University of Maryland
Eastern Shore

HAZARD MITIGATION PLAN

December 2009

Prepared by:

HAZARD MITIGATION PLAN

UNIVERSITY OF MARYLAND EASTERN SHORE

PRINCESS ANNE, MD

Prepared for:
University of Maryland Eastern Shore

Acknowledgments

This Hazard Mitigation Plan was prepared under the guidance of the University of Maryland Eastern Shore Hazard Mitigation Committee. The Committee members are listed in Table 3.1.

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December 2009

INSTRUCTIONS FOR USING THE PLAN REVIEW CROSSWALK FOR REVIEW OF LOCAL MITIGATION PLANS

Attached is a Plan Review Crosswalk based on the ***Local Multi-Hazard Mitigation Planning Guidance***, published by FEMA in July, 2008. This Plan Review Crosswalk is consistent with the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act), as amended by Section 322 of the *Disaster Mitigation Act of 2000* (P.L. 106-390), the *National Flood Insurance Act of 1968,* as amended by the *National Flood Insurance Reform Act of 2004* (P.L. 108-264) and *44 Code of Federal Regulations (CFR) Part 201 – Mitigation Planning,* inclusive of all amendments through October 31, 2007.

SCORING SYSTEM
N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.
S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Each requirement includes separate elements. All elements of a requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a summary score of "Satisfactory." A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing.

When reviewing single jurisdiction plans, reviewers may want to put an N/A in the boxes for multi-jurisdictional plan requirements. When reviewing multi-jurisdictional plans, however, all elements apply. States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements. Optional matrices for assisting in the review of sections on profiling hazards, assessing vulnerability, and identifying and analyzing mitigation actions are found at the end of the Plan Review Crosswalk.

The example below illustrates how to fill in the Plan Review Crosswalk.:

Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	Section II, pp. 4-10	The plan describes the types of assets that are located within geographically defined hazard areas as well as those that would be affected by winter storms.		☐
B. Does the **new or updated** plan address the **impact** of each hazard on the jurisdiction?	Section II, pp. 10-20	The plan does not address the impact of two of the five hazards addressed in the plan. **Required Revisions:** • Include a description of the impact of floods and earthquakes on the assets. **Recommended Revisions:** This information can be presented in terms of dollar value or percentages of damage.	☐	
		SUMMARY SCORE	☐	

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a **"Needs Improvement"** score.

Prerequisite(s) (Check Applicable Box)	NOT MET	MET
1. Adoption by the Local Governing Body: §201.6(c)(5) OR		
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) **AND**		
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)		

Planning Process	N	S
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		

Risk Assessment	N	S
5. Identifying Hazards: §201.6(c)(2)(i)		
6. Profiling Hazards: §201.6(c)(2)(i)		
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		
8. Assessing Vulnerability: Addressing Repetitive Loss Properties. §201.6(c)(2)(ii)		
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)		
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)		
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		

*States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	N	S
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)		
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)		
15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)		
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)		
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		

Plan Maintenance Process	N	S
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)		
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		
20. Continued Public Involvement: §201.6(c)(4)(iii)		

Additional State Requirements*	N	S
Insert State Requirement		
Insert State Requirement		
Insert State Requirement		

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED ☐

See Reviewer's Comments

PLAN APPROVED ☐

LOCAL MITIGATION PLAN REVIEW CROSSWALK

Local Mitigation Plan Review and Approval Status

Jurisdiction: University of Maryland Eastern Shore	**Title of Plan: University of Maryland Eastern Shore Hazard Mitigation Plan**	**Date of Plan: December 2009**

Local Point of Contact: Ed Johnson	**Address: University of Maryland Eastern Shore College Backbone Road Princess Anne, MD 21853**
Title: Project Manager	
Agency: University of Maryland Eastern Shore	
Phone Number: 410 651 4340	**E-Mail: ehjohnson@umes.edu**

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Approved		
Date Approved		

	DFIRM		**NFIP Status***			
Jurisdiction:	**In Plan**	**NOT in Plan**	**Y**	**N**	**N/A**	**CRS Class**
1. University of Maryland Eastern Shore		X		X		N
2.						
3.						
4.						
5. [ATTACH PAGE(S) WITH ADDITIONAL JURISDICTIONS]						

*** Notes:** **Y = Participating** **N = Not Participating** **N/A = Not Mapped**

PREREQUISITE(S)

1. Adoption by the Local Governing Body

***Requirement §201.6(c)(5)**: [The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Has the local governing body adopted **new or updated** plan?	Adoption pending approval			
B. Is supporting documentation, such as a resolution, included?				
		SUMMARY SCORE		

2. Multi-Jurisdictional Plan Adoption

***Requirement §201.6(c)(5)**: For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan indicate the specific jurisdictions represented in the plan?	NA			
B. For each jurisdiction, has the local governing body adopted the **new or updated** plan?	NA			
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?	NA			
		SUMMARY SCORE		

3. Multi-Jurisdictional Planning Participation

***Requirement §201.6(a)(3)**: Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process … Statewide plans will not be accepted as multi-jurisdictional plans.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan describe **how** each jurisdiction participated in the plan's development?	NA			
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?	NA			
		SUMMARY SCORE		

PLANNING PROCESS: *§201.6(b): An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process* ***shall*** *include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): *[The plan* ***shall*** *document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	**Location in the Plan** (section or annex and page #)	**Reviewer's Comments**	SCORE N	SCORE S
A. Does the plan provide a narrative description of the process followed to prepare the **new or updated** plan?	Pages 7-10			
B. Does the **new or updated** plan indicate who was involved in the **current** planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, *etc*.?)	Page 10			
C. Does the **new or updated** plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Page 11			
D. **Does the new or updated plan discuss the** opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	Pages 7-11			
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Pages 13-23			
F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?	NA			
		SUMMARY SCORE		

RISK ASSESSMENT: *§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include **a description** of the types of **all natural hazards** that affect the jurisdiction?	Page 24			
		SUMMARY SCORE		

6. Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the risk assessment identify the **location** (*i.e.*, geographic area affected) of each natural hazard addressed in the **new or updated** plan?	Pages 24-41			
B. Does the risk assessment identify the **extent** (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?	Pages 24-41			
C. Does the plan provide information on **previous occurrences** of each hazard addressed in the **new or updated** plan?	Pages 43-59			
D. Does the plan include the **probability of future events** (*i.e.*, chance of occurrence) for each hazard addressed in the **new or updated** plan?	Page 58			
		SUMMARY SCORE		

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	Pages 61-73			
B. Does the **new or updated** plan address the **impact** of each hazard on the jurisdiction?	Pages 61-73			
		SUMMARY SCORE		

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): *[The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of *repetitive loss properties* located in the identified hazard areas?	Pages 67-69	***Note: This requirement becomes effective for all local plans approved after October 1, 2008.***		
		SUMMARY SCORE		

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): *The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area … .*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan describe vulnerability in terms of the **types and numbers** of **existing** buildings, infrastructure, and critical facilities located in the identified hazard areas?	Pages 61-73	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the **new or updated** plan describe vulnerability in terms of the **types and numbers** of **future** buildings, infrastructure, and critical facilities located in the identified hazard areas?	Pages 61-73	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): *[The plan* ***should*** *describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate … .*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan estimate **potential dollar losses** to vulnerable structures?	Pages 61-73	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
B. Does the **new or updated** plan describe the **methodology** used to prepare the estimate?	Pages 61-73	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan* ***should*** *describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan describe land uses and development trends?	Pages 73-74	***Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.***		
		SUMMARY SCORE		

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment* ***must*** *assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	NA			
		SUMMARY SCORE		

MITIGATION STRATEGY: *§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy* ***shall*** *include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new or updated** plan include a description of mitigation **goals** to reduce or avoid long-term vulnerabilities to the identified hazards?	Page 76			
		SUMMARY SCORE		

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy* ***shall*** *include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan identify and analyze a **comprehensive range** of specific mitigation actions and projects for each hazard?	Pages 76-88			
B Do the identified actions and projects address reducing the effects of hazards on **new** buildings and infrastructure?	Pages 76-88			
C. Do the identified actions and projects address reducing the effects of hazards on **existing** buildings and infrastructure?	Pages 76-88			
		SUMMARY SCORE		

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?	NA	***Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.***		
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?	Pages 90-91	***Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.***		
		SUMMARY SCORE		

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** mitigation strategy include how the actions are **prioritized**? (For example, is there a discussion of the process and criteria used?)	Page 93			
B. Does the **new or updated** mitigation strategy address how the actions will be implemented and administered, including the responsible department , existing and potential resources and the timeframe to complete each action?	Pages 76-88			
C. Does the **new or updated** prioritization process include an emphasis on the use of a **cost-benefit review** to maximize benefits?	Page 100			
D. Does the **updated** plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	NA			
		SUMMARY SCORE		

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new or updated** plan include identifiable **action items** for each jurisdiction requesting FEMA approval of the plan?	NA			
B. Does the **updated** plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	NA			
		SUMMARY SCORE		

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan describe the method and schedule for **monitoring** the plan, including the responsible department?	Pages 100-101			
B. Does the **new or updated** plan describe the method and schedule for **evaluating** the plan, including how, when and by whom (*i.e.* the responsible department)?	Page 100-101			
C. Does the **new or updated** plan describe the method and schedule for **updating** the plan within the five-year cycle?	Page 100-101			
		SUMMARY SCORE		

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	Pages 100-101			
B. Does the **new or updated** plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	Pages 101-102			
C. Does the **updated** plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	NA			
		SUMMARY SCORE		

Continued Public Involvement

Requirement §201.6(c)(4)(iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new or updated** plan explain how **continued public participation** will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Page 102			
		SUMMARY SCORE		

MATRIX A: PROFILING HAZARDS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required**.

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each *applicable* ***hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.***

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Erosion	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dam Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐	☐	☐	☐	☐
Earthquake	☐	☐	☐	☐	☐	☐	☐	☐	☐
Expansive Soils	☐	☐	☐	☐	☐	☐	☐	☐	☐
Levee Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flood	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hailstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hurricane	☐	☐	☐	☐	☐	☐	☐	☐	☐
Land Subsidence	☐	☐	☐	☐	☐	☐	☐	☐	☐
Landslide	☐	☐	☐	☐	☐	☐	☐	☐	☐
Severe Winter Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tornado	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tsunami	☐	☐	☐	☐	☐	☐	☐	☐	☐
Volcano	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wildfire	☐	☐	☐	☐	☐	☐	☐	☐	☐
Windstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other ________________	☐	☐	☐	☐	☐	☐	☐	☐	☐

To check boxes, double click on the box and change the default value to "checked."

Legend:

§201.6(c)(2)(i) Profiling Hazards
A. Does the risk assessment identify the location (*i.e.*, geographic area affected) of each hazard addressed in the **new or updated** plan?
B. Does the risk assessment identify the extent (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?
C. Does the plan provide information on previous occurrences of each natural hazard addressed in the **new or updated** plan?
D. Does the plan include the probability of future events (*i.e.*, chance of occurrence) for each hazard addressed in the plan?

MATRIX B: ASSESSING VULNERABILITY

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that the new or updated plan addresses each requirement. **Completing the matrix is not required**.

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each ***applicable*** *hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk. Note: Receiving an N in the shaded columns will not preclude the plan from passing.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	§201.6(c)(2)(ii) Assessing Vulnerability: Overview	A. Overall Summary Description of Vulnerability		B. Hazard Impact		§201.6(c)(2)(ii) Assessing Vulnerability: Identifying Structures	A. Types and Number of Existing Structures in Hazard Area (Estimate)		B. Types and Number of Future Structures in Hazard Area (Estimate)		§201.6(c)(2)(ii) Assessing Vulnerability: Estimating Potential Losses	A. Loss Estimate		B. Methodology	
	Yes		N	S	N	S		N	S	N	S		N	S	N	S
Avalanche	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Coastal Erosion	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Coastal Storm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Dam Failure	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Drought	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Earthquake	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Expansive Soils	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Levee Failure	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Flood	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Hailstorm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Hurricane	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Land Subsidence	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Landslide	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Severe Winter Storm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Tornado	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Tsunami	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Volcano	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Wildfire	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Windstorm	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Other ________	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Other ________	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐
Other ________	☐		☐	☐	☐	☐		☐	☐	☐	☐		☐	☐	☐	☐

To check boxes, double click on the box and change the default value to "checked."

Legend:

§201.6(c)(2)(ii) Assessing Vulnerability: Overview

A. Does the **new or updated** plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
B. Does the **new or updated** plan address the impact of each hazard on the jurisdiction?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures

A. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
B. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses

A. Does the **new or updated** plan estimate potential dollar losses to vulnerable structures?
B. Does the **new or updated** plan describe the methodology used to prepare the estimate?

MATRIX C: IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each ***applicable*** *hazard. An "N" for any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	☐	☐	☐
Coastal Erosion	☐	☐	☐
Coastal Storm	☐	☐	☐
Dam Failure	☐	☐	☐
Drought	☐	☐	☐
Earthquake	☐	☐	☐
Expansive Soils	☐	☐	☐
Levee Failure	☐	☐	☐
Flood	☐	☐	☐
Hailstorm	☐	☐	☐
Hurricane	☐	☐	☐
Land Subsidence	☐	☐	☐
Landslide	☐	☐	☐
Severe Winter Storm	☐	☐	☐
Tornado	☐	☐	☐
Tsunami	☐	☐	☐
Volcano	☐	☐	☐
Wildfire	☐	☐	☐
Windstorm	☐	☐	☐
Other ______________	☐	☐	☐
Other ______________	☐	☐	☐
Other ______________	☐	☐	☐

To check boxes, double click on the box and change the default value to "checked."

Legend:
§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions
A. Does the **new or updated** plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?

TABLE OF CONTENTS

CHAPTER I - INTRODUCTION

HAZARD MITIGATION PLANNING ACTS AND REGULATIONS

This Hazard Mitigation Plan for the University of Maryland Eastern Shore (UMES) has been developed in accordance with current federal regulations that govern local hazard mitigation plans. The Plan shall be routinely monitored to ensure compliance with Section 322, Mitigation Planning, Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 and by FEMA's Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201 and 44 CFR Part 201.6.

- The *Disaster Mitigation Act of 2000* (DMA 2000) came into effect in October of 2000 to emphasize the importance of pre-disaster mitigation planning at the local level. DMA 2000 underscores the concept of sustainability for disaster resistance and encourages and rewards state and local pre-disaster planning. Its ultimate goal is to assist state, local governments and universities to better articulate needs for mitigation and secure funding to implement effective risk reduction projects.
- *44 Code of Federal Regulations Part 201.6*: The Code of Federal Regulations (CFR) focuses on natural hazards and emphasizes an opportunity for public comment and involvement in the mitigation plan development process.
- The FEMA 443 “Building a Disaster-Resistant University” (FEMA) publication was also used as a guide during the preparation of this plan.

This Plan was prepared in coordination with FEMA and the Maryland Emergency Management Agency to ensure that it meets all applicable DMA 2000 planning requirements. An Updated Local Mitigation Plan Crosswalk, located at the beginning of the report, provides a summary of FEMA’s current standards of acceptability and identifies the location within the document where each planning requirement is included.

OVERVIEW OF HAZARD MITIGATION

Hazard Mitigation is defined by the Federal Emergency Management Agency (FEMA) as any “sustained action taken to reduce or eliminate long-term risk to people and property from hazards and their effects”. The hazard mitigation planning process involves identifying risks and developing appropriate actions to reduce injuries, deaths, property damage, economic losses, and degradation of natural resources due to natural and human-caused disasters.

Hazard mitigation is considered one of four phases in emergency management activities. Mitigation activities involve actions that reduce or eliminate the probability of an occurrence or reduce the impact of a disaster. The goal of the mitigation phase is to decrease the need for a response. The other phases in emergency management include preparedness (planning and preparing for when a disaster strikes); response (providing emergency assistance to victims and minimizing property loss); and recovery (short and long term activities - clean-up efforts, temporary housing, and replacement of infrastructure that help return individuals and communities to normalcy as soon as possible).

A. Hazard Mitigation Planning Principles

FEMA has developed 10 fundamental principles for hazard mitigation plans that have been taken into consideration during the development of this All-Hazard Mitigation Plan. They include the following:

1. Risk reduction measures should ensure long-term economic success for the community as a whole rather than address short-term benefits for special interests.
2. Risk reduction measures for one natural hazard must be compatible with risk reduction measures for other natural hazards.
3. Risk reduction measures must be evaluated to achieve the best mix for a given location.
4. Risk reduction measures for natural hazards must be compatible with risk reduction measures for technological hazards and vice versa.
5. All mitigation is local.
6. Disaster costs and the impacts of natural hazards can be reduced by emphasizing pro-active mitigation before emergency response; both pre-disaster (preventive) and post-disaster (corrective) mitigation are needed.
7. Hazard identification and risk assessment are the cornerstones of mitigation.
8. Building new federal-state-local partnerships and public-private partnerships is the most effective means of implementing measures to reduce the impacts of natural hazards.
9. Those who knowingly choose to assume greater risk must accept responsibility for that choice.
10. Risk reduction measures for natural hazards must be compatible with the protection of natural and cultural resources.

PURPOSE

The purpose of the All-Hazards Mitigation Plan is to go through a process of identifying hazards and risk, estimating losses due to specific hazards, developing goals, objectives, and mitigation actions to reduce the risk to the University’s students, staff, and structures from those risks. The plan focuses on two main hazards – flood and high wind (including hurricanes, tropical storms and tornadoes). The primary objectives of this All-Hazard Mitigation Plan are:

- To comply with federal requirements for local hazard mitigation plans;
- To protect life and property on campus by reducing the potential for future damages and economic losses that result from natural or human-caused hazards;
- To expedite the recovery and redevelopment process following a future disaster event; and;
- To qualify for additional grant funding, in both the pre-disaster and post-disaster environment.

SCOPE

In December 2008, the University of Maryland Eastern Shore's Facility Department contracted with the George, Miles & Buhr team from Salisbury, Maryland (which included Vision Planning and Consulting from Columbia, Maryland, and the Eastern Shore Regional GIS Cooperative, from Salisbury, Maryland) to develop the All-Hazard Mitigation Plan for the UMES campus. The Plan was funded by pre-disaster mitigation funds from FEMA and administered by the Maryland Emergency Management Agency (MEMA).

This All Hazard Mitigation Plan will be updated every five years and maintained to continually address those hazards determined to be "high risk" and "moderate risk" based on the hazard risk assessment in Chapter 5 of this document. Other hazards that pose a low or negligible risk will continue to be evaluated during future updates to the Plan, but they will not be fully addressed until they are determined to be of high or moderate risk to the University. The geographic scope or study area for this Plan includes the Eastern Shore (main) campus in the Town of Princess Anne and Hawk's Landing. It must be noted that future funding for mitigation projects will be contingent upon having the UMES adopting the plan and become eligible for pre- and post-disaster mitigation funds.

ORGANIZATION OF THE PLAN

The All-Hazard Mitigation Plan comprises seven chapters. The Prerequisites of the Plan, including letter of adoption by the Board of Regents, can be found prior to this Introduction Chapter, immediately following the Table of Contents.

Chapter 1 provides an introduction to hazard mitigation, current hazard mitigation acts and requirements, and identifies the purpose and scope of the project.

Chapter 2 is an overview of the campus' location, climate, and population.

Chapter 3 documents the planning process and includes a review of relevant plans and ordinances from the State, Somerset County, and Town of Princess Anne.

Chapters 4 and 5 cover the hazard identification and risk assessment and provide an in-depth look at the potential losses from various hazards experienced by the University. Chapter 4 includes a historical profile of hazard types and Chapter 5 includes a vulnerability assessment which analyzes the potential for future damages due to the hazards identified in Chapter 4 and associated losses.

Chapter 6 discusses the mitigation strategy including mitigation goals and objectives, identification of mitigation actions, and the method for prioritization and implementation of mitigation actions.

Chapter 7 outlines how the University will implement the Plan once it is adopted and addresses ways to monitor progress and ensure continued public involvement.

CHAPTER II – BACKGROUND

LOCATION

The University of Maryland Eastern Shore is located in Somerset County and covers 745 acres of land adjacent to the Town of Princess Anne. The campus is located approximately 20 miles south of the City of Salisbury and 20 miles north of Pocomoke City. The major highway that provides access to the campus is US 13. The main campus entrance is along Route 822 (UMES Boulevard Road) with two secondary entrances: McCain Drive and Broad Street.[1]

The UMES campus area includes: the main campus, Hawk's Landing, the Bozman Farm, the ENT Farm, and a vast forested area which includes a forestation preserve and the Maryland Fire Research Institute (MFRI). The majority of the campus is located between two branches of the Manokin River to the north and south; the Manokin Branch and Loretto Branch respectively. To the east, the main campus is bordered by a large forested area including a Forestation Preserve. An active freight railway line borders the western side of the campus. The University is growing in a northeasterly direction and the greatest opportunity for land acquisition exists on the opposite side of the Manokin Branch north of the main campus. [1]

CLIMATE

The Delmarva Peninsula experiences warm, humid summers and mild winters. Princess Anne has an average high of 88°F during July and an average low of 26°F occurring in January. Summer months tend to have the most rainfall with an average of 4.08 inches per month and winter is the driest season generating approximately 3.3 inches of rain per month. The proximity of UMES to the Atlantic Coast puts it at risk of hurricane elements. Typically, hurricane season is between mid-August to October with most hurricanes occurring during September.[2]

LAND USE

The land use surrounding the UMES campus reflects that of the eastern shore of Maryland and is comprised of 40 percent forested area, 32 percent water and wetlands, 25 percent agriculture, and 3 percent developed areas. The topography is relatively flat due to the University's close proximity to the Chesapeake Bay. The elevation varies only a few feet across

[1] UMES Master Plan Draft 2008-2018
[2]Weather.com

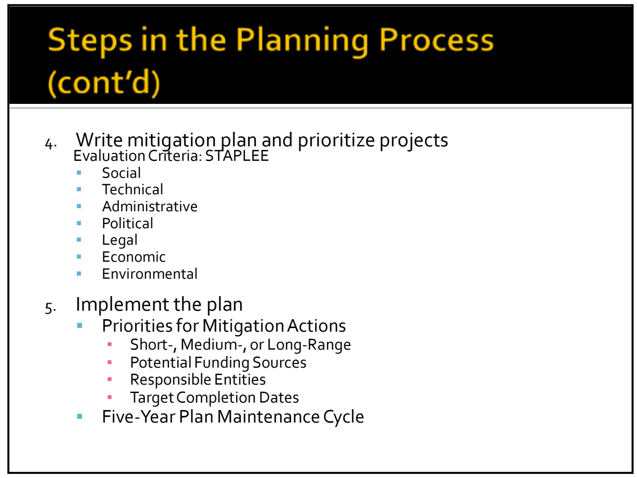
the campus with the biggest difference occurring along the banks of river branches. The area is marked by an interconnected system of wetlands, swamps, and rivers that empty into the Bay.

POPULATION

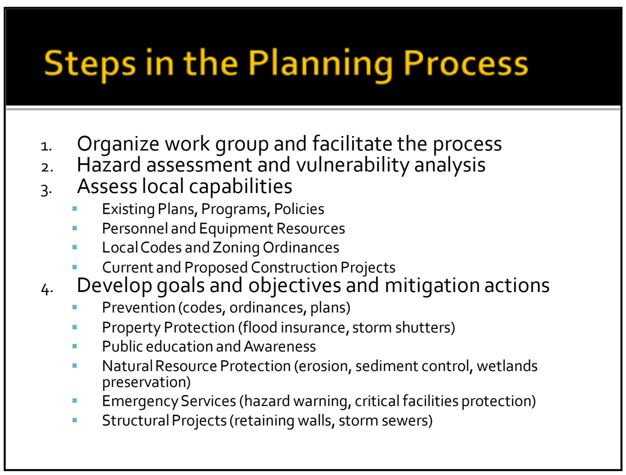
The student body was 4,086 during the Fall 2007 semester and continues to grow. By 2017, the enrollment is projected to reach 5,704 students.[1] As a historically black college, UMES is predominately African American. The Fall 2007 semester's student body was 76 percent African American, 11 percent White, one percent Asian, one percent Hispanic, and less than one percent Native American.

CHAPTER III – PLANNING PROCESS

REQUIREMENT §201.6(b): IN ORDER TO DEVELOP A MORE COMPREHENSIVE APPROACH TO REDUCING THE EFFECTS OF NATURAL DISASTERS, THE PLANNING PROCESS **SHALL** INCLUDE:
(2) AN OPPORTUNITY FOR NEIGHBORING COMMUNITIES, LOCAL AND REGIONAL AGENCIES INVOLVED IN HAZARD MITIGATION ACTIVITIES, AND AGENCIES THAT HAVE THE AUTHORITY TO REGULATE DEVELOPMENT, AS WELL AS BUSINESSES, ACADEMIA AND OTHER PRIVATE AND NON-PROFIT INTERESTS TO BE INVOLVED IN THE PLANNING PROCESS



Hazard Mitigation Committee



The hazard mitigation planning process included five steps that were completed over an eight month period:

STEP 1 – ORGANIZE WORK GROUP AND FACILITATE PROCESS

In order for the plan to be successful, it involved extensive participation from project initiation to project completion. The public involvement process was comprised of three tiers:

UMES Hazard Mitigation Committee (HMC) – UMES had previously identified members who would serve on a HMC. The members included a number of persons associated with the University who were closely involved with the development of the plan. HMC members were authorized to make decisions on behalf of the University as well and were knowledgeable about key departments and their possible roles in plan implementation. Suggestions were made to UMES for additional entities/agencies that should be represented on the Committee. A total of five HMC meetings were conducted during the planning process and facilitated by the Consultants.

The initial project kickoff meeting was held at the UMES Facilities Department on January 8th 2009 with officials from UMES and the consultants. The topics of discussion focused on the overall project approach, in which emphasis was placed on the steps necessary to meet the requirements of the Disaster Mitigation Act of 2000, timeline, and a suggested schedule for meetings. Finally, the Consultants emphasized the need for ongoing involvement throughout the planning process. Future meetings were discussed, including the first Hazard Mitigation Committee meeting. A description of the agenda items for each meeting is listed below.

HMC Meeting #1, 10 February 2009

HMC Meeting #1 was held at the Facilities Department on 10 February 2009. At this meeting:

- A review of the planning process was conducted;
- Roles and responsibilities of the Consultant Team and the Steering Committee were discussed;
- Input on potential hazards associated with the University was solicited;
- Discussion on mitigation issues in various plans and studies begun; and
- A Capability Assessment Feedback Form was distributed to the Committee members.

HMC Meeting #4, 19 May 2009

HMC Meeting #2 was held at the Facilities Department on 24 March 2009. At this meeting:

- A discussion on the Hazard Identification and Profiling was facilitated; and
- Results of the asset inventory were presented to the group.

HMC Meeting #3 was held at the Facilities Department on 21st April 2009. At this meeting:

- Asset inventory was finalized;
- A discussion on Loss Estimates was conducted; and
- The preliminary Vulnerability Assessment was presented.

HMC Meeting #5, 23 September 2009

HMC Meeting #4 was held at the Facilities Department on 19th May 2009. At this meeting:

- Goals and Objectives were developed; and
- Preliminary Mitigation Actions and Evaluation Criteria were developed.

HMC Meeting #5 was held at the Facilities Department on 2nd June 2009. At this meeting:

- Mitigation Actions were finalized and an action plan was developed;
- Mitigation Actions were prioritized; and
- Preliminary Implementation Strategy was discussed.

HMC Meeting #6 was held on 23rd September 2009. At this meeting:

- The architectural/engineering options to mitigate flooding were discussed;
- Cost estimates were provided; and
- Submission of the draft and final plans were discussed.

Table 3.1 – UMES Hazard Mitigation Committee

UMES HAZARD MITIGATION COMMITTEE		
Name	**Agency**	**Role**
J. Carter Struve	Maryland Emergency Management Agency	State Hazard Mitigation Officer
Garland Hayward	Town of Princess Anne	Town Commissioner
Jay Parker	Town of Princess Anne	Town Manager
Dale Pusey	Somerset County Dept. of Technical & Community Services	Engineer
Stever Marshall	Somerset County Emergency Services	Director
Dr. Ronnie Holden	UMES	Vice President of Administrative Affairs
Dr. Maurice Ngwaba	UMES	Assistant to the Vice President of Admin Affairs
Mark Clauss	UMES	Grounds Supervisor
Preston Cottman	UMES	Environmental Health and Safety Manager
Peter Okemmuo	UMES	Architect Planner
Edward Johnson	UMES	Civil Structural Engineer
Tracie Earl	UMES	GIS Coordinator
Marvin Jones	UMES	Residence Life Director
Warner Stumpter	UMES	Public Safety Director & Chief
Lawrence Wright	UMES	Public Safety Captain
Dr. Charles Williams	UMES	Vice President of Academic Affairs
Dr. Ronald Forsythe	UMES	Vice President for Technology and Commercialization
Quentin Johnson	UMES	Acting Vice President for Student Life & Enrollment Management
Dr. Gladys Shelton	UMES	Dean of Agricultural and Natural Sciences
Dr. Robert Johnson	UMES	Professor of Math & Sciences
Dr. Brian Mitchell	UMES	Associate Professor of Business, Management & Accounting
Danna Maloney	UMES	Assistant Environmental Health and Safety Manger

The Hazard Mitigation Committee comprised State, County, Town, and University representatives from a variety of departments. Some of these members also served as subject matter experts and provided the consultants with information including those related to academic departments, transportation, police and fire departments (from the Town of Princess Anne and Somerset County), student organizations, public works/capital projects departments, emergency managers, and the risk management department, among others.

Table 3.2 – UMES Hazard Mitigation Stakeholders

Name	Role	Agency
Mr. Larry Dryden	Resident Maintenance Engineer	State Highway Administration
Ms. Rochelle Outten	Project Engineer	State Highway Administration
Ralph Taylor	Director	Somerset County Roads Department
Mr. Jack Willing, Jr.		Somerset County Department of Technical & Community Services
Mr. Robin Street	Manager	Somerset County Sanitary District
Earl Ludy	Wasterwater Superintendent	Somerset County Sanitary District
Tray Grangier		Town of Princess Anne Public Works
JR Mister	Fire Chief	Princess Anne Volunteer Fire Department
Chief Scott Keller		Town of Princess Anne Police Department
Robert N. Jones	Sheriff	Somerset County
	Commander	America Legion Post 94
Phil Taylor	Director	UMES Information Technology
William Miles	Supervisor	UMES Boiler Plant
Leon Bivens	Director	UMES Physical Plant
John Palmer	Supervisor	UMES HVAC
Bruce Williams	Energy Manager	UMES
James Lunnermon, Sr.		UMES

A list of Stakeholders was compiled by the Facilities Division. These stakeholders were kept abreast of the planning process and were asked to provide input, as required. The consultant held one-on-one meetings with various stakeholders on a variety of topics (Table 3.3). While a few stakeholders were part of the Committee and attended meetings, others were not expected to be at the HMC meetings but provided valuable input.

Table 3.3 – Stakeholder Meetings

Name	Title	Department	Issues Discussed
Phil Taylor	Director	UMES Information Technology	Protection of equipment, data storage, contingency procedures, backup operations
Leon Bivens	Director	UMES Physical Plant	Utilities, back up procedures, roofing issues, flood prone buildings
John Palmer	Supervisor	UMES HVAC	HVAC systems, flood prone buildings
Bruce Williams	Energy Manager	UMES	Backup, communications, flood prone structures
Lisa Johnson	Human Resources Specialist	UMES Human Resources	Damage assessments, training
Warner Sumpter	Director	Public Safety	Facility, staffing, response procedures, EOP, COOP

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

Involvement of the Public and other Jurisdictions

Public Meetings – Residents of the Town of Princess Anne as well as Somerset County citizens were invited to participate in the planning process. They were kept abreast of the progress of the plan through the media (radio, television, website, and newspapers) who disseminated information and helped gauge the interests of the community. Since mitigation may be a new concept to some people, while others may not understand the technical engineering aspects and outcome, information was shared with the public and University community through presentations to make them become interested, educated, and involved in the planning process.

The Consultant Team facilitated two public meetings during the planning process, both of which were open to the campus community as well as the residents of the Town of Princess Anne. The first public meeting was held on 16th July 2009 at the Ella Fitzgerald Performing Arts Center. This meeting was critical in gaining community support and was conducted to:

- introduce the hazard mitigation planning process;
- gather local knowledge on the University/City/County's historical hazard events; and
- share the initial findings from the hazard assessment and vulnerability analysis.

The second public meeting was held on 12th October 2009 at the Ella Fitzgerald Performing Arts Center at the end of the planning process to:

- present the proposed hazard mitigation planning recommendations;
- present the design for the proposed mitigation project(s); and
- advertise the availability of the Draft Plan.

The UMES Facilities Department was in charge of securing the meeting location, notifying the community, and securing the meeting locations.

STEP 2 – HAZARD ASSESSMENT AND VULNERABILITY ANALYSIS

The Hazard Identification and Vulnerability Assessment process was a critical phase in the development of a mitigation plan for the University of Maryland Eastern Shore. The consultant team, with the help of the UMES Hazard Mitigation Committee, determined what environmental hazards (both natural and technological) were a threat to the campus residents, staff, and physical assets, how likely those threats were to occur; the magnitude of those threats; which campus assets are vulnerable to damage and to what degree; and how to estimate the potential losses.

The local capabilities were assessed to determine the capacity of the University to carry out the effort in terms of human, technological, and financial resources. The assessment included: UMES' mission, programs, policies and existing plans (e.g., Master Plan, Emergency Operations Plan, Strategic Plan) as they relate to hazard mitigation and reducing risk;

- Personnel, and equipment resources;
- Building codes and other land development regulations; and
- Examination of current and proposed construction projects that would affect the capability of the University to respond to a hazard.

STEP 3 – DEVELOP A MITIGATION PLAN

The development of a list of goals and objectives provided a framework for making decisions on funding and implementing mitigation actions. The Consultant Team worked with the HMC to develop mitigation goals aimed at reducing or avoiding the University's vulnerabilities to the identified hazards. The consultants then worked with the HMC to identify the mitigation actions to protect the University's facilities, research, staff, and students. A comprehensive range of specific mitigation actions and projects were identified to reduce the affects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

The Consultant then prepared an action plan describing how the mitigation strategies and activities identified would be prioritized, implemented, funded, and administered. This was presented to the HMC for review and comment. The mitigation actions were then ranked by the HMC. The criteria for ranking included: life safety, operational criticality, timeline, cost, etc. A matrix was used to list multiple criteria whereby the HMC participated in the prioritization process.

STEP 4 – WRITE MITIGATION PLAN DOCUMENT

The Consultant prepared a draft mitigation plan comprising all of the plan elements for review by the HMC. Comments from the draft plan were incorporated into the final draft. The draft plan was available for review and the highlights of the plan were presented to the University Faculty, Staff and Students, and the local community at the second public meeting. The final document was sent to MEMA and FEMA for approval, upon which, it would be adopted by the University Board of Regents.

STEP 5 – IMPLEMENT THE PLAN

A plan implementation strategy was developed to determine how the mitigation actions will be funded, and included an approximate cost for each recommended project and possible funding sources for implementation.

The Consultant performed topographic field survey of the area along the Manokin tributary (south and west borders of the campus). Finish floor elevations of all buildings on campus were determined and vertical and horizontal data with topographic information from the field survey was coordinated.

The Consultant performed flooding analysis along the tributaries to determine risks, frequency of flooding, and an appropriate response to flood potential. Schematic designs of appropriate improvements to minimize flooding risk, as well as cost estimates of recommended improvements were prepared.

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process* ***shall*** *include:*
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Review and Incorporation of Relevant Plans and Studies

This section comprises a review and summary of various documents at the University, Town, County, and State levels as they relate to land use, building construction, and floodplain management in and around the UMES campus. Each subsection includes a summary of the document and potential options for including hazard mitigation principles and practices in these documents, as the case might be. The purpose of these recommendations is to provide facility planners with ideas on how to better integrate hazard mitigation into future plans and activities.

UMES Master Plan (2008-2012)
The main purpose of the Master Plan is to determine where and how all planned and anticipated construction can be accommodated within a well defined urban design and open space network and to guide the prioritization of individual projects by suggesting their most appropriate location. The Plan's objective is to determine how much future development can be accommodated through the campus and to establish who and where this growth should be sited. Therefore, this Plan provides an excellent avenue to incorporate general hazard mitigation principles.

Recommendations for Incorporating Hazard Mitigation Principles into the Master Plan

- In the Purpose of the Plan section (1.1), include a sentence (6) under 'interrelated factors that need to be examined concurrently' that states "Location in proximity to forested areas and the floodplain."
- Incorporate into the Planning and Design Issues section (1.7): "High hazard areas".
- In Section 1.8 – Facility Master Plan Concept, expand the 1st point to include "The nature of the buildings and open spaces should reflect the existing patterns and work around natural barriers and topography and consider the potential effects of natural hazards such as wildfires and floods".
- Include a reference to the DCFS, indicating that the location of future structures on campus will conform to DCFS guidelines and be located away from high hazard areas and/or those that are vulnerable to the effects of wind and water.
- Incorporate into the Mission Statement, given that the University is bordered by branches of the Manokin River - the Loretto Branch to the north and the Manokin Branch to the south, the campus is at increased risk from damage related to flooding, and will look for opportunities to better protect itself from these events and their effects.

<u>Design Criteria/Facility Standards Manual (DCFS, 2005)</u>
The UM Design Criteria/Facility Standards (DCFS) Manual is the document that is used by all campuses of the University of Maryland system, including the UMES uses to guide development at the various campus locations throughout the State. The DCFS include specific guidance and references to many other documents. These Standards and Guidelines are intended to serve as a guide for renovation and new construction projects at the University.

All buildings, including the University, are required to apply the standards in the State's Model Performance Code (COMAR 05.02.07) and the Maryland State Fire Prevention Code (COMAR 29.06.01) for any construction, alteration, remodeling or renovation. The Model Performance Code One includes the BOCA Building Mechanical and Energy Conservation Codes and the State Fire Prevention Code includes the NFPA 101 and the BOCA Fire Prevention Code.

A goal identified in the Manual is to create facilities that will last 50-100 years, which should take into consideration, adequate hazard mitigation measures. Therefore, this Manual may serve as a good platform to incorporate mitigation measures and practices into the University's long-term development process.

Note: A few of these principles have been extracted from options to incorporate hazard mitigation principles form the UM College Park Hazard Mitigation Plan as they follow the same Manual.

Options for Incorporating Hazard Mitigation Principles into the DCFS

- In Section 1.01 (Building Goals and Design Principles), include hazard mitigation as a design principle.
- In Section 1.03 (Codes), include references to FEMA engineering guidelines for shelters.

- Review and update Section 1.07 E1 (Exterior Cladding) to specify wind resistance standards, especially regarding window construction and details.
- In the Mechanical and Electrical Equipment subsection (1.07 F 2), as appropriate, include language specifying standards for attaching mechanical and electrical equipment to roofs and exteriors.
- Section 2.16 - The University follows the 1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control. Continue to enforce the requirement of sediment and erosion control approval to be obtained from the Maryland Department of the Environment if more than 5,000 square feet of surface area or more than 100 cubic yards is disturbed to reduce flooding problems related to run-off.
- Section 2.19 – Continue to design and construct stormwater drainage systems to convey the 10-year storm in accordance with the Maryland State Highway standards.
- Section 2.20 discusses wetlands and the floodplain, which are regulated in accordance with the Maryland Department of the Environment and the U.S. Army Corps of Engineers. This section does not provide specific guidelines. Consider updating this section to include a list of guidelines and regulations related to development in and around floodplains and wetlands, for reference.
- Modify Section 8.01 (Doors and Frames) to include requirements for wind-resistant construction practices.
- Modify Section 8.02 (Glass and Glazing) to include requirements for wind-resistant construction practices.
- Modify Section 8.04 (Windows) to include requirements for wind-resistant construction practices and specifications.
- Modify Section 15.02 (HVAC) to include requirements to properly secure and raise HVAC systems.
- Add a section to the Manual that discusses sheltering-in-place. The section should identify locations and specifications for shelters on campus.

<u>Maryland Stormwater Management Guidelines</u>

The University's stormwater regulations and permit procedures are similar to that of the State and are based on the State's Stormwater Management Guidelines. For all redevelopment projects, the existing impervious area impacted within project limits is at least 20 percent.

- UMES may want to consider developing a stormwater master plan that would consider low impact development techniques to manage storm water by incorporating techniques such as bio-retention areas, dry wells, infiltration trenches, filter/buffer strips, vegetated swales, rain barrels, and cisterns. This will reduce the impact of flooding on campus.
- Additionally, UMES may consider clarifying and formalizing the stormwater impact review processes that are currently employed. This could include establishment of a review committee comprising staff from the Maryland Department of the Environment, Somerset County, and the Town of Princess Anne.

University of Maryland Eastern Shore Emergency Resources Guide

The UMES Emergency Resources Guide provides procedures for responding to various agencies. The guide also includes general procedures to evacuate buildings during the time of an emergency. The guide also offers recommendations for medical emergencies related to hazards such as heat exhaustion, hypothermia and a brief section on sheltering-in-place. Options for Coordination between the UM and State Hazard Mitigation Plans.

University of Maryland Eastern Shore Crisis Management Plan

The UMES Crisis Management Plan mentions tornadoes, hurricanes, winter storms and earthquakes as natural and man-made emergencies that my impact the campus and details the response procedures that campus officials should follow during an emergency. Options for Incorporating Hazard Mitigation Principles into the Crisis Management Plan:

- The University EOP highlights tornadoes, winter storms, hurricanes, and earthquakes as natural hazards and outlines protection measures that should be taken in case such an event threatens the campus. This list should be extended to include other natural hazards such as floods and wildfires to which the University is vulnerable, based on the analysis in the Hazard Mitigation Plan.

UMES Emergency Preparedness Audit

In May 2009, a review of the Emergency Preparedness Plan was conducted to determine whether UMES' Plan complied with University System of Maryland's Policy on Campus Emergency Planning, Preparedness, and Response. A number of areas were noted for review and improvement. Of those, items that are relevant to the Hazard Mitigation Plan are listed below:

- The Crisis Management Plan should be updated to include the hazards/risks and appropriate mitigation actions.
- The evacuation planning section in the Emergency Evacuation and Operations Plan should be updated annually.
- Town Hall meetings facilitated by the Department of Public Safety should include question and answer segments on various topics such as preparedness, evacuation, and response, and feedback forms should be made on the Public Safety website.
- The range of hazards and the campus' vulnerability to these hazards should be assessed annually.

UMES Emergency Evacuation and Operations Plan

The Environmental Health and Safety Department has developed a model Emergency Evacuation and Operation Plan (EEOP) to assist departments in low-rise buildings prepare for emergencies. The EEOP model plan correlates with the UMES EOP that was developed for campus operations during large scale or campus-wide emergencies.

The document discusses coordination with the UMES Emergency Operations Plan and other Departmental Emergency Operations Plans as well as coordination with Departmental Health and Safety Plans. University emergency resources and contacts from various departments are listed as well as expectation for departments and staff. The Plan's appendix includes detailed evacuation procedures for persons with disabilities and procedures for conducting, critiquing, recording, and reporting fire drills.

The University has as many as 38 Emergency Building Evacuation Plans for emergency coordination and response by buildings. A listing of these can be found at http://www.umes.edu/EHS/Default.aspx?id=20930. Each building's evacuation plan identifies: assembly points, emergency management coordinators, and contact information. An individual (Building Manager) is assigned for each building, who is responsible for the health and safety of the building.

Options for Incorporating Hazard Mitigation Principles into the Crisis Management Plan:

- The EEOP outlines emergency procedures for fire, bomb threats, chemical spills or release and earthquakes. Emergency procedures for floods should be included in this section since the campus is particularly vulnerable to flooding. Procedures would include: moving items of value to a higher level; shutting off all ignition, heat, and gas sources, etc.

University System of Maryland (USM) Report on Campus Safety and Security (2008)

The goals of this project were to: identify "best practices" that can be implemented at USM institutions to enhance of safety and security of all campuses; ensure that steps taken did not diminish the atmosphere of the campus atmosphere; and to establish an official, ongoing mechanism to support, monitor, coordinate, and update campus safety and security initiatives. A recommended policy was developed for campus safety and security and emergency planning, prevention, preparation, and response that identified key areas in campus response plans.

Three sub-groups were formed for the project:

Subgroup 1: Risk assessment and planning – identification of potential hazards and threats, assessment of vulnerability and planning and prioritization of actions to address potential threats.

Subgroup 2: Emergency preparedness and prevention – actions to be taken prior to an emergency event and on mitigating the impact of the event;

Subgroup 3: Response and recovery – response to significant events in the intermediate and longer term and restoration of normal operations to the institution.

Options for Coordination between the UMES Mitigation and Campus Safety and Security Plan

- This plan identifies the need for the inclusion of appropriate mitigation activities targeted to specific threats, in the Emergency Preparedness Plan. The need for this integration should be reinforced and specific section from the Hazard Mitigation Plan can be cited in the Safety and Security Plan.
- The plan recommends that local and state emergency responders are included in the preparation of various campus plans and that the institutions should establish close

working relationships with these entities. This has been emphasized in the Hazard Mitigation Plan as well and should continue to be a priority.

University of Maryland Eastern Shore System Disaster Recovery Plan (DRP)
The DRP is designed to mitigate the risk of system and service unavailability by providing solutions for the prompt and effective continuation or resumption of mission-critical services in the event of a disaster. The Plan identifies mission-critical infrastructure components and offers measures to protect them.

The DRP consists of the following phases: Notification and activation, assessment and conditions evaluations and reporting, continuity of Information Technology services and initial recovery; and full recovery and reconstitution of normal operations - reestablishing IT operations at the permanent location, returning platforms to operations, restoring network continuity and that of computer operations. In the event of a catastrophic scenario that renders the system facility located in Waters Hall Server Room 2107 as inoperable, it would require the availability of information technology resources needed to restore IT services at an alternate site.

The Plan also includes a DRP form. The purpose of this report is to capture information on problems encountered during execution of the system DRP, and to identify necessary changes in DRP policies, processes and procedures to prevent reoccurrence. It includes a Disaster Log form, a facility/site evaluation checklist, a platform damage and operability checklist, applications status checklist, network evaluation checklist, and a security operations checklist.

Options for Coordination between the UMES Mitigation Plan and DRP

- Work to ensure that the DRP and HMP recommendations are integrated, particularly those that relate directly to mitigation projects such as facility elevations.

University of Maryland Eastern Shore Capital Improvement Plan
The UMES Master Plan draft identifies 17 capital projects and 11 system funded projects that are slated for construction between 2008 and 2018. The major portion of funding for these projects is from State funds (general obligation bonds).

Options for Coordination between the UMES Hazard Mitigation Plan and Capital Improvement Plans

- Work to ensure that hazard mitigation principles are introduced into the capital improvements planning process and on new construction and reconstruction projects, UMES should emphasize those projects that mitigate the impact of natural hazards and consider them high priority projects.
- Consider a more unified approach to better integrate efforts between the Master Plan, Hazard Mitigation Plan, DCFS manual and CIP by including a staff member who is knowledgeable about hazard mitigation, to be involved in the CIP.
- On the renovation/new addition projects in the proposed CIP, identify opportunities to incorporate hazard mitigation principles, i.e., improving resistance to wind or flood.

