenced dynamics (e.g., water/resource extraction, canal dredging, saltwater intrusion, marsh restoration projects, etc.).

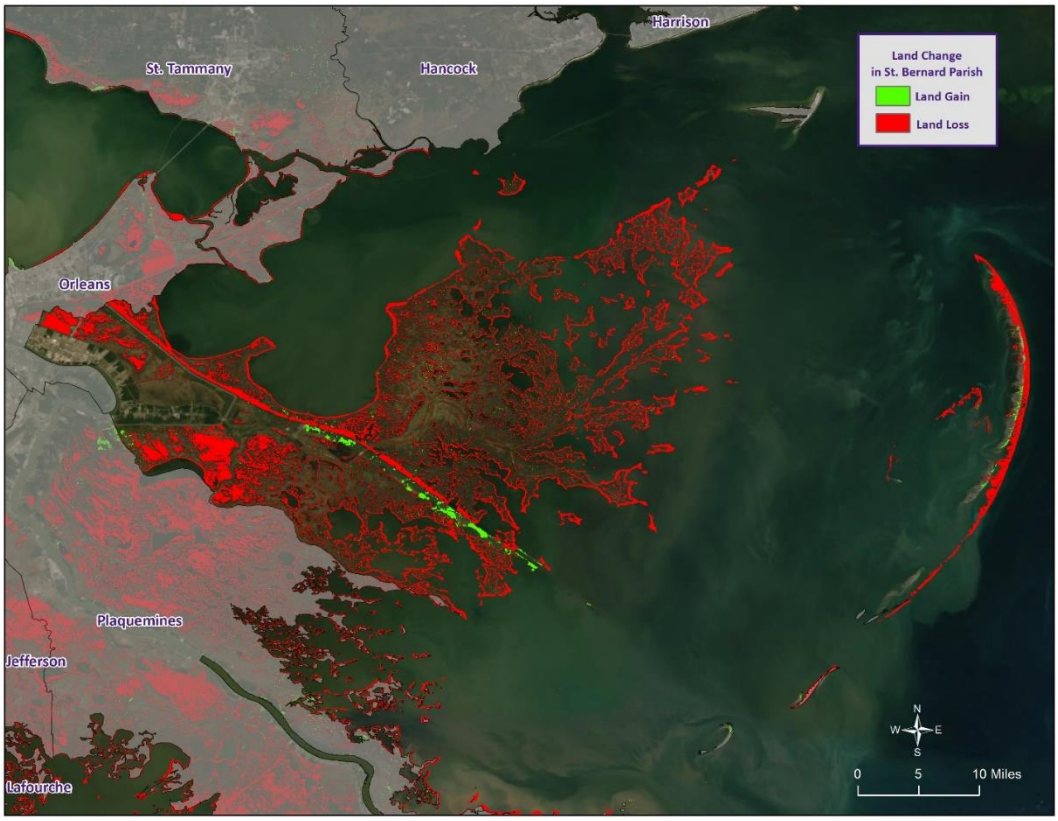


Figure 2-7: Historical Areas of Land Loss and Gain between 1932 and 2010.
(Source: State of Louisiana Hazard Mitigation Plan)

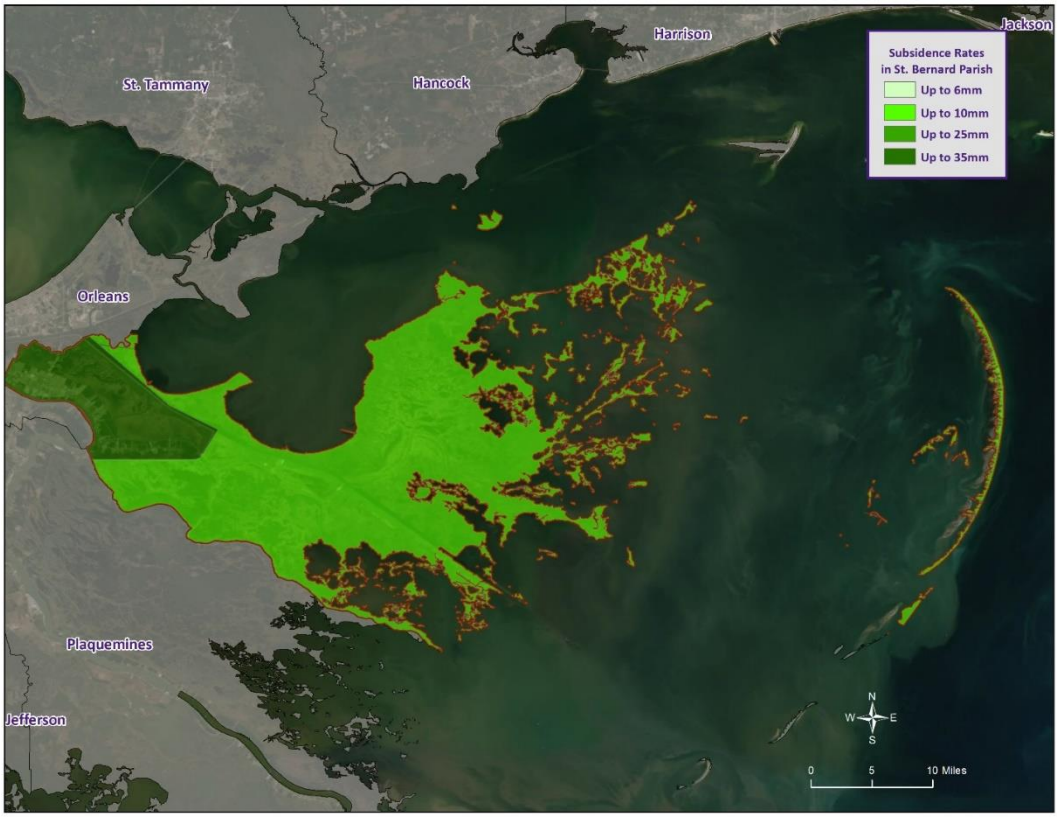


Figure 2-8: Maximum Annual Subsidence Rates Based on Subsidence Zones in Coastal Louisiana. (Source: State of Louisiana Hazard Mitigation Plan)

Estimated Potential Loses

To determine the estimated potential losses, the methodology implemented in the 2014 Louisiana State Plan Update was used. In the state plan, two parameters were considered to estimate the projected increase in coastal flood losses from storm surge scenarios – global sea level rise and subsidence. A timeframe of 10 years was used for evaluation of future effects of sea level rise and subsidence for comparison with current conditions. The NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) model was used to estimate the maximum of maximum (MOM) storm surge elevations for a Category 1 hurricane at mean tide along the coast of Louisiana. The MOM scenario is not designed to describe the storm surge that would result from a particular event, but rather evaluates the impacts of multiple hurricane scenarios with varying forward speeds and storm track trajectories to create the maximum storm surge elevation surface that would occur given the simultaneous occurrence of all hurricane events for a given category.

There are many global sea level rise scenarios from which to select; however, within a 10-year timeframe, methods that predict accelerating sea level rise rates do not deviate significantly from straight line methods. Therefore, a linear sea level rise projection for the sea level rise occurring in 10 years (SLR2024) using a linear global sea level rise rate of 3.1 mm/year was used (IPCC, 2007), which is also in accordance with the CPRA Coastal Master Plan. This resulted in an increase of 0.1 feet, which was applied to the NOAA MOM storm surge elevation results over the model output domain.

$$SLR_{2024} = 0.0031 \frac{m}{year} x\ 10\ years$$
$$SLR_{2024} = 0.031\ meters = 0.10\ ft\ in\ 2024$$

To estimate the effects of subsidence, the elevation profile for southern Louisiana was separated into sections based on subsidence zones. The 20th percentile values for subsidence were used, in accordance with the CPRA Master Plan, and subtracted from the digital elevation model (DEM) for each zone and re-joined to create a final subsided ground elevation layer.

To perform the economic loss assessment, depth grids were created for current conditions (SLOSH MOM Results – Current Land Elevation) and for projected 2024 conditions ([SLOSH MOM Results + 0.1 ft sea level rise] – [Current Land Elevation – Subsidence]). Hazus was used to calculate economic loss for the current and future depth grids.

Figure 2-9 shows the projected increase in total flood loss resulting from a SLOSH Category 1 MOM in the year 2014, with many areas expecting increase in losses. Some areas that would be currently unaffected by a SLOSH Category 1 MOM would be impacted in ten years based on subsidence and sea level rise projections (*Figure 2-10*).

To determine annual potential loss estimates for coastal land loss, increased exposure estimates over the next 10 years calculated using Hazus were annualized at the parish level (*Figure 2-11*). To provide an annual estimated potential loss per jurisdiction, the total loss for the census block groups within each jurisdiction were calculated. Based on hazard exposure, *Table 2-12* provides an estimate of annual potential losses for St. Bernard Parish.

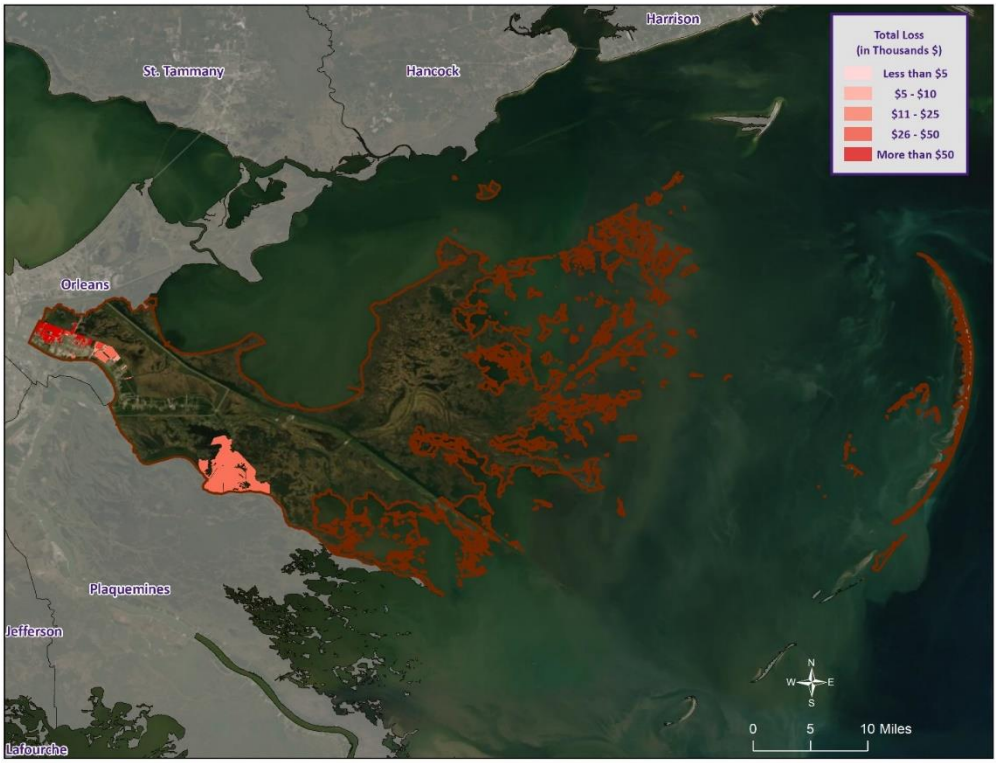


Figure 2-9: Increase in Total Loss Estimates in 2024 by Census Block Group Based on the Hazus Flood Model and NOAA SLOSH Model.
(Source: State of Louisiana Hazard Mitigation Plan)

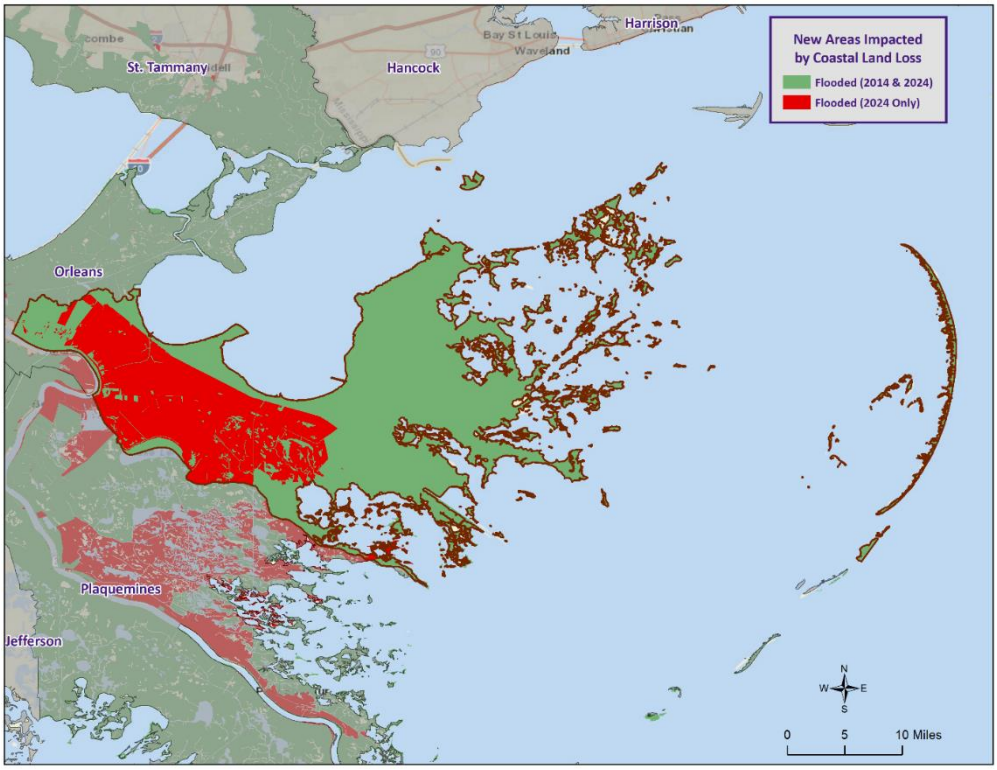


Figure 2-10: Census Block Groups Not Currently Impacted by Category 1 Hurricane Storm Surge but Expected to be Impacted in 2024 are Shown in Red.
(Source: State of Louisiana Hazard Mitigation Plan)

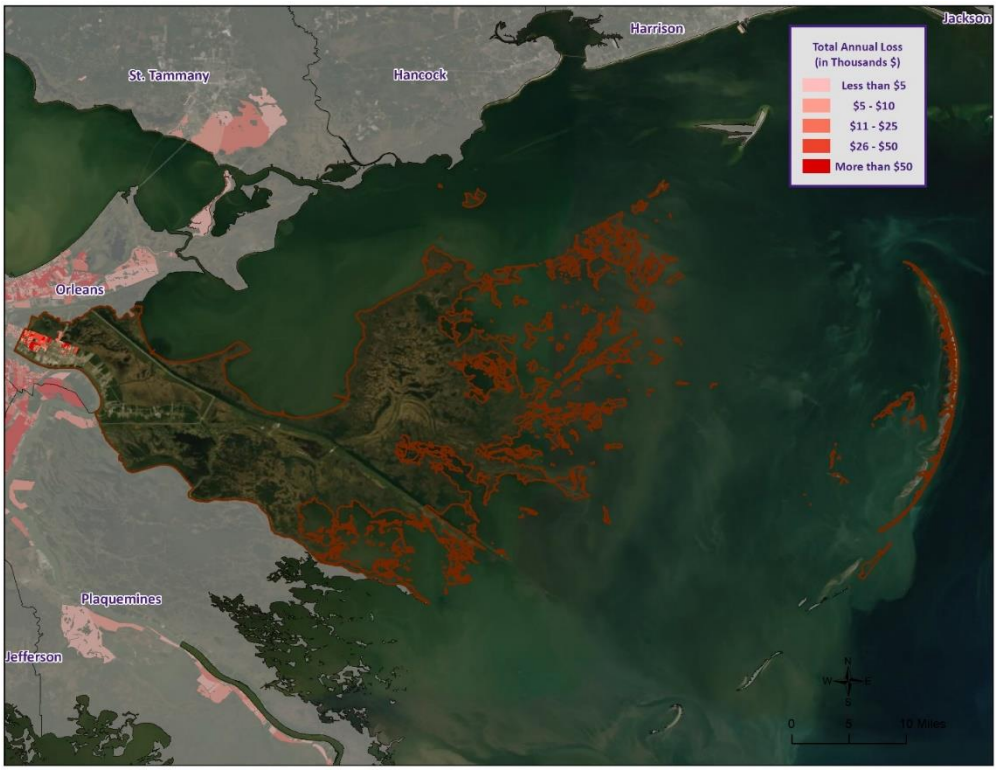


Figure 2-11: Estimated Annual Losses for Coastal Land Loss by Census Block Group.

The following table shows the current and future exposure potential based on the Hazus inventory database.

Table 2-12: Estimated Annual Losses for Coastal Land Loss in St. Bernard Parish. (Source: Hazus)

Coastal Land Loss Estimated Annual Potential Losses
$96,200

Threat to People

Coastal land loss can impact all demographics and age groups. Buildings located within highly vulnerable coastal land loss areas could be eventually permanently shut down and forced to re-locate. Long-term sheltering and permanent relocation could be a concern for communities that are at the highest risk for future coastal land loss. The total population within the parish that is susceptible to the effects of coastal land loss are shown in the following table.

Table 2-13: Number of People Susceptible to Coastal Land Loss in St. Bernard Parish.

Number of People Exposed to Coastal Hazards			
Location	**# in Community**	**# in Hazard Area**	**% in Hazard Area**
St. Bernard Parish	35,897	35,897	100%

The Hazus hurricane model was used to identify populations vulnerable to coastal land loss throughout the jurisdictions in the tables below:

Table 2-14: Population Vulnerable to Coastal Land Loss in St. Bernard Parish.

St. Bernard Parish		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	35,897	100.0%
Persons Under 5 years	2,847	7.9%
Persons Under 18 years	6,329	17.6%
Persons 65 Years and Over	3,288	9.2%
White	26,578	74.0%
Minority	9,319	26.0%

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to coastal land loss and subsidence.

Flooding

A flood is the overflow of water onto land that is usually not inundated. The National Flood Insurance Program defines a flood as:

> A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from overflow of inland or tidal waves, unusual and rapid accumulation or runoff of surface waters from any source, mudflow, or collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

Factors influencing the type and severity of flooding include natural variables such as precipitation, topography, vegetation, soil texture, and seasonality, as well as anthropogenic factors such as urbanization (extent of impervious surfaces), land use (agricultural and forestry tend to remove native vegetation and accelerate soil erosion), and the presence of flood-control structures such as levees and dams.

Excess precipitation, produced from thunderstorms or hurricanes, is often the major initiating condition for flooding, and Louisiana can have high rainfall totals at any time of day or year. During the cooler months, slow-moving frontal weather systems produce heavy rainfalls, while the summer and autumn seasons produce major precipitation in isolated thunderstorm events (often on warm afternoons) that may lead to localized flooding. During these warmer seasons, floods are overwhelmingly of the flash flood variety, as opposed to the slower-developing river floods caused by heavy stream flow during the cooler months.

In cooler months, particularly in the spring, Louisiana is in peak season for severe thunderstorms. The fronts that cause these thunderstorms often stall while passing over the state, occasionally producing rainfall totals exceeding ten inches within a period of a few days. Since soil tends to be nearly saturated at this time (due to relatively low overall evaporation rates), spring typically becomes the period of maximum stream flow across the state. Together, these characteristics increase the potential for high water, with low-lying, poorly drained areas being particularly susceptible to flooding during these months.

In Louisiana, six specific types of flooding are of main concern: riverine, flash, ponding, backwater, urban, and coastal.

- **Riverine flooding** occurs along a river or smaller stream. It is the result of runoff from heavy rainfall or intensive snow or ice melt. The speed with which riverine flood levels rise and fall depends not only on the amount of rainfall, but even more on the capacity of the river itself, as well as the shape and land cover of its drainage basin. The smaller the river, the faster that water levels rise and fall. Thus, the Mississippi River levels rise and fall slowly due to its large capacity. Generally, elongated and intensely-developed drainage basins will reach faster peak discharges and faster falls than circular-shaped and forested basins of the same area.
- **Flash flooding** occurs when locally intense precipitation inundates an area in a short amount of time, resulting in local stream flow and drainage capacity being overwhelmed.
- **Ponding** occurs when concave areas (e.g., parking lots, roads, and clay-lined natural low areas) collect water and are unable to drain.
- **Backwater flooding** occurs when water slowly rises from a normally unexpected direction where protection has not been provided. A model example is the flooding that occurred in LaPlace

during Hurricane Isaac in 2012. Although the town was protected by a levee on the side facing the Mississippi River, floodwaters from Lake Maurepas and Lake Pontchartrain crept into the community on the side of town opposite the Mississippi River.

- **Urban flooding** is similar to flash flooding but is specific to urbanized areas. It takes place when storm water drainage systems cannot keep pace with heavy precipitation, and water accumulates on the surface. Most urban flooding is caused by slow-moving thunderstorms or torrential rainfall.
- **Coastal flooding** can appear similar to any of the other flood types, depending on its cause. It occurs when normally dry coastal land is flooded by seawater, but may be caused by direct inundation (when the sea level exceeds the elevation of the land), overtopping of a natural or artificial barrier, or the breaching of a natural or artificial barrier (i.e., when the barrier is broken down by the sea water). Coastal flooding is typically caused by storm surge, tsunamis, or gradual sea level rise.

Historically, in St. Bernard Parish, most of these flooding events have historically been observed. For purposes of this assessment, ponding, flash flood, and urban flooding are considered to be flooding as a result of storm water from heavy precipitation thunderstorms

Based on stream gauge levels and precipitation forecasts, the National Weather Service (NWS) posts flood statements, watches, and warnings. The NWS issues the following weather statements with regard to flooding:

- **Flood Categories**
  - Minor Flooding: Minimal or no property damage, but possibly some public threat.
  - Moderate Flooding: Some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.
  - Major Flooding: Extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.
  - Record Flooding: Flooding which equals or exceeds the highest stage or discharge at a given site during the period of record keeping.
- **Flood Warning**
  - Issued along larger streams when there is a serious threat to life or property.
- **Flood Watch**
  - Issued when current and developing hydrometeorological conditions are such that there is a threat of flooding, but the occurrence is neither certain nor imminent.

Floods are measured mainly by probability of occurrence. A 10-year flood event, for example, is an event of small magnitude (in terms of stream flow or precipitation) but with a relatively high annual probability of recurrence (10%). A 100-year flood event is larger in magnitude, but it has a smaller chance of recurrence (1%). A 500-year flood is significantly larger than both a 100-year event and a 10-year event, but it has a lower probability than both to occur in any given year (0.2%). It is important to understand that an X-year flood event does not mean an event of that magnitude occurs only once in X years. Instead, it means that on average, we can expect a flood event of that magnitude to occur once every X years. Given that such statistical probability terms are inherently difficult for the general population to understand, the Association of State Floodplain Managers (ASFPM) promotes the use of more tangible expressions of flood probability. As such, the ASFPM also expresses the 100-year flood event as having a 25% chance of occurring over the life of a 30-year mortgage.

It is essential to understand that the magnitude of an X-year flood event for a particular area depends on the source of flooding and the area's location. The size of a specific flood event is defined through historic data of precipitation, flow, and discharge rates. Consequently, different 100-year flood events can have very different impacts. The 100-year flood event in two separate locations have the same likelihood to occur, but they do not necessarily have the same magnitude. For example, a 100-year event for the Mississippi River means something completely different in terms of discharge values (ft^3/s) than for the Amite River. Not only are the magnitudes of 100-year events different between rivers, they can be different along any given river. A 100-year event upstream is different from one downstream due to the change of river characteristics (volume, discharge, and topography). As a result, the definition of what constitutes a 100-year flood event is specific to each location, river, and time, since floodplain and river characteristics change over time. Finally, it is important to note that each flood event is unique. Two hypothetical events at the same location, given the same magnitude of stream flow, may still produce substantially different impacts if there were different antecedent moisture characteristics, different times of day of occurrence (which indicates the population's probable activities at the flood's onset), or other characteristic differences.

The 100-year flood event is of particular significance since it is the regulatory standard that determines the obligation (or lack thereof) to purchase flood insurance. Flood insurance premiums are set depending on the flood zone, as modeled by National Flood Insurance Program (NFIP) Rate Maps. The NFIP and FEMA suggest insurance rates based on Special Flood Hazard Areas (SFHAs), as diagrammed in *Figure 2-12*.

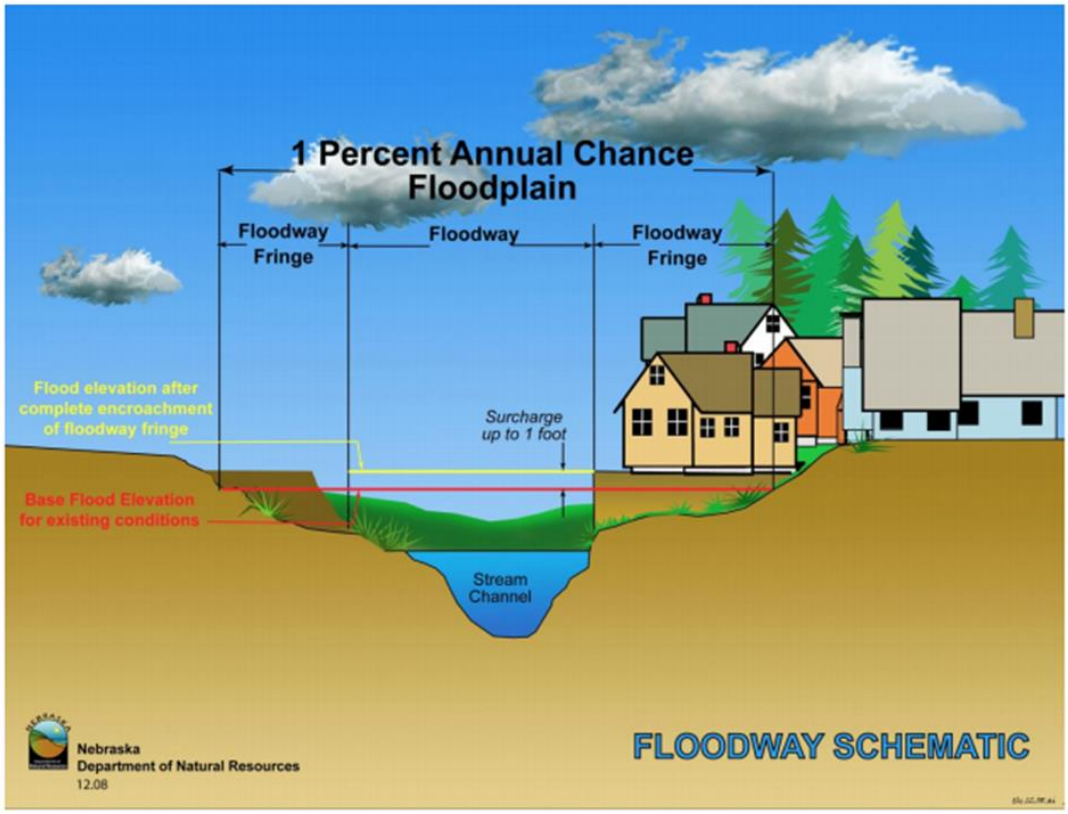


Figure 2-12: Schematic of 100-year Floodplain. The Special Flood Hazard Area (SFHA) extends to the end of the floodway fringe.
(Source: Nebraska Department of Natural Resources)

A SFHA is the land area covered by the floodwaters of the base flood (red line in *Figure 2-12*), where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.

