Disaster Resistant University
All Campus Plan

University of Southern Mississippi
April 2024

Prepared by Allen Engineering & Science

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1.0 EXECUTIVE SUMMARY

This update to the University of Southern Mississippi's (USM) Disaster Resistant University planning process began in March 2023 and is inclusive of the University's primary campus in Hattiesburg, Mississippi, and its Gulf Coast assets including the Gulf Park Campus in Long Beach and the Gulf Coast Research Lab in Ocean Springs. The main campus of USM includes identified areas where USM could increase resilience to natural disasters and minimize the costly impacts of natural disasters on the University. Several improvements to emergency communications and records management have been made since the original plan. Staff and faculty revisited their original plan approximately five years after beginning the process and decided to include their two additional campuses that border the Mississippi Sound, USM at Gulf Park, and the Gulf Coast Research Lab. Upon successful review and approval from FEMA and MEMA, the University will continue to be eligible to apply for FEMA Hazard Mitigation Grant assistance and other funding to financially assist in the implementation of mitigation measures in the plan. The goals of this process are:

1. To provide a safer environment for the University community by implementing measures to protect human health and safety.
2. To protect the assets of the University that represents a significant investment on the part of the taxpayers of the State of Mississippi.
3. To implement measures that will ensure continuity of operations so that the University may continue to fulfill its mission before, during, and after a significant natural disaster event.

The University executed a professional services agreement with Allen Engineering & Science. (AllenES) to guide the planning process. AllenES assisted the University in the development of the original plan and worked under the guidance of a DRU Committee of representatives from various divisions, departments, and functions of the University to prepare this update. The Committee provided valuable guidance and insight into University operations and the planning process and will continue to exist as an Ad Hoc committee to guide the implementation of the plan.

The plan provides information relative to the original natural hazards that have the highest probability of affecting the University including:

- Drought/ Extreme Temperature,
- Expansive Soils,
- Flood/Flash Flooding,
- Hailstorms,
- Hurricanes and Tropical Storms/Storm Surge,
- Thunderstorms, Lightning, and High Winds
- Tornados & Funnel Clouds,
- Wildfire,
- Winter Storms.

Through the addition of two coastal campuses, the Committee identified two additional hazards with a probability of affecting the University:

- Coastal Erosion,
- Sea Level Rise.

Because of the statewide and local impacts of the COVID-19 pandemic, this update will also give attention to pandemics and infectious diseases as hazards potentially affecting all University campuses.

The DRU Committee also eliminated six hazards that have limited or no probability of affecting the University, including:

- Avalanche,
- Dam Failure,
- Earthquake,
- Land Subsidence,
- Tsunami, and
- Volcano.

In addition to addressing natural hazards, the DRU Committee addressed manmade hazards. Because of previous planning efforts addressing a variety of man-made hazards, the level of detail applied to man-made hazards in this plan is less than that applied to natural hazards. However, many of the mitigation strategies selected for inclusion in the plan have potential benefits for reducing the risks associated with all hazards.

The plan development process resulted in the University selecting and prioritizing seventeen mitigation measures to reduce the University's vulnerability to probable natural hazards. The mitigation measures selected and prioritized range from policy actions to planning initiatives, to physical improvements to select structures and buildings on the University campuses. All measures are designed to address specific vulnerabilities that could affect the people and facilities of all University of Southern Mississippi campuses.

2.0 INTRODUCTION AND USM CAMPUS PROFILES

This update to the University of Southern Mississippi's (USM) Disaster Resistant University planning process began in March 2023. The main campus of USM in Hattiesburg, Mississippi identified specific areas in which USM could increase its resilience to natural disasters and minimize the costly impacts of natural disasters on the University. The scope of the original Mitigation Plan included the primary campus of USM in Hattiesburg. Staff and faculty revisited their original hazard mitigation plan approximately five years after beginning the process and decided to include their two additional campuses that border the Mississippi Sound, Southern Miss, Gulf Park, and the Gulf Coast Research Lab. Upon successful review and approval from FEMA, the Mississippi Emergency Management Agency, the University will become eligible to apply for FEMA Hazard Mitigation Grant assistance and other funding to financially assist in the implementation of mitigation measures outlined in the plan. The initially planned scope called for analysis and assessment of natural disasters only. However, manmade hazards are also being considered through the current planning process.

2.1 HISTORY OF HAZARD MITIGATION PLANNING AT USM

USM has engaged in a variety of planning efforts designed to limit vulnerability and plan for appropriate responses to hazard events. Included among these plans is a regional Hazard Mitigation Plan that includes the Cities of Hattiesburg and Petal, Forrest County, and USM as plan participants. The University also has a current Emergency Incident Response Plan with standards that apply to all University properties. USM has developed a Readiness and Response Plan that specifically addresses manmade hazards such as terrorism associated with large public gatherings including sporting events. A summary of these plans is provided in **Table 2.1**.

TABLE 2.0 - SUMMARY OF USM HAZARD-RELATED PLANS

Ref. #	Title	Purpose
I. USM Response Plans and Procedures		
I.A	Emergency Incident Response Plan	The basic emergency procedures outlined in this guide are for the protection of lives and property through effective use of University and surrounding community resources. The University utilizes the Incident Command System to assign responsibilities for command and control of an emergency incident.

Ref. #	Title	Purpose
I.B	Crisis Communication Plan	Crisis communication plan dovetails with the university's safety and emergency plans.
I.C	Emergency Notification System EAGLE ALERT Policies	To aid in the education of USM students, faculty, staff, and visitors at all USM campuses, the University combines all of its emergency notification systems described herein into a single system concept "EAGLE ALERT." Regardless of the notification methods or media utilized, by the recipient, all emergency notification and warning messages come from "EAGLE ALERT."
I.D.	Gulf Coast Emergency Operations Plan	The Emergency Operations Plan enables quick evaluation of an emergency condition; coordinates divisions of the university to provide a unified response; provides for rapid and necessary mobilization of personnel and material resources; assures the health and safety of the university community; preserves lives and property; lessens the impact potential of emergencies; enables lockdown or evacuation of personnel; and provides for the dissemination of accurate information
I.E	USM Gulf Park Emergency Operations Plan	In the event that the Southern Miss Gulf Park is confronted with a potential or declared emergency, The Vice-President implements legal and necessary measures to cope with a wide variety of natural and man-made emergencies. The Emergency Operations Plan, once activated, remains in effect until the critical situation has passed and the appropriate authority deactivates the Plan.
I.F	Cook Library Emergency Procedures	Establishes procedures for the protection, safety, and evacuation of people in the library.
I.G	Emergency Response and Evacuation Plan for Athletic Facilities	The Emergency Response and Evacuation Plan for USM Athletic Facilities provides for a clear course of action in the event of an emergency,

Ref. #	Title	Purpose
		which could necessitate a response or eventual evacuation of the affected facility. While this plan has been developed to address all emergencies, it should be noted that situations can vary greatly in magnitude, scope, timing, and type.
I.H	Active Shooter Protocol	To guide the development, implementation, and maintenance of a comprehensive emergency management program to prepare the University to manage an active shooter or violent intruder situation.
I.I	Gulf Coast Research Laboratory Hurricane Plan	Determines the level of response to a hurricane (or storm) based on risk. Establishes tiered emergency procedures, for securing offices, laboratories, data, vehicles, and boats. Establishes standards for evacuation of dormitories.
II. USM Behavioral Intervention Plans		
II.A	Campus Violence Prevention Plan	The plan establishes violence prevention measures, support systems, resources, and strategies through the integration of university policies and procedures regarding violent and threatening behavior, and the prohibition of violence.
II.B	Campus Action Referral and Evaluation Response System	The plan facilitates rapid and effective referral of students with mental health issues and behavioral issues to optimize the function of students with mental health issues and behavioral issues; Reduces the risk of students causing harm to themselves or others; Contributes to a safe and productive learning environment for students, faculty, and staff. Educates and trains students, faculty, and staff to recognize students in need of a referral.
II.C	Emergency Plan for Students with Disabilities	Plan provides information on the university's emergency procedures so a student's safety plans can be made for assistance in the event an emergency arises.

Ref. #	Title	Purpose
III. USM Cyber Plan		
III.A	Recoverability Gap Analysis	The Recoverability Gap Analysis reviews current technical processes and procedures to determine how well they can support the identified business recovery requirements.
III.B	Disaster Recovery and Business Continuity Plan	The plan facilitates recovery and business continuity for IT systems in the aftermath of an incident affecting them.
IV. USM WMD-Hazardous Materials/Terrorism Plans		
IV.A	Emergency Response Plan for Select Agents	Response and security plan addressing certain biohazards and other hazardous agents used in research processes.
IV.B	Safety Plan for Biological, Chemical, and Recombinant DNA Laboratories	USM has adopted the CDC/NIH Biosafety in Microbiological and Biomedical Laboratories (BMBL) as the institution's biosafety manual. All laboratories conducting research with potentially biologically hazardous materials must follow these guidelines.
IV.C	Campus Public Safety: Weapons of Mass Destruction Terrorism Protective Measures	Consistent with each college or university's policies, procedures, and governing philosophy, consideration may be given to the steps listed within the plan to prevent, deter, or effectively respond to a weapons of mass destruction terrorist attack. These steps may be calibrated to local, state, or national alert levels.
IV.D	Lab Management Plan	To establish standards for each lab on campus to develop policies and procedures for incident response.
V. USM Pandemic Plan		
V.A	Pandemic and Public Health Emergency Plan	The emergency procedures outlined in this plan are designed to protect the lives and property of The USM community through the effective use of campus and community resources. The plan addresses all potential public health emergencies including, but not limited to, communicable diseases that may result in mass fatalities and hospitalizations.

VI. Related Plans

Ref. #	Title	Purpose
VI.A	MEMA District 8 Regional Hazard Mitigation Plan	The most recent adaptation of the MEMA District 8 (2020) Regional Hazard Mitigation Plan includes Forrest County and the City of Hattiesburg (Hattiesburg Campus). The plan seeks to reduce the vulnerability of affected populations through education, regional cooperation, capital investments, and long-range development policies.
VI.A	MEMA District 9 Regional Hazard Mitigation Plan	The most recent adaptation of the MEMA District 9 (2023) Regional Hazard Mitigation Plan includes Jackson County and the City of Ocean Springs (GCRL), Harrison County, and the City of Long Beach (Gulf Park Campus). The plan seeks to reduce the vulnerability of affected populations through education, regional cooperation, capital investments, and long-range development policies.
VI.C	Adapting Infrastructure to Climate Conditions, Ocean Springs, Mississippi	This publication refines previous projections about how sea level rise is likely to affect the City's coastline, identifies infrastructure at risk, and analyzes the feasibility of techniques to adapt Ocean Springs' infrastructure to an environment of slowly rising waters. The study area represents the intersection of local infrastructure investment and coastal habitats.

Although the University does maintain these plans as part of an overall readiness and response strategy, the DRU plan was the first planning effort specific to the University that addressed the incorporation of mitigation strategies to limit the vulnerability of critical facilities with the University and its associated campuses. The latest version of the Campus Master Plan was updated before the finalization of the original DRU Plan. As the various plans outlined in **Table 2.1** are updated, however, relevant aspects of the DRU Plan will be integrated or the plan will be adopted by reference.

There are numerous examples and case studies of natural and manmade disasters that have had significant impacts on universities both direct (damage to facilities and university assets) and indirect costs (loss of time and research capabilities). Mississippi and neighboring coastal states have experienced significant losses of university assets due to hurricane and tropical weather activity. In 1969, Hurricane Camille caused catastrophic damage to the Mississippi Gulf Coast and USM's Gulf Coast Research Lab. The Gulf Coast Research Lab and the Gulf Park Campus in Long Beach were virtually destroyed in 2005 by Hurricane Katrina.

Due to the proximity of the Hattiesburg Campus of USM to the Gulf Coast, the presence of two campuses on the Gulf Coast, and based on historic accounts of damage to the University from a variety of hazard types, it is critical that this plan consider multiple contingencies and potential hazard impacts in the planning process. While the devastation of Hurricane Katrina affected the University in many ways, it is critical throughout the planning process to assess the potential impacts of multiple disaster types including both natural and manmade.

3.0 DESCRIPTION OF THE PLANNING PROCESS

In the early stages of the planning process, USM identified and communicated a seven-step planning process that would be followed to direct and organize planning activities. The primary steps in this process include:[1]

1. Establishment of the planning process:
    a. Setting up the planning team and organizing a DRU Advisory Committee.
    b. Coordinating and communicating with project stakeholders and resource agencies.
    c. Reviewing existing plans and other materials to plan for incorporation into the DRU Plan.
    d. Providing opportunities for public input into the plan and the planning process.
2. Assessment of risks:
    a. Identification of potential hazard types.
    b. Assessment of the risks associated with identified hazards.
    c. Development of an inventory of University assets.
    d. Determining the vulnerability of identified assets to identified hazards.
3. Prioritization of critical infrastructure, facilities, and University functions:
    a. Analysis of existing University infrastructure, facilities, and services.
    b. Determination of those critical assets that must remain operational before, during, and immediately after a hazard event.
    c. Consideration of mitigation measures and actions to ensure continuity of service.
4. Development of mitigation strategies:
    a. Definition of goals and objectives.
    b. Identification and analysis of a comprehensive range of possible mitigation measures.
    c. Development of an action plan for the implementation of mitigation measures.
5. Plan assembly:
    a. Incorporation of all plan elements into a single, consolidated document.
    b. Conduct multiple levels of review including peer review, review on the University level, public review, and agency review.
    c. Refinement of the plan to a final draft stage.
6. Plan adoption:
    a. Obtain broad consensus on plan elements and recommendations.
    b. Solicit stakeholder and public input.
    c. Formal adoption of the plan by the University.
7. Plan maintenance:
    a. Develop methods and schedules for regular monitoring, review, evaluation, and updates of the adopted plan.
    b. Incorporation of the Mitigation Plan into other planning efforts such as the Campus Master Plan and Capital Improvement plans.
    c. Provide a mechanism for continued public involvement.[2]

[1] FEMA: Building a Disaster Resistant University, August 2003

The DRU Advisory Committee provided critical oversight for the planning process and valuable input into plan development. The DRU Committee is comprised of representatives from the University including faculty and staff from both the Hattiesburg and Gulf Coast campuses. The Committee was engaged early in the planning process and participated in all elements of plan development including identification of critical facilities, infrastructure, and functions; identification of potential hazards; and identification of priority mitigation measures.

The overall function of the Committee is critical to the long-term success and implementation of the plan to the extent that the Committee will be relied upon periodically throughout the implementation process to monitor progress and to ensure that the plan is updated regularly to maintain its relevance to existing conditions at the University. **Table 3.0** provides a listing of Committee members and their affiliations. A sign-in sheet from the Committee meetings is provided in **Appendix A. Correspondence related to this outreach is in Appendix C.** In the early stages of the planning process, USM executed a contract with AllenES, Inc. AllenES' role in the project included coordination of the planning process, assistance with the organization of the committee and other planning resources, data gathering, analysis, and interpretation, and plan development and assembly. The process of developing the DRU plan document was completed by AllenES through the direction and guidance of the DRU Advisory Committee. Although AllenES is the primary author of the plan, the content was guided and directed by the Advisory Committee, and the plan is reflective of input and information obtained from the committee through a series of meetings conducted throughout the planning process. From a chronological standpoint, the plan development process followed the overall planning process as previously described. Each subsequent Advisory Committee meeting provided guidance and valuable information that was then incorporated into the plan. The plan development process was also guided by several FEMA documents including the Local Hazard Mitigation Plan Review Crosswalk, and the Planning Matrix for Multi-Hazard Mitigation Planning at the Institutions of Higher Learning.

TABLE 3.0 – DRU ADVISORY COMMITTEE MEMBERSHIP

USM DRU Advisory Committee		
Hattiesburg Campus		
Name	**Organization**	**Affiliation/Title**
Clint Atkins	USM	Assistant Director for Fire/Safety - Physical Plant
David Bounds	USM	Senior Associate Director - Physical Plant
Lachel Story	USM	College of Nursing and Health Professionals
Brian Hauff	USM	VP for Facilities Management and Planning
Rusty Keyes	USM	Chief of Police
Teresa Crum	USM	Executive Director of Housing and Residence Life
Shana Riles	USM	Assistant Director, Business Operations - Physical Plant
Chris Winstead	USM	College of Arts and Sciences
Trent Gould	USM	College of Education and Human Sciences
Sirena Cantrell	USM	Associate VP for Student Affairs & Dean of Students
Krystyna Varnado	USM	Sr. Associate VP for Human Resources
Susie Murphy	USM	Assistant Director, Student Accessibility Services
Jay Estes	AllenES	Contract Consultant
J. Bret Becton	USM	College of Business and Economic Development

Gulf Park and Gulf Coast Research Lab		
Name	**Organization**	**Affiliation/Title**
Shannon Campbell	USM	Sr. Associate VP for Coastal Operations
Jacob Breland	USM	Associate VP for Academic Affairs, Coastal Operations
Leila Hamdan	USM	Associate VP for Research, Coastal Operations
Kelly Darnell	USM	Director, Gulf Coast Research Lab
Lisa Carter	USM	University Police Department, Coastal Operations
Binnaz Baley	USM	Assistant Director for Environmental Health & Safety, Coastal
Lucas Applewhite	USM	Director of Facilities Planning and Management, Coastal
Tracie Sempier	USM	MS-AL Sea Grant Coastal Resilience Engagement Coordinator
Jason Cantu	USM	Asst. Director for Projects and Space Utilization, Coastal
Joby Bass	USM	Associate Professor, School of Coastal Resilience
Rusty Keyes	USM	Chief of Police

3.1 PUBLIC PARTICIPATION AND OUTREACH EFFORTS

To ensure the USM DRU Plan had adequate input from the general public outside of the DRU Committee, the University conducted two public hearings on the plan. The first hearing targeted the University community including students, faculty, and staff, and was held on December 7, 2016, at the University. The meeting was publicized through direct mail-outs to members of the University community. Eleven people attended this initial meeting, many of whom became active in subsequent committee meetings held after the first public meeting. The second public meeting was held on March 1 2018 and invitations were emailed and the meeting was posted to the

Sun Herald and the USM *Student Printz*. It targeted the University community as well as the general public in surrounding communities including the City of Hattiesburg, Forrest County, Lamar County, and the City of Petal. The meeting will be publicized through direct mail-outs to the University community, and advertisements in the USM Student Printz. Details of these meetings including published notices, and sign-in sheets are included in the plan in **Appendix C**. Throughout the planning process, a diversity of input was received from the DRU Committee as well as from other stakeholders including graduate students currently conducting research related to hazard mitigation and emergency management, faculty, staff, and representatives from the surrounding communities.

There was general interest expressed in the plan and the planning process. However, neither public hearing yielded significant comments resulting in additions, deletions, or other changes to the plan document.

3.2 RELATED PLANNING EFFORTS

As part of the planning process for the USM DRU Plan, other existing plans were reviewed to provide context for an overall emergency management, mitigation, and response strategy potentially impacting the University and surrounding communities.

3.2.1 Hattiesburg Campus

One of the primary existing plans reviewed was the MEMA District 8 Regional Hazard Mitigation Plan. This plan was a multi-jurisdictional plan with participants including Forrest County, the Cities of Petal and Hattiesburg, the Forrest County Emergency Management Agency, and the University of Southern Mississippi. Finalized in 2020, the Plan was designed to address multiple hazards that could affect Forrest County and surrounding communities.[2] The relevance of this plan to the USM DRU plan is that it does address university issues from a broad perspective. However, since the plan is broad from a geographic perspective, it does not address university issues at the level of detail required to fully ensure the protection of the University from future hazard events.

In addition to the District 8 Plan, the University's Master Campus Facility Plan was reviewed to provide a context through which mitigation planning can address plans for land uses and new facilities on the USM Hattiesburg Campus. The Campus Facility Plan was finalized in August 2007 and provides the framework for campus growth and development over the next ten to fifteen years.[3] More discussion of this plan is included in the Vulnerability and Risk Assessment section of this DRU Plan. Other hazard-related plans are summarized in **Table 2.1**.

3.2.2 Gulf Park Campus

The MEMA District 9 Regional Hazard Mitigation Plan is a regional plan that includes Harrison County and the City of Long Beach. Participants in the planning process included the Mississippi Emergency Management Agency (MEMA); the National Weather Service

[2] MEMA District 8 Regional Hazard Mitigation Plan (2020)
[3] Ely Associates, Evans V., Sasaki Associates, University of Southern Mississippi – Hattiesburg Master Campus Facility Plan

(NWS); the Mississippi Department of Marine Resources; the U.S. Army Corps of Engineers (USACE); the Mississippi Department of Environmental Quality (MDEQ); the Gulf Regional Planning Commission (GRPC) and the Gulf Coast Community College. Finalized in 2023, the District 9 Hazard Mitigation Plan was designed to address multiple hazards that could affect the University and its institutions. However, since the plan is broad from a geographic perspective, it does not address all university issues at the level of detail required to fully ensure the protection of the University from future hazard events.

3.2.3 Gulf Coast Research Lab

The MEMA District 9 Regional Hazard Mitigation Plan is a regional plan that includes Jackson County and the City of Ocean Springs. Participants in the planning process included the Mississippi Emergency Management Agency (MEMA); the National Weather Service (NWS); the Mississippi Department of Marine Resources; the U.S. Army Corps of Engineers (USACE); the Mississippi Department of Environmental Quality (MDEQ); the Gulf Regional Planning Commission (GRPC) and the Gulf Coast Community College. Finalized in 2023, the District 9 Hazard Mitigation Plan was designed to address multiple hazards that could affect the University and its institutions.[4] However, since the plan is broad from a geographic perspective, it does not address all university issues at the level of detail required to fully ensure the protection of the University from future hazard events.

[4] MEMA District 9 Regional Hazard Mitigation Plan (2023)

4.0 RISK ASSESSMENT

4.1 INTRODUCTION TO THE PLANNING JURISDICTION

To fully understand the planning context for this DRU Plan, and the types of hazards potentially affecting the University, it is necessary to understand the geography and the population of its three campus locations. All three campuses are in South Mississippi and are subject to many of the same weather patterns, temperature ranges, and natural hazards. Whereas Hattiesburg lies in the gently rolling Piney Woods region of southern Mississippi, the coastal campuses are located in the low-lying, poorly drained Coastal Plain which borders the Gulf of Mexico. With two of the University's primary assets located in a coastal environment, issues related to tropical hazards including hurricanes, tropical storms, and sea level rise will be given additional consideration.

Overall, the number of students studying at the University of South Mississippi campuses numbers reaches nearly 10,000. The scale and time of occupancy, however, varies by campus. Only the Hattiesburg Campus has a large full-time population. The students at the Gulf Park Campus reflect only the daytime population, whereas the Gulf Coast Research Lab has a small number of dormitories and a rotating population of researchers living on the premises at any given time. All of the campuses are participating in the USM Disaster Resistant University process and are profiled below.

TABLE 4.0 - USM STUDENT ENROLLMENT SUMMARY

Student Enrollment Summary		
Facility	**Location**	**Population (Students, Faculty, & Staff)**
Main Campus	Hattiesburg	10,652
Gulf Park Campus/ Gulf Park	Long Beach	946
Gulf Coast Research Lab	Ocean Springs	187

4.1.1 Hattiesburg Campus of USM

The Hattiesburg Campus of USM is located within the City of Hattiesburg in a largely urban setting. The campus community includes approximately 8,456 students and approximately 2,196 faculty and staff for a total campus population of approximately 10,652, equating to a population density of approximately 13,000 per square mile. In contrast, the overall population density of the City of Hattiesburg is approximately 1000 persons per square mile.[5] The high population density of the University combined with the urban nature of its surroundings suggests that any given hazard event could potentially impact a large population located within a relatively small land area. In addition, the University represents a significant investment on the part of the taxpayers of the State of Mississippi not only in terms of brick-and-mortar infrastructure but also in terms of the University's economic impact and benefit to the region and the State. Additional assets include the value of research conducted within the University and intangible assets such as archival collections

[5] U.S. Census Bureau: www.census.gov

that are virtually irreplaceable. With these considerations, efforts related to mitigation planning and the mitigation strategies themselves are critical to ensuring that the University is resilient to potential future disaster events.

The university is geographically constrained by the City of Hattiesburg with growth strategies targeted towards increasing density within the existing campus. The urban nature of the university requires specific considerations concerning mitigation strategies addressing natural and man-made hazards. The University exists close to a major U.S. highway that serves as a primary transportation corridor for passenger as well as freight vehicles, increasing the potential for impacts to the University from traffic accidents involving sensitive or hazardous cargo. This same highway serves as a primary evacuation route from Coastal Mississippi during events related to tropical weather and hurricanes. Proximity to this major highway could potentially create challenges and opportunities related to campus evacuation in the event of a major hurricane or tropical storm.

From a broader geographical perspective, the Hattiesburg campus of USM is situated approximately sixty miles north of the shoreline of the Gulf of Mexico. This proximity to the Gulf Coast significantly increases the likelihood of impacts from tropical activity. As further illustrated in later sections of this plan, the University has a history of varying levels of impacts from tropical storms and hurricanes with the most recent being Hurricane Katrina in 2005. History has shown that severe tropical weather has the potential to interrupt university operations including class scheduling, ongoing research, and travel for students living off campus. Maps providing the geographical context for the University and other plan maps are found in **Appendix B**.[6]

4.1.2 Gulf Park Campus

The University of Southern Mississippi's Gulf Park Campus (Gulf Park) is a 52-acre non-residential campus in Long Beach, Mississippi that offers undergraduate and graduate degree programs.[7] Gulf Park occupies a distinctive position across from the Gulf of Mexico on Highway 90, or Beach Boulevard, within the City of Long Beach. As in Hattiesburg, the campus fronts directly onto a state highway which is a primary transportation corridor for the Mississippi Gulf Coast, and transports a high volume of passenger and freight traffic, including sensitive and potentially hazardous cargo. Both vehicle accidents and roadway inundation are potential hazards for the campus, blocking ingress and egress from the main entrance. The historic campus is geographically constrained, and new construction is anticipated to occur within the existing boundaries. The University is on relatively high ground. However, its position directly facing the Mississippi Sound makes it highly vulnerable to heavy winds and flooding.

One of the most beloved landmarks on campus is the 500-year-old "Friendship Oak. This live oak tree is approximately 60 feet tall and nearly six feet in diameter. It is a gathering place for students and faculty and has survived Hurricane Katrina and centuries of the storms that batter the communities of the Mississippi Sound.

[6] GIS Shapefiles and Data provided by the Mississippi Automated Resources Information System (MARIS), https://maris.mississippi.edu/Home.html#gsc.tab=0
[7] https://www.usm.edu/university/gulf-park-campus.php

4.1.3 Gulf Coast Research Lab

The Gulf Coast Research Lab (GCRL) is in the City of Ocean Springs in Jackson County, Mississippi. It is the largest marine laboratory in the Gulf of Mexico. Approximately 145 scientists and support staff are employed by GCRL and conduct research in a diverse array of laboratory facilities on the facility's 50-acre Halstead campus and nearby 224-acre Cedar Point site. Collectively, the Department of Coastal Sciences and three research centers are the platforms for GCRL's scientific and educational programs. Researchers at GCRL work closely with state and federal partners to provide scientific support for the management of marine and coastal resources. Outreach educational programs include after-school, weekend, and summer day camp activities, as well as a visitors' center under construction to introduce tourists to the Lab's research.[8]

Coastal flooding can impede access and egress to the southernmost facility, as the entrance is in a low-lying area. Both research campuses are surrounded by a combination of forest, marsh, and waterways to facilitate access to the subjects of their research. The campus possesses two research vessels and a docking facility that leads from an inlet to the Mississippi Sound. Both campuses are likely to experience the direct effects of high winds and water due to their location.

4.2 INTRODUCTION TO THE RISK ASSESSMENT

The process of determining appropriate mitigation actions and strategies begins with an identification of the types of hazards with the greatest potential of impacting the identified University assets and conducting an analysis of the potential significance of each hazard. **Table 4.1** provides a listing and preliminary evaluation of the probability of occurrence of each hazard type as well as priority ranking for mitigation measures based on the probability of impacts and the likelihood of occurrence. The list of hazards included in **Table 4.1** is consistent with the hazards identified and analyzed in the Region 8 and 9, Hazard Mitigation Plans and those required to be considered by FEMA.

TABLE 4.1 – Identified Hazards of Concern[9]

Hazard	Location	Likely Occurrence	Mitigation Priority
Coastal Erosion	GCRL	Medium	Medium
Drought & Extreme Temperature	All Campuses	Medium	Medium
Expansive Soils	Hattiesburg	Medium	Medium
Flood & Flash Flooding	All Campuses	High	High
Hailstorm	All Campuses	Medium	Low
Hurricane, Tropical Storm & Storm Surge	All Campuses	High	High
Climate Change & Sea Level Rise	Gulf Coast	Medium	Medium
Tornado	All Campuses	High	High
Thunderstorms, Lightning & High Winds	All Campuses	High	Medium
Wildfire, Urban Fire	All Campuses	Low	Low
Winter Storm	Hattiesburg	Low	Low

[8] https://www.usm.edu/gulf-coast-research-laboratory/index.php
[9] FEMA: Understanding Your Risks: Identifying Hazards and Estimating Losses (August 2001)

Hazards Not Considered a Concern to the University

Hazard	Accept as Hazard	Likely Occurrence
Avalance	No	Low
Dam Failure	No	Low
Earthquake	No	Low
Land Subsidence	No	Low
Tsunami	No	Low
Volcano	No	Low

The hazards identified for consideration in **Table 4.1** are categorized as a high, medium, or low priority in terms of the potential severity of the event, the likelihood of occurrence, and potential losses from each event type. To place discussions of potential hazard types in a logical order, the following sections provide information relative to those hazards not considered to have the potential to impact the University. Detailed discussions of each hazard type determined to be of concern to the University are included in ***Section 6.0, Profiles of Potential Hazards of Concern.*** Although most hazards of concern apply across all three campuses, certain hazards are only relevant to specific locations, such as Expansive Soils for Hattiesburg and Sea Level Rise and Coastal Erosion for the University's Coastal campuses.

In addition to an analysis of natural hazards, the DRU Plans consider manmade hazards as they relate to potential impacts on the University. The listing of manmade hazards is also consistent with FEMA requirements and those considered in the Region 8 and 9 Hazard Mitigation Plans. **Table 4.2** provides a listing of manmade hazards, their potential for impacts on the University, and the mitigation priority of each. It should also be noted that at the time of the writing of this plan, a significant and parallel planning effort was being undertaken by the University to plan for manmade hazard events, specifically those related to terrorism, and public disturbance that may occur at a high-attendance event such as a University football game.

The three primary risk areas are defined as:

1. The Hattiesburg campus of the University.
2. The Gulf Park campus of the University in Long Beach
3. The Gulf Coast Research Lab in Ocean Springs, including the Halstead and Cedar Park facilities.
4. Other Gulf Coast facilities including assets at the Port of Gulfport and Stennis Space Center.

Because of the geographically compact nature of these campuses, an assumption is made for planning purposes that each campus in its entirety is at equal risk to a given hazard type. To allow for effective mitigation planning, certain buildings, functions, and facilities have been given a higher priority based on function, value, or usefulness before, during, or immediately after a hazard event.

TABLE 4.2 – LIST OF MANMADE HAZARDS TO BE EVALUATED

Hazard	Accept as Hazard	Likely Occurrence	Mitigation Priority
Chemical	Yes	Medium	Medium
Civil Disturbance	Yes	Low	Low
Hazardous Materials Accident	Yes	Medium	Medium
Power Failure	Yes	Medium	High
Terrorism/Active Shooter	Yes	Low	Low
Transportation Incident	Yes	High	High
Health Incident / Infectious Disease	Yes	High	High

Detailed information for each identified hazard type including historical occurrence data, probability of future occurrences, the University's vulnerability to each hazard type, and potential impacts are included in ***Section 6.0 Profiles of Potential Hazards of Concern***.

4.3 IDENTIFICATION OF HAZARDS NOT CONSIDERED A CONCERN TO THE UNIVERSITY

4.3.1 Avalanche

An avalanche typically refers to the slope failure of a mass of snow and ice on a mountainside that moves swiftly down to lower elevations, growing in size as it descends and collecting debris such as rocks, boulders, and vegetation along the way. This type of event can occur on slopes exceeding 20 to 30 degrees. Since all three campuses of USM are located in southern Mississippi where the topographical elevation variance is less than 100 feet within a 30-mile radius and exists at a latitude that typically does not experience large snow events, the hazard potential posed by an avalanche is considered to be zero.

4.3.2 Dam Failure

According to the MDEQ, since 1960, in the United States, there have been at least 25 dam failures that caused one or more fatalities.[10] Several dams are breached each year in Mississippi, including both unintentional failures and intentional breaches. Since 1979, there have been seven dam breaches in Forrest County, one in Harrison County, and three in Jackson County. In 1983 the Hattiesburg area experienced a 500-year (flash) flood that resulted in the failure of a dam west of the City of Hattiesburg in Lamar County. There were no deaths from that dam breach. There have been no reported deaths from dam breaches in the State of Mississippi to date. There are 5 dams located within a three-mile radius of the main campus of USM. Among these five dams is the Lake Sehoy Dam owned by USM located at the former Van Hook Golf Course site. The Lake Sehoy Dam is classified by MDEQ as a high hazard dam. However, due to its location and proximity to the primary Hattiesburg campus, a breach would not impact the campus. All five dams are located to the west of the University campus with four of the five located southwest of the University.

In Harrison County, where the Gulf Park Campus is located, there are 68 dams registered with the MDEQ Dam Safety Division. Of these 68 dams, one is classified as high hazard

[10] Mississippi Department of Environmental Quality, Dam Safety Division: https://www.mdeq.ms.gov/water/dam-safety/

and three have been identified as needing further investigation to classify. In Jackson County, the site of the Gulf Coast Research Lab, there are 38 dams, with the only high hazard dam located north of the Vancleave community, over 20 miles away. Based on the topographic conditions and the mean distance of the dams from all three University campuses, none of these dams pose a significant hazard to the University's assets. Due to the absence of potentially hazardous dams within the vicinity of the university, dam failure is considered to pose no threat and was given no further consideration. **Figure 4.5** provides a map of dams in proximity to the main USM campus as well as each dam's status of High or Low Hazard.[11]

4.3.3 Earthquakes

Earthquakes can be described as the positive and negative acceleration of the ground over a relatively short period; seconds or minutes. The effect of the ground acceleration can be very destructive to buildings and other structures, particularly in areas of the United States where the intensity of the acceleration is severe. The incidence of earthquake occurrence is somewhat rare in Mississippi and when earthquakes have occurred, they have caused very little damage. The majority of the earthquakes occurring in Mississippi are centered in the northern two-thirds of the state. However, there was at least one earthquake that was centered as far south as the Gulf Coast. It occurred on February 1, 1955, and was perceptible across the coastal counties but was not reported to have caused damage to any structures.[12]

The campuses of USM are located in an area described by the United States Geological Survey as having a ***%g*** rating of 6. This means that the expected acceleration due to an earthquake occurring at or near the campuses of USM would be 6% of the acceleration due to gravity. For perspective, there are certain areas of California with a rating of 350% and thousands of square miles of California near the coastline classified within the 120% rating zone. A seismic hazard map of the state of Mississippi is shown indicating that the University is not considered to be located in an area of consideration for earthquake hazards. **Figure 4.4** provides a map showing the boundaries of the earthquake intensity zones.

4.3.4 Land Subsidence

The subsidence of land is the sinking of land elevation due to consolidated materials or the collapse of a section of land due to large subsurface voids. In the case of large sinking land masses, the cause is generally the extraction of subsurface fluids such as groundwater or petroleum. Some examples of this type of subsidence include the City of New Orleans, Houston, Texas, and San Joaquin Valley, California. Additionally, subsurface caverns resulting from mining, or the natural dissolution of certain rock types (gypsum and limestone) can suddenly collapse and create a surface sinkhole.[13] Forrest County, and more specifically, the campus of USM is located on the Pascagoula/Hattiesburg formation that consists of Faulkner-Susquehanna Urban Complex and Prentiss Urban Land Complex soils. The City of Hattiesburg and the University utilize groundwater wells that have an

[11] MARIS: https://maris.mississippi.edu/Home.html#gsc.tab=0
[12] United States Geologic Survey (USGS) Earthquakes in Mississippi and Vicinity 1811-2010: https://pubs.usgs.gov/of/2011/1117/downloads/OF11-1117.pdf
[13] USGS, Land Subsidence: https://www.usgs.gov/mission-areas/water-resources/science/land-subsidence

average depth of 609 feet and pull water from the Upper and Middle Catahoula Aquifers.[14] Long Beach and Ocean Springs both rely on the Coastal Lowlands aquifer system. Based upon the history and geology of Forrest, Harrison, and Jackson Counties, it is highly unlikely that subsidence would pose a hazard to the university and it is therefore dismissed from further consideration.

4.3.5 Tsunami

A tsunami is a series of waves typically generated by the sudden displacement of large volumes of ocean water. Tsunamis are usually the result of earthquakes with epicenters that are located miles offshore but can be caused by other forces such as volcanic eruptions or landslides.[15] While these events are destructive, they are generally a hazard for locations close to the coastline. The campus of USM is located approximately 60 miles from the Mississippi Gulf Coast and rests at an elevation of approximately 170 feet above mean sea level. For this reason, the hazard potential posed to the campus of USM by a tsunami is considered to be zero.

4.3.6 Volcano

The closest known volcano to the USM campuses is the extinct Jackson Volcano located approximately 85 miles to the northwest. The Jackson Volcano lies approximately 2,900 feet below Jackson, Mississippi, and is believed to have been extinct for approximately 65 million years. Consequently, it is unlikely that volcanic activity poses a hazard to the university and is therefore given no further consideration.

[14] MARIS

[15] Federal Emergency Management Agency (FEMA) Understanding Tsunamis: https://www.fema.gov/fact-sheet/understanding-tsunamis

5.0 VULNERABILITY ASSESSMENT

For this plan, University facility structures have been classified according to functional classifications including Academic, Campus Services, Athletic, and Housing. These structures have also been classified according to their relative importance and value in terms of their function before, during, and after a hazard event. Each University building has been classified as Critical, High Priority, Medium Priority, and Low Priority. Assigning a hazard classification to each building, building, or facility's potential value to the University in preparation or response to a hazard event was considered of higher importance than the replacement value of the structure itself.

Those buildings or systems with usefulness to the continuity of campus operations and response during a crisis event or those buildings useful to recovery operations after a hazard event were classified as Critical. Buildings and systems with high exposure in terms of the building value or value of contents including research data and special collections were classified as High Priority. Also classified as High Priority structures were those buildings housing high concentrations of the University population such as buildings designated as shelters or those buildings providing services related to human sustainability such as dining halls. Buildings containing particularly expensive equipment, research, or cultural materials warranting special consideration were classified as Medium Priority. All other structures were classified as Low Priority. The facility structures of each campus are described in the following three sections.

To establish a vulnerability assessment of buildings classified as critical, high, or medium priority, some general assumptions were made based on certain hazard types. Because of the compact nature of each of the three locations campus and based on their geographical proximity, the likelihood of certain types of hazards occurring is assumed to be relatively homogenous throughout the three campus locations. Other hazard types might only impact the coastal campuses. For example, a severe winter storm is a hazard event that would be regional and would impact all three USM campuses as well as surrounding communities. In contrast, flash flooding would potentially only impact certain areas that have historically demonstrated vulnerability or susceptibility to flash flooding. The hazard types approached in a general or regional fashion include:

- Drought/ Extreme Temperatures
- Expansive Soils,
- Hailstorms,
- Hurricanes and Tropical Storms/ Storm Surge,
- Thunderstorms, Lightning, and Wind
- Tornados
- Winter Storms,

Hazard events that are profiled on a more site-specific basis are those that can be modeled or predicted based on historical data that indicates more localized impacts such as:

- Coastal Erosion,
- Flooding/ Flash Floods,
- Sea Level Rise,
- Urban Fires.
- Storm Surge,
- Wildfires

5.1 USM MAIN CAMPUS

USM's Hattiesburg campus includes approximately 133 structures with an estimated value of more than $677 million. These structures serve a variety of purposes, from housing to research, to campus infrastructure. Their relative priority is classified in **Table 5.0** which provides an overview of structure classifications for the Hattiesburg Campus of USM.