Somerset County Hazard Mitigation Plan (2005)

The Somerset County Hazard Mitigation Plan was prepared and adopted in 2004 and is expected to be updated in 2010. The County had applied for a PDM grant in 2009 that was not obtained. The County is resubmitting a PDM grant application in 2010 for the plan update for Somerset County and the municipalities of Crisfield and Princess Anne. The Plan provides information on the various hazards to which the County is prone. Hurricanes, storm surge, winter storms, high winds, and floods rank high among other hazards. While the County Plan ranks the top two hazards as hurricanes and storm surge, the UMES Hazard Mitigation Plan ranks the top three hazards as flood (including storm surge), wind (including hurricanes and tropical storms), and lightning.

Recommendations for Coordination between UMES and Somerset County Hazard Mitigation Plans:

- One goal of the County Hazard Mitigation Plan is to improve coordination and communication with other relevant organizations and establish lasting partnerships. The goal does not list UMES in particular. As part of the 2010 update to Somerset Count's Hazard Mitigation Plan, the planning process should allow for facility planners from UMES to be present on the Committee so they can jointly identify areas of cross reference between the County Plan and the University Plan and ensure they are in harmony with one another.
- One objective in the County Plan is to increase the number of critical facilities that have carried out mitigation measures to ensure their functionality in a 100-year flood event. This goal includes facilities at the UMES campus which are identified by the University as being in the floodplain or storm surge area. This goal to protect critical facilities on campus should continue to be achieved jointly by the University and the County.
- One mitigation action in the County plan discusses the identification of structures for retrofit projects, particularly at UMES, for which the University would be the applicant. This should be made a priority and UMES and the County should work closely to develop project applications.
- The 2005 County HMP recognizes that the campus could grow to more than 5,000 students by the year 2008 and that new student housing would be constructed adjacent to the campus within the growth corridor. The City of Princess Anne and the University should work together in identifying suitable locations for off-campus student housing and identify properties that are not in high hazard areas such as in or near the floodplain.

Somerset County Comprehensive Plan (2002)

The Somerset County Comprehensive Plan serves as a general long-term guide for growth and development in the County and its municipalities. The Plan includes an important special activities goal: To establish a Joint Consultative Committee between the County, Town of Princess Anne, and UMES to coordinate expansion programs, annexation issues and areas of mutual interest, including provision of off-campus amenities and recreation opportunities for students. This goal is vital to improve the relations with UMES. The University, City, and County should regularly communicate and cooperate on issues and work together to coordinate decision-making and share resources.

Under the Environmental Goals, the Plan discusses the need for respecting sensitive areas such as floodplains and wetlands, and discouraging new development in areas with steep slopes, unstable soils, or has the potential for flooding or erosion, and promotes cluster development. These goals closely mirror hazard mitigation planning principles.

The Plan designates the area to the north-east of UMES as one of three growth nodes for the county, which will be primarily residential in nature. It discusses that stronger ties should be developed between UMES and the Town of Princess Anne, particularly in providing services and entertainment needs for the students. It also recommends that the Town work closely with the University and take student needs into consideration while developing a commercial area revitalization program.

Options for Coordination between the UMES and Somerset County Comprehensive Plan

- The County, City and University should collaborate in preparing grant applications and work closely with the State to understand the mitigation program and allocation of mitigation dollars from the state for project development, particularly where the project is of interest to the local jurisdiction (City or County) as well.
- The City and University should collaborate on applying for joint funding for emergency management equipment.

Somerset County Emergency Operations Plan

Somerset County is currently in the process of completing their new Emergency Operations Plan, using the Emergency Support Functions (ESFs). The Plan is expected to be completed this spring. Currently there are no memorandums of agreements between the County and UMES although the University plays a large role in the County's Sheltering Plan. UMES representatives are invited to the County EOC meetings to stay in the loop on any emergency situations and means of response.

Options for Coordination between the UMES and Somerset County Emergency Operations Plan:

- Involve the University in reviewing the draft EOP when completed.
- Continue to have discussions with the University in areas where there can be mutual aid to one another and consider a memorandum of agreement, if appropriate.

Maryland Hazard Assessment (2005)

Part V of the Maryland Hazard Assessment comprises jurisdictional profiles that have risks summarized for weather related- and other natural hazards and technological risks for each county in the State. The State Risk Assessment considered the following for each of its jurisdictions: the hazards for which numerous Maryland jurisdictions share significant risk; jurisdictions that face the largest number of hazards with significant risks; and jurisdictions that appear to be most vulnerable to specific types of hazards. The State assessment ranks Somerset County as high risk for hurricane/tropical storm and storm surge and wildfires and as medium-high risk for ice and medium risk for hail and tidal/coastal flooding.

- Future updates to the UMES Hazard Mitigation Plan should continue to take into account the State Risk Assessment data for Somerset County to ensure that the hazards identified as high priority continue to be aligned with those identified by the State.

<u>Maryland State Hazard Mitigation Plan (2005)</u>

The Maryland State Hazard Mitigation Plan addresses risks, mitigation capabilities, strategies and actions on a State level. There are a few areas of the State plan that suggest possible actions on the part of both the State and UMES that would help to align their mitigation goals and strategies, and would foster cooperation between the groups to advance mitigation efforts.

Options for Coordination between the UM and State Hazard Mitigation Plans:

Section 7.1.3 of the State Plan states an objective to "identify and explore the implementation of mitigation activities for State-owned facilities that are most at-risk to multiple hazards and most valuable in terms of use and cost". The Plan states that the State should "begin the development of facility specific mitigation actions with the facilities that are at risk from one or more hazards." The strategy related to this objective is for the State to approach the agencies with responsibility for the facilities in order that potential mitigation projects can be included in the 2007 State plan update. The numbers in parentheses after the goals refer to sections in the Maryland State plan.

- One of the goals in the State Plan is to have the State Mitigation Planner serve on other boards and committees. UMES should continue to invite State mitigation representative to participate in their annual hazard mitigation project update meeting. This would improve understanding of mitigation principles and may improve UMES's opportunities for securing FEMA mitigation grants.
- Expand mitigation education and outreach efforts (7.1.6).
- Undertake and sustain efforts to identify and analyze projects that reduce wind risk to UMES' assets and operations (7.5.1).
- Continue efforts to ensure that building codes are enforced with regard to wind resistance (7.5.3).
- Explore mitigation options for mitigating the effects of "criminal actions" (presumed to mean acts of terrorism, sabotage or vandalism) in combination with natural hazard mitigation efforts. (7.12.1).

A comparative analysis of the hazard risk between the 2004 Somerset County HMP and the 2009 UMES HMP indicates that the summary for risk indicated was similar in both plans. Table 3.4 indicates that the levels of risk in columns 3 and 4 were similar for those hazards where both the County and UMES plans determined the levels of risk.

Table 3.4 - Comparison of Summary of Hazard Risk for Somerset County and UMES

Hazard	2005 Maryland Hazard Assessment for Somerset County	2004 Somerset County Hazard Mitigation Plan	2009 UMES Hazard Mitigation Plan
Weather-Related			
Drought	Low	Medium	Medium
Extreme Heat	Low	Medium-Low	Low
Thunderstorms	Low	Medium	Medium
Lightning	Low		Medium
Wind	Low		High
Hail	Medium		Low
Tornado	Low	Medium-Low	High
Hurricane/Tropical Storm	High	High	High
Storm Surge (Category One Risk)	High		High
Tidal/Coastal Flooding	Medium	Medium-High	High
Heavy Rain	Low		
Flash Flooding	Low		High
Riverine Flooding	Low	Medium-High	High
Extreme Cold	Medium-Low	Medium	Medium
Snow	Low	Medium	Medium
Ice	Medium-High	Medium	Medium
Other Natural			
Earthquakes	Low		Medium
Land Subsidence	Low	Low	
Mass Movement	Low	Low	
Expansive Soils	Medium-High		
Wildfires	High	Medium	Medium
Brush Fires	Medium-Low	Medium-Low	
Epidemics	Medium-High	Medium-Low	
Technological			
Dam Failure	Low	Low	
Structure Fires	Medium-High		Low
Fixed-Site Hazardous Material Incidents	Low	Medium	Low
Transportation Hazardous Material Incidents	Low	Medium	
Radiological Emergency	Medium-Low		
Airplane Accidents	Low		
Rail Accidents	Low		

<u>Town of Princess Anne Draft Comprehensive Plan – 2009</u>

One goal listed in the Town's Comprehensive Plan is to involve UMES in the Princess Anne community and its economic development in various areas such as entertainment, education, downtown revitalization, and job creation. This paves the way for various options for coordination between the Town's Comprehensive Plan and the UMES Hazard Mitigation Plan and the Town and the University, respectively.

- The University and Town should continue to regularly communicate and cooperate on issues and develop a close working relationship to coordinate decision-making and share resources and projects. An example of this close working relationship between the two entities is the new recreation facility that includes playgrounds, soccer field, basketball courts, and a community center. UMES is managing the construction of the facilities to provide training for students in its construction management and athletic departments and the Town will manage the operation of the facility.

- The Plan discusses expanding the existing interagency cooperation between UMES's Public Safety Department and Princess Anne's Police Department, particularly for calls at student housing facilities in the Town. This will provide assistance to the UMES Public Safety Department that is currently short-staffed.
- The Comprehensive Plan identifies most of the area between the Town limits and UMES as undevelopable with wetlands, floodplains, and restricted Critical Areas and recommends annexation of these areas to make the Town's boundary more compact. This has been emphasized in the UMES Hazard Mitigation for the campus and should be implemented at the Town level as well.
- The Plan recommends requiring environmental site design and other better site design techniques to reduce the impervious surface and the runoff into the Manokin River and to reduce the impediments in the Manokin River by encouraging new developments to use pervious materials and other techniques that will mitigate the effects on the Manokin River. This policy should be encouraged in the University as well.

Town of Princess Anne Emergency Operations Plan

The Town of Princess Anne does not have its own Emergency Operations Plan. They refer to the Somerset County Emergency Operations Plan for all emergency procedures.

CHAPTER IV – HAZARD IDENTIFICATION

REQUIREMENT §201.6(C)(2)(I): [THE RISK ASSESSMENT **SHALL** INCLUDE A] DESCRIPTION OF THE TYPE … OF ALL NATURAL HAZARDS THAT CAN AFFECT THE JURISDICTION.

INTRODUCTION

The United States and its communities are vulnerable to a wide array of natural and human-caused hazards that threaten life and property. As part of its efforts to support and encourage hazard mitigation initiatives, the University of Maryland, Eastern Shore's Hazard Mitigation Core Team (MCT) prepared an assessment of hazards that have caused or have the potential to impact the Princess Anne campus. These hazards include:

Natural

- Flood
- Hurricanes and Coastal Storms
- Severe Thunderstorms (Wind/Lightning/Hail)
- Tornadoes
- Wildfire
- Drought
- Winter Storms
- Extreme Temperatures
- Earthquakes

Human-caused

- Hazardous Materials (HazMat)

Some of these hazards are interrelated (i.e., hurricanes can cause flooding and tornadoes), and some consist of hazardous elements that are not listed separately (i.e., severe thunderstorms can cause lightning; hurricanes can cause coastal erosion). In addition, terrorist-related incidents or accidents involving chemical, radiological or biological agents can coincide with natural hazard events, such as flooding caused by destruction of a dam or an accidental chemical release caused by a tornado. It should also be noted that some hazards, such as severe winter storms, may impact a large area yet cause little damage, while other hazards, such as a tornado, may impact a small area yet cause extensive damage. This section provides a general description for each of the hazards listed above along with their hazardous elements, written from a national perspective.

FLOOD

Flooding is the most frequent and costly natural hazard in the United States, a hazard that has caused more than 10,000 deaths nationwide, since 1900. Nearly 90 percent of presidential disaster declarations have resulted from natural events in which flooding was a major component.

Floods are generally the result of excessive precipitation, and can be classified under two categories: general floods, precipitation over a given river basin for a long period of time; and flash floods, the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is determined by the following: a combination of stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing.

General floods are usually long-term events that may last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, nor'easters, and other large coastal storms. Urban flooding occurs where man-made development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

Flash flooding events usually occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by an ice jam. Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. Although flash flooding occurs often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces. Flash flood waters move at very high speeds—"walls" of water can reach heights of 10 to 20 feet. Flash flood waters and the accompanying debris can uproot trees, roll boulders, destroy buildings, and obliterate bridges and roads.

The periodic flooding of lands adjacent to rivers, streams, and shorelines (land known as floodplain) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood and the 100-year floodplain by the 100-year flood. Flood frequencies such as the 100-year flood are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1 percent chance of occurring in any given year.

HURRICANES AND COASTAL STORMS

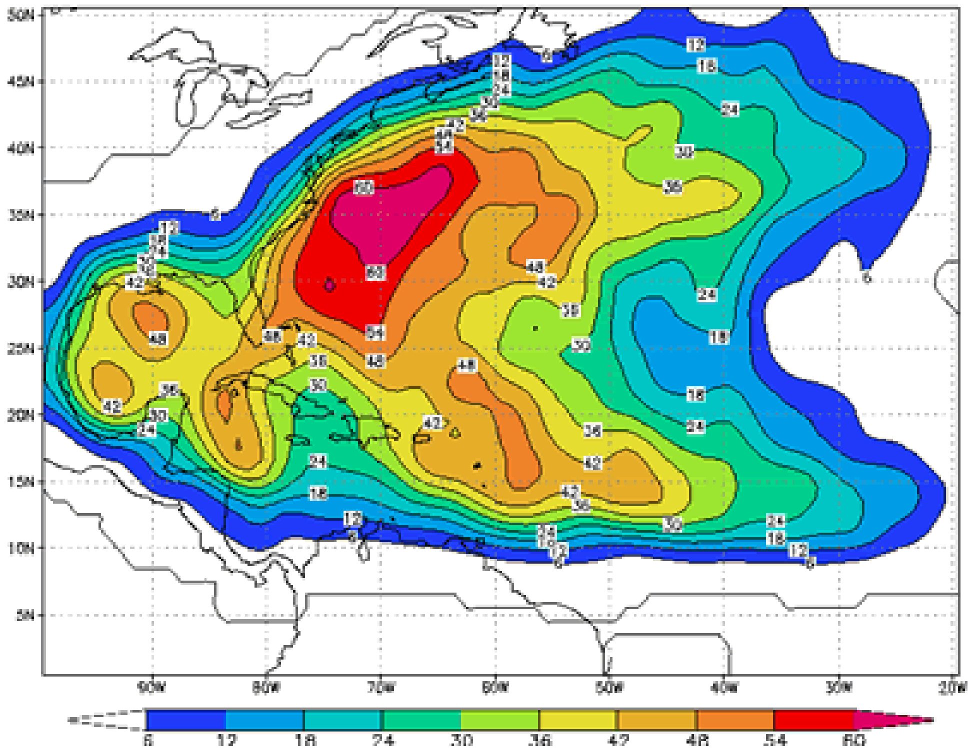
Hurricanes, tropical storms, nor'easters and typhoons, also classified as cyclones, are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a "safety-valve," limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves, and tidal flooding which can be more destructive than cyclone wind.

The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in this basin is about six (6).

As an incipient hurricane develops, barometric pressure (measured in Millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida (Figure 1). When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale, which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense (Table 1).

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as "major" hurricanes, and while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States (Table 2).

Figure 1. Empirical Probability of a Named Tropical Storm



Source: National Oceanic and Atmospheric Administration, Hurricane Research Division

Table 1. Saffir-Simpson Scale

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)	Storm Surge (Feet)
1	74—95	Greater than 980	3—5
2	96—110	979—965	6—8
3	111—130	964—945	9—12
4	131—155	944—920	13—18
5	155+	Less than 920	19+

Source: National Hurricane Center

Table 2. Hurricane Damage Classification

Category	Damage Level	Description
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.

Source: National Hurricane Center

A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to 20 feet in a Category 5 storm. The storm surge arrives ahead of the storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Water rise can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas. A storm surge is a wave that has outrun its generating source and become a long period swell. The surge is always highest in the right-front quadrant of the direction in which the hurricane is moving. As the storm approaches shore, the greatest storm surge will be to the northeast of the hurricane eye. Such a surge of high water topped by waves driven by hurricane force winds can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast.

Storm surge heights, and associated waves, are dependent upon the shape of the continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves.

Damage during hurricanes may also result from spawned tornadoes and inland flooding associated with heavy rainfall that usually accompanies these storms. Hurricane Floyd, as an example, was at one time a Category 4 hurricane racing towards the North Carolina coast. As far inland as Raleigh, the state capital located more than 100 miles from the coast, communities were preparing for extremely damaging winds exceeding 100 miles per hour. However, Floyd made landfall as a Category 2 hurricane and will be remembered for causing the worst inland flooding disaster in North Carolina's history. Rainfall amounts were as high as 20 inches in certain locales and 67 counties sustained damages.

Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their associated strong winds and heavy surf. Nor'easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful.

Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surfs that cause severe beach erosion and coastal flooding. There are two main components to a nor'easter: (1) a Gulf Stream low-pressure system (counter-clockwise winds) generated off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic, and pulled up the East Coast by strong northeasterly winds at the leading edge of the storm; and (2) an Arctic high-pressure system (clockwise winds) which meets the low-pressure system with cold, arctic air blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation and have the potential for creating dangerously high winds and heavy seas. As the low-pressure system deepens, the intensity of the winds and waves will increase and cause serious damage to coastal areas as the storm moves northeast. Nor'easters have their own intensity scale (Table 3)

Table 3. Dolan-Davis Nor'easter Intensity Scale

Storm Class	Beach Erosion	Dune Erosion	Overwash	Property Damage
1 (Weak)	Minor changes	None	No	No
2 (Moderate)	Modest; mostly to lower beach	Minor	No	Modest
3 (Significant)	Erosion extends across beach	Can be significant	No	Loss of many structures at local level
4 (Severe)	Severe beach erosion and recession	Severe dune erosion or destruction	On low beaches	Loss of structures at community-scale
5 (Extreme)	Extreme beach erosion	Dunes destroyed over extensive areas	Massive in sheets and channels	Extensive at regional-scale; millions of dollars

Source: North Carolina Division of Emergency Management

SEVERE THUNDERSTORMS

According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10 percent of these storms are classified as "severe." Although thunderstorms generally affect a small area when they occur, they are very dangerous because of their ability to generate tornadoes, hailstorms, strong winds, flash flooding, and damaging lightning. While thunderstorms can occur in all regions of the United States, they are most common in the central and southern states because atmospheric conditions in those regions are most ideal for generating these powerful storms.

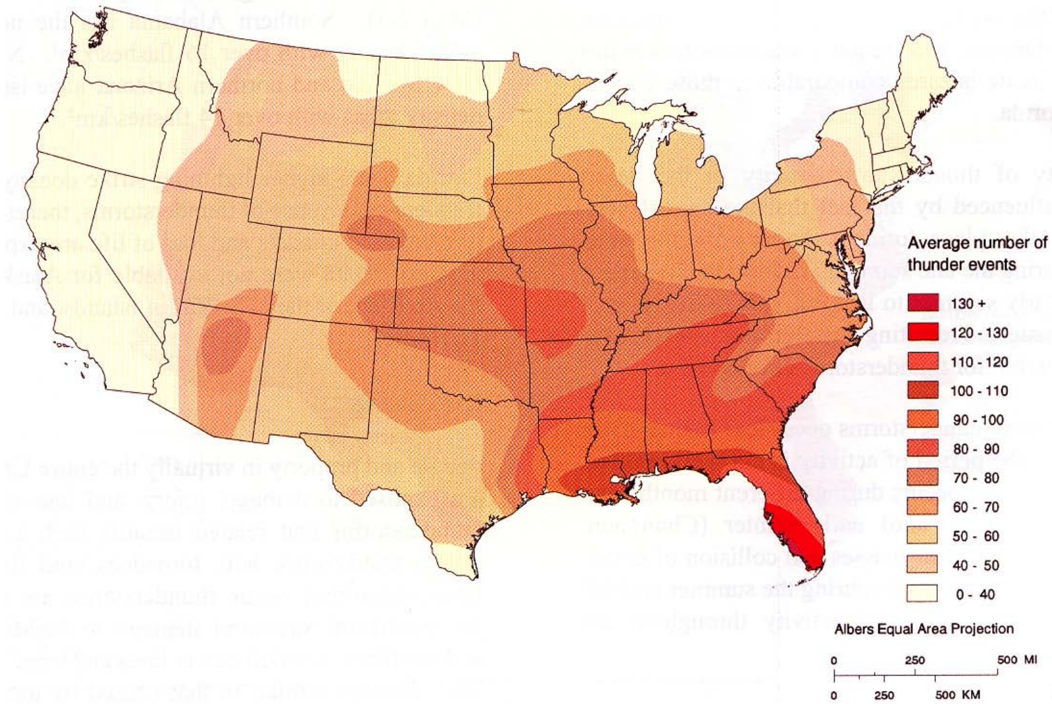
Thunderstorms are caused when air masses of varying temperatures meet. Rapidly rising warm moist air serves as the "engine" for thunderstorms. These storms can occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours.

Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder. On average, 89 people are killed each year by lightning strikes in the United States.

The National Weather Service collected data for thunder days, number and duration of thunder events, and lightening strike density for the 30-year period from 1948 to 1977. A series of maps was generated showing the annual average thunder event duration, the annual average number of thunder events, and the mean annual density of lightning strikes (Figure 2).

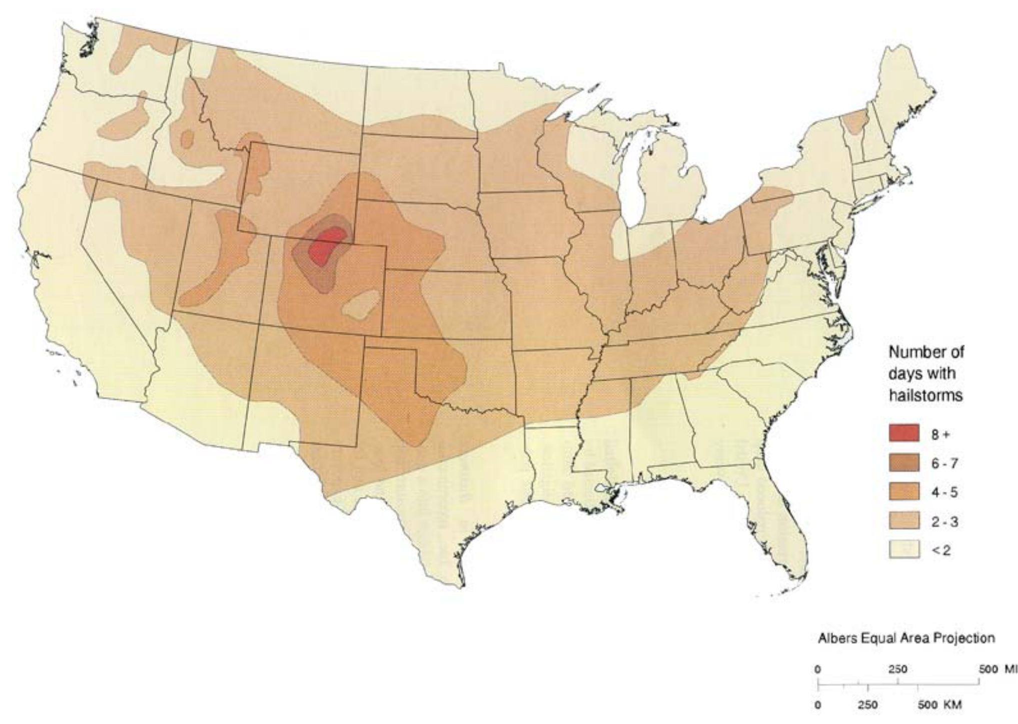
Hailstorms are an outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation—as balls or irregularly shaped masses of ice greater than 0.75 in. (1.91 cm) in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size. The annual frequency of hailstorms in the United States is shown below (Figure 3).

Figure 2. Annual Average Number of Thunder Events in the United States



Source: Federal Emergency Management Agency

Figure 3. Annual Frequency of Hailstorms in the United States



Source: Federal Emergency Management Agency

TORNADOES

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other coastal storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). They are more likely to occur during the spring and early summer months of March through June and can occur at any time of day, but are likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

Waterspouts are weak tornadoes that form over warm water and are most common along the Gulf Coast and southeastern states. Waterspouts occasionally move inland, becoming tornadoes that cause damage and injury. However, most waterspouts dissipate over the open water causing threats only to marine and boating interests. Typically a waterspout is weak and short-lived, and because they are so common, most go unreported unless they cause damage.

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction such as residential homes (particularly mobile homes), and tend to remain localized in impact. The Fujita-Pearson Scale for Tornadoes (Table 4) was developed to measure tornado strength and associated damages.

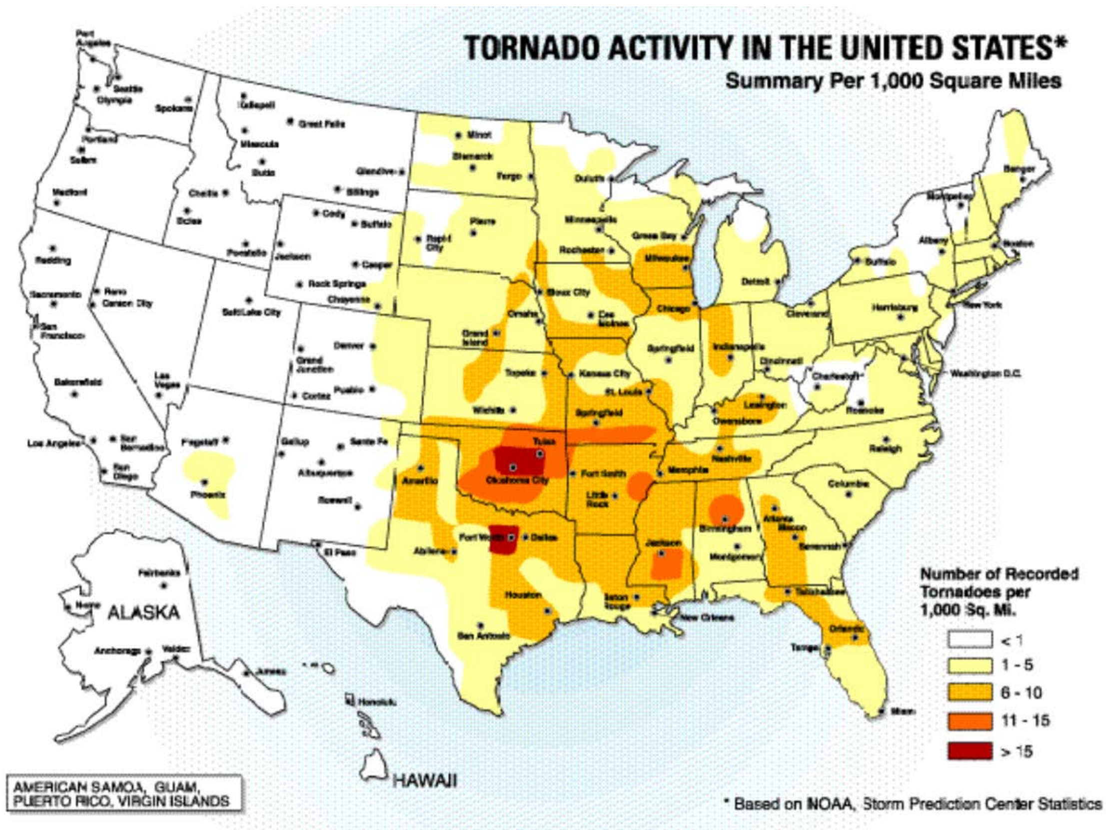
According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of "tornado alley"), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). The map below shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles (Figure 4).

Table 4. Fujita-Pearson Scale for Tornadoes

F-Scale Number	Intensity Phrase	Wind Speed	Type of Damage Done
F0	Gale tornado	40-72 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
F1	Moderate tornado	73-112 MPH	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant tornado	113-157 MPH	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe tornado	158-206 MPH	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
F4	Devastating tornado	207-260 MPH	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	Incredible tornado	261-318 MPH	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
F6	Inconceivable tornado	319-379 MPH	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

Source: The Tornado Project, 2002.

Figure 4. Tornado Activity in the United States



Source: American Society of Civil Engineers

The tornadoes associated with tropical cyclones are most frequent in September and October when the incidence of tropical storm systems is greatest. This type of tornado usually occurs around the perimeter of the storm, and most often to the right and ahead of the storm path or the storm center as it comes ashore. These tornadoes commonly occur as part of large outbreaks and generally move in an easterly direction.

WILDFIRE

A wildfire is any fire occurring in a wildland area (i.e., grassland, forest, brush land) except for fire under prescription.[1] Wildfires are part of the natural management of the Earth's ecosystems, but may also be caused by natural or human factors. Over 80 percent of forest

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[1] Prescription burning, or "controlled burn," undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.

There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around.

State and local governments can impose fire safety regulations on home sites and developments to help curb wildfire. Land treatment measures such as fire access roads, water storage, helipads, safety zones, buffers, firebreaks, fuel breaks, and fuel management can be designed as part of an overall fire defense system to aid in fire control. Fuel management, prescribed burning, and cooperative land management planning can also be encouraged to reduce fire hazards.

Fire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural disasters (tornadoes, hurricanes, etc.) increase the probability of wildfires by producing fuel in both urban and rural settings. Forest damage from hurricanes and tornadoes may block interior access roads and fire breaks, pull down overhead power lines, or damage pavement and underground utilities.

Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses, and industries are located within high fire hazard areas. The increasing demand for outdoor recreation places more people in wildlands during holidays, weekends, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for the inferno that can sweep through the brush and timber and destroy property in minutes.

DROUGHT

Drought is a natural climatic condition caused by an extended period of limited rainfall beyond that which occurs naturally in a broad geographic area. High temperatures, high winds, and low humidity can worsen drought conditions, and can make areas more susceptible to wildfire. Human demands and actions can also hasten drought-related impacts.

Droughts are frequently classified as one of following four types:
- Meteorological,
- Agricultural,
- Hydrological, and

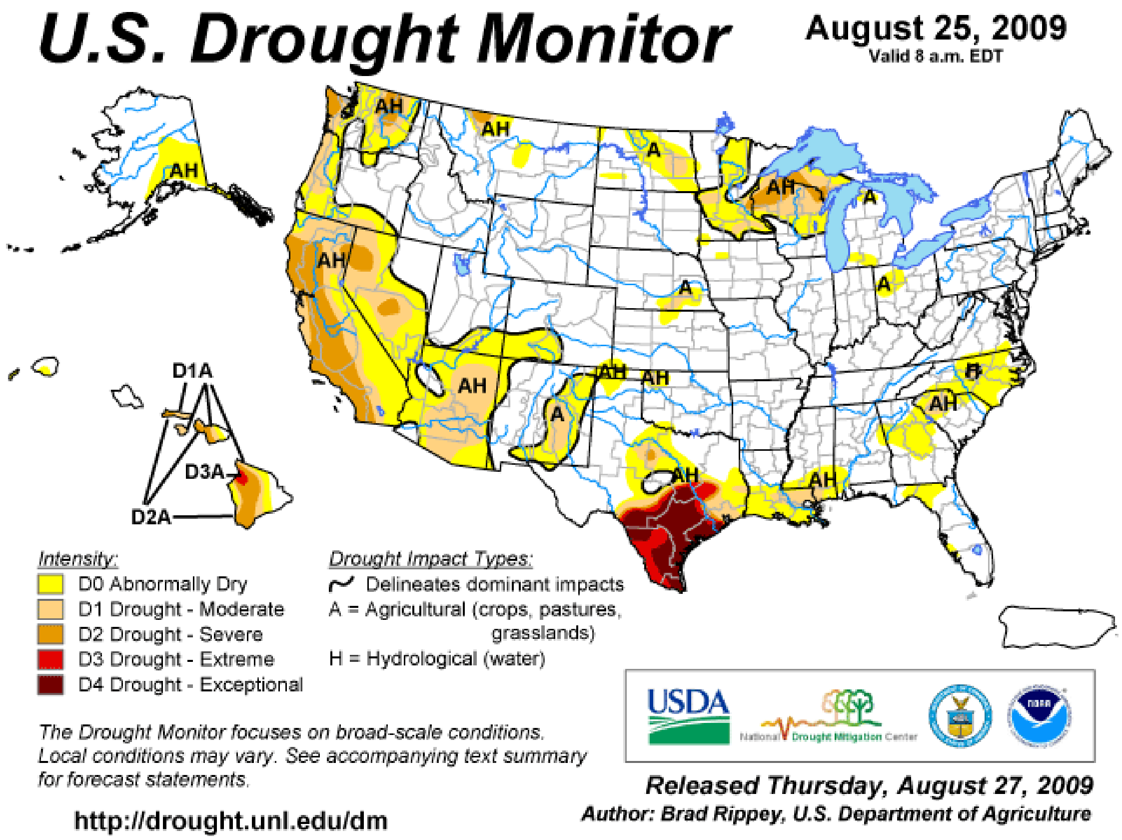
- Socio-economic.

Meteorological droughts are typically defined by the level of “dryness” when compared to an average, or normal amount of precipitation over a given period of time. Agricultural droughts relate common characteristics of drought to their specific agricultural-related impacts. Emphasis tends to be placed on factors such as soil water deficits, water needs based on differing stages of crop development, and water reservoir levels. Hydrological drought is directly related to the effect of precipitation shortfalls on surface and groundwater supplies. Human factors, particularly changes in land use, can alter the hydrologic characteristics of a basin. Socio-economic drought is the result of water shortages that limit the ability to supply water-dependent products in the marketplace.

While drought mostly impacts land and water resources, extreme heat can pose a significant risk to humans. Extreme heat can be defined as temperatures that hover 10 degrees or more above the average high temperature for the region, last for prolonged periods of time, and are often accompanied by high humidity. Under normal conditions, the human body’s internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work much harder to maintain a normal temperature. Elderly persons, young children, persons with respiratory difficulties, and those who are sick or overweight are more likely to become victims of extreme heat. Because men sweat more than women, they are more susceptible to heat-related illness because they become more quickly dehydrated. Studies have shown that a significant rise in heat-related illness occurs when excessive heat persists for more than two days. Spending at least two hours per day in air conditioning can significantly reduce the number of heat-related illnesses.

A U.S. Drought Monitor summary map from the United States Department of Agriculture for August 25, 2009 is shown below (Figure 5). Drought Monitor summary maps identify general drought areas and label droughts by intensity, with D1 being the least intense and D4 being the most intense.

Figure 5. U.S. Drought Monitor Summary Map



Weekly-updated maps may be obtained online from The Drought Monitor Web site, maintained by the National Drought Mitigation Center, located at the following Web address: http://drought.unl.edu/dm.

WINTER STORMS

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Some winter storms may be large enough to affect several states, while others may affect only a single community. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility.

Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Sleet—raindrops that freeze into ice pellets before reaching the ground—usually bounce when hitting a surface and do not stick to objects; however, sleet can accumulate like snow and cause a hazard to motorists. Freezing rain is rain that falls onto a surface with a temperature below freezing, forming a glaze of ice. Even small accumulations of ice can cause a significant hazard, especially on power lines and trees. An ice storm occurs when freezing rain falls and freezes immediately upon impact. Communications and power can be disrupted for days, and even small accumulations of ice may cause extreme hazards to motorists and pedestrians.

EXTREME TEMPERATURES

Extreme heat in urban areas can create health concerns when stagnant atmospheric conditions trap pollutants, thus adding unhealthy air to excessively hot temperatures. In addition, the “urban heat island effect” can produce significantly higher nighttime temperatures because asphalt and concrete (which store heat longer) gradually release heat at night.

A freeze is weather marked by low temperatures, especially when below the freezing point (zero degrees Celsius or thirty-two degrees Fahrenheit). Agricultural production is seriously affected when temperatures remain below the freezing point.

EARTHQUAKES

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles; cause damage to property measured in the tens of billions of dollars; result in loss of life and injury to hundreds of thousands of persons; and disrupt the social and economic functioning of the affected area.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses the ability to resist shear and flows much like quick sand. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth’s outer crust. These fault planes are typically found along borders of the Earth's ten tectonic plates. These plate borders generally follow the outlines of the continents, with the North American plate following the continental border with the Pacific Ocean in the west, but following the mid-Atlantic trench in the east. As earthquakes occurring in the mid-Atlantic trench usually pose little danger to humans, the greatest earthquake threat in North America is along the Pacific Coast.

The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength, a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (Table 5). Each unit increase in magnitude on the Richter Scale corresponds to a ten-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, with a I corresponding to imperceptible (instrumental) events, IV corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given below (Table 6).

Table 5. Richter Scale

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings
6.1-6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

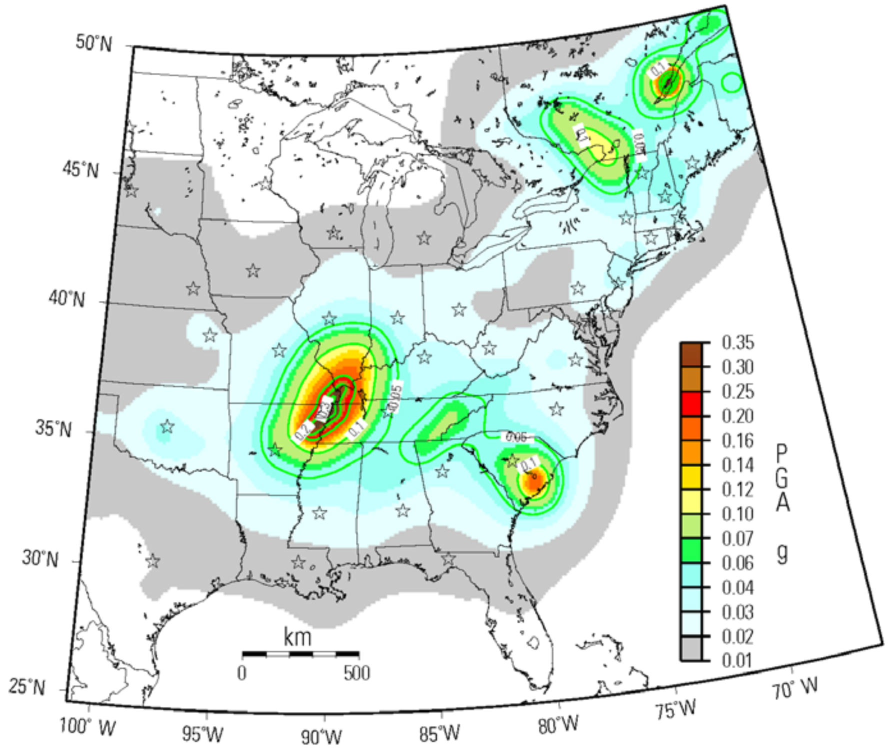
The probability that ground motion will reach a certain level during an earthquake in the Eastern US is shown below (Figure 6). The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedence in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards.

Table 6. Modified Mercalli Intensity Scale for Earthquakes

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	<5.4
VII	Very Strong	Mild Alarm; walls crack; plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>8.1

Source: North Carolina Division of Emergency Management

Figure 6. Peak Acceleration with 10 Percent Probability of Exceedance in 50 Years



Source: United States Geological Survey,2008

HAZARDOUS MATERIALS (HAZMAT)

Hazardous materials (HazMat) incidents can apply to fixed facilities as well as mobile, transportation-related accidents in the air, by rail, on the Nation's highways and on the water. Approximately 6,774 HazMat events occur each year, 5,517 of which are highway incidents, 991 are railroad incidents and 266 are due to other causes (FEMA, 1997). In essence, HazMat incidents consist of solid, liquid and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HazMat incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind and possibly wildlife as well.

HazMat incidents can also occur as a result of or in tandem with natural hazard events, such as floods, hurricanes, tornadoes and earthquakes, which in addition to causing incidents can also hinder response efforts. In the case of Hurricane Floyd in September 1999, communities along the Eastern United States were faced with flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills and a variety of other environmental pollutants that caused widespread toxological concern.

DATA SOURCES

American Society of Civil Engineers (ASCE), "Facts About Windstorms."
Web site: www.windhazards.org/facts.cfm

Bureau of Reclamation, U.S. Department of the Interior
Web site: www.usbr.gov

Federal Emergency Management Agency (FEMA)
Web site: www.fema.gov

National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: http://lwf.ncdc.noaa.gov/oa/ncdc.html

National Drought Mitigation Center, University of Nebraska-Lincoln
Web site: www.drought.unl.edu/index.htm

National Severe Storms Laboratory (NSSL), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nssl.noaa.gov

National Weather Service (NWS), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nws.noaa.gov

Storm Prediction Center (SPC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service
Web site: www.spc.noaa.gov

The Tornado Project, St. Johnsbury, Vermont
Web site: www.tornadoproject.com

United States Geological Survey (USGS), U.S. Department of the Interior
Web site: www.usgs.gov

CHAPTER V – HAZARD ANALYSIS

REQUIREMENT §201.6(C)(2)(I): [THE RISK ASSESSMENT **SHALL** INCLUDE A] DESCRIPTION OF THE … LOCATION AND EXTENT OF ALL NATURAL HAZARDS THAT CAN AFFECT THE JURISDICTION. THE PLAN **SHALL** INCLUDE INFORMATION ON PREVIOUS OCCURRENCES OF HAZARD EVENTS AND ON THE PROBABILITY OF FUTURE HAZARD EVENTS.

INTRODUCTION

The Hazard Analysis section provides information on historical hazard occurrences for the University of Maryland Eastern Shore for the hazards listed below. The term "planning area" is used extensively in this section, and refers to the geographic limits of the Princess Anne campus. Due to the way in which data is provided by the National Climatic Data Center, it is often not possible to differentiate those events that may have directly, substantially or exclusively impacted the Town of Princess Anne and by extension, UMES. Therefore, some of these listings reflect all known countywide events for Somerset County with the assumption that a "countywide" event did to some extent affect the Town of Princess Anne and the University.

The following subsections provide an overview of past hazard events in and around the planning area and associated losses. Damage and losses (including physical damage, indirect and economic losses, and injuries and deaths) associated with hazards result when an event affects areas where people and improved property are located. After hazards are identified, risk or vulnerability assessments can be prepared. When the full range of possible natural and man-made hazards is reviewed, it becomes apparent that some events occur frequently and some are extremely rare. Some hazards impact large numbers of people to a limited degree, while others may cause very localized but significant damage.

Natural

- Flood
- Hurricanes and Coastal Storms
- Severe Thunderstorms (Wind/Lightning/Hail)
- Tornadoes
- Wildfire
- Drought
- Winter Storms
- Extreme Temperatures
- Earthquakes

Human-caused

- Hazardous Materials (HazMat)

Historical records, such as those available from the National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC), are used to identify the level of risk. The methodological assumption is that the data sources cited are the best data available, however not always complete. To the extent possible, other sources have been used to supplement NCDC records.

FLOOD

The University of Maryland Eastern Shore is prone to flooding primarily on its southern boundary, which lies along a tributary of the Manokin River. In addition, because of its flat topography, the University also suffers from localized storm water system flooding. Flooding characteristics of the area are associated with short, high-intensity storms within the Manokin watershed and the tidal influence of the Chesapeake Bay/Pocomoke Sound on the Manokin River.

According to the National Climatic Data Center, 12 significant flood events were reported as having affected Somerset County generally and the City of Princess Anne specifically between 1994 and 2009. These events resulted in no reported deaths or injuries (NCDC, 2009). The following sections provide details of flood activity by type: flash flooding, riverine flooding and coastal flooding.

FLASH FLOODING

Flash flooding, particularly related to short, intense rainfall into an overwhelmed stormwater management system, occurs fairly frequently according to UMES officials. However, many do not get officially reported to the National Weather Service. The NCDC reports one significant flash flooding event that has impacted people, property and the environment:

Town of Princess Anne, July 5, 2006, 6:30 p.m. to 7 p.m. ET
A series of thunderstorms moved through the area, dropping significant rainfall in the Manokin River basin. Many streets in Princess Anne were flooded.

RIVERINE FLOODING

Due to the relatively small basin of the Manokin River Tributary, it is prone to flooding caused by both local storms as well as regional storms. Some recent riverine flood events that have impacted people, property and the environment are:

Town of Princess Anne, January 27, 1998, 2 p.m. through January 28, 1998, 10 p.m. ET
A Nor'easter produced heavy rain and strong winds across the Lower Maryland Eastern Shore on Tuesday, January 27th and Wednesday, January 28th. Rainfall totals generally ranged from 3 to 5 inches. This rainfall caused street flooding and flooding of poorly drained areas throughout the region.

Town of Princess Anne, February 4, 1998, 12 a.m. through February 6, 1998, 12 p.m. ET
A Nor'easter produced heavy rain and strong winds across the Lower Maryland Eastern Shore from Tuesday, February 3rd through Thursday, February 5th. Rainfall totals generally ranged from 2 to 4 inches. Heavy rain caused some urban flood/poor drainage flood problems with a few roads closed due to high water.

Town of Princess Anne, October 24, 2007, 12 p.m. through October 27, 2007, 11 a.m. ET
The combination of low pressure over the Southeast United States and a nearly stationary frontal boundary across the Middle Atlantic Region helped to produce heavy rain across portions of the Lower Maryland Eastern Shore. The storm system brought an average of two to three inches of rainfall to the area.

Town of Princess Anne, October 10, 2008, 10 p.m. through October 12, 2008, 6 a.m. ET
The combination of a frontal boundary laying across the area and low pressure moving along that boundary and through the region, produced rainfall amounts between two and seven inches over much of the Lower Maryland Eastern Shore. Rainfall amounts between one and four inches occurred across Somerset County. Rainfall amount of 2.99 inches was measured at Princess Anne.

COASTAL FLOODING

Abnormally high tidal stages on the Chesapeake Bay/Pocomoke Sound are the primary cause of flooding along the Manokin River within the Town of Princess Anne and the University of Maryland Eastern Shore. High winds from the southwest, usually associated with hurricanes, drive water into Pocomoke Sound from a temporary increase in the bay tide adjacent to the sound entrance. Significant coastal flooding events that have impacted people, property and the environment:

All of Somerset County including Princess Anne, July 13, 1996, 2 a.m. to 9 a.m. ET
Hurricane Bertha moved across the Lower Maryland Eastern Shore on July 13th. Spiral bands around the northern and eastern side of the storm affected the Lower Maryland Eastern Shore during Saturday morning. The highest sustained wind speed recorded was 23 mph at Salisbury, but the Fenwick Island Buoy, which is just offshore along the Delaware-Maryland border, recorded a sustained wind speed of 47 mph. The highest gusts recorded were 63 mph at Ocean City, and 55 mph at the Fenwick Island Buoy. Numerous trees and power lines blown down resulted in scattered property damage and power outages. Rainfall amounts generally ranged from 3.0 to 5.0 inches and caused some street flooding. The lowest sea level pressure recorded was 995 mb at Salisbury.