Property Damage

The depth and velocity of flood waters are the major variables in determining property damage. Flood velocity is important because the faster water moves, the more pressure it puts on a structure and the more it will erode stream banks and scour the earth around a building's foundation. In some situations, deep and fast moving waters can push a building off its foundation. Structural damage can also be caused by the weight of standing water (hydrostatic pressure).

Another threat to property from a flood is called "soaking". When soaked, many materials change their composition or shape. Wet wood will swell, and if dried too quickly, will crack, split, or warp. Plywood can come apart and gypsum wallboard can deteriorate if it is bumped before it has time to completely dry. The longer these materials are saturated, the more moisture, sediment, and pollutants they absorb.

Soaking can also cause extensive damage to household goods. Wooden furniture may become warped, making it unusable, while other furnishings such as books, carpeting, mattresses, and upholstery usually are not salvageable. Electrical appliances and gasoline engines will flood, making them worthless until they are professionally dried and cleaned.

Many buildings that have succumbed to flood waters may look sound and unharmed after a flood, but water has the potential to cause severe property damage. Any structure that experiences a flood should be stripped, cleaned, and allowed to dry before being reconstructed. This can be an extremely expensive and time consuming effort.

Repetitive Loss Properties

Repetitive loss structures are structures covered by a contract for flood insurance made available under the NFIP that:

a. Have incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and
b. At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

Severe repetitive loss (SRL) is defined by the Flood Insurance Reform Act of 2004 and updated in the Biggert-Waters Flood Insurance Reform Act of 2012. For a property to be designated SRL, the following criteria must be met:

a. It is covered under a contract for flood insurance made available under the NFIP; and
b. It has incurred flood related damage –
    1) For which four or more separate claims payments have been made under flood insurance coverage with the amount of each claim exceeding $5,000 and with the cumulative amount of such claims payments exceeding $20,000; or
    2) For which at least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Figures regarding repetitive loss structures for St. Bernard Parish are provided in the table below:

Table 2-15: Repetitive Loss Structures for St. Bernard Parish

Jurisdiction	Number of Structures	Residential	Commercial	Government	Total Claims	Total Claims Paid	Average Claim Paid
St. Bernard Parish	1,207	1,176	27	4	4,084	$160,345,645	$39,262

Of the 1,207 repetitive loss properties, 1,196 were able to be geocoded in order to provide an overview of where the repetitive loss structures are located throughout the parish. *Figure 2-13* shows the approximate location of the 1,196 structures, while *Figure 2-14* shows where the highest concentration of repetitive loss structures are located. Through the repetitive loss map, it is clear the primary concentrated area of repetitive loss structures is focused in western and southern portions of St. Bernard Parish.

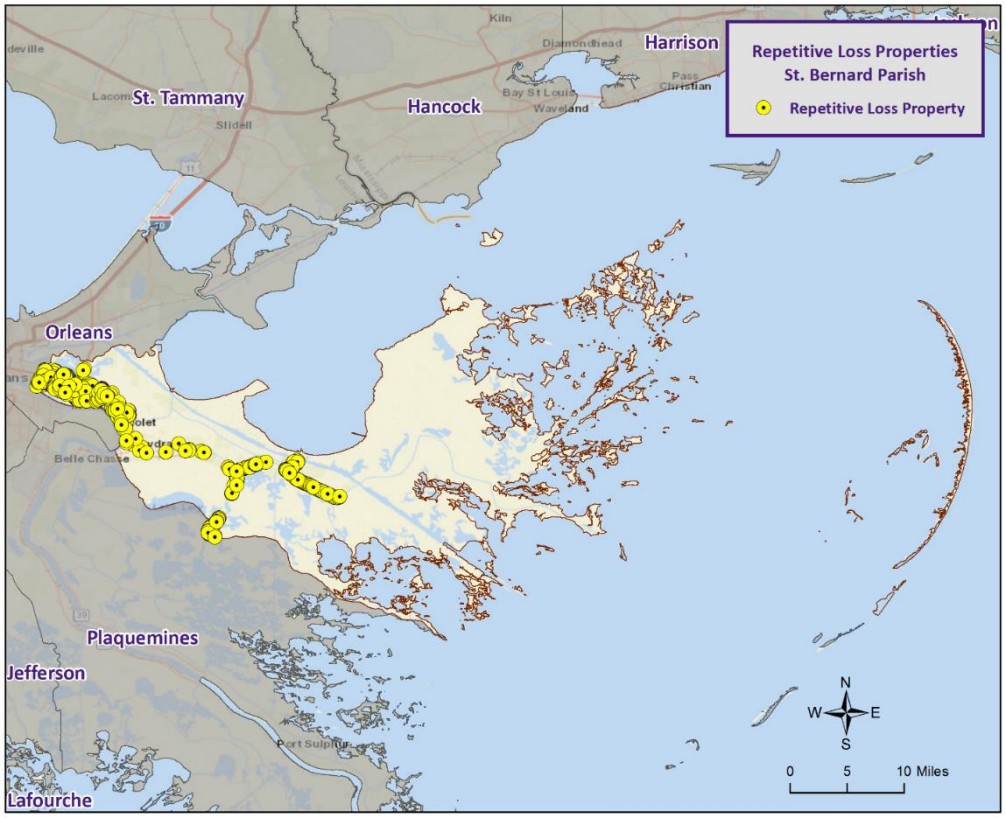


Figure 2-13: Repetitive Loss Properties in St. Bernard Parish.

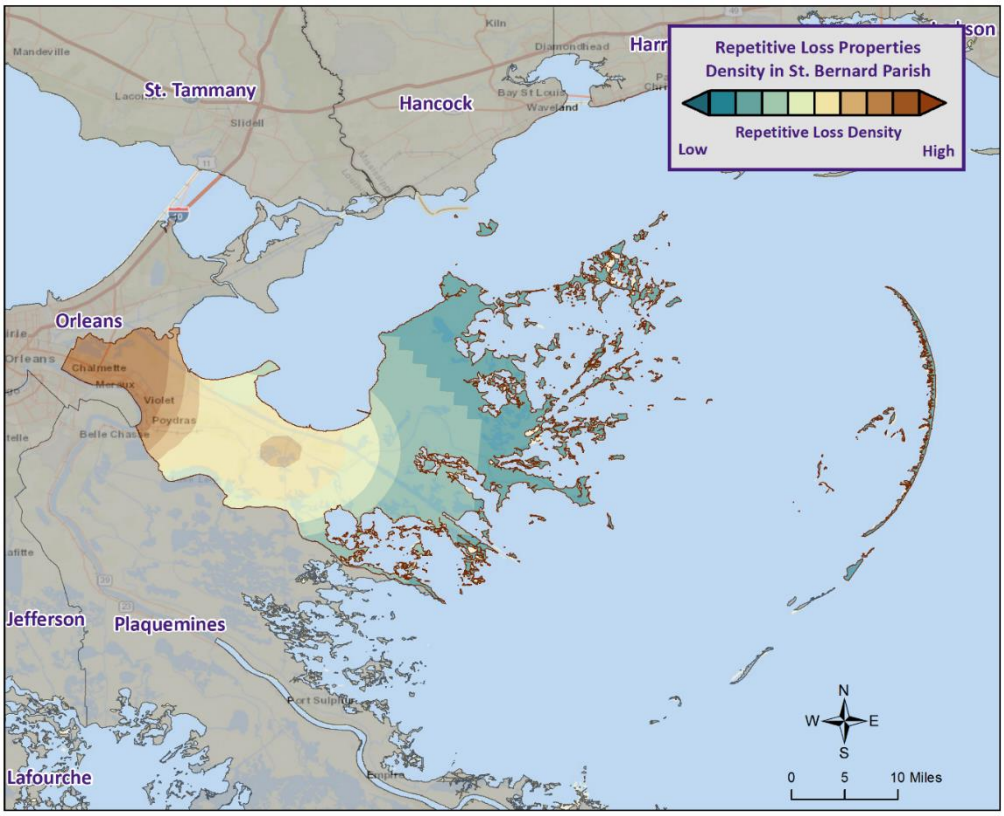


Figure 2-14: Repetitive Loss Property Densities in St. Bernard Parish.

National Flood Insurance Program

Flood insurance statistics indicate that St. Bernard Parish has 5,318 flood insurance policies with the NFIP, with total annual premiums of $4,148,451. St. Bernard Parish is a participant in the NFIP. St. Bernard Parish will continue to adopt and enforce floodplain management requirements, including regulating new construction Special Flood Hazard Areas, and will continue to monitor activities including local requests for new map updates. Flood insurance statistics and additional NFIP participation details for St. Bernard Parish is provided in the tables to follow.

Table 2-16: Summary of NFIP Policies for St. Bernard Parish.

Location	No. of Insured Structures	Total Insurance Coverage Value	Annual Premiums Paid
St. Bernard Parish	10,770	$3,201,246,400	$5,922,401

Table 2-17: Summary of Community Flood Maps for St. Bernard Parish.

CID	Community Name	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Date Joined the NFIP	Tribal
225204#	St. Bernard Parish	3/13/1970	8/31/1973	3/4/1987	3/13/1970	No

According to the Community Rating System (CRS) list of eligible communities dated May 1, 2019, St. Bernard Parish does not participate in the Community Rating System.

Threat to People

Just as with property damage, depth and velocity are major factors in determining the threat posed to people by flooding. It takes very little depth or velocity for flood waters to become dangerous. A car will float in less than two feet of moving water, and can be swept downstream into deeper waters, trapping passengers within the vehicle. Victims of floods have often put themselves in perilous situations by entering flood waters that they believe to be safe, or by ignoring travel advisories.

Major health concerns are also associated with floods. Flood waters can transport materials such as dirt, oil, animal waste, and chemicals (e.g., farm, lawn, and industrial) that may cause illnesses of various degrees when coming in contact with humans. Flood waters can also infiltrate sewer lines and inundate wastewater treatment plants, causing sewage to backup and creating a breeding ground for dangerous bacteria. This infiltration may also cause water supplies to become contaminated and undrinkable.

Flooding in St. Bernard Parish

By definition, flooding is caused when an area receives more water than the drainage system can convey. The following is a synopsis of the types of flooding that St. Bernard Parish experiences.

Flash Floods: Flash floods are characterized by a rapid rise in water level, high velocity, and large amounts of debris. They are capable of uprooting trees, undermining buildings and bridges, and scouring new channels. Major factors in flash flooding are the high intensity and short duration of rainfall, as well as the steepness of watershed and stream gradients.

Local Drainage or High Groundwater Levels: Locally heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable drainage channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems.

Backwater Flooding: Backwater flooding is normally associated with riverine flooding and connotes minimal velocity. All low-lying areas are at risk. A heavy rainfall event coupled with a swollen river, canal, bayou, or marsh hinders drainage outflow, causing backwater flooding to the same areas susceptible to storm surge.

Riverine Flooding: Riverine flooding, by definition, is river-based. Most of the riverine flooding problems occur when the Sabine River crests at flood stage levels, causing extensive flooding in low-lying areas.

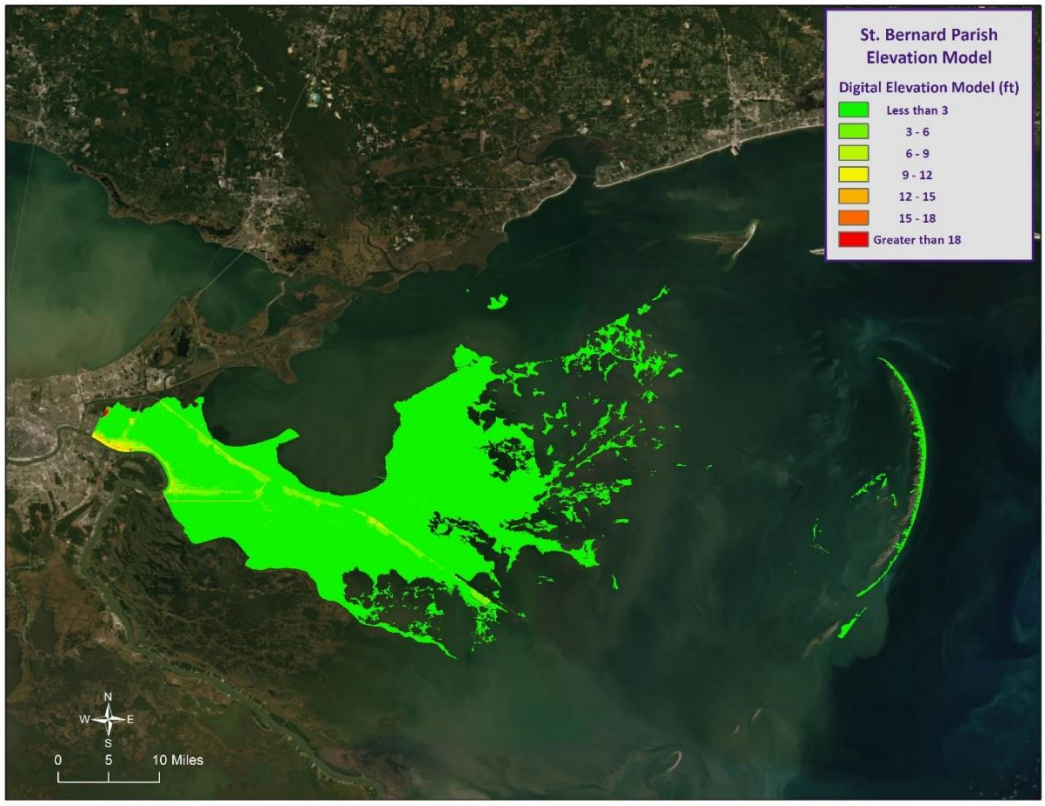


Figure 2-15: Elevation throughout St. Bernard Parish.

The digital elevation model (DEM) in the figure above for St. Bernard Parish is instructive in visualizing where the low-lying and high risk areas are for the parish. The parish is dominated by water and low-lying areas with the average elevation throughout the parish at approximately 5 feet (NAVD88). Elevation increases slightly in the western portions of the parish, but the remainder of the parish has an elevation of less than six feet.

Location

St. Bernard Parish has experienced significant flooding in its history and can expect more in the future. St. Bernard Parish is susceptible to several different types of flooding due to its geographical location, including riverine, flash, and storm surge.

The following is a flood zone map displaying 100- and 500-year flood zones for St. Bernard Parish:

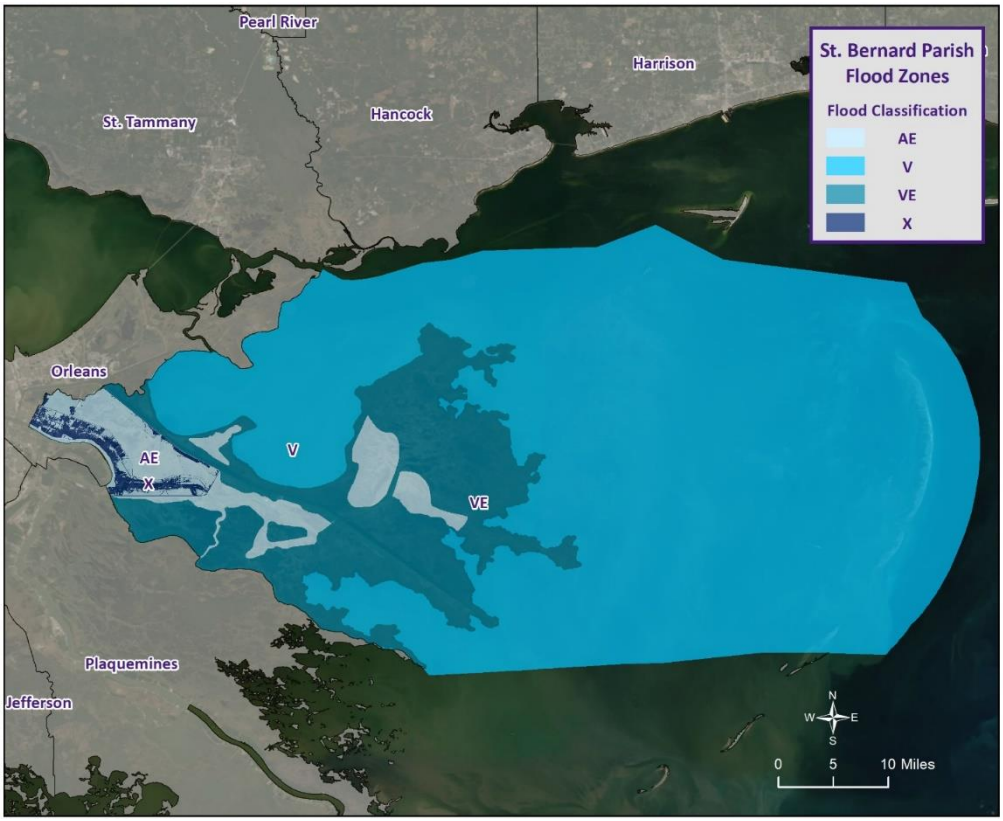


Figure 2-16: St. Bernard Parish Areas within the Flood Zones.

Previous Occurrences / Extents

Historically, there have been 14 flooding events that have caused significant flooding in St. Bernard Parish between 1989 and 2019. Below is a brief synopsis of the flooding event which occurred since the last St. Bernard Parish HMP Update in 2015.

Table 2-18: Historical Floods in St. Bernard Parish with Locations since the 2015 St. Bernard Parish HMP Update.

Date	Extents	Type of Flooding	Estimated Damages	Location
August 26, 2019	Three to five inches of rain fell across part of New Orleans extending into St. Bernard Parish during the mid afternoon. Widespread street flooding was reported throughout the parish closing several roads.	Flash Flood	$0	ARABI

Based on previous flood events, the worst-case scenarios are based on historical flooding events. Storm water excesses and riverine flooding primarily affect the low-lying areas of the parish, and flood depths of up to six feet can be expected in St. Bernard Parish.

Frequency / Probability

The NCEI Storm Events Database identified 14 flooding events within the St. Bernard Parish planning area since 1989. The table below shows the probability and return frequency for each jurisdiction.

Table 2-19: Annual Flood Probabilities for St. Bernard Parish.

Jurisdiction	Annual Probability	Return Frequency
St. Bernard Parish	47%	1 event every 1 to 2 years

Based on historical record, the overall flooding probability for the entire St. Bernard Parish Planning area is 47% with 14 events occurring over a 30-year period.

Estimated Potential Losses

Using the Hazus Flood Model, the 100-year flood scenario, along with the Parish DFIRM, was analyzed to determine losses from this worst-case scenario. *Table 2-20* shows the total economic losses that would result from this occurrence.

Table 2-20: Estimated Losses in St. Bernard Parish from a 100-year Flood Event. (Source: Hazus)

Jurisdiction	Estimated Total Losses from 100-Year Flood Event
St. Bernard Parish	$3,120,000

The Hazus Flood model also provides a breakdown for seven primary sectors (Hazus occupancy) throughout the parish. The losses for St. Bernard Parish by sector are listed in the following table:

Table 2-21: Estimated 100-year Flood Losses for St. Bernard Parish by Sector. (Source: Hazus)

St. Bernard Parish	Estimated Total Losses from 100-Year Flood Event
Agricultural	$0
Commercial	$615,000
Government	$111,000
Industrial	$671,000
Religious / Non-Profit	$234,000
Residential	$971,000
Schools	$518,000
Total	**$3,120,000**

Threat to People

The total population within the parish that is susceptible to a flood hazard is shown in the table below:

Table 2-22: Vulnerable Populations Susceptible to a 100-year Flood Event. (Source: Hazus)

Number of People Exposed to Flood Hazards			
Location	**# in Community**	**# in Hazard Area**	**% in Hazard Area**
St. Bernard Parish	35,897	9,413	26.2%

The Hazus flood model was also extrapolated to provide an overview of vulnerable populations throughout the jurisdictions in the following table.

Table 2-23: Vulnerable Populations Susceptible to a 100-year Flood Event in St. Bernard Parish. (Source: Hazus)

St. Bernard Parish		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	9,413	26.2%
Persons Under 5 Years	746	7.9%
Persons Under 18 Years	1,660	17.6%
Persons 65 Years and Over	862	9.2%
White	6,969	74.0%
Minority	2,444	26.0%

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to flooding due to proximity within the 100-year flood plain.

Sinkholes

Sinkholes are areas of ground—varying in size from a few square feet to hundreds of acres, and reaching in depth from 1 to more than 100 ft.—with no natural external surface drainage. Sinkholes are usually found in karst terrain—that is, areas where limestone, carbonate rock, salt beds, and other water-soluble rocks lie below the Earth's surface. Karst terrain is marked by the presence of other uncommon geologic features such as springs, caves, and dry streambeds that lose water into the ground. In general, sinkholes form gradually (in the case of cover subsidence sinkholes), but they can also occur suddenly (in the case of cover-collapse sinkholes).

Sinkhole formation is a very simple process. Whenever water is absorbed through soil, encounters water-soluble bedrock, and then begins to dissolve it, sinkholes start to form. The karst rock dissolves along cracks; as the fissures grow, soil and other particles fill the gaps, loosening the soil above the bedrock. Figure 1 illustrates the development of a cover subsidence sinkhole. As the soil sinks from the surface, a depression forms, which draws in more water, funneling it down to the water-soluble rock. The increase of water and soil in the rock pushes open the cracks, again drawing more soil and water into it. This positive feedback loop continues, unless clay plugs into the cracks in the bedrock, at which time a pond may form. A sudden cover-collapse sinkhole occurs when the top soil above dissolving bedrock does not sink, but forms a bridge over the soil that is sinking beneath it. Underground soil continues to fill the bedrock fissures, until finally the soil bridge collapses and fills the void beneath it.

Both kinds of sinkholes can occur naturally or through human influence. While sinkholes tend to form naturally in karst areas, sinkholes can form in other geological areas that have been altered by humans such as mining, sewers, hydraulic fracture drilling, groundwater pumping, irrigation, or storage ponds. In all of these cases, and others, the cause for the sinkhole is that support for surface soil has been weakened or substantially removed.

In the United States, 20% of land in the United States is susceptible to sinkholes. Most of this area lies in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. In Louisiana, most of the sinkholes are precipitated by the human-influenced collapse of salt dome caverns. The collapse of a salt dome is usually a slow process; however, it may occur suddenly and without any advance warning.

Location

Currently, there is one identifiable salt dome location in St. Bernard Parish. *Figure 2-17* displays the location of the salt dome which is located in the western section of St. Bernard Parish.

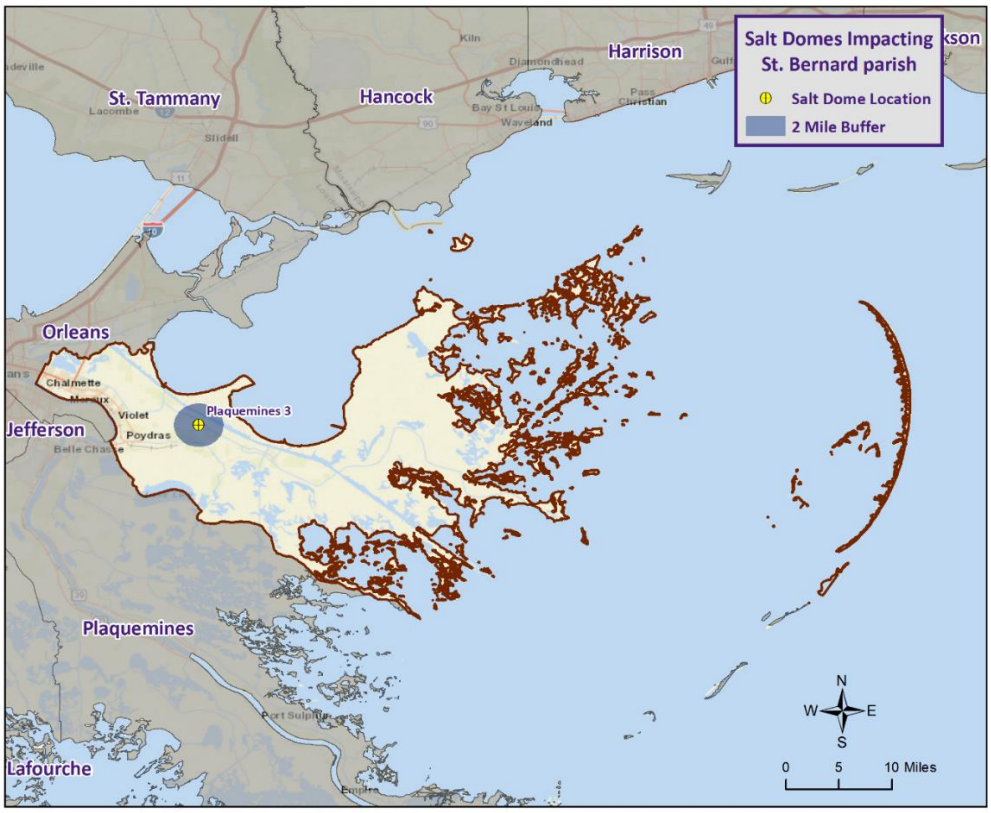


Figure 2-17: Salt Dome Locations in St. Bernard Parish.

Previous Occurrences / Extent

There have been no recorded incidents of sinkholes or salt dome collapses in St. Bernard Parish to date.

Frequency / Probability

Since there has been no recorded incidents of sinkhole or salt dome collapse in St. Bernard Parish, the annual chance of occurrence is calculated at less than 1%.

Estimated Potential Losses

The salt dome was analyzed to determine the number of people and houses that are potentially susceptible to losses from a sink hole materializing from the salt dome. The following table is based on conducting a two-mile buffer around the center of the salt dome. The values were determined by querying the 2010 U.S. Census block data to determine the number of houses and people located within two miles of the salt dome. Critical facilities were also analyzed to determine if they fell within the two-mile buffer of the salt dome. Total value for all occupancy group from Hazus was used to estimate a total loss of all facilities that were within two miles of the salt domes.

Table 2-24: Estimated Potential Losses from a Sinkhole Formation.
(Source: U.S. 2010 Census Data and Hazus)

Salt Dome Name	Total Building Exposure	Critical Infrastructure Exposure	Number of People Exposed	Number of Houses Exposed
Plaquemines 3	$19,470,000	0	379	159

The Plaquemines 3 Salt Dome is the only salt dome located within St. Bernard Parish. It contains a total of 159 homes and 379 people within its two-mile buffer. Total building exposure is approximately $19 million, and there is no critical infrastructure located within the two-mile buffer.

