This document is a redacted public version of the UM-Flint Hazard Mitigation Plan. Sensitive information is contained in the plan, and owing to the safety and security of the university community this information has been carefully redacted and/or held out of this public version of the plan. The redactions do not diminish demonstrating the robust planning process that took place to develop the final hazard mitigation goals. The elements contained in Section 9 of the plan contain sensitive information which would compromise the safety and security of the university community if widely distributed to the public. The table of contents for the plan outlines the content within these elements. Even with redacting in place, it is important to understand that all of the key planning elements exist within the body of the plan including the Risk Assessment, Vulnerability Analysis, and the Identification and Prioritization of the Mitigation Goals. Please contact UM-Flint Environment, Health and Safety if you should have any questions or concerns.
The University of Michigan – Flint
Multi-Hazard Mitigation Plan

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Section 1: Introduction

I. Background & Purpose

Hazard mitigation encompasses the pre-incident process of identifying, quantifying and mitigating risks in an attempt to contain them and ensure that event outcomes are controlled to the maximum extent possible. Successful approaches to hazard mitigation focus upon acting proactively to reduce the potential for negative event outcomes. While risk can never be reduced to zero, attempts can be made to minimize them to such a degree that hazard related events do not produce impacts that could be characterized as disastrous to the university community—students, faculty, and staff or its facilities and infrastructure.

There are many reasons for The University of Michigan-Flint (UM-Flint) to pursue the aggressive reduction of risk. Mitigation can address exposures that exist across the university’s facilities and operations, or that result from the university’s physical and cultural placement in the community. The university occupies a unique position in the City of Flint and during the planning process a recurring theme emerged in that the university is a vital part of a community that has experienced many economically adverse changes over the past several decades. The university is a vital economic engine for the City of Flint. If the university were to experience significant operational or physical impact, it would reflect directly and immediately upon the vitality of downtown Flint.

In order to address how adverse events might impact the university, a wide range of hazard exposures were examined, along with how those exposures might translate as risks to the university. The process involved the evaluation of the vulnerabilities across of the university, evaluation of existing mitigation measures that the university pursues to control risks, the effectiveness of these, and how the overall risk profile of the university could be improved.

The list below summarizes the outcomes that might occur as a result of hazard driven events and could include:

- Loss of human life,
- Injuries to students, faculty, staff or campus visitors,
- Property damage to university utilities, facilities, infrastructure and information technology systems,
- Loss of instructional facilities,
- Student, Faculty and Staff departures if there were to be a loss of confidence in the safety and security at the university,
Section 1: Introduction

- Increases in insurance premiums, and
- Reduced Alumni and/or Foundation funding.

If the university were to experience a catastrophic event that significantly impaired its ability to conduct normal operations for an extended period of time, the local community would inevitably suffer as well. The university-community relationship is even more important when the university is located in a town such as Flint that has experienced the negative effects of a long term societal shift involving deindustrialization, and a vast reduction in the size of the automobile manufacturing employment base that the city once enjoyed.

Mitigation is essential in the emergency management process because it has the potential to lessen all of the outcomes discussed above.

The UM-Flint Multi-Hazard Mitigation Plan was created to further protect the health and safety of the students, faculty, staff and visitors; as well as to provide for enhancement of property and asset protection. The university considers the development of this plan to be a beginning rather than an end to a process. Prior to receiving the FEMA Grant to develop this plan, the university was already proactively pursuing risk mitigation efforts that are summarized throughout this document.

The university took the opportunity of receiving this grant to build upon these efforts and develop several significant tools that can be used for risk mitigation efforts going forward. Outcomes such as the GIS mapping work, and enhancement of the Environment, Health and Safety website are just two such examples that are highlighted in the plan.

While the university maintains significant and on-going community involvement participation with stakeholder groups such as the Genesee County Office of Emergency Management, the Local Emergency Planning Committee, the Genesee County Health Department, local Police/Fire/EMS, and the Flint River Corridor Alliance during this process allowed the campus to strengthen the level of community involvement. The UM-Flint Hazard Mitigation Plan positions the university as a leader in local Emergency Management.

II. Authority

The UM-Flint Multi-Hazard Mitigation Plan was created in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The University of Michigan Flint was awarded a Pre Disaster Mitigation (PDM) Grant from FEMA in July of 2010. This grant is part of the FEMA Hazard Mitigation Assistance Program which is administered under the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The enabling legislation for the Grant is 44 CFR Part 201.

The grant was intended to fund the development of a Pre-Disaster Hazard Mitigation Plan for the university, frequently referred to as a FEMA Hazard Mitigation Plan. The process is designed to facilitate the university building upon the prior preparedness planning, risk assessment and mitigation work that the university has completed, and extending the efforts at identifying, quantifying and further mitigating risks that the campus community faces over the full scope of operations.

Mitigation projects need funding and an approved local mitigation plan is now a requirement for pre-disaster Federal mitigation funds under Section 104 of the Disaster Mitigation Act (DMA) of 2000 (42 USC 5165). Additionally, since November 2004, a plan is required for post-disaster mitigation
funds under the Hazard Mitigation Grant Program where requirements are detailed in 44 CFR, Part 201 of the Code of Federal Regulations.

Under the DMA, not only states and communities are eligible for funding, but Universities qualify as well under FEMA's Disaster Resistant University (DRU) initiative.

A brief summary of the grant structure is as follows:

- Anyone with an approved local mitigation plan may qualify for **Hazard Mitigation Assistance (HMA)** funds.
- HMA funds consist of several programs which may or may not apply to the university due to the nature of the funding, these include…
  - **Pre Disaster Mitigation or PDM funds** - The university has already received a grant under this program
  - **Hazard Mitigation Grants or HMGP funds** - These are post disaster grants which require a presidential disaster declaration in order for funds to be made available
  - **Flood Mitigation Assistance or FMA funds** - This program would be open to the university with an approved plan
  - **National Flood Insurance Program grants** - *This program would not apply to the university*
  - **Severe Repetitive Loss Grants** - *This program is being de-emphasized and the university would not qualify for this avenue of funding*

This UM-Flint adopted hazard mitigation plan is intended to meet the requirements of FEMA, thereby positioning the university to be eligible to obtain mitigation funds before or after disasters strike through the programs listed above.

### III. Disaster Resistant University (DRU) Initiative

FEMA's DRU program was initiated in 2000 through a pilot program involving six Universities nationwide. The DRU initiative was created as an outreach of FEMA's Project Impact Program to help Universities develop actions to improve the safety of life and continuity of operations in the face of a natural disaster. As of 2005, Universities compete with states, Indian Tribal governments, and local governments to obtain funding through the Pre-Disaster Mitigation (PDM) program.

The purpose of FEMA's DRU initiative is to support the activities of Universities to help reduce their vulnerabilities to hazards. A university will assess its risk from potential disasters, identify its vulnerability and actively implement plans, programs and policies that mitigate its risk and vulnerability under the initiative. A Disaster Resistant University has committed leadership and plans in place to reduce risk at a level deemed appropriate. Furthermore, it is committed to changing practices and policies to manage risk and reduce vulnerability to minimize potential losses.

### IV. All Hazards Planning Team (AHPT) and the DRU Initiative

The UM-Flint has made significant strides towards controlling risks and managing/mitigating hazard
Section 1: Introduction

exposures over the past several years.

This is largely due to the vigilance of staff members and their willingness to participate in the efforts of the All Hazards Planning Team (AHPT). The AHPT has been and continues to be the primary internal venue for identifying, quantifying, developing and implementing risk mitigation efforts. The AHPT had been formed prior to the development of the FEMA funded planning effort, and is supported by the Executive Officers including the Chancellor, Provost, and the Vice Chancellor for Business & Finance and Division of Student Affairs.

The AHPT consists of representation from the following departments across the university:

- Chancellor
- Provost
- Vice Chancellor for Business and Finance
- Vice Chancellor for Student Affairs
- University Relations
- Government Relations
- Business and Finance
- Public Safety
- Facilities and Operations
- Auxiliary & Recreational Services
- Human Resources
- Environment, Health & Safety
- Division of Student Affairs
- Graduate Programs and Office of Extended Learning
- School of Health Professional Science
- Housing and Residential Life
- Information Technology Services
- Library
- Urban Health and Wellness Clinic
- Early Childhood Development Center
- International Student Center

All of these groups, as well as the following listed groups, were engaged with the development of the plan, to varying degrees, depending upon the input needed to accomplish the drafting of the plan.

- Procurement & Contracts
- Financial Services
- School of Management
- Admissions
- Lab Supervision
- Development & Alumni Relations
- Student Government
- Faculty Council
- Staff Council

Many of these groups were polled and interviewed extensively, as part of and in support of the process and the AHPT have been given a chance to participate in the review of the plan.

Summaries of the interviews, and other input from these operations areas is included in various parts of the plan where the it applies to either university vulnerabilities, hazard identification or risk
Section 1: Introduction

mitigation. Section 4 of the plan contains a tabular summary of the key interviewees, dates they were interviewed, and topics discussed.

Given that the AHPT is the overriding body for implementation of hazard mitigation initiatives, all of the members will be involved with use of the Hazard Mitigation Plan as a platform for risk mitigation going forward.

V. UM-Flint AHPT/DRU Mission

A. Multi-Hazard Mitigation Planning… A Campus Wide Approach toward Hazard and Risk Quantification, Prioritization and Mitigation

The efforts of the All Hazards Planning Team, led by the Department of Environment, Health & Safety, represent the local linkage with the Disaster Resistant university effort for the UM-Flint. The development of this Hazard Mitigation Plan represents the latest effort to strengthen this Campus-wide effort and further mitigate the risks facing the university, its students, faculty, staff and facilities.

The overall mission is to promote a culture of preparedness for the university as shown in the graphic below.
Figure 1-1 Creating a Culture of Preparedness
Figure 1-2 Emergency Preparedness

B. Multi Hazard Mitigation Planning

The university’s Multi Hazard Mitigation and Emergency Management process is the product of the All Hazard Planning Team’s efforts to Identify, Quantify, and Mitigate risks through physical and operational improvements and enhanced Emergency Response and Preparedness Planning.

Figure 1.2 below summarizes the key existing elements of the Pre-Incident Risk Mitigation, and Post-Incident Response Planning efforts. The university considers Pre-Incident Planning and Post-Incident Response to both be a part of the process. The Pre-Incident Planning sets the university up for success during a Post Incident Response, as well as addressing efforts to mitigate risks and contain incidents to their absolute minimum level of impact.
C. All Hazards Planning, the University/Community Interface

Over the past couple of decades, the population and physical size of the university has expanded. The university has acquired and now occupies several structures in downtown Flint, most recently the property on the north side of the Flint River that is the location of the William S. White building, and the Northbank Center high rise. The university is now leasing approximately 20,000 square feet of space in the former Hyatt Hotel that is now known as the Riverfront Center. The student population has expanded to above 8,000, and the university now has an on-campus residence hall housing 300 students. This, along with neighboring student housing development, has significantly changed the character of the campus community and surrounding areas from a commuter to a full-time student residential campus.

The growth of the university is in direct contrast to the overall local community. The university’s purchase of significant structures has in some cases stemmed the tide of downtown economic malaise. The City of Flint has been faced with severe budget shortfalls and this has affected the public safety of the surrounding community in terms of vast reductions in the police force and fire department. In response to the situation, the university has emphasized its Public Safety efforts, and there is a high degree of communication and interface with local law enforcement.
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As the university and community profile has changed, its concern with risk mitigation and management has escalated. A brief history of how efforts have progressed at UM-Flint follows:

- Prior to 1995, efforts mainly focused upon basic emergency response and building evacuation/sheltering planning. The AHPT had not been formed.
- In 1998, the Incident Command concept was developed and formally implemented at the university and integrated into the Campus Emergency Response Plan (ERP).
- In 1999 and leading up to the millennium the university conducted planning and mitigation around the concerns related to Y2K.
- Also beginning in 1999 the university began a greater focus on pandemic planning and the potential impact of infectious disease outbreaks.
- Between 1998 and the present, the AHPT has grown to include all of the current stakeholders, focused upon evaluation of risks on an all hazards basis.

In addition to the Hazard Mitigation Plan, the AHPT and university maintains many emergency related plans, many of which are summarized in the earlier graphic.

VI. Scope of Planning-Hazards Considered

As noted, the AHPT takes a campus-wide Multi-Hazard Mitigation approach during its normal course of operations. For the Hazard Mitigation Plan development process this approach was continued. The FEMA grant funding received included a defined scope of operations housed in the following structures across the campus:

- University Pavilion
- Pavilion Parking Deck
- Pavilion Annex
- Pavilion outdoor rink
- Northbank Center
- Northbank Center Parking Ramp
- William S. White Building
- White Building Parking (Lot P)
- White Building Parking (Lot Q)
- White Building Parking (Lot R)
- White Building Parking (Lot S)
- Frances Willson Thompson Library
- Theatre
- Harrison Street Parking Ramp
- David M. French Hall
- W.R. Murchie Science Building
- McKinnon Plaza
- Harding Mott University Center
- Recreation Center
- First Street Residence Hall
- Willson Park
- Mill Street Parking Deck (Visitor Parking)
- Parking Lot A (Student Permit)
- Central Energy Plant
Section 1: Introduction

- Faculty/Staff Parking Lot
- Hubbard Building
- International Institute parking lot
- Riverfront Center (leased space)

Note on International Institute: As of this writing the International Center is not owned or occupied by the university. The parking lot is leased for use by university staff.

The following figure shows the layout of the campus buildings with all of the major structures identified. Note that many of the bulleted locations from the list above are surface parking lots and these are not individually labeled on the map.

Figure 1-4 UM-Flint Campus Map

A. Hazards Considered in the Multi Hazard Mitigation Plan

In order to evaluate the risks that the university faces, the following list of risk/hazards were examined. This suggested list of risks is taken from the FEMA process documentation, and was shared with the Michigan State Police Office of Emergency Management at the outset of the process.

Owing to several factors the risks were examined in varying depths. These factors include:
Section 1: Introduction

- Degree to which the hazards actually exist as determined through the FEMA DRU Risk Identification and Assessment process.
- Geographical location of the university, and the presence or absence of certain hazards risks.
- University’s ability/responsibility to fund and control mitigation.

Each of these hazards have been reported upon in terms of its risk profile to the university, and the priority issues have been developed via a mitigation development method described in Section 4 of this plan.

Buildings and Infrastructure

1) Fire- in any building, either on campus or off, that The UM-Flint owns or occupies.

2) Infrastructure Failure- Loss of the Central Energy Plant- fire, explosion (fuel gases), loss of AC chillers, steam, compressed air, city water or any other critical resource provided by the physical plant.

3) Infrastructure Failure- Power outages or disruptions whether they result from the loss of the utility feed (area wide power outages), or damage to university-owned power conversion or distribution components (sub stations, major switchgear installations, step down transformers, etc.).

4) Infrastructure Failure- Telecommunications outages- either area-wide or campus specific.

5) Infrastructure Failure- Nuclear Attack.

6) Infrastructure Failure- Nuclear Power Plant Accident.

7) Infrastructure Failure- Loss of Information and/or Mass Notification systems
   - The primary data center/main frame systems that support university operations
   - Key IT sub installations housed either in a dorm or in academic buildings
   - Loss of desk top computing resources throughout the campus
   - Loss of e mail
   - Loss of the WiFi system
   - Loss of campus wide notification systems designed to inform students, faculty and staff of dangerous and developing situations on or near the campus.

8) Hazardous Materials Incidents- Transportation Related Hazardous Materials incidents that could occur on adjacent surface transportation routes-primarily Interstate highways and railroad right of ways that expose the university to direct physical damage, and/or a disruption of key operations.


10) Hazardous Materials Incidents- Incidents involving Oil and Gas Pipelines.
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11) Hazardous Materials Incidents- Incidents involving Oil and Gas Wells.

Public Health

12) Public Health- Food Services Incidents- Product contamination leading to food-borne illness

13) Public Health- Campus wide illness and the university’s response to situations such as an H1N1 outbreak, TB, Meningitis, or the sudden emergence of the Norwalk virus.

Natural Hazards

14) Severe Winter Weather Events- Snow and ice/sleet storm events

15) Thunderstorm Events- Severe windstorm events such as tornados or extreme straight line winds, hail, and lightning

16) Flooding- Riverine/Urban Flooding, Dam Failure, and shoreline flooding/erosion.

17) Earthquake

18) Extreme temperature situations

19) Wildfire

20) Subsidence (sinkholes, mine subsidence)

21) Drought

Consequential Loss

22) Consequential Loss- Loss of use of any major academic building as a result of the risks identified in this listing (e.g. fire, explosion, windstorm, flooding).

23) Consequential Loss- Loss of use of any student housing building stemming from these same reasons.

Security Related Risks

24) Civil Disturbance-Hostage Crisis situations that occur on campus or at the residences of faculty, staff or students.

25) Civil Disturbance- Hostage Crisis situations that involve staff, faculty or students while overseas, at conferences, on sabbatical, etc…

26) Civil Disturbance- Bomb Threats or Bombing incidents.

27) Civil Disturbance - Labor strikes and/or union actions.

28) Workplace violence situations involving disgruntled staff, faculty, students or someone from the community at large.
29) **Sabotage/Terrorism** - Eco/socio-based terrorist organization attacks on the physical or personnel assets of the university, faculty and staff, or students.

30) **Sabotage/Terrorism** - Political or Religious based terrorist organization attacks on the physical or personnel assets of the university, faculty and staff, or students.

**Other Significant Risks**

31) **Destruction of research resources** such as legacy records or physical samples from multi-year research projects, which if lost, cannot be recreated without substantial reinvestment in time and effort.

32) **Mass Transit Incidents**

**VII. Plan Overview**

The overarching goal of the Hazard Mitigation Plan is to assist in understanding the potential hazards that could affect the university, the university’s risk and vulnerability associated with identified hazards, and to serve as a venue for prioritizing strategic mitigation initiatives and solutions to reduce the university’s risk and vulnerability.

The Hazard Mitigation Plan is considered one tool in the overall risk management and risk mitigation initiatives for the university. It has been adopted by the Executive Leadership at the university as the overriding risk mitigation support tool in support of the university’s overall risk management program.

The section content is as follows:

A. **Section 1 - Introduction**

The introduction presents the purpose of the plan, the authority it was created under, and the Hazard Mitigation Plan development initiative. It briefly introduces the university and the mission of the AHPT in support of the UM-Flint Disaster Resistant University program, and summarizes the scope of the plan along with this overview.

B. **Section 2 - Community Profile**

The community profile details the Community Background, Demographics, Employment and Industry, Transportation Network, Police-Fire-Emergency Facilities, and information on the local Flint government. It demonstrates some of the distinctive issues the university faces in terms of being located in an urban environment, with proximity to a community that has one of the highest crime rates in the U.S.

C. **Section 3 - University Profile**

The profile details UM-Flint through its history, growth, mission, population, structure, and curriculum. Furthermore, it presents the impact the university has on the region socially, economically, and culturally.
D. Section 4 - Planning Process

The planning process outlines the steps taken and the methodology behind creation of the Plan. This section discusses who was involved, who was on the All Hazards Planning Team, and how other stakeholders and the public contributed to the Plan.

The information gathering processes are described, and the method for identifying mitigation opportunities is detailed.

E. Section 5 - Hazard Identification & Risk Analysis

This section provides a summary of the hazards from the prior list including information on:

- Overall exposure represented by the hazard
- Key vulnerabilities associated with the hazard
- Existing mitigation measures associated with the hazard, if any
- Additional mitigation opportunities associated with the hazard

Due to the nature of some of the risks, their impact could be felt university wide. In other cases, a specific risk is centered upon a specific facility. This section summarizes the risks that the university faces in both contexts.

F. Section 6 - Vulnerability Assessment

The vulnerability assessment summarizes the built environment, operational details, and critical infrastructure. As part of the process, the UM-Flint engaged Green Oak Solutions of Brighton, MI to conduct building surveys centered upon providing up-to-date information on structures and develop recommendations for risk mitigation.

The vulnerability assessment works in conjunction with the risk analysis to summarize utilities, facilities, infrastructure exposures and risk mitigation efforts. This allows the campus to examine the built environment, determine the most critical infrastructure elements, and prioritize mitigation efforts around protection of critical infrastructure.

G. Section 7 - Mitigation Strategy

The mitigation strategy presents mitigation goals, proposed mitigation actions, a subset of physical mitigation actions identified for several of the buildings, and the prioritization method utilized to establish the prioritization of mitigation goals and actions.

H. Section 8 - Plan Maintenance Procedures

This section describes how UM-Flint will manage the plan's implementation and maintenance. Also included are considerations for updating the plan, continuing public involvement, and identifying the party responsible for maintaining and implementing the plan in the future.

I. Section 9 - Appendices and Resources

This section contains material that supports the Hazard Mitigation Plan in various ways. The plan is structured such that each Appendix or Resource item is placed into this section in the order that it is cited in the plan.
I. Community Background

A. University Community-Internal and External

The University of Michigan-Flint is located in downtown Flint, and is a vital part of the downtown Flint community and Genesee County with over 9,000 students, faculty and staff who either attend or are employed by the university. For the purpose of the Hazard Mitigation Plan, it is important that the university define the community it is located in and a good deal of material has been gathered and placed into the plan to address this in the sections that follow.

First and foremost, the university’s own community-internal/campus and extended/surrounding-should be defined in the context of groups that were involved with the development of the plan.

B. Internal/Campus Community

The university defines community as consisting of students, faculty, staff, and alumni. All of these groups were involved with the development of plan in different ways. Of these groups, alumni were not directly involved with the development of the plan; however, their interests were represented via input from the Executive Director of Development and Alumni Relations.

Section 4 - Planning Process offers a summary of how each of these groups was engaged with the process.

The lifeblood of the university is the students, as without them there is no reason for the university to exist. The university’s efforts to mitigate risk are almost entirely directed at ensuring that the students have a safe and secure environment in which to conduct their studies. Efforts to mitigate physical risk do provide asset protection for the university, but if you protect the property you protect the people and that is the main goal.

The faculty of the university supports the academic mission which is critical to the university’s viability. Faculty expects a safe and secure environment in the classroom and across the campus so efforts to enhance the physical protection and security across all areas of operations is very important. If faculty feels that security provisions are sub-standard or that the facilities are not properly protected, the university will have difficulty in attracting top talent.

The staff provides executive leadership, operations and business support. The All Hazards Planning Team detailed in Section 1 of the plan took a lead role in the plan’s development, and
represents all of the areas listed above. While the AHPT is composed primarily of staff members there is faculty representation that is a part of the team. Additionally as noted in Section 4, meetings were held with the Faculty Council as part of the plan development process and the plan was made available to Faculty for review, comment and input.

The Risk Manager for the University of Michigan system was extremely helpful to the process by providing building values, FM Global information including the site diagram, and insights on the key risk issues the university faces. The Risk Manager has given approval for the use of the FM site diagram to be placed into the plan document and it can be found in the Appendices. FM Global is the university’s insurance carrier, and a recognized leader in property risk control. The university relies upon their expertise and judgment a great deal when it comes to physical risk mitigation.

While they were not a part of the plan development process per se, the Ann Arbor based team that conducts annual fire pump tests at the university should be mentioned as well. Many of the university’s buildings have fire pumps, and these pumps are critical to the adequacy of fire protection systems in the buildings. The annual pump tests this group performs are extremely important, and over the years the group has identified and addressed performance issues with the pumps.

C. External/Surrounding Community

During the plan development process many external groups were engaged for meetings and discussions on hazard mitigation at the university. These groups are detailed in Section 4; however, there are two entities that deserve mention here as respects their contribution to the plan development and ongoing hazard mitigation.

FM Global performs annual property risk control assessments of the university in support of the risk and insurance management process. FM Global has been involved with the university and the risk mitigation process virtually since it was founded. They provide valuable survey work, and develop risk mitigation actions for the university to consider. As part of the plan development process, the work of FM Global was integrated into the plan via review and evaluation of their reports and mitigation recommendations. Mitigation actions that FM Global has developed have been placed into the plan, primarily in the area of physical risk mitigation improvements to the buildings.

Green Oak Solutions, L.L.C. of Brighton, MI was instrumental in guiding the university through the plan development process, and completed the bulk of the drafting of the plan. Green Oak did a great many things during the development of the plan including conducting of internal interviews, external meeting support, completed building surveys, and developed reports covering our major structures. Green Oak also worked to develop the mitigation goals and actions that resulted from the risk assessment. Green Oak is referred to in various portions of the plan as the university’s Hazard Mitigation Consultant.

D. Area History- Excerpted from the University Website

Fur, Lumber, Carriages, Cars, Colleges? Even before its incorporation as a city in 1855, Flint had forged a reputation as a place where innovative, world-changing ideas could be made real.

Billy Durant transformed the city’s lumber boom into international success in the carriage industry. He then transformed his carriage achievements into the world’s leading automobile manufacturer, General Motors.

The success of General Motors would be shared with workers after the Flint Sit-Down Strikes gave birth to the United Auto Workers union (UAW). The gains of Flint’s autoworkers lifted wages and
benefits for workers throughout the world, and are credited with building the American middle class.

Average working families were then able to send their children to college. Such was the case for the Page family. In his 2009 commencement speech in Ann Arbor, University of Michigan alumnus and Google co-founder and CEO Larry Page acknowledged the role Flint and last century’s dominant technology played in shaping his family's future:

"My father's father worked in the Chevy plant in Flint, Michigan. He was an assembly line worker. He drove his two children here to Ann Arbor, and told them, 'That is where you're going to go to college.' Both his kids did graduate from Michigan. That was the American dream."

E. Car Town to College Town

Nearly 34,000 college students are currently enrolled at institutions of higher learning in Genesee County, the majority at the University of Michigan-Flint, Kettering University, Mott Community College, and Baker College.

With more and more of these students choosing to live on or near campus, local community and business leaders are responding by providing this growing population with the services and amenities college students want and expect.

New restaurants, entertainment venues, retail shops, and loft apartments fill historic downtown buildings refurbished to meet these needs – while preserving the architecture, history, and uniqueness of downtown Flint.

Flint has always been a hub where creative and innovative people from all walks of life interact. Musicians and artists have long mingled with business people, community activists, and others. Today, that mix of perspectives and talents is paying off. Flint is quickly becoming known more as a true educational, cultural, artistic, and recreational hotbed than as "Vehicle City."

Those who embrace Flint's transformation as an opportunity to engage with and contribute to "real change" may find the experience to be the most meaningful education of all.

F. Getting Around

Still a key transportation hub, Flint is located at the intersection of two interstate highways, I-75 and I-69, making convenient travel to nearby cities like Detroit, Ann Arbor, and Lansing – all are less than 60 miles from Flint. The city has a local MTA bus system, an Amtrak train station, and Bishop International Airport – one of the fastest growing airports in the nation.

G. Signature Events

Metro Flint also boasts many signature annual events, including the Crim Festival of Races, the Flint Film Festival, the Back to the Bricks Classic Car Cruise, and a wide array of vibrant local art, music, and other cultural events.

II. Demographics

Demographic data contained in Tables 2.1 through 2.5 is from the 2010 Census. Income data in Table 2.6 is from the American Community Survey (ACS).
## Table 2-1 Population Demographics

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<td>Population 2000</td>
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<td>Percentage of change in Population</td>
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## Table 2-2 Population Density

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<th>City of Flint</th>
<th>State of Michigan</th>
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<td>Population 2010</td>
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<td>9,883,640</td>
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<tr>
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<td>Housing units per square mile</td>
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## Table 2-3 Race/Ethnicity

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<tr>
<td></td>
<td>0.5%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Native Hawaiian and other Pacific Islander</td>
<td>16</td>
<td>2,604</td>
</tr>
<tr>
<td></td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other</td>
<td>1,169</td>
<td>147,029</td>
</tr>
<tr>
<td></td>
<td>1.1%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Two or more races/multi-racial</td>
<td>3,968</td>
<td>230,319</td>
</tr>
<tr>
<td></td>
<td>3.9%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>3,976</td>
<td>436,358</td>
</tr>
<tr>
<td></td>
<td>3.9%</td>
<td>4.4%</td>
</tr>
</tbody>
</table>

## Table 2-4 Households

<table>
<thead>
<tr>
<th></th>
<th>City of Flint</th>
<th>State of Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total households</td>
<td>40,472</td>
<td>3,872,508</td>
</tr>
<tr>
<td>Family households</td>
<td>23,949</td>
<td>2,554,073</td>
</tr>
<tr>
<td>Husband-wife family</td>
<td>9,359</td>
<td>1,857,127</td>
</tr>
<tr>
<td>Male householder, no wife present</td>
<td>2,867</td>
<td>185,363</td>
</tr>
<tr>
<td>Female householder, no husband present</td>
<td>11,723</td>
<td>511,583</td>
</tr>
<tr>
<td>Households with individuals under 18 years</td>
<td>13,879</td>
<td>1,224,631</td>
</tr>
<tr>
<td>Households with individuals 65 years and over</td>
<td>8,946</td>
<td>985,333</td>
</tr>
<tr>
<td>Average household size</td>
<td>2.45</td>
<td>2.49</td>
</tr>
<tr>
<td>Average family size</td>
<td>3.13</td>
<td>3.05</td>
</tr>
</tbody>
</table>
Section 2: Community Profile

Table 2-5 Age Breakdown

<table>
<thead>
<tr>
<th>Age Range</th>
<th>City of Flint</th>
<th>State of Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 18</td>
<td>27,914</td>
<td>2,344,068</td>
</tr>
<tr>
<td>18-24</td>
<td>11,571</td>
<td>973,889</td>
</tr>
<tr>
<td>25-44</td>
<td>26,208</td>
<td>2,442,123</td>
</tr>
<tr>
<td>45-64</td>
<td>25,742</td>
<td>2,762,030</td>
</tr>
<tr>
<td>65 years or older</td>
<td>10,999</td>
<td>1,361,530</td>
</tr>
<tr>
<td>Median age</td>
<td>31</td>
<td>38.9</td>
</tr>
</tbody>
</table>

Table 2-6 Household and Family Income

<table>
<thead>
<tr>
<th>Income Range</th>
<th>City of Flint</th>
<th>State of Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Households</td>
<td>Families</td>
</tr>
<tr>
<td>Less than $10,000</td>
<td>8,490</td>
<td>20.0%</td>
</tr>
<tr>
<td>$10,000 to $14,999</td>
<td>3,952</td>
<td>9.3%</td>
</tr>
<tr>
<td>$15,000 to $24,999</td>
<td>7,316</td>
<td>17.2%</td>
</tr>
<tr>
<td>$25,000 to $34,999</td>
<td>6,003</td>
<td>14.1%</td>
</tr>
<tr>
<td>$35,000 to $49,999</td>
<td>6,347</td>
<td>15.0%</td>
</tr>
<tr>
<td>$50,000 to $74,999</td>
<td>5,800</td>
<td>13.6%</td>
</tr>
<tr>
<td>$75,000 to $99,999</td>
<td>2,607</td>
<td>6.1%</td>
</tr>
<tr>
<td>$100,000 to $149,999</td>
<td>1,615</td>
<td>3.8%</td>
</tr>
<tr>
<td>$150,000 to $199,999</td>
<td>292</td>
<td>0.6%</td>
</tr>
<tr>
<td>$200,000 or more</td>
<td>81</td>
<td>0.2%</td>
</tr>
<tr>
<td>Median</td>
<td>$27,199</td>
<td>$31,196</td>
</tr>
<tr>
<td>Mean</td>
<td>$36,201</td>
<td>$40,609</td>
</tr>
</tbody>
</table>

Table 2.6 information based on the American Community Survey which used the following demographics
City of Flint households = 42,503, City of Flint Families = 24,634.

A  Education

Note: The information in the bullets that follow under Education, Culture, Other Institutions, and Media was excerpted from various internet sites; however it has been reviewed by university staff and is considered accurate as of the issuance of the plan in 2012.

B  Universities

University of Michigan-Flint is one of three campuses in the University of Michigan system.

- Kettering University (formerly known as GMI for General Motors Institute) is an engineering school.
- Baker College is a private institution with thirteen different campuses in Michigan that offers career education in business, health and human services, and technical fields.
- Davenport University is a private institution offering business degrees which has a satellite campus in Flint.
- Mott Community College is a community college in Flint with satellite campuses in nearby Fenton, Lapeer, and Clio.
- Central Michigan University has a Satellite location in Flint.
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C  Primary and secondary schools

Public K-12 education is provided under the umbrella of the Genesee Intermediate School District and the Flint Community Schools.

The state-run Michigan School for the Deaf is located in Flint.

D  Flint Libraries

- Genesee District Library main branch on West Pasadena Avenue
- Flint Public Library main branch location at 1026 East Kearsley Street

E  HealthCare

- Hurley Medical Center
- McLaren Regional Medical Center
- Genesys Regional Medical Center
- Numerous Branch Clinics
- Numerous After Hours Clinics

F  Culture

The Flint Cultural Center was built with revenue from the auto industry in the 1950s. Set on a 30-acre site near downtown, it boasts:

- Flint Public Library
- Alfred P. Sloan Museum, with a large portion dedicated to rare automobiles.
- Buick Gallery and Research Center
- Flint Institute of Arts, an art museum with an extensive collection and learning facility.
- Flint Institute of Music, home of the Flint Symphony Orchestra, Flint School of Performing Arts and Flint Youth Theatre, a world class organization dedicated to lifelong continuum of music, dance, and theatre.
- Longway Planetarium
- Whiting Auditorium, a 2100-seat auditorium which hosts fine arts performances, including symphonic concerts and touring theatrical performances

Other Institutions

- Our Lady of Guadalupe, a Mexican based Roman Catholic church, serving Mexican Catholics in the Genesee and Shiawasee counties for 50 years.
- Flint Central Academy Theatre, which puts on and promotes educational theatre within the community.
- Flint Local 432, one of the country's longest-running youth concert venues.
- The Machine Shop, Concert lounge which books many bands that are locally, nationally, and internationally known.
Section 2: Community Profile

- Flint Children’s Museum, a “hands-on” museum for children located on the campus of Kettering University.
- Flint City Theatre
- Buckham Alley Theatre, the nomadic troupe of alternative theater performers currently based at the Greater Flint Arts Council and the Unitarian-Universalist Church.[24]
- Vertigo Productions, the only semi-professional theater company in Genesee County. Vertigo presents critically acclaimed theater and dinner shows in the Historic Masonic Temple in downtown Flint, as well as sponsoring the annual Summer favorite, Shakespeare in the Park and Gilkeyshire Renaissance Faire.
- Buckham Gallery, an artist-run gallery in downtown Flint serving the arts community for over 20 years.
- Pages Independent Bookstore, a cultural crossroads in downtown Flint that provides a wide selection of books and can be used as a meeting space for the community.
- Flint Concert Band
- Flint Symphonic Wind Ensemble
- Whaley Children’s Center
- TOPS original theatre, Theatre for Original Productions and Shows. The area’s only theatre to produce and perform all original productions from all over.

Annual events
- Flint Jazz Festival
- Michigan Storytellers Festival
- Crim Festival of Races
- Back To The Bricks (Car Show)

Media

Print

The county’s only daily newspaper is the Flint Journal, which dates back to 1876. Effective June 2009 the paper ceased to be a daily publication, opting to publish on Thursdays, Fridays and Sundays. The move made Genesee County the largest county in the United States without a daily newspaper.

University publications include University of Michigan–Flint’s student newspaper The Michigan Times, Kettering University’s The Technician and the MCC Chronicle, formerly the MCC Post, which is a monthly magazine from Mott Community College.

Television

WJRT-TV (ABC), owned by SJL Corporation, is currently the only area station to operate from Flint. WSMH (Fox) and WCMZ-TV (PBS) are licensed to Flint, but their programming originates from outside of Flint proper, with WSMH originating from Flint suburb Mt. Morris Township and WCMZ rebroadcasting WCMU-TV of Mount Pleasant. WEYI (NBC), licensed to Saginaw, and WBSF (The CW), licensed to Bay City, has their studios in nearby Vienna Township, just north of Flint. Other stations outside the Flint area that serve the area include Saginaw-based WNEM-TV (CBS), Delta
Section 2: Community Profile

College's WDCQ-TV (PBS), and WAQP (TCT).

Radio

The Flint radio market has a rich history. The city's very first radio station, AM 910 WFDF, first went on the air in 1922. It has since relocated south into the Detroit market, changing its city of license to Farmington Hills and increasing its power to 50,000 watts.

Today, the following stations serve Flint with an array of programming choices:

AM
- 600 WSNL- Flint (Christian Broadcasting System)
- 1160 WCXI- Fenton (Classic Country)
- 1330 WTRX- Flint (Sports, Sports Xtra)
- 1420 WFLT- Flint (Urban Gospel, Flint Evangelical Broadcasting Association)
- 1470 WFNT- Flint (Adult Standards/Oldies)
- 1570 WWCK- Flint (Talk)

FM
- 88.9 WAKL- Flint (Contemporary Christian,)
- 89.7 WTAC- Burton-Flint (Contemporary Christian, Superior Communications)
- 91.1 WFUM- Flint (Public Radio, Michigan Radio, University of Michigan; simulcast of WUOM Ann Arbor)
- 92.7 WDZZ- Flint (Urban Adult Contemporary, DZ93, Cumulus Media)
- 93.7 WRCL- Frankenmuth (Rhythmic CHR, Club 93-7, Regent Broadcasting)
- 94.3 WKUF- Flint (Kettering University student station)
- 95.1 WFBE- Flint (Country, B95, Citadel Broadcasting)
- 98.9 WOWE- Vassar (Urban Adult Contemporary, Praestantia Broadcasting)
- 101.5 WWBN- Tuscola-Flint (Active Rock, Banana 101.5, Regent Broadcasting)
- 102.5 WIOG- Bay City
- 103.1 WQUS- Flint (Classic Rock)
- 103.9 WRSR- Owosso-Flint (Classic Rock)
- 105.5 WWCK- Flint (Mainstream CHR)
- 107.9 WCRZ- Flint (Adult Contemporary)

II. Employment and Industry

The following employment and industry data in Tables 2.7 through 2.9 is from the American Community Survey (ACS) 5-year estimates for 2006-2010.
### Table 2-7 Employment Status

<table>
<thead>
<tr>
<th></th>
<th>City of Flint</th>
<th>State of Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population 16 years and over</td>
<td>80,662</td>
<td>7,836,314</td>
</tr>
<tr>
<td>Civilian labor force</td>
<td>41,258</td>
<td>4,944,003</td>
</tr>
<tr>
<td>Employed</td>
<td>32,323</td>
<td>4,369,785</td>
</tr>
<tr>
<td>Unemployed</td>
<td>8,935</td>
<td>568,552</td>
</tr>
<tr>
<td>Armed Forces</td>
<td>41</td>
<td>5,666</td>
</tr>
<tr>
<td>Not in labor force</td>
<td>39,363</td>
<td>2,892,311</td>
</tr>
</tbody>
</table>

### Table 2-8 Occupation

<table>
<thead>
<tr>
<th></th>
<th>City of Flint</th>
<th>State of Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civilian Employed Population 16 years and over</td>
<td>32,323</td>
<td>4,369,785</td>
</tr>
<tr>
<td>Management, business, science and arts</td>
<td>6,866</td>
<td>1,466,434</td>
</tr>
<tr>
<td>Service</td>
<td>9,297</td>
<td>784,602</td>
</tr>
<tr>
<td>Sales and office</td>
<td>8,012</td>
<td>1,097,121</td>
</tr>
<tr>
<td>Natural resources, construction and maintenance</td>
<td>2,153</td>
<td>362,561</td>
</tr>
<tr>
<td>Production, transportation, and material moving</td>
<td>5,995</td>
<td>659,067</td>
</tr>
</tbody>
</table>

### Table 2-9 Industry

<table>
<thead>
<tr>
<th></th>
<th>City of Flint</th>
<th>State of Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civilian Employed Population 16 years and over</td>
<td>32,323</td>
<td>4,369,785</td>
</tr>
<tr>
<td>Agriculture, forestry, fishing and hunting, and mining</td>
<td>105</td>
<td>54,946</td>
</tr>
<tr>
<td>Construction</td>
<td>1,257</td>
<td>230,305</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>4,967</td>
<td>770,715</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>732</td>
<td>122,378</td>
</tr>
<tr>
<td>Retail trade</td>
<td>4,328</td>
<td>507,530</td>
</tr>
<tr>
<td>Transportation and warehousing, and utilities</td>
<td>1,484</td>
<td>181,648</td>
</tr>
<tr>
<td>Information</td>
<td>472</td>
<td>82,395</td>
</tr>
<tr>
<td>Finance and insurance, and real estate and rental and leasing</td>
<td>1,487</td>
<td>250,855</td>
</tr>
<tr>
<td>Professional, scientific, and management, and administrative and waste management services</td>
<td>2,129</td>
<td>388,626</td>
</tr>
<tr>
<td>Educational services, and health care and social assistance</td>
<td>8,900</td>
<td>1,012,153</td>
</tr>
<tr>
<td>Arts, entertainment, and recreation, and accommodation and food services</td>
<td>3,457</td>
<td>397,267</td>
</tr>
<tr>
<td>Other services, except public administration</td>
<td>1,591</td>
<td>206,152</td>
</tr>
<tr>
<td>Public administration</td>
<td>1,414</td>
<td>164,815</td>
</tr>
</tbody>
</table>

### III. Transportation Network

The City of Flint is served by Bishop International Airport and various bus lines. Amtrak provides intercity passenger rail service on the *Blue Water* line from Chicago to Port Huron at the border to Canada. For travel within and around the city, the Flint Mass Transportation Authority (MTA) provides local bus services. Greyhound Lines also runs inter-city bus services north to Bay City and south to Detroit. Indian Trails runs inter-city bus services west to Chicago.

Main line freight rail lines for CN North America and CSX Transportation run through Genesee County and the city proper.

**Airlines**
There is scheduled airline service at Flint Bishop International Airport. For the past decade the airport has become an attractive alternative to Detroit Metropolitan Wayne County Airport (Metro) near Detroit for area residents who wish to avoid the drive to Metro. Metro is the closest full service International airport to Flint.

**Major highways**

Interstate 69 has its eastern (northern) terminus at the Blue Water Bridge in Port Huron, and runs west through Flint to Lansing and then turns south and continues through Marshall and on into Indiana.

Interstate 75 running concurrently with US 23, cuts through the southwest corner of the city and passes the west side of the city through Flint Charter Township. I-75/US 23 continues north to Saginaw and Bay City.

Interstate 475 begins south of Flint at Interstate 75 and runs north through downtown Flint then loops back to I-75 northwest of the city.

US-23 runs concurrently with I-75 and passes west of the city. US 23 continues north on a scenic route along the Lake Huron shoreline. South of Flint, US 23 continues to Ann Arbor, on to Toledo, and continues south into Florida.

M-21 runs nearly due west to Grand Rapids. Through Flint it is also known as Corunna Road and Court Street.

M-54, also known as Dort Highway, runs mostly parallel to I-475 to the east from I-75 to I-69.

**IV. City of Flint Public Safety**

Residents are served by the Flint Police Department, Flint Fire Department, and several private ambulance companies. Flint has its own 9-1-1 call center, located in the police department headquarters, which operates independently of Genesee County's 911 Call Center in Flint Township.

**A  City of Flint Public Safety Plan**

In May 2012, the city of Flint published the following Public Safety Plan.

**Background**

In November 2011, Governor Snyder placed Flint in receivership and appointed an Emergency Manager (EM) Michael Brown, to address Flint’s financial emergency. The EM identified three primary functional areas of focus for city government: finance/administration, infrastructure and public safety (police, fire and 9-1-1 operations). Several conditions developed over a period of decades to place the City of Flint in the situation of chronic fiscal stress which necessitated appointment of an EM.

The major employer, General Motors (GM), massively reduced operations in Flint (in 1978 GM employed over 80,000 people here, but by 2006 employment totaled 8,000). The population declined from its 200,000 peak in the 1960s to 102,434 per the 2010 census. Owner occupied housing decreased from a high of 73.1 percent in 1960 to a 2010 low of 44.7 percent. The jobless
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The rate for the 2011 annual reporting period was 9.9 percent. State Shared Revenue, which accounts for 31 percent of the General Fund, decreased 13 percent over the past five years. In addition the City’s two other primary sources of revenue, property tax and income tax, have both suffered major reductions.

The City’s fiscal/financial decline has had a minor impact on conditions within the Flint Police Department (FPD). At its prime, the Department was known as a front runner for community policing and active foot patrols and strong citizen support. Morale was high, staffing was plentiful, and officers were the second highest paid officers in the state. The agency that remains today is much smaller than years prior with fewer services to the community, less citizen support and decreased funding. For the last five years Federal Bureau of Investigation (FBI) statistics have ranked Flint in the top five most dangerous cities in the United States and in 2011 it was ranked the second most violent city per capita.

Goals
Flint’s Emergency Manager identified several goals in his January 15, 2012 Financial and Operating Plan. His overall goals for the City included: to provide public safety services, focusing on reducing violent crime, commensurate with cities of comparable size and resources.

The overall goals for Flint public safety are:

1. Re-establish Flint as one of the safest cities in Michigan — both in reality and perception.
2. Continue and develop additional partnerships with Michigan State Police (MSP) and other law enforcement agencies.
3. Re-develop and stabilize the foundation of the Flint Police Department (FPD) as necessary to support a data-driven community policing style of service delivery.
4. Build Flint Police Department’s capacity for data-driven decision making.
5. Enhance existing community partnerships and develop new collaborative partnerships with individual stakeholders and organizations to support problem solving and a shared responsibility in public safety.
6. Stabilize and enhance annual revenue for public safety in Flint.

Strategies and Objectives
Development and implementation of plans for improving public safety, of course, is a continual process. The recent implementation of cost reducing collective bargaining agreements, for instance, enables us to limit budgeted reductions in public safety personnel. We are currently focusing on the following principal broad actions:

- **Partnerships with the Michigan State Police and other law enforcement agencies.**
  An agreement with MSP currently has the Flint MSP Post assigning two squads to patrol inside the City. Additional support resources may be available from MSP in coordination with other revisions to policing strategy in the FPD. FPD works cooperatively with the Federal Bureau of Investigation (FBI), the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), the Drug Enforcement Administration (DEA), the U.S. Marshalls Service and the U.S. Attorney, and has done so for many years. These partnerships will continue. We also will seek new partnerships with these and other law enforcement agencies.

  We will continue to utilize the resources available through the Michigan State University (MSU) School of Criminal Justice Training & Technical Assistance Team which currently funded through the C.S. Mott Foundation.
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- **Opening the Flint City Lockup**
  A portion of the FPD headquarters includes a 110 bed capacity 72-hour lockup facility that has been closed since 2008. Governor Snyder, EM Brown, Flint Public Safety Administrator Barnett Jones and FPD Chief of Police/Public Safety Director Alvem Lock have all made reopening the lockup a key component of the Public Safety Plan. The Governor and the State Legislature recently approved an appropriation of approximately $3 million for public safety initiatives in Flint. The City, the Genesee County Prosecuting Attorney’s Office and the Genesee County Jail are all intended to receive a portion of this money.

  When the lockup was last open (May 2007-July 2008) 6,000 suspects were lodged for over 16,000 charges. Homicides were down 17%, aggravated assaults were down 20% and robberies down 22% from the previous year. Bonds posted increased from $18,000 between May and December of 2007 to $252,000 for the same period in 2008. A Flint millage measure to authorize funding to reopen the lockup was defeated in 2011.

- **Transitions to 800 MHz Communications System**
  The entire county (exclusive of Flint) and MSP operate on an 800 MHz communications system. The city uses old analog technology which will not be allowed by the Federal Communications Commission after December 31, 2012. The City is actively completing the steps necessary to change over to the 800 MHz system by summer 2012.

- **9-1-1 Reconsolidation**
  The City continues to operate its own 9-1-1 system, separate from the Genesee County 9-1-1 Consortium. Flint's 9-1-1 Center is responsible for all dispatching functions for the Flint Police and Fire Departments and is typically the first point of contact for citizens when they are in need of police or fire services.

  At one time Flint was part of the 9-1-1 Consortium. The City split from that system in the early 1990s. The Governor’s Public Safety Plan has made it very clear that financial assistance from the State will be tied to increased collaborative efforts in delivering public safety to Michigan’s communities. His Economic Vitality Incentive Program (EVIP) promotes service consolidation and innovation among communities. Flint plans to utilize the capabilities of the EVIP program to assist in the reintegration of the two 9-1-1 systems in the near future.

- **Data-Driven Information and Application**
  A policing approach initiated by MSP in Flint is Data-Driven Approaches to Crime and Traffic (DDACTS). DDACTS is a law enforcement model that integrates location-based crime and traffic crash data to determine the most effective methods for deploying law enforcement and other resources. By utilizing both crime reports and arrest data supervisors can be held accountable for activity and results within their district.

- **Technology Applications**
  The MSU Training and Technical Assistance Team has been asked to conduct a technology audit of currently available systems and equipment in the Flint Public Safety Departments. These departments will then use the audit to prioritize a list of technology upgrades to be performed, and target desired outcomes once the technology is fully implemented.

  Train all officers and firefighters on the proper use of the technologies once they are implemented, ensuring that officers and firefighters are taking maximum advantage of the tools that have already been given to them.
For example: the FPD has begun to transition some calls away from sending an officer to
taking information over the telephone and using technology to report some crimes on-line.

- **Criminal Justice System Advisory Council**
  An arrest merely begins the Criminal Justice System (CJS) process. An effective ultimate
  outcome requires adequate resources and cooperation among prosecutorial agencies,
courts, detention agencies, and alternative rehabilitation and support services. Changes in
one component of the CJS can be ineffective or even counterproductive if the impact of
those changes on other CJS components is not considered and adequate preparation for
the changes is not made.

A Genesee County CJS Advisory Council will be established. The Council will consist of
representation from public safety CJS professionals and agencies (police, prosecutors,
courts, corrections, programs providing alternatives to incarceration, and 9-1-1) and local
government unit political leadership (Flint, Genesee County, and townships, small cities, and
villages). The Council also will include representation from the Federal Government (U. S.
Attorney, FBI, ATF, DEA and U. S. Marshalls), and State Government (Governor’s Office
and MSP). The Council will assist improved CJS operation through information sharing and
making recommendations regarding possible CJS changes.