All of Somerset County including Princess Anne, September 6, 1996, 1 a.m. to 3 p.m. ET
Spiral bands associated with Hurricane Fran affected the Lower Maryland Eastern Shore during Friday, September 6th. The highest sustained wind speed recorded was 22 mph at Salisbury with the highest gust at 35 mph. A storm surge of 4 to 6 feet inundated portions of the communities of Taylors Island, Hoopers Island, and Madison in Dorchester County along the Chesapeake Bay. Many roads were flooded with some homes receiving water damage at the time of high tide. In some locations, nearly 10 feet of shore was lost due to surge effects. This was considered the worst storm surge flooding since Hurricane Hazel in October 1954. Some minor flooding also occurred in Somerset County. Tides were 2 feet above normal. Also, a few trees and power lines were blown down.

All of Somerset County including Princess Anne, October 8, 1996, 1 a.m. to 10 p.m. ET
Remnants of Tropical Storm Josephine moved quickly up the East Coast during Tuesday, October 8th, affecting the Lower Maryland Eastern Shore. The storm produced 1.5 to 3.5 inches of rain resulting in flooding of several roads. The Coast Guard Station in Ocean City recorded a wind gust of 77 mph. Several trees and power lines were blown down resulting in some minor structural damage and scattered power outages. In addition, the storm's winds broke loose a 160-foot barge from its moorings.

All of Somerset County including Princess Anne, September 15, 1999, 12 p.m. through September 16, 1999, 5 p.m.
Hurricane Floyd was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. Tropical storm force wind gusts occurred over the northwest quadrant of the storm over portions of the Lower Maryland Eastern Shore. The highest sustained wind speed recorded was 36 mph at Ocean City, Maryland. The highest sustained wind speed recorded at Salisbury was 32 mph. The highest gusts recorded were 52 mph at Ocean City, and 48 mph at Salisbury. Few trees and power lines were blown down across the Lower Maryland Eastern Shore resulting in scattered power outages. Storm surge flooding of 5 to 7 feet occurred over central portions of the Chesapeake Bay inundating sections of Dorchester and Somerset counties. Five feet of water flooded portions of Crisfield in Somerset County. Rainfall amounts generally ranged from 3 to 6 inches across much of the Lower Maryland Eastern Shore and caused some crop damage and street flooding. The lowest sea level pressure recorded was 976.8 mb at Ocean City (OXB).

All of Somerset County including Princess Anne, September 18, 2003, 9 a.m. through September 19, 2003, 9 a.m.
Hurricane Isabel was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. Isabel produced tropical storm force sustained winds and wind gusts over the Lower Maryland Eastern Shore. Isabel made landfall near Ocracoke Inlet in North Carolina, tracked northwest into central Virginia just west of Richmond, then continued northward into western Pennsylvania. The highest sustained wind speed recorded was 45 mph at Cambridge, Maryland in Dorchester County. The highest gust recorded were 62 mph at Hurlock in Dorchester County. Approximately several thousand persons were evacuated and housed in numerous shelters across the Lower Maryland Eastern Shore. The unusually large wind field uprooted many thousands of trees, downed many power lines, damaged hundreds of houses, and snapped thousands of telephone poles and cross arms. Hundreds of roads, including major highways, were blocked by fallen trees. Local power companies reported many thousands of customers were without power. Storm surge values near 8 feet were reported in the Hoopers Island area, with 4 to 5 foot surge values reported on the Wicomico and Nanticoke Rivers. The lowest sea level pressure recorded was 1003 mb at Cambridge Maryland. Isabel will be remembered for the greatest wind and storm surge in the region since Hazel in 1954, and the 1933 Chesapeake-Potomac Hurricane. Also, Isabel will be remembered for the extensive power outages across the Lower Maryland Eastern Shore, and permanent change to the landscape from all the fallen trees and storm surge. Rainfall amounts ranged from 1 to 3 inches across the Lower Maryland Eastern Shore. Inland flooding due to heavy rainfall occurred over parts of the Lower Maryland Eastern Shore.

All of Somerset County including Princess Anne, May 12, 2008, 12 a.m. through May 13, 2008, 5 p.m. ET
A strong low pressure produced coastal flooding across portions of the Lower Maryland Eastern Shore, including Somerset County.

All of Somerset County including Princess Anne, September 6, 2008, 7 a.m. to 5 p.m ET
Tropical Storm Hanna affected much of the Lower Maryland Eastern Shore during Saturday, September 6th. Storm total rainfall ranged from around one inch to just below three inches. The highest sustained wind of 37 knots (43 mph) was recorded at Bishops Head, with a peak gust of 57 knots (66 mph) recorded at Ocean City. Minimum pressure of 991 MB was recorded at Bishops Head. Coastal storm tides of 1 to 3 feet above astronomical tide levels were common, with only minor beach erosion reported. Near the coast, as well as inland, tropical storm winds knocked down several trees and power lines, as well as caused minor structural damage. The storm produced heavy rain and gusty winds across much of Somerset County. Few trees were downed.

HURRICANE/TROPICAL STORM

Severe wind events resulting from hurricanes, tropical storms and nor'easters can cause widespread damage and loss life, as evidenced by the numerous coastal events that have impacted the State of Maryland. Somerset County, and by extension the University of Maryland Eastern Shore has experienced the effects of at least 10 tropical storms/hurricanes since 1933. Details of these events are presented below.

Tropical Storm Hanna (2008)[1]

Hanna was a tropical cyclone that was briefly a hurricane over the Caicos Islands. Hanna also made landfall in the United States as a strong tropical storm near the border between North and South Carolina. Impacts from Hanna were greatest in Haiti, where heavy rainfall and subsequent flooding resulted in a large loss of life. The storm affected much of the Lower Maryland Eastern Shore during Saturday, September 6th. Storm total rainfall ranged from around one inch to just below three inches. The highest sustained wind of 37 knots (43 mph) was recorded at Bishops Head, with a peak gust of 57 knots (66 mph) was recorded at Ocean City. Minimum pressure of 991 MB was recorded at Bishops Head. Coastal storm tides of 1 to 3 feet above astronomical tide levels were common, with only minor beach erosion reported. Near the coast, as well as inland, tropical storm winds knocked down several trees and power lines, as well as caused minor structural damage. The storm produced heavy rain and gusty winds across much of Somerset County. Few trees were downed.

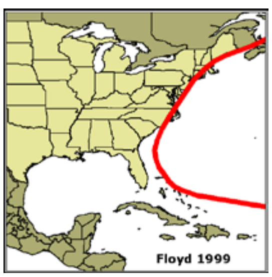
Hurricane Isabel (2003)

Hurricane Isabel was a long-lived Cape Verde hurricane that reached Category 5 status on the Saffir-Simpson Hurricane Scale. It made landfall near Drum Inlet on the Outer Banks of North Carolina as a Category 2 hurricane. Isabel is considered to be one of the most significant tropical cyclones to affect portions of northeastern North Carolina and east-central Virginia since Hurricane Hazel in 1954 and the Chesapeake-Potomac Hurricane of 1933. Hurricane Isabel was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. Isabel produced tropical storm force sustained winds and wind gusts over the Lower Maryland Eastern Shore. Isabel made landfall near Ocracoke Inlet in North Carolina, tracked northwest into central Virginia just west of Richmond, then continued northward into western Pennsylvania. The highest sustained wind speed recorded was 45 mph at Cambridge, Maryland in Dorchester County. The highest gust recorded were 62 mph at Hurlock in Dorchester County.

[1] Images and track maps are primarily courtesy of the National Hurricane Center. The earliest hurricane images may be found in Wikipedia.

Approximately several thousand persons were evacuated and housed in numerous shelters across the Lower Maryland Eastern Shore. The unusually large wind field uprooted many thousands of trees, downed many power lines, damaged hundreds of houses, and snapped thousands of telephone poles and cross arms. Hundreds of roads, including major highways, were blocked by fallen trees. Local power companies reported many thousands of customers were without power. Storm surge values near 8 feet were reported in the Hoopers Island area, with 4 to 5 foot surge values reported on the Wicomico and Nanticoke Rivers. The lowest sea level pressure recorded was 1003 mb at Cambridge Maryland. Isabel will be remembered for the greatest wind and storm surge in the region since Hazel in 1954, and the 1933 Chesapeake-Potomac Hurricane. Also, Isabel will be remembered for the extensive power outages across the Lower Maryland Eastern Shore, and permanent change to the landscape from all the fallen trees and storm surge. Rainfall amounts ranged from 1 to 3 inches across the Lower Maryland Eastern Shore. Inland flooding due to heavy rainfall occurred over parts of the Lower Maryland Eastern Shore.

Hurricane Floyd (1999)

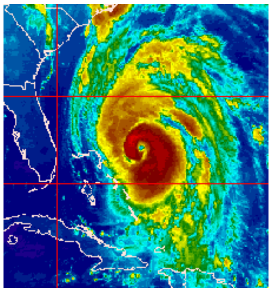


Hurricane Floyd was a large and intense Cape Verde hurricane that pounded the central and northern Bahama Islands, seriously threatened Florida, struck the coast of North Carolina and moved up the United States east coast into New England. It neared the threshold of category five intensity on the Saffir/Simpson Hurricane Scale as it approached the Bahamas, and produced a flood disaster of immense proportions in the eastern United States, particularly in North Carolina. Floyd was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. Tropical storm force wind gusts occurred over the northwest quadrant of the storm over portions of the Lower Maryland Eastern Shore. The highest sustained wind speed recorded was 36 mph at Ocean City, Maryland. The highest sustained wind speed recorded at Salisbury was 32 mph. The highest gusts recorded were 52 mph at Ocean City, and 48 mph at Salisbury. Few trees and power lines were blown down across the Lower Maryland Eastern Shore resulting in scattered power outages. Storm surge flooding of 5 to 7 feet occurred over central portions of the Chesapeake Bay inundating sections of Dorchester and Somerset counties. Five feet of water flooded portions of Crisfield in Somerset County. Rainfall amounts generally ranged from 3 to 6 inches across much of the Lower Maryland Eastern Shore and caused some crop damage and street flooding. The lowest sea level pressure recorded was 976.8 mb at Ocean City.

Tropical Storm Josephine – Remnants (1996)

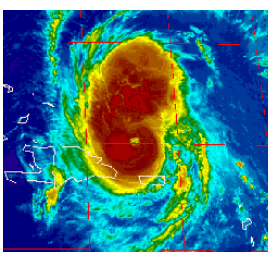
Josephine made landfall in eastern Apalachee Bay, Florida. A strong tropical storm, Josephine dumped heavy rain across most of the southeastern and eastern United States killing two people and leaving $130 million dollars in damage. Remnants of Tropical Storm Josephine moved quickly up the East Coast during Tuesday, October 8th, affecting the Lower Maryland Eastern Shore. The storm produced 1.5 to 3.5 inches of rain resulting in flooding of several roads. The Coast Guard Station in Ocean City recorded a wind gust of 77 mph. Several trees and power lines were blown down resulting in some minor structural damage and scattered power outages. In addition, the storm's winds broke loose a 160-foot barge from its moorings.

Hurricane Fran (1996)



Fran was a Cape Verde hurricane that moved across the Atlantic during the peak of the hurricane season. It made landfall on the North Carolina coast as a category three hurricane on the Saffir/Simpson Hurricane Scale, resulting in significant storm surge flooding on the North Carolina coast, widespread wind damage over North Carolina and Virginia, and extensive flooding from the Carolinas to Pennsylvania. Spiral bands associated with Hurricane Fran affected the Lower Maryland Eastern Shore during Friday, September 6th. The highest sustained wind speed recorded was 22 mph at Salisbury with the highest gust at 35 mph. A storm surge of 4 to 6 feet inundated portions of the communities of Taylors Island, Hoopers Island, and Madison in Dorchester county along the Chesapeake Bay. Many roads were flooded with some homes receiving water damage at the time of high tide. Dorchester county officials reported approximately $925,000 in damage from Fran. The vast majority of this amount was for replacement of damaged bulkheads and shoreline. In some locations, nearly 10 feet of shore was lost due to surge effects. This was considered the worst storm surge flooding since Hurricane Hazel in October 1954. Some minor flooding also occurred in Somerset County in the towns of Crisfield and Wenona. Tides were 2 feet above normal. Also, a few trees and power lines were blown down.

Hurricane Bertha (1996)

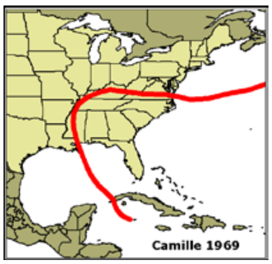


Bertha was an early-season Cape Verde Hurricane that moved across the islands of the northeastern Caribbean Sea as a category 1 hurricane on the Saffir/Simpson scale and made landfall on the North Carolina coast near Wilmington as a category 2 hurricane. Bertha's one-minute winds reached their maximum value of 100 knots on 9 July, while located to the north of Puerto Rico. Bertha was responsible for an estimated eight deaths and $250 million in U.S. damages. Hurricane Bertha moved across the Lower Maryland Eastern Shore on July 13th. Spiral bands around the northern and eastern side of the storm affected the Lower Maryland Eastern Shore during Saturday morning. The highest sustained wind speed recorded was 23 mph at Salisbury, but the Fenwick Island Buoy, which is just offshore along the Delaware-Maryland border, recorded a sustained wind speed of 47 mph. The highest gusts recorded were 63 mph at Ocean City, and 55 mph at the Fenwick Island Buoy. One confirmed tornado was spawned by the hurricane near Madison in Dorchester County. Numerous trees and power lines blown down resulted in scattered property damage and power outages. Rainfall amounts generally ranged from 3.0 to 5.0 inches and caused some street flooding. The lowest sea level pressure recorded was 995 mb at Salisbury.

Hurricane Agnes (1972)

No description/details available for Somerset County.

Hurricane Camille (1969)



No description/details available for Somerset County.

Hurricane Hazel (1954)

Hurricane Hazel's center tore inland from Myrtle Beach, passing to the west of Baltimore and driving a storm surge up the bay that triggered flooding much like that delivered by Isabel in September 2003. The Baltimore *Evening Sun* reported the next day that eight people had died in Maryland, with scores injured in what it described as "one of the most severe storms ever to lash the state". Tides rose 7 feet above normal, swamping bayside homes and islands. Winds in Baltimore reached 73, with gusts to 84 mph. Trees toppled. Eastern Shore boats, barns, piers, coops and fishing shacks took a beating. Phones and power went out, and trains were stopped by landslides. Ninety-five people died in the storm's path from South Carolina to Canada. President Eisenhower ordered federal relief funds for Somerset County as a result of damage done by Hurricane Hazel. Hooper's, Smith, and Deal Islands were particularly hard hit. There were two deaths in the county associated with this storm. Sources suggest that thousands of dollars worth of property damage was caused by high tides along the waterfronts.

1933 Chesapeake-Potomac Hurricane

On August 22, 1933, perhaps the most severe storm of the past century hit Somerset County. Reports claim that almost the entire downstream section of Crisfield was several feet under water. High winds as well as high water caused thousands of dollars worth of property damage. Deal Island was only accessible by boat.

THUNDERSTORMS

According to the National Climatic Data Center, Somerset County experienced 38 countywide thunderstorm high wind events for the period 1969 through May 2009, four of which directly mention the Town of Princess Anne. In the county, these events resulted in no deaths, four injuries and $5,321,000 in property damage (NCDC, 2009). A listing of thunderstorm activity specific to the Town of Princess Anne is provided (Table 1).

Table 1
Summary of Thunderstorm Activity in Princess Anne (1969-2009)

Storm Location	Date	Time	Type	Magnitude	Deaths	Injuries	Property Damage
Princess Anne	6/16/1998	7:10 PM	Thunderstorm Wind	N/A	0	0	$3,000
Princess Anne	8/26/2003	5:30 PM	Thunderstorm Wind	61 kts.	0	0	$2,000
Princess Anne	7/4/2006	7:30 PM	Thunderstorm Wind	50 kts.	0	0	$2,000
Princess Anne	7/5/2006	6:30 pm	Thunderstorm Wind	50 kts.	0	0	$2,000
TOTALS:					**0**	**0**	**$9,000**

Source: National Climatic Data Center

TORNADOES

The NCDC indicates that the Somerset County, Maryland has experienced 5 tornado events from January 1, 1950 through May 31, 2009. NCDC data supports the statistics of zero deaths and injuries, with approximately $68,000 in property damage. These statistics are confirmed by the Tornado History Project (www.tornadohistoryproject.com). There have been no known occurrences of tornadoes in the Town of Princess Anne.

Table 2
Summary of Tornado Activity in Somerset County (1950-2009)

Storm Location	Date	Time	Type	Magnitude	Deaths	Injuries	Property Damage
Somerset County	9/8/1981	5:00 PM	Tornado	F1	0	0	$25,000
Deal Island	1/6/2002	4:02 PM	Tornado	F0	0	0	$20,000
Shelltown	5/13/2002	7:50 PM	Tornado	F1	0	0	$20,000
Crisfield	7/14/2003	8:11 AM	Tornado	F0	0	0	$0
Marion	7/5/2006	3:00 PM	Tornado	F0	0	0	$3,000
TOTALS:					**0**	**0**	**$68,000**

Source: National Climatic Data Center

WILDFIRE

In Maryland, the busiest wildfires seasons typically occur in the spring and the fall of the year. These are the transition times for natural cover fuels. In spring, with the absence of moist deciduous vegetation and forest canopy shade, the sun warms the forest floor pre-heating the fuels. In fall, an abundance of new fuel accumulates with leaf fall. Given adequate rainfall amounts throughout the state, wildfires are mostly suppressed on initial attack and can be intense but of short duration. However, unusually hot and dry conditions or drought can turn a mild fire season into a serious problem that often requires extended attack operations to completely suppress wildfires. (Maryland Department of Resources, 2009). Wildfires do occur occasionally in Somerset County but none has been recorded by the NCDC for the period 1950-2009 (NCDC, 2009).

DROUGHT

Although Maryland is blessed with abundant water resources, climate conditions combined with increasing anthropogenic influences have periodically resulted in a shortage of water for Maryland's citizens and environment. Maryland has experienced two severe drought situations in the memorable past, one in the mid-1960's, and more recently in the late 1990's. Only one instance of drought has been recorded by the NCDC for the period 1950 – 2009. It occurred in 1998 from July to November, causing no deaths or injuries but over $6 million in crop damage.

WINTER STORMS

According to the National Climatic Data Center, Somerset County experienced 35 distinct, countywide winter storm (snow and ice) events from January 1, 1993 through May 2009 (see Table 3). In recent history, the two most powerful and costly storms to affect Maryland were the Blizzard of 1996 and a storm over President's Day Weekend 2003. These 35 events resulted in $5 million in property damage, no deaths, and no injuries.

Table 3
Winter Storm Activity in Somerset County (1993-2009)

Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	2/12/1993	02:00 AM	Winter Weather	0	0	0
Countywide	12/28/1993	09:00 AM	Heavy Snow	0	0	0
Countywide	1/6/1996	10:00 PM	Winter Storm	0	0	0
Countywide	2/2/1996	02:00 AM	Winter Storm	0	0	0
Countywide	2/16/1996	03:00 AM	Winter Storm	0	0	0
Countywide	3/1/1996	09:00 PM	Winter Storm	0	0	0
Countywide	3/7/1996	11:00 PM	Winter Storm	0	0	0
Countywide	2/8/1997	08:00 AM	Winter Storm	0	0	0
Countywide	12/23/1998	02:00 PM	Ice Storm	0	0	$5.0 million
Countywide	3/9/1999	01:00 PM	Winter Storm	0	0	0
Countywide	1/20/2000	02:00 AM	Winter Storm	0	0	0
Countywide	1/25/2000	06:00 AM	Winter Storm	0	0	0
Countywide	2/12/2000	01:00 PM	Winter Storm	0	0	0
Countywide	2/22/2001	12:00 PM	Winter Storm	0	0	0
Countywide	1/3/2002	04:30 AM	Winter Storm	0	0	0
Countywide	12/4/2002	10:00 PM	Winter Storm	0	0	0
Countywide	1/15/2003	12:00 AM	Winter Weather/mix	0	0	0
Countywide	1/16/2003	09:00 PM	Winter Storm	0	0	0
Countywide	2/15/2003	04:00 PM	Winter Storm	0	0	0
Countywide	2/26/2003	12:00 PM	Winter Storm	0	0	0
Countywide	1/25/2004	09:00 PM	Winter Storm	0	0	0
Countywide	2/17/2004	01:00 PM	Winter Weather/mix	0	0	0

Location	Date	Time	Type	Deaths	Injuries	Property Damage
Countywide	12/19/2004	09:00 PM	Winter Weather/mix	0	0	0
Countywide	1/19/2005	12:00 PM	Winter Weather/mix	0	0	0
Countywide	1/22/2005	11:00 AM	Winter Weather/mix	0	0	0
Countywide	1/30/2005	12:00 AM	Winter Weather/mix	0	0	0
Countywide	2/24/2005	08:00 AM	Winter Weather/mix	0	0	0
Countywide	3/8/2005	12:00 PM	Winter Weather/mix	0	0	0
Countywide	12/5/2005	12:00 PM	Winter Storm	0	0	0
Countywide	2/12/2006	05:00 AM	Winter Weather	0	0	0
Countywide	1/21/2007	02:00 PM	Winter Weather	0	0	0
Countywide	3/7/2007	10:00 AM	Winter Weather	0	0	0
Countywide	1/27/2009	08:00 AM	Winter Weather	0	0	0
Countywide	3/1/2009	04:00 PM	Winter Weather	0	0	0
TOTALS:				**0**	**0**	**$5.0M**

Source: National Climatic Data Center

EXTREME TEMPERATURES

Extreme temperatures, both heat waves and deep freezes, are often one of the most dangerous natural hazards in the United States with regard to death and injuries. The slow onset of the hazard and the lack of appreciation for the threat combine to create a significant vulnerability of Maryland's residents, particularly those in urban areas. In Somerset County over the period of 1995 - 2009, there have only been two occurrences of extreme temperatures recorded. On February 5, 1996, an extreme cold event occurred and on May 18, 1996, an excessive heat event occurred with neither causing any deaths or injuries.

EARTHQUAKES

According to the Maryland Geological Survey, 62 earthquakes have been recorded in the State of Maryland during a period from 1758 through 2005. Maryland's strongest confirmed tremor was a 3.1-magnitude event near Hancock, Washington County, in 1978. That perhaps was rivaled by an intensity V event (unknown magnitude) near Phoenix, Baltimore County, in 1939. Earthquakes of such magnitudes or intensities are still considered to be minor, and very seldom result in significant damage or injury. The majority of the earthquakes in Maryland register less than 3.0 on the Richter Scale and are barely felt (Table 4). No damage estimates are currently available for these events.

Table 4
Recorded Earthquakes in the State of Maryland (1758-2005)

Date of Occurrence	Felt Area	Modified Mercalli Intensity
April 25, 1758	Annapolis	V
February 24, 1828	Bowie	unk
January 30, 1876	Annapolis	unk
April 10, 1876	Prince Frederick	III
September 1, 1877	Brandywine	III
January 4, 1881	Westminster	IV-V
March 11, 1883	Fallston	IV
March 12, 1883	Fallston	III
March 10, 1902	Union Bridge	III
March 11, 1902	Union Bridge	III
January 1, 1903	Union Bridge	III
January 1, 1903	Union Bridge	II
October 13, 1906	Catonsville	III
January 24, 1910	Westminster	II
April 24, 1910	Catonsville	III
October 15, 1928	Ocean City	IV
November 1, 1930	Round Bay - Severna Park	IV
November 1, 1930	Round Bay - Severna Park	III
June 22, 1939	Phoenix	III
November 18, 1939	Phoenix	IV
November 26, 1939	Phoenix	V
September 7, 1962	Hancock	IV
April 26, 1978	Hancock	unk
May 23, 1986	Accoceek - Piscataway	unk
January 13, 1990	Randallstown, Eldersburg, and more	V
April 4, 1990	Granite - Randallstown - Baltimore	II
September 28, 1991	Granite - Randallstown	III
March 10, 1993	Columbia, Ellicott City, Fulton	II-IV
March 12, 1993	Columbia - Allview Estates	II-III
March 15, 1993	Columbia - Allview Estates - Laurel	III-V
March 16, 1993	Columbia - Allview Estates	II-III
March 16, 1993	Columbia - Allview Estates	II-III

Date of Occurrence	Felt Area	Modified Mercalli Intensity
March 17, 1993	Columbia - Allview Estates	I-II
March 19, 1993	Columbia - Allview Estates	I-II
March 19, 1993	Columbia - Allview Estates	I
March 21, 1993	Aberdeen - Bel Air	I-II
March 22, 1993	Columbia - Allview Estates	not felt
March 26, 1993	Ellicott City near jct US40 & 29	I-II
April 4, 1993	Columbia - Allview Estates	I-III
April 4, 1993	Columbia - Allview Estates	I-II
April 8, 1993	Columbia - Allview Estates	I-II
July 9, 1993	Columbia - Allview Estates	II-III
July 12, 1993	Columbia - Allview Estates	III-IV
October 28, 1993	Ilchester - Ellicott City	IV
October 28, 1993	Ilchester - Ellicott City	IV
November 17, 1993	Columbia - Allview Estates	III
November 27, 1993	Columbia - Allview Estates	I-II
November 27, 1993	Columbia - Allview Estates	I-II
October 28, 1994	Glen Burnie, Pasadena, and more	IV
August 2, 1996	Perryville	II-III
October 17, 1996	Rising Sun	IV
December 6, 1996	Columbia - Allview Estates	II
December 6, 1997	Columbia - Allview Estates	II
December 6, 1998	Columbia - Allview Estates	II
December 14, 1996	Columbia - Allview Estates	II
December 14, 1997	Columbia - Allview Estates	II
December 14, 1998	Columbia - Allview Estates	II
December 16, 1996	Ilchester - Ellicott City	I
December 22, 1996	Columbia - Allview Estates	III
February 18, 2001	Columbia nr US29-Md32	II
March 22, 2002	Columbia nr US29-Md32	I
February 23, 2005	SE Baltimore	II-VI

Source: Maryland Geological Survey

HAZARDOUS MATERIALS (HAZMAT)

A history of hazards is not currently available for hazardous materials (HazMat) incidents in Somerset County or the Town of Princess Anne.

ALL OTHER HAZARDS

All other hazards that are normally under consideration in a hazard mitigation plan were reviewed by the Steering Committee. These include avalanches, coastal erosion, dam failures, expansive soils, hailstorms, land subsidence, landslides, tsunamis, and volcanoes. Given the geographic location of the UMES campus, the characteristics of the campus site itself, and the considerable previous experience of the Committee, these hazards are regarded as having little to no chance of impacting the University. Therefore, they were not analyzed further.

PROBABILITY OF FUTURE EVENTS

The final step of any hazard analysis is calculating the likelihood of future events. Given the number of events that have occurred in the past and the time period over which those events have occurred, one can calculate the number of events that occur per year. This gives a sense of the probability of future occurrences. The results of this calculation for the University of Maryland, Eastern Shore are presented in Table 5. For floods, the events that are tallied are generally nuisance events without a great deal of damage. The probability of a 100-year flood (and its predicted extent) is 1% in any given year. Earthquakes require a similar explanation. While 62 total events have taken place according to the historical record, only two of those were capable of causing any damage at all, however slight. Finally, there is no historical record of occurrence for several hazards, particularly those that are technological in origin.

Table 5
Probability of Future Events (All Hazards)

Hazard	Number of Events	Time Period	Events per Year	Probability of Future Occurrence
Flood	12	1994 – 2009	0.800/0.0100	High/Low
Tropical Storm	10	1933 – 2009	0.132	Medium
Severe Thunderstorm	38	1969 – 2009	0.95	High
Tornado	5	1950 – 2009	0.085	Medium
Wildfire	0	1993 – 2009	0.000	Low
Drought	1	1995 – 2009	0.071	Low
Winter Storm	35	1993 – 2009	2.188	High
Extreme Temperature	2	1995 – 2009	0.143	Medium
Earthquake	62 (2 MMI >= VI)	1758 – 2009	0.247/0.008	Medium/Low
Hazardous Material Release	Unknown	N/A	Unknown	Medium

HAZARD RANKING AND PRIORITIZATION

As one moves from a hazard analysis to the quantitative risk assessment, there is a need to further pare down those hazards selected for intense study. Not all hazards pose the same level of threat – there is a need focus efforts on those hazards that pose the greatest overall threat to UMES. Upon deliberating upon the results of the hazard analysis, the Steering Committee ranked each hazard as low, medium or high according to five criteria:

- History: High ranking indicates the hazard has occurred often
- Potential for mitigation: High ranking suggests that there are ways to address the threat that are feasible and cost-effective
- Presence of susceptible areas: High ranking indicates that UMES has many facilities and/or populations at risk for a hazard
- Data availability: High ranking confirms sufficient quality data exists to assess the vulnerability
- Federal and local disaster declarations: High ranking is given to those hazards that have caused previous significant disasters

The result of the Committee's ranking appears below (Table 6). In this ranking exercise, the wind threat of tropical storms, severe thunderstorms, and tornadoes are grouped together because both the effects and the mitigation actions for wind are likely to be the same, irrespective of the source. The results of the ranking show that flooding and wind hazards are significantly more threatening than other hazards. Therefore, they will be the primary subjects of the detailed risk assessment.

Table 6
UMES Hazard Ranking

Hazard	History	Mitigation	Vulnerable	Data	Disaster	Total
Flood	3	3	3	3	3	15
Wind	3	3	3	2	3	14
Lightning	3	2	2	2	1	10
Earthquake	1	2	3	3	1	10
Winter Storm	2	2	2	2	2	10
Drought	2	1	2	2	2	9
Extreme Temperature	1	1	1	2	1	6
Hazardous Material Release	1	1	1	2	1	6

DATA SOURCES

American Society of Civil Engineers (ASCE), "Facts About Windstorms."Web site: www.windhazards.org/facts.cfm

Bureau of Reclamation, U.S. Department of the Interior. Web site: www.usbr.gov

Federal Emergency Management Agency (FEMA). Web site: www.fema.gov

National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Web site: lwf.ncdc.noaa.gov/oa/ncdc.html

National Hurricane Center, National Oceanic & Atmospheric Administration (NOAA). Web site: www.nhc.noaa.gov

National Severe Storms Laboratory (NSSL), U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Web site: www.nssl.noaa.gov

National Weather Service (NWS), U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Web site: www.nws.noaa.gov

Storm Prediction Center (SPC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service. Web site: www.spc.noaa.gov

The Tornado History Project. Web site: www.tornadohistoryproject.com

United States Geological Survey (USGS), U.S. Department of the Interior. Web site: www.usgs.gov

Maryland Department of Natural Resources Forest Service. Website: www.dnr.state.md.us/forests/fire/index.asp

Maryland Geological Survey. Website: www.mgs.md.gov

CHAPTER VI – RISK ASSESSMENT

REQUIREMENT §201.6(C)(2)(II): [THE RISK ASSESSMENT **SHALL** INCLUDE A] DESCRIPTION OF THE JURISDICTION'S VULNERABILITY TO THE HAZARDS DESCRIBED IN PARAGRAPH (C)(2)(I) OF THIS SECTION. THIS DESCRIPTION **SHALL** INCLUDE AN OVERALL SUMMARY OF EACH HAZARD AND ITS IMPACT ON THE COMMUNITY

INTRODUCTION

This section of the Plan describes and quantifies UMES's expected future losses from two natural hazards that have the most potential to affect the campus, flooding and high winds related to hurricanes, tropical storms and tornadoes. Each hazard-specific subsection is a generalized risk assessment for the entire campus – this is intended to provide an overall perspective of risk to the University, not an exact quantification of expected losses. The Steering Committee did identify a subset of critical facilities for the purpose of comparison and to focus certain mitigation actions. In general, these facilities are not particularly at risk from natural hazards, because the University uses appropriate land development and building controls in siting and designing its facilities. Nevertheless, there are some vulnerabilities in particular parts of the campus, with regard to the flood hazard in particular.

A GENERAL DEFINITION OF RISK

Risk is a quantification of future damages; it has three components:

Value (what it costs to repair or replace something that is damaged)
Vulnerability (the degree to which something is damaged when exposed to a hazard)
Probability (the likelihood that a hazard will impact a particular place)

Asset values can be determined several ways, though most often this is done through subject-matter experts or open information sources such as the RS Means or Marshall & Swift guides. Vulnerability is also usually determined through several standard methodologies and information sources, but this can be complicated when the asset being evaluated is unusual and has not been studied in terms of expected damage from hazards. Probability is simply a determination of how often something is likely to happen, and by definition include measures of severity such as flood depth or wind speed. Risk is usually projected over a fairly long period of time to account for cumulative probability. As required by FEMA and Office of Management and Budget guidance, future expected damages (risks) are discounted to present value using a 7% discount rate, for all assessments in this section.

SOURCES OF INFORMATION ABOUT VALUE, VULNERABILITY AND PROBABILITY

For the purpose of this plan, the values of various assets included in the risk assessment were obtained from University sources. Section 3 provides an overview and analysis of the University's vulnerability to hazards. In terms of natural hazards, vulnerabilities are weaknesses (further defined below) that result in damages to people, assets or operations when they are exposed to natural hazards. For example, older buildings were not designed to meet the requirements of modern building codes, so they may be at increased threat of damage when they are exposed to earthquakes or fires. Vulnerabilities are a key component of risk, which is defined as the expected future monetary losses related to hazard impacts

OVERVIEW

As discussed in Section 1 of this Plan (Hazard Identification), the University of Maryland Eastern Shore campus has at least some exposure to as many as ten environmental hazards, but most of them have such low probability that there is little or no potential future loss from them. Section 2 described the process by which the University reduced the list of ten possible hazards to the two that create the most risk to UMES's people, assets and operations. As shown in the ranking table below, these are flooding and high winds (including tornadoes and hurricane-related winds).

Table 1
UMES Hazard Ranking

Hazard	History	Mitigation	Vulnerable	Data	Disaster	Total
Flood	3	3	3	3	3	15
Wind	3	3	3	2	3	14
Lightning	3	2	2	2	1	10
Earthquake	1	2	3	3	1	10
Winter Storm	2	2	2	2	2	10
Drought	2	1	2	2	2	9
Extreme Temperature	1	1	1	2	1	6
Hazardous Material Release	1	1	1	2	1	6

This section addresses vulnerabilities to these two predominant risks, and provides projected future losses from them, in accordance with FEMA requirements.

UMES ASSETS

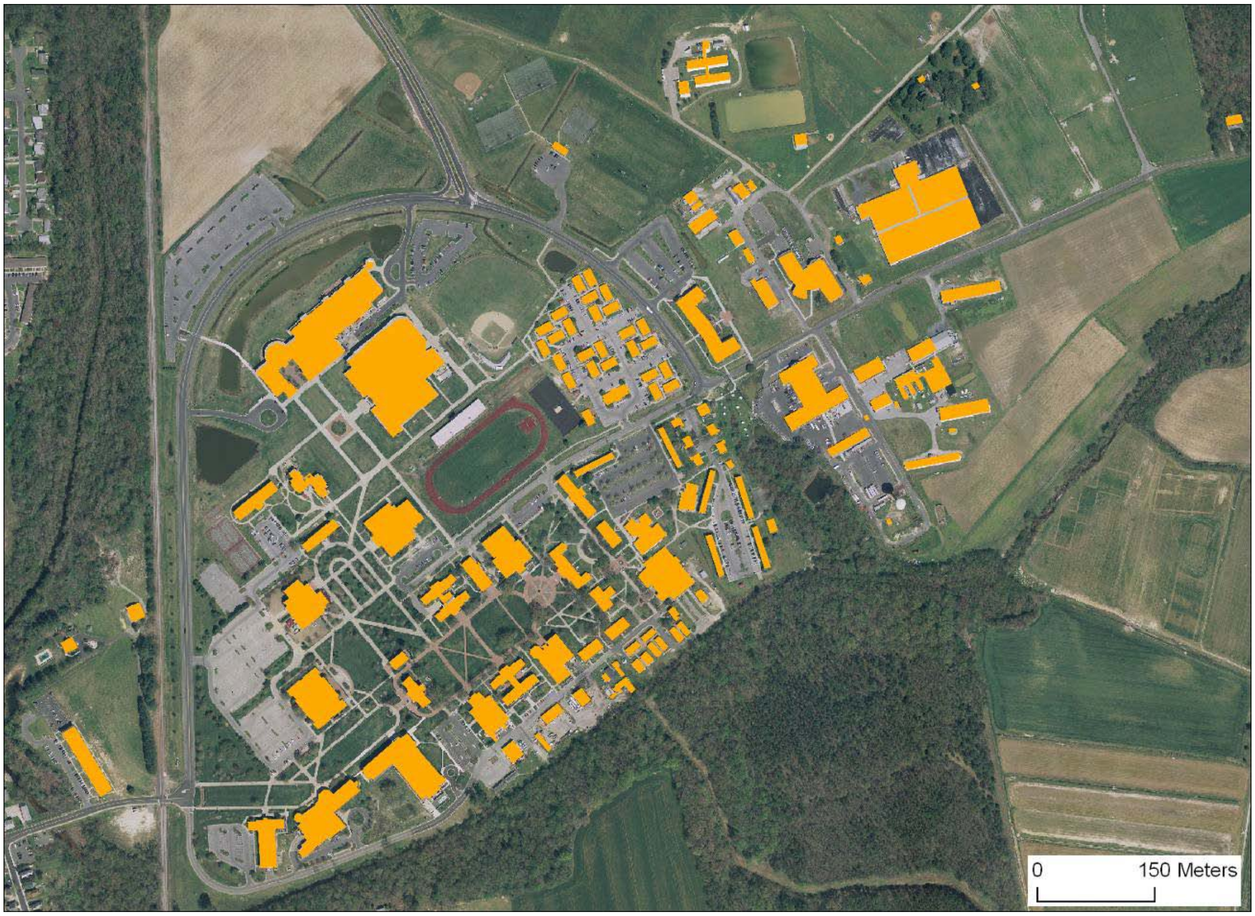
The UMES campus is home to over 4,000 students and over 850 staff, and a large number of physical assets of various types and ages. In many respects the University is the equivalent of a small town, with 92 buildings comprising more than 1.7 million square feet. The campus is also home to a very complex infrastructure that supports all the buildings and functions of the University. The physical assets on the campus, including the infrastructure, have a wide range of ages, some of the older ones dating back to the 1940s. The majority of these assets, however, were built from the 1960s to the 1990s. As expected, infrastructure on the campus also ranges in age quite significantly. As of 2009, the average age of facilities on the campus was 33 years. The gross square footages of structures on the campus, ordered by year of construction, are shown below (Table 2)

Table 2
Building Dates by Gross Square Footage (2009)

Year of Construction	Number of Buildings	Total GSF	% of GSF
Pre-1940	1	2,996	0.17%
1940 – 1949	6	140,805	7.85%
1950 – 1959	14	125,587	7.00%
1960 – 1969	17	110,522	6.16%
1970 – 1979	11	251,628	14.02%
1980 – 1989	11	143,575	8.00%
1990 – 1999	23	523,224	29.15%
2000 – present	8	496,303	27.65%
Total	92	1,794,640	100.00%

Source: UMES Facilities Management

Figure 1
Location of Buildings on UMES Campus



The physical assets and operations at UMES are a true "system", with many interdependent parts. Although most of these have redundancies to prevent permanent damage when hazards impact them, even short-term losses of service can have widespread and expensive impacts on people and operations. The University periodically reviews and ranks the condition of buildings on the campus (Table 3)

Table 3
Building Condition by Gross Square Footage (2009)

Condition	Number of Buildings	Total GSF	% of GSF
1 – Normal Maintenance	43	1,281,278	71.39%
2 – Minimal Renovation	25	290,585	16.19%
3 – Major Updating	13	77,296	4.31%
4 – Major Remodeling	8	137,426	7.66%
5 – Removal	2	4,455	0.25%
6 – Planned Termination	1	3,600	0.20%
Total	92	1,794,640	100.00%

Source: UMES Facilities Management

Each building on the campus of UMES has a vital role to play in the operation of the University. The function of each building is another critical element in determining which structures have a higher level of vulnerability. The building functions, their number, and size are shown below (Table 4)

Table 4
Buildings by General Use with Count and Gross Square Footage

General Use	Number of Buildings	Total GSF	% of GSF
Academic	11	334,889	18.66%
Athletic	3	154,373	8.60%
Auxiliary	16	238,851	13.31%
Administrative	4	94,894	5.29%
Library	1	70,206	3.91%
Residential	30	639,667	35.64%
Non-academic	27	261,760	14.59%
Total	92	1,794,640	100.00%

Source: UMES Facilities Management

UTLITIES AND INFRASTRUCTURE

SELECTING A SUBSET OF CRITICAL FACILITIES

During one of its early meetings, the Steering Committee ranked the 92 facilities on the campus using a variation of the FEMA “452” methodology. The 452 methodology is actually intended for evaluating terrorist threats to buildings, but the valuation part of the process is a useful tool for objectively determining the criticality of assets in a complex environment. The process assigns values to operations and assets based on the anticipated effects if these elements were to be lost or damaged. The results of the ranking are provided below in Table 5. This list was developed in order to provide important context to the campus-wide risk assessment and to focus the effort to create specific mitigation actions and vulnerability and risk assessments on the most important facilities on the campus.

Table 5
UMES Critical Facilities, Ranked by Criticality

Building Name	General Function	Specific Function	Score
Waters Hall	Administrative	Administrative/ Communications	71
Hazel Hall	Academic	Academic	57
Student Services Center	Administrative	Support	53
J.T. Williams Administration Building	Administrative	Administrative	52
University Terrace	Residential	Residential	52
Food Science and Technology Building	Auxiliary	Research	47
Kiah Hall	Academic	Academic	46
Trigg Hall	Academic	Research	46
Public Saftey	Non-academic	Public Safety	45
Physical Plant	Non-academic	Support	44
William P. Hytche Center	Athletic	Public Safety	42
Henson Center	Academic	Academic	41
WESM Radio Station	Academic	Communications	41

Building Name	General Function	Specific Function	Score
Ella Fitzgerald Performing Arts Center	Auxiliary	Communications	40
SRC Community Center	Residential	Residential	40

Source: UMES Steering Committee

ESTIMATE OF POTENTIAL LOSSES (RISK ASSESSMENT)

This section describes risks to UMES from natural hazards. Risks are expected future damages to students and staff, physical assets and operations from flooding, wind and lightning. There are several methods for calculating risk; the choice of methodology depends on the availability of loss and engineering information. As noted above, risk is an expression of expected future monetary losses resulting from the impacts of natural hazards. The risk assessment process is based on several sequential steps:

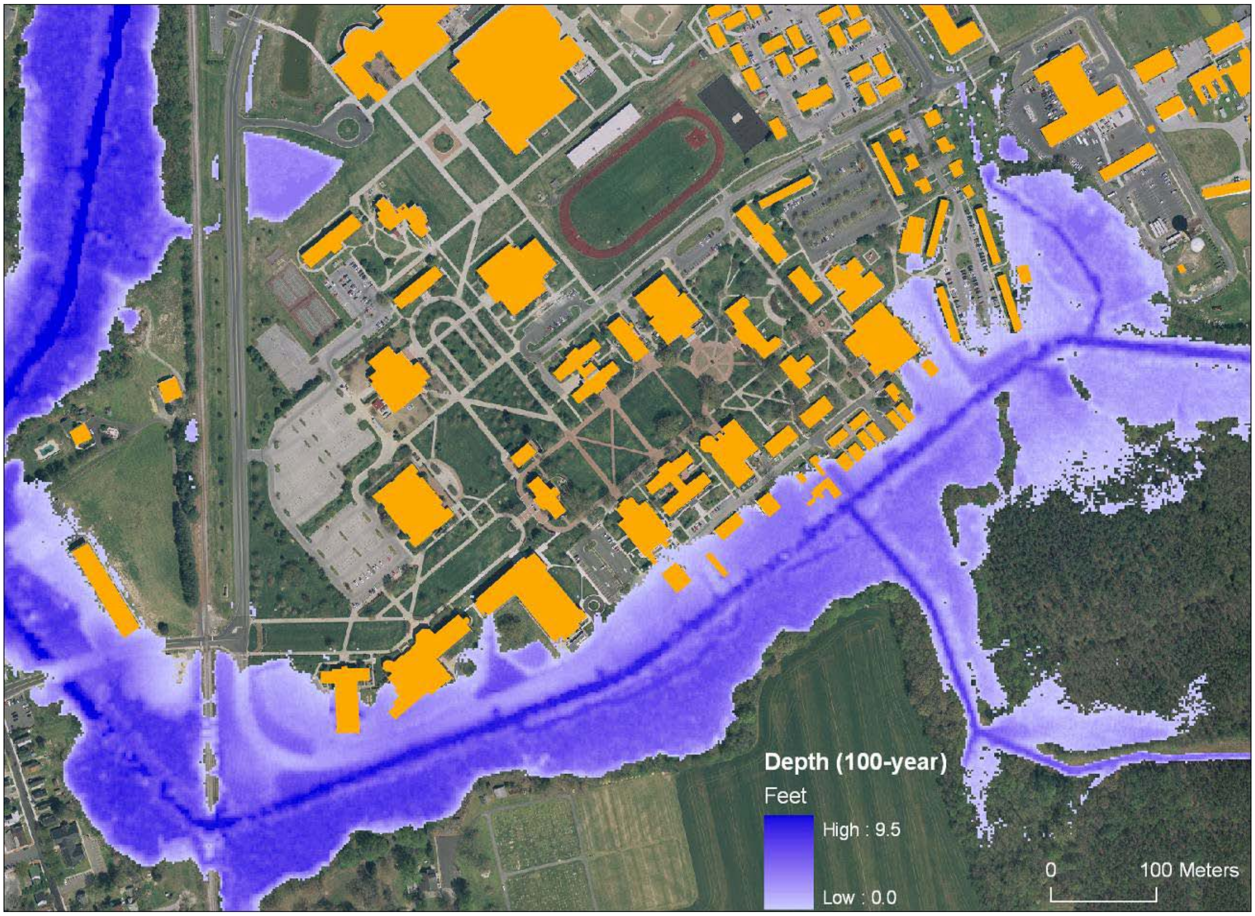
1. Assign values to the assets
2. Develop damage, injury and mortality functions for the assets (quantify the vulnerabilities)
3. Determine annual probabilities and severity of natural hazard events impacting the assets
4. Calculate the annual damages from the impacts of the hazards
5. Perform a present-value calculation to bring future risks to current dollars (required by FEMA)

The risk assessment procedures used in this plan vary depending on the type, extent and reliability of data that was available.

FLOOD HAZARD

Generally, the flood hazard at UMES is from localized overland flow, ponding, and overbank from the tributary of Manokin Branch. Flood issues on the campus are generally confined to a particular area of concern, specifically the southern boundary of campus

Figure 2
Modeled 100-year Flood Depth along the Manokin Branch



In addition to these floodplains, the campus also has various areas where floods occur during heavy rainfall, usually associated with thunderstorms, tropical depressions, or hurricanes. Most of these events are relatively minor, and are related to ponding and overland flows when storm drainage capacity is temporarily exceeded. Although it is generally well controlled by appropriately-designed infrastructure, the continued development of the campus has sometimes resulted in more impermeable surfaces, which may exacerbate localized flooding problems. Even though the affected areas normally drain in a fairly short period of time, certain critical areas – specifically Kiah Hall – are subject to near-flash flooding when overland flow builds up very rapidly after rainfall. In most areas of the campus ponding and overland flow creates serious but manageable flood problems, but Kiah Hall and certain other facilities house expensive equipment and mission-critical operations. Flood risk from the Manokin Tributary can be characterized as low-probability/high consequence because of the potential for the facilities on the south side of campus, which could be impacted by an extreme event.