Vulnerability

See Appendix C for parish and municipality building exposure to a sinkhole hazard.

Thunderstorms

The term "thunderstorm" is usually used as a catch-all term for several kinds of storms. Here "thunderstorm" is defined to include any precipitation event in which thunder is heard or lightning is seen. Thunderstorms are often accompanied by heavy rain and strong winds and, depending on conditions, occasionally by hail or snow. Thunderstorms form when humid air masses are heated, which causes them to become convectively unstable and therefore rise. Upon rising, the air masses' water vapor condenses into liquid water and/or deposits directly into ice when they rise sufficiently to cool to the dew-point temperature.

Thunderstorms are classified into four main types (single-cell, multicell, squall line, and supercell), depending on the degree of atmospheric instability, the change in wind speed with height (called wind shear), and the degree to which the storm's internal dynamics are coordinated with those of adjacent storms. There is no such interaction for single-cell thunderstorms, but there is significant interaction with clusters of adjacent thunderstorms in multicell thunderstorms and with a linear "chain" of adjacent storms in squall line thunderstorms. Though supercell storms have no significant interactions with other storms, they have very well-organized and self-sustaining internal dynamics, which allows them to be the longest-lived and most severe of all thunderstorms.

The life of a thunderstorm proceeds through three stages: the developing (or cumulus) stage, the mature stage, and the dissipation stage. During the developing stage, the unstable air mass is lifted as an updraft into the atmosphere. This sudden lift rapidly cools the moisture in the air mass, releasing latent heat as condensation and/or deposition occurs, and warming the surrounding environment, thus making it less dense than the surrounding air. This process intensifies the updraft and creates a localized lateral rush of air from all directions into the area beneath the thunderstorm to feed continued updrafts. At the mature stage, the rising air is accompanied by downdrafts caused by the shear of falling rain (if melted completely), or hail, freezing rain, sleet, or snow (if not melted completely). The dissipation stage is characterized by the dominating presence of the downdraft as the hot surface that gave the updrafts their buoyancy is cooled by precipitation. During the dissipation stage, the moisture in the air mass largely empties out.

The Storm Prediction Center in conjunction with the National Weather Service (NWS) have the ability to issue advisory messages based on forecasts and observations. The following are the advisory messages that may be issued with definitions of each:

- *Severe Thunderstorm Watch*: Issued to alert people to the possibility of a severe thunderstorm developing in the area. Expected time frame for these storms is three to six hours.

- *Severe Thunderstorm Warning*: Issued when severe thunderstorms are imminent. This warning is highly localized and covers parts of one to several counties (parishes).

A variety of hazards might be produced by thunderstorms, including lightning, hail, tornadoes or waterspouts, flash floods, and high-speed winds called downbursts. Nevertheless, given all of these criteria, the National Oceanic and Atmospheric Administration (NOAA) characterizes a thunderstorm as severe when it produces one or more of the following:

- Hail of 1 inch in diameter or larger
- Wind gusts to 58 mph or greater
- One or more tornadoes

Tornadoes and flooding hazards have been profiled within this report; therefore, for the purpose of thunderstorms, the sub hazards of hail, high winds, and lightning will be profiled.

Thunderstorms occur throughout Louisiana at all times of the year, although the types and severity of those storms vary greatly, depending on a wide variety of atmospheric conditions. Thunderstorms generally occur more frequently during the late spring and early summer when extreme variations exist between ground surface temperatures and upper atmospheric temperatures.

Hazard Description

Hailstorms

Hailstorms are severe thunderstorms in which balls or chunks of ice fall along with rain. Hail develops in the upper atmosphere initially as ice crystals that are bounced about by high-velocity updraft winds. The ice crystals grow through deposition of water vapor onto their surface, fall partially to a level in the cloud where the temperature exceeds the freezing point, melt partially, get caught in another updraft whereupon re-freezing and deposition grows another concentric layer of ice, and fall after developing enough weight, sometimes after several trips up and down the cloud. The size of hailstones varies depending on the severity and size of the thunderstorm. Higher surface temperatures generally mean stronger updrafts, which allows more massive hailstones to be supported by updrafts, leaving them suspended longer. This longer time means larger hailstone sizes. The tables on the next page display the TORRO Hailstorm Intensity Scale along with a spectrum of hailstone diameters and their everyday equivalents.

Table 2-25: TORRO Hailstorm Intensity Scale.

Intensity Category		Hail Diameter (mm)	Probable Kinetic Energy	Typical Damage Impacts
H0	Hard Hail	5	0 - 20	No damage
H1	Potentially Damaging	5 - 15	>20	Slight general damage to plant, crops
H2	Significant	10 - 20	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20 - 30	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25 - 40	>500	Widespread glass damage, vehicle body work
H5	Destructive	30 - 50	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40 - 60		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50 - 75		Severe roof damage, risk of serious injuries
H8	Destructive	60 - 90		Severe damage to aircraft bodywork
H9	Super Hailstorms	75 - 100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Table 2-26: Spectrum of Hailstone Diameters and their Everyday Description.
(Source: National Weather Service)

Spectrum of Hailstone Diameters	
Hail Diameter Size	**Description**
1/4”	Pea
1/2”	Plain M&M
3/4”	Penny
7/8”	Nickle
1” (severe)	Quarter
1 1/4”	Half Dollar
1 1/2”	Ping Pong Ball / Walnut
1 3/4”	Golf Ball
2”	Hen Egg / Lime
2 1/2"	Tennis Ball
2 3/4"	Baseball
3”	Teacup / Large Apple
4”	Softball
4 1/2"	Grapefruit
4 3/4” – 5”	Computer CD-DVD

Hailstorms can cause widespread damage to homes and other structures, automobiles, and crops. While the damage to individual structures or vehicles is often minor, the cumulative cost to communities, especially across large metropolitan areas, can be quite significant. Hailstorms can also be devastating to crops. Thus, the severity of hailstorms depends on the size of the hailstones, the length of time the storm lasts, and where it occurs.

Hail rarely causes loss of life, although large hailstones can cause bodily injury.

High Winds

In general, high winds can occur in a number of different ways, within and without thunderstorms. The Federal Emergency Management Agency (FEMA) distinguishes these as shown in *Table 2-27*.

Table 2-27: High Winds Categorized by Source, Frequency, and Duration.
(Source: Making Critical Facilities Safe from High Wind, FEMA)

High Winds Categories			
High Wind Type	**Description**	**Relative Frequency in Louisiana**	**Relative Maximum Duration in Louisiana**
Straight-line Winds	Wind blowing in straight line; usually associated with intense low-pressure area	High	Few-minutes – 1 day
Downslope Winds	Wind blowing down the slope of a mountain; associated with temperature and pressure gradients	N/A	N/A
Thunderstorm Winds	Wind blowing due to thunderstorms, and thus associated with temperature and pressure gradients	High (especially in the spring and summer	~Few minutes – several hours
Downbursts	Sudden wind blowing down due to downdraft in a thunderstorm; spreads out horizontally at the ground, possibly forming horizontal vortex rings around the downdraft	Medium-to-High (~5% of all thunderstorms)	~15 – 20 minutes
Northeaster (nor'easter) Winds	Wind blowing due to cyclonic storm off the east coast of North America; associated with temperature and pressure gradients between the Atlantic and land	N/A	N/A
Hurricane Winds	Wind blowing in spirals, converging with increasing speed toward eye; associated with temperature and pressure gradients between the Atlantic and Gulf and land	Low-to-Medium	Several days
Tornado Winds	Violently rotating column of air from base of a thunderstorm to the ground with rapidly decreasing winds at greater distances from center; associated with extreme temperature gradient	Low-to-Medium	Few minutes – few hours

The only high winds of present concern are thunderstorm winds and downbursts. Straight-line winds are common but are a relatively insignificant hazard (on land) compared to other high winds. Downslope winds are common but relatively insignificant in the mountainous areas of Louisiana where they occur. Nor'easters are cyclonic events that have at most a peripheral effect on Louisiana, and none associated with high winds. Winds associated with hurricanes and tornadoes will be considered in their respective sections.

Table 2-28 presents the Beaufort Wind Scale, first developed in 1805 by Sir Francis Beaufort, which aids in determining relative force and wind speed based on the appearance of wind effects.

Table 2-28: Beaufort Wind Scale.
(Source: NOAA's SPC)

Beaufort Wind Scale			
Force	**Wind (MPH)**	**WMO Classification**	**Appearance of Wind Effects on Land**
			Calm, smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves and small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust, leaves, and loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Twigs breaking off trees, generally impedes progress
9	47-54	Strong Gale	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	54-73	Violent Storm	
12	74+	Hurricane	

Major damage directly caused by thunderstorm winds is relatively rare, while minor damage is common and pervasive, and most noticeable when it contributes to power outages. These power outages can have major negative impacts such as increased tendency for traffic accidents, loss of revenue for businesses, increased vulnerability to fire, food spoilage, and other losses that might be sustained by a loss of power.

Power outages may pose a health risk for those requiring electric medical equipment and/or air conditioning.

Lightning

Lightning is a natural electrical discharge in the atmosphere that is a by-product of thunderstorms. Every thunderstorm produces lightning. There are three primary types of lightning: intra-cloud, cloud-to-ground, and cloud-to-cloud. Cloud-to-ground lightning has the potential to cause the most damage to property and crops, while also posing as a health risk to the populace in the area of the strike.

Damage caused by lightning is usually to homes or businesses. These strikes have the ability to damage electrical equipment inside the home or business and can also ignite a fire that could destroy homes or crops.

Lightning continues to be one of the top three storm-related killers in the United States per FEMA, but it also has the ability to cause negative long-term health effects to the individual that is struck. The following table outlines the lightning activity level that is a measurement of lightning activity.

Table 2-29: Lightning Activity Level (LAL) Grids.

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

Hazard Profile

Hailstorms

Location

Hailstorms are a meteorological phenomenon that can occur anywhere. Therefore, the entire planning area for St. Bernard Parish is at risk for hailstorms. The worst-case scenario for hailstorms is hail up to a 2" diameter.

Previous Occurrences / Extents

Historically, there have been 17 hail incidents in St. Bernard Parish. Hailstorm diameters have ranged from one inch to two inches per the National Climatic Data Center since 1950. The most frequently recorded hail sizes have been 1.75-inch in diameter. Since the last update, there has been no significant hailstorm events in St. Bernard Parish since the 2015 St. Bernard Parish HMP update.

Frequency

Hailstorms occur frequently within St. Bernard Parish with an annual chance of occurrence calculated at 57% based on the records for the past 30 years (1989-2019). *Figure 2-18* displays the density of hail storm events in St. Bernard Parish, while *Figure 2-19* provides an overview of hailstorm size based on location.

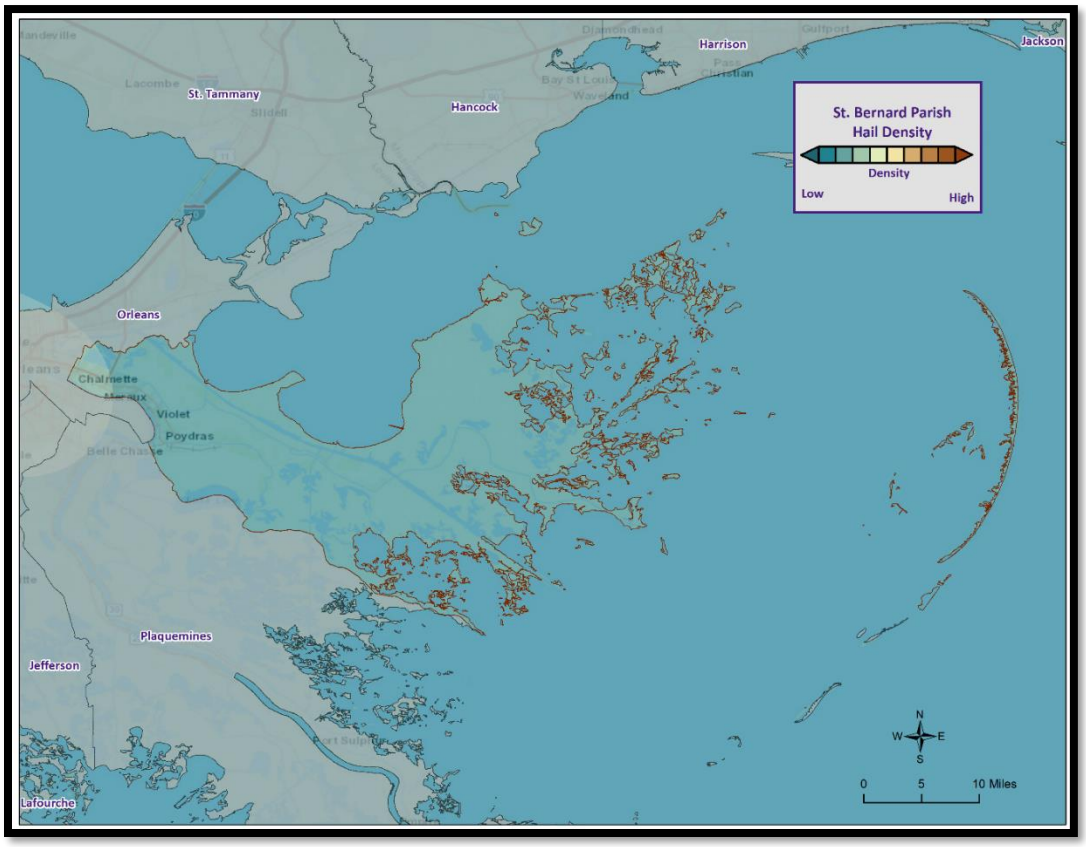


Figure 2-18: Density of Hailstorms by Diameter from 1950-2019.

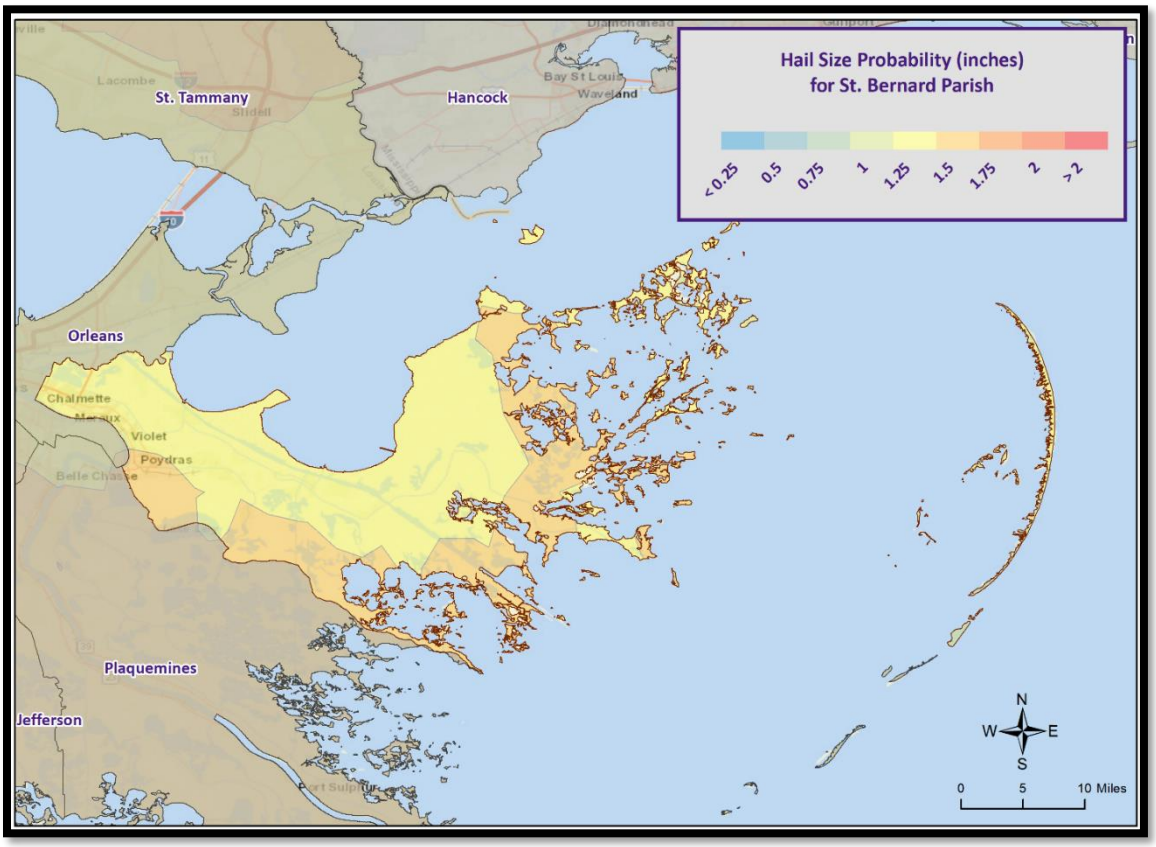


Figure 2-19: Hail Size Probability in Inches for St. Bernard Parish.

Estimated Potential Losses

Since 1989, there have been 17 significant hail events that have resulted in property damages according to NCEI Storm Events Database. The total property damages associated with those storms have totaled approximately $1,000. To estimate the potential losses of a wind event on an annual basis, the total damages recorded for wind events was divided by the total number of years of available wind data in the NCEI Storm Events Database (1989 - 2019). This provides an annual estimated potential loss of $33 and $59 per event. The following table provides an estimate of potential property losses for St. Bernard Parish:

Table 2-30: Estimated Annual Property Losses in St. Bernard Parish resulting from Hail Damage.

Estimated Annual Potential Losses from Hail for St. Bernard Parish
$33

There have been no reported injuries or fatalities as a result of a hail events over the 30-year record.

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to hailstorms.

High Winds

Location

Because high winds are a meteorological phenomenon that can occur anywhere, the entire planning area for St. Bernard Parish is at risk from high winds. The worst-case scenario for thunderstorm high wind is wind speeds of approximately 81 mph.

Previous Occurrences / Extents

Historically, there have been 24 thunderstorm high wind events in St. Bernard Parish. High winds have ranged from 57 mph to 81 mph per the National Climatic Data Center since 1989. The most frequently recorded high wind speed has been 57 mph. Since the last update, there has been three high wind events in St. Bernard Parish. *Table 2-31* provides an overview of the high wind speeds which impacted the St. Bernard Parish Planning area since the 2015 St. Bernard Parish HMP update.

Table 2-31: Previous Occurrences for Thunderstorm High Wind Events since the 2015 Hazard Mitigation Plan Update.
(Source: NCEI Storm Events Database)

Location	Date	Recorded Wind Speeds (mph)	Property Damage	Crop Damage
ALLUVIAL CITY	May 12, 2017	61	$0	$0
VERSAILLES	March 11, 2018	57	$0	$0
SHELL BEACH	February 12, 2019	58	$0	$0

Frequency

High winds are a common occurrence within St. Bernard Parish with an annual chance of occurrence calculated at 80% based on the records for the past 30 years (1989-2019). *Figure 2-20* displays the thunderstorm wind speed probability for St. Bernard Parish.

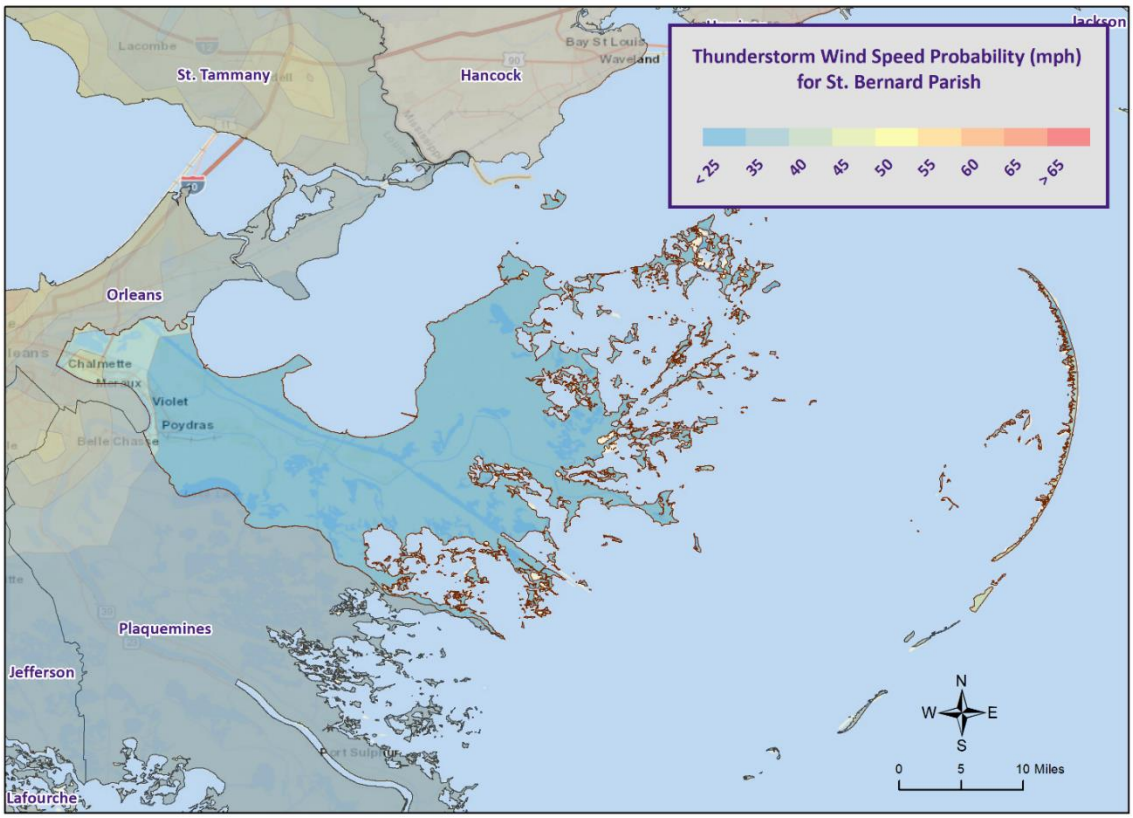


Figure 2-20: Thunderstorm High Wind Speed Probability in Miles Per Hour for St. Bernard Parish.

Estimated Potential Losses

Since 1989, there have been 24 significant wind events that have resulted in property damages according to NCEI Storm Events Database. The total property damages associated with those storms have totaled approximately $143,400. To estimate the potential losses of a wind event on an annual basis, the total damages recorded for wind events was divided by the total number of years of available wind data in the NCEI Storm Events Database (1989 - 2019). This provides an annual estimated potential loss of $4,780 and $5,975 per event. The following table provides an estimate of potential property losses for St. Bernard Parish.

Table 2-32: Estimated Annual Property Losses in St. Bernard Parish resulting from Wind Damage.

Estimated Annual Potential Losses from Thunderstorm Winds for St. Bernard Parish
$4,780

There have been two deaths and no reported injuries as a result of thunderstorm high wind events over the 30-year record.

Vulnerability

See appendix C for parish and municipality buildings that are susceptible to thunderstorm high winds.

Lightning

Location

Like hail and high winds, lightning is a meteorological phenomenon that can occur anywhere within the St. Bernard Parish planning area. The worst-case scenario for lightning events is a lightning activity level of 4 which is approximately 16 to 25 lightning strikes every 15 minutes.

Previous Occurrences / Extent

Historically, there has been five lightning events in St. Bernard Parish between the years 1989 and 2019. Since the last HMP update, there has been one significant lighting event within the boundaries of St. Bernard Parish. *Table 2-33* provides an overview of the lightning events which impacted the St. Bernard Parish Planning area since the 2015 St. Bernard Parish HMP update.

Table 2-33: Previous Occurrences for Lightning Events since the 2015 Hazard Mitigation Plan Update. (Source: NCEI Storm Events Database)

Location	Date	Property Damage	Crop Damage
VERSAILLES	May 20, 2016	$0	$0

Frequency

Lightning can strike anywhere and is produced by every thunderstorm, so the chance of lightning occurring in St. Bernard Parish is high. However, lightning that meets the definition that is used by the NCEI Storm Events Database that results in damages to property and injury or death to people is a less likely event. St. Bernard Parish experienced five significant lightning events between the years 1989 and 2019 resulting in a 21% annual chance of occurrence.

Estimated Potential Losses

Since 1989, there have been five significant lightning events that have resulted in property damages according to NCEI Storm Events Database. The total property damages associated with those storms have totaled approximately $20,500. To estimate the potential losses of a lightning event on an annual basis, the total damages recorded for lightning events was divided by the total number of years of available lightning data in the NCEI Storm Events Database (1989 - 2019). This provides an annual estimated potential loss of $683 and $4,100 per event. The following table provides an estimate of potential property losses for St. Bernard Parish.

Table 2-34: Estimated Annual Property Losses in St. Bernard Parish resulting from Lightning Damage.

Estimated Annual Potential Losses from Lightning for St. Bernard Parish
$683

Per the NCEI Storm Events Database, there has been one death and one injury as a result of lightning in St. Bernard Parish.

Vulnerability

See Appendix C for parish and municipality building exposure to lightning hazards.

Tornadoes

Tornadoes (also called twisters and cyclones) are rapidly rotating funnels of wind extending between storm clouds and the ground. For their size, tornadoes are the most severe storms, and 70% of the world's reported tornadoes occur within the continental United States, making them one of the most significant hazards Americans face. Tornadoes and waterspouts form during severe weather events, such as thunderstorms and hurricanes, when cold air overrides a layer of warm air, causing the warm air to rise rapidly, which usually occurs in a counterclockwise direction in the northern hemisphere. The updraft of air in tornadoes always rotates because of wind shear (differing speeds of moving air at various heights), and it can rotate in either a clockwise or counterclockwise direction; clockwise rotations (in the northern hemisphere) will sustain the system, at least until other forces cause it to die seconds to minutes later.

Since February 1, 2007, the Enhanced Fujita (EF) Scale has been used to classify tornado intensity. The EF Scale classifies tornadoes based on their damage pattern rather than wind speed; wind speed is then derived and estimated. This contrasts with the Saffir-Simpson scale used for hurricane classification, which is based on measured wind speed. *Table 2-35* shows the EF scale in comparison with the old Fujita (F) Scale, which was used prior to February 1, 2007. When discussing past tornadoes, the scale used at the time of the hazard is used. Damage and adjustment between scales can be made using the following tables.

Table 2-35: Comparison of the Enhanced Fujita (EF) Scale to the Fujita (F) Scale.

	Enhanced Fujita Scale					
	EF0	**EF1**	**EF2**	**EF3**	**EF4**	**EF5**
Wind Speed (mph)	65-85	86-110	111-135	136-165	166-200	>200
	Fujita Scale					
	F0	**F1**	**F2**	**F3**	**F4**	**F5**
	<73	73-112	113-157	158-206	207-260	>261

Table 2-36: Fujita and Enhanced Fujita Tornado Damage Scale.