Genesee County Circuit Judge Richard B. Yuille has agreed to serve as the Chairperson of
the Advisory Council. Judge Yuille is Chief Judge of the Genesee County Circuit and
Probate Courts and the 67th and 68th District Courts. Ward Chapman, Special Assistant
Flint City Attorney, will serve as Coordinator for the Council. Mr. Chapman is the former
Genesee County Corporation Counsel and also served for 11 years as an Assistant
Prosecuting Attorney. Key CJS staff, such as the County Board and Criminal Justice
Coordinator and the Court Administrators for the four State Courts within the County, will
provide additional staff assistance to the Council. Technical assistance also will be provided
by the MSU School of Criminal Justice Training and Technical Assistance Team.

- **Patrol Districts and 12 hour Shift Assignments**
The District Plan will divide the city into four assignment districts. Two patrol cars per 12
hour shift will be assigned in each district. One floater car will be available per shift and will
concentrate in an identified “hot spot” area. There will also be four sergeants assigned per
shift. Three will be assigned on patrol and one will remain at the Headquarters Police
Station.

The 12-hour shift assignment is a better utilization of personnel, and it also allows the ability
to balance assignments during the hours of highest call and/or criminal activity.

- **Fire Department Re-organization (after SAFER)**
The Staffing for Adequate Fire and Emergency Response Grant Program (SAFER) from the
Federal Emergency Management Agency (FEMA) provides for the wages and benefits for
39 firefighters. The current grant is expiring in June 2012 and a new grant application was
submitted in February 2012. We expect to receive a funding determination before July. In a
reduced manpower condition the public safety plan is to keep the main station and two other
stations open on a regular basis. Consideration is being given to maintaining reduced
staffing and equipment at two other stations. This plan will require changes to the current 24
hour staffing schedule.

- **Community Engagement**
The FPD has a long history of utilizing citizen volunteers to supplement police resources in
the operation of mini-stations and in traffic and crowd control during major events. The Blue Badge program has approximately 100 new volunteers who have received six weeks of training.

The City of Flint is working collaboratively with the Building Neighborhood Power (BNP) organization to establish and strengthen neighborhood block clubs, other neighborhood organizations, including crime watch programs to enhance residents’ crime prevention efforts.

Public Safety works with many other organizations which help strengthen community ties and provide safe, alternative programming include Flint LifeLines, the Boys and Girls Club, Police Athletic League (PAL) youth programs and many others.

- **Revenue Stability for Public Safety**
  The City of Flint has had a Foot Patrol millage which originated in the 1980’s. That was revised to a general police millage, which today is set at 2 mills. In the November, 2011 election a millage for the operation of the lockup was rejected by the voters. There are currently over 40 officers funded by grants or other sources which may or may not continue year to year. The City’s General Fund can currently support approximately 59 officers.

  The City will need an annually designated source of funds to remove the uncertainty surrounding the lockup and will give officers a much needed enforcement tool. Also, longer term, the lockup could be made available to surrounding communities to house offenders for short periods of time. This could bring additional funding to the City.

  The City recognizes that a longer term, more stable source of revenue is required. Several options for revenue enhancement are under consideration. The EM believes that it is necessary to first engage the community, labor organizations, business community and other stakeholders in these considerations and then make a proposal. At this point, it is too early to have a detailed plan of action.

B **Meeting with City of Flint Police Chief**

The Public Safety Plan is an important component of Flint’s stabilization and future growth. The City is run under its 1974 charter that gives the city a “strong mayor” form of government. At present the City is being administered by a Governor appointed Emergency Manager which means that current mayoral powers have been reduced in deference to the Emergency Manager. The City of Flint faces many challenges over the coming years in the areas of Public Safety, and maintaining governmental operations.

The issuance of the Public Safety Plan coincided with the conclusion of the initial Hazard Mitigation Plan development process, and this offered an opportunity for the university to meet with the Chief of Police to discuss how the city and the university might work more closely together to enhance the safety and security of students, faculty and staff at the university.

On June 13, 2012 a meeting was held and attended by Alvern Lock-Flint Police Chief, Ray Hall-Director of Public Safety for UM-Flint, Phil Smith-Lt. UM-Flint Public Safety, Mike Lane-Director EHS UM-Flint, Gail Novak Phelps- EHS UM-Flint, and Craig Holmes of Green Oak Solutions. The agenda for the meeting is located in Section 9-1 Internal and External Questions and Answers, and the points raised and discussed in the meeting are summarized directly below.

The university continues the discussions with the city and attempt to work through the bullet pointed actions that are described below as a set clearly outline steps in the process of even greater
coordination.

- Coordination with State Police
  - The Michigan State Police (MSP) has been deployed by the Governor to the city in response to the reduction in force that has been experienced by the Flint police department. An enhanced level of coordination between the city police, the state police and the university's public safety efforts would be desirable.

- State Police DDACTS Model Implementation
  - The MSP is incrementally identifying areas within the city where they will establish their greatest presence and visibility. The DDACTS model discussed above is the method that will be used to develop the prioritization of areas where the MSP will focus their efforts, and this model is based more upon frequency of crime and traffic events as opposed to severity of events.

- State Police increasing presence near the university
  - Because of some recent events that occurred in the DDA parking lot across the street from the university and identification of local bars that have been serving underage patrons the MSP is increasing their presence near the university.

- It may be possible for the university to provide resources to the MSP
  - These resources might include giving the MSP access to the Hubbard Building for the purpose of establishing an informal base of operations for the university area.

- Increased levels of coordination
  - Greater levels of coordination between the city police and the university's Public Safety would be desirable. At present a degree of coordination exists but it is based upon incident response and not structured pre planning.

- Enhanced Joint Operations Planning
  - It may be possible to conduct joint operations planning, in particular during large public events that occur each year such as the street fair known as Back to the Bricks. A formal process for joint operations planning may be possible and should be considered.

- Enhanced Information Sharing
  - By enhancing information sharing there is an opportunity to identify trends and individuals that pose a threat to public safety at the university. Incident records or incident logs may be another point of coordination that can be instituted between the university and the city. By sharing this information there is an opportunity to identify trends or even individuals that pose a threat to public safety at the university.

- It may be possible for the city police to be given access to the university’s network of security cameras. This would require review by both parties and communications connections between the university and city.

- Community Wide Programs
  - Enhance cooperation with implementing and organizing community wide programs operated by both the university and Flint police. It may be possible to establish a mini station on university property and within the DPS structure. Certain community wide programs operated by the Flint police could be extended to the university. It may be possible to establish a mini station and Blue Badge program (see the Public Safety Plan above for description of these programs) on university property.

- Communications Enhancements
  - Movement to the 800 MHz band by the Flint police will put them on the same frequency as the university Public Safety department. This will enable a greater degree of cross monitoring of developing events between the Flint police and the university.
Section 3: University Profile

I. Introduction

This section of the plan outlines the University’s mission and vision, background and history, organizational structure and the scope and areas covered by the Hazard Mitigation Plan including economic impact on those areas.

Sections II-University Mission and Vision, III-Background and History, and IV-Organizational Structure were all primarily excerpted from the UM-Flint web site and have been reviewed by members to the AHPT to ensure that the most up to date information available has been included in the plan.

II. University Mission and Vision

At the time of the drafting of this Hazard Mitigation Plan the UM-Flint was in the process of developing its strategic plan for 2011 to 2016. The new plan is a reflection of the prior Strategic Mission statement that remains today as the foundation of how the UM-Flint defines its place in the higher education community in Michigan.

The Flint campus of the University of Michigan is a community of diverse learners and scholars, where students from this region and beyond prepare for leadership, achievement, and service through interactive instruction in the arts, sciences, humanities, and professions. UM-Flint’s mission rests on three pillars: excellence in teaching, learning and scholarship; student centeredness; and engaged citizenship. The students become leaders in their fields, in their professions, and in their communities.

The UM-Flint campus implements its vision and mission in a wider context of growth and change. The strategic plan seeks to foster growth in enrollment and initiatives that support academic excellence and student achievement.

The plan focuses on three strategic directions that emerge from this mission:

- Sustain and enhance excellence in teaching, learning, and scholarship.
- Foster increased student-centeredness.
- Build on the tradition of engaged citizenship.

A Vision

Engaging Minds, Preparing Leaders through Academic Excellence, Student Centeredness and Engaged Citizenship
III. University Background – History & Information

A History

The UM-Flint is one of three campuses of the internationally-renowned University of Michigan System. For over 55 years, UM-Flint has been committed to the highest standards of teaching, scholarship, and creative endeavors.

UM-Flint students choose from over 120 undergraduate degrees, 41 master’s programs, two doctoral programs, and five post-doctoral certificates. Over 530 faculty members are devoted to the university’s standard of excellence in teaching, and the knowledge, skills, and talents of over 500 full-time staff members contribute to the success of UM-Flint. Students at UM-Flint are community-oriented, engaging in civic projects and undergraduate research in an effort to achieve a deeper understanding and appreciation of their campus and community.

The history of UM-Flint is a story of cooperation between the Flint community and the University of Michigan. It was in 1956 that the community celebrated the opening of a two-year senior college. As time passed, there was a call for major changes in the college. The Flint Board of Education proposed that the University of Michigan expand the senior college to a four-year institution. The U-M Board of Regents adopted the proposal in 1964. The first freshman class was admitted the next year making the Flint College the first four-year University of Michigan program offered outside of Ann Arbor.

In 1971, the Regents officially changed the name of the institution from Flint College to the University of Michigan-Flint.

Responding to the needs of the community in the 1970’s, an Academic Planning Board identified major areas of program development for the university, including professional and career-oriented programs. Those programs eventually led to the establishment of graduate degrees, new academic units, service units, and the expansion of the campus into downtown Flint.


In 1988, the William R. Murchie Science Building was dedicated. Three years later, UM-Flint took possession of the University Pavilion (formerly Water Street Pavilion) from the city. As a result of generous donations, the Frances Willson Thompson Library opened in 1994.

The university acquired an additional 25 acres immediately north of the Flint River in 1997, where the William S. White Building was completed in 2002. A grant from the Charles S. Mott Foundation provided the university with funds to assist with the construction and programming of new facilities on the north site. The White Building houses the School of Health Professions and Studies, the Early Childhood Development Center, the Urban Health and Wellness Center, and the Department of Communication and Visual Arts.

Enrollment growth over the last several years has been brisk, with the university attracting a diverse group of students from around the state as well as internationally. That growth created a need for additional space to accommodate new programs and new students.
Section 3: University Profile

In 2008, the university opened its first student housing facility. The modern, 310-bed residence hall was the first step of moving from a commuter to a residential campus to better serve the area's needs. In addition, the university now has Dining Services and Student Life on campus has greatly changed.

Recently, the School of Management (SOM) expanded to the Riverfront Center located across Saginaw St. on the west-end of the campus. The school occupies 27,000 square feet of newly renovated space, or three times the amount it formerly had.

Through the continued growth of new programs, technologies, resources, and facilities, UM-Flint assists students in becoming leaders in their careers and their communities, and in an ever-changing world.

B UM-Flint "At a Glance"

Founded: September 23, 1956
- Institution: Four-year public university. One of three University of Michigan campuses (Ann Arbor and Dearborn).
- Campus: The University of Michigan-Flint is situated on 76 acres along the north and south banks of the Flint River in the heart of a revitalized downtown Flint. The university built its first residence hall in 2008, which has helped bring new energy to campus as well as the downtown neighborhood.
- School Colors: Maize and Blue

C Leadership

The University of Michigan-Flint adheres to the University of Michigan's traditional faculty governance model of campus leadership. (See profiles of UM-Flint administrative and academic leadership for more details.)

D Tuition (2010-11, per 12 credit-hour semester):

- Average undergraduate tuition including mandatory fees (in-state) - $4,153.05
- Average undergraduate tuition including mandatory fees (out-of-state) - $8,304
- Graduate tuition - Varies by degree

E Institutional Funding

- General Fund (2011-12): $92,500,000

F Degrees & Programs

UM-Flint offers degrees in over 100 undergraduate and 40 graduate areas, including two doctorate program areas.

G RECENTLY ADDED DEGREE PROGRAMS:

- Undergraduate:
  - Clinical Lab Science/Medical Technology (Bachelor of Science)
  - Interdisciplinary Studies (Bachelor of Interdisciplinary Studies)
Section 3: University Profile

- English (Master of Arts)
- Social Sciences (Master of Arts)
- Computer Science and Information Systems (Master of Science)
- Doctor of Nursing Practice (DNP)
- Nursing (MSN) - Accelerated MSN

H ADDITIONAL ACADEMIC OFFERINGS:

- 2+2 Guaranteed Transfer Program to University of Michigan College of Engineering
- Early Assurance Program to Michigan State University Med School for students who meet eligibility standards
- Online and Distance Learning
- English as Second Language Program
- Honors Scholar Program
- Independent Study (see Academic Advising and Career Center for details)
- Internships
- Student-Designed Majors (see Academic Advising and Career Center for details)
- Study Abroad
- Teacher Certification
- Double Major (see Academic Advising and Career Center for details)
- Dual Enrollment for high school students

I Students

Fall 2011 Enrollment
Undergraduate - 6,959
Graduate - 1,303
Total - 8,262

Average Age (Fall 2011) - 26

Average high school GPA for incoming freshman class (Fall 2011) - 3.32

Student to Faculty Ratio (Fall 2010) - 17:1

65% of UM-Flint students receive some form of financial aid (Fall 2010)

Since 2005, international student enrollment has increased over 200%, with students hailing from over 37 different countries

During the last academic year, nearly 2,000 UM-Flint students participated in over 13,000 hours of community service.
Section 3: University Profile

J  Rankings & Recognitions
For nine consecutive years, The Princeton Review has named the University of Michigan-Flint one of "the best colleges and Universities in the Midwest."

In 2009, BusinessWeek named the University of Michigan-Flint’s MBA program one of the top 10 part-time MBA programs in the Midwest.

In 2008, for the second year in a row, UM-Flint was named to the President’s Higher Education Community Service Honor Roll by the Corporation for National and Community Service.

UM-Flint's School of Management has been rated one of the "best business schools" in the country by The Princeton Review for three consecutive years.

Six Fulbright Scholarships have been granted to UM-Flint faculty since 2000.

According to the 2008 Noel-Levitz Student Satisfaction Inventory, students' overall satisfaction with UM-Flint exceeds the national average.

K  Alumni
Every graduate of UM-Flint becomes a member of the University of Michigan alumni body, the world's largest.

There are over 30,000 living alumni of the University of Michigan-Flint. 81% of UM-Flint alumni live in Michigan.

L  NOTABLE ALUMNI:

- Dan Gaydou: Publisher, Grand Rapids Press
- Christopher Paul Curtis: Newberry Award-winning children's author
- Elizabeth Jordan, Ph.D.: regional assessor for the National Association for the Education of Young Children
- Robert J. Beltz: U.S. Steel, vice president-commercial, Europe
- John Sinclair: poet, activist, former manager of the rock band MC5
- Ernie Gilbert: character designer for Nickelodeon's animated series "The Fairly Odd Parents"
- John D. Cherry: Lieutenant Governor of Michigan
- Archie L. Hayman: Chief Judge, Genesee County Circuit Court
- Boh Ruffin, Ph.D.: senior research scientist, Corning Incorporated
- Donald Norris Reed Jr., M.D.: professor of surgery, Michigan State University
- Doris Hasan: Continuing Education Approval Program Coordinator, Michigan Nurses Association
- Donald Tallman: executive director, Colorado Railroad Museum
IV. Organizational Structure

The organizational chart that follows represents the overall Executive and Staff Management structure of the UM-Flint:

Table 3-1 UM-Flint Organizational Structure
V. Economic Impact

The UM-Flint is a vital economic engine for the City of Flint. The university has approximately 8,100 students enrolled for the 2010 year and those students travel to downtown Flint on a daily basis in order to attend classes.

The university is located on 76 acres of land adjacent to the Flint River in downtown Flint, Michigan. The campus itself presents a green space type environment in an urban area, and total building replacement costs are estimated at approximately $227,000,000. Building and contents replacement costs are estimated at approximately $364,000,000. The overall environmental impact of the campus on the downtown area is very positive.

The university has always been considered more of an urban commuting university. That still holds largely true; however, with the construction of the first 310 person dormitory in 2008 this has somewhat changed and the university now generates $1.5 million in on campus housing revenue from the First Avenue Residence Hall.

Best Available Data- Data from the Integrated Postsecondary Education Data System (IPEDS) for the 2010-11 fiscal year was the most recent and complete summary available at the time of this project.

A. Revenues and Economic Impact Data

For 2010, the university’s total revenues were approximately $106,729,000 including tuition & fees, grants and contracts-operating, non-operating revenues, grants - non-operating, and other revenues.

Tuition revenue was approximately $52,091,000.

Salaries and Benefits for Faculty and staff were approximately $63,000,000.

The university is an approximately $107,000,000 a year business that generates many favorable community wide economic benefits, including:

- Faculty and staff living in the community, buying homes, and raising families.
- Attracting approximately 8,000 students into downtown Flint where they support local businesses during the school day.
- Student rental housing in the vicinity of campus.
- Overall community vitality enhancement via faculty and staff involvement with community organizations and structures

B. Other Economic Impacts

On Campus Housing: In addition to its direct academic mission the university opened its first residence hall in 2008. As of the 2010 school year, the revenues are expected to be approximately $1.5 million per year from this 310 person capacity dormitory. The university also has partnership arrangements with the owner of an adjacent condominium building-the Riverfront Residence Hall where most of the tenants are UM-Flint students.
**Auxiliary Operations** - In addition to academic revenues, several sub operations of the university generate annual revenues based upon user fees, grants or a combination of both.

- Urban Health and Wellness Clinic - $800,000
- Early Childhood Development Center - $725,000
- Events and Building Services - $734,000
- Recreation Center - $923,000

All of these auxiliary services provide added revenue to the university as well as vital services that users rely upon.

In addition to the academic mission of the university the Urban Health and Wellness Clinic provides medical services for the Flint community and serves many individuals who have no other avenue for obtaining health care services.

The Early Childhood Development Center assists the community by providing services to at risk children who would be otherwise unable to obtain quality preschool and day care services.

These two programs provide vital community support services which if lost would be sorely missed by the community they serve and the greater Flint community as well.

**Economic Leadership** - The university is an economic leader in the greater Flint community. Since its inception the university has been a conduit for foundation giving directed at improving the downtown area and the wider area around the entire university corridor. In the course of conducting the Hazard Mitigation Planning, thoughts were focused on what can be done to reduce risks, as well as ways for the community to support the wider risk reduction efforts at the city and county level. The work to develop Mitigation Goals surrounding river/flood monitoring, and emergency power provisions are two examples of community outreach used in an attempt to provide assistance with risk reduction efforts.

This economic leadership aspect of the university’s presence in the community will be very important going forward. With the loss of the automotive sector jobs in Flint, there are few other major stakeholders in downtown Flint area in a better position to provide economic support and continued vitality for downtown Flint.
Section 4: Planning Process

I. Overview of Hazard Mitigation Planning at UM-Flint

Hazard mitigation is any action taken before, during, or after a disaster to eliminate or reduce the risk to human life and property from natural, technological or societal hazards. This is accomplished through the coordination of resources, programs, and authorities. When successful, mitigation will lessen the impacts of hazards to such a degree that future events will remain incidents rather than culminate into disaster.

The University’s risk mitigation approach is summarized in the graphic that follows.

This graphic shows existing programs and plans currently in place at the University, and when viewed in the context of the Risk Management process, it can be categorized as consisting of the following:

A. Pre-Incident Planning
   - Risk Identification
   - Risk Quantification
   - Risk Mitigation

B. Post-Incident Response
   - Emergency Response Planning
   - Crisis Management Planning
   - Business Continuity Plans
The FEMA Hazard Mitigation Plan works in conjunction with the overall risk mitigation process at the University, and the process of developing the plan was used as an opportunity to reinforce several aspects of the existing risk mitigation program. As can be seen from the graphic above, the University has spent considerable effort in developing a comprehensive approach to risk mitigation.

The FEMA Hazard Mitigation Planning process was also used as an opportunity to delve more deeply into key risks that University faces. The everyday process of planning at the University has to focus upon both strategic and tactical risk mitigation efforts.

Tactical efforts involve issues such as student security/mass notification, emergency response to...
weather events, monitoring severe weather potential in an effort to provide a proactive approach should adverse events occur involving storms, tornados, etc.

The Hazard Mitigation Plan, owing to its name focuses upon the identification of Hazard and Risk Mitigation opportunities ranging from tactical to strategic. The process was used to develop mitigation opportunities over several areas of University operations in several key categories.

The plan preparation discussion that follows outlines the methods and steps used to develop these mitigation opportunities. Once the plan is fully approved and adopted, the mitigation opportunities will be ongoing risk mitigation initiatives that will be addressed by the AHPT members in their normal course of operations.

II. Preparing the Plan

A. Overall Approach towards the FEMA Hazard Mitigation Planning Process

The FEMA Hazards Mitigation Planning process is intended to identify, quantify and prioritize mitigation measures that will produce the maximum level of impact reduction or improvement in the overall risk profile for the UM-Flint. The flowchart that follows on page 4-6 of the plan shows how the “Building a Disaster Resistant University” process was executed to identify risks and develop Mitigation Goals.

Mitigation goals refer to distinct areas of potential risk mitigation and reduction, and specific actions that will benefit the UM-Flint by reducing risk. Aside from being an avenue for capturing and driving action on internally driven risk reduction efforts, these Mitigation Goals will carry over and act as guidance on future risk reduction efforts.

The overall process began by developing a list of risks to be examined. This list was initially derived from the FEMA website, and other University Hazard Mitigation Plans. The list was then shared with the Emergency Management Division of the MSP at the inception of the project, and revised to reflect their input.

Reporting in Section 5 covers the following basic points as part of the overall summary on each Hazard:

- A description of the risk as it exists at the University
- The exposure to loss or impact
- Consideration of past events resulting from the risk
- Existing mitigation measures
- Potential impact scenarios

The University’s ultimate goal was to use the process to determine where mitigation opportunities might exist, determine how best to prioritize those opportunities, and ensure that they remain on the All Hazards Planning Team and University Agenda once the plan development process is completed.
B. Risk Assessment, Information Gathering, Website Development

Risk Assessment activities kicked off with project organization activities with the All Hazards Planning Team, Hazard Mitigation website development and the consultant conducting a risk based survey for each building that is a part of the grant application.

The support team for the process was identified as the All Hazards Planning Team, and completed hazard mitigation plans for both universities and local planning units were evaluated for content and format as the process got underway.

A considerable amount of effort was made to engage the All Hazards Planning Team and other key internal and external stakeholders during the risk assessment phase of the project. This consisted of an initial orientation to the process, provision of ongoing updates on progress, and support for the assessment of risks via focused meetings and interviews with each department represented on the All Hazards Planning Team, including all of the Executive Officers of the University.

Information gathered through the interviews was summarized and used to report preliminary findings at various phases of the process leading up to the final version of the mitigation plan. Additional information on the details of the interview and interaction process with members of the All Hazards Planning Team is summarized later in this section of the plan.

C. Mitigation Goal Identification and Prioritization

The ultimate goal of the risk assessment process is to identify then prioritize a number of mitigation opportunities that are of key and strategic importance to the University. The Hazard Mitigation Plan development process is just one of many avenues that the University uses to identify ways to mitigate and reduce risks. Existing processes surrounding Public Safety, Environment Health & Safety, Facilities Management, Risk and Insurance all serve to surface mitigation opportunities on a day to day basis.

The approach for reporting the Hazard Mitigation Plan, used information gathering processes, and ongoing discussions about key risks to develop mitigation goals and actions. Information captured in Sections 5-Risk Identification, 6-Vulnerability, and 7-Risk Mitigation provide the substantiation for the presentation of the key mitigation goals and actions.

During key parts of the process the AHPT came together to review, and prioritize the Major Mitigation Goals that have been identified in the plan. They used a set of preliminary mitigation ranking scores as a guide for an on site discussion leading to adjustments in the mitigation prioritization. The overall mitigation goal prioritization scores were adjusted to determine the final rankings for hazard mitigation as a result of this process.

D. Preparing the Plan - In process activities, and plan review

From the early stages of the process through to the issuance of the final plan, the All Hazards Planning Team was engaged with the process. The All Hazards Planning Team activities are summarized below. Samples of the information gathering tools used within the group to evaluate risk to the University are included in Section 9-I of the plan.

The foundation of the plan is the recognition that the current approach towards risk mitigation provides a good base process. From this base, the University will continue to further develop and implement risk mitigation initiatives. The comprehensive nature of the All Hazards Planning Team and their commitment to action support this.
As noted in the flowchart on page 4-6, several avenues of information gathering, many external in nature, were pursued in order to get the widest view of risk identification and prioritization. This information gathering was rolled up into the reporting on risk exposures, risk identification and prioritization, and mitigation development.

**Real Time Planning** - During the development of the plan, the university experienced events that confirmed the need to an aggressive approach towards hazard mitigation, and provided real time examples of additional mitigation steps that might be beneficial. These events mainly involve severe weather incidents including several instances of high water levels in the Flint River. Incidents that occurred during the process were used as learning experiences with regard to Hazard Mitigation Goal identification, and are reflected in the mitigation measures developed.

In some cases risks were identified as part of the intensified view of risk presented by the process, and addressed immediately. The focus on Flood Mitigation is one example. Other examples include modification of the evacuation process for the First Avenue Residence Hall, and deeper evaluation of emergency power coverage.

**Website Development** – As part of this grant the University has developed a section of the EHS website dedicated to Hazard Mitigation. The site was used during the development process as an education avenue for project participants and interested extended community participants.

It can be accessed at http://www.umflint.edu/ehs/fema/index.htm. The University anticipates using this webpage as an extension of the All Hazards Planning Team preparedness planning and mitigation efforts and as a future venue for access to real time data on natural hazards. The web resources that were developed for this project will continue as a legacy part of the risk mitigation process, and may be expanded, as part of efforts to develop an electronic platform for the campus-wide Business Continuity Plan.

**Plan Development and Review** – The approach toward planning and the format for this plan was based upon several steps:

- Review and recognition of the FEMA requirements including local mitigation plans and as described in their “Building a Disaster Resistant University” documentation,

- Review of other university Hazard Mitigation Plans,

- Input received from the Emergency Management and Homeland Security Division of the Michigan State Police,

- Drafting the plan, ease of use of the plan document, and creating web resources that would be sustainable as part of the overall ongoing risk mitigation effort

As sections of the plan were developed, they were reviewed by the appropriate stakeholders within the All Hazards Planning Team. Because the Team is so large the University was efficient in allocating effort and approached the review of individual portions of the plan on a subject matter expert basis.

This applied throughout the review of the plan, and was instrumental in ensuring that the AHPT input was preserved throughout the process yet focused upon the areas where input was most
needed. All members of the AHPT were able to participate and comment on any and all sections of the planning documents and process, regardless of their specific area of expertise. This type of feedback provided healthy debate and discussion, particularly during the discussion of mitigation of risks and prioritization of mitigation goals and actions.

Once the plan was fully completed all members of the AHPT reviewed it prior to it being formally issued.

Figure 4-2 Hazard Assessment-Documentation-Prioritization
III. Overall Project Timeline

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University receives Grant</td>
<td>Thu 7/1/10</td>
<td>Thu 7/1/10</td>
</tr>
<tr>
<td>2</td>
<td>University engages Green Oak Solutions</td>
<td>Mon 8/2/10</td>
<td>Mon 8/2/10</td>
</tr>
<tr>
<td>3</td>
<td>First Meeting with the Michigan State Police</td>
<td>Tue 8/7/10</td>
<td>Tue 8/17/10</td>
</tr>
<tr>
<td>4</td>
<td>Preliminary list of Hazards to be evaluated adopted</td>
<td>Tue 8/17/10</td>
<td>Tue 8/24/10</td>
</tr>
<tr>
<td>5</td>
<td>First Meeting of the All Hazards Planning Team related to the HMP</td>
<td>Tue 8/24/10</td>
<td>Tue 8/24/10</td>
</tr>
<tr>
<td>6</td>
<td>Website development activities dedicated to the process</td>
<td>Wed 9/1/10</td>
<td>Thu 9/30/10</td>
</tr>
<tr>
<td>7</td>
<td>RA Begins with site surveys of all campus buildings by GOS</td>
<td>Fri 10/1/10</td>
<td>Wed 12/1/10</td>
</tr>
<tr>
<td>8</td>
<td>RA continues via surveys and information gathering with AHPT and Eos</td>
<td>Mon 11/1/10</td>
<td>Thu 3/31/11</td>
</tr>
<tr>
<td>9</td>
<td>External Mtgs - LEPC, FRCA, Consumers Energy, City of Flint</td>
<td>Tue 1/25/11</td>
<td>Fri 4/29/11</td>
</tr>
<tr>
<td>10</td>
<td>GIS Elements developed</td>
<td>Tue 3/1/11</td>
<td>Tue 11/1/11</td>
</tr>
<tr>
<td>11</td>
<td>Internal Stakeholder Mtgs</td>
<td>Tue 3/1/11</td>
<td>Tue 11/1/11</td>
</tr>
<tr>
<td>12</td>
<td>Natural, Technological, Security Hazards RA</td>
<td>Tue 3/1/11</td>
<td>Thu 12/1/11</td>
</tr>
<tr>
<td>13</td>
<td>Plan Development &amp; Drafting Begins</td>
<td>Mon 5/2/11</td>
<td>Mon 5/2/11</td>
</tr>
<tr>
<td>14</td>
<td>UMF Risk Management Div provides Bldg Values, past losses, etc.</td>
<td>Fri 7/1/11</td>
<td>Thu 5/31/12</td>
</tr>
<tr>
<td>15</td>
<td>Vulnerability Assessment</td>
<td>Fri 7/1/11</td>
<td>Mon 8/1/11</td>
</tr>
<tr>
<td>16</td>
<td>AHPT Review of Draft Pan Sections</td>
<td>Mon 8/1/11</td>
<td>Thu 5/31/12</td>
</tr>
<tr>
<td>17</td>
<td>Mitigation Goal Development</td>
<td>Mon 8/1/11</td>
<td>Fri 9/30/11</td>
</tr>
<tr>
<td>18</td>
<td>Mitigation Goal Prioritization</td>
<td>Mon 10/3/11</td>
<td>Thu 12/1/11</td>
</tr>
<tr>
<td>19</td>
<td>MSP Preliminary Review of Plan Elements</td>
<td>Wed 12/7/11</td>
<td>Sun 1/15/12</td>
</tr>
<tr>
<td>20</td>
<td>Continued Plan Development, AHPT Review and Revision</td>
<td>Mon 1/16/12</td>
<td>Thu 5/31/12</td>
</tr>
</tbody>
</table>
IV. All Hazards Planning Team (AHPT) Meetings and Involvement

Preparation of the plan included addressing hazard mitigation planning activities during regular meetings and interviews with All Hazard Planning Team members to gather information, discuss plan direction, and collaborate to reach consensus on content.

The meetings provided a platform for regular input and feedback during all stages of plan development from the key stakeholders. Below is a tabular summary of the All Hazards Planning Team meetings where the hazard mitigation plan was a topic of discussion.

Table 4-1 AHPT Planning Team Meetings

<table>
<thead>
<tr>
<th>AHPT Meeting Date</th>
<th>Topics Discussed</th>
<th>Type of Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/26/10</td>
<td>Hazard Mitigation Plan Orientation, Project Kick Off</td>
<td>Full AHPT meeting</td>
</tr>
<tr>
<td>October/November 2010</td>
<td>Hazard Prioritization</td>
<td>Zoomerang Survey for AHPT</td>
</tr>
<tr>
<td>12/2/10</td>
<td>Process update, and findings update</td>
<td>Full AHPT meeting</td>
</tr>
<tr>
<td>1/13/11</td>
<td>Process update, and interview process</td>
<td>Full AHPT meeting</td>
</tr>
<tr>
<td>5/19/11</td>
<td>Process update, preliminary findings summary</td>
<td>Full AHPT meeting</td>
</tr>
<tr>
<td>1/1/11 to 6/1/11</td>
<td>University Enterprise Risk issues, departmental/operations level risk issues</td>
<td>20 Face to face interviews with all departments represented on the AHPT</td>
</tr>
<tr>
<td>8/18/11</td>
<td>Introduce and review Mitigation Initiatives from risk assessment</td>
<td>Full AHPT meeting</td>
</tr>
<tr>
<td>12/15/11</td>
<td>Plan review process check Obtain Comments on Plan Elements</td>
<td>Full AHPT meeting</td>
</tr>
<tr>
<td>1/19/12</td>
<td>Plan review process check Obtain Comments on Plan Elements</td>
<td>Full AHPT</td>
</tr>
<tr>
<td>2/16/12</td>
<td>Review Vulnerability Analysis, Review Risk Mitigation and Prioritization</td>
<td>Full AHPT</td>
</tr>
</tbody>
</table>

A. AHPT Interviews

In addition to the regular AHPT meetings face to face one hour interviews were conducted with many of the stakeholder groups represented on the AHPT. The interview questionnaires can
be found in Section 9-I of the plan. The table that follows summarizes the members of the AHPT that were interviewed, the date that it occurred, and the topics that were discussed. The interviews were used in the plan development to identify and prioritize risks, as well as to get as wide a view of exposure as possible from a University operations perspective.

B. AHPT Focused Risk Mitigation Inquiries

As the process developed it became clear that two groups within the University, along with the EHS leadership would contribute heavily to the overall evaluation of risk, and development of mitigation opportunities.

EHS leadership, in particular Mike Lane was the spearhead for virtually all activities on the project. As the leader of the AHPT and risk management and mitigation for the campus Mike was the logical leader for activities related to the HMP development.

EHS spearheaded the risk mitigation review by focusing the team on issues such as;

- Severe Weather preparedness
- Safety and Security initiatives
- Incident Management and Communications
- Emergency Response Planning
- On going risk mitigation and insurance carrier interface
- Business Continuity Planning

The Facilities and Operations Department, and the Department of Public Safety both played pivotal roles in the development of risk assessment information and mitigation opportunities. Numerous meetings were held with both of these groups surrounding campus safety and security related risk issues, facility infrastructure failure potential, planning surrounding riverine flooding and the Hamilton Dam exposure, utility provider reliability, and natural hazard mitigation.

Table 4-2 AHPT & Executive Officer Interview Summary

<table>
<thead>
<tr>
<th>Interviewee’s</th>
<th>Meeting Date</th>
<th>Hazards of Primary Concern/Hazard Exposures Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>George Hakim, Director of Facilities &amp; Operations</td>
<td>1/13/11</td>
<td>Critical infrastructure review – several follow up meetings occurred related to power, water, natural gas, and sewer.</td>
</tr>
<tr>
<td>Tim Barden, Maintenance Manager</td>
<td>1/28/11</td>
<td>Flood – Flint River flood risk assessment.</td>
</tr>
<tr>
<td></td>
<td>3/11/11</td>
<td>Power – Consumers Energy meeting to discuss power reliability.</td>
</tr>
<tr>
<td><strong>Department of Public Safety</strong></td>
<td>12/10/10</td>
<td>Overview of DPS operations</td>
</tr>
<tr>
<td>Allen Cozart, Police Sergeant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phil Smith, Police Sergeant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interviewee’s</td>
<td>Meeting Date</td>
<td>Hazards of Primary Concern/Hazard Exposures Assessed</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>12/14/10</td>
<td>Continued overview of DPS operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Numerous meetings and discussions throughout the course of the project regarding safety and security, plan development.</td>
</tr>
<tr>
<td><strong>Information Technology Services</strong></td>
<td>12/14/10</td>
<td>Overview of ITS operations</td>
</tr>
<tr>
<td>Scott Arns, Director, Ken Heiser, IT Manager</td>
<td></td>
<td>Numerous meeting and discussion throughout the course of the project regarding plan development.</td>
</tr>
<tr>
<td><strong>University Relations</strong></td>
<td>7/26/11</td>
<td>Safety and security, crisis communications, crisis management, incident management, community relations.</td>
</tr>
<tr>
<td>Jennifer Hogan, Exec. Dir., Mel Serow, Media Relations Mgr.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Government Relations</strong></td>
<td>3/18/11</td>
<td>Flood and Hamilton dam modernization project.</td>
</tr>
<tr>
<td>David Lossing, Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VCBF</strong></td>
<td>3/25/11</td>
<td>Flooding and Hamilton dam, safety and security, vulnerable population, residence hall safety and evacuation, DPS operations, DPS venues, workplace violence, emergency and incident management.</td>
</tr>
<tr>
<td>Bill Webb, Asst. Vice Chancellor</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Auxiliary &amp; Rec. Services</strong></td>
<td>7/20/11</td>
<td>Food safety and dining services, auxiliary revenue stream exposure, rec center safety, severe weather warnings, safety and security, rec center safety training.</td>
</tr>
<tr>
<td>Theresa Landis, Director, Gary Parr, Rec. Svcs. Assoc. Dir.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Human Resources</strong></td>
<td>3/17/11</td>
<td>University business continuity planning, governmental compliance, union relations, workplace violence, food borne illness, student safety, employee HR management.</td>
</tr>
<tr>
<td>Diana Curran, Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Division of Student Affairs</strong></td>
<td>7/20/11</td>
<td>Student safety and security</td>
</tr>
<tr>
<td>Johnny Young, Asst. VC</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Housing and Residential Life</strong></td>
<td>7/20/11</td>
<td>Fire, tornado sheltering for residents, communicable disease issues, safety and security, residence hall contingency plan, emergency evacuation drills, emergency power, food borne illness.</td>
</tr>
<tr>
<td>Kim Butka, Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Admissions</strong></td>
<td>3/2/11</td>
<td>Safety and security, cyber security, student information checks, continuity of operations, IT business continuity.</td>
</tr>
<tr>
<td>Kimberly Buster-Williams, Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Library</strong></td>
<td>3/7/11</td>
<td>Safety and security, implementation of M-card system, IT business continuity planning, physical protection.</td>
</tr>
<tr>
<td>Bob Houbeck, Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UHWC</strong></td>
<td>1/15/11</td>
<td>Zuza – Safety &amp; Security, Genesee County Health Department interface, Communicable Disease Program</td>
</tr>
<tr>
<td>David Zuza, Administrative Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandy Mansourr,</td>
<td>3/30/11</td>
<td>Communicable Disease Program, Genesee County Health Department interface.</td>
</tr>
<tr>
<td><strong>ECDC</strong></td>
<td>3/2/11</td>
<td>Safety and security, proximity to urban health and wellness clinic, food safety, emergency power.</td>
</tr>
<tr>
<td>Della Becker-Cornell, Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interviewee’s</td>
<td>Meeting Date</td>
<td>Hazards of Primary Concern/Hazard Exposures Assessed</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>International Student Center</strong></td>
<td>3/4/11</td>
<td>Student safety and security, student international travel, international student documentation</td>
</tr>
<tr>
<td>Dan Adams, Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Procurement &amp; Contracts</strong></td>
<td>3/18/11</td>
<td>Power and emergency power, emergency procurement</td>
</tr>
<tr>
<td>Greg Snyder, Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Development and Alumni Relations</strong></td>
<td>3/4/11</td>
<td>Safety and security, crisis management/community perception, financial impact of crime,</td>
</tr>
<tr>
<td>Scott Bertschy, Executive Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Genesee Early College</strong></td>
<td>June 2011</td>
<td>Review of risk assessment report prepared by Genesee County</td>
</tr>
<tr>
<td><strong>Lab Supervisors</strong></td>
<td>12/9/11</td>
<td>Laboratory safety, flammable and hazardous material transport, storage and handling. Chemical storage. Laboratory contingency planning, laboratory security, laboratory gas supply control. Emergency power, lab safety and chemical hygiene planning.</td>
</tr>
<tr>
<td>Monique Wilhelm, Chemistry &amp; Biochem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Michelle Coeman, CSEP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keith King, Earth &amp; Resource Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Executive Officers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Ruth Person, Chancellor</td>
<td>6/1/11</td>
<td>Flood and flood mitigation, ITS business continuity planning, winter weather events, safety-health-well being, urban health and wellness clinic exposure, emergency power, business continuity planning enhancement.</td>
</tr>
<tr>
<td><strong>Dr. Gerard Voland, Provost</strong></td>
<td>6/1/11</td>
<td>Safety and security, building security and card access, flood, laboratory safety procedures, safety-health-well being</td>
</tr>
<tr>
<td><strong>Dave Barthelmes, Vice Chancellor</strong></td>
<td>4/14/11</td>
<td>safety-health-well being, public safety, parental perception, infrastructure maintenance and operations, critical infrastructure upgrades, environmental contamination, Hamilton dam exposure, ITS business continuity planning, emergency power provision, student safety patrol, University business continuity planning.</td>
</tr>
<tr>
<td>Business and Finance</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dr. Mary Jo Sekelsky, Vice Chancellor</strong></td>
<td>3/30/11</td>
<td>safety-health-well being, residence hall exposures – fire evacuation, food safety program, SUITS program.</td>
</tr>
<tr>
<td>Student Services</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UM- Ann Arbor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kate Rychlinski – Director Risk Management</td>
<td>7/26/11</td>
<td>Safety-health-well being /DPS, flood mitigation, FM global, physical protection in mitigation, past losses at the University.</td>
</tr>
<tr>
<td>Andy Birchfield- Manager, Office of Emergency Preparedness</td>
<td>7/27/11</td>
<td>Reviewed HMP program. Reviewed UMAA database project and discussed how HMP elements might fit with this larger database once complete.</td>
</tr>
</tbody>
</table>

C. GIS Element Development

The Campus Architect, University Outreach Staff, EHS as well as Assistant Professor Dr. Greg Rybarczyk of the Department of Earth and Resource Sciences were all instrumental in determining the application of GIS mapping to this project, identifying specific mapping needs, development of the various GIS diagrams, and facility layouts in this plan. The various levels of diagrams that have been developed allow the University to show key risk assets more clearly, and use these in the
vulnerability analysis to highlight risks, and better identify their location across campus. The GIS mapping elements are described in further detail in Section 6 of the plan, and can be located in the Section 9-II of the plan.

V. Other University Stakeholders- Students, Faculty and Staff

During the plan development process, input was enlisted from as broad a range of stakeholders as possible. Presentations were conducted and meetings were held with student, faculty and staff organizations across the University. The communication process offered a chance for groups who are not as involved with the risk mitigation process to have a voice in it, and provide some input as to risk priorities of the greater University community.

A tabular summary of meetings with these groups is shown below

Table 4-3 Other University Stakeholders Meetings – Students, Faculty and Staff

<table>
<thead>
<tr>
<th>Student/Faculty/Staff Meeting</th>
<th>Meeting Date</th>
<th>Topics Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff Council Meeting</td>
<td>3/17/11</td>
<td>Hazard Mitigation Planning, and solicited input from Staff perspective</td>
</tr>
<tr>
<td>Student Government Meeting</td>
<td>5/27/11</td>
<td>Hazard Mitigation Planning, and solicited input from Student perspective. Distributed questions on risk to student govt. members</td>
</tr>
<tr>
<td>Faculty Council Meeting</td>
<td>10/28/11</td>
<td>Hazard Mitigation Planning and Business Continuity Planning in the classroom context. Solicited feedback on key risk issues from Faculty leadership.</td>
</tr>
<tr>
<td>Laboratory Managers</td>
<td>12/9/11</td>
<td>Lab safety, student safety and laboratory operations</td>
</tr>
<tr>
<td>Art Department</td>
<td>12/9/11</td>
<td>Workshop safety</td>
</tr>
<tr>
<td>Theatre Department</td>
<td>12/9/11</td>
<td>Theatre operations and risks</td>
</tr>
</tbody>
</table>

VI. Public Involvement

The UM-Flint has strong ties to the Flint and Genesee County community. These ties exist with city and county governmental officials, law enforcement agencies, public health agencies, emergency management service providers and organizations, utility providers, and community organizations. As part of the Hazard Mitigation Planning process, the University used the opportunity of developing the plan to further engage with these community organizations in various ways. The list of meetings and discussions that follow summarize the groups met with, and the issues addressed.

The Hazard Mitigation planning process has just ended; however, the contacts and planning the University is doing with the noted organizations will continue, and be supported by risk mitigation initiatives that the University began to address during the development of the plan.
### Table 4-4 Public Meetings

<table>
<thead>
<tr>
<th>Participants</th>
<th>Meeting Date</th>
<th>Topics Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flint River Corridor Alliance</td>
<td>1/25/11</td>
<td>This group has a mission related to various issues surrounding the Flint River flooding, dam safety, and river vitality. Riverine Flooding is one of the greatest risks that expose the University, and this group is instrumental in shaping the future use of the river.</td>
</tr>
<tr>
<td>Wade Trim Jason Kenyon, P.E. Vice President Wade Trim</td>
<td>2/22/11</td>
<td>Evaluation of the Flood risk. Wade Trim is a local engineering firm that is working under contract from the City of Flint in support of a river redevelopment project.</td>
</tr>
<tr>
<td>Genesee County Local Emergency Planning Committee</td>
<td>4/14/11</td>
<td>This meeting provided the opportunity to engage with local fire, ems, and law enforcement agencies and discuss the plan. As a result of this meeting the Flint FD indicated a desire to further tour the University facilities for purposes of pre planning hazardous materials response.</td>
</tr>
<tr>
<td>City of Flint Water Department Brent Wright, Plant Supervisor</td>
<td>6/6/11 8/4/11</td>
<td>The manager is responsible for managing flows through the various dams along the Flint River and its tributaries, and is instrumental in the ongoing management of flood risks that expose the University. The work has contributed significantly to the plan, and aided in developing a set of mitigation opportunities surrounding river monitoring and flood emergency response planning.</td>
</tr>
<tr>
<td>Consumers Energy Christina Gipson, Corporate Account Manager</td>
<td>5/26/11</td>
<td>University power provisions and options for increasing resiliency to power disruptions. This meeting was used as an opportunity to open discussions internally on options for provision of enhanced emergency power coverage across the University. Subsequent to the meeting on electric power a hazard exposure was identified related to an above ground Consumers Energy gas line housed in a structure both close the University, and exposed to potential traffic impact. The structure had inadequate vehicle impact protection and Consumers Energy took steps to reduce the hazard exposure by installing additional bollards around the structure.</td>
</tr>
<tr>
<td>Genesee County Health Department</td>
<td>11/27/11</td>
<td>Discussions with the GCHD led to identification of the potential ways for University to work more closely with the GCHD on matters related to community health.</td>
</tr>
<tr>
<td>US Geological Survey Thomas Weaver Hydrologist</td>
<td>8/14/11</td>
<td>Feasibility of installation of a stream flow gauge to better monitor river conditions in the direct proximity of the University.</td>
</tr>
<tr>
<td>DPS is in consultation with Hurley Medical Center</td>
<td>Spring 2012</td>
<td>Recent events have caused a concern that the university needs to report events under the Clery</td>
</tr>
</tbody>
</table>
Each of these meetings consisted of preparation of structured questions related to hazard mitigation. In some cases, responses were received and that information has been factored into the hazard mitigation plan.

VII. University Community and Public Review

The final public and private versions of the plan were posted for review by to the groups noted in the table 4-5 below. The public copy of the plan was posted on the UM-Flint EHS Hazard Mitigation website at [http://www.umflint.edu/ehs/fema/index.htm](http://www.umflint.edu/ehs/fema/index.htm), and the private version of the plan was posted on a Green Oak Solutions website at [https://www.greenoaksolutionsllc.com/commerce/file_share.aspx](https://www.greenoaksolutionsllc.com/commerce/file_share.aspx) in a secure location that requires a security credential in order to access the plan document and view the materials. The university will compile comments from the various parties and integrate them into the final plan.

**Table 4-5 Summary of Distribution for Review**

<table>
<thead>
<tr>
<th>Group, Entity or Individual</th>
<th>Version of Plan</th>
<th>Date Notified</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHS</td>
<td>Private</td>
<td>9/6/12</td>
</tr>
<tr>
<td>Public Copy Posted</td>
<td>Public</td>
<td>9/6/12</td>
</tr>
<tr>
<td>University Community via the University Relations Department</td>
<td>Public, this group includes some 10,000 individuals across the university community including students, faculty and staff</td>
<td>9/11/12</td>
</tr>
<tr>
<td>UM-Flint Executive Officers</td>
<td>Private</td>
<td>9/12/12</td>
</tr>
<tr>
<td>Group, Entity or Individual</td>
<td>Version of Plan</td>
<td>Date Notified</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Genesee County Emergency Manager</td>
<td>Public</td>
<td>9/12/12</td>
</tr>
<tr>
<td>Consumers Energy</td>
<td>Public</td>
<td>9/12/12</td>
</tr>
<tr>
<td>Genesee County Health Department</td>
<td>Public</td>
<td>9/12/12</td>
</tr>
<tr>
<td>City of Flint Public Safety Department</td>
<td>Public</td>
<td>9/12/12</td>
</tr>
<tr>
<td>City of Flint Water Department</td>
<td>Public</td>
<td>9/12/12</td>
</tr>
<tr>
<td>Local Emergency Planning Committee- 9/13 (notice retransmitted by Genesee County Emergency Manager)</td>
<td>Public</td>
<td>9/13/12</td>
</tr>
<tr>
<td>All Hazards Planning Team- 9/14 (final review, this group conducted numerous incremental reviews during process)</td>
<td>Private</td>
<td>9/14/12</td>
</tr>
<tr>
<td>Meeting and approval of draft plan for submittal to State by UM-Flint Executive Officers- 9/14</td>
<td>Private</td>
<td>9/14/12</td>
</tr>
</tbody>
</table>
Section 5: Hazard Identification & Risk Analysis

I. The Hazard Identification Process

The Hazard Mitigation Planning process began with an evaluation of the hazards that would be a part of the risk assessment.

The complete list of hazards considered in planning follows in the next section of the plan. This broad list of hazards was derived from a review of prior plans, FEMA direction within the DRU documentation, and was used as a starting point for evaluation of the key exposures the university faces.

Owing to the scope of the list, the geographic location of Flint in a downtown urban environment, and the types of risks that expose southeast Michigan and the university to the greatest losses, many of the hazards present little to no exposure.