FLOOD RISK

Using information provided by UMES Facilities Management regarding structure replacement values, FEMA's HAZUS-MH loss estimation software for formulas to calculate both the estimated replacement value of the buildings' contents, as well as the depth-to-damage formulas, and percent damaged estimates from geospatial analysis, each building subject to the 100-year flood was assessed. The results (Table 6) show that for a 100-year event, 12 buildings would likely be impacted, generating a loss of over $5.7 million. This then computes to an average annual loss of $401,342. The majority of this loss comes from Kiah Hall and the Henson Center, the most expensive buildings under threat of flooding.

It bears repeating that while these results are based upon the best available data, they must be considered estimates because highly-detailed engineering studies of each facility were not performed as part of this planning process.

Table 6
Flood Risk per Building, using HAZUS-MH Depth/Damage Curves

Building Name	Repl. Value (Structure)	Repl.Value (Contents)	Total Value	% Damaged (100-yr event)	Risk
Hawks Landing	$5,625,000	$2,812,500	$8,437,500	1.50%	$126,562
Kiah Hall	$13,475,250	$20,212,875	$33,688,125	5.00%	$1,684,406
Henson Center	$22,523,250	$33,784,875	$56,308,125	5.75%	$3,237,717
(Old) Public Safety	$1,038,825	$519,412	$1,558,237	11.00%	$171,406
Maintenance Shop	$540,000	$270,000	$810,000	3.50%	$28,350
Central Steam Plant	$1,857,765	$928,883	$2,786,648	6.75%	$188,098
Crab Research	$231,250	$346,875	$578,125	7.00%	$40,469
Environmental Storage	$9,125	$4,562	$13,687	5.50%	$753
Maintenance Storage	$225,000	$112,500	$337,500	20.25%	$68,344
Temporary Classrooms	$540,000	$810,000	$1,350,000	5.50%	$74,250
Alumni Building	$592,875	$296,438	$889,312.5	10.5%	$93,378
Student Apt 4	$2,629,260	$1,314,630	$3,943,890	0.50%	$19,719
Total	$48,972,600	$61,256,050	$110,228,650		$5,733,453

HURRICANE WIND HAZARD

This part of the risk assessment discusses wind risk to facilities, people and operations on the UMES campus. The structure of this section is the same as the flood section above, however the section does not address wind risks to specific critical facilities as there is simply not enough data to reach any reasonable conclusions. The first step in the risk calculation is to determine the probability of hurricanes impacting UMES (Table 7). The figures in these tables are estimates based on best available data. Information sources are provided in the notes below the tables, where applicable. The speed and probability data in this table is extracted from the FEMA wind database on Version 3.0 of the BCA Toolkit.

Table 7
Hurricane Wind Probabilities in Maryland

Wind Speed	Return Frequency
28	10
44	25
57	50
66	100
94	2000

This information is used in the FEMA Hurricane Wind BCA module, in combination with data about the building stock and UMES's operating budget to calculate future wind damages (i.e. risk), as described below.

HURRICANE WIND RISK

Campus-wide hurricane risk at UM was determined using the FEMA Hurricane Wind BCA Module, Version 1.1.0. This calculation is intended as a very general assessment of risk to physical assets and operations, and does not include the potential for casualties, primarily because exposed populations are generally warned far enough in advance that injuries and deaths are minimized and the future risk of injuries and fatalities negligible. The expected annual number of storms is shown in Table 8. The probability calculations are performed by the FEMA software using default calculations and a recently-developed database that provides wind speeds for hurricane categories by ZIP code. This information is used in conjunction with basic data about the University's facilities, as shown in table 7.

Table 8
Expected Annual Number of Hurricane-related Wind Storms at UMES

Storm Class	Wind Speed (mph)	Estimated Number of Storms
0	60 – 73	0.0119
1	74 – 95	0.003376
2	96 – 110	0.000296
3	111 – 130	0.00009224
4	131 – 155	0.00002283
5	> 155	0.000007228

Table 9
Basic Data Parameters used in Hurricane Wind Risk Calculation for UMES

Data Parameter	Value
Gross area of buildings in square feet	1,794,640
Estimated value of structures	$472,071,848
Estimated value of contents	$530,784,805
Annual budget of UMES operations	$94.2 million

Hurricane wind risk for the campus was then calculated using the FEMA Hurricane Wind Full-Data BCA module and default data for wind probabilities and damage functions from the 2006 BCA Toolkit. Table 10 is a summary of wind risk for the overall campus, for direct physical damage to facilities and contents, and loss of operations. The cumulative risk categories are risks for a 100-year time horizon at a 7% discount rate. Using a shorter time horizon would decrease the estimated risks.

Table 10
Expected Hurricane Wind Risk to all UMES Facilities

Data Parameter	Value
Estimated cumulative hurricane wind risk to structures	$1,965,305
Estimated annual hurricane wind risk to structures	$137,571
Estimated cumulative hurricane wind risk to contents	$1,733,048
Estimated annual hurricane wind risk to contents	$121,313

Data Parameter	Value
Estimated cumulative loss of public services	$66,107
Estimated annual loss of public services	$4,627
Estimated total cumulative hurricane wind risk (100-year horizon)	$3,764,459
Estimated hurricane wind risk, annualized	$263,512

TORNADO HAZARD

As noted in the hazard profile section of this plan, Maryland has a relatively low probability of tornadoes compared to many areas in the south and central U.S. According to NOAA's National Climatic Data Center (NCDC) database, the State has experienced 279 tornadoes since 1950, with the large majority of them F0 and F1 class. The County level is the smallest reporting area for NCDC, and Somerset County has experienced 5 tornadoes in the same reporting period, all of which were either Fujita class F0 or F1. It is important to note, however, that in September 2001, an F3 tornado struck the UM College Park campus, killing two students and causing millions in structural damages. Tornado events are rare but do happen.

TORNADO RISK

Tornado risk for the UMES campus was calculated using the FEMA Tornado BC Analysis software. Note that the FEMA tornado assessment software considers only injuries and casualties related to tornadoes, not direct physical damages to structures or contents. There is no reliable methodology for assessing potential tornado damage to physical assets, except to perform highly detailed engineering studies, something that was outside the scope and requirements of this plan. Clearly, there is potential for damage to buildings and infrastructure if they are impacted by tornado winds, but the injuries and death calculations are used as a proxy for relative damages in this plan.

It is worth noting that although tornado recurrence probability in any specific area (particularly small ones) is extremely low, the density of both the built environment and population significantly influences risk because of the variability of casualties and damages to physical assets. College campuses, including UMES, are typically high-density environments, and thus have an increased tornado risk (again, not related to probability). UMES has seven shelter facilities: the Henson Center, Tawes Gymnasium, Food Science & Technology Center, University Terrace, Hazel Hall, Hytche Center, and Student Service Center. The University has not identified shelter areas in specific buildings other than these facilities, and has included a mitigation action item to begin to address this issue.

The estimated future damages (risk) for the UMES campus as a whole is shown below (Table 11). Note that the FEMA software used for this calculation counts only the values of injuries and deaths, not direct damages to buildings and contents.

Table 11
Expected Tornado Wind Risk to all UMES Facilities

Data Parameter	Value
Estimated cumulative tornado wind risk (injuries)	$138,159
Estimated annual tornado wind risk (injuries)	$9,671
Estimated cumulative tornado wind risk (fatalities)	$734,933
Estimated annual tornado wind risk (fatalities)	$51,445
Estimated cumulative tornado risk (100-year horizon)	$873,092
Estimated tornado risk, annualized	$61,116

SUMMARY OF FLOOD AND WIND RISK ASSESSMENTS

The estimates of future losses from floods and wind for the overall campus are summarized below (Table 12). Comparatively, floods pose a greater risk to UMES than either hurricane wind or tornadoes due to the nature of the hazard as well as location of buildings related to the threat. The particular criticality of Kiah Hall, the Henson Center, and the Steam Plant make them especially vulnerable.

Table 12
Risk Summary for UMES

Hazard	Annual Risk	100-year Risk
Flood	$401,342	$5,733,453
Hurricane Wind	$263,512	$3,764,459
Tornado	$61,116	$873,092

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Based on the 2008-2018 Master Plan for the University, forested areas take up a large portion of the campus and forms a natural boundary along the campus. The eastern boundary of the campus consists of the forestation reserve and forested areas and the forest area on Hawk's Landing lines the western edge of the campus. There are five land use districts: academic, residential, athletic facilities, farm areas, and administration/student services. The administration/student services buildings are situated in the historic quad and the athletic field lies along College Backbone Road. The residential cluster is located at the intersection of Backbone Road and McCain Drive. Residential use mostly occurs along the east edge of the campus and along Backbone Road along the western edge of the campus. The Master Plan recommends additional residences on the eastern edge and the development of McCain Drive as an academic corridor.

In the past the direction of growth was mostly to the west and north of the historic core but is now tending toward the east and northeast due to the presence of large areas of undeveloped land. The Master Plan indicates that the greatest potential for development is south of the historic quad on the opposite side of the Manokin Branch. Since the majority of the land is open space (farmland or forested areas), as these areas are slated for development, efforts should be made to ensure that development does not encroach upon the areas that have been identified as high hazard areas in this plan.

CHAPTER VII – MITIGATION STRATEGY

MITIGATION STRATEGY: §201.6(C)(3): THE PLAN SHALL INCLUDE A MITIGATION STRATEGY THAT PROVIDES THE JURISDICTION'S BLUEPRINT FOR REDUCING THE POTENTIAL LOSSES IDENTIFIED IN THE RISK ASSESSMENT, BASED ON EXISTING AUTHORITIES, POLICIES, PROGRAMS AND RESOURCES, AND ITS ABILITY TO EXPAND ON AND IMPROVE THESE EXISTING TOOLS.

INTRODUCTION

The Mitigation Strategy serves as the long-term roadmap for reducing potential losses identified in the earlier sections of the report. This Chapter identifies: 1) goals and objectives to help the University to be better prepared to face various hazards; 2) specific actions that should be implemented to reduce the University's vulnerability to various hazards; and 3) prioritization of mitigation actions.

13. Local Hazard Mitigation Goals
Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy* ***shall*** *include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

GOALS AND OBJECTIVES

The goals and objectives form a basis upon which specific mitigation actions will be developed. During the HMC meetings and Public Meeting held in July 2009, citizens and local government representatives discussed the findings of the vulnerability assessment, its implications for various hazards, and actions that needed to be taken to mitigate the risk. Mitigation goals and objectives have been developed for UMES on this premise. For the purpose of this report, goals and objectives have been defined as the following:

Goals are general guidelines that explain what is to be achieved. They are usually broad policy-type statements, long term and represent global visions.

Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, they are more specific and measurable.

The goals and objectives developed in this Plan have been divided into the following six categories: prevention; property protection; emergency services; structural projects; natural resource protection; and public information.

UMES' Overarching Hazard Mitigation Goal: "*To provide a mechanism for the University through which, the likelihood of threat to the land, structures, and constituents from natural hazards (e.g., flood, wind, tornadoes, hurricanes, wildfire, drought, etc.) can be assessed and to devise an action plan to reduce the impact of those threats and to develop a road map for future efforts".*

Prevention
Goal 1: Integrate hazard mitigation principles in existing plans and guidances.
Goal 2: Coordinate mitigation policies and actions with the Town of Princess Anne and Somerset County.

Property Protection
Goal 3: Ensure that any new construction and renovation of buildings makes them resistant to one or more hazards.
Goal 4: Protect the University's valuable and irreplaceable property in 'safer' areas within buildings.

Emergency Services
Goal 5: Reduce potential impacts to critical facilities and make them less vulnerable to hazards.
Goal 6: Improve coordination and notification procedures during emergencies.

Structural Projects
Goal 7: Ensure regular maintenance of the University's infrastructure within the 100-year floodplain.

Natural Resource Protection
Goal 8: Protect existing natural resources and open-space within the floodplain and watersheds.

Public Information
Goal 9: Improve public awareness and outreach during hazard events through education.

14. Identification and Analysis of Mitigation Actions
Requirement §201.6(c)(3)(ii): *[The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Mitigation Actions
Specific mitigation projects that have been derived from the goals and objectives in Chapter 9 that should be implemented over a period of time have been detailed as mitigation actions. The mitigation actions developed have been classified in the same six categories as the goals and objectives. These categories have been elaborated below along with examples:

1. *Preventive Measures*: Preventive activities involve government administrative or regulatory actions or processes that influence land development and building construction. Examples of preventive actions include planning and zoning, modifications to building codes and stormwater management regulations, capital improvement programs, and open space preservation programs.

2. *Property Protection*: Property protection activities include the modification of existing buildings or infrastructure to protect them from a hazard, or removal from the hazard area. Examples of property protection include acquisition, elevation, relocation, structural retrofits, flood-proofing, storm shutters, and shatter-resistant glass.

3. *Emergency Services*: Emergency services are those actions that are performed by emergency management departments at local levels who respond to emergencies, such as natural disasters. Examples include staffing for the Emergency Operations Center and equipment.

4. *Structural Projects*: Structural projects involve the construction of structures to reduce the impact of a hazard. Examples include the construction of culverts, dams, floodwalls, retaining walls, and safe rooms.

5. *Natural Resources and Open Space Protection*: Natural resource protection actions are those that minimize hazard losses as well as preserve or restore the functions of natural systems. Examples of these actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

6. *Public Information*: These activities involve actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Examples include outreach projects, real estate disclosure, hazard information centers, and environmental education programs.

For each action item, the relevant hazard(s) addressed and the goal supported by it, are identified. Key departments at UMES that are responsible for implementation are included, as well as possible funding sources, an approximate cost, and general timeline for the implementation of each mitigation action. A detailed list of funding sources is also included and the abbreviations used below in the mitigation actions refer to the funding resources listed.

<u>Prevention</u>

1. As elaborated in the document review section, examine recommendations and consider integrating effective mitigation practices and concepts into other UMES plans such as the Master Plan and CIP. Identify members from the HMC to form a sub-group to develop a process for plan integration.
   Hazard(s) addressed: All hazards
   Key implementation department(s): All departments

Goal: 1
Possible Funding Sources: None required
Approximate Cost: Staff time
Timeline: 1-2 years

2. Continue to work closely with the Town of Princess Anne and Somerset County to ensure that the mitigation actions are coordinated effectively and are in harmony with that of the Town and County.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Physical Plant (Facilities)
   Goal: 2
   Possible Funding Sources: None required
   Approximate Cost: Staff time
   Timeline: Ongoing

3. The Draft Master Plan lists capital funded projects from 2008 to 2018 (page 20). A number of buildings including Kiah Hall, the Arts and Technology Building, Wilson Hall, Carver Hall, and J.T. Williams Building, among others, are slated for renovation. Ensure these renovations incorporate hazard mitigation principles and implement the mitigation actions listed for specific buildings in this section.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Physical Plant (Facilities), Office of Administrative Affairs
   Goal: 1
   Possible Funding Sources: PDM, HMGP
   Approximate Cost: To be determined (will vary with the number of structures)
   Timeline: 5-10 years

4. Work in collaboration with local government to improve the University's and the community's disaster resistance by conducting regular meetings with the County EMA to mobilize funds through the local mitigation strategy.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Administrative Affairs
   Goal: 1
   Possible Funding Sources: None required
   Approximate Cost: Staff time
   Timeline: 1-2 years

5. Work with the Office of Alumni Affairs to identify alumni who: 1) may be able to assist through fundraising; 2) serve as valuable technical resources for retrofit and modernization projects; and 3) serve in positions to influence government and nonprofit resource allocation.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Office of Alumni Affairs

Goal: 2
Possible Funding Sources: University Funds
Approximate Cost: Staff time
Timeline: 1-2 years

Property Protection

1. In order to alleviate flooding along the Manokin Tributary and minimize damages in floodprone areas, incorporate the following protection measures in various buildings across campus:

   - Install check valves in floor drains at all buildings in flood prone areas.
   - Install tideflex where storm drain system discharges to creek, where appropriate.

   Hazard(s) addressed: Flood
   Key implementation department(s): Facilities
   Goal: 3
   Possible Funding Sources: PDM, FMA
   Approximate Cost: $30,000
   Timeline: 1-2 years

   - Raise utilities in floodprone area
   - Construct walls around Kiah and Central Steam Plant or provide other flood proofing mechanisms

   Hazard(s) addressed: Flood
   Key implementation department(s): Facilities
   Goal: 3
   Possible Funding Sources: PDM, FMA
   Approximate Cost: raise utilities = $150,000/walls at Kiah Hall, Central Steam Plant = $225,000
   Timeline: 1-2 years

   - Abandon specific buildings in physical floodplain, restore floodplain.
   - Construct floodwall/berm/levee along Manokin Tributary.

   Hazard(s) addressed: Flood
   Key implementation department(s): Facilities
   Goal: 3
   Possible Funding Sources: PDM, FMA
   Approximate Cost: $1.5 million – $2 million
   Timeline: 5 years or longer

2. The dFIRMS do not convey the actual extent of the flood threat. They currently under-predict the extent and frequency of flooding, i.e., the physical floodplain appears to be larger than that indicated in the maps. Coordinate with FEMA to revise the dFIRMs as necessary, based on the flood analysis in this Plan and submit a Letter of Map Revision to

have the 100-year floodplain adjusted to reflect past flooding events. Coordinate with the Town of Princess Anne and Somerset County.
Hazard(s) addressed: Flood
Key implementation department(s): Facilities
Goal: 3
Possible Funding Sources: FMA, University funds
Approximate Cost: Staff time, $30,000 Consultant fee
Timeline: 1-2 years

3. The Frederick Douglass Library's basement houses books, utilities, and media equipment and has flooded a few times.

   - Relocate the media equipment and books to a higher level within the building.
   - Install sump pump outside of basement doors
   - Install larger grate on floor drain, install check valve.

   Hazard(s) addressed: Flood
   Key implementation department(s): Physical Plant (Facilities)
   Goal: 4
   Possible Funding Sources: None required
   Approximate Cost: Staff time, Physical improvements = $7,000
   Timeline: 1-2 years

4. The campus is vulnerable to lightning strikes. Between 1960 and 2007, there have been 11 reported lightning incidents. However, there have been many more actual occurrences than those reported. Conduct a detailed engineering assessment of areas on campus that may be vulnerable to lightning strikes such as antennae and computer and electrical systems that may be exposed to power surges and develop appropriate mitigation measures.
   Hazard(s) addressed: Lightning
   Key implementation department(s): Public Safety, Physical Plant
   Goal: 3
   Possible Funding Sources: PDM
   Approximate Cost: $50,000
   Timeline: 3-5 years

5. The Ella Fitzgerald Performing Arts Center contains utilities in the basement including two sump pumps. In the event of a power outage, water could get into the electrical system and short the building, requiring the power to be disconnected. Install a small generator to pump the water up during power outage and keep the basement from flooding
   Hazard(s) addressed: Flood
   Key implementation department(s): Physical Plant (Facilities)
   Goal: 3
   Possible Funding Sources: University Funds, PDM
   Approximate Cost: $50,000

Timeline: 1-2 years

6. The Carver Science Building contains a number of experiments that need to stay refrigerated. In addition to this, large food storage areas, infirmary, and laboratories on campus also have the same need. These buildings should develop a list of their needs for refrigeration and contain a back-up plan to deal with power outages.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Physical Plant (Facilities)
   Goal: 4
   Possible Funding Sources: University Funds
   Approximate Cost: Staff time
   Timeline: 1-2 years

7. University Terrace has a network hub in the basement and is prone to flooding.
   - Consider moving the hub to higher ground.
   - Improve site drainage as necessary.
   - Re-grade as necessary.
   - Extend downspouts as necessary.
   - Install sump pump as appropriate.

   Hazard(s) addressed: Flood
   Key implementation department(s): Physical Plant (Operations), Information Technology
   Goal: 3
   Possible Funding Sources: PDM, University Funds
   Approximate Cost: $7,000 if hub remains in place
   Timeline: 1-2 years

8. Kiah Hall contains utilities in the mechanical room in the basement. After Tropical Storm Isabel in 2003, the motors, controls, and electrical panels for boilers, pumps, and air handlers were retrofitted. (See flood mitigation estimates if equipment is to remain in basement)
   - Consider moving the utilities out of the basement into an external shed on grade or above.

   Hazard(s) addressed: Flood
   Key implementation department(s): Physical Plant (Facilities)
   Goal: 3
   Possible Funding Sources: University Funds, PDM
   Approximate Cost: $250,000 - $500,000
   Timeline: 3-5 years

9. In the Thomas/Briggs Art and Technology Center, the utilities are 3-4 feet below grade.
   - Consider relocating these utilities to higher ground.
   - Install check valve on mechanical room underdrain.

   Hazard(s) addressed: Flood
   Key implementation department(s): Physical Plant (Facilities)

Goal: 3
Possible Funding Sources: University Funds, PDM
Approximate Cost: $250,000 - $500,000 to relocate utilities
$3,000 for installation of valves.
Timeline: 3-5 years

10. The campus contains a loop electrical system that runs around campus. There is an old maintenance building by the Police Station that has 25kv switching gears and transformers that are in the 100-year floodplain. Consider opening the loop around the floodplain areas near the old Maintenance Building to ensure continuity of power supply to the rest of the campus during a flood.
Hazard(s) addressed: Flood
Key implementation department(s): Physical Plant (Operations)
Goal: 3
Possible Funding Sources: University Funds
Approximate Cost: $400,000
Timeline: 1-2 years

11. There are several trees on campus that are close to buildings such as the Kiah Hall, Public Safety Building, Ella Fitzgerald Performing Arts Center, etc. Monitor and prune trees around buildings regularly and examine tree bases for early signs of uprooting. Avoid planting of large trees adjacent to buildings.
Hazard(s) addressed: Wildfire
Key implementation department(s): Physical Plant (Facilities)
Goal: 3
Possible Funding Sources: University Funds
Approximate Cost: $5,000 per year
Timeline: Ongoing

12. There are a number of older buildings on campus. Conduct a structural inspection (5 or 10-year cycle) of the structural elements and access to buildings.
Hazard(s) addressed: Flood, wind
Key implementation department(s): Physical Plant (Facilities)
Goal: 3
Possible Funding Sources: University Funds
Approximate Cost: $1,500 per building
Timeline: Ongoing

13. The fence along the south and west side of University Terrace could pose an access problem for ingress/egress as well as for firefighters. Include additional gates. Mark gates clearly for access.
Hazard(s) addressed: Wildfire
Key implementation department(s): Physical Plant (Facilities)
Goal: 3

Possible Funding Sources: University Funds
Approximate Cost: $5,000
Timeline: 1-2 years

14. The William Hytche Center and the Student Services Center do not have any lightning protection. Add a lightning protection system.
    Hazard(s) addressed: Lightning
    Key implementation department(s): Physical Plant (Facilities)
    Goal: 3
    Possible Funding Sources: University Funds
    Approximate Cost: $10,000 design, $40,000 material and labor installation per building
    Timeline: 1-2 years

15. The hazardous materials facilities building near the Central Steam Plan is inadequate for the storage of these materials. Identify a site on campus to relocate these materials.
    Hazard(s) addressed: Hazardous materials
    Key implementation department(s): Physical Plant (Facilities)
    Goal: 3
    Possible Funding Sources: University Funds
    Approximate Cost: $30,000
    Timeline: 3-5 years

<u>Emergency Services</u>

1. Install generators in Kiah Hall, Wicomico Hall and all other residence halls as well as the student services center.
   Hazard(s) addressed: all hazards
   Key implementation department(s): Physical Plant (Facilities)
   Goal: 5
   Possible Funding Sources: PDM
   Approximate Cost: $5,000 design per building, $45,000 material and labor per building
   Timeline: 1-2 years

2. Purchase a UMES 4-wheel drive vehicle to help during emergency situations.
   Hazard(s) addressed: all hazards
   Key implementation department(s): Public Safety
   Goal: 6
   Possible Funding Sources: University Funds
   Approximate Cost: $30,000
   Timeline: 3-5 years

3. The Physical Plant serves as the alternate EOC and is insufficient. It does not have phone and internet connectivity to operate as a secondary location. Upgrade the Physical Plant

Building to include a spot where communication lines could come in and introduce a back up data network correction in the building.
Hazard(s) addressed: All hazards
Key implementation department(s): Information Technology, Facilities
Goal: 5, 6
Possible Funding Sources:
Approximate Cost: University Funds
Timeline: 1-2 years

4. The Public Safety Building serves as the Police Station and is the center of communication. When it floods, the whole building is surrounded by water. This building is currently not an accredited facility and lacks holding cells, juvenile cells, shower facilities, etc. The building was not designed to function as a public safety building.

5. Short Term - Upgrade the Physical Plant Building to include a spot where communication lines could come in and introduce a back up data network correction in the building. Also, install a generator in the building.
Hazard(s) addressed: All hazards
Key implementation department(s): Information Technology, Physical Plant
Goal: 5, 6
Possible Funding Sources: PDM
Approximate Cost: $5,000-$10,000
Timeline: 1-2 years

6. Long Term - Consider relocating it out of the flood zone to higher ground and redesign it with a control room so that it can be used as a command center. Identify a location on Route 822 near the main entrance for a facility that is more visible, accessible, and safe that can function as a Public Safety Building and EOC. The new facility would also function as an EOC and contain shower rooms, locker rooms, kitchenette, juvenile cell, adult cell, interrogation room, holding cells (male and female), working area, and vehicle parking.
Hazard(s) addressed: All hazards
Key implementation department(s): Physical Plant (Engineering and Planning)
Goal: 5, 6
Possible Funding Sources: PDM, FMA, HMGP
Approximate Cost: $3.3 million dollars (12,000 sf @ $200/sf for building, $500,000 for site and utilities, $400,000 for design, permitting, etc)
Timeline: 5-10 years

7. The network core and main switchboard is located in the J.T. Williams Admission Building. This building does not have a generator. Install a generator at the JT Williams Building.
Hazard(s) addressed: All hazards
Key implementation department(s): Physical Plant (Facilities)
Goal: 5
Possible Funding Sources: PDM

Approximate Cost: $75,000
Timeline: 1-2 years

8. The Police Department currently has 16 staff members and recently recruited two people. However, they are still short- staffed. Emergency calls get stacked up due to staffing constraints and most times, there are not enough officers to respond to an emergency situation. Consider hiring at least two additional staff members: an Accreditation Manager to rewrite the rules and regulations for planning and operations by the Standards for Law Enforcement Agency Accreditation Program; and an Emergency Manager to write the COOP and Emergency Preparedness Plan, run table top exercises and coordinate with federal, stake, and local stakeholders.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Police Department
   Goal: 6
   Possible Funding Sources: University Funds
   Approximate Cost: $40,000 per staff person
   Timeline: 1-2 years

9. The University's Continuity of Operations Plan is currently being developed. Continue to update this Plan regularly.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Police Department
   Goal: 6
   Possible Funding Sources: PDM
   Approximate Cost: $40,000
   Timeline: Ongoing

Structural Projects

1. The Campus Facilities staff conducts an annual maintenance on roofs that includes cleaning drains and gutters and examines damage. Consider hiring a roofing expert to conduct preventive maintenance, identify issues and recommendations, and also keep regular records.
   Hazard(s) addressed: Winter storms, high wind
   Key implementation department(s): Physical Plant
   Goal: 7
   Possible Funding Sources: FMA, PDM
   Approximate Cost: $25,000-$30,000 per year
   Timeline: 1-2 years

2. The Richard Henson Center, Kiah Hall, Tawes Gymnasium, Student Services Center and University Terrace serve as shelters for the campus. The Food Science Building serves as a shelter for pets. The Art and Technology Building serves as a shelter for the Red Cross and Richard Henson Center serves as a backup shelter for the County. Conduct a study to

determine the shelter requirements and specifications and also examine the feasibility of hardening the Henson Center and other shelter locations.
Hazard(s) addressed: Tornadoes
Key implementation department(s): Physical Plant, Police Department
Goal: 7
Possible Funding Sources: FMA, PDM
Approximate Cost: $10,000-$25,000
Timeline: 1-2 years

3. The campus is vulnerable to high wind as indicated in the risk assessment section of this Plan. Select high-priority facilities for additional study, and develop recommendations regarding potential retrofits to harden these against potential wind damage.
Hazard(s) addressed: High wind
Key implementation department(s): Physical Plant (Facilities)
Goal: 7
Possible Funding Sources: PDM
Approximate Cost: $20,000-$25,000
Timeline: 1-2 years

4. There are six manholes on the main sewer line near Kiah Hall. Since these are at the lowest point on the campus, they tend to flood the sewer system. Work closely with the Somerset County Sanitary District to consider raising the manholes to above the height of the base flood, lining interior of existing manholes, repairing pipe connections and install sealed/watertight covers on these manholes to prevent water from flowing into the Town's pumping station.
Hazard(s) addressed: Flood
Key implementation department(s): Physical Plant (Operations)
Goal: 7
Possible Funding Sources: FMA, PDM, State of MD Bay Restoration Fund
Approximate Cost: $46,000 with consultant fees, specifications and bidding, including complete MH
Timeline: 1-2 years

5. The Central Steam plant is located across from the George Washington Carver Science Building and next to the Public Safety Building. The building contains a 2-foot wall. Consider raising the walls around the two doors and install a sump pump in the central steam plant to keep out water. Consider other flood-proofing options.
Hazard(s) addressed: Flood
Key implementation department(s): Physical Plant (Planning and Engineering, Facilities)
Goal: 7
Possible Funding Sources: FMA, PDM
Approximate Cost: $130,000
Timeline: 1-2 years

Natural Resource Protection

1. Seek low impact development techniques to manage storm water and reduce the impact of flooding on campus by incorporating techniques such as include bioretention areas, dry wells, infiltration trenches, filter/buffer strips, vegetated swales, rain barrels, and cisterns. Identify specific areas here.
   Hazard(s) addressed: Flood
   Key implementation department(s): Physical Plant (Planning and Engineering)
   Goal: 8
   Possible Funding Sources: PDM
   Approximate Cost: Varies by number and type of bio-retention areas - $25,000-$100,000 / acre
   Timeline: 1-2 years

Public Information

1. Develop a training session for lab directors on hazard mitigation. The training would address appropriate preparation, protection, and securing measures during hazard events.
Hazard(s) addressed: All hazards
Key implementation department(s): Physical Plant (Facilities)
   Goal: 9
   Possible Funding Sources: University Funds
   Approximate Cost: <$25,000
   Timeline: 1-2 years

2. Introduce a campus hazards segment in the administration newsletter for regular updates and information on various hazards.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Office of Administrative Affairs
   Goal: 9
   Possible Funding Sources: None Required
   Approximate Cost: Staff time
   Timeline: 1-2 years

3. Encourage employees to bring hazard newsletters home to their families.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Public Safety, Community Relations
   Goal: 9
   Possible Funding Sources: None Required
   Approximate Cost: Staff time, printing costs
   Timeline: 1-2 years

4. The 2009 UMES Preparedness Audit identifies the need for programs to solicit feedback from students on issues related to campus safety and emergency preparedness and

recommends town hall meetings that includes question and answer sessions on various issues. Incorporate a hazards preparedness segment into these town hall meetings.
Hazard(s) addressed: All hazards
Key implementation department(s): Public Safety, Community Relations
Goal: 9
Possible Funding Sources: Not Required
Approximate Cost: Staff time
Timeline: 1-2 years

5. On the campus' emergency preparedness website: http://www.umes.edu/Emergency/Default.aspx?id=11290, include information on how faculty, student, and staff should be prepared for hazards events.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Public Safety
   Goal: 9
   Possible Funding Sources: None Required
   Approximate Cost: Staff time
   Timeline: 1-2 years

6. It is important for students and staff to stay informed about hazard risks on campus and become knowledgeable on how to respond to various hazard situations. Work with the Office of Community Relations to conduct a public outreach effort on campus. This would involve a variety of outreach techniques: printed materials such as brochures, information via the internet, presentations, and setting up a kiosk at UMES History Week in the fall and Springfest. The information would include warning alerts, shelter locations, safety procedures, and evacuation routes, among others. New students can also be handed relevant hazard related materials during orientation.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Office of Community Relations, Public Safety
   Goal: 9
   Possible Funding Sources: University Funds
   Approximate Cost: varies by magnitude of the outreach effort - $25,000
   Timeline: 1-2 years

7. Work with the Crisis Response Team on their public outreach efforts and include flood mitigation information in these efforts.
   Hazard(s) addressed: All hazards
   Key implementation department(s): Community Relations, Public Safety
   Goal: 9
   Possible Funding Sources: University Funds
   Approximate Cost: Staff time
   Timeline: 1-2 years

Funding Sources

The following funding sources provide grants for flood mitigation planning and project related activities:

- Hazard Mitigation Grant Program (HMGP) – HMGP is administered by FEMA and provides grants to states, tribes and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation activities to be implemented as a community recovers from a disaster. Eligible projects include: elevating flood-prone homes or businesses; acquisition of flood-prone homes from willing owners and returning the property to open space; retrofitting buildings; and construction of floodwall systems to protect critical facilities.

- Pre-Disaster Mitigation (PDM) Program – The PDM program provides funds for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. The program provides technical and financial assistance to States and local governments to assist in the implementation of pre-disaster mitigation actions, which must be cost-effective and designed to reduce injuries, loss of life and damage and destruction of property.

- Flood Mitigation Assistance (FMA) Program – FMA provides funding to assist communities and states in implementing actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, or other National Flood Insurance Program (NFIP) insurable structures with a focus on repetitive loss properties. The NFIP enables property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Three types of FMA grants are available to States and communities: 1) planning grants to prepare Flood Mitigation Plans; 2) project grants to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures; and 3) technical assistance grants for the State to help administer the FMA program and activities.

- Repetitive Flood Claims – The program provides funding to States and communities to reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP that have had one or more claims for flood damages, and that cannot meet the requirements of the Flood Mitigation Assistance (FMA) program for either cost share or capacity to manage the activities. Eligible activities include: 1)acquisition of properties and either demolition or relocation of flood-prone structures, where the property is deed restricted for open space uses in perpetuity; 2) elevations; 3) dry floodproofing of non-residential structures; and 4) minor localized flood control projects.

- Severe Repetitive Loss (SRL) - A SRL property is defined as a residential property that is covered under a NFIP flood insurance policy and: 1) that has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or 2) for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. Eligible flood mitigation project activities under the SRL program include: 1) acquisition and demolition or relocation of at risk structures and conversion of the property to open space; 2) elevation of existing structures to at least the base flood elevation; 3) minor physical localized flood reduction projects; and 4) dry floodproofing for historic properties.

- Emergency Management Performance Grants (EMPG) – The EMPG program provides resources to state and local governments to develop an all-hazards planning approach to emergency management. The EMPG program provides resources to assist State and local governments to sustain and enhance all-hazards emergency management capabilities.

- UMES University Funds

Most State and Federal grant programs require local communities to provide at least part of the necessary project funding in real dollars or through "in-kind" services. The percentage of local contribution varies from program to program. Local communities need to assess their financial capability and resources to implement their hazard mitigation action plans.

NATIONAL FLOOD INSURANCE PROGRAM COMPLIANCE

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

Communities that participate in the NFIP are required to adopt flood maps and local requests for map updates; adopt and enforce minimum floodplain management regulations that help mitigate the effects of flooding on new and improved structures in the Special Flood Hazard Area; offer property owners flood insurance as a protection against flood losses in exchange for floodplain management regulations that reduce future flood damages; and perform community assistance and monitoring activities.

Participation in the NFIP is based on a voluntary agreement between a community and FEMA. Compliance with the NFIP, however, extends beyond mere participation in the program. The three basic components of the NFIP include 1) floodplain identification and mapping risk, 2) responsible floodplain management and 3) flood insurance. Minimum compliance actions for communities include the following:

Floodplain identification and mapping

- Maintenance of publicly accessible copy of effective FIRM and FIS;
- Adopt most current DFIRM or FIRM and FIS;
- Support of local requests for map updates;
- Share with FEMA any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data;
- Assistance with local floodplain determinations; and
- Maintain a record of approved Letters of Map Change.

Floodplain management

- Adopt a compliant floodplain management ordinance that at a minimum regulates the following:
  - Issue permits for all proposed development in the SFHA;
  - Obtain, review and utilize any Base Flood Elevation and floodway data, and require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres;
  - Identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the Base Flood Elevation, including anchoring, using flood resistant materials, designing or locating utilities and service facilities to prevent water damage; and
  - Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.
- Enforce the ordinance by monitoring compliance and taking remedial action to correct violations
- Consider adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community Rating System, freeboard, prohibition of production or storage of chemicals in SFHA, prohibition of certain types of structures such as: hospitals, nursing homes, jails, prohibition of certain types of residential housing such as manufactured homes, and finally floodplain ordinances that prohibit any new residential or non-residential structures in the SFHA.

Flood insurance

- Educate community members about the availability and value of flood insurance;
- Inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates; and
- Provide general assistance to community members relating to insurance issues.

The Town of Princess Anne participates in the NFIP. Its current effective map was adopted on 2 June 1994. Since UMES is a State-owned institution, its processes are somewhat autonomous and do not belong to the National Flood insurance Program. However a number of actions provided in Table 6.2 that support the NFIP and are geared to mitigating the effects on new and existing structures in the flood hazard area. These actions are indicated with an *.

MITIGATION PRIORITIES

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Prioritization of Actions

Once the mitigation actions were finalized by the HMC, mitigation actions were prioritized based on the following evaluation criteria. The following questions were used by the Committee to determine the level of importance for the social, administrative, and economic considerations for each action. These priorities were translated into points to facilitate the ranking and identification of high priority projects.

Social Considerations – Life/Safety Impact

- Will the project have minimal/direct/or significant impact on the safety of businesses, residents, and properties?
- Will the proposed action adversely affect one segment of the population?
- Will the project be a proactive measure to reducing flood risk?

Administrative Considerations – Administrative/Technical Assistance

- Is there sufficient staff currently to implement the project?
- Is training required for the staff to implement this project?

Economic Considerations – Project Cost

- What is the approximate cost of the project?

These considerations were then grouped into low, medium, and high categories and assigned points for the three criteria (Table 6.1). Timelines for these projects were also established: Short range projects – implemented within first 2 years; Medium range projects - 3 to 5 years; and Long range projects – over 5 years.

Table 6.1 – Prioritization Criteria Point Values

Criteria	Points	High	Points	Medium	Points	Low
Life/ Safety Impact	**10**	Impact on life and safety of a large population on campus	**6**	Impact on life and safety on a moderate population on campus	**2**	Impact on life and safety to a few people on campus
Administrative/ Tech Assistance	**5**	No additional staff or technical support needed to implement action	**3**	Some administrative and technical support needed to implement action	**1**	Significant administrative and technical support needed to implement action
Project Cost	**5**	Low cost (<$25,000)	**3**	Moderate cost ($25,000-$100,000)	**1**	High cost to implement (>$100,000)

Table 6.2 – Ranking of Mitigation Actions

Action No.	Project Description	Life/Safety Impact	Admin/ Tech Support	Cost	Total Score	Timeline
1	Consider integrating effective mitigation practices and concepts into other UMES plans such as the Master Plan and CIP and identify members from the HMC to form a sub-group to develop a process for plan integration.	6	3	5	14	1-2 years
2	Continue to work closely with the Town of Princess Anne and Somerset County to ensure that the mitigation actions are coordinated effectively and are in harmony with that of the Town and County.	6	3	5	14	Ongoing
3	A number of buildings are slated for renovations (as identified in the campus Master Plan). Ensure these renovations incorporate hazard mitigation principles and implement the mitigation actions listed for specific buildings in this section.	6	3	1	10	5-10 years

4	Work in collaboration with local government to improve the University's and the community's disaster resistance by conducting regular meetings with the County EMA to mobilize funds through the local mitigation strategy.	2	5	5	12	1-2 years
5	Work with the Office of Alumni Affairs to identify alumni who: 1) may be able to assist through fundraising; 2)serve as valuable technical resources for retrofit and modernization projects; and 3) serve in positions to influence government and nonprofit resource allocation.	2	3	5	10	1-2 years
6	*Incorporate the following protection measures in various buildings across campus: o Install check valves in floor drains at all buildings in flood prone areas. Install tideflex where storm drain system discharges to creek, where appropriate. o Raise utilities in floodprone areas. o Build wall around Kiah Hall and Steam Plant. o Abandon specific buildings in physical floodplain, restore floodplain. Construct floodwall/berm/levee.	6 10 10 10	3 3 3 3	1 1 1 1	10 14 14 14	1-2 years 1-2 years 1-2 years 5-10 years
7	*Coordinate with FEMA to revise the dFIRMs as necessary, based on the flood analysis in this Plan and submit a Letter of Map Revision to have the 100-year floodplain adjusted to reflect past flooding events.	2	3	3	8	1-2 year s
8	* Relocate the media equipment and books to a higher level within the Frederick Douglass Library. • Install sump pump outside basement doors. • Install larger grate on floor drain. Install check valves.	2	3	5	10	1-2 years
9	Conduct a detailed engineering assessment of areas on campus that may	6	3	3	12	3-5 years

	be vulnerable to lightning strikes such as antennae and computer and electrical systems that may be exposed to power surges and develop appropriate mitigation measures.					
10	*Install a small generator in the Ella Fitzgerald Performing Arts Center to pump the water up during power outage and keep the basement from flooding.	6	3	3	12	1-2 years
11	The Carver Science Building, food storage areas, the infirmary, and laboratories should develop a list of their needs for refrigeration and contain a back-up plan to deal with power outages.	2	5	5	12	1-2 years
12	*Consider moving the network hub in University Terrace to higher ground. • Identify flooding source. • Improve site drainage as necessary. • Re-grade as necessary. • Extend downspouts as necessary. • Install sump pump as necessary	6	1	5	12	1-2 years
13	*Consider moving the utilities out of Kiah Hall's basement into an external shed on grade or above.	6	3	1	10	3-5 years
14	*In the Thomas/Briggs Art and Technology Center, the utilities are 3-4 feet below grade. Consider relocating these utilities to higher ground. Install check valve on mechanical room underdrain.	6	3	1	10	3-5 years
15	Consider opening the loop electrical system around the floodplain areas near the old Maintenance Building to ensure continuity of power supply to the rest of the campus during a flood.	6	3	1	10	1-2 years
16	Monitor and prune trees around buildings regularly and examine tree bases for early signs of uprooting. Avoid planting of large trees adjacent to buildings.	2	5	5	12	Ongoing
17	Conduct a structural inspection (5 or 10-year cycle) of the older buildings on campus.	6	5	5	16	Ongoing

18	The fence along the south and west side of University Terrace could pose an access problem for ingress/egress as well as for firefighters. Include additional gates and mark gates clearly for access.	6	5	5	16	1-2 years
19	The William Hytche Center and the Student Services Center does not have any lightning protection. Add a lightning protection system.	6	5	3	14	1-2 years
20	Remove hazardous materials storage to a better location. Identify a site on campus to relocate these materials.	6	3	3	12	3-5 years
21	Install generators in Kiah Hall, Wicomico Hall and all other residence halls as well as the student services center.	6	5	3	14	1-2 years
22	Purchase a UMES 4-wheel drive vehicle to help during emergency situations.	6	5	3	14	3-5 years
23	• Upgrade the Physical Plant Building to include a spot where communication lines could come in and introduce a back up data network correction in the building. Also install a generator in the building. • Consider relocating the Public Safety Building out of the flood zone to higher ground and redesign it with a control room so that it can be used as a command center. Identify a location on Route 822 near the main entrance for a facility that is more visible, accessible, and safe that can function as a Public Safety Building and EOC.	10 10	3 3	5 1	18 14	1-2 years 5-10 years
24	Install a generator at the JT Williams Building.	2	5	3	10	1-2 years
25	Consider hiring at least two additional staff members: an Accreditation Manager and an Emergency Manager.	10	3	3	16	1-2 years
26	The University's Continuity of Operations Plan is currently being developed. Continue to update this Plan regularly.	6	3	3	12	Ongoing

27	Consider hiring a roofing expert to conduct preventive maintenance, identify issues and recommendations, and also keep regular records.	6	5	3	14	1-2 years
28	Conduct a study to determine the shelter requirements and specifications and also examine the feasibility of hardening the Henson Center and other shelter locations.	10	3	5	18	1-2 years
29	Select high-priority facilities for additional study, and develop recommendations regarding potential retrofits to harden these against potential wind damage.	10	3	5	18	1-2 years
30	Consider raising the manholes near Kiah Hall to above the height of the base flood or install sealed/watertight covers on these manholes to prevent water from flowing into the Town's pumping station.	10	3	3	16	1-2 years
31	* Consider raising the walls around the two doors and install a sump pump in the central steam plant to keep out water.	10	3	1	14	1-2 years
32	* Identify specific areas on campus to incorporate low impact development techniques to manage storm water and reduce the impact of flooding on campus by incorporating techniques such as include bioretention areas, dry wells, infiltration trenches, filter/buffer strips, vegetated swales, rain barrels, and cisterns.	6	3	3	12	1-2 years
33	Develop a training session for lab directors on hazard mitigation. The training would address appropriate preparation, protection, and securing measures during hazard events.	10	5	5	20	1-2 years
34	Introduce a campus hazards segment in the administration newsletter for regular updates and information on various hazards and encourage employees to bring hazard newsletters home to their families.	2	5	5	12	1-2 years

36	Incorporate a hazards preparedness segment into town hall meetings in addition to issues related to campus safety and emergency preparedness.	2	5	5	12	1-2 years
37	On the campus' emergency preparedness website:http://www.umes.edu/Emergency/Default.aspx?id=11290, include information on how faculty, student, and staff should be prepared for hazards events.	10	5	5	20	1-2 years
38	*Work with the Office of Community Relations to conduct a public outreach effort on campus. This would involve a variety of outreach techniques: printed materials such as brochures, information via the internet, presentations, and setting up a kiosk at UMES History Week in the fall and Springfest.	10	5	5	20	1-2 years
39	*Work with the Crisis Response Team on their public outreach efforts and include flood mitigation information in these efforts.	6	5	5	16	1-2 years

*Support continued NFIP compliance

High Priority Actions

- (20 pts) Develop a training session for lab directors on hazard mitigation. The training would address appropriate preparation, protection, and securing measures during hazard events.
- (20 pts) On the campus' emergency preparedness website: http://www.umes.edu/Emergency/Default.aspx?id=11290, include information on how faculty, student, and staff should be prepared for hazards events.
- (20 pts) Work with the Office of Community Relations to conduct a public outreach effort on campus. This would involve a variety of outreach techniques: printed materials such as brochures, information via the internet, presentations, and setting up a kiosk at UMES History Week in the fall and Springfest.
- (18 pts) Upgrade the Physical Plant Building to include a spot where communication lines could come in and introduce a back up data network correction in the building. Also, install a generator in the building.
- (18 pts) Conduct a study to determine the shelter requirements and specifications and also examine the feasibility of hardening the Henson Center and other shelter locations.