TABLE 5.0 – BUILDING CLASSIFICATIONS: HATTIESBURG CAMPUS

The University of Southern Mississippi			
Building List - Hattiesburg Campus			
Building Number	**Building Name**	**Building Function**	**Ranking**
605	Henderson Physical Plant Building	Campus Services	Critical
610	Physical Plant Motor Pool	Campus Services	Critical
810	Bond Hall	Academic	Critical
602	Forrest County Hall	Campus Services	Critical
602A	Mechanical Plant (Forrest County)	Campus Services	Critical
601	Lucas Administration Building	Administrative	Critical
501	Kennard-Washington Hall	Academic	Critical
629	Residence Life Maintenance Building	Housing	Critical
	Moffit Health Clinic	Campus Services	Critical
116	Walker Science Building	Academic	High Priority
119	Johnson Science Tower	Academic	High Priority
120	Chemical Storage (Flammable)	Academic	High Priority
143	Chain Technology Building	Academic	High Priority
143A	Mechanical Plant (Chain)	Campus Services	High Priority
146	Thames Polymer Science Research Center	Academic	High Priority
146A	Mechanical Plant (Polymer)	Campus Services	High Priority
401	Cook Library	Academic	High Priority
638	Mechanical Plant (Cook Library)	Campus Services	High Priority
402	McCain Library and Archives	Academic	High Priority
797	Century Park South (Scott Hall)	Housing	High Priority
798	Century Park South (Vann Hall)	Housing	High Priority
799	Century Park South (Luckyday Citizenship Hall)	Housing	High Priority
643	Mechanical Plant (CPS)	Campus Services	High Priority
814A	McCarty Hall - North	Housing	High Priority
814B	McCarty Hall - Center	Housing	High Priority
814C	McCarty Hall - South	Housing	High Priority
815	Cedarbrook A	Housing	High Priority
816	Cedarbrook B	Housing	High Priority

The University of Southern Mississippi			
Building List - Hattiesburg Campus			
Building Number	Building Name	Building Function	Ranking
817	Cedarbrook C	Housing	High Priority
818	Cedarbrook D	Housing	High Priority
819	Cedarbrook E	Housing	High Priority
820	Cedarbrook F	Housing	High Priority
846	Century Park North #1	Housing	High Priority
847	Century Park North #2	Housing	High Priority
848	Century Park North #3	Housing	High Priority
849	Century Park North #4	Housing	High Priority
807	Wilber Hall	Housing	High Priority
633	Mechanical Plant (Wilbur Hall)	Campus Services	High Priority
809	Hillcrest Hall	Housing	High Priority
809A	Mechanical Plant (Hillcrest)	Campus Services	High Priority
855	Village A (Duplex)	Housing	High Priority
856	Village B (Scholarship Hall)	Housing	High Priority
857	Village C (Pi Beta Phi Sorority)	Housing	High Priority
858	Village D (Alpha Delta Pi Sorority)	Housing	High Priority
859	Village E (Phi Mu Sorority)	Housing	High Priority
860	Village F (Delta Gamma Sorority)	Housing	High Priority
861	Village G (Alpha Kappa Alpha Sorority)	Housing	High Priority
862	Village H (Kappa Delta Sorority)	Housing	High Priority
863	Village J (Alpha Chi Omega Sorority - Nursing)	Housing	High Priority
864	Village K (Chi Omega Sorority)	Housing	High Priority
865	Village L - (Delta Delta Delta Sorority)	Housing	High Priority
642	Village Fire Pump Building	Housing	High Priority
870	Alpha Tau Omega Fraternity	Housing	High Priority
875	Sigma Alpha Epsilon Fraternity	Housing	High Priority
876	Kappa Sigma Fraternity	Housing	High Priority
877	Phi Kappa Alpha (PIKE) Fraternity	Housing	High Priority
878	Pi Kappa Phi Fraternity	Housing	High Priority
879	Sigma Phi Epsilon Fraternity	Housing	High Priority
880	Delta Tau Delta Fraternity	Housing	High Priority
883	Sigma Nu Fraternity	Housing	High Priority
884	Phi Kappa Tau Fraternity	Housing	High Priority
886	Sigma Chi Fraternity House	Housing	High Priority

The University of Southern Mississippi			
Building List - Hattiesburg Campus			
Building Number	**Building Name**	**Building Function**	**Ranking**
101	Southern Hall	Academic	Low Priority
102	College Hall	Academic	Low Priority
103	Stout Hall	Academic	Low Priority
105	Marsh Hall	Academic	Low Priority
106	Mannoni Performing Arts Center	Academic	Low Priority
106A	Mechanical Plant (Mannoni)	Campus Services	Low Priority
107	Hurst Building	Academic	Low Priority
108	Fritzsche-Gibbs Hall	Academic	Low Priority
109	Owings-McQuagge Hall	Academic	Low Priority
110	Greene Hall	Academic	Low Priority
800	Spirit Park at Century Park South	Campus Services	Low Priority
119A	Mechanical Plant (JST)	Campus Services	Low Priority
121	Scianna Hall	Academic	Low Priority
122	Biological Sciences Building at Lake Thoreau	Academic	Low Priority
122A	Primate Research Facility at Lake Thoreau	Academic	Low Priority
123	Johnson Natatorium	Campus Services	Low Priority
124	George Building	Academic	Low Priority
125	Harkins Hall	Academic	Low Priority
135	Hubbard House	Academic	Low Priority
137	Asbury Hall (College of Nursing)	Academic	Low Priority
138	Pride Field Band Director's Tower	Academic	Low Priority
142	Kelley Hall	Academic	Low Priority
144	Center for Child Development	Campus Services	Low Priority
147	3D Arts Studio	Academic	Low Priority
149	Liberal Arts Building	Academic	Low Priority
149A	Mechanical Plant (LAB)	Campus Services	Low Priority
150	Theater and Dance Building	Academic	Low Priority
152	Dubard School for Language Disorders	Academic	Low Priority
153	International Center	Academic	Low Priority
155	Lott Center	Campus Services	Low Priority
209	Accelerator	Academic	Low Priority
219	Soccer Dressing Room (Module L)	Athletics	Low Priority
222	Anthropology Lab and Collections	Academic	Low Priority
223	Baptist Student Union	Campus Services	Low Priority
235	Office of Sustainability	Campus Services	Low Priority

The University of Southern Mississippi			
Building List - Hattiesburg Campus			
Building Number	Building Name	Building Function	Ranking
236	Center for Military Veterans, Service Members, and Families	Campus Services	Low Priority
403	Bennett Auditorium	Campus Services	Low Priority
405	Century Park North Learning Center	Housing	Low Priority
502	McLemore Hall	Academic	Low Priority
502A	Mechanical Plant (McLemore)	Campus Services	Low Priority
504	The Hub Building	Campus Services	Low Priority
505	Cook University Union	Campus Services	Low Priority
505A	Mechanical Plant (Union)	Campus Services	Low Priority
506	Bedie Smith Clinic (VACANT)	Campus Services	Low Priority
507	Danforth Chapel	Campus Services	Low Priority
507A	Mechanical Plant (Danforth Chapel)	Campus Services	Low Priority
508	Roberts Stadium West	Athletics	Low Priority
509	Roberts Stadium East	Athletics	Low Priority
510	Roberts Stadium South	Athletics	Low Priority
510A	Ticket Booth	Athletics	Low Priority
512	Kinesiology Building (HPER)	Academic	Low Priority
514	Payne Center	Campus Services	Low Priority
515	Cochran Center	Campus Services	Low Priority
516	Roberts Video Scoreboard (North End)	Campus Services	Low Priority
518	Duff Athletic Center	Athletics	Low Priority
519	Reed Green Coliseum	Athletics	Low Priority
520	Tennis Courts (Pearl Street)	Athletics	Low Priority
521	Intramural Fields & Storage Bldg	Campus Services	Low Priority
526	Dormitory Laundry	Housing	Low Priority
526A	Stone's Throw Food Pantry	Campus Services	Low Priority
528A	Golf Course	Campus Services	Low Priority
531	Baseball Field Concessions	Athletics	Low Priority
533	Peck House (OLLI)	Campus Services	Low Priority
534	Baseball Field Stadium	Athletics	Low Priority
535	Bell Track, Field, Soccer Complex, and Press Box	Athletics	Low Priority
536	Bell Track Storage Building	Athletics	Low Priority
537	Ferlise Center	Campus Services	Low Priority
538	Baseball Field House (Rogers, Thames, Welsh)	Athletics	Low Priority
539	Softball Complex	Athletics	Low Priority
540	Softball Batting Cage	Athletics	Low Priority

The University of Southern Mississippi			
Building List - Hattiesburg Campus			
Building Number	**Building Name**	**Building Function**	**Ranking**
541	Softball Field House	Athletics	Low Priority
542	Baseball Batting Cages	Athletics	Low Priority
543	Baseball Weight Room	Athletics	Low Priority
544	Southern Miss Athletic Wellness Center	Campus Services	Low Priority
544A	Beach Volleyball Facility	Athletics	Low Priority
604	Power House Restaurant	Campus Services	Low Priority
606	Math Zone	Academic	Low Priority
607	Stores and Receiving	Campus Services	Low Priority
608	Stores Warehouse	Campus Services	Low Priority
609	Receiving and Property Accounting	Campus Services	Low Priority
611	Flammable Chemical Storage Building	Campus Services	Low Priority
612	Physical Plant Storage Bldg A	Campus Services	Low Priority
613	Physical Plant Storage Bldg B	Campus Services	Low Priority
614	Physical Plant Storage Bldg C	Campus Services	Low Priority
615	Physical Plant Furniture Shop	Campus Services	Low Priority
619	Biology Field Lab (VACANT)	Academic	Low Priority
620	Wombat Facility (VACANT)	Academic	Low Priority
623	Physical Plant Lumber Shed	Campus Services	Low Priority
624	Food Services Storage Building	Campus Services	Low Priority
625	Information Booth and Entrance Kiosk	Campus Services	Low Priority
626	Theatre Arts Storage Building	Academic	Low Priority
627	Physical Plant Storage Building	Campus Services	Low Priority
628	Golf Cart Maintenance Building	Campus Services	Low Priority
630	Credit Union	Campus Services	Low Priority
631	Mechanical Plant (JB George)	Campus Services	Low Priority
632	Mechanical Plant (East Stadium)	Campus Services	Low Priority
634	Electronic Message Center	Campus Services	Low Priority
635	Softball Practice Facility	Athletics	Low Priority
637	Parking Management Garage Building	Campus Services	Low Priority
639	Century Park North Security Kiosk	Housing	Low Priority
640	Mechanical Plant (CPN)	Campus Services	High Priority
641	West 4th Street Parking Garage	Campus Services	Low Priority
644	Century Park South Security Kiosk	Housing	Low Priority
645	Warehouse and Storage Facility at Midtown Plaza	Campus Services	Low Priority
701	Ogletree Alumni House	Campus Services	Low Priority

The University of Southern Mississippi			
Building List - Hattiesburg Campus			
Building Number	**Building Name**	**Building Function**	**Ranking**
702	Honor House	Academic	Low Priority
702A	Mechanical Plant (Honor House)	Campus Services	Low Priority
800A	Southern Station	Campus Services	Low Priority
801	Mississippi Hall	Housing	Low Priority
802	Hickman Hall	Academic	Low Priority
802A	Mechanical Plant (Hickman)	Campus Services	Low Priority
803	Hattiesburg Hall	Housing	Low Priority
804	Jones Hall (PARTIALLY VACANT)	Academic	Low Priority
805	Bolton Hall (VACANT)	Campus Services	Low Priority
806	Pulley Hall (VACANT)	Campus Services	Low Priority
895	President's Home	Campus Services	Low Priority
895A	President's Home Support Building	Campus Services	Low Priority

5.2 GULF PARK CAMPUS

USM's Gulf Park Campus includes approximately 20 structures with an estimated value of over $54 million. These structures serve a variety of purposes, from academic, to administrative to campus infrastructure. Their relative priority is classified in **Tables 5.4 – 5.7**, which provide an overview of structure classifications for the Gulf Park Campus of USM.

TABLE 5.1– CRITICAL FACILITIES

Building Name	Building Function	Critical Status
Physical Plant	Campus Services	Critical
Campus Safety	Campus Services	Critical
Hardy Hall	Academic	Critical

TABLE 5.2– HIGH PRIORITY FACILITIES

Building Name	Building Function	Critical Status
Library	Academic	High Priority
University Communications	Campus Services	High Priority

TABLE 5.3– MEDIUM PRIORITY FACILITIES

Building Name	Building Function	Critical Status
Business Complex	Administrative	Medium Priority
HVAC Building	Campus Services	Medium Priority

TABLE 5.4– LOW PRIORITY FACILITIES

Building Name	Building Function	Critical Status
Business Administration	Academic	Low Priority
Elizabeth Hall	Academic	Low Priority
Fleming Education Center	Academic	Low Priority
Greenhouse	Campus Services	Low Priority
Human Resources	Campus Services	Low Priority
Learning Center	Academic	Low Priority
Lloyd Hall	Academic	Low Priority
Nursing College	Academic	Low Priority
Science Building	Academic	Low Priority
Workforce Development Institute	Academic	Low Priority

5.3 *GULF COAST RESEARCH LAB*

USM's Gulf Coast Research Lab campus includes approximately 50 structures with an estimated value of approximately $60 million.[24] These structures serve a variety of purposes, from housing, and research to campus infrastructure. Their relative priority is classified in **Tables 5.8 – 5.11**, which provide an overview of structure classifications for the Gulf Coast Research Lab Campus of USM.

TABLE 5.5– CRITICAL FACILITIES

Building Name	Building Function	Critical Status
Physical Plant Bldg	Physical Plant Shop	Critical

TABLE 5.6– HIGH PRIORITY FACILITIES

Building Name	Building Function	Critical Status
Oceanography	Office/Laboratories	High Priority
Caylor	Classroom/Laboratories	High Priority
Dormitory	Dormitory	High Priority
Dining Hall	Cafeteria	High Priority

TABLE 5.7 – MEDIUM PRIORITY FACILITIES

Building Name	Building Function	Critical Status
Aquaculture Visitors Pavilion	Office/Laboratories	Medium Priority
Aquaculture Demonstration Lab	Laboratory	Medium Priority
Faculty	Dormitory	Medium Priority
Fisheries	Offices	Medium Priority
Director's House	Offices	Medium Priority
Field Studies Building	Classroom	Medium Priority
Research	Office/Laboratories	Medium Priority
MERL	Laboratory	Medium Priority
Research	Office/Laboratories	Medium Priority
Office Research Building	Office/Laboratories	Medium Priority
Office/Receiving	Offices	Medium Priority
Toxicology	Office/Laboratories	Medium Priority

TABLE 5.8 – LOW PRIORITY FACILITIES

Building Name	Building Function	Critical Status
Aquaculture Growout 1	Laboratory	Low Priority
Storage	Physical Plant Shop	Low Priority
Aquaculture Growout 2	Laboratory	Low Priority
Aquatic Wet Lab-GCRL	Laboratory	Low Priority
Botany Green House	Office/Laboratories	Low Priority
Botany Greenhouse #2	Laboratory	Low Priority
Crab Lab	Laboratory	Low Priority
GCGC	Offices	Low Priority
Maturation	Laboratory	Low Priority
Broodstock	Laboratory	Low Priority
Small Growout	Laboratory	Low Priority
Large Scale Growout	Laboratory	Low Priority
Maint/Receiving	Offices/Storage	Low Priority
Aquaculture Grow out	Laboratory	Low Priority
Red Snapper Culture/ Broodstock	Laboratory	Low Priority
Red Snapper Growout	Laboratory	Low Priority
Fish Health	Laboratory	Low Priority
Aquatic Wet Lab- Cedar Point	Laboratory	Low Priority
Crab Aquaculture	Laboratory	Low Priority
Marine Ed Center 1	Classroom	Low Priority
Marine Ed Center 2	Classroom	Low Priority
Marine Ed Center Latrine	Washroom	Low Priority
One BR Park Model Cottage CP116	Housing	Low Priority
One BR Park Model Cottage CP117	Housing	Low Priority
One BR Cottage CP118	Housing	Low Priority
Two BR Cottage CP119	Housing	Low Priority
Two BR Cottage CP120	Housing	Low Priority
Toxicology Quonset Hut	Laboratory	Low Priority
Temp Red Snapper Bldg #39	Laboratory	Low Priority
Temp Red Snapper Bldg #40	Laboratory	Low Priority
Seatrout Greenhouse	Laboratory	Low Priority
Shrimp Matur	Laboratory	Low Priority
Small Greenhouse	Laboratory	Low Priority

6.0 PROFILES OF POTENTIAL HAZARDS OF CONCERN

The following sections provide details on each identified hazard of concern with general information, historic occurrences, and the University's relative vulnerability and potential damage associated with each hazard type. ***Because the majority of hazard data is compiled at the City and County level, there is often no campus-specific information.*** The data used most accurately shows the previous history of the hazard in the city or county. Where the relative risk from a hazard is similar across campuses, it is included in a general section. Hazards of concern to a particular campus are under a heading specific to that campus. This section, combined with the previous section identifying critical, high, medium, and low priority facilities is the basis for the development of appropriate mitigation strategies to minimize risk, reduce vulnerability, reduce costs associated with recovery from natural hazards, and protect life and property. Specific hazards identified in this section as well as their relative priority for mitigation are included in **Table 6.0** below:

TABLE 6.0 – MITIGATION PRIORITY BY HAZARD TYPE

Hazard	Location	Likely Occurrence	Potential Severity	Mitigation Priority
Coastal Erosion	GCRL	Medium	Medium	Medium
Drought & Extreme Temperature	All Campuses	Medium	Medium	Medium
Expansive Soils	Hattiesburg	Medium	Medium	Medium
Flood & Flash Flooding	All Campuses	High	Medium	High
Hailstorm	All Campuses	Medium	High	Low
Hurricane, Tropical Storm & Storm Surge	All Campuses	High	High	High
Climate Change & Sea Level Rise	Gulf Coast	Medium	Medium	Medium
Tornado	All Campuses	High	High	High
Thunderstorms, Lightning & High Winds	All Campuses	High	High	Medium
Wildfire, Urban Fire	All Campuses	Low	Medium	Low
Winter Storm	Hattiesburg	Low	Low	Low

Low = 0-33% chance of occurring in the next year. Medium = 34-66% chance of occurring in the next year. High - 67-100% chance of occurring in a given year. Tornado severity evaluated by the Fujita Scale. Hurricanes by the Saffir- Simpson Scale

6.1 COASTAL EROSION – GENERAL INFORMATION

Coastal erosion is a complex physical process shaped by both natural processes and human intervention. Natural factors that influence erosion include sand supply; changes in sea level; characteristics of the shoreline; the effects of waves, currents, tides, and wind; and the slope of the offshore sea bottom. Waves move material onto, off, and along the shore daily, depending upon their height, length, period, and the direction at which they strike the shore. A major storm can erode the coastal shoreline inland 100 feet or more in a day, only to be followed by accretion over the next decade. States bordering the Gulf of Mexico have the nation's highest average annual erosion rates at approximately 6 feet per year with variation by location and surrounding environments.[16]

[16] FEMA: National Flood Insurance Program Community Rating System: CRS Credit for Management of Coastal Erosion Hazards, 2006

6.1.1 Coastal Erosion – Historic Occurrence Data

HATTIESBURG CAMPUS

The Hattiesburg Campus of USM is not adjacent to the Gulf of Mexico and is therefore not susceptible to Coastal Erosion.

GULF PARK CAMPUS

Long Beach's Gulf Coast shorelines have changed significantly since 1850, according to data provided by the Mississippi Department of Environmental Quality (MDEQ). Harrison County's artificial beach, which forms the southern border of Long Beach, was established in 1952 as a shoreline stabilization and erosion control feature. It protects U.S. Highway 90 and is maintained by the Harrison County Sand Beach Authority. The campus is separated from the beach by Hwy 90. Periodic renourishment of the beach with new sand is required to maintain its integrity and to counteract the effect of sand and vegetation lost to coastal storms. Such projects are implemented by Harrison County Sand Beach Authority in coordination and cooperation with the State of Mississippi and the U.S. Army Corps of Engineers. Beach nourishment was required after Hurricane Camille in 1969 again after Hurricanes Elena and Kate in 1985, and now most recently following Hurricane Katrina in 2005.

USGS National Assessment of Coastal Change, MS Barrier Islands

GULF COAST RESEARCH LAB

Although the City of Ocean Springs boasts a sand beach similar to that of Harrison County, the property where the Gulf Coast Research Lab is located is bounded by coastal marsh. Between 1850 and 1986, Jackson County lost a total of 465 acres to erosion. The loss of marshland in the last century has been even more dramatic. It is estimated that nearly ten times that area or 4,600 acres of marshland were destroyed between the 1950s and the 1990s, including along the shoreline of the property that is currently the Gulf Coast Research Lab. Severe erosion threatens this property and its adjacent marshes as well.[17]

[17] Schmid, Keil. Coastal Change in Mississippi: A Review of 1850 to 1999 Data. 2001. https://geology.deq.ms.gov/coastal/NOAA_DATA/Publications/Presentations/Coastwide/CoastwideHistoricalChange.pdf

6.1.2 USM's Vulnerability to Coastal Erosion

HATTIESBURG CAMPUS

The Hattiesburg Campus of USM is not adjacent to the Gulf of Mexico and is therefore not susceptible to Coastal Erosion.

GULF PARK CAMPUS

Due to its lack of frontage on the shores of the Mississippi Gulf Coast, the Gulf Park Campus is not anticipated to be directly affected by coastal erosion. However, as documented by the Long Beach Local Hazard Mitigation Plan, vegetation loss, sedimentation, and frequent flooding are causing canal erosion to take place in Bear Creek. This upland erosion may require action to prevent future damage to the campus.

GULF COAST RESEARCH LAB

Because of its location surrounded by the Gulf and its tributaries, and continual threats to the health of the coastal marsh along its southern and eastern borders, the Gulf Coast Research Lab is at moderate risk of coastal erosion.

6.1.3 Potential Coastal Erosion Impacts on the University

HATTIESBURG CAMPUS

The Hattiesburg Campus of USM is not adjacent to the Gulf of Mexico and is therefore not susceptible to Coastal Erosion.

GULF PARK CAMPUS

Coastal erosion along the Harrison County Sand Beach could potentially undermine some of the infrastructure supporting Gulf Park Campus, particularly U.S. Highway 90, and the campus' stormwater drainage system. Coastal erosion poses a low risk to this campus.

GULF COAST RESEARCH LAB

Structures located on the shores of the Gulf Coast Research Lab, including a boat launch, parking lot, and current storage areas are susceptible to coastal erosion. Continued loss of coastal marsh could also leave the campus more vulnerable to the effects of future storm events. The effects of coastal erosion on this campus would be similar to those discussed in the section on Sea Level Rise. The potential for facility damage as a result of coastal erosion is therefore considered to be a **medium risk** specific to the Gulf Coast Research Laboratory.

6.2 DROUGHT AND EXTREME TEMPERATURES– GENERAL INFORMATION

Weather patterns associated with extreme temperatures occur routinely in the Deep South. When these weather patterns are associated with several days, weeks, or months with limited rainfall, they have the potential to create drought conditions that could impact university operations. County-level NCEI data indicates approximately eight major drought periods have occurred in south Mississippi in the last sixty years.

6.2.1 Drought and Extreme Temperatures- Historic Occurrence Data

HATTIESBURG CAMPUS

There have been eight major droughts/extreme temperature events in the past 60 years affecting the area of Mississippi that includes the campuses of USM. All have occurred since 2006 and are classified by the National Centers for Environmental Information as D2 and D3. The campuses of USM do not rely on precipitation for their normal operation and function, therefore drought would not be expected to impact the functional capacity of any critical facilities. The most recent incidence of drought occurred in October 2010 during which Forrest County and the Pine Belt Region experienced D3 drought in some portions of the County. The impacts of these weather conditions on the University's operations were minimal except for higher than normal energy usage by air conditioning systems.[18]

GULF PARK CAMPUS

Research of records from 1958 to the present yielded no reported incidences of drought and only one incidence of extreme heat on 7/30/2010 in Harrison County, Mississippi.

GULF COAST RESEARCH LAB

Research of records from 1958 to the present yielded no reported incidences of drought in and only one incidence of extreme heat on 8/2/2010 in Jackson County, Mississippi.[19]

6.2.2 USM's Vulnerability to Drought and Extreme Temperatures

While periods of extreme temperatures are relatively common in south Mississippi, these events typically do not impact the University. All buildings on campus designed for occupancy are equipped with mechanical air conditioning equipment that serves to mitigate potential human impacts of drought and extreme temperature events. In terms of University operations, none of the University campuses are dependent on surface water supply for potable water, nor are the University campuses dependent on precipitation for routine functions, therefore drought and extreme temperatures do not present a significant vulnerability risk to the University.

6.2.3 Potential Impacts to the University of Drought and Extreme Temperatures

Typical impacts of drought on University operations are associated with higher than normal energy usage and potential restrictions on irrigation activities for green areas throughout campus. While extreme temperature events occur for all three campuses in this region, mitigation opportunities are slight. The most logical mitigation action is public education about potential health risks associated with extreme temperatures including dehydration and heat stroke. For this plan, mitigation for drought and extreme temperatures is considered to be a low priority.

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[18] NOAA National Climatic Data Center: https://www.ncei.noaa.gov/cdo-web/
[19] NOAA Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

6.3 EXPANSIVE SOILS – GENERAL INFORMATION

Soils differ in their ability to absorb and retain moisture. Generally, as the soil absorbs more moisture, it tends to expand. Soils with higher clay content typically absorb and retain very high levels of moisture. These soils also tend to have higher linear extensibility (shrink-swell potential).

6.3.1 Historic Occurrence Data - Expansive Soils

Hattiesburg Campus

The majority of the USM campus is underlain by the Falkner-Susquehanna Urban Land Complex soil (approximately 90%). The remaining 10% of soils underlying the campus are from the Prentiss-urban Land Complex. The Falkner-Susquehanna Urban Land Complex soil has a linear extensibility of 6.7%, a 37.7% plasticity index, and a 64.3% liquid limit.[20] These attributes mean that the soil has a high plasticity and has the potential to cause damage to structures due to its shrink-swell potential. It is therefore retained as a potential hazard to the University. **Figure 6.7** depicts the soil types and approximate locations found on campus.

Gulf Park Campus

The soils within the City of Long Beach are characterized by twelve individual soil types or classifications. The majority of these soils are characterized as sandy-loam, loamy-sand, or silt-loam soils.[21] In addition, many of the soils are classified as hydric or hydric-tidal, which are defined as soils formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil strata. The combination of sandy, loamy, and silty soils combined with large areas of hydric soils indicates a general absence of high clay-content soils that are typically associated with high shrink-swell potential.

Gulf Coast Research Lab

The soils within the City of Ocean Springs are characterized by eight individual soil types or classifications. The majority of these soils are characterized as sandy-loam, loamy-sand, or silt-loam soils.[22] In addition, many of the soils are classified as hydric or hydric-tidal, which are defined as soils formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil strata. The combination of sandy, loamy, and silty soils combined with large areas of hydric soils indicates a general absence of high clay-content soils that are typically associated with high shrink-swell potential.

[20] Forrest County Soil Survey: https://www.mdeq.ms.gov/wp-content/uploads/2012/02/SITE-INSP.-REPORT-1993G.PDF
[21] MARIS
[22] Jackson County Soil Survey: https://geology.deq.ms.gov/Publications/County_Soil_Surveys/1927Jackson.pdf

6.3.2 USM's Vulnerability to Expansive Soils

Hattiesburg Campus

As previously indicated, the majority of the University campus is underlain by the Falkner-Susquehanna Urban Land Soil Complex with linear extensibility, plasticity index, and liquid limit characterizations associated with a tendency of the soil to expand under certain conditions. The fact that such soils exist beneath the majority of campus represents a vulnerability to the University. However, knowledge of soil conditions combined with appropriate structural engineering practices associated with building design and construction should mitigate issues associated with the presence of expansive soils on the USM campus.

Gulf Park Campus

Based on conditions within the City of Long Beach as described above, it is determined that expansive soils pose no threat to the campus and merit no further consideration.

Gulf Coast Research Lab

Based on conditions within the City of Ocean Springs as described above, it is determined that expansive soils pose no threat to the campus and merit no further consideration.

6.3.3 Potential Impacts of Expansive Soils on the University

Concerns associated with this type of soil are related to potential impacts on buildings and infrastructure on campus as shrinking and swelling soils can impact the integrity of building foundations and result in impacts on the structural and functional capabilities of buildings.

Hattiesburg Campus

Due to the predominance of expansive soils beneath the campus, the potential impact on older buildings potentially constructed without consideration of soil conditions is a cause for concern. While this is a concern for the University campus, the University presented no documented evidence to date that this hazard of concern has adversely impacted the University, or buildings and infrastructure located on campus. Opportunities for mitigation associated with potential impacts from expansive soils will need to be associated with construction practices, design standards, and foundation designs for buildings to be constructed on campus. Within the context of other hazard types with a potential to impact the University, mitigation for expansive soils is considered to be a low priority.

Gulf Park Campus

Based on conditions within the City of Long Beach as described above, it is determined that expansive soils pose no threat to the campus and merit no further consideration.

Gulf Coast Research Lab

Based on conditions within the City of Ocean Springs as described above, it is determined that expansive soils pose no threat to the campus and merit no further consideration.

6.4 *FLOODING OR FLASH FLOODING – GENERAL INFORMATION*

Floods are one of the most common types of hazards experienced in the United States and can affect almost any property except for those situated at the highest elevations. However, not all floods are alike. Some may generate and build up over days while others may occur quickly and without advance notice. The rapid onset of flooding is typically referred to as flash flooding.

6.4.1 Flooding or Flash Flooding - Historic Occurrence

Hattiesburg Campus

The campus of USM is located outside the 100-year floodplain according to the most recent version of the Flood Insurance Rate Map (FIRM) for the City of Hattiesburg and Forrest County, Mississippi. Additionally, there are no natural streams, creeks, or rivers that transect or border the campus of USM. Therefore it is not anticipated that the USM campus would be affected by flooding from the overtopping of natural, improved, or manmade surface water drainage channels. However, localized rainstorms that have intensities greater than the 25-year, 24-hour storm may cause flash flooding concerns for certain areas of the campus, particularly if the area stormwater systems are blocked or in need of repair. Flood- producing storms may occur any month of the year but are more prevalent during the winter and spring months. Records indicate that floods and flash floods have occurred in Forrest County during December, January, February, March, April, and May.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	57°	62°	70°	78°	84°	90°	91°	91°	87°	78°	68°	61°
Avg. Low	34°	37°	45°	54°	60°	67°	70°	70°	65°	52°	44°	37°
Mean	46°	50°	58°	66°	74°	78°	81°	81°	76°	66°	57°	50°
Avg. Precipitation (inches)	5.8	5.7	6.3	4.8	5.3	4.3	5.5	5.3	3.6	3.3	4.8	6.3

Historically, incidents of flash flooding on campus have been directly related to improperly functioning drainage infrastructure and drainage infrastructure with reduced capacities due to congestion from leaves, limbs, and other natural debris. Periodic maintenance and preventive maintenance can go a long way towards mitigating potential adverse impacts from flash flooding. In addition, one area of concern located near and along the drainage system found between the Payne Center and the Polymer Science building has been previously mitigated through stabilization and channelization designed to improve flows and reduce incidents of flash flooding. **Appendix B, Figure 6.5** depicts areas of campus that have a potential for flash flooding concerns.

TABLE 6.1 – FORREST COUNTY FLOODS AND FLASH FLOODS[39]

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
HATTIESBURG	12/14/2022	Flash Flood	0	0	$300,000	$0
HATTIESBURG	8/24/2022	Flash Flood	0	0	$30,000	$0
HATTIESBURG	8/24/2022	Flash Flood	0	0	$100,000	$0
HATTIESBURG	8/24/2022	Flash Flood	0	0	$90,000	$0
HATTIESBURG	6/10/2022	Flash Flood	0	0	$0	$0
HATTIESBURG	6/10/2022	Flash Flood	0	0	$10,000	$0
HATTIESBURG	8/30/2021	Flash Flood	0	0	$5,000	$0
HATTIESBURG	6/24/2021	Flash Flood	0	0	$35,000	$0
HATTIESBURG	5/27/2020	Flash Flood	0	0	$2,000	$0
HATTIESBURG	2/10/2020	Flash Flood	0	0	$2,000	$0
HATTIESBURG	5/9/2019	Flash Flood	0	0	$3,000	$0
HATTIESBURG	1/23/2019	Flash Flood	0	0	$1,000	$0
HATTIESBURG	1/23/2019	Flash Flood	0	0	$5,000	$0
HATTIESBURG	12/27/2018	Flash Flood	0	0	$100,000	$0
HATTIESBURG	11/1/2018	Flash Flood	0	0	$5,000	$0
HATTIESBURG	8/18/2018	Flash Flood	0	0	$5,000	$0
HATTIESBURG	8/9/2017	Flash Flood	0	0	$3,000	$0
HATTIESBURG	8/9/2017	Flash Flood	0	0	$300,000	$0
HATTIESBURG	6/22/2017	Flood	0	0	$20,000	$0
HATTIESBURG	1/21/2017	Flash Flood	0	0	$15,000	$0
HATTIESBURG	3/31/2016	Flash Flood	0	0	$3,000	$0
HATTIESBURG	3/31/2016	Flash Flood	0	0	$10,000	$0
HATTIESBURG	3/31/2016	Flash Flood	0	0	$2,000	$0
HATTIESBURG	3/10/2016	Flash Flood	0	0	$5,000	$0
HATTIESBURG	12/24/2015	Flash Flood	0	0	$5,000	$0
HATTIESBURG	2/20/2014	Flash Flood	0	0	$10,000	$0
HATTIESBURG	2/4/2014	Flash Flood	0	0	$20,000	$0
HATTIESBURG	8/13/2013	Flash Flood	0	0	$0	$0
HATTIESBURG	6/6/2013	Flash Flood	0	0	$0	$0
HATTIESBURG	8/29/2012	Flash Flood	0	0	$20,000	$0
HATTIESBURG	7/18/2012	Flash Flood	0	0	$6,000	$0
HATTIESBURG	3/21/2012	Flash Flood	0	0	$50,000	$0
HATTIESBURG	2/18/2012	Flash Flood	0	0	$0	$0
HATTIESBURG	7/24/2011	Flash Flood	0	0	$10,000	$0
HATTIESBURG	3/5/2011	Flash Flood	0	0	$1,000	$0
HATTIESBURG	1/24/2010	Flash Flood	0	0	$5,000	$0
HATTIESBURG	5/16/2009	Flash Flood	0	0	$2,000	$0
HATTIESBURG	7/29/2008	Flash Flood	0	0	$600,000	$0
HATTIESBURG	4/14/2007	Flash Flood	0	0	$400,000	$0
COUNTYWIDE	8/29/2005	Flash Flood	0	0	$300,000	$0
COUNTYWIDE	3/31/2005	Flash Flood	0	0	$40,000	$0

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
HATTIESBURG	7/6/2004	Flash Flood	0	0	$0	$0
HATTIESBURG	6/1/2004	Flash Flood	0	0	$300,000	$0
HATTIESBURG	6/1/2004	Flash Flood	0	0	$2,000	$0
HATTIESBURG	2/23/2004	Flash Flood	0	0	$45,000	$0
HATTIESBURG	8/20/2003	Flash Flood	0	0	$20,000	$0
COUNTYWIDE	8/16/2003	Flash Flood	0	0	$10,000	$0
HATTIESBURG	6/30/2003	Flash Flood	0	0	$10,000	$0
HATTIESBURG	6/27/2003	Flash Flood	0	0	$1,000	$0
HATTIESBURG	6/21/2003	Flash Flood	0	0	$30,000	$0
HATTIESBURG	12/13/2001	Flash Flood	0	0	$0	$0
COUNTYWIDE	10/13/2001	Flash Flood	0	0	$0	$0
HATTIESBURG	9/4/2001	Flash Flood	0	0	$100,000	$0
COUNTYWIDE	6/11/2001	Flash Flood	0	0	$1,000	$0
COUNTYWIDE	6/11/2001	Flash Flood	0	0	$6,000	$0
COUNTYWIDE	3/3/2001	Flash Flood	0	0	$0	$0
HATTIESBURG	3/3/2001	Flash Flood	0	0	$0	$0
HATTIESBURG	3/2/2001	Flash Flood	0	0	$0	$0
COUNTYWIDE	3/13/1999	Flash Flood	0	0	$0	$0
COUNTYWIDE	1/29/1999	Flash Flood	1	0	$500,000	$0
HATTIESBURG	3/7/1998	Flash Flood	0	0	$50,000	$0
HATTIESBURG	1/7/1998	Flash Flood	0	0	$500,000	$0
Totals			**1**	**0**	**$4,095,000**	**$0**

Gulf Park Campus

The majority of the Gulf Park Campus is located in the 100-year floodplain, according to the most recent version of the Flood Insurance Rate Maps (FIRM) for the City of Long Beach and Harrison County. The remaining area is located in the 500-year floodplain, with 0.2% of flooding annually. The campus is located south of the railroad tracks, which, in the case of storm surge acts as a de facto levee for properties to the north. Bear Creek and Bear Point Bayou transect the Gulf Park Campus, navigating a narrow passage between the Fleming Education Center and Auditorium and the Gulf Coast Library. The majority of the campus buildings are located in the floodplain. The property and its structures are particularly vulnerable to storm surges associated with hurricanes.

Harrison County is highly susceptible to floods and flash flooding due to the location of multiple bayous, rivers within its boundaries, as well as its miles of coastline. Since 1996, Harrison County has recorded 45 total incidences of flooding and flash flooding, or approximately 1.73 per year resulting in approximately $2.278 million in property damages. Seven of these events were localized to Long Beach, with the most destructive flooding resulting in $750,000 in damages on March 28, 2009. **Appendix B, Figure 6.6** depicts areas of campus that have a history of flash flooding concerns.

TABLE 6.2 – HARRISON COUNTY FLOODS AND FLASH FLOODS[23]

Location	Date	Type	Deaths	Injuries	Property Damage
Beauvoir	8/25/2022	Flash Flood	0	0	$0
Wortham	6/30/2022	Flash Flood	0	0	$0
Lyman	6/30/2022	Flash Flood	0	0	$0
Biloxi	10/4/2021	Flash Flood	0	0	$25,000
Keesler AFB	9/17/2021	Flash Flood	0	0	$0
D'Iberville	9/17/2021	Flash Flood	0	0	$20,000
Handsboro	9/15/2021	Flash Flood	0	0	$0
Orange Grove	7/6/2021	Flash Flood	0	0	$33,000
Nugent	7/6/2021	Flash Flood	0	0	$30,000
North Gulfport	7/6/2021	Flash Flood	0	0	$0
Beauvoir	7/6/2021	Flood	0	0	$45,000
Mississippi City	6/21/2021	Flash Flood	0	0	$5,000
Biloxi	6/21/2021	Flash Flood	0	0	$0
D'Iberville	6/21/2021	Flash Flood	0	0	$0
Lyman	4/15/2021	Flash Flood	0	0	$0
Ricevill	5/12/2019	Flood	0	0	$0
Orange Grove	7/16/2018	Flash Flood	0	0	$0
Howison	4/14/2018	Flash Flood	0	0	$0
Lyman	4/14/2018	Flash Flood	0	0	$0
Henderson Pt.	4/14/2018	Flash Flood	0	0	$0
Long Beach	4/14/2018	Flash Flood	0	0	$0
Orange Grove	4/14/2018	Flood	0	0	$0
Long Beach	10/22/2017	Flash Flood	0	0	$0
Howison	8/6/2017	Flash Flood	0	0	$0
Long Beach	6/29/2017	Flash Flood	0	0	$0
Landon	6/28/2017	Flash Flood	0	0	$0
D'Iberville	6/22/2017	Flood	0	0	$0
Lorraine	6/21/2017	Flood	0	0	$0
Woolmarket	8/11/2016	Flash Flood	0	0	$270,000
Lyman	5/17/2016	Flash Flood	0	0	$0
Biloxi	4/28/2016	Flash Flood	0	0	$0
Wortham	5/16/2015	Flash Flood	0	0	$ -
Long Beach	4/29/2014	Flash Flood	0	0	$ -
Biloxi	8/18/2013	Flash Flood	0	0	$100,000
Woolmarket	5/1/2013	Flash Flood	0	0	$100,000
Long Beach	8/29/2012	Flash Flood	0	0	$500,000

23 NOAA Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

Location	Date	Type	Deaths	Injuries	Property Damage
Long Beach	7/18/2011	Flash Flood	0	0	$ -
Long Beach	3/28/2009	Flash Flood	1	0	$750,000
Harrison (Zone)	4/1/2005	Flood	0	0	$100,000
Countywide	4/1/2005	Flash Flood	0	0	$50,000
Harrison (Zone)	7/1/2003	Flood	0	0	$150,000
Countywide	9/26/2002	Flash Flood	0	0	$ -
Countywide	3/7/1998	Flash Flood	0	0	$ -
Pass Christian	5/19/1997	Flood	0	0	$ -
South Portion	7/8/1996	Flood	0	0	$100,000
Total:					**$2,278,000**

Gulf Coast Research Lab

The outer perimeter of the Gulf Coast Research Lab is in the 100-year flood plain, classified as the AE Flood Zone. However, according to the most recent version of the Flood Insurance Rate Map (FIRM) for the City of Ocean Springs, the majority of the buildings on campus are located 18' above sea level, in an area with only a 0.2 % annual chance of flooding.[24] The building locations mitigate the hazard posed to the campus, but as the site is bordered by water to the north and south, heavy rainfall and storm surge pose a heightened risk of flooding.

Jackson County as a whole is highly susceptible to floods and flash flooding due to the location of multiple bayous, rivers within its boundaries, as well as its miles of coastline. Since 1996, NCEI documented 28 floods and flash floods at a rate of 1.07 per year resulting in approximately $3.595 million in property damage. **Appendix B, Figures 6.7 and 6.8** depict areas of the two campus locations that have a history of flash flooding concerns.

TABLE 6.3– JACKSON COUNTY FLOODS AND FLASH FLOODS

Location	Date	Type	Deaths	Injuries	Property Damage
Fontainebleau	8/25/2022	Flash Flood	0	0	$0
Hilda	8/25/2022	Flash Flood	0	0	$0
Eastside	8/10/2022	Flash Flood	0	0	$0
Orange Grove	8/30/2021	Flash Flood	0	0	$0
Gautier	4/15/2021	Flash Flood	0	0	$0
Pascagoula	7/23/2021	Flash Flood	0	0	$0
Pascagoula	8/30/2017	Flash Flood	0	0	$0
Wade	6/29/2017	Flash Flood	0	0	$0

[24] Jackson County, MS: https://webmap.co.jackson.ms.us/

Location	Date	Type	Deaths	Injuries	Property Damage
Ocean Spgs APT	6/22/2017	Flash Flood	0	0	$0
Pascagoula	9/27/2015	Flash Flood	0	0	$100,000
Ocean Springs	4/29/2014	Flash Flood	0	0	$0
Vancleave	5/1/2013	Flash Flood	0	0	$1,500,000
Arena	2/25/2013	Flash Flood	0	0	$0
OS Airport	9/5/2012	Flash Flood	0	0	$10,000
Jackson Co APT	8/30/2012	Flash Flood	0	0	$1,200,000
Pascagoula	9/3/2011	Flash Flood	0	0	$25,000
Orange Grove	3/28/2009	Flash Flood	0	0	$0
Ocean Springs	4/6/2005	Flash Flood	0	0	$0
Jackson (Zone)	4/1/2005	Flood	0	0	$200,000
Countywide	4/1/2005	Flash Flood	0	0	$200,000
Jackson (Zone)	7/1/2003	Flood	0	0	$100,000
Moss Point	8/5//2002	Flash Flood	0	0	$50,000
Pascagoula	6/20/2002	Flood	0	0	$0
Countywide	6/11/2001	Flood	0	0	$150,000
Jackson (Zone)	3/8/1998	Flood	0	0	$0
Countywide	3/7/1998	Flash Flood	0	0	$0
Countywide	1/7/1998	Flash Flood	0	0	$50,000
South Portion	7/8/1996	Flash Flood	0	0	$10,000
Total:					**$3,595,000**

6.4.2 USM's Vulnerability to Flooding and Flash Flooding

Hattiesburg Campus

As previously mentioned, the USM Campus in Hattiesburg is not included in areas designated by FEMA as Special Flood Hazard Areas. This analysis includes the current Flood Insurance Rate Maps (FIRM) in force since 1990 and the new FIRM maps adopted by the City of Hattiesburg and Forrest County in 2010.[25] In addition, the University does not contain properties covered under the National Flood Insurance Program. As a result, the University does not have any repetitive loss properties subject to special consideration for flooding through this mitigation planning process. In general terms, the University is not particularly vulnerable to normal occurrences of flooding. However, history does indicate that there are areas of campus subject to localized flash flooding in recent years. These particular areas of campus remain vulnerable to flash flooding. However, recent drainage improvements to at least one of these areas have served to minimize vulnerability to flash floods.

[25] MDEQ Office of Geology, Geospatial Resources Division, Mississippi Map Modernization Program: https://geology.deq.ms.gov/floodmaps/

Gulf Park Campus

As previously mentioned, a substantial portion of the USM Campus in Long Beach is designated by FEMA as a Special Flood Hazard Area. Also as documented in Section 4.0, Gulf Park Campus received substantial flood damage during Hurricane Katrina in 2005. The campus has made several improvements during the reconstruction process, but periodic flooding during heavy rains and tropical storms is likely to be a continued challenge for the campus.

Gulf Coast Research Lab

As previously mentioned, the outer perimeter of the GCRL campus is in the 100-year floodplain. The majority of the campus structures are located in the 500-year floodplain, with a 0.2 percent annual chance of flooding. As documented in Section 4.0, the Gulf Coast Research Lab received substantial flood damage during Hurricane Katrina in 2005. In addition to the proximity of the Mississippi Sound, two bayous (Davis and Halstead) converge near the site. The campus made several improvements during the reconstruction process, but periodic flooding during heavy rains and tropical storms is likely to be a continued challenge.

6.4.3 Potential Flooding and Flash Flooding Impacts on the University

Hattiesburg Campus

Based on the information presented relative to the absence of FEMA-designated flood zones within the USM campus and measures taken in recent years to mitigate known flash flooding issues, potential impacts to the Hattiesburg Campus from flooding and flash flooding are considered to be minimal with impacts confined to localized areas of campus and potential impacts to no more than one or two buildings in the most extreme of circumstances. An analysis of contour information from the USM campus indicates a topographic differential of approximately 30’ from north to south and east to west across the campus. This same analysis indicates that the known flash flooding areas on campus are the only areas with the potential for flash flooding. Since no lands associated with the University are located within FEMA-designated flood hazard areas, the application of the HAZUS-MH model to predict potential impacts from flooding is not warranted. It is anticipated outputs from the HAZUS-MH model would yield nil results for the Hattiesburg campus of USM.

Gulf Park Campus

Based on the history of flooding and flash flooding in Harrison County, as well as the location of the Southern Miss campus in a SFHA, it is anticipated that this hazard could have substantial impacts on the campus in the future. The southern exposure of the campus to the Mississippi Sound and the presence of Bear Creek through the campus pose both storm surge and flooding hazards. This hazard is considered to be a high priority for mitigation actions.

Gulf Coast Research Lab

Based on the history of flooding and flash flooding in Jackson County, as well as the presence of an SFHA on the outer perimeter of the Southern Miss campus, the impacts of this hazard on the campus could have substantial impacts on the campus in the future. Although the majority of the campus structures are located at approximately 18-20 feet above sea level in the 500-year flood plain, the outer perimeter, including parking, circulation, and storage areas are in the SFHA. Given the southern and eastern exposure to the Mississippi Sound and the location of Davis and Halstead Bayous, this hazard is considered to be a high priority for mitigation actions.

6.5 HAILSTORMS – GENERAL INFORMATION

Hail, a form of precipitation, usually develops in severe thunderstorms and could be characterized as spheroids of ice. The spheres typically range in size from 1/4 inch in diameter to 4 ½ inches in diameter. The National Severe Storms Laboratory (NSSL) compiles data on severe storms and has developed the maps included below (**Appendix B, Figures 6.9 – 6.12**) based on that data.[26] USM is located very close to the border of the area that receives between 2 and 3 hail days per year; therefore hailstorms are retained for mitigation consideration. Because data on hailstorms are not collected at the campus level, all data reflects the occurrence of hailstorms at a County or City level.