In other cases, the hazards present strategic challenges to the university, and the planning process afforded the opportunity to examine the more acute risks that present the greatest exposure in depth. As the process developed, some logical breakdowns on reporting emerged along with recognition of the key risks that warranted the most emphasis during the planning process.

A. Format of the Plan-Hazard Reports

Hazard summary reporting begins in Section V of the plan and is arranged into five major categories:

1) Natural Hazards- Weather related, Geological, Climatological

2) Technological – Fire, Infrastructure Failure, Hazardous Materials Release (internal/external)

3) Security Related – Civil Disturbance, Bomb Threats, Workplace violence, Sabotage/Terrorism, Labor Related

4) Public Health - Food safety/Foodborne Illness, Contagious Disease control

5) Other Significant Risks – Mass Transit-air traffic, surface rail, and Flint MTA bus service

Beginning with Section V of Section 5 individual hazards are summarized including information on
Section 5: Hazard Identification & Risk Analysis

- Definition of the Hazard
- Past Occurrences
- Risk Assessment and Vulnerability
- Mitigation

Please note that hazard definitions were obtained from various sources. In some cases the definition within the 2011 State of Michigan Hazard Mitigation Plan (MHMP) has been excerpted and annotated. For natural hazards the university examined definitions of hazards from various sources including the MHMP, NOAA, the National Weather Service, and the USGS. The definitions or excerpts from the MHMP that apply more locally to the university have been adopted due to the state’s more detailed description of the hazard.

B. Hazard Exposure-Vulnerability-Mitigation Information

Hazard exposure information was gathered using:

- On site surveys directed at risk identification,
- Interviews, Hazard Identification, Hazard Quantification, and Hazard Mitigation evaluation with university leadership, in particular the departments responsible for the infrastructure-utilities-facilities,
- Information derived from existing processes related to Hazard Identification and Risk Mitigation - The AHPT process, Campus Emergency Response Plan, FM Global survey and mitigation action resolution process
- Interviews and Hazard Identification with the university’s Department of Public Safety,
- Interviews with the university IT leadership group,
- U.S. government information sources,
- Regional climate data, community and
- University historical data, and
- Various information sources such as NOAA, the USGS, etc.
- The State of Michigan Hazard Mitigation Plan

Where information is used credit is given, to the extent possible, in the body of the report.

C. Historical Hazard Related Events in Flint

Flint has a history that includes two prominent natural disasters.

- The 1947 flood on the Flint River produced massive flooding in downtown Flint, and led to the construction of additional flood control structures on the Flint River both upstream and downstream of the university, and
- The 1953 Beecher Tornado is now the 10th deadliest tornado in U.S. history

Additional details on these incidents are provided in the Hazard Assessment summaries for Flood and Tornado within this section, and they offer good examples of the key natural hazard risk exposures that exist in southeast Michigan and expose the university.
Section 5: Hazard Identification & Risk Analysis

Two of the mitigation goals that were identified as part of the plan development process relate to tornado and flood mitigation as these are the most likely or probable catastrophic exposure that expose the university.

II. The University and its Risk Profile

A. Natural Hazards

- Geographically the university is located in southeast Michigan, an area not prone to natural disasters, outside of tornado and localized flooding, both of which are a concern to the university.

- Flood and tornado are the two natural hazards that present the greatest exposure to the university and the plan concentrates mitigation efforts around these two risks in several ways.

- Typical weather patterns involve winter storm events, some severe in nature. The primary risks that winter weather events pose are costs incurred due to wear and tear on structures, intermittent shutdowns for a day or two, pedestrian traffic safety issues, and chronic costs incurred for managing snow removal.

- Summer daytime temperatures can reach above 100 degrees for extended periods, and severe thunderstorms are not uncommon. Severe weather accompanied by lightning, winds, or possibly tornados produce stress on structures and cause wear and tear plus exposure to localized damage during storm events.

- Exposure to geologic events such as earthquake and subsidence are negligible in the Flint area.

- Earthquakes have occurred in Michigan, however, there are no active faults in Michigan and the risk is considered low. The plan includes earthquake exposure mapping and a brief history of earthquakes in Michigan in order to show that the exposure is not one of the key hazards of concern.

- Exposures to hazards such as wildfire, and drought are virtually nonexistent for the university proper and are addressed only briefly in the plan.

B. Technological Risk - Buildings and Infrastructure

With a major physical plant, tunnel system, 11 major buildings, and several parking structures to operate and maintain, physical risk mitigation is a high priority for the university. Protection of the operations infrastructure is critical due to the single site/sole site nature of most facilities across the campus.

- Fire in any structure is a concern at any time and ranks high on the overall list of technological risk mitigation priorities, along with internal or external infrastructure failure.

- The plan places a high priority on risk mitigation across all facilities and over 20 mitigation actions have been developed for building level mitigation. Each building was surveyed by Green Oak Solutions and mitigation actions were developed on a building-by-building basis. Additionally building and risk management survey work performed by FM Global was factored into the assessment, and where appropriate, the FM Global recommendations for mitigation were incorporated into the plan.

- Included in the university infrastructure is the ITS Data Center operations environment. The risk assessment for this area centered upon the physical operations environment,
Section 5: Hazard Identification & Risk Analysis

adequacy of fire protection, and the ITS department’s ongoing efforts to improve IT security, network connectivity and resilience, and backup operations capability.

- The university is located adjacent to I-475 which runs along its eastern perimeter and there are rail exposures in the realistic proximity of the campus which pose a degree of risk to transportation-related hazardous materials incidents. These risks exist however no significant incidents associated with them have resulted in the mass evacuation of the university.

- Hazards associated with oil and gas pipelines and oil and gas wells are low to nonexistent and are addressed only briefly in the plan.

- Hazards associated with a nuclear power plant accident are addressed briefly in the plan. There are three nuclear plants located in Michigan, and the university is well outside the evacuation zone for all three. The most notable of the plants recently has been the Palisades facility near Saugatuck. While it is felt that the impact potential from events involving nuclear power plant accidents is low, there is a small potential for some disruption if a major event occurred at one of the Michigan plants.

- The hazard of nuclear attack is on the list of risks to be examined, however, the university feels that this risk is outside the scope of the university’s ability to affect mitigation.

C. Security Related Hazards

Security risks and mitigating them are a high priority for the university. Other portions of the plan document the university’s place in the overall community and the importance of safety and security to the overall risk mitigation profile of the university.

The university faces a range of security related hazards that are addressed in detail in the risk summaries and elsewhere within the plan.

D. Public Health

With over 9,000 students, faculty and staff on campus on a daily basis, public health issues are a key risk issue. The university has a 310-person on campus residence hall, and operates the Urban Health and Wellness Clinic where the public interfaces with the university community. Contagious disease control and public health issues in general are a present and future focus for the university.

As part of the university operations, food services are provided in various locations and venues. While the use of an outside vendor somewhat transfers the risk to the provider, the university still has ultimate responsibility to manage this risk.

Public health issues are addressed in detail in the risk assessment summary.

E. Other Risks

With the majority of students commuting to the university, transportation issues have been evaluated and briefly summarized.
III. Hazards- Frequency/Severity/Probability/Vulnerability

Hazards were evaluated using the base criterion listed below. In order to take a wider view of all the criterion that might be considered this list was somewhat expanded for the detailed rating process that is summarized on pages 5-81 through 5-85.

**Frequency:** Does a hazard exposure exist, and if so, with what frequency do incidents occur?

**Severity:** What magnitude of impact could occur related to the hazard? Is it a catastrophic or chronic/systemic risk?

**Probability:** How likely it is that some event will occur based on the frequency and magnitude of past occurrences to the university across the region, or based upon current exposures that exist. For some natural hazard type events it is relatively easy to assess probabilities, for other hazard related events a numerical probability is more difficult to assign. Probability of a negative event outcome can also be assessed based upon the relative likelihood of an event and the relative strength of current mitigation.

**Vulnerability:** Level of potential impact, susceptibility and exposure to an identified hazard while taking into account, when possible, processes already implemented to mitigate the impact of events.

**Risk:** The tabular risk summary that follows represents a broad overview of how each of the hazards has been evaluated and rated within the plan. Note that ratings have been assigned a priority within each major category of risk for this summary.

To assist with the prioritization of hazard mitigation, a set of evaluation criteria, including all of the factors listed above was developed and employed to establish a hazard risk points rating. While the points rating is not the sole criteria for hazard mitigation prioritization, the process did confirm where the strongest efforts at risk mitigation need to be directed.

As noted beginning on page 5-81 of the plan there is a detailed rating summary. In that summary a specific numerical rating was developed and then the hazards were judged in six categories as shown in table 5.1 that follows.

Ratings are assigned as follows:

**Negligible:** Hazards that pose little to no threat or are beyond the scope of the university to mitigate. Full risk ranking score not developed.

**Low or Extremely Low:** Hazard or threat may exist in region or state but doesn't directly impact the university. Relatively low risk ranking score exists.

**Moderate:** Hazard exists at the university and is addressed in detail in the risk assessment, and where appropriate, supported by appendix materials. Mid level risk score; accompanied by other risk assessment, and vulnerability data that supports the importance of the hazard and mitigation.

**High:** Hazard exists and is one of the high priority hazards addressed in the plan. Mitigation actions are likely identified in Section 7 of the plan, and are noted in the hazard summary reporting. High risk ranking score.
# Section 5: Hazard Identification & Risk Analysis

## Table 5-1: Hazard Risk Mitigation Ratings

<table>
<thead>
<tr>
<th>Hazards</th>
<th>State of Michigan Haz-Mit Plan</th>
<th>Genesee County Haz-Mit Plan</th>
<th>UM-Flint Haz-Mit Plan</th>
<th>UM-Flint Hazard Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural Hazards (NH)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tornadoes</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>1 NH-High</td>
</tr>
<tr>
<td>Thunderstorms, Hail, Lightning, Wind</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>3 NH-Moderate</td>
</tr>
<tr>
<td>Flood: Riverine and Surface</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>2 NH-High</td>
</tr>
<tr>
<td>Severe Winter Weather</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>4 NH-Low</td>
</tr>
<tr>
<td>Extreme Temps: Summer</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>5 NH-Low</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>6- Extremely Low</td>
</tr>
<tr>
<td>Subsidence</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Negligible to no risk</td>
</tr>
<tr>
<td>Drought</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Negligible to no risk</td>
</tr>
<tr>
<td>Wildfire</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Technological Hazards (T)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire: Any Structure</td>
<td>NA*</td>
<td>NA</td>
<td>Y</td>
<td>3 T High</td>
</tr>
<tr>
<td>Infrastructure Failure Internal/External:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Energy Plant</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>1 T High</td>
</tr>
<tr>
<td>IS/IT/Telecom Outages</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>4 T High</td>
</tr>
<tr>
<td>Electric Power</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>2 T High</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>5 T Moderate</td>
</tr>
<tr>
<td>Public Water</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>6 T Moderate</td>
</tr>
<tr>
<td>Public Sewer</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>7 T Low</td>
</tr>
<tr>
<td>Nuclear Power Plant Accidents</td>
<td>Y</td>
<td>N</td>
<td></td>
<td>8 T Negligible</td>
</tr>
<tr>
<td>Nuclear Attack</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Beyond university’s ability to mitigate</td>
</tr>
<tr>
<td><strong>Hazardous Material Incidents- External and Internal (HM)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation-Related Over the road</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>2 HM Moderate</td>
</tr>
</tbody>
</table>
### Hazards

<table>
<thead>
<tr>
<th>Hazards</th>
<th>State of Michigan Haz-Mit Plan</th>
<th>Genesee County Haz-Mit Plan</th>
<th>UM-Flint Haz-Mit Plan</th>
<th>UM-Flint Hazard Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Rail</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>4HM Low</td>
</tr>
<tr>
<td>University Operations</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>1HM High</td>
</tr>
<tr>
<td>Oil &amp; Gas Pipelines and Wells</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>3HM Low</td>
</tr>
</tbody>
</table>

#### Security Related Hazards(S)

<table>
<thead>
<tr>
<th>Hazards</th>
<th>State of Michigan Haz-Mit Plan</th>
<th>Genesee County Haz-Mit Plan</th>
<th>UM-Flint Haz-Mit Plan</th>
<th>UM-Flint Hazard Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Disturbance/Crime</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>1S High</td>
</tr>
<tr>
<td>Bomb Threats / Bombing</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>2S Moderate</td>
</tr>
<tr>
<td>Workplace Violence/Active Shooter</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>1S Moderate</td>
</tr>
<tr>
<td>Sabotage / Terrorism</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>3S Low</td>
</tr>
<tr>
<td>Labor Strikes / Union Actions</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>4S</td>
</tr>
</tbody>
</table>

#### Public Health(PH)

<table>
<thead>
<tr>
<th>Hazards</th>
<th>State of Michigan Haz-Mit Plan</th>
<th>Genesee County Haz-Mit Plan</th>
<th>UM-Flint Haz-Mit Plan</th>
<th>UM-Flint Hazard Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Services/Food Borne Illness</td>
<td>NA</td>
<td>NA</td>
<td>Y</td>
<td>2PH High</td>
</tr>
<tr>
<td>Public Health/Contagious Disease Control</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>1PH Moderate</td>
</tr>
</tbody>
</table>

#### Other

<table>
<thead>
<tr>
<th>Hazards</th>
<th>State of Michigan Haz-Mit Plan</th>
<th>Genesee County Haz-Mit Plan</th>
<th>UM-Flint Haz-Mit Plan</th>
<th>UM-Flint Hazard Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass Transit</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Low</td>
</tr>
</tbody>
</table>

*Where NA is indicated under the State of Michigan or Genesee County Plans this does not mean that the risk isn’t addressed in those plans. The NA applies in the context that the State and County level Plans address these risks at the level of county wide or state wide concern while the university plan addresses these highly localized and contextual risks in the context of the university operations or community. In some cases the risk itself does not risk exist at the State or County level such as the Central Energy Plant.*

### IV. Federal and State Disaster Declarations

The statistical data and the two tables that follow were extracted from the 2011 State of Michigan Hazard Mitigation Plan and show Presidential and Gubernatorial Disaster Declarations for 1953-2010, and 1977-2010 respectively. The events covering Genesee County are highlighted in the tables in yellow.

The data for both levels of declaration mirrors the exposures that face the university - tornado, flood, and snow/ice storm events; however, it is difficult to determine the consequential losses, if any, occurred at the university.

The extended power outage statewide in 2003 which covered most of the eastern United States resulted in a Presidential Declaration for Genesee County, but not from the Governor. The outage occurred in August at a time when the university was in summer semester, and the student body population was significantly reduced.
A. Presidential Declarations

From 1953 to 2010, there were 32 total Presidential Disaster declarations with 12 applying to Genesee County. The most notable of all of the declarations was the first one which covered the Beecher Tornado that ranks as the 10th deadliest Tornado in U.S. history in terms of life loss.

Of the 12 declarations they break down into:
- 4 Flooding events
- 3 Tornado events
- 2 Ice storm
- 1 Snow/Blizzard
- 1 Power Outage - 2003 East Coast Outage
- 1 Hurricane - 2005 Katrina

Of the 12 events, two were statewide and one of those had limited impact on Genesee County (Hurricane Katrina).

B. Governor’s Declarations

From 1977 to 2010, there were 60 total declaration and 10 declarations that applied to Genesee County and break down as follows:
- 4 Flood
- 2 Tornado
- 2 Snow/Ice
- 1 Hurricane
- 1 Emerald Ash Borer

### Table 5-2: Presidential Declarations in Michigan: 1953-2010

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Type of Incident</th>
<th>Affected Area</th>
<th>Type of Declaration / Federal ID Number**</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/14/08</td>
<td>Thunderstorms, flooding</td>
<td>12 counties: Allegan, Barry, Eaton, Ingham, Lake, Manistee, Mason, Missaukee, Osceola, Ottawa, Saginaw, and Wexford Co.</td>
<td>Major Disaster (1777)</td>
</tr>
<tr>
<td>9/07/05</td>
<td>Hurricane evacuation</td>
<td>All 83 counties</td>
<td>Emergency (3225)</td>
</tr>
<tr>
<td>8/14-17/03</td>
<td>Electric power failure</td>
<td>14 counties: Calhoun, Eaton, Genesee, Hillsdale, Ingham, Kalamazoo, Lapeer, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Co.</td>
<td>Emergency (3189)</td>
</tr>
<tr>
<td>4/10-5/9/02</td>
<td>Flooding</td>
<td>6 counties: Baraga, Gogebic, Houghton, Iron, Marquette, and Ontonagon Co.; plus the Keweenaw Bay Indian Community</td>
<td>Major Disaster (1413)</td>
</tr>
<tr>
<td>12/11-31/00</td>
<td>Blizzard, snowstorm</td>
<td>39 counties: Allegan, Barry, Bay, Berrien, Branch, Calhoun, Cass, Clare, Clinton, Eaton, Genesee, Gladwin, Gratiot, Hillsdale, Huron, Ingham, Ionia, Isabella, Mecosta, Midland, Montcalm, Muskegon, Oakland, Osceola, Ottawa, Saginaw, St. Clair, St. Joseph, Sanilac, Shiawassee, Tuscola, Van Buren, and Washtenaw Co.</td>
<td>Emergency (3160)</td>
</tr>
<tr>
<td>9/10-11/00</td>
<td>Urban flooding</td>
<td>2 counties: Oakland and Wayne Co.</td>
<td>Major Disaster (1346)</td>
</tr>
<tr>
<td>5/2-10/99</td>
<td>Wildfire</td>
<td>2 counties: Marquette and Mackinac Co.; (Grant Recipient: Michigan Dept. of Natural Resources)</td>
<td>Fire Suppression</td>
</tr>
<tr>
<td>1/2-15/99</td>
<td>Blizzard, snowstorm</td>
<td>31 counties: Alcona, Allegan, Arenac, Barry, Berrien, Cass, Crawford, Ionia, Isosco, Jackson, Kalamazoo, Kent, Lenawee, Macomb, Marquette, Mecosta, Monroe, Montmorency, Muskegon, Newaygo, Oakland, Oceana, Ogemaw, Osceola, Oscoda, Otsego,</td>
<td>Emergency (3137)</td>
</tr>
</tbody>
</table>
### Section 5: Hazard Identification & Risk Analysis

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Type of Incident</th>
<th>Affected Area</th>
<th>Type of Declaration / Federal ID Number**</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/21/98</td>
<td>Thunderstorms, high winds</td>
<td>2 counties: Macomb and Wayne Co.</td>
<td>Major Disaster (1237)</td>
</tr>
<tr>
<td>5/31/98</td>
<td>Thunderstorms, high winds</td>
<td>13 counties: Bay, Clinton, Gratiot, Ionia, Kent, Mason, Montcalm, Muskegon, Newaygo, Oceana, Ottawa, Saginaw, and Shiawassee Co.</td>
<td>Major Disaster (1226)</td>
</tr>
<tr>
<td>7/2/97</td>
<td>Tornadoes, flooding</td>
<td>5 counties: Genesee, Macomb, Oakland, Saginaw, and Wayne Co.</td>
<td>Major Disaster (1181)</td>
</tr>
<tr>
<td>6/21-7/1/96</td>
<td>Rains, flooding</td>
<td>7 counties: Bay, Lapeer, Midland, Saginaw, Sanilac, St. Clair, and Tuscola Co.</td>
<td>Major Disaster (1128)</td>
</tr>
<tr>
<td>12/93-5/94</td>
<td>Underground freeze</td>
<td>10 counties: Charlevoix, Cheboygan, Chippewa, Delta, Gogebic, Houghton, Mackinac, Marquette, Ontonagon, and Schoolcraft Co.</td>
<td>Major Disaster (1028)</td>
</tr>
<tr>
<td>9/10-19/86</td>
<td>Flooding</td>
<td>30 counties: Allegan, Arenac, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Huron, Ionia, Isabella, Kent, Lake, Lapeer, Macomb, Manistee, Mason, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, Sanilac, Shiawassee, Tuscola, and Van Buren Co.</td>
<td>Major Disaster (774)</td>
</tr>
<tr>
<td>9/5-6/85</td>
<td>Flooding</td>
<td>6 counties: Alcona, Genesee, Iosco, Lapeer, Saginaw and Shiawassee Co.</td>
<td>Major Disaster (744)</td>
</tr>
<tr>
<td>3/12-20/82</td>
<td>Flooding</td>
<td>2 counties: Berrien and Monroe Co.</td>
<td>Major Disaster (654)</td>
</tr>
<tr>
<td>5/13/80</td>
<td>Tornado</td>
<td>2 counties: Kalamazoo and Van Buren Co.</td>
<td>Major Disaster (621)</td>
</tr>
<tr>
<td>1/26-27/78</td>
<td>Blizzard, snowstorm</td>
<td>Statewide</td>
<td>Emergency (3057)</td>
</tr>
<tr>
<td>1/26-31/77</td>
<td>Blizzard, snowstorm</td>
<td>15 counties: Allegan, Barry, Berrien, Cass, Chippewa, Hillsdale, Kalamazoo, Kent, Monroe, Muskegon, Newaygo, Oceana, Ottawa, St. Joseph, and Van Buren Co.</td>
<td>Emergency (3030)</td>
</tr>
<tr>
<td>3/20/76, 3/2-7/76</td>
<td>Ice storm, tornadoes</td>
<td>29 counties: Allegan, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Ionia, Isabella, Jackson, Kent, Lapeer, Macomb, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oakland, Oceana, Osceola, Ottawa, Roscommon, Saginaw, St. Clair, Sanilac, Shiawassee, Tuscola, and Wayne Co.</td>
<td>Major Disaster (495)</td>
</tr>
<tr>
<td>8/20/75-9/6/75</td>
<td>Rainstorms, high winds, flooding</td>
<td>16 counties: Allegan, Clare, Genesee, Gratiot, Ingham, Isabella, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, and Shiawassee Co.</td>
<td>Major Disaster (486)</td>
</tr>
<tr>
<td>4/18-30/75</td>
<td>Flooding, rain, tornadoes</td>
<td>21 counties: Allegan, Barry, Berrien, Calhoun, Clinton, Crawford, Eaton, Genesee, Ingham, Ionia, Kalamazoo, Kent, Lapeer, Livingston, Macomb, Oakland, Ottawa, Saginaw, St. Clair, Shiawassee, and Van Buren Co.</td>
<td>Major Disaster (465)</td>
</tr>
<tr>
<td>4/3/74</td>
<td>Tornado</td>
<td>1 county: Hillsdale Co.</td>
<td>Major Disaster (429)</td>
</tr>
<tr>
<td>4/12/73</td>
<td>Severe storms, flooding</td>
<td>14 counties: Arenac, Bay, Berrien, Huron, Iosco, Macomb, Menominee, Monroe, Saginaw, Sanilac, St. Clair, Tuscola, Van Buren, and Wayne Co.</td>
<td>Major Disaster (371)</td>
</tr>
<tr>
<td>12/1/72</td>
<td>Severe storms, flooding</td>
<td>9 counties: Arenac, Bay, Berrien, Iosco, Macomb, Monroe, Saginaw, Sanilac, St. Clair, Tuscola, and Wayne Co.</td>
<td>Major Disaster (363)</td>
</tr>
<tr>
<td>4/5/72</td>
<td>Snowstorm, freezing rain</td>
<td>9 counties: Allegan, Barry, Calhoun, Clinton, Eaton, Ingham, Ionia, Jackson, and Kalamazoo Co.</td>
<td>Major Disaster (330)</td>
</tr>
<tr>
<td>4/11/65</td>
<td>Tornadoes, severe storms</td>
<td>16 counties: Allegan, Barry, Bay, Branch, Clinton, Eaton, Gratiot, Hillsdale, Kalamazoo, Kent, Lenawee, Monroe, Montcalm, Ottawa, Shiawassee, and Washtenaw Co.</td>
<td>Major Disaster (190)</td>
</tr>
<tr>
<td>4/3/56</td>
<td>Tornado</td>
<td>4 counties: Benzie, Leelanau, Manistee, and Ottawa Co.</td>
<td>Major Disaster (53)</td>
</tr>
<tr>
<td>6/8/53</td>
<td>Tornado</td>
<td>3 counties: Genesee, Iosco, and Monroe Co.</td>
<td>Major Disaster (6)</td>
</tr>
<tr>
<td>5/21/53</td>
<td>Tornado</td>
<td>1 county: St. Clair Co.</td>
<td>Major Disaster (4)</td>
</tr>
</tbody>
</table>

**Notes**

| Totals for 1953-2010: | 32 Incidents | 25 Major Disasters; 6 Emergencies; 1 Fire Suppression |
Section 5: Hazard Identification & Risk Analysis

*Does not include separate Secretary of Agriculture or Small Business Administration (SBA) disaster declarations, which are issued under other authorities. Declarations after 1974 were issued under PL 93-288 (Disaster Relief Act), as amended by the Robert T. Stafford Disaster Relief and Emergency Assistance Act (1988) and the Disaster Mitigation Act (2000).

**Indicates federal declaration number assigned by FEMA and its predecessor agencies

Table 5-3: Frequency Distribution of Presidential Declarations in Michigan: 1953-2010+

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUNE</th>
<th>JULY</th>
<th>AUG</th>
<th>SEPT</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>TOTAL</th>
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<td>19%</td>
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<td>3%</td>
<td>3%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Notes
+ For the incident period, not the declaration date. However, the December 1993-May 1994 underground freeze declaration was assigned to the month of May (the date of the declaration). The May 2004-June 2004 thunderstorms and flooding declaration was assigned to June (the date of the declaration). Percentages may not add up to 100% due to rounding.

Table 5-4: Governor’s Declarations in Michigan: 1977-2010

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Type of Incident</th>
<th>Affected Area</th>
<th>Type of Declaration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/27/10</td>
<td>Oil pipeline spill</td>
<td>Calhoun Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>6/9/10</td>
<td>Thunderstorms, tornadoes</td>
<td>Monroe Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>7/21/09</td>
<td>Tanker truck explosion, fire</td>
<td>Oakland Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>6/19/08</td>
<td>Thunderstorms</td>
<td>Manistee Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/19/08</td>
<td>Thunderstorms</td>
<td>Wexford Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/19/08</td>
<td>Thunderstorms</td>
<td>Lake Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/19/08</td>
<td>Thunderstorms</td>
<td>Ottawa Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/19/08</td>
<td>Thunderstorms</td>
<td>Osceola Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/13/08</td>
<td>Thunderstorms</td>
<td>City of Saginaw (Saginaw Co.)</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/13/08</td>
<td>Thunderstorms</td>
<td>Eaton Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/13/08</td>
<td>Thunderstorms</td>
<td>Allegan Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/13/08</td>
<td>Thunderstorms</td>
<td>City of Lansing (Ingham Co.)</td>
<td>Emergency+</td>
</tr>
<tr>
<td>6/13/08</td>
<td>Thunderstorms</td>
<td>Mason Co.</td>
<td>Emergency+</td>
</tr>
<tr>
<td>8/27/07</td>
<td>Tornado</td>
<td>City of Fenton (Genesee Co.)</td>
<td>Emergency</td>
</tr>
<tr>
<td>8/10/07 8/9/07</td>
<td>Wildfire</td>
<td>Luce Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>7/28/06</td>
<td>Thunderstorms, heavy rain</td>
<td>Oscoda Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>2/27/06</td>
<td>Severe winds, ice storm</td>
<td>Montcalm Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>9/4/05</td>
<td>Hurricane evacuation</td>
<td>All 83 counties</td>
<td>Disaster</td>
</tr>
<tr>
<td>6/3/04</td>
<td>Thunderstorms, flooding</td>
<td>Arenac, Barry, Berrien, Cass, Genesee, Gladwin, Ingham, Ionia, Jackson, Kent, Livingston, Macomb, Mecosta, Newaygo, Oakland, Ottawa, Saginaw, St. Clair, St. Joseph, Sanilac, Shiawassee, Van Buren and Wayne Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>4/30/04</td>
<td>Insect infestation (Emerald Ash Borer)</td>
<td>Genesee, Ingham, Jackson, Lapeer, Livingston, Macomb, Monroe, Oakland, Washtenaw and Wayne Co.; City of Allen Park (Wayne Co.); City of Ann Arbor (Washtenaw Co.); City of Birmingham (Oakland Co.); City of Dearborn (Wayne Co.); City of Dearborn Heights (Wayne Co.); City of Detroit (Wayne Co.); City of Fraser (Macomb Co.); City of Livonia (Wayne Co.); City of River Rouge (Wayne Co.); City of Romulus (Wayne Co.); City of Southfield (Oakland Co.); City of Sterling Heights (Macomb Co.); City of Trenton (Wayne Co.); City of Warren (Macomb Co.); City of Wayne (Wayne Co.); Bloomfield Township (Oakland Co.); Canton Township (Wayne Co.); Charter Township of Plymouth (Wayne Co.); Lathrup Village (Oakland Co.)</td>
<td>Emergency</td>
</tr>
<tr>
<td>8/15/03</td>
<td>Electric power failure</td>
<td>Macomb, Monroe, Oakland, Washtenaw, and Wayne Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>5/15/03</td>
<td>Flooding</td>
<td>City of Marquette, Marquette Township, and Negaunee Township</td>
<td>Emergency</td>
</tr>
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</table>
### Section 5: Hazard Identification & Risk Analysis

#### 2000-10

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Type of Incident</th>
<th>Affected Area</th>
<th>Type of Declaration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/10/02</td>
<td>Flooding</td>
<td>Baraga, Houghton, Iron, Marquette, and Ontonagon Co.; City of Ironwood (Gogebic Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>4/30/02</td>
<td>Flooding</td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>4/16/02</td>
<td>Flooding</td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>12/29/01</td>
<td>Heavy snow</td>
<td>Emmet Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>10/26/01</td>
<td>Severe winds</td>
<td>Kalamazoo Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>3/9/01</td>
<td>Flooding</td>
<td>Genesee Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>9/20/00</td>
<td>Urban flooding</td>
<td>Wayne Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>6/7/00</td>
<td>Gasoline pipeline rupture</td>
<td>Blackman Twp. (Jackson Co.)</td>
<td>Emergency</td>
</tr>
</tbody>
</table>

#### 1990-99

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Type of Incident</th>
<th>Affected Area</th>
<th>Type of Declaration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8/99</td>
<td>Subsidence (mine shaft cave in)</td>
<td>Dickinson Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>7/5/99</td>
<td>Tornado</td>
<td>Oscoda Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>1/15/99</td>
<td>Blizzard, snowstorm</td>
<td>City of Detroit (Wayne Co.)</td>
<td>Emergency</td>
</tr>
<tr>
<td>9/27/98</td>
<td>High winds</td>
<td>Otsego Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>9/1/98</td>
<td>Thunderstorms, high winds</td>
<td>City of Niles (Berrien Co.)</td>
<td>Emergency</td>
</tr>
<tr>
<td>7/24/98</td>
<td>Thunderstorms, high winds</td>
<td>Wayne Co.; City of Dearborn (Wayne Co.); City of Warren (Macomb Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>7/23/98</td>
<td>Thunderstorms, high winds</td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>6/5/98</td>
<td>Thunderstorms, high winds</td>
<td>Bay, Clinton, Gratiot, Ionia, Kent, Mason, Mecosta, Montcalm, Muskegon, Newaygo, Oceana, Ottawa, Saginaw, and Shiawassee Co.; Village of Armada (Macomb Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>6/4/98</td>
<td>Thunderstorms, high winds</td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>6/3/98</td>
<td>Thunderstorms, high winds</td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>4/1/98</td>
<td>Flooding</td>
<td>Alpena Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>7/6/97</td>
<td>Tornadoes, flooding</td>
<td>Genesee, Macomb, Oakland and Wayne Co.; City of Detroit (Wayne Co.); Village of Chesaning (Saginaw Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>7/3/97</td>
<td></td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>6/27/97</td>
<td>Rainstorms, flooding</td>
<td>Allegan and Ottawa Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>6/26/96</td>
<td>Rainstorms, flooding, tornado</td>
<td>Bay, Lapeer, Saginaw, Sanilac, St. Clair, and Tuscola Co.; City of Midland (Midland Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>6/21/96</td>
<td>Rainstorms, flooding, tornado</td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>5/22/96</td>
<td>Flooding</td>
<td>Berrien Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>12/13/95</td>
<td>Snowstorm</td>
<td>City of Sault St. Marie (Chippewa Co.)</td>
<td>Emergency</td>
</tr>
<tr>
<td>7/8/94</td>
<td>Flooding</td>
<td>Lapeer, Tuscola and Sanilac Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>3/10/94</td>
<td>Underground freeze</td>
<td>Charlevoix, Cheboygan, Chippewa, Delta, Gogebic, Houghton, Mackinac, Marquette, Ontonagon, and Schoolcraft Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>3/4/94</td>
<td></td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>2/25/94</td>
<td></td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>2/23/94</td>
<td></td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>4/20/93</td>
<td>Flash flood</td>
<td>Shiawassee Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>7/16/92</td>
<td>Heavy rain</td>
<td>Gogebic Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>7/14/92</td>
<td>Tornado</td>
<td>Cass Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>10/6/90</td>
<td>Tornado</td>
<td>Genesee Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>9/16/90</td>
<td>Ship explosion, fire</td>
<td>Bay Co.</td>
<td>Emergency</td>
</tr>
<tr>
<td>5/9/90</td>
<td>Wildfire</td>
<td>Crawford Co.</td>
<td>Emergency</td>
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#### 1980-89

<table>
<thead>
<tr>
<th>Date of Incident</th>
<th>Type of Incident</th>
<th>Affected Area</th>
<th>Type of Declaration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/8/89</td>
<td>Flooding, high winds</td>
<td>Branch, Kalamazoo and St. Joseph Co.; Village of Manchester (Washtenaw Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>6/9/88</td>
<td>Fire</td>
<td>City of Corunna (Shiawassee Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>8/18/87</td>
<td>Airline crash</td>
<td>City of Romulus (Wayne Co.)</td>
<td>Disaster</td>
</tr>
<tr>
<td>10/28/86</td>
<td>Flooding, heavy rain</td>
<td>Allegan, Arenac, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Huron, Ionia, Isabella, Kent, Lake, Lapeer, Macomb, Manistee, Mason, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, Shiawassee, Tuscola, and Van Buren Co.</td>
<td>Disaster</td>
</tr>
<tr>
<td>9/15/86</td>
<td></td>
<td></td>
<td>Disaster</td>
</tr>
<tr>
<td>9/12/86</td>
<td></td>
<td></td>
<td>Disaster</td>
</tr>
</tbody>
</table>
V. Natural Hazards

Natural hazards represent some of the most difficult hazard mitigation challenges for the university.

The university’s most severe natural hazards risks are tornado, and flooding exposure from the Flint River.

Table 5-5: Frequency Distribution of Governor’s Declarations in Michigan: 1977-2010*

<table>
<thead>
<tr>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUNE</th>
<th>JULY</th>
<th>AUG</th>
<th>SEPT</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
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</tr>
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<tbody>
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<td>4</td>
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<td>13%</td>
<td>3%</td>
<td>0%</td>
<td>5%</td>
<td>100%</td>
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</tbody>
</table>

Notes
**Declarations since 1977 were issued under 1976 PA 390, as amended (Michigan Emergency Management Act).

***A “State of Emergency” was also declared for this incident under 1945 PA 302 (Emergency Powers of Governor Act).

+Some incidents have resulted in multiple declarations for the same incident (each jurisdiction declared separately). These are counted as one declaration only for the purposes of this list.
Section 5: Hazard Identification & Risk Analysis

Due to the relative difficulty with mitigation of catastrophic risk stemming from natural hazards, the university is keenly aware of the need to identify ways to control risks stemming from this class of hazard. Existing emergency response plans address pre incident planning and post incident response for severe weather situations including tornado and the university has achieved Storm Ready status with the National Weather Service.

As part of the plan development process, a great deal of focus was placed upon the area of flood exposure. As the plan was being developed the university experienced one of the highest water conditions in recent time on the Flint River, and this is documented in the GIS Elements located in Section 9 of the plan.

Tornado and flood represent the hazards with the greatest catastrophic potential, and both have occurred in Flint in the past. At the same time, the university and southeast Michigan are subject to other extreme weather conditions, notably winter periods of cold weather-snowfall-sleet as well as summer conditions that can be extreme in nature.

Information throughout this section of the plan was obtained from several sources, and the plan was greatly aided by the data sources listed below:

- The 2011 State of Michigan Hazard Mitigation Plan. This plan provides guidance on local hazard planning as well as source data on hazard exposures.
- Various NOAA and National Weather Service data sources on climate data, and statistics.
- Other publicly available sources such as the USGS, the NCDC and their partner websites.

Data from these sources is combined with information on the university's vulnerability and existing mitigation measures and summarized in this section of the plan.

In most cases, exposure information has been presented in the body of the plan document. Where data has been sourced a reference is provided, and in many cases, website link data has been provided to allow the plan user to access expanded data via the Internet.

Additional reference materials that support the natural hazards risk assessment can be found in Section 9, including:

FEMA Flood Insurance Rate Maps - This is the most up-to-date flood map for the area including the university campus.

Hamilton PFMA Report - This is a report on the condition of the Hamilton Dam that was developed by the engineering firm URS as part of a study conducted by the US Army Corps of Engineers. The report contains valuable technical information on the condition of the dam.

Stantec-Hamilton Dam Study Report - This is an engineering report developed by Stantec that summarizes several options for rehabilitation of the Hamilton Dam. The report offers valuable engineering information that supported the evaluation of the flood risk at the dam.

Weather Related Hazards
Tornado and flooding represent the number 1 and 2 natural hazards for the university due to both historical events and the exposure that each of these hazards poses to the university. One of the deadliest tornadoes in U.S. history occurred just miles from the university in 1953, and one of the worst floods in Michigan history occurred on the Flint River in 1947 in downtown Flint.

The hazard mitigation plan presents a description of each hazard, a summary of past occurrences related to it, and information on the risk and vulnerability associated with the particular hazard.

For some hazards, evaluation of the risks related to them must consider two or more specific hazards working in tandem to produce an exposure. Examples of this would be flooding that results from a spring snowmelt accompanied by a rain event, or a tornado that is spawned by a thunderstorm.

Geological Hazards
The geology of Michigan is relatively stable with no known active earthquake faults. Earthquakes occur in Michigan but they are relatively small in size. The largest proximate exposure to the university is the New Madrid Fault line which is several hundred miles away. The largest exposure to a major quake on the New Madrid fault doesn’t lie at the university but in the potential for a natural gas supply interruption should there be a pipeline failure on one of the pipelines that cross the fault en route to Michigan.

The possibility of subsidence at the university from mine collapse or sinkholes is minimal. While virtually the entire Lower Peninsula is underlain with a massive salt deposit, mining hasn’t been and is not currently conducted in the area around Flint. Even if it were, there is little evidence of subsidence from salt mining operations in Michigan which typically occur about 1,200’ below ground. There are no known areas of Karst topography in the Flint area, a precondition for sinkhole exposures to exist. Karst topography exists in Michigan, in particular in the area around Alpena to Black Lake in the northern Lower Peninsula but not in the Flint area.

Climatological and Ecological Hazards
The primary hazard that was examined in these categories was drought. The primary exposure stemming from drought would be the loss of the university water supply as a result of an extended period of drought, and this exposure is very low. The university obtains its water from the City of Flint who obtains it from the City of Detroit with the ultimate water source being Lake Huron.

Ecological hazards that are of a concern at the state and federal level, such as long term climate change or the Emerald Ash Borer, are not within the scope of the university’s ability to mitigate risk.

Because the plan attempts to show prioritization throughout, the Hazards are presented in order of priority by the risk ranking. The exception to this is the placement of thunderstorms - risk rank 3 in front of flooding - risk rank 2 in the plan, because of its relationship with tornado and the common data required in support of the risk assessment.

The hazard ranking was achieved by applying several factors related to the hazard; its severity, impact, speed of onset, and ease of mitigation. The ranking criterion is shown in the appendix to Section 5 of the plan.

Where a specific hazard exposure has generated a mitigation goal or action this is noted in the hazard summary.

A. Weather Related Hazards
Weather related hazards present risk to the university can be categorized into warm and cold weather exposures. These include:
Section 5: Hazard Identification & Risk Analysis

- Tornadoes
- Thunderstorms
  - Rain
  - Hail
  - Wind
  - Lightning
- Flood
  - Riverine including dam exposure
  - Surface
- Severe Winter Weather
- Summer Extreme Temperatures

**Warm Weather Exposures** - Warm weather events including tornadoes, thunderstorms and their related effects of rain, hail, extreme straight line winds, and lightning, all present risk to the university. The single largest loss the university has experienced over the past decade was a lightning strike at the Northbank Center that occurred on June 9, 2005 and caused a total of $220,000 in damage.

**Cold Weather Exposures** - Winter storms and their related snow/ice storm potential are addressed later in the plan as they pose more of a chronic exposure to the university versus warm weather exposures which pose more catastrophic risk potential.

Michigan’s climate is temperate in the spring, summer, and fall with cold winter temperatures spanning from mid-November through early April most years. Data from various sources is presented in the hazard sections that follow to show statistical measures, historical exposure, frequency, and severity. A good “hub” for weather related information can be found at the NOAA site link listed below.

http://www.crh.noaa.gov/dtx/

**Tornadoes**

A tornado is defined as an intense rotating column of wind that extends from the base of a severe thunderstorm to the ground.

Tornadoes in Michigan are most frequent in the spring and early summer when warm, moist air from the Gulf of Mexico collides with cold air from the Polar Regions to generate severe thunderstorms. These thunderstorms often produce the violently rotating columns of wind known as funnel clouds. Michigan lies at the northeastern edge of the nation's primary tornado belt, which extends from Texas and Oklahoma through Missouri, Illinois, Indiana, and Ohio. Most of a tornado's destructive force is exerted by the powerful winds that knock down walls and lift roofs from buildings in the storm's path. The violently rotating winds then carry debris aloft that can be blown through the air as dangerous missiles.

A tornado may have winds up to 300+ miles per hour and an interior air pressure that is 10-20% below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tracks much longer than that, even up to 200 miles, have been reported. Tornado path widths are generally less than one-quarter mile wide. Typically, tornadoes last only a few minutes on the ground, but those few minutes can result in tremendous damage and devastation. Historically, tornadoes have resulted in tremendous loss of life, with the mean national annual death toll being 87 persons. Property damage from tornadoes is in the hundreds of millions of dollars every year. (MHMP)

**Past Occurrences**

One of the deadliest Tornadoes in U.S. History occurred near the university on June 8, 1953. A brief account of this historically significant event is shown below, and was excerpted from a greater summary that can be accessed via the link provided below.
Besides the Flint-Beecher tornado, several other tornadoes occurred in Michigan and Ohio late on the afternoon of June 8th. An F4 intensity tornado touched down near Temperance, moved east through Erie, and then traveled 44 minutes as a waterspout over Lake Erie, one of the longest waterspout tracks on record. Another tornado touched down in southwestern Washtenaw County and tracked several miles before dissipating just south of the Ann Arbor - Ypsilanti area. Yet another tornado touched down just northeast of Brighton in Livingston County and moved northeast across GM Proving Grounds into the Milford area. In all, 8 tornadoes were reported in Michigan that day resulting in 125 deaths and 925 injuries.

The system that spawned these tornadoes was a classic severe weather producer in terms of its meteorological characteristics - and was very recognizable by forecasters of the day. Even in that early age of weather forecasting, when forecast accuracy was as much "miss" as "hit", the weather forecasts were astounding in their accuracy.

The forecast on the front page of the afternoon edition of the Flint Journal trumpeted "strong thunderstorms with hail and gusty winds over 50 mph" for the coming evening based upon a forecast the Weather Bureau Severe Storms Unit (precursor of today's NWS Storm Prediction Center) Severe Weather Bulletin #27 issued at approximately 730 pm the evening of June 8th - an hour prior to the Flint-Beecher tornado. The blue scalloped area denotes the expected severe thunderstorm threat, and the solid red area denotes the expected tornado threat. Even though it was not a perfect forecast, it was certainly a remarkable forecast given the total lack of today's satellite data, radar data, and computer processing.

**Figure 5-1: Path of Flint-Beecher Tornado**

**Risk Assessment & Vulnerability**

The risk of tornado in Genesee County exists with 41 EF-0 to EF5 tornados recorded from 1953 to 2007 according to the NOAA data listed below. The risk is well understood by the university and mitigation measures are in place to the extent possible in terms of detailed sheltering plans for each building integrated in with the university’s overall Storm Ready status.

Good quality construction that complies with state and local codes is the primary mitigation coupled with good building maintenance especially for roof mounted equipment and building adornment and signage. The university pursues this approach towards physical mitigation.
Section 5: Hazard Identification & Risk Analysis

The majority of the university’s structures, in terms of square footage and importance to academic support, were built between 1980 and the 2000's. These structures are in generally good condition and constructed of modern materials.

Probability

Based upon the NOAA statistics shown below for the years 1953 to 2007 Genesee County has the following annualized probability of tornadoes in the EF3, 4 and 5 categories:

- EF 5- 1 event/54 years or about a 1.8% annual probability
- EF 4 or greater- 2 events/54 years or about a 3.6% annual probability
- EF 3 or greater- 6 events/54 years or about a 11% annual probability

The probability at the university itself is somewhat lower but difficult to measure. While it is valuable to understand that the probability and frequency of tornadoes is relatively low, it is also important to note that the damage potential is extremely high.

Tornado Season and Timing of Events - The statistics show that the tornado season is primarily April through October with the most intense period being May-September. The most likely time a tornado would occur is between 3 and 6 pm.

Table 5-6: The Enhanced Fujita Scale of Tornado Intensity

<table>
<thead>
<tr>
<th>EF-Scale Number</th>
<th>Intensity Descriptor</th>
<th>Wind Speed (mph)</th>
<th>Type/Intensity of Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF0</td>
<td>Gale tornado</td>
<td>65-85</td>
<td>Light damage. Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.</td>
</tr>
<tr>
<td>EF1</td>
<td>Weak tornado</td>
<td>86-110</td>
<td>Moderate damage. 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.</td>
</tr>
<tr>
<td>EF2</td>
<td>Strong tornado</td>
<td>111-135</td>
<td>Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.</td>
</tr>
<tr>
<td>EF3</td>
<td>Severe tornado</td>
<td>136-165</td>
<td>Severe damage. Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.</td>
</tr>
<tr>
<td>EF4</td>
<td>Devastating tornado</td>
<td>166-200</td>
<td>Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.</td>
</tr>
<tr>
<td>EF5</td>
<td>Incredible tornado</td>
<td>Over 200</td>
<td>Incredible damage. 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 reinforced concrete structures badly damaged; incredible phenomena will occur.</td>
</tr>
</tbody>
</table>

NOTE: When describing tornadoes, meteorologists often classify the storms as follows: EF0 and EF1 = weak tornado; EF2 and EF3 = strong tornado; EF4 and EF5 = violent tornado (Source: The Tornado Project; Storm Data, National Climatic Data Center) (MHMP)

Table 5-7: Genesee County Tornado Statistics

<table>
<thead>
<tr>
<th>County</th>
<th>Date</th>
<th>Time (EST)</th>
<th>Type</th>
<th>F-Scale</th>
<th>Deaths</th>
<th>Injuries</th>
<th>$$</th>
<th>$$ (crops)</th>
</tr>
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<tbody>
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<td>Tornado</td>
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<td>115</td>
<td>785</td>
<td>50000000</td>
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</table>
### Section 5: Hazard Identification & Risk Analysis

<table>
<thead>
<tr>
<th>County</th>
<th>Date</th>
<th>Time (EST)</th>
<th>Type</th>
<th>F-Scale</th>
<th>Deaths</th>
<th>Injuries</th>
<th>$$</th>
<th>$$ (crops)</th>
</tr>
</thead>
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<td>-99</td>
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<td>-99</td>
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<td>GENESEE</td>
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</tr>
<tr>
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<td>3:20 PM</td>
<td>Tornado</td>
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<td>0</td>
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</tr>
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<td>GENESEE</td>
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</tr>
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<td>0</td>
<td>1000000</td>
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</tr>
</tbody>
</table>

Section 5: Hazard Identification & Risk Analysis

Figure 5-2: Number of Tornadoes by EF-Scale

![Pie chart showing number of tornadoes by EF-Scale]

Figure 5-3: Number of Tornadoes by Month

![Bar chart showing number of tornadoes by month]

Number of Tornadoes by EF-Scale

- EF0: 14
- EF1: 1
- EF2: 10
- EF3: 11
- EF4: 4
- EF5: 1

Number of Tornadoes by Month

- Jan: 0
- Feb: 0
- Mar: 0
- Apr: 1
- May: 6
- Jun: 10
- Jul: 9
- Aug: 8
- Sep: 5
- Oct: 2
- Nov: 0
- Dec: 0
Section 5: Hazard Identification & Risk Analysis

Figure 5-4: Number of Tornadoes by Time of Day

![Number of Tornadoes by Time (LST)](image)

**Strongest Tornadoes**

The strongest tornado in Genesee County occurred on June 8, 1953. This tornado, well-known as the Flint-Beecher tornado, resulted in considerable damage and loss of life as it moved from two miles north of Flushing, through the north part of the Flint area, and into parts of Lapeer County south and southeast of Columbiaville. 115 persons were killed and 785 injured in Genesee County from the tornado. This tornado was categorized as an EF5 (out of 5) on the Fujita scale with a mean width of nearly one-half mile.

The second strongest tornado in Genesee County since 1950 occurred on May 12, 1956. This tornado was categorized as an EF4, resulting in 3 deaths and 116 injuries. The tornado moved from 3 miles east of Flint to 3 miles northwest of Atlas, destroying over 100 homes in its path.

Four tornadoes since 1950 have been categorized as EF3 in Genesee County. These tornadoes occurred on 7/14/74, 8/8/84 (4:15 PM EDT), and 7/2/97 (4:30 PM EDT and 4:45 PM EDT). One death and one injury resulted from the 7/2/97 tornado at 4:45 PM that occurred in Thetford Township. The death occurred when a woman was killed by a falling tree. The tornadoes on 7/2/97 were part of an outbreak of 13 tornadoes in southeast Lower Michigan, the largest number for a single day since records have been kept. All other tornadoes since 1950 in Genesee County have either been EF2, EF1, or EF0.