- (18 pts) Select high-priority facilities for additional study, and develop recommendations regarding potential retrofits to harden these against potential wind damage.

CHAPTER VIII – PLAN MAINTENANCE PROCESS

PLAN MONITORING – METHOD AND SCHEDULE

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Once this Plan has received approval from Maryland Emergency Management Agency (MEMA) and the Federal Emergency Management Agency (FEMA), the Plan will be adopted by the UMES Board of Regents. Since this Hazard Mitigation Plan is envisioned to be a 'living document', plan adoption is not considered the final step in the planning process but rather as a first step to 'realization'. The plan monitoring and maintenance schedule is a cycle of events that involve periodic review, adjustments, and improvement. This Chapter establishes a method to monitor how the Plan will be evaluated and maintained in the future.

It is critical to ensure that this is a 'living' document that is periodically reviewed and updated for the following reasons: to ensure that the risk and vulnerability information is current, that mitigation projects reflect the needs and priorities of the University, that projects are regularly reviewed for their relevancy, and to maintain the University's eligibility for Federal pre- and post-disaster grants.

The Facilities Department at UMES will be responsible for maintaining, evaluating, and updating the Plan and will convene an annual meeting of the Hazard Mitigation Committee. An annual report form (included in the Appendix) will be used to obtain an update from and keep track of the University's mitigation activities. This form may be distributed to all "Key Implementation Departments" requesting them to document the status of the hazard mitigation actions. Each action proposed in the Mitigation Plan would be categorized as one of the following: completed, in progress, not started/delayed, modified, or cancelled. This form may be used as a status report of the mitigation actions, particularly those listed as 'high priority'. In addition to conducting an annual review of the plan, the HMC will review the Plan within 30 days after a disaster. Each goal and objective will be examined for its relevance and its validity to the changing situation on campus and the mitigation actions will be reviewed to ensure that it addresses any recent issues that may have stemmed from the disaster. During quiet times, the

Plan will be updated every five years to reflect the current risk, vulnerabilities, development trends and appropriate mitigation actions.

This Plan will likely be adopted in late 2009 and will undergo a formal update and approval/adoption process prior to late 2014. The 2014 Plan Update will document in detail, how the each section of the Plan was reviewed and analyzed each section of the plan and, which sections were revised as part of the update process and why. The Facilities Department point-of-contact will initiate the draft update activities and will forward the draft updates for the HMC for review. Once the update to the draft plan is completed, the MCT will prepare a final draft of the Updated Plan for review and approval to MEMA and FEMA and adoption by the Board of Regents.

Benefit-Cost Analysis

A benefit-cost analysis (BCA) determines the cost effectiveness of a project to minimize damage or prevent future damage from future hazard events. By determining the benefit cost of the proposed mitigation project, it will provide the University as well as project developers with additional knowledge about the feasibility of the proposed mitigation alternative. If the costs outweigh the benefits, then other alternatives that are more effective can be identified to accomplish the Plan's goals.

All mitigation projects that are considered for FEMA's Hazard Mitigation Assistance (HMA) program funding will have a comprehensive BCA completed using FEMA approved BCA software. Both the State Hazard Mitigation Officer (SHMO) and the Flood Mitigation Assistance program coordinator can provide assistance with the BCA. This analysis will be the basis by which the University either pursues a FEMA grant or seeks funding elsewhere. Only cost-effective eligible projects will be submitted under the HMA program. A benefit-cost review considers the project cost against both tangible and non-tangible benefits. Tangible benefits are those benefits that could be considered in a comprehensive Benefit-Cost Analysis (BCA). Non-tangible benefits include public support, political will, and life safety.

OTHER LOCAL PLANNING MECHANISMS

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(i): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Since UMES is a State-owned institution, its comprehensive and long term planning and development review processes are somewhat autonomous. As recommended in the document, this Plan should be integrated into the University's annual project planning and budgeting procedures. The University should maximize the opportunities to incorporate the Hazard Mitigation Plan into the Design Criteria Facilities Standards Manual, UMES Master Plan and UMES Crisis Management Plan.

Continued Public Involvement

Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a) discussion on how the community will continue public participation in the plan maintenance process.

The preparation of this Plan has involved the public throughout the process through public meetings. Copies of the All-Hazards Mitigation Plan will be provided to the public libraries in the Town of Princess Anne, Crisfield and Smith Island and will be made available on the UMES website for the public. The UMES Facilities point-of-contact, Mr. Ed Johnson will be available to discuss the Plan and the planning process with interested citizens.

For the five-year Plan Update, UMES will commit to continuing to solicit public participation as required by FEMA and will observe its public notification processes by publishing a notice in the local newspaper and campus newsletter announcing the public meetings. UMES will have paper and electronic copies of the Plan Update and hard copies at the UMES Facilities Management Department for public review as well as an electronic version online on the UMES website for download.

CHAPTER IX – DETAILED ENGINEERING ANALYSIS

INTRODUCTION

At the University's request, several proposed mitigation action items from the prioritization matrix were investigated in more detail, either due to relative ease and low cost in which they could be implemented, or because implementation would provide significant benefit in protecting the University against hazards.

SPECIFIC MITIGATION ACTIONS

These projects are detailed below as follows:

- *Abandon specific buildings in physical floodplain, restore floodplain. Construct floodwall/berm/levee.*
  In direct response to the request for proposal for the Mitigation Study, a flood analysis was performed for the Manokin Tributary that runs along the southern border of campus. The U.S. Army Corps Hydrologic Engineering Center River Analysis System (HEC-RAS) was used to predict water surface elevations (WSE) for various rainfall events. Approximate channel cross sections were input for the reach section from the UMES campus to downstream of the bridge crossing at Deal Island Road, which is the furthest downstream flow restriction. There are no further flow restrictions downstream of the of the bridge crossing. Geometric data was input from a combination of site survey, and LiDAR and obstruction (bridge and culvert) data obtained from the Eastern Shore Regional GIS Cooperative at Salisbury University. Flow data was developed using both the GISHydro program at the University of Maryland and Haestad Methods' PondPack. GIS hydro utilizes USGS regression equations to predict streamflow for different rainfall events based on watershed characteristics. PondPack utilizes TR-20, which was developed by the United States Soil Conservation Service to simulate the rainfall-runoff process for a watershed by using the unit hydrograph methodology. Generally, flow rates projected by TR-20 are higher than those projected by the USGS regression equations for the Maryland coastal plain.

Figure 9-1 – Proposed digital Flood Insurance Rate Map (dFIRM)

Prior to performing the flood study, the digital Flood Insurance Rate Map (dFIRM) for the 1% chance probability (100 year floodplain) was evaluated. At the time of the study, the dFIRM had not been formally released. The proposed dFIRM is shown in Figure 1.

Severe flooding was observed on campus for Hurricane Isabelle in September 2003, in August 2004, and July 2005, as well as during several other events. During one severe event, the basement of Kiah Hall flooded through the basement doorway and mechanical room vents, and the ground floor of the steam plant was under several feet of water.

Based on field investigations with several members of the Hazard Committee (Lawrence Wright, Leon Bivens), it was estimated that flood waters reached approximate elevation 9.5 feet. The approximate limits of flooding for a floodwater elevation of 9.5' is shown in Figure 2.

It was noted by several Hazard Committee members that the Manokin tributary frequently floods its banks. It is believed that the limits of flooding depicted in the proposed dFIRM significantly underestimate the limits of flooding during the 100 year event, and underestimate the frequency that flooding impacts campus.

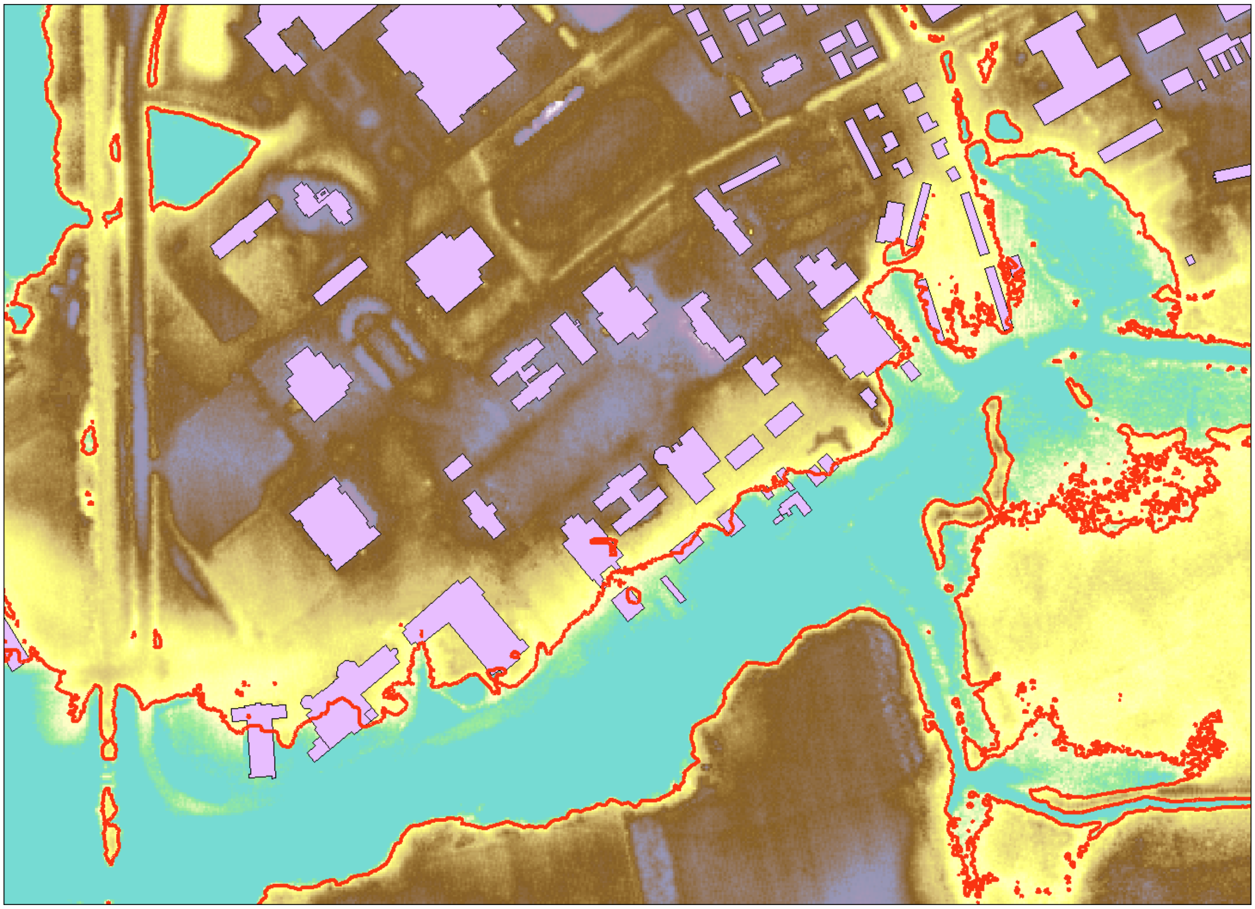


Figure 9-2 – Approximate limits of flooding for flood water elevation 9.5 feet

Model results for the existing conditions simulation suggest that the water surface elevation at the Manokin Tributary on campus is approximately 8-8.5’ for the 100 year event. This is lower than expected, based on the frequency of flooding observed on site, and the severity during past event. However, it still represents significant flooding at both Kiah Hall and the Steam Plant.

The HEC-RAS model was then used to predict the impact on water surface elevations from construction of a floodwall. The purpose of the modeling effort was to evaluate appropriate flood wall heights to protect campus buildings along the floodplain and to predict the upstream and downstream impacts on water surface elevations. Upstream increases in water surface elevation ranged from 0.37 – 0.7’, depending on the simulation for the 100 year event. This is a significant increase in elevation on the lower Eastern Shore of Maryland, and its impact on upstream property should be evaluated in more detail prior to moving forward with a floodwall project.

In terms of downstream impacts, several HMC members expressed concern over the potential that a flood wall may have on increasing flowrates downstream from campus; the concern was that a floodwall constructed on campus would eliminate the storage behind the railroad culvert and impact the stage-storage relationship behind the railroad culvert at the edge of campus.

Accordingly, HydroCAD software was used to model the impact a proposed floodwall would have on the loss of storage and projected downstream flow rates. The model predicts a 100-year WSE of 6.90 ft with 864 cfs being released downstream under existing conditions. (Note there are no downstream controls on flow in the Hydrocad model. The culvert was modeled as free outflow.) With the proposed levee, the 100-year WSE is projected as 6.93 ft with 870 cfs being released downstream. As such, the levee impacts on flood routing are relatively minor.

Based on the model results, it appears a floodwall with top elevation of 10.0’ would provide a minimum 1’ of freeboard for the 100 year event. The floodwall would tie in somewhere along the railroad embankment, and extend for approximately 2400 linear feet, and then tie in at grade east of the wet lab. A plan view of a preliminary flood wall location is shown in Figure 3. The estimated cost is $1,200,000.00.

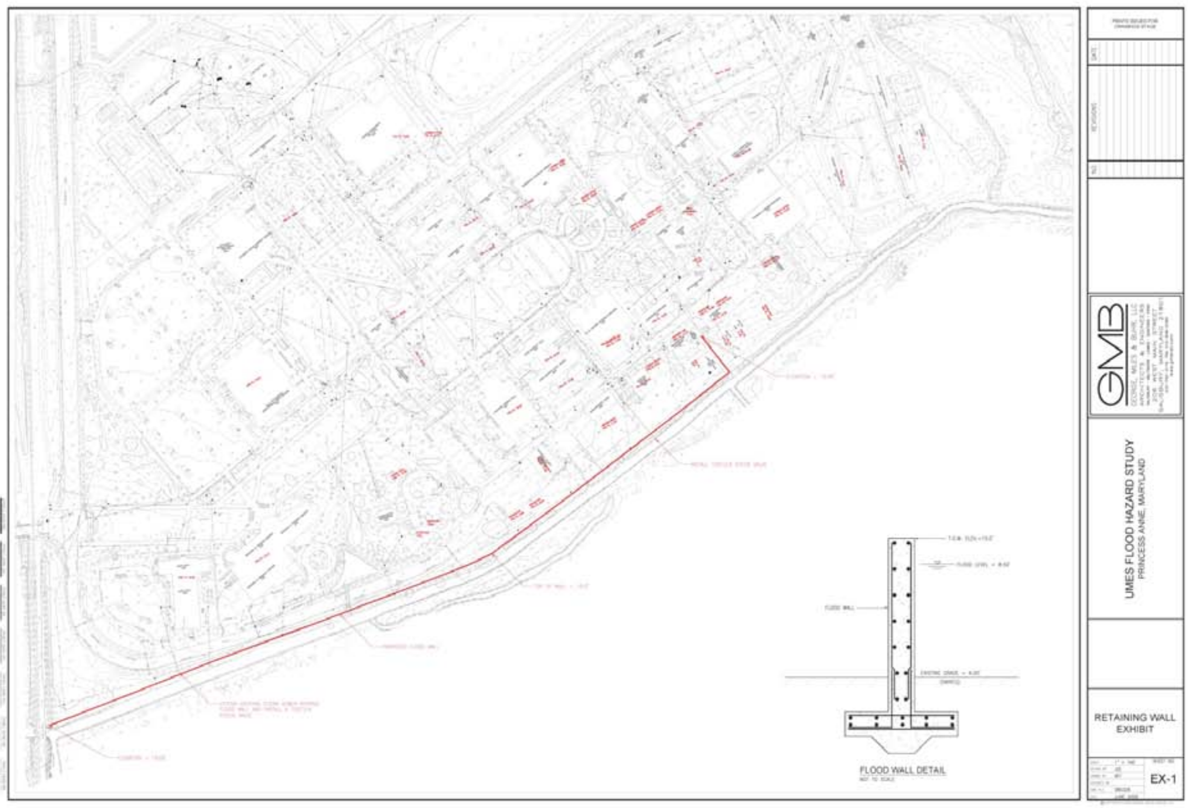


Figure 9-3 - Limits of conceptual floodwall - top of floodwall elevation 10.0 feet

Another simulation was performed considering potential blockage at the railroad culvert and at the triple culverts at Hytche Boulevard. Model results indicate that a flood wall elevation of 12.0 ft will provide greater protection at campus in the event the culverts become blocked. A plan view of the preliminary flood wall location is shown in Exhibit 4. Approximately 3600 lf of floodwall is required at an estimated cost of approximately $2,000,000.00.

The HEC-RAS model results clearly indicate that the dFIRM does not accurately represent the flooding condition on campus. The University should pursue a Letter of Map Change through FEMA and coordinate with the Town of Princess Anne and Somerset County. Additional field data at crossings and along the channel will be required prior to finalizing the HEC-RAS analysis with sufficient detail to submit a Letter of Map Change request.

A flood wall will also help prevent damages from a storm surge, in which extremely high tidal inundation would be expected for a hurricane travelling up the Chesapeake Bay. A storm surge was modeled with the Slosh Model by the ESRGC and was discussed in Chapters 4, 5 and 6.

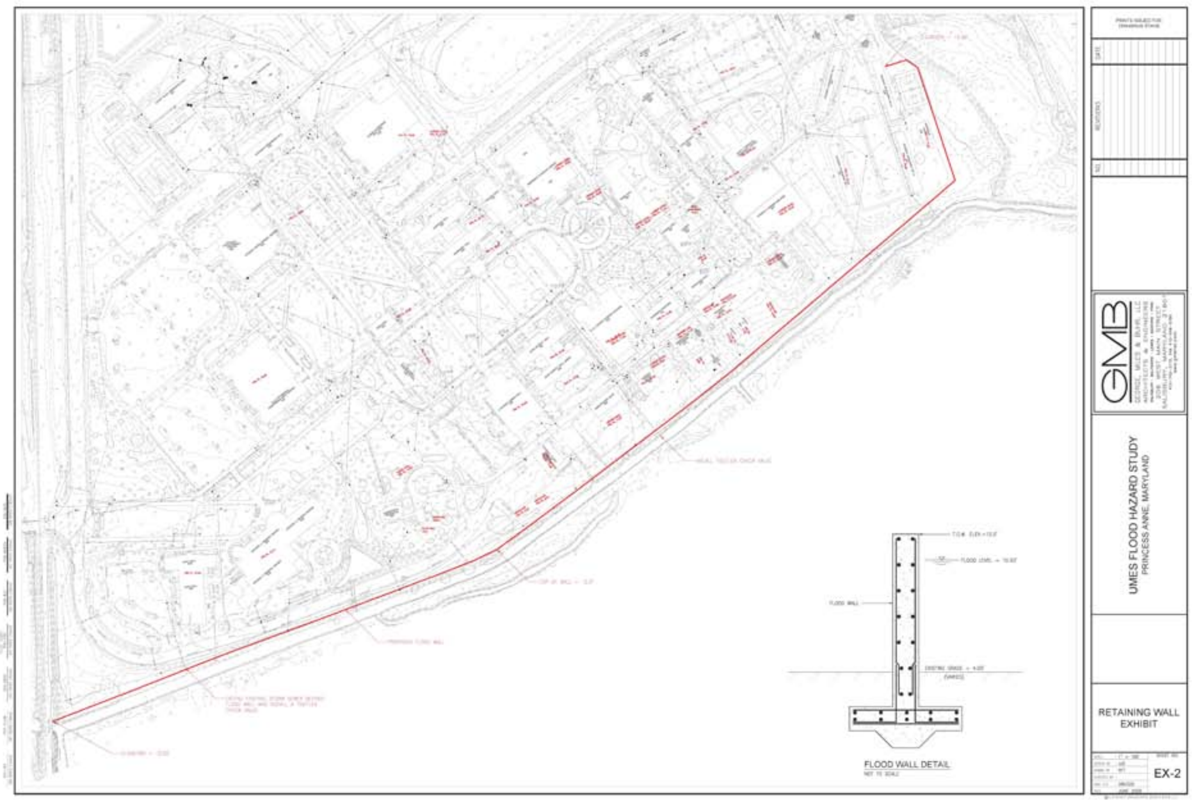


Figure 9-4 - Limits of conceptual floodwall - top of floodwall elevation 12.0 feet

During field investigation of the floodplain and buildings prone to flood damage, several HMC members indicated that flood damage would have been less severe and less costly if Kiah Hall and the Steam Plan had been protected. With the understanding that there remain many administrative, political, permitting and funding obstacles to construction of a flood wall, alternatives were evaluated to protect Kiah Hall and the Steam Plant as follows:

- *Build wall around Kiah Hall.*
  By constructing a barrier around the southern face of the building and extending it around the southeastern and southwestern corners, beyond the basement access stairwells, Kiah Hall can be protected from floodwaters. The finish floor elevation of the main floor at Kiah Hall is 12.53', so preventing floodwaters from spilling into the basement through the three basement

access stairwells and through the basement vents along the southern face of the building should prevent the building from experiencing significant damage during a FLOOD event. The difficulty with the proposed improvements is in extending the existing stairways up to the floodwall elevation, and then back down to grade. Care will have to be taken to blend in the proposed wall and stairs with the existing architecture.

A sketch of the proposed improvements is shown in Figure 5. Estimated cost is $120,000.00.

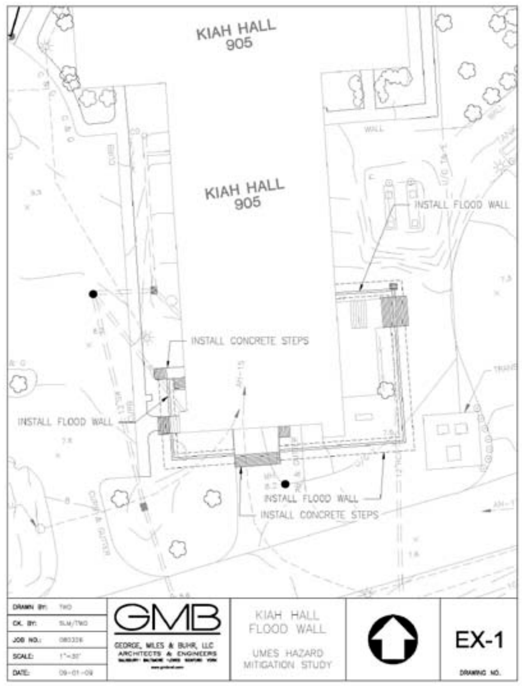


Figure 9-5 – Flood protection for Kiah Hall

- *Consider raising the walls around the two doors and install a sump pump in the central steam plant to keep out water.*
  In evaluating the potential for additional walls around the steam plant, there were too many difficulties with extending the walls around the stairwells, in that access to parking would be blocked, and the overhead doors would become useless in the event equipment needed to be removed. Installing a floodwall at the creek and extending it to the west and east of the building, then extending it perpendicular to the creek to tie in at grade at the southern edge of University Blvd. would provide flood protection, but would cause drainage problems, limit access and be costly. The use of flood protection devices such as retrofitting existing doors with sliding or hinged flood proof doors, installing flood panels in windows that are lower than base flood elevation, and installing water tight stop logs in overhead doors will prevent floodwaters from inundating the equipment in the basement. These flood protection devices are not intended for everyday use, but can be installed (closed) whenever there is a coastal or flash flood warning, or during nor'easters, tropical storms, or hurricanes. In addition, use of these flood protection measures will allow the demolition of the existing flood protection curbing around the doors, which currently presents a safety hazard for employees. See Figure

9-6 for recommended solutions for flood prevention at the Steam Plant. Estimated cost is \$90,000. A structural evaluation of the existing walls would have to be completed to ensure that the buildings do not need to be reinforced to withstand the differential pressure associated with flood waters.

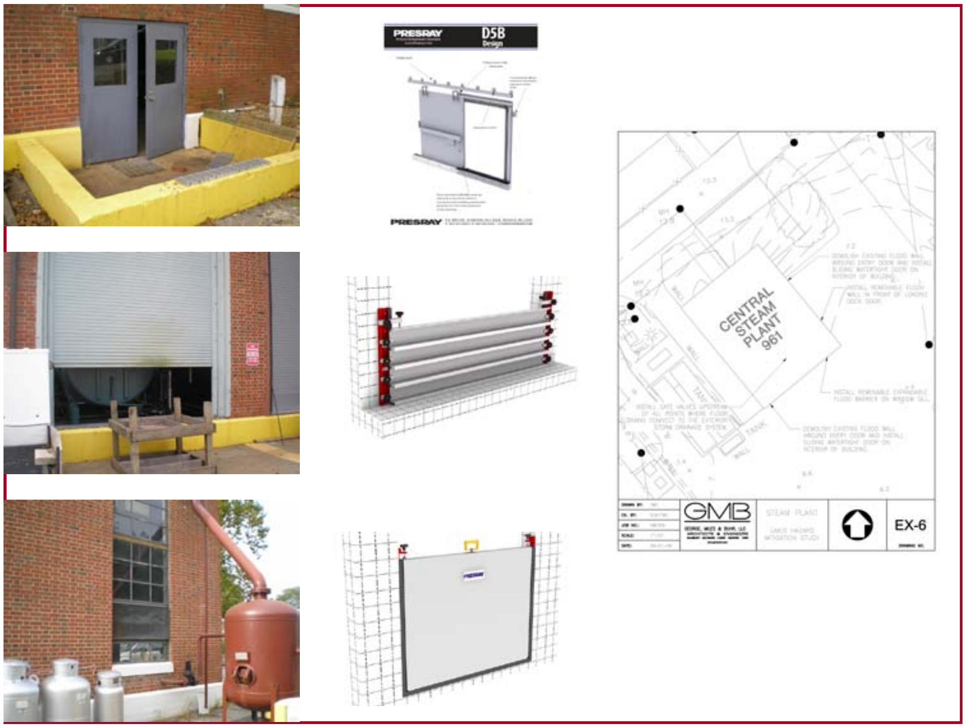


Figure 9-6A – Flood protection for steam plant

- *In the Frederick Douglass Library: Install larger grate on floor drain. Install check valve. Install sump pump outside basement doors.*
  The sump area outside the basement doors has flooded in the past, and rainwater has seeped into the Library and caused moldy conditions on the carpets. This situation is considered more of a nuisance than a severe threat. By installing a larger grate and sump pump, rainwater can be directed away from the basement doors and into the storm drain. See Figure 9-7. Estimated cost is \$12,000.00.

Figure 9-7 – Recommended Improvements at Frederick Douglass Library

- *The fence along the south and west side of University Terrace could pose an access problem for ingress/egress as well as for firefighters. Include additional gates and mark gates clearly for access.*
  During the site inspection over the summer months, the gates in front of University Terrace, at the emergency blue light station, were closed. Prior to Hazard Committee Meeting #6, Captain Wright of the University Police Department confirmed that the gates remain open at all times when school is in session, and students are living in the buildings. During Hazard Committee Meeting #6, HMC members decided that it was not necessary to add further detail to this action.

- *The William Hytche Center and the Student Services Center does not have any lightning protection. Add a lightning protection system.*
  Due to the critical nature of these two buildings in carrying out the mission of the University, it was decided to further investigate the costs of installing lightning protection at both the Hytche Center and the Student Services Center. Two different lightning protection systems were evaluated; one to protect the physical buildings and one to protect all of the communication lines inside the buildings. Estimated cost is approximately $250,000.

- *Consider raising the manholes near Kiah Hall to above the height of the base flood or install sealed/watertight covers on these manholes to prevent water from flowing into the Town's pumping station.*
  Based on the rim elevations on the manhole lids of six different manholes along the Manokin Tributary, the manholes are underwater during flood events and potentially allow significant

inflows into the sanitary sewer. This also impacts causes an overload on the downstream pump station, located just west of the campus along Hytche Blvd. The proper operation of the pump station capacity may be critical during an emergency event, when students and residents are housed on campus at the emergency shelters. Manhole inserts can reduce inflow into the tops of manholes during flooding events. A polymer resin lining can be retrofit into the manhole to stop infiltration through the mortar. Estimated cost is $25,000.

- *Consider installing a drinking water production and supply well on campus.*
  This recommended mitigation action was not included in the original list of mitigation actions in the prioritization matrix, but was added after Public Meeting No. 1. During the Public Meeting, Robin Street, the Somerset County Sanitary District Commission engineer, commented that the University would not be able to get water during an emergency if the Town of Princess Anne supply was off-line. Due to the fact that several buildings on campus may serve as shelters for students, local residents, and pets and University livestock, it will be critical to deliver potable water to the shelter locations. As such it was assumed that a dedicated campus well would be critical to the University's emergency management operations. Estimated cost is $160,000.00.

At Hazard Mitigation Committee Meeting No. 6, Dr. Maurice Ngwaba of UMES requested that GMB look at two other areas: standing water under the Public Safety Building and additional moisture problems at the Library. Representatives of GMB met Leon Bivens of UMES on site to investigate the problems on Wednesday, October 14th, and were on-site again after a severe rainfall event on Wednesday, October 28th.

At the Public Safety Building, the crawlspace is approximately eighteen (18) inches lower than the surrounding grade. The floor of the crawlspace under the building was wet on October 14th and had approximately one (1) foot of water on it on October 28th. It is recommended a sump pump be installed under the building to remove moisture during and after rainfall events, with possible hand grading under the building too direct water to the sump pump. Estimated Cost is $5,000.

At the Library, water was seeping through the concrete block and at the joint between the wall and floor. It did not appear that water was coming in through the windows. A French drain connecting to a swale had previously been installed along the building edge, but the swale was full of water on October 28th and did not seem to be draining. We recommend regrading the swale and installing a new culvert to promote positive drainage and/or installing a sump pump at the end of the French drain to remove water from the base of the building. Estimated Cost is $5,000.

APPENDIX A

HAZARD COMMITTEE MEETING NO. 1

SIGN IN SHEET

AGENDA HANDOUTS

PRESENTATION

UNIVERSITY *of* MARYLAND
EASTERN SHORE

Facilities Planning & Engineering

SIGN-IN SHEET

PROJECT TITLE: HAZARD MITIGATION COMMITTEE
Meeting #1
University of Maryland Eastern Shore, Princess Anne, Maryland

DATE: Tuesday February 10,2009 TIME: 10:00 am

NAME	COMPANY	TELEPHONE & EMAIL
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Danna Maloney	UMES	T: 410-621-3040 E: dkmaloney@umes.edu
Wayne Shelton	SU	T: 410 546 6485 E: wxshelton@salisbury.edu
Mark Clauss	UMES	T: 410-651-6686 E: maclauss@UMES.EDU
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Deepa Srinivasan	Vision Planning	T: E: dsrinivasan@vision-pc.net
Karla King	Vision Planning	T: E: karlaking2@gmail.com
PETER OKEMMUO	UMES	T: 410 651 6651 E: Paokemmuo@umes.edu
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Tracie Earl	UMES	T: 410-651-6383 E: tjearl@umes.edu
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Dale Pusey Somerset County dpusey@ci.salisbury.md.us

Laurence Wright UMES 410 651 6593 lawright@umes.edu

University of Maryland Eastern Shore
ALL-HAZARDS MITIGATION PLAN

Hazard Mitigation Committee Meeting #1
10 February 2009
10am to 12 noon
AGENDA

Introductions – Ed Johnson, UMES

- UMES Staff
- Other Hazard Mitigation Committee Members
- Consultants
    - Deepa Srinivasan, Vision Planning and Consulting
    - Dr. Mike Scott, ESRGC
    - Amanda Pollock and Steve Marsh, GMB

PowerPoint Presentation – Deepa Srinivasan, Dr. Mike Scott, Amanda Pollock

- DMA Plan Requirements
- Overview of the Hazard Mitigation Planning Process
- Schedule
- Requested Information

Discussion - Group

- Hazard Identification and Risk Assessment
- Distribution of Questionnaires
- Mitigation Capability Analysis

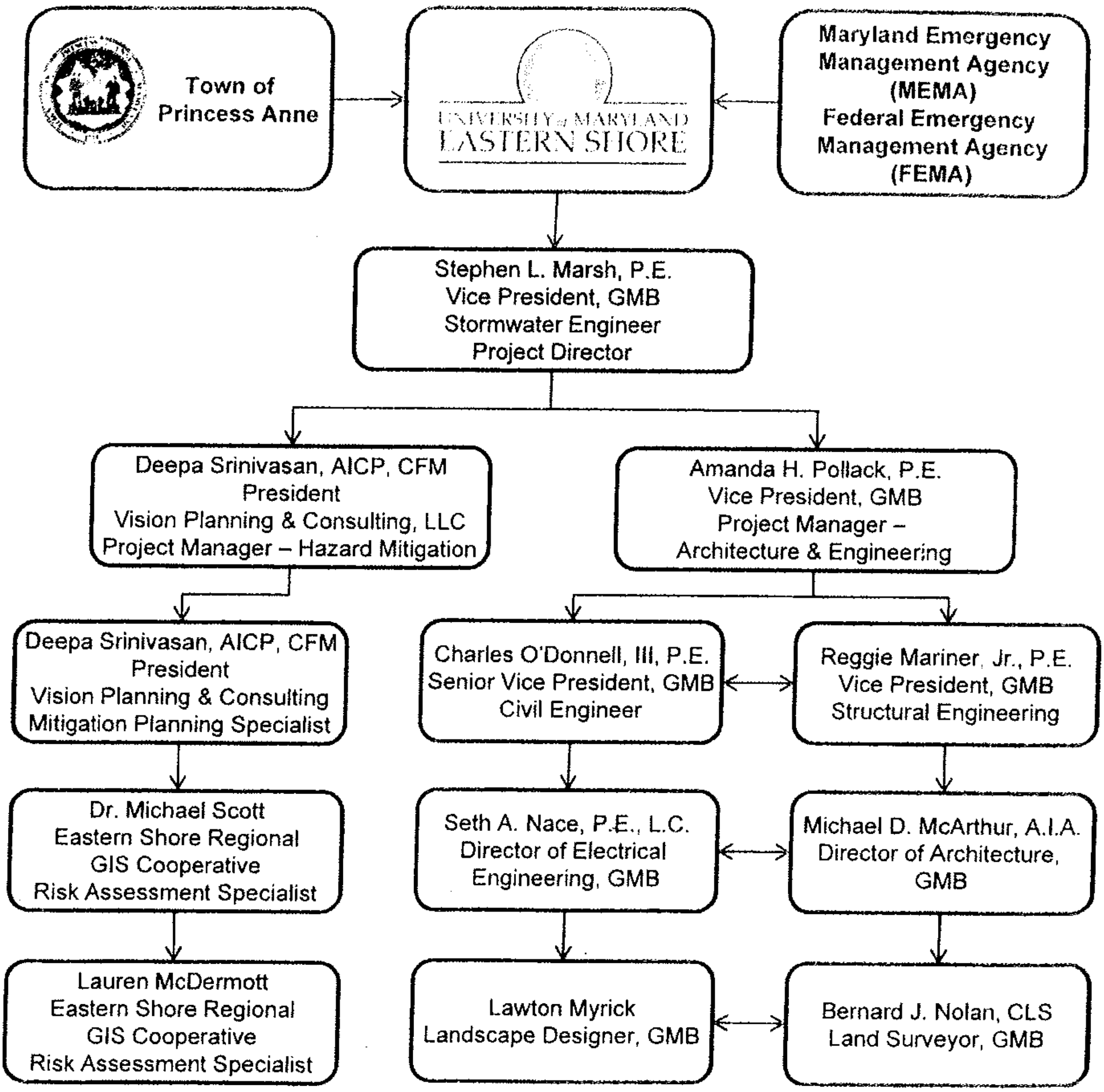
Wrap-up – Deepa Srinivasan

- Next steps
- Schedule Hazard Mitigation Committee Meeting #2
- Questions

Adjournment

Handout to all present @ Mtg No. 1 Feb 10th

PROJECT ORGANIZATION CHART



- All team members will work closely with each other and will update the team on a regular basis to ensure all aspects of the projects are properly covered.

- Members of the Consultant Team are very familiar with current best practices regarding Quality Assurance/Quality Control and will insure that the data, the analysis, and the plan are of the highest practical quality.

PROJECT APPROACH AND SCOPE OF WORK

The objective for preparing a Hazard Mitigation Plan for the University of Maryland Eastern Shore is to provide a mechanism for the University through which, the likelihood of threat to the land, structures, and constituents from natural and technological hazards (e.g., flood, wind, tornadoes, hurricanes, wildfire, drought, hazardous materials, etc.) can be assessed and to devise an action plan to reduce the impact of those threats and to develop a road map for future efforts.

University of Maryland Eastern Shore

The proposed Scope of Work for the Hazard Mitigation Plan for UMES is based on the following:

- Work Requirements provided in the Request for Proposal (ES08/09-#013) for the Hazard Mitigation Plan for the University of Maryland Eastern Shore
- Requirements of the Disaster Mitigation Act of 2000 (DMA 2000); and
- Publications from the Federal Emergency Management Agency (FEMA) - *State and Local Mitigation Planning (FEMA 386), and Building a Disaster-Resistant University (FEMA 443).*

The GMB Consultant Team comprising GMB, Vision Planning & Consulting (VPC) and the Eastern Shore Regional GIS Cooperative (ESRGC) will develop the Hazard Mitigation Plan for UMES in five key steps:

Step 1- Organize Work Group and Facilitate Process (lead consultant VPC)

We understand that for any plan to be successful, it should involve community participation from project initiation to project completion. We propose a public involvement process that will comprise three tiers.

"GMB routinely deploys a highly efficient design team that places a high emphasis on problem solving, client needs, and budget goals. Based on my past professional experiences with GMB, I would highly recommend this firm."

Charles Anderson
Assistant City Manager
City of Seaford, DE

1. Hazard Mitigation Committee (HMC) – This will be a small group of 6-8 people who will be closely involved with the development of the plan. HMC members should be authorized to make decisions on behalf of the University as well as be knowledgeable about key departments and their possible roles in plan implementation. It is our understanding that UMES has already identified members who will serve on this Committee.

   We will review the composition of the UMES Hazard Mitigation Committee and make suggestions to UMES on any additional entities/agencies that should be represented on the Committee. A total of five HMC meetings will be conducted during the planning process. All meetings will be facilitated by the Consultant.

   HMC Meeting #1: The Consultant Team (lead Consultant VPC) will prepare and conduct a progress and coordination meeting with the Committee (1st of 5 meetings) to:
   - Discuss the planning process;

- Discuss roles and responsibilities of the Consultant Team and the Steering Committee;
- Solicit input on potential hazards associated with the University; and
- Distribute a Capability Assessment feedback form to be completed by Committee members.

HMC Meeting #2: The Consultant Team (lead consultant ESRGC) will prepare and conduct a progress and coordination meeting with the Committee (2nd of 5 meetings) to:

- Discuss results of the Hazard Identification, Profiling and Loss Estimates;
- Discuss results of the Mitigation Capability Assessment; and
- Develop preliminary Goals and Objectives.

HMC Meeting #3: The Consultant Team (lead consultant VPC) will prepare and conduct a progress and coordination meeting with the Committee (3rd of 5 meetings) to:

- Review and approve Goals and Objectives List; and
- Discuss Preliminary Mitigation Actions List and Evaluation Criteria.

HMC Meeting #4: The Consultant Team (lead consultant VPC) will prepare and conduct a progress and coordination meeting with the Steering Committee (4th of 5 meetings) to:

- Finalize Mitigation Actions;
- Prioritize Mitigation Actions; and
- Discuss Preliminary Implementation Strategy

HMC Meeting #5: The Consultant Team (lead consultant GMB) will prepare and conduct a final progress and coordination meeting with Steering Committee (5th of 5 meetings) to:

- Discuss the architectural/engineering aspect of the project to mitigate flooding;
- Provide cost estimates; and
- Discuss project close-out.

"Ms. Srinivasan was extremely responsive to the concerns of the county and municipalities and provided us with the needed guidance and walked the Hazard Mitigation Committee through this process with commitment and ease. She was with us every step of the way and I highly recommend Ms. Srinivasan to any community with mitigation planning needs."

William Mullikin, Director
Talbot County Emergency Management

2. The Stakeholders Group will comprise of individuals, citizens, UMES Departments, Town of Princess Anne staff, and any other entity that has a stake in the University's mitigation activities. It could include representatives from academic departments, transportation, police and fire departments (from the Town of Princess Anne and Somerset County), student organizations, public works/capital projects departments, emergency managers, and the risk management department, among others. This group will be identified by the HMC. Their role will be to receive periodic updates on the plan via email and provide any input through the HMC.

3. Public Meetings – As this Plan will affect parts of the Town of Princess Anne as well as Somerset County, citizens will be invited to participate in the planning process. They will be kept abreast of the progress of the

plan through the media (radio, television, website, and newspapers who will disseminate information and help to gauge the interests of the community. We understand that mitigation may be a new concept to some people while others may not understand the technical engineering aspects and outcome. Our goal is to share the information to the public and University community through presentations that will be tailored in a manner to engage the group so they can become interested, educated, and involved in the planning process.

The Consultant Team will lead/facilitate two public meetings during the planning process, both of which will be open to the campus community as well as the residents of the Town of Princess Anne. The first public meeting is critical in gaining community support and will be conducted to:

- introduce the hazard mitigation planning process;
- gather local knowledge on the University/City/County's historical hazard events; and
- share the initial findings from the hazard assessment and vulnerability analysis.

The second public meeting will be held towards the end of the planning process to:

- present the proposed hazard mitigation planning recommendations;
- present the design for the proposed mitigation project(s); and
- advertise the availability of the Draft Plan and the upcoming public hearing.

UMES will be in charge of securing the meeting location, notifying the community, securing the meeting locations, and assisting the Consultant Team with meeting logistics.

As part of the plan facilitation process, the Consultant Team will work with UMES to develop the Plan Document which will be included in the Plan Maintenance section of the document:

- A description of a routine process to monitor plan implementation and indicators to measure progress of the plan on an annual basis;
- A meeting schedule and procedures for plan evaluation and reporting to the Maryland Emergency Management Agency (MEMA);
- Procedures for plan revisions and updates;
- Facilitate a period of open comments on the draft plan and will incorporate the comments received during the draft period, into the Plan; and
- Develop a document that is approval by MEMA and FEMA and is adoption for adoption by the University Board of Regents.

"Ms. Srinivasan has developed and delivered exceptionally professional presentation to our Planning Committee and was able to explain technical matters at the lay person level and still convey the concepts in their entirety. She has always been well prepared with computerized, graphic and print information to keep participants engaged and informed."

Charlotte Johnson
Planning and Development
City of Elkhart, Indiana

<u>Step 2- Hazard Assessment and Vulnerability Analysis (lead consultant ESRGC)</u>

A critical phase in the development of a mitigation plan for the University of Maryland Eastern Shore will be the Hazard Identification and Vulnerability Assessment process. It is during this phase that the consultant team, with the help of the UMES Hazard Mitigation Committee, will decide what environmental hazards (both natural and technological) are a threat to the campus residents, staff, and physical assets, how likely those threats are to occur, the potential magnitude of those threats, which campus assets are vulnerable to damage and to what degree, and estimate the potential losses.

Identify Hazards

The first step in the Hazard Identification and Vulnerability Assessment phase is the identification of the natural and technological hazards that threaten the campus of UMES. This identification process has occurred for Somerset County as part of MEMA's mitigation planning process, in both the *2000 Maryland Hazard Analysis, 2004 Maryland Hazard Analysis, as well as in the Somerset County Hazard Mitigation Plan*. Regarding Somerset County, the combined results from the statewide hazard analyses indicated the following as the top hazards:

- High Risk
  - Hurricane/Tropical Cyclone
- Medium-high Risk
  - Epidemic
- Medium Risk
  - Flooding (Tidal/Coastal)
  - Wildfire

While a useful reference, the State Hazard Analysis and the County Hazard Mitigation Plan will be simply a starting point for the HMP's conversations regarding hazards and risk. The hazards at a specific place, like UMES, will almost always be different than the larger composite. For example, while exposure to hazardous materials and radiological material may be a medium-low risk for the residents of Somerset County in general, that is certainly not true for the faculty, staff, and students of the University.

The Consultant Team will also conduct an electronic and analog search of The Daily Times, the primary newspaper of record for Princess Anne. This is likely to yield the best possible record of the occurrence of hazard events, along with discussions with the University faculty and staff. The Consultants will also perform an academic and popular literature search for an instance of historical hazard events, which may give us more historical context for particular large events, such as hurricanes. Steve Marshall, Director of the Somerset County Department of Emergency Services, will also likely be a wealth of information regarding hazard occurrence in and around the UMES campus.

This data collection process, along with the collective experience of advisory board members, will facilitate the prioritization of environmental hazards based on both magnitude and probability of occurrence. Those events with a large degree of danger and a high probability of occurrence should take top priority, while those that pose little threat and happen infrequently will not receive much scrutiny.

Profile Hazards and Assets

Once the hazards have been identified, the second step is to create a profile for each threat, as well as document the vulnerable assets on campus. This process will be primarily conducted within the context of a Geographic Information System (GIS). Any known hazard zones (like a floodplain) and all identifiable campus resources will be referenced within a geodatabase, thus allowing them to be visualized and analyzed for intersections. To accomplish this step, a number of important data layers need to be inventoried, evaluated, and overlain. Fortunately, with Tracy Earle's GIS Center at UMES, the Facilities Planning & Engineering Department, and the Eastern Shore Regional GIS Cooperative, most of these datasets are already in-hand/available.

1. Digital Flood Insurance Rate Map –The DFIRM will be delivered as a set of GIS data layers including the 100-year and 500-year floodplain, the floodway, a set of flood depths, and the cross-sections used to create the DFIRM. It should be completed in time to use for this project.
2. SLOSH Model output – The Sea, Lake and Overland Surges from Hurricanes (SLOSH) Model was run in 2006 for all of Maryland's Eastern Shore counties using the LiDAR elevation measurements collected by the Maryland Department of Natural Resources. This SLOSH Model output depicts the inundation areas and flood depths in Somerset County from different categories of hurricanes coming from a multitude of path angles.
3. Obstructions to Flow (OTF) data – As part of the work on the new DFIRM for Somerset County, the ESRGC inventoried all of the OTF's in the winter of 2006. An obstruction to flow might be a bridge, a culvert, a pipe, or any other water conveyance that can become overwhelmed in a flood and obstruct the flow of floodwaters. This data may be particularly useful when discussing potential future flood remediation projects.
4. Critical facilities\lifelines – Both point and line locations of critical facilities will have to be either collected or created. Emergency response resources (fire, police, EMS), evacuation shelters, electrical infrastructure, wastewater treatment facilities, rail lines, roads, etc. will be accounted for in the hazard assessment.
5. Street centerlines – As part of Somerset County's E911 mapping project in 2006-2007, new address-enabled street centerlines were created. These are necessary for both lifeline analysis and as an important context layer.
6. Orthophotography – By the time this project gets underway, Somerset County should have the new (2007/2008) 100 scale, color infrared orthophotography. Because these photos consist

"Deepa, I would like to express how smooth the process was, with working with your firm. We have received MEMA and FEMA approval at the 1st submission without having to make any changes. In addition, Mike Scott was very knowledgeable and easily accessible with any questions. I would highly recommend working with Vision Planning in the future."

Bill Sterling, Project Manager
City of Salisbury

of 6" pixels, many important objects in the hazard zone will be noticeable, identifiable, and examined.