6.5.1 Historic Occurrence Data – Hailstorms

Hattiesburg Campus

NOAA has recorded 175 reports of hail in Forrest County between 1965 and 2023. This represents an average of approximately 3 reported hail events in Forrest County each year. However, the data suggests that hail events or the number of reported events may have increased over the past 2 decades. For instance, the year 2000 saw a reported 17 incidents of hail in Forrest County while there were no reported hail events for the years 1950-1965, 1966-1970, and 1972-1974. The largest hailstone on record in Forrest County fell on April 17, 1998, in Carnes and measured 4 ½ inches in diameter. The storm that produced the large hailstone caused $50,000 in damage to area rooftops and vehicles. Table 6.4 provides historical data on hailstorms occurring in the City of Hattiesburg from 1994 – 2023.[27]

TABLE 6.4 – HISTORIC HAILSTORM DATA: HATTIESBURG CAMPUS

Location	Date	Size (Inches)	Property Damage
Hattiesburg	5/24/2020	1	$0
Hattiesburg	1/27/1994	0.75	$0
Hattiesburg	6/9/1994	1.75	$0
Hattiesburg	7/26/1995	0.75	$0
Hattiesburg	1/26/1996	2.75	$250,000
Hattiesburg	3/18/1996	1.75	$2,000,000

[26] NOAA National Severe Storms Laboratory: Severe Weather 101 – Hail: https://www.nssl.noaa.gov/education/svrwx101/hail/
[27] NOAA Storm Events Database

Location	Date	Size (Inches)	Property Damage
Hattiesburg	3/18/1996	2.75	$2,000,000
Hattiesburg	3/18/1996	0.75	$0
Hattiesburg	8/19/1996	0.75	$0
Hattiesburg	11/30/1996	1	$0
Hattiesburg	3/29/1997	0.75	$0
Hattiesburg	4/22/1997	1	$0
Hattiesburg	5/28/1997	0.88	$0
Hattiesburg	5/28/1997	1.75	$100,000
Hattiesburg	12/23/1997	1.75	$0
Hattiesburg	1/22/1998	1.75	$100,000
Hattiesburg	2/26/1998	0.88	$0
Hattiesburg	3/7/1998	1	$0
Hattiesburg	4/17/1998	0.75	$0
Hattiesburg	4/17/1998	1.75	$0
Hattiesburg	4/17/1998	1.75	$0
Hattiesburg	4/17/1998	1	$0
Hattiesburg	4/17/1998	0.88	$0
Hattiesburg	1/29/1999	0.75	$0
Hattiesburg	4/14/1999	1.75	$35,000
Hattiesburg	5/23/1999	0.88	$0
Hattiesburg	4/23/2000	1	$0
Hattiesburg	7/22/2000	1	$3,000
Hattiesburg	8/25/2000	0.75	$0
Hattiesburg	8/30/2000	0.75	$0
Hattiesburg	8/31/2000	0.75	$0
Hattiesburg	8/31/2000	0.75	$0
Hattiesburg	8/31/2000	1.75	$15,000
Hattiesburg	9/5/2000	0.75	$0
Hattiesburg	5/2/2001	1.75	$8,000
Hattiesburg	5/2/2001	0.75	$0
Hattiesburg	3/12/2002	0.88	$0
Hattiesburg	12/24/2002	0.75	$0
Hattiesburg	3/6/2003	0.88	$1,000
Hattiesburg	3/6/2003	1	$5,000
Hattiesburg	4/25/2003	1	$1,000
Hattiesburg	4/25/2003	2.5	$300,000
Hattiesburg	4/25/2003	0.75	$1,000
Hattiesburg	4/25/2003	0.75	$1,000
Hattiesburg	8/20/2003	0.88	$1,000
Hattiesburg	5/11/2004	1	$0
Hattiesburg	3/22/2005	0.88	$0
Hattiesburg	4/1/2005	0.75	$0
Hattiesburg	4/6/2005	0.88	$0

Location	Date	Size (Inches)	Property Damage
Hattiesburg	4/11/2005	0.88	$0
Hattiesburg	4/22/2005	1.75	$80,000
Hattiesburg	4/30/2005	0.75	$0
Hattiesburg	5/29/2005	1.75	$100,000
Hattiesburg	5/24/2006	0.88	$0
Hattiesburg	7/19/2006	0.75	$0
Hattiesburg	3/1/2007	0.75	$0
Hattiesburg	3/1/2010	0.88	$0
Hattiesburg	7/4/2011	1.25	$0
Hattiesburg	3/18/2013	1	$0
Hattiesburg	4/30/2017	1.75	$20,000
Hattiesburg	4/19/2020	1	$0
Hattiesburg	6/18/2022	0.88	$0
Hattiesburg	4/25/2003	1.75	$10,000
		Totals	**$5,031,000**

Gulf Park Campus

NOAA has recorded 85 reports of hail in Harrison County between 1969 and 2016. This represents approximately 1.5 reported hail events in Harrison County each year. However, the data suggests that either hail events or the number of reported incidents have increased over the past 2 decades. The severity of those events appears to have increased as well, with a greater incidence of reporting hail of 1" in diameter. For instance, the year 1996 saw a reported 5 incidents of hail in Harrison County while there were no reported hail events for the years 1970-1974, 1976-1979, and 1982. **Table 6.5** and **Appendix B, Figure 6.10** provide historical data on hailstorms occurring in the City of Long Beach and the surrounding communities of Gulfport and Pass Christian from 1994 – 2023.[28]

TABLE 6.5 – HISTORIC HAILSTORM DATA, HARRISON COUNTY

Location	Date	Size (Inches	Damages
Long Beach	4/10/2021	1	$0
Gulfport	2/23/2016	1	$0
Pass Christian	2/23/2016	1	$0
Gulfport	4/2/2009	0.88	$0
Gulfport	4/2/2009	0.75	$0
Gulfport	5/11/2007	1.75	$0
Gulfport	2/13/2007	1	$0
Pass Christian	8/4/2006	0.88	$0
Gulfport	5/31/2004	0.75	$0
Gulfport	7/17/2003	0.75	$0
Gulfport	3/13/2003	0.88	$0

[28] NOAA Storm Events Database

Location	Date	Size (Inches	Damages
Long Beach	4/13/2000	1.75	$0
Long Beach	3/7/1998	1.75	$0
Pass Christian	3/7/1998	1.75	$0
Gulfport	1/24/1997	1.75	$0
Gulfport	6/3/1996	0.88	$0
Pass Christian	3/30/1996	1.75	$0
Gulfport	2/19/1996	0.75	$0
Long Beach	2/19/1996	0.75	$0
Gulfport	9/9/1994	0.75	$0
Gulfport	3/1/1994	1.75	$0

Gulf Coast Research Laboratory

NOAA has recorded 75 reports of hail in Jackson County between 1965 and 2016. This represents an average of approximately 1.4 reported hail events in Jackson County each year. However, the data suggests that either hail events or the number of reported incidents has increased over the past 2 decades, with a greater likelihood of 2 or more reported events occurring in a single year. Hail diameter reported ranges from 0.75" to 1.75". There have been no reported damages, injuries, or deaths from hail in Jackson County. Table 6.6 and Appendix B, 6.11 provide historical data on hailstorms occurring in the City of Ocean Springs and the surrounding communities from 1994 – 2023.[29]

TABLE 6.6 – HISTORIC HAILSTORM DATA, JACKSON COUNTY[30]

Location	Date	Size (Inches)	Damages
Ocean Springs	6/18/2022	1.75	$0
Ocean Springs	6/18/2022	1	$0
Pascagoula	4/9/2021	1.75	$0
Gautier	1/21/2017	0.88	$0
Ocean Springs	4/28/2016	1	$0
Gautier	4/25/2015	1	$0
Pascagoula	4/25/2015	1.75	$0
Gautier	5/1/2013	1	$0
Ocean Springs	7/13/2007	1	$0
Ocean Springs	6/23/2006	1	$0
Pascagoula	6/23/2006	0.88	$0
Ocean Springs	5/29/2005	1.25	$0
Pascagoula	7/25/2004	0.88	$0
Ocean Springs	4/29/2004	0.88	$0
Moss Point	7/17/2003	0.88	$0

29 NOAA Storm Events Database

Location	Date	Size (Inches)	Damages
Ocean Springs	3/11/2001	1.75	$0
Ocean Springs	5/28/1999	0.88	$0
Gautier	4/29/1999	1	$0
Gautier	4/29/1999	1.75	$200
Moss Point	4/29/1999	1.75	$0
Pascagoula	4/29/1999	0.75	$0
Pascagoula	5/6/1998	0.75	$0
Ocean Springs	1/8/1997	0.75	$0
Ocean Springs	4/14/1996	1.75	$0
Moss Point	6/2/1995	0.75	$0
Pascagoula	5/3/1994	0.88	$0
		Totals	**$200**

6.5.2 USM's Vulnerability to Hailstorms (All campuses)

Based on historic events, the average hailstone size experienced in Hattiesburg storms from 1994 – 2023 was approximately 1.14" in diameter or slightly smaller than a ping pong ball. Also based on historical data, Hattiesburg has experienced four hailstorms per year on average from 1994 – 2023.[31]

Hailstorms in the coastal regions are less frequent, with Harrison and Jackson County only experiencing one to two hailstorms per year. The average hailstone size in Harrison and Jackson County storms from 1994 to 2015 is approximately 1.14" and 1.15" in diameter.[32] Due to the high likelihood of USM experiencing a hailstorm each year and the potential for hailstorms to cause damage to buildings, structures, infrastructure, and transportation, it is considered a priority hazard and is included in discussions related to mitigation strategies. However, due to the limited nature of injury and property damage documented due to hailstorms, it is anticipated that the cost/benefit ratio for mitigation strategies related to hailstorm events will place mitigation for hailstorms as a medium to low priority, particularly for the two Gulf Coast campuses.

6.5.3 Potential Hailstorm Impacts on the University

The National Severe Storms Laboratory indicates that hailstones of ¾" or greater have the capability of causing severe damage including property damage. Larger hailstones also have the potential to cause injury to people caught in the open during a severe hailstorm. Common property damage to property from severe hailstorms includes broken windows in buildings and vehicles and roof damage. The probability of significant structural damage from a hailstorm event is greatest in Hattiesburg at the USM main campus, where they occur approximately 4x annually. An occurrence of approximately 1x annually in the Long Beach and Ocean Springs areas indicates that these campuses are of lesser concern. Since most hailstorms are associated with severe thunderstorms, the potential for roof damage combined with large volumes of rain is the most likely source of significant structural and content damage to university buildings.

[31] NOAA National Weather Service Data Download in GIS Format: https://www.weather.gov/gis/NWS_Shapefile
[32] NOAA Storm Events Database

6.6 HURRICANES AND TROPICAL STORMS/STORM SURGE – GENERAL INFORMATION

Atlantic hurricanes are tropical cyclones that form over the warm waters of the Atlantic Ocean, the Caribbean Sea, or the Gulf of Mexico from mid-summer to late fall. Some hurricanes can produce Category 1 wind speeds (74 miles per hour) over one hundred miles from the eye of the hurricane. Consequently, these storms can cause widespread damage long before the center of the storm moves over land; after which the storms begin to rapidly lose strength.[33] The three USM campuses covered by this DRU are well within the destructive reach of a major hurricane. The Hattiesburg campus is located approximately 60 miles from the Gulf of Mexico coastline, the Gulf Park Campus is across State Highway 90 from the Gulf of Mexico, and the Gulf Coast Research Lab borders directly on the Gulf of Mexico. In addition to exposure to the damaging winds of hurricanes, the two Gulf Coast campuses are at high risk of storm surge, which is produced by water being pushed toward the shore by the force of the winds moving cyclonically around the storm or hurricane. This risk will be discussed in greater detail in the sections about Gulf Park and the Gulf Coast Research Lab.

Therefore hurricanes and coastal storms are considered potential hazards to all of the university's facilities. Hurricane severity is rated by the Saffir-Simpson Scale which established severity or intensity by a rating of Category 1 through Category 5. Hurricane categories are based on both maximum sustained winds and minimum central barometric pressure. **Table 6.7** provides an overview of the Saffir-Simpson Scale with wind categories and potential damages associated with each category.[34]

TABLE 6.7 – SAFFIR-SIMPSON HURRICANE SCALE

Saffir-Simpson Category	Maximum Sustained Wind Speeds		Minimum Central Pressure	Storm Surge	Typical Damages
	MPH	Knots	Mb	ft	
1	74-95	64-82	>980	3-5	Damage to vegetation and tree foliage; no real structural damage; low-lying areas potentially inundated.
2	96-110	83-95	979-965	6-8	Considerable damage to vegetation and tree foliage; some trees blown down; major damage to exposed mobile homes; some damage to building roofs; no major structural damage; low-lying areas inundated; considerable damage to piers.
3	111-130	96-113	964-945	9-12	Large trees blown down; damage to roofing, doors, and windows; some structural damage to small buildings; serious flooding in coastal zones; flat terrain 5' or less above sea level potentially flooded 8 miles or more inland.
4	131-155	114-135	944-920	13-18	Trees blown down; signs destroyed; extensive damage to roofs, windows, and doors; complete failure of roofs on many small buildings; major

[33] FEMA: https://community.fema.gov/ProtectiveActions/s/article/Hurricane
[34] NOAA National Hurricane Center: https://www.nhc.noaa.gov/aboutsshws.php

Saffir-Simpson Category	Maximum Sustained Wind Speeds		Minimum Central Pressure	Storm Surge	Typical Damages
	MPH	Knots	Mb	ft	
					damage to lower floors of structures near shore; major erosion of beaches; flat terrain 10' or less above sea level potentially flooded 10 miles or more inland.
5	156+	136+	<920	19+	Trees blown down; considerable damage to roofs of all buildings; severe and extensive damage to windows and doors; complete failure of roofs on many residences and industrial buildings; some complete building failure; small buildings overturned or blown away.

6.6.1 Hurricanes - Historic Occurrence

Hattiesburg Campus

The destructive capability of hurricanes was demonstrated on August 29, 2005, when Hurricane Katrina made landfall at the mouth of the Pearl River. A total of 1,844 people died as a result of Hurricane Katrina with 238 of those fatalities occurring in Mississippi. According to NOAA, the Hattiesburg area experienced wind speeds of over 100 miles per hour. The City of Hattiesburg and the University are within a 100-110 mile per hour design wind speed zone based on figure 6-1 of ASCE 7-05. This same design wind speed is incorporated into the International Building Codes which serves as the code standard for all new construction on the University campus. The primary concerns associated with high winds related to hurricanes or other severe storms lie with older buildings that may not have been constructed by the same standard and the potential damage to buildings and infrastructure from downed trees. During Hurricane Katrina, the majority of the structural damage to buildings and infrastructure in Forrest County was caused by downed trees. There was widespread damage to the electrical distribution grid resulting in the loss of refrigeration for residential and commercial users and the loss of wastewater collection and drinking water distribution capability. For the historic tracks of Hurricanes passing through Forrest County, see **Appendix B, Figure 6.13.** The loss of basic services can lead to unsanitary conditions, particularly in an urban area, and can result in human health concerns.

TABLE 6.8– HISTORIC TROPICAL/HURRICANE DATA, HATTIESBURG REGION

Name	Date	Type	Property Damage	Crop Damage
Ida	8/29/2021	Tropical Storm	$40,000	$0
Zeta	10/28/2020	Tropical Storm	$150,000	$0
Gordon	9/4/2018	Tropical Storm	$15,000	$0
Isaac	8/29/2012	Tropical Storm	$200,000	$0
Ida	11/10/2009	Tropical Storm	$1,000	$0
Gustav	9/1/2008	Tropical Storm	$100,000	$0
Katrina	8/29/2005	Hurricane	$750,000,000	$90,000,000
Dennis	7/10/2005	Hurricane	$20,000	$150,000
Cindy	7/6/2005	Tropical Storm	$50,000	$0

Name	Date	Type	Property Damage	Crop Damage
Ivan	9/16/2004	Hurricane	$93,750	$31,300
	7/1/2003	Tropical Storm	$0	$0
Bill	6/30/2003	Tropical Storm	$0	$0
Isadore	9/26/2002	Tropical Storm	$0	$0
		Totals	**$750,669,750**	**$90,181,300**

Gulf Park Campus

Hurricane Katrina devastated the Gulf Park campus in Long Beach in 2005. High winds and a storm surge of approximately 30' inundated the City of Long Beach and washed through the structures of the beachfront campus. The Gulf Park Campus engaged in $26 million in campus rebuilding and renovation projects after Hurricane Katrina. Five principal buildings were the primary recipients of this investment. The first buildings to be completed on the Gulf Park campus were the Science and Nursing Buildings, on the northwest corner of campus. The Science Building, a $10 million new construction project, features nine teaching laboratories, research space, 20 faculty, and administrative offices, and an 80-seat instructional classroom. The $1.5 million Nursing Building is a renovation project with two laboratories, faculty offices, and study areas within the 10,000-square-foot facility.

Historic restoration projects for Hardy Hall and Lloyd Hall were completed in the spring of 2013. The $10 million project for Hardy Hall included renovations, new construction for the bookstore, and an adjacent parking lot. The three-story building also houses dining services, the College of Education and Psychology, and administrative offices including Admissions and Student Services. Lloyd Hall is a $2.4 million project that provides ten classrooms for students. Finally, the renovation project for Elizabeth Hall, which cost $1.7 million, is home to the university's Film Program which includes two offices, a film animation studio, two film editing suites, a room for film recording and mixing, an equipment room, two video editing suites, and a studio space.

Gulf Coast Research Lab

During Hurricane Georges in 1996, Jackson County experienced a storm surge of 8 to 11 feet, the county's highest storm surge flooding in nearly 30 years. In the East Beach section of the Bellefontaine area, the surge heavily damaged or destroyed 23 of 27 homes. Many businesses and industries in low-lying coastal areas were also flooded, causing considerable property damage and loss of revenue. During Hurricane Katrina, storm surge was one of the most devastating aspects of the storm. FEMA identified high water marks in Jackson County of 17-21 feet.[35] The Cedar Point Campus of the Gulf Coast Research Laboratory, which is located slightly inland of the Mississippi Sound on Davis Bayou, received relatively minor damages, considering the extent of the storm. About 100 computers and 40 vehicles were lost to Hurricane Katrina. The FEMA estimate of total damages was approximately $18 million. Staff and facility preparedness led to the rescue of several resources, like the library volumes and journals at the Caylor Building near Halstead Bayou.[36]

[35] National Hurricane Center: Hurricanes in History: https://www.nhc.noaa.gov/outreach/history/#katrina
[36] Shaw, Joyce. "History of the Gulf Coast Research Laboratory". Gulf of Mexico Science, 2010(1-2), pp. 109-126.

TABLE 6.9 – HISTORIC TROPICAL/HURRICANE DATA FOR STORMS, GULF COAST REGION[37]

Name	Date	Type	Property Damage
Bertha	8/4/2002	Tropical Storm	$50,000
Hanna	9/14/2002	Tropical Storm	$0
Isadore	9/25/2002	Tropical Storm	$18,750,000
Lili	10/2/2002	Tropical Storm	$5,010,000
Unnamed	6/30/2003	Tropical Storm	$500,000
Ivan	9/15/2004	Hurricane	$7,840,000
Matthew	10/9/2004	Tropical Storm	$20,000
Arlene	6/10/2005	Tropical Storm	$0
Cindy	7/5/2005	Tropical Storm	$8,000,000
Dennis	7/10/2005	Tropical Storm	$0
Katrina	8/28/2005	Hurricane	$5,510,000,000
Fay	8/24/2008	Tropical Depression	$0
Gustav	9/1/2008	Hurricane	$7,500,000
Ike	9/11/2008	Tropical Storm	$0
Ida	11/9/2009	Tropical Storm	$0
Lee	9/2/2011	Tropical Storm	$30,000
Isaac	8/28/2012	Tropical Storm	$800,000
Cindy	6/21/2017	Tropical Storm	$0
Nate	10/7/2017	Hurricane/Tropical Storm	$0
Gordon	9/4/2018	Tropical Storm	$0
Michael	10/8/2018	Tropical Storm	$0
Barry	7/13/2018	Tropical Depression	$0
Sally	9/16/2020	Tropical Storm	$0
Delta	10/9/2020	Tropical Storm	$750,000
Zeta	10/28/2020	Hurricane	$90,000,000
Ida	8/29/2021	Hurricane/Tropical Storm	$5,500,000
		Totals	**$5,654,750,000**

6.6.2 USM's Vulnerability to Hurricanes

Hattiesburg Campus

Since 2002, six named storms have directly impacted Forrest County. Of these storms, three were major hurricanes. Because of the proximity of the Hattiesburg Campus to the coastline of the Gulf of Mexico, hurricanes are considered to be a significant mitigation concern for the University and are established as a high-priority hazard event for mitigation. Since 1855, seventy-five significant tropical events have passed within thirty miles of Forrest County. Of these seventy-five events, nine were hurricanes rated as a Category 1 or larger. Because of the unpredictable nature of hurricanes and the region's history of impacts from both hurricanes and strong tropical storms, the potential impact from a major

[37] NOAA Storm Events Database

storm in any given year is high. While many newer buildings on campus are constructed to a higher standard and designed to withstand hurricane-strength winds, history has shown that the potential for damage to the USM Hattiesburg campus is high.

Gulf Park Campus

Because USM's Gulf Park Campus fronts directly on the Mississippi Sound, hurricanes and named storms are a significantly larger concern for this location than for the main campus. Between 1997 and 2023, a total of 7 hurricanes and 27 named storms made landfall in the Long Beach area. Damages resulting from these storms totaled $3,212 billion, with 97 lives lost in Hurricane Katrina and one death associated with Tropical Storm Isidore in 2002. Because of the unpredictable nature of hurricanes and the region's history of impacts from both hurricanes and strong tropical storms, the potential impact from a major storm in any given year is high. While many newer buildings on campus were reconstructed after Hurricane Katrina to a higher standard designed to withstand hurricane-strength winds, history has shown that the potential for damage to the Gulf Park Campus is high.

Gulf Coast Research Lab

Because USM's Gulf Coast Research Lab fronts directly on the Mississippi Sound, hurricanes and tropical storms are a significantly larger concern for this location. Between 1997 and 2023, a total of 7 hurricanes and 18 tropical storms made landfall in Jackson County. Damages resulting from these storms totaled $1,496 billion, with 13 lives lost in Hurricane Katrina. Because of the unpredictable nature of hurricanes and the region's history of impacts from both hurricanes and strong tropical storms, the potential impact from a major storm in any given year is high. While many newer buildings on campus were reconstructed after Hurricane Katrina to a higher standard designed to withstand hurricane-strength winds, history has shown that the potential for damage to the Gulf Coast Research Lab campus is high.

6.6.3 Potential Hurricane Impacts on the University

To better quantify the University's vulnerability to hurricanes, FEMA's HAZUS-MH model was used to assess vulnerability to hurricanes and tropical activity. The primary output from the HAZUS-MH model was a probability scale indicating the probability of slight, moderate, or severe damage to critical facilities on the main Hattiesburg campus from the impacts of a Category 2 hurricane with maximum sustained winds ranging from 96-110 miles per hour. These probabilities were then associated with predicted ranges of potential damages to buildings and contents categorized as critical, high priority, or medium priority for mitigation planning purposes. **Table 6.10** provides a summary of estimated wind losses by structure class and reveals areas of particular vulnerability concerning impacts from hurricanes. Given the potential for substantial damage to buildings and contents combined with the probability of occurrence of hurricanes, this hazard type is considered a high-priority hazard for mitigation actions that would be related to both policy and structural mitigation strategies.

TABLE 6.10 – SUMMARY OF ESTIMATED WIND LOSSES BY STRUCTURE CLASS (CATEGORY 3 HURRICANE)

Structural Damage						
Structure Class	**Minor**		**Moderate**		**Severe**	
	2%	**14%**	**15%**	**49%**	**50%**	**75%**
Critical	$687,036	$4,809,250	$5,152,768	$16,832,374	$17,519,410	$25,763,838
High Priority	$5,151,864	$36,133,051	$38,713,983	$126,465,677	$131,627,541	$193,569,914
Medium Priority	$77,681	$543,765	$582,606	$1,903,178	$1,980,859	$2,913,028
Contents Loss						
	Minor		**Moderate**		**Severe**	
	2%	**14%**	**15%**	**49%**	**50%**	**75%**
Critical	$515,277	$3,606,937	$3,864,576	$12,624,281	$12,881,919	$19,322,879
High Priority	$3,871,398	$27,099,788	$29,035,487	$94,849,258	$96,784,957	$145,177,435
Medium Priority	$58,261	$407,824	$436,954	$1,427,384	$1,456,514	$2,184,771
Total Losses						
	Minor		**Moderate**		**Severe**	
	2%	**14%**	**15%**	**49%**	**50%**	**75%**
Critical	$1,202,312	$8,416,187	$9,017,343	$29,456,655	$30,401,329	$45,086,717
High Priority	$9,033,263	$63,232,838	$67,749,470	$221,314,934	$228,412,498	$338,747,349
Medium Priority	$135,941	$951,589	$1,019,560	$3,330,562	$3,437,373	$5,097,799

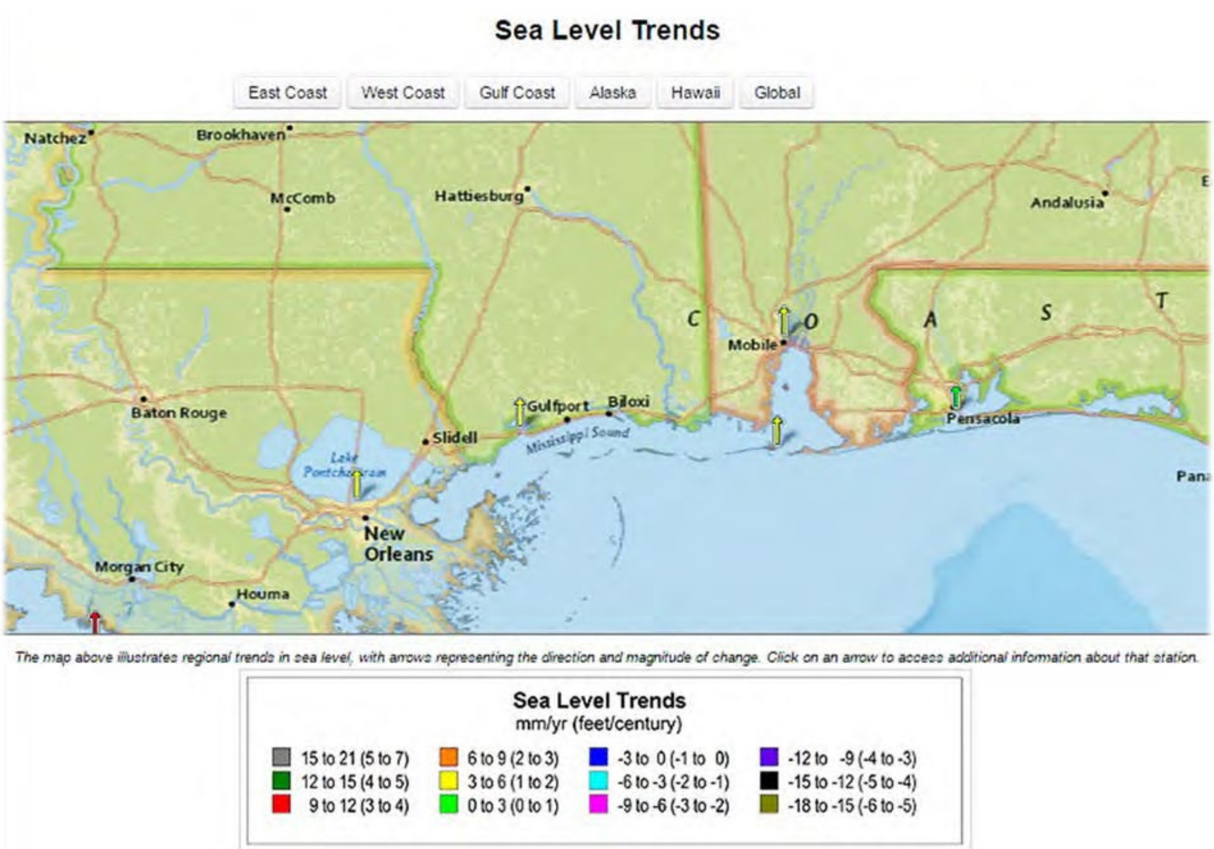
Because of the compact nature of the Gulf Park and GCRL, the HAZ-US model was a less effective tool for the assessment of these facilities. Both campuses have a high known risk for hurricane damage, and the historic damage records provide a good predictor of future potential damage.

6.7 SEA LEVEL RISE – GENERAL INFORMATION

On the Mississippi Gulf Coast, NOAA mean sea level (MSL) records indicate that the water is slowly rising, The projected sea level rise trend for Mississippi's Gulf Coast is, on average, 14-18 inches over the next three decades.[38] Rising sea levels will equate to more frequent high tide flooding in coastal communities and increased damages from above-normal storm surge levels. Communities along the Coast are implementing strategies to deal with this challenge, including hardening their shorelines, adapting development patterns and infrastructure, and in rare cases, even retreating from the Coastline. Although Sea Level Rise is not a concern for the main campus of USM in Hattiesburg, both Long Beach and Ocean Springs anticipate substantial impacts from this hazard and will be looking to follow adaptive strategies that better prepare them for future conditions.

[38] Mississippi Department of Marine Resources (MDMR), Eco-Systems, Inc., Assessment of Sea Level Rise in Coastal Mississippi. 2011.

Local sea level is determined by measuring the height of the water along the coast relative to a specific point on land. Several factors contribute to long and short-term variations in sea level, including waves, tides, or flood events, such as those associated with a hurricane or other coastal storm. Seasonal weather patterns, changes in coastal and ocean circulation, dredging, subsidence, and El Niño are just a few of the many factors influencing changes in sea level over time. The term "sea level rise" refers to a long-term trend of higher monthly mean sea levels.[39]



The map above was produced using NOAA's sea level trend website, which bases its estimates of Mean Sea Level change on over 150 years of sea level measurements. Changes in Mean Sea Level (MSL) are measured by local tide gauges that document local as opposed to global sea level trends. To improve local accuracy, tide gauge measurements are made to a local fixed reference point on land to account for mitigating factors such as subsidence or accretion of land. It is estimated that MSL is rising at approximately 3 mm per year on the U.S. Gulf Coast, which is equivalent to approximately one foot over the coming century. **Appendix B, Figure 6.15** provides a more detailed look at the potential outcomes of Sea Level rise on Mississippi's Gulf Coast. While estimates vary somewhat, coastal communities are anticipated to be directly impacted by rising sea levels in the coming decades.[40]

[39] NOAA Tides and Currents: "Frequently Asked Questions: What is Sea Level?" https://tidesandcurrents.noaa.gov/sltrends/faq.html#:~:text=Tide%20stations%20measure%20Local%20Sea,a%20known%20relationship%20is%20established.

[40] NOAA Sea Level Rise Viewer: https://coast.noaa.gov/slr/#/layer/slr

6.7.1 Historic Occurrence Data – Sea Level Rise

Hattiesburg Campus

Forrest County does not border the Gulf of Mexico and therefore, there are no recorded instances of sea level rise-related events on or near the University's main campus.

Gulf Park Campus

Harrison County is bordered by the Gulf of Mexico and could potentially be affected by any rise in sea levels. According to data gathered from NOAA's tidal data stations and recent studies conducted by NOAA and others, the mean sea level is gradually rising on the Mississippi Gulf Coast. Using the Bay St. Louis monitoring station as an indicator of trends in sea levels for the Long Beach community, historical sea level rise in the Gulf Coast region appears to range from 3 to 6 mm per year, or approximately one to two feet a century. Additional data gathered from nearby Mobile indicates a similar trend. However, more recent technical reports indicate that the northern Gulf of Mexico could see similar increases in sea levels over the next few decades.

Gulf Coast Research Laboratory

Jackson County is bordered by the Gulf of Mexico and could potentially be affected by any rise in sea levels. According to data gathered from NOAA's tidal data stations and recent studies conducted by NOAA and others, the mean sea level is gradually rising on the Mississippi Gulf Coast. Using the Bay St. Louis monitoring station as an indicator of trends in sea levels for the Long Beach community, historical sea level rise in the Gulf Coast region appears to range from 3 to 6 mm per year, or approximately one to two feet a century. Additional data gathered from nearby Mobile indicates a similar trend. Ongoing efforts by the City of Ocean Springs to adapt to rising sea levels identify a similar historical trend using data and research methods from NOAA, the Naval Research Laboratory, and the USGS to confirm this estimate from multiple sources.

6.7.2 USM's Vulnerability to Sea-Level Rise

Hattiesburg Campus

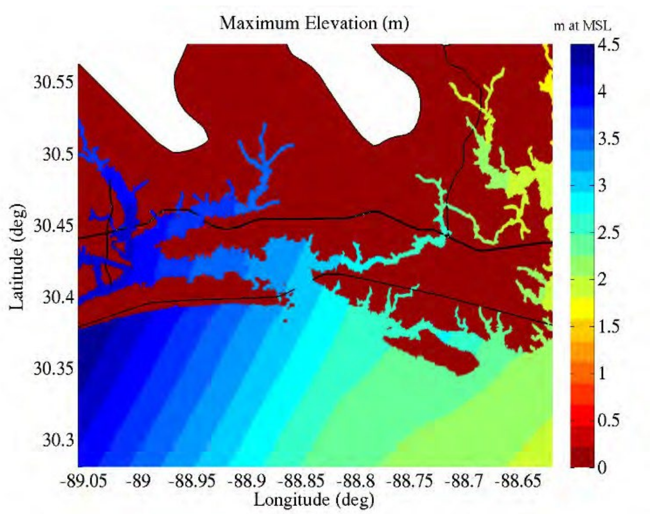
Forrest County does not border the Gulf of Mexico and therefore, there are no recorded instances of sea level rise-related events on or near the University's campus.

Gulf Park Campus

The location of the Southern Miss campus across from Highway 90/Beach Boulevard makes the campus moderately vulnerable to the impacts of sea level rise. The majority of the structures on campus are 20-25 feet in elevation above sea level, well above the anticipated rise in coastal waters for the next century. However, the campus may experience secondary effects of sea level rise, such as the increased risk of storm surge and inundation of infrastructure systems. Storm surge associated with tropical storms and hurricanes rises higher in coastlines with shallow slopes, like Mississippi's Gulf Coast. This means that it is possible that under higher mean sea level conditions, storm surges associated with an event like Hurricane Katrina could result in more severe damage to campus buildings than previously experienced.

Gulf Coast Research Laboratory

The Gulf Coast Research Lab is surrounded on three sides by the waters of Halstead, Stark, and Davis Bayous. Although the majority of its structures are out of the SFHA at a high point of approximately 18 feet above sea level, accessory uses of the campus, such as parking lots, circulation, bulkheads, piers, and boat launches are located in the SFHA. The Caylor Building was submerged during Hurricane Katrina and the salt water damaged the building's wiring.



From 2011-2013, the City of Ocean Springs investigated the potential extent and impact of sea level rise on its bays, bayous, and Gulf coastline. Consulting several sources, the study confirmed the 3 to 6 mm per year rise illustrated in NOAA's Sea Level Trends map above. The City also worked with the Naval Research Laboratory at Stennis to model a scenario that combined a future Hurricane Katrina magnitude storm surge with an additional foot of sea level rise. The model anticipates that the difference in storm surge attributable to sea level rise could be as much as 1.5 feet, resulting in a total storm surge of as great as three meters, or almost 10 feet. While this would not overtop GCRL's buildings, rising sea levels combined with storm surges could likely produce significant damage to the transportation, water, wastewater, and drainage systems that the campus depends upon.

6.7.3 Potential Sea-Level Rise Impacts on the University

Hattiesburg Campus

Forrest County does not border the Gulf of Mexico and therefore, there are no recorded instances of sea level rise-related events on or near the University's main campus.

Gulf Park Campus

Because of the proximity to the Gulf Coast and the additional risk factor of a creek traversing the campus, sea level rise may affect the Gulf Park Campus. Potential sea level rise impacts with 3-6 mm mean SLR per year will include increasingly frequent inundation of Highway 90, which already occurs under current conditions. Flooding of this major traffic artery could block a primary access and egress route to the campus. Higher mean water levels could also increase the risk associated with flooding of Bear Creek and cross-contamination of the storm and sanitary sewer system, which could lead to campus closures and property damages at Southern Miss. Given the slow rate of rising water levels, the impact of sea level rise is of medium concern for this facility.

Gulf Coast Research Lab

Because of the proximity to the Gulf Coast and the presence of water on three sides of the campus, sea level rise is likely to affect the GCRL in the future. The impacts associated with storm surges are a primary concern, as coastlines with shallow slopes, like Mississippi's Gulf Coast, tend to experience higher surges with tropical storms and hurricanes. The presence of water on all sides of the campus could result in rising waters converging during a storm surge. The Caylor Building and its surrounding structures were flooded by a storm surge above 18 feet during Hurricane Katrina.

Infrastructure systems such as stormwater drainage, water supply, sanitary sewer, and transportation resources could all be affected by changing coastal conditions like rising water tables and saltwater inundation affecting the native marsh. In addition, the main entrance to the campus is an easement across a neighboring piece of property, which frequently floods due to rising sea levels. The flooded entrance sometimes prevents employees from attending or leaving work. The Lab hopes to acquire adjoining property on higher ground to realign the entrance and parking area soon. Structures in the flood zone include a pier and a guardhouse.

If the area's slowly rising water level begins to affect these structures, they could be moved or retrofitted to adapt to new conditions. Because of its direct frontage on the shallow slope of the Mississippi Sound, the campus is likely to experience both direct and secondary effects of sea level rise. With recent studies indicating that sea levels potentially rising at rates higher than previously expected in the northern Gulf of Mexico, sea level rise should be given a higher mitigation priority at the Gulf Coast Research Lab.

6.8 THUNDERSTORMS, LIGHTNING, AND HIGH WIND – GENERAL INFORMATION

Severe thunderstorms develop when a cold dry air mass moves into an area dominated by warm moist air. This basic scenario develops frequently during the spring and late summer in the Southeast. Severe thunderstorms in the southeast typically include high winds, lightning, high rainfall amounts, and occasional spin-off tornados. Severe thunderstorms are typically seasonal and most frequently occur in the afternoon and early evening hours.

6.8.1 Thunderstorms, Lightning, and High Wind – Historic Occurrence

Hattiesburg Campus

NOAA recorded more than 347 reports of lightning, severe thunderstorms, and high wind events in Forrest County between 1963 and 2023.[41] This represents an average of approximately 6.4 reported thunderstorms and wind events in Forrest County each year. However, the data suggests that these events have either increased over the past 2 decades or the number of reported incidents has increased. For instance, the year 2006 saw a reported 14 events in Forrest County while there were no reported events for the years 1964-1965 and 1979-1981, to list a few. Severe thunderstorms and the high wind events associated with severe thunderstorms caused an estimated $500,000 in property damage in Forrest County during 2011 alone. For planning purposes, FEMA classifies high winds as a separate hazard category based on FEMA's Wind Zone delineation for the United States. USM's Hattiesburg campus exists within a zone categorized as Hurricane Susceptible.

Gulf Park Campus

NOAA recorded 227 reports of severe thunderstorms and high wind events in Harrison County between 1963 and 2016, which represents an average of approximately 4.2 reported thunderstorms and wind events in Harrison County each year. However, the data suggests that these events have either increased over the past 2 decades or the number of reported incidents has increased. For instance, the year 2015 saw a reported 8 events in Harrison County, while there were no reported events for the years 1972 and 1976. Severe thunderstorms and the high wind events associated with severe thunderstorms caused an estimated $123,000 in property damage in Harrison County in 2011 alone. Gulf Park Campus is in FEMA's Wind Zone III, which is categorized as Hurricane Susceptible, and subject to winds as high as 200 mph.

Gulf Coast Research Lab

NOAA recorded 163 reports of severe thunderstorms and high wind events between 1963 and 2016, which represents an average of approximately 3 reported thunderstorms and wind events in Jackson County each year. However, the data suggests that these events have either increased over the past 2 decades or the number of reported incidents has increased. While there were no reported events for the years 1964, 1969, or 1978, there were 9 reported events in 2000. Severe thunderstorms and the high wind events associated with those storms caused an estimated $369,000 in damages during this time. The Gulf

[41] NOAA Storm Events Database

Coast Research Lab is located in FEMA's Wind Zone III, which is categorized as hurricane-susceptible, and subject to winds as high as 200 mph.

6.8.2 USM's Vulnerability to Thunderstorms, Lightning, and High Wind

Hattiesburg Campus

Based on the geographical location of USM within the context of FEMA's Wind Zone Map, high wind occurrences are detailed in this section as well as sections dealing with hurricanes and tornados. **Figure 6.16** found in **Appendix B** depicts FEMA's National Wind Zone Map.

Gulf Park Campus

The Gulf Park Campus is in FEMA's Wind Zone III, which is categorized as hurricane-susceptible, and subject to winds as high as 200 mph.

Gulf Coast Research Lab

The Gulf Coast Research Lab is located in FEMA's Wind Zone III, which is categorized as hurricane-susceptible, and subject to winds as high as 200 mph.

6.8.3 Potential Thunderstorm, Lightning, and High Wind Impacts on the University

Events related to thunderstorms in south Mississippi are generally accompanied by other activities that have a higher probability of causing significant damage than the thunderstorm itself. High winds, lightning, spin-off tornados, and widespread or localized flooding are common events associated with severe thunderstorms. Because of the high probability of occurrence and the unpredictable nature of severe thunderstorms, any given storm has the potential to cause at least minor or moderate damage to the University. In general terms, the University is susceptible to damages from high wind gusts, lightning, localized flooding, and associated damages to buildings, trees, and other university property. Thunderstorms in Mississippi may have a duration of a few minutes to hours depending on the intensity, tracking speed, and other factors. Based on the potential for damage, frequency of occurrence, and unpredictability, severe storms, and associated activities are considered to be a high mitigation priority for the University.

6.9 TORNADOS AND FUNNEL CLOUDS – GENERAL INFORMATION

Tornados or funnel clouds can develop from severe thunderstorms or hurricanes. Generally, the most active time of year for tornados is during the spring months; however, tornados can develop any time of the year in the Southeast. A tornado's path can be as narrow as a few yards and do little more than damage tree limbs or it can be over ½ mile wide and destroy everything it contacts. A tornado's wind speed and corresponding damage potential are measured utilizing the Enhanced Fujita Scale (Enhanced F-Scale). **Table 6.11** illustrates the Original and Enhanced F Scales.

TABLE 6.11 – TORNADO INTENSITY SCALES

F-Scale	Intensity Phrase	Wind Speed (MPH)	Enhanced F-Scale	EF-Scale Wind Speed
F0	Gale Tornado	45-78	EF0	65-85
F1	Moderate Tornado	79-117	EF1	86-109
F2	Significant Tornado	118-161	EF2	110-137
F3	Severe Tornado	162-209	EF3	138-167
F4	Devastating Tornado	210-261	EF4	168-199
F5	Incredible Tornado	262-317	EF5	200-234

To further enhance the level of information concerning tornado intensities, the Enhanced F-Scale rates damages to specific types of buildings based on identified Damage Indicators (DI) and a Degree of Damage (DOD) scale. For this plan DODs for DI- 20: Institutional Buildings including university buildings, hospitals, or government buildings are detailed in the following table:

TABLE 6.12 – DEGREES OF DAMAGE FROM TORNADOS BASED ON WIND SPEED

DOD	Damage Description	Wind Speed (In MHP)		
		Expected	Lower Bound	Upper Bound
1	Threshold of visible damage	72	59	88
2	Loss of roof covering (<20%)	86	72	109
3	Damage to penthouse roof and walls; loss of rooftop HVAC equipment	92	75	111
4	Broken glass in windows or doors	95	75	115
5	Uplift of lightweight roof deck and insulation; significant loss of roofing material (>20%	114	95	136
6	Façade components torn from structure	118	97	140
7	Damage to curtain walls or other wall cladding	131	110	152
8	Uplift of pre-cast concrete roof slabs	142	119	163
9	Uplift of metal deck with concrete fill slab	146	118	170
10	Collapse of some top story exterior walls	148	127	172
11	Complete destruction of all or a large portion of building	210	178	268

Given the anticipated degrees of damage to institutional buildings combined with historical data shown in **Table 6.12** and associated maps, the University can expect with some degree of certainty that tornados potentially affecting the University will fall within the F0-F3 range with the most common occurrences being tornados of F1 and F2 magnitude with expected DOD ranges from 1 through 5 as indicated in **Table 6.12** above. Mitigation for tornados is considered a high priority based on the historical record, the probability of tornado activity in the region, and the potential for significant damage to the USM campuses.