Scale	Typical Damage
F0/EF0	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1/EF1	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2/EF2	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; light-object missiles generated; cars lifted off ground.
F3/EF3	Severe damage. Roofs and some walls torn of well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4/EF4	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5/EF5	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

The National Weather Service (NWS) has the ability to issue advisory messages based on forecasts and observations. The following are the advisory messages that may be issued with definitions of each:

- *Tornado Watch*: Issued to alert people to the possibility of a tornado developing in the area. A tornado has not been spotted but the conditions are favorable for tornadoes to occur.
- *Tornado Warning*: Issued when a tornado has been spotted or when Doppler radar identifies a distinctive "hook-shaped" area within a thunderstorm line.

Structures within the direct path of a tornado vortex are often reduced to rubble. Structures adjacent to the tornado's path are often severely damaged by high winds flowing into the tornado vortex, known as inflow winds. It is here, adjacent to the tornado's path, that the building type and construction techniques are critical to the structure's survival. Although tornadoes strike at random, making all buildings vulnerable, mobile homes, homes on crawlspaces, and buildings with large spans are more likely to suffer damage.

The major health hazard from tornadoes is physical injury from flying debris or being in a collapsed building or mobile home. Within a building, flying debris or missiles are generally stopped by interior walls. However, if a building has no partitions, any glass, brick, or other debris blown into the interior is life threatening. Following a tornado, damaged buildings are a potential health hazard due to instability, electrical system damage, and gas leaks. Sewage and water lines may also be damaged.

Peak tornado activity in Louisiana occurs during the spring, as it does in the rest of the United States. Nearly one-third of observed tornadoes in the United States occur during April. About half of those in Louisiana, including many of the strongest, occur between March and June. Fall and winter tornadoes are less frequent, but the distribution of tornadoes throughout the year is more uniform in Louisiana than in locations farther north.

Location

While there is a significant tornado record in St. Bernard Parish with actual locations, tornadoes in general are a climatological based hazard and have the same approximate probability of occurring in St. Bernard Parish as all of its communities. Because a tornado has a similar probability of striking anywhere within the planning area for St. Bernard Parish, all areas in the parish are equally at risk for tornadoes.

Previous Occurrences / Extent

The NCEI Storm Events Database reports a total of nine tornadoes or waterspouts occurring within the boundaries of St. Bernard Parish since 1989 ranging in extent from F0 to F2 under the Fujita Scale and EF0 to EF1 on the Enhanced Fujita Scale. St. Bernard Parish can expect future tornadoes up to an EF3 under the Enhanced Fujita Scale as a worst case scenario.

The most destructive tornado to impact St. Bernard Parish was a F2 tornado which occurred on May 8, 1995. The tornado touched down briefly near Arabi, overturning eight railroad tank cars and heavily damaging several commercial buildings. The tornado was responsible for over $300k in damage. There have been no reported injuries or deaths as a result of tornadoes in St. Bernard Parish.

Since the 2015 HMP Update, one tornado has occurred within the boundaries of St. Bernard Parish. Below is a list and brief description of the impact for the event.

Table 2-37: Historical Tornadoes in St. Bernard Parish with Locations since the 2015 Update.

Date	Impacts	Property Damage	Location	Magnitude
July 18, 2019	0.1 mile path with a width of 100 yards. A large waterspout was spotted near Bayou Bienvenue Lock south of the Great Flood Barrier.	$0	MERAUX	EF0

Frequency / Probability

Tornadoes occur frequently within St. Bernard Parish with an annual chance of occurrence calculated at 30% based on the records for the past 30 years (1989-2019). *Figure 2-21* displays the density of tornado touchdowns in St. Bernard Parish and neighboring parishes.

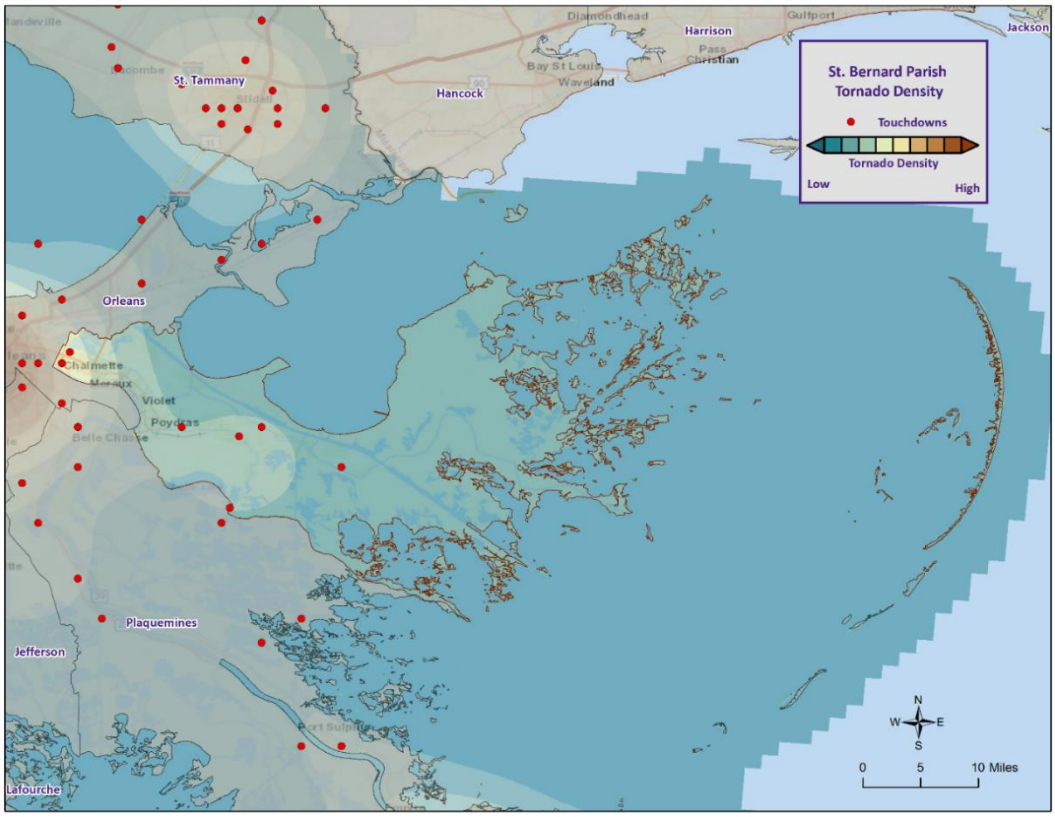


Figure 2-21: Location and Density of Tornadoes to Touchdown in St. Bernard Parish. (Source: NOAA/SPC Severe Weather Database)

Estimated Potential Loses

According to the NCEI Storm Events Database, there have been nine tornadoes that have caused some level of property damage. The total damage from the actual claims for property is approximately $2,070,000 with an average cost of $230,000 per tornado event. When annualizing the total cost over the 30-year record, total annual loses based on tornadoes are estimated to be $69,000. *Table 2-38* provides an annual estimate of potential losses for St. Bernard Parish.

Table 2-38: Estimated Annual Losses for Tornadoes in St. Bernard Parish.

Estimated Annual Potential Losses from Tornadoes for St. Bernard Parish
$69,000

Table 2-39 presents an analysis of building exposure that are susceptible to tornadoes by general occupancy type for St. Bernard Parish along with the percentage of building stock that are mobile homes.

Table 2-39: Building Exposure by General Occupancy Type for Tornadoes in St. Bernard Parish. (Source: FEMA's Hazus 2.2)

Building Exposure by General Occupancy Type for Tornadoes Exposure Types ($1,000)							
Residential	Commercial	Industrial	Agricultural	Religion	Government	Education	Mobile Homes (%)
2,741,825	646,044	133,490	8,759	74,759	15,932	60,286	14.4%

The Parish has suffered through a total of eight days in which tornadoes or waterspouts have accounted for no injuries or fatalities during this 30-year period.

In accessing the overall risk to population, the most vulnerable population throughout the parish are those residing in manufacturing housing. Approximately 14.4% of all housing in St. Bernard Parish consists of manufactured housing. Based on location data collected in a previous hazard mitigation project, there are 18 known locations where manufactured housing is concentrated. The location and density of manufactured houses can be seen in *Figure 2-22*.

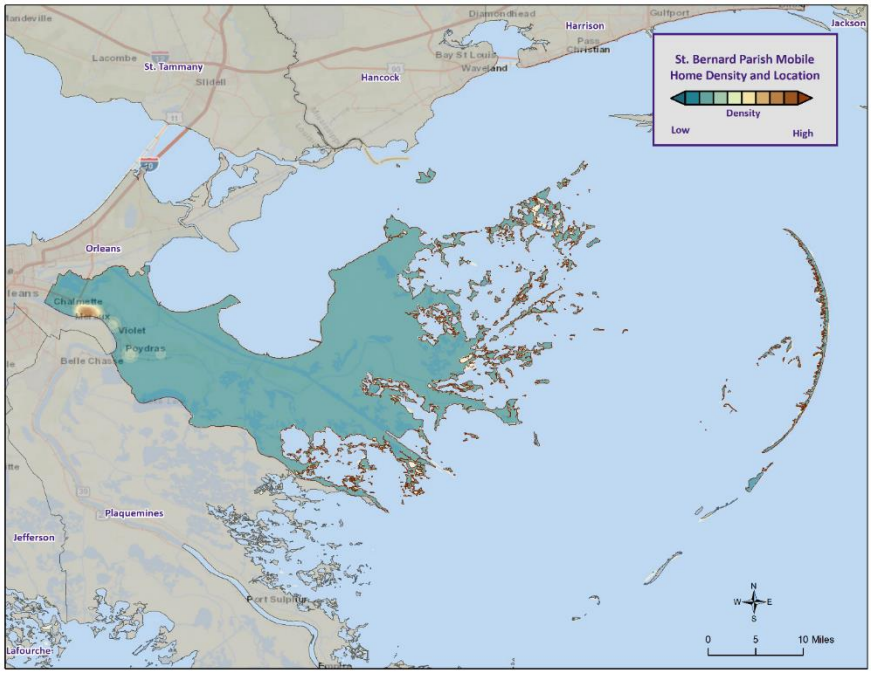


Figure 2-22: Location Density of Manufactured Housing Units throughout St. Bernard Parish.

Vulnerability

See Appendix C for parish and municipality building exposure to tornadoes.

Tropical Cyclones

Tropical cyclones are among the worst hazards Louisiana faces. These spinning, low-pressure air masses draw surface air into their centers and attain strength ranging from weak tropical waves to the most intense hurricanes. Usually, these storms begin as clusters of oceanic thunderstorms off the western coast of Africa, moving westward in the trade wind flow. The spinning of these thunderstorm clusters begins because of the formation of low pressure in a perturbation in the westerly motion of the storms associated with differential impacts of the Earth's rotation. The west-moving, counterclockwise-spinning collection of storms, now called a tropical disturbance, may then gather strength as it draws humid air toward its low-pressure center. This results in the formation of a tropical depression (defined when the maximum sustained surface wind speed is 38 mph or less), then a Tropical Cyclone (when the maximum sustained surface wind ranges from 39 mph to 73 mph), and finally a hurricane (when the maximum sustained surface wind speeds exceed 73 mph). On the next page, the table presents the Saffir-Simpson Hurricane Wind Scale, which categorizes tropical cyclones based on sustained winds.

Table 2-40: Saffir-Simpson Hurricane Wind Scale

Saffir-Simpson Hurricane Wind Scale			
Category	**Sustained Winds**	**Pressure**	**Types of Damage Due to Winds**
Tropical Depression	<39 mph	N/A	N/A
Tropical Cyclone	39-73 mph	N/A	N/A
1	74-95 mph	>14.2 psi	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 shallow-rooted trees may be toppled, especially after the soil becomes waterlogged. Extensive damage to power lines and poles will likely result in power outages that could last several days.
2	96-110 mph	14-14.2 psi	Extremely dangerous winds will cause extensive damage. Well-constructed frame homes could sustain major roof and siding damage. Many shallow-rooted trees will be snapped or uprooted, especially after the soil becomes waterlogged, and block numerous roads. Near total power loss is expected, with outages that could last from several days to weeks.
3	111-129 mph	13.7 -14 psi	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, especially after the soil becomes waterlogged, blocking numerous roads. Electricity and water may be unavailable for several days to weeks after the storm passes.
4	130-156 mph	13.3-13.7 psi	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, especially after the soil becomes waterlogged, 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 or higher	<13.7 psi	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 to months.

Many associated hazards can occur during a hurricane, including heavy rains, flooding, high winds, and tornadoes. A general rule of thumb in coastal Louisiana is that the number of inches of rainfall to be expected from a tropical cyclone is approximately 100 divided by the forward velocity of the storm in mph; so a fast-moving storm (20 mph) might be expected to drop five inches of rain while a slow-moving (5 mph) storm could produce totals of around 20 inches. However, no two storms are alike, and such generalizations have limited utility for planning purposes. Hurricane Beulah, which struck Texas in 1967, spawned 115 confirmed tornadoes. In recent years, extensive coastal development has increased the storm surge resulting from these storms so much that this has become the greatest natural hazard threat to property and loss of life in the state. Storm surge is a temporary rise in sea level generally caused by reduced air pressure and strong onshore winds associated with a storm system near the coast. Although storm surge can technically occur at any time of the year in Louisiana, surges caused by hurricanes can be particularly deadly and destructive. Such storm surge events are often accompanied by large, destructive waves (exceeding ten meters in some places) that can inflict a high number of fatalities and economic losses. In 2005, Hurricane Katrina clearly demonstrated the destructive potential of this hazard, as it produced the highest modern-day storm surge levels in the State of Louisiana, reaching up to 18.7 feet near Alluvial City in St. Bernard Parish.

Property can be damaged by the various forces that accompany a tropical cyclone. High winds can directly impact structures in three ways: wind forces, flying debris, and pressure. By itself, the force of the wind can knock over trees, break tree limbs, and destroy loose items, such as television antennas and power lines. Many things can be moved by high winds. As winds increase, so does the pressure against stationary objects. Pressure against a wall rises with the square of the wind speed. For some structures, this force is enough to cause failure. The potential for damage to structures is increased when debris breaks the building “envelope” and allows the wind pressure to impact all surfaces (the building envelope includes all surfaces that make up the barrier between the indoors and the outdoors, such as the walls, foundation, doors, windows, and roof). Mobile homes and buildings in need of maintenance are most subject to wind damage. High winds mean bigger waves. Extended pounding by waves can demolish any poorly or improperly designed structures. The waves also erode sand beaches, roads, and foundations. When foundations are compromised, the building will collapse.

Nine out of ten deaths during hurricanes are caused by storm surge flooding. Falling tree limbs and flying debris caused by high winds have the ability to cause injury or death. Downed trees and damaged buildings are a potential health hazard due to instability, electrical system damage, broken pipelines, chemical releases, and gas leaks. Sewage and water lines may also be damaged. Salt water and freshwater intrusions from storm surge send animals, such as snakes, into areas occupied by humans.

Location

Hurricanes are the single biggest threat to all of South Louisiana. With any single tropical cyclone event having the potential to devastate multiple parishes at once, tropical cyclones are a significant threat to the entire St. Bernard Parish planning area. The worst-case scenario for a tropical cyclone event in St. Bernard Parish is a Category 5 Hurricane.

Previous Occurrences / Extents

St. Bernard Parish has experienced 20 major tropical cyclone events since 2002. Hurricane Katrina has been by far the worst hurricanes to impact St. Bernard Parish in recorded history. Katrina’s devastation was compounded with Hurricane Rita just days after. The following table provides a list of tropical cyclones which have impacted St. Bernard Parish since 2002.

Table 2-41: Historical Tropical Cyclone Events in St. Bernard Parish from 2002 - 2019.

Date	Name	Storm Type At Time of Impact
2002	Bertha	Tropical Storm
2002	Hanna	Tropical Storm
2002	Isidore	Tropical Storm
2002	Lili	Hurricane – Category 1
2003	Bill	Tropical Storm
2004	Ivan	Hurricane – Category 1
2004	Matthew	Tropical Storm
2005	Cindy	Hurricane
2005	Dennis	Tropical Storm
2005	Katrina	Hurricane – Category 3
2005	Rita	Tropical Storm
2008	Fay	Tropical Depression
2008	Gustav	Hurricane – Category 1
2008	Ike	Tropical Storm
2009	Ida	Tropical Storm
2011	Lee	Tropical Storm
2012	Isaac	Tropical Storm
2017	Cindy	Tropical Storm
2017	Nate	Hurricane
2019	Barry	Hurricane

Since the last St. Bernard Parish HMP update in 2015, there have been three tropical cyclone events which have impacted the parish. Below is a brief description of the three events and the impact they had on St. Bernard Parish.

Tropical Storm Cindy (2017)

Tropical Storm Cindy was the first tropical cyclone to make landfall in Louisiana since Hurricane Isaac in 2012. The third named storm of the 2017 Atlantic hurricane season, Cindy formed out of a broad area of low pressure that developed in the northwestern Caribbean Sea near the Yucatan Peninsula in June 2017. The disturbance gradually organized as it drifted northwards into the Gulf of Mexico before organizing into a tropical storm on June 20, 2017. Tropical Storm peaked with sustained winds of 60 mph on June 21, and weakened slightly prior to making landfall in southwestern Louisiana on June 22. The storm quickly weakened as it moved further inland eventually degenerating into a remnant low on June 23, 2017.

The minimum sea level pressure of 1004.4 mb, along with the highest wind gust, and highest sustained wind in southeast Louisiana were all measured by the New Orleans Lakefront Airport. The highest wind gust recorded was 49 mph, and the highest maximum sustained wind was 44 mph. Tropical storm force winds were primarily experienced in gusts as squalls moved through the area. The winds did cause minor damage to trees, roofs, and power lines. The only known injuries in southeast Louisiana resulted from a tree falling on a mobile home in Houma, Louisiana.

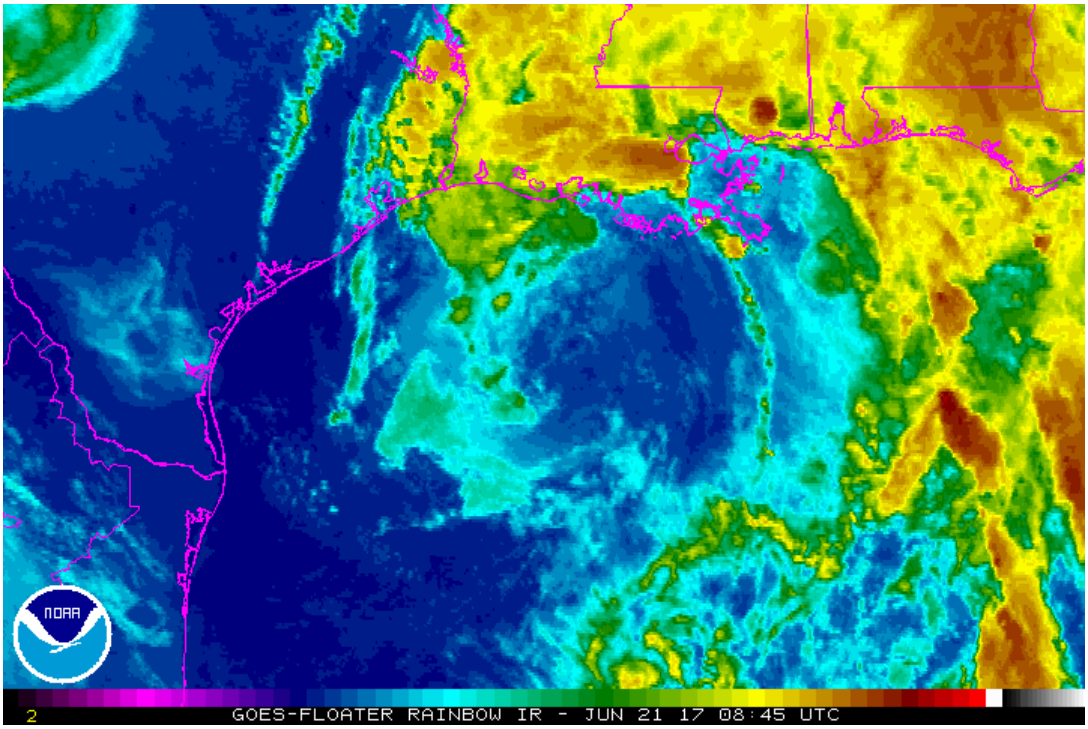


Figure 2-23: Tropical Cyclone Cindy Rain Bands across the Gulf Coast Area. (Source: NOAA)

A storm tide of generally four to six feet occurred along the Gulf Coast of southeast Louisiana from St. Bernard Parish to Terrebonne Parish. The highest measured storm tide was 6.18 feet NAVD88 at the USCOE gauge near Mandeville, Louisiana. Impacts from storm surge were minor to moderate with flooding occurring in low lying areas and roadways outside of levee systems.

Many areas of southeast Louisiana received three to five inches of rain with a few measurements in excess of six inches. Maximum storm total rainfall was 6.52 inches measured in St. Bernard Parish. The rainfall resulted in some minor river flooding across portions of the north shore of Lake Pontchartrain.

The primary impact in St. Bernard Parish was flooding of lowland property and minor roof damage due to winds. Frequent tropical storm force gusts and a few instances of sustained tropical storm force winds were reported at the Shell Beach C-Man Station (SHBL1). The highest gust reported was 46 knots on the evening of June 21st.

Hurricane Nate (2017)

Hurricane Nate began as a tropical depression over the northwest Caribbean Sea on the morning of October 4th. Nate moved fairly rapidly northward, with forward speeds in excess of 20 mph while it gained strength. The storm moved north-northwestward through much of the day on October 7th, eventually turning northward as it approached southeast Louisiana. The storm became asymmetric as it approached southeast Louisiana and coastal Mississippi with the stronger winds primarily on the east side of the system. The storm continued moving to the north and north-northeast as it weakened into a tropical depression near Birmingham, Alabama on October 8, 2017.

Minor impacts due to storm surge flooding were noted over several parishes in southeast Louisiana, while moderate impacts due to strong winds and storm surge were noted over the Mississippi coastal counties. Storm tides of four to eight feet were general observed in the coastal counties of Mississippi ranging from

two to four feet in the western counties and four to eight feet in the eastern counties. In southeast Louisiana, storm tides from two to five feet were noted resulting in storm surge of one to three feet. Only minor impacts from storm surge were reported. Rain amounts of three to six inches were common over the Mississippi coastal counties, while Louisiana observed rainfall amounts of two inches or less.

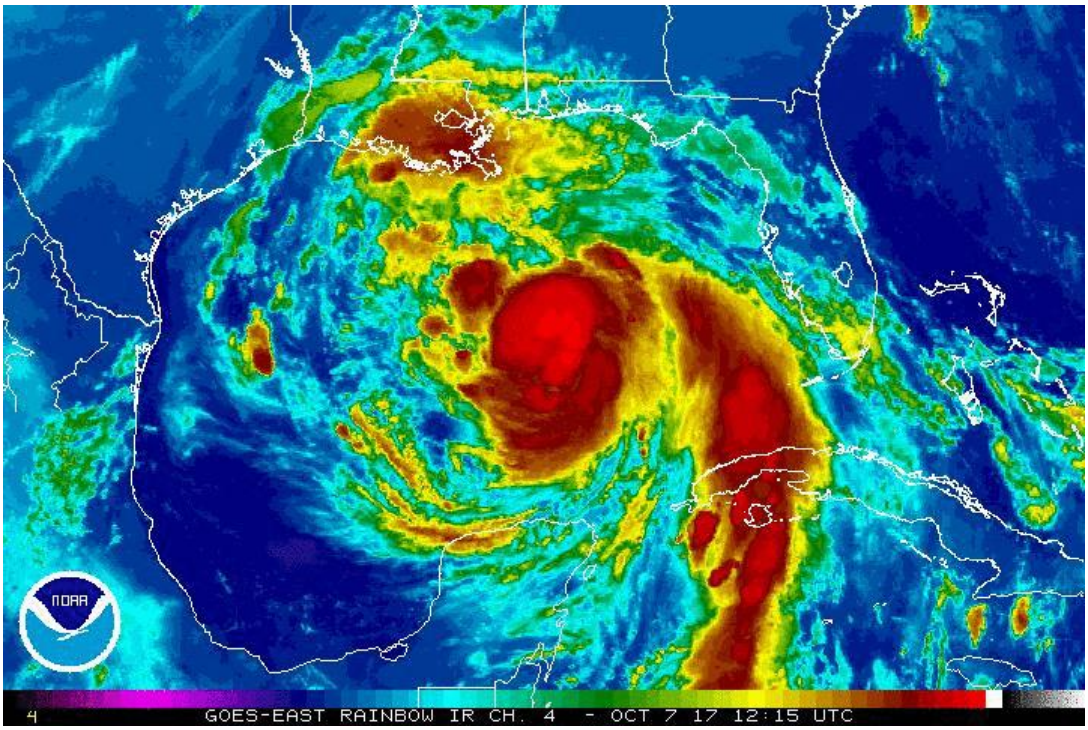


Figure 2-24: Hurricane Nate Rain Bands across the Gulf Coast Area.
(Source: NOAA)

In St. Bernard Parish, lower end tropical storm force wind gusts were felt throughout the parish with a wind gust of 40 knots and sustained winds of 34 knots recorded at the at the Shell Beach CMAN station. No significant impacts were noted in St. Bernard Parish. No injuries or fatalities were recorded in St. Bernard Parish as a result of Hurricane Nate.

Hurricane Barry (2019)

Hurricane Barry initially developed from a disturbance that moved from Georgia southwest to the northeast Gulf of Mexico on July 8-9, 2019. The weak low pressure system continued to move west-southwest and strengthen, and was eventually classified as Tropical Storm Barry on the morning of July 11th, 95 miles south-southeast of the mouth of the Mississippi River. Barry continued to move slowly west then northwest and briefly reached hurricane strength on the morning of July 13th before landfall in south-central Louisiana near Intracoastal City, Louisiana in Vermillion Parish. Tropical storm force winds reached the southeast Louisiana coast by midday on Friday, July 12th and spread slowly northwest reaching the Baton Rouge area during the evening of the 12th. Tropical storm wind impacts had ended across all of southeast Louisiana by midday on July 14th. Tropical storm force winds were primarily measured in gusts across southeast Louisiana. The exception was in Terrebonne and Assumption Parishes, close to the landfall location, where sustained tropical storm force winds and frequent gusts caused more significant power line and tree damage. A few tropical storm wind gusts were recorded in the metro New Orleans area but were not very impactful. No hurricane force wind gusts were recorded in southeast Louisiana.