7. LiDAR – Somerset County is fortunate to have been the subject of MDDNR's LiDAR data acquisition. LiDAR (Light Detection and Ranging) is a very accurate way to collect elevation data over large areas. Three LiDAR-derived products will be of interest for this study.

   a. Bare-earth mass points – the actual laser sample points taken from the airplane, then processed to show only the height of the bare earth. There are more than 400 million points in Somerset County alone.

   b. Gridded bare earth – to make the mass points more manageable, they are aggregated into 2 sq meter grid cells, each cell representing an average height for all of the mass points that fall in or near that cell. This detailed Digital Elevation Model (DEM) will be a critical input to the vulnerability model.

   c. Contours – The ESRGC recently created a 2 ft contour map for Somerset County. While not perfect (no breaklines were used, for example), the layer still represents a step forward regarding contour coverage in the county and is a useful planning tool.

8. Building footprints/other planimetrics – The UMES Facilities Planning and Engineering Department maintains current AutoCad drawings of building locations, parking lots, and utility locations, as well as other points of interest on campus. These layers will be absolutely critical to the successful completion of this phase.

9. Building inventory – In addition to the geographic location of the campus buildings, we will seek to create an inventory of the contents and use of each building. This inventory process, which will supplement what UMES has accomplished internally, will particularly focus on the assets located at or below ground level, those located inside exposed facades, and those known to contain hazardous/radiological materials. The types of information, if available, that will be collected for each building include:

   - Building Type/Type of Foundation
   - Building Code Design Level/Date of Construction
   - Roof Material
   - Roof Construction
   - Vegetation
   - Topography
   - Location relative to the hazard zone

- Locations of hazardous materials and biological agent storage and use areas and animal research facilities will also be noted.

10. Asset inventory – In addition to buildings, we will capture the key elements of the other campus assets including electric system, water system, gas system, communication systems, and key computer systems (such as the student records system). For each, we will determine the characteristics of these systems that make them most vulnerable to environmental hazards.

For all of the data layers listed here, as well as others that present themselves during the project, all areas of UMES' campus will be examined, including the surrounding Town of Princess Anne. However, particular attention will be given to areas/buildings of concern such as the potential flooding of the tributaries of the Manokin River.

Estimate Losses (Conduct vulnerability analysis)

The purpose of this step is to describe how the University's assets will be affected by a hazard event and evaluate the impact of an event on people, buildings and infrastructure. The Consultant Team will conduct a vulnerability study using HAZUS-MH, FEMA's loss estimation software, to assess the University's built environment and critical facilities' vulnerability to environmental hazards, specifically earthquakes, flooding, and hurricanes. HAZUS-MH is a Geographic Information System (GIS)-based software tool that applies engineering and scientific risk calculations that have been developed by hazard and information technology experts to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk. It supports the evaluation of the three types of hazards mentioned above and assessment of inventory and loss estimates for these hazards.

Because the HAZUS modeling only estimates loss with regard to earthquakes, hurricanes, and flooding, some additional loss estimation will be conducted. Three different types of losses will need to be considered: human life, property damage (both to structures and their contents, particularly specific pieces of high-value equipment), and function (if the University couldn't operate for a period of time). Those losses that are specific to a particular location will be incorporated into the geodatabase, so that potential loss maps of the campus and surrounding area can be created.

The Consultant Team will work closely with the HMP to review the critical University assets as well as confirm the built environment data collected earlier. Second, after the HAZUS-MH model runs are complete and the loss estimates tallied, we propose to bring those model results back to the HMP to both interpret the results in a local context as well as evaluate the validity of the results.

The Plan will describe vulnerability in terms of providing a general description of land uses and development trends on the campus so that mitigation options can be considered in future land use decisions.

Step 3- Mitigation Capability Assessment (lead consultant VPC)

The Consultant Team will prepare a Capability Assessment feedback form to help identify the University's existing programs and policies, regulations, plans and ordinances, to determine the University's capabilities and capacity. The Consultant will draft a Capability Assessment questionnaire and distribute it to the HMC. The results of the feedback form will form the basis of the Capability Assessment in terms of the capacity of the University to carry out efforts in terms of human, technological and financial resources.

The assessment of local capabilities will include an inventory including but not limited to:

- UMES' mission, programs, policies and existing plans (e.g., Master Plan, Emergency Operations Plan, Strategic Plan) as they relate to hazard mitigation and reducing risk;
- Personnel, and equipment resources;
- Building codes and other land development regulations; and
- Examination of current and proposed construction projects that will affect the capability of the University to respond to a hazard.

Step 4 - Develop a Mitigation Plan (lead consultant VPC)

The development of a list of clear goals and objectives will provide a framework for making decisions on funding and implementing mitigation actions. The GMB team has a clear understanding of the various steps involved in the development of the mitigation plan and will follow the following general definitions while developing goals, objectives, and mitigation actions:

- Goals are general statements of what is to be achieved. They are usually long term and represent global visions. For example: Minimize interruption to the instructional mission of the University.
- Objectives are more specific and measurable and define strategies. For example: Inform the campus community about potential hazards and appropriate ways to take action to reduce losses.
- Actions are specific activities that help achieve the goals and objectives. For example: Introduce a section in the campus newsletter that discusses campus hazards, campus shelters, and important phone numbers.

The goals will be based on our understanding of the problems revealed in the Hazard Assessment and Vulnerability Analysis and will form the basis on which mitigation actions will be developed.

The Consultant Team will work with the HMC to develop mitigation goals aimed at reducing or avoiding the University's vulnerabilities to the identified hazards.

The next step is to work with the HMC to identify the mitigation focus areas and prioritize by comparing the University's mission with the results of the risk assessment so that mitigation needs may be ranked according to their associated risks and potential threats to the University's instructional, research, and public service operations. Once the focus areas have been determined, appropriate mitigation actions will be developed to protect the University's facilities, research, staff, and students.

The Consultant will work with the HMC to identify actions that will help the University accomplish the established goals by identifying and analyzing a comprehensive range of specific mitigation actions and projects to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. Specific buildings that are vulnerable to flooding along the Manokin tributary including: Heating plant, Carver Hall, Murphy Hall, Murphy Anex, Water's Hall, Banneker, Spaulding, Tanner, Thomas and Briggs, Public Safety building, Hazel Hall, temporary classrooms, modular buildings, student apartments, and the water tower, will be analyzed. Mitigation options will be developed under the following six categories: 1) Prevention (through codes, ordinances, and plans); 2) Property Protection (e.g., flood insurance and storm shutters); 3) Public Education and Awareness; 4) Natural Resource Protection (e.g., erosion sediment control, and wetlands preservation); 5) Emergency Services (e.g. hazard warning and protection of critical facilities); and 6) Structural Projects (e.g. retaining walls and storm sewers).

Below are some examples of mitigation actions that may be considered to address the minimization of damage from various hazards, if appropriate:
High wind - saferooms, reinforcing window glass and frames, improving roofing materials, etc. Flood - elevation or floodproofing of buildings, moving critical uses to higher locations, etc.
All hazards - improvement of backup systems, maintenance of emergency plans, etc.

The Consultant will prepare an action plan describing how the mitigation strategies and activities identified will be prioritized, implemented, funded, and administered. This will be presented to the HMC for review and comment. The mitigation actions will then be ranked by the HMC. The criteria for ranking will include: life safety, operational criticality, timeline, lifespan, etc. A matrix will be used to list multiple criteria whereby the HMC can participate in the prioritization process.

Ms. Srinivasan has conducted DMA 2000 hazard mitigation plan reviews on behalf of FEMA and its Regional Offices and is therefore very conversant of the Crosswalk requirements.

<u>Step 5 - Write Mitigation Plan Document (lead consultant VPC)</u>

The Consultant will prepare a draft mitigation plan comprising all of the plan elements for review by the Committee. The Plan will include required elements discussed above and summarized in the local Hazard Mitigation Plan Review Crosswalk. The Consultant Team will incorporate comments from draft plan into final draft. The draft plan will become available for review and the highlights of the plan will be presented to the University Faculty, Staff and Students, and the local community at the second public meeting.

<u>Step 6 - Implement the Plan (lead consultant GMB)</u>

A plan implementation strategy will be developed to determine how the mitigation actions will be funded, and will include an approximate cost for each recommended project and possible funding sources to implement the recommended projects.

The Consultant Team will prepare a final draft for review by the University and by MEMA and FEMA. Comments from MEMA and FEMA will be incorporated to produce a final document that can be adopted by the University leadership.

The Consultant Team will provide progress reports to the University at least monthly. The Team will work with the HMC to prioritize the actions recommended in the mitigation plan that require structural modifications to the site or to specific buildings.

The Consultant will perform topographic field survey of the area along the Manokin tributary (south and west borders of the campus). We will identify finish floor elevations of all buildings on campus. We will coordinate vertical and horizontal data with topographic information from the field survey and as supplied by UMES. Where appropriate, we will determine elevation of associated building infrastructure (HVAC and electric pads and equipment), specifically in areas of high flooding potential along the tributaries.

The Consultant will perform flooding analysis along the tributaries to determine risks, frequency of flooding, and an appropriate response to flood potential. We will prepare schematic designs of appropriate improvements to minimize flooding risk, as well as cost estimates of recommended improvements. The Consultant Team has the necessary structural, civil, landscape, architectural, surveying, and electrical expertise to provide the evaluation for critical facilities along Manokin tributary.

The list of potential mitigation and improvements projects will be more clearly defined upon completion of steps 1-5. We understand that the RFP requests full construction documents, however the team cannot accurately project the fees for projects where the scope is unknown. The team that has been assembled can handle project of multi-disciplines, such as ones that may include structural engineering, surveying, stormwater engineering, civil engineering, landscaping, and mechanical/electrical engineering. Once the mitigation plan is complete, the scope could be expanded to include additional, specific design projects. An expanded scope may include preparing construction drawings and specifications, submitting for construction permits, and assistance in public bidding procedures.

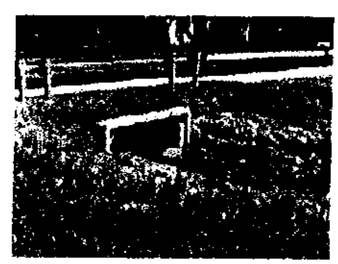
Deliverables

The Consultant will comply with all file type requirements specified in the Request for Proposals, as follows:

- A non-proprietary database for use with ArcGIS 9.1 and AutoCAD 2002 to contain all data collected;
- All associated files used for ArcGIS 9/1 (.shp, .shx, .dbf, .mdb, .lyr), including any URL's accessed via ArcCatalog;
- Electronic drawing files in AutoCAD 2002 for use with ArcGIS 9/1;
- Contractor requirements for AutoCAD and ArcGIS file submission

"GMB administered a very challenging project with a level of professionalism and integrity that is rarely found in this day. From the quality of the plans, to the project team individuals, GMB provided the guidance that made this project a pleasure to build."

James J. Julian
President
JJID, Inc.



- All project drawings for mapping presentation will be provided in the format usable by AutoCAD 2002 or later for general mapping and ArcGIS 9.1 for GIS based mapping;
- Site or area mapping drawings in AutoCAD will be developed in Maryland State Plane Coordinates (NAD 83 or later);
- GIS mapping will be in a coordinate projection compatible with or translatable to the same coordinate projection as for AutoCAD;
- Contract drawings and Xreferenced drawings for AutoCAD will be provided in an integrated file reference structure so that the university will not have to re-reference the drawings. Xreferenced drawings that are to be permanently integrated into drawing must be "inserted" as a block, not "bound". If for some reason they are "bound", the Layer names will be cleaned up to eliminate reference to Xrefed files before submission to the university;
- An electronic file copy of all AutoCAD and GIS files will be provided to the University at the end of the project. All associated files for ArcGIS (dbf, shp, etc.) and referenced drawings for AutoCAD will be included in the submission; and
- Contractor will provide an electronic copy of the completed draft Multi-Hazard Mitigation Plan and all data collected, plus twenty (20) bound hard copies of same.
    - Plan will meet the criteria of FEMA's section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 44CFR, parts 201 and 206, enacted under Sec. 104 of the Disaster Mitigation Act of 2000 (DMA 2000).
    - Plan will conform to and meet all pertinent criteria and regulations, including those found in applicable state and local ordinances and NFIP requirements.
    - Plan will be consistent with the University "Emergency Operations plan."
    - Plan document will be in Microsoft word format.
    - Final plan must be delivered to the University by November 30, 2009.

All-Hazards Mitigation Plan
University of Maryland Eastern Shore

1st Hazard Mitigation Committee Meeting
10 February 2009

Presented by
Deepa Srinivasan, Vision Planning and Consulting, LLC
Dr. Michael Scott, ESRGC/Salisbury University

Project Purpose

"To provide a mechanism for the University through which, the likelihood of threat to the land, structures, and constituents from natural hazards (e.g., flood, wind, tornadoes, hurricanes, wildfire, drought, etc.) can be assessed and to devise an action plan to reduce the impact of those threats and to develop a road map for future efforts."

Key Players

- UMES Staff
- Stakeholders
- Hazard Mitigation Committee (HMC)
- Local Representatives
- Consultants
  - Steve Marsh and Amanda Pollack, Civil Engineers, GMB
  - Deepa Srinivasan, President, Vision Planning & Consulting, LLC
  - Dr. Mike Scott, Director, Eastern Shore Regional GIS Cooperative @ Salisbury University
- Public
- Maryland Emergency Management Agency (MEMA)
- Federal Emergency Management Agency (FEMA)

Project Goals

The All-Hazard Mitigation Plan for UMES will:

Satisfy work requirements provided in the Request for Proposal for the Hazard Mitigation Plan for the University;
Satisfy requirements of the Disaster Mitigation Act of 2000 (DMA 2000);
Incorporate information from publications from the Federal Emergency Management Agency (FEMA) - *State and Local Mitigation Planning, and Building a Disaster-Resistant University;*
Help reduce the risk of loss of life, personal injury and property damage to the County's residences and businesses by identifying the flood risk;
Include mitigation strategies to address the risk within the University; and
Gain approval from the MEMA and FEMA, paving the way for future federal funding of mitigation projects.

Steps in the Planning Process

1. Organize work group and facilitate the process
2. Hazard assessment and vulnerability analysis
3. Assess local capabilities
   - Existing Plans, Programs, Policies
   - Personnel and Equipment Resources
   - Local Codes and Zoning Ordinances
   - Current and Proposed Construction Projects
4. Develop goals and objectives and mitigation actions
   - Prevention (codes, ordinances, plans)
   - Property Protection (flood insurance, storm shutters)
   - Public education and Awareness
   - Natural Resource Protection (erosion, sediment control, wetlands preservation)
   - Emergency Services (hazard warning, critical facilities protection)
   - Structural Projects (retaining walls, storm sewers)

Steps in the Planning Process (cont'd)

4. Write mitigation plan and prioritize projects
   - Evaluation Criteria: STAPLEE
     - Social
     - Technical
     - Administrative
     - Political
     - Legal
     - Economic
     - Environmental

5. Implement the plan
   - Priorities for Mitigation Actions
     - Short-, Medium-, or Long-Range
     - Potential Funding Sources
     - Responsible Entities
     - Target Completion Dates
   - Five-Year Plan Maintenance Cycle

Meetings

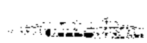
- 5 Hazard Mitigation Committee Meetings
  - Meeting 1: Planning process, schedule, deliverables, capability assessment
  - Meeting 2: Hazard identification, asset inventory
  - Meeting 3: Hazard/vulnerability assessment
  - Meeting 4: Goals and objectives, mitigation actions
  - Meeting 5: Mitigation actions prioritization and implementation
  - Meeting 6: Architectural/engineering project details
- 2 Public Meetings
  - Meeting 1
    - Planning process, capability assessment
    - Hazard identification, risk assessment, asset inventory
  - Meeting 2
    - Goals and objectives
    - Mitigation actions and implementation

Hazard Identification, Risk Profile and Vulnerability Assessment

- In order to plan for a response to hazards, we must first inventory the threats, assess the chance of occurrence, and determine the degree of loss potential
- Definitions
  - Hazard – the threat to things we value
  - Risk – the probability the hazard might occur
  - Vulnerability – the potential for loss
  - Mitigation Capability – the degree of ability to either remove the threat or to resist and/or recover from a hazard event

Hazard Identification

- Seek to determine what threats the University faces
  - Natural – would occur without human existence
    - Flood, earthquake, tornado, etc
  - Technological – would not occur without humans
    - Toxic chemical release, train derailment, etc.
- Information comes from:
  - Local emergency managers
  - Historical sources such as local newspapers
  - Mitigation committee questionnaire
- Hazard prioritization



Risk Profile

- Seek to determine the probability of occurrence for each hazard and its potential magnitude
- Create a map of the specific hazard zone
  - Some hazards (like floods) are geographically specific
- Review past occurrences regionally for patterns
- Identify the top priority hazards

Vulnerability Assessment

- Inventory the University's assets
  - Buildings
    - Size, age, type of construction, materials
    - Type and value of activities, operations, & contents
      - Research, instruction, special collections, irreplaceable specimens, etc.
    - Use and occupancy rates
  - Infrastructure
    - Electric, water, gas, communication systems
      - Condition and vulnerabilities
    - Administrative systems
      - Payroll, accounting, student records

Vulnerability Assessment

- Estimate losses for each specific hazard event
- Create hazard scenarios and explore how the buildings and infrastructure would potentially be impacted
- Normally, loss potential is described in dollars but much of a University's work is priceless
  - Lost potentially life-saving research, unique historical artifacts and library collections
  - These types of losses must be communicated also
- Create a composite vulnerability map of all hazards and potential for loss.

Plan Implementation

- Perform topographic field survey of the area along the Manokin tributary (south and west borders of the campus).
- Survey finish floor elevations of all buildings on campus.
- Determine elevation of associated building infrastructure (HVAC, electric pads, equipment), specifically in areas of high flooding potential along the tributaries.

Plan Implementation

- Prepare schematic drawings for the mitigation projects identified in the Hazard Mitigation Plan.
- Develop construction cost estimates for each recommended project.
- Determine possible funding sources to implement the recommended projects.
- Prioritize the projects based on the hazard risks.
- Assist the University in developing short term and long term capital improvements budgets and schedules.

Capability Assessment

Document Review

- UMES Campus Master Plan
- UMES Design Criteria/Facility Standards Manual
- UMES Capital Improvements Program
- UMES Emergency Operations Plan
- UMES Stormwater Regulations
- City of Princess Anne Comprehensive Plan
- City of Princess Anne Emergency Operations Plan
- Somerset County Comprehensive Plan
- Somerset County Hazard Mitigation Plan

Capability Assessment

UMES Master Plan - Goal - to determine how much future development can be accommodated through the campus and to establish who and where this growth should be sited. Therefore this Plan provides an excellent avenue to incorporate general hazard mitigation principles.

Design Criteria/Facility Standard Manual – Goal - to create facilities that will last 50-100 years. Facility construction should take into consideration, adequate hazard mitigation measures and this Manual may serve as a good platform to incorporate mitigation measures and practices into the University's long-term development process.

Capability Assessment

UMES stormwater regulations and permit procedures are based on the State's Stormwater Management Guidelines.

- For all redevelopment projects, the existing impervious area impacted within project limits is at least 20 percent.

Consider developing a stormwater master plan that would consider LID techniques to manage storm water by incorporating techniques such as bio-retention areas, dry wells, infiltration trenches, filter/buffer strips, vegetated swales, rain barrels, and cisterns. This will reduce the impact of flooding on campus.

Consider clarifying and formalizing the stormwater impact review processes that are currently employed - establishment of a review committee comprising staff from the MDE, Somerset County, and the Town of Princess Anne.

Capability Assessment

UMES Emergency Resources Guide provides procedures for responding to various agencies and includes general procedures to evacuate buildings during the time of an emergency.

UMES Crisis Management Plan identifies tornadoes, hurricanes, winter storms and earthquakes as natural and man-made emergencies that may impact the campus and details the response procedures that campus officials should follow during an emergency.

UMES Emergency Operations Plan highlights tornadoes, winter storms, hurricanes, and earthquakes as natural hazards and outlines protection measures that should be taken in case such an event threatens the campus. This list should be extended to include other natural hazards such as floods and wildfires to which the University is vulnerable, based on the analysis in the Hazard Mitigation Plan.

Capability Assessment

Summary of Risk – Somerset County

Maryland Hazard Analysis 2005 - High risk for hurricane/tropical storm and storm surge and wildfires; medium-high risk for ice; and medium risk for hail and tidal/coastal flooding.

Somerset County Hazard Mitigation Plan – Hurricanes, storm surge, winter storms, high winds, and floods rank high among other hazards.

Capability Assessment

2005 Somerset County Hazard Mitigation Plan

Goal - to improve coordination and communication with other relevant organizations and establish lasting partnerships. Facility planners from UMES should be on the Committee so they can jointly identify areas of cross reference between the County and UMES plan.
Mitigation action - identification of structures for retrofit projects, particularly at UMES, for which the University would be the applicant.
The City of Princess Anne and the University should work together in identifying suitable locations for off-campus student housing (adjacent to the campus and within the growth corridor) and identify properties that are not in high hazard areas such as in or near the floodplain.

Capability Assessment

2002 Somerset County Comprehensive Plan

- The Plan designates the area to the north-east of UMES as one of three growth nodes for the county, which will be primarily residential in nature. It also recommends that the City work closely with the University and take student needs into consideration while developing a commercial area revitalization program.
- The County, City and University should collaborate in preparing grant applications and work closely with the State to understand the mitigation program and allocation of mitigation dollars from the state for project development.
- The City and University should collaborate on applying for joint funding for emergency management equipment.

Capability Assessment

2005 Maryland State Hazard Mitigation Plan – A goal in the State Plan is to have the State Mitigation Planner serve on other boards and committees.
UMES should continue to invite State mitigation representatives to participate in their annual hazard mitigation project update meeting.
Expand mitigation education and outreach efforts.
Undertake and sustain efforts to identify and analyze projects that reduce wind risk to UMES' assets and operations .
Continue efforts to ensure that building codes are enforced with regard to wind resistance .
Explore mitigation options for mitigating the effects of criminal actions in combination with natural hazard mitigation efforts.

Schedule

Task	January	February	March	April	May	June	July	August
Hazard assessment and vulnerability analysis								
Assess mitigation capabilities								
Develop goals and mitigation actions								
Implement the plan								
Prepare draft plan document								
Organize work group, facilitate process								
HMC Meetings								
Public Meetings								

Next Steps

- Data Collection – documents, etc.
- HMC Meeting #2 - Hazard Identification and Asset Inventory – March 3rd week
- HMC Meeting #3 - Hazard/vulnerability Assessment – April 3rd week

APPENDIX B

HAZARD COMMITTEE MEETING NO. 2

SIGN IN SHEET

HANDOUT

MEETING MINUTES

UNIVERSITY of MARYLAND
EASTERN SHORE

Facilities Planning & Engineering

SIGN-IN SHEET

PROJECT TITLE: HAZARD MITIGATION COMMITTEE
Meeting #2
University of Maryland Eastern Shore, Princess Anne, Maryland
DATE: Tuesday March 24, 2009 TIME: 10:00 am

NAME	COMPANY	TELEPHONE & EMAIL
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Amanda Pollack	GMB	T: 410-742-3115 E: apollack@gmbnet.com
Danna Maloney ✓	UMES	T: 410-621-3040 E: dkmaloney@umes.edu
Wayne Shelton	SU	T: 410-546-6485 E: wxshelton@salisbury.edu
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John Palmer	UMES	T: 410-651-7977 E:
Marvin Jones	UMES	T: 410-651-6144 E: mljones@umes.edu

Tracie Earl	UMES	T: 410-651-6383 E: tjearl@umes.edu
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Garland Hayward	Town of Princess Anne	T: 410-651-9472 / 443-880-7308 E: gmilgar1@verizon.net
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Dale Pusey	Somerset County	T: E: ~~dpusey@ci.salisbury.md.us~~ dpusey@co.somerset.md.us.
Lawrence Wright	UMES	T: 410-651-6593 E: lewright@umes.edu
Earle Cantor	UMES	T: 410-651-6646 E: emcanter@umes.edu
Steve Marshall	Somerset Co. E.S.	T: 410-430-2291 E: smarshall@co.somerset.md.us
Ronnie Holden	UMES	T: 410-651-6230 E: reholden@umes.edu
		T: E:
		T: E:
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		T: E:
		T: E:

Name: ____________________ Unit: ____________________ Date: ____________________

Thank you for taking the time to complete this asset ranking worksheet in support of the UMES Hazard Mitigation Planning process. The goal of this worksheet is to account for the degree of "asset value" for each building on campus regarding the key functions of the University. These include:

Academic – related to the teaching mission of the University, includes libraries and teaching labs (science or computer)
Research – those assets dedicated to advancing the University's research mission
Administration – assets key to the leadership and organization of the University
Support – all assets that enable the other functions to take place
Communications – those assets key for both internal and external communication
Residence Life – those assets related to student housing and activities
Utility Delivery – electric, sewer, water, Internet
Emergency Response – public safety concerns

For each building (or other asset), please consider the above functions along with the following index of asset value:

Very High	10	Loss or damage to the building's assets would have exceptionally grave consequences, such as extensive loss of life, widespread severe injuries, or a total loss of primary services, core processes, and functions.
High	8-9	Loss or damage to the building's assets would have grave consequences, such as loss of life, severe injuries, or a major loss of primary services, core processes, and functions for an extended period of time
Medium High	7	Loss or damage to the building's assets would have serious consequences, such as serious injuries or impairment of core processes and functions for an extended period of time
Medium	5-6	Loss or damage to the building's assets would have moderate to serious consequences, such as injuries or impairment of core processes and functions
Medium Low	4	Loss or damage to the building's assets would have moderate consequences, such as minor injuries or minor impairment of core processes and functions
Low	2-3	Loss or damage to the building's assets would have minor consequences or impact, such as a slight impact on core processes and functions for a short period of time
Very Low	1	Loss or damage to the building's assets would have negligible consequences or impact

Finally, record your opinion of the degree of occupancy of the asset in question.

AO – Always occupied at a consistent level
Day – Primarily occupied during the workday (8 am – 5 pm)
Night – Primarily occupied during the night (5 pm – 8 am)
NO – Not usually occupied

These rankings will be tallied to create an overall index of asset value in order to prioritize potential vulnerability and mitigation actions

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
900	Student Development Center												
901	Wilson Hall												
902	Trigg Hall												
903	Early Childhood Research Center												
904	Thomas/Briggs Arts and Technology Center												
905	Kiah Hall												
906	Henson Center												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
909	Tawes Gym												
913	Banneker Hall												
914	Spaulding Hall												
915	Tanner Airway Science Center												
916	Linda Brown Building												
920	Ella Fitzgerald Performing Arts Center												
922	GW Carver Science Building												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
929	Williams Admissions Building												
930	Bird Hall												
933	Douglass Library												
935	Murphy Hall												
937	Waters Hall												
938	Somerset Hall												
939	Harford Hall												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
940	Wicomico Hall												
941	Public Safety												
950	Charles Drew Student Health Center												
954	Nuttle Hall												
956	Plaza Hall												
957	Court Plaza												
960	President's House												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
962	WESM Radio Station												
978	Crop Research and Aquaculture Building												
985	Residence Life/Student Clusters												
988	Student Apartments												
996	Hytche Center												
997	Student Services Center												
999	Hawks Landing												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
	Agricultural and Research Facilities												
	Sports Facilities												
New	University Terrace												
Unk	Food Science and Technology Building												
New	Physical Plant												
New	Hazel Hall												
	Swine Research Facilities Center												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
	Agriculture Research Building												
	Temporary Classroom Building 1												
	Purchasing												
New	Alumni House												
	Poultry Research Center												
	Commercial Greenhouse												
New?	Access & Success Building												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)
New	Coastal Ecology Research Laboratory												

Num	Building Name	Academic	Research	Administration	Support	Communications	Residence Life	Utility Delivery	Emer. Response			Occupancy?	Comments (includes primary activities, ground floor vs. upper floors, special collections of specimens, documents, records?)

HAZARD MITIGATION COMMITTEE
MEETING NO. 2 MINUTES

Meeting No. 2
March 24, 2009

<u>Distribution</u>
All HMC Members
All attendees (as denoted by check mark on sign-in sheet)
Amanda Pollack
Steve Marsh
Mike Scott
Deepa Srinivasan

<u>Business</u>

1. Ed distributed additional copies of GMB project approach and scope of work to those who had not yet received it.
2. Ed distributed the proposed Stakeholders list for final comment and additions. The list was finalized and will be sent to the consultants.
3. Mike Scott worked with the attendees to develop an asset inventory and ranking worksheet. The worksheet will be sent to all committee members shortly as a draft for final comment by April 14th. Ed will coordinate with IT to complete the communications and utility delivery columns.
4. Peter Okemmuo will review and coordinate the building numbers for accuracy.
5. The next meeting will be scheduled for 10:00 am on April 21st. The meeting will entail hazard and vulnerability assessment. Mike will send a more detailed agenda. Ed will send a meeting minder to all members.

APPENDIX C

HAZARD COMMITTEE MEETING NO. 3

SIGN IN SHEET

AGENDA

PRESENTATION

MEETING MINUTES

UNIVERSITY of MARYLAND
EASTERN SHORE

Facilities Planning & Engineering

SIGN-IN SHEET

PROJECT TITLE: HAZARD MITIGATION COMMITTEE
Meeting #3
University of Maryland Eastern Shore, Princess Anne, Maryland
DATE: Tuesday April 21, 2009 TIME: 10:00 am

NAME	COMPANY	TELEPHONE & EMAIL
Ed Johnson	UMES	T: 410-651-6340 E: ehjohnson@umes.edu
Steve Marsh	GMB	T: 410-742-3115 E: smarsh@gmbnet.com
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Gladys Shelton Earl Canter	UMES	T: 410-621-3999 E: ggshelton@umes.edu
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Ron Forsythe	UMES	T: 410-651-8371 E: rgforsythe@umes.edu
Quentin Johnson	UMES	T: E: qrjohnson1@umes.edu
Dale Pusey	Somerset County	T: E: dpusey@ci.salisbury.md.us
Lawrence Wright	UMES	T: 410-651-6593 E: lewright@umes.edu
Earle Canter	UMES	T: x6646 E: emcanter@umes.edu
Preston Cottman	UMES	T: x6652 E: plcottman@umes.edu
		T: E:
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		T: E:
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Third Steering Committee Meeting : UMES Hazard Identification, Profiling, and Ranking

Michael S. Scott, PhD, GISP
Eastern Shore Regional GIS Cooperative
Salisbury University
April 21, 2009

Outline

- Review of process
- Summary of Asset Inventory process
- Hazard Assessment
- Hazard Ranking
- What happens next?

Review of Planning Process

- Organize work group and facilitate the process
- Hazard assessment and vulnerability analysis
- Assess local capabilities
- Develop goals and objectives and mitigation actions
- Write mitigation plan and prioritize projects
- Implement the plan

Asset Inventory Summary

- Ranked each building on campus according to its value in the following categories:
  - Academic, Research, Administration, Support, Communications, Residence Life, Utility Delivery, & Emergency Response
- Sum of scores yielded 16 buildings of particular overall importance, with 5 ranked as "critical"

Particularly Important Buildings

- Trigg Hall
- Kiah Hall
- Henson Center
- Food Science & Technology Building
- Fitzgerald Performing Arts Center
- Williams Administration Building
- Waters Hall
- University Terrace
- Hazel Hall
- WESM Radio Station
- Physical Plant
- Public Safety
- President's House
- SRC Community Center
- Hytche Center
- Student Services Center

Hazard Identification & Profiling

- Data Sources
  - Federal Emergency Management Agency
  - National Climatic Data Center
  - University of South Carolina
  - US Army Corps of Engineers (Philadelphia)
  - Maryland Geological Survey
  - US Department of Transportation
  - US Geological Survey
  - US Department of Agriculture
- Primarily data for Somerset County

Critical Hazards

- Floods
- Wind
- Lightning
- Earthquakes
- Winter Storms
- Wildfire
- Hail
- Extreme Temperatures
- Droughts
- Hazardous materials release

Flood

An overflowing of water onto land that is normally dry

- Geographic Extent
  - Southern/western portions of campus
- Severity: To Be Determined
- Impact on life and property
  - 4 casualties, $2.6 million in property damage
- Occurrence (in the County)
  - 12 occurrences from 1960 - 2007

FIRM Extent

UMES & SLOSH Model

Buildings Vulnerable to SS

Wind

Air moving (sometimes with considerable force) from an area of high pressure to an area of low pressure

- Tropical storms/hurricanes, tornadoes, thunderstorms

Geographic Extent: Entire study area is possible

Severity: Moderate severity

Impact on life and property

- 11 casualties, $8.1 million in property damage

Occurrence from 1960 - 2007

- Tropical storm wind: 9 occurrences
- Tornadic wind: 5 occurrences
- Thunderstorm wind: 64 occurrences

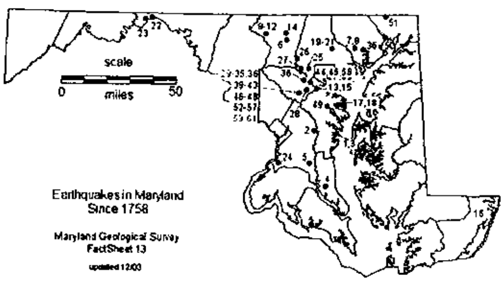
Lightning

- Abrupt electric discharge from cloud to cloud or from cloud to earth accompanied by the emission of light
- Geographic Extent: Entire study area is possible
- Severity: Minimal
- Impact on life and property
  - 3 casualties, $330 K in property damage
- Occurrence
  - 11 occurrences from 1960 - 2007

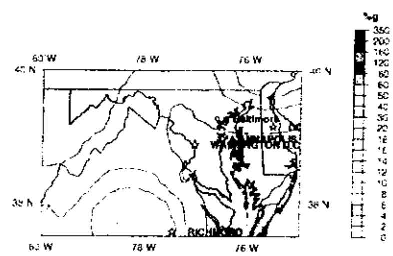
Earthquake

- Shaking and vibration at the surface of the earth resulting from underground movement along a fault plane
- Geographic Extent: Entire study area is possible
- Severity:
  - All events have had magnitude of 3.7 or less
- Impact on life and property: None
- Occurrence (in Maryland)
  - 62 occurrences from 1758 – 2005

MGS: Maryland Earthquakes



USGS Seismic Hazard Map



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
National Seismic Hazard Mapping Project (2008)

Winter Storm

- Weather hazard associated with freezing or frozen precipitation or combined effects of winter precipitation and strong winds
- Geographic Extent: Entire study area is possible
- Severity: Moderate
- Impact on life and property
  - 38 casualties, $3.6 million in property damage
- Occurrence
  - 65 occurrences from 1960 - 2007

Wildfire

- A wildfire, also known as a wildland fire, forest fire, or brush fire, is an uncontrolled fire often occurring in wildland areas, but which can also consume houses or agricultural resources
- Geographic Extent: Entire study area is possible
- Severity: Minimal
- Impact on life and property
  - None
- Occurrence
  - 2 from 1960 - 2007

Hail

- Form of precipitation which consists of balls or irregular lumps of ice (hailstones)
- Geographic Extent: Entire study area is possible
- Severity: Minimal
- Impact on life and property
  - No casualties, $3.1 million in property damage
- Occurrence
  - 32 occurrences from 1960 - 2007

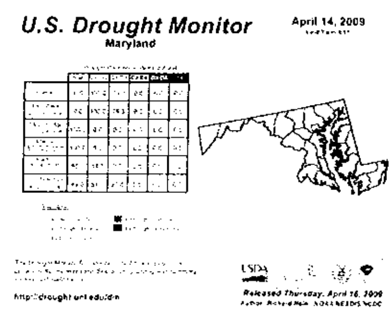
Extreme Temperature

- Temperatures that reach far above or below normal
- Geographic Extent: Entire study area is possible
- Severity: Minimal
- Impact on life and property
  - 5 casualties, $35 k in property damage
- Occurrence
  - 10 occurrences from 1960 to 2007
    - 1 extreme cold, 9 excessive heat

Drought

- Drought is a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area
- Geographic Extent: Entire study area is possible
- Severity: Moderate
- Impact on life and property
  - No casualties, $6.1 million in property damage
- Occurrence
  - Severe drought has occurred about once every 10 years since 1930

USDA: Current Drought



Hazardous Materials Release

- Accidental release of a chemical known to cause acute or chronic health effects
- Geographic Extent: Area near the railroad
- Severity: Unlikely to be high
- Impact on life and property
  - None
- Occurrence
  - None since 1996

HazMat on Norfolk Southern

- 7 different hazardous materials moving through Princess Anne in the past 12 months and their Protective Action Distances
  - Petroleum gases (most likely LPG) – 330 ft
  - Corrosive liquid, basic - 150 ft
  - Propane – 330 ft
  - Pentanes (like gasoline or fuel oil) – 150 ft
  - Other regulated – 150 ft
  - Flammable liquids, N.O.S. – 150 ft
  - Other regulated – 150 ft

Norfolk Southern PAD

Ranking of Hazards for Vulnerability Assessment

- Not all hazards pose the same level of threat – there is a need focus efforts on those hazards that pose the greatest threat to UMES
- Hazards are ranked (low, medium, high) according to five criteria
- Those hazards ranked highly will be examined with a detailed vulnerability assessment.

Ranking Criteria

- History: High ranking indicates the hazard has occurred often
- Potential for mitigation: High ranking suggests that there are ways to address the threat that are feasible and cost-effective
- Presence of susceptible areas: High ranking indicates that UMES has many facilities and/or populations at risk for a hazard
- Data availability: High ranking confirms sufficient quality data exists to assess the vulnerability
- Federal and local disaster declarations: High ranking is given to those hazards that have caused previous significant disasters

Ranking Results

Hazard	History	Mitigation	Vulnerable	Data	Disaster	Total
Flood	3	3	3	3	3	15
Wind	3	3	3	2	3	14
Lightning	3	2	2	2	1	11
Earthquake	1	2	3	3	1	10
Winter Storm	2	2	2	2	2	10
Drought	2	1	2	2	2	9
Wildfire	1	1	2	2	1	7
Hail	2	1	1	1	1	6
Extreme Temp	1	1	1	2	1	6
HazMat Release	1	1	1	2	1	6

What's Next

- Gather individual building information
  - Square footage, cost, building condition, height to first finished floor
- Vulnerability Assessment
  - HAZUS-MH Modeling for flood and wind
  - FEMA BCA Tool
- Predict potential damage from flooding, tropical storms, tornados, and thunderstorms

HAZARD MITIGATION COMMITTEE
MEETING NO. 3 MINUTES

Meeting No. 3
April 21, 2009

Distribution
All HMC Members
All attendees (as denoted by check mark on sign-in sheet)
Amanda Pollack
Steve Marsh
Mike Scott
Deepa Srinivasan

Business

1. Mike Scott distributed the asset ranking worksheet that has been completed since meeting no. 2. Some suggestions were made to further improve the list. Mike will send the list out to the attendees for any final comments.
2. Deepa has scheduled meetings with several of the stakeholders at UMES for today.
3. Deepa advised of the purpose for the next meeting(no. 4), which is scheduled for Tuesday June 4th at 10:00 am. This will be an interactive session discussing the goals and objectives, and mitigation actions.
4. Meeting no. 5 is tentatively scheduled for Tuesday June 23.
5. Deepa asked about the campus risk manager, insurance liason. The committee refered her to Ms. Lisa Johnson in the Human Resources Dept.
6. Deepa requested a copy of the Emergency Evacuation and Operation Plan. Preston will forward her a copy.
7. Chief Sumpter suggested that, particulary for the next meeting, that the crisis management committee be present at the meeting. He will notify those individuals.
8. Mike had a few questions/clarifications he needed based on the building numbering information. He and Peter will get together to resolve these.
9. A meeting minder will be sent out to all members for the next meeting which will be on June 4th at 10:00 am.

APPENDIX D

HAZARD COMMITTEE MEETING NO. 4

SIGN IN SHEET

AGENDA

PRESENTATION

MEETING MINUTES

UNIVERSITY of MARYLAND
EASTERN SHORE

Facilities Planning & Engineering

SIGN-IN SHEET

PROJECT TITLE: HAZARD MITIGATION COMMITTEE
Meeting #4
University of Maryland Eastern Shore, Princess Anne, Maryland
DATE: Tuesday June 2, 2009 TIME: 10:00 am

NAME	COMPANY	TELEPHONE & EMAIL
Ed Johnson	UMES	T: 410-651-6340 E: ehjohnson@umes.edu
Steve Marsh	GMB	T: 410-742-3115 E: smarsh@gmbnet.com
Amanda Pollack	GMB	T: 410-742-3115 E: apollack@gmbnet.com
Danna Maloney	UMES	T: 410-621-3040 E: dkmaloney@umes.edu
Wayne Shelton	SU	T: 410-546-6485 E: wxshelton@salisbury.edu
Mark Clauss	UMES	T: 410-651-6680 E: maclauss@umes.edu
Mike Scott	SU/ESRGC	T: E: msscott@salisbury.edu
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Marvin Jones	UMES	T: 410-651-6144 E: mljones@umes.edu

Tracie ~~Earl~~ Bishop	UMES	T: 410-651-6383 tjbishop E: ~~tjearl~~@umes.edu
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Garland Hayward	Town of Princess Anne	T: 410-651-9472 / 443-880-7308 E: gmilgar1@verizon.net
Warner Sumpter	UMES	T: 410-651-6089 E: wisumpter@umes.edu
Ron Forsythe	UMES	T: 410-651-8371 E: rgforsythe@umes.edu
Quentin Johnson	UMES	T: E: qrjohnson1@umes.edu
Dale Pusey	Somerset County	T: E: dpusey@ci.salisbury.md.us
Lawrence Wright	UMES	T: 410-651-6593 E: lewright@umes.edu
Phillip Thomas	UMES	T: 410-651-8611 E: pmthomas@umes.edu
JESYL SILVA	GMB	T: 410 742 3115 E: JSILVA@GMBNET.COM
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Henry Brooks	UMES	T: 410-651-6204 E: hmbrooks@umes.edu
Leon Bivens	"	T: E: X6681 lbivens@umes.edu
Preston Cottman	UMES	T: 410-651-6652 E: PLC@UMES.edu
[illegible] C. Johnson	UMES	T: 410-651-7848 E: lcjohnson@umes.edu

Dr. Ronnie Holden

Dr. Charles Williams

Dr. James White

University of Maryland Eastern Shore
ALL-HAZARDS MITIGATION PLAN

Hazard Mitigation Committee Meeting #4
2 June 2009
10am-12noon

AGENDA

Review of Goals and Objectives

Review of Floodprone Properties

Discussion of Preliminary Mitigation Actions
Identification of Responsible Agencies and Implementation Schedule

Wrap-up
- **Next steps**
- **Discuss Public Meeting #1 (date tbd)**
- **Hazard Mitigation Committee Meeting #5 (23 June 2009)**
- **Questions**

Adjournment

All Hazards Mitigation Plan

[illegible]

2 June 2009

4th Hazard Committee Meeting

Presented by:

Deepa Srinivasan, AICP, CFM
Vision Planning and Consulting, LLC

VISION

Plan Elements

- Preventive Measures
- Property Protection
- Emergency Services
- Structural Projects
- Natural Resource Protection
- Public Information

Goals

Prevention

- *Goal 1: Integrate hazard mitigation principles in existing plans and guidances.*
- *Goal 2: Coordinate mitigation policies and actions with the Town of Princess Anne and Somerset County.*

Property Protection

- *Goal 3: Ensure that any new construction and renovation of buildings makes them resistant to one or more hazards.*

Goals

Emergency Services

- *Goal 4: Reduce potential impacts to critical facilities and make them less vulnerable to hazards.*
- *Goal 5: Improve coordination and notification procedures during emergencies.*

Structural Projects

- *Goal 6: Ensure regular maintenance of the University's infrastructure within the 100-year floodplain.*

Goals

Natural Resource Protection

- *Goal 7: Protect existing natural resources and open-space within the floodplain and watersheds.*

Public Information

- *Goal 8: Improve public awareness and outreach during hazard events through education.*

Priority Buildings

Trigg Hall
Kiah Hall
Henson Center
Food Science & Technology Building
Fitzgerald Performing Arts Center
Williams Administration Building
Waters Hall
University Terrace
Hazel Hall
WESM Radio Station
Physical Plant
Public safety
SRC Community Center
Hytche Center
Student Services Center

Floodprone Buildings along Tributary

- Heating Plant
- Carver Hall
- Murphy Hall
- Murphy Annex
- Waters Hall
- Banneker
- Spaulding
- Tanner
- Thomas and Briggs
- Public Safety Building
- Hazel Hall
- Temporary Classrooms
- Modular Buildings
- Student apartments

Floodprone Buildings along Tributary

Typical Eastern Shore Scenario

Seaford Flood, June '06

Floodprone Buildings along Tributary

Typical Eastern Shore Scenario

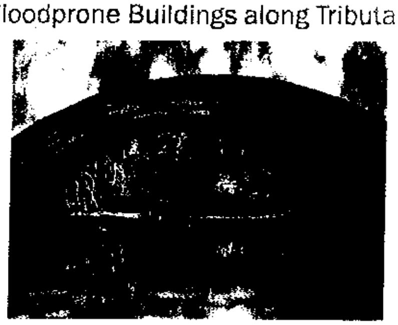
Seaford Flood, June '06

Floodprone Buildings along Tributary

Typical Eastern Shore Scenario

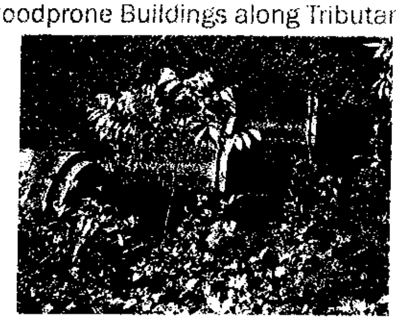
Seaford Flood, June '06

Floodprone Buildings along Tributary



Railroad crossing at campus

Floodprone Buildings along Tributary

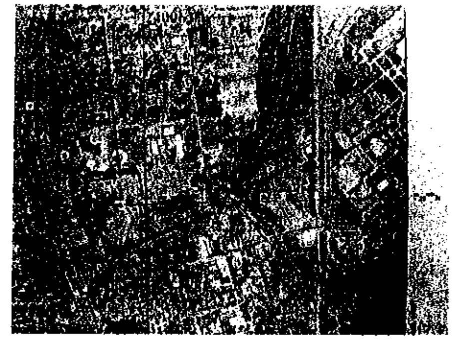


Hytche Blvd. crossing

Floodprone Buildings along Tributary

Somerset Avenue crossing

Floodprone Buildings along Tributary



Preliminary FIRM Maps

Floodprone Buildings along Tributary

Preliminary FIRM Maps

Floodprone Buildings along Tributary

Identifying Extent of Flooding

Preliminary Mitigation Actions
Prevention

- As elaborated in the document review section, examine recommendations and consider integrating effective mitigation practices and concepts into other UMES plans (Master Plan, CIP).
- Continue to work closely with the Town of Princess Anne and Somerset County to ensure that mitigation actions are coordinated effectively and are in harmony with that of the Town and County.
- The Draft Master Plan lists capital funded projects from 2008 to 2018 A number of buildings including Kiah Hall, the Arts and Technology Building, Wilson Hall, Carver Hall, and J.T. Williams Building are slated for renovation. Ensure these renovations incorporate hazard mitigation principles and implement the mitigation actions listed for specific buildings in this section.