6.9.1 Historic Occurrence Data – Tornados and Funnel Clouds

USM Hattiesburg Campus

NOAA recorded 46 reports of confirmed tornados in Forrest County between 1957 and 2023, with 23 occurrences within the last 16 years. The overall total represents an average of approximately .70 confirmed tornados in Forrest County each year. The majority of these are a magnitude of F1 or EF1. Since 2001, two tornado events resulted in a federal disaster declaration for Forrest County. In March 2001, a supercell thunderstorm produced a total of four tornados. The fourth tornado impacted Forrest County and the Cities of Hattiesburg and Petal. The tornado touched down in the northwest part of the City of Hattiesburg and traveled across northern sections of Hattiesburg and Petal. The total damage in Forrest County was estimated at $6 million with major damage to 112 houses, 8 businesses, and 6 vehicles. Minor damage was reported to 223 houses and 21 businesses. No fatalities were reported with this event, but five injuries were reported.

In 2013, tornadic winds blew across Arkansas, Louisiana, and Mississippi, with a resulting EF-3 tornado touching down in Hattiesburg. The tornado moved into Forrest County just to the south of Hardy Street damaging numerous homes. It then crossed Hardy Street impacting the southeast corner of the University of Southern Mississippi campus. Numerous buildings were damaged in this area including several campus buildings and a large church. Power poles were blown down in this area and several metal traffic lights were bent or torn off their bases. Damage in this area was EF-2 and EF-3 and reached $25 million.

TABLE 6.13 – HISTORIC TORNADO DATA, FORREST COUNTY[42]

Location	Date	Magnitude	Property Damage	Crop Damage
Macedonia	12/14/2022	EF0	$25,000	$15,000
Macedonia	12/14/2022	EF2	$75,000	$125,000
Carnes	12/14/2022	EF1	$40,000	$25,000
Bonhomie	3/30/2022	EF0	$10,000	$0
Carnes	3/30/2022	EF2	$250,000	$0
Bonhomie	4/19/2020	EF1	$100,000	$0
Macedonia	7/14/2019	EF0	$3,000	$0
Petal	8/30/2017	EF1	$200,000	$0
Bonhomie	1/21/2017	EF3	$9,000,000	$49,500
Rock Hill	1/2/2017	EF1	$30,000	$0
Carnes	2/23/2016	EF0	$15,000	$0
Bonhomie	10/31/2015	EF0	$17,000	$0
Hattiesburg	2/10/2013	EF3	$25,000,000	$0
Fruitland Park	12/25/2012	EF2	$200,000	$0
Petal	3/21/2012	EF0	$20,000	$0
Bonhomie	3/2/2012	EF1	$15,000	$0
McLaurin	9/4/2011	EF0	$500	$0
Maxie	9/1/2008	EF0	$2,000	$0
Rock Hill	5/15/2008	EF1	$700,000	$500,000
McLaurin	5/15/2008	EF1	$80,000	$0
McLaurin	3/3/2008	EF1	$1,500,000	$0
Mammoth Springs	10/17/2007	EF1	$100,000	$0
Petal	4/14/2007	EF1	$200,000	$0
Rawls Springs	11/15/2006	F1	$2,000	$0

[42] NOAA Storm Events Database

Location	Date	Magnitude	Property Damage	Crop Damage
Hattiesburg	8/29/2005	F1	$2,000	$15,000
Hattiesburg	1/7/2005	F1	$125,000	$0
Hattiesburg	3/12/2001	F1	$6,000,000	$0
Hattiesburg	4/14/1999	F0	$0	$0
Hattiesburg	6/5/1998	F1	$20,000	$0
Carnes	4/17/1998	F0	$5,000	$0
Carnes	2/19/1996	F1	$100,000	$0
Hattiesburg	3/7/1995	F0	$5,000	$0
Forrest County	3/9/1994	F1	$50,000	$0
Forrest County	5/24/1992	F0	$25,000	$0
Forrest County	12/11/1983	F1	$250,000	$0
Forrest County	5/7/1982	F3	$250,000	$0
Forrest County	3/28/1977	F2	$250,000	$0
Forrest County	3/28/1977	F2	$25,000	$0
Forrest County	5/7/1975	F1	$2,500	$0
Forrest County	5/7/1975	F2	$250,000	$0
Forrest County	5/24/1973	F1	$2,500	$0
Forrest County	7/20/1966	F1	$250,000	$0
Forrest County	12/12/1965	F1	$250	$0
Forrest County	2/20/1961	F1	$25,000	$0
Forrest County	5/2/1957	F1	$0	$0
		Totals	**$45,221,750**	**$729,500**

Gulf Park Campus

NOAA recorded 80 confirmed tornados in Harrison County between 1957 and 2016, a considerably larger number than in Forrest County. In that time, over $64 million in damages have been reported.

Since 2000, 36 tornados have been recorded, producing over $4.232 million worth of property damage. The overall total represents approximately 1.21 confirmed tornados in Harrison County each year. From 1994-2023 there were 40 reported tornados with 3 or more occurring in 2000, 2001, 2011, and 2012. The most recent catastrophic tornado recorded in Harrison County was an F2, touching down in Orange Grove on November 24, 2004. The tornado caused $3 million in damages but did not result in any injuries or deaths.

TABLE 6.14 – HISTORIC TORNADO DATA, HARRISON COUNTY

Location	Date	Magnitude	Property Damage	Crop Damage
Harrison County	8/10/1957	F0	$30	$0
Harrison County	2/26/1958	F2	$25,000	$0
Harrison County	4/6/1963		$25,000	$0
Harrison County	4/27/1966	F1	$25,000	$0
Harrison County	10/30/1967	F3	$25,000,000	$0
Harrison County	6/11/1968	F1	$0	$0

Location	Date	Magnitude	Property Damage	Crop Damage
Harrison County	6/12/1968		$0	$0
Harrison County	11/3/1968	F3	$0	$0
Harrison County	5/17/1969		$0	$0
Harrison County	2/1/1970	F0	$250,000	$0
Harrison County	2/1/1970	F2	$0	$0
Harrison County	8/27/1971	F1	$25,000	$0
Harrison County	9/16/1971	F1	$0	$0
Harrison County	5/7/1972	F1	$0	$0
Harrison County	5/7/1972	F2	$25,000	$0
Harrison County	5/7/1972	F1	$2,500	$0
Harrison County	5/7/1972	F1	$0	$0
Harrison County	5/7/1972	F1	$2,500	$0
Harrison County	5/7/1972	F2	$25,000	$0
Harrison County	5/7/1972	F2	$25,000	$0
Harrison County	8/16/1974	F1	$2,500	$0
Harrison County	1/10/1975	F1	$250	$0
Harrison County	8/30/1975	F0	$30	$0
Harrison County	10/15/1975	F0	$0	$0
Harrison County	9/5/1977	F2	$250,000	$0
Harrison County	4/13/1980	F3	$25,000,000	$0
Harrison County	5/16/1980	F3	$250,000	$0
Harrison County	5/19/1980	F3	$2,500,000	$0
Harrison County	5/19/1980	F2	$250,000	$0
Harrison County	4/20/1982	F2	$250,000	$0
Harrison County	9/2/1985	F1	$0	$0
Harrison County	9/2/1985	F1	$0	$0
Harrison County	9/23/1985	F0	$25,000	$0
Harrison County	9/23/1985	F2	$250,000	$0
Harrison County	9/23/1985	F1	$250,000	$0
Harrison County	3/29/1987	F0	$25,000	$0
Harrison County	3/29/1987	F0	$25,000	$0
Harrison County	3/29/1987	F1	$25,000	$0
Harrison County	3/3/1988	F2	$250,000	$0
Harrison County	5/10/1988	F1	$25,000	$0
Woolmarket	4/12/1994	F2	$5,000,000	$0
Gulfport	4/13/1996	F0	$1,000	$0
Gulfport	4/14/1996	F0	$0	$0
Saucier	11/21/1997	F1	$50,000	$0
Biloxi	7/22/2000	F0	$0	$0
Orange Grove	9/2/2000	F0	$500	$0
Gulfport	9/2/2000	F0	$30,000	$0
Howison	3/12/2001	F0	$1,500	$0
Airey	3/12/2001	F0	$0	$0

Location	Date	Magnitude	Property Damage	Crop Damage
Gulfport	6/11/2001	F1	$100,000	$0
Biloxi	10/3/2002	F0	$15,000	$0
Orange Grove	11/24/2004	F2	$3,000,000	$0
Gulfport	2/12/2008	EF0	$0	$0
Long Beach	3/9/2011	EF1	$20,000	$0
Biloxi	3/9/2011	EF1	$100,000	$0
Lyman	9/4/2011	EF1	$20,000	$0
Mississippi City	9/19/2011	EF0	$0	$0
Ligana	3/21/2012	EF0	$5,000	$0
Woolmarket	3/21/2012	EF1	$15,000	$0
D'Iberville	3/22/2012	EF0	$10,000	$0
Gulfport	8/29/2012	EF1	$25,000	$0
Ligana	12/13/2016	EF0	$0	$0
Biloxi	6/21/2017	EF0	$0	$0
Biloxi	8/30/2017	EF0	$0	$0
Long Beach	4/14/2018	EF0	$0	$0
Woolmarket	11/1/2018	EF1	$0	$0
Gulfport	6/24/2020	EF0	$20,000	$0
Woolmarket	6/24/2020	EF1	$20,000	$0
Pass Christian	6/18/2021	EF0	$50,000	$0
Long Beach	6/19/2021	EF0	$50,000	$0
Pass Christian	8/29/2021	EF1	$50,000	$0
Gulfport	8/29/2021	EF0	$100,000	$0
Henderson Point	8/29/2021	EF0	$100,000	$0
Biloxi	8/30/2021	EF0	$50,000	$0
Biloxi	8/30/2021	EF0	$50,000	$0
Gulfport	8/30/2021	EF0	$50,000	$0
Handsboro	8/30/2021	EF0	$100,000	$0
Biloxi	8/30/2021	EF0	$100,000	$0
Biloxi	8/30/2021	EF0	$150,000	$0
Biloxi	12/14/2022	EF1	$0	$0
		Totals	**$64,090,810**	**$0**

Gulf Coast Research Lab

NOAA recorded over 73 confirmed tornados in Jackson County between 1957 and 2023, a considerably larger number than in Forrest County. 31 tornados have been recorded within the last 16 years, producing over $965 thousand in property damages. The overall total represents an average of approximately 1.1 confirmed tornadoes in Jackson County each year. Although several severe tornados causing over $100 thousand in damages were recorded in the 1980s and 1990s, the number of tornados causing substantial damage in Jackson County has decreased in the last two decades.

TABLE 6.15– HISTORIC TORNADO DATA, JACKSON COUNTY

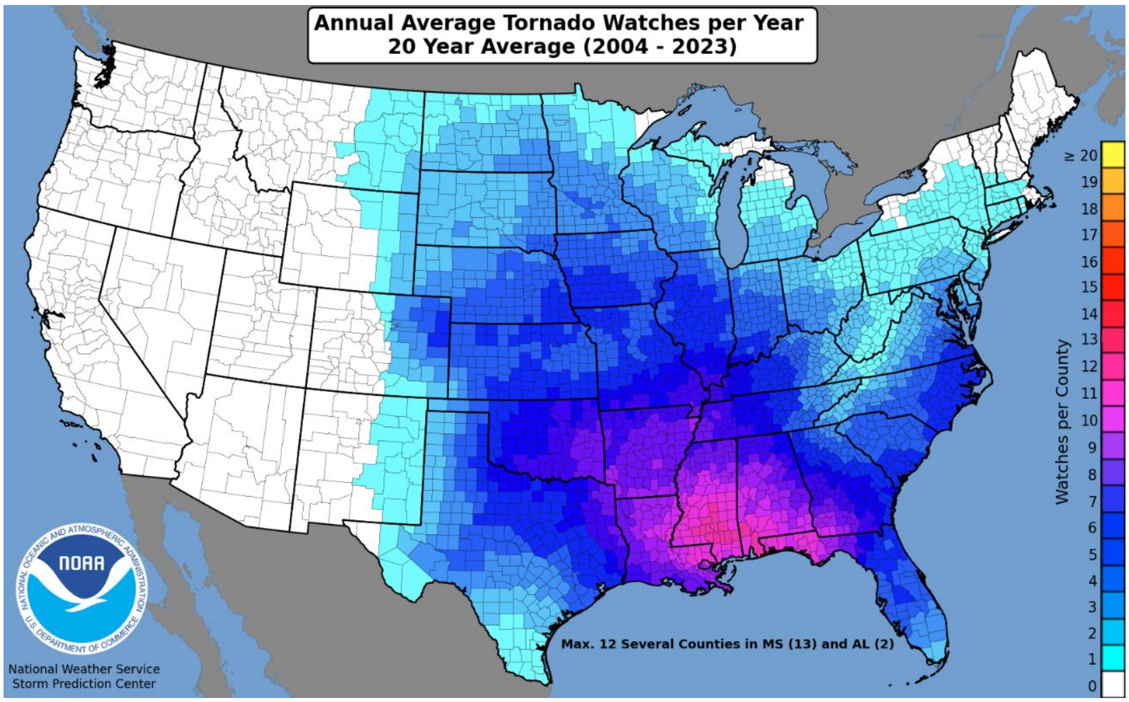
Location	Date	Magnitude	Property Damage	Crop Damage
Jackson County	2/26/1958	F2	$25,000	$0
Jackson County	4/6/1963	F1	$25,000	$0
Jackson County	4/27/1966	F2	$25,000	$0
Jackson County	5/8/1969	F1	$0	$0
Jackson County	8/9/1969		$0	$0
Jackson County	12/21/1969	F1	$2,500	$0
Jackson County	2/12/1971	F1	$2,500	$0
Jackson County	5/8/1971	F2	$25,000	$0
Jackson County	5/8/1971	F1	$2,500	$0
Jackson County	2/13/1973	F1	$2,500	$0
Jackson County	6/13/1974	F0	$30	$0
Jackson County	6/20/1974	F0	$250	$0
Jackson County	9/8/1974	F0	$30	$0
Jackson County	11/4/1974	F1	$30	$0
Jackson County	1/10/1975	F1	$250	$0
Jackson County	1/10/1975	F2	$250,000	$0
Jackson County	5/2/1977	F2	$25,000	$0
Jackson County	6/1/1977	F0	$250	$0
Jackson County	7/15/1977	F0	$250,000	$0
Jackson County	7/29/1978		$2,500	$0
Jackson County	4/23/1979	F0	$2,500	$0
Jackson County	5/19/1980	F2	$250,000	$0
Jackson County	2/10/1981	F2	$250,000	$0
Jackson County	4/25/1982	F2	$250,000	$0
Jackson County	2/1/1983	F1	$250,000	$0
Jackson County	5/21/1985	F2	$250,000	$0
Jackson County	5/21/1985	F1	$250,000	$0
Jackson County	9/16/1988	F0	$25,000	$0
Jackson County	2/10/1990	F1	$250,000	$0
Vancleave	3/1/1994	F0	$5,000	$0
Jackson County	12/3/1994	F0	$0	$0
Ocean Springs	5/9/1995		$0	$0
Moss Point	5/9/1995	F1	$0	$0
Ocean Springs	5/9/1995	F1	$0	$0
Hurley	1/18/1996	F0	$0	$0
Gautier	4/29/1996	F0	$100,000	$0
Pascagoula	3/13/1999	F0	$0	$0
Pascagoula	7/16/2000	F0	$0	$0
Escatawpa	8/20/2000	F0	$2,000	$0
Hurley	6/11/2001	F0	$5,000	$0
Pascagoula	8/7/2001	F0	$25,000	$0
Ocean Springs	11/15/2006	F1	$50,000	$0

Location	Date	Magnitude	Property Damage	Crop Damage
Ocean Springs	2/13/2007	EF0	$0	$0
Vancleave	10/18/2007	EF1	$90,000	$0
Pascagoula	3/26/2009	EF0	$18,000	$0
Ocean Springs	4/2/2009	EF0	$50,000	$0
Vancleave	12/24/2009	EF0	$2,000	$0
Fountainbleau	4/4/2011	EF1	$35,000	$0
Jackson County	5/26/2011	EF0	$20,000	$0
Ocean Springs	8/29/2012	EF1	$40,000	$0
Pascagoula	8/30/2012	EF2	$75,000	$0
Pascagoula	6/16/2017	EF1	$0	$0
Pascagoula	8/30/2017	EF0	$0	$0
Ocean Springs	8/30/2017	EF0	$0	$0
Pascagoula	10/22/2017	EF1	$0	$0
Vestry	4/14/2018	EF1	$0	$0
Jackson County	4/14/2018	EF1	$0	$0
Wade	4/14/2018	EF1	$0	$0
Ocean Springs	11/1/2018	EF1	$0	$0
Escatawpa	11/1/2018	EF1	$0	$0
Jackson County	4/14/2019	EF1	$0	$0
Jackson County	6/24/2020	EF1	$0	$0
Jackson County	6/24/2020	EF0	$0	$0
Pascagoula	6/19/2021	EF0	$15,000	$0
Jackson County	6/19/2021	EF1	$5,000	$0
Pascagoula	8/30/2021	EF0	$200,000	$0
Jackson County	10/27/2021	EF1	$150,000	$0
Jackson County	3/30/2022	EF1	$250,000	$0
Jackson County	3/30/2022	EF0	$0	$0
Jackson County	10/29/2022	EF1	$0	$0
Jackson County	10/29/2022	EF1	$5,000	$0
Jackson County	10/29/2022	EF1	$10,000	$0
Wade	10/29/2022	EFU	$0	$0
		Totals	**$3,567,840**	**$0**

6.9.2 USM's Vulnerability to Tornados and Funnel Clouds

Hattiesburg and Gulf Park Campuses, Gulf Coast Research Lab

The National Weather Service Storm Prediction Center compiles data on severe storms and tornados and has mapped Average Annual Tornado Watches Per Year, derived from empirical data collected from 1993-2012. **Appendix B, Figure 6.18** depicts the average number of days per year that a tornado watch may be expected for any community within each of the color-coded regions.



The region where all three USM campuses are located is one of the highest-risk locations in the US for tornado activity, with an average number of tornado watches per year of 9-10 in the coastal counties and as many as 15-16 in Forrest County.[43] According to a 25-year assessment of tornado frequency across the United States, results show that the months of highest risk for Mississippi are March, April, and November.[44] Because of the frequency of tornados in the region, and the record of damage caused by these storms, all three USM campuses are considered at high risk of tornadoes.

6.9.3 Potential Tornado Impacts on the University

Hattiesburg Campus

An impact analysis was conducted based on an F3 tornado affecting a direct strike on the Hattiesburg campus. The illustration uses a 1000-yard damage swath caused by an F3 tornado. As illustrated in **Figure 6.24,** found in **Appendix B**, a tornado of this intensity

[43] NOAA Tornado Watches Per Year (2022) https://www.spc.noaa.gov/wcm/2022-wbc-anoms.png
[44] NOAA Average Tornadoes By State By Month 1998-2022: https://www.spc.noaa.gov/wcm/permonth_by_state/

would potentially impact all but one facility prioritized for mitigation. Anticipated damages would be at least equal to or greater than the projected ranges of damages from a Category 2 hurricane. Based on projected probabilities and estimated damages from a direct tornado impact, mitigation strategies for this hazard type are considered to be a high priority.

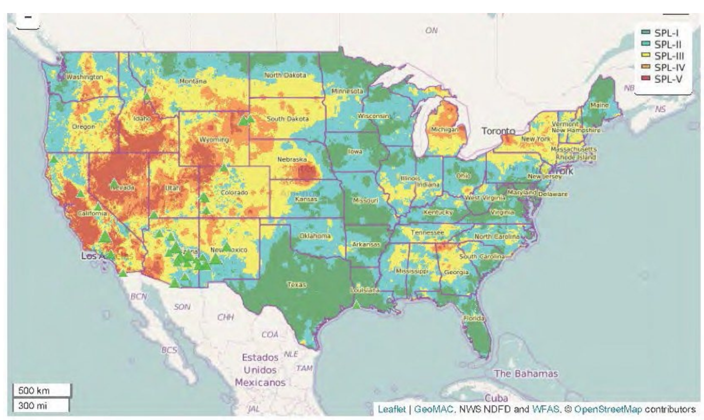
Gulf Park Campus

An impact analysis was conducted based on an F3 tornado affecting a direct strike on the Long Beach campus. The illustration uses a 1000-yard damage swath caused by an F3 tornado. As illustrated in **Figure 6.25,** found in **Appendix B**, a tornado of this intensity could potentially impact all facilities prioritized for mitigation. Anticipated damages would be at least equal to or greater than the projected ranges of damages from a Category 2 hurricane. Based on projected probabilities and estimated damages from a direct tornado impact, mitigation strategies for this hazard type are considered to be a high priority.

Gulf Coast Research Lab

An impact analysis was conducted based on an F3 tornado affecting a direct strike on the Long Beach campus. The illustration uses a 1000-yard damage swath caused by an F3 tornado. As illustrated in **Figure 6.26,** found in **Appendix B**, a tornado of this intensity would potentially impact all facilities prioritized for mitigation. Anticipated damages would be at least equal to or greater than the projected ranges of damages from a Category 2 hurricane. Based on projected probabilities and estimated damages from a direct tornado impact, mitigation strategies for this hazard type are considered to be a high priority.

6.10 WILDFIRES- GENERAL INFORMATION



A wildfire is any uncontrolled burning of undeveloped grassland, brush, or forest. Wildfires are more prevalent in the western United States where the climate is more arid. However, wildfires can be a danger in South Mississippi, particularly during drought conditions. The U.S. Forest Service tracks wildfire risk around the nation with the Wildland Fire Assessment System, which considers factors such as current and forecast weather to determine potential risks. The Mississippi Forestry Commission reports that there are on average more than 3,000 wildfires burning over 58,000 acres a year in Mississippi. An unnatural buildup of forest fuels is one element that contributes to these sobering figures. Prescribed burning is a method that can reduce the intensity of these wildfires.

Hattiesburg Campus

Forrest County has experienced some cases of wildfire, however, no incidents of significance have been recorded by NOAA for Forrest County. Since the University is located within the City of Hattiesburg, it is highly unlikely that an uncontrolled wildfire would endanger campus property. Therefore, the threat of wildfires has been excluded from further consideration as a hazard for the campus of USM. However, due to the density of development and the proximity of many University buildings to each other, the potential for an urban fire significantly affecting the University is high. Consideration should be given to potential mitigation actions relative to urban fires.

Gulf Park Campus

From 1950 to today, there have been no reported cases of wildfire occurring in Harrison County. Although this is a tree-lined campus, graced with beautiful live oaks, the situation is similar to that of Harrison County, in that the campus surroundings are predominantly urban, and it is highly unlikely that an uncontrolled wildfire would endanger campus property. Therefore, the threat of wildfires has been excluded from further consideration as a hazard for the campus of USM. However, due to the density of development and the proximity of many University buildings to each other, the potential for an urban fire significantly affecting the University is high. Consideration should be given to potential mitigation actions relative to urban fires.

Gulf Coast Research Lab

The Research Lab, particularly the Cedar Point portion of the facility, is located adjacent to the Gulf Islands National Seashore, which is a heavily wooded area of Jackson County. Prescribed burns are conducted periodically at Gulf Islands to reduce a buildup of dry fuel and restore the coastal habitat. Although there are no recorded instances of wildfire in Jackson County, because of the campus surroundings, the threat of wildfires is considered a low-priority hazard for the Gulf Coast Research Lab. Consideration should be given to potential mitigation actions relative to wildfires at this campus location.

6.10.1 Wildfires and Urban Fires – Historic Occurrence

Hattiesburg and Gulf Park Campuses

The densely developed campus and the proximity of some buildings to others make urban fire a hazard of concern. Fire protection and response services for the University are provided by the City of Hattiesburg and the City of Hattiesburg's Fire Departments. Documented evidence of a significant urban fire on the USM campus does not exist.

Gulf Coast Research Lab

The setting of the Gulf Coast Research Lab in a forested national park makes wildfire a hazard of concern. However, documented evidence of a significant wildfire on or near the campus does not exist.

6.10.2 USM's Vulnerability to Wildfires and Urban Fires

Hattiesburg Campus

Although this is a hazard of concern, most structures on campus are constructed from materials that tend to resist the spread of a fire from one building to another. Modern building codes and construction methods also reduce the risk of adverse impacts from urban fires. Mitigation strategies for this risk should be policy-related in nature and should include continuous monitoring of construction codes to ensure new buildings on campus are constructed in a manner that ensures optimum protection of life and property from potential impacts related to urban fires.

Gulf Park Campus

Although this is a hazard of concern, most structures on campus are constructed from materials that tend to resist the spread of a fire from one building to another. Modern building codes and construction methods also reduce the risk of adverse impacts from urban fires. Mitigation strategies for this risk should be policy-related in nature and should include continuous monitoring of construction codes to ensure new buildings on campus are constructed in a manner that ensures optimum protection of life and property from potential impacts related to urban fires.

Gulf Coast Research Lab

Although this is a hazard of concern, most structures on campus are constructed from materials that tend to resist the spread of a fire from one building to another. Modern building codes and construction methods also reduce the risk of adverse impacts from wildfires in a forested setting.

Mitigation strategies for this risk at the GCRL should relate to policies and construction codes, for new buildings and should also include additional protective measures, such as landscape buffer zones that set buildings away from potential fuel for wildfires. Regular pruning, planning, and maintenance standards should be established to minimize risks on the property.

6.10.3 Potential Wildfire or Urban Fire Impacts on the University

Hattiesburg Campus

Based on previously stated information related to predominant construction materials, placement of buildings on campus, and the level of available response services, it is anticipated that impacts to the University's Hattiesburg campus from urban or wildfires are slight and would potentially impact one or two buildings as opposed to widespread or campus-wide urban fire. Mitigation considerations should include education of the University community on building evacuation practices, routine fire drills, and monitoring of construction codes to ensure that new buildings are constructed to ensure the protection of life and property from fire threats. Mitigation for urban fires is considered to be a low priority based on the potentially minimal impacts of an urban fire on the USM campus.

Gulf Park Campus

Based on previously stated information related to predominant construction materials, placement of buildings on campus, and the level of available response services, it is anticipated that impacts to the University's Southern Miss campus from urban or wildfires are slight and would potentially only impact one or two buildings as opposed to widespread or campus-wide urban fire. Mitigation considerations should include education of the University community related to building evacuation practices, routine fire drills, and monitoring of construction codes to ensure that new buildings are constructed in a manner that ensures the protection of life and property from fire threats. Mitigation for urban fires is considered to be a low priority based on the potentially minimal impacts of an urban fire on the Southern Miss campus.

Gulf Coast Research Lab

Based on the location factors above, the threat of wildfires is considered a potential hazard for the campus, particularly for the Cedar Point portion of the GCRL. Urban fire mitigation measures pursued for the Hattiesburg and Southern Miss campuses should apply. In addition, the Gulf Coast Research Lab should consider using landscape management standards to minimize the risk associated with this medium-priority hazard.

6.11 WINTER STORMS – GENERAL INFORMATION

Severe winter storms can include heavy snowfall, freezing rain, and high wind speeds. While these types of storms are not typical for south Mississippi, they can occur. The USM campus is located in south-central Mississippi just above the 31st parallel and has an average low temperature in January of 36°F (the lowest). The USM Gulf Park and Research Lab Campuses are located just below the 30th parallel and have an average low temperature in January of approximately 43°F.

6.11.1 Winter Storms - Historic Occurrence

Hattiesburg and Gulf Park Campuses, Gulf Coast Research Lab

Although rare, NOAA has two recent storms on record in Hattiesburg, one in Jackson County and two in Harrison County. A winter storm occurred on January 1, 2002, and on December 11, 2008, that produced snow and some icing conditions affecting the Forrest County area. On Christmas Day, 2004, both Gulf Coast counties experienced a winter storm with no reported damages or injuries, and Harrison County reported one additional event on January 28, 2014. The most recent notable event occurred in Forrest County in February of 2021 and resulted in approximately $15,000 in property damage.

6.11.2 USM's Vulnerability to Winter Storms

Hattiesburg and Gulf Park Campuses, Gulf Coast Research Lab

The Gulf South is typically unaccustomed to snow, ice, and freezing temperatures. Occasionally, cold air penetrates across Texas and Florida, into the Gulf of Mexico. Temperatures fall below freezing killing vegetation. Wet snow and ice rapidly accumulate on trees, causing branches to snap under the load. Motorists are unaccustomed to driving on slick roads and traffic accidents increase. Municipalities generally do not have snow removal equipment or treatments, such as sand or salt, for icy roads. Fortunately for this region, extremely cold temperatures and associated freezing rain, sleet, and snow do not last more than a few days. However, this type of storm has the potential to disable transportation, communications, and electrical service.

USM's main campus has seen a few occurrences of severe winter weather in the last eight years. In these instances, classes were canceled due to the impact on communication systems and utilities. These documented events spanned a relatively short timeframe with normal university operations resuming within a couple of days. None of these events resulted in structural damage to buildings or facilities. Critical University functions were able to continue operating despite canceled classes. Based on the rare occurrence of severe winter weather and its minimal impacts, this is considered to be a low priority for mitigation.

6.11.3 Potential Winter Storm Impacts on the University

Hattiesburg and Gulf Park Campuses, Gulf Coast Research Lab

Potential impacts to the University from severe winter weather are generally limited to short-term power outages, canceled classes, and impacts to transportation access. Power outages and transportation difficulties are generally the precipitating factors in canceling classes. As previously mentioned, these impacts are typically short-lived. Normal operations generally resume within a day or two of the actual event. There have been no reports of significant impacts on buildings or critical University functions.

Primary concerns for all University campuses associated with severe winter storms include prolonged power outages from accumulations of freezing rain on tree limbs and power lines. Secondary concerns related to power outages are associated with transportation and communication systems impacts. Because of its "deep south" location, students, faculty, and staff are generally unaccustomed to driving conditions associated with severe winter weather. Because the frequency of these storms is generally less than 1x per year, and the risks associated with this hazard are manageable, this particular hazard is qualified as a low priority for mitigation.

6.12 MANMADE HAZARDS – ALL CAMPUSES

In addition to the Natural Hazards considered for mitigation purposes, this plan incorporates a discussion and consideration of manmade hazards with the potential to impact the University. Due to the proximity of a major U.S. highway and two major local thoroughfares, considerations for manmade hazards are of particular concern to USM. Within the context of man-made hazards, it is significant to note that other planning efforts are also considering the impacts of manmade hazards and are developing plans for mitigation and response to such activities. The listing of manmade hazards considered for this planning effort is included in **Table 6.16** below. Many of the manmade hazards addressed in this section have been subject to previous planning efforts as outlined in **Table 2.0** near the beginning of this document. The University's level of concern for manmade hazards is demonstrated through its considerable efforts to prepare and implement a variety of emergency management plans.

TABLE 6.16 – MANMADE HAZARDS INCLUDED FOR CONSIDERATION

Hazard	Accept as Hazard	Likely Occurrence	Mitigation Priority
Chemical	Yes	Medium	Medium
Civil Disturbance	Yes	Low	Low
Hazardous Materials Accident	Yes	Medium	Medium
Power Failure	Yes	Medium	High
Terrorism	Yes	Low	Low
Transportation Incident	Yes	High	High
Health Incident / Infectious Disease	Yes	Medium	High

6.12.1 Chemical

The University stores and maintains stockpiles of various types of chemicals related to the academic, research, and maintenance activities occurring on campus. These chemicals range from cleaning supplies such as solvents to chemicals used in research processes that may be considered hazardous or sensitive. Due to the presence of these types of materials, the University must have policies and procedures in place to address issues related to potential spills, leaks, and other incidents. To address these concerns, the DRU Committee identified facilities such as chemical storage buildings at Johnson Science Tower, the Physical Plant, the Motor Pool, and the University Stores Facility as Critical or High Priority Facilities.

6.12.2 Civil Disturbance/Terrorism

In recent years, concerns related to civil disturbance on University campuses have increased due to recent events on campuses around the country. Active shooter incidents at Virginia Tech and the University of Alabama-Huntsville have increased awareness of the potential for these types of incidents to occur on any campus. These concerns combined with a heightened awareness of terrorism have led many universities to adopt plans, policies, and procedures to address active shooter incidents and other types of civil disturbance activities including those that may occur at spectator sports events.

The University Police Department has initiated programs and policies on campus designed to reduce crime and incidents of civil disturbance. Included in these policies is the University's Emergency and Critical Incident Response Process. This process is designed to specifically outline how the University will respond to emergency incidents. The process also provides the University with the means to notify and involve additional service providers if necessary.

Additional programs implemented by the University include:

6.1.1.1 Campus Watch program is modeled after the National Neighborhood Watch Program and encourages individual vigilance and informed awareness regarding crimes and suspicious activity.

6.1.1.2 Campus Violence Prevention Plan

6.1.1.3 Active Shooter Protocols

6.1.1.4 Campus Action Referral and Evaluation Response to identify students at risk of harming themselves or others

6.1.1.5 Gulf Coast Emergency Operations Plan

6.1.1.6 Emergency Response and Evacuation Plan for Athletic Facilities

The University has also implemented technological resources aimed at crime prevention including twenty-seven "code blue" emergency telephones located throughout campus and the Eagle Alert system that uses email, voice, and text messaging designed to send emergency messages to all of the University's employees and students. Three principles guiding these programs are Intervention, Communication, and if needed, Evacuation. The University has also incorporated outdoor warning sirens, public address systems, news alerts, and the University's website as means of communicating emergency messages to the campus.

6.12.3 Hazardous Materials Transportation Incidents/Accidents

Western portions of campus are located within ½ mile of I-59 with the entirety of the USM Hattiesburg campus located within 1 mile of I-59. Additionally, the campus is directly adjacent to Mississippi State Highway 49 to the east and an abandoned railway to the north. Gulf Park Campus is located along Beach Boulevard, also known as Mississippi State Highway 90 to the south, and an active railroad to the north. Such proximity to major transportation routes could result in the partial or complete evacuation of campus for severe incidents located nearby. According to the City of Hattiesburg, they have no record of a major transportation-related hazmat event on or near the campus in the last ten years. The GCRL campuses are much less subject to hazardous material transport accidents, as they are accessible only via Beach Boulevard and the Gulf Islands National Sea Shore park roads. However, the University does have a contingency plan as referenced in **Table 2.0** to direct appropriate responses should such an incident occur.

6.12.4 Power Failure

Power failure events occur at the University occasionally. These events are typically associated with other types of events such as weather extremes. Recent power failures have been related to severe thunderstorms and periods during the summer when peak power demands exceed the system's capacity. The University's power grid is supported by an on-campus electrical substation and most transmission lines are underground. In addition, the University has an informal agreement with Mississippi Power Company to ensure rapid response to power failures on campus. Since incidents of power failure are sporadic and typically occur for a short period, the need to address power failure through mitigation strategies is considered a low priority. However, the University is in the process of mapping the entire electrical grid on the Hattiesburg campus. Upon completion of that process, issues may be identified that would exist as a potential mitigation action. Therefore, this particular issue of concern is included in the plan and the list of potential mitigation strategies.

6.12.5 Health Incident/Infectious Disease

According to the National Center for Biotechnology Information, pandemics are large-scale outbreaks of infectious diseases that can increase morbidity and mortality over a wide geographic area and cause significant economic, social, and political disruptions. Evidence suggests that the likelihood of pandemics has increased in the modern era due to increased global travel and population integration, urbanization, changes in land use, and greater exploitation of the natural environment. It is anticipated that these trends will continue and intensify. The most recent pandemic impacting Mississippi was the COVID-19 pandemic. The following sections will discuss risks, impacts, mitigation, and knowledge gaps generally, as well as a general timeline of the COVID-19 pandemic and its impacts on the State of Mississippi.

Risks and Impacts

- Pandemics have occurred throughout history and appear to be increasing in frequency, particularly because of the increasing emergence of viral diseases from animals.
- Pandemic risk is driven by the combined effects of spark risk (where a pandemic is likely to arise) and spread risk (how likely it is to diffuse broadly through human populations).
- Some geographic regions with high spark risk, including Central and West Africa, lag behind the rest of the globe in pandemic preparedness.
- Probabilistic modeling and analytical tools such as exceedance probability (EP) curves are valuable for assessing pandemic risk and estimating the potential burden of pandemics.
- Influenza is the most likely pathogen to cause a severe pandemic. EP analysis indicates that in any given year, a 1 percent probability exists of an influenza pandemic that causes nearly 6 million pneumonia and influenza deaths or more globally.
- Pandemics can cause significant, widespread increases in morbidity and mortality and have disproportionately higher mortality impacts on low to moderate-income regions.
- Pandemics can cause economic damage through multiple channels, including short-term fiscal shocks and longer-term negative shocks to economic growth.
- Individual behavioral changes, such as fear-induced aversion to workplaces and other public gathering places, are a primary cause of negative shocks to economic growth during pandemics.
- Some pandemic mitigation measures can cause significant social and economic disruption.

Likelihood of Occurrence and Vulnerability

As indicated in the opening paragraph of this section, increases in global travel and population integration, urbanization, changes in land use, and greater exploitation of the natural environment are all variables at least partially responsible for the increasing likelihood of the recurrence of a global pandemic similar to what we experienced with COVID-19. During COVID, we experienced the tendency of the virus to mutate and adapt to our collective attempts at control and eradication. This phenomenon indicates that the next pandemic we experience may be vastly different from COVID. It may transmit differently and affect different population groups, leaving little in the way of mitigation options. The most cost-effective strategies for increasing pandemic preparedness consist of investing to strengthen core public health infrastructure, including water and sanitation systems; increasing situational awareness, public health messaging, and rapidly extinguishing sparks that could lead to pandemics. Successful contingency planning and response require surge capacity – the ability to scale up the delivery of health interventions proportionately for the severity of the event, the pathogen, and the population at risk.[45]

6.13 POTENTIALLY VULNERABLE INFRASTRUCTURE

Hattiesburg Campus

Critical infrastructure serving the University including water, sewer, phone, and electricity is located underground and is not particularly vulnerable to the majority of hazards of concern discussed in this section. Infrastructure serving the University is controlled in part by the University. However, other components are under the control of the particular utility providing the particular infrastructure service or the City of Hattiesburg. Infrastructure elements of note include Mississippi Power Company's electrical substation, and a City of Hattiesburg elevated water storage tank. Either of these facilities are potentially vulnerable to a variety of natural and man-made hazards including hurricanes, severe winter storms, thunderstorms and lightning, and terrorism.

Mitigation priorities for future infrastructure would be dependent on which entity has operational and maintenance control of the infrastructure. In cases of university-maintained infrastructure, consideration would be given during project planning stages to ensure the incorporation of mitigation strategies that would reduce or eliminate potential vulnerabilities.

Gulf Park Campus

Critical infrastructure serving the University including water, sewer, phone, and electricity is relatively vulnerable to hazards of concern discussed in this section. Storm surges and flooding on Highway 90 and within the campus at Bear Creek could knock out electrical power, water, sewer, and transportation access, among other risks. High

[45] National Center for Biotechnology Information: Disease Control Priorities: Improving Public Health and Reducing Poverty: 3rd Edition: https://www.ncbi.nlm.nih.gov/books/NBK525302/

winds associated with thunderstorms, coastal storms, and hurricanes could affect the same systems.

Gulf Coast Research Lab

Critical infrastructure serving the University including water, sewer, phone, and electricity are all relatively vulnerable to hazards of concern discussed in this section. Storm surges and flooding could knock out electrical power, water, sewer, and transportation access, among other risks. High winds associated with thunderstorms, coastal storms, and hurricanes could affect the same systems. Transportation access is of particular concern since the low-lying entrance and parking lots for the GCRL already flood during extreme high tides.

6.14 POTENTIAL DOLLAR LOSSES TO VULNERABLE INFRASTRUCTURE

An estimation of potential dollar losses to identified vulnerable structures for each type of hazard is difficult to predict and would vary depending on the type, location, extent, duration, and severity of the hazard event. However, actual dollar losses from recent hazard events provide a dollar loss scenario relative to multiple hazard types. Hurricane Katrina resulted in approximately $13 million in damages to the Hattiesburg campus alone. Of this $13 million, approximately $2.9 million or 22% of the total wind damages from Katrina was to campus facilities classified as Critical, High, or Medium priority. While this is not to be considered a worst-case scenario, it is evident of the range of damages potentially realized from a variety of hazard types that have a high probability of affecting the USM Hattiesburg campus.

Gulf Park Campus

Hurricane Katrina devastated the Gulf Park Campus in Long Beach in 2005. High winds and a storm surge of approximately 30’ inundated the City of Long Beach and washed through the structures of the beachfront campus. Gulf Park Campus engaged in a total of $26 million in campus rebuilding and renovation projects after this storm.[85]

Gulf Coast Research Lab

During Hurricane Katrina, storm surge was one of the most devastating aspects of the storm. FEMA identified high water marks in Jackson County of 17-21 feet. The Cedar Point Campus of the Gulf Coast Research Laboratory, which is located slightly inland of the Mississippi Sound on Davis Bayou, received relatively minor damages, considering the extent of the storm. About 100 computers and 40 vehicles were lost to Hurricane Katrina. The FEMA estimate of total damages was approximately $18 million. [86]

6.15 DEVELOPMENT TRENDS

The Hattiesburg Campus of USM is in a constant state of growth, development, reuse, and redevelopment. In general terms the campus represents a broad mixture of land uses that in the traditional sense can be classified as a mixture of educational, residential, institutional, professional offices, and recreational. The University exists in a somewhat land-locked situation with limited opportunities for growth and expansion beyond its current boundaries, particularly to the south and east. However, growth and expansion opportunities do exist primarily to the north of the existing campus. The University’s current Campus Master Plan, completed in August 2007, indicates opportunities for growth as far north as 7th Street. However, the plan also emphasizes the wise use of existing land resources and the maximization of available land for development with sensitivity to the maintenance of green and open spaces. Given the geographical constraints to the expansion of the campus boundaries, the general growth trend of the Hattiesburg campus will focus primarily on the strategic use of existing land resources.

7.0 MITIGATION STRATEGIES

7.1 INTRODUCTION TO MITIGATION STRATEGIES

Mitigation strategies in this section resulted from a careful analysis of the risk and vulnerability assessments of each University campus. They reflect the administration's judgment of the best options to minimize risks and vulnerabilities. Strategies were considered for feasibility relative to implementation, cost, and other considerations included in FEMA's STAPLEE criteria, as derived directly from FEMA's Multi-Hazard Mitigation Planning Guidance and include considerations of **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental merits and impacts of a given mitigation strategy.[87]

Buildings constructed on the Hattiesburg Campus since the adoption of the Original DRU Plan include structures to house the nursing and business academic programs. No new buildings were built in areas defined as specific hazard areas. Generally, the level of vulnerability has decreased due to the University's mitigation actions. Examples include: 1. Implementation of the Eagle Alert system notifying students, faculty, and staff of hazard events by text, email, and phone; 2. Evacuation plan for persons with disabilities in each campus building; 3. HVAC Backup for Century Park North & South, Forrest County Data Center, University Police; 4. Digital storage of personnel records and Forrest County Hall data center to back up all critical campus data.

Some current mitigation strategies may include multiple options for achieving a desired outcome. Options are explored, prioritized, and ranked in this section. The following narrative describing goals and mitigation options also includes elements from DRU Committee discussions about the pros and cons of various mitigation strategies, hazards to be addressed, and buildings affected, where applicable.[88]

7.2 GOAL 1

Protect the health, safety, and welfare of students, faculty, and staff at all campuses of the University of Southern Mississippi.

7.2.1 Background

Protection of the health, safety, and welfare of the university community is the highest mitigation priority associated with USM's Disaster Resistant University status. While USM, Gulf Park, and GCRL have done an outstanding job of ensuring each campus is secure and response plans are adequate to address potential emergencies, efforts should be undertaken to ensure all university communities are aware of mitigation strategies and appropriate responses to a variety of identified events.