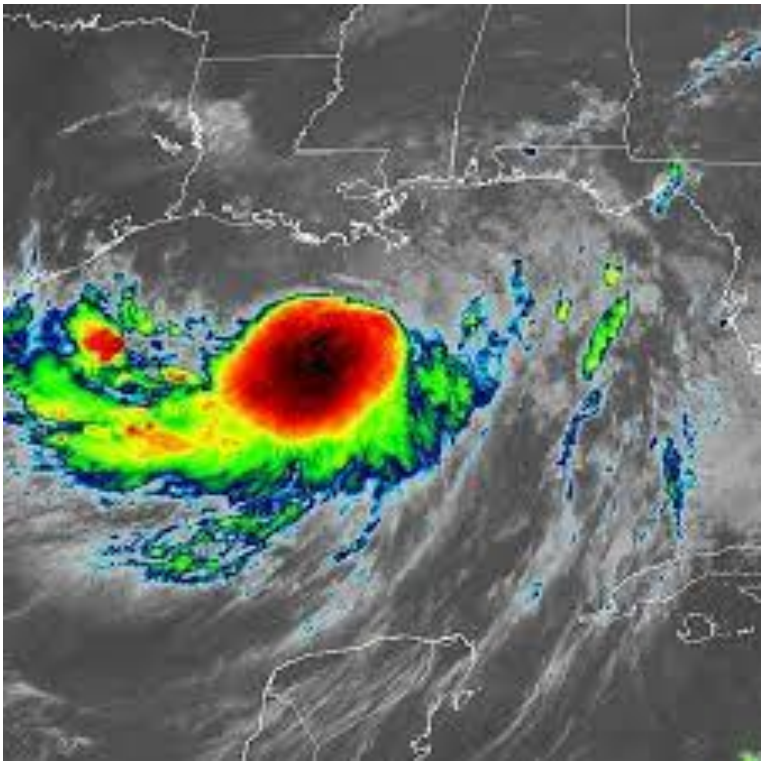


Figure 2-25: Hurricane Barry Rain Bands in the Gulf Coast Area. (Source: NOAA)

Mostly minor to moderate storm surge flooding occurred across coastal southeast Louisiana, including Lake Pontchartrain, and a small part of the Mississippi Coast. Terrebonne Parish had significant storm surge flooding in the lower portion of the parish with storm tides of five to eight feet, locally up to nine feet. Several local levees were overtopped on the morning of July 13th flooding roads and a few homes. The highest storm tide reading was 9.11 feet NAVD88 at a USGS tide gauge at Caillou Lake near Dulac, Louisiana.

Storm total rainfall was generally between four and eight inches with a maximum rainfall of 8.83 inches recorded northeast of Denham Springs, Louisiana in Livingston Parish. Isolated flash flooding of streets and secondary roadways occurred on July 13th in the greater Baton Rouge area, but flash flooding was not widespread or significant. The lower Mississippi River was at unusually high stages from late August with the state at the New Orleans Carrolton gauge near 16.5 feet. The combination of storm surge entering the lower Mississippi River with very high river stages prompted concern of potential overtopping of levees along the Mississippi River in lower Plaquemines Parish prompting some evacuations of the area.

In St. Bernard Parish, occasional tropical storm force wind gusts were observed in the parish. A sustained 35 knot wind and a wind gust of 41 knots were noted at Shell Beach during the afternoon of the 12th. Storm total rainfall was estimated to be 2 to 4 inches except for the extreme eastern portion of the parish, where lower totals were likely. The highest observed rainfall total was 2.96 inches near COCORAHS site LA-SB-2.

The figure on the next page displays the wind zones that affect St. Bernard Parish in relation to critical facilities throughout the parish.

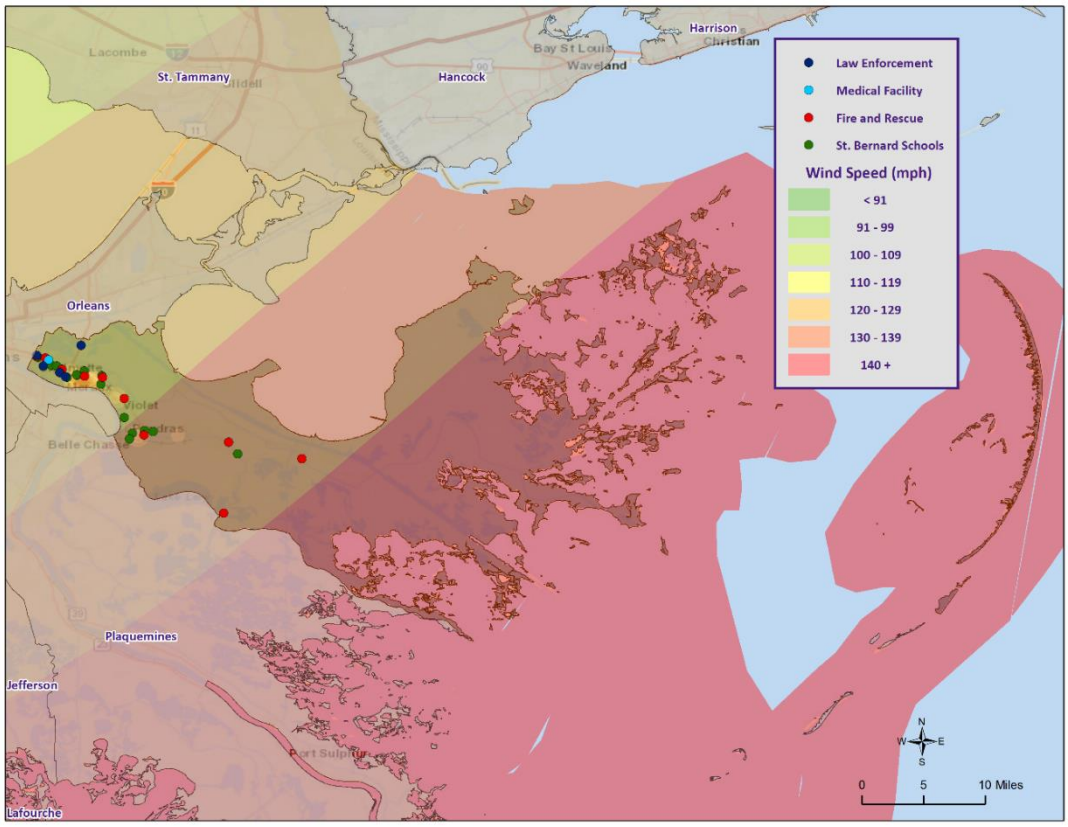


Figure 2-26: Winds Zones for St. Bernard Parish in Relation to Critical Facilities.

Frequency / Probability

Tropical cyclones are large natural hazard events that regularly impact St. Bernard Parish. The annual chance of occurrence for a tropical cyclone is estimated at 100% for St. Bernard Parish with 20 events occurring within 17 years (2002 to 2019). The tropical cyclone season for the Atlantic Basin is from June 1st through November 30th, with most of the major hurricanes (Saffir-Simpson Categories 3, 4, & 5) occurring between the months of August and October. Based on geographical location alone St. Bernard Parish is highly vulnerable to tropical cyclones. This area has experienced several tropical cyclone events in the past and can expect more in the future.

Estimated Potential Losses

Using Hazus 100-Year Hurricane Model, the 100-year hurricane scenario was analyzed to determine losses from this worst-case scenario. The following table shows the total economic losses that would result from this occurrence.

Table 2-42: Total Estimated Losses for a 100-Year Hurricane Event (Source: Hazus)

Jurisdiction	Estimated Total Losses from 100-Year Hurricane Event
St. Bernard Parish	$210,776,147

Total losses from a 100-year hurricane event for St. Bernard Parish were compared with the total value of assets to determine the ratio of potential damage to total inventory in the table below.

Table 2-43: Ratio of Total Losses to Total Estimated Value of Assets for St. Bernard Parish (Source: Hazus)

Jurisdiction	Estimated Total Losses from 100-Year Hurricane Event	Total Estimated Value of Assets	Ratio of Estimated Losses to Total Value
St. Bernard Parish	$210,776,147	$3,681,095,000	5.7%

Based on the Hazus Hurricane Model, estimated total losses for St. Bernard Parish was 5.7% of the total estimated value of all assets.

The Hazus Hurricane Model also provides a breakdown for seven primary sectors (Hazus occupancy) throughout the parish. The losses for St. Bernard Parish by sector are listed in the table below.

Table 2-44: Estimated Losses in St. Bernard Parish for a 100-Year Hurricane Event (Source: Hazus)

St. Bernard Parish	Estimated Total Losses from 100-Year Hurricane Event
Agricultural	$650,410
Commercial	$3,919,870
Government	$690,777
Industrial	$5,651,799
Religious / Non-Profit	$2,501,099
Residential	$195,405,020
Schools	$1,957,172
Total	**$210,776,147**

Threat to People

The total population within the parish that is susceptible to a hurricane hazard is shown in the table below:

Table 2-45: Number of People Susceptible to a 100-Year Hurricane Event in St. Bernard Parish (Source: Hazus)

Number of People Exposed to Hurricane Hazards			
Location	**# in Community**	**# in Hazard Area**	**% in Hazard Area**
St. Bernard Parish	35,897	35,897	100%

The Hazus hurricane model was also extrapolated to provide an overview of vulnerable populations throughout St. Bernard Parish. These populations are illustrated in the following table:

Table 2-46: Vulnerable Populations in St. Bernard Parish for a 100-Year Hurricane Event (Source: Hazus)

St. Bernard Parish		
Category	**Total Numbers**	**Percentage of People in Hazard Area**
Number in Hazard Area	35,897	100.0%
Persons Under 5 Years	2,847	7.9%
Persons Under 18 Years	6,329	17.6%
Persons 65 Years and Over	3,288	9.2%
White	26,578	74.0%
Minority	9,319	26.0%

Vulnerability

See Appendix C for parish and municipality buildings that are susceptible to tropical cyclones.

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3. Capability Assessment

This section summarizes the results of St. Bernard Parish and other agency efforts to develop policies, programs, and activities that directly or indirectly support hazard mitigation. It also provides information on resources and gaps in the parish's infrastructure, as well as relevant changes in its law since the last plan update, in order to suggest a mitigation strategy.

Through this assessment, St. Bernard Parish is able to identify strengths that could be used to reduce losses and reduce risk throughout the communities. It also identifies areas where mitigation actions might be used to supplement current capabilities and create a more resilient community before, during and after a hazard event.

Policies, Plans and Programs

St. Bernard Parish capabilities are unique to the parish, including planning, regulatory, administrative, technical, financial, and education and outreach resources. There are a number of mitigation-specific acts, plans, executive orders, and policies that lay out specific goals, objectives, and policy statements which already support or could support pre- and post-disaster hazard mitigation. Many of the ongoing plans and policies hold significant promise for hazard mitigation, and take an integrated and strategic look holistically at hazard mitigation in St. Bernard Parish to propose ways to continually improve it. These tools are valuable instruments in pre- and post-disaster mitigation as they facilitate the implementation of mitigation activities through the current legal and regulatory framework. Examples of existing documents in St. Bernard Parish include the following:

Table 3-1: Planning and Regulatory Capabilities

Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
	St. Bernard Parish	Comments
Plans	**Yes / No**	
Comprehensive / Master Plan	Y	Community Dev, annually
Capital Improvements Plan	N	
Economic Development Plan	Y	Econ Dev commission, annually
Local Emergency Operations Plan	Y	2019 - OHSEP, annually
Continuity of Operations Plan	Y	2019 - OHSEP, annually
Transportation Plan	Y	2019 - OHSEP, annually
Stormwater Management Plan	Y - 2018	Master Drainage Plan - 2019
Community Wildfire Protection Plan	N	
Other plans (redevelopment, recovery, coastal zone management)	Y	Redevelopment - comm development, annually; Recovery - recovery dept and OHSEP, annually; Coastal - coastal zone manager in comm dev, annually
Building Code, Permitting and Inspections	**Yes / No**	
Building Code	Y	2012
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	
Fire Department ISO/PIAL rating	Y	
Site plan review requirements	Y	
Land Use Planning and Ordinances	**Yes / No**	
Zoning Ordinance	Y	
Subdivision Ordinance	Y	
Floodplain Ordinance	Y	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	Y	
Flood Insurance Rate Maps	Y	
Acquisition of land for open space and public recreation uses	Y	
Other	N	

St. Bernard Parish will work to expand their capabilities by adding to these plans, as well as work to create new plans that will address a long-term recovery and resiliency framework. In instances where there are no existing plans, there will be a commitment to explore opportunities to create new plans that will address long-term recovery and resiliency framework as parish and local resources allow.

Building Codes, Permitting, Land Use Planning and Ordinances

The St. Bernard Parish Government provides oversight for building permits and codes, land use planning, and all parish ordinances.

As of the 2020 update, St. Bernard Parish and its communities ensure that all adopted building codes are enforced and in compliance relating to the construction of any structure within the boundaries of the parish. Building permits are required prior to beginning any type of construction or renovation projects, installation of electrical wiring, plumbing or gas piping, moving manufactured/modular or portable buildings, and reroofing or demolitions.

The St. Bernard Parish Government is also responsible for enforcing the parish ordinances related to health and safety, property maintenance standards, and condemnation of unsafe structures.

The St. Bernard Parish Government meets regularly to consider any proposed ordinance changes, and to take final actions on proposed changes.

While local capabilities for mitigation can vary from community to community, St. Bernard Parish as a whole has a system in place to coordinate and share these capabilities through the OHSEP and through this Parish Hazard Mitigation Plan.

Some programs and policies, such as the above described, might use complementary tools to achieve a common end, but fail to coordinate with or support each other. Thus, coordination among local mitigation policies and programs is essential to hazard mitigation.

Administration, Technical, and Financial

As a community, St. Bernard Parish has administrative and technical capabilities in place that may be utilized in reducing hazard impacts or implementing hazard mitigation activities. Such capabilities include staff, skillset, and tools available in the community that may be accessed to implement mitigation activities and to effectively coordinate resources. The ability to access and coordinate these resources is also important. The table on the following page shows examples of resources in place in St. Bernard Parish.

Table 3-2: Administration and Technical Capabilities

Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
	St. Bernard Parish	Comments
Administration	Yes / No	
Planning Commission	Y	
Mitigation Planning Committee	Y	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	
Mutual Aid Agreements	Y	
Staff	Yes / No; FT/PT	
Chief Building Official	Y/FT	
Floodplain Administrator	Y/FT	
Emergency Manager	Y/FT	
Community Planner	Y/FT	
Civil Engineer	Y/FT	
GIS Coordinator	Y/PT	
Grant Writer	Y	Contractor
Other	N	
Technical	Yes / No	
Warning Systems / Service (Reverse 911, Everbridge)	Y	
Hazard Data & Information	Y	
Grant Writing	Y	
Hazus Analysis	Y	
Other	N	

Financial capabilities are the resources that St. Bernard Parish has access to or are eligible to use in order to fund mitigation actions. Costs associated with implementing the actions identified by the parish may vary from little to no cost actions, such as outreach efforts, or substantial action costs such acquisition of flood prone properties.

The following financial resources are available to fund mitigation actions in St. Bernard Parish:

Table 3-3: Financial Capabilities

Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
	St. Bernard Parish	Comments
Funding Resource	Yes / No	
Capital Improvements project funding	Y	
Authority to levy taxes for specific purposes	N	Needs voter approval
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Stormwater Utility Fee	N	
Community Development Block Grant (CDBG)	Y	
Other Funding Programs	N	

Education and Outreach

A key element in hazard mitigation is promoting a safer, more disaster resilient community through education and outreach activities and/or programs. Successful outreach programs provide data and

information that improves overall quality and accuracy of important information for citizens to feel better prepared and educated with mitigation activities. These programs enable the individual communities and the parish as a whole to maximize opportunities for implementation of activities through greater acceptance and consensus of the community.

St. Bernard Parish has existing education and outreach programs to implement mitigation activities, as well as communicate risk and hazard related information to its communities. Specifically, focusing on advising repetitive loss property owners of ways they can reduce their exposure to damage by repetitive flooding remains a priority for the entire parish. The existing programs are as follows:

Table 3-4: Education and Outreach Capabilities

Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
	St. Bernard Parish	Comments
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	LEPC
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Y	LEPC
Natural Disaster or safety related school program	N	
Storm Ready certification	Y	2019
Firewise Communities certification	N	
Public/Private partnership initiatives addressing disaster-related issues	Y	
Other	N	

The communities within St. Bernard Parish rely on St. Bernard OHSEP and/or St. Bernard Parish Government agencies for the above listed planning and regulatory, administrative and technical, financial, and education and outreach capabilities.

As reflected with above existing regulatory mechanisms, programs and resources within the parish, St. Bernard Parish remains committed to expanding and improving on the existing capabilities within the parish. Communities, along with St. Bernard Parish will work together toward increased participation in funding opportunities and available mitigation programs. Should funding become available, the hiring of additional personnel to dedicate to hazard mitigation initiatives and programs, as well as increasing ordinances within the parish, will all enhance and expand risk reduction for all of St. Bernard Parish.

Flood Insurance and Community Rating System

St. Bernard Parish is not currently participating in the Community Rating System (CRS). Participation in the CRS strengthens local capabilities by lowering flood insurance premiums for jurisdictions that exceed NFIP minimum requirements.

The Federal Emergency Management Agency's National Flood Insurance Program (NFIP) administers the Community Rating System (CRS). Under the CRS, flood insurance premiums for properties in participating communities are reduced to reflect the flood protection activities that are being implemented. This program can have a major influence on the design and implementation of flood mitigation activities, so a brief summary is provided here.

A community receives a CRS classification based upon the credit points it receives for its activities. It can undertake any mix of activities that reduce flood losses through better mapping, regulations, public information, flood damage reduction and/or flood warning and preparedness programs.

There are ten CRS classes: Class 1 requires the most credit points and gives the largest premium reduction; Class 10 receives no premium reduction (see *Figure 3-1*). A community that does not apply for the CRS or that does not obtain the minimum number of credit points is a class 10 community.

CLASS	DISCOUNT	CLASS	DISCOUNT
1	45%	6	20%
2	40%	7	15%
3	35%	8	10%
4	30%	9	5%
5	25%	10	–
SFHA (Zones A, AE, A1–A30, V, V1–V30, AO, and AH): Discount varies depending on class.			
SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1–A30, AR/AH, and AR/AO): 10% discount for Classes 1–6; 5% discount for Classes 7–9.*			
Non-SFHA (Zones B, C, X, D): 10% discount for Classes 1–6; 5% discount for Classes 7–9.			

Figure 3-1: CRS Discounts by Class (Source: FEMA)

As of September 2019, 317 communities in the State of Louisiana participate in the Federal Emergency Management Agency's National Flood Insurance Program (NFIP). Of these communities, 47 (or 15%) participate in the Community Rating System (CRS). Jefferson Parish leads the state with a rating of Class 5, followed by the City of Mandeville in St. Tammany Parish with a Class 6 rating. Of the top fifty Louisiana communities, in terms of total flood insurance policies held by residents, 27 participate in the CRS. The remaining 23 communities present an outreach opportunity for encouraging participation in the CRS.

The CRS provides an incentive not just to start new mitigation programs, but to keep them going. There are two requirements that "encourage" a community to implement flood mitigation activities. Once the parish has obtained a CRS rating and is a participant, the parish will receive CRS credit for this plan when it is adopted. To retain that credit, though, the parish must submit an evaluation report on progress toward implementing this plan to FEMA by October 1 of each year. That report must be made available to the media and the public. Second, the parish must annually recertify to FEMA that it is continuing to implement its CRS credited activities. Failure to maintain the same level of involvement in flood protection can result in a loss of CRS credit points and a resulting increase in flood insurance rates to residents.

In 2011[1], the National Flood Insurance Program (NFIP) completed a comprehensive review of the Community Rating System (CRS) that resulted in the release of a new CRS Coordinator's Manual. The changes to the 2013 CRS Coordinator's Manual are the result of a multi-year program evaluation that included input from a broad group of contributors to evaluate the CRS and refine the program to meet its stated goals. The changes helped to drive new achievements in the following six core flood loss reduction areas important to the NFIP: (1) reduce liabilities to the NFIP Fund; (2) improve disaster resiliency and sustainability of communities; (3) integrate a Whole Community approach to addressing emergency management; (4) promote natural and beneficial functions of floodplains; (5) increase understanding of risk, and; (6) strengthen adoption and enforcement of disaster-resistant building codes.

Since the revision of the 2013 Coordinator's Manual, FEMA released the 2017 CRS Coordinator's Manual which continued the evolution of the CRS program and its mission to reward communities that prioritize mindful floodplain regulations. As with the 2013 manual, the changes made in the 2017 manual impact

[1] https://www.fema.gov/national-flood-insurance-program-community-rating-system

each CRS community differently. Some communities see an increase in the points they receive since points for certain activities have increased (e.g., Activity 420 Open Space Preservation). Other communities receive fewer points for certain activities (e.g., Activity 320 Map Information Service). It is likely that some communities with marginal CRS Class 9 programs have to identify new CRS credits in order to remain in the CRS class. Most notably, as it relates to this hazard mitigation plan, more credit was made available for Activity 410 Floodplain Mapping.

Typically, CRS communities do not request credit for all the activities they are currently implementing unless it would earn enough credit to advance the community to a higher CRS Class. A community that finds itself losing CRS credit with the 2017 manual could likely identify activities deserving credit they had not previously received. Due to the changes in both activities and CRS points, community CRS coordinators should speak with their ISO/CRS Specialist to understand how the 2017 manual will impact their community and when.

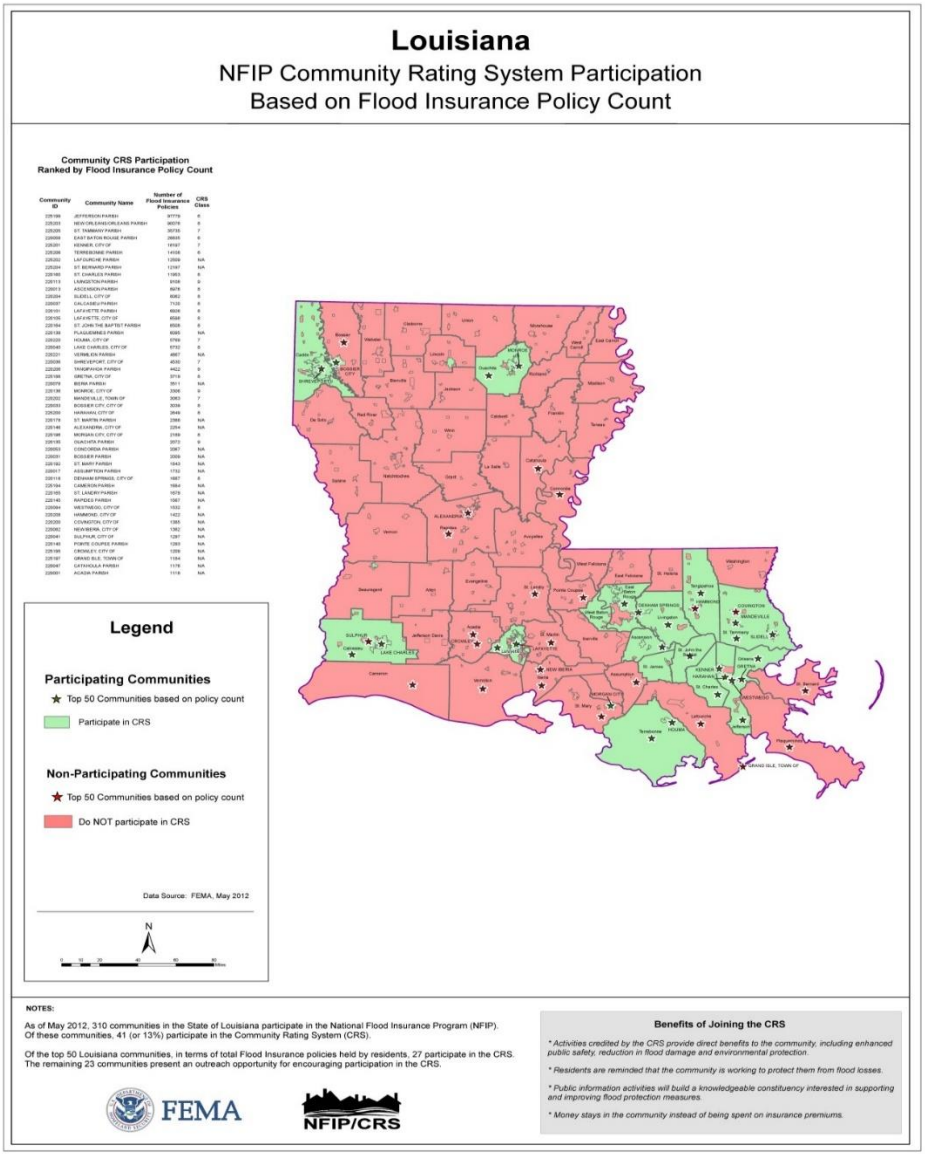

Figure 3-2: Louisiana CRS Participation
(Source: FEMA[2])

[2] http://www.fema.gov/media-library-data/20130726-2128-31471-9581/ks_ky_la_crs_may_2012_508.zip

In addition to the direct financial reward for participating in the Community Rating System, there are many other reasons to participate in the CRS. As FEMA staff often say, "If you are only interested in saving premium dollars, you're in the CRS for the wrong reason."

The other benefits that are more difficult to measure in dollars include:
1. The activities credited by the CRS provide direct benefits to residents, including:
   – Enhanced public safety
   – A reduction in damage to property and public infrastructure
   – Avoidance of economic disruption and losses
   – Reduction of human suffering
   – Protection of the environment

2. A community's flood programs will be better organized and more formal. Ad hoc activities, such as responding to drainage complaints rather than an inspection program, will be conducted on a sounder, more equitable basis.

3. A community can evaluate the effectiveness of its flood program against a nationally recognized benchmark.

4. Technical assistance in designing and implementing a number of activities is available at no charge from the Insurance Services Office.

5. The public information activities will build a knowledgeable constituency interested in supporting and improving flood protection measures.

6. A community would have an added incentive to maintain its flood programs over the years. The fact that its CRS status could be affected by the elimination of a flood related activity or a weakening of the regulatory requirements for new developments would be taken into account by the governing board when considering such actions.

7. Every time residents pay their insurance premiums, they are reminded that the community is working to protect them from flood losses, even during dry years.

**More information on the Community Rating System can be found at https://www.fema.gov/national-flood-insurance-program-community-rating-system **

NFIP Worksheets

Parish NFIP worksheets can be found in Appendix E: State Required Worksheets.