Preliminary Mitigation Actions
Prevention (continued)

- Work in collaboration with local government to improve the University's and the community's disaster resistance by conducting regular meetings with the County EMA to mobilize funds through the local mitigation strategy.
- Work with the Office of Alumni Affairs to identify alumni who: 1) may be able to assist through fundraising; 2)serve as valuable technical resources for retrofit and modernization projects; and 3) serve in positions to influence government and nonprofit resource allocation.

Preliminary Mitigation Actions
Prevention (continued)

- The new digital FIRMS will show the area of UMES that lies in the 100-year floodplain. Provide training for the use of digital FIRMs to stakeholder groups including UMES facility planners and engineers.
- Develop a training session for lab directors on hazard mitigation. The training would address appropriate preparation, protection, and securing measures during hazard events.

Preliminary Mitigation Actions
Property Protection

- Since the campus is vulnerable to lightning strikes, conduct a detailed engineering assessment of areas on campus that may be vulnerable to lightning strikes such as antennae and computer and electrical systems that may be exposed to power surges and develop appropriate mitigation measures.
- Consider introducing a valve on the storm drain on College Backbone Road on the east side of the campus to keep water from backing into the buildings.
- The Ella Fitzgerald Performing Arts Center contains utilities in the basement including two sump pumps. Install a small generator to pump the water up during power outage and keep the basement from flooding.

Preliminary Mitigation Actions
Property Protection (continued)

- The Carver Science Building, laboratories, infirmary, and food storage areas contain a number of experiments that need to stay refrigerated. These buildings should develop a list of their needs for refrigeration and contain a back-up plan to deal with power outages.
- University Terrace has a network hub in the basement and is prone to flooding. Consider moving the hub to higher ground.
- Kiah Hall contains utilities in the mechanical room in the basement. After Tropical Storm Isabel in 2003, the motors, controls, and electrical panels for boilers, pumps, and air handlers were retrofitted. Consider moving the utilities out of the basement into an external shed on grade or above. Also, close the exit facing the Henson Center and move it to the other side of the building.

Preliminary Mitigation Actions
Property Protection (continued)

- In the Thomas/Briggs Art and Technology Center, the utilities are 3-4 feet below grade. Consider relocating these utilities to higher ground.
- The campus contains a loop electrical system that runs around campus. There is an old maintenance building by the police station that has 25kv switching gears and transformers that are in the 100-year floodplain. Consider opening the loop around the floodplain areas near the Maintenance Building to ensure continuity of power supply to the rest of the campus during a flood.

Preliminary Mitigation Actions
Emergency Services

- Install generators in Kiah Hall, Wicomico Hall and all other residence halls as well as the Student Services Center (generator large enough to operate the entire SSC).
- Purchase an additional 4-wheel drive vehicle to help during emergency situations.
- The network core and main switchboard is located in the J.T. Williams Admission Building. This building does not have a generator. Install a generator at the JT Williams Building.
- The Physical Plant serves as the alternate EOC and is insufficient. It does not have phone and internet connectivity to operate as a secondary location. Upgrade the Physical Plant Building to include a spot where communication lines could come in and introduce a back up data network correction in the building.

Preliminary Mitigation Actions
Emergency Services (continued)

- The Public Safety Building serves as the Police Station and is the center of communication. When it floods, the whole building is surrounded by water. This building is currently not an accredited facility.
  - Short Term - Upgrade the Public Safety Building to include a spot where communication lines could come in and introduce a back up data network correction in the building. Also install a generator in the building.
  - Long Term - Consider relocating it out of the flood zone to higher ground and redesign it with a control room so that it can be used as a command center. Identify a location on Route 822 near the main entrance for a facility that is more visible, accessible, and safe that can functions as a Public Safety Building and EOC.

Preliminary Mitigation Actions
Emergency Services (continued)

- The Police Department currently has 16 staff members and recently recruited two people. However, they are still short-staffed. Consider hiring at least two additional staff members: an Accreditation Manager and an Emergency Manager.
- The University's Continuity of Operations Plan is currently being developed. Continue to update this Plan regularly.
- The Central Steam Plant (located across from the George Washington Carver Science Building and next to the Public Safety Building) contains a 2-foot wall. Consider raising the walls around the two doors and put install a sump pump in the central steam plant to keep out water.

Preliminary Mitigation Actions
Structural Projects

- The Campus Facilities staff conducts annual maintenance on roofs that includes cleaning drains and gutters and examines damage. Consider hiring a roofing expert to conduct preventive maintenance, identify issues and recommendations, and also keep regular records.
- Conduct a study to determine the shelter requirements and specifications and also examine the feasibility of hardening the Henson Center and other shelter locations.
- The campus is vulnerable to high wind as indicated in the risk assessment section of this Plan. Select high-priority facilities for additional study, and develop recommendations regarding potential retrofits to harden these against potential wind damage.
- There are 6 manholes on the main sewer line near Kiah Hall. Raise the manholes to above the height of the base flood or install sealed or watertight covers on them to prevent water from flowing out.

Preliminary Mitigation Actions
Natural Resources Protection

- Seek low impact development techniques to manage storm water and reduce the impact of flooding on campus by incorporating techniques such as include bioretention areas, dry wells, infiltration trenches, filter/buffer strips, vegetated swales, rain barrels, and cisterns. Identify specific areas on campus where this can be done.

Preliminary Mitigation Actions
Public Information

- Introduce a campus hazards segment in the administration newsletter for regular updates and information on various hazards.
- Work with the Office of Public Relations to conduct a public outreach effort on campus. The information would include warning alerts, shelter locations, safety procedures, and evacuation routes, among others. Distribute hazard-related reading materials to new students during orientation.

Next Steps

- 5th Core Team Meeting – 23 June 2009 – 10am
  - Finalize Mitigation Actions
  - Prioritize Projects
  - Discuss Public Meeting
- Preparation of Draft Plan
- Submission of Draft Plan

HAZARD MITIGATION COMMITTEE
MEETING NO. 4 MINUTES

Meeting No. 4
June 2, 2009

<u>Distribution</u>
All HMC Members
Lisa Johnson
Amanda Pollack
Steve Marsh
Mike Scott
Deepa Srinivasan

<u>Business</u>

1. The purpose of todays meeting was to discuss the goals and objectives and to review the proposed mitigation actions.
2. Ed welcomed the members of the crisis management team that were present. The group joined in the meeting today to develop an understanding of the HMC actions and how the committees interface and parallel each other. Chief Sumpter gave a brief description of what the crisis team's role is.
3. Ed commended the consultants and the HMC for working together well with each other, for being resourceful, and for their patience with him as he has been tied up with other projects recently.
4. Deepa presented the proposed goals, objectives and preliminary mitigation actions and provided a handout of the slide presentation.
5. Steve showed and discussed the current FEMA flood map that he recently acquired from Somerset County and discussed historical flood data of the Monokin River. From the discussion it was learned that actual flooding seems to occur more frequently than the flood map indicates. Further investigations by GMB will continue and will involve Leon Bivens and the Boiler Plant personell.
6. Deepa stated that we are targeting to have a draft mitigation plan for review sometime in July.
7. Mike Scott will conduct the first of two public meetings. The meeting is tentatively planned for July.
8. Our next meeting is tentatively scheduled for June 23. The purpose will be to finalize mitigation actions, prioritize the projects and discuss the public meetings. Ed will send out meeting notice.

APPENDIX E

HAZARD COMMITTEE MEETING NO. 5

SIGN IN SHEET

AGENDA

PRESENTATION

MEETING MINUTES

UNIVERSITY of MARYLAND
EASTERN SHORE

Facilities Planning & Engineering

SIGN-IN SHEET

PROJECT TITLE: HAZARD MITIGATION COMMITTEE
Meeting #~~4~~ 5
University of Maryland Eastern Shore, Princess Anne, Maryland
DATE: Tuesday June ~~2~~ 23, 2009 TIME: 10:00 am

NAME	COMPANY	TELEPHONE & EMAIL
Ed Johnson ✓	UMES	T: 410-651-6340 E: ehjohnson@umes.edu
Steve Marsh ✓	GMB	T: 410-742-3115 E: smarsh@gmbnet.com
Amanda Pollack	GMB	T: 410-742-3115 E: apollack@gmbnet.com
Danna Maloney	UMES	T: 410-621-3040 E: dkmaloney@umes.edu
Wayne Shelton	SU	T: 410-546-6485 E: wxshelton@salisbury.edu
Mark Clauss ✓	UMES	T: 410-651-6680 E: maclauss@umes.edu
Mike Scott ✓	SU/ESRGC	T: 410-677-5390 E: msscott@salisbury.edu
Deepa Srinivasan ✓	Vision Planning	T: 240-893-8719 E: dsrinivasan@vision-pc.net
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Peter Okemmuo ✓	UMES	T: 410-651-6651 E: paokemmuo@umes.edu
Preston Cottman	UMES	T: 410-651-6652 E: plcottman@umes.edu
Marvin Jones ✓	UMES	T: 410-651-6144 E: mljones@umes.edu

Tracie Bishop ✓	UMES	T: 410-651-6383 E: tjbishop@umes.edu
Gladys Shelton	UMES	T: 410-621-3999 E: ggshelton@umes.edu
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Warner Sumpter ✓	UMES	T: 410-651-6089 E: wisumpter@umes.edu
Ron Forsythe ✓	UMES	T: 410-651-8371 E: rgforsythe@umes.edu
Quentin Johnson	UMES	T: E: qrjohnson1@umes.edu
Dale Pusey ✓	Somerset County	T: E: dpusey@ci.salisbury.md.us
Lawrence Wright ✓	UMES	T: 410-651-6593 E: lewright@umes.edu
Tracy Grangier ✓	Town of Princess Anne	T: 410-651-1818 E: tgrangier@townofprincessanne.com
Karla King ✓	Vision Planning	T: 301 2194200 E:
MAURICE NGWABA ✓	UMES	T: 410-651-6229 E: mengwaba@umes.edu
Phillip Thomas ✓	UMES Res. Life	T: 410-725-1076 E: pnthomas @ umes. edu
Victoria Lloyd ✓	SOMERSET COUNTY EMERGENCY MANAGEMENT	T: 410-651 3467 E: vlloyd@cosomerset.md.us
John Palmer ✓	UMES	T: E: 410 651-7977
Ronnie Holden ✓	UMES	T: E: 410-651-6230
		T: E:

University of Maryland Eastern Shore
ALL-HAZARDS MITIGATION PLAN

Hazard Mitigation Committee Meeting #5
23 June 2009
10am-12noon

AGENDA

Review of Flood Mitigation Actions (Steve Marsh, GMB)

Review of Mitigation Strategy (Deepa Srinivasan, Vision Planning)

Prioritization of Actions

Wrap-up and Next steps

- **Draft report**
- **Public Meeting #1 (date tbd)**
- **Hazard Mitigation Committee Meeting #6 (July 2009)**
- **Questions**

Adjournment

All-Hazards Mitigation Plan

University of Maryland Eastern Shore

2 June 2009
3rd Steering Committee Meeting

Presented by:
Deepa Srinivasan, AICP, CFM
Vision Planning and Consulting, LLC

VISION

Mitigation Actions - Flooding

- Nuisance Flooding
- Extreme event flooding
- Isolated Flooding – due to undersize storm drain or localized grading example from jeremy memo
- Global flooding – floodplain/creek issues

Mitigation Actions - Flooding

- Check Valve at basement drain connections to storm and sanitary sewers
- Immediate relief of more frequent flood events
- Will not necessarily prevent flooding from larger events at all locations
- Kiah, Central Plant, Thomas and Briggs

Mitigation Actions - Flooding

- Tide flex at storm drain outfalls to existing ditches
- High head loss
- Must evaluate the benefits of preventing flood backups with increased "nuisance" flooding frequency

Mitigation Actions - Flooding

- Localized flood "walls"
- Raise utilities/HVAC equipment

Mitigation Actions - Flooding

- Abandon existing buildings

Mitigation Actions - Flooding

- Flood wall / berm along tributary

Hazard Mitigation Committee
Meeting No. 5

Mitigation Actions - Flooding

- Nuisance Flooding
- Isolated Flooding – due to undersize storm drain or localized grading
- Extreme event flooding
- Global flooding – floodplain/creek issues

Princess Anne Police Chief Russell Pecoraro, left, and Town Manager Jay Parker survey flood waters on Somerset Avenue at the Manokin River bridge Friday morning.

GMB

Hazard Mitigation Committee
Meeting No. 5

Proposed dFIRM is not consistent with known conditions on campus

GMB

Hazard Mitigation Committee
Meeting No. 5

Physical floodplain does not match the proposed regulated floodplain

GMB

Hazard Mitigation Committee
Meeting No. 5

Flood WSE = 9.5' appears to be consistent with flooding observed on campus

GMB

Hazard Mitigation Committee
Meeting No. 5

Mitigation Actions - Flooding

- Check Valve at basement floor drains at connections to storm and sanitary sewers
- Immediate relief of more frequent flood events
- Will not necessarily prevent flooding from larger events at all locations
- Kiah Hall, Central Plant, Thomas and Briggs

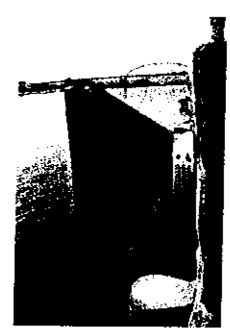
Floor drain in mechanical room, Thomas and Briggs Center

GMB

Hazard Mitigation Committee
Meeting No. 5

Mitigation Actions - Flooding

- Tide flex at storm drain outfalls to existing ditches
- High head loss
- Must evaluate the benefits of preventing flood backups with increased "nuisance" flooding frequency

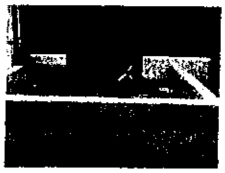


GMB

Hazard Mitigation Committee
Meeting No. 5

Mitigation Actions - Flooding

- Localized flood "walls"
- Raise utilities/HVAC equipment



GMB

Hazard Mitigation Committee
Meeting No. 5

Mitigation Actions - Flooding

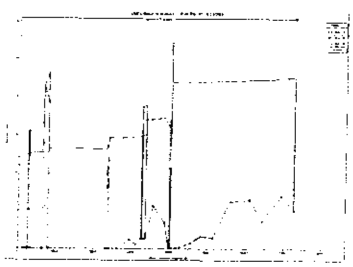
- Flood wall / berm along tributary
- Abandon existing buildings
- Combination of Strategies

GMB

Hazard Mitigation Committee
Meeting No. 5

Next Steps

- Finalize Hydraulic / Hydrology model
- Determine Base Flood Elevation
- Determine downstream and upstream impacts of flood wall along campus
- Coordinate with FEMA to revise FIRM, as necessary



Preliminary HEC-RAS results – 100 year rainfall with a high tide of elevation 5.0'.

GMB

HAZARD MITIGATION COMMITTEE
MEETING NO. 5 MINUTES

Meeting No. 5
June 23, 2009

Distribution
All HMC Members
Amanda Pollack
Steve Marsh
Mike Scott
Deepa Srinivasan

Business

1. The purpose of todays meeting was to review the flood mitigation actions, review mitigation strategies, prioritize actions, and discuss future meetings.
2. Steve discussed probable flood elevations, options for protecting facilities, and ongoing efforts towards completing the flood model.
3. Deepa went over the Preliminary Mitigation Goals and Actions handout and discussed.
4. Deepa stated that we are targeting to have a draft mitigation plan for review sometime in August.
5. Maurice needs to coordinate the costs of actions with the Master Plan. The consultants agreed to furnish this information.
6. As it appears, the Board of Regents will need to approve the plan by resolution. Deepa/Mike suggested that the draft plan be submitted to the board as well and mentioned that this is the procedure UMCP followed.
7. Deepa will send out the scoring matrix identifying the criteria and points for each item.
8. Ed will contact MEMA and request extension of the work to extend beyond August so the plan can receive input from students/faculty in September.
9. Meeting No. 6 is scheduled for August 11th at 10:00 am.
10. The first of two public input meetings will be held on Thursday July 11th from 5-7 pm in Ella Fitzgerald Performing Arts Center. Deepa will send a meeting notice to Ed to be distributed and advertised locally. Mike will conduct this meeting.

APPENDIX F

HAZARD COMMITTEE MEETING NO. 6

SIGN IN SHEET

AGENDA

PRESENTATION

MEETING MINUTES

UNIVERSITY of MARYLAND
EASTERN SHORE

Facilities Planning, Design & Construction Department

SIGN-IN SHEET

PROJECT TITLE: HAZARD MITIGATION COMMITTEE
Meeting #6
University of Maryland Eastern Shore, Princess Anne, Maryland

DATE: Wednesday September 23, 2009 TIME: 2:00 pm

NAME	COMPANY	TELEPHONE & EMAIL
Ed Johnson	UMES	T: 410-651-6340 E: ehjohnson@umes.edu
Steve Marsh	GMB	T: 410-742-3115 E: smarsh@gmbnet.com
Amanda Pollack	GMB	T: 410-742-3115 E: apollack@gmbnet.com
Danna Maloney	UMES	T: 410-621-3040 E: dkmaloney@umes.edu
Wayne Shelton	SU	T: 410-546-6485 E: wxshelton@salisbury.edu
Mark Clauss	UMES	T: 410-651-6680 E: maclauss@umes.edu
Mike Scott	SU/ESRGC	T: 410-677-5390 E: msscott@salisbury.edu
Deepa Srinivasan	Vision Planning	T: 240-893-8719 E: dsrinivasan@vision-pc.net
Earl Canter	UMES	T:410-651-6646 E: emcanter@umes.edu
Peter Okemmuo	UMES	T: 410-651-6651 E: paokemmuo@umes.edu
Preston Cottman	UMES	T: 410-651-6652 E: plcottman@umes.edu
Marvin Jones	UMES	T: 410-651-6144 E: mljones@umes.edu

Tracie Bishop	UMES	T: 410-651-6383 E: tjbishop@umes.edu
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Ron Forsythe	UMES	T: 410-651-8371 E: rgforsythe@umes.edu
Quentin Johnson	UMES	T: E: qrjohnson1@umes.edu
Dale Pusey	Somerset County	T: E: ~~dpusey@ci.salisbury.md.us~~ dpusey@somersetmd.us
Lawrence Wright	UMES	T: 410-651-6593 E: lewright@umes.edu
Ronnie Holden	UMES	T: 410-651-6230 E:
Tracy Grangier	Town of PA	T: 410-651-1818 E: tgrangier@townofprincessanne.com
Maurice Ngwaba	UMES	T: 410-651-6229 E: mcngwaba@umes.edu
John Palmer	UMES	T: 410-651-7977 E:
Victoria Lloyd	Somerset County Emergency Mngmt	T: 410-651-3457 E: vlloyd@co.somerset.md.us
Phillip Thomas	Residence Life	T: 410-725-1076 E:
		T: E:
		T: E:

University of Maryland Eastern Shore
ALL-HAZARDS MITIGATION PLAN

Hazard Mitigation Committee Meeting #6
23 September 2009
2 pm – 4 pm

AGENDA

Summary of Previous Actions

Summary of Activity since Meeting #5

- **Summary of Flood Study Results**
- **Results of the Prioritization Matrix**
- **Sketches/ Cost Estimates on Recommended Actions**

Steps to Project Close-out

Adjournment

Hazard Mitigation Committee
Meeting No. 6

9-23-09

Steve Marsh, P.E.

GMB

Hazard Mitigation Committee
Meeting No. 6

Agenda – 9-23-09

Summary of Previous Activities

Summary of Activity since Meeting #5

- Summary of Flood Study Results
- Prioritization Matrix
- Sketches/ Cost Estimates on Recommended Actions

Steps to Project Close-out

Adjournment

GMB

Hazard Mitigation Committee
Meeting No. 6

Summary of Previous Activities

Meetings 1-3

- Overview of the Hazard Mitigation Plan Process
- Overview of Potential Hazards and Data Availability
- Building "Ranking" Process
- Presentation of Hazards / Particularly Important Buildings

GMB

Hazard Mitigation Committee
Meeting No. 6

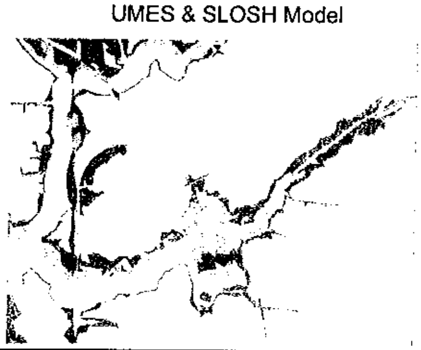
Particularly Important Buildings

- Trigg Hall
- Kiah Hall
- Henson Center
- Food Science & Technology Building
- Fitzgerald Performing Arts Center
- Williams Administration Building
- Waters Hall
- University Terrace
- Hazel Hall
- WESM Radio Station
- Physical Plant
- Public Safety
- President's House
- SRC Community Center
- Hytche Center
- Student Services Center

GMB

Hazard Mitigation Committee
Meeting No. 6

UMES & SLOSH Model



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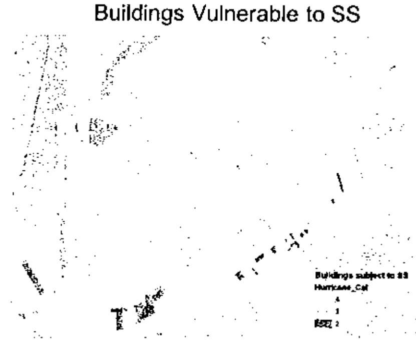
Hazard Mitigation Committee
Meeting No. 6

Buildings Vulnerable to SS



GMB

Hazard Mitigation Committee
Meeting No. 6

Summary of Previous Activities

Meetings 4-5

Review of Floodprone Areas
Discussion of Preliminary Mitigation Actions
Review of Flood Mitigation Actions
Review of Mitigation Strategy
Prioritization of Actions
  Life Safety Impact, Cost, Administrative Support

GMB

Hazard Mitigation Committee
Meeting No. 6

Proposed dFIRM is not consistent with known conditions on campus

GMB

Hazard Mitigation Committee
Meeting No. 6

Physical floodplain does not match the proposed regulated floodplain

GMB

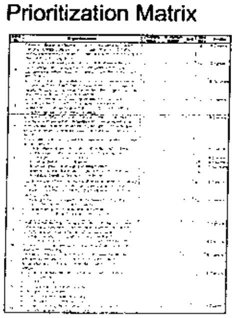
Hazard Mitigation Committee
Meeting No. 6

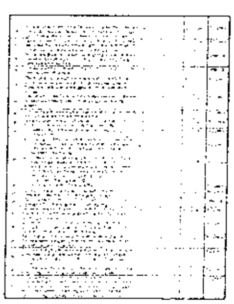
Flood WSE = 9.5' appears to be consistent with flooding observed on campus

GMB

Hazard Mitigation Committee
Meeting No. 6

Prioritization Matrix

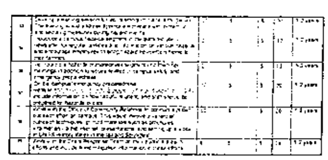


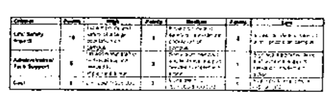


GMB

Hazard Mitigation Committee
Meeting No. 6

Prioritization Matrix





GMB

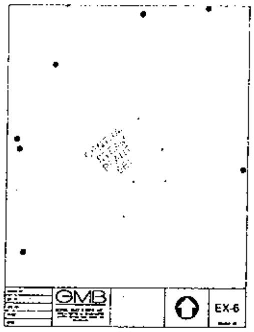
Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Central Steam Plant

Rather than build a flood wall …

Remove existing at-grade walls

Install watertight flood doors, stop logs and window inserts to prevent flood waters from entering building

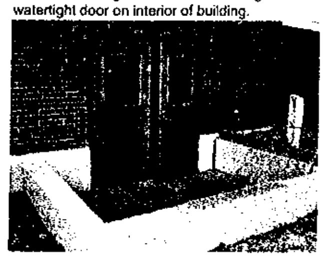


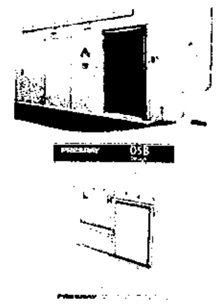
GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Central Steam Plant

Remove existing wall and install sliding watertight door on interior of building.



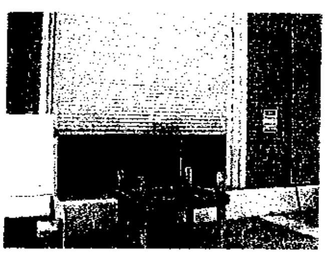


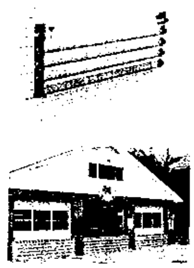
GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Central Steam Plant

Install flood-proof stop logs – raise the waterproof height of the overhead doors.



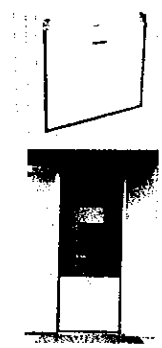


GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Central Steam Plant

Install expandable flood barrier in windows.



GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Central Steam Plant

Item No.	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate Unit Price	Engineer's Estimate Total Price
1	Furnish and Install Sliding Watertight Door	-	EA	2	12,500.00	25,000.00
2	Furnish and Install Window Flood Barrier	-	EA	2	1,250.00	2,500.00
3	Furnish and Install Garage Door Flood Wall	-	EA	2	5,500.00	11,000.00
4	Demolish Existing Concrete Floodwall	-	LF	60	100.00	6,000.00
5	Furnish and Install Gate Valves	TBD	EA	2	2,500.00	5,000.00
6	Mobilization	-	LS	1	500.00	500.00
SUBTOTAL						$50,000.00

Contingency 20% $10,000.00

Total Estimated Construction Cost $60,000.00

GMB

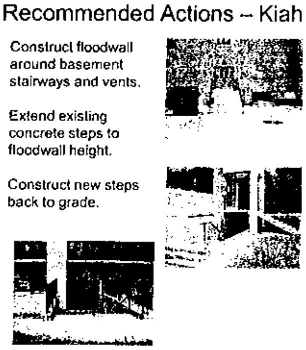
Hazard Mitigation Committee
Meeting No. 6

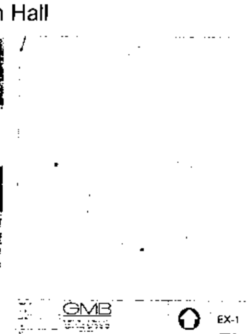
Recommended Actions – Kiah Hall

Construct floodwall around basement stairways and vents.

Extend existing concrete steps to floodwall height.

Construct new steps back to grade.





GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Kiah Hall

Item No.	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate: Unit Price	Engineer's Estimate: Total Price
1	Furnish and Install Flood Wall	-	L.F.	200	315.00	63,000.00
2	Furnish and Install Steps	-	C.Y.	43	550.00	23,650.00
3	Furnish and Install HDPE Storm Drain	12"	L.F.	100	50.00	5,000.00
4	Furnish and Install Catch Basin	-	EA	1	1,200.00	1,200.00
5	Demolition	-	LS	1	5,000.00	5,000.00
6	Mobilization	-	LS	1	2,000.00	2,000.00
SUBTOTAL:						$99,850.00

Contingency 20% $19,970.00

Total Estimated Construction Cost $119,820.00

GMB

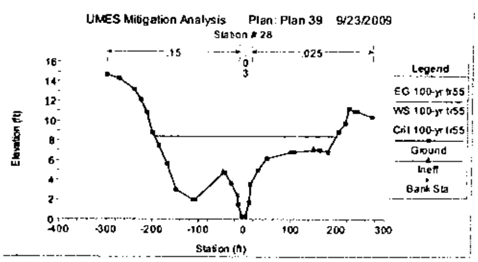
Hazard Mitigation Committee
Meeting No. 6

Flood WSE = 9.5' appears to be consistent with flooding observed on campus

GMB

Hazard Mitigation Committee
Meeting No. 6

Long Term Solutions – Flood Wall



GMB

Hazard Mitigation Committee
Meeting No. 6

Long Term Solutions – Flood Wall – El. 10.0'

GMB

Hazard Mitigation Committee
Meeting No. 6

Long Term Solutions – Flood Wall – El. 10.0'

Item No	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate: Unit Price	Engineer's Estimate: Total Price
1	Furnish and Install Flood Wall		L.F.	2365	350.00	827,750.00
2	Miscellaneous Storm Drain Repairs/Extensions	-	LS	1	100,000.00	100,000.00
3	Mobilization and ESC	-	LS	1	50,000.00	50,000.00
SUBTOTAL:						$977,750.00

Contingency 20% $195,550.00

Total Estimated Construction Cost $1,173,300.00

GMB

Hazard Mitigation Committee
Meeting No. 6

What happens when a culvert is blocked?

Seaford Flood, June '06

GMB

Hazard Mitigation Committee
Meeting No. 6

Seaford Flood, June '06

GMB

Hazard Mitigation Committee
Meeting No. 6

Seaford Flood, June '06

GMB

Hazard Mitigation Committee
Meeting No. 6

Railroad crossing at campus

GMB

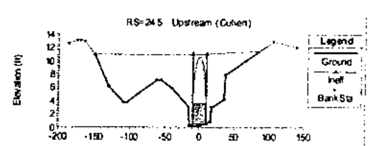
Hazard Mitigation Committee
Meeting No. 6

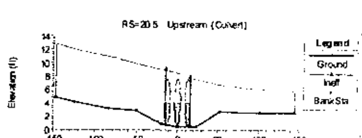
Hytche Blvd. crossing

GMB

Hazard Mitigation Committee
Meeting No. 6

Long Term Solution – Flood Wall – El 12.0'

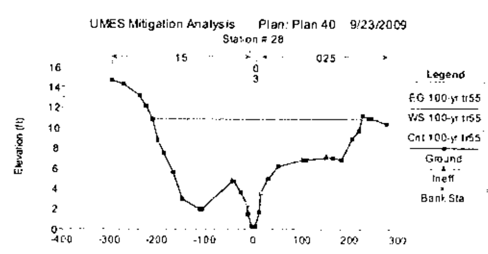




GMB

Hazard Mitigation Committee
Meeting No. 6

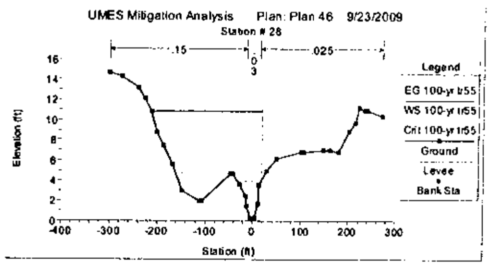
Long Term Solutions – Flood Wall



GMB

Hazard Mitigation Committee
Meeting No. 6

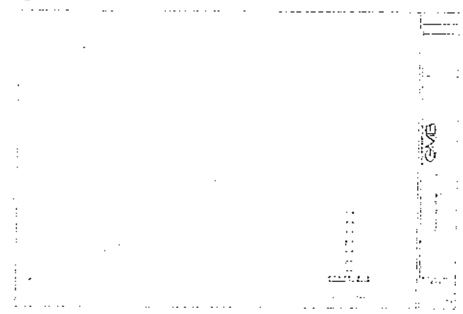
Long Term Solutions – Flood Wall



GMB

Hazard Mitigation Committee
Meeting No. 6

Long Term Solutions – Flood Wall – El. 12.0'



GMB

Hazard Mitigation Committee
Meeting No. 6

Long Term Solutions – Flood Wall – El. 12.0'

Item No	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate: Unit Price	Engineer's Estimate: Total Price
1	Furnish and Install Flood Wall	-	LF	3530	400.00	1,412,000.00
2	Miscellaneous Storm Drain Repairs/Extensions	-	LS	1	150,000.00	150,000.00
3	Mobilization and ESC	-	LS	1	75,000.00	75,000.00
SUBTOTAL:						$1,637,000.00

Contingency 20% $327,400.00

Total Estimated Construction Cost $1,964,400.00

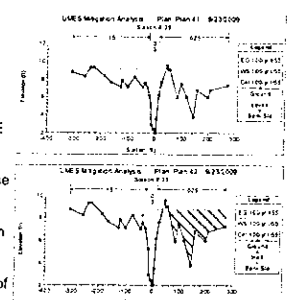
GMB

Hazard Mitigation Committee
Meeting No. 6

Long Term Solutions – Flood Wall

Potential Difficulties

- Need LOMR to apply for funding.
- Cost-Benefit Analysis may make funding difficult.
- Model results indicate upstream WSE increase of 0.5' with flood wall.
- Model results indicate a slight increase in flow downstream with flood wall.
- Political difficulties in coordinating with Town and County officials.
- Project will be unpopular, regardless of model results.

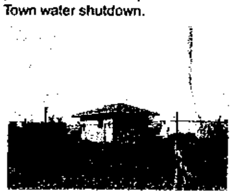


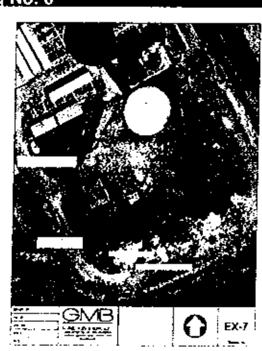
GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Campus Well

Install campus well. Well to discharge downstream of existing booster pumps. Install generator. Well to provide water to campus in case of Town water shutdown.





GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Campus Well

Item No	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate: Unit Price	Engineer's Estimate: Total Price
1	Furnish and Install Well and Pump	-	EA	1	80,000.00	80,000.00
2	Furnish and Install Water Treatment System	-	EA	1	15,000.00	15,000.00
3	Furnish and Install Water Main	2"	LF	103	25.00	2,575.00
4	Furnish and Install Generator	-	EA	1	20,000.00	20,000.00
5	Furnish and Install Transfer Switch and Miscellaneous Electrical Modifications	-	LS	1	15,000.00	15,000.00
6	Mobilization	-	LS	1	1,000.00	1,000.00
SUBTOTAL						$133,575.00

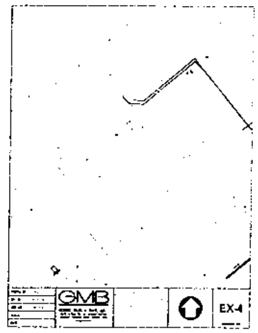
Contingency 20% $26,715.00

Total Estimated Construction Cost $160,290.00

GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Lightning Protection



GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Lightning Protection

Item No.	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate Unit Price	Engineer's Estimate Total Price
1	Furnish and Install Lightning Protection (WHC)	-	SF	115130	0.95	109,373.50
2	Furnish and Install Lightning Protection (SSC)	-	SF	97000	0.95	92,150.00
3	Furnish and Install TVSS (WHC)	-	EA	1	3,500.00	3,500.00
4	Furnish and Install TVSS (SSC)	-	EA	1	5,300.00	5,300.00
5	Mobilization	-	LS	1	1,000.00	1,000.00
SUBTOTAL:						$211,323.50

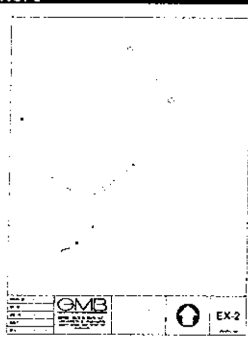
Contingency	20%	$42,264.70
Total Estimated Construction Cost		$253,588.20

GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Frederick Douglas Library

Install sump pump to remove rainwater from basement door.



GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Frederick Douglas Library

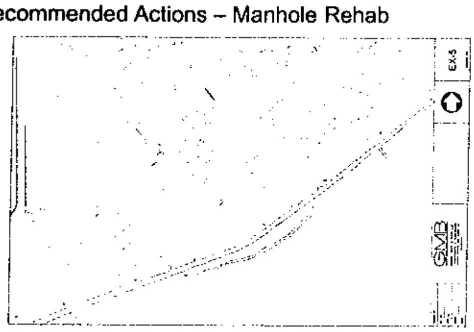
Item No	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate Unit Price	Engineer's Estimate Total Price
1	Furnish and Install Sump Pump	-	EA	1	1,500.00	1,500.00
2	Furnish and Install Storm Drain Force Main	2"	LF	245	25.00	6,125.00
3	Pavement Restoration	1.5"	SY	105	13.00	1,365.00
14	Mobilization	-	LS	1	1,000.00	1,000.00
SUBTOTAL:						$9,990.00

Contingency	20%	$1,998.00
Total Estimated Construction Cost		$11,988.00

GMB

Hazard Mitigation Committee
Meeting No. 6

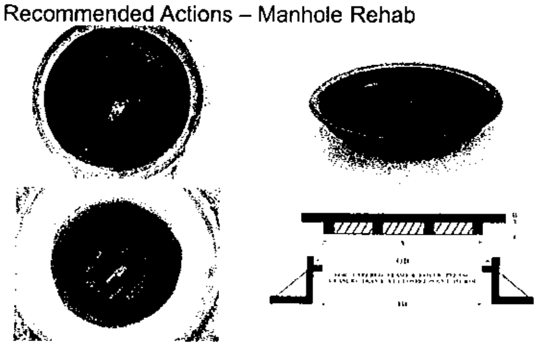
Recommended Actions – Manhole Rehab



GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – Manhole Rehab



GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions -- Manhole Rehab

Item No	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate: Unit Price	Engineer's Estimate: Total Price
1	Furnish and Install Manhole Rehabilitation	-	V.F.	80	215.00	17 200.00
2	Furnish and Install Watertight Manhole Insert	-	EA	8	150.00	1,200.00
3	Mobilization	-	LS	1	2,000.00	2,000.00
SUBTOTAL:						$20,400.00

Contingency 20% $4,080.00

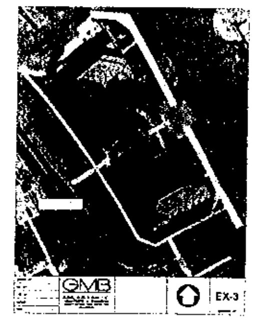
Total Estimated Construction Cost: $24 480.00

GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – University Terrace

Install emergency gate.



GMB

Hazard Mitigation Committee
Meeting No. 6

Recommended Actions – University Terrace

Item No.	Description	Size or Depth	Unit	Est Quantity	Engineer's Estimate: Unit Price	Engineer's Estimate: Total Price
1	Furnish and Install Gate Operator	-	EA	1	3,000.00	3,000.00
2	Pavement Restoration	1.5"	S.Y.	10	13.00	130.00
3	Miscellaneous Electrical Modifications	-	LS	1	1,000.00	1,000.00
14	Mobilization	-	LS	1	250.00	250.00
SUBTOTAL:						$4 380.00

Contingency 20% $676.00

Total Estimated Construction Cost: $5 256.00

GMB

Hazard Mitigation Committee
Meeting No. 6

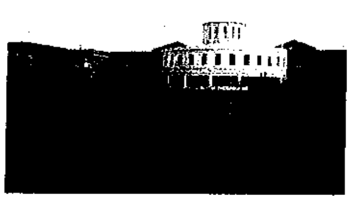
Steps to Project Close-out

1. Sept. 23rd – Committee Meeting #6
2. Oct. 12th - 2nd public meeting - 3-5 pm
3. Oct. 26th (or earlier) - final draft to UMES committee for review
4. 1st week in Nov. - UMES to forward draft to MEMA for review
5. Nov. 15 – FEMA extension expires - plan to be forwarded to FEMA prior to that date.
6. Nov. - plan review by Board of Regents

GMB

Hazard Mitigation Committee
Meeting No. 6

Thank you for your time this afternoon.



GMB

HAZARD MITIGATION COMMITTEE
MEETING NO. 6 MINUTES

Meeting No. 6
September 23, 2009

Distribution
All HMC Members
Amanda Pollack
Steve Marsh
Mike Scott
Deepa Srinivasan

Business

1. The purpose of todays meeting was to present and discuss the results of the flood study and look at several of the mitigation actions proposed in detail along with cost estimates. Meeting handouts included the agenda, FEMA time extension request letter, and copy of slide presentation.

2. Steve summarized the previous work that has been performed.

3. Ed provided an update on the FEMA performance period extension request and commented on public hearing no. 1 held July 16th.

4. Steve summarized the flood study results and then presented the following:
   a. Recommended actions to flood proof the central steam plant.
   b. Recommended actions to flood proof Kiah Hall
   c. Recommended actions to provide a new well to provide emergency operations water to shelters in the event water is not provided from Sanitary District.
   d. Lightning protection recommendations for the Student Service Center and the Hytche Center.
   e. Recommended actions to improve Library nuisance flooding - Maurice asked for additional investigation at the Library.
   f. Recommended actions to rehab sanitary manholes along Manokin River.
   g. Recommended action to install emergence gate at University Terrace. The committee advised that this was not necessary.

5. The security/police dept building was discussed. Maurice suggested looking at how we can mitigate mold/mildew problems which result from flooding under this building. Steve agreed to look into this. Steve suggested that consideration should be given to relocating the security dept to an area that it not floodprone.

6. Ed mentioned the next and final public meeting is in the process of being scheduled for October 12th in the PAC auditorium from 3-5pm. A public

announcement of the event is in the process of being finalized for publication and will be sent out to all HMC members.

7. No future HMC meetings are currently planned, however, the HMC will have the opportunity to review and comment on the draft plan as well as attend the upcoming public hearing on Oct 12th. The draft plan will be submitted to UMES on Oct 26 at the latest. This will be followed by submissions to MEMA, FEMA and UM Bd of Regents.

8. Steve has suggested that, following final plan approval by FEMA, that UMES coordinate with Princess Anne and the County and endeavor to make necessary computer model revisions and submit a Letter of Map Revision to FEMA for the flood plain maps. Steve will provide additional information on how GMB can assist in this process. A FEMA flood plain map revision will assist and likely benefit UMES to be eligible for grants to help accomplish some of the flood related projects that are being recommended in the All Hazards Mitigation Plan.

APPENDIX G

PUBLIC MEETING NO. 1

PRESS RELEASE

PRESENTATION

Sign-in Sheet
Public Meeting #1
UMES Hazard Mitigation Plan

Name	Contact Info
Michael Scott	msscott@salisbury.edu
Scott Jones	aquaponics@earthlink.net
Lori Jones	
ROBERT STREET	SOMERSET COUNTY SANITARY DISTRICT 410.651.3831
Tracy Grangier	tgrangier@townofprincessanne.com
MAURICE NGWABA	mngwaba@umes.edu
Ronnie Holden	UMES Reholden@umes.edu
Ed Johnson	UMES

Press Release for Open House/Public Meeting

UMES All-Hazards Mitigation Plan

Date: July 16, 2009
Time: 5PM-7PM
Location: UMES Ella Fitzgerald Performing Arts Center

Are floods, tornadoes, hurricanes and other natural hazards that could occur on the UMES campus of major concern to you?

UMES is holding an open meeting on Thursday July 16, 2009 to present the hazard identification and risk assessment of the natural hazards that could be faced by the UMES campus. The purpose of the meeting is to introduce students, faculty, and the community to the hazard mitigation planning process and solicit public input. The meeting will be held at the Ella Fitzgerald Performing Arts Center in the main auditorium to allow residents in the area to attend. This is the first public meeting in the planning process. The second open meeting will be held in September 2009. At the second meeting, recommendations will be presented, to address various hazards.

As a result of a grant from the Maryland Emergency Management Agency, UMES formed a Hazard Mitigation Committee (HMC) comprising of University Staff, Faculty, and municipal representatives from the Town of Princess Anne and Somerset County to assist with the Hazard Mitigation Planning Process. The HMC held its first meeting on February 10, 2009. Since that time, the Committee has worked together to develop the Plan which aims to: identify and prioritize various hazards; assess the campus' vulnerability to the hazards; and develop mitigation measures to help reduce UMES' vulnerability and prevent loss of life, injury, and property damage.

Lead organization for the All-Hazard Mitigation Plan:

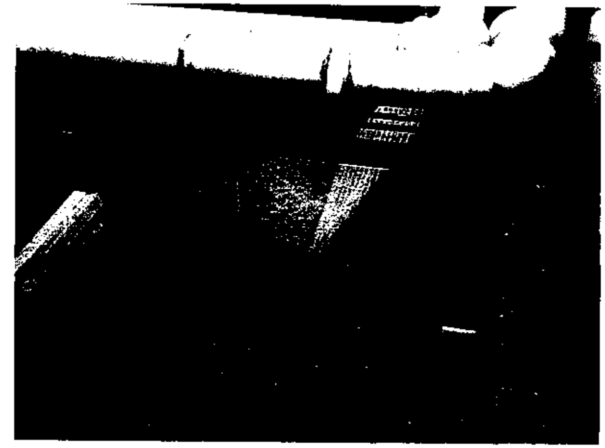
Facilities Planning, Design & Construction Department
11960 Backbone Road, Princess Anne, Maryland 21853

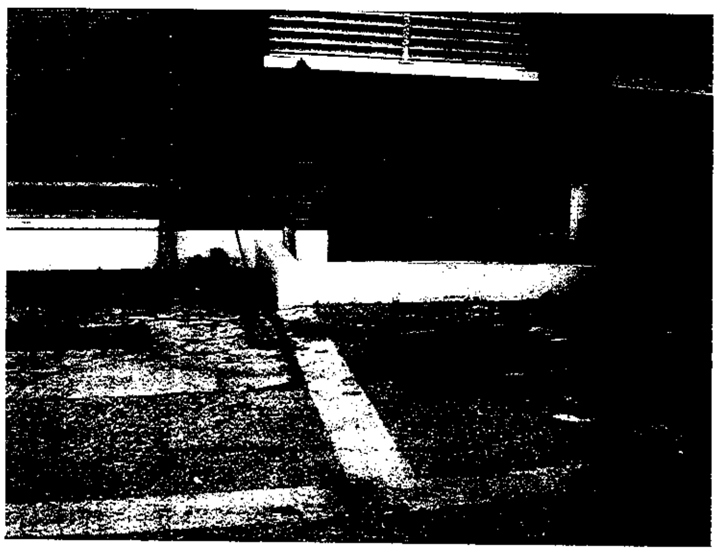
Point of Contact:

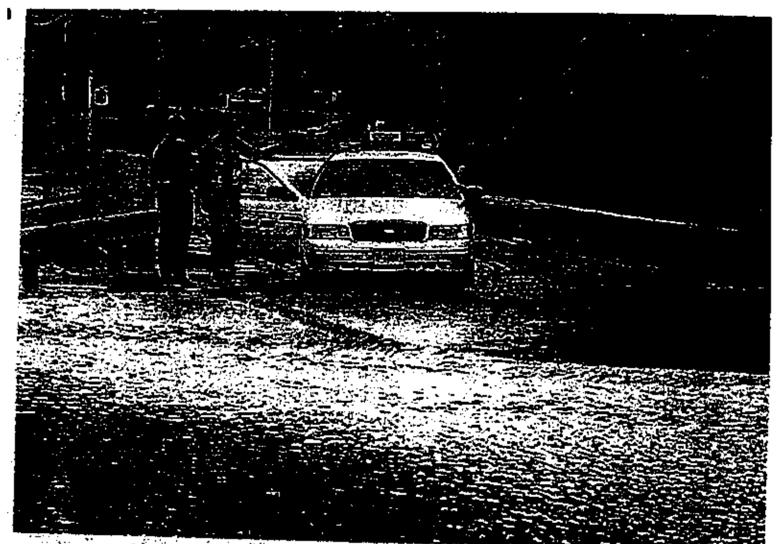
Ed Johnson
410-651-6340

Flooding

- Nuisance Flooding
- Isolated Flooding – due to undersize storm drain or localized grading
- Extreme event flooding
- Global flooding – floodplain/creek issues







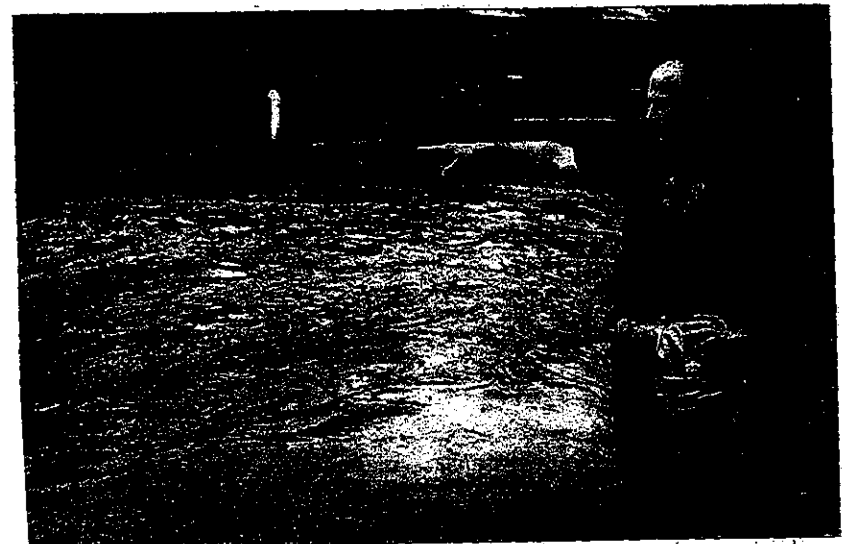
Princess Anne Police Chief Russell Pecoraro, left, and Town Manager Jay Parker survey flood waters on Somerset Avenue at the Manokin River bridge Friday morning.