7.2.2 Potential Hazards

Goal 1 applies to all identified hazards of concern and all campuses addressed in this plan update.

7.2.3 Mitigation Options

Mitigation Option 1: The University is in the process of conducting facility condition assessments to document potential building deficiencies. This strategy will be an ongoing effort to identify building deficiencies that may affect each building's resilience to natural hazards. Through this strategy, the University will implement recommendations from the assessment process and will seek funding through the Hazard Mitigation Grant Program and the Pre-Disaster Mitigation Grant Program to address building deficiencies and improve the overall structural resilience of the University's structural assets.

Mitigation Option 2: Develop a comprehensive inventory of distributed sites inclusive of the University's Gulf Coast operations including people, places, and other fixed assets.

7.3 GOAL 2

Reduce/eliminate vulnerabilities associated with faculty and staff personnel records that currently exist in paper form only.

7.3.1 Background

Some faculty and staff critical records continue to be housed in university facilities that lack adequate mitigation/protection from natural hazard events. In these cases, records exist in paper format only and are potentially vulnerable to irreplaceable loss.

7.3.2 Potential Hazards

Applicable hazards include fire, tornado, hurricane, and windstorm.

7.3.3 Potentially Affected Facilities

The strategy associated with **Goal 2** applies primarily to the Hattiesburg campus but may have applicability to coastal campuses as well.

7.3.4 Mitigation Options

Mitigation Option 1: This is an existing strategy from the previous plan version. The University has been going through a systematic process of digitizing paper records with each college, school, and department responsible for the implementation of the digitization process. As an ongoing effort, this will continue as a mitigation strategy in the plan update.

7.4 GOAL 3

To reduce/eliminate vulnerabilities to research equipment investments, unique research data, and other security-sensitive data.

7.4.1 Background

Several University facilities that house expensive research equipment, unique research data, irreplaceable archived collections, and other security-sensitive data may not have adequate protection in the event of a variety of hazard types.

7.4.2 Potential Hazards

The strategy associated with **Goal 3** applies to all identified hazards of concern.

7.4.3 Potentially Affected Facilities

Potentially affected facilities include multiple buildings and facilities at the Hattiesburg and all Gulf Coast campuses.

7.4.4 Mitigation Options

Mitigation Option 1: Evaluate and upgrade access control systems including video monitoring and surveillance systems.

7.5 GOAL 4

To establish mechanisms that will ensure the continuity of the University's Disaster Resistant University Plan through continuous review, revision, and updates.

7.5.1 Background

To ensure that this Hazard Mitigation Plan stays relevant for the University's needs over time, specific policies and strategies must be implemented. Effective implementation of the following strategy will ensure that the Plan is reviewed, revised, and updated regularly to ensure continuity. In addition, the implementation of the following will ensure that new facilities developed on campus will be done in a manner that is consistent with the plan.

7.5.2 Potential Hazards

The following strategies are relevant to all identified hazard types.

7.5.3 Potentially Affected Facilities

All identified buildings and systems on all three campuses are potentially affected by these strategies.

7.5.4 Mitigation Options

Mitigation Option 1: The University will retain the DRU Advisory Committees on the Hattiesburg and Gulf Coast campuses. The Committees will meet a minimum of once per semester to review plan implementation progress and to make recommendations for mid-cycle modifications to the DRU Plan.

7.6 GOAL 5

To incorporate mitigation strategies intended to ensure University continuity of operations and critical functions before, during, and following a hazard event.

7.6.1 Background

Continuity of operations ensures a return to normalcy with potential societal, economic, and secondary impacts on the University community and the surrounding communities in which they exist.

7.6.2 Potential Hazards

The following strategy is relevant to all identified hazards of concern.

7.6.3 Potentially affected facilities and campuses

The following strategy is relevant and will benefit all campuses and locations included in this plan.

7.6.4 Mitigation Options

Mitigation Option 1: Using the University's Critical Incident Management Plan as a guide, each College, School, and Department will develop and implement its own Continuity of Operations Plan.

7.7 GOAL 6

Increase awareness and promote risk reduction activities through education and outreach.

7.7.1 Background

Continued education of the University community specific to hazard awareness issues will serve to create a culture of weather and hazard awareness and will reduce the overall vulnerability of the University community.

7.7.2 Potential Hazards

The following strategies apply to all identified hazards of concern.

7.7.3 Potentially affected facilities and campuses

The following strategies are relevant and will benefit all campuses and locations included in this plan.

7.7.4 Mitigation Options

Mitigation Option 1: Representatives from the Physical Plants at the Hattiesburg and Coastal Operations will coordinate with the Office of University Communications to develop and implement an education and outreach program specific to hazard preparation and response.

Mitigation Option 2: The University will develop and implement a training program specific to the Critical Incident Management Plan. This training program will be targeted towards members of the Critical Incident Response Teams.

7.8 GOAL 7

To reduce disruption of essential infrastructure and critical services from natural disasters.

7.8.1 Background

Through meetings and discussions, the Advisory Committee identified issues of concern at multiple locations related to infrastructure and critical services that have a history of significant disruption due to natural hazards. The strategies outlined through this goal are designed to mitigate those disruptions.

7.8.2 Potential Hazards

The following strategies apply to multiple hazards including floods, hurricanes, tropical events, winter storms, severe thunderstorms, storm surge, and power failure.

7.8.3 Potentially affected facilities and campuses

The following strategies apply to all campuses and locations included in this plan with some strategies specific to the Hattiesburg, Gulf Park, and Halstead Campuses.

7.8.4 Mitigation Options

Mitigation Option 1: Identify causes and implement solutions to flash and nuisance flooding around the northern areas of the Hattiesburg campus (near Hillcrest Dormitory).

Mitigation Option 2: Identify causes and implement solutions to flash and nuisance flooding around the main entrance to the Halstead Campus of the Gulf Coast Research Laboratory.

Mitigation Option 3: Identify causes and implement solutions to flash and nuisance flooding around Gulf Park Drive and Beach Park Place at the Gulf Park Campus.

Mitigation Option 4: Several power lines at the Halstead Campus of the Gulf Coast Research Lab are still above ground and are susceptible to the effects of hurricanes, tropical storms, and other high wind events. Areas of most concern include Gunter Drive and Franks Drive. The University desires to have these remaining service lines placed underground to improve the continuity of electrical service during high wind events.

Mitigation Option 5: Several power lines at the Gulf Park campus are still above ground and are susceptible to the effects of hurricanes, tropical storms, and other high-wind events. Areas of concern include Seagull Lane, Chimney's Pass, Gulf Park Drive, 3rd Street, Bear Point Drive, and Beach Park Place. The University desires to have these remaining service lines placed underground to improve the continuity of electrical service during high wind events.

Mitigation Option 6: The University is initiating an update to the Campus Master Plan in 2024. The Master Plan should include the DRU by reference and the DRU should be amended, as appropriate to incorporate recommendations from the updated Master Plan as they relate to hazard mitigation.

Mitigation Option 7: The University is in the process of mapping its entire electrical grid. The mapping process will likely identify systemic issues with the electrical system that need to be addressed to ensure continuity of services related to hazard events. Through this strategy, those issues will be incorporated into the DRU plan and addressed as appropriate.

7.9 GOAL 8

To minimize disruption of University functions from infectious diseases and pandemics.

7.9.1 Background

Based on lessons learned from the COVID-19 pandemic and to continue to strengthen the University's capacity to manage future pandemic events, the University seeks to employ strategies to continually improve personal hygiene and sanitation.

7.9.2 Potential Hazards

The following strategies apply to health incidents and infectious diseases.

7.9.3 Potentially affected facilities and campuses

The following strategies apply to all campuses included in this plan.

7.9.4 Mitigation Options

Mitigation Option 1: The University Physical Plant will evaluate all buildings for opportunities to improve contactless scenarios in restrooms and other common areas. Once the evaluation is complete, a cost estimate for implementation will be developed on a per-building basis and the improvements will be implemented as funding is available.

Mitigation Option 2: Develop and implement an internal training program on the existing Infectious Disease / Pandemic Plan.

7.10 BENEFIT-COST REVIEW

Every potential mitigation strategy has a cost associated with implementation. These costs may be direct costs associated with infrastructure upgrades, building retrofits, or the purchase of equipment, supplies, or materials. Indirect costs may be associated with staff time dedicated to implementation or costs associated with the implementation of policy-related strategies. Similarly, every potential mitigation strategy has an associated benefit or set of benefits. Direct and indirect costs associated with the implementation of mitigation strategies are often easy to quantify in monetary terms. However, the relative benefits of mitigation strategies are often more difficult to quantify. In general terms, those strategies offering the greatest benefit at the lowest cost are considered the highest priority and are described as having the highest benefit-cost ratio.

According to FEMA, benefits realized from mitigation projects are directly associated with the avoided damages and losses as a direct result of the mitigation activity. Specific benefits are calculated based on the estimation of future losses resulting from two scenarios: 1) the resulting damages and losses from a particular event without undertaking the mitigation project; and 2) the resulting damages and losses from the same event with the mitigation project completed.[89] Direct benefits are the derivation of the difference between anticipated results potentially incurred if the losses with the mitigation project in place are less than losses incurred without the mitigation project in place. With this approach, it is assumed that the greatest potential benefits are associated with hazard events with higher severity and higher potential for damages and losses. Thus those event types prone to higher damages and losses typically have mitigation projects with the highest benefits. It can also be reasoned that mitigation strategies necessary to mitigate damages and losses from the most severe events have the potential to have the highest costs of implementation.

According to FEMA, there are four categories of avoided damages associated with any hazard type. These include:

1. Avoidance of casualties: Because of the high population density at the University's Hattiesburg Campus, potential casualties factor into all considered hazard types and most of the mitigation strategies being considered for implementation.
2. Avoidance of loss-of-function: Loss of function is a significant consideration in the establishment of mitigation strategies, and many were designed around the need to ensure continuity of service and function, specifically for those systems on campus critical to preparedness, response, and recovery from a hazard event.
3. Avoidance of physical damage: The potential for physical damage and the potential for loss of function may be directly related. Physical damage is also a significant consideration given the density of buildings on campus and the presence of valuable

equipment, infrastructure, and irreplaceable research data and archived collections.

4. Avoidance of emergency management costs: These costs are associated with the level of effort and costs associated with hazard preparedness, response, and recovery. Examples of emergency management costs associated with recent hazard events include debris removal and management, cleanup costs, and costs associated with enhanced security.

All of the mitigation strategies outlined in this section were examined in light of the four categories of potential damage and given a relative value within one or more of the four categories illustrated in Table 7.1. Those strategies with the highest potential influence on a particular category were given a value of three while those with the lowest potential influence on a particular category were given a value of zero. Casualties and loss of function tend to contribute the greatest monetary damage to universities and other institutions. To ensure the benefit of a given mitigation strategy acknowledges these potentially higher costs; a multiplier factor of two was incorporated into the analysis and included in the final ranking values of each mitigation strategy. The multiplier is only applied to the casualty and loss of function categories. Table 7.1 was provided to the DRU Committee to gain a broader perspective on ranking and prioritizing the proposed mitigation strategies. The information in **Table 7.1** is reflective of the ranking conducted by the committee.

TABLE 7.1 – BENEFIT / COST AND RANKING SUMMARY TABLE

Goal 1: To protect the health, safety, and welfare of students, faculty, and staff at all campuses of the University of Southern Mississippi					
Multiplier Factor	**2**	**2**	**1**	**1**	
Strategy 1	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
The University is in the process of conducting facility condition assessments to document potential building deficiencies. This strategy will be an ongoing effort to identify building deficiencies that may affect each building's resilience to natural hazards. Through this strategy, the University will implement recommendations from the assessment process and will seek funding through the Hazard Mitigation Grant Program and the Pre-Disaster Mitigation Grant Program to address building deficiencies and improve the overall structural resilience of the University's structural assets.	**48**	**68**	**36**	**15**	**167**
Applicability: All Campuses					
Applicable Hazards of Concern: Hurricanes, Tornadoes, Floods, Winter Storms, Thunderstorms, Lightning & High Winds.					
Strategy 2	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
Develop a comprehensive inventory of distributed sites inclusive of the University's Gulf Coast operations including people, places, and other fixed assets.	**36**	**50**	**24**	**17**	**127**
Applicability: Gulf Coast Campuses					
Applicable Hazards of Concern: All Hazards					
Goal 2: To reduce/eliminate vulnerabilities associated with faculty and staff personnel and other vital records that currently exist in paper form only.					
Strategy 1	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**

	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total
This is an existing strategy from the previous plan version. The University has been going through a systematic process of digitizing paper records with each college, school, and department responsible for the implementation of the digitization process. As an ongoing effort, this will continue as a mitigation strategy in the plan update. **Applicability:** All Campuses **Applicable Hazards of Concern:** Hurricanes, Tornadoes, Floods, Winter Storms, Thunderstorms, Lightning & High Winds.	**20**	**62**	**26**	**19**	**127**
Goal 3: To reduce/eliminate vulnerabilities to research equipment investments, unique research data, and other security-sensitive data.					
Strategy 1	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
Evaluate and upgrade access control systems including video monitoring and surveillance systems. **Applicability:** All Campuses **Applicable Hazards of Concern:** Civil Disturbance, Power Failure	**38**	**50**	**25**	**19**	**132**
Goal 4: To establish mechanisms that will ensure the continuity of the University's Disaster Resistant University Plan through continuous review, revision, and updates.					
Strategy 1	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
The University will retain the DRU Advisory Committees on the Hattiesburg and Gulf Coast campuses. The Committees will meet a minimum of once per semester to review plan implementation progress and to make recommendations for mid-cycle modifications to the DRU Plan. **Applicability:** All Campuses **Applicable Hazards of Concern:** All Hazards	**44**	**62**	**27**	**24**	**157**
Goal 5: To incorporate mitigation strategies intended to ensure University continuity of operations and critical functions before, during, and following a hazard event.					

Strategy 1	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total
Using the University's Critical Incident Management Plan as a guide, each College, School, and Department will develop and implement its own Continuity of Operations Plan. **Applicability:** All Campuses **Applicable Hazards of Concern:** All Hazards	48	64	23	20	155

Goal 6: Increase awareness and promote risk reduction activities through education and outreach.

Strategy 1	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total
Representatives from the Physical Plants at the Hattiesburg and Coastal Operations will coordinate with the Office of University Communications to develop and implement an education and outreach program specific to hazard preparation and response. **Applicability:** All Campuses **Applicable Hazards of Concern:** All Hazards	54	56	24	21	155

Strategy 2	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total
Develop and implement a training program specific to the Critical Incident Management Plan. This training program will be targeted towards members of the Critical Incident Response Teams. **Applicability:** All Campuses **Applicable Hazards of Concern:** All Hazards	58	52	23	24	157

Goal 7: To reduce disruption of essential infrastructure and critical services from natural hazards.

Strategy 1	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total
Identify causes and implement solutions to flash and nuisance flooding around the northern areas of the Hattiesburg campus (near Hillcrest Dormitory). **Applicability:** Hattiesburg Campus **Applicable Hazards of Concern:** Floods, Flash Floods	44	52	33	24	153

Strategy 2	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total
Identify causes and implement solutions to flash and nuisance flooding around the main entrance to the Halstead Campus of the Gulf Coast Research Laboratory. **Applicability:** Gulf Coast Research Lab (Halstead) **Applicable Hazards of Concern:** Floods, Flash Floods, Hurricanes, Tropical Storms, Storm Surge.	40	48	29	21	138

Strategy 3	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total
Identify causes and implement solutions to flash and nuisance flooding around Gulf Park Drive and Beach Park Place at the Gulf Park Campus. **Applicability:** Gulf Park Campus (Long Beach) **Applicable Hazards of Concern:** Floods, Flash Floods, Hurricanes, Tropical Storms, Storm Surge.	44	48	27	19	138

Strategy 4	Avoidance of Casualties	Loss of University Function	Avoidance of Physical Damages	Emergency Management Costs	Total

Several power lines at the Halstead Campus of the Gulf Coast Research Lab are still above ground and are susceptible to the effects of hurricanes, tropical storms, and other high-wind events. Areas of most concern include Gunter Drive and Franks Drive. The University desires to have these remaining service lines placed underground to improve the continuity of electrical service during high wind events. **Applicability:** Gulf Coast Research Lab (Halstead) **Applicable Hazards of Concern:** Hurricanes, Tropical Storms, Thunderstorms, Winter Storms, Power Failure, Tornado	**36**	**66**	**34**	**29**	**165**
Strategy 5	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
Several power lines at the Gulf Park campus are still above ground and are susceptible to the effects of hurricanes, tropical storms, and other high wind events. Areas of concern include Seagull Lane, Chimney's Pass, Gulf Park Drive, 3rd Street, Bear Point Drive, and Beach Park Place. The University desires to have these remaining service lines placed underground to improve the continuity of electrical service during high wind events. **Applicability:** Gulf Park Campus (Long Beach) **Applicable Hazards of Concern:** Hurricanes, Tropical Storms, Thunderstorms, Winter Storms, Power Failure, Tornado	**36**	**66**	**35**	**29**	**166**
Strategy 6	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
The University is initiating an update to the Campus Master Plan in 2024. The Master Plan should include the DRU by reference and the DRU should be amended, as appropriate to incorporate recommendations from the updated Master Plan as they relate to hazard mitigation. **Applicability:** Hattiesburg Campus **Applicable Hazards of Concern:** All Hazards	**36**	**50**	**23**	**21**	**130**
Strategy 7	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of**	**Emergency Management Costs**	**Total**

			Physical Damages		
The University is in the process of mapping its entire electrical grid. The mapping process will likely identify systemic issues with the electrical system that need to be addressed to ensure the continuity of services related to hazard events. Through this strategy, those issues will be incorporated into the DRU plan and addressed as appropriate. **Applicability:** Hattiesburg Campus **Applicable Hazards of Concern:** Hurricanes, Tornadoes, Thunderstorms, Winter Storms, Power Failure.	**32**	**66**	**28**	**22**	**148**
Goal 8: To minimize disruption of University functions from infectious diseases and pandemics.					
Strategy 1	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
The University Physical Plant will evaluate all buildings for opportunities to improve contactless scenarios in restrooms and other common areas. Once the evaluation is complete, a cost estimate for implementation will be developed on a per-building basis and the improvements will be implemented as funding is available. **Applicability:** All campuses **Applicable Hazards of Concern:** Health Incident/Infectious Disease	**30**	**36**	**13**	**17**	**96**
Strategy 2	**Avoidance of Casualties**	**Loss of University Function**	**Avoidance of Physical Damages**	**Emergency Management Costs**	**Total**
Develop and implement an internal training program on the existing Infectious Disease / Pandemic Plan. **Applicability:** All campuses **Applicable Hazards of Concern:** Health Incident/Infectious Disease	**52**	**50**	**11**	**18**	**131**

7.13 MITIGATION STRATEGY PRIORITIZATION

Table 7.1 provides a rough indication of the prioritization of mitigation strategies but does not account for relative or perceived cost as compared to relative or perceived benefit. (It also does not account for other factors that are generally considered as part of the STAPLEE criteria that provide insight into the feasibility, ease of implementation, and general acceptance of certain mitigation actions.) In addition, **Table 7.1** includes alternatives to some actions that would achieve the same goals through differing means. **Table 7.2** is designed to further evaluate the proposed mitigation strategies and to refine the prioritization based on the STAPLEE criteria. In **Table 7.2**, criteria are marked with a plus (+) for favorable, and a negative (-) for less favorable. The number of pluses is then added to the relative ranking score from **Table 7.1** to provide a more refined ranking score for the proposed mitigation strategies.

The STAPLEE Criteria is included as part of the mitigation prioritization process as required by FEMA (FEMA, 2003) as a guide for evaluating the appropriateness and potential effectiveness of potential mitigation actions. While the STAPLEE Criteria are designed to evaluate mitigation actions on a local government level, it was felt that the criteria are equally applicable to a university setting. In this case, the STAPLEE Criteria was used to evaluate each proposed mitigation strategy and to enhance and complement the initial priority ranking provided in **Table 7.1**. Within this context, it is critical to the success of the plan that all stakeholders have an opportunity to provide input and gain acceptance of the plan document. The University exists in many ways as a self-contained community with many constituency groups within that community. Each has a unique perspective on a given issue and each group's input is necessary to achieve success.

Additional considerations for prioritization of potential mitigation strategies included a review of the included hazard profiles, vulnerabilities, costs, and projected or potential benefits. Some strategies offer benefits to only one hazard type or one structure while others provide potential benefits relative to multiple hazards and in some cases, the entire campus or university community. As shown, this table is illustrative of the ranking process based on the STAPLEE Criteria. The Results from **Table 7.1** and **Table 7.2** were combined to provide the final mitigation strategy ranking and prioritization illustrated in **Table 7.3**.

In this update to the USM DRU, University officials affirmed that the primary priorities indicated in the plan include:

1. To provide a safer environment for the University community by implementing measures to protect human health and safety.
2. To protect the assets of the University that represent a significant investment on the part of the taxpayers of the State of Mississippi.
3. To implement measures that will ensure continuity of operations so that the University may continue to fulfill its mission before, during, and after a significant natural disaster event.

The University's priorities concerning hazard mitigation have not changed. As the

University continues to invest and grow in terms of new facilities and campus population growth, these priorities become more important regardless of progress made through the implementation of mitigation measures.

TABLE 7.2 – STAPLEE CRITERIA RANKING

STAPLEE Criteria	S (Social)		T (Technical)			A (Admin.			P (Political)			L (Legal)			E (Economic)				E (Environmental)					Total
Considerations For Alternate Actions	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/ Water	Effects on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws	
Address facility condition assessment report deficiencies.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	21
Develop a comprehensive inventory of coastal distributed sites.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23
Digitization of paper records.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23
Evaluation and upgrade of access control systems.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	21
Continuation of the DRU Committee meeting and review process.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23
Development of college, school, and department-specific continuity of operations plans.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23
Development and implementation of a hazard preparation and response education and outreach program.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23
Develop and implement a Critical Incident Management training program for members of the Critical Incident Response Teams.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23

STAPLEE Criteria	S (Social)		T (Technical)			A (Admin.			P (Political)			L (Legal)			E (Economic)				E (Environmental)					
Considerations For Alternate Actions	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/ Water	Effects on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws	Total
Implement solutions to nuisance and flash flooding at the Hattiesburg campus.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	21
Implement solutions to nuisance and flash flooding at the GCRL (Halstead)	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	21
Implement solutions to nuisance and flash flooding at the Gulf Park Campus.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	21
Place power lines underground at Halstead.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+	+	+	+	+	20
Place power lines underground at Gulf Park.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+	+	+	+	+	20
Amend the DRU as appropriate to include elements of the updated Campus Master Plan (2024).	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23
Address electrical deficiencies (Hattiesburg Campus) when grid mapping is complete.	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Identify and implement contactless scenarios in restrooms and other common areas throughout all campuses.	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	22
Develop and implement an internal training program for the Infectious Disease / Pandemic Plan.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	23

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Table 7.3 provides a summary of the DRU Committee's ranking based on STAPLEE Criteria. This table also provides a total of the ranking results from **Tables 7.1** and **Table 7.2**.

TABLE 7.3 – MITIGATION RANKING SUMMARY TABLE

Strategy	Benefit Ranking	Staplee Ranking	Total
Address facility condition assessment report deficiencies.	167	21	188
Place power lines underground at Gulf Park.	166	20	186
Place power lines underground at Halstead.	165	20	185
Continuation of the DRU Committee meeting and review process.	157	23	180
Develop and implement a Critical Incident Management training program for members of the Critical Incident Response Teams.	157	23	180
Development of college, school, and department-specific continuity of operations plans.	155	23	178
Development and implementation of a hazard preparation and response education and outreach program.	155	23	178
Implement solutions to nuisance and flash flooding at the Hattiesburg campus.	153	21	174
Address electrical deficiencies (Hattiesburg Campus) when grid mapping is complete.	148	22	170
Implement solutions to nuisance and flash flooding at the GCRL (Halstead)	138	21	159
Implement solutions to nuisance and flash flooding at the Gulf Park Campus.	138	21	159
Develop and implement an internal training program for the Infectious Disease / Pandemic Plan.	131	23	154
Evaluation and upgrade of access control systems.	132	21	153
Amend the DRU as appropriate to include elements of the updated Campus Master Plan (2024).	130	23	153
Develop a comprehensive inventory of coastal distributed sites.	127	23	150
Digitization of paper records.	127	23	150
Identify and implement contactless scenarios in restrooms and other common areas throughout all campuses.	96	22	118

Specific mitigation activities will be implemented as time and resources are available to facilitate implementation. Some strategies with a lower ranking may be implemented before higher-ranking strategies primarily due to the ease of implementation, low cost of implementation, or other factors.

The final priority ranking of proposed mitigation strategies resulted from the quantitative analysis offered in **Tables 7.1 and 7.2**. However, those prioritization processes were not without input from the DRU Committee. Opportunities to override the quantitative rankings were provided to the committee based on their priorities, the priorities of the University, and input obtained from public meetings and other input processes.

8.0 PLAN IMPLEMENTATION, MAINTENANCE, AND EVALUATION

8.1 PLAN IMPLEMENTATION

The Office of the University Physical Plant will be the lead implementing unit within the University. The Physical Plant Management will work in concert with the Administration to implement the prioritized measures and will engage other units within the University as necessary and appropriate to assist with implementation activities. In addition to general oversight of implementation, the Physical Plant will identify specific work to be completed, timelines for completion, estimated project costs, and identification of potential funding sources. It is understood that some measures may be implemented without the assistance of external funding. In those cases, the Physical Plant, working through the University's budgeting process, will assign those projects for implementation as internal budget resources allow.

8.2 PLAN MAINTENANCE, EVALUATION, AND REVISION

The DRU Committee, as the lead planning group for the development of the Hazard Mitigation Plan, will continue to serve in an advisory role for plan maintenance, evaluation, and subsequent revisions to the plan. The DRU Committee will meet twice per year to ensure that implementation schedules are being followed and to ensure the plan continues to be relevant to actual campus conditions. A recommended meeting schedule will include one meeting per semester, with one conducted in the fall semester and one in the spring semester. Plan updates will continue to be an ongoing task and will be reported to the DRU Committee for their comment, input, and approval. A plan implementation worksheet is included in **Appendix E** and is designed as a tool for the DRU Committee to monitor implementation progress.

During its fall meeting, the DRU Committee evaluates the plan's overall functionality and relevance to current conditions. The purpose of this evaluation is to analyze current conditions on campus and changes since the previous fall meeting that necessitate changes to the plan. In determining the need for plan updates, the DRU Committee will consider the following criteria:

1. New construction or planned construction of buildings that warrant consideration in the mitigation planning process,
2. Identification of additional risks or vulnerabilities that may be attributed to material changes on campus (significant population increases, new construction, etc.),
3. Identification of new mitigation strategies to be added to the plan or existing strategies that have been determined infeasible and need to be removed from the plan. It is important to note that new strategies should be subjected to the same level of review and analysis as the initial strategies to ensure potential effectiveness,
4. New legislation, campus policies, or other rules, laws, or regulations that have the potential to impact the effectiveness of implementation, and
5. Other conditions or changes that warrant significant review, changes, or updates to the plan.

The spring semester meeting of the DRU Committee will include discussions and activities as necessary to update major components of the plan based on changing conditions on campus and also based on discussions and materials presented in the fall meeting. These discussions will consider ongoing implementation activities and the impacts, if any, of hazard events occurring since the previous meeting. Specific attention will be paid to the effectiveness of implemented strategies as they relate to hazard events that may have occurred since the last meeting. This meeting will also provide an opportunity for discussion of additional mitigation strategies that may need to be incorporated into the plan. The DRU Committee may choose to update the plan on an annual basis as needed or may choose to wait until the five-year required update. In either case, the DRU Committee shall follow the appropriate process for updating the plan including elements related to public outreach, approval by the DRU Committee as a whole, and submission to MEMA and FEMA for their concurrence. All committee meetings will be open to the University community and the general public. However, the spring semester meeting will be advertised as a public meeting in general local publications including the local and campus newspapers and the University website.

The plan must be considered for a major update every five years. If significant changes are made to the plan at the five-year interval, MEMA and FEMA will be notified of major upgrades to the plan and the updated plan will be submitted to them for concurrence. In addition, all major plan upgrades must be provided to the University Administration and neighboring jurisdictions including the Cities of Hattiesburg, Long Beach, Ocean Springs, and Forrest County. To facilitate communication of proposed plan changes to neighboring communities, a public hearing will be conducted before the adoption and submission of comprehensive plan updates. These public hearings will be advertised in local and campus news outlets as well as on the University's website.

The University of Southern Mississippi's DRU Plan will be considered as part of the University's overall planning process and will interface directly with the Capital Improvement Plan and the Campus Master Plan. This is to ensure that all new construction planning on campus will consider mitigation strategies in the siting and design of new facilities on campus. In addition, all new structures on campus will be classified as Critical, High Priority, Medium Priority, or Low Priority and incorporated into **Tables 5.0 – 5.11** as appropriate.

Appendix A: Sign-in Sheets for DRU Committee Meetings

University of Southern Mississippi
Disaster Resistant University Plan
2023 Plan Update Project Kick-Off Meeting
February 24, 2023

Meeting Agenda

1. DRU Advisory Committee
    a. Meeting Schedule
2. General Discussion of Applicable Hazards
3. University Asset Inventory/Map
    a. Insurance Valuation of Assets
4. Mitigation Strategies
5. Invoicing and Reporting
6. Other Discussion

University of Southern Mississippi
Disaster Resistant University Plan
2023 Plan Update Project Kick-Off Meeting
February 24, 2023

Meeting Agenda

1. DRU Advisory Committee ✓
   a. Meeting Schedule
2. General Discussion of Applicable Hazards
3. University Asset Inventory/Map
   a. Insurance Valuation of Assets
4. Mitigation Strategies
5. Invoicing and Reporting
6. Other Discussion

Attendance Record

Name	Email	Title	Organization
Jay Estes	jestes@allens.com	Principal	Allen Engineering
DAVID BOUNDS	David.Bounds@usm.edu	SENIOR ASSOC. DIR	USM PHY. PLANT
CLINT ATKINS	Clint.Atkins@usm.edu	[illegible]	USM

University of Southern Mississippi
Disaster Resistant University Plan
Gulf Coast Advisory Committee
October 23, 2023

Meeting Agenda

1. Welcome
2. Plan History
3. DRU Plan Objectives
4. DRU Planning Process
5. Hazards of Concern
6. Gulf Coast Geography & Assets
7. Mitigation Goals & Strategies
    a. Mitigation Strategy Examples
8. Open Discussion

University of Southern Mississippi
Disaster Resistant University Plan Update (2023)
Gulf Coast Advisory Committee Meeting

October 23, 2023

Name	Title	Email
JOBY BASS	ASSOC PROF	joby@usm.edu
LUCAS APPLEWHITE	Dir. Facilities Planning & Management	lucas.applewhite@usm.edu
Jay Estes	AllenES Senior Principal Planner	jestes@allenes.com
Tracie Sempier	Coastal Resilience Specialist MASGC	tracie.sempier@usm.edu
Jacob Breland	AVP Academic Affairs	jacob.breland@usm.edu
JASON CANTU	ARCHITECT	JASON.CANTU@usm.edu
Rusty Keyes	Chief of Police	Rusty.Keyes@usm.edu
Leila Hamdan	AVPR-CO	leila.hamdan@usm.edu

University of Southern Mississippi
Disaster Resistant University Plan
Hattiesburg Campus Advisory Committee
November 28, 2023

Meeting Agenda

1. Welcome

2. Plan History

3. DRU Plan Objectives

4. DRU Planning Process

5. Hazards of Concern

6. Geography & Assets

7. Mitigation Goals & Strategies
    a. Mitigation Strategy Examples

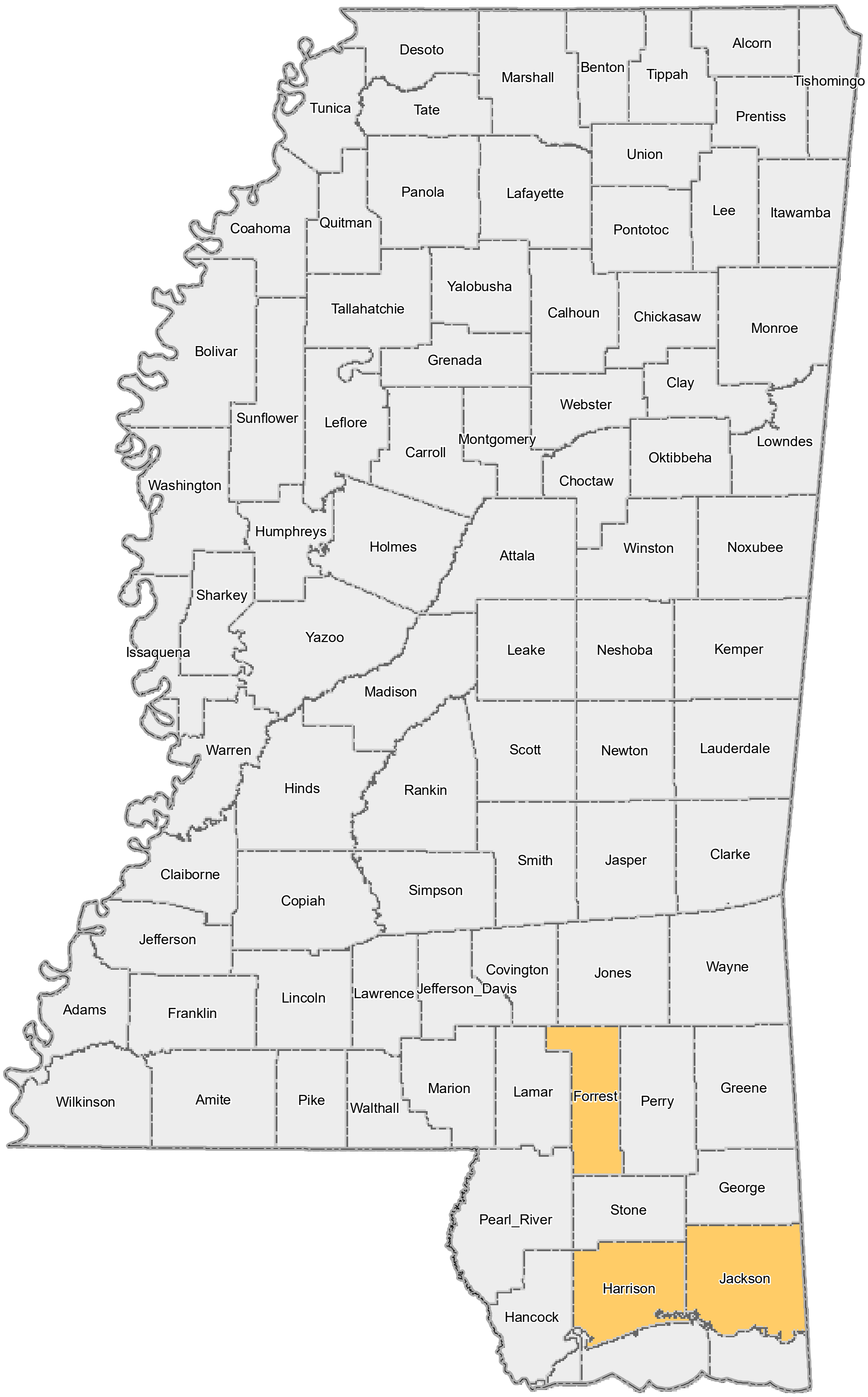
8. Open Discussion

University of Southern Mississippi
Disaster Resistant University Plan Update (2023)
Hattiesburg Campus Advisory Committee Meeting

November 28, 2023

Name	Title	Email
Clint Atkins	USM	clint.atkins@usm.edu
Sirena Cantrell	AVP & Dean of Students	sirena.cantrell@usm.edu
David A. Bounds	USM Phy. Plant	David.Bounds@usm.edu
Shana Riles	USM Phy Plant	shana.riles@usm.edu
Brian Hauff	USM Physical Plant	brian.hauff@usm.edu

Appendix B: Maps



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LEGEND

- State of Mississippi Boundary
- Mississippi Counties
- Forrest, Jackson, Harrison County

N W E S

0 107,500 215,000 Feet

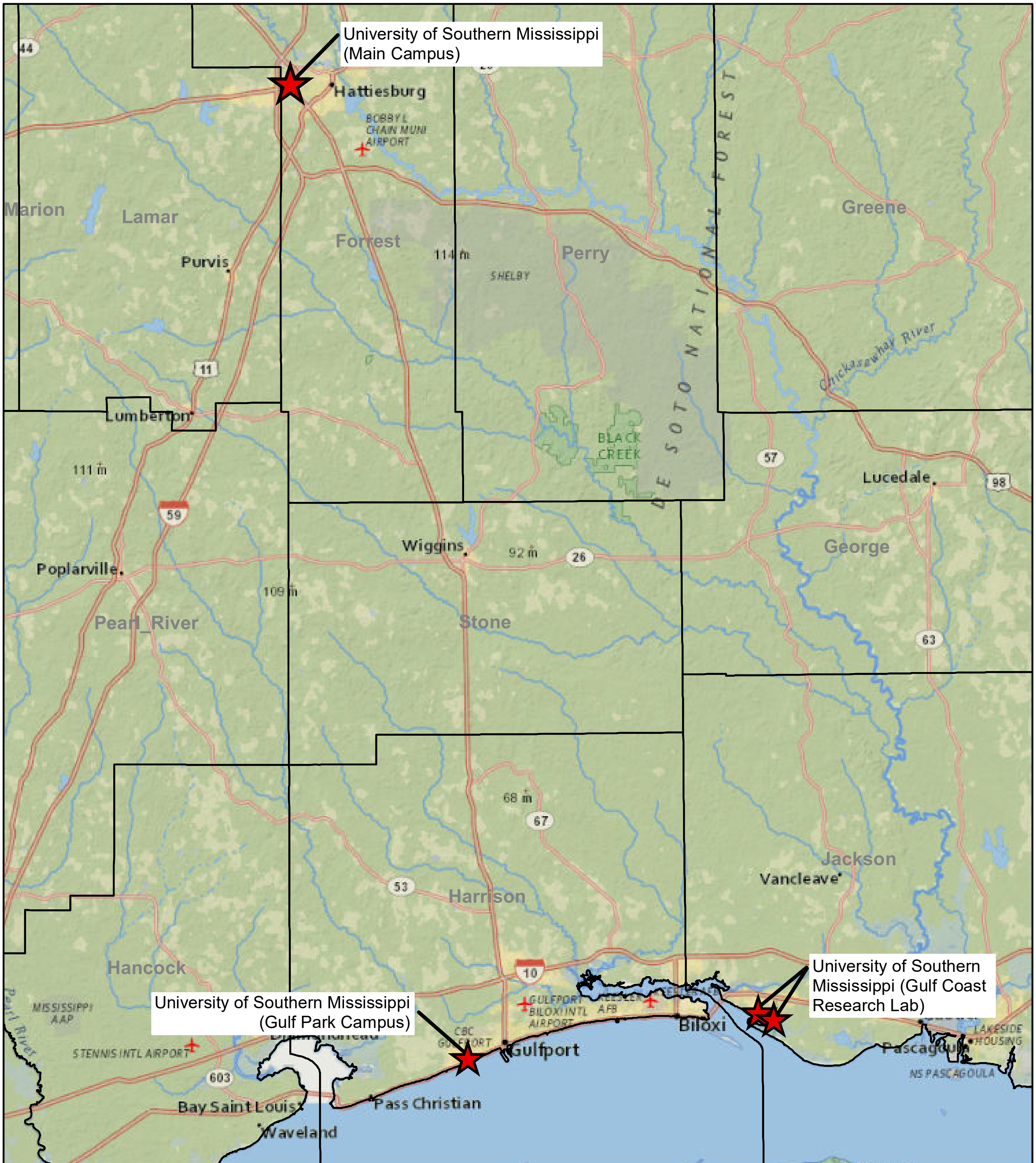
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 215,000'	CHKD BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 FIG. 4.1 GL OF USM	

GEOGRAPHICAL LOCATION OF USM (STATE)

FIGURE 4.1



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LEGEND

★ Approximate University of Southern Mississippi Campus Locations

Source: National Geographic World Map

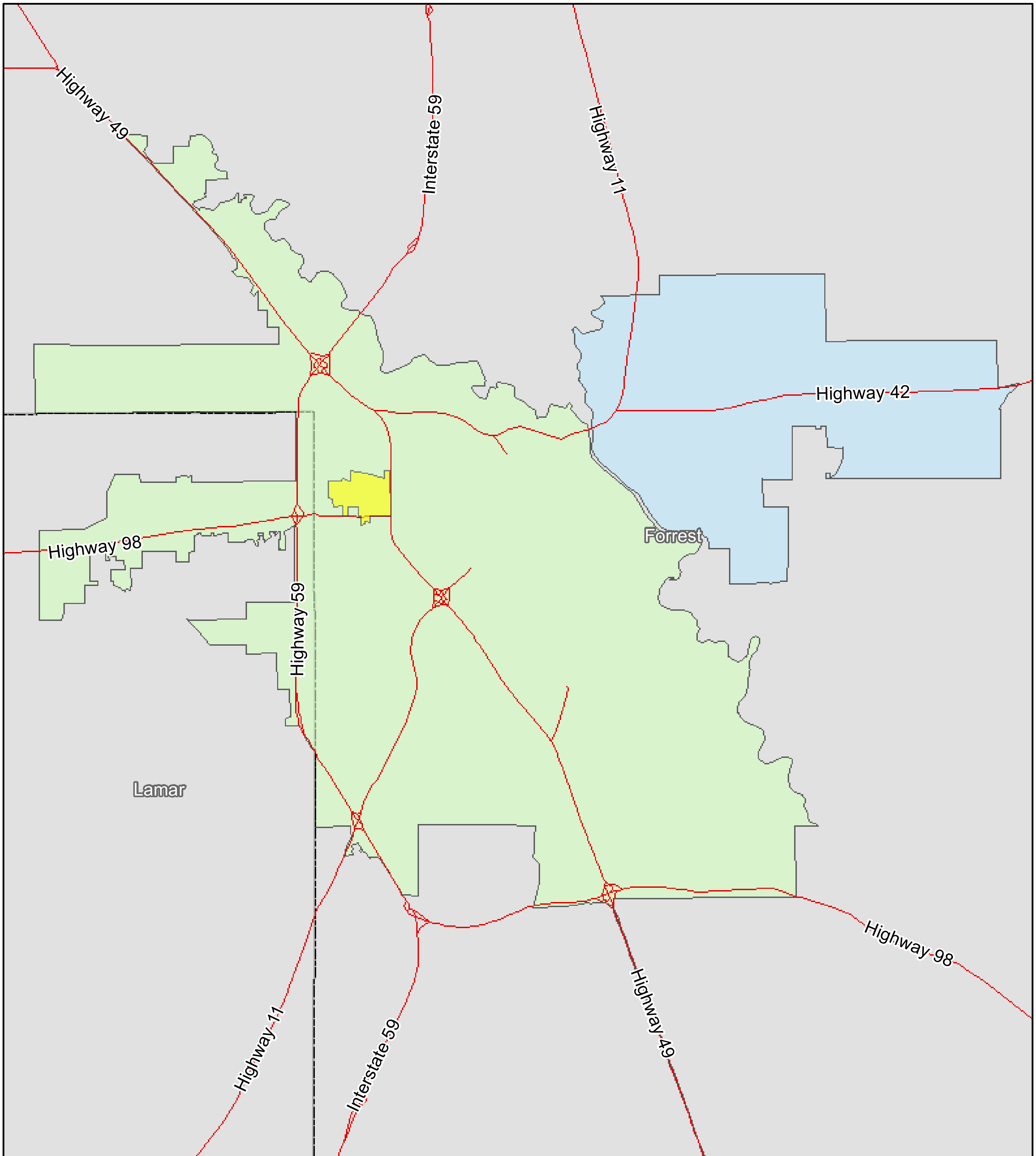
0 25,000 50,000 Feet

N

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE: 1"=50,000'	DRAWN BY: PML	DATE: 10-25-2016
	CHKD BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 D00 FIG. 4.2 GL	
GEOGRAPHICAL LOCATION OF USM (REGIONAL)		FIGURE 4.2



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LEGEND

- Counties
- City of Petal
- City of Hattiesburg
- USM Boundary
- Major Interstates/Highways