Statistics last updated: November 2nd, 2011

**Mitigation**

An important aspect of tornado vulnerability is evacuation/sheltering procedures for the First Street Residence Hall where residents have to evacuate over open ground to the Murchie Science building to shelter below grade. A mitigation goal has been developed directed at changing this situation via construction of a storm shelter, or integration of a storm shelter into any expansion of the residence hall. See Section 7- Mitigation for details on this hazard exposure.

The key vulnerability that exists for the university is the safety of more than 9,000 faculty, staff and students who might be on site during a tornado event. To address this exposure the
university has attained “Storm Ready” status with the National Weather Service and maintains a comprehensive weather monitoring capability via the Department of Public Service. Severe weather monitoring is conducted using NOAA weather radio and Internet-based warning systems. Warning procedures exist, and messages are transmitted to subscribers via several methods, primarily email, and text messages.

In addition, all major buildings are equipped with PA systems that will allow for recorded and non-recorded messages to be sent to building occupants for their direction during a developing storm event.

**County Level Siren Systems**

The Genesee County Emergency Management and Homeland Security office serves as the county warning center. The county has over 80 early warning sirens owned by the community where each is located in. One outdoor warning siren owned by the City of Flint is located ½ mile south and partially covers the campus. It is located on the corner of Fourth and Wallenberg Streets.

Map of warning sirens for entire county


All of the university’s buildings have take cover locations within them, except the residence hall. These locations have been chosen over time to offer the best shelter for the given facility using the concepts of either below ground shelter, or sheltering in an interior location away from windows.

Despite the best efforts of the university this hazard will always present a substantial risk to both people and property.

Because of the difficulty with mitigating this, the catastrophic potential presented by it, and the past exposure history this hazard is the number one natural hazards risk for the university.

**Thunderstorms: Rain, Hail, Wind, Lightning**

Severe thunderstorms are weather systems accompanied by strong winds, lightning, heavy rain, and possibly hail and tornadoes. Severe thunderstorms can occur at any time in Michigan, although they are most frequent during the warm spring and summer months from May through September. The potential thunderstorm threat is often measured by the number of “thunderstorm days” – defined as days in which thunderstorms are observed. (MHMP)

Thunderstorms are the pre cursor for several storm related hazards. Tornado was treated separately due to its importance and impact potential and the remaining hazards are grouped together due to their linkage. In general a thunderstorm must occur prior to any of the other effects being felt so the hazards have been summarized in sequence.

**Past Occurrences**

The university experiences the regional and local effects of thunderstorms on a regular basis. The map that follows shows that the university can expect to experience around 34 thunderstorm days per year. This means that there is an average of 34 days per year where a thunderstorm might be experienced. The map was excerpted from the 2011 State of Michigan Hazard Mitigation Plan.

Thunderstorms and their related effects could be experienced in virtually any month in Michigan; however, the bulk of them occur from late April through August. Thunderstorm frequency tends to coincide with the warmest weather months in Michigan which would make June through August peak season.
It should be noted that one of the largest losses the university has experienced in the past 10 years was from lightning hitting roof mounted equipment at the Northbank Center. This incident is detailed under the hazard summary for lightning.

Risk Assessment & Vulnerability

The discussion here on thunderstorms is restricted to rain and the general effects of thunderstorms. The other related hazards are addressed separately in the sections that immediately follow.

Probability

The following statistics for Flint are from http://coolweather.net/staterainfall/michigan.htm which cites the National Climatological Data Center sourcing for their data derivations.

- # of Precipitation days per year - 136 (37% chance of precipitation on average for any day)
- Average annual precipitation - 31.61" (State average 32")
- 33 Thunderstorm days per year - 9% chance of a thunderstorm on any given day although this % increases when only the summer months are considered
- 3 Severe Thunderstorm Watches per year average - < 1% chance on any given day although this % increases when only the summer months are considered
- 1 Hailstorm day per year on average - < 0.5% chance on any given day although this % increases when only the summer months are considered
- 10 Tornado watches per year average - 2.7% probability on any given day although this is higher when only “Tornado Season” is considered

Maximum daily rainfall intensity is more difficult to find for Flint; however, the highest 24 hour rainfall ever recorded in Michigan is 9.78" in Bloomingdale, MI on 9/1/1914.
Mitigation

The university’s primary mitigation approach for thunderstorms and severe weather is encompassed in the monitoring and early warning procedures that have earned the university Storm Ready status with the National Weather Service.

Other than the noted lightning incident, the university hasn’t experienced any severely damaging events related to thunderstorms themselves. That doesn’t lessen the need to remain committed to Storm Ready status, and looking for ways to improve advance notification of approaching severe weather.

Hail
Hail is a product of the strong thunderstorms that frequently move across the state. As one of these thunderstorms passes over, hail usually falls near the center of the storm, along with the heaviest rain. Sometimes, strong winds occurring at high altitudes in the thunderstorm can blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened.

Most hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred with the most severe thunderstorms. Hail is formed when strong updrafts within the storm carry water droplets above the freezing level, where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. They finally fall to the ground, battering crops, denting autos, and injuring wildlife and people. Large hail is a characteristic of severe thunderstorms, and it may precede the occurrence of a tornado. (MHMP)

Past Occurrences

There have been no significant hail events at the university in recent memory of staff interviewed for the plan development. Hail events do occur but, as noted above, there is less than a 1% probability of an event occurring on any given day.

Risk Assessment & Vulnerability

Structurally, there are a few ways to mitigate against hail damage. New homes and businesses can be equipped with impact resistant roofing materials, and window shutters can be used. These techniques are rarely applied to existing structures, especially in northern states. Insurance recovery can lessen economic impact. Source: 2011 MHMP

University structures are susceptible to impact damage during events.

The University Pavilion building has a glass structure at its north end that consists of glass walls and roof on a steel frame. It also has a fabric roof structure over the former ice rink near the University Pavilion that represents a nontraditional type of structure that may or may not be more susceptible to the effect and impact of hail depending upon the size of the hailstones.

Roof mounted equipment of all types could be damaged in an event such as those described below.

Student and staff vehicles could be exposed to the effects of hail in the large open parking lots at the east end of the campus; however, it is unlikely that the university would assume any liability for damage to personal vehicles during a hail storm event. University vehicles would be subject to damage if left out and exposed during a hail storm.

Landscaping and foliage could be severely damaged by a hailstorm.

According to NCDC data, Flint experiences an average of one hailstorm event per year. This information was obtained from the previously cited source under thunderstorms. Hail is not uncommon in southeast Michigan and occurs with regularity on a localized basis when conditions are correct.

While the probability of a hailstorm appears low, its severity could be quite serious. The three events detailed below were excerpted from the State of Michigan Hazard Mitigation Plan and are representative of the type of event that might be experienced at the university under the most adverse conditions.

July 2, 1997 - Lower Peninsula (Berrien County)

A severe thunderstorm during the early morning hours of July 2, 1997 pounded Berrien County with 1” to 2.25” diameter hail that caused agricultural losses of nearly $1 million. The hail destroyed 280 acres of fruits and 100 acres of vegetables in a two-mile wide swath from
Stevensville southeast to the county line. Damaging hail was reported in numerous other locations across the Lower Peninsula on July 2 – just one of the impacts of a storm system that would eventually spawn deadly tornadoes in southeast Michigan and lead to a Presidential Disaster Declaration. (Refer to the Tornadoes section for additional information.)

June 24, 1998 - Lower Peninsula (central and southern counties)

On June 24, 1998 two tracts of severe thunderstorms crossed the state moving east to west – one tract stretched across central Lower Michigan, while the other moved into the southern portion of the state. The more northerly thunderstorms produced large amounts of hail in several counties, ranging from dime to quarter size hail up to baseball size (2.75” in diameter) hail. Damage was widespread, but not overly severe. However, in Petoskey, hail (2.5” in diameter) caused $100,000 in damage to cars on two lots west of town. In Ingham County, near Onondaga, baseball-sized hail damaged auto glass and roofs, but specific damage figures were not available.

Sept. 26, 1998 - Lower Peninsula (northern counties)

A line of severe thunderstorms that ravaged northern Lower Michigan during the weekend of September 26-27, 1998 produced hail up to 2” in diameter in Manistee County, destroying an estimated 30,000-35,000 bushels of apples at area farms. The same storm system produced tennis ball-sized hail north of the town of Gladwin, which damaged several homes and vehicles. In Arenac County, near Sterling, 3.5” diameter hail damaged crops and injured some livestock at area farms, and damaged several homes, satellite dishes, and vehicles.

Mitigation

The low probability of occurrence, coupled with a lack of loss history results in no immediately identifiable risk mitigation measures related to hail. Some minor exposures to loss do exist, but those exposures cannot really be reduced in any significant way without altering the character of the building structure (in the case of the pavilion for example).

Extreme Wind

Non-tornadic winds of 58 miles per hour or greater.

Severe winds spawned by thunderstorms or other storm events have had devastating effects on Michigan, resulting in 118 deaths, nearly 700 injuries, and hundreds of millions of dollars in damage to public and private property and agricultural crops since 1970. Severe wind events are characterized by wind velocities of 58 miles per hour or greater, with gusts sometimes exceeding 74 miles per hour. (MHMP)

Severe winds are fairly common in various parts of Michigan. Along the Great Lakes shoreline, high winds occur regularly and gusts of over 74 miles per hour (hurricane velocity) occasionally occur with a storm system. Severe winds can cause damage to structures, power lines, and trees. Power outages can result in the need for sheltering those left without power for extended periods.

Past Occurrences

Based upon the 10-year loss history obtained from the U of M Risk Manager there have been several wind related losses, however all were small in size and of a non specific nature as recorded in the record of property damage losses provided by the U of M Risk Management department.

Risk Assessment & Vulnerability

Figures from the National Weather Service indicate that severe winds occur more frequently in the southern-half of the Lower Peninsula than any other area of the state. On average, severe wind events can be expected 2-3 times per year in the Upper Peninsula, 3-4 times per year in the northern Lower Peninsula, and 5-7 times per year in the southern Lower Peninsula. It must
be emphasized that this refers to winds from thunderstorms and other forms of severe weather, but not tornadoes. (MHMP)

While the potential for wind damage is usually focused upon tornado, straight line wind events can produce severe damage. The link that follows below contains a report of a series of damage reports from Western Michigan in July of 2011. Wind speeds during this event varied by location but reached between 80 and 90 mph (possibly locally higher) which is the upper end of the high quality design criterion recommended by FM Global for non-hurricane type design.


Michigan is surrounded by the Great Lakes, and as a result experiences sustained winds along most of the lakes shorelines. The link that follows goes to the State of Michigan website for wind resources which offers several maps showing the primary wind zones across the state. Examination of the map shows that areas directly bordering the Great Lakes have the greatest potential for high or sustained winds.

http://www.michigan.gov/mdcd/0,4611,7-122-25676_25774-254583--,00.html

With Flint’s inland location, straight line wind events that might impact the university would be more thunderstorm related with intensity potential similar to the Western Michigan events that occurred inland from Lake Michigan (Grand Rapids, Battle Creek, etc…).

**Probability**

The most likely scenario that would lead to high straight line winds would be during a thunderstorm which has a 9% probability of occurring on any given day over the year.

The primary exposures for the university related to straight line winds are:

- Potential damage to poorly anchored roof mounted equipment
- Impact damage to buildings from “missiles” across campus such as trash cans and other non-anchored equipment, or landscaping elements that might be uprooted
- Student-Faculty-Staff safety if caught outside during an event
- Damage to trees which could potentially be uprooted
- Loss of power supply to the Central Energy Plant or other structures due to downed trees on power lines

**Mitigation**

The primary mitigation measure in place is good maintenance and an ability to respond to repair damage if it should occur. The university pursues a strong preventative maintenance program including roof inspections and inspections of roof mounted equipment anchorage. FM Global also reviews roof conditions and roof mounted equipment anchorage conditions and has no outstanding recommendations in that regard.

**Lightning**

Lightning is a random and unpredictable product of a thunderstorm’s tremendous energy. The energy in the storm produces an intense electrical field like a giant battery, with the positive charge concentrated at one end and the opposite charge concentrated at the other. Lightning strikes when a thunderstorm’s electrical potential (the difference between its positive and negative charges) becomes great enough to overcome the resistance of the surrounding air. Bridging that difference, lightning can jump from cloud to cloud, cloud to ground, ground to
Section 5: Hazard Identification & Risk Analysis

cloud, or even from the cloud to the air surrounding the thunderstorm. Lightning strikes can generate current levels of 30,000 to 40,000 amperes, with air temperatures often superheated to higher than 50,000 degrees Fahrenheit and speeds approaching one-third the speed of light. (MHMP)

**Flood: Riverine including Dam Exposures**
The overflowing of rivers, streams, drains and lakes due to excessive rainfall, rapid snow and ice melt.

Riverine flooding can be formally defined as the periodic occurrence of flows of streams and rivers outside of their banks, resulting in the inundation of the adjacent floodplain. Prolonged intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors, can cause riverine floods. These over bank flows are natural and may occur on a regular basis on river systems that drain large geographic areas. Floods on large river systems may last for several days. Many areas of Michigan are subject to riverine flooding.

**NFIP Information**

The information that follows was excerpted from the Genesee County Hazard Mitigation Plan located at:


Excerpted from page 77 of the county plan the following italicized information outlines the status of the county as respects completion of the NFIP digital mapping process. The university itself has no jurisdictional status as respects the NFIP program. It is located within Genesee County and as such is subject to the requirements and the jurisdiction of the county. As noted all but three townships have been mapped in the county, and UM-Flint is located in an area that has been extensively mapped. The FIRM maps for the university are located at the end of the public version of the plan, and these are the most up to date maps having been produced as part of the digital mapping project discussed below.

An important step in hazard mitigation is knowing where the county’s floodplains are located. This information could impact future land use decisions. Also, homes or businesses already located in the floodplain may need to take action to mitigate the effects of the next flood on their property. Floodplain maps for Genesee County were developed by the NFIP. These maps, called Flood Insurance Rate Maps (FIRM), indicate which areas are vulnerable to flood hazards. These maps were then digitized using computer software, and can now be used as an overlay on county maps that show, where property is located.

All of the county has had its floodplains mapped, except for Forest Township, Richfield Township, and Thetford Township. Genesee County’s mapped floodplain areas contain 2,691 structures that could potentially be flooded. Included in that number are 2,149 structures that have been identified as single- and multi-family homes. There are also 362 mobile homes, for a total of 2,511 residences. This means that 93% of the structures in the floodplains are homes.

**Repetitive Loss Structures**

The University has no repetitive loss structures.

The list below was excerpted from the Genesee County Hazard Mitigation Plan. It summarizes all of the repetitive loss structures in the City of Flint. All of these structures are Single Family structures, and none are located at the University of Michigan-Flint. The summary below was excerpted from table 2-13 on page 81 of the Genesee County Plan.
Table 5-8 Genesee County Repetitive Loss Structures

<table>
<thead>
<tr>
<th>City</th>
<th>Mit</th>
<th>Ins</th>
<th>Occupancy</th>
<th>Value($)</th>
<th>#losses</th>
<th>Total Pd.($)</th>
<th>Most Recent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flint</td>
<td>No</td>
<td>No</td>
<td>Single Family</td>
<td>40,000</td>
<td>2</td>
<td>18,842.77</td>
<td>9/6/1985</td>
</tr>
<tr>
<td>Flint</td>
<td>No</td>
<td>No</td>
<td>Single Family</td>
<td>170,000</td>
<td>2</td>
<td>8,578.58</td>
<td>3/13/1982</td>
</tr>
<tr>
<td>Flint</td>
<td>Yes</td>
<td>No</td>
<td>Single Family</td>
<td>23,000</td>
<td>4</td>
<td>28,476.07</td>
<td>9/6/1985</td>
</tr>
<tr>
<td>Flint</td>
<td>Yes</td>
<td>No</td>
<td>Single Family</td>
<td>25,000</td>
<td>2</td>
<td>7,328.27</td>
<td>9/5/1985</td>
</tr>
<tr>
<td>Flint</td>
<td>Yes</td>
<td>No</td>
<td>Single Family</td>
<td>22,000</td>
<td>2</td>
<td>16,898.00</td>
<td>9/6/1985</td>
</tr>
<tr>
<td>Flint</td>
<td>No</td>
<td>SDF</td>
<td>Single Family</td>
<td>98,850</td>
<td>5</td>
<td>163,199.08</td>
<td>2/9/2011</td>
</tr>
<tr>
<td>Flint</td>
<td>Yes</td>
<td>No</td>
<td>Single Family</td>
<td>38,000</td>
<td>2</td>
<td>4,869.13</td>
<td>9/6/1985</td>
</tr>
</tbody>
</table>

Past Occurrences

There have been severe instances of flooding on the Flint River in the past. On April 6, 1947 the historical peak flow (Corps of Engineers Potential Failure Mode Analysis report dated 12/28/10) on the river occurred with an estimated flow of 14,900 cfs (cubic feet per second). This is one of the worst urban floods in Michigan history and it inundated downtown Flint. The links below provide some brief background on this incident along with photos of the downtown area during the flood.


After the 1947 event, significant effort was placed on mitigating the potential for future events similar to the 1947 experience. The Flint River is a dynamic environment, particularly so in the area of downtown Flint. The river both upstream and downstream from the university includes several dam structures, and a flood control project “owned” by the Corps of Engineers which begins just downstream of the Hamilton Dam.

For a complete view of the Flint River system in the vicinity of Flint proper and the university please refer to Section 9 GIS Maps containing a map entitled “Dams and Impoundments”.

The two most notable of these major actions that occurred after the 1947 flood include:

- Construction and placing into service the Holloway Dam and Reservoir in 1953. This dam and reservoir are located several miles upstream of downtown Flint, and flows on the river upstream of downtown Flint are controlled using the Holloway Dam.

- The Corp of Engineers construction of a flood control project downstream of the Hamilton Dam in the 1960’s.

Risk Assessment & Vulnerability

The university lays adjacent to the Flint River and as noted on the FIRM Flood maps no university structures are located in the actual flood plain. The FIRM mapping only tells part of the story when it comes to evaluation of the flood risk.

While the river routinely over tops its banks on the south side of the river downstream of the Hamilton Dam during managed high flow conditions, the university has never experienced water entering a structure as a result of flood conditions on the Flint River. This is favorable in terms of historical performance; however the exposure is a constant one and peaks each spring during periods of snowmelt/runoff/heavy rain.
Assessment of the flood risk near the university was supported by numerous individuals and reports. The discussion that follows was supported the Engineering Company Wade Trim (WT) and Jason Kenyon of WT was very helpful in guiding the review of this exposure. Wade Trim has been involved with an engineering study directed at identifying ways that the Hamilton Dam could be modified and improved to enhance its safety and provide a recreational opportunity on the river in downtown Flint.

This work is summarized in their Engineering Report on the dam and can be located via the following web link.


Brent Wright, the Water Plant Supervisor for the City of Flint, was extremely helpful in assisting the university with the understanding of the flood risk. Brent and his team manage the flows on the Flint River via the operation of all of the dams shown in the Dams and Impoundments Map in Section 9 – GIS Maps. As a result, Brent has the most detailed empirical knowledge related to how the Dam system works in the vicinity of downtown Flint.

A great deal of the discussion that follows addresses the effect that the Hamilton Dam has on the flood risk for the university. This is due to the fact that the Dam is located directly adjacent to the university and has a major influence upon how flow needs to be controlled along the river in the vicinity of the university and through downtown Flint.

To support the hazard assessment several reports on the Hamilton Dam were reviewed and are cited below. Where relevant, these reports are included in various appendices to the plan.

**Information Referenced:** The Wade Trim Final Engineering Report linked above, the URS produced/Corps of Engineers led 12/28/10 PFMA Process Report on the Hamilton Dam, and a 2008 Stantec produced engineering inspection report that provides a great deal of technical information on the Flint River, the Corps of Engineers flood control project, and the Hamilton Dam. A primary source for this information was the Wade Trim website dedicated to their work on a proposed reconstruction project for the Dam. The 12/28/10 PFMA report was provided to the university by Wade Trim as a stand-alone document. The university received clearance from Wade Trim to use these materials as part of the Hazard Mitigation Plan and they are located in Section 9 of the plan.

**Current Flood Plain Map** - The most current FEMA flood plain map for the Flint River in the proximity of the UM-Flint is the September 25, 2009 published version.

It can be viewed via the link
http://map1.msc.fema.gov/idms/IntraView.cgi?ROT=0&O_X=7483&O_Y=5342&O_ZM=0.077310&O_SX=673&O_SY=454&O_DPI=401&O_TH=

Finally, FIRMettes of the flood plain map were produced and placed in Section 9 – GIS Maps of the plan.

Various assessments of headwater flood plain elevation data have been developed in the engineering studies and reports that were reviewed during the plan development process.

**The 9/25/2009 FIRM shows the 100 year flood plain elevation near the university at between 708’ and 709’ above sea level (asl).** Per discussions with Wade Trim it appears that this map assumed a 100 year flow of 11,800 cfs with 3 gates open. At present there are only 2 operative gates.

Per the referenced 2008 Stantec Inspection report and numerous other sources, the City of Flint is under consent order from the Michigan DEQ to maintain the headwater above the Hamilton dam at a maximum of 705.25’ asl. The same report states that a minimum upstream
pool elevation of 703.5’ should be maintained in order to ensure operation of the water treatment plant.

Also per the 2008 Stantec Inspection report (page 2.3), there have been other peak flow flood studies conducted…

1981 FEMA Flood Plain - 200 year flood plain elevation of 709.5’ with all 6 gates operable, and 200 year flood flow of 13,000 cfs. This condition assessment appears to not be valid since only 2 of 6 gates are currently operable.

1981 Corps of Engineers Dam Inspection Report - Upstream river elevation of 711.6’ at a 200 year flow of 13,000 cfs with two operable gates. This indicates that at 13,000 cfs the upstream pool elevation will reach 711.6’ and conflicts with other studies.

Information Conflicts - River flow modeling is difficult and is based upon numerous assumptions, most notably the number of operable gates. While the two studies listed above indicate two different 200 year flood plain elevations, page 2-6 of the PFMA report listed below shows that at 10,800 cfs (note this is less than the 11,800 cfs, 100 year flow) with two gates open an expected elevation of about 711.5 would exist upstream of the Dam and result in overtopping of the right abutment of the dam.

Corrective Effective Flood Plain Map - This 2009 FEMA map has been analyzed by Wade Trim and they have applied a more localized, detailed and extensive analysis of the existing flood plain. The results of this more detailed analysis are shown on Page 34 of the Wade Trim Engineering Report, and the resulting flood plain boundary is shown in their report as the Corrective Effective model flood plain boundary.

Per Wade Trim, they believe that this model puts the upstream flood plain at near the same level as the FEMA 2009 map with the exception noted below. They are quick to point out that modeling cannot be relied upon down to the 1’ to 2’ range with certainty. The river is a dynamic body of water that can fluctuate in flow, and the dam can be adjusted for various spillway flows so there are several factors working in concert.

As can be seen on page 34 of the Wade Trim report, this Corrective Effective modeling shows that the University Pavilion area covered by the fabric roof is in the flood plain.

It appears that this structure is the only UM-Flint structure that comes into the 100 year flood plain as a result of this more in depth mapping. Several structures are close to being in the 100 year flood plain and the State of Michigan building is on the edge of it.

The assumed conditions for the Corrective Effective Flood Map are a 100 year flood flow of 11,800 cfs with 3 gates open.

High Hazard Classification Definition per FEMA - This designation is an outcome based rating, and not a statement of the condition of the dam. While there is ample evidence, including the information contained in the recent PFMA report that portions of the dam are in bad condition, the High Hazard rating does not speak to the dam’s condition in arriving at that rating.

Taken directly from the FEMA website the High Hazard definition states... “Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life”. It goes on to further state that the High Hazard classification results from the following specific criteria:

Loss of Human Life - Probable. One or more expected.

Economic, Environmental, Lifeline Losses- Yes (but not necessary for this classification)
Section 5: Hazard Identification & Risk Analysis

In other words **High Hazard** primarily relates to the potential for loss of human life if the dam fails.

**Potential Failure Mode Analysis Report**

The Corps of Engineers has issued a PFMA analysis intended to assess various failure mode scenarios for the dam. This analysis was performed as part of a scheduled process of evaluation that might eventually lead up to the Corps investing in repairs or restoration of the dam.

The PFMA process is one step in this overall process. It takes a deeper look at the problems associated with the condition of the dam, and suggests measures that the City of Flint might employ to reduce the risks associated with the dam. As part of that analysis, the Corps assembled and reviewed a large body of data related to the dam, flood flows, anticipated elevations at various conditions of flow and gate operation, and several potential failure scenarios.

The Corps of Engineers sanctioned and led the PFMA. Their interest in the project is mainly related to the protection of their assets encompassed in the flood control project located downstream from the dam.

Select staff from the university has reviewed the PFMA in detail and believe that it is a key risk mitigation information source for UM-Flint. In looking at the various information sources, the university has reached several preliminary conclusions regarding the dam, its risk to the university, and the overall flood exposure presented by it.

- The PFMA contains an analysis of the physical structure of the dam. The report basically seems to conclude that the underlying structure of the dam is solid, but that there are severe issues with the gates, their mechanisms, and the walkway structure on top of the dam. The text of the report seems to indicate that the dam itself is not in danger of failing by overturn or sliding or undermining, but other negative factors cited in the report provided the PFMA team fodder for discussing failure modes that wouldn’t exist if the dam were in better condition. Most notably this includes failure of the walkway bridge, or failure due to an inability to maintain the bridge because of access issues with the walkway.

- A key headwater elevation is approximately 711.5’. At this elevation an overtopping condition is likely to occur at the right abutment of the dam (PFMA report Page 2-6), the river will begin to flow north around the dam into the streets with an unknown course/route. This right abutment flow would increase in height as stream flow’s increase if those flows went uncontrolled.

- Per the PFMA report (Table 2-3, page 2-6) this condition apparently occurs at a total flow of around 10,800 cfs with 7,000 cfs flowing through the two operable gates, and approximately 3,800 cfs flowing either around the right abutment or in part around the abutment and over the 4 remaining closed gates.

- The aerial photo with elevation data superimposed upon it shown directly below shows that at elevations of 712’ or above an exposure to the William S. White building exists.

- While this is what would theoretically occur, the City of Flint has control of the flows that reach the Hamilton Dam via their operation of the upstream dams. A review of historical flow data available on the USGS waterwatch website (see link below) shows that flow seems to be controlled below the 7,000 cfs level, and it appears that the city has been able to achieve this by controlling flow using the dams located upstream from the university as flow control mechanisms. This 7,000 cfs flow information was derived from gage data on the noted website.
Even with this method to control flow there are still combinations of events that could evade this method of control. One such event is a scenario that produces excessive run off/snowmelt/rain and run off downstream of the Holloway dam. The most likely time for this to occur is late February/early March per actual stream flow records.

Figure 5-6: Flint River Levels - April 29, 2011

Mitigation

- The biggest issue for the UM-Flint is not where a theoretical line lays on a flood plain map. The dynamic set up by the River, its fluctuating flow, control of the flow by the city, and the operation of the Hamilton dam make it more complex than a simple mapping exercise.

- The key information needed to manage risk is an understanding of the combination of stream flow events, and gate operation protocols that could lead to an upstream elevation of 711.5' or greater occurring.

- Another key factor is understanding how the city manages the overall river system flows such that flows reaching the Hamilton Dam never reach a volume that would produce an elevation greater than 711.5'. The city is theoretically bound by the consent order to maintain the elevation below 705.25'. That said, the river is dynamic, and short-term run off conditions could result in elevations above 705.25' for short periods of time during extreme run off situations.

- People and actions matter. As the exposure to flooding was examined it became clear to the university that one key individual-Brent Wright of the city- has a tremendous amount of knowledge on the dam, the river, the condition of each dam, and how to manage gate openings on the various dams to limit the danger of flooding. As the hazard mitigation plan
was developed, the university was able to gain additional visibility with the city on this issue including having university staff notified whenever a release of water was going to occur from Holloway Dam. Holloway is the principle means used to control water entering the river directly upstream of downtown Flint. A secondary means of control exists at Kearsley Creek dam which is also located upstream of the university.

- Real time information is important. During the course of the project the university began to utilize the USGS website at http://waterwatch.usgs.gov/index.php?id=ww to get near real time information on developing flow conditions on the Flint River. The near real time river flow information that is available on this site is a valuable tool that the university can utilize to monitor developing flow conditions on the river. The term near real time is used because data on the site is usually posted about an hour after the actual flow condition existed.

The only limitation with this is the fact that there is no stream gage located directly near the university, and a mitigation action has been developed to address how this situation might be improved through installation of a stream gage just downstream of the Hamilton Dam.

In order for the university to calculate the flow approaching the Hamilton Dam several stream gages must be monitored and manual calculations have to be made to determine the flow at the Hamilton Dam. A meeting has been held with the USGS to discuss the costs and mechanics of how such a gage could be installed.

- While the university buildings have not flooded in the past there are several mitigation opportunities related to ensuring this remains the case. Attention is directed to Section 7-Mitigation Goal 4 where several actions to mitigate the potential impact from Flood are outlined in detail. In addition to the stream gage installation other actions have been identified, including:
  - Potential construction of a berm or levee to provide protection for the William S. White building located near the dam on the north side of the river. This is the most exposed structure should a north abutment over top condition occur. The university has preliminarily identified an elevation of 713’ asl as the protection level and it is understood that construction of any such berm or levee would likely require multiple levels of approval from stakeholders at the City of Flint, Genesee County, the Corps of Engineers, and the MDEQ. The 713’ level of protection would equate to just above a 200 year flow condition on the river (PFMA report Table 2-3, page 2-6)
  - Development of a formal flood mitigation plan. The university feels there is an opportunity to improve both pre incident planning and post incident response in this area.
  - Greater coordination of flood mitigation planning between the university, the City of Flint and Genesee County.

**Flood: Surface**

It is sometimes difficult to discern the difference between surface water flooding and riverine flooding exposures because of the interrelationship between these two hazards. Even though the university is located directly adjacent to the Flint River and its attendant flood related risks, there is a distinct difference between these two hazards for the university.

During periods of high flow on the Flint River water exits the confined bank of the river south of the Hamilton Dam. The university maintains file photos and video evidence that this occurs, and documented it during an event that occurred during the spring of 2011. This is still considered riverine flooding and not surface water run off in that the overflow results directly from an inability of the river to contain flow. This situation applies to the hazard description from above on riverine flooding.
Section 5: Hazard Identification & Risk Analysis

Surface water flow and flooding potential is considered a different condition even though it is driven at least in part by the same forces (e.g. excessive rainfall over a short period of time). Riverine flooding is more complex and related to how the river flow is managed by the City of Flint as described above.

Past Occurrences
The university regularly experiences surface water conditions including water coming out of the banks of the Flint River. As noted above in riverine flooding, these situations have not resulted in any water intrusion into university buildings. This is a result of the successful and active management of the various control structures on the Flint River itself and on the major tributaries to it in the vicinity of campus.

As part of the overall process of evaluation, concerns were raised by members of the AHPT that certain surface water conditions could result in surface run off and flow directly into university structures.

Risk Assessment & Vulnerability
The biggest concerns related to surface water run off are:

- Storm sewer surcharging or backing up due to inadequate capacity to effectively carry away surface run off.
- Intrusion of water into the university tunnel system that is located in below ground areas on the south side of the river. This tunnel system is mapped on the FM Global site diagram, and on several of the GIS mapping elements.

The university’s insurer, FM Global, shared the concern of the university in this regard and conducted an extensive survey of the tunnels to determine if any external points of intrusion existed where water might enter the tunnels. None were noted in their analysis.

In addition to the evaluation of the tunnel exposures, FM went further in their review. This included examining the nine remaining storm sewer system outfalls (and the surcharge exposure that might exist) into the Flint River that still exist in the vicinity of the university along the south side of the Flint River.

Finally, they examined surface water run off conditions and determined via physical survey that there were two areas that might cause some concern during very intense and adverse rainfall type events. See Mitigation below for their conclusions on actions the university should consider regarding this hazard exposure.

A copy of the full report developed by FM Global is on file in the EHS office and available for review upon request.

Mitigation
As a result of the FM Global analysis there were two areas cited for potential action should severe run off conditions appear possible/probable.

There is a storm drain constraint scenario to the northwest of the William S. White building near the main building entry that may result in water intrusion into the building. FM reports that this would occur only in 100 year intensity rain event situations of 5” of rain over a 24 hour period and would have to be accompanied by the blocking of one particular storm drain. The university is now well aware of this drain’s location and the probability of it becoming clogged is relatively low due to its location on a street. For example, it is not widely subject to blockage with mulch.

Under 500 year flood conditions there is an opening on an external stairway that might allow water to reach areas adjacent to, but outside of, the University Pavilion.
As an overall recommendation FM echoed the idea that a flood mitigation plan would be a valuable tool for the university to develop. This has already been considered and drafted as a Major Mitigation Goal (Goal 4) prior to FM making their observations. While Mitigation Goal 4 is considered to mainly address riverine flooding, such a plan will be of value for all situations surrounding flood, whether they are considered riverine or surface water run off related.

**Severe Winter Weather: Snowstorms, Extreme Temperature, Ice, and Sleet**
Severe winter weather hazards include snowstorms, blizzards, extreme cold, and ice and sleet storms. As a northern state, Michigan is vulnerable to all of these winter hazards. Most of the severe winter weather events that occur in Michigan have their origin as Canadian and Arctic cold fronts that move across the state from the west or northwest, although some of the most significant winter storms have their origins from the southwest, in combination with Arctic air masses. (MHMP)

**Risk Assessment & Vulnerability**
Severe winter weather is a reality in Michigan. Winter begins officially on or around December 21-23, however winter like weather occurs in Michigan beginning in late October or early November. The most severe temperatures occur from mid December through mid March. January is the coldest month, followed by February.

Over the past two years there have been two instances of full university closure due to snow storms. While this causes disruption the duration was one day in both situations, and it is hard to justify that a severe long term impact occurred.

Snowstorms will cause potential for shutdown, require parking lot clearing, and generally hinder traffic and pedestrian flow around the campus. Storms are generally no more than two days in duration and usually result in a maximum snowfall of no more than 10”.

**Snowfall**
As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall over relatively short geographic distances. The average annual snowfall accumulation in different areas ranges from 30 to 200 inches of snow. The highest accumulations are in the northern and western parts of the Upper Peninsula. In Lower Michigan, the highest snowfall accumulations occur near Lake Michigan and in the higher elevations of northern Lower Michigan.

Blizzards are the most dramatic and perilous of all snowstorms, characterized by low temperatures and strong winds (35+ miles per hour) bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles that are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. Just the cost of clearing the snow can be enormous. (MHMP).

Statistical data supporting this section of the plan was obtained from the following internet sites:


Average snowfalls are approximately 45 inches with the peak months being December through February. Snow can be expected to fall between November and early April most years.

From 1921 through 2003 records at Bishop Airport show that the 25 largest snowstorms range from 22.7 inches on 1/26, 27/67 to 9.0 inches over a 24 hour period on several occasions.
The map below shows the average annual snowfall and was obtained from the State of Michigan Hazard Mitigation Plan.

**Figure 5-7: Michigan Annual Snowfall Totals**

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**Extreme Cold Temperatures**

Prolonged periods of extreme temperatures, whether extreme summer heat or extreme winter cold, can pose severe and life-threatening problems for Michigan’s citizens. Although they differ in their initiating
Section 5: Hazard Identification & Risk Analysis

conditions, the two hazards share a commonality in that they both tend to have a special impact on the most vulnerable segments of the population—the elderly, young children and infants, impoverished individuals, and persons who are in poor health.

Due to their unique characteristics, extreme summer heat and extreme winter cold hazards will mostly be discussed separately in this section. For both types of temperature extremes, however, a longer hot or cold spell makes the temperature effects much more severe on vulnerable populations—a longer duration tends to produce more severe effects. (MHMP)

From 1921 to 2003 Bishop Airport records maintained by NOAA show that the lowest average daily temperature was 16.7 degrees F in 1976-77 and highest daily winter temperature was 32.2 degrees F in 1983.

Based upon the same records noted above the lowest temperature recorded was -25 degrees F on 1/18/76. Extreme cold is not uncommon with several instances of -20 degrees F referenced in the temperature records, several instances with successive days below zero, several days with an average high of -10 degrees F. These type of deep cold events occur in January or February.

The temperature data above was obtained from the NOAA NWS data base for monthly climate data-Flint, MI. Additional data can be found via the web link at:


Ice and Sleet

Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is small frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. When electric lines are downed, power may be out for several days, resulting in significant economic losses and the disruption of essential services in affected communities. (MHMP)

Southeast Michigan is susceptible to sleet events and ice storms, as is most of Michigan. Conditions favorable to ice and sleet storms occur when temperatures are in transition from above freezing to below freezing and precipitation occurs. Depending on the temperature gradient and the nature and intensity of the precipitation, conditions can range from granular sleet type rain to near immediate freezing of cold rain into sheet or coating ice.

The table below illustrates the frequency distribution of ice and sleet storms in Michigan for the period 1970-July 2007. Approximately 81% of those storms occurred during the months of January, February, March and April, when conditions are most conducive for the development of ice and sleet. One-quarter of all ice and sleet storms in the period occurred during the month of March.


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Source: National Weather Service; Storm Data, National Climatic Data Center (percentages are rounded off)

Source: Italicized information and table State of Michigan Hazard Mitigation plan
Section 5: Hazard Identification & Risk Analysis

Mitigation

Via review of the FM Global risk control reports no high roof/low roof situations were noted for structural review. This recommendation will appear on the FM reports where there is a question with regard to whether a low roof is structurally adequate to support the snow load that results from this type of building configuration.

During interviews with Facilities and Operations it was indicated that there are no chronic snow loading situations that they have to routinely respond to aside from occasional leakage that occurs when roof coverings are breached and need to be repaired.

Extreme cold has the potential to produce several impacts across the campus. Based upon discussions with Facilities and Operations there are no chronic freeze up situations of buildings across campus.

Under extended periods of extreme cold the Urban Health and Wellness Clinic might become crowded with people who have become impacted by the cold. The pavilion could also be a congregation point for the local homeless community under worst case conditions.

Ice storms pose the potential to produce wide spread power outages, and the Central Energy Plants main feeds run above ground in part—See Section 6 Vulnerability, and Section 7 Mitigation for additional detail on planning surrounding planning with Consumers Energy and Mitigation Actions related to Emergency Power.

**Extreme Temperatures: Summer**

Prolonged periods of extreme temperatures, whether extreme summer heat or extreme winter cold, can pose severe and life-threatening problems for Michigan's citizens. Although they differ in their initiating conditions, the two hazards share a commonality in that they both tend to have a special impact on the most vulnerable segments of the population—the elderly, young children and infants, impoverished individuals, and persons who are in poor health.

Due to their unique characteristics, extreme summer heat and extreme winter cold hazards will mostly be discussed separately in this section. For both types of temperature extremes, however, a longer hot or cold spell makes the temperature effects much more severe on vulnerable populations—a longer duration tends to produce more severe effects. (MHMP)

**Past Occurrences**

Temperatures in Michigan have a very wide swing between winter and summer with near sub artic extremes in the winter and potential for extreme temperatures and extended hot periods in the summer. The warmest months in order are July, August, and June.

NOAA Temperature records for Flint from 1921 to 2003 show the following:

- **Highest Temperature** - 108 degrees F July 8, 1936
- **Top ten highest daily temperatures** range from 102 to 108 degrees F
- **Longest extended heat wave** - July 8th-14th, 1936. The daily high temperature during this 7 day period was 102 degrees F at the lowest and included two 108 degree F days. The average daily temperature 24 hours a day for the week of the heat wave was 90 degrees F.

**Risk Assessment & Vulnerability**

Dealing with extreme temperatures in Michigan is another reality of doing business. With operations conducted 12 months per year, the university must provide a conditioned environment for its students, faculty and staff.
The key utilities and facilities required to maintain cooling for the facilities are the Central Energy
Plant where power is distributed to and chilled water is produced for the buildings on the south
side of the river. Loss of the CEP’s capability to distribute power, and chilled water would shut
down cooling capacity for all of the buildings on the south side of the river. See Section 6-
Vulnerability and Section 7-Mitigation for additional information on CEP mitigation for Power
Outages, and Single Point of Failure Analysis.

Cooling provisions for buildings on the north side of the river are building specific with no single
point of failure able to take out chilled water and cooling capacity for multiple buildings outside of
an area wide power outage.

Area wide power interruptions or brown outs are possible during extreme heat events that
extend for several days. This is due to heavy local air conditioning loads and the exposure is
accentuated by the chance for thunderstorms and high winds during extended periods of high
heat.

Heat takes its toll on the university community and the downtown community. If an extended
period of heat were experienced similar to 1936 it is possible that the Urban Health and
Wellness Clinic could experience a high influx of patients.

B. Geological Hazards

- Earthquake
- Subsidence

Earthquake
A shaking or trembling of the crust of the earth caused by the breaking and shifting of rock
beneath the surface.

Most areas in the country, including Michigan, are subject to minor earthquakes which occur
thousands of times per year. Usually, earthquakes are minor tremors that result in minimal or no
loss of life, property, and essential services.

Earthquakes pose danger because they can occur without warning and can cause severe loss
and devastation. Death and injury are usually the result of secondary effects, such as collapsing
structures.

Earthquakes are measured by their magnitude (amount of energy released at the epicenter) and
intensity (measure of damage done at one location). The Richter Magnitude Scale is commonly
used to determine earthquake magnitude and the Modified Mercalli Intensity Scale is used to
define intensity. On the Richter scale, a measure of 5.0 is considered a moderate
event, while a
measurement of 8.0 is a catastrophic event. The Mercalli Intensity Scale describes 12
increasing levels from imperceptible to catastrophic.

Information throughout this section of the plan was obtained via web search of the USGS
website at http://earthquake.usgs.gov/earthquakes/states/?region=Michigan and has been
transferred over into the plan with noted accreditation.

Past Occurrences
The earliest record of earthquake tremors felt in Michigan Territory (statehood came in 1837)
were from the great series of shocks centered near New Madrid, Missouri in 1811 and 1812. As
many as nine tremors from the New Madrid earthquake series were reported felt distinctly at
Detroit.
A damaging earthquake, apparently centered between Montreal and Quebec in the Saint Lawrence Valley, occurred on October 20, 1870. This shock was felt over an area estimated to be at least a million square miles including Sault Sainte Marie.

The destructive earthquake that hit Charleston, SC on August 31, 1886 was felt as far north as Milwaukee, Wisconsin and probably in parts of Michigan. On October 31, 1895 Charleston, Missouri experienced a major earthquake. Considered the severest shock in the central U.S. region since the 1811 - 1812 earthquakes, the 1-million-square-mile felt area included parts of Michigan. A moderate earthquake of intensity V was felt at Menominee on March 13, 1905.

The earthquake of August 9, 1947, damaged chimneys and cracked plaster over a large area of south-central Michigan and affected a total area of about 50,000 square miles, including points north to Muskegon and Saginaw and parts of Illinois, Indiana, and Wisconsin. The cities of Athens, Bronson, Coldwater, Colon, Matteson Lake, Sherwood, and Union City in the south-central part of the State all experienced intensity VI effects. Reports of damage to chimneys and some instances of cracked or fallen plaster, broken windows, and merchandise thrown from store shelves were common over the epicentral area.

A number of other earthquakes centered outside the State have been felt in Michigan. Noteworthy among these are the following:

**February 28, 1925**
St. Lawrence River region northwest of Murray Bay (La Malbaie), Quebec, Canada; felt area approximately 2 million square miles; intensity V at Grand Rapids, Newberry, and Whitefish Point, Michigan.

**November 1, 1935**
Timiskaming, Quebec, Canada; 1-million-square-mile felt area; intensity V at Alpena, Hillman, Mount Clemens, Pellston, and Port Huron, Michigan.

**March 2 and 8, 1937**
Western Ohio; 150,000-square-mile felt area (second shock); felt at many places in southern Michigan.

**September 4, 1944**
St. Lawrence River region between Massena, New York and Cornwall, Ontario, Canada; 175,000-square-mile felt area (in the U.S.); felt at Alpena, Detroit, Grand Rapids, Lansing, Saginaw, and Sault Sainte Marie, Michigan.

**November 9, 1968**
South-central Illinois; felt area approximately 580,000 square miles (including all or portions of 23 states); felt throughout southern Michigan.


Source USGS website

**Risk Assessment & Vulnerability**

The map below shows the seismic exposure within Michigan in terms of peak ground acceleration expected from an event on the New Madrid fault with a 2% chance of exceedance in 50 years. As can be seen the expected ground acceleration in the university area-located to the north and east of Lansing on the Map- is approximately 2 g’s, a level where little to no damage would be expected.
Section 5: Hazard Identification & Risk Analysis

Earthquake and its related hazards of technological impact and infrastructure failure is not a key hazard concern for the university. If an event as depicted in the map below were to occur, minimal damage would be expected, and no injuries are likely to occur.

All of the university’s structures would be expected to come through such an event with minimal damage.

**Figure 5-8: Seismic Exposure within Michigan**

It may be possible to identify earthquake related events that might have some impact upon the university; however, these are of a relatively low probability and would have to be considered for a secondary level of planning. Events such as a regional loss of natural gas supply are beyond the ability of the university to mitigate directly; however, planning for utility outages including natural gas is one of the mitigation actions identified in Section 7 of the plan.

**Subsidence**

Depressions, cracks and sinkholes in the ground surface can threaten people and property. Although the sudden collapse of ground surface does pose an immediate threat to life and property, subsidence depressions normally happen over a period time varying from several days to several years. The ground movements continue until the walls stabilize, which may damage structures with low strain tolerance, such as dams and utility structures.

**Past Occurrences**

There have been no significant incidents of land subsidence due to failure of the underlying strata or mine collapse on the UM-Flint campus. As noted below, the conditions associated with land subsidence do not exist in the Flint area or expose the university in any great way.

While not considered land subsidence, erosion of the riverbank on the Flint River upstream of the Hamilton Dam is of some concern to the university from a safety, environmental and...
ecological standpoint. The river runs through the campus and there is no hard barrier to its access in several spots. This poses a risk to passers by e.g. students having direct access to the river. The river is monitored by the university, and to date no shoreline restoration has been required.

**Risk Assessment & Vulnerability**

Land subsidence has several origins. Chief among them are the presence of Karst topography accompanied by significant dewatering of the underground strata, or past underground mining where mine roof collapses translate through to the ground surface.

The Flint area does not have a significant history of land subsidence. While the area is underlain with massive salt deposits and limestone deposits, neither have been mined in areas under Flint. There is no evidence of massive dewatering in the area of the university that can be found via research.

**C. Climatological and Ecological Hazards**

**Drought**

A water shortage caused by a deficiency of rainfall, generally lasting for an extended period of time.

**Past Occurrences**

Droughts typically impact a large area that cannot be precisely defined geographically. The Palmer Drought Severity Index (PDSI), see Figure 5.2, is a tool that interprets temperature and rainfall information to determine dryness and illustrates the widespread nature of drought severity. Droughts more commonly affect natural resources than built physical structures. Its effects generally are felt directly by the agricultural industry. However, the community at large may experience drought related effects if there is a water shortage.

**Risk Assessment & Vulnerability**

The primary exposure for the university is related to the supply of water required to support operations including steam production, chilled water, domestic water and fire protection water supplies, all of which are critical to the ability to operate. With the City of Flint purchasing water from the City of Detroit, as well as having its own water supply and water treatment plant as a backup, the risk to complete loss of the water supply is considered low.

Figure 5.2 illustrates that the region has experienced a small amount of time in severe or extreme drought in the 100 year period.

Flint is located near the borders of the zone of 5% to 9.99% and 10% to 14% PDSI less than or equal to -3 (-3 indicates severe drought).

This can be interpreted to mean that severe drought is a relatively low risk to the region and the university has never experienced any drought related impacts.
Drought events affect widespread areas, yet it is difficult to determine exact geographical boundaries. If a drought event were to occur, it would extend far past the university into the region; however, the risk and vulnerability of drought to the region is considered low.

**Wildfire**

*An uncontrolled fire in grasslands, brushlands or forested areas.*

**Past Occurrences**

None that impacted the university

**Risk Assessment & Vulnerability**

The university is located in an urban area that is not exposed either directly or indirectly to the effect and impact of wildfires. There is no significant history of wildfire in the vicinity of the campus.

**Mitigation**

Given the location of the university and the lack of exposure to this hazard there are no mitigation goals or items identified for Wildfire.

**VI. Technological Hazards**

Technological Hazards covered by this section of the plan include fire, infrastructure failure, external nuclear events, and internal/external hazardous material events.

Information to support the risk assessment includes reference sources and information cited in the body of the reporting that follows, as well as several reports and data sources developed as part of the plan development process.

Also, information that supports the risk assessment in the area of campus vulnerability is presented in Section 6 of the plan. Section 6 contains an extensive discussion of the campus infrastructure, and the risks and vulnerabilities associated with failures in the infrastructure.
Section 5: Hazard Identification & Risk Analysis

References to the following supplemental information are made throughout the sections that follow. This information is located in Section 9 of the plan - Resources and References:

**Building Risk Assessment Reports** - These reports detail the construction-occupancy-protection-exposure for each of the university's major buildings. The reports contain a great deal of information on the operations and hazards at each building, and were developed as a means of further identifying risk and mitigation opportunities by the university's consultant Green Oak Solutions.

**GIS Mapping** - As part of the plan development process several GIS maps were created to show different "levels" of information. These maps provide a visual description of various aspects of the risk landscape at the university and capture community-wide risks as well as specific university exposures. For a detailed description of the GIS Maps, please refer to page 6-5 within the section on vulnerability, and Section 9 - Resources and References for the full map content.

**FM Global Campus Diagram** - This diagram has been developed over time by FM Global and offers a good full campus view of the university structures, construction, fire protection and water supply features, fire pump installations, and age of construction. This diagram is located in Section 9 of the plan as a standalone reference.

A. FIRE HAZARDS: STRUCTURAL HAZARDS

A fire, of any origin, that ignites one or more structures, causing loss of life and/or property.

**Past Occurrences**

While fire is an ever present hazard for the university a summary of property loss history provided by the university's risk management department in Ann Arbor shows that for the past 10 years there have been no significant fires in any structure. A great deal of attention is given to identification and mitigation of fire risks across the university and this is the major reason why the fire experience has been favorable.