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4. Mitigation Strategy

Introduction

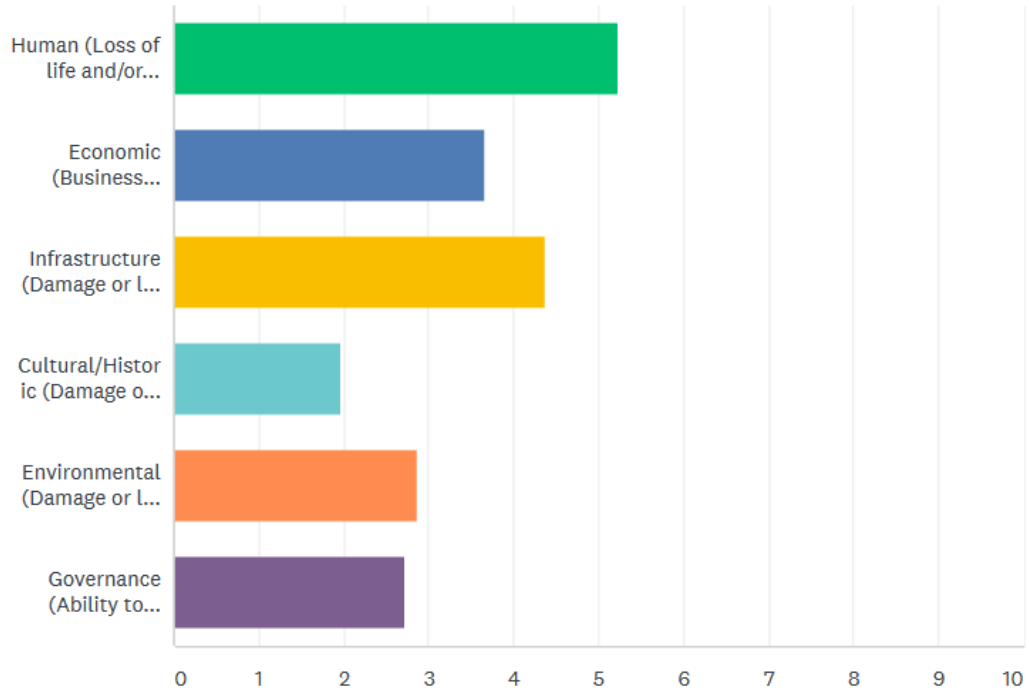
St. Bernard Parish's Hazard Mitigation Strategy has a common guiding principle and is the demonstration of the parish's commitment to reduce risks from hazards. The strategy also serves as a guide for parish and local decision makers as they commit resources to reducing the effects of hazards.

St. Bernard Parish confirmed the goals, objectives, actions and projects over the period of the hazard mitigation plan update process. The mitigation actions and projects in this 2020 HMP update are a product of analysis and review of the St. Bernard Parish Hazard Mitigation Plan Steering Committee under the coordination of the St. Bernard Parish Office of Homeland Security and Emergency Preparedness. The committee was presented a list of projects and actions, new and from the 2015 plan, for review from March 2020 – July 2020.

An online public opinion survey of St. Bernard Parish residents was conducted between March and October 2020. The survey was designed to capture public perceptions and opinions regarding natural hazards in St. Bernard Parish. In addition, the survey collected information regarding the methods and techniques preferred by the respondents for reducing the risks and losses associated with local hazards.

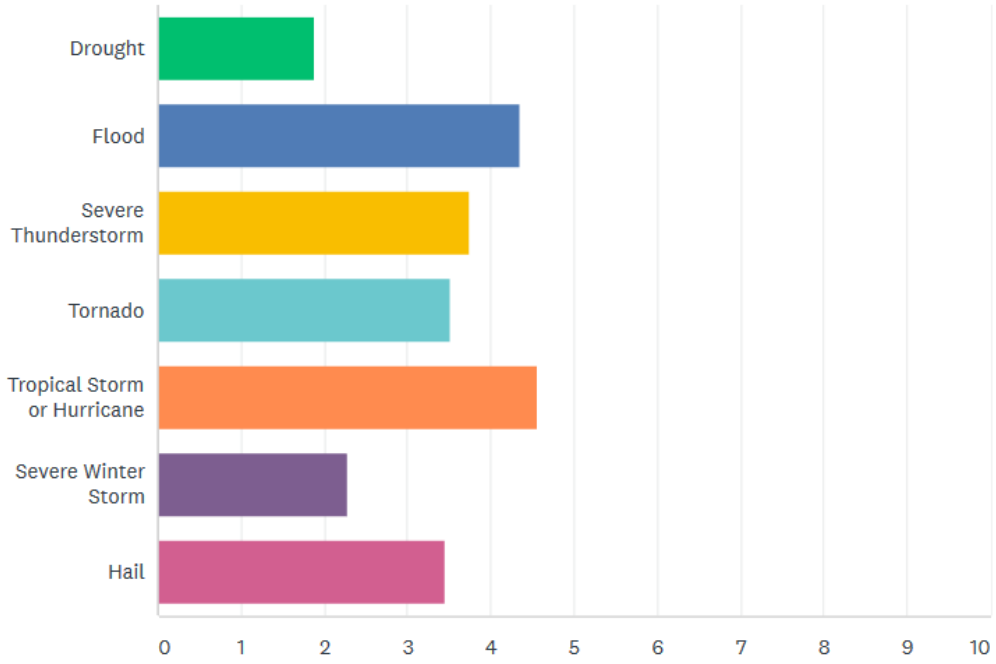
When asked to gauge from a list which categories were most susceptible to impacts caused by natural hazards, the top three categories selected were:

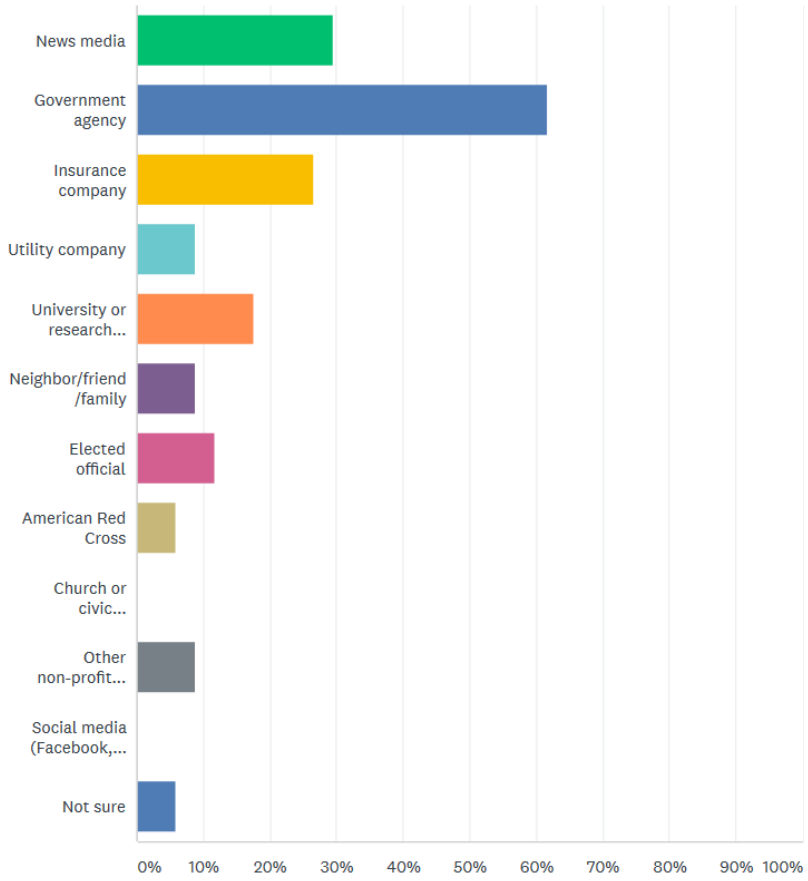
1. Human (Loss of life and/or injuries)
2. Infrastructure (Damage or loss of bridges, utilities, schools, etc.)
3. Economic (Business closures and/or job losses)



The survey results also indicated which natural disasters citizens were *most concerned* with being affected by in St. Bernard Parish. The top three natural disasters selected were:

1. Tropical Storm or Hurricane
2. Flooding
3. Severe Thunderstorm





The results shown above are related to the manner in which the general population receives information on how to make their home safer from natural disasters. These results are encouraging because it shows that the public has high confidence and trust in the information being disseminated by local government agencies. Implementation of the outreach activities put forth by parish officials and offices seem to have been executed in a successful manner

This activity confirms that the goals and action items developed by the St. Bernard Parish Hazard Mitigation Plan Steering Committee are representative of the outlook of the community at large. Full survey results can be found here:

https://www.surveymonkey.com/results/SM-9FRZVTSP7/

Goals

The goals represent the guidelines that the parish and its communities want to achieve with this plan update. To help implement the strategy and adhere to the mission of the Hazard Mitigation Plan, the preceding section of the plan update was focused on identifying and quantifying the risks faced by the residents and property owners in St. Bernard Parish from natural and manmade hazards. By articulating goals and objectives based on the previous plans, the risk assessment results, and intending to address those results, this section sets the stage for identifying, evaluating, and prioritizing feasible, cost effective, and environmentally sound actions to be promoted at the parish and municipal level – and to be undertaken by the state for its own property and assets. By doing so, St. Bernard Parish can make progress toward reducing identified risks.

For the purposes of this plan update, goals and action items are defined as follows:

- **Goals** are general guidelines that explain what the parish wants to achieve. Goals are expressed as broad policy statements representing desired long-term results.
- **Action Items** are the specific steps (projects, policies, and programs) that advance a given goal. They are highly focused, specific, and measurable.

The current goals of the St. Bernard Parish Hazard Mitigation Plan Update Steering Committee represent long-term commitments by the parish. After assessing these goals, the committee decided that the current remain valid.

The goals are as follows:

Goal 1: Identify and pursue preventative measures that will reduce future damages from hazards

Goal 2: Enhance public awareness and understanding of disaster preparedness

Goal 3: Reduce repetitive flood losses in the parish

Goal 4: Facilitate sound development and rebuilding in the parish so as to reduce or eliminate the potential impacts of hazards

The Mitigation Action Plan focuses on actions to be taken by St. Bernard Parish. All of the activities in the Mitigation Action Plan will be focused on helping the parish and its communities in developing and funding projects that are not only cost effective but also meet the other DMA 2000 criteria of environmental compatibility and technical feasibility.

The Hazard Mitigation Plan Steering Committee reviewed and evaluated the potential action and project lists in which consideration was given to a variety of factors. Such factors include determining a project's eligibility for federal mitigation grants as well as its ability to be funded. This process required evaluation of each project's engineering feasibility, cost effectiveness, and environmental and cultural factors.

2020 Mitigation Actions and Update on Previous Plan Actions

The St. Bernard Parish Hazard Mitigation Plan Steering Committee identified new actions that would reduce and/or prevent future damage within St. Bernard Parish and their respective communities. In that effort, the parish focused on a comprehensive range of specific mitigation actions. These actions were identified in thorough fashion by the consultant team and the committee by way of frequent and open communications and meetings held throughout the planning process. The addition of these new actions, coupled with any ongoing and/or carried over projects from their previous update, provide St. Bernard Parish with a solid mitigation strategy through which risk and losses will be reduced throughout the parish and its communities.

As outlined in the Local Mitigation Planning Handbook the following are eligible types of mitigation actions:

- **Local Plans and Regulations –** These actions include government authorities, policies, or codes that influence the way land and buildings are developed and built.
- **Structure and Infrastructure Projects –** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area, and also includes projects to construct manmade structures to reduce the impact of hazards.

- **Natural System Protection –** These actions minimize the damage and losses and also preserve or restore the functions of natural systems.
- **Education and Awareness Programs –** These actions inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.

The established and agreed upon parish actions relative to the parish-wide goals are below. Additionally, action updates from the previous plan updates can be found below the new actions.

St. Bernard Parish Completed Mitigation Actions

Completed Mitigation Projects in St Bernard Parish					
Completed Mitigation Projects in St. Bernard Parish	**Action Description**	**Funding Source**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
Culvert Upgrades	Upgrade the culverts: replace with larger pipes and box culverts; provide floodgates. Benefits: Reduce the street flooding and the number of flooded structures by increasing the volume of water pumped out by the drainage pumps.	Parish Budget, Grant funds (HMGP, PDM, FMA)	St. Bernard Parish Public Works	Flooding, Tropical Cyclones	Completed
Safe Rooms: Schools	Provide safe rooms in schools and public buildings. Benefit: Protect from loss of life and injury due high wind events	Parish Budget, School Board Budget, Grant funds (HMGP, PDM)	OHSEP Director, Public Works Director, School Board Superintendent	Thunderstorms, Tropical Cyclones	Completed
Building Code Improvements	Amend building code regulations. Adopt the updated Louisiana Uniform Construction Code as per State Law. Benefits: Reduce the losses to new structures from natural hazards.	Parish funding	Director of Community Development	Flooding, Tropical Cyclones, Thunderstorms	Completed
Land Use/Zoning Improvements	Amend the land use and zoning regulations. Benefits: Reduce the losses to new structures from natural hazards.	Parish funding	Director of Community Development	Flooding, Tropical Cyclones, Sinkholes	Completed
Floodplain Ordinance Improvement	Amend the floodplain ordinance and adopt updated flood insurance rating maps for new structures upon their issue by FEMA. Benefits: Ensure continued compliance for NFIP participation. Reduce flood losses to new structures.	Parish funding	St. Bernard Parish Director of Community Development	Flooding, Tropical Cyclones	Completed
Safe Rooms: Critical Facilities.	Construction of safe rooms for identified critical facilities in the parish. Benefit: Protect from loss of life and injury due high wind events	Parish Budget, School Board Budget, Grant funds (HMGP, PDM)	St. Bernard Parish OHSEP Director, Public Works Director, School Board Superintendent	Thunderstorms - High Wind, Tropical Cyclones	Completed
Lightning Protection Projects	Installation of lightning rods and surge protectors for governmental buildings and critical facilities	Parish funding	St. Bernard Parish OHSEP Director	Thunderstorms - Lightning	Completed

St. Bernard Parish Previous and New Mitigation Actions

St. Bernard Parish Existing Mitigation Actions						
Jurisdiction-Specific Action	**Action Description**	**Funding Source**	**Timeframe**	**Responsible Party, Agency, or Department**	**Hazard**	**Status**
Participate and pursue projects to result in increased CRS scores and protect homeowners.	Promote the purchase of flood insurance. Conduct fairs and open houses to advertise the NFIP. Maintain a library of flood insurance maps for public review. Benefits: Enables homeowners to financially recover from the devastating effects of flooding as rapidly as possible. Improves CRS score and lower the flood insurance premiums. Implement programs for participation in the CRS program to decrease the flood insurance premiums in the parish.	Parish funding	N/A	St. Bernard Parish Director of Community Development	Flooding, Tropical Cyclones	Deleted
Flood proof existing and new Public Buildings.	Create a more disaster resistant structure, which will prevent interruption of services in times of emergencies. Reduce the losses due to flooding.	Parish Budget, Grant funds (HMGP, PDM, FMA)	1-5 Years	St. Bernard Parish Public Works	Flooding, Tropical Cyclones	Carried Over - Not Started
Flood proof existing and new critical infrastructure	Provide berms/floodwalls to protect existing and new critical infrastructure and to create a more disaster resistant structure, which will prevent interruption of services in times of emergencies. Reduce the losses due to flooding.	Parish Budget, Grant funds (HMGP, PDM, FMA)	1-5 Years	St. Bernard Parish Public Works	Flooding, Tropical Cyclones	Carried Over - Not Started
Drainage upgrade projects	Widen the canals; stabilize the canal banks to reduce the street flooding and the number of flooded structures by increasing the volume of water pumped out by the drainage pumps. Upgrade the drainage pump stations: elevate the pump station building, generator, control panel, transformers etc.	Parish Budget, Grant funds (HMGP, PDM, FMA)	1-5 Years	St. Bernard Parish Public Works	Flooding, Tropical Cyclones	Carried Over - Not Started
Saltwater intrusion prevention	Install screw gates for crossings under LA 624 to prevent salt water intrusion into Hopedale Basin	Grant funds (HMGP, PDM)	1-5 Years	St. Bernard Parish Public Works	Land subsidence/ Saltwater Intrusion	Carried Over - Not Started
Pursue elevation projects for repetitive loss structures.	Benefits: Losses due to flooding is reduced considerably as the repetitive loss structures account for majority of the NFIP payments.	Grant funds (HMGP, PDM, FMA, SRL)	1-5 Years	St. Bernard Parish Director of Community Development	Flooding, Tropical Cyclones	In-Progress/23 of 40 structures completed

Pursue acquisition projects for repetitive loss structures.	Benefits: Losses due to flooding is reduced considerably as the repetitive loss structures account for majority of the NFIP payments.	Grant funds (HMGP, PDM, FMA, SRL)	1-5 Years	St. Bernard Parish Director of Community Development	Flooding, Tropical Cyclones	In-Progress/25% completed
Hazard Mitigation Outreach and Education	Conduct public education and outreach programs. Distribute flyers and brochures regarding hazards, special hazard areas, and potential mitigation measures using public service announcements, local newspaper, utility bill inserts, phone books, and parish website. Benefits: An informed public is better able to respond and protect themselves in times of hazards.	Parish funding	1-5 Years	St. Bernard Parish OHSEP Director	Flooding, Land Subsidence/Salt water Intrusion, Sinkholes, Thunderstorms - High Wind, Hail, and Lightning, Tropical Cyclones	In-Progress
Harden/Retrofit New and Existing Public Buildings	Emergency generators; back-up communications systems; storm shutters; roof tie-downs and additional storm protection features.	Parish Budget, Grant funds (HMGP, PDM, FMA)	1-5 Years	St. Bernard Parish Public Works	Thunderstorms - High Wind and Hail, Tropical Cyclones	In-Progress
Harden/Retrofit new and existing critical infrastructure	Emergency generators; back-up communications systems; storm shutters; roof tie downs and additional storm protection features.	Parish Budget, Grant funds (HMGP, PDM, FMA)	1-5 Years	St. Bernard Parish Public Works, OHSEP	Thunderstorms - High Wind and Hail, Tropical Cyclones	In-Progress
Generators and Communications Equipment for Essential Facilities	Purchase of generators and communications equipment for emergency response personnel and parish buildings so that day to day operations may continue during events to protect the life and safety of essential personnel and citizens	HMGP, Federal, local	1-5 years	St Bernard Parish OHSEP	Coastal Hazards, Flooding, Sinkholes, Thunderstorms, Tornadoes, Tropical Cyclones	New
Education and Outreach for NFIP	Continue to promote the purchase of flood insurance. Advertise the availability, cost, and coverage of flood insurance through the NFIP. This enables homeowners to financially recover from the devastating effects of flooding as rapidly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.	HMGP, Federal, local	1-5 years	St Bernard Parish OHSEP	Flooding, Tropical Cyclones	New
Flood Proofing of Critical Facilities	Flood-proof critical structures within the parish to help promote continuation of critical services during a storm event	HMGP, Federal, local	1-5 years	St Bernard Parish OHSEP	Flooding, Tropical Cyclones	New

Enhanced Public Awareness Campaigns for All-Hazards	Increase public awareness of hazards and hazardous areas. Actions may include distribution of public awareness information regarding all hazards and potential mitigation measures; implementation of educational program for children and merchants; providing public education on the importance of maintaining the ditches, promotion of the purchase of flood insurance for public. Sponsor a "Multi-Hazard Awareness Week", to educate the public on all hazards. Utilize social media for mass message distribution.	HMGP, Federal, local	1-5 years	St Bernard Parish OHSEP	Coastal Hazards, Flooding, Sinkholes, Thunderstorms, Tornadoes, Tropical Cyclones	New
Coastline Restoration Projects	Identify and implement coastline preservation and restoration projects that continue to protect the parish coastline from coastal hazards.	HMGP, Federal, local	1-5 years	St Bernard Parish OHSEP	Coastal Hazards, Tropical Cyclones	New
Elevate or Acquire all RL and SRL Structures in St Bernard Parish Flood Zones	Elevations parish wide of RL & SRL structures	HMGP, Federal, local	1-5 years	St Bernard Parish OHSEP	Flooding, Tropical Cyclones	New
Building Retrofits of Critical Facilities	Retrofit of identified critical facilities throughout parish. Reduces damage from high winds, and helps assure that the public buildings can be used, occupied and operable during or after storms.	FEMA	1-5 years	St Bernard Parish OHSEP	Thunderstorms, Tornadoes, Tropical Cyclones	New
Properties at Risk Study	Conduct and complete a study to determine the effects of risks to parish properties and implement a campaign to alert affected citizen of magnitude potential and provide mitigation suggestions. Identify, develop and implement available technologies.	FEMA, Parish, Local	1-5 years	St Bernard Parish OHSEP	Coastal Hazards, Flooding, Sinkholes, Thunderstorms, Tornadoes, Tropical Cyclones	New

Action Prioritization

During the prioritization process, the steering committee considered the costs and relative benefits of each new action. Costs can usually be listed in terms of dollars, although at times it involves staff time rather than the purchase of equipment or services that can be readily measured in dollars. In most cases, benefits, such as lives saved or future damage prevented, are hard to measure in dollars. Therefore, many projects were prioritized with these factors in mind. In addition, prioritization of the mitigation actions was performed based on the following economic criteria: i) whether the action can be performed with the existing parish resources; ii) whether the action requires additional funding from external sources; and iii) relative costs of the mitigation actions.

In all cases, the committee concluded that the benefits (in terms of reduced property damage, lives saved, health problems averted and/or economic harm prevented) outweighed the costs for the recommended action items.

The steering committee prioritized the possible activities that could be pursued. Steering committee members consulted appropriate agencies in order to assist with the prioritizations. The results were items that address the major hazards, are appropriate for those hazards, are cost-effective, and are affordable. The steering committee met internally for mitigation action meetings to review and approve St. Bernard mitigation actions. On-going actions, as well as actions which can be undertaken by existing parish staff without need for additional funding, were given high priority. The actions with high benefit and low cost, political support, and public support but require additional funding from parish or external sources were given medium priority. The actions that require substantial funding from external sources with relatively longer completion time were given low priority.

St. Bernard Parish will implement and administer the identified actions based off of the proposed timeframes and priorities for each reflected in the portions of this section where actions are summarized. The inclusion of any specific action item in this document does not commit the parish to implementation. Each action item will be subject to availability of staff and funding. Certain items may require regulatory changes or other decisions that must be implemented through standard processes, such as changing regulations. This plan is intended to offer priorities based on an examination of hazards.

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Appendix A: Planning Process

Purpose

The Hazard Mitigation Plan Update process prompts local jurisdictions to keep their hazard mitigation plan current and moving toward a more resilient community. The plan update builds on the research and planning efforts of previous plans while reviewing recent trends. The steering committee followed FEMA's hazard mitigation planning process per the FEMA Local Mitigation Planning Handbook. This planning process assured public involvement and the participation of interested agencies and private organizations. Documentation of the planning process for the updated plan is addressed in this section.

The St. Bernard Parish Hazard Mitigation Plan Update

The St. Bernard Parish Hazard Mitigation Plan Update process began in December 2019 with a series of meetings and collaborations between the contractor (SDMI) and the participating agencies. Update activities were intended to give each participating agency the opportunity to shape the plan to best fit their community's goals. Community stakeholders and the general public were invited to attend and contribute information to the planning process during specific time periods or meetings.

The table below details the meeting schedule and purpose for the planning process:

Date	Meeting or Outreach	Location	Public Invited	Purpose
12/18/2019	Kick Off Meeting	Chalmette, LA	No	Discuss with Parish HM Director the expectations and requirements of the project.
1/15/2020	Initial Planning Meeting	Chalmette, LA	No	Discuss with the plan Steering Committee expectations and requirements of the project. Assign plan worksheets to Parish.
9/30/2020	Risk Assessment Overview	Chalmette, LA	No	Discuss and review the Risk Assessment with the Steering Committee. Discuss and review expectations for Public Meeting.
9/30/2020	Public Meeting	Chalmette, LA	Yes	The Public Meeting allowed the public and community stakeholders to participate and provide input into the hazard mitigation planning process. Maps of the St. Bernard Parish communities were provide for the meeting attendees to identify specific areas where localized hazards occur.
Ongoing	Public Survey Tool	Online	Yes	This survey asked participants about public perceptions and opinions regarding natural hazards in St. Bernard Parish. In addition, questions covered the methods and techniques preferred for reducing the risks and losses associated with these hazards. Survey Results: https://www.surveymonkey.com/results/SM-9FRZVTSP7/
2 Week Period	Public Plan Review (Digital)		Yes	Parish Website or other locations determined by Steering Committee

Planning

The plan update process consisted of several phases:

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10
Plan Revision										
Data Collection										
Risk Assessment										
Public Input										
Mitigation Strategy and Actions										
Plan Review by GOHSEP and FEMA										
Plan Adoption										
Plan Approval										

Coordination

The St. Bernard Parish Office of Homeland Security and Emergency Preparedness (OHSEP) oversaw the coordination of the 2020 Hazard Mitigation Plan Update Steering Committee during the update process. The parish OHSEP was responsible for identifying members for the committee.

The Parish Director and SDMI were jointly responsible for inviting the steering committees and key stakeholders to planned meetings and activities. SDMI assisted the Parish Director with press releases and social media statements for notification to the media and general public for public meetings and public outreach activities.

SDMI was responsible for facilitating meetings and outreach efforts during the update process.

Neighboring Community, Local and Regional Planning Process Involvement

From the outset of the planning process, the steering committee encouraged participation from a broad range of parish entities. The involvement of representatives from the city, state, and regional agencies provided diverse perspectives and mitigation ideas.

Formal participation in this plan includes but is not limited to the following activities:

- Participation in Hazard Mitigation Team meetings at the local and parish level
- Sharing local data and information
- Action item development
- Plan document draft review
- Formal adoption of the Hazard Mitigation Plan document following provisional approval by the State of Louisiana and FEMA

The 2020 Hazard Mitigation Plan Update Steering Committee consisted of representatives from the following parish, municipal or community stakeholders:

- St. Bernard Parish Government
- St. Bernard Office of Homeland Security and Emergency Preparedness
- St. Bernard Parish Public Works
- St. Bernard Sheriff's Office
- St. Bernard Parish Fire Department
- St. Bernard Chamber of Commerce
- St. Bernard Parish School Board
- Port of St. Bernard
- Entergy
- Valero
- Nunez Community College

The Plaquemines Parish OHSEP Director was invited to attend the Kick Off, Initial Planning, and Risk Assessment Meetings for St. Bernard Parish in an effort to coordinate mitigation efforts where possible as neighboring communities. The Plaquemines OHSEP Director was invited via email and phone call to participate in an effort to collaborate with neighboring communities. SDMI assisted St. Bernard Parish with encouraging the collaboration with these neighboring communities via email by extending an invitation to the St. Bernard Hazard Mitigation Plan Update Meetings. The participation of the GOHSEP Region 1 Coordinator during the process also contributed to neighboring community representation.

As part of the coordination and planning process, the parish was provided the State Required Hazard Mitigation Plan Update Worksheet. The completed worksheets can be found in Appendix E – State Required Plan Update Worksheets.