N W E S

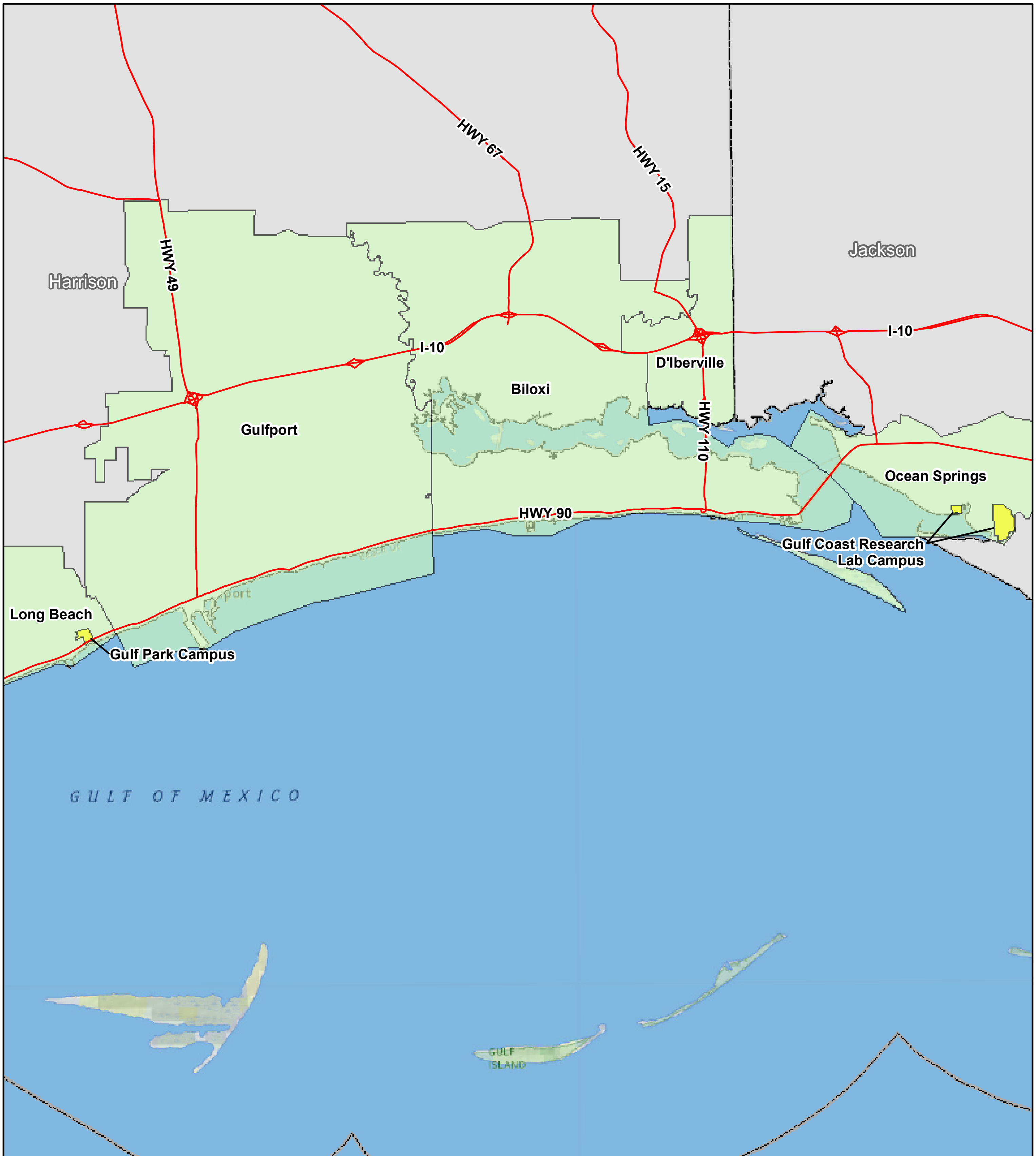
0 5,000 10,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 10,000'	CHKD BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 4.3 GL of USM	

GEOGRAPHICAL LOCATION OF USM (REGIONAL) — FIGURE 4.3



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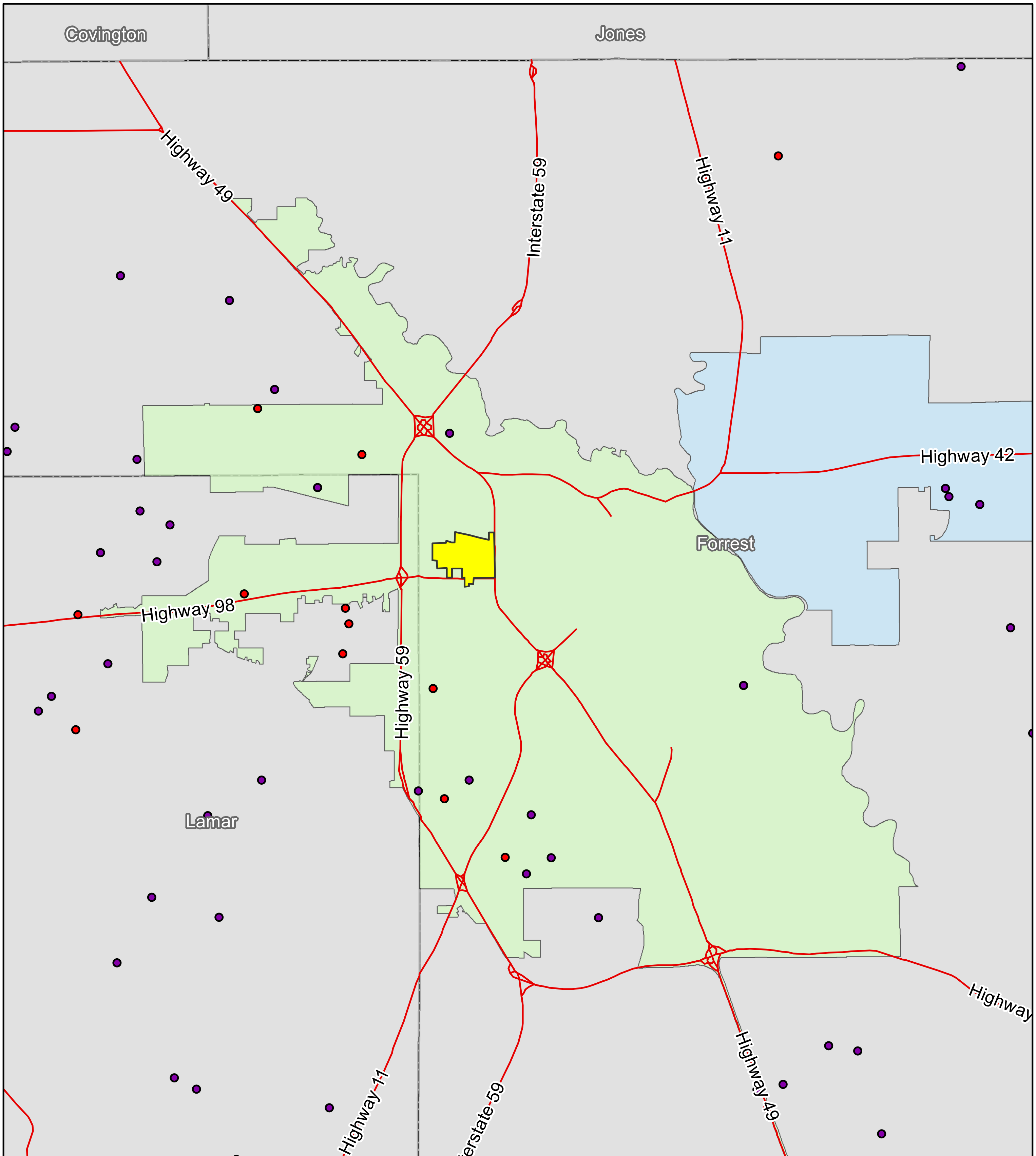
LEGEND

- Counties
- City Limit Boundaries
- USM Gulf Park Campus and Gulf Coast Research Lab Campus
- Major Interstates/Highways

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 16,000'	CHKD BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 4.4 GL of USM	
GEOGRAPHICAL LOCATION OF USM (REGIONAL)		FIGURE 4.4



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LEGEND

- Counties
- City of Petal
- City of Hattiesburg
- USM Boundary
- Major Interstates/Highways

DAMS

Hazardous Dams (2023)

- High Hazard
- Low Hazard

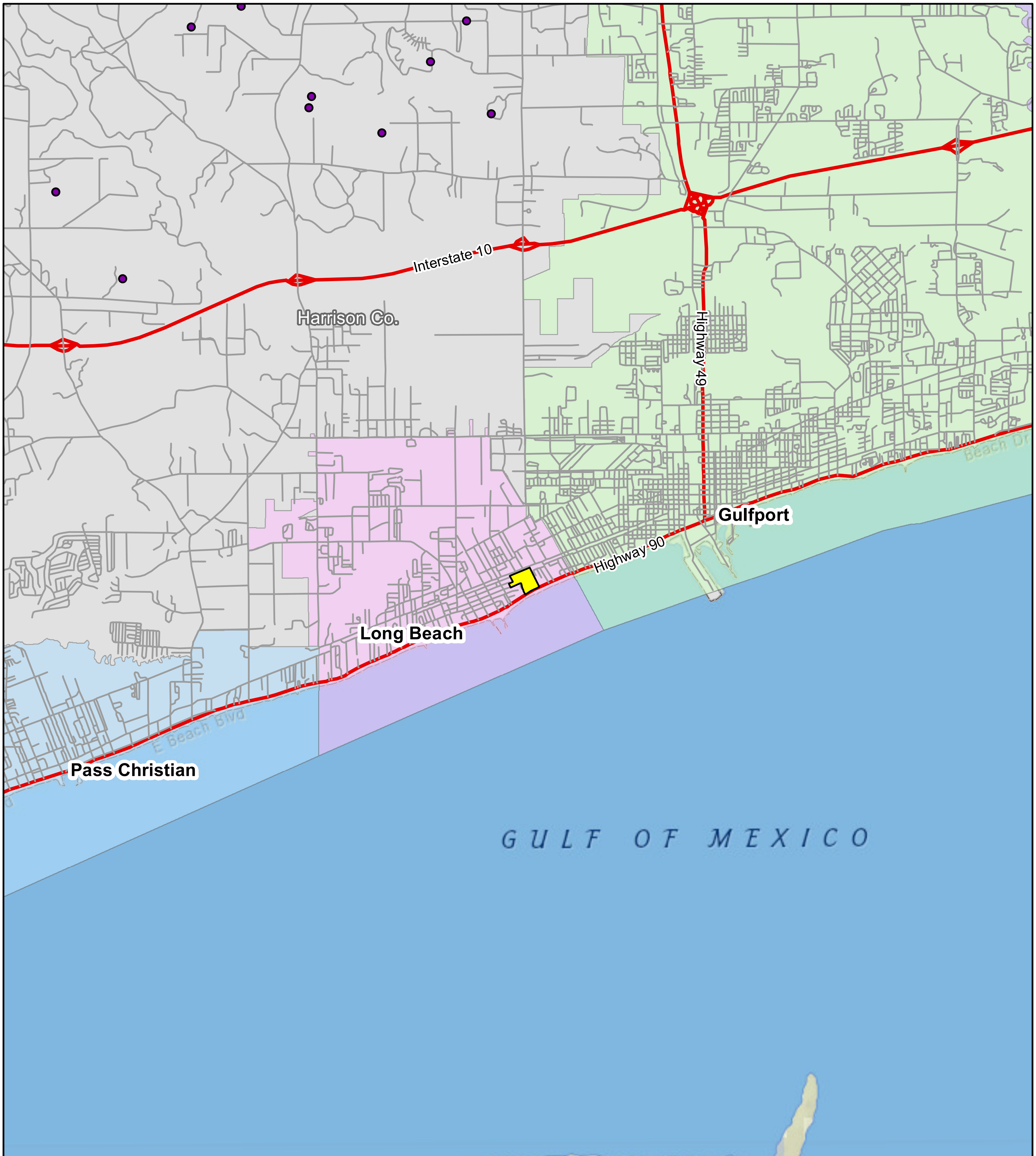
N W E S

0 5,000 10,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE 1" = 10,000'	DRAWN BY: OB	DATE: 03-20-2024
	CHKD BY: JE	DATE: 03-20-2024
PROJECT NO. 23033	FILE 23033 032024 R00 D FIG. 4.5 DAMS	
DAMS IN FORREST AND LAMAR COUNTY	FIGURE 4.5	



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LEGEND

- Counties
- Gulfport
- Long Beach
- Pass Christian
- USM Boundary
- Major Interstates/Highways

DAMS

Hazardous Dams (2023)

- High Hazard
- Low Hazard

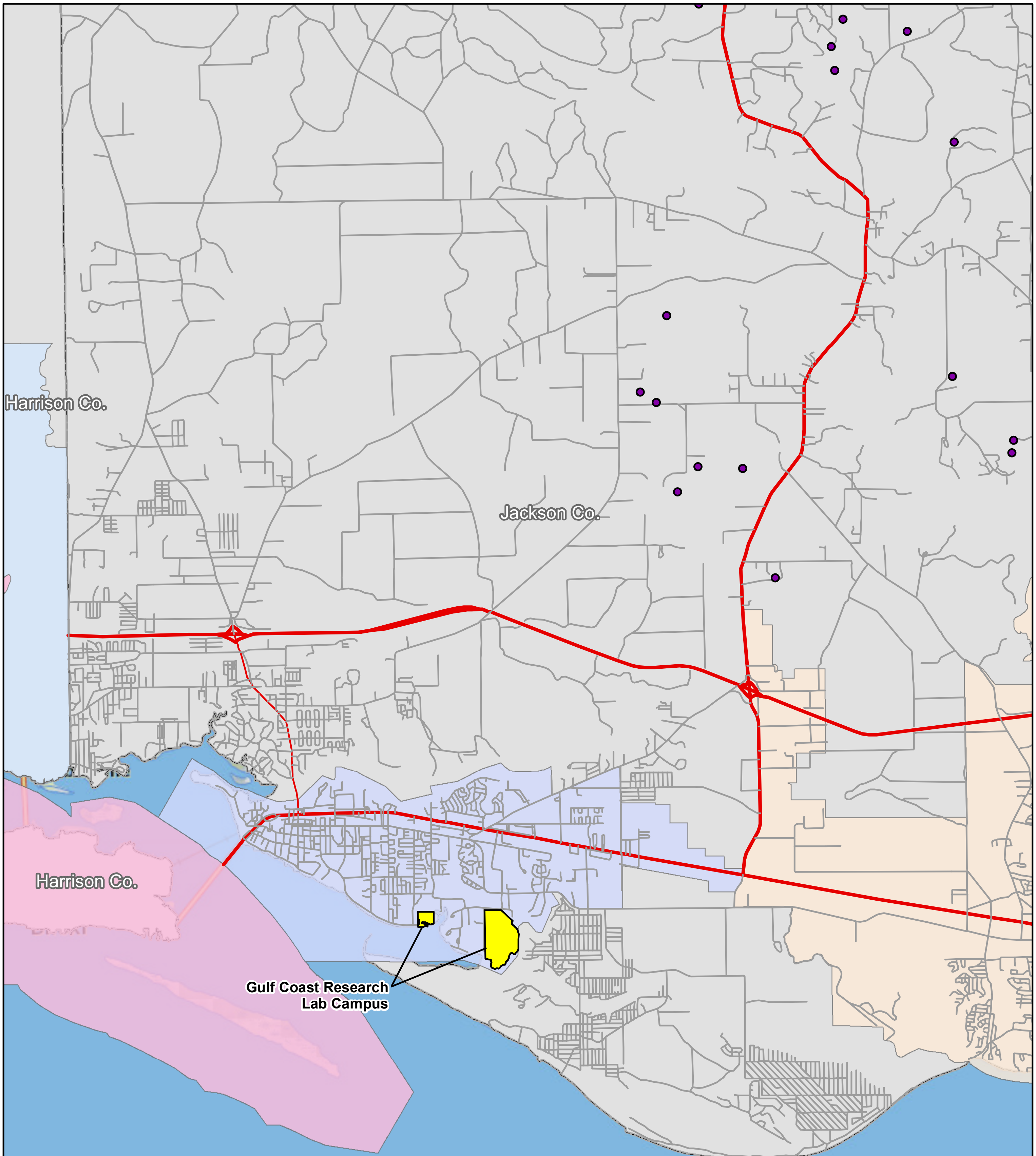
N W E S

0 5,000 10,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: OB	DATE: 03-20-2024
1" = 10,000'	CHKD BY: JE	DATE: 03-21-2024
PROJECT NO. 23033	FILE 23033 032024 R00 D FIG. 4.6 DAMS	
DAMS IN HARRISON COUNTY	FIGURE 4.6	



LEGEND

- Mississippi Counties
- Biloxi
- D'Iberville
- Gautier
- Ocean Springs
- USM Boundary
- Major Interstates/Highways

DAMS

Hazardous Dams (2023)

- High Hazard
- Low Hazard

N
W E
S

0 5,000 10,000
Feet

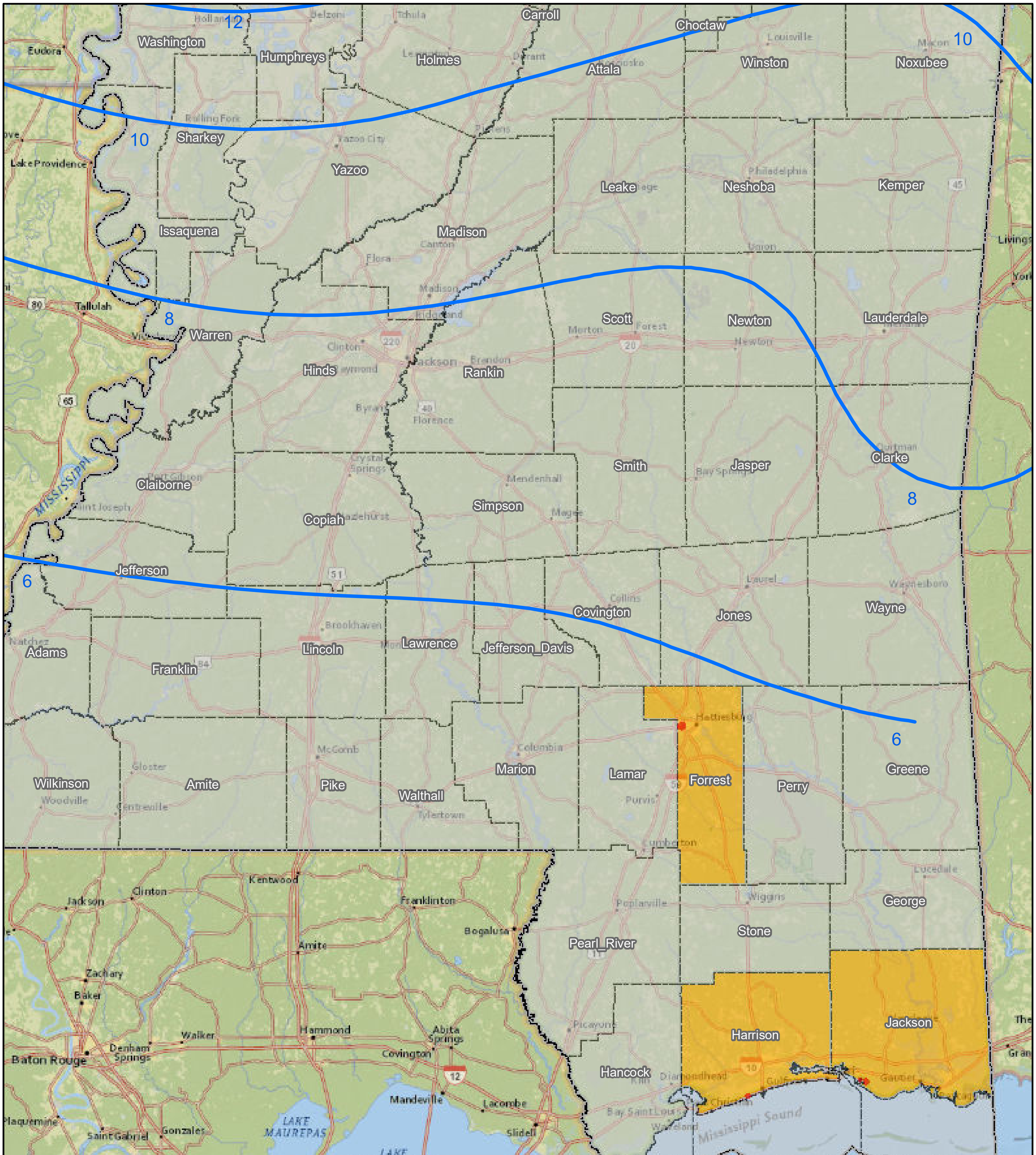
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE 1" = 10,000'	DRAWN BY: OB	DATE: 03-21-2024
	CHKD BY: JE	DATE: 03-21-2024
PROJECT NO. 23033	FILE 23033 032124 R00 D FIG. 4.7 DAMS	

DAMS IN JACKSON COUNTY

FIGURE 4.7



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LEGEND

- State of Mississippi Boundary
- Mississippi Counties
- Forrest, Jackson & Harrison County
- USM Boundary
- Earthquake Intensity Zones

N W E S

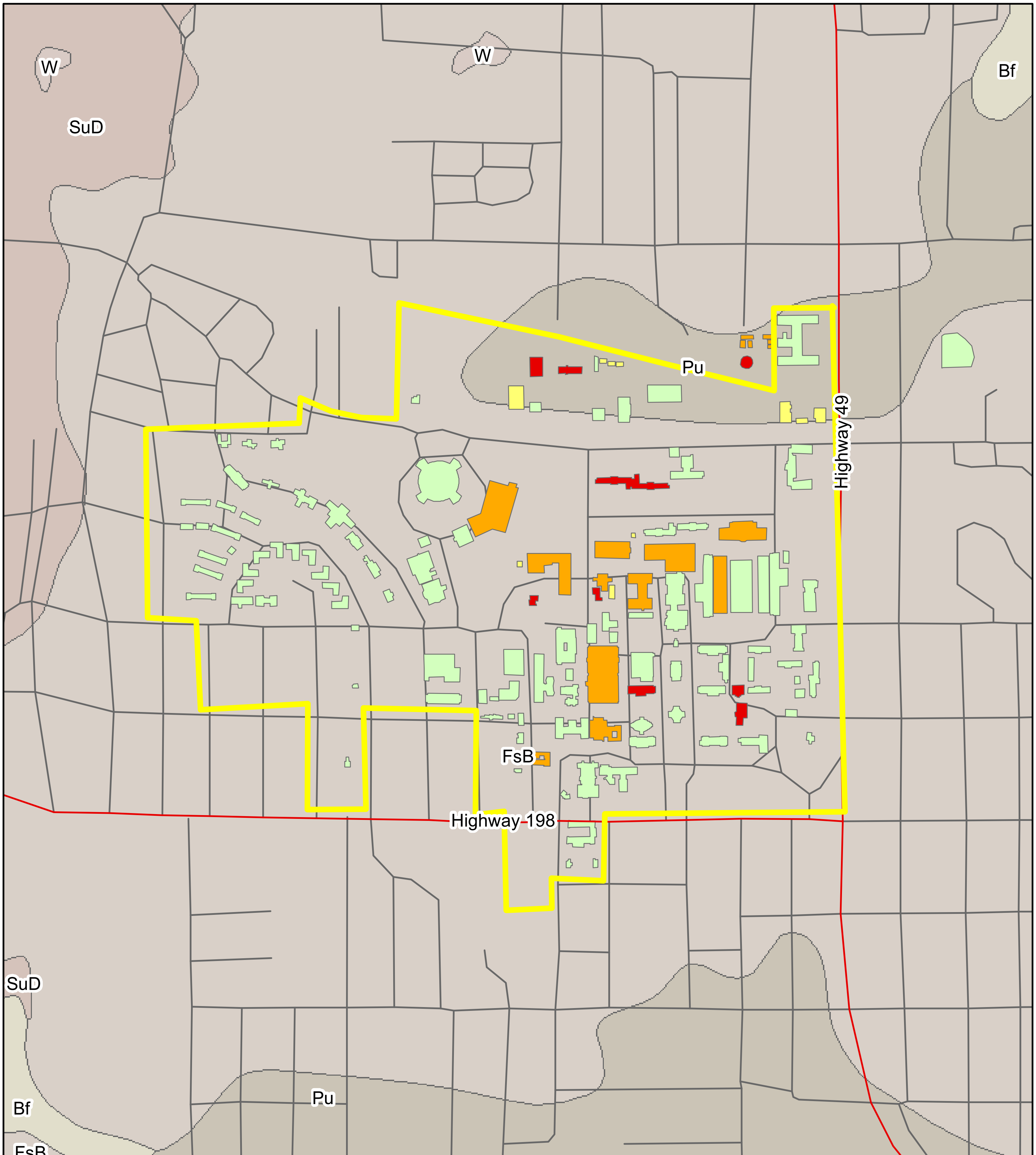
0 62,500 125,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 125,000'	CHKD BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 4.8 EIZ	

EARTHQUAKE INTENSITY ZONES — FIGURE 4.8



LEGEND

- USM Boundary
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

Soils

- Bf - Bibb silt loam
- FsB - Falkner-Susquehanna-urban land complex
- Pu - Prentiss-urban land complex
- SuD - Susquehanna silt loam, 5-12% slopes
- W - Water

N W E S

0 450 900 Feet

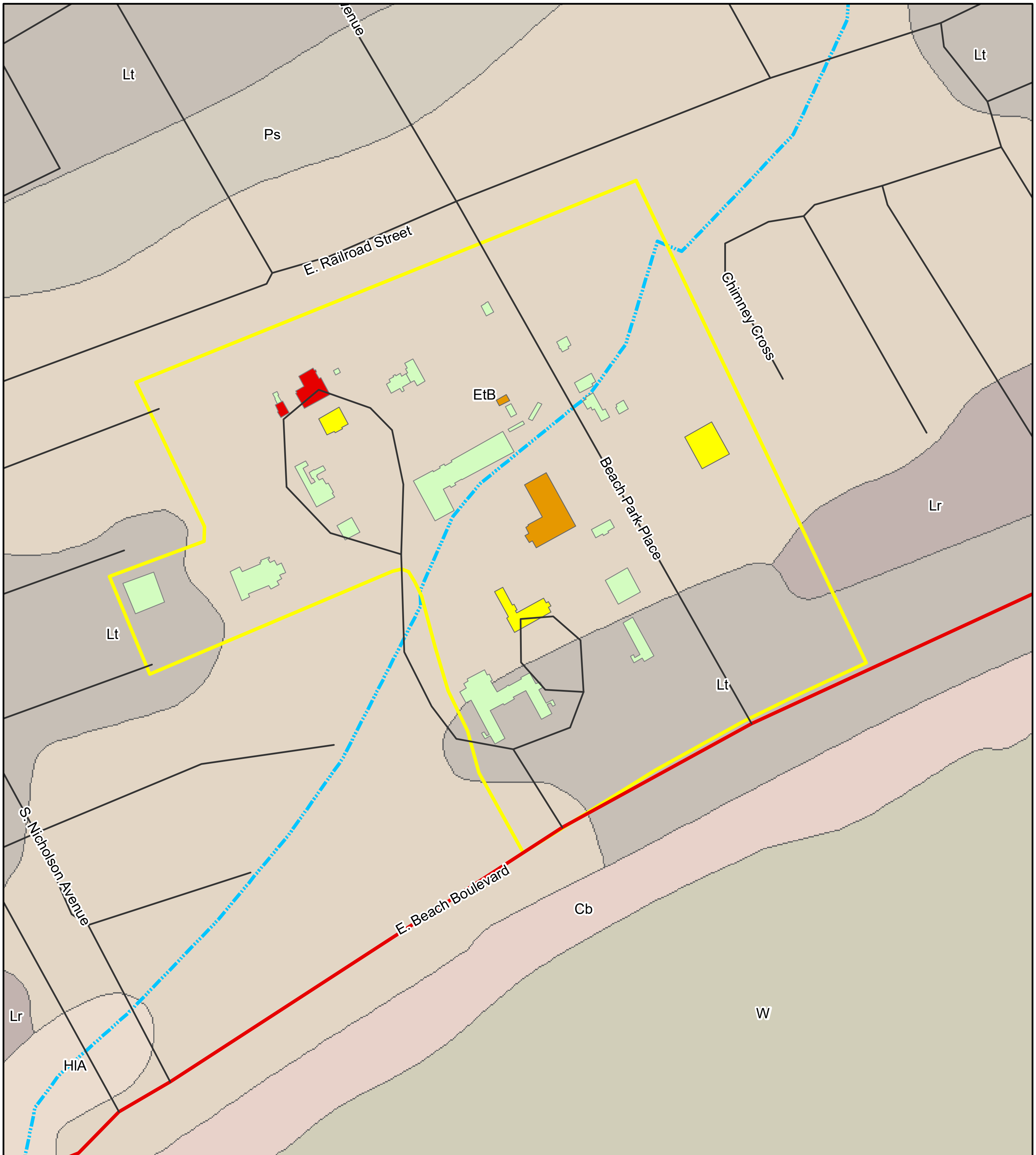
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 900'	CHECKED BY: KM	DATE: 10-25-2016

PROJECT NO.	FILE
16067	16067 102516 R00 D FIG. 6.1 PST-USM

PREDOMINANT SOIL TYPES - USM CAMPUS	FIGURE 6.1



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LEGEND

- USM Boundary
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

Soils

- HIA - Harleston fine sandy loam 0-2
- Lr - Lakeland fine sand
- Lt - Latonia loamy sand
- Ps - Ponzer and Smithton soils
- Cb - Coastal beach
- W - Water

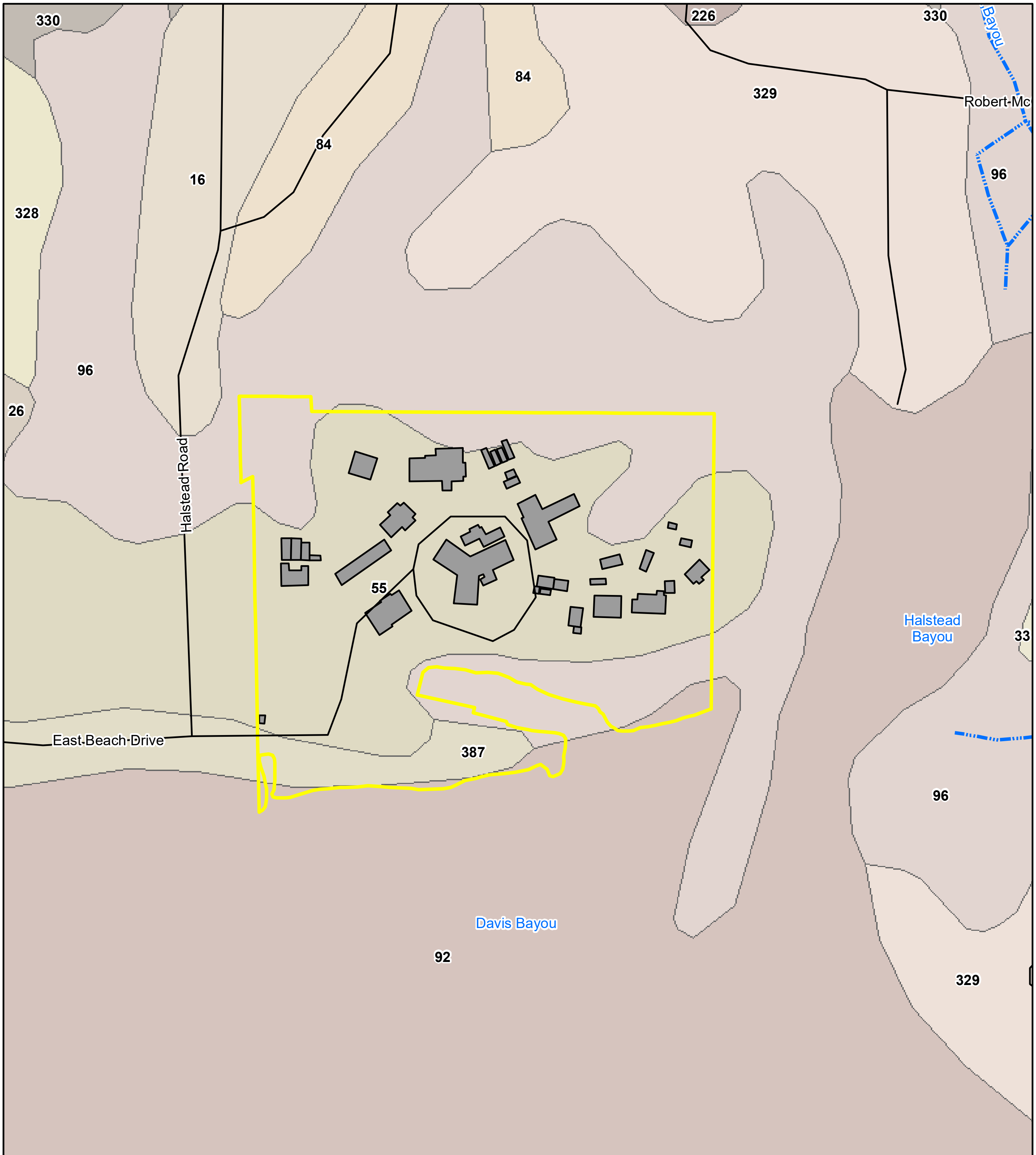
N W E S

0 200 400 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE 1" = 400'	DRAWN BY: PML	DATE: 10-25-2016
	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.2 PST-GP	
PREDOMINANT SOIL TYPES - USM - GULF PARK CAMPUS		FIGURE 6.2



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LEGEND

- USM Boundary
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

Soils

- 55 - Ocilla loamy sand 0-2
- 92 - Water gt 40 acres
- 96 - Handsboro mucky silt loam FF
- 387 - Beaches

N W E S

0 200 400 Feet

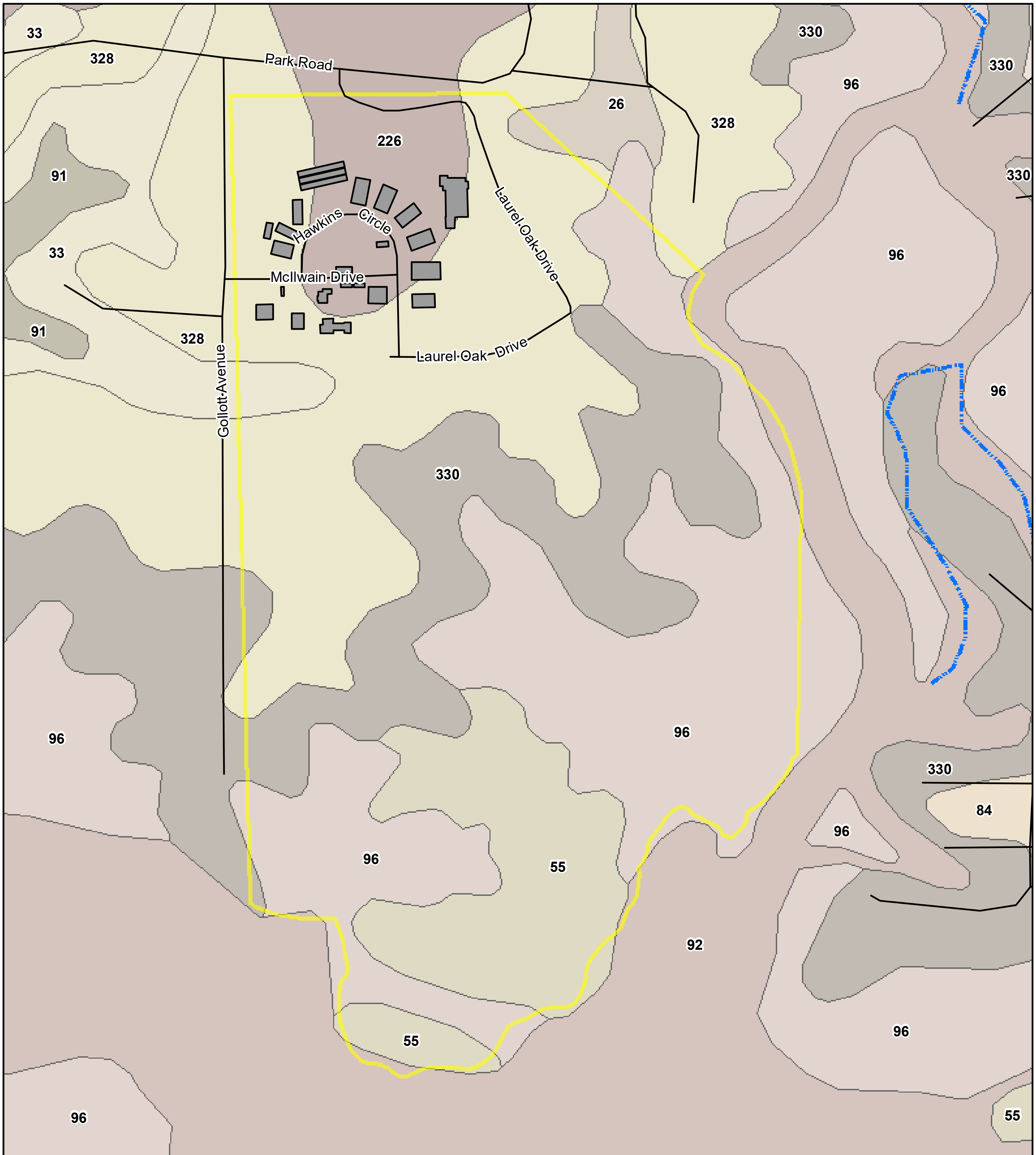
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 400'	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.3 PST-GP	

PREDOMINANT SOIL TYPES - USM - GULF COAST RESEARCH LAB CAMPUS

FIGURE 6.3



LEGEND

- USM Boundary
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

Soils

- 26 - Smithton loam 0-1 OF
- 33 - Escambia very fine sandy loam
- 55 - Ocilla loamy sand 0-2
- 92 - water gt 40 acres
- 96 - Handsboro mucky silt loam FF
- 226 - Bayou sandy loam 0-1
- 328 - Harleston fine sandy loam 0-2
- 330 - Harleston fine sandy loam 5-8

N
W E
S

0 200 400 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

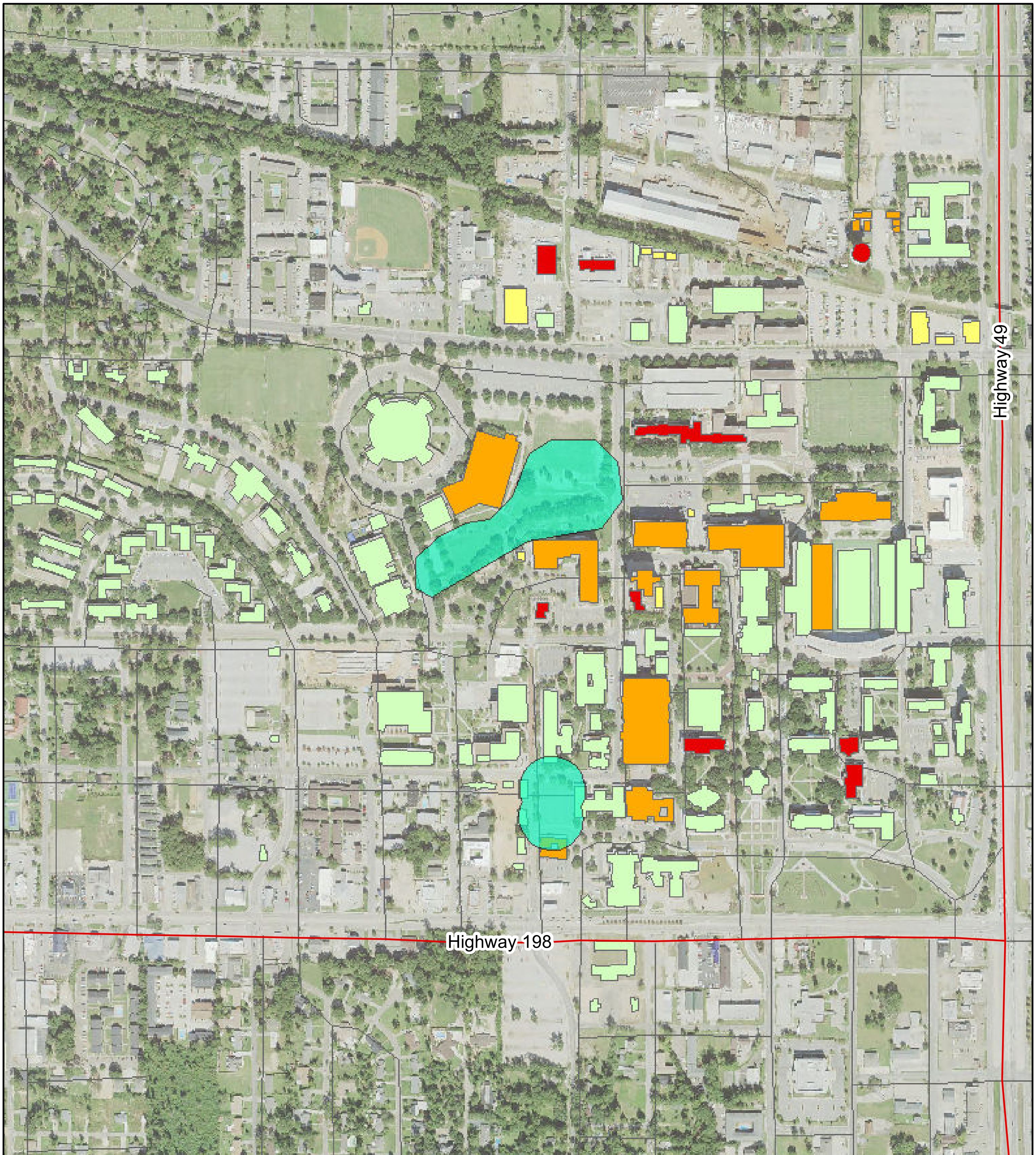
ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 400'	CHECKED BY: KM	DATE: 10-25-2016

PROJECT NO.	FILE
16067	16067 102516 R00 D FIG. 6.4 PST-GP

PREDOMINANT SOIL TYPES - USM - GULF COAST RESEARCH LAB CAMPUS

FIGURE 6.4



LEGEND

- Flash Flood Prone Areas
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

N
W E
S

0 300 600
Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE 1" = 600'	DRAWN BY: PML	DATE: 10-25-2016
	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.5 FFPA	
FLASH FLOOD PRONE AREAS - USM MAIN CAMPUS		FIGURE 6.5

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LEGEND

- USM Boundary
- Flash Flood Prone Areas
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