Fire is a ubiquitous hazard that will always exist at the university. It exposes people, property and operations and is one of the primary focal points in the insurance and risk mitigation process. Because of the exposure represented by fire, its mitigation is influenced by both fire and lifesafety codes. Fire codes address the physical mitigation of the exposure while lifesafety codes address the mitigation of human factor risk. Physical mitigation goes a long way towards mitigating lifesafety; however, the university goes further with mitigation by ensuring that good notification systems are in place along with evacuation plans.

**Risk Assessment & Vulnerability**

The fire risks for the university are challenging. With nearly 2.0 million square feet of operations area and 10,000 students, faculty and staff on campus, the maintenance of a fire safe environment across operations is a task that requires constant attention.

The operations profile of the university is detailed in Section 6 on vulnerability including summaries of the building level details, which buildings are provided with sprinkler protection, etc…

Additional information on each building, and its fire risk profile can be found in the individual building reports in Section 9 - Resources and References.

As part of the plan development, a set of mitigation goals and actions have been developed and can be found in Section 7. A part of those mitigation actions are building level mitigation actions, many of which are related to the fire risks in various buildings, and ways to mitigate those risks.
The fire risk and vulnerability for the university is linked to building use and occupancy. In general the university pursues a policy of providing automatic sprinkler protection throughout all of its primary structures. Attention is directed to Section 6 - Vulnerability, and the Building Reports in Section 9 for additional information on the specifics of building use and fire protection features.

The primary vulnerabilities for the university from fire are:

**Impact upon the students, faculty, staff, and visitors** from fire events not adequately controlled by active and passive protection measures.

**Physical Damage** - Damage to the built environment should physical protection coupled with emergency and public response; prove ineffective in limiting damage.

**Loss of Use** - The impact of an event where physical protection has failed could range from major impact upon the physical plant for the university, to loss of use of the residence hall, to loss of academic buildings. All of these impacts ultimately equate to a financial impact to the university.

**Mitigation**

Table 6.1 provides a summary of the building details for the structures across the UM-Flint campus, and shows that the majority of structures across the university are provided with sprinkler protection throughout. This is true of all major academic, residence hall, and administrative facilities.

In addition, the university’s consultant Green Oak Solutions has developed or reinforced recommendations related to fire risk. Please refer to Section 7- Risk Mitigation where an extensive list of building level mitigation items has been developed.

A brief summary of the most important aspects of fire hazard mitigation are as follows;

**Consistent Application of Standards and Oversight**

The university is subject to local building codes which generally adopt National Fire Protection Association codes in the area of fire and lifesafety. Attendant to this NFPA 101 (LifeSafety), NFPA 13 (Design and Installation of Automatic Sprinkler Systems), and NFPA 20 (Fire Pumps) would be the most prevalent standards applied by the university’s Facilities and Operations group in the area of fire risk mitigation.

Additionally, FM Global conducts annual or more frequent surveys of the university and these surveys center, in large part, on the evaluation and mitigation of fire risks. The perspective of the FM survey work is centered upon property risk control and mitigation of loss potential. FM Global maintains their own standards which are equal to or more stringent than NFPA standards and they use these standards to develop their recommended risk reduction improvements.
Section 5: Hazard Identification & Risk Analysis

FM Global has surveyed the facilities for several years, and an ongoing risk reduction dialogue exists between FM Global and UM-Flint.

Quality Construction
To the maximum extent possible the university pursues a strategy to maintain the built environment in good condition, free of code violations, and in good repair. With nearly 2.0 million square feet under roof, with some structures dating back to the 1920’s there is a constant challenge to maintain the built environment.

Attendant to the fire risk, the university makes every attempt to maintain stairwell integrity, and fire wall/fire door integrity throughout the campus. Attention is given to fire stopping of fire wall penetrations and openings in fire rated floor systems. This aspect of construction is reviewed during all renovations, and plans for such renovations are reviewed by FM Global as a standard practice.

The majority of the square footage across the campus was built from the late 1980’s to the present including all of the major academic buildings and the residence hall. This means that the bulk of the campus is of more modern construction with the attendant built in fire and lifesafety features expected in modern buildings. This includes sprinkler protection, horizontal and vertical fire rated compartmentation, smoke detection where required by code due to the educational occupancy, alarm notification systems, and building occupant notification systems.

The two exceptions to this more modern construction are the Northbank Center which was built in 1929 and the Hubbard Building which was built in 1920.

The Northbank Center is the only high rise structure owned and occupied by the university and has undergone extensive renovation since the university assumed ownership. It is now nearly fully sprinklered and provided with fire alarms and compartmentalization in accordance with current building code requirements for an office building.

Sprinkler Protection, Fire Pumps and Water Supply
The university is provided with its fire protection water supply via the City of Flint water main system. The City of Flint system is considered reliable and of high quality in terms of being adequate to provide the flow and pressure needed by the university in order to support the buildings sprinkler system water demand requirements.

The water supply is considered reliable based upon its source supply being the City of Detroit feed to the City of Flint, coupled with the fact that the City of Flint has the ability to provide the full supply itself via water treatment using the Flint River as the source supply.

Additional information on the City of Flint water system is provided in Section 6 - Vulnerability. Water supply testing is conducted annually either by FM Global, or in conjunction with the university’s own internal team that conducts annual fire pump flow tests for all of the building fire pumps. The results of the most recent pump tests and city water supply tests can be found in the previously mentioned building reports available in Section 9.

Most of the buildings across campus have fire pumps which are required in order to provide adequate flow and pressure for the sprinkler system. The university has an Ann Arbor based team that is dedicated to conducting fire pump flow tests on an annual basis. The results of these tests appear in the Section 9 building reports.
At present all pumps are capable of providing adequate flow and pressure to support sprinkler system demands. In a couple of cases, the pumps are performing slightly below their standard rating and this is being addressed by Facilities and Operations as a standard operations investigation.

At present the fire protection water supply and sprinkler protection is considered adequate for the occupancy protected throughout all areas of the university. This of course applies to areas where sprinklers are provided.

**Alarm System Monitoring**

Alarms also sound locally in each building to alert building occupants of the need to evacuate.

**Building Public Address (PA) Systems**

Building alarm systems are supplemented by Public Address (PA) systems capable of alerting building occupants of the need to evacuate. The PA systems operate using prerecorded messages that are selected by Public Safety dispatch staff depending upon the nature of the alarm condition.

**New Construction/Renovation Oversight**

The university has routine needs to upgrade, renovate, or modernize small or large portions of structures at various times. The university Architect provides oversight for these types of projects, including oversight for code compliance in the area of fire and lifesafety.

As a supplement to this process FM Global provides support, review services, and recommendations directed at ensuring compliance with industry standard fire protection practices.

The combination of these two oversight avenues mitigates the risk that any structure would be modified and become noncompliant with existing codes.

**Control of Ignition Sources**

Ignition sources are well controlled across the university. In July 2011, the university instituted a smoke free policy which bans smoking from all areas within buildings and on the grounds of the campus. This eliminates a large potential ignition source from the equation.

Other ignition sources within the buildings include the typical electrical/mechanical equipment sources; however, these installations are largely isolated in either tunnel locations, or utility penthouses where access is limited and the equipment is physically separated from building occupants.
Section 5: Hazard Identification & Risk Analysis

Standardized cutting and welding procedures exist including the issuance of cutting and welding permits during any building repair or renovation. Internal staff and/or contractors must obtain a hot work permit from the Department of Public Safety in order to conduct any such work. Procedures include issuance of the permit based upon the purpose of the activity, pre work evaluation of the area directly around the work, and provision of a fire watch during and following operations.

Public Fire Department

The Flint Fire Department is an ISO Class III department and the university is served by their primary downtown fire station. The location of each fire station is shown on the mapping in Section 9. The fire department routinely visits the university and has developed fire attack plans for the major structures across the campus.

Fire Department operations are supported by the City of Flint water main system. The university is situated in downtown Flint and served by the well gridded main system. A full map of the fire main system, main sizes, and fire protection connections to university buildings can be examined by review of the FM Global diagram for the university which is located in Section 9 of this plan.

B. Infrastructure Failure

The failure of critical public or private utility infrastructure, resulting in a temporary loss of essential functions and/or services...

The evaluation of infrastructure related risks was a major part of the plan development process. The summary here in Section 5 is intended to guide the plan user as to the different parts of the plan that cover the evaluation of these risks and identification of mitigation goals and actions that are designed to reduce them.
Past Occurrences

As part of the HMP development process past losses and impacts were evaluated. The two areas where these losses have been best documented are the summary of property damage losses contained on pages 6-13 through 6-15 and the Clery Act crime statistics which are shown on pages 6-15 and 6-16.

As noted throughout the Section 6 discussion on critical utilities, facilities and infrastructure, the university has a relatively good experience in terms of prior losses and impacts upon infrastructure. Even so, the potential for these losses exists and mitigation initiatives have been developed for several areas related to the infrastructure. These are summarized below under Mitigation.

Risk Assessment & Vulnerability

The university owns, operates and maintains a significant infrastructure base in order to support full operations. The extensive discussion in Section 6 - Vulnerability Assessment of the plan contains a full discussion of the university infrastructure. Plan users are encouraged to utilize Section 6 as the base document for evaluation of the risk issues related key elements of university and public infrastructure.

Included in the Section 6 discussion is a summary of the most critical facilities, utilities and infrastructure including public utilities. Beginning on page 6-6 of plan there is a summary of the risks and vulnerabilities related to the critical elements of infrastructure and operations.

The infrastructure summary covers the entire built environment of the university and is augmented in Section 9 by the building risk assessment reports, several GIS diagrams which provide specific mapping of key infrastructure elements, and the FM Global site diagram of the facility showing the complete layout of the campus.

Finally, there are a number of worksheets that capture the specific impact events that might occur under several scenarios of loss from different hazard exposures including a direct hit by a tornado, a 200 year flow condition on the Flint River, a fixed site flammable liquids release and fire in the Murchie Science building, an area wide power outage of extended duration, and a security event involving an active shooter on campus.

Mitigation

Several major mitigation goals were developed as part of the plan development process and many of them relate to improvement of the university's infrastructure. The plan user is encouraged to utilize Section 7 for a complete description on the nature of the risk, specific mitigation issues that have been identified, the rationale behind the mitigation goals, a detailed accounting of the cost, “ownership” of the mitigation goals and actions, as well as prioritization of the goals and actions.

The major mitigation goals related to infrastructure are located in Section 7 of the plan, and are briefly described below.

Mitigation Goal 1 - Department of Public Safety/Security Operations Enhancements. The physical mitigation portion of the mitigation goal contains several items that if implemented with improve security provisions across campus. The items contained in this goal are all “hardware” related improvements designed to improve and modernize the DPS security infrastructure.

Mitigation Goal 2 - Enhance the First Street Residence Hall Evacuation and Sheltering Process. This goal recognizes the fact that sheltering provisions for the residence hall could be improved by construction of a structure designed for this purpose that will allow residents to not exit the building to take shelter. Currently residents are required to leave the residence hall and evacuate over open areas to the Murchie Science Building to seek shelter from severe storms.
Mitigation Goal 3 - Power Reliability/Emergency Power improvements. While the university has not experienced a chronic issue with long term power outages, it is felt that there may be opportunities to further enhance the overall power reliability profile for the university. It is also felt that increased pre planning with Consumers Energy surrounding the issue of pre and post incident planning and response would be beneficial.

Mitigation Goal 4 - Flood mitigation. This goal contains a provision for adding a berm or barrier near the William S. White Building to ensure that flood waters cannot make their way into the building under extreme conditions related to a 200 year river flow on Flint River (see analysis of flood risk).

Mitigation Goal 5 - Hardening of DPS operations locations. This mitigation goal outlines several DPS facilities that would benefit from relocation to a more modern and use appropriate facility in order to support the critical mission that this department performs in support of the safety and security of the university students, faculty and staff.

Mitigation Goal 7 - Building Level Risk Mitigation Improvements. This goal consists of several items across the built environment of the campus designed to reduce the risk at the building level.

Nuclear Power Plant Incidents

Risk Discussion: With three commercial nuclear power plants currently operating in the state, emergency preparedness is required in all potentially affected jurisdictions. Michigan’s three commercial nuclear power plants are 1) the Enrico Fermi-2 plant near Monroe; 2) the Donald C. Cook plant near Bridgman; and 3) the Palisades plant near Covert. A fourth plant, the Big Rock Point plant near Charlevoix, was closed in 1997 and is now being decommissioned. Spent fuel from the Big Rock Point reactor is being stored on-site in dry cask storage containers. In addition, the Davis-Besse nuclear power station near Toledo, Ohio has several Michigan counties within its Secondary Emergency Planning Zone, requiring coordinated planning between Michigan and Ohio. Michigan is also home to three small nuclear testing and research facilities—two at state universities (in East Lansing and Ann Arbor) and one privately owned by the Dow Chemical Company in Midland. It was recently announced that a new Facility for Rare Isotope Beams (FRIB) will also be constructed in East Lansing. Source-State of Michigan Hazard Mitigation plan 2011

The university is located remotely from all of the major nuclear power plants in the state, and well outside any Emergency Planning Zones. Due to the nature of potential incidents, some level of monitoring is warranted and under the most severe foreseeable scenario it may be appropriate to consider a strategy for administration of potassium iodine tablets. This situation would require release of radioactive materials and would most likely be accompanied by a state wide emergency response.

Past Incidents and Current concerns:

At the state level there has been one severe event which has been well documented over time.

October 5, 1966, Enrico Fermi-1, Monroe County, Michigan

Although Michigan has never experienced a significant nuclear power plant accident that involved an off-site release of radioactive material, on October 5, 1966, a serious incident did occur at Detroit Edison's then-new Enrico Fermi Atomic Power Plant near Monroe (commonly called Fermi-1). Fermi-1 was an experimental breeder reactor designed to demonstrate the feasibility of liquid fast-metal breeder reactor technology. On October 5, a metal flow guide inside the reactor broke off and blocked the flow of sodium coolant in the space below the reactor core. As a result, approximately 1% of the fuel melted. The fuel damage caused the release of some radiation into the reactor containment building; however, no off-site release occurred. The plant was eventually repaired, and it operated for a short period until it was
permanently shut down in 1972. The fuel and related materials were removed and sent to a federal government facility in the mid-1970s. The Enrico Fermi-2 nuclear power plant opened next door in 1988. *Source-State of Michigan Hazard Mitigation plan 2011*

Nuclear power plants are increasingly in the news as the overall age of the plants has increased, and there is an increased need for maintenance. The Palisades plant near Covert is a good example of an aging plant that has experienced a number of safety related shutdowns in the recent past.

One of the most current situation reports for the Palisades plant follows.

Palisades Nuclear Plant news- Source “Daily Designs” e mail feed NSPE 8/16/12
NRC Team Seeks Cause Of Leak At Palisades Plant.

The AP (8/16) reports, "The Nuclear Regulatory Commission is looking for the cause of a steam leak that led operators to shut down the Palisades nuclear power plant in southwestern Michigan. A three-member team Wednesday began inspecting the plant in Van Buren County's Covert Township." NRC spokeswoman Prema Chandrathil explained that "the leak was coming from a control rod drive," and that "the steam has been confined to the building that houses the reactor." She also said that it "must be fixed before the plant can resume operations."

- The Holland (MI) Sentinel (8/16, Hayden) reports, "Four additional inspectors are now on site" as "a three-member team began investigating the cause of the leak today," and "Monday, another inspector, 'well versed in engineering repair codes'...was sent to the plant at 27780 Blue Star Highway in Covert Township to observe and inspect actions at the facility." So far, "no radiation has been released to the environment and the leak is not a threat to public health and safety, both NRC and plant officials said."

- MLive (8/16, Klug) reports, "The Nuclear Regulatory Commission has launched a special inspection into Palisades nuclear power plant because of a leak in the plant." The NRC's Chandrathil issued a release explaining that the team "will review the utility's monitoring of the leak and subsequent plant shutdown, verify the adequacy of radiological controls, evaluate any potential degradation, and review the plant's repair actions." It will also release a report of "findings within 45 days after completing their investigation."

- WXMI-TV Grand Rapids, MI (8/15, 10:35 pm EDT) broadcast, "The Nuclear Regulatory Commission has launched a special inspection of Palisades Nuclear Plant because of a leak. The plant shut down on Sunday because of a leak from a control rod drive mechanism inside the containment building. The inspection team is looking into the circumstances surrounding the leak and how well the plant acts to repair it. Inspectors will release their findings within 45 days after completing their investigation. A spokesperson for Palisades says this leak is unrelated to another leak that kept the plant shut down for a month earlier this summer."

- WHTC-Radio Holland (MI) (8/16) reports, "An additional inspector from the Nuclear Regulatory Commission has been sent to the Palisades plant south of South Haven to oversee repairs to a leak that has shut down the facility since Sunday."

- Reuters (8/16) and other media sources also cover the story.

This summary is placed in the HMP to show that there is one current plant that might warrant monitoring.

**Mitigation**

The university can do little to directly mitigate a nuclear power plant incident. If an incident were to occur it would likely be accompanied by some time for the implementation of a response due the remote nature of the risk related facilities.
Under the most dire of circumstances such as a radiation release at the west Michigan facility, the university would be part of a wide area impact and it is likely that public authorities would respond on several fronts including emergency management, and public health. The university’s ability to act to evacuate on its own may be constrained by civil authority and the direction that authorities give to the public.

One potential remedy available to the university during a nuclear emergency would be an attempt to administer KI tablets to the students, faculty and staff. It must be noted that this is mentioned in the plan however the university considers the potential or probability is very low that this action will be needed.

Potassium Iodide (KI) Distribution
The possibility that radiation could be released into the environment during a radiation emergency, such as a nuclear reactor accident, has been a concern for years. The major concern with exposure to whole-body radiation or to heat and debris from a radioactive explosion is massive tissue damage and death from the explosion. Radiation-related thyroid cancer is another possible effect of exposure if radioactive iodine (radioiodine) is released by the accident. It can take 10 years or more after exposure for the thyroid cancer to develop, but it may then require surgery or chemotherapy. Taking potassium iodide (KI) pills in the immediate aftermath of radiiodine exposure can reduce the risk of subsequent thyroid cancer. The pills protect the thyroid from radiation poisoning for 24 hours, which is usually enough time to evacuate to safety. Though the pills won't protect against the other harmful effects of radiation exposure, they are so effective at preventing thyroid cancer caused by this type of radiation that many people and organizations have begun purchasing and stockpiling supplies of this over-the-counter tablet as a precautionary step. The federal government has asked states to consider the distribution of potassium iodide pills to people who live within 10 miles of nuclear plants, as a precaution against a severe nuclear accident. About 220,000 people in Michigan live within 10 miles of the state’s three nuclear power plants. People living or working within 10 miles of any of the three nuclear power plants are able to receive a voucher for a 20-pill pack of potassium iodide (KI pills) at nearby pharmacies, free of charge. Source- State of Michigan Hazard Mitigation Plan.

Nuclear Attack
This risk is outside of the scope of the university planning process.

C. Hazardous Material Release- Internal/External
An uncontrolled release of hazardous materials from a fixed site capable of posing a risk to life, health, safety, property or the environment.

A hazardous material is any solid, liquid, or gas that can cause harm to humans and other living organisms due to it being radioactive, flammable, explosive, toxic, corrosive, a biohazard, an oxidizer, an asphyxiant, or capable of causing severe allergic reactions. Hazardous materials are present in quantities of concern in business and industry, Universities, hospitals, agriculture, utilities, and other community facilities.

The primary concerns the university has in the area of Hazardous Material Release are from Transportation Exposures- Over the Road, Rail and on a fixed site basis related to university operations.

Of lesser concern are issues related to pipelines and oil and gas wells as noted in the detailed summary of these hazards and how they might expose the university.

i) TRANSPORTATION – Related over the Road
- An uncontrolled release of hazardous materials during transport capable of posing a risk to life, health, safety, property or the environment.
Section 5: Hazard Identification & Risk Analysis

Highway, railroad, and pipeline systems are carrying thousands of hazardous material shipments on a daily basis through local communities. A transportation incident with hazardous materials could cause a local emergency. Areas at risk are those within 1-5 miles of major transportation routes for hazardous materials. The U.S. Department of Transportation regulates the transport and shipping of over 18,000 different materials. All areas of Michigan are vulnerable to a hazardous materials transportation incident, with more urban industrial areas being at greater risk.

Past Occurrences

Due to the presence of the university in direct proximity to I-475 there is an on going concern that incidents occurring on that roadway could impact the university either directly or via a need to evacuate portions of the campus following an incident. To date there have been no such mass evacuation situations.

As noted in the summary below there was an incident on I-475 on 7/3/2010 that was severe, but did not cause any direct physical damage to the university or cause the university to be evacuated. However the proximity concerns, coupled with the acute effects of such an incident are cause enough for the university to be aware of the potential for them, and the actions that might be needed if an incident were to occur.

The following list of incidents addresses both highway and rail transport incidents involving hazardous material release and their related impacts. This list along with a brief description of each incident offers a range of potential scenarios that could be experienced.

This list of incidents offers good insight to a few fundamental issues related to transportation related hazardous material incidents.

A wide range of materials could be involved. Gasoline is probably the most frequently involved material in these types of incidents however a wide range of industrial material could be involved including Flammable and/or combustible liquids, gaseous or liquid propane, industrial chemicals (corrosives/acids, oxidizing agents, basis materials), chlorine gas or in liquid form, ammonia and its derivates. Essentially if a material is allowed for transport either over the road or via rail it can be considered a potential source for an incident. The summary below which was extracted from the State of Michigan Hazard Mitigation Plan shows this to be the case.

Hazardous Material Transportation Incidents of significance or major relevance within the state, near or in Flint, MI especially.

August 27, 1978, Farmington Hills (Oakland County)
A commercial van containing radioactive material (iridium 192) was involved in an accident. The van caught on fire, prompting fears of a serious radiological incident. Traffic was re-routed around the accident site until it was determined that no leakage of radioactive material had occurred.

January 11, 1979, Frankenmuth Twp. (Tuscola County)
A freight train derailment involving liquid petroleum gas forced the evacuation of 75 persons in the vicinity of the accident site.

February 18, 1981, River Rouge (Wayne County)
A freight train derailed, carrying 56,000 gallons of liquid propane gas resulted in a precautionary evacuation of over 6,000 persons. Fortunately, a serious spill was averted.

February 27, 1981, Dayton Twp. (Tuscola County)
A freight train derailed, spilling hydrochloric acid, liquid petroleum gas, isobutane, and butylenes. The derailment prompted the evacuation of 60 persons living in the vicinity of the accident site.

April 5, 1995, Detroit (Wayne County)
A tractor trailer transporting 8,500 gallons of gasoline overturned on a ramp at I-94 and I-75. The driver was killed in the crash and ensuing fire. A one-half mile area around the crash scene was evacuated due to the risk of explosion from seeping gas that washed down into the sewer.

**June 4, 1999, Whitehall (Muskegon County)**
At a tannery, a tanker truck driver unloaded (unknowingly) a shipment of sodium hydrosulfide solution into a storage tank used exclusively for ferrous sulfate solution, creating a chemical reaction that produced hydrogen sulfide – a poisonous gas. The truck driver was pronounced dead at the scene after having been overcome by the hydrogen sulfide gas. An employee of the tannery was rendered unconscious by the gas, but regained consciousness in time to avoid lasting, serious injury. Eleven employees at the tannery were evacuated. Total property damage was in excess of $411,000.

**September 7, 1999, Ecorse (Wayne County)**
A four-car freight train derailment that included a tanker car carrying 23,000 gallons of ethylene oxide forced an evacuation of 600 persons from nearby homes, businesses, and schools on the Ecorse-River Rouge border. The tanker car was inspected and determined not to be leaking. After several hours, the train cars were uprighted and the evacuated residents were allowed to return to the area.

**January 21, 2000, Flint (Genesee County)**
A rail car with 33,000 gallons of liquid propane gas caught fire in the CSX rail yard in Flint, forcing the evacuation of 2,600 homes within a one-mile radius of the incident site. The danger of a potential explosion also shut down a section of I-475 and closed two elementary schools near the scene. An estimated 3,500 evacuees were housed in three shelters and local motels until the incident was stabilized the next day. CSX railroad and local fire officials determined that the best course of action was to separate the burning tanker from the 54 other liquid propane tanker cars, vent the tanker, and allow the remaining product to burn off.

**May 27, 2000, Detroit (Wayne County)**
A semi-tanker carrying 13,000 gallons of gasoline overturned, exploded and caught fire on I-75 in downtown Detroit, killing the driver and forcing the cancellation of the city's Memorial Day parade that was to be held nearby. The parade was cancelled because officials feared that fuel entering the sewer system could ignite and launch manhole covers into the crowd. Firefighters pumped foam and water into storm drains to prevent further explosions. The stretch of I-75 involved in the accident was closed for several hours to allow for cleanup activities.

**November 15, 2001, Springfield Twp. (Oakland County)**
Two freight trains – one carrying a tanker of chloride gas – collided head on and derailed in rural Springfield Township, killing two train crewmen and critically injuring two others. The crash ignited the swampland around the accident site as three of the four locomotives derailed and caught fire. The accident forced the evacuation of 100 homes within a half-mile radius for several hours and closed two nearby schools for the day. Fortunately, the tanker of chloride gas did not leak. The accident is being investigated by the National Transportation Safety Board and other regulatory agencies.

**May 27, 2002, Potterville**
A horizontal break in a railroad track running through Potterville caused the derailment of 35 cars from a 58-car Canadian National Railroad freight train. Nine cars contained liquid propane, two of which leaked the gas. About 2,200 citizens were evacuated for up to four days. Canadian National Railroad reimbursed residents who could document losses such as missed work, spoiled food, and hotel stays.

**January 29, 2003, Flint**
A truck hauling propane gas plunged from a freeway overpass and exploded on top of a set of railroad tracks, killing the driver and cutting off power to 1,100 people. Interstate 69 was closed in both directions for several hours because of this incident.

**September 16, 2003, Detroit (Wayne County)**
A collision between a car and a tanker resulted in an explosion at an I-75 overpass on Detroit's southwest side. The tanker was carrying 22,000 gallons of gasoline, and burned for several hours. The truck's driver had been pulled to safety before the explosion.

**October 6, 2003, Detroit (Wayne County)**
A tanker explosion and fire killed the tanker driver and closed expressway ramps for about six months. The fire was extremely intense (estimated at 2400 degrees Fahrenheit), and gasoline leaked and burned over a stretch of about one mile, causing I-94 there to be closed down.

**January 7, 2005, Detroit (Wayne County)**
A collision between a jeep and tanker truck resulted in the tanker overturning on northbound I-75. The tanker spilled an estimated 5,000 gallons of flammable xylene and toluene liquid, requiring the freeway to be closed for several hours. The driver of the jeep was injured, but no evacuations were required.

**September 13, 2005, Detroit (Wayne County)**
A collision between a car and tanker on I-275 caused the tanker to roll over, into the median. Hazardous material crews responded, due to leaking chemicals that are used in asphalt manufacture. The driver of the car was killed, and the driver of the tanker suffered minor injuries. Lane closures on the freeway continued through the afternoon rush hour.

**August 28, 2007, Wixom (Oakland County)**
Approximately 5,000 to 10,000 gallons of nitric acid leaked when the driver was forced to stop quickly due to a traffic jam. Two buildings were evacuated during the clean-up process.

**January 10, 2008, Detroit (Wayne County)**
A liquid propane tanker hauling approximately 7,200 gallons of butane plunged through an overpass guardrail. The resulting explosion damaged a section of northbound Interstate 75, set nearby homes on fire, melted a school playground, and killed the driver. One home was completely destroyed, and many others damaged. Two northbound lanes of I-75 were closed for several weeks, due to severe structural damage to the concrete overpass pillars.

**July 3, 2010, Flint (Genesee County)**
A semi-tanker and a motorcycle collided on southbound I-475 and the tanker exploded shortly afterwards. The heat from the explosion was so intense it melted construction barrels and damaged the concrete. The tanker explosion sent a huge fireball into the sky and flames could be seen for miles. The man riding the motorcycle was killed, but the truck driver survived the explosion. Both sides of the expressway were shutdown as hazmat teams were called to deal with the toxic spill.

**July 14, 2010, Romulus (Wayne County)**
A vehicle exiting I-275 north at westbound Interstate 94 clipped a semi truck, causing the semi to lose control and roll on its side. The truck was hauling several different chemicals that are used to make detergent, but one of the chemicals leaking was hydrogen peroxide. Many frustrated motorists spent long delays in traffic because of delays in transferring the remaining materials to another vehicle. High heat and humidity were also a challenge for the two hazmat teams, but there were only minor injuries.

**Risk Assessment & Vulnerability**
It is difficult to assess the total volume, frequency or specific type of hazardous materials that are transported along the highways that are in most direct proximity to the university. Flint is an industrial town so it can be assumed that flammable liquids, combustible liquids,
corrosive materials, oxidizing agents, industrial gases, chemicals, fertilizer, pesticides, etc…are routinely transported on the interstate highway system in and around Flint. Because of their higher speed limits interstates are considered a greater exposure; however incidents could occur on main line trunk surface streets as well. Because of the proximity to major interstates these roads are of the greatest concern to the university.

The university is located in downtown Flint and three interstate highways provide the primary transportation network in and around the city. Hazardous material transport is allowed on all of the roads discussed below and there are no known restriction zones such as bridges or tunnels where the transport of hazardous materials is prohibited.

I-75/US-23 runs north-south and is located several miles from the university to the west; I-69 runs east-west and is located approximately two miles to the south of the university.

Both of these routes could result in an exposure to accidental release of hazardous materials and their attendant side effects of fire/explosion/contamination; however, they are located remotely enough from the university to provide some assurance that the direct physical or operational impact felt from incidents on either of these routes would be minor.

I-475 presents the most immediate concern for the university. The east end of the campus, and in particular the First Street Residence Hall, Mill Street Parking Garage, Central Energy Plant, and the Hubbard Building are all located in direct proximity to I-475 with a separation of approximately 0.25 to 0.5 miles. Any event occurring on I-475 in the direct proximity of the university has the potential for causing a partial evacuation of the university including the noted buildings. While I-475 does not route in a tunnel fashion it is what could be termed a depressed routing with the main road bed lying below the prevailing ground elevation on university property. This might have the effect of containing any spill that is experienced to the vicinity of the right of way.

Mitigation

The university can do little to directly mitigate the potential for over the road hazardous material release. If an incident were to occur the university would be aware of it in its very early stages through its relatively constant communications with the Flint police department. It is expected that the Flint PD would be immediately aware of an incident via their normal reporting mechanisms, and the university would be made aware of an incident via radio monitoring.

The primary mechanism for further mitigation would be the university mass communication systems accompanied by actions detailed in the Campus Emergency Response Plan, actions taken by university DPS in conjunction with public police and fire authorities.

Any incident of this nature that occurs in the immediate vicinity of the university will require an immediate reaction on the part of the university DPS and most likely the university Crisis Management Team and Executive leadership. The mechanisms for ensuring a quick and effective evaluation of incidents are all in place; however the challenge will be for the university to make tough decisions quickly with possibly limited information. Additionally the university will be subject to Civil Authority if a situation related to mass public safety exists. This will mean that public authorities’ direction to evacuate the university or portions of the university will need to be followed quickly, and for the most part without any questions as respects options other than evacuation.

ii) Transportation- SURFACE RAIL

Past Occurrences

There have been many rail accidents, train collisions, and derailments in the State of Michigan. The two internet site links listed below summarize some of the worst incidents that have occurred. Also, the list of incidents located directly above under
http://www.gendisasters.com/trains/index.htm

http://www.michiganrailroads.com/RRHX/Wrecks/WrecksMenu.htm

A search of these sites, along with discussions with local officials responsible for hazardous material response did not indicate any recent severe events of note other than the i-475 incident detailed above. These facts aside there have been incidents across the state, and the presence of the main line rail exposures outlined below mean that events could occur in the future.

Throughout the history of the university there has never been a situation which required the full evacuation of the university as a result of a hazardous material spill resulting from a rail incident.

Risk Assessment & Vulnerability

Flint is historically an industrial town, and as a result of that it is served by surface rail systems that carry a variety of industrial commodities.

Canadian National North America (CN NA) operates a main line that runs roughly E-W through the City of Flint and is located approximately 2 miles to the South of the university. Due to the variability of train scheduling and composition it is not really possible to comment upon the probability of the frequency or that any given train might contain materials that could result in a hazardous material incident. Practical wisdom says that the exposure may exist with any train that is operating on the main line. Review of the CN website shows that they market transportation of automotive products, bulk commodities, coal, consumer goods, containers, dimensional loads, fertilizer, forest products, grain, hazardous materials, metals and minerals, petroleum and chemicals, specialty crops, alternative energy products, and waste products. Clearly some potential for severe incidents exists given the transport of hazardous materials, petroleum and chemicals, waste products (potentially hazardous-not indicated on the website) and under the right conditions fertilizer (fertilizer in combination with certain petroleum products can form an explosive product).

CSXT (CSX Transportation) operates a main line that runs roughly N-S through the City of Flint and is located approximately 4 miles to the east of the university. Review of the CSX website shows that they market the transportation of agricultural products, automotive parts, building materials, chemicals and fertilizers, coal, consumer products, food, machinery, metals, minerals, pulp/paper/fiber, transportation equipment, and waste products. http://www.csx.com/

Review of publicly available rail maps show that both CN and CSXT have several spurs off of their main lines, some of which may extend more closely to the university than the distances indicated in the above discussion. These spurs present less of a concern when it comes to the potential for accidents/derailment/hazardous material spills in that speeds on the spurs are lower than on the main lines, and the potential for two trains to collide due to signal or other malfunction is not as great. The primary concern is associated with the main line exposures.

The link below can be accessed to view a high level rail map of Michigan, and the links indicated in the body of the text above can be used to access rail line maps for CN NA and CSX T. http://www.michigan.gov/documents/MDOT_Official_Rail_130897_7.pdf

Mitigation

It is important for the university to recognize that some exposure to surface rail incidents exists as noted above under Risk and Vulnerability. At the same time the university has no real ability to directly prevent accidents or mitigate the impact that might result from surface rail hazardous material spill events.
Section 5: Hazard Identification & Risk Analysis

The university is located some distance from the rail freight lines that run through the City of Flint; however, severe incidents that result in significant spills and/or fires or explosions have the potential to produce area wide evacuations. Should an event of this proportion occur the university will rely upon their connection and communications with the local law enforcement community in order to optimize the evacuation process, and produce the minimum possible impact upon the university community, physical facilities and operations.

iii) Fixed Site - UNIVERSITY OPERATIONS

Past Occurrences

The university has a good performance record and there have been no hazardous material releases in the past several years that have reached regulatory required reporting. This is due to good controls on risk as summarized in the mitigation discussion below.

Due to the nature of operations, small de minimus spills do occur from time to time in laboratories, facilities and maintenance operation areas. These have been addressed within laboratory procedures for the handling of corrosive, flammable/combustible liquids and the chemical hygiene plan. Other de minimus spills are managed as part of the employee hazard communication program. Additionally, EHS covers spill response actions in several other safety trainings as well as contractor orientation and project documents. EHS, DPS and Facilities & Operations have many employees maintain HAZWOPER certification and able to respond to larger spills, in the event that they may occur. Lastly, UM has contracts with a number of emergency response contractors that are able to quickly respond if an incident were to occur that is beyond our employees immediate response capabilities.

Risk Assessment & Vulnerability

University exposures to hazardous material release were evaluated and mapped in detail as part of the plan development process. The university's EHS department takes a lead role in the management of hazardous material and provided primary support assistance in the development of the plan. This stems from their ongoing role in day-to-day support of this activity.
Section 5: Hazard Identification & Risk Analysis

Currently the tanks are mostly empty. Plans are to provide additional fuel oil dependent upon cost factors. The yard drains have valves to prevent spills from entering the sewer system and the yard area is sloped to contain any spills.

Fuel Oil Pumping:
There is a small noncombustible building in the lot between the CEP and Hubbard Building which contains the pumps which deliver fuel oil from the underground storage tanks to the steam generators in the CEP. Electrical systems within this building have been installed to meet the NEC (National Electrical Code – NFPA 70) for hazardous locations. This equipment is designed to seal out any combustible vapors (vapor proof) and meet Class 1, Division 2 ratings.

Murchie Science Building exposures - Environmental
Release of toxic chemicals:
The university has a Chemical Hygiene Program which has been adopted for use by the Chemistry and Biology Departments. This program manages chemicals, provides training for faculty and staff, provides for inspections of work sites, etc.

Environmental – Release of nuclear radiation:
There has been no research or need for radioactive materials to be stored in campus buildings for the last three years. There are a number of faculty and staff personnel who have certifications to handle radioactive materials. Since there has been no such materials in use or available for the last three years, the annual certifications for those personnel have expired.

Environmental – Release of biological contaminants:
The biology department has an autoclave which through heat and pressure kills any waste product microorganisms prior to disposal. The autoclave is only used by trained and authorized personnel. Records are maintained of all waste materials.

Fire – Use & Storage of combustible and flammable liquids (chemicals):
Overall the university has a program for the elimination of all chemicals whose self-life has expired or is no longer an active product used by faculty for research or laboratory instruction. All incoming chemicals are received at the loading dock of the east wing. They are sent to the 5th floor for the recording of their receipt and distribution to the various labs or storage rooms. The low flash point liquid chemicals are sent back to the 1st floor where there is a secured storage room. This room is segregated by fire-resistive construction and arranged to contain any spills, provided with low-level mechanical exhaust (for the control of flammable fumes), and vapor-proof electrical equipment (for elimination of electrical systems as a fire ignition source). Corrosive liquids are retained and stored in the 5th floor receiving area.

On the 4th floor the Biology Department has a chemical storage room. This area has limited combustible or flammable liquids which are only stored in flammable liquid cabinets that are listed/approved for this purpose.

Laboratory Safety:
All labs that handle toxic chemicals will have fume hoods for the dispensing of those products. All hoods are inspected and certified as having appropriate capture velocities on an annual basis. Individual laboratories are secured at all times against unauthorized entry. Doors are only opened for regularly scheduled classes. Each lab will have a shutoff valve which controls the main gas supply for the individual work-station gas outlets serving burners, etc. The main shutoff valves are readily accessible for emergency use, but are currently not arranged to be locked in either the open or closed position for unauthorized use. Each lab has approved/listed flammable liquid storage cabinets.
Mitigation
Strong programs provide the fundamental risk mitigation for the university. Although risk management and protection of the safety and health of members of the campus community is recognized as a shared responsibility among many departments and leadership, EHS department acts as the hub for programs, plans and control measures related to the management of risk related to hazardous materials, employee health and safety and overall control of the risk. The following link will take plan users to the hub page for EHS plans related to this risk. Each of the listed plans and/or programs is kept up to date in line with regulatory updating procedures, as well as via specifically identified risk issues that surface through day to day management of the risk along with input gained as part of the All Hazards Planning Team process.

A sample of some of the key programs and plan that exist for addressing hazardous material controls follows the link.

http://www.umflint.edu/ehs/EHS%20prog-guide.htm

- UM Flint SPCC/PIP Plan- Spill Prevention Control and Countermeasure Plan
- Formaldehyde Exposure Control Program
- Guidelines for employee work-related accidents
- Hazard Communication and Worker Right to Know (HAZ COM)
- Hazardous Waste Management Guidelines
- Hazardous Air Pollutants (HAPs) and Criteria Pollutants tracking
- Hearing Conservation
- Injury and Illness Reporting
- Integrated Pest Management Program
- Laboratory Safety & Chemical Hygiene Plan
- UM OSEH Guidelines
Mitigation Challenges

Training and Adherence to Plan Provisions: While strong programs provide a good foundation for the management of risk, they are only as good as their implementation, and the training that supports these programs. Risks related to hazardous materials are numerous across the university and carry different implications. Due to this wide variance of risk, it is a constant challenge to ensure the faculty, staff and students are aware of all of the provisions of the numerous plans designed to address their health and safety.

The university puts forth a significant effort in providing safety training. EHS provides numerous training programs and coordinates sending employees to off-site HAZWOPER training on the UM-Ann Arbor campus. More information about the UM-Flint EHS health and safety training is available on the EHS website link below:

http://www.umflint.edu/ehs/EHS%20Training.htm

Major Mitigation Goal 8 - Training is a broad goal and training at various levels of the campus community related to the care, handling, transport, dispensing and use of hazardous materials is a high priority. This aspect of training should be placed near or at the top of the training program priority list.

F. OIL & GAS PIPELINES – WELLS

An uncontrolled release of petroleum products, natural gas or other flammable/combustible/hazardous material being conveyed in the pipeline, or the poisonous by-product hydrogen sulfide.

Pipeline exposures are often overlooked as a threat because much of the petroleum and gas infrastructure in the State, is located underground. Petroleum and natural gas pipelines can leak, erup, or explode, causing property damage, environmental contamination, injuries or loss of life. If hydrogen sulfide is released, it is an extremely poisonous gas that is explosive when mixed with air at temperatures of 500°F or above. Inhalation of even minute amounts of this gas can be fatal. These dangers can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities as well as in pipelines.

As noted in the plans summary of risks earlier in this section oil and gas wells are not a large concern for the university. This is because of the university’s location in downtown Flint and the lack of any such exposure to the university.

Note: The above language both italicized and non-italicized was excerpted from the State of Michigan Hazard Mitigation Plan.

The remainder of Section G relates to pipeline exposure and not natural gas service.
connections or sub-mains for the most part.

Past Occurrences

July 26, 2010, Calhoun & Kalamazoo Counties, Enbridge Pipeline Disaster
On July 26, 2010, an oil spill was reported by Calhoun County officials. The spill was discovered by the owners of an oil pipeline, Enbridge Energy Partners L.P., during a maintenance activity at a pumping station along the pipeline located on the south edge of the City of Marshall (in Marshall Township). The 30-inch pipeline normally transported 190,000 barrels per day of light synthetic, heavy crude oil, and medium crude oil from Griffith, Indiana, to Sarnia, Ontario, and passes through Calhoun County and several other Michigan counties. Oil from the pipeline leaked into the Talmadge Creek and then into the Kalamazoo River and began to flow downstream toward Lake Michigan. Enbridge Energy officials shut down the pipeline pumps and closed valves located upstream and downstream from the leak site to stem the flow of additional oil and try to contain the spill. Based on company estimates, up to 19,500 barrels of crude oil had leaked from the pipeline (approximately 800,000 gallons).

February 23, 1989, Gratiot County
On February 23, 1989, a Michigan Consolidated Gas Company (MICHCON) underground natural gas pipeline in rural Gratiot County exploded and caught fire, releasing a vast quantity of gas into the atmosphere. The huge fire necessitated the evacuation of several families from the immediate area. No deaths or injuries occurred. Company officials shut off valves on either side of the break and allowed the remaining gas to burn off.

March 7, 1999, Plainwell (Allegan County)
On March 7, 1999, a ruptured natural gas transmission line near Plainwell caused an explosion and fire that could be seen for 20 miles away. The explosion and fire occurred in a primarily rural area two miles southeast of Plainwell and about 10 miles north of Kalamazoo. Fortunately, there were no structures nearby, and the explosion and fire did not cause any injuries. The fire, which spread to over 400 feet wide and 100 feet high, burned for nearly two hours before utility workers were able to shut down the gas supply to the line.

June 7, 2000, Jackson County
On the morning of June 7, 2000, a Wolverine Pipeline Company gasoline pipeline ruptured in Jackson County’s Blackman Township, releasing 75,000 gallons of gasoline into the environment and forcing the evacuation of more than 500 homes in a one square mile area around the spill. The leak was detected when a drop in pressure was recorded at a metering station along the 80-mile pipeline that runs through Blackman Township from Joliet, Illinois to Detroit. The spill caused significant environmental and public safety problems and shut down 30% of the state’s gasoline supplies for nine days. (The pipeline carries approximately seven million gallons of gasoline per day.)

February 28, 2008, Flint (Shiawassee County)
Around noon on February 28, 2008, a man was injured in a house explosion as an apparent suicide attempt. The man disconnected a gas line in his house and then intentionally sparked the blast, resulting in the explosion of his Linden Place manufactured home. The park’s maintenance manager kicked in the door to the home and pulled the man to safety just before a major fire broke out, and fire fighters later rescued a pet cat safely.

Risk Assessment & Vulnerability

Pipeline safety and security is a major issue of concern due to the potential impact that could occur, and concerns that this type of resource would present a target of opportunity for a terrorist attack. As such, the information available to the public is limited when it comes to the size, specific location, product volumes, and control valve locations.

The university was provided with a publication entitled “2009 Pipeline Emergency Response
Planning Information” published by Paradigm Liaison Services that shows the pipeline operators that have lines running through Genesee County. This publication was provided by Jenifer Boyer of the Genesee County Office of Emergency Management, and discussions with that office as late as April 2011 indicate that they believe the information on pipelines to still be accurate.

Due to Homeland Security concerns the information contained on this exposure is limited within the hazard mitigation plan itself. It is felt that the information summarized below is available to the public, however to provide mapping of any kind would be inappropriate within the plan. The publication noted above includes intentionally rough mapping data and is on file with the EHS office at the university. It can be viewed by specific request to that office. Each such request will be evaluated based upon a need to know basis due to the sensitivity of the information.

There are 5 pipeline operators within Genesee County:

Buckeye Partners, LP - Pipeline enters Genesee County near the SE corner of the county traverses the county N-S to a point roughly straight east of Flint, then proceeds W to Flint to a Buckeye facility located in Flint (specific location and type of facility not disclosed). From the Buckeye facility the pipeline heads roughly NW and exits the county near the NW corner of the county. This is a multi-use pipeline that can carry any of the following products: Diesel Fuel, Fuel Oil, Gasoline, Jet Fuel, Kerosene, or Propane. Per discussion with the Mundy Township fire chief the university was told that it is not possible to know what will be contained in the pipeline at any given time as this is dependent upon the pipeline operators’ distribution operations. Based upon the mapping within the Paradigm publication it is felt that this pipeline represents the greatest potential exposure to the university due to its apparent routing through the City of Flint.

DTE Energy-Michigan Consolidated Gas Company - This pipeline barely touches the far SE corner of the county several miles from the university and is utilized for Natural Gas transmission.

Merit Energy Company - This pipeline enters Genesee County near the far NE corner of the county, proceeds NW and exits the county near the midpoint of the E-W boundary line that defines the north end of the county. Based upon the rough mapping it appears that this pipeline is located several miles from the university. This pipeline carries Ethane and Natural Gas Liquids.

Trans Canada/ANR and Trans Canada/Great Lakes Transmission Company - The publicly available mapping for these two related operators’ pipelines is so rough the pipeline locations cannot be readily determined. Both pipelines carry Natural Gas.

Mitigation

The university will rely upon the pipeline operators in combination with the local first responders should a pipeline leak, fire or explosion incident occur. There is very little that the university can do to directly mitigate this risk. In the Paradigm publication noted above, each of the pipeline operators provides at least a basic summary of their intended response to pipeline incidents. The level of detail provided in the document is sufficient to give the university confidence that emergency response and pipeline safety is taken extremely seriously by the operators. The pipeline operators are all subject to regulation by the federal Department of Transportation.

Due to the university’s inability to directly control the risk, it is difficult to identify actions that the university can take to physically reduce the risk. One possible avenue of risk reduction would be for the university to encourage formation of a county level liaison team consisting of the Office of Emergency Management and local hazardous material response team(s) leadership. The university might be able to encourage that liaison team to more specifically...
identify the location and produce a more detailed map each pipeline, in particular the Buckeye pipeline. Additionally, the process might include engagement with the pipeline operators to develop a localized plan for how pipeline incidents will be handled.

It must be noted once again that the university has no real ability to directly mitigate this risk, and must rely upon the heavily regulated pipeline operators to invoke their documented Emergency Response Actions in conjunction with local first responders.

VII. Security Related Hazards

The university has exposure to several security related hazards including:

- Civil disturbances
- Bomb threats/bombing
- Workplace violence
- Sabotage/Terrorism
- Labor strikes and union actions

During the interview process that was used to support the development of the Hazard Mitigation Plan the most frequently voiced concern was related to security-related exposures and how they might impact the university. As noted in Section 2 of the plan-Community Profile, the City of Flint’s approach to a renewed effort on Public Safety is being pursued, and the university is considering ways that it can become and even more involved partner in this process.

The reinvigoration of the public safety effort will be an important part of how the university works with the community on reduction of security related risks in the future. This aspect of security risk reduction rises to the level of becoming a major risk mitigation goal for the university, and the planning and response aspect of Mitigation Goal 1 reflects specific actions that the university is considering for implementation in conjunction with local and state level law enforcement agencies.

As noted in several portions of the plan one of the most primary concerns of the university is the safety and security of the students, faculty, staff, and visitors. Any security related incident, particularly one that results in a severe injury or death of any member of the university community, may result in student migration, students not enrolling due to student and/or parental concerns for their safety, difficulty in attracting or retaining faculty, or even a reduction in alumni and philanthropic giving to the university.

The university has standing practices and procedures that address all of the specific security issues listed above. Owing to the sensitivity of certain issues and concerns with homeland security, the university provides various levels of public access to information related to the specifics of these procedures.

The primary procedure documents that exist related to security are summarized in the Campus Emergency Response Plan, the UM Flint Campus Emergency Response Flip Chart, and as part of the Department of Public Safety’s operations protocols. The Department of Public Safety is the first line of defense when it comes to university security and safety risk control and mitigation. All of the aspects of Mitigation Goal 1 - Department of Public Safety/Security Operations Enhancements are intended to enhance, bolster and modernize the DPS operations environment and/or enhance campus wide security capabilities.

http://www.umflint.edu/ehs/Emer-Prep-Resp.htm

A. CIVIL DISTURBANCES

A public demonstration or gathering that results in a disruption of essential functions, rioting, looting, arson or other unlawful behavior.
Large-scale civil disturbances, while rare, are typically instigated by an event, which could include labor disputes, controversial activities, resource shortages, celebrations, or disagreement concerning a particular issue between two or more groups. Some places that may be impacted by such disturbances are government buildings, prisons, military bases, businesses, critical service facilities, and universities.