Below is a detailed list of the 2020 HMPU Steering Committee:

St. Bernard Parish Hazard Mitigation Planning Committee		
Name	**Title**	**Agency**
John Rahaim	Director	St. Bernard OHSEP
Roxanne Adams	Clerk	St. Bernard Parish Government
Ronnie Alonzo	CAO	St. Bernard Parish Government
Collin Arnold	Director	NOHSEP
Henry Ballard	Pastor	Christian Fellowship Family Worship Center
Jaylynn Bergeron-Turner	Assessor	St. Bernard Parish Government
Scott Boyle	ADA of Operations	LA DOTD
Elizabeth Dauterive	CEO	St. Bernard Chamber of Commerce
Chad Ellinwood	Fire Chief	PBF Energy

Matt Falati	Public Works Director	St. Bernard Parish Government
Pamela Ferbos	Representative	Entergy
David Fernandez	CFO	St. Bernard Parish School Board
Jake Groby	Superintendent of Quality Control	St. Bernard Parish Government Water & Sewer
Patrick Harvey	Director	Plaquemines Parish OHSEP
Drew Heaphy	Executive Director	St. Bernard Port, Harbor, and Terminal District
Kim Keene	Director	St. Bernard Parish Hospital
Steve Krynski	Refinery Manager	PBF Energy
John Lane	Coastal Manager	St. Bernard Parish Government
Richard Lewis	Councilman	St. Bernard Parish Government
Theresa LoGiudice	Environmental Scientist	LDEQ
Clarence Marthet	Security Manager	ASR Domino Sugar Refinery
William McCartney	HR Director	St. Bernard Parish Government
William McGoey	Assistant DA	St. Bernard Parish Government
Guy McInnis	Parish President	St. Bernard Parish Government
Jimmy Pohlmann	Sheriff	St. Bernard Sheriff's Office
Thomas Stone	Chief	St. Bernard Fire Department
Tommy Stone	Fire Chief	Valero
Jason Stopa	Director	St. Bernard Parish Community Development
Leslie Sullivan	VP General Manager	Valero
Matt Timothy	Supervisor	Atmos Energy
Tina Tinney	Chancellor	Nunez Community College
Katie Tommaseo	Tourism Manager	St. Bernard Parish Government
JJ Vickers	Deputy Chief	St. Bernard Sheriff's Office
Steve Volante	Master Trooper	Louisiana State Police
Doris Voitier	Superintendent	St. Bernard Parish School Board

Program Integration

Local governments are required to describe how their mitigation planning process is integrated with other ongoing local and area planning efforts. This subsection describes St. Bernard Parish programs and planning.

A measure of integration and coordination is achieved through the HMPU participation of Steering Committee members and community stakeholders who administer programs such as: floodplain management under the National Flood Insurance Program (NFIP), coastal protection and restoration, parish planning and zoning and building code enforcement.

St. Bernard Parish will continue to integrate the requirements of this Hazard Mitigation Plan into other local planning mechanisms that are to be identified through future meetings of the Parish, and through the five-year review process described in the Plan Maintenance section. The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update and implementation of any individual city/town plans that require specific planning and administrative tasks (e.g. risk assessment, plan amendments, ordinance revisions, capital improvement projects, etc.).

The members of the St. Bernard Parish Hazard Mitigation Steering Committee will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their communities or agencies are consistent with the goals and actions of the Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability in the Parish. Existing plans, studies, and technical

information were incorporated in the planning process. Examples include flood data from FEMA and the U. S. Geological Survey. Much of this data was incorporated into the Risk Assessment component of the plan relative to plotting historical events and the magnitude of damages that occurred. The parish's 2015 Hazard Mitigation Plan was also used in the planning process. Other existing data and plans used in the planning process include those listed below:

- Louisiana Coastal Master Plan
- Parish Emergency Operations Plan
- State of Louisiana Hazard Mitigation Plan
- Flood Insurance Rate Maps

Further information on the plans can be found in the Capabilities Assessment, Section 3.

Meeting Documentation and Public Outreach Activities

The following pages contain documentation of the meetings and public outreach activities conducted during this hazard mitigation plan update for St. Bernard Parish.

Meeting #1: Hazard Mitigation Plan Update Kick-Off

Date: December 18, 2019

Location: Chalmette, Louisiana

Purpose: Discuss the expectations and requirements of the hazard mitigation plan update process and establish an initial project timeline with the Parish's OHSEP Director and any additional personnel.

Public Initiation: No

Meeting Invitees:

Name	Title	Agency
John Rahaim	Director	St. Bernard OHSEP
Roxanne Adams	Clerk	St. Bernard Parish Government
Ronnie Alonzo	CAO	St. Bernard Parish Government
Collin Arnold	Director	NOHSEP
Henry Ballard	Pastor	Christian Fellowship Family Worship Center
Jaylynn Bergeron-Turner	Assessor	St. Bernard Parish Government
Scott Boyle	ADA of Operations	LA DOTD
Elizabeth Dauterive	CEO	St. Bernard Chamber of Commerce
Chad Ellinwood	Fire Chief	PBF Energy
Matt Falati	Public Works Director	St. Bernard Parish Government
Pamela Ferbos	Representative	Entergy
David Fernandez	CFO	St. Bernard Parish School Board
Jake Groby	Superintendent of Quality Control	St. Bernard Parish Government Water & Sewer
Patrick Harvey	Director	Plaquemines Parish OHSEP
Drew Heaphy	Executive Director	St. Bernard Port, Harbor, and Terminal District
Kim Keene	Director	St. Bernard Parish Hospital
Steve Krynski	Refinery Manager	PBF Energy
John Lane	Coastal Manager	St. Bernard Parish Government
Richard Lewis	Councilman	St. Bernard Parish Government
Theresa LoGiudice	Environmental Scientist	LDEQ
Clarence Marthet	Security Manager	ASR Domino Sugar Refinery
William McCartney	HR Director	St. Bernard Parish Government
William McGoey	Assistant DA	St. Bernard Parish Government

Guy McInnis	Parish President	St. Bernard Parish Government
Jimmy Pohlmann	Sheriff	St. Bernard Sheriff's Office
Thomas Stone	Chief	St. Bernard Fire Department
Tommy Stone	Fire Chief	Valero
Jason Stopa	Director	St. Bernard Parish Community Development
Leslie Sullivan	VP General Manager	Valero
Matt Timothy	Supervisor	Atmos Energy
Tina Tinney	Chancellor	Nunez Community College
Katie Tommaseo	Tourism Manager	St. Bernard Parish Government
JJ Vickers	Deputy Chief	St. Bernard Sheriff's Office
Steve Volante	Master Trooper	Louisiana State Police
Doris Voitier	Superintendent	St. Bernard Parish School Board

Meeting #2: Hazard Mitigation Plan Update Initial Planning Meeting

Date: January 15, 2020

Location: Chalmette, Louisiana

Purpose: Discuss the expectations and requirements of the hazard mitigation plan update process and establish an initial project timeline with the Parish's Hazard Mitigation Plan Steering Committee. Assign each individual the parish data collection for the plan update.

Meeting Invitees:

Name	Title	Agency
John Rahaim	Director	St. Bernard OHSEP
Roxanne Adams	Clerk	St. Bernard Parish Government
Ronnie Alonzo	CAO	St. Bernard Parish Government
Collin Arnold	Director	NOHSEP
Henry Ballard	Pastor	Christian Fellowship Family Worship Center
Jaylynn Bergeron-Turner	Assessor	St. Bernard Parish Government
Scott Boyle	ADA of Operations	LA DOTD
Elizabeth Dauterive	CEO	St. Bernard Chamber of Commerce
Chad Ellinwood	Fire Chief	PBF Energy
Matt Falati	Public Works Director	St. Bernard Parish Government
Pamela Ferbos	Representative	Entergy
David Fernandez	CFO	St. Bernard Parish School Board
Jake Groby	Superintendent of Quality Control	St. Bernard Parish Government Water & Sewer
Patrick Harvey	Director	Plaquemines Parish OHSEP
Drew Heaphy	Executive Director	St. Bernard Port, Harbor, and Terminal District
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Theresa LoGiudice	Environmental Scientist	LDEQ
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Thomas Stone	Chief	St. Bernard Fire Department
Tommy Stone	Fire Chief	Valero
Jason Stopa	Director	St. Bernard Parish Community Development
Leslie Sullivan	VP General Manager	Valero
Matt Timothy	Supervisor	Atmos Energy
Tina Tinney	Chancellor	Nunez Community College
Katie Tommaseo	Tourism Manager	St. Bernard Parish Government
JJ Vickers	Deputy Chief	St. Bernard Sheriff's Office
Steve Volante	Master Trooper	Louisiana State Police
Doris Voitier	Superintendent	St. Bernard Parish School Board

Meeting #3: Risk Assessment Overview

Date: September 30, 2020

Location: Chalmette, Louisiana

Purpose: Members of the St. Bernard Parish Hazard Mitigation Plan Update Steering Committee were presented the results of the risk assessment and an overview of the public meeting presentation during this overview. The assessment was conducted based on hazards identified during previous plans and on any newly identified risks.

Public Initiation: No

Meeting Invitees:

Name	Title	Agency
John Rahaim	Director	St. Bernard OHSEP
Roxanne Adams	Clerk	St. Bernard Parish Government
Ronnie Alonzo	CAO	St. Bernard Parish Government
Collin Arnold	Director	NOHSEP
Henry Ballard	Pastor	Christian Fellowship Family Worship Center
Jaylynn Bergeron-Turner	Assessor	St. Bernard Parish Government
Scott Boyle	ADA of Operations	LA DOTD
Elizabeth Dauterive	CEO	St. Bernard Chamber of Commerce
Chad Ellinwood	Fire Chief	PBF Energy
Matt Falati	Public Works Director	St. Bernard Parish Government
Pamela Ferbos	Representative	Entergy
David Fernandez	CFO	St. Bernard Parish School Board
Jake Groby	Superintendent of Quality Control	St. Bernard Parish Government Water & Sewer
Patrick Harvey	Director	Plaquemines Parish OHSEP
Drew Heaphy	Executive Director	St. Bernard Port, Harbor, and Terminal District
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Katie Tommaseo	Tourism Manager	St. Bernard Parish Government
JJ Vickers	Deputy Chief	St. Bernard Sheriff's Office
Steve Volante	Master Trooper	Louisiana State Police
Doris Voitier	Superintendent	St. Bernard Parish School Board

Meeting #4: Public Meeting

Date: September 30, 2020

Location: Chalmette, Louisiana

Purpose: The Public Meeting allowed the public and community stakeholders to participate and provide input into the hazard mitigation planning process. Maps of the St. Bernard Parish communities were provided for the meeting attendees to identify specific areas where localized hazards occur.

Public Initiation: Yes

Meeting Invitees:

St. Bernard Parish Hazard Mitigation Planning Committee		
Name	**Title**	**Agency**
John Rahaim	Director	St. Bernard OHSEP
Roxanne Adams	Clerk	St. Bernard Parish Government
Ronnie Alonzo	CAO	St. Bernard Parish Government
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JJ Vickers	Deputy Chief	St. Bernard Sheriff's Office
Steve Volante	Master Trooper	Louisiana State Police
Doris Voitier	Superintendent	St. Bernard Parish School Board

Outreach Activity #1: Public Opinion Survey

Date: Ongoing throughout planning process
Location: Web survey
Public Initiation: Yes

Outreach Activity #2: Incident Questionnaire

Date: Public Meeting Activity
Location: Public Meeting
Public Initiation: Yes

Outreach Activity #3: Mapping Activities

Public meeting attendees were asked to identify areas on parish and community specific maps provided that were "problem areas." They were also asked to indicate any areas of new development. This activity gave the public an opportunity to interact with SDMI's GIS Mapping division as well as provide valuable input on areas that may flood repeatedly during rain events that may not get reported to local emergency managers as significant events.

Appendix B: Plan Maintenance

Purpose

The section of the Code of Federal Regulations (CFR) pertaining to Local Mitigation Plans lists five required components for each plan: a description of the planning process; risk assessments; mitigation strategies; a method and system for plan maintenance; and documentation of plan adoption. This section details the method and system for plan maintenance, following the CFR's guidelines that the Plan Update must include (1) "a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle," (2) "a process by which local governments incorporated the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans" and (3) "discussion on how the community will continue public participation in the plan maintenance process."

Monitoring, Evaluating, and Updating the Plan

The St. Bernard Parish Planning Committee will be responsible for monitoring, evaluating, and documenting the plan's progress throughout the year. Part of the plan maintenance process should include a system by which local governing bodies incorporate the HMP into the parish's comprehensive or capital improvement plans. This process provides for continued public participation through the diverse resources of the parish to help in achieving the goals and objectives of the plan. Public participation will be achieved through availability of copies of HMP in parish public library and parish website. This section describes the whole update process which includes the following:

- Responsible parties
- Methods to be used
- Evaluation criteria to be applied
- Scheduling for monitoring and evaluating the plan

Responsible Parties

St. Bernard Parish has designated an entity that will perform a regular review and update of the Hazard Mitigation Plan. This will be the responsibility of the steering committee, which consists of representatives from governmental organizations, local businesses, and private citizens, who will be involved in the process of monitoring, evaluating and updating the plan. All committee members in this plan will remain active in the steering committee.

Although the people filling the positions may change from year to year, the parish and its stakeholders will have representatives on the Steering Committee. The future Steering Committee will continue to be comprised of the same job functions as currently evident in the Steering Committee. However, the decision of specific job duties will be left to the Parish OHSEP Director to be assigned as deemed appropriate.

Methods for Monitoring and Evaluating the Plan and Plan Evaluation Criteria

St. Bernard Parish has developed a method to ensure monitoring, evaluating, and updating of the HMP occurs during the five-year cycle of the plan. The planning committee will become a permanent body and will be responsible for monitoring, evaluating, and updating of the plan. The planning committee meeting

will be held annually in order to monitor, evaluate, and update the plan. The St. Bernard Parish OHSEP Director will be responsible for conducting the annual planning committee meetings. The lead person of the agency responsible for the implementation of a specific mitigation action will submit a progress report to the St. Bernard Parish OHSEP Director at least 30 days prior to the planning committee meeting. The progress report will provide project status monitoring to include the following: whether the project has started; if not started, reason for not starting; if started, status of the project; if the project is completed, whether it has eliminated the problem; and any changes recommended to improve the implementation of the project etc. In addition, the progress report will provide status monitoring on the plan evaluation, changes to the hazard profile, changes to the risk assessment, and public input on the Hazard Mitigation Plan updates and reviews.

Progress on the mitigation action items and projects will be reviewed during the annual planning committee meeting. The criteria that would be utilized in the project review will include the following:

1) Whether the action was implemented and reasons, if the action was not implemented
2) What were the results of the implemented action
3) Were the outcomes as expected, and reasons if the outcomes were not as expected
4) Did the results achieve the stated goals and objectives
5) Was the action cost-effective
6) What were the losses avoided after completion of the project
7) In case of a structural project, did it change the hazard profile

An evaluation of the plan will be conducted in the annual planning committee meeting. The planning committee will review each goal and objective to determine their relevance to changing situations in the parish, as well as changes to state or federal policy, and to ensure that they are addressing current and expected conditions. The planning committee will evaluate if any change in hazard profile and risk in the parish occurred during the past year. In addition, the evaluation will include the following criteria in respect of plan implementation:

1) Any local staffing changes that would warrant inviting different members to the planning committee
2) Any new organizations that would be valuable in the planning process or project implementation need to be included in the planning committee
3) Are there any procedures that can be done more efficiently
4) Are there more ways to gain more diverse and widespread cooperation
5) Are there any different or additional funding sources available for mitigation planning and implementation

The HMP will be updated every five years to remain eligible for continued HMGP funding. The planning committee will be responsible for updating the HMP. The OHSEP Director will be the lead person for the HMP update. The HMP update process will commence at least one year prior to the expiration of the plan. The HMP will be updated after a major disaster if an annual evaluation of the plan indicates a substantial change in hazard profile and risk assessment in the parish.

Additionally, the public will be canvassed to solicit input to continue St. Bernard Parish's dedication to involving the public directly in review and updates of the Hazard Mitigation Plan. Meetings will be scheduled as needed by the plan administrator to provide a forum for which the public can express their

concerns, opinions, and/or ideas about the plan. The plan administrator will be responsible for using parish resources to publicize the annual public meetings and maintain public involvement through the newspapers, radio, and public access television channels. Copies of the plan will be catalogued and kept at all appropriate agencies in the city government, as well as at the Public Library.

The review by the steering committee and input from the public will determine whether a plan update is needed prior to the required five-year update.

2020 Plan Version Plan Method and Schedule Evaluation

For the current plan update, the previously approved plan's method and schedule were evaluated to determine if the elements and processes involved in the required 2015 update were adequate. Based on this analysis, the method and schedule were deemed to be acceptable, and nothing was changed for this update.

Incorporation into Existing Planning Programs

It is the responsibility of the St. Bernard Parish Hazard Mitigation Plan Steering Committee to determine additional implementation procedures when appropriate. This may include integrating the requirements of the St. Bernard Parish Hazard Mitigation Plan into planning documents, processes, or mechanisms as follows:

- Ordinances, Resolutions, Regulations
- Floodplain Ordinances
- Comprehensive Master Plan
- Economic Development Plan
- Emergency Operations Plan
- Continuity of Operations Plan
- Transportation Plan
- Stormwater Management/Master Drainage Plan
- Redevelopment Plan
- Recovery Plan
- Coastal Plan
- Louisiana Watershed Initiative

The above referenced ordinances, building codes, and regulations will be amended by a resolution in the parish council in order to incorporate the mitigation actions identified in the HMP.

Opportunities to integrate the requirements of this plan into other local planning mechanisms will continue to be identified through future meetings of the St. Bernard Parish Hazard Mitigation Steering Committee and through the five-year review process described herein. The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update and implementation of individual plans that require specific planning and administrative tasks (e.g. risk assessment, plan amendments, ordinance revisions, capital improvement projects, etc.). The members of the steering committee will meet with Department Heads to discuss what should be included in the changes that are necessary before the changes are introduced to the city council or police jury meetings. The members of the steering committee will remain charged with ensuring that the goals and strategies

of new and updated local planning documents for their agencies are consistent with the goals and actions of the St. Bernard Parish Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability within the parish.

During the planning process for new and updated local planning documents, such as a Risk Assessment, Comprehensive Plan, Capital Improvements Plan, or Emergency Operations Plan, the parish provided a copy of the previously approved Parish Hazard Mitigation Plan to the appropriate parties and recommended that all goals and strategies of new and updated local planning documents are consistent with and support the goals of the Parish Hazard Mitigation Plan and will not contribute to increased hazards. As a participant in the Louisiana Watershed Initiative, St. Bernard Parish has incorporated strategies identified in the previously approved Hazard Mitigation Plan into their watershed planning processes. St. Bernard Parish has also expressed interest in becoming an active participant in the Community Rating System. The Hazard Mitigation Plan updates will provide a solid foundation for processes and actions that will be incorporated into the CRS planning process.

Although it is recognized that there are many possible benefits to integrating components of this plan into other parish planning mechanisms, the development and maintenance of this stand-alone Hazard Mitigation Plan is deemed by the steering committee to be the most effective and appropriate method to ensure implementation of parish and local hazard mitigation actions. And while the development and maintenance of this stand-alone plan has been recognized as the most effective course of mitigation action implementation, individual facets of this plan have been used to bolster other planning and mitigation efforts. The following parish plans incorporate requirements of the St. Bernard Parish Hazard Mitigation Plan Update as follows:

- Comprehensive Master Plan – Updated annually by St. Bernard Parish Government Dept. of Community Development
- Economic Development Plan – Updated annually by St. Bernard Parish Economic Development Commission
- Emergency Operations Plan – Updated annually by St. Bernard Parish OHSEP
- Continuity of Operations Plan – Updated annually by St. Bernard Parish OHSEP
- Transportation Plan – Updated annually by St. Bernard Parish OHSEP
- Stormwater Management/Master Drainage Plan – Updated annually by St. Bernard Parish Government
- Redevelopment Plan – Updated annually by St. Bernard Parish Government Dept. of Community Development
- Recovery Plan – Updated annually by St. Bernard Parish Government Recovery Dept. and OHSEP
- Coastal Plan – Updated annually by St. Bernard Parish Government Dept. of Community Development

Continued Public Participation

Public participation is an integral component of the mitigation planning process and will continue to be essential as this plan evolves over time. Significant changes or amendments to the plan require a public hearing prior to any adoption procedures. Other efforts to involve the public in the maintenance, evaluation, and revision process will be made as necessary. These efforts may include:

- Advertising meetings of the Mitigation Committee in the local newspaper, public bulletin boards, and/or city and county office buildings
- Designating willing and voluntary citizens and private sector representatives as official members of the Mitigation Committee
- Utilizing local media to update the public of any maintenance and/or periodic review activities taking place
- Utilizing city and Parish web sites to advertise any maintenance and/or periodic review activities taking place
- Keeping copies of the plan in appropriate public locations.

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Appendix C: Essential Facilities

St. Bernard Parish Essential Facilities

St. Bernard Parish Unincorporated Essential Facilities									
Type	**Name**	**Coastal Hazards**	**Flooding**	**Hail**	**Lightning**	**Wind**	**Sinkholes**	**Tornadoes**	**Tropical Cyclones**
Fire and Rescue	Fire Station #1	X	X	X	X	X		X	X
	Fire Station #2	X	X	X	X	X		X	X
	Fire Station #3	X	X	X	X	X		X	X
	Fire Station #5	X	X	X	X	X		X	X
	Fire Station #6	X	X	X	X	X		X	X
	Fire Station #7	X	X	X	X	X		X	X
	Fire Station #8	X	X	X	X	X		X	X
	Fire Station #10	X	X	X	X	X		X	X
	Fire Station #11	X	X	X	X	X		X	X
	Fire Station #12	X	X	X	X	X		X	X
Law Enforcement	Sheriff's Office	X	X	X	X	X		X	X
Corrections	Jail Complex	X	X	X	X	X		X	X
Government	34th Courthouse & Equipment	X	X	X	X	X		X	X
	911 Building & Equipment	X	X	X	X	X		X	X
	Animal Control Shelter	X	X	X	X	X		X	X
	Area 4 Administration Bldg.	X	X	X	X	X		X	X
	Aycock Barn Office Bldg	X	X	X	X	X		X	X

St. Bernard Parish Unincorporated Essential Facilities									
Type	**Name**	**Coastal Hazards**	**Flooding**	**Hail**	**Lightning**	**Wind**	**Sinkholes**	**Tornadoes**	**Tropical Cyclones**
	Council on Aging	X	X	X	X	X		X	X
	Courthouse Annex - Drug Court Adm	X	X	X	X	X		X	X
	Courthouse Square & Equipment	X	X	X	X	X		X	X
	Gov't Complex & Equipment	X	X	X	X	X		X	X
	Main Library	X	X	X	X	X		X	X
	Mosquito Control Office Adm. Bldg.	X	X	X	X	X		X	X
	Public Works/Main Yard	X	X	X	X	X		X	X
	Public Works Administrative Office	X	X	X	X	X		X	X
	Road Maintenance & Transit Dept.	X	X	X	X	X		X	X
	Transit Car Wash	X	X	X	X	X		X	X
	Water Treatment Administrative	X	X	X	X	X		X	X
Public Health	St. Bernard Parish Hospital	X	X	X	X	X		X	X
Schools	Arabi Elementary	X	X	X	X	X		X	X
	Andrew Jackson Middle	X	X	X	X	X		X	X
	C.F. Rowley Alternative School	X	X	X	X	X		X	X
	Chalmette Elementary	X	X	X	X	X		X	X
	Chalmette High	X	X	X	X	X		X	X
	J.F. Gauthier Elementary School	X	X	X	X	X		X	X

St. Bernard Parish Unincorporated Essential Facilities									
Type	Name	Coastal Hazards	Flooding	Hail	Lightning	Wind	Sinkholes	Tornadoes	Tropical Cyclones
	Joseph Davies Elementary	X	X	X	X	X		X	X
	Lynn Oaks	X	X	X	X	X		X	X
	Arlene Meraux Elementary	X	X	X	X	X		X	X
	Nicholas P. Trist Middle School	X	X	X	X	X		X	X
	Our Lady of Prompt Succor	X	X	X	X	X		X	X
	Sebastian Roy School	X	X	X	X	X		X	X
	St. Bernard Middle	X	X	X	X	X		X	X
	Lacoste Elementary School	X	X	X	X	X		X	X
	W. Smith Jr. Elementary	X	X	X	X	X		X	X

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Appendix D: Plan Adoption

St. Bernard Parish Council
8201 West Judge Perez Drive Chalmette, Louisiana, 70043
(504) 278-4228 Fax (504) 278-4209
www.sbpg.net

#9

EXTRACT OF THE OFFICIAL PROCEEDINGS OF THE COUNCIL OF THE PARISH OF ST. BERNARD, STATE OF LOUISIANA, TAKEN AT A REGULAR MEETING HELD IN THE COUNCIL CHAMBERS OF THE ST. BERNARD PARISH GOVERNMENT COMPLEX, 8201 WEST JUDGE PEREZ DRIVE, CHALMETTE, LOUISIANA ON TUESDAY, DECEMBER 15, 2020 AT THREE O'CLOCK P.M.

On motion of Mrs. Alcon, seconded by Mr. McCloskey, it was moved to **adopt** the following resolution:

RESOLUTION SBPC #2087-12-20

A RESOLUTION ADOPTING THE PARISH-WIDE HAZARD MITIGATION PLAN.

WHEREAS, the St. Bernard Parish Government has received grant funds from the Federal Emergency Management Agency, through the Governor's Office of Homeland Security and Emergency Preparedness, for the preparation of a hazard mitigation plan; and,

WHEREAS, our community has participated in the process to prepare a DMA compliant Hazard Mitigation Plan based on the FEMA guidance available in the How to Guides; and,

WHEREAS, our community wishes to participate in the Hazard Mitigation Plan prepared by the St. Bernard Parish government under the oversight of a Steering Committee comprised of Parish- wide representatives; and,

WHEREAS, St. Bernard Parish has participated in the mitigation planning process; and,

WHEREAS, appropriate opportunity for input by public and community officials has been provided through press releases, open meetings and availability of draft documents; and

WHEREAS, the Plan has been recommended for adoption by the Steering Committee; and,

WHEREAS, adoption of the Plan is required prior to further consideration for FEMA funding under the following programs:

- Pre-Disaster Mitigation
- Hazard Mitigation Grant Program
- Flood Mitigation Assistance Program

St. Bernard Parish Council
8201 West Judge Perez Drive Chalmette, Louisiana, 70043
(504) 278-4228 Fax (504) 278-4209
www.sbpg.net

The above and foregoing having been submitted to a vote, the vote thereupon resulted as follows:

YEAS: McCloskey, Moran, Luna, Alcon, Everhardt

NAYS: None

ABSENT: Callais

The Council Vice-Chair, Mr. Lewis, cast his vote as **YEA**.

And the motion was declared **adopted** on the 15th day of December, 2020.

CERTIFICATE

I HEREBY CERTIFY that the above and foregoing is a true and correct copy of a motion adopted at a Regular Meeting of the Council of the Parish of St. Bernard, held at Chalmette, Louisiana, on Tuesday, December 15, 2020.

Witness my hand and the seal of the Parish of St. Bernard on this 15th day of December, 2020.