N W E S

0 200 400 Feet

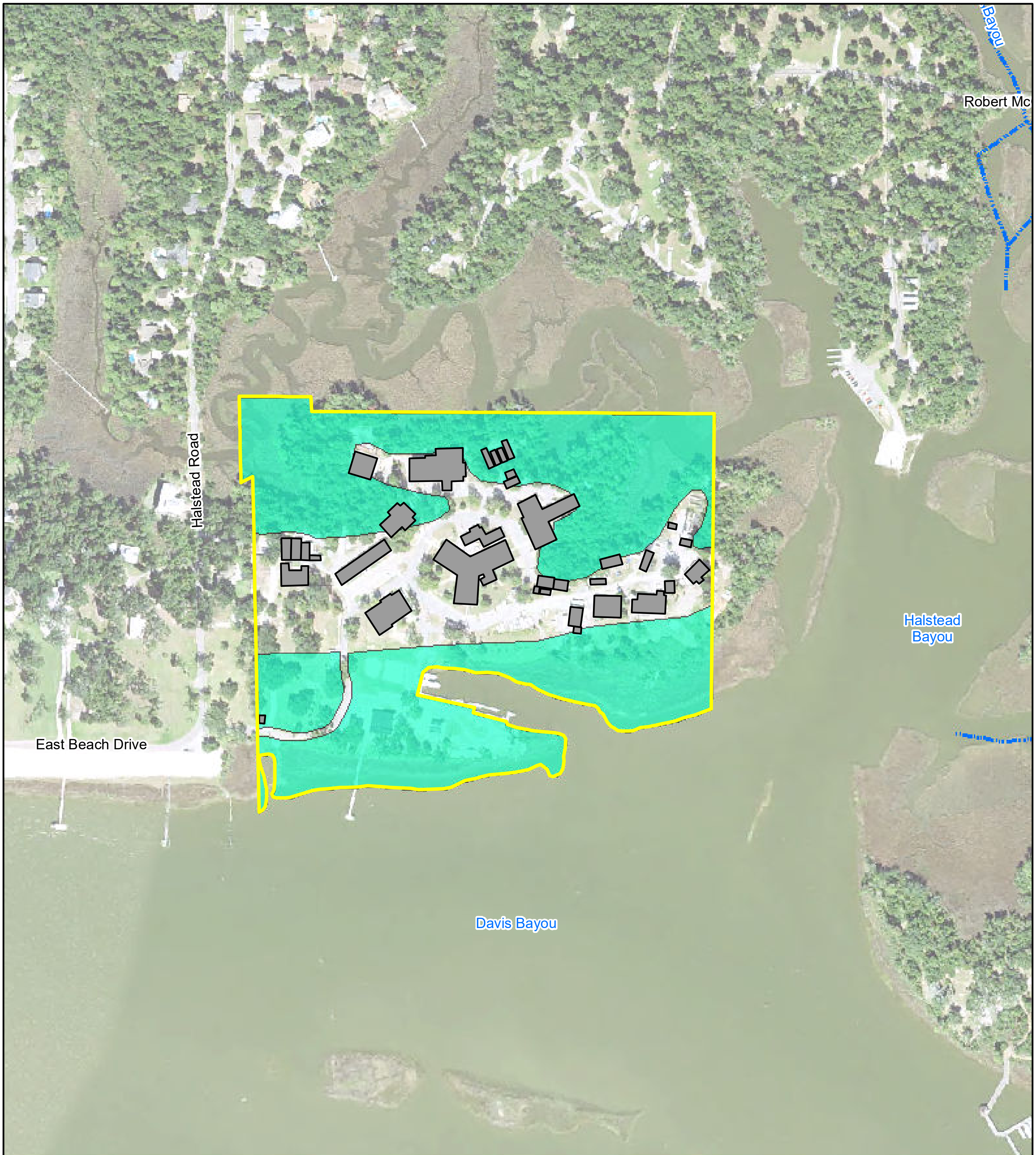
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 400'	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.6 PST-GP	

FLASH FLOOD PRONE AREAS - USM - GULF PARK CAMPUS

FIGURE 6.6



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LEGEND

- USM Boundary
- Flash Flood Prone Areas
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

N W E S

0 200 400 Feet

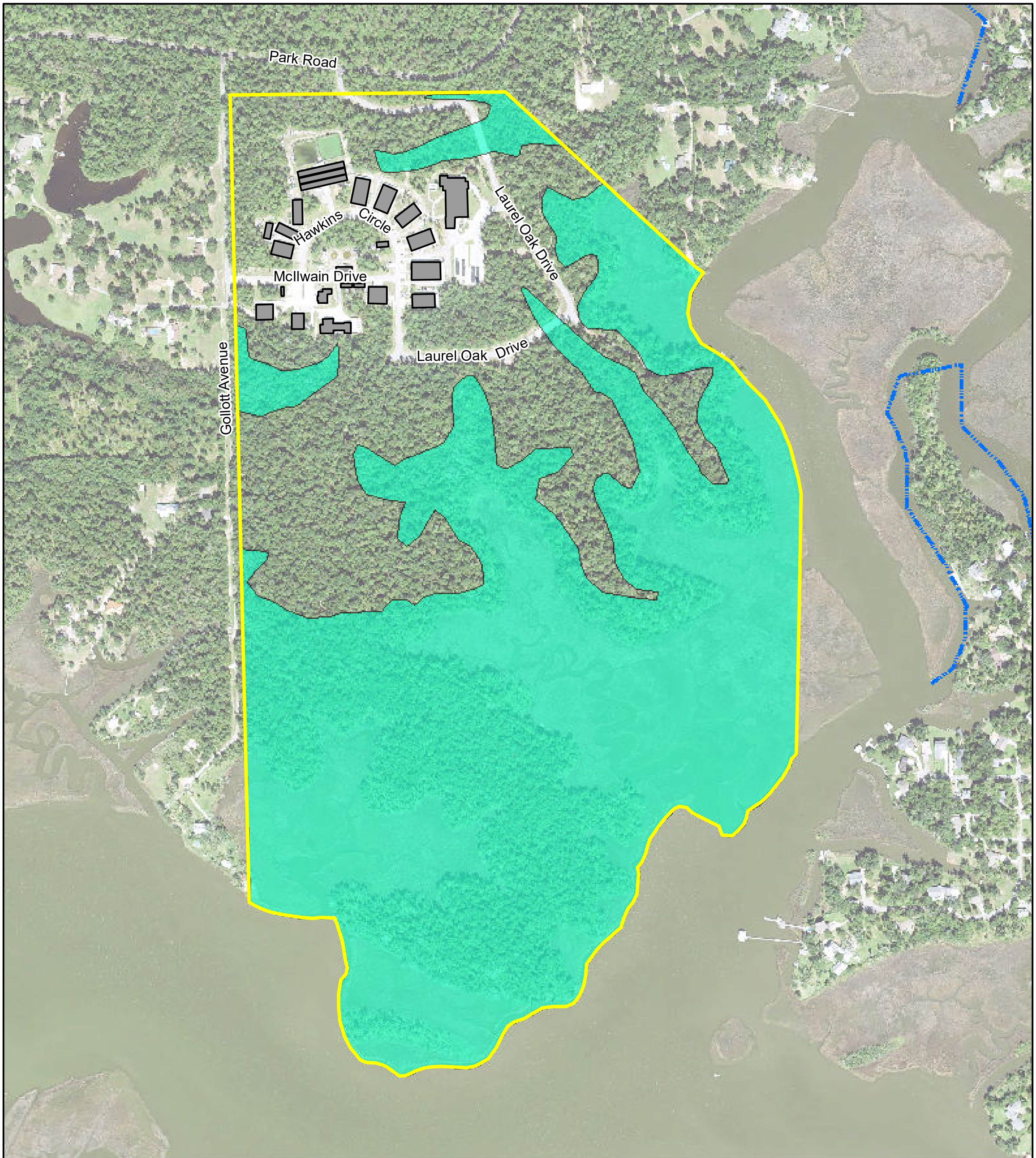
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 400'	CHECKED BY: KM	DATE: 10-25-2016

PROJECT NO.	FILE
16067	16067 102516 R00 D FIG. 6.7 PST-GP

FLASH FLOOD PRONE AREAS - USM - GULF COAST RESEARCH LAB CAMPUS	FIGURE 6.7



LEGEND

- USM Boundary
- Flash Flood Prone Areas
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

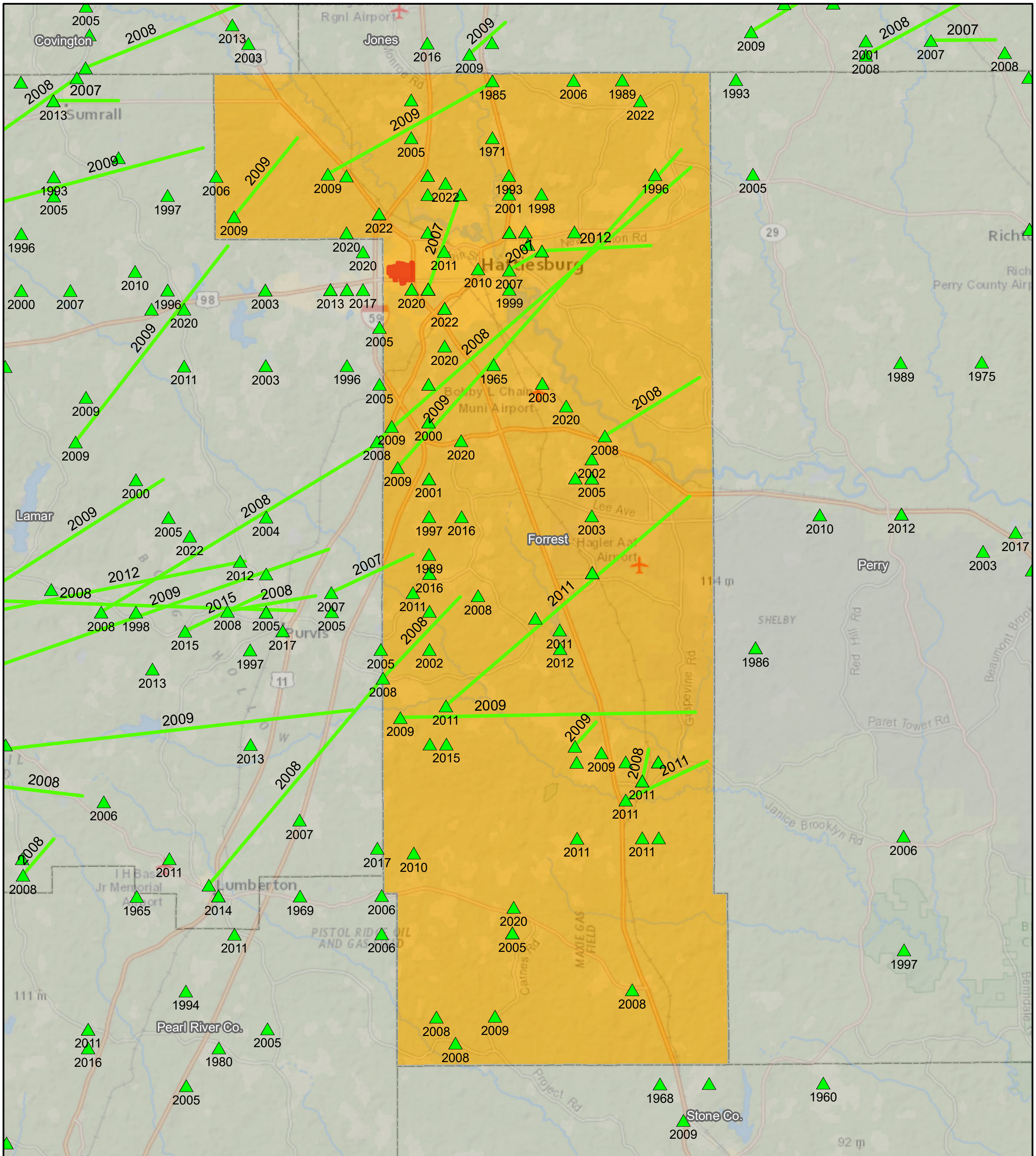
N W E S

0 300 600 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE 1" = 600'	DRAWN BY: PML	DATE: 10-25-2016
	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.8 PST-GP	
FLASH FLOOD PRONE AREAS - USM - GULF COAST RESEARCH LAB CAMPUS	FIGURE 6.8	



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LEGEND

- Mississippi Counties
- Forrest County
- USM Boundary
- 2008 Hail Storm Location by Year (1955-2022)
- 2008 Hail Storm Path by Year

Source: NOAA's Storm Predicition Center / SVRGIS

N W E S

0 12,500 25,000 Feet

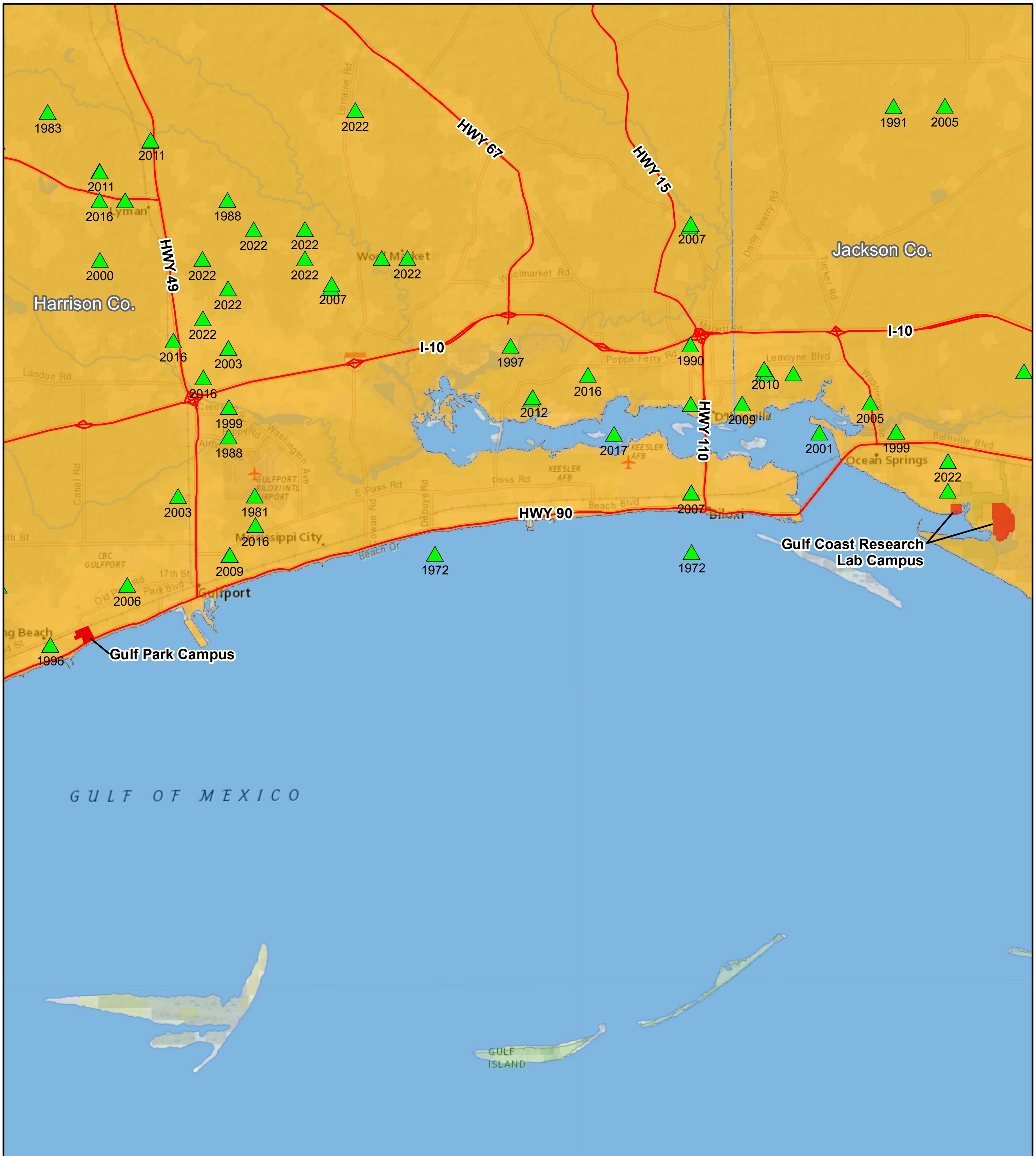
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: OB	DATE: 03-21-2024
1" = 25,000'	CHECKED BY: JE	DATE: 03-21-2024
PROJECT NO. 23033	FILE 23033 032124 R00 D FIG. 6.1 HHSFC	

HISTORICAL HAIL STORMS IN FORREST COUNTY BY YEAR

FIGURE 6.9



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LEGEND

- Mississippi Counties
- Harrison & Jackson County
- USM Boundary
- 2008 — Hail Storm Location by Year (1955-2022)

Source: NOAA's Storm Predicition Center / SVRGIS

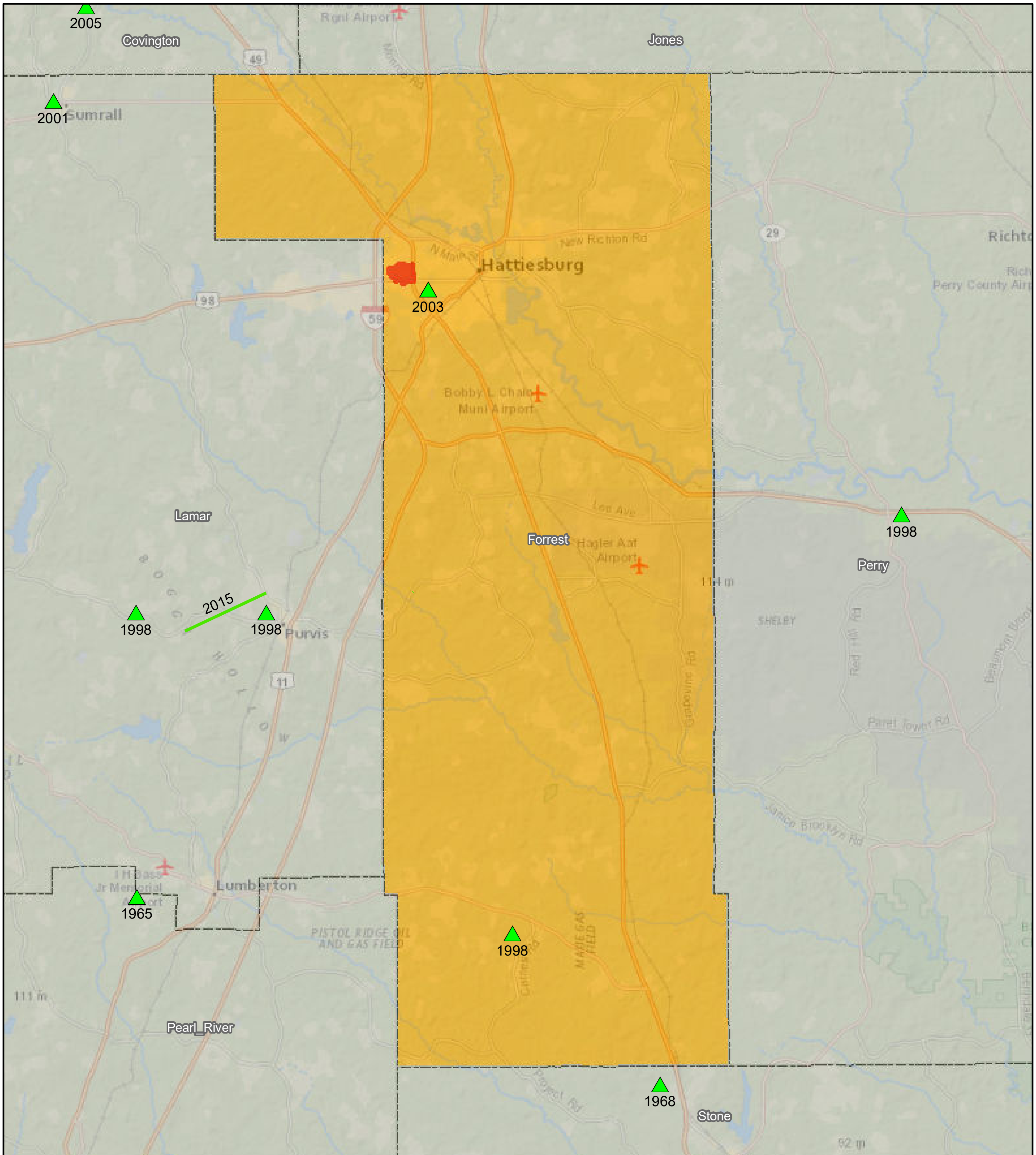
N W E S

0 8,000 16,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: OB	DATE: 03-21-2024
1" = 16,000'	CHECKED BY: JE	DATE: 03-21-2024
PROJECT NO. 23033	FILE 23033 032124 R00 D FIG. 6.2 HHSHJC	
HISTORICAL HAIL STORMS IN HARRISON & JACKSON COUNTY BY YEAR		FIGURE 6.10



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LEGEND

- Mississippi Counties
- Forrest County
- USM Boundary
- 1998 Large Hail 2" or Greater
- 2015 Large Hail (2" or Greater) Storm Path by Year

Source: NOAA's Storm Predicition Center / SVRGIS

N W E S

0 12,500 25,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
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SCALE	DRAWN BY: PML	DATE: 10-25-2016
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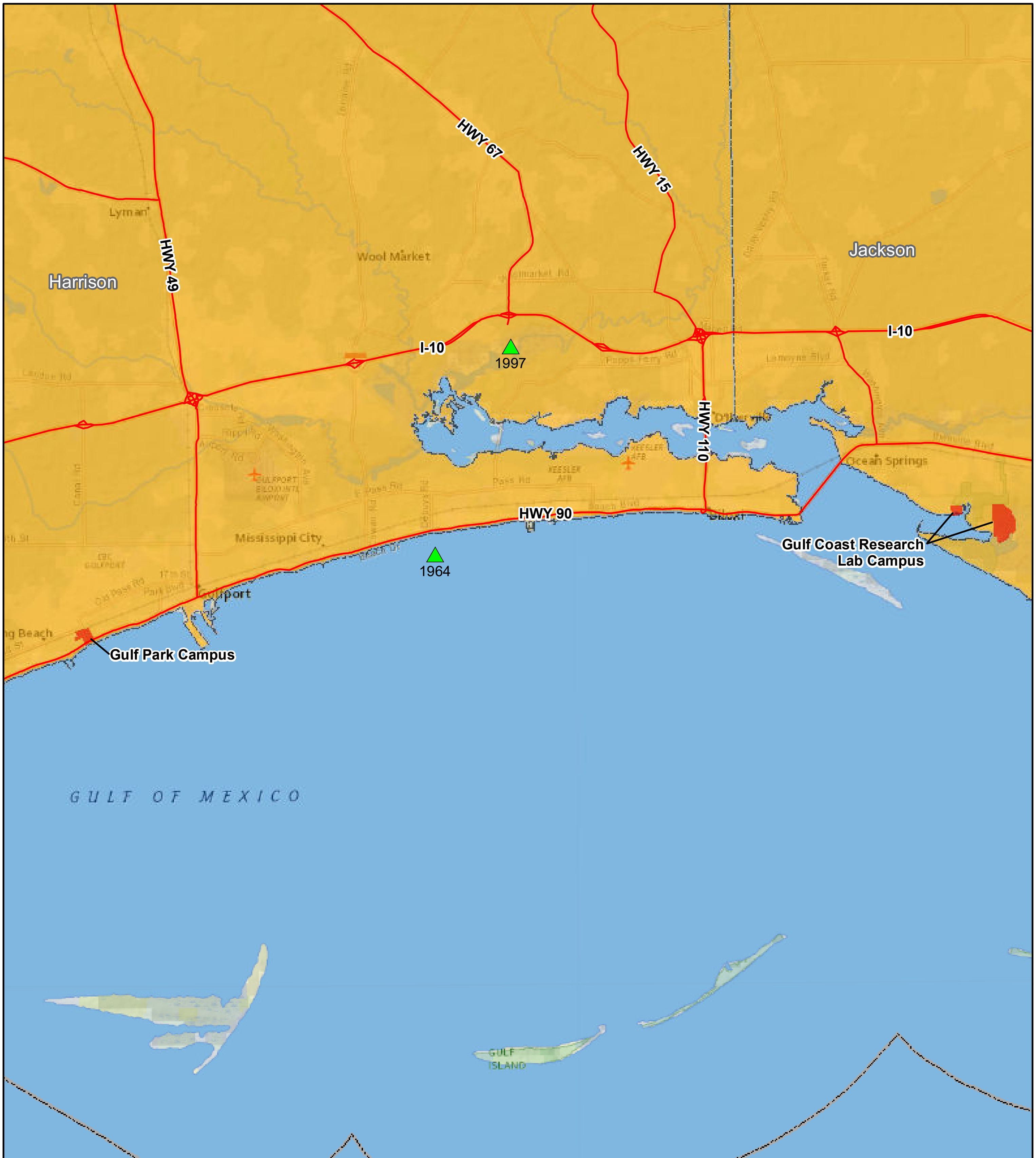
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.11 HOLHS	
HISTORICAL OCCURRENCES OF LARGE HAIL STORMS (2" OR GREATER)	FIGURE 6.11	



LEGEND

- Mississippi Counties
- Harrison & Jackson County
- USM Boundary
- Large Hail 2" or Greater (2008)

Source: NOAA's Storm Predicition Center / SVRGIS

N W E S

0 8,000 16,000 Feet

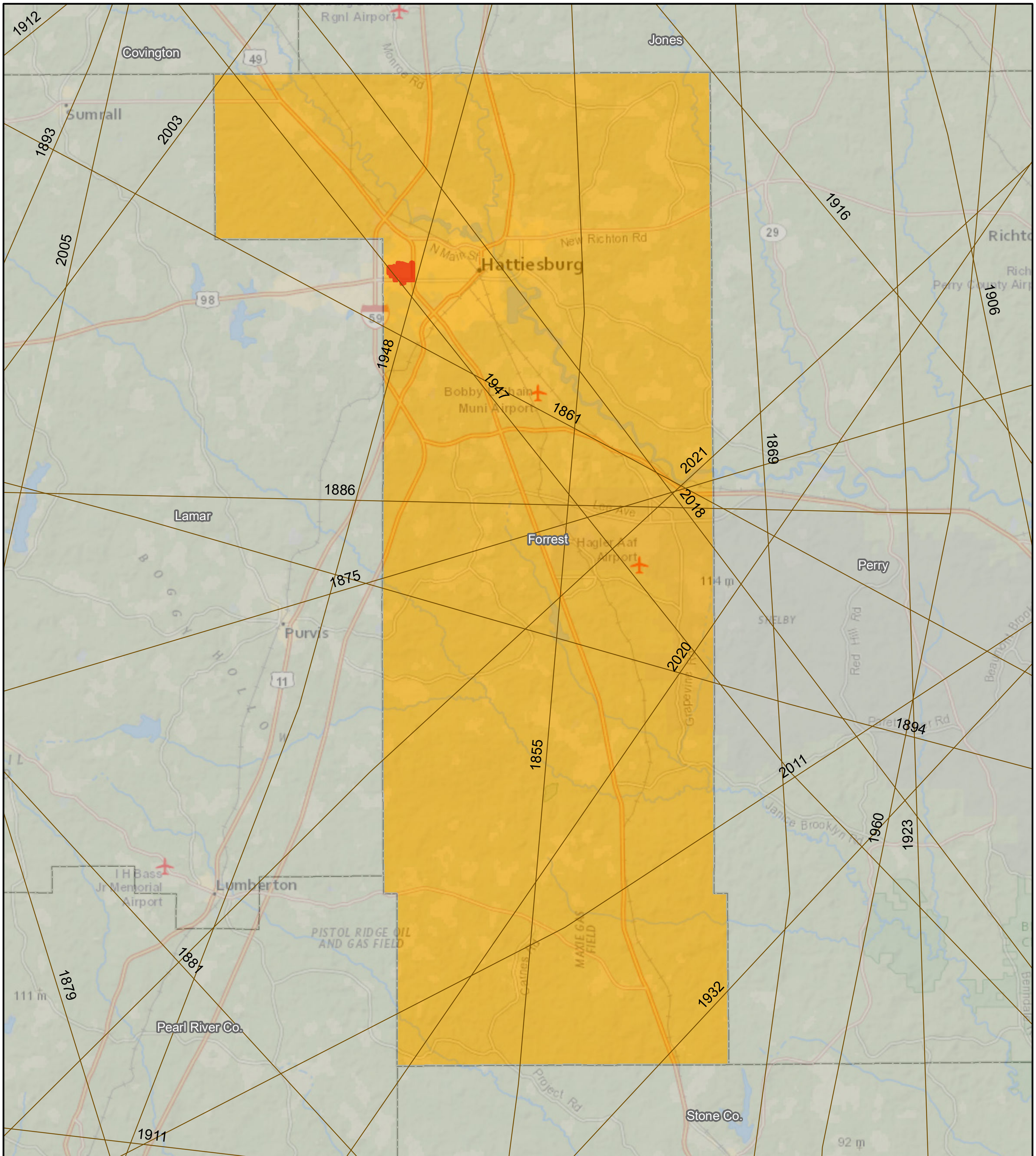
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 16,000'	CHECKED BY: KM	DATE: 10-25-2016

PROJECT NO.	FILE
16067	16067 102516 R00 D FIG. 6.12 HOLHS

HISTORICAL OCCURRENCES OF LARGE HAIL STORMS (2" OR GREATER)	FIGURE 6.12



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LEGEND

- Mississippi Counties
- Forrest County
- USM Boundary
- Atlantic Basin Hurricane Tracks

N W E S

0 12,500 25,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

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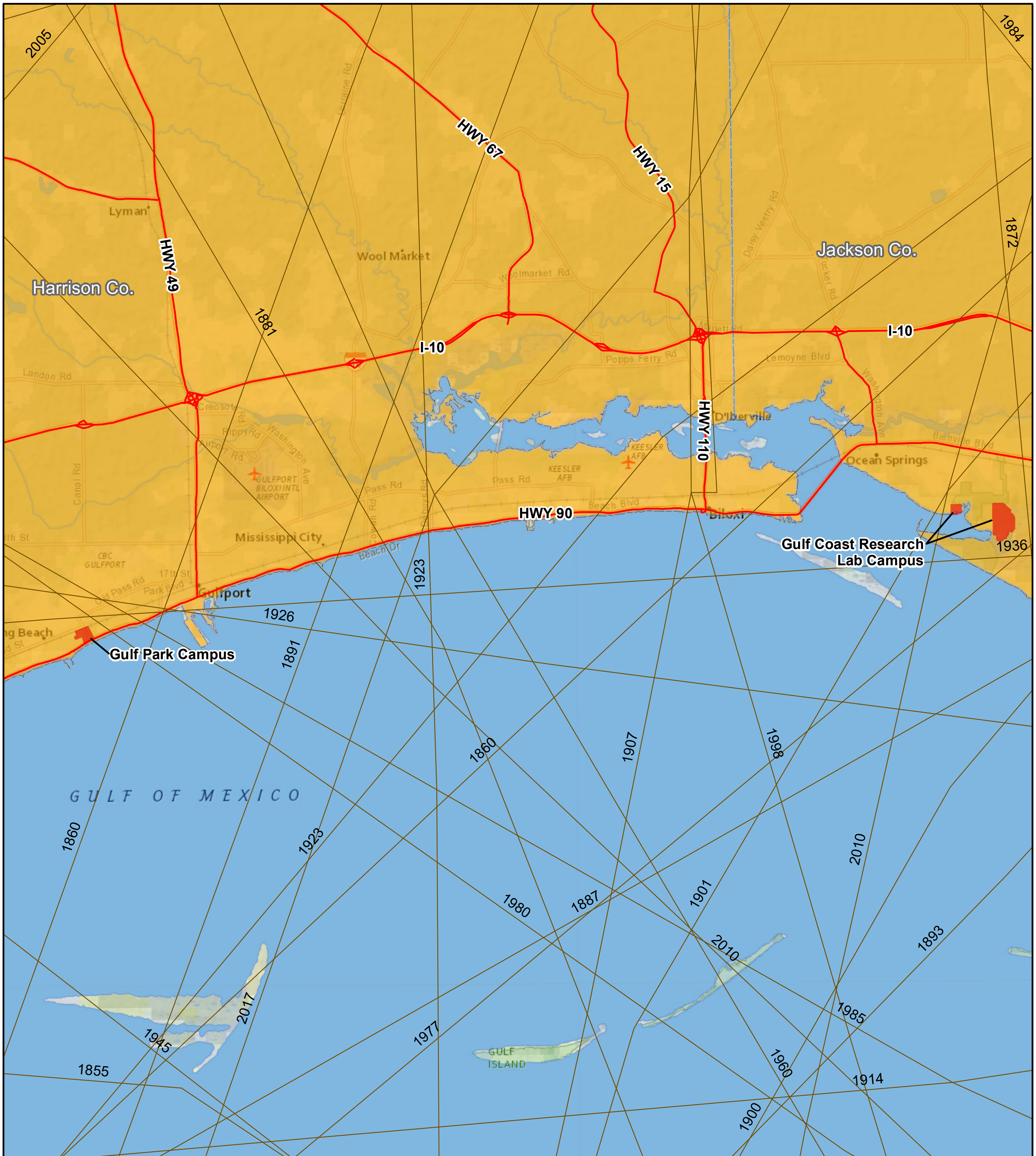
SCALE	DRAWN BY: OB	DATE: 03-21-2024
1" = 25,000'	CHECKED BY: JE	DATE: 03-21-2024

PROJECT NO.	FILE
23033	23033 032124 R00 D FIG. 6.5 HHTBY

HISTORIC HURRICANE TRACKS BY YEAR - FORREST COUNTY

FIGURE 6.13



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LEGEND

- Mississippi Counties
- Harrison & Jackson County
- USM Boundary
- Atlantic Basin Hurricane Tracks

N W E S

0 8,000 16,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

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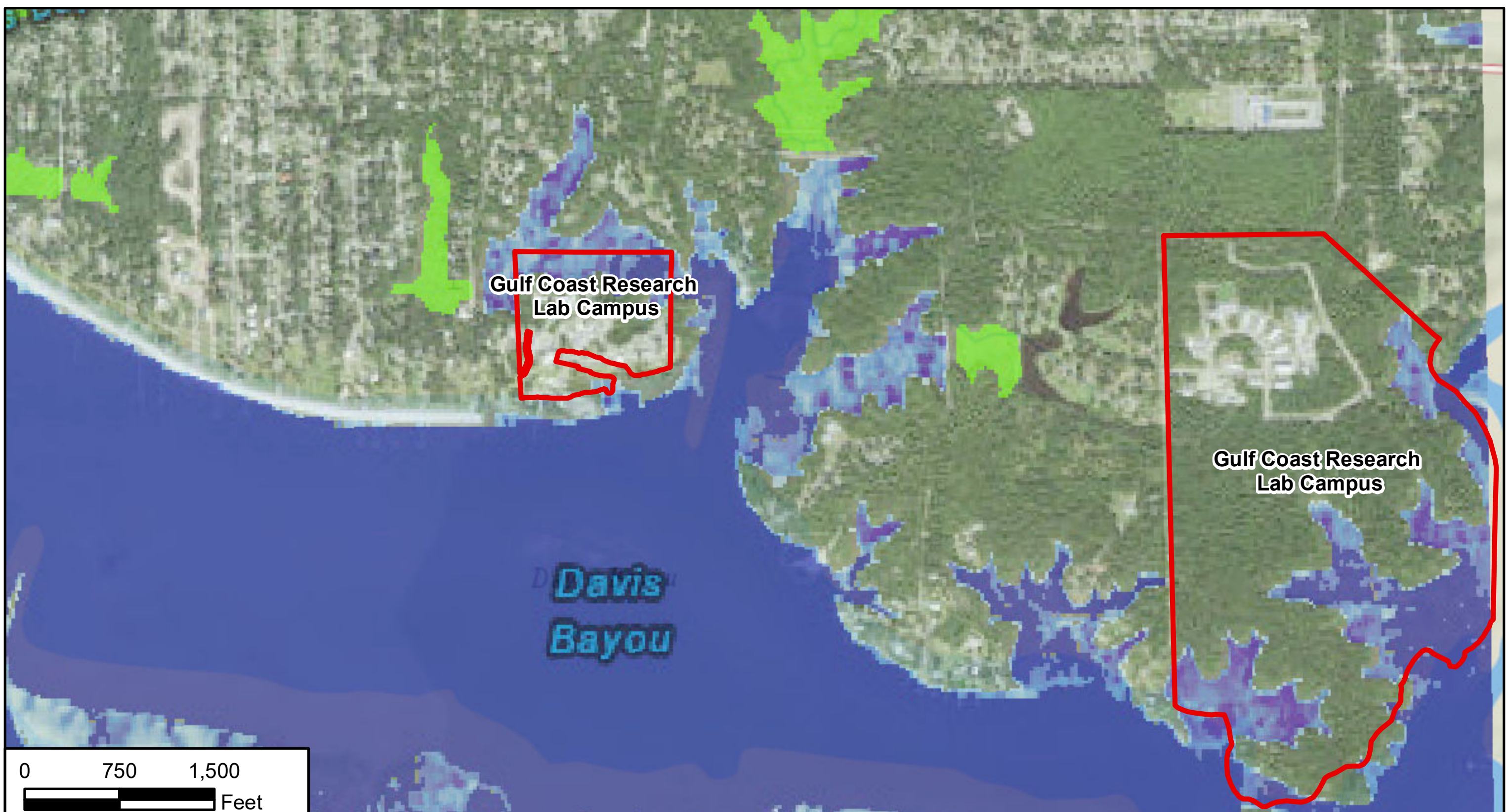
1" = 16,000'	CHECKED BY: JE	DATE: 03-22-2024
PROJECT NO. 23033	FILE 23033 032224 R00 D FIG. 6.6 HHTBY	
HISTORIC HURRICANE TRACKS BY YEAR - HARRISON & JACKSON COUNTY	FIGURE 6.14	



LEGEND

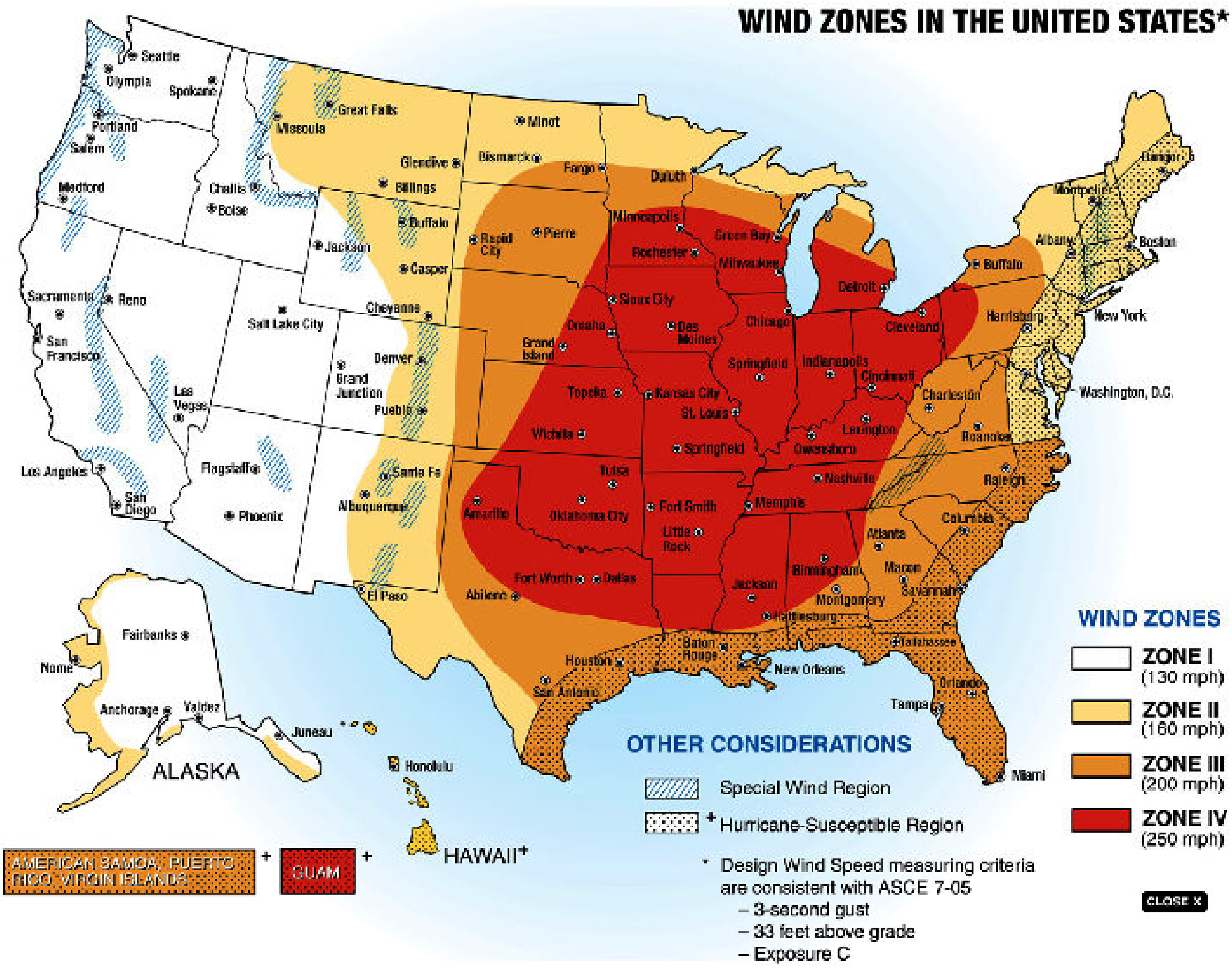
USM Boundary

Sea Level Rise data obtained from NOAA

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE As Shown	DRAWN BY: PML	DATE: 10-25-2016
	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.15 CSLR	
IMPACTS OF 1' OF SEA LEVEL RISE		FIGURE 6.15



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LEGEND

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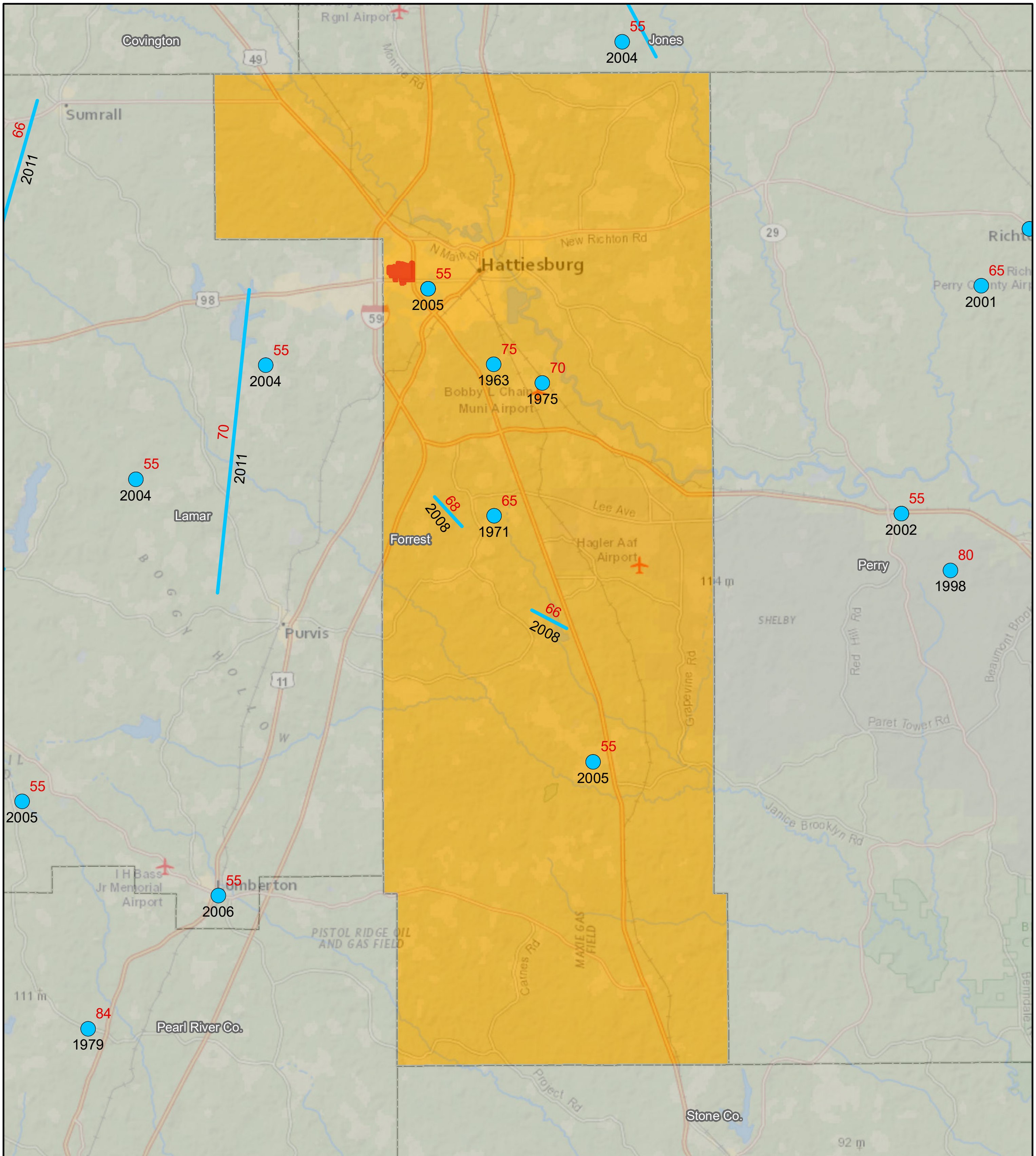
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.16 WZM	
WIND ZONES IN THE UNITED STATES		FIGURE 6.16



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LEGEND

- Mississippi Counties
- Harrison & Jackson County
- USM Boundary
- Wind Events - 65 Knots or Greater
- Wind Event Path - 65 Knots or Greater by Year (1955-2022)
- 66 Wind Event Magnitude
- 2008 Wind Event Year