**College Campus Anti-Rioting Law**

In the wake of the riot that occurred at Michigan State University in 1999, a new state law (2000 PA 51) aimed at curbing rioting on or near (within 2,500 feet of) Michigan’s public colleges and universities took effect on June 1, 2000. This Act, which amended the state Code of Criminal Procedure, allows judges to ban campus rioters and others convicted of riot-related offenses, unlawful assembly, and civil disorder, from all public college and university campuses in Michigan for up to two years for a felony conviction, one year for a misdemeanor. (Note: Although the Act is intended to serve as a deterrent to the type of unlawful behavior exhibited at Michigan State University and other college campuses in recent years, civil libertarians have expressed concern that the law, as written, could potentially be interpreted in such a manner as to punish persons for simple, non-violent acts of civil disobedience.) Source: State of Michigan Hazard Mitigation Plan.

**Past Occurrences**

Historically, universities have been areas for demonstrations, especially during the widespread political protests during late 1960s and early 1970s. Today, most riots develop out of peaceful protests and, more notably, recent university-related riots have been fueled by sporting event outcomes. Alcohol consumption is often a factor in sport-related unrest, as was the case in both of the following riots occurring in the Midwest region, listed below:

**Michigan State University—March 27, 1999**

Riots broke out after the MSU men’s basketball team lost to Duke in the NCAA final four. Approximately 5,000 to 10,000 people rioted, broke windows, overturned cars, and started fires causing an estimated $150,000 in damages to the university and surrounding area before tear gas and riot gear helped control the situation.

Source: State of Michigan Hazard Mitigation Plan

Recently an exposure has emerged related to large public gatherings that occur from time at the Downtown Development Authority (DDA) parking lot located directly across the street from the University Pavilion. This parking lot is used for structured local festival type events that for the most part cause no problems, however one event during the early summer of 2012 involved the spontaneous gathering of a large number of people as a result of a “flash mob” type gathering involving a local rock band. During the event a large group of people gathered, some gunfire was experienced, and a generally unruly crowd was present. The event was curtailed and halted without any real impact; however it served to demonstrate that an exposure that hadn’t been seen prior to this event might be of concern to the university.

As a result of this event the university DPS met with state and local law enforcement to determine and implement ways to better anticipate, prevent and handle these types of events should any occur in the future. Included in the options for handling these types of situations is a potential for the university DPS to take more of a lead role in the policing of the DDA lot in the future.

**Risk Assessment & Vulnerability**

The UM-Flint has not had any civil disturbance occurrences that have caused death, injury or damage to physical property directly on campus property in the past. The university feels that this is in large part due to the proactive risk mitigation that is in place.

It should be noted that the university profile does not include operations that have
generated recent protests or riots at other universities. This includes the lack of organized sports teams, and animal research and testing. The situation described above related to the DDA lot is more representative of the type of exposure that would be of greater concern to the university.

The university does have a study abroad program that potentially exposes students to situations and settings in other countries where civil disturbances may occur.

International Center is responsible for the management of the study abroad program. Approximately 100 students participate annually. Faculty-lead programs where the university has a greater degree of control represent 40% of the programs, and third party programs represent 60%.

The study abroad committee is responsible for group travel arrangements, review of risk and safety, program review and approval, recognition of state department warnings and issuance of travel alerts.

**Mitigation**

The university has an excellent relationship with local, county and state law enforcement, and as a general rule the university attempts to limit access to the campus areas and parking with the exception of some local special events that occur each year in the downtown area adjacent to the campus.

In addition to regular patrols of the campus and the areas bounding the campus, the university maintains a security camera system that provides campus wide coverage. The security camera system presents a twofold approach towards mitigation of this risk. First, it is well known by the university community as well as the greater Flint community that the camera system exists. This serves to act as a deterrent to crime related activity in that the majority of individual(s) who might intend to do harm or damage will be less likely to do so in the presence of security cameras. Second, if an event occurred it is likely that the offender(s) will be caught on camera and this will enhance the ability of university DPS or law enforcement to identify the individual(s) involved.

The university expends a great deal of time, effort and resource in support of security. It is a frequent topic of the All Hazards Planning Team meetings, and team members are encouraged to bring any issues of concern to the attention of DPS and the AHPT. In the case of the security camera system a mitigation action to upgrade and enhance the quality of the security cameras across the campus has been captured within Mitigation Goal 1 - Department of Public Safety/Security Operations Enhancements.

**B. BOMB THREATS / BOMBING**

A bomb threat is generally defined as a threat, usually verbal or written, to detonate an explosive or incendiary device to cause property damage, death, or injuries, whether or not such a device actually exists. Typically delivered by telephone, or other telecommunication means, the great majority of such threats are intended to cause disruption, revenge or play practical jokes, rather than warning of real devices.

**Past Occurrences**

There have been no bombing events at the university in the past. The university has however received threats.

**Risk Assessment & Vulnerability**

Bomb threats can come from many sources including disgruntled employees, former employees, students, faculty members or other ill-intentioned individuals.
There is no way to predict the frequency with which a bomb threat might occur.

The source and the motivation for threats is relatively difficult to assess although a generalized statement can be made that they may be related to an individual who has a problem with the university. These problems might stem from employment related issues, students who feel they are being treated unfairly in one way or another, faculty or staff whose employment with the university has been ended abruptly (firings/dismissals) or simply individuals who desire to disrupt university operations.

The most important issue related to bomb threats and response to those threats is that the university has a recognized program for handling the threats. This program is captured in the Campus Emergency Response Plan.

http://www.umflint.edu/ehs/Emer-Prep-Resp.htm

**Mitigation**

The university has a detailed emergency response plan that addresses the procedure for handling of bomb threats and bombing related incidents.

The emergency response plan is located in Section 9 and is also available on the UM-Flint website as noted above.

**C. WORKPLACE VIOLENCE**

According to the Occupational Health and Safety Administration (OSHA), workplace violence is violence or the threat of violence against workers. It can occur at or outside the workplace and can range from threats and verbal abuse to physical assaults and homicide, and is one of the leading causes of job-related deaths. However it manifests itself, workplace violence is a growing concern for employers and employees nationwide.

While an active shooter can be considered an act of terrorism or an act of workplace violence, the plan will discuss an active shooter situation in the context of workplace violence.

**Past Occurrences**

Per discussion with DPS, they have intervened many times to stop potential incidents of workplace violence, including stopping a potentially active shooter in 2006 and, more recently, disarming individuals near campus attending a large community gathering.

**Risk Assessment & Vulnerability**

With over 10,000 students, faculty and staff the university community population is larger than many towns. Workplace violence can also result from relationships that any member of the community maintains.

The university attempts to balance the desirable environment of an open campus with the needs to provide a safe and secure environment. Currently there is a great deal of discussion on the implementation of the M Card card access system across the university buildings. At present the card access system is in place in only a few of the university's structures, and is not active 24 hours per day in locations where it has been implemented. One of the mitigation actions within Major Mitigation Goal 1-Department of Public Safety/Security Operations Enhancements identifies greater implementation of the card access system across the campus.

The university maintains the Student Update Information Team or SUIT's committee which is part of the university's threat assessment process involving confidential and thoughtful
discussion of individuals who may potentially pose a threat to the university community. The team identified intervention strategies to provide possible assistance, resources to assist the individual or, when appropriate, coordinate a reasonable response to address the threatening behavior in the short and long term. The committee meets every Monday morning. The Department of Public Safety leads the SUIT’s committee.

Mitigation

Based upon confrontational situations that have occurred, the DPS, at the request of the business units, has installed panic buttons at various key locations across the campus to allow for prompt secure communications of a threat situation at the university. Owning to security related concerns the specific locations of these devices is not made widely public. If a panic button is activated it transmits an alarm to the DPS central dispatch center, and this results in the immediate deployment of a DPS officer to the point of origin of the alarm signal.

The university conducts regular tabletop and simulated emergency response exercises in conjunction with local and state law enforcement and uses debriefings from these exercises to enhance the capabilities and response to these types of incidents. These drills are an essential part of university operations, and are taken very seriously by all members of the university community.

Based upon various emergency related event scenarios the university, via DPS operations and in conjunction with Information Technology Services, maintains the capability to conduct mass simultaneous communications with the university community. For sake of brevity in the Hazard Mitigation Plan two links are provided below in order to allow plan users to quickly access information on this important program.

The existence of mass communications programs is only the first step in attempting to ensure that dangerous situations can be communicated across the university. The program is only effective if it is utilized by as many members of the community as possible. The goal is for 100% of the university community members to sign onto the services; however the services cannot be made mandatory. To work towards 100% participation the university makes a review of the system a part of all freshmen orientation sessions, and conducts an on going information campaign directed at informing members of the community on how to sign up for the service.


http://www.umflint.edu/emergency/emergency_alert_faqs.htm

D. SABOTAGE/TERRORISM (Eco/Socio, Political/Religious, Information Security/Cyber attack)

- An intentional, unlawful use of force, violence or subversion against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives. Source- State of Michigan Hazard Mitigation Plan

Sabotage/Terrorism can take many forms, including: bombings; assassinations; organized extortion; use of nuclear, chemical and biological weapons; information warfare; ethnic/religious/gender intimidation (hate crimes); pre-meditated plans of attack on institutions of public assembly; and disruption of legitimate scientific research or resource-related activities (eco-extremism). Virtually any public space is vulnerable to the threat of sabotage and terrorism. Saboteurs and terrorists often go to great lengths to avoid detection by authorities while still seeking publicity for their organization and/or ideals, often the motive for these events.
Universities must take additional precautions to protect their information technology services and computer services from hackers.

**Past Occurrences**

To date there has been only one notable attempt at Terrorism/Sabotage against the university. Several years ago a disgruntled student accessed the Murchie Science Building, went into a laboratory, lit several Bunsen burners and attempted to start a major fire which resulted in limited to no damage.

The university’s ITS department takes great lengths to protect against Information Security/Cyber Attacks. As part of the process outlined below under Risk Assessment & Vulnerability the ITS department regularly thwarts such attacks and to date none have resulted in a serious breach of security.

**Risk Assessment & Vulnerability**

The university is an open environment and desires to remain so but has to balance security concerns with maintenance of a relatively open environment. By its nature university operations represent mass gathering exposures. This results from open buildings, open public spaces, parking garages and a concentration of population in relatively small areas. Mitigation Goal 1-Department of Public Safety/Security Operations Enhancements includes a mitigation action related to further implementation of M Card access security across all of the buildings on the campus. This is a matter that is somewhat controversial with some members of the university community feeling strongly that all buildings should be open to the public at all times they are open. Other members of the university community advocate for more limited and controlled access.

Because of the desire to maintain an open environment there are security limitations inherent to university operations, which will always be of concern to the university.

**Information Security/Cyber Attacks** - An effort to develop university-wide IT security incident reporting and management policies was initiated in May 2005. Policies and procedures were developed for central reporting of serious incidents and for consistent incident classification and response. The IT Security Program provides the university community with a robust, scalable information technology security framework to enable the appropriate protection of university information technology resources and services.

ITS Flint falls under this program and as such has developed and maintains a campus wide (unit) IT security plan. A part of this plan is to review IT systems on campus that contain sensitive or private, personal information every four years and create a remediation plan to mitigate risks if necessary. Current staffing levels of IT security personal do not allow for ITS Flint staff to complete the required number of reviews in the necessary time frame. However, ITS Ann Arbor in FY 2010 offered one-time funding to perform all 13 assessments for the Flint campus at no cost. ITS Ann Arbor has decided to continue to offer this service at no cost for now, therefore there should be no impact if, however, they decide to discontinue this service then ITS Flint may fall behind on its security plan.

**Mitigation**

The university maintains a robust Department of Public Safety (DPS) staff including a Director, 3 full time Sergeants, 3 part time Sergeants, 1 detective Sergeant, 6 officers, 9 security officers, 3 full time dispatchers, 3 part time dispatchers and clerical staff. DPS efforts are supported by 15 to 20 (number fluctuates over time) students who conduct student patrols and act as the “eyes and ears” for DPS across campus.

Because the main mission of DPS is campus safety and security it cannot be considered a counter terrorism task force. The university maintains excellent relationships with the local, county and state law enforcement. This relationship enables the university to have access
to the full resources of law enforcement including federal officials from Homeland Security, the FBI, and ATF.

The Planning and Response portion of Mitigation Goal 1-Department of Public Safety/Security Operations Enhancements has been drafted to address additional planning and coordination with local, county and state law enforcement that can further extend the capabilities of DPS.

**Information Security/Cyber Attacks**-The university is purchasing cyber risk insurance in FY 2012 and a unit’s compliance (using an annual rating of 0-6) with their unit security plan will be the basis under which a deductible will be assessed to the unit in the event of a security breach. Units that rate 5-6 (U of M Flint currently has a rating of 5) will incur no costs. Units that rate a 3-4 will have to pay $10,000 per reported serious security incident and units that rate a 0-2 will have to pay $50,000 per reported serious security incident. Therefore there is a significant fiscal need to ensure that the Flint campus continues to maintain a high annual rating or we could incur significant costs in the event of a serious security breach.

**E. LABOR STRIKES / UNION ACTIONS**

Major labor disputes, in which workers protest and seek changes in their relations with employers, have occurred in virtually every decade in Michigan. However, some have been worse than others in their overall impact on the communities in which they have occurred. Unfortunately, some disputes have turned violent at times, requiring a response by law enforcement agencies to quell the disturbances and maintain order.

Unions present on the UM-Flint campus are as follows:

- Police Officers Association of Michigan (POAM)
- American Federation of State, County & Municipal Employees (AFSCME)
- International Union of Operating Engineers (IUOE)
- Skilled Trades Union
- Lecturers’ Employee Organization (LEO)

**Past Occurrences**

Labor relations between the university and the AFSME have been good and there haven't been any chronic or widespread situations that warranted invoking the union rules on a wide scale.

The regional community has had numerous labor strikes/union actions in the past. Three situations that have occurred in the past are detailed below and have been excerpted from the State of Michigan Hazard Mitigation Plan. The first of these is of historical significance to the City of Flint and the United Autoworkers. These are presented in the plan to show that if labor relations are not handled well serious implications may be felt.

**Dec. 30, 1936 to Feb. 11, 1937 – Flint (also Detroit and other cities)**

In a series of auto worker “sit-down” strikes, industrial sites were occupied by workers who wanted improvements in wage and working conditions. Many picketers wielded sticks and other potential weapons, and many industries had their own teams of “muscle” and security men, as well as the general support of law enforcement personnel. The flashpoint occurred in Flint, on January 11, 1937, when tear gas and fire hoses were used against picketers, who employed various makeshift weapons. The conflict escalated to the use of firearms by police. Several dozen persons were injured on both sides of the issue. (Various issues involving union organization took decades of discontent, conflict, and legal and political action to be ironed out into the modern forms in which labor-industrial relations exist today. Although these issues became more stable by the second half of the 20th Century, some aspects of these issues are still evolving even today.)
1960s and 1970s, Detroit, Flint, Lansing
In the 1960s and early 1970s, strikes between the United Auto Workers Union and the major automobile manufacturing companies headquartered in the state (General Motors, Ford, Chrysler and American Motors) occasionally led to clashes with police. These strikes primarily affected Metro-Detroit, Flint and Lansing.

July 1995 to 1997, Metro Detroit
The most recent period of serious labor unrest has been the Detroit Newspaper Strike, which started in July 1995 and continued on through 1997. (The labor dispute officially ended in December 2000 when the involved unions ratified new contracts – 5 ½ years after the strike began.) The strike was marked by periods of sporadic violence and involved approximately 2,500 workers from Detroit’s two daily newspapers. The strike negatively impacted many facets of the community, and at times required extensive use of law enforcement resources to supervise strike-related activities and maintain order. The most significant strike-related activity occurred on June 20-21, 1997, when a national union mass demonstration was held in support of the strikers, drawing over 100,000 people to Detroit.

Risk Assessment & Vulnerability
A labor demonstration would be subject to public gathering laws of the City of Flint, monitored by DPS and there is every expectation that they would be peaceable in nature.

Mitigation
The Human Resources department of the university takes the lead role in labor relations and the university maintains a strong working relationship with the local AFSCME leadership and membership.

VIII. PUBLIC HEALTH

A. Food Services/Foodborne Illness
Foodborne illnesses, including the contamination of products during manufacture process, is a type of public-health emergency that is likely to be associated in the university communities collective mind with the effectiveness of the university policy regarding food safety. The university has a wide range of exposures related to food safety and food borne illness, although the experience with food related incidents has been good. This is in large part due to the vigilance of the department of Event and Building Services and University Catering Services and the policies and procedures that this department develops, manages and monitors.

Past Occurrences
While the university hasn’t had any widespread “community” level outbreaks of food borne illness this risk is of on going concern due to the presence of the various operations across the campus involving food services. The following list of events was excerpted from the State of Michigan Hazard Mitigation Plan, and serves as a reminder of the types of exposures that the university faces.

1977, Oakland County, Foodborne Pathogenic Contamination (Botulism Outbreak)
In 1977, the worst outbreak of botulism in U.S. history was linked to home-canned jalapeno peppers served by an Oakland County restaurant. (Botulism is caused by a bacterium that grows from spores in an atmosphere without oxygen. Improperly canned foods are a primary source of the botulism bacterium. Botulism attacks the neuromuscular system and is one of the most dreaded of food poisoning agents, with a high mortality rate.) The restaurant used 200 jars of home canned peppers because a crop failure the preceding winter had created a shortage of commercially prepared peppers. Fifty-nine (59) restaurant patrons reportedly fell ill from the botulism poisoning, though no one died. Many of those affected required intensive care level treatment and horse serum botulism antitoxin. (Note:
The supply of horse serum botulism antitoxin is limited, and it must be transported from regional depots to a hospital that has need of it. Because the amount of toxin required to paralyze a person is so low, the potential for a very large botulism outbreak always exists.

Spring 1997, Michigan, Foodborne Pathogenic Contamination (Hepatitis A Outbreak)
In the spring of 1997, almost 300 cases of hepatitis A occurred in at least four Michigan school districts. A rapid epidemiological investigation by local, state and federal epidemiologists linked this outbreak to frozen strawberries distributed through the national school lunch program. Tracing of the implicated strawberries identified 13 different lots sent to several states in addition to Michigan. Several hundred Michigan schools were potentially affected. A massive program was instituted in many schools in these regions to evaluate risk at schools that received the frozen strawberries, to inform parents about immune globulin prophylaxis, and to provide it to recently exposed children. The prompt and insightful epidemiological investigation and rapid, well-organized response of the Michigan local health department system helped to prevent the occurrence of additional illnesses and to reduce community anxiety.

2002, Nationwide outbreaks, Foodborne Pathogenic Contamination (Listeriosis Outbreak)
A multi-state outbreak of Listeriosis, from August 1998 to February 1999, had its origin at a Bil Mar Foods meat plant in Zeeland. (Listeriosis is caused by the foodborne bacterium Listeria monocytogenes – commonly call Listeria – that can cause serious illness and death to pregnant women, newborns, older adults, and persons with weakened immune systems.) Health officials identified the vehicle for transmission of the Listeria bacterium as hot dogs and deli meats produced at the plant under numerous brand names. The exact source of the contamination was not determined. A total of 21 deaths and 100 illnesses nationwide had been linked to the contaminated meats. In December, 1998, 35 million pounds of hot dogs and deli meats were voluntarily recalled by the manufacturer—the largest meat recall in U.S. history. Once the recall was instituted, the number of illnesses caused by the outbreak decreased dramatically. The Zeeland plant was allowed to resume meat production in March, 1999, after more stringent food safety procedures were implemented. In 2002, at least 40 persons were sickened and 10 were killed in a nationwide listeria outbreak linked to the meat company Pilgrim’s Pride Corp. The company then recalled 27.4 million pounds of meat, after tests at a Pennsylvania plant revealed strains of Listeria monocytogenes that matched the outbreak strain.

Risk Assessment & Vulnerability
The university has several outlets where food is either prepared or served, and the food safety policy for the university is promulgated, and managed by the office of Events and Building Services. The food safety policy is available from EBS, and this policy establishes a standard requiring that all food served at a university facility be prepared in a licensed facility in accordance with the requirements of the Genesee County Health Department which is a branch of the Michigan Department of Agriculture. The only exception to this policy is department level gatherings where a “pot luck” type arrangement for food brought from a home setting might exist.

The primary areas where food is prepared, and/or served across the university are:

- The University Center where there is a small snack bar along with the main kitchen utilized by Sodexo as part of their food provision for meal plan participants, primarily residents of the First Street Residence Hall.

- The food court located on the ground floor of the University Pavilion where several commercial restaurants exist in a food court type orientation designed for a quick lunch or snack (sandwiches, pizza, ethnic foods, smoothies, etc…).
Snack bar at the William S. White building

At various locations across the university as approved under the food safety policy of the university.

Food services provided by vendors located in the University Pavilion food court are considered a third party exposure in that the food court vendors located in UPAV are considered a private restaurant type situation, and these vendors are subject to regular health department inspections and ratings. The university rents space to these vendors and while there may be some level of concern regarding any food preparation and dispensing location on campus these vendors operations are within their own control, and subject to public inspection by health department authorities. The Genesee County Health Department routinely inspects the food vendors operating at the University Pavilion.

Residence Hall food services are provided by an outside vendor, Sodexo. All food for residents of residence halls is prepared by Sodexo in a licensed and inspected facility then served to the hall residents at the University Center.

Event and Building Services maintains a list of approved vendors/catered outlet providers who are acceptable outlets for obtaining food for events that may occur across campus. All use of these outside providers is to be contracted for via Event and Building Services, and the food safety policy for caterers and outside vendors is reviewed on an annual basis. Site visits are made to all approved vendors on an annual basis. The preferred mode for on campus events involving the serving of food is the use of University Catering Services.

Outdoor grilling of food is allowed in specified areas only. All grilling must be performed by University Catering Services, Pavilion food vendors, or an approved caterer. The Genesee County Health Department requires a special license for all outdoor cooking, including grilling.

The most notable exception to the broad based policy regarding food safety is food service for the Early Childhood Development Center. Officials from EBS made note during interviews that the ECDC management is responsible for their own food service provision, and therefore sit outside of the food safety policy for the university as a whole. As noted below in Mitigation this policy has been noted in the plan, and has been taken under review by EBS and the All Hazards Planning Team

Mitigation

The university’s best controls on this risk are related to ensuring that the standing food safety policy is well understood and followed by various members of the university community, and the outside vendors that the university employs in support of residence hall foodservices, and campus wide catered events.

One noted area of concern that should be put under further review is the policy of allowing the management of the ECDC to contract for food services on their own outside of the direct management of the office of EBS and University Catering Services.

B. Public Health/Contagious Disease Control

The issues related to Contagious/Infectious Disease control across the university community are of concern in all situations where a large population exists, and there is a high potential for disease communication due to the close proximity of that population. The university setting could be a prime environment for contagious/infectious diseases, and the university takes numerous steps to ensure that this risk is controlled. Primary concerns are undiagnosed tuberculosis, meningitis and seasonal flu however concerns are not limited to these three specific event profiles.
Past Occurrences

Per conversations with the Genesee County Health Department, the Campus Health Officer, leadership of the Urban Health and Wellness Center, and the EHS Director only one potentially severe incident from the past was noted. Several years ago there was an instance where a case of Tuberculosis occurred at the university with one student having been infected. The case was closely monitored by UM Flint and the Genesee County Health Department and resulted in no further exposure to any other students or employees. None of the interviewee’s was aware of any widespread infection that occurred at that time.

The lack of numerous historical incidents does not lower the concern level for university leadership however.

Risk Assessment & Vulnerability

The university has over 9,000 students, faculty and staff and with a population this large there is always the chance for an event to occur. The Urban Health and Wellness Center (UHWC) is located on campus at the William S. White building however it is not considered a “student health center” in the sense that not all students would be expected to obtain healthcare services there. The UHWC is primarily a community based clinic serving the local Flint community (many who have what could be termed a low income profile). It is also not a certainty that members of faculty or staff would obtain healthcare services there as they are more likely to utilize their primary care physician and the health system provided for under their healthcare coverage from the university or other provider.

Even though the UHWC cannot be considered a student or university health center in the sense that not all community members utilize the facility it is the epicenter for policy and procedures related to community wide health along with EHS.

The following links to university website resources related to the UHWC and student health are included directly below.

Urban Health and Wellness Clinic primary link: http://www.umflint.edu/uhwc/

Student health news: http://www.umflint.edu/uhwc/campushealth_news.htm

Pandemic flu planning and related resources: http://www.umflint.edu/ehs/Pan%20Flu%20Planning.htm

In discussions with the parties noted above in Past Occurrences it was noted that a formal contagious disease control program does not currently exist. As part of those same discussions it was noted that further enhancements to the existing practices, and formalizing these practices should be considered. Even though a formal program does not exist at present there are a number of rudiments of such a program that are considered as current standard operations practices, including:

- The Campus Emergency Response Plan contains a provision that EHS should be notified whenever a student, faculty or staff member has an apparent serious illness. This reporting could come from the UHWC, the student themselves, the parent or grandparent of a student, or any member of the university community.

- Once the evidence of an illness is confirmed the ill person is directed to seek medical attention via their own provider or through the Urban Health and Wellness Center.

- EHS contacts the Campus Health Officer.
A discussion occurs wherein it is determined how to best handle the incident, whether a wider potential for contagious disease exists and whether contact with the Genesee County Health Department is warranted. If an incident has escalated to this point it is likely that the GCHD will be contacted.

If the GCHD concurs that a wider public health concern exists a “Public Health Recommendation” is developed by the GCHD and actions required to complete it would be executed by EHS and the Campus Health Officer.

International students may present an area of concern due to varying public health standards, and vaccination requirements internationally. While the risk related to international students and their presence at the university cannot be fully controlled any more than issues related to domestic students the university does require I-20 documentation, and a F1 student visa to be in place for all international students coming to the university. Additionally all international students are required to have healthcare insurance in place prior to enrolling for classes.

Mitigation

At the time of the writing of this plan the university was in active discussions amongst the Campus Health Officer, EHS, and leadership at the UHWC related to development of a formal Contagious Disease Control program. Due to the many parties engaged with this discussion and the complexity involved with developing such a program it is considered a day to day operations issue that is already under examination for improvement.

As such a Major Mitigation Goal was not developed around this topic, however this does not diminish the fact that a more formal approach on this issue would appear to be beneficial to the university.

The challenge for the current standard practice is that it is contained within the Campus Emergency Response Plan and as such it may not be widely read by all members of the university community. The ERP is publicly available however it is somewhat unrealistic to assume that all members of the campus community are fully aware of all of the provisions contained within the ERP. This is a on going challenge that all university’s face.

The Genesee County Health Department offered the following points that provide the greatest level of concern as respects their view of university operations, and areas that might be considered for further mitigation:

- Communication with the GCHD is important and there should be regular contact between the university and the GCHD. It is important to do this so that both parties are aware of any emerging situations that may exist in either the public health arena or at the university specifically. Regular communications do occur however they could be made more regular and formal.

- Communication between the university leadership and the university community is important. This relates to reinforcing sanitation and practical means of attempting to limit the spread of infectious diseases. It also relates, of course, to communications related to emerging or known situations involving the spread of infectious diseases.

- The university represents a diverse population including students from across the globe. The GCHD indicated that they have some concerns (specifics unstated) that the immigration process may not be fully effective in identifying the presence of contagious or infectious diseases. The GCHD suggested that the university consider asking for immunization records for TB, measles and mumps for all incoming international students.
TB, meningitis, measles and mumps are the diseases of greatest concern for the GCHD when it comes to university populations and the potential for the spread of contagious diseases.

The GCHD also suggested that awareness training for "signs and symptoms" might be a good program to consider for students, faculty and staff across the community. This is because the first line of identification will be the university community.

The university has a long standing relationship with the GCHD, and the two have worked together during past public health situations such as the H1N1 flu pandemic that occurred several years ago. The GCHD has the potential for providing an outlet and access to the Strategic National Stockpile for vaccines and medicines and the university was able to obtain doses of the H1N1 vaccine via the GCHD during the pandemic.

As a result of the discussions and at the urging of the GCHD the university has developed a Major Mitigation Goal of developing a Closed Point of Dispensing (Closed POD) for vaccines that might be administered under widespread public health emergencies. The formality and actions surrounding this process is substantial, however the GCHD felt that this would be a valuable resource for the university should a severe public health emergency occur in the future. Mitigation Goal 10 addresses this.

IX. OTHER HAZARDS

A. MASS TRANSIT

Mass transit can apply to any form of transportation that involves the transport of a large number of people. In the case of the university the main exposures from Mass Transit are:

Bus Services provided by the Flint MTA- http://www.mtaflint.org/index.shtml

Air Traffic exposures from Bishop International Airport- http://www.mtaflint.org/index.shtml

Rail exposures from Amtrak passenger rail service

Past Occurrences

**Bus Services** - Based upon anecdotal information obtained via the interview processes outlined in Section 4 of the plan there have been minor incidents involving the Flint MTA buses and vehicle collision. While incidents related to vehicular collision have occurred in the past there have been no incidents that have produced significant impact upon the students, faculty, and staff of the university.

**Air Traffic** - Search of publicly available information showed no major aircraft crashes in the vicinity of the university. On November 16, 2011 a Piaggio P.180 Avanti operating as Avant Airlines Flight 168 (Detroit-Metro to West Bend Municipal, tail number N168SL) Crashed upon landing due to engine failure. The plane was destroyed, but everyone aboard survived with only minor injuries.

Sources- The Flint Journal via MLive.com November 16, 2011 and N168SL NTSB Accident Report

**Amtrak Passenger Rail** - While numerous incidents involving passenger trains have occurred in Michigan a search of publicly available information did not reveal any such incidents in the direct vicinity of the university. The following site provides a good overview of historical events involving train accidents in Michigan- http://www.michiganrailroads.com/RRHX/Wrecks/WrecksMenu.htm
In order to provide a wider historical perspective related to past occurrences the following information was excerpted from the State of Michigan Hazard Mitigation Plan.

October 28, 1942, Hamtramck (Wayne County), School Bus and Passenger Train Collision
During the morning of October 28, 1942, a major transportation accident occurred in Hamtramck when a school bus collided with a passenger train bound from Chicago to Detroit. The accident resulted in 16 fatalities and 27 injuries, and of the total of 45 bus passengers, only three were not injured. The driver of the bus claimed he did not see the approaching train because of an overcrowded doorway blocking clear visibility. The majority of the fatalities occurred near the back of the bus, and many of them were children headed for school.

Easter Sunday, 1958, Saginaw (Saginaw County), Passenger Airplane Crash
Prior to the August 1987 crash of Northwest Airlines Flight 255, Michigan's worst commercial passenger airplane crash had occurred on Easter Sunday, 1958, at Saginaw Tri-City International Airport. In that incident, which resulted in 47 fatalities, ice had built up on the plane's directional systems and the pilot was unable to reach the runway on the landing approach.

August 16, 1987, Romulus (Wayne County), Passenger Airplane Crash
Michigan's worst commercial passenger airplane crash, and the fifth worst in U.S. aviation history (see the table below), occurred on August 16, 1987, at Detroit Metropolitan Airport. In that incident, Northwest Airlines Flight 255 was unable to gain sufficient altitude at takeoff and crashed onto a nearby highway, killing 156 passengers and crew. A small child was the lone survivor. A Governor's Disaster Declaration was granted to the City of Romulus and numerous state resources were mobilized to assist in the recovery.

December 3, 1990, Romulus (Wayne County), Passenger Airplane Crash
An unfortunate example of an airliner ground collision occurred on December 3, 1990, when two Northwest Airlines aircraft (Flight 299 and Flight 1482) collided with one another in heavy fog on a runway at Detroit Metropolitan Airport. The Flight 1482 aircraft was heavily damaged and caught fire. Eight persons died and 21 were injured in that incident.

March 10, 1993, Comstock Township (Kalamazoo Co), Passenger Train Accident
On March 10, 1993, an Amtrak passenger train with 45 passengers collided with a liquid propane tanker truck in Comstock Township, killing the driver of the truck and injuring the train’s engineer. The truck had been exiting a private drive when it slid into the path of the train, which was traveling eastbound at approximately 62 miles per hour. Upon impact, the liquid propane tank exploded with a large fireball. The train engine received considerable damage from the impact and explosion. The windows were blown out, causing the train engineer to receive second degree burns from the fireball. One passenger was transported to a nearby hospital for treatment. The private crossing at which this accident occurred, 11 other private crossings, and a public highway crossing in this area were all eliminated in 1996.

December 17, 2000, Battle Creek (Calhoun County), Passenger Train Accident
An Amtrak passenger train with 161 passengers partially derailed near the train station in Battle Creek, forcing the closure of the railroad tracks in both directions for an extended period of time. The train, composed of a locomotive and five coach cars, was traveling at a low rate of speed when the locomotive and first coach car ran off the tracks a half mile east of the Battle Creek station. The entire train remained upright and the derailed cars were lifted by crane back onto the track. No injuries were reported.

June 4, 2007, Lake Michigan, Passenger Airplane Crash
An unfortunate incident occurred when a plane carrying a team of surgeons and technicians from Milwaukee, WI to Ann Arbor crashed into Lake Michigan. All six passengers died in the incident, including the two pilots, two University of Michigan surgeons, and two technicians due to prepare an organ for transplant surgery at the University of Michigan Health System hospital in Ann Arbor that same afternoon. The National Transportation Safety Board said that one of the
pilots had reported severe difficulty steering the plane because of trouble with its trim system, which controls bank and pitch.

**March 1, 2010, Detroit (Wayne County), Passenger Train Accident**
A Chicago-bound Amtrak train with 76 people aboard struck a Detroit fire truck on March 1, 2010 that had stopped on the tracks in southwest Detroit. The fire truck parked on the train track was already responding to a previous crash involving a car and a semi truck. Several passengers sought treatment for minor injuries like head and back pain, and there was $600,000 damage to the ladder truck.

**Risk Assessment & Vulnerability**
The primary risks associated with mass transit are the impact that incidents might have on the students, faculty and staff of the university or the physical impact that might occur at the university if a mass transit related incident were to occur. The latter of these, physical impact, refers to major damage scenarios that would result from accidents involving these modes of transportation.

A brief synopsis of the operations profiles of mass transit operations near the university follows.

**Bus Services** - The Flint MTA operates throughout the City of Flint, 7 days a week with hours ranging from 6:30 am to 11:30 am Monday through Saturday, and 9:30 am to 7:00 pm on Sunday. The primary station serving the university is Station 14-Downtown Campus located just north of the university proper. A program of significant importance to the university is the Transit Watch program which is designed to encourage system users to identify potential safety and security concerns, and report them to MTA management.

This information was sourced from the MTA website that is listed above at the beginning of this section.

**Air Traffic** - Flint is provided with commercial and general aviation air service via Bishop International Airport which is located several miles to the south and west of the university. There are 5 additional airports located with 25 miles of the university, and all of these airports are smaller general aviation type facilities.

Publicly available information is limited as respects determination of exact flight paths for Bishop Airport, however the facility has two operating runways- 9/27 (East to West) and 18/36(North to South). Due to the configuration of these runways, and the airports location several miles to the SW of the university it is apparent that the main flight patterns for aircraft do not including routing directly over downtown Flint and/or the university. The airport experiences approximately 125 operations per day (operation refers to either a take off or a landing). There are approximately 93 aircraft based at the field consisting of 72 single engines, 18 multi engines, and 3 jet aircraft.

The airport opened in April of 1940 and other than the noted occurrence listed above, public records don’t indicate any major air crashes at the field or within the City of Flint.

It should be noted that Detroit Metro Airport is located approximately 50 miles to the SW of Flint. Metro is a major international airport and has experienced at least one significant air disaster on August 16, 1987. This incident is summarized above in the material excerpted from the State of Michigan Hazard Mitigation Plan.

**Sources**-

http://www.airnav.com/airport/KFNT/ Link to hub site that contains technical data on Bishop Airport

http://vfrmap.com/?type=vfrc&lat=42.965&lon=-83.744&zoom=10 Link to area map showing all airports in region
http://www.bishopairport.org/AboutUs/Statistics.aspx

**Amtrak Passenger Rail** - Flint is provided with passenger rail service via the Amtrak system which utilizes the Canadian National railway line through the City of Flint and to the east and west of Flint. The Flint station is located at 1407 Dort Highway which is approximately 2 miles to the SE of the university, making direct physical impact from a derailment a non-issue.

**Mitigation**

Due to the nature of mass transit the ability for the university to mitigate the risk to students, faculty and staff and facilities is very low to non existent. The university doesn’t own or operate any mass transit systems so there is minimal opportunity to directly mitigate risk.

It is possible that a group of or individual students, faculty or staff could be involved in a Flint MTA bus accident, a plane crash, or a passenger rail accident. The university’s only real remedy for this is to prevent the incident from occurring by ensuring drivers are licensed and the transportation company is reputable with no history of incidents/violations. However, if even after proactively screening contract drivers/transportation the university would be limited to only providing whatever assistance is reasonable and appropriate to the individuals involved in an accident or incident. This is a matter that would be addressed via the university’s standing procedures for crisis management including communications with public authorities for the purpose of identifying members of the university community that may have been involved, rendering aid and assistance to the impacted parties, communicating with their families, etc...

**X. Hazard Priority Ranking**

*Historical Occurrence*: Low Occurrence (1 pt)—Excessive Occurrence (10 pts)

*Affected Areas*: Single Site (1 pt)—Large area (10 pts)

*Speed of Onset*: Greater than 24 hours (1 pt)—Minimal/No Warning (10 pts)

*Population Impact*: No Impact (1 pt)—High Impact (10 pts)

*Economic Effects*: Minimal Effects (1 pt)—Significant Effects (10 pts) *Duration*: Minimal Duration (1 pt)—Long Duration (10 pts)

*Seasonal Pattern*: One Season (1 pt)—Year Round (10 pts)

*Predictability*: Highly Predictable (1 pt)—Unpredictable (10 pts)

*Collateral Damage*: No Possibility (1 pt)—High Possibility (10 pts)

*Availability of Warnings*: Warnings Available (1 pt)—Not Available (10 pts)

*Mitigative Potential*: Easy to Mitigate (1 pt)—Impossible to Mitigate (10 pts)

Table 5.3 below displays each hazard and their respective scores along with their hazard ranking. In order to show a total risk rank a composite score is shown for each risk. In order to establish priorities in a realistic manner the hazards were grouped together in the 6 categories shown-Natural Hazards, Technological, Hazardous Materials, Security, Public Health, and Other.
## Figure 5-10: UM-Flint Hazard Profile & Evaluation

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Historical Occurrence</th>
<th>Affected Area</th>
<th>Speed of Onset</th>
<th>Population Impact</th>
<th>Economic Effects</th>
<th>Duration</th>
<th>Seasonal Pattern</th>
<th>Predictability</th>
<th>Collateral Damage</th>
<th>Availability of Warnings</th>
<th>Mitigative Potential</th>
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<td>5</td>
<td>5</td>
<td>8</td>
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<tr>
<td>Pipelines and Wells</td>
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<td>5</td>
<td>8</td>
<td>4</td>
<td>4</td>
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<td><strong>Security Related Hazards</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</table>
## Section 5: Hazard Identification & Risk Analysis

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Historical Occurrence</th>
<th>Affected Area</th>
<th>Speed of Onset</th>
<th>Population Impact</th>
<th>Economic Effects</th>
<th>Duration</th>
<th>Seasonal Pattern</th>
<th>Predictability</th>
<th>Collateral Damage</th>
<th>Availability of Warnings</th>
<th>Mitigative Potential</th>
<th>Score</th>
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<tbody>
<tr>
<td>Civil Disturbance/Crime</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>7</td>
<td>81</td>
</tr>
<tr>
<td>Bomb Threats/Bombing</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>4</td>
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<td>76</td>
</tr>
<tr>
<td>Workplace Violence</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>6</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>7</td>
<td>81</td>
</tr>
<tr>
<td>Sabotage / Terrorism</td>
<td>1</td>
<td>8</td>
<td>9</td>
<td>10</td>
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<td>8</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>80</td>
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<tr>
<td>Labor Strikes / Union</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>1</td>
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<td>3</td>
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**Public Health**

<table>
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<th>Hazard</th>
<th>Historical Occurrence</th>
<th>Affected Area</th>
<th>Speed of Onset</th>
<th>Population Impact</th>
<th>Economic Effects</th>
<th>Duration</th>
<th>Seasonal Pattern</th>
<th>Predictability</th>
<th>Collateral Damage</th>
<th>Availability of Warnings</th>
<th>Mitigative Potential</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Services/Food</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>42</td>
</tr>
<tr>
<td>Contagious Disease</td>
<td>1</td>
<td>10</td>
<td>3</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>58</td>
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**Other**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Historical Occurrence</th>
<th>Affected Area</th>
<th>Speed of Onset</th>
<th>Population Impact</th>
<th>Economic Effects</th>
<th>Duration</th>
<th>Seasonal Pattern</th>
<th>Predictability</th>
<th>Collateral Damage</th>
<th>Availability of Warnings</th>
<th>Mitigative Potential</th>
<th>Score</th>
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<tbody>
<tr>
<td>Mass Transit</td>
<td>1</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>74</td>
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</table>
## XI. Hazard Summary

### Figure 5-11: Hazard Summary

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Score out of 100</th>
<th>Mitigation Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural Hazards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tornadoes</td>
<td>83</td>
<td>1 NH-High</td>
</tr>
<tr>
<td>Thunderstorms, Hail, Wind</td>
<td>53</td>
<td>3 NH-Moderate</td>
</tr>
<tr>
<td>Flood: Riverine and Surface</td>
<td>75</td>
<td>2 NH-High</td>
</tr>
<tr>
<td>Severe Winter Weather</td>
<td>53</td>
<td>4 NH-Low</td>
</tr>
<tr>
<td>Extreme Temps: Summer</td>
<td>51</td>
<td>5 NH-Low</td>
</tr>
<tr>
<td>Earthquake</td>
<td>0</td>
<td>6- Extremely Low</td>
</tr>
<tr>
<td>Wildfire</td>
<td>0</td>
<td>Negligible to no risk</td>
</tr>
<tr>
<td>Subsidence</td>
<td>0</td>
<td>Negligible to no risk</td>
</tr>
<tr>
<td>Drought</td>
<td>0</td>
<td>Negligible to no risk</td>
</tr>
<tr>
<td><strong>Technological</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire: Any Structure</td>
<td>67</td>
<td>3T High</td>
</tr>
<tr>
<td>Infrastructure Failure Internal/External:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Energy Plant</td>
<td>92</td>
<td>1T High</td>
</tr>
<tr>
<td>IS/IT/Telecom Outages</td>
<td>64</td>
<td>4T High</td>
</tr>
<tr>
<td>Electric Power</td>
<td>81</td>
<td>2T High</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>63</td>
<td>5T Moderate</td>
</tr>
<tr>
<td>Public Water</td>
<td>52</td>
<td>6T Moderate</td>
</tr>
<tr>
<td>Public Sewer</td>
<td>50</td>
<td>7T Low</td>
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</table>

### Figure 5-12: Mitigation Goal Summary

<table>
<thead>
<tr>
<th>Mitigation Goal</th>
<th>Total Score</th>
<th>Overall Goal Rank</th>
<th>Physical Mitigation Risk Ranking</th>
<th>Planning and Response Risk Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Public Safety/Security Operations Enhancements</td>
<td>91</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Enhance the First Street Residence Hall Evacuation and Sheltering Process</td>
<td>89</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Power Reliability/Emergency Power Improvements</td>
<td>83</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Flood Mitigation</td>
<td>83</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Hardening of DPS Operations Locations</td>
<td>82</td>
<td>5</td>
<td>5</td>
<td>X</td>
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<tr>
<td>IT DR &amp;Continuity Plan enhancements including alternative facilities and resiliency improvements</td>
<td>79</td>
<td>6</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>
### Figure 5-11: Hazard Summary

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Score out of 100</th>
<th>Mitigation Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Nuclear events</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear Power Plant</td>
<td>42</td>
<td>8T Negligible</td>
</tr>
<tr>
<td>Nuclear Attack</td>
<td>Not Rated</td>
<td>Not Rated</td>
</tr>
<tr>
<td><strong>Hazardous Material Incidents - External and Internal</strong></td>
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<td></td>
</tr>
<tr>
<td>Transportation - Rail Related</td>
<td>61</td>
<td>2HM Moderate</td>
</tr>
<tr>
<td>Surface Rail</td>
<td>54</td>
<td>4HM Low</td>
</tr>
<tr>
<td>University Operations</td>
<td>63</td>
<td>1HM High</td>
</tr>
<tr>
<td>Oil &amp; Gas Pipelines</td>
<td>59</td>
<td>3HM Low</td>
</tr>
<tr>
<td><strong>Security Related Hazards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil Disturbance/Crime</td>
<td>81</td>
<td>1S High</td>
</tr>
<tr>
<td>Bomb Threats / Bombing</td>
<td>76</td>
<td>2S Moderate</td>
</tr>
<tr>
<td>Workplace Violence incl. Active Shooter</td>
<td>81</td>
<td>1S Moderate</td>
</tr>
<tr>
<td>Sabotage / Terrorism</td>
<td>80</td>
<td>3S Low</td>
</tr>
<tr>
<td>Labor Strikes / Union Actions</td>
<td>37</td>
<td>4S</td>
</tr>
<tr>
<td><strong>Public Health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Services/Food Borne Illness</td>
<td>42</td>
<td>2PH High</td>
</tr>
<tr>
<td>Public Health/Contagious Illness</td>
<td>58</td>
<td>1PH Moderate</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass Transit</td>
<td>74</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Figure 5-12: Mitigation Goal Summary

<table>
<thead>
<tr>
<th>Mitigation Goal</th>
<th>Total Score</th>
<th>Overall Goal Rank</th>
<th>Physical Mitigation Risk Ranking</th>
<th>Planning and Response Risk Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Level Risk Mitigation Improvements</td>
<td>78</td>
<td>7</td>
<td>6</td>
<td>X</td>
</tr>
<tr>
<td>Training</td>
<td>78</td>
<td>8</td>
<td>X</td>
<td>6</td>
</tr>
<tr>
<td>Improve the university’s Business Continuity Plans</td>
<td>76</td>
<td>9</td>
<td>X</td>
<td>7</td>
</tr>
<tr>
<td>Improve Contagious/Infectious Disease Control Program with the Genesee County Health Department No Rank</td>
<td>74</td>
<td>10</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>GIS Systems Expansion, Enhancement and Integration</td>
<td>51</td>
<td>11</td>
<td>X</td>
<td>9</td>
</tr>
</tbody>
</table>
Commentary on Hazard Rankings and Risk Mitigation

It must be recognized that any attempt to rank a long list of dissimilar hazards against a single set of criterion is not a simple quantative measurement, but rather is partially qualitative and somewhat a subjective activity. As each hazard was evaluated the university had to take several factors into consideration, among these were:

Hazard rankings have to assume some scenario related to the worst case type of exposure to the university. For example if a direct impact by a Tornado is experienced at the Central Energy Plant it has the potential to completely destroy the building. The CEP is primarily non sprinklered however if a fire were to occur it is unlikely that the building would be a total loss due to a lack of combustible loading within the structure.

Mitigation is a broad term. Once the hazards were evaluated the task of sorting through the various priority rankings was overlaid against the various competing priorities regarding risk reduction at the university. These priorities include the known background of the greater community and its crime profile, known risks and hazards that the university wants to prioritize for mitigation, the ability to fund mitigation projects, and the ability to initiate and control the level of risk mitigation that might be employed.

Risk assessment must be tied with mitigation and in order to show how the hazard rankings from the above discussion apply to the university’s major mitigation goals Table 7.2- Overall Priority of the Mitigation Goals, and Mitigation Action Rankings follows on the next page. This table was taken from Section 7 which addresses Mitigation Identification and Prioritization.

A side by side comparison of the hazard rankings and the mitigation goal and action prioritization shows that the plan does a good job of blending all of the factors that have been described for both hazard evaluation and risk mitigation ranking.

Points based ratings are a guide, and don’t always show the entire picture. Some risks of relatively low concern such as Mass Transit related incidents score high but have a low potential for causing impact at the university. Other risks such as the broad range of security risks that were evaluated score high but not at the very top of the list numerically. Even with a slightly lower point ranking the range of security related issues along with ongoing concerns for university community safety place security related mitigation at the top of the Major Mitigation Goals for the university.
Section 6: Vulnerability Assessment

I. Introduction

The UM-Flint campus is located in downtown Flint encompassing over 70 acres. The campus consists of 11 major buildings, and several parking decks, with a total square footage of approximately 1.9 million square feet. The total building-plus-contents-value is approximately $354,051,259 and breaks down to approximately $227,600,276 building and $126,450,982 contents values.

Of the 11 main structures there are three buildings that house academic operations. They are the W.R. Murchie Science Building, the William S. White Building, and the David M. French Hall and Theatre. The highest valued facility at the university is the Francis Willson Thompson Library with total building and contents values of $88,822,694.

A. Overview and Vulnerability Information

This section provides a summary of the principal structures across the university including basic attributes such as number of stories, percent of square footage provided with sprinkler protection, year built, gross square footage, and building and contents values.

Building reports were prepared as part of the Hazard Mitigation Plan development process and are located in Section 9-VI - University Building Risk Assessment Reports. These reports provide greater detail about each building’s size, occupancy configuration, fire protection systems, life safety system features, and common and special hazards related to operations.

In addition to providing details on each building, the survey activity for each building included identification of mitigation opportunities that might support the goals of the process. Mitigation opportunities that were surfaced at the buildings are briefly noted within the reports, and have been summarized in Section 7. Real time mitigation-mitigation actions that were taken in advance of the formal issuance of the Hazard Mitigation Plan- are noted in Section 6 here as well as in Section 5. These include actions that the university has adopted related to response to developing riverine flow exposures, and guardrails that Consumers Energy has placed around one of their structures adjacent to university property.

The building reports were developed by the university’s Hazard Mitigation Consultant Green Oak Solutions, LLC.

The FM Global diagram found in Section 9-VII provides a view of the overall campus and was provided courtesy of FM Global and the University of Michigan Risk Management department in Ann Arbor. This diagram includes the location and size of the buildings, basic fire protection
details including the water supply arrangement to the building, fire pump details, basic construction details, building occupancy, and water main layouts across the campus. This diagram was added as a quick reference source for plan users as it provides a complete diagram of the facility in a single location.