Roxanne Adams

ROXANNE ADAMS
CLERK OF COUNCIL

Appendix E: State Required Worksheets

During the planning process (Appendix A) the Hazard Mitigation Plan Update Steering Committee was provided state-required plan update process worksheets to be filled out. The worksheets were presented at the Initial Planning Meeting by SDMI as tools for assisting in the update of the Hazard Mitigation Plan, but also as a State Requirement (Element E) for the update. The plan update worksheets allowed for collection of information such as planning team members, community capabilities, critical infrastructure and vulnerable populations and NFIP information. The following pages contain documentation of the state required worksheets.

Mitigation Planning Team

St. Bernard Parish Hazard Mitigation Planning Committee		
Name	**Title**	**Agency**
John Rahaim	Director	St. Bernard OHSEP
Roxanne Adams	Clerk	St. Bernard Parish Government
Ronnie Alonzo	CAO	St. Bernard Parish Government
Collin Arnold	Director	NOHSEP
Henry Ballard	Pastor	Christian Fellowship Family Worship Center
Jaylynn Bergeron-Turner	Assessor	St. Bernard Parish Government
Scott Boyle	ADA of Operations	LA DOTD
Elizabeth Dauterive	CEO	St. Bernard Chamber of Commerce
Chad Ellinwood	Fire Chief	PBF Energy
Matt Falati	Public Works Director	St. Bernard Parish Government
Pamela Ferbos	Representative	Entergy
David Fernandez	CFO	St. Bernard Parish School Board
Jake Groby	Superintendent of Quality Control	St. Bernard Parish Government Water & Sewer
Patrick Harvey	Director	Plaquemines Parish OHSEP
Drew Heaphy	Executive Director	St. Bernard Port, Harbor, and Terminal District
Kim Keene	Director	St. Bernard Parish Hospital
Steve Krynski	Refinery Manager	PBF Energy
John Lane	Coastal Manager	St. Bernard Parish Government
Richard Lewis	Councilman	St. Bernard Parish Government
Theresa LoGiudice	Environmental Scientist	LDEQ
Clarence Marthet	Security Manager	ASR Domino Sugar Refinery
William McCartney	HR Director	St. Bernard Parish Government
William McGoey	Assistant DA	St. Bernard Parish Government

Guy McInnis	Parish President	St. Bernard Parish Government
Jimmy Pohlmann	Sheriff	St. Bernard Sheriff's Office
Thomas Stone	Chief	St. Bernard Fire Department
Tommy Stone	Fire Chief	Valero
Jason Stopa	Director	St. Bernard Parish Community Development
Leslie Sullivan	VP General Manager	Valero
Matt Timothy	Supervisor	Atmos Energy
Tina Tinney	Chancellor	Nunez Community College
Katie Tommaseo	Tourism Manager	St. Bernard Parish Government
JJ Vickers	Deputy Chief	St. Bernard Sheriff's Office
Steve Volante	Master Trooper	Louisiana State Police
Doris Voitier	Superintendent	St. Bernard Parish School Board

Capability Assessment

Capability Assessment Worksheet		
Local mitigation capabilities are existing authorities, polices and resources that reduce hazard impacts or that could be used to implement hazard mitigation activities. Please complete the tables and questions in the worksheet as completely as possible.		
Planning and Regulatory		
Please indicate which of the following plans and regulatory capabilities your jurisdiction has in place.		
	St. Bernard Parish	**Comments**
Plans	Yes / No	
Comprehensive / Master Plan	Y	Community Dev, annually
Capital Improvements Plan	N	
Economic Development Plan	Y	Econ Dev commission, annually
Local Emergency Operations Plan	Y	2019 - OHSEP, annually
Continuity of Operations Plan	Y	2019 - OHSEP, annually
Transportation Plan	Y	2019 - OHSEP, annually
Stormwater Management Plan	Y - 2018	Master Drainage Plan - 2019
Community Wildfire Protection Plan	N	
Other plans (redevelopment, recovery, coastal zone management)	Y	Redevelopment - comm development, annually; Recovery - recovery dept and OHSEP, annually; Coastal - coastal zone manager in comm dev, annually
Building Code, Permitting and Inspections	Yes / No	
Building Code	Y	2012
Building Code Effectiveness Grading Schedule (BCEGS) Score	N	
Fire Department ISO/PIAL rating	Y	
Site plan review requirements	Y	
Land Use Planning and Ordinances	Yes / No	
Zoning Ordinance	Y	
Subdivision Ordinance	Y	
Floodplain Ordinance	Y	
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	Y	
Flood Insurance Rate Maps	Y	
Acquisition of land for open space and public recreation uses	Y	
Other	N	

Administration and Technical		
Identify whether your community has the following administrative and technical capabilities. For smaller jurisdictions without local staff resources, if there are public resources at the next higher level government that can provide technical assistance, indicate so in your comments.		
	St. Bernard Parish	**Comments**
Administration	Yes / No	
Planning Commission	Y	
Mitigation Planning Committee	Y	
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	
Mutual Aid Agreements	Y	
Staff	Yes / No; FT/PT	
Chief Building Official	Y/FT	
Floodplain Administrator	Y/FT	
Emergency Manager	Y/FT	
Community Planner	Y/FT	
Civil Engineer	Y/FT	
GIS Coordinator	Y/PT	
Grant Writer	Y	Contractor
Other	N	
Technical	Yes / No	
Warning Systems / Service (Reverse 911, Everbridge)	Y	Alert FM
Hazard Data & Information	Y	
Grant Writing	Y	
Hazus Analysis	Y	
Other	N	

Financial		
Identify whether your jurisdiction has access to or is eligible to use the following funding resources for hazard mitigation.		
	St. Bernard Parish	Comments
Funding Resource	Yes / No	
Capital Improvements project funding	Y	
Authority to levy taxes for specific purposes	N	Needs voter approval
Fees for water, sewer, gas, or electric services	Y	
Impact fees for new development	N	
Stormwater Utility Fee	N	
Community Development Block Grant (CDBG)	Y	
Other Funding Programs	N	

Education and Outreach		
Identify education and outreach programs and methods, already in place that could be used to implement mitigation activities and communicate hazard-related information.		
	St. Bernard Parish	Comments
Program / Organization	Yes / No	
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	LEPC
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Y	LEPC
Natural Disaster or safety related school program	N	
Storm Ready certification	Y	2019
Firewise Communities certification	N	
Public/Private partnership initiatives addressing disaster-related issues	Y	
Other	N	

Building Inventory

St. Bernard Parish Owned Building Information									
St. Bernard Parish									
Critical Facility (If Yes, Mark X)	Name of Building	Purpose of Building	Address	City	Latitude	Longitude	Assessed Value	Date Built	Construction Type
Y	Aycock Barn Office Bldg, Covered Area and Storage Facility	Administration	409 Aycock St.	Arabi	29° 57' 3.8268"	-90° 0' 20.6676"	$1,220,505.00	2010	Fire Resistive
Y	Fire Station #1	Fire	1500 Aycock St.	Arabi	29° 57' 36.756"	-90° 0' 4.0428"	$500,000.00	1991/2008	Metal Stud
Y	Fire Station #2	Fire	7639 W. Judge Perez Dr.	Arabi	29° 57' 28.426"	-89° 59' 23.8744"	$1,150,000.00	2010	Metal
Y	First Ward Old Jail - Museum	Recreation	242 Hernandez St.	Arabi	29° 56' 56.6855"	-90° 0' 21.7109"	$400,000.00	1909/2012	Masonry
	Edward Kattengall Gymnasium	Recreation	801 Community St.	Arabi	29° 57' 10.2964"	-90° 0' 5.791"	$650,000.00	1937	Wood
Y	Gov't Complex & Equipment	Administration	8201 W. Judge Perez Dr.	Chalmette	29° 57' 22.4467"	-89° 58' 56.5115"	$10,000,000.00	1977/2008	Fire Resistive
	Torres Park Boat House	Administration	8201 W Judge Perez Dr.	Chalmette	29° 57' 22.4467"	-89° 58' 56.5115"	$75,000.00	2011	Wood
	Torres Park Gazebo 30'	Administration	8201 W Judge Perez Dr.	Chalmette	29° 57' 22.4467"	-89° 58' 56.5115"	$70,000.00	2011	Wood
	Torres Park Gazebo 24'	Administration	8201 W Judge Perez Dr.	Chalmette	29° 57' 22.4467"	-89° 58' 56.5115"	$135,000.00	2011	Wood
	Torres Restroom Facility	Administration	8201 W Judge Perez Dr.	Chalmette	29° 57' 22.4467"	-89° 58' 56.5115"	$150,000.00	1995	Wood
Y	Auditorium & Cultural Center & Equipment	Auditorium	8245 W. Judge Perez Dr.	Chalmette	29° 55' 20.3347"	-89° 54' 22.725"	$6,700,000.00	1972/2009	Fire Resistive
	Auditorum Marquee/Electronic Sign	Auditorium	8245 W. Judge Perez Dr.	Chalmette	29° 55' 20.3347"	-89° 54' 22.725"	$370,000.00	2009	
Y	Grand Ballroom (Behind Auditorium)	Auditorium	8245 W. Judge Perez Dr.	Chalmette	29° 55' 20.3347"	-89° 54' 22.725"	$2,000,000.00	2008	
Y	Council on Aging	Council on Aging	8201 W. Judge Perez Dr. ("B)	Chalmette	29° 57' 22.4467"	-89° 58' 56.5115"	$2,500,000.00	2009	Fire Resistive
Y	Courthouse Annex - Drug Court Adm. Off.	Courthouse	1009 W. Moreau St.	Chalmette	29° 56' 26.2561"	-89° 58' 21.5083"	$800,000.00	1964/2009	Masonry

Y	34th Courthouse & Equipment	Courthouse	1101 W. St. Bernard Hwy.	Chalmette	29° 56' 22.9765"	-89° 58' 21.9335"	$13,500,000.00	1939/2013	Fire Resistive
Y	Sheriff's Office New Annex & Equipment	Courthouse	#2 Courthouse Sq.	Chalmette	29° 56' 28.918"	-89° 58' 22.9912"	$2,300,000.00	2011	Fire Resistive
Y	Courthouse Square & Equipment	Courthouse	2118 Jackson Blvd.	Chalmette	29° 56' 26.7338"	-89° 58' 25.3132"	$3,050,000.00	2012	Fire Resistive
Y	Fire Station #5	Fire	2000 East Judge Perez Dr.	Chalmette	29° 56' 14.95"	-89° 56' 40.646"	$1,250,000.00	2010	Steel
Y	Fire Station #6	Fire	4119 East Judge Perez Dr.	Chalmette	29° 56' 10.9194"	-89° 55' 26.7744"	$1,375,000.00	2010	Steel
Y	Jail Complex	Jail	1900 Paris Rd.	Chalmette	29° 55' 57.8168"	-89° 58' 5.655"	$7,500,000.00	1985	Fire Resistive
	Main Library	Library	2600 Palmisano Blvd.	Chalmette	29° 56' 18.6295"	-89° 57' 8.1263"	$0.00	Leased to parish	Unknown
Y	911 Building & Equipment	Nine- 911	8001 W. St. Bernard Hwy.	Chalmette	29° 56' 42.54"	-89° 59' 9.7631"	$1,100,000.00	2003/2010	Masonry
Y	Road Maintenance & Transit Dept.	Public Works	120 W. Agriculture St.	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$600,000.00	1988/2010	Non Combustible
Y	Road Maintenance Bay/Shed (open car ports/bays)	Public Works	120 W. Agriculture St.	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$175,000.00	2010	Metal
Y	Public Works Administrative Office (Old Library)	Public Works	1125 E. St. Bernard Hwy.	Chalmette	29° 55' 55.9189"	-89° 57' 27.8726"	$650,000.00	1964/2010	Non Combustible
Y	Public Works/Main Yard New Road Office	Public Works	120 W.Agriculture St.	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$1,400,000.00	2011	Metal Stud
Y	Public Work Leased Storage Building (Vicknair Bldg)	Public Works	109 W. Agriculture St.	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$0.00	1975	Metal
Y	Public Work Leased Storage Building (Vicknair Bldg)	Public Works	111 W. Agriculture St.	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$0.00	1975	Metal
Y	Paul Noel Gym	Recreation	Moreau St. @ Tournefort	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$650,000.00	1983/2009	Masonry
Y	Buccaneer Villa Gym	Recreation	8600 Victory Dr.	Chalmette	29° 57' 37.0058"	-89° 58' 13.3608"	$500,000.00	1974	steel
Y	Val Riess Multi-Plex	Recreation	3900 Palmisano Blvd.	Chalmette	29° 57' 6.592"	-89° 56' 43.116"	$7,317,788.00	2014	Non-Combustible

	Val Riess Concession Stand, Phase I	Recreation	3900 Palmisano Blvd.	Chalmette	29° 57' 6.592"	-89° 56' 43.116"	$2,000,000.00	2009	Non-Combustible
	Val Riess Concession Stand, Phase II	Recreation	3900 Palmisano Blvd.	Chalmette	29° 57' 6.592"	-89° 56' 43.116"	$2,500,000.00	2010	Non-Combustible
	Val Riess Support Facilities (covered pavilion area, bleachers, etc.	Recreation	3900 Palmisano Blvd.	Chalmette	29° 57' 6.592"	-89° 56' 43.116"	$250,000.00	2010	Non-Combustible
	Benjamin Street Boat House	Recreation	8300 Benjamin St.	Chalmette	29° 57' 49.5029"	-89° 58' 30.1202"	$183,000.00	2015	Wood
Y	Transit Car Wash	Transit	120 W. Agriculture St.	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$117,633.00	2014	Metal
Y	Water Treatment Administrative Office Building	Water	1111 E. St. Bernard Hwy.	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$900,000.00	1940/2010	Masonry
Y	Water Treatment Plant #1 & Equipment, Generator System	Water	1111 E. St. Bernard Hwy.	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$1,900,000.00	2010	
Y	Water Treatment Plant #2 & Equipment, Generator System	Water	1111 E. St. Bernard Hwy. (rear)	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$1,850,500.00	2010	
Y	Dravo Electrical Building & Equipment	Water	4020 Jean Lafitte Blvd.	Chalmette	29° 57' 52.087"	-89° 58' 29.5972"	$2,000,000.00	1987/2012	Concrete
Y	Raw Water Pump Station & Equipment	Water	Mobil Oil Access Rd. # 1	Chalmette	29° 56' 34.0188"	-89° 57' 48.6583"	$1,750,000.00	2012	Concrete
Y	Red Cross Building - Storage	Water	2200 Palmisano Blvd.	Chalmette	29° 56' 0.762"	-89° 57' 16.5265"	$175,000.00	1980	
Y	Control Building & Pipe Gallery & Equipment	Water	1111 E. St. Bernard Hwy. (Palmisano Blvd. Entrance)	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$7,957,032.79	2015	Concrete
Y	Chemical Building & Equipment	Water	1111 E. St. Bernard Hwy. (Palmisano Blvd. Entrance)	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$4,137,485.48	2015	Concrete
Y	Three Clarifier Tanks	Water	1111 E. St. Bernard Hwy. (Palmisano Blvd. Entrance)	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$7,384,705.16	2015	Concrete

Y	Clearwell Pump Station	Water	1111 E. St. Bernard Hwy. (Palmisano Blvd. Entrance)	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$2,051,647.00	2015	Concrete
Y	Waste Transfer Pump Station & Equipment	Water	1111 E. St. Bernard Hwy. (Palmisano Blvd. Entrance)	Chalmette	29° 55' 56.1922"	-89° 57' 28.3738"	$2,265,099.00	2015	Concrete
Y	Fire Station #3	Fire	9240 W. Judge Perez Dr.	Chalmette	29° 56' 48.0728"	-89° 58' 19.2371"	$2,010,356.00	2013	Non Combustible
Y	Fire Station #7	Fire	5680 E. Judge Perez Dr.	Meraux	29° 54' 43.0182"	-89° 53' 53.344"	$1,850,000.00	2009	Metal
Y	Cypress Garden Gym	Recreation	2900 Bloomquist Dr.	Meraux	29° 56' 18.2627"	-89° 55' 17.8928"	$1,450,000.00	2009	Metal
Y	Hannan Bldg.	Recreation	2501 Archbishop Hannan Blvd.	Meraux	29° 56' 3.2168"	-89° 55' 23.3447"	$250,000.00	1990/2009	Metal
	Hannan Concession Stand	Recreation	2501 Archbishop Hannan Blvd.	Meraux	29° 56' 3.2168"	-89° 55' 23.3447"	$150,000.00	1990/2009	
	Hannan Bleachers & Score House	Recreation	2501 Archbishop Hannan Blvd.	Meraux	29° 56' 3.2168"	-89° 55' 23.3447"	$250,000.00	1990/2009	
Y	Munster Plant-Entire Plant Site & Equipment	Water	3300 Munster Blvd.	Meraux	29° 56' 40.731"	-89° 55' 44.1311"	$40,000,000.00	2012	
Y	Fire Station #8	Fire	613 Bayou Rd.	St. Bernard	29° 52' 4.2672"	-89° 52' 31.7503"	$1,500,000.00	2011	Metal
Y	Fire Station #10	Fire	3901 Bayou Rd.	St. Bernard	29° 51' 43.5665"	-89° 46' 48.2963"	$500,000.00	1995/2013	Metal
Y	Fire Station #11	Fire	2424 Florissant Hwy.	St. Bernard	29° 50' 27.0449"	-89° 41' 24.5645"	$935,000.00	2009	Metal
Y	Fire Station #12	Fire	4623 Delacroix Hwy.	St. Bernard	29° 48' 4.3708"	-89° 46' 1.4794"	$885,837.00	2010	Metal
Y	North Florissant Pump Station & Equipment	Public Works	North Florissant: Located 900 feet east of LA Highway 46 on the North Florissant Levee	St. Bernard	29° 52' 2.3318"	-89° 51' 32.0472"	$805,000.00	2009	Metal
Y	South Florissant Pump Station & Equipment	Public Works	South Florissant: Located 1,150 feet south of 840 Florissant Highway on South Florissant Levee	St. Bernard	29° 50' 51.6548"	-89° 44' 14.537"	$815,000.00	2009	Metal

Y	Reggio Drainage Pump Station & Equipment	Public Works	Parcel of Land in Section 96, T-14-S, R-14-E Delacroix	St. Bernard	29° 45' 41.7539"	-89° 47' 27.2281"	$235,000.00	2010	Metal
Y	Alluvial City Drainage Station & Equipment	Public Works	2200 Maple St.	St. Bernard	29° 50' 37.1857"	-89° 41' 27.3696"	$260,000.00	2010	Metal
Y	Jacks Canal Drainage Station & Equipment	Public Works	4352 Delacroix Hwy., St. Bernard (closest municipal address in the area)	St. Bernard	29° 48' 26.7718"	-89° 45' 51.4631"	$260,000.00	2010	Metal
Y	Delacroix Pump Station & Equipment	Public Works		St. Bernard	29° 46' 05.5513"	-89° 47' 20.2854"	$598,500.00	2010	Metal
Y	Woodlake Drainage Stations & Equipment	Public Works	4352 Delacroix Hwy., St. Bernard (closest municipal address in the area)	St. Bernard	29° 50' 37.1857"	-89° 41' 27.3696"	$280,000.00	2010	Metal
Y	Gauthier Gym/Kenilworth	Recreation	2214 Bobolink	St. Bernard	29° 52' 13.2082"	-89° 53' 17.1614"	$1,850,500.00	2009	Metal
Y	Ducros Museum	Recreation	1345 Bayou Rd.	St. Bernard	29° 52' 2.9946"	-89° 51' 37.1545"	$350,000.00	1800/2010	Wood
Y	Islenos Multi-Purpose Bldg.	Recreation	1357 A Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$480,000.00	2010	Wood
	Cresap/Caserta	Recreation	1357 E. Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$95,000.00	1900/2010	Wood
	Messa/Coconut Hut	Recreation	1357 B Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$75,000.00	1900/2010	Wood
	Trapper's Shack	Recreation	1357 F Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$70,000.00	2010	Wood
Y	Los Islenos Museum	Recreation	1357 Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$510,000.00	2009	Wood
Y	Esteves House	Recreation	1357 F Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$80,000.00	1890/2010	Wood
Y	Estopinal-Salles House	Recreation	1367 C Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$205,000.00	2010	Wood
Y	Estopinal-Salles Kitchen	Recreation	1357 C Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$75,000.00	2010	wood
	Islenos Food Court and Pavilions	Recreation	1357 Bayou Rd.	St. Bernard	29° 52' 4.1977"	-89° 51' 34.1438"	$250,000.00	2010	Unknown
Y	PGT Beauregard Historic Courthouse & Equipment Bldg.	Recreation	1201 Bayou Rd.	St. Bernard	29° 52' 4.9138"	-89° 51' 53.9507"	$5,525,000.00	1916/2012	Masonry

Y	Animal Control Shelter	Animal Control	5455 East Judge Perez Dr.	Violet	29° 54' 55.1243"	-89° 53' 58.1471"	$805,000.00	2010	Metal
Y	Violet Pump Station & Equipment	Public Works	3400 Stacie Dr.	Violet	29° 54' 56.1442"	-89° 53' 28.4233"	$1,200,000.00	2008	Non-Combustible
Y	Area 4 Administration Bldg.	Public Works	7715 East Judge Perez Dr.	Violet	29° 54' 39.677"	-89° 53' 51.1166"	$100,000.00	2011	Metal
	Area 4 Storage Bldg.	Public Works	7715 East Judge Perez Dr.	Violet	29° 54' 39.677"	-89° 53' 51.1166"	$45,000.00	2011	Metal
	Area 4 Guard Building	Public Works	7715 East Judge Perez Dr.	Violet	29° 54' 39.677"	-89° 53' 51.1166"	$156,000.00	2011	Metal
Y	Mosquito Control Office Adm. Bldg.	Public Works	3400 Stacie Dr.	Violet	29° 54' 56.1442"	-89° 53' 28.4233"	$410,000.00	2011	Wood
Y	Mosquito Control Garage/Warehouse	Public Works	3400 Stacie Dr.	Violet	29° 54' 56.1442"	-89° 53' 28.4233"	$220,000.00	2011	Metal Stud
	Violet Park #2 Concession Stand	Recreation	6609 E. St. Bernard Hwy.	Violet	29° 53' 37.4647"	-89° 53' 57.1524"	$100,000.00	2013	Cinder Block, metal
Y	Violet Pump Station Electrical Room & Equipment	Public Works	3400 Stacie Dr.	Violet	29° 54' 56.1442"	-89° 53' 28.4233"	$260,000.00	2008	Non-Combustible
Y	Water Treatment Plant #3	Water	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Vulnerable Populations

Vulnerable Populations Worksheet						
St. Bernard Parish						
All Hospitals (Private or Public)	**Address**	**Street**	**City**	**Zip Code**	**Latitude**	**Longitude**
St. Bernard Parish Hospital	8000	W. Judge Perez Dr.	Chalmette	70043	29° 57' 20.9376"	-89° 59' 10.117"
Nursing Homes (Private or Public)	**Address**	**Street**	**City**	**Zip Code**	**Latitude**	**Longitude**
There are no Nursing Homes located in St. Bernard Parish						
Mobile Home Parks	**Address**	**Street**	**City**	**Zip Code**	**Latitude**	**Longitude**
Chalmette Trailer Park	3224	E. St. Bernard Hwy.	Chalmette	70043	29° 55' 47.8315"	-89° 55' 54.6503"
Colonial Trailer Park	5600	E. St. Bernard Hwy.	Violet	70092	29° 54' 31.8085"	-89° 54' 17.5288"
Dicarlo's Trailer Park	692	Bayou Rd.	St. Bernard	7085	29° 52' 4.1952"	-89° 52' 26.1084"
Fanz Mobile Park	2237	Bayou Rd.	St. Bernard	70085	29° 52' 2.8272"	-89° 50' 5.8862"
Henley's Trailer Park	5012	E. St. Bernard Hwy.	Violet	70092	29° 54' 53.9125"	-89° 54' 39.7894"
Lind's Trailer Park	348	Bayou Rd.	St. Bernard	70085	29° 52' 4.4728"	-89° 52' 53.5397"
Liccardi's Trailer Park	2817	E. St. Bernard Hwy.	Meraux	70075	29° 55' 49.0613"	-89° 56' 15.2542"
Mary Ann Trailer Park	2813	E. St. Bernard Hwy.	Meraux	70075	29° 55' 49.0807"	-89° 56' 15.8525"
Myrtle Grove Trailer Park	2821	E. St. Bernard Hwy.	Meraux	70075	29° 55' 49.0415"	-89° 56' 14.6558"
Nehligs's Trailer Park	3025	Bayou Rd.	St. Bernard	70085	29° 52' 1.596"	-89° 48' 37.872"
Packenham Trailer Park	1408	E. St. Bernard Hwy.	Chalmette	70043	29° 55' 50.1247"	-89° 57' 15.6704"
Paup's Trailer Park	1800	E. St. Bernard Hwy.	Chalmette	70043	29° 55' 49.4738"	-89° 56' 57.2784"
Poydras Trailer Park	2100	Newton St.	Meraux	70075	29° 55' 35.4"	-89° 55' 10.1964"
Richard's Trailer Park	350	Bayou Rd.	St. Bernard	70085	29° 51' 57.4574"	-89° 52' 54.5326"
Riveredge Trailer Park	2020	E. St. Bernard Hwy.	Chalmette	70043	29° 55' 49.4879"	-89° 56' 55.4996"
Seelos Trailer Park #1	1300	E. St. Bernard Hwy.	Chalmette	70043	29° 55' 50.1247"	-89° 57' 15.6704"
Seelos Trailer Park #2	1400	E. St. Bernard Hwy.	Chalmette	70043	29° 55' 50.1247"	-89° 57' 15.6704"
Sidlenie Trailer Park	209	E. Urquhart St.	Chalmette	70043	29° 56' 38.5321"	-89° 57' 40.0338"

National Flood Insurance Program (NFIP)

National Flood Insurance Program (NFIP)		
St. Bernard Parish		
Insurance Summary		**Comments**
How many NFIP polices are in the community? What is the total premium and coverage?	Policies: 11,557; Premiums: $7,592,884; Coverage: $3,196,598,8000	
How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	Claims Paid: 23,604; Total Paid: $2,238,822,210; Subs Damage: 0	
How many structures are exposed to flood risk with in the community?	15375	
Describe any areas of flood risk with limited NFIP policy coverage.	None	
Staff Resources		**Comments**
Is the Community FPA or NFIP Coordinator certified?	3 CFMs	
Is flood plain management an auxiliary function?	Primary	
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	All	
What are the barriers to running an effective NFIP program in the community, if any?	N/A	
Compliance History		**Comments**
Is the community in good standing with the NFIP?	Yes	
Are there any outstanding compliance issues(i.e., current violations)?	No	
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact(CAC)?	2016	
Is a CAV or CAC scheduled or needed? If so when?	No	
Regulation		**Comments**
When did the community enter the NFIP?	1970	
Are the FIRMs digital or paper?	Digital	
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Exceed; 18" Freeboard	
Community Rating System (CRS)		**Comments**
Does the community participate in CRS?	No	
What is the community's CRS Class Ranking?	N/A	
Does the plan include CRS planning requirements?	N/A	