Public Meeting No. 1

Flooding - Definitions

- Return Period or Recurrence Interval –
- An event that has a return period of 100 years means that it has a 1/100, or 1% chance, of being equaled or exceeded in any year.
- On average, over a long time, the 100 year event should happen about once every 100 years.
- However, the 100 year event could happen several times in a few years, or even several times in a year.
- A 100 year high tide is not the same event as a 100 year rainfall event.

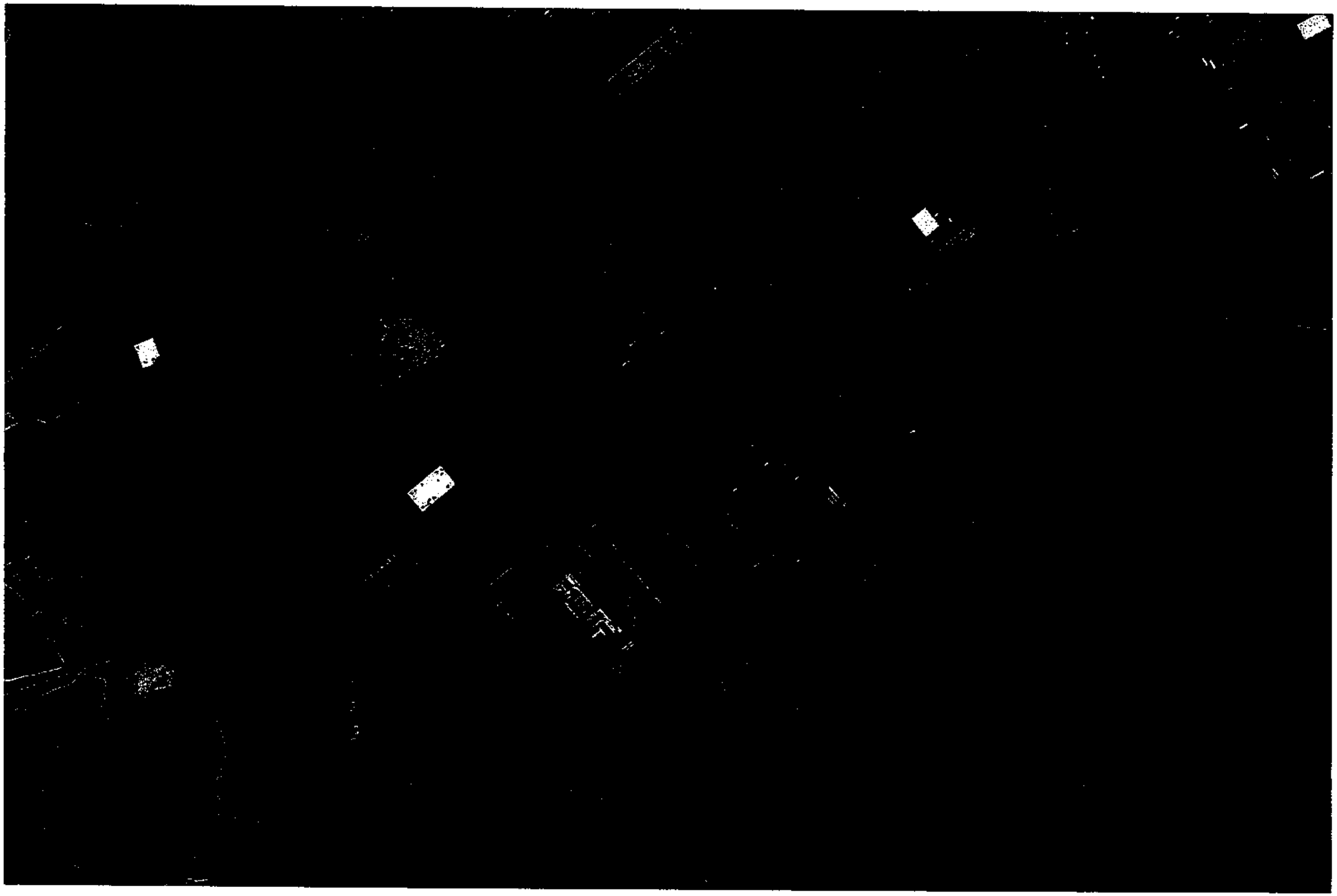
FLOOD WATERS



Princess Anne Police Chief Russell Pecoraro points to water rushing under the Somerset Avenue bridge Monday where three days worth of rain was draining into the Manokin River.

GMB
ARCHITECTS / ENGINEERS

Public Meeting No. 1



Proposed dFIRM (100 year flood event) is not consistent with known conditions on campus

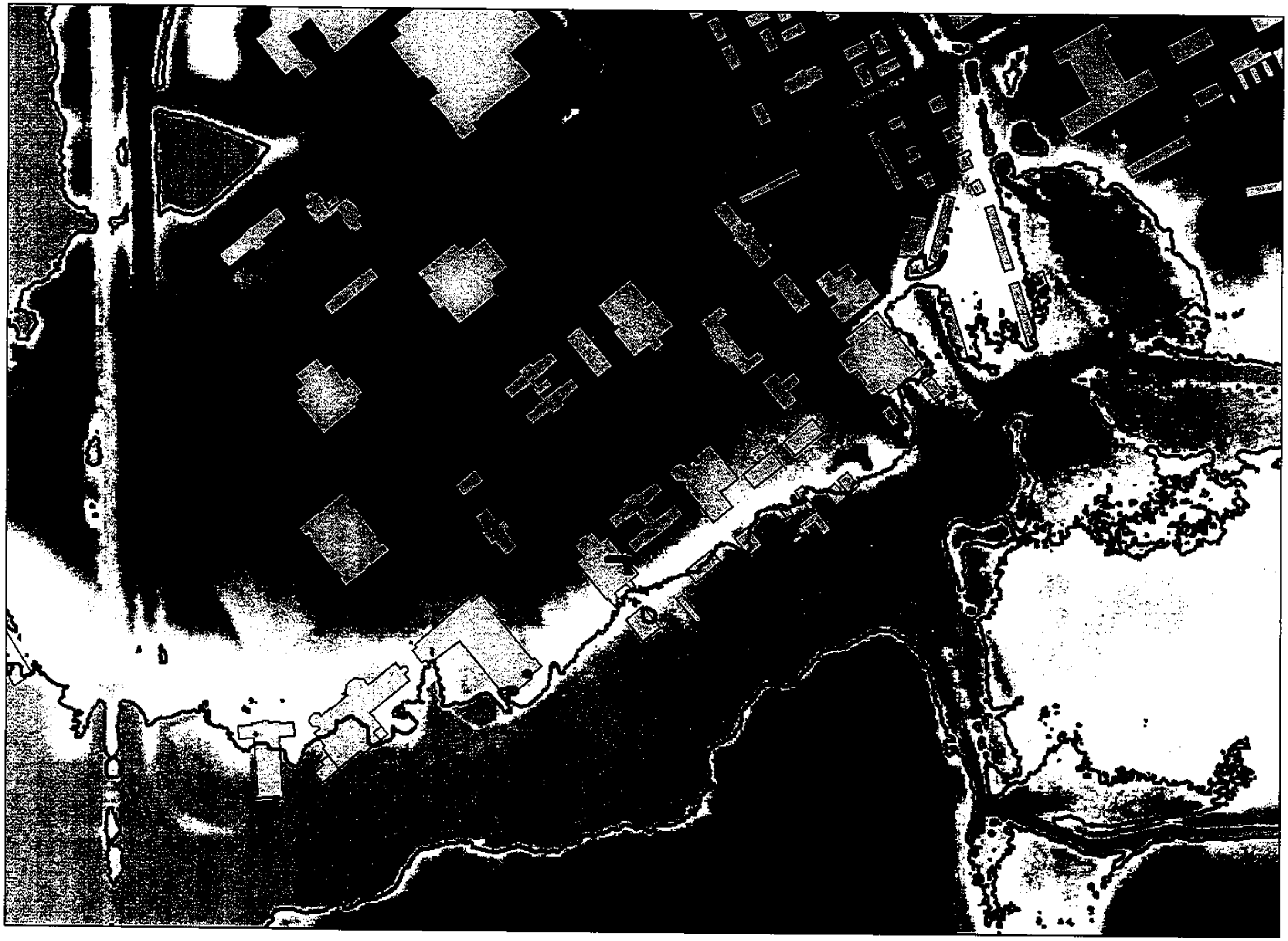
GMB ARCHITECTS / ENGINEERS

Public Meeting No. 1

Physical floodplain does not match the proposed regulated floodplain

GMB ARCHITECTS / ENGINEERS

Public Meeting No. 1



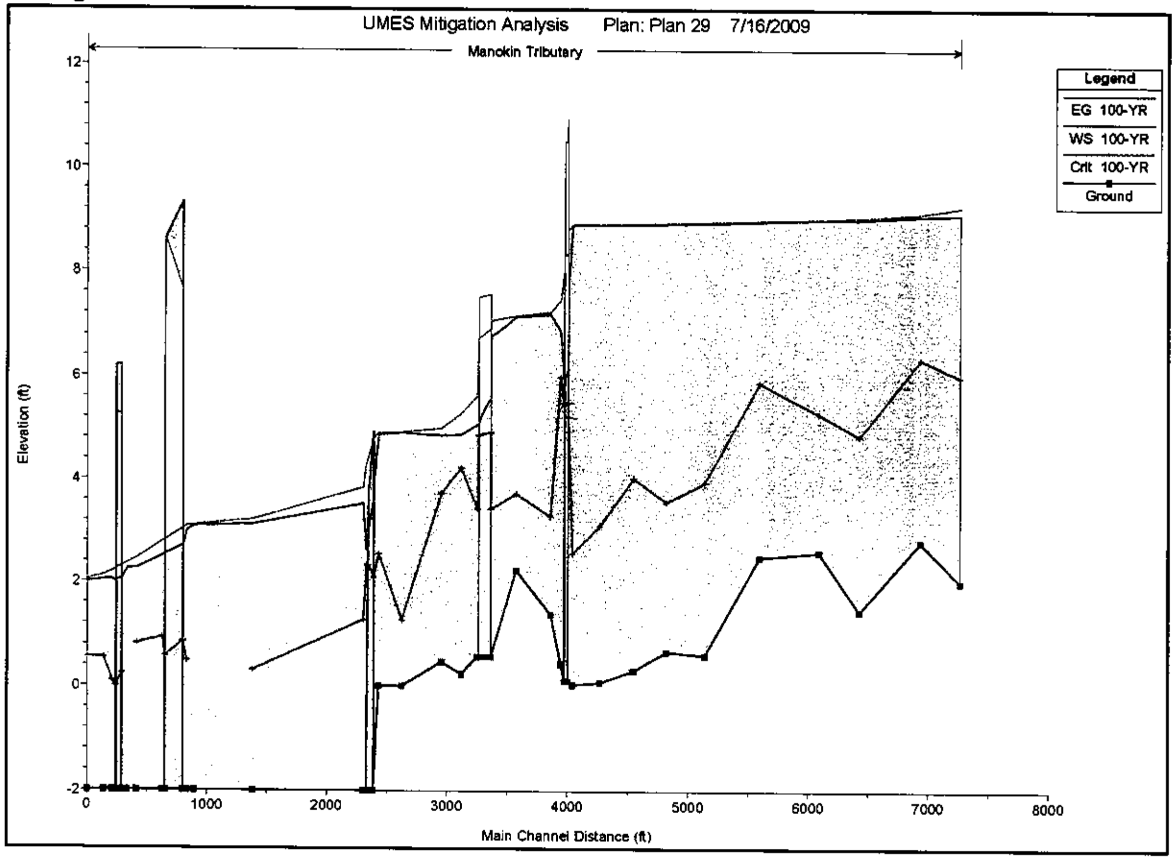
Flood WSE = 9.5' appears to be consistent with flooding observed on campus

GMB
ARCHITECTS + ENGINEERS

Public Meeting No. 1

Next Steps

- Sensitivity Analysis

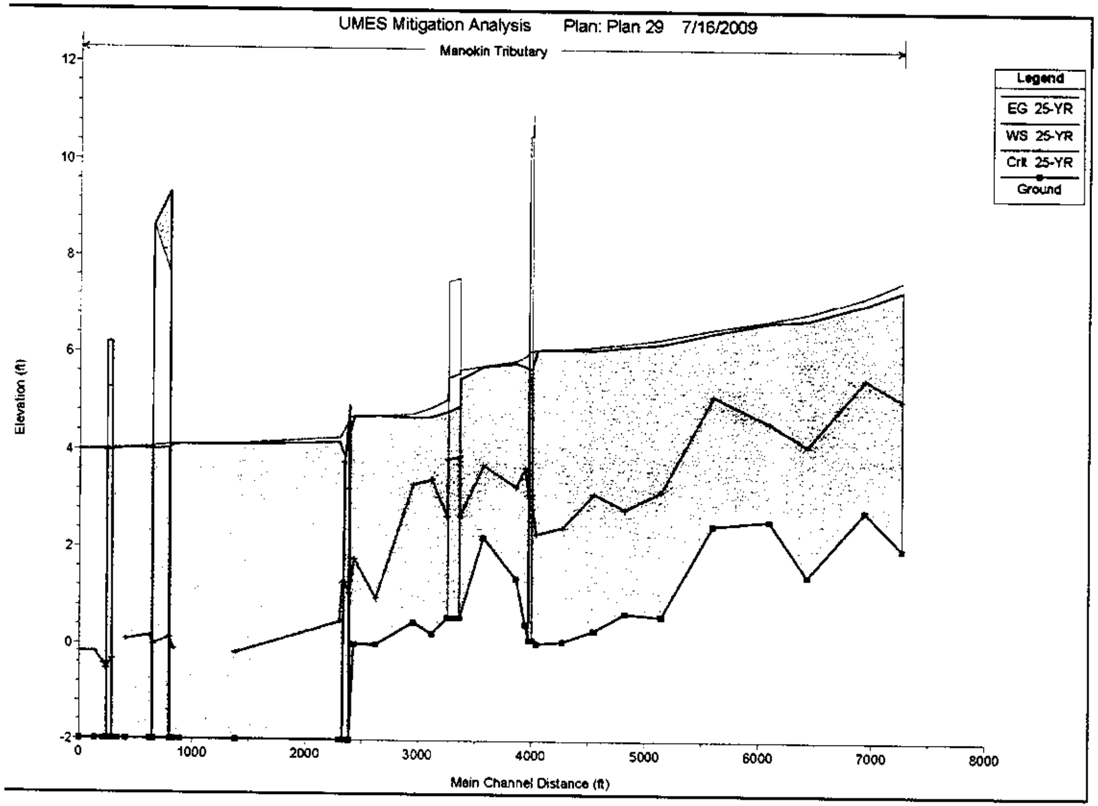


Preliminary HEC-RAS results – River profile – 100 year rainfall with a high tide of elevation 2.0'.

GMB ARCHITECTS / ENGINEERS

Next Steps

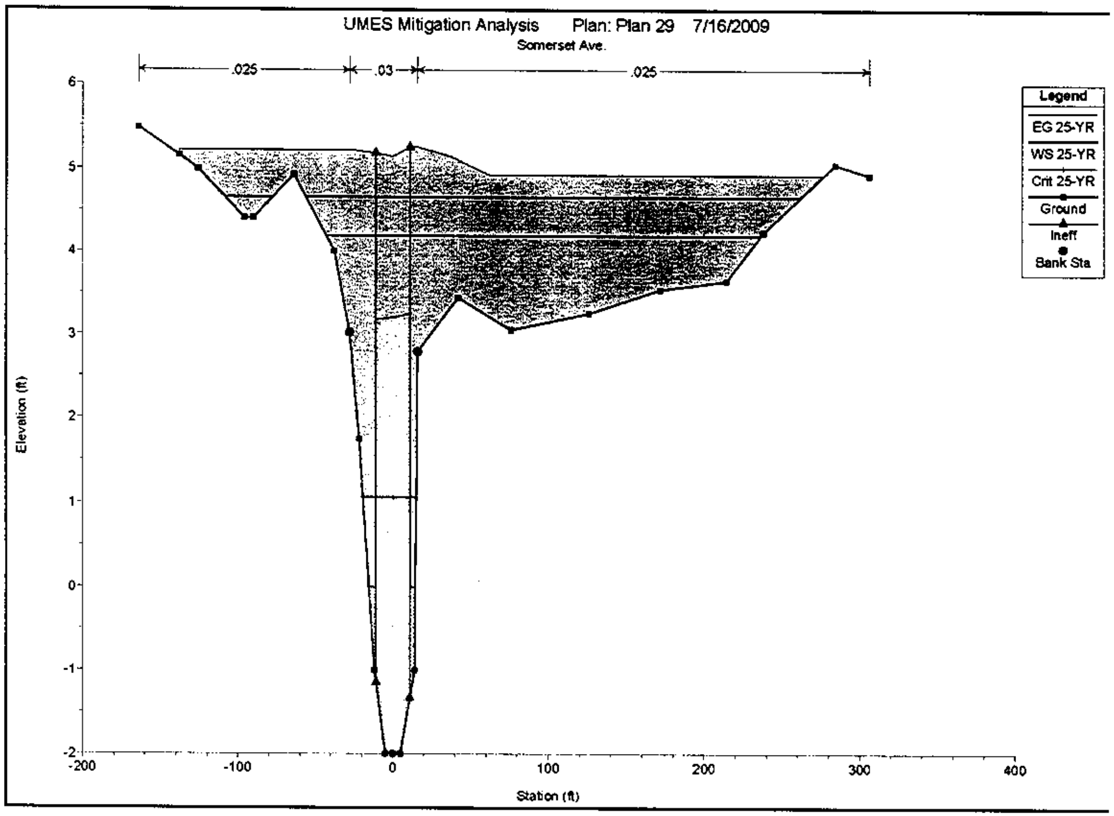
- Sensitivity Analysis



Preliminary HEC-RAS results – River Profile - 25 year rainfall with a high tide of elevation 4.0'.

Next Steps

- Sensitivity Analysis

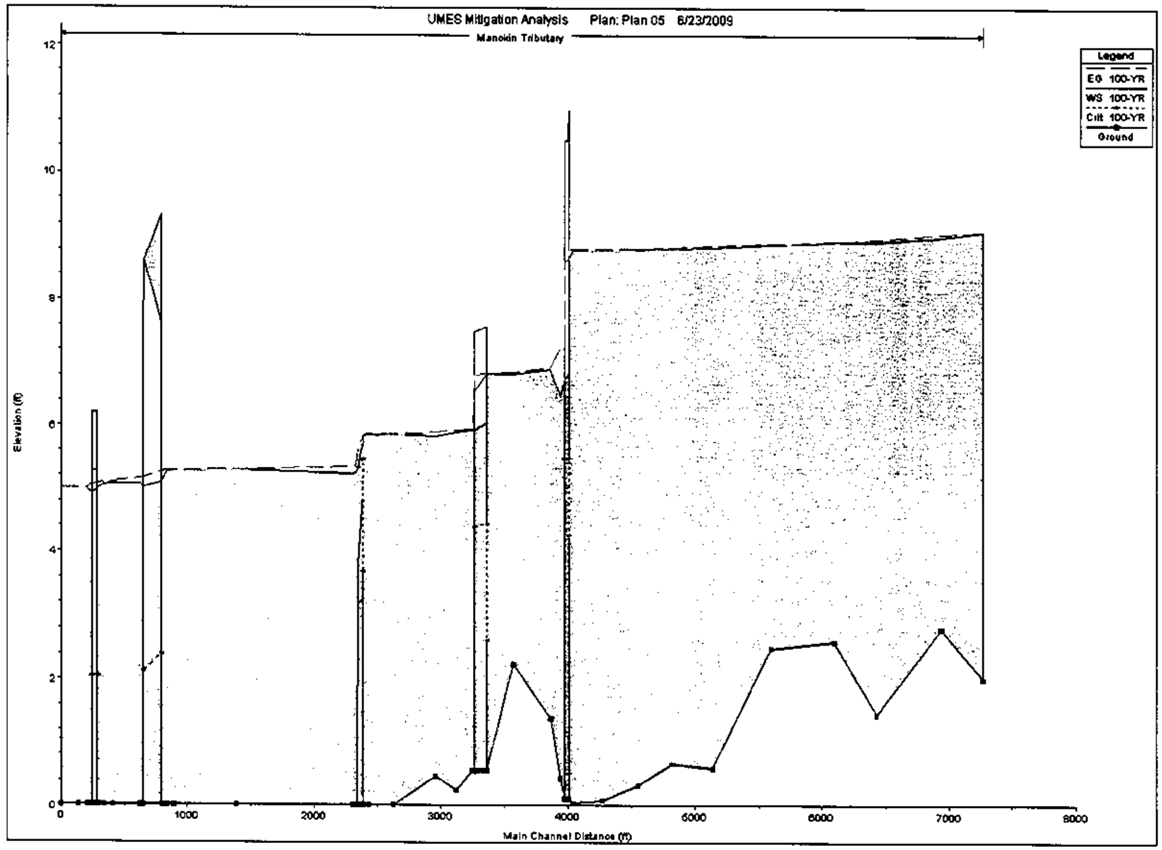


Cross Section at Somerset Avenue –
25 year rainfall with a high tide of 4.0'

Public Meeting No. 1

Next Steps

- Sensitivity Analysis

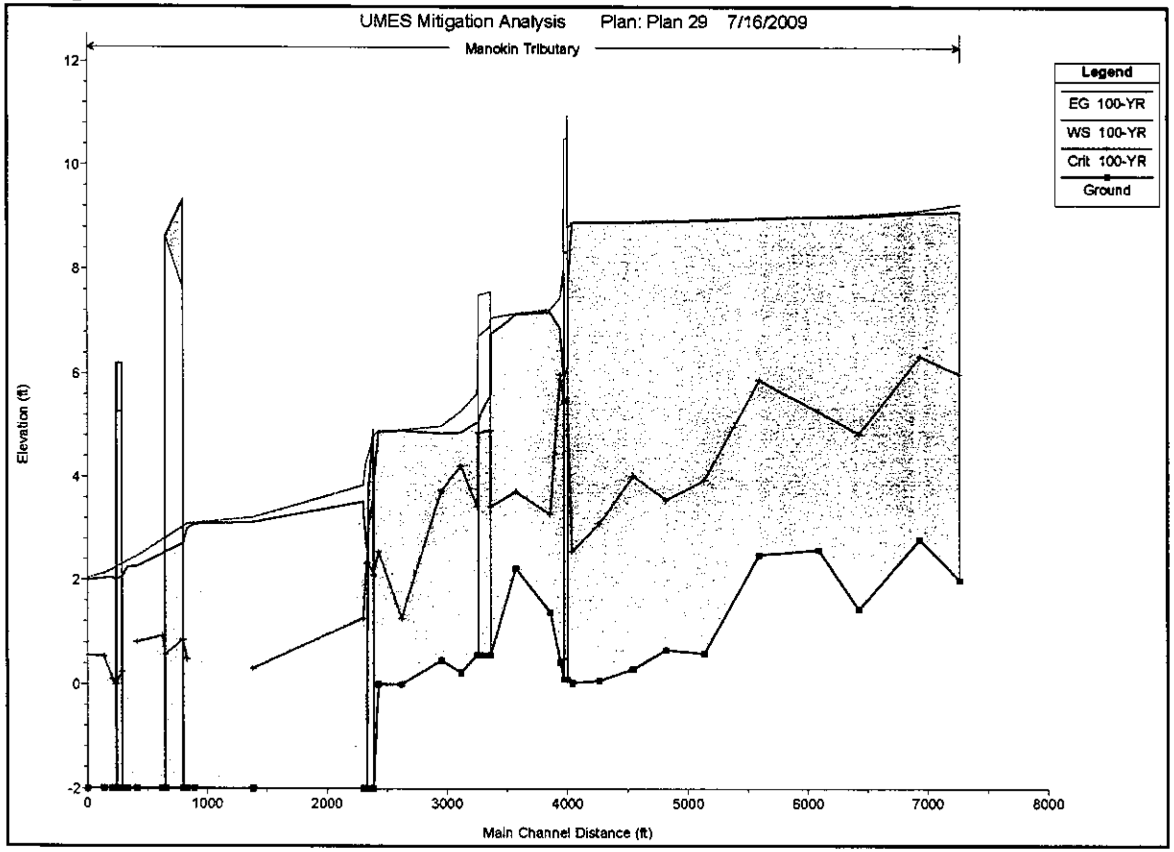


Preliminary HEC-RAS results – River profile – 100 year rainfall with a high tide of elevation 5.0'.

GMB
ARCHITECTS / ENGINEERS

Next Steps

- Sensitivity Analysis

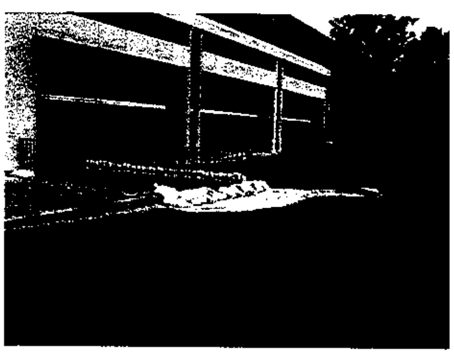


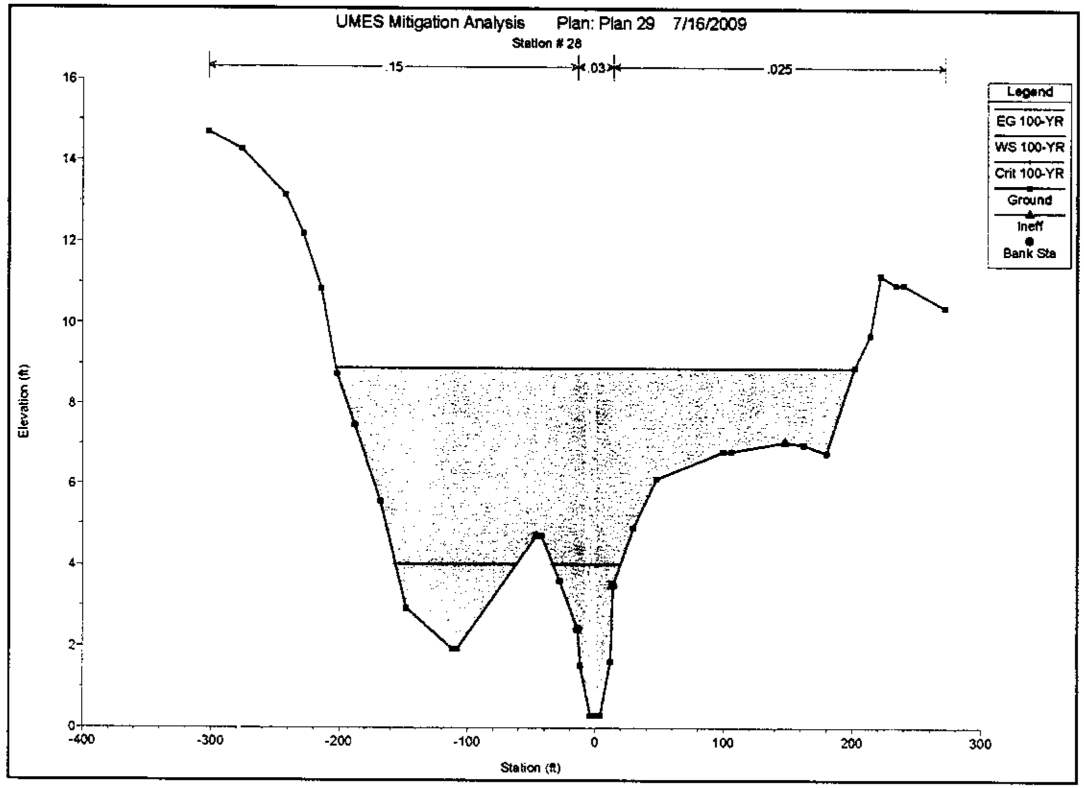
Preliminary HEC-RAS results – River profile – 100 year rainfall with a high tide of elevation 2.0'.

Public Meeting No. 1

Next Steps

- Finalize Hydraulic / Hydrology model
- Assign a frequency (return period) to previously observed flooding events
- Determine Base Flood Elevation
- Coordinate with FEMA to revise FIRM, as necessary





Cross Section near Kiah Hall–
100 year rainfall with a high tide of 2.0’

GMB ARCHITECTS / ENGINEERS

APPENDIX H

PUBLIC MEETING NO. 2

PRESS RELEASE

PRESENTATION

For Immediate Release:
No. 2587

September 23, 2009

UMES invites community to open meeting on natural disasters

PRINCESS ANNE, MD- An open meeting of the All-Hazards Mitigation Plan for the University of Maryland Eastern Shore will be held on Monday, October 12, from 3-5 p.m. in the Ella Fitzgerald Center for the Performing Arts. Natural hazards that could face the university will be discussed.

"This is the second and final public meeting being held to educate students, faculty, staff and the community about the hazard mitigation planning process and to introduce the project goals and mitigation actions that are being proposed," said Ed Johnson, a civil and structural engineer in the Facilities Planning, Design and Construction Department at UMES. A copy of the draft plan will be available for review.

As a result of a grant from the Federal Emergency Management Agency, UMES formed a Hazard Mitigation Committee comprised of university staff, faculty and municipal representatives from the Town of Princess Anne and Somerset County. According to Johnson, the committee developed a plan to identify and prioritize various natural hazards, to assess the campus' vulnerability to the hazards and is now completing the final phase of identifying mitigation measures and program goals to help prevent loss of life, injury and property damage.

For more information, contact Ed Johnson at 410-651-6340 or by email at ehjohnson@umes.edu.

###

All-Hazards Mitigation Plan
University of Maryland Eastern Shore

[illegible] Public Meeting
12 October 2009

Presented by
Steve Marsh, PE GMB
[illegible] Planning and Consulting, LLC
Dr. [illegible] Scott, ESRGC Salisbury University

Project Purpose

"To provide a mechanism for the University through which, the likelihood of threat to the land, structures, and constituents from natural hazards (e.g., flood, wind, tornadoes, hurricanes, wildfire, drought, etc.) can be assessed and to devise an action plan to reduce the impact of those threats and to develop a road map for future efforts."

Key Players

- UMES Staff
- Stakeholders
- Hazard Mitigation Committee (HMC)
- Local Representatives
- Consultants
  - Steve Marsh and Amanda Pollack, Civil Engineers, GMB
  - Deepa Srinivasan, President, Vision Planning & Consulting, LLC
  - Dr. Mike Scott, Director, Eastern Shore Regional GIS Cooperative @ Salisbury University
- Public
- Maryland Emergency Management Agency (MEMA)
- Federal Emergency Management Agency (FEMA)

Project Goals

The All-Hazard Mitigation Plan for UMES will:

- Satisfy work requirements provided in the Request for Proposal for the Hazard Mitigation Plan for the University;
- Satisfy requirements of the Disaster Mitigation Act of 2000 (DMA 2000);
- Incorporate information from publications from the Federal Emergency Management Agency (FEMA) - *State and Local Mitigation Planning, and Building a Disaster-Resistant University;*
- Help reduce the risk of loss of life, personal injury and property damage to the County's residences and businesses by identifying the flood risk;
- Include mitigation strategies to address the risk within the University; and
- Gain approval from the MEMA and FEMA, paving the way for future federal funding of mitigation projects.

Steps in the Planning Process

1. Organize work group and facilitate the process
2. Hazard assessment and vulnerability analysis
3. Assess local capabilities
   - Existing plans, programs, policies
   - Personnel and equipment resources
   - Local codes and zoning ordinances
   - Current and proposed construction projects
4. Develop goals and objectives and mitigation actions
5. Write mitigation plan and prioritize projects
6. Implement the plan
   - Priorities for Mitigation Action
   - Five-Year Plan Maintenance Cycle

Meetings

6 Hazard Mitigation Committee Meetings
- Meeting 1: Planning process, schedule, deliverables, capability assessment
- Meeting 2: Hazard identification, asset inventory
- Meeting 3: Hazard/vulnerability assessment
- Meeting 4: Goals and objectives, mitigation actions
- Meeting 5: Mitigation actions prioritization and implementation
- Meeting 6: Architectural/engineering project details

2 Public Meetings
- Meeting 1
  - Planning process, capability assessment
  - Hazard identification, risk assessment, asset inventory
- Meeting 2
  - Goals and objectives
  - Mitigation actions and implementation

Schedule

Task	January	February	March	April	May	June	July	August
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Plan Elements

- Preventive Measures
- Property Protection
- Emergency Services
- Structural Projects
- Natural Resource Protection
- Public Information

Floodprone Buildings along Tributary

- Heating Plant
- Carver Hall
- Murphy Hall
- Murphy Annex
- Waters Hall
- Banneker
- Spaulding
- Tanner
- Thomas and Briggs
- Public Safety Building
- Hazel Hall
- Temporary Classrooms
- Modular Buildings
- Student apartments

Asset Inventory Summary

- Ranked each building on campus according to its value in the following categories:
  - Academic, Research, Administration, Support, Communications, Residence Life, Utility Delivery, & Emergency Response
- Sum of scores yielded 16 buildings of particular overall importance, with 5 ranked as "critical"

Priority Buildings

- Trigg Hall
- Kiah Hall
- Henson Center
- Food Science & Technology Building
- Fitzgerald Performing Arts Center
- Williams Administration Building
- Waters Hall
- University Terrace
- Hazel Hall
- WESM Radio Station
- Physical Plant
- Public Safety
- President's House
- SRC Community Center
- Hytche Center
- Student Services Center

Hazard Identification & Profiling

- Data Sources
  - Federal Emergency Management Agency
  - National Climatic Data Center
  - University of South Carolina
  - US Army Corps of Engineers (Philadelphia)
  - Maryland Geological Survey
  - US Department of Transportation
  - US Geological Survey
  - US Department of Agriculture
- Primarily data for Somerset County

Critical Hazards

- Floods
- Wind
- Lightning
- Earthquakes
- Winter Storms
- Wildfire
- Hail
- Extreme Temperatures
- Droughts
- Hazardous materials release

FIRM Extent

UMES & SLOSH Model

Buildings Vulnerable to SS

Wind

- Air moving (sometimes with considerable force) from an area of high pressure to an area of low pressure
  - Tropical storms/hurricanes, tornadoes, thunderstorms
- Geographic Extent: Entire study area is possible
- Severity: Moderate severity
- Impact on life and property
  - 11 casualties, $8.1 million in property damage
- Occurrence from 1960 - 2007
  - Tropical storm wind: 9 occurrences
  - Tornadic wind: 5 occurrences
  - Thunderstorm wind: 64 occurrences

Lightning

Abrupt electric discharge from cloud to cloud or from cloud to earth accompanied by the emission of light

Geographic Extent: Entire study area is possible

Severity: Minimal

Impact on life and property

- 3 casualties, $330 K in property damage

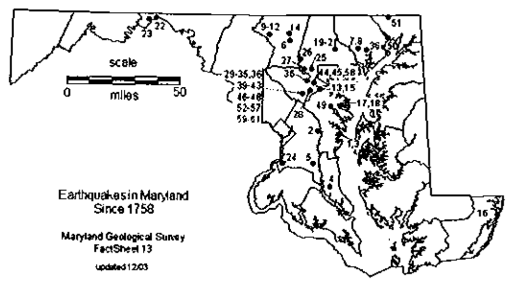
Occurrence

- 11 occurrences from 1960 - 2007

Earthquake

- Shaking and vibration at the surface of the earth resulting from underground movement along a fault plane
- Geographic Extent: Entire study area is possible
- Severity:
  - All events have had magnitude of 3.7 or less
- Impact on life and property: None
- Occurrence (in Maryland)
  - 62 occurrences from 1758 – 2005

MGS: Maryland Earthquakes



Winter Storm

- Weather hazard associated with freezing or frozen precipitation or combined effects of winter precipitation and strong winds
- Geographic Extent: Entire study area is possible
- Severity: Moderate
- Impact on life and property
  - 38 casualties, $3.6 million in property damage
- Occurrence
  - 65 occurrences from 1960 - 2007

Wildfire

- A wildfire, also known as a wildland fire, forest fire, or brush fire, is an uncontrolled fire often occurring in wildland areas, but which can also consume houses or agricultural resources
- Geographic Extent: Entire study area is possible
- Severity: Minimal
- Impact on life and property
  - None
- Occurrence
  - 2 from 1960 - 2007

Hail

- Form of precipitation which consists of balls or irregular lumps of ice (hailstones)
- Geographic Extent: Entire study area is possible
- Severity: Minimal
- Impact on life and property
  - No casualties, $3.1 million in property damage
- Occurrence
  - 32 occurrences from 1960 - 2007

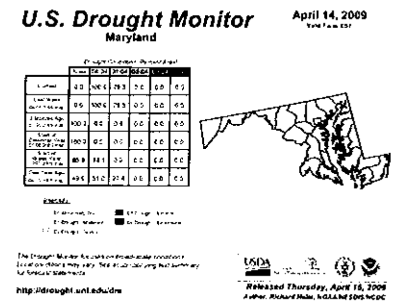
Extreme Temperature

- Temperatures that reach far above or below normal
- Geographic Extent: Entire study area is possible
- Severity: Minimal
- Impact on life and property
  - 5 casualties, $35 k in property damage
- Occurrence
  - 10 occurrences from 1960 to 2007
    - 1 extreme cold, 9 excessive heat

Drought

- Drought is a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area
- Geographic Extent: Entire study area is possible
- Severity: Moderate
- Impact on life and property
  - No casualties, $6.1 million in property damage
- Occurrence
  - Severe drought has occurred about once every 10 years since 1930

USDA: Current Drought



Hazardous Materials Release

- Accidental release of a chemical known to cause acute or chronic health effects
- Geographic Extent: Area near the railroad
- Severity: Unlikely to be high
- Impact on life and property
  - None
- Occurrence
  - None since 1996

HazMat on Norfolk Southern

- 7 different hazardous materials moving through Princess Anne in the past 12 months and their Protective Action Distances
  - Petroleum gases (most likely LPG) – 330 ft
  - Corrosive liquid, basic - 150 ft
  - Propane – 330 ft
  - Pentanes (like gasoline or fuel oil) – 150 ft
  - Other regulated – 150 ft
  - Flammable liquids, N.O.S. – 150 ft
  - Other regulated – 150 ft

Norfolk Southern PAD

Ranking of Hazards for Vulnerability Assessment

Not all hazards pose the same level of threat – there is a need focus efforts on those hazards that pose the greatest threat to UMES

Hazards are ranked (low, medium, high) according to five criteria

Those hazards ranked highly will be examined with a detailed vulnerability assessment.

Ranking Criteria

- History: High ranking indicates the hazard has occurred often
- Potential for mitigation: High ranking suggests that there are ways to address the threat that are feasible and cost-effective
- Presence of susceptible areas: High ranking indicates that UMES has many facilities and/or populations at risk for a hazard
- Data availability: High ranking confirms sufficient quality data exists to assess the vulnerability
- Federal and local disaster declarations: High ranking is given to those hazards that have caused previous significant disasters

Ranking Results

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Flood	3	3	3	3	3	15
Wind	3	3	3	2	3	14
Lightning	3	2	2	2	1	11
Earthquake	1	2	3	3	1	10
Winter Storm	2	2	2	2	2	10
Drought	2	1	2	2	2	9
Wildfire	1	1	2	2	1	7
Hail	2	1	1	1	1	6
Extreme Temp	1	1	1	2	1	6
HazMat Release	1	1	1	2	1	6

Goals

Prevention

- *Goal 1: Integrate hazard mitigation principles in existing plans and guidances.*
- *Goal 2: Coordinate mitigation policies and actions with the Town of Princess Anne and Somerset County.*

Property Protection

- *Goal 3: Ensure that any new construction and renovation of buildings makes them resistant to one or more hazards.*

Goals

Emergency Services

- *Goal 4: Reduce potential impacts to critical facilities and make them less vulnerable to hazards.*
- *Goal 5: Improve coordination and notification procedures during emergencies.*

Structural Projects

- *Goal 6: Ensure regular maintenance of the University's infrastructure within the 100-year floodplain.*

Goals

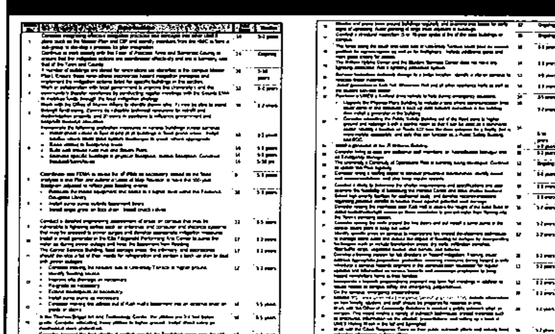
Natural Resource Protection

- *Goal 7: Protect existing natural resources and open-space within the floodplain and watersheds.*

Public Information

- *Goal 8: Improve public awareness and outreach during hazard events through education.*

Mitigation Actions



Proposed dFIRM is not consistent with known conditions on campus

Physical floodplain does not match the proposed regulated floodplain

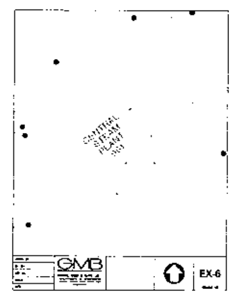
Flood WSE = 9.5' appears to be consistent with flooding observed on campus

Recommended Actions – Central Steam Plant

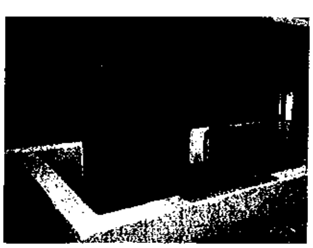
Rather than build a flood wall ...

Remove existing at-grade walls

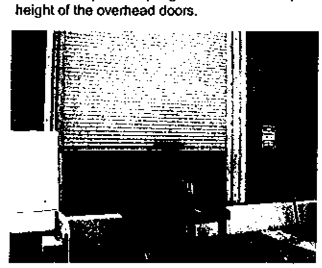
Install watertight flood doors, stop logs and window inserts to prevent flood waters from entering building



Remove existing wall and install sliding watertight door on interior of building.



Install flood-proof stop logs – raise the waterproof height of the overhead doors.



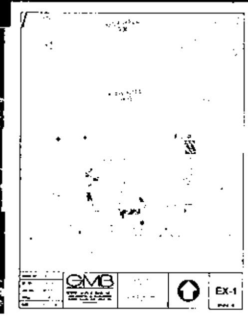
Recommended Actions – Central Steam Plant

Install expandable flood barrier in windows.

Construct floodwall around basement stairways and vents.

Extend existing concrete steps to floodwall height.

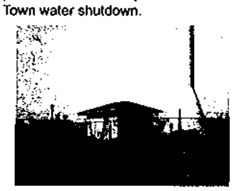
Construct new steps back to grade.

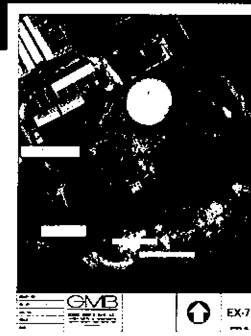


Flood WSE = 9.5' appears to be consistent with flooding observed on campus

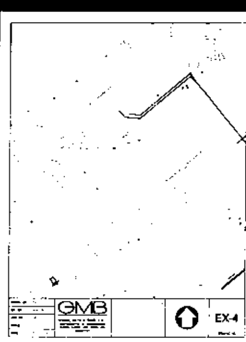
Recommended Actions – Campus Well

Install campus well. Well to discharge downstream of existing booster pumps. Install generator. Well to provide water to campus in case of Town water shutdown.



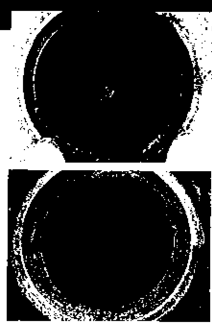


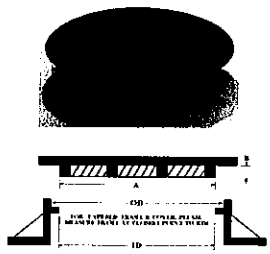
Recommended Actions – Lightning Protection



Recommended Actions – Frederick Douglas Library

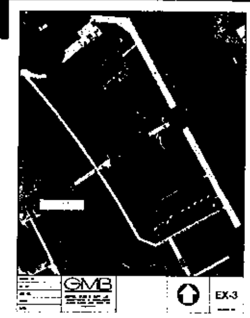
Install sump pump to remove rainwater from basement door.





Recommended Actions – University Terrace

Install emergency gate.



Final Steps

- Preparation of final document for review by UMES
- Review by Hazard Mitigation Committee
- Review by Maryland Emergency Management Agency
- Review by Federal Emergency Management Agency
- Adoption of Plan by UMES Board of Regents