**GIS Elements** - To provide an even more in depth view of the campus utilities and infrastructure several GIS type elements have been provided in Figures 6.1 through 6.9 that follow in Section 9-II - GIS Elements. Each of these diagrams provides a different level view of the university, and captures different aspects of risks that exist. Each diagram is provided with a legend indicating the elements covered and is intended to show various attributes that influence the risk across the university.

**B. Major Vulnerability Factors**

**Natural Hazards** - The dominant natural hazards vulnerability for the university is the Flint River which runs through the campus separating the north and south sides of the campus. As noted in Section 5 of the plan, Tornado and Flood are the two hazards with the greatest potential for catastrophic loss potential. While other natural hazard exposures exist in southeast Michigan e.g. hail, severe thunderstorm, lightning none with exception of lightning have produced losses of any significant level in the past ten years.

Due to the importance of the Flood exposure background information on this hazard has been placed into three appendices to section 6. The FEMA FIRM flood maps make up Section 9-III, while a Corp or Engineers Potential Failure Mode Analysis, and a 2008 Stantec Consulting authored engineering inspection report make up Section 9-IV and Section 9-V.

**Safety and Security** - A second dominant feature of the university is its location in downtown Flint. As noted in earlier sections of the plan Flint has experienced the negative effects of a long term process of de-industrialization, and as part of that process the overall economic vitality of the city has diminished. One of the chief outcomes related to this loss of vitality has been an escalating crime rate as documented by various crime statistics summarized in Section 2 of the plan. While anecdotal in nature the City of Flint chief of police indicated in a meeting held on 6/13/12 that the university is located in perhaps the lowest crime area within the City.

While the City of Flint has experienced an escalation in crime the university’s Department of Public Safety-maintained Clery Act crime statistics show that on campus crime has been on the decline over the past 3 years. These statistics are summarized in tabular form in a later section of the plan dedicated to past losses.
C. Built Environment Overview

General observations regarding the campus and its built environment include:

- Buildings were constructed over a wide range of time from 1920 to 2008.
- While the buildings were built over a long scale of time, the most critical facilities from an academic and revenue support standpoint were built in the 1980's, 1990's, and post 2000.
- With the exceptions noted in table 6.1 and the building reports, the most critical structures are provided with automatic sprinkler protection. The most notable exception to this is the Central Energy Plant (CEP) which is provided with sprinkler protection in limited areas. The majority of the CEP has no sprinkler protection and the fire risk is managed by control of ignition sources (external of actual operations related to steam production and power distribution), and through limitation of combustible materials within the building.
- The university's property risk control service provider FM Global has recommended that sprinklers be provided in all areas of the building; however, the university has taken this under careful consideration based upon the presence of high voltage electrical equipment and the other noted controls on the risk. This is a risk and mitigation management issue that is currently under examination by the university.
- The university strives to maintain all properties in good condition, however, their age, use profile, and exposure to the environmental effects in Michigan (relatively hot summer peak temperatures, and generally cold winters with attendant snow/ice/low temperature exposures) presents a continuing challenge to maintain the structures.
- Loss expectancy worksheets have been developed for scenarios involving several key risks including Tornado, Flood, Fire in a fixed site hazardous material storage location, Extended Power Outage, Structural Fire, and a Security Related event. These worksheets along with the criterion used to develop the loss expectancies are located at the end of Section 6.
- Because the plan was developed over a period of time information of varying ages was used to develop it.
- Building information was obtained by direct tour of the buildings by the university’s hazard mitigation consultant Green Oak Solutions in late 2010. The reports have been reviewed and updated throughout the process to ensure that they are accurate at the time of plan issuance.
- Building values were obtained from the University of Michigan Risk Management department in Ann Arbor, and represent the values as of September 2011.
- Information was obtained via review of the ongoing information exchange and dialogue between the university and their property loss control service provider FM Global. This information exchange included review of the FM Global loss control reports, and recommended risk improvements. The FM Global process is considered in parallel with the university’s hazard mitigation planning efforts and is a continuous process that will remain in force going forward.

II. University Building Inventory

Table 6.1 provides a tabular summary of the principal structures across the university including basic attributes such as the number of stories, percent of square footage provided with
sprinkler protection, year built, gross square footage, and building and contents replacement values. Table 6.8 provides an additional breakdown of building values by showing separate Building and Contents values.

Table 6.1 U-M Flint Holdings Overview

<table>
<thead>
<tr>
<th>Building</th>
<th>Stories</th>
<th>Sprinkler Protection</th>
<th>Year Built</th>
<th>Gross Square Footage</th>
<th>Building + Contents Replacement Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Pavilion</td>
<td>1 and partial 2 plus Bsmt.</td>
<td></td>
<td>1987</td>
<td>85,040</td>
<td>$14,884,331</td>
</tr>
<tr>
<td>Pavilion Parking Deck</td>
<td>6</td>
<td></td>
<td>NA</td>
<td>114,439</td>
<td>$5,953,758</td>
</tr>
<tr>
<td>Pavilion Annex</td>
<td>1</td>
<td></td>
<td>1985</td>
<td>3,037</td>
<td>$529,167</td>
</tr>
<tr>
<td>Northbank Center</td>
<td>Main-12+Bsmt, Annex- 2, South- 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbank Center Parking Ramp</td>
<td>3</td>
<td></td>
<td>1960's</td>
<td>71,280</td>
<td>$2,571,782</td>
</tr>
<tr>
<td>William S. White Building</td>
<td>1, partial 3, partial 5</td>
<td></td>
<td>2002</td>
<td>178,491</td>
<td>$39,386,939</td>
</tr>
<tr>
<td>Frances W Thompson Library</td>
<td>3</td>
<td></td>
<td>1994</td>
<td>109,750</td>
<td>$88,822,694</td>
</tr>
<tr>
<td>Harrison Street Parking Ramp</td>
<td>4</td>
<td></td>
<td>1970</td>
<td>121,359</td>
<td>$6,313,775</td>
</tr>
<tr>
<td>David M. French Hall &amp; Theatre</td>
<td>1+partial Bsmt.</td>
<td></td>
<td>1975</td>
<td>173,598</td>
<td>$38,558,556</td>
</tr>
<tr>
<td>W.R. Murchie Science Building</td>
<td>5+ Penthouse</td>
<td></td>
<td>1988</td>
<td>193,420</td>
<td>$42,739,631</td>
</tr>
<tr>
<td>Harding Mott University Center</td>
<td>3+partial Bsmt.</td>
<td></td>
<td>1979</td>
<td>114,675</td>
<td>$22,451,260</td>
</tr>
<tr>
<td>Recreation Center</td>
<td>1+Mezz. And part Bsmt.</td>
<td></td>
<td>1983</td>
<td>81,923</td>
<td>$11,700,571</td>
</tr>
<tr>
<td>First Street Residence Hall</td>
<td>4 + Attic &amp; Mech. Space Below Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mill Street Parking Deck (Visitor Parking)</td>
<td>4 with one level below grade</td>
<td></td>
<td>1988</td>
<td>302,100</td>
<td>$19,704,654</td>
</tr>
<tr>
<td>Central Energy Plant</td>
<td>1+ Bsmt.</td>
<td></td>
<td>1972</td>
<td>26,586</td>
<td>$10,639,419</td>
</tr>
<tr>
<td>Hubbard Building</td>
<td>1+ Partial Bsmt</td>
<td></td>
<td>1920</td>
<td>24,852</td>
<td>$1,909,437</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td>1,893,090</td>
<td>$354,051,259</td>
</tr>
</tbody>
</table>
A. Campus Maps - Overview and Infrastructure

Section 9-II - GIS Elements provides various views of the campus ranging from aerial photography of the campus to GIS type elements showing the university, where it sits in the community, and critical infrastructure elements that support operations.

Each map is provided with a key or legend to guide the user as to their content. These maps were developed to clearly show where the Universities critical infrastructure elements are located.

The future use of these elements may include expansion to truly interactive GIS elements that can be electronically linked to building level data. One of the university’s mitigation goals is to fully develop a GIS mapping system that will allow for electronic access to risk information, emergency response plans, business continuity plans, etc.

For this first version of the Hazard Mitigation Plan, a select set of GIS maps were chosen for inclusion in the plan itself. These maps were selected because they show the key risk attributes for the university. Additional maps have been developed and a small library of GIS elements has evolved as part of the Hazard Mitigation Plan development process. These additional elements may be included in future versions of the plan, or used to develop the GIS mapping system mentioned above.

The Campus Architect, university outreach Staff, EHS, as well as Greg Rybarczyk, Assistant Professor, Department of Earth and Resource Sciences with expertise in GIS mapping, were all instrumental in determining the application of GIS mapping to this project. The process involved identifying specific mapping needs and development of the various GIS diagrams and facility layouts in this plan. The various levels of diagrams that have been developed allow the university to show key risk assets more clearly, and use these in the vulnerability analysis to highlight risks, and better identify their location across campus.

B. GIS Map Reference

Due to the volume of data associated with the GIS elements they have been placed in Section 9-II of the plan, and compiled for use there. A brief description of each GIS map follows to better guide the plan user to information they may be attempting to locate.

C. Aerial Overview of Campus

This map shows an overall view of the campus with all major buildings labeled.

D. Community Exposures and Critical Infrastructure

This wide view shows aerial mapping of dams, hospitals, fire and police stations, Bishop Airports’ proximity to the university, major highways and surface roads and their proximity to the university, and rail main lines (CSX and CN North America)

E. Dams and Impoundments

One the key risks and most notable features of the university is the presence of the Flint River running through the campus, and the Flood risk represented by the river. The Flint River is a managed watershed consisting of several dams and impoundments both on the river and its major local tributaries. Water elevations and flows on the river are managed by the City of Flint. This map supports discussion on Flood within this section of the plan as well as for Section 5 where the risk from Flood is summarized, and shows the entire system of dams, including the Hamilton Dam which is located within the confines of the university campus but owned by the City of Flint.
I. Storm sewers and drains - South side of river
This is a map of the storm lines and outfalls on the south side of the river.

J. Storm sewers and drains - North side of river
This is a map of the storm lines and outfalls on the north side of the river.

III. Identified Critical Facilities-Utilities

A. Criticality Defined
The term criticality as used in this plan refers to a summarization of the issues that influence how important a given resource or service is along with the factors that have led the university to determine the degree of importance of the resource or service.

B. Critical Facilities
Campus critical facilities are those facilities and services that the university depends on to maintain daily operations and are crucial to business continuity in the face of disaster. Without regard to prioritization, facility use across the campus can be placed into the following categories of use.

- Facilities essential to university-wide operations (i.e. public safety, administrative, maintenance, etc.);
- Facilities that provide essential utilities or serve as communications nodes for buildings;
- Facilities that serve as repositories of reference materials, collections, and those also containing unique records;
- Student and on-campus housing;
- High traffic, high occupancy buildings;
- Facilities housing academic functions, classrooms; and
- Instances where a facility would be cited under multiple criteria elements reinforced the critical nature of the facility.

For various reasons all of the university’s facilities can be considered critical at some level.
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Table 6.2 below lists the university buildings and categorizes the buildings by primary functions performed in each facility.

Given the nature of operations at the university, each of the noted categories have a different use or occupancy profile, but all are considered critical to varying degrees, for different reasons due to the singular nature of the operations that are housed in them. Four categories have been established to provide a clear indication of the function of each building within the overall university operation.

As noted above, some buildings appear more than once, emphasizing their importance in hazard mitigation.

- Group A: Administration, Emergency Operations, Communications
- Group B: Student Residences, High Occupancy Buildings
- Group C: Research Labs, Hazardous Materials, Collections
- Group D: Critical Support, Infrastructure Facilities

Table 6.2 Critical Facilities Buildings

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>University Pavilion – Administration</td>
<td>First Street Residence Hall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubbard – Facility &amp; Operations Offices</td>
<td>W. R. Murchie Science Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubbard – DPS Offices</td>
<td>Francis Willson Thompson Library</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubbard – Campus Emergency Operations Center</td>
<td>David M French Hall &amp; Theatre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbank Center – Administrative Offices</td>
<td>William S. White Building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mill Street Garage- Primary Alarm Monitoring center</td>
<td>University Center</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recreation Center</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C. Critical Utilities

The most critical utilities for the university are electric power, potable water, natural gas, and sewer
Section 6: Vulnerability Assessment

system service. The split between the south side of the river with most of the buildings provided with centralized utility support and distribution supported by the Central Energy Plant, and the north side of the river with its individual building support arrangement is the notable feature of the utilities vulnerability exposure.

D. Public Water

Public water is provided both north and south of the river by the Flint Public Water System. Flint primarily utilizes water purchased from the City of Detroit to provide the supply for the city; however they also maintain the water plant as a backup. Each year the city switches from the Detroit source of supply for approximately one month, during which the Flint River is used as the source of supply. The overall source supply for the city is considered highly reliable as evidenced by the City of Flint fire departments ISO 3 rating. Approximately 50% of the ISO rating is based upon the quality and reliability of the towns’ water supply. At the time the plan was drafted, the city was examining additional sources of supply via a new pipeline from Lake Huron as part of a pipeline development project known as the Karagnondi project.

Public water is needed to support university operations in several ways. The university is located in downtown Flint in an area of the water main system that is well gridded with few dead end mains. The routing and main sizing for the university can be viewed by examining the FM Global insurance diagram located in Section 9-VII. Examination of the diagram shows a typical main system for a well-distributed city water system with adequate hydrant spacing and sectional valve locations.

Over time, the public water supply system has shown itself to be generally reliable in terms of providing an adequate flow and pressure that will support domestic use, and the fire protection water requirements of the university structures. As with all city water systems located in mature urban environments that are instances where main breaks have occurred, or where system leakage is detected. When situations like this occur the City of Flint responds and addresses the situation as best they can with the resources that exist.

Criticality

The CEP has a high reliance on the public water supply in their mission to support operations.
Mitigation
At present, systems have not shown a lack of reliability in the form of frequent main breaks, disruption of supply, or degradation of the quality of supply.

Due to the importance of the water supply it may be prudent to further explore contingency arrangements to address how the university would ensure the operation of the Central Energy Plant during an extended outage of the city water system. This might include plans to truck in potable water, or to arrange for water purification of Flint River water.

E. Electric Power
For additional details on electric power and emergency generators at the building level please refer to the individual building reports.

Electric Power is provided to the university by Consumers Energy.

Criticality
Electric power is required for the university to operate its facilities. With exception of the University Pavilion all of the major facilities across the campus have at least minimum emergency generator/emergency lighting capability that will allow for the safe evacuation of the facility during a power outage. A list of emergency generators across the campus is shown below in Table 6.3.

Table 6-3 Emergency Generators

<table>
<thead>
<tr>
<th>Building</th>
<th>Location</th>
<th>Size</th>
<th>Fuel Tank</th>
<th>Fuel Tank Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEP</td>
<td>Ground floor Emergency Generator Room, North side of building</td>
<td>310 KW</td>
<td>250 gallon plus 50 gallon day tank</td>
<td>Adjacent to Generator</td>
</tr>
<tr>
<td>WSW</td>
<td>1st floor mechanical room</td>
<td>275 KW</td>
<td>Natural Gas Fired - direct fed</td>
<td>Integral to engine set</td>
</tr>
<tr>
<td>French Hall and Theatre</td>
<td>Penthouse</td>
<td>200 KW</td>
<td>250 gallons</td>
<td>Tunnel under French Hall</td>
</tr>
<tr>
<td>Murchie Science West Wing Penthouse</td>
<td></td>
<td>230 KW</td>
<td>250 gallons plus 25 gallon day tank</td>
<td>1st Floor Murchie Science</td>
</tr>
<tr>
<td>Thompson Library</td>
<td>1st Floor Mechanical Room - NW side of mechanical area</td>
<td>350 KW</td>
<td>250 gallons</td>
<td>Buried outside adjacent to building wall of mechanical room</td>
</tr>
</tbody>
</table>
Mitigation - Consumers Energy Reliability
The following content is based upon notes taken by Green Oak Solutions during a meeting held on 5/26/11 with representatives of EHS, Facilities and Operations, and university purchasing. Christina Gipson, Corporate Account Manager for Consumers spearheaded their efforts to address our questions on power reliability, their emergency response provisions, and options for overall power systems resilience that may exist now and into the future.

Power Reliability to the University
According to Consumers Energy records there have only been two significant outages in the past 5 years.

On 3/29/2009 at 10:29 am a “squirrel in substation” incident occurred at the substation supplying the Central Energy Plant and resulted in an 89 minute outage of power to the CEP and the entire university complex on the south side of the river.

On 2/3/2010 at 6:07 pm a cable failure occurred at the substation supplying all of the buildings north of the river and resulted in a 287 minute outage of power to university buildings north of the river.

Commentary and Questions
1. This frequency of outage is not outside the realm of what would be considered normal for an urban system that is of varying age, and subject to the various weather, maintenance and system related exposures that exist.

2. Momentary Outages - Consumers doesn’t account for what they term momentary outages. This was defined as “very limited in duration-usually seconds to a couple of minutes”. So even with limited long duration outages there may have been several shorter duration events during the 5-year period. Short of a documentation methodology for these events, it will not be possible to capture a summary of the shorter term outages, at least using Consumers records, and while Consumers tends to downplay the impact and importance of momentary outages those types of outages can cause disruptions of operations.

3. Mitigation - The network representatives for Consumers indicated that several risk mitigation efforts are currently, and have been, underway. First, all power supply lines on university property are underground including the private distribution system. Second, Consumers has pursued a systematic movement of the lines underground between the university and the primary substation on the south side of the river. This has been accompanied by an upgrading
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of manholes and vaults and will continue for approximately 5 more years. Third, Consumers has an ongoing program for tree trimming to address lines that are still located above ground.

4. Overall the Consumers representatives were very attentive to university’s request for assistance with its hazard mitigation planning activities.

The elements of their plan consist of...

1. Establishment of a Storm Center when weather conditions appear conducive to production of power outages.
2. Mutual aid agreements with other power companies for line services and equipment.
3. Communication mechanisms with major customers.
4. Coordination with the high voltage power transmission provider.
5. Deployment of mobile substations when substation damage occurs.
6. Focus on downtown Flint as a priority recovery.
7. Pre-incident assistance (if desired) with generator design and selection issues and strategies.

Commentary
1. The provisions noted above are typical for a well-run utility.
2. The key item among the provisions is communication between the provider and UM-Flint at the time of the incident. It may make sense to capitalize on the opportunity of this meeting to ensure that the best possible lines of communication are established between the university’s ERT and Consumers Energy.
3. While Consumers can provide consultation on generator issues, it does not appear that they can provide any services beyond those available in the commercial market. This refers to generator strategy development, sizing, engineering, and configuring emergency connection provisions at individual buildings, etc.
4. Some value might be derived from working directly with the utility on generator strategies as they may have deeper access to information on Consumers’ strategies for restoration (speculation however).

G. Natural Gas
Natural gas is utilized at the CEP primarily for the production of steam. Natural gas is provided by Consumers Energy and the basic supply is considered reliable. Consumers’ representatives could cite no known outages for the past several years, and university experience has been good.
Criticality
Natural gas is critical to maintenance of building operations, in particular steam and heat production throughout all buildings.

Mitigation
Existing boilers can operate on fuel oil as a backup to loss of natural gas supply at CEP.

H. Centralized Steam Production
Steam is produced on four dual-fueled boilers located in the Central Energy Plant. For additional information on the size and capacity of the boilers see the building report for the CEP located in Section 9-VI.

Criticality

Mitigation
The steam production boilers are dual fueled and can be operated with either natural gas or fuel oil. This provides a good redundancy for this critical aspect of steam production.

The plan for loss of the steam generators themselves is to bring in truck mounted generators, obtained at the time of disaster, to support production of steam.

I. Centralized Chilled Water Production
Criticality
Chilled water is required in order to meet the building comfort standards of the university. Operations could most likely continue during an air conditioning outage, however during certain times of the year operations would be very difficult. It is felt that loss of chilled water would not shut down the university.

Mitigation
Maintenance of chillers, cooling towers, and system components to ensure they are reliable in service.

System capacity is double the demand load, and equipment is set up in a primary and back up arrangement.

J. Sewer Systems
The building sanitary sewer systems across the university feed into the separated Sanitary and Storm water system operated by the City of Flint. During the course of the project, significant focus was placed on the evaluation of storm water runoff in the areas surrounding and within the university boundaries. In addition to the work that Green Oak performed in analyzing the flood risk, FM Global conducted an analysis of the surface water runoff exposure. The results of both of these analyses are summarized in Section 5 of the plan in the sections related to riverine and surface water flooding.

Each major building has one or more connections to the public sewer system, and overland flow across the university is accomplished via catch basins across the campus.

As part of the Hazard Mitigation Planning process and other university wide planning a map of all of the sewer mains and outfalls was developed. This map is being used to evaluate the potential for placement of flap gates or check valves on outgoing sewer lines to limit the change of surcharge and back up into university structures.

At present the university is exposed to surface water conditions during high river flow events. This occurs when the river overtops its containment to the west of the Hamilton Dam, and is not related to sewer system failure.

IV. Vulnerability of Critical Facilities and Crime Statistics
Understanding prior losses, their type, frequency, magnitude and trends are a key part of the Hazard Mitigation process. The All Hazards Planning Team (AHPT) is actively involved with managing risks, and ultimately, those efforts should result in a reduction of measurable losses.

A. Property Damage Losses
The U of M Ann Arbor Risk Management Department has provided a 10-year loss run that includes all of the property damage incidents/losses that were reported for potential reimbursement through the university’s property insurance program. The 10-year period from 2001 to 2010 offers a good sampling period for the FEMA analysis, and its full content is available in an Excel spreadsheet via Mike Lane. The information that follows represents a summary of some of the key data points that can be derived from the summary.

The loss history strongly supports a need to emphasize campus security, with approximately 40% of losses being attributed to theft or Vandalism. This also supports the investigative findings of the hazard mitigation planning efforts, information obtained during the interviews with AHPT members, and the Executive Officers.
V. Conclusions from Review of the Loss Data

1. Security and planned security package of mitigation opportunities are confirmed as a high priority based upon 40% of losses being related to Theft and Vandalism.

2. Trends in loss frequency are downward. Several factors are contributing to this, and the efforts of DPS and the AHPT should be cited as two major contributing factors.

   Continued vigilance on issues related to safety, security, and operations level risk on the part of these groups has contributed to the downward trend in loss frequency.

3. Four large losses produced the majority of the dollar loss (70%), while almost 90% of losses by number generate impact less than $5,000 of impact per event. This indicates that the university is doing a good job of controlling day to day risk, but where catastrophic or frequent impact potential exists it should be aggressively mitigated.

4. Losses are distributed across most of the university’s buildings.

5. Event types cover a wide range of risk categories.

6. After theft and vandalism, the most frequent loss category was natural hazards including wind, water damage, and lightning with 22% of the total losses. Wind is the most frequent natural hazard but lightning produced the single largest loss during the 10-year period.

A few basic statistics regarding the losses for the past 10 years…

- Total $ Losses reimbursed = $521,246
- Total Number of Losses= 82
- Average $/ Loss= $6,356

**Four Largest Losses**

1. 5/16/03-Vandalism- Lapeer St. Annex= $86,249.00
2. 12/24/04-Mold- UCEN= $24,451.49
4. 6/9/2005- Lightning-Northbank= $220,220.03

The 4 Largest Losses (5% of losses) represent 70% of total dollar loss over the past ten years, and one loss represented 42% of total loss sustained.

A. Data Breakdown and Analysis

B. When They Occurred

2007 was the peak year for losses with 16. 2005 to 2007 were the overall peak years for the decade with 39/82 total losses. Since 2007, losses have trended downward with only three losses per year for both 2009 and 2010. This trend can be attributed to the efforts of the AHPT and other staff involved with risk management at the operations level across the university. Clery act statistics show this same downward trend in the number of losses.
C. Where They Occurred and the Cause

Among the major operations facilities for the university, the highest frequency of losses occurred in WSW, Murchie, the UCEN, the UPAV, the Northbank Center and the Thomson Library. With the exception of Northbank Center, all of these buildings have theft and/or vandalism as their leading type of loss.

Each of these major buildings averages less than one loss per year over the ten year period and there are no recurring loss themes in the key areas of building level risk including fire and hazardous materials incidents/fires. In fact, there is only one loss attributed to explosion which occurred at the CEP. There are no events categorized as fires for the full 10-year summary.

Table 6-4 Losses per year from 2001 to 2010

<table>
<thead>
<tr>
<th>Loss Location</th>
<th>Number of Losses</th>
<th>Comments/Type of Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSW</td>
<td>7</td>
<td>Theft, Vandalism, unknown</td>
</tr>
<tr>
<td>Murchie</td>
<td>7</td>
<td>Wind, Water Damage, Theft</td>
</tr>
<tr>
<td>UCEN</td>
<td>6</td>
<td>4th Largest Loss-Mold-Water, Wind, Vandalism, Theft</td>
</tr>
<tr>
<td>UPAV</td>
<td>4</td>
<td>Wind, Theft, Vandalism</td>
</tr>
<tr>
<td>Northbank</td>
<td>4</td>
<td>Largest Loss-Lightning-Water</td>
</tr>
<tr>
<td>Thompson Library</td>
<td>4</td>
<td>Mishandling, Power int., Wind, Lightning</td>
</tr>
<tr>
<td>UPAV Annex</td>
<td>4</td>
<td>All Vandalism</td>
</tr>
<tr>
<td>Lapeer Street Annex</td>
<td>3</td>
<td>2nd Largest Loss-Vandalism</td>
</tr>
<tr>
<td>CEP</td>
<td>2</td>
<td>3rd Largest Loss-Explosion- Power Failure</td>
</tr>
<tr>
<td>Rec. Ctr.</td>
<td>2</td>
<td>Vandalism, Theft</td>
</tr>
<tr>
<td>Lot A</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ross House</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mill Street Parking</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>French Hall</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Harrison Street Parking</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Flint Plant and Services</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Unknown-Facility not noted</td>
<td>34</td>
<td>Mostly vandalism and theft losses</td>
</tr>
</tbody>
</table>

Table 6-5 Event Type Breakdown / Frequency of Occurrence

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Number of Occurrences</th>
<th>Percentage of Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vandalism</td>
<td>17</td>
<td>20%</td>
</tr>
<tr>
<td>Theft</td>
<td>16</td>
<td>20%</td>
</tr>
<tr>
<td>Unknown</td>
<td>14</td>
<td>17%</td>
</tr>
<tr>
<td>Vehicle related</td>
<td>7</td>
<td>9%</td>
</tr>
<tr>
<td>Water Damage</td>
<td>7</td>
<td>9%</td>
</tr>
<tr>
<td>Wind Damage</td>
<td>6</td>
<td>8%</td>
</tr>
<tr>
<td>Lightning</td>
<td>5</td>
<td>7%</td>
</tr>
</tbody>
</table>
D. Crime Statistics

The following chart contains the number of reported crimes on the campus for the past three years. The statistics are for the calendar year, January 1 to December 31. Statistics include all reported attempts and occurrences involving property or buildings owned or controlled by the university, and property or buildings owned or controlled by student organizations.

The department maintains a liaison with the City of Flint Police Department to obtain and record incidents reported through the City of Flint Police Department.

### Table 6-7 Crime Statistics

<table>
<thead>
<tr>
<th>Offense</th>
<th>Year</th>
<th>On Campus Property</th>
<th>Residential*</th>
<th>Non Campus Property</th>
<th>Public Property</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murder and Non-negligent Manslaughter</td>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Negligent Manslaughter</td>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sex Offense- Forcible</td>
<td>2008</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sex Offense- Non forcible</td>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Robbery</td>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Aggravated Assault</td>
<td>2008</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Burglary</td>
<td>2008</td>
<td>17</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>8</td>
<td>2</td>
<td>0</td>
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<td>Motor Vehicle Theft</td>
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<td></td>
<td>2010</td>
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## Section 6: Vulnerability Assessment

<table>
<thead>
<tr>
<th>Offense</th>
<th>Year</th>
<th>On Campus Property</th>
<th>Residential*</th>
<th>Non Campus Property</th>
<th>Public Property</th>
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<tr>
<td>Liquor Law Violation arrests</td>
<td>2008</td>
<td>1</td>
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<tr>
<td></td>
<td>2009</td>
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<td>2</td>
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<td></td>
<td>2010</td>
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<td>Liquor Law Violation referred for Disciplinary action</td>
<td>2008</td>
<td>18</td>
<td>18</td>
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<td>Drug Abuse Violation arrests</td>
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<td>Drug Abuse Violation referred for Disciplinary action</td>
<td>2008</td>
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<td>2010</td>
<td>4</td>
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<tr>
<td>Weapons Possession Arrest</td>
<td>2008</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2009</td>
<td>0</td>
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</tr>
<tr>
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<td>2010</td>
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<td>0</td>
<td>0</td>
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<td>Weapons possession referred for Disciplinary action</td>
<td>2008</td>
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<td></td>
<td>2009</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
</tbody>
</table>

* This column is a subset of on-campus property statistics.

No reported hate crimes for 2009 and 2010. Two hate crimes reported for 2008 related to graffiti characterized as ethnicity based.

These statistics include all attempted and completed offenses.

Public Property crimes include statistics received from the City of Flint Police Department.

### Table 6-8 Identified Critical Facilities

<table>
<thead>
<tr>
<th>Critical Facility</th>
<th>Total Replacement Value ($)</th>
<th>Building Value($)</th>
<th>Contents Value ($)</th>
<th>Displacement Cost Notes ($ per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Pavilion</td>
<td>$14,884,331</td>
<td>$11,000,774</td>
<td>$3,883,556</td>
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<tr>
<td>Pavilion Parking Deck</td>
<td>$5,953,758</td>
<td>$5,337,435</td>
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</tr>
<tr>
<td>Pavilion Annex</td>
<td>$529,167</td>
<td>$392,886</td>
<td>$136,201</td>
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</tr>
<tr>
<td>Northbank Center</td>
<td>$33,214,542</td>
<td>$24,715,392</td>
<td>$8,499,150</td>
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<tr>
<td>Northbank Center Parking Ramp</td>
<td>$2,571,782</td>
<td>$2,571,782</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td>William S. White Building</td>
<td>$39,386,939</td>
<td>$30,629,056</td>
<td>$8,757,883</td>
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</tr>
<tr>
<td>Frances W Thompson</td>
<td>$88,822,694</td>
<td>$16,615,180</td>
<td>$72,307,514</td>
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</tr>
<tr>
<td>Critical Facility</td>
<td>Total Replacement Value ($)</td>
<td>Building Value($)</td>
<td>Contents Value ($)</td>
<td>Displacement Cost Notes ($ per day)</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>----------------------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Library</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harrison Street Parking Ramp</td>
<td>$6,313,775</td>
<td>$5,660,184</td>
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</tr>
<tr>
<td>David M. French Hall &amp; Theatre</td>
<td>$38,558,556</td>
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<tr>
<td>W.R. Murchie Science Building</td>
<td>$42,739,631</td>
<td>$33,190,872</td>
<td>$9,548,759</td>
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</tr>
<tr>
<td>Harding Mott University Center</td>
<td>$22,451,260</td>
<td>$19,476,402</td>
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</tr>
<tr>
<td>Recreation Center</td>
<td>$11,700,571</td>
<td>$10,597,559</td>
<td>$1,103,011</td>
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<tr>
<td>First Street Residence Hall</td>
<td>$14,670,743</td>
<td>$13,395,492</td>
<td>$1,275,251</td>
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</tr>
<tr>
<td>Mill Street Parking Deck (Visitor Parking)</td>
<td>$19,704,654</td>
<td>$18,077,664</td>
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</tr>
<tr>
<td>Central Energy Plant</td>
<td>$10,639,419</td>
<td>$4,959,884</td>
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</tr>
<tr>
<td>Hubbard Building</td>
<td>$1,909,437</td>
<td>$1,290,316</td>
<td>$619,121</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>$354,051,259</td>
<td>$227,600,276</td>
<td>$126,450,982</td>
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</tr>
</tbody>
</table>
VI. Estimating Losses

The last step in performing the vulnerability assessment for UM-Flint includes the estimation of the potential losses the university could face from a specific hazard event. Likely hazard scenarios were developed and the structure, content and function loss for vulnerable critical facilities were quantified.

Following the guidelines of Worksheet 7 of the FEMA 443 *Building a Disaster Resistant University* publication, DRU worksheets 1-6 (Tables 6.9 thru 6.14) were developed to address several different incident profiles that represent key loss scenarios for the university.

A. Calculation Methods and Measurements

In order to provide valid data with which to populate the worksheets, the following factors were considered.

B. Basics

Data to support the calculations was obtained from our building reports, UM-Flint publicly available data from its website, information on building and contents values provided by the Risk Manager for the university dated 2009-10, risk data from various sources such as safety codes/governmental hazard data, and Green Oak Solutions technical expertise.

C. Structure and Contents Losses

These loss exposures are the easiest to calculate. Once a hazard scenario is identified, and building damage estimates are made a percentage of building and contents loss can be estimated. This percentage can then be applied to building and contents values obtained from the risk manager to arrive at the total dollar loss for these elements of the loss.

D. Loss of Use Metrics

This is an inexact science that can be made more relevant by thoughtful application of various income measurements that the university routinely maintains.

“Daily Operations Budgets or Costs” were determined by calculating the revenue impact associated with a given portion of the university’s operations, or the costs the university will continue to incur to support “non-revenue” producing structures, and staff following an incident that impairs the university’s operations.

“Displacement Costs” refer to the estimated cost to support a business continuity strategy through actions, like relocation of staff or students to another facility, or provision of temporary resources to support critical services that must be provided. For purpose of estimation it is assumed that it will require expenditure equal to the daily operations budget to produce a continuity solution. This is most likely a low estimation of the amount of funding required to produce a complete solution, however estimates of relocation strategy costs are not readily available on their own.

E. Metrics

The following metrics have been reviewed with the university’s All Hazard Planning Team and Executive Officers and have been used in the calculations.

- **Operating costs are approximately equal to revenue**
- **Total annual University revenue**: Approximately $100,000,000
- **Number of students**: 8,262
Section 6: Vulnerability Assessment

- **Average revenue per student**: Approximately $12,100
- **Average revenue per day (calendar year basis)**: $100,000,000/365 = $273,972

**Academic building revenue/sq ft/day:**

- Approximately 881,000 sq ft of academic building space
- $100,000,000/881,000 sq ft/365 days = $0.31/sq ft/day
- 30 day outage of Murchie = $193,420 sqft × $0.31/sq ft/day × 30 = $1,804,188

- **Residence Hall annual revenue 2010**: $1,500,000
- **Residence Hall daily revenue 2010**: $4,109

- **Non Academic Building Revenue or “Daily Operating Budgets”**
  - Method and dollar values are assumed, for calculation purposes to be equal to academic buildings.
  - This may slightly overestimate the cost for loss of use for buildings that don’t directly support revenue production via academics. These structures are important to the university and support its overall mission. Without them, the overall experience of students is diminished. In most cases, impact scenarios focused on the primary revenue producing structures.
  - For situations in which the Central Energy Plant is impacted, an aggregated loss approach was developed (e.g. if the Central Energy Plant is lost, the overall revenue production capability of all buildings south of the Flint River is lost).
Incident Scenario 1

Hazard: Tornado Impacting First Street Residence Hall, CEP, Hubbard

Scenario
It is a Tuesday in early August and the fall semester is slated to start in 2 weeks. The bulk of the student body has not returned, and there are 10 students currently housed in the First Street Residence hall for the summer.

At 11:55 pm, a rapidly developing thunderstorm escalates into a severe EF 3 Tornado (136-165 mph winds) which is tracking from SW to NE on a line just south of the main campus.

Fortunately, DPS is monitoring the storm. The evacuation procedure for First Street is implemented, and the students are able to evacuate to the Murchie Science Building prior to the Tornado reaching campus. The students take cover and remain at Murchie.

The tornado directly impacts the First Street Residence Hall, and continues to track directly over the Central Energy Plant and the Hubbard Building.

Structure and Contents Loss

Based upon the type of construction of each building, and damage estimate criteria from the NOAA data, the damage to each structure is estimated as follows:

- First Street Residence Hall - Roof is removed and partial collapse of the structure’s walls. Damage appears substantial, bordering on 50%, which will make rebuilding questionable. Assume a 100% building and contents loss due to condemnation.

- Central Energy Plant - Roof is removed, but due to substantial wall construction only partial damage to the walls occurs. The structure is open to the environment and there is significant damage to contents from water and storm driven debris. Assume a 25% loss of the structure and a 50% loss of contents pending full damage assessment.

- Hubbard Building - Roof is removed and due to storm debris being carried by the tornado, the building is severely impacted by flying missiles which results in significant damage to the structure, most likely a full loss of the building and contents.

Loss of Use Variables

- First Street Residence Hall
  - Assume 2 years to rebuild and therefore 2 years lost revenue of about $4,109 per day per ($1,500,000 annually per university accounting). It is assumed that a like cost would be incurred to support a relocation strategy for the displaced students, and this cost would be offset by their continued payments for housing. For this reason the lost revenue is shown as the displacement costs required to support the recovery.

  - Assume that 100/310 capacity would migrate from university. This would mean a loss of $12,100 per student or a total loss of $1,210,000 for up to two years while the students are either attracted back or replaced. Total loss of revenue would be $2,420,000

  - Assume remaining 210 students would have to be accommodated in alternative location for 2 years

- Central Energy Plant
  - Assume 6 months to replace the roof of the CEP
Section 6: Vulnerability Assessment

- Assume that contents are 50% loss and that some restoration of critical equipment may be possible. With expedited service it is assumed the CEP is back in operation within 6 months.

- Assume that temporary power distribution/production equipment and truck mounted steam generation may have to be obtained and implemented. Costs for this are very difficult to estimate but would be substantial and sustained for the duration of time they would be needed. Assume that a minimum of $1,000,000 extra expense is incurred to obtain and operate temporary equipment to support power distribution, steam production, and chilled water production from the CEP.

- Hubbard
  - Loss of use is not really an accurate outcome for these groups. Assume at least $1,000,000 to relocate these two operations to semi permanent quarters.

- University Shutdown
  - Assume that there is a great deal of ancillary impact to the university related to storm debris clean up, possible damage to other structures due to flying missiles, and a general need to stabilize the entire campus. Assume a full shutdown of the university for up to 30 days, and a difficult operations environment for at least 2 years until the First Street Residence Hall is rebuilt, and CEP and Hubbard are repaired and returned to normal operations. University revenues are approximately $101,000,000 or about $276,000 per day.
### Table 6-9 DRU Worksheet 1 - Hazard: Tornado Impacting First Street Residence Hall, CEP, Hubbard

#### Structure and Contents Loss

<table>
<thead>
<tr>
<th>Name/Description of Structure</th>
<th>Structure Loss</th>
<th>Contents Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Structure Replacement Value ($) x Percent Damage (%) = Loss to Structure ($)</td>
<td>Replacement Value of Contents ($) x Percent Damage (%) = Loss to Contents ($)</td>
</tr>
<tr>
<td>Main Campus (Flint)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Street Residence Hall</td>
<td>$13,395,492 X 100 = $13,395,492</td>
<td>$1,275,251 X 100 = $1,275,251</td>
</tr>
<tr>
<td>Central Energy Plant</td>
<td>$4,959,884 X 25 = $1,239,971</td>
<td>$5,679,535 X 50 = $2,839,767</td>
</tr>
<tr>
<td>Hubbard</td>
<td>$1,290,316 X 100 = $1,290,316</td>
<td>$619,121 X 100 = $619,121</td>
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</table>

#### Loss of Use

<table>
<thead>
<tr>
<th>Name /Description of Structure</th>
<th>Structure Use and Function Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily Operating Budget ($) x Functional Downtime (# of Days) + Displacement Cost per Day ($) x Displacement Time in days ($) = Structure Use &amp; Function Loss ($)</td>
</tr>
<tr>
<td>Main Campus (Flint)</td>
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</tr>
<tr>
<td>First Street Residence Hall</td>
<td>$273,972 x See Notes x See Notes + $4,109 X 730 = $3,000,000</td>
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<tr>
<td>Central Energy Plant</td>
<td>See Notes x 180 + $1,000,000</td>
</tr>
<tr>
<td>Hubbard Relocation F&amp;O and DPS</td>
<td>See Notes x Assume Immediate Relocation + Assume Immediate Relocation = $1,000,000</td>
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</table>

Loss to Structure Use & Function: $5,000,000

<table>
<thead>
<tr>
<th>Daily Operating Costs</th>
<th>University Closure in Days</th>
<th>Cost</th>
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<tbody>
<tr>
<td>$273,972</td>
<td>30</td>
<td>$8,219,178 plus loss of 100 students for one year ($12,100/student/year x 100 = $1,210,000)</td>
</tr>
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</table>

TOTAL Loss to Structure Use & Function: $14,429,178

#### Totals

<table>
<thead>
<tr>
<th>Structure Loss</th>
<th>Content Loss</th>
<th>Function Loss</th>
<th>Total Potential Loss for Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>$15,925,779</td>
<td>$4,734,018</td>
<td>$14,429,178</td>
<td>$35,088,975</td>
</tr>
</tbody>
</table>


**Section 6: Vulnerability Assessment**

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**Incident Scenario 2**

**Hazard: Flood 200-year Flow Scenario on Flint River**

**Scenario**

It is a Wednesday in mid-April, and a late season snow storm has resulted in 12" of heavy wet snow over a 24-hour period. As the storm abates, the temperature rises back to seasonal norms and the snow turns into rain on Wednesday night. The rain causes an immediate melt of the snow, along with the run off attendant to the rain itself.

UM-Flint staff is monitoring the river level in line with their SOP that was developed during the hazard mitigation planning project. UM-Flint staff is in contact with the City of Flint Water Department, also per the SOP, and the City staff is attempting to control the flow in the river via the use of selective gate openings and closures on the dams at Kearsley Creek and Swartz Creek.

As of noon on Thursday, this is marginally effective and flow is being controlled to a point where the flow equates to just below the 100-year flow of 11,800 cfs. UM-Flint staff knows this is the estimated flow rate via use of various stream gauges that are currently located on the river, but their estimates are just that, because there is no single gauge that shows the flow on the river right at the Hamilton Dam.

Just after noon on Thursday, the City of Flint Water Department determines that there is a need to release water from the Holloway reservoir. They plan on deploying two crews to simultaneously restrict flow from Kearsley Creek by gate closure on the Kearsley Creek dam and opening gates at Holloway Dam. Because the flow from Holloway takes some time to reach downtown, they open the gate at Holloway in anticipation of being able to restrict the Kearsley flow which is much further downstream toward the university.

The Holloway flow begins and the volume of water moving towards the university begins to increase.

As the City attempts to close the gate on Kearsley Creek, the lifting mechanism breaks due to age and lack of maintenance. All attempts to restrict flow from Kearsley fail but it takes over an hour and a half before their efforts to restrict flow are abandoned, and the flow from Holloway is subsequently shut down.

Due to the unplanned opening of both Holloway and Kearsley the flow in the river increases to the point where it is estimated that a flow of approximately 13,000 cfs is moving towards downtown Flint. This equates to a 200-year flow on the Flint River, and a water elevation in the vicinity of the Hamilton Dam of approximately 712.5 to 713 feet above MSL. It is estimated by the City that this level of flow will persist for at least one hour then begin to recede slowly to a level below the 100-year flow.

This results in water flowing around the north abutment of the dam and into the city streets on the north side of the river. As the full flow of the river is experienced, water begins to enter the William S. White building and ultimately reaches a level of one foot in the building before receding.

**Structure and Contents Loss**

At a maximum elevation of 713’ water in the WSW building would be approximately 2’ deep for more than an hour. The building is partially one floor, partially 3 floors and partially 5 floors in height.

It is expected that all contents on the first floor would be lost including the contents for the early childhood development center and the Urban Health and Wellness Clinic.

The university doesn’t readily break down the contents values for the ECDC, and the UHWC separately from the overall contents values for the WSW building. For purposes of estimation we
have applied a square footage weighting to establish the amount of the contents loss. The first floor of the building represents approximately 25% of the total square footage of the building so that percentage has been applied to the contents loss.

The structure itself would require extensive repair, restoration, decontamination, etc. For the purposes of estimation it is assumed that these extensive costs would extend up to 25% of the total building value in order to bring the facility back to its original condition.

**Loss of Use Variables**

Repair of damage of the scope outlined would take an estimated 4 to 12 weeks depending upon the measures taken before the flood waters reached the building. If a full flood mitigation plan were in place, along with the berm providing protection up to 712’ the full effect of the flooding would be reduced. The berm would impede flow to an extent and sandbagging of openings might limit actual intrusion of water into the building.

The loss of use calculations use two months outage for the UHWC and the ECDC in addition to 2 months loss of use for Academic Operations. Even though damage will occur to only the first floor operations throughout the building would be curtailed for the extent of the duration of the clean up.

Academic loss of use costs are based upon the metrics discussion for Academic facilities earlier in this section. Academic operations would need to be relocated in order to fulfill the university’s commitment to the student population. The strategy for this is as yet to be fully developed, and will be addressed in the planned update of the university Business Continuity Plans. There are numerous potential alternatives including use of academic facilities at Mott Community College and Kettering University. It is assumed that the cost to invoke these alternatives will be roughly equal to the daily revenues produced by maintaining operations.

Daily loss of use numbers, based upon daily revenues noted in Section 3 of the plan on page 3-8, for the ECDC($725,00 annual revenue) and UHWC($800,000 annual revenue) reflect the latest revenue information available for each of these revenue producing operations. Both would be impacted by a flood event, and would require relocation. If relocation didn’t occur then both of the facilities might experience loss of grant funding, and/or customers.

It is assumed that there will be a 30 day period of total interruption with no revenue from WSW, and there will be another 30 days where relocation costs will be incurred in order to resume operations.

Further it is assumed that during the 30 days of relocated operations, costs to support the relocation will be in line with normal revenues produced from operations.

Finally it is assumed that some background operations costs would be incurred for the continued operation of the WSW building. This is why a 60 day figure was used in the portion of the summary that captures the daily operating budget. The building will be shut down for 30 days, costs will still be incurred to operate the building during repairs for 30 days, and alternative means of operation will need to exist for 30 days.
### Table 6-10 DRU Worksheet 2 - Hazard: Flood 200-year Flow Scenario on Flint River

#### Structure and Contents Loss

<table>
<thead>
<tr>
<th>Name/Description of Structure</th>
<th>Structure Replacement Value ($)</th>
<th>Percent Damage (%)</th>
<th>Loss to Structure ($)</th>
<th>Contents Replacement Value ($)</th>
<th>Percent Damage (%)</th>
<th>Loss to Contents ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Campus (Flint)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Loss of Use

<table>
<thead>
<tr>
<th>Name /Description of Structure</th>
<th>Daily Operating Budget ($)</th>
<th>Functional Downtime (# of Days)</th>
<th>Displacement Cost per Day ($)</th>
<th>Displacement Time in days</th>
<th>Structure Use &amp; Function Loss ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Campus (Flint)</td>
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<td></td>
</tr>
<tr>
<td>WSW Academic</td>
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<td>$44,622</td>
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<td>ECDC</td>
<td>$2,788</td>
<td>60</td>
<td>$2,788</td>
<td>30</td>
<td>$250,920</td>
</tr>
<tr>
<td>UHWC</td>
<td>$2,191</td>
<td>60</td>
<td>$2,191</td>
<td>30</td>
<td>$197,190</td>
</tr>
</tbody>
</table>

**Loss to Structure Use & Function:** $4,463,110

<table>
<thead>
<tr>
<th>Daily Operating Costs</th>
<th>NA</th>
<th>University Closure in Days</th>
<th>NA</th>
<th>Cost</th>
<th>NA</th>
</tr>
</thead>
</table>

**TOTAL Loss to Structure Use & Function:** $4,463,110

#### Totals

<table>
<thead>
<tr>
<th>Structure Loss</th>
<th>Content Loss</th>
<th>Function Loss</th>
<th>Total Potential Loss for Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7,657,250</td>
<td>$2,189,470</td>
<td>$4,463,110</td>
<td>$14,309,830</td>
</tr>
</tbody>
</table>
Incident Scenario 3

Hazard: Fixed Site Haz Mat Flammable Liquids Spill accompanied by ignition utilizing Natural Gas supply within a laboratory

Scenario
This scenario is based a malicious event that has occurred in the past within the laboratory areas of .

A disgruntled student accesses the during hours of lesser traffic, and locates a vacant laboratory . The student obtains a quantity of 2 total gallons of flammable liquids from the cabinet in the laboratory . The student then accesses the Natural Gas supply that feeds the lab table burners, and proceeds to light several burners near the area of the flammable liquid accelerant spill.

In a short period of time the flammable liquids ignite and produce an intense pool fire. Several automatic sprinklers activate(10 heads at 15.0 gallons per minute per head) and eventually control the fire but not before extensive damage is done to the laboratory. By the time the fire department arrives, assesses the situation, and orders the sprinklers shut down about 40 minutes have passed and it is estimated that 6,000 gallons of water have been discharged by the sprinklers.

Structure and Contents Loss

The Laboratory itself is heavily damaged with direct fire damage and smoke damage. There is smoke and water damage throughout all of the floor areas directly below the fire, and extensive smoke damage on the floor above the fire and in the mechanical equipment penthouse. While the structure itself is sound most of one of the wings of the building will require restoration to one degree or another.

For purposes of estimating losses the following assumptions are made:

The direct loss of one laboratory represents ½ of 1 floor of 1 wing or about 50% of 10% of the building-5% of the total building.

Smoke and Water damage throughout 50% of the building will require extensive clean up. For purposes of estimation it is assumed that restoration will cost 10% of the replacement cost of the building- This adds another 5% of the building value to the loss estimate.

Contents Value loss are estimated to be in line with the percentage of building value loss or 10%.

Loss of Use Variables

It is assumed that 50% of the building will be lost for one full semester, or 33% of the year.

The strategies that might be employed in such a situation would include obtaining lab space at another nearby university. In order to maintain operations it is assumed that full shutdown of the damaged will occur, but that operations will be relocated. For this reason only the displacement costs are included in the Loss of use calculations.