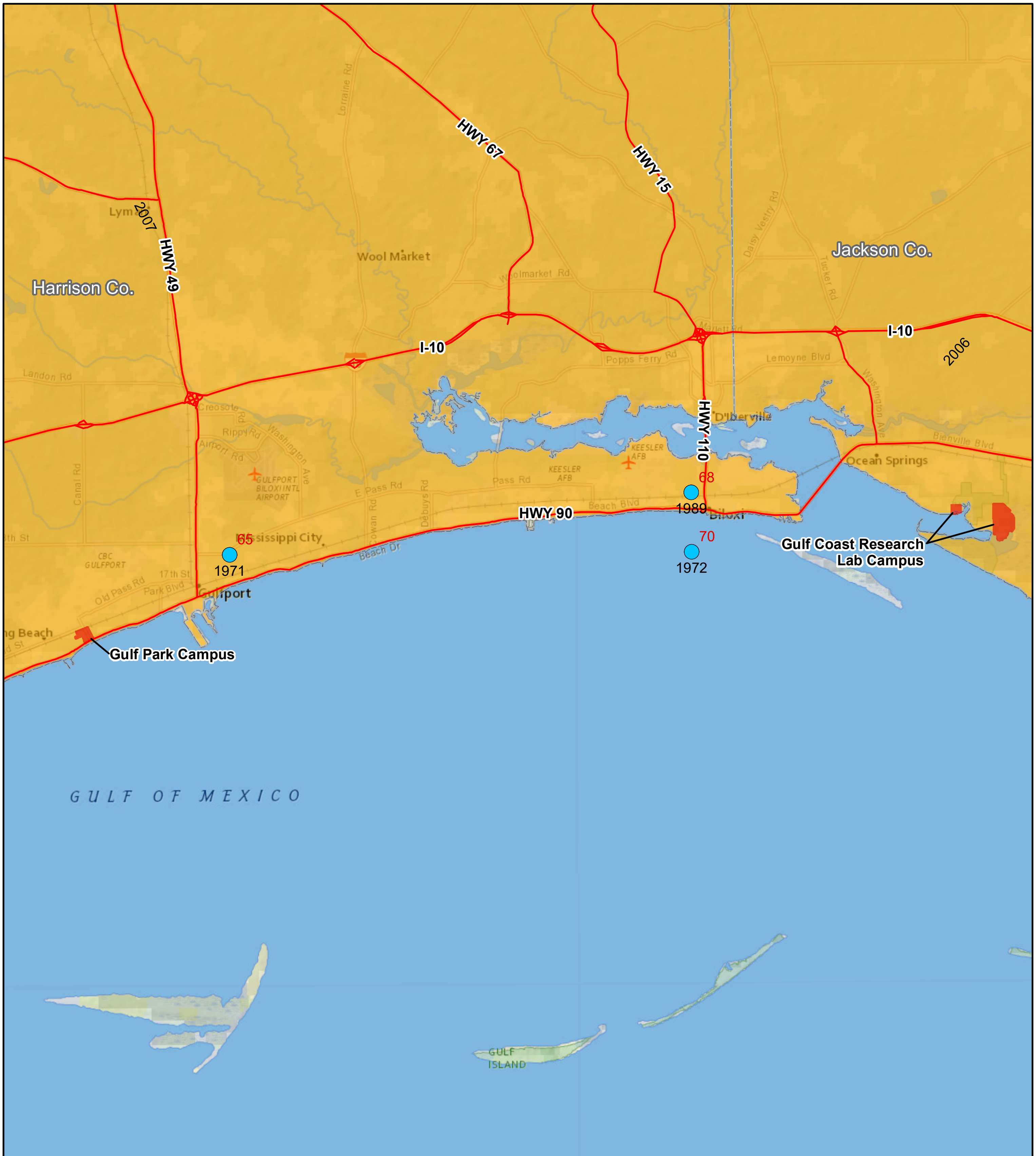
N S W E

0 12,500 25,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: OB	DATE: 03-22-2024
1" = 25,000'	CHECKED BY: JE	DATE: 03-22-2024
PROJECT NO. 23033	FILE 23033 032224 R00 D FIG. 6.8 WE65KG	
WIND EVENTS 65 KNOTS OR GREATER - 1954-2022	FIGURE 6.17	



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LEGEND

- Mississippi Counties
- Harrison & Jackson County
- USM Boundary
- Wind Events - 65 Knots or Greater

N W E S

0 8,000 16,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: OB	DATE: 03-22-2024
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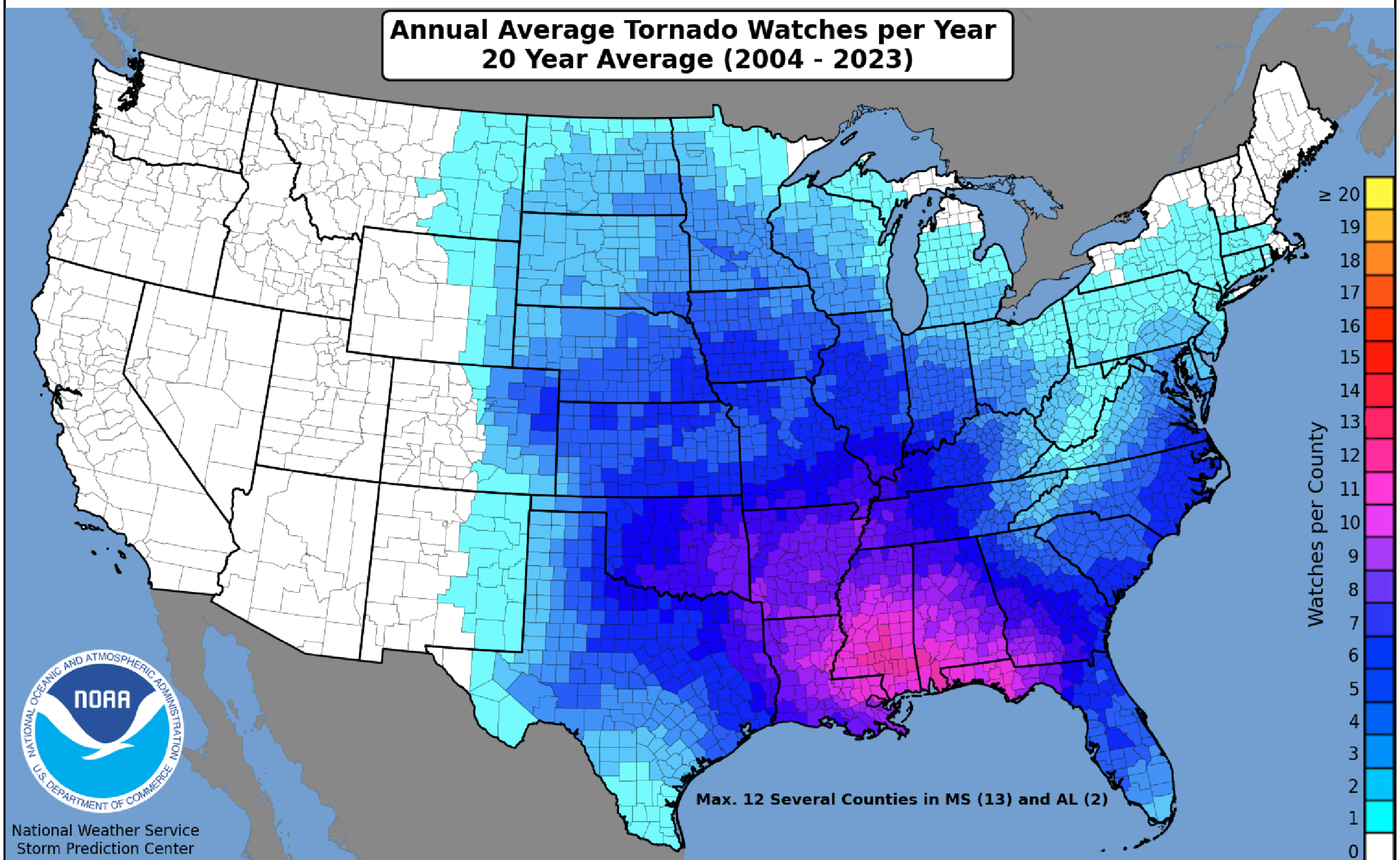
PROJECT NO. 23033	FILE 23033 032224 R00 D FIG. 6.9 WE65KG	

WIND EVENTS 65 KNOTS OR GREATER - 1955-2022 - HARRISON/JACKSON COUNTY

FIGURE 6.18



LEGEND

Map and Data Provided by the National Oceanic and Atmospheric Administration

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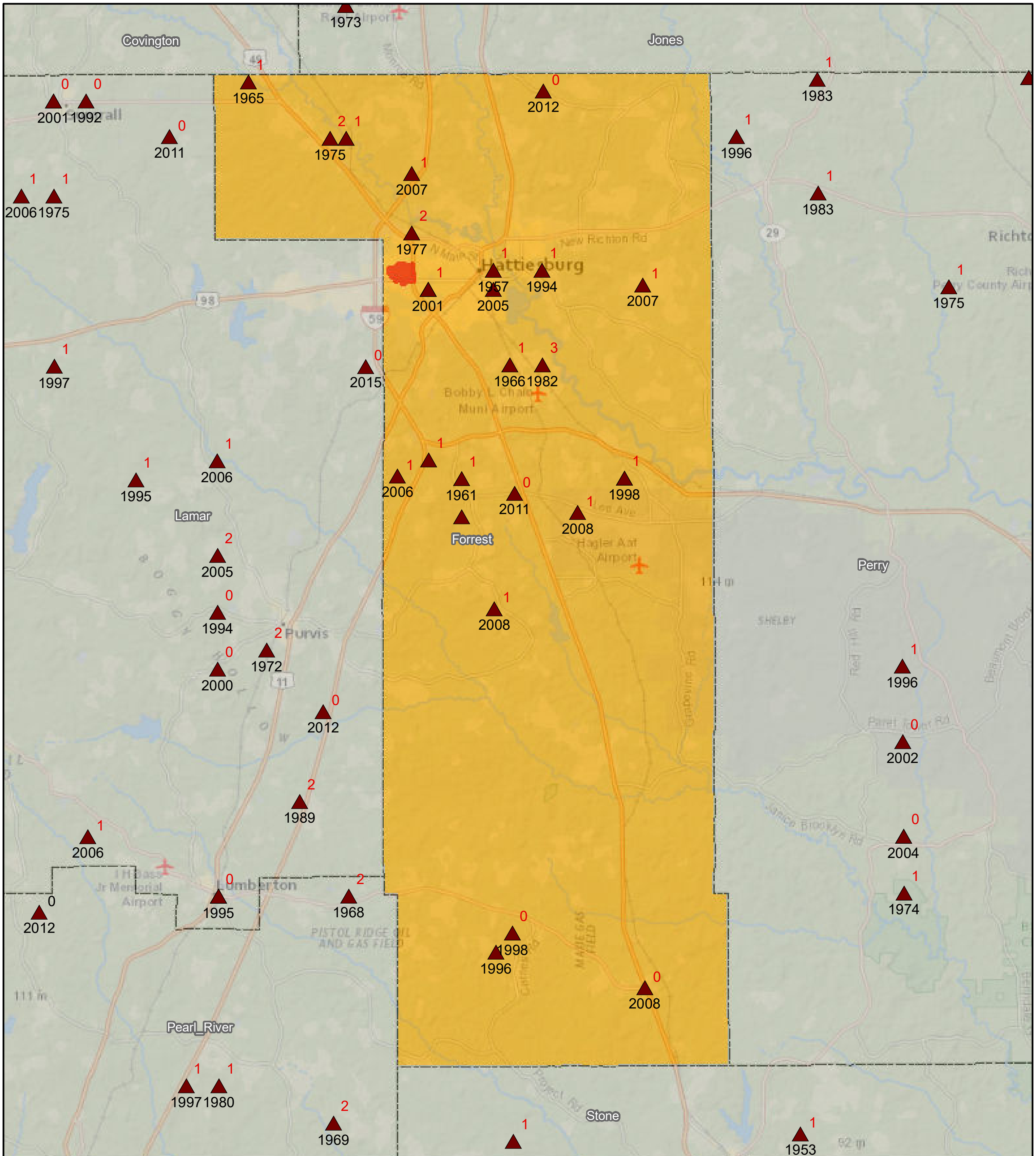
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE N.T.S.	DRAWN BY: OB	DATE: 03-22-2024
	CHECKED BY: JE	DATE: 03-22-2024
PROJECT NO. 23033	FILE 23033 032224 R00 D FIG. 6.14 TWPYM	
ANNUAL AVERAGE TORNADO WATCHES PER YEAR (2004-2023)	FIGURE 6.19	



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LEGEND

- Mississippi Counties
- Forrest County
- USM Boundary
- ▲ Tornado Touchdowns
- 66 Tornado Magnitude
- 2008 Tornado Year

N W E S

0 12,500 25,000 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
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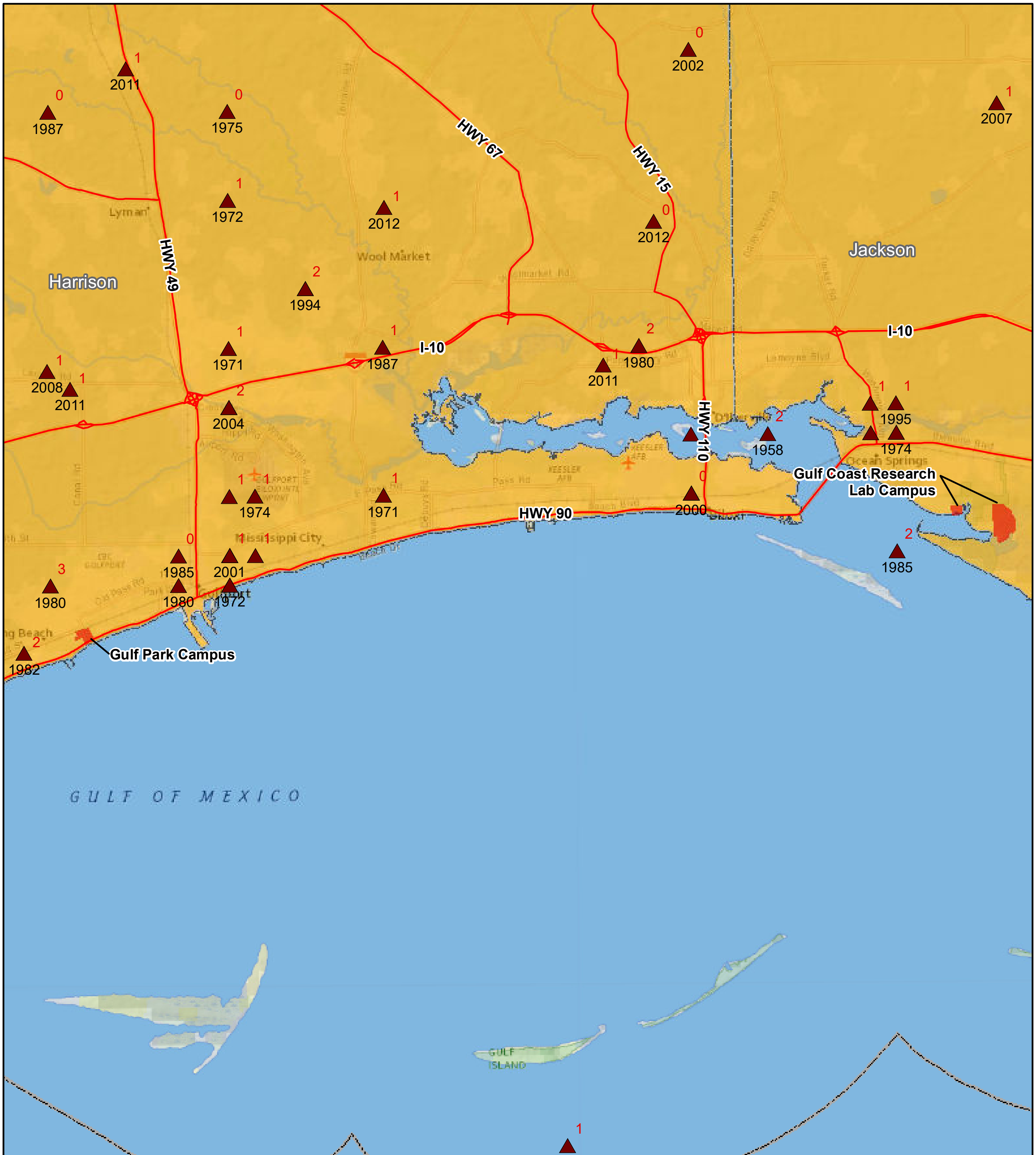
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.20 TT	

TORNADO TOUCHDOWNS - 1950-2015

FIGURE 6.20



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LEGEND

- Mississippi Counties
- Harrison & Jackson County
- USM Boundary
- Tornado Touchdowns
- 66 Tornado Magnitude
- 2008 Tornado Year

N W E S

0 8,000 16,000 Feet

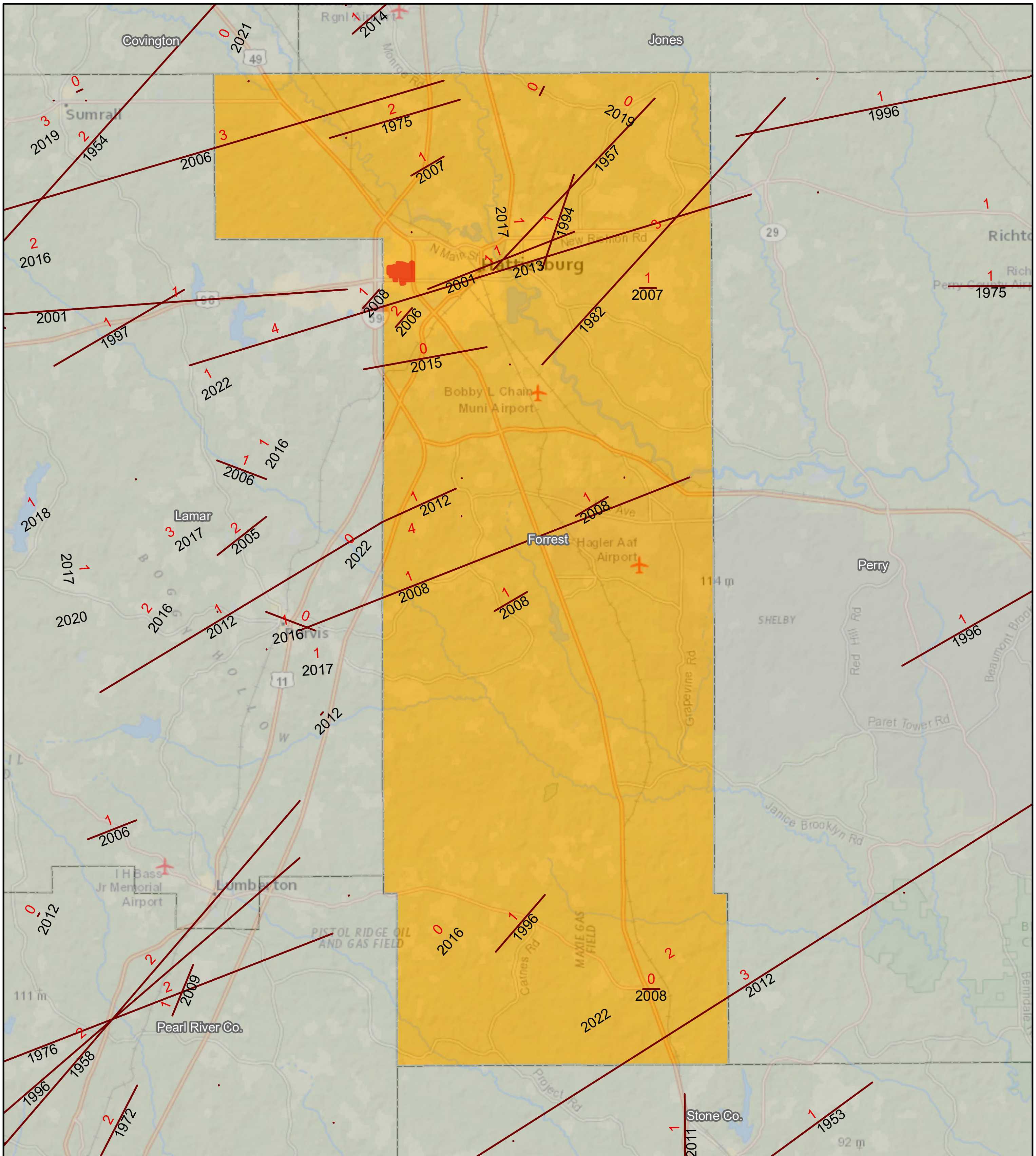
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 16,000'	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.21 TT-HJ	

TORNADO TOUCHDOWNS - 1950-2015 - HARRISON & JACKSON COUNTY

FIGURE 6.21



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LEGEND

- Mississippi Counties
- Forrest County
- USM Boundary
- Tornado Tracks
- 66 Tornado Magnitude
- 2008 Tornado Year

N W E S

0 12,500 25,000 Feet

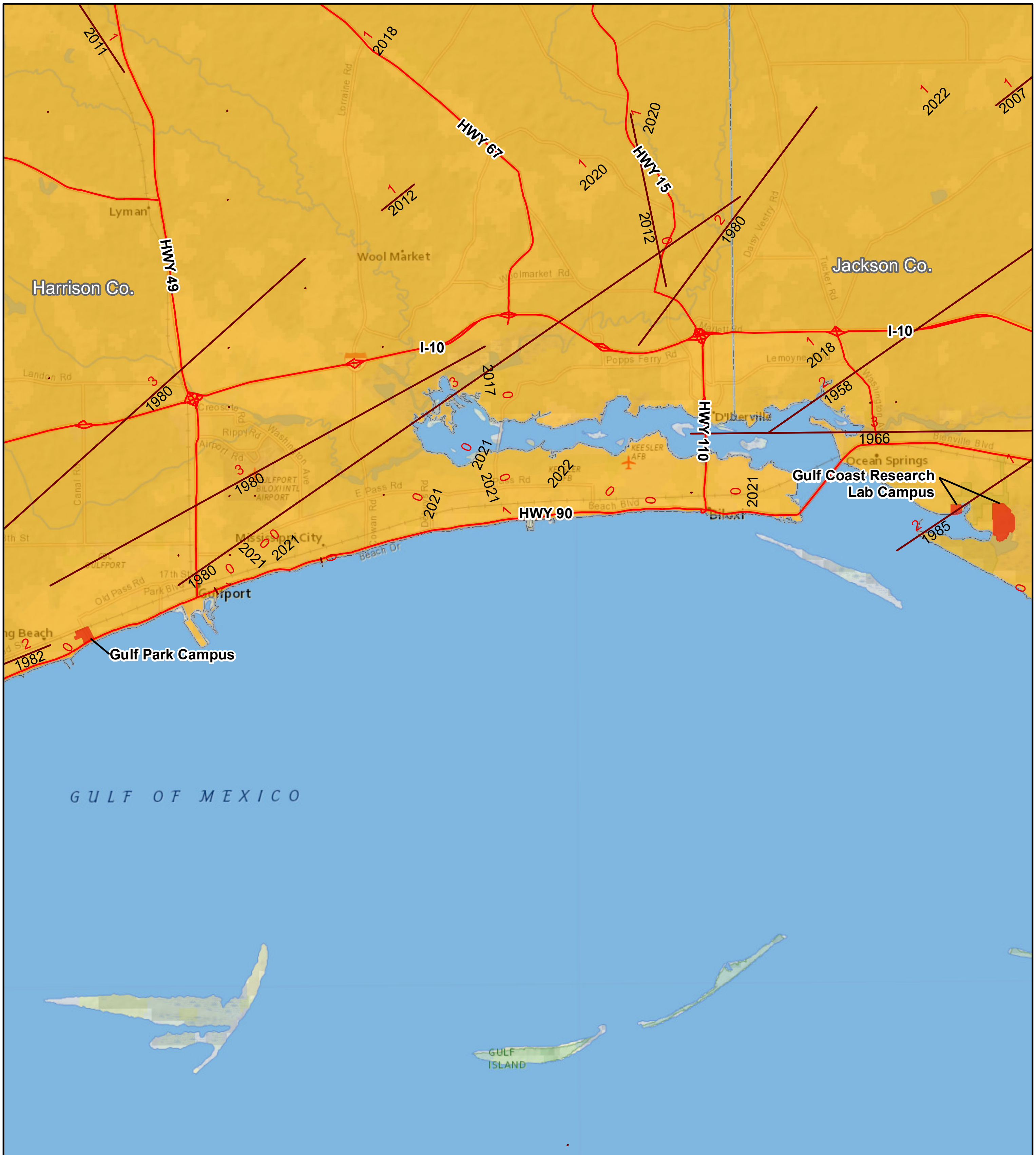
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: OB	DATE: 03-22-2024
1" = 25,000'	CHECKED BY: JE	DATE: 03-22-2024
PROJECT NO. 23033	FILE 23033 032224 R00 D FIG. 6.12 TTBY	

TORNADO TRACKS BY YEAR AND F-SCALE - 1950-2022

FIGURE 6.22



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LEGEND

- Mississippi Counties
- Harrison & Jackson County
- USM Boundary
- Tornado Tracks
- 66 Tornado Magnitude
- 2008 Tornado Year

N
W E
S

0 8,000 16,000 Feet

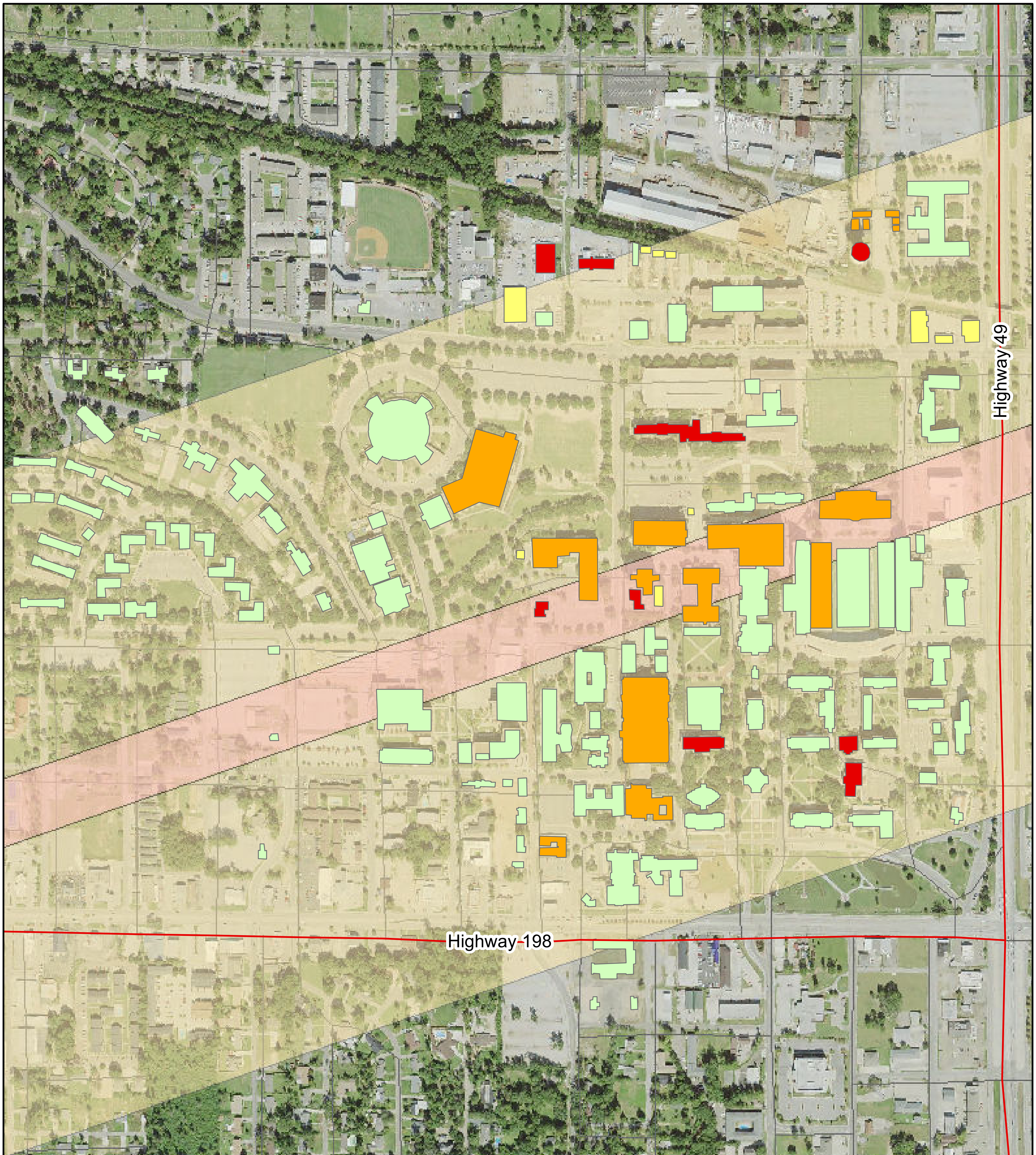
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: OB	DATE: 03-22-2024
1" = 16,000'	CHECKED BY: JE	DATE: 03-22-2024

PROJECT NO.	FILE
23033	23033 032224 R00 D FIG. 6.13 TTBY

TORNADO TRACKS BY YEAR AND F-SCALE - 1950-2022 - HARRISON/JACKSON COUNTY	FIGURE 6.23



LEGEND

- Tornado Track 100 Yard Swath
- Tornado Track 1000 Yard Swath
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

N
W E
S

0 300 600 Feet

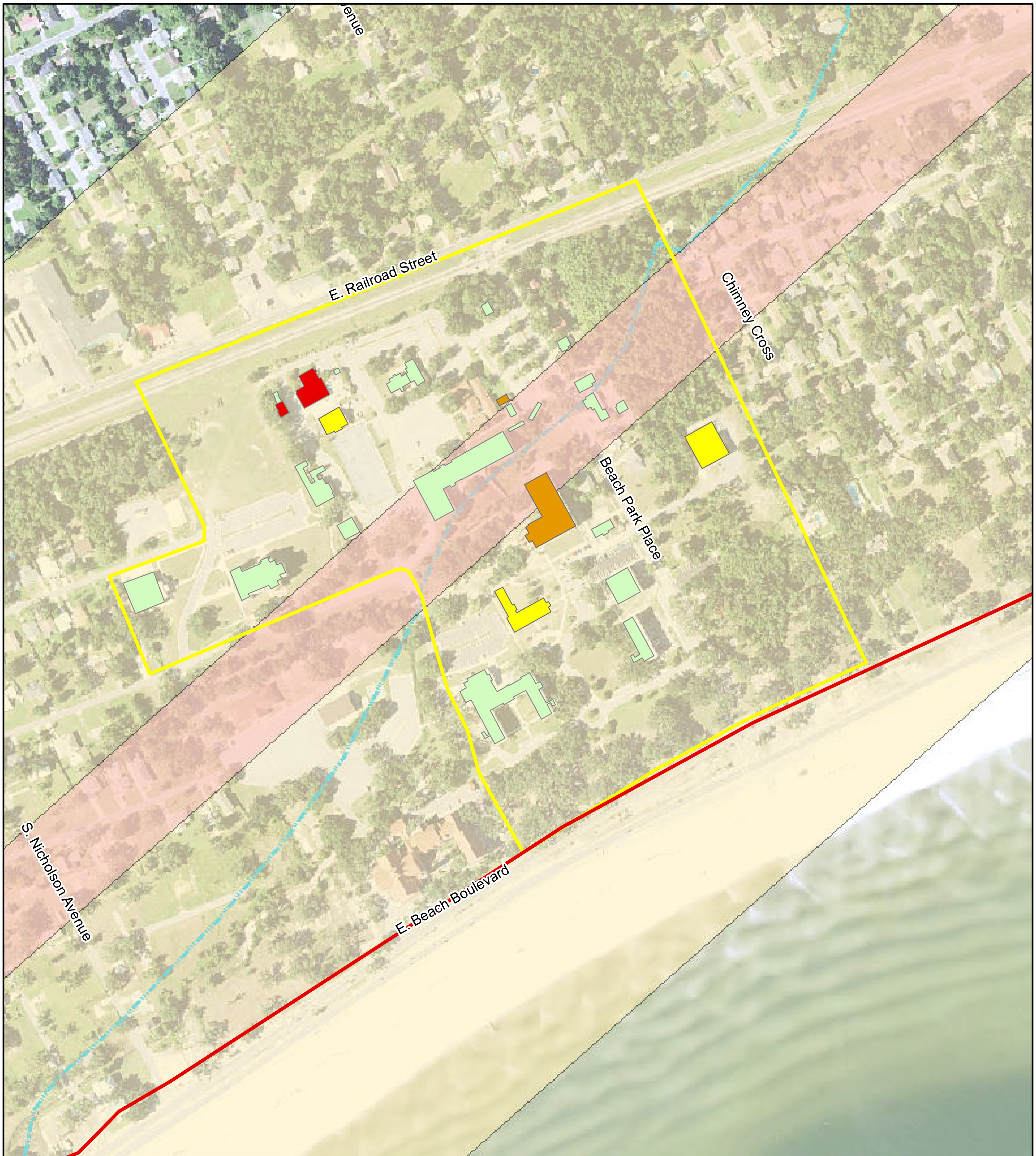
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE 1" = 600'	DRAWN BY: PML	DATE: 10-25-2016
	CHKD BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.24 TPS	

TORNADO PATH SCENARIO
USM MAIN CAMPUS

FIGURE 6.24



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LEGEND

- Tornado Track 100 Yard Swath
- Tornado Track 1000 Yard Swath
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

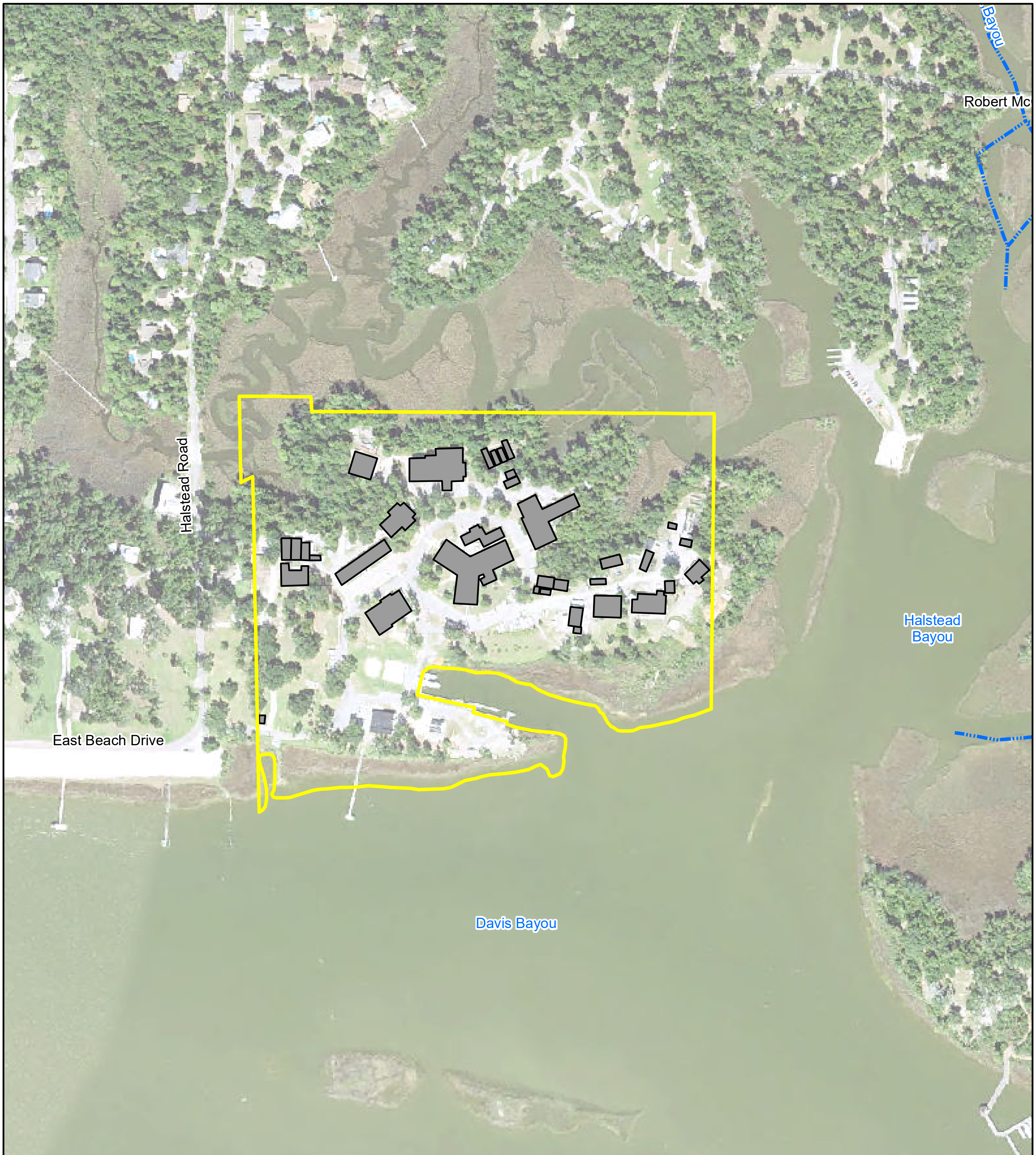
N W E S

0 200 400 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 400'	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.25 PST-GP	
TORNADO PATH SCENARIO - USM - GULF PARK CAMPUS		FIGURE 6.25



LEGEND

- Tornado Track 100 Yard Swath
- Tornado Track 1000 Yard Swath
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

N W E S

0 200 400 Feet

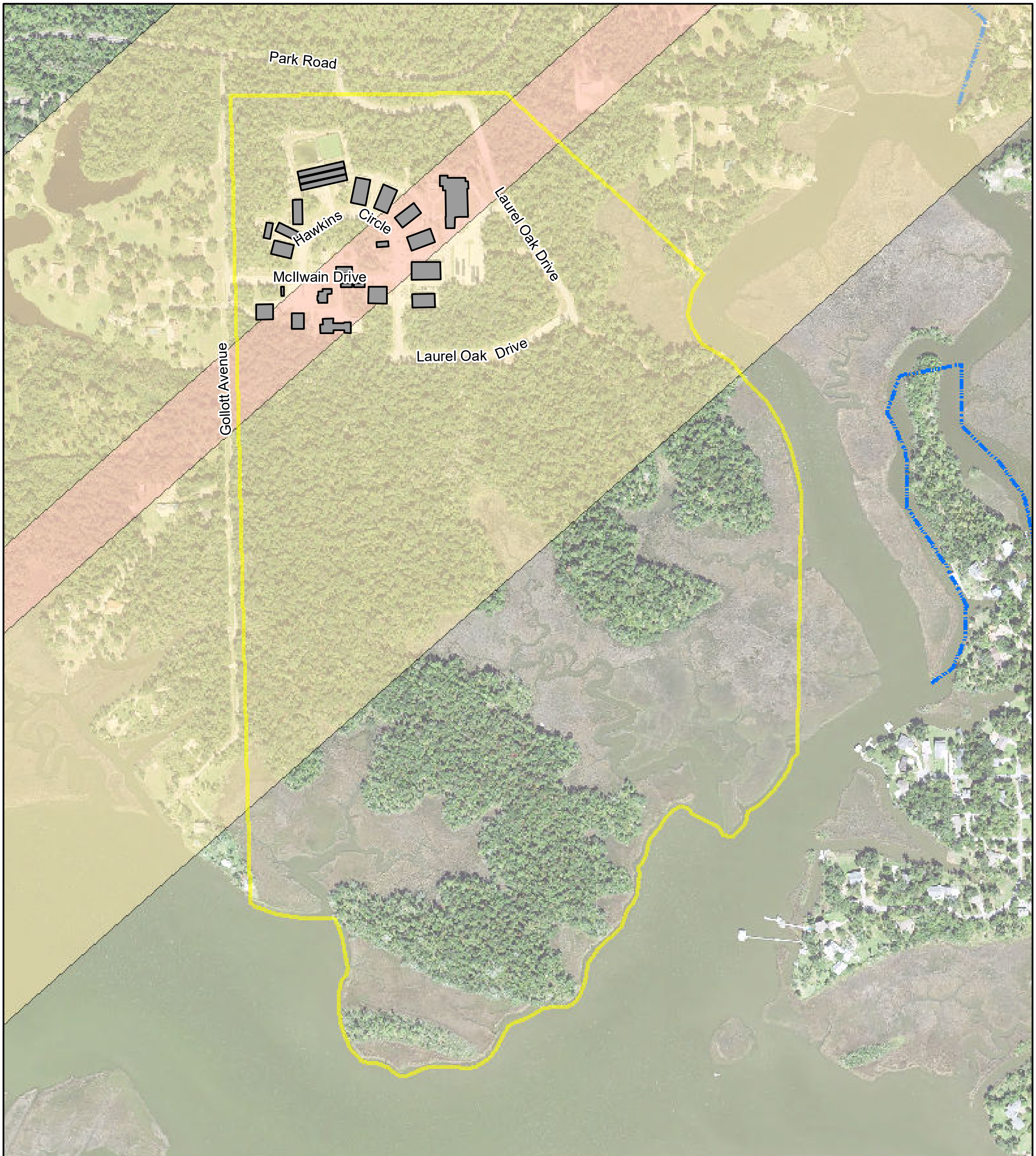
DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE	DRAWN BY: PML	DATE: 10-25-2016
1" = 400'	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.26 PST-GP	

TORNADO PATH SCENARIO - USM - GULF COAST RESEARCH LAB CAMPUS

FIGURE 6.26



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LEGEND

- Tornado Track 100 Yard Swath
- Tornado Track 1000 Yard Swath
- Major Highways
- Streets

USM Buildings

Building Priority

- Critical
- High Priority
- Medium Priority
- Low Priority

N W E S

0 300 600 Feet

DISASTER RESISTANT UNIVERSITY PLAN
UNIVERSITY OF SOUTHERN MISSISSIPPI

ALLEN ENGINEERING AND SCIENCE

SCALE 1" = 600'	DRAWN BY: PML	DATE: 10-25-2016
	CHECKED BY: KM	DATE: 10-25-2016
PROJECT NO. 16067	FILE 16067 102516 R00 D FIG. 6.27 PST-GP	

TORNADO PATH SCENARIO - USM - GULF COAST RESEARCH LAB CAMPUS

FIGURE 6.27

Appendix C: Public Meeting and Public Outreach Information

Appendix D: Summary Listing of Suggested Action Measures

Strategy	Benefit Ranking	Staplee Ranking	Total
Address facility condition assessment report deficiencies.	167	21	188
Place power lines underground at Gulf Park.	166	20	186
Place power lines underground at Halstead.	165	20	185
Continuation of the DRU Committee meeting and review process.	157	23	180
Develop and implement a Critical Incident Management training program for members of the Critical Incident Response Teams.	157	23	180
Development of college, school, and department-specific continuity of operations plans.	155	23	178
Development and implementation of a hazard preparation and response education and outreach program.	155	23	178
Implement solutions to nuisance and flash flooding at the Hattiesburg campus.	153	21	174
Address electrical deficiencies (Hattiesburg Campus) when grid mapping is complete.	148	22	170
Implement solutions to nuisance and flash flooding at the GCRL (Halstead)	138	21	159
Implement solutions to nuisance and flash flooding at the Gulf Park Campus.	138	21	159
Develop and implement an internal training program for the Infectious Disease / Pandemic Plan.	131	23	154
Evaluation and upgrade of access control systems.	132	21	153
Amend the DRU as appropriate to include elements of the updated Campus Master Plan (2024).	130	23	153
Develop a comprehensive inventory of coastal distributed sites.	127	23	150
Digitization of paper records.	127	23	150
Identify and implement contactless scenarios in restrooms and other common areas throughout all campuses.	96	22	118

Appendix E: Plan Implementation Worksheet

USM DRU Plan Implementation Worksheet

Action Measure Number	Current DRU Committee Priority	Proposed, Active, Complete, or Ongoing	% Complete	Funding Status	Completion Date	Comments

<u>Questions for Committee:</u>

1. New construction?
2. Additional risks or vulnerabilities?
3. Are new mitigation strategies required or desired?
4. Legislative or regulatory changes?
5. Other conditions warranting significant review?