Further it is assumed that the cost to support the relocation will be in line with the daily operations revenues per square foot for academic buildings at the university. contains 193,420 square feet total of which possibly 90% can be considered academic space.
This means that daily revenues for all of Murchie are approximately 193,000 sq ft x $0.31/sq ft/day or about $59,830 per day. If half of the building is impacted it would amount to about $29,915 per day of impacted revenues.

If an immediate relocation strategy isn’t employed to address the loss of academic space, in particular lab space it is possible that some migration of students or even faculty could occur. This is hard to estimate and the plans for such a situation would call for some immediate remedy in the form of an alternative facility.
### Table 6-11 DRU Worksheet 3 - Hazard: Fixed Site Haz Mat Incident Spill and Fire in Murchie 1st Floor Flammable Liquids Storage Room

#### Structure and Contents Loss

<table>
<thead>
<tr>
<th>Name/Description of Structure</th>
<th>Structure Replacement Value ($)</th>
<th>Percent Damage (%)</th>
<th>Loss to Structure ($)</th>
<th>Contents Replacement Value ($)</th>
<th>Percent Damage (%)</th>
<th>Loss to Contents ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Campus (Flint)</td>
<td>$33,190,873</td>
<td>10</td>
<td>$3,319,087</td>
<td>$9,548,759</td>
<td>10</td>
<td>$954,875</td>
</tr>
</tbody>
</table>

#### Loss of Use

<table>
<thead>
<tr>
<th>Name /Description of Structure</th>
<th>Daily Operating Budget ($)</th>
<th>Functional Downtime (# of Days)</th>
<th>Displacement Cost per Day ($)</th>
<th>Displacement Time in days</th>
<th>Structure Use &amp; Function Loss ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Campus (Flint)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$3,589,800</td>
</tr>
<tr>
<td>50% of Murchie lost for 33% of a year</td>
<td>Relocation maintains revenue</td>
<td>Relocation maintains revenue</td>
<td>$29,915</td>
<td>120</td>
<td>$3,589,800</td>
</tr>
</tbody>
</table>

**Loss to Structure Use & Function:**

- Daily Operating Costs
- University Closure in Days
- Cost

<table>
<thead>
<tr>
<th>Daily Operating Costs</th>
<th>University Closure in Days</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**TOTAL Loss to Structure Use & Function:** $3,589,800

#### Totals

<table>
<thead>
<tr>
<th>Structure Loss</th>
<th>Content Loss</th>
<th>Function Loss</th>
<th>Total Potential Loss for Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3,319,087</td>
<td>$954,875</td>
<td>$3,589,800</td>
<td>$7,854,762</td>
</tr>
</tbody>
</table>
Incident Scenario 4:

Hazard: Extended Power Outage – South Side of River

Scenario
It is early May and a severe thunderstorm with lighting and high winds is experienced near downtown Flint. As the storm worsens a Tornado watch is issued for the area including the university, and shortly after the warning is issued the Central Energy Plant loses all utility power. The emergency generator starts and provides support for emergency circuits throughout the CEP and the Hubbard Building, however Facilities and Operations notices that the secondary feed line from the Consumers Energy primary substation on the south side of the river is not energized.

Because of the general loss of power from the substation emergency generators across the south side of campus all start simultaneously. A call is made to Consumers Energy and it is determined that the primary substation feeding the CEP has been directly impacted by lighting strikes and high winds. It is damaged and off line with no estimate of the time for it to be restored.

A load imbalance occurs on the Consumers system which causes a breaker to trip and causes a shutdown of the primary substation that serves buildings located on the north side of the river. The generators on the north side of the river in university buildings all activate simultaneously.

The storm passes quickly but the utility power to the university is 100% out. The damage assessment shows that the substation south of the river will be off line for approximately 10 to 14 days while repairs are made and equipment is tested. Due to system configuration issues, and the scope of damage to the Consumers system even the buildings not fed by the CEP south of the river are without power.

Power is restored to the buildings on the north side of the river within 24 hours of the initial outage, however operations are so disrupted it is decided to conduct only skeleton operations until the full university power supply is restored both north and south of the river.

When the incident is finally resolved the university is without utility power for all buildings on the south side of the river for a total of 12 days. The time period of outage was such that emergency power resources could not be obtained, installed, and tested to produce a meaningful reduction in the outage timeframe. It was decided to sustain the outage and attempt to make up the lost academic time.

Structure and Contents Loss

There is minimal damage to structures at the university. Some minor damage occurred to electrical equipment during the peak of the storm when the UPS systems activated in advance of the emergency generators starting.

Contents loss for the university itself is minimal however the food court vendors at the UPAV, and Sodexo food services lose the majority of their food stocks during the outage. This is considered a matter between them and their insurers however university staff is engaged with the process and are asked to assist them with preparing their claims.

Loss of Use Variables

Since emergency generators and UPS systems worked as designed the primary impact felt as a result of this incident was the total shutdown of the university for over two weeks. Ideally the academic time could be made up, however this causes a large disruption.

Additionally extra expense costs could be incurred by the university for a variety of reasons- payroll and paying employees for the time off would be a point of discussion and potential action, time spent with the Consumers Energy staff, communications with faculty-staff and students, planning for
the orderly shutdown and resumption of operations in particular the CEP, servicing of emergency generators as it is determined which buildings would be maintained as partially operational during the outage, staff time for the university to manage the crisis, IT staff time to monitor systems outage and resumption following the outage, and other minor building level mitigation actions that would occur for the duration of the incident on the part of Facilities and Operations, relocation of residence hall residents for 12 days. These costs are difficult to quantify, and many of the costs associated with these actions are related to staff time.

This scenario points to the difficulty in planning for major power outages. One of the universities mitigation goals relates to better pre planning with Consumers Energy surrounding catastrophic outages and developing plans to address the specific scenario that is described here.

As noted the scenario outlines a 12 day shutdown of the university so for the purposes of stating a raw, unmitigated loss this 12 day outage are the only costs that have been specifically captured at this time. In the future, assuming action is taken on the power reliability mitigation goal, additional dollar loss numbers and even more detailed planning and response actions can be captured in the plan. This will require additional Business Continuity type planning internally and with Consumers Energy.
## Table 6-12 DRU Worksheet 4 - Hazard: Extended Power Outage - South Side of River

### Structure and Contents Loss

<table>
<thead>
<tr>
<th>Name/Description of Structure</th>
<th>Structure Loss</th>
<th>Contents Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Structure Replacement Value ($)</td>
<td>Percent Damage (%)</td>
</tr>
<tr>
<td>Main Campus (Flint)</td>
<td>See notes for commentary on physical damage to university property</td>
<td></td>
</tr>
</tbody>
</table>

### Loss of Use

<table>
<thead>
<tr>
<th>Name/Description of Structure</th>
<th>Structure Use and Function Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily Operating Budget ($)</td>
</tr>
<tr>
<td>Main Campus (Flint)</td>
<td>See Notes on Loss of Use variables and implications</td>
</tr>
<tr>
<td>Relocation of Residence Hall residents for 12 days</td>
<td></td>
</tr>
</tbody>
</table>

**Loss to Structure Use & Function:**

<table>
<thead>
<tr>
<th>Daily Operating Costs</th>
<th>University Closure in Days</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$273,972</td>
<td>12</td>
<td>$3,287,664</td>
</tr>
</tbody>
</table>

**TOTAL Loss to Structure Use & Function:** $3,336,972

**Totals**

<table>
<thead>
<tr>
<th>Structure Loss</th>
<th>Content Loss</th>
<th>Function Loss</th>
<th>Total Potential Loss for Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>See Notes</td>
<td>$3,287,664</td>
<td>$3,336,972</td>
<td>$3,336,972 (See notes for additional commentary)</td>
</tr>
</tbody>
</table>

---

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Section 6: Vulnerability Assessment

Incident Scenario 5

Hazard: Security Related Incident-Shooting at University Pavilion

Scenario
It is the beginning of the school year in September. The first few weeks on the university campus is busy with new students. It is a Wednesday early afternoon when two persons from the general public open fire on several students gathered together in the University Pavilion. Someone calls 9-1-1 and DPS arrives with backup from Flint Police Department and Genesee County Sheriff. The shooters flee the Pavilion, and attempt to evade law enforcement but are caught about 30 minutes later off campus.

Within 5 minutes paramedic units arrive to stabilize the shooting victims and transport them to local hospitals. An emergency alert was put out advising of the incident within 5 minutes of DPS being notified of the situation, and within 10 minutes of the actual shooting event. The Crisis Management Team mobilizes to develop response and recovery actions.

Structure and Contents Loss

There may be damage to doors, windows, furniture, walls due to gunfire or other violent behavior. The dollar value of this is difficult to estimate however it is assumed that the costs to repair will be nominal and less than $25,000.

Loss of Use Variables

University shutdown – There will be a great deal of impact to the operation of the university. Local, state and federal law enforcement officials will be present conducting investigations and upsetting general operations. This could last from one week to one month. It is assumed that the university will be shut down for one week but that the revenue from that period will be recouped when operations resume.

Students may be fearful to attend classes. There may be discussions on how to better secure the Pavilion or even relocate Administrative Offices and Cashiers Window. In general the incident will cause a great deal of disruption in the short and midrange timeframes, and may result in an extended period of interruption in and around the Pavilion. Since it is not an academic building, and key operations can most likely be relocated if need be, the loss of use is restricted to displacement costs for the Administrative Offices, Cashiers Window and the Bookstore. The Bookstore is an outsourced operation which the university provides domicile to for rent, and the Administrative Offices could be disbursed to other campus locations including the Northbank Center if need be, and it may be possible to maintain the Cashiers window while law enforcement is conducting their investigation.

Assuming relocation would occur for the Administrative Offices and the Bookstore for a period of time the university would incur costs for movement of staff, and establishment of alternative locations for both for at least a period of time up to a month. It is assumed that this can be accomplished for nominal costs due to space being available in other buildings on campus. For purposes of estimation an amount of $25,000 has been estimated for this relocation activity.

While the perpetrators in the scenario are not students it is still likely that lawsuits will be filed against the university, alleging that the university should have provided a greater level of security for the Pavilion. In the end these lawsuits may or may not be successful, however the university would have to pay legal defense costs to attempt to mitigate any legal implications. A conservative number for this might be $1,000,000.

Notes-
It must be pointed out that this scenario has many aspects that could result in a more negative outcome for the university.
First—the scenario doesn’t result in any fatalities and if this were not the case the outcome would be potentially be much worse from both a perception and legal standpoint.

Second—the estimates of loss do not include potential for student migration. This is difficult to quantify and research of past events and student migration haven’t revealed any hard data that can be used in this regard.

Third—the scenario describes that the shooters are from the general public. This means that the university most likely had no prior knowledge of the shooters identity or intent. If the situation involved university students as the perpetrators then an additional level of investigation would ensue, and the university’s exposure to liability would increase if there were any chance that the shooters had been previously identified as posing a threat of any kind.
### Table 6-13 DRU Worksheet 5 - Hazard: Security Related Incident

#### Structure and Contents Loss

<table>
<thead>
<tr>
<th>Name/Description of Structure</th>
<th>Structure Loss</th>
<th>Contents Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Structure Replacement Value ($) x Percent Damage (%) = Loss to Structure ($)</td>
<td>Replacement Value of Contents ($) x Percent Damage (%) = Loss to Contents ($)</td>
</tr>
</tbody>
</table>

- **Main Campus (Flint)**
  - **Repair Damage to Pavilion structure**
    - See Notes
    - See Notes
    - See Notes
    - See Notes
    - See Notes
    - $25,000

#### Loss of Use

<table>
<thead>
<tr>
<th>Name /Description of Structure</th>
<th>Structure Use and Function Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily Operating Budget ($) x Functional Downtime (# of Days) + Displacement Cost per Day ($) x Displacement Time in days ($) = Structure Use &amp; Function Loss ($)</td>
</tr>
</tbody>
</table>

- **Main Campus (Flint)**
  - **Relocation of Administrative Offices**
    - 30
    - $10,000
  - **Relocation of Bookstore**
    - 30
    - $15,000
  - **Legal defense fees**
    - $1,000,000

Loss to Structure Use & Function: $1,025,000

<table>
<thead>
<tr>
<th>Daily Operating Costs x University Closure in Days</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Would be recouped upon resumption of operations</td>
</tr>
<tr>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

TOTAL Loss to Structure Use & Function: $1,025,000

#### Totals

| Structure Loss + Content Loss + Function Loss = Total Potential Loss for Hazard |
|---------------------------------|---------------------------------|---------------------------------|
| NA                              | $25,000                          | $1,025,000                      | $1,050,000                     |
Section 7: Mitigation Identification and Prioritization

I. Introduction

The development process for the Hazard Mitigation Plan has been centered upon identifying and developing major goals that could guide future risk mitigation, and be implemented among the many competing risk based priorities that the university is pursuing. The Hazard Mitigation Plan development process offered an opportunity to identify goals and aggregate mitigation specifics in a systematic way.

The process has involved assessment via several channels of information; on site surveys of the buildings, interviews or process reviews with key stakeholder groups representing most members on the AHPT, and meetings with county and city level community stakeholders who share risk mitigation goals with the university.

We have also drawn on the prior work of the AHPT, and other existing mitigation focused efforts such as the FM Global risk control survey and engineering process.

This assessment approach has worked to identify numerous risk mitigation goals, and risk mitigation actions. These goals include physical mitigation opportunities, as well as planning and response types of mitigation approaches.

Section I and IV of the plan detail the risk assessment activities that were conducted across the campus. For sake of brevity here the reader is referred to those sections of the plan for additional information on the process that was used to identify, and quantify the risks that were examined as part of the process.

II. Mitigation Goals-Identification and Prioritization

A. Mitigation Goal Identification

The primary goal for the Hazard Mitigation Planning effort is to identify ways that the university can further mitigate exposures to both day to day operations risk, as well as strategic risks.

Because information was gathered across such a wide range of project participants the university was able to define several strategic risks that warrant long term consideration by the university.

Graphic below shows the various information channels that were utilized to gather information during plan development.
Figure 7-1 Hazard Assessment-Documentation-Prioritization

University of Michigan-Flint Hazard Mitigation Plan
Risk Assessment Process Flow
Hazard Assessment-Vulnerability Analysis-Mitigation Goal Development

**Risk Assessment**
- Description of Hazard
- Description of Exposure From Hazard
- Historical Events Related to Hazard
- Existing Mitigation Measures
- Potential Impact Scenarios- People, Buildings, Operations

**Data Source**
- All Hazards Planning Team and Other Stakeholder Interviews
- Executive Officers
- ITS
- Facilities and Operations
- Building Surveys
- Nat Haz Data Sources
- State and County HMPs

**Other Hazard Data**
- FM Global
- USGS
- FEMA
- NWS
- Genesee County HMP
- State of MI HMP
- NFPA Standards
- Loss Data from UMAA
- City of Flint
- Facilities and Operations

**Additional Groups Engaged**
- Staff Council
- Student Govt.
- Consumers Energy, City of Flint, FRCA
- LEPC

**Risk Assessment**
- Examines built environment and operations
  - Vulnerabilities Identified
  - Mitigation Goals Identified

**FEMA Building a Disaster Resistant University Process**
- Risk Assessment
- Vulnerability Analysis
- Mitigation Opportunities Identified-Goals Developed
- Prioritization of Mitigation Goals and Actions
- Formal HMP Goals and Actions identified to be carried forward
B. Categorization of Mitigation

As the process unfolded it became clear that the mitigation goals would fall into two main categories:

- **Physical Mitigation**
- **Planning and Response**

In some cases the goals for a given area of risk, and its mitigation might fall into both categories.

Because of the scope of operations and facilities, several physical mitigation opportunities have been identified to address the key risks the university faces. These opportunities exist at the building level, as well as being applicable to specific risk reduction planning situations.

Because the size of the university community a great deal of effort is put into planning and preparedness at the university today. The preparedness stance led the plan development participants to identify many Mitigation Actions that center of improved planning and response.

Through our information gathering efforts, interviews, on site surveys, and technical analysis a set of risk mitigation goals, or areas of key emphasis emerged. After a great deal of internal examination the overall goal priority was developed based upon the scoring system that was developed, consultation with the AHPT, and evaluation of loss potential.

C. Rationale for Mitigation Goals

The basis for goal development was risk assessment. As the information gathering efforts were conducted a great deal of information was developed in support of identifying the most critical risk issues across the university, and potential ways that that those risks might be mitigated.

A summary of the rationale behind each mitigation goal has been provided in subsection V and VIII of this section of the plan. These subsections provide a brief description of the key risk drivers, current risk mitigation approaches and potential improvements associated with each mitigation goal.

D. Prioritization of Mitigation Goals

Initial Prioritization of the Mitigation Goals was accomplished using a systematic approach to evaluate each Goal area and determine a priority based upon the overall risk mitigation that a given goal might produce.

A ratings based scoring system was applied considering several key elements of risk reduction and by using this ratings system we established a risk score for each of the 8 major Mitigation Goals that were developed as part of the planning process.

The higher the score, the higher the priority associated with the Goal. There were 7 measurements of risk used within the scoring methodology. The full detail of the rating and scoring system is included at the end of this section of the plan.

Our rating and scoring system is based upon criteria derived from the FEMA DRU approach, blended with UM-Flint priorities for risk reduction. Key elements of the ratings include the degree of lifesafety improvement, and the degree of property protection improvement.
Section 7: Mitigation Identification and Prioritization

All of the Mitigation Goals were evaluated against the STAPLEE criteria that FEMA refers to in their suggested approach towards prioritization of mitigation. The STAPLEE criteria were one of 7 measures that were used to establish Goal priority. The STAPLEE Criteria are as follows in the table below.

Table 7-1: STAPLEE Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socially Acceptable</td>
<td>Is the proposed activity acceptable to the university community?  Is the activity compatible with present and future university values? Are there disparity issues that would leave one of the university community adversely affected</td>
</tr>
<tr>
<td>Technically Feasible</td>
<td>Will the proposed activity be effective in the long run? Will it create negative secondary impacts? Will it create more problems than it solves? Will it solve the problem or only address a symptom?</td>
</tr>
<tr>
<td>Administratively Possible</td>
<td>Does the university have the capability to implement the proposed activity? Is there someone who will coordinate, implement, and maintain the activity?</td>
</tr>
<tr>
<td>Politically Acceptable</td>
<td>Is there political support to implement the proposed activity? Is there enough university and/or community support to ensure the success of the activity?</td>
</tr>
<tr>
<td>Legal</td>
<td>Does the university have the authority to implement the proposed activity? Is there a clear legal precedent, and are there any potential legal consequences of the activity?</td>
</tr>
<tr>
<td>Economically Sound</td>
<td>Are there current sources of funding to implement the proposed activity? Do the benefits outweigh the costs of the activity? Is the activity compatible with other economic goals of the university</td>
</tr>
<tr>
<td>Environmentally Sound</td>
<td>How will the proposed activity affect the environment? Will the activity comply with local, state and federal environmental laws and regulations? Is the activity consistent with university environmental goals?</td>
</tr>
</tbody>
</table>

The rating scores for each goal were established based upon discussions with the responsible parties listed in the Mitigation Goal tabulations along with overall review by the the All Hazards Planning Team (AHPT). This ensures that the parties responsible for implementing a mitigation approach have had input into its overall place among university priorities. The AHPT as a whole has reviewed and approved the prioritization of the initiatives.

As might be expected, nearly all of the Mitigation Goals rank relatively high on the risk scoring scale.

All of the Mitigation Goals warrant attention and all represent important strategic risks the university would like to address via mitigation.
Section 7: Mitigation Identification and Prioritization

E. Mitigation Goals & Actions- Risk Score Summary and Prioritization

Table 7-2 Risk Score Summary and Prioritization

<table>
<thead>
<tr>
<th>Action</th>
<th>Life Safety</th>
<th>Safety/Sec.</th>
<th>Property Protection</th>
<th>STAPLEE Score Rating</th>
<th>Cost to Complete</th>
<th>Total Score</th>
<th>Action Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Public Safety/Security Operations Enhancements</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>45 avg.</td>
<td>91</td>
</tr>
<tr>
<td>Enhance the First Street Residence Hall Evacuation and Sheltering Process</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>8</td>
<td>50</td>
<td>89</td>
</tr>
<tr>
<td>Power Reliability/Emergency Power Improvements</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>35 avg.</td>
<td>83</td>
</tr>
<tr>
<td>Flood Mitigation</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>40</td>
<td>83</td>
</tr>
<tr>
<td>Hardening of DPS Operations Locations</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>4</td>
<td>40 avg.</td>
<td>82</td>
</tr>
<tr>
<td>IT DR &amp; Continuity Plan enhancements including alternative facilities and resiliency improvements</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>40</td>
<td>79</td>
</tr>
<tr>
<td>Building Level Risk Mitigation Improvements</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>35 (avg.)</td>
<td>78</td>
</tr>
<tr>
<td>Training</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>35 (avg.)</td>
<td>78</td>
</tr>
<tr>
<td>Improve the Universities Business Continuity Plans</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>40</td>
<td>76</td>
</tr>
<tr>
<td>Improve Contagious/Infectious Disease Control Program with the Genesee County Health Department No Rank</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>8</td>
<td>10</td>
<td>40</td>
<td>74</td>
</tr>
<tr>
<td>GIS Systems Expansion, Enhancement and Integration</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>51</td>
</tr>
</tbody>
</table>

F. Action Rankings identify the priority of the Goals and Mitigation Actions

O= Overall Ranking of the Mitigation Goal
P= Ranking of the Physical Mitigation Elements within the Plan Overall
R= Ranking of the Response related mitigation elements within the Plan Overall
X= Mitigation Action does not address one aspect e.g. either solely physical or response
G. Prioritization of Mitigation Actions

Within each major Mitigation Goal there are several specific actions that have been identified to address the risks within the goal. Eleven (11) Mitigation Goals were identified with several Mitigation Actions identified under each goal.

In order to organize our summary of Mitigation Actions by priority according to our two main categories, the Mitigation Actions have been organized as follows.

- **Mitigation Actions** are tabulated under each Mitigation Goal in the order of Goal Priority.

- **Mitigation Actions** are tabulated in order of priority under the goal, by category as listed below.

- **Physical Mitigation Action** priority mirrors goal priority. Specific Mitigation Actions are described in tabular form, with a description of the goal supported and its overall priority.

- **Planning and Response Mitigation Actions** also mirror goal priority. Specific Planning and Response Mitigation Actions are described in a tabular form, with a description of the goal supported and its overall priority.

This method is used to present the summary of Mitigation Actions, however it is recognized that individual Mitigation Actions may need to be highlighted and may not receive their proper prioritization in a mass evaluation of priorities.

To assist with further prioritizing the Mitigation Actions we derived Physical Mitigation and Planning and Response Mitigation priorities and have summarized those in front of the overall Mitigation Action summary sheets that follow.

A Mitigation Action numbering protocol has been developed to allow for reference and tracking the progress on completion of a given action. This is recommended to effectively manage the process.

Under each Mitigation Action summary, each action is assigned a number such as 1-1, 1-2.

For actions assigned a number of 1-1, 1-2, etc. those numbers relate to Physical Mitigation-Goal Priority 1, Action priority 1, 2, etc…

Actions with a 1-1 (PR) designation refer to Goal 1, Action Priority 1 for Planning and Response Actions

III. Mitigation Actions - Summarization and Prioritization

The table below provides summary of the overall priority of the Mitigation Goals, and Mitigation Action Rankings. The prioritization is presented this way to show which goals are made up primarily of physical mitigation, which ones are composed of Planning and Response actions. By showing the two components of actions along with the overall ranking it allows for quick review and check of the overall priorities for mitigation and which category they are in.
### Table 7-3 Overall Priority of the Mitigation Goals, and Mitigation Action Rankings

<table>
<thead>
<tr>
<th>Mitigation Goal</th>
<th>Total Score</th>
<th>Overall Goal Rank</th>
<th>Physical Mitigation Risk Ranking</th>
<th>Planning and Response Risk Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Public Safety/Security Operations Enhancements</td>
<td>91</td>
<td>1</td>
<td>1 Retains number 1 overall ranking due to importance of Safety and Security</td>
<td>1</td>
</tr>
<tr>
<td>Enhance the First Street Residence Hall Evacuation and Sheltering Process</td>
<td>89</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Power Reliability/Emergency Power Improvements</td>
<td>83</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Flood Mitigation</td>
<td>83</td>
<td>4</td>
<td>4</td>
<td>3 Number 3 P&amp;R while Number 4 Physical Mitigation</td>
</tr>
<tr>
<td>Hardening of DPS Operations Locations</td>
<td>82</td>
<td>5</td>
<td>5</td>
<td>X</td>
</tr>
<tr>
<td>IT DR &amp; Continuity Plan enhancements including alternative facilities and resiliency improvements</td>
<td>79</td>
<td>6</td>
<td>7 Overall ranking elevates to 6 due to importance of technology to university</td>
<td>7</td>
</tr>
<tr>
<td>Building Level Risk Mitigation Improvements</td>
<td>78</td>
<td>7</td>
<td>6 7th ranking spot does not diminish the importance of improving the risk profile at the building level</td>
<td>X</td>
</tr>
<tr>
<td>Training</td>
<td>78</td>
<td>8</td>
<td>X</td>
<td>6</td>
</tr>
<tr>
<td>Improve the university’s Business Continuity Plans</td>
<td>76</td>
<td>9</td>
<td>X</td>
<td>7</td>
</tr>
<tr>
<td>Improve Contagious/Infectious Disease Control Program with the Genesee County Health Department No Rank</td>
<td>74</td>
<td>10</td>
<td>X</td>
<td>8</td>
</tr>
<tr>
<td>GIS Systems Expansion, Enhancement and Integration</td>
<td>51</td>
<td>11</td>
<td>X</td>
<td>9</td>
</tr>
</tbody>
</table>
### IV. Mitigation Goals and Actions - Summary and Prioritization

Table 7-4: Mitigation Goal: Dept of Public Safety/Security Operations Enhancements

<table>
<thead>
<tr>
<th>Mitigation Goal: Department of Public Safety/Security Operations Enhancements</th>
<th>Goal Priority: 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Mitigation Actions</strong></td>
<td><strong>Physical Mitigation Priority: 1</strong></td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td><strong>Timeframe</strong></td>
</tr>
<tr>
<td>Upgrade Video Camera Quality for better Monitoring capability</td>
<td>On-Going, and will depend upon funding.</td>
</tr>
<tr>
<td>M Card Access Program - Implement M Card Access Card program across university for full time use and application</td>
<td>Immediate upon funding.</td>
</tr>
<tr>
<td>Assess Call Box Locations - Conduct a baseline assessment and implement a program for improving call box coverage and technology across campus.</td>
<td>On-Going, and will depend upon funding.</td>
</tr>
<tr>
<td>Hearing Impaired Emergency Notification Services - Provide Sign/Message boards for hearing impaired students at several strategic locations across campus.</td>
<td>Immediate upon funding. No specialized signage currently exists</td>
</tr>
<tr>
<td>Improved PA Notification Capabilities - Expand the existing PA system to include for the ability to prerecord more than the current 5 or 6 messages</td>
<td>Immediate upon funding. Current system is adequate but has significant limitations</td>
</tr>
<tr>
<td>Work with Consumers Energy to examine ways to improve lighting around perimeter of university property for all areas adjacent to the border of the U of M-Flint</td>
<td>Immediate upon establishing schedule with Consumers to examine coverage of lighting</td>
</tr>
</tbody>
</table>
### Planning and Response Mitigation Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
<th>Cost</th>
<th>Action Priority</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination with the Michigan State Police</td>
<td>Immediate upon agreement at the university to move forward, and agreement on key points where information exchange is involved</td>
<td>Primarily staff time pending any costs identified to create information sharing technology</td>
<td>1-1(PR)</td>
<td>DPS, Executive Officers</td>
</tr>
<tr>
<td>Increase level of coordination with Flint Police Department</td>
<td>Immediate upon agreement at the university to move forward, and agreement on key points where information exchange is involved</td>
<td>Primarily staff time pending any costs identified to create information sharing technology</td>
<td>1-2(PR)</td>
<td>DPS, Executive Officers</td>
</tr>
</tbody>
</table>
A number of points of coordination were discussed at the 6/13/12 meeting summarized in Section 2 of the plan, including:

<table>
<thead>
<tr>
<th>Point of Coordination</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Information Sharing</td>
<td>Incident records or incident logs may be a point of coordination that can be instituted between the university and the city. By sharing this information, there is an opportunity to identify trends or even individuals that pose a threat to public safety at the university.</td>
</tr>
<tr>
<td>B. Joint Operations Planning</td>
<td>It may be possible to conduct joint operations planning, in particular during large public events that occur each year such as the street fair known as Back to the Bricks. A formal process for joint operations planning may be possible, and should be considered for implementation.</td>
</tr>
<tr>
<td>C. Information Sharing</td>
<td>It may be possible for the city police to be given access to the university's network of security cameras. This would require review by both parties.</td>
</tr>
<tr>
<td>D. Community Wide Programs</td>
<td>Certain community wide programs operated by the Flint police could be extended to the university. It may be possible to establish a mini station and Blue Badge program (see the Public Safety Plan above for description of these programs) on university property.</td>
</tr>
<tr>
<td>E. Communications Enhancements</td>
<td>Movement to the 800 MHz band by the Flint police will put them on the same frequency as the university Public Safety department. This will enable a greater degree of cross-monitoring of developing events between the Flint police and the university.</td>
</tr>
</tbody>
</table>
### Physical Mitigation Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
<th>Cost</th>
<th>Action Priority</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Develop Additional Options for Sheltering</strong> - Work with Facilities and Operations to develop additional sheltering alternatives for consideration.</td>
<td>Dependent upon option chosen. Option A would be desirable but would require extensive new construction</td>
<td>Option A&lt;br&gt;Option B</td>
<td>2-1</td>
<td>Housing and Residence Hall Facilities and Operations</td>
</tr>
<tr>
<td>This might include:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Drawing up plans and specifications for construction of a storm shelter to house the 310 residents of the First Street Residence Hall</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Development of a strategy that can be used to integrate plans for a shelter into any expansion of the residence hall.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of particular importance for either option is provision of alarm signaling to address those with functional needs such as the hearing or vision impaired, or students with mobility limitations. This aspect of alarm signaling is also cited in Mitigation Goal 1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Planning and Response Mitigation Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
<th>Cost</th>
<th>Action Priority</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Install a near or on campus Outdoor Warning Siren</td>
<td>Immediate upon funding</td>
<td>Bids are being obtained</td>
<td>2-1(PR)</td>
<td>EHS, Housing and Residence Hall</td>
</tr>
</tbody>
</table>

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
### Table 7-6: Mitigation Goal: Power Reliability/Emergency Power Improvements

<table>
<thead>
<tr>
<th>Mitigation Goal: Power Reliability/Emergency Power Improvements</th>
<th>Goal Priority: 3</th>
</tr>
</thead>
</table>

#### Physical Mitigation Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
<th>Cost</th>
<th>Action Priority</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct Response Planning with Consumers Power to address pre and post incident planning for power outages of extended duration</td>
<td>Immediate upon funding of staff time</td>
<td>Staff time Costs may be identified</td>
<td>3-1</td>
<td>Facilities and Operations</td>
</tr>
<tr>
<td>UPAV Emergency Power- Provide emergency power to the University Pavilion</td>
<td>???</td>
<td>???</td>
<td>3-2</td>
<td>Facilities and Operations</td>
</tr>
<tr>
<td>Review remaining buildings where fire pumps are not on emergency generator circuits and implement coverage</td>
<td>Under review now by F&amp;O</td>
<td>???</td>
<td>3-3</td>
<td>Facilities and Operations</td>
</tr>
</tbody>
</table>

#### Planning and Response Mitigation Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
<th>Cost</th>
<th>Action Priority</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form an Emergency Power Working Group for purposes of conducting long range strategic planning on Power, Emergency Power provision, and Response</td>
<td>Immediate upon funding of staff time</td>
<td>Staff time</td>
<td>4-1 (PR)</td>
<td>Facilities and Operations, Purchasing, EHS</td>
</tr>
<tr>
<td>Conduct Response Planning with Consumers Power to address pre and post incident planning for power outages of extended duration</td>
<td>Immediate upon funding of staff time</td>
<td>Staff time plus any hardware assoc. with the pre planning</td>
<td>4-2 (PR)</td>
<td>Facilities and Operations, Purchasing, EHS</td>
</tr>
<tr>
<td>Mitigation of Single Points of Failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coordinated planning with Consumers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identification of emergency response resource enhancements at the university- Generators, equipment spares, temporary generator connections</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
### Table 7-7: Mitigation Goal: Flood Mitigation

<table>
<thead>
<tr>
<th>Physical Mitigation Actions</th>
<th>Physical Mitigation Priority: 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Timeframe</td>
</tr>
<tr>
<td>Facilitate installation of USGS river gage near U of M Flint Campus</td>
<td>6 to 12 Months after USGS agreement is signed</td>
</tr>
<tr>
<td>Construct Berm/Physical Barrier at William S White Building capable of resisting the elevation associated with a 200 year flow on the Flint River.</td>
<td>TBD. Would require approval by the City, Corp of Engineers, FEMA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning and Response Mitigation Actions</th>
<th>Planning and Response Priority: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Timeframe</td>
</tr>
<tr>
<td>Develop formal Flood Mitigation Plan</td>
<td>Immediate upon funding</td>
</tr>
<tr>
<td>✗ Pre Incident Planning</td>
<td></td>
</tr>
<tr>
<td>✗ River Monitoring Protocol</td>
<td></td>
</tr>
<tr>
<td>✗ Incident Response and Mitigation</td>
<td></td>
</tr>
<tr>
<td>✗ Communications</td>
<td></td>
</tr>
<tr>
<td>✗ Community Liaison</td>
<td></td>
</tr>
<tr>
<td>Coordinate University Flood Mitigation Planning with City/County Planning</td>
<td>Immediate-planning is under way at the County</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
Table 7-8: Mitigation Goal: Hardening of DPS Operations Locations

<table>
<thead>
<tr>
<th>Mitigation Goal: Hardening of DPS Operations Locations</th>
<th>Goal Priority: 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Mitigation Actions</strong></td>
<td><strong>Physical Mitigation Priority: 5</strong></td>
</tr>
<tr>
<td>Action</td>
<td>Timeframe</td>
</tr>
<tr>
<td>Finalize the evaluation of DPS operations centered upon determining the costs and feasibility of relocating the DPS Central Offices and primary Dispatch Center to another available location on campus</td>
<td>Evaluation is underway but has not been fully formalized due to staff transition in DPS</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>The planned location would be:</td>
<td></td>
</tr>
<tr>
<td>• Dedicated to DPS operations,</td>
<td></td>
</tr>
<tr>
<td>• Provided with perimeter security,</td>
<td></td>
</tr>
<tr>
<td>• Configured as a modern law enforcement operations location</td>
<td></td>
</tr>
<tr>
<td>Suitable to accommodate day to day DPS operations for the university</td>
<td></td>
</tr>
<tr>
<td>Budget and Implement the plan developed in Action 7-1</td>
<td></td>
</tr>
<tr>
<td>Prepare a summary of the options for relocation of both the central office location and the primary dispatch center.</td>
<td></td>
</tr>
<tr>
<td>Develop costs for reconfiguration and consider avenues for funding either internally or through grant funding.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dependent upon 7-1 and project staffing. No formal budget has been prepared but a conservative estimate would be a minimum of $250,000 to reconfigure on campus facilities</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
Table 7-9: Mitigation Goal: IT DR & Continuity Plan Enhancements

<table>
<thead>
<tr>
<th>Physical Mitigation Actions</th>
<th>Physical Mitigation Priority: 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Timeframe</strong></td>
</tr>
<tr>
<td>Implement an off-site back up operations location for the primary ITS data center environment, and network access equipment</td>
<td>3 to 6 months following funding</td>
</tr>
<tr>
<td>Provide fiber optic connection to Merit and the cloud</td>
<td>TBD upon funding. Installation would involve running cable under Saginaw street</td>
</tr>
<tr>
<td>Provide an additional chiller unit in the data center to address cooling load needed for the new U of M Ann Arbor backup server environment</td>
<td>3 to 6 months following funding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning and Response Mitigation Actions</th>
<th>Planning and Response Priority: 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Timeframe</strong></td>
</tr>
<tr>
<td>Complete a user driven Business Impact Analysis across all university operations</td>
<td>6 months following funding</td>
</tr>
</tbody>
</table>

Utilize the BIA to implement changes to the existing ITS Business Continuity Plans. This would result in IT DR plans being aligned with user driven criticality requirements across all aspect of operations. Utilize GIS systems mapping to support ITS BCP activity.

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
Table 7-10: Building Level Risk Mitigation Improvements

Mitigation Goal: **Building Level Risk Mitigation Improvements**

<table>
<thead>
<tr>
<th>Physical Mitigation Actions</th>
<th>Physical Mitigation Priority: 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Timeframe</strong></td>
</tr>
<tr>
<td>Improve risk at the individual building level by addressing mitigation action items identified as part of the Hazard Mitigation Plan development process.</td>
<td>On-going and based upon prioritization Implementation is also subject to influence by the FM Global inspection and mitigation planning efforts which are continuous and on going</td>
</tr>
<tr>
<td>Items addressed include…</td>
<td></td>
</tr>
<tr>
<td>✷ Facility Fire Protection</td>
<td></td>
</tr>
<tr>
<td>✷ Life safety issues</td>
<td></td>
</tr>
<tr>
<td>✷ Generator fuel line/distribution systems</td>
<td></td>
</tr>
<tr>
<td>✷ Laboratory gas distribution systems</td>
<td></td>
</tr>
<tr>
<td>✷ Fuel Gas Supplies</td>
<td></td>
</tr>
<tr>
<td>✷ Fire Pump performance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning and Response Mitigation Actions</th>
<th>Planning and Response Priority: N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Timeframe</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1</td>
<td>Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.</td>
</tr>
</tbody>
</table>
Table 7-11: Mitigation Goal: Training

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
<th>Cost</th>
<th>Action Priority</th>
<th>Responsible Party</th>
</tr>
</thead>
</table>
| Develop a three pronged training and educational outreach program to promote the Culture of Preparedness approach:  
  - Personal safety and preparedness  
  - Departmental preparedness and safe response  
  - Community wide preparedness and integrated response. | Dependent Upon Funding of Staff Time | Staff time and resources required to conduct training sessions with noted audiences | 6-1 (PR) | EHS DPS University Relations |
| Incorporate website and social media in the education and preparedness planning promotion | Dependent Upon Funding of Staff Time | TBD | 6-2 (PR) | EHS ITS University Relations |
| Develop emergency preparedness and response training modules for target groups… i.e. students, staff, faculty, Deans/Directors, visitors, contractors working on campus, etc. | Dependent Upon Funding of Staff Time | Estimate $10,000 in staff time and resources to develop modules | 6-3 (PR) | EHS DPS University Relations |

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
Table 7-12: Mitigation Goal: Improve the University’s Business Continuity Plans

<table>
<thead>
<tr>
<th>Physical Mitigation Actions</th>
<th>Physical Mitigation Priority: N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Timeframe</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning and Response Mitigation Actions</th>
<th>Planning and Response Priority: 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Timeframe</td>
</tr>
<tr>
<td>Conduct a Business Impact Analysis with a first step of identifying and prioritizing critical business operations and processes for each Executive Officer Operations area</td>
<td>3-6 Months following funding approval</td>
</tr>
<tr>
<td>Establish a set of campus wide Business Continuity Management plan templates for the various operations across the campus, and implement the templates for the 2012 BCP update process</td>
<td>3-6 Months following funding approval. Should follow implementation of the BIA in 5-1 (PR)</td>
</tr>
<tr>
<td>Integrate the…</td>
<td>On Going however the process proposed would formalize our efforts in Business Continuity Planning for our planned 2012 plan revision</td>
</tr>
<tr>
<td>Emergency Response Planning</td>
<td></td>
</tr>
<tr>
<td>Crisis Management Planning</td>
<td></td>
</tr>
<tr>
<td>Departmental and Institutional BCP’s</td>
<td></td>
</tr>
<tr>
<td>ITS DR and BC plans</td>
<td></td>
</tr>
<tr>
<td>Into one cohesive program under one plan documentation platform</td>
<td></td>
</tr>
<tr>
<td>Implement a web based platform for all Hazard Mitigation Plans and Business Continuity Plans</td>
<td>3 to 6 months following funding approval</td>
</tr>
</tbody>
</table>

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1. Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
### Table 7-13: Improve Contagious/Infectious Disease Control Program by Achieving Closed POD Status at University

<table>
<thead>
<tr>
<th>Mitigation Goal: Improve Contagious/Infectious Disease Control Program by Achieving Closed POD Status at University</th>
<th>Goal Priority: 10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Physical Mitigation Actions</strong></th>
<th><strong>Physical Mitigation Priority:</strong> N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Timeframe</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Planning and Response Mitigation Actions</strong></th>
<th><strong>Planning and Response Priority:</strong> 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Timeframe</strong></td>
</tr>
</tbody>
</table>

**Establish a Closed Point of Distribution at the Urban Health and Wellness Clinic**:
Enter into discussions/negotiations with the Genesee County Health Department with the goal of establishing a Closed Point of Distribution on university property at the Urban Health and Wellness Clinic.

Closed Point of Distribution status will give the university first priority for its community of Students-Faculty-Staff in situations where public health emergencies occur and the GCHD can assist with response for mass inoculations and other mass casualty/mass exposure events.

TBD. Key stakeholders will need to engage, review and determine the process then implement it. Possibly as long as 12 months to implement. Funding for possible actions that the GCHD would require as part of process.

<table>
<thead>
<tr>
<th><strong>Improve/Formalize the Campus Infectious Disease Response Process</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Document a more formal process of infectious disease identification including more formal screening efforts for international students, and study abroad students.</td>
</tr>
<tr>
<td>TBD. Key stakeholders will need to engage, review and determine the process then implement it. Possibly as long as 12 months to implement.</td>
</tr>
</tbody>
</table>

**Action Priority protocol**: Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
Section 7: Mitigation Identification and Prioritization

Table 7-14: Mitigation Goal: GIS Systems Expansion, Enhancement and Integration

<table>
<thead>
<tr>
<th>Mitigation Goal: GIS Systems Expansion, Enhancement and Integration</th>
<th>Goal Priority: 11</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Physical Mitigation Actions</th>
<th>Physical Mitigation Priority: N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Timeframe</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning and Response Mitigation Actions</th>
<th>Planning and Response Priority: 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Timeframe</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Form a working group to establish the overall GIS approach and how it can be integrated into the University Continuity Planning program and overall Emergency Management Platform</td>
<td>First half 2013</td>
</tr>
<tr>
<td>Identify a GIS process owner who will be responsible for maintaining the information as current</td>
<td></td>
</tr>
<tr>
<td>Identify and implement the hardware and software approach that will be implemented, with an emphasis on use of desktop systems by users</td>
<td>First half 2013</td>
</tr>
<tr>
<td>Identify information that can be linked electronically within the GIS layers developed during the Hazard Mitigation Planning project to further enhance information access on key risk attributes across the university</td>
<td>First half 2013</td>
</tr>
<tr>
<td>Implement the expanded GIS capability within the web based Emergency Management documentation platform, and establish platform capability and access for members of the AHPT</td>
<td>Second half 2013</td>
</tr>
</tbody>
</table>

Action Priority protocol- Assigning priority 1-1 refers to Mitigation Goal 1, and Mitigation Action 1

Where Physical Mitigation and Planning and Response actions are required to meet a Mitigation Goal both aspects of the actions are summarized. For some Mitigation Goals the actions are purely physical mitigation, and for some goals the actions are purely planning and response oriented.
V. Mitigation Goals and Rationale

A. Goal Priority 1: Mitigation Goal - DPS/Security Operations Enhancements

Provide various Security Measures enhancements in order to improve DPS operations and provide a safer and more secure environment for students, faculty and staff.

Take actions related to developing and implementing greater levels of coordination with the Michigan State Police and the city of Flint police department.

**Lead Departments – DPS, Facilities and Operations with ITS Consultation**

**Rationale for the goal**

University DPS operations are critically important to maintaining a safe and secure campus environment, and have shown their effectiveness as evidenced by the improved Clery Act statistics over the past several years. At the same time the DPS is challenged by the zero clearance urban environment that exists at the university, and especially in light of the local crime rate and reduction in the public police force.

At present UM-Flint DPS operations are distributed across several facilities on the campus. DPS operations include officers, student employees, a primary and secondary dispatch/alarm monitoring center, electronic building perimeter security alarms, call stations and 140 security cameras located across the campus. This compliment of measures has worked to effectively reduce on campus crime which can be seen in the improvement of the Clery Act statistics for the past several years.

At the conclusion of the Hazard Mitigation Plan development a meeting was held with the city of Flint police chief. This meeting comes on the heels of the city issuing a Public Safety Plan as part of its evolution under the Emergency Financial Manager appointed by the governor. As part of the meeting several points of greater coordination between the university, the city police, and the Michigan State Police were discussed, and these have been captured as a set of Response and Planning mitigation actions as a subset of the overall Mitigation Goal.

In order to continue to improve the safety and security across the campus several measures can be further improved to enhance this aspect of the risk mitigation. The measures listed in the tabulated Goal Summary represent several current areas of emphasis for improvement in DPS operations, all of which require investment to implement.

B. Goal Priority 2: Mitigation Goal- Enhance the First Street Residence Hall Evacuation Process and Sheltering Location

Review options and develop enhanced evacuation and shelter provisions for the First Street Residence Hall considering present and future facility configuration and capacity.
Section 7: Mitigation Identification and Prioritization

Lead Departments- Housing and Residence, Facilities and Operations

Rationale for the goal
At present the First Street Residence Hall does not have a recognized sheltering area with in the immediate structure recognized by the building architect/engineer capable of withstanding severe storm events in line with FEMA construction standards. During Tornado Warning conditions students are directed to evacuate the residence hall and travel outside of the adjacent building to a recognized shelter in the lowest floor at the W.R. Murchie Science building.

This is an adverse situation in that it potentially exposes students to harm from developing storm situations, if they are not provided enough time to respond and relocate safely. It also could have the potential to place residence hall resident assistants in a position of having to make tough evacuation (sheltering) decisions sometimes without full information at their disposal as respects to acute weather conditions during severe events.

A potential option for evacuation via the university tunnel system has been examined, and may end up being a partial solution to the issue, however only under the most severe of situations. There are several negatives to this approach which have been examined right now by Department of Public Safety, Housing and Residence Life, EHS and Facilities and Operations. Even if adopted it is felt by the AHPT that longer term solutions should be examined.

During the course of the Hazard Mitigation Plan development this issue came under considerable discussion. As of September 2011 there have been improvements/modifications to the evacuation procedure involving a greater degree of communication between DPS and the residence hall during developing storm events.

Also, revised evacuation routes have been developed to account for the ability to exit the residence hall from the northern most stairwell. This makes the trip to the Murchie Science Building much shorter but still requires travel outside the building.

As part of the revised evacuation procedures the residence hall leadership has created additional prerecorded messages regarding evacuation.

C. Goal Priority 3: Mitigation Goal - Power Reliability/Emergency Power Improvements

Provide Emergency Power for the University Pavilion (UPAV), conduct additional internal university pre planning, and conduct additional pre and post incident planning with Consumers Energy

Lead Departments- Facilities & Operations, University Purchasing

Rationale for the goal
The university is located in an urban environment and relies exclusively upon Consumers Energy to provide power in support of operations. These operations include support for a campus housing 10,000 Students, Faculty and Staff. While electric power outages of extended duration have been limited in frequency there are routine short term disruptions.

Existing Emergency Power provisions consist of distributed generators located at the building level, and the strategy is to ensure that emergency lighting, fire protection alarms and other life safety features within the building remain powered during utility outages. This minimum level of coverage is sufficient to protect building occupants and that is important, however the generators that support this strategy require maintenance and will ultimately come under lifecycle review for replacement.
In some cases the locations of the generators themselves impose building level risk via their fuel systems and storage configurations.

All major buildings are provided with this level of Emergency Power coverage with the exception of the UPAV building. The UPAV building is a multi-use facility consisting of public spaces on the ground level, and university administration and executive offices on the mezzanine level. This results in a situation where both public safety and key university operations may be impaired if there is an electric power outage of extended duration.

While severe outages have been infrequent the power grid components are aging, and the potential for failure will most likely increase in the future as the grid is stressed under the load of electric vehicle charging and other increasing demands. Per consensus discussions the university does not have the funds or physical space to implement costly full power back up provisions such as might be available via construction of a Cogeneration facility on both sides of the Flint River.

It may be feasible to consider means and methods for providing full replacement of the power supply for the south side of the river via truck mounted generators obtained at the time of an incident. This would require pre planning on the part of the university including planning for sizing of the temporary generators, provision of pig tail(s), identifying contractors who can provide and configure the generators, and any other modifications to the CEP located switchgear and transformers that would be needed to accommodate the temporary feed.

Provisions for full power replacement north of the river will be more complex, and will have to rely upon Consumers Energy ability to repair their substation or to provide an emergency substation while reconstruction activities are under way.

D. Goal Priority 4: Mitigation Goal-Flood Mitigation

Flood mitigation planning including enhanced river monitoring, pre-incident response planning, emergency response resource acquisition and deployment plans, and planning with city and county officials.

Lead Departments- EHS, Facilities & Operations

Rationale for the goal

The university is located adjacent to the Flint River with portions of the campus lying both north and south of the river in downtown Flint. The river is controlled by a managed system of dams which are utilized to control flow and elevation on the river, including the portion that runs through the university. As part of the process it has become clear that while the river is managed closely, the university still has a significant exposure to loss if conditions exceed the City of Flints ability to full manage the river flow and elevation during high flow conditions. This analysis is covered in depth in the Vulnerability Assessment in Section 5 of the plan. As can be seen in Section 5 even managed flow situations during high flow conditions threaten the university. While all of the Universities buildings lay out of the official 100 year flood plain a significant exposure to flooding still exists under certain conditions that are foreseeable, and possible including rapid rainfall/snowmelt scenarios, gate failure at one of the dams, or excessive release from the Holloway reservoir.

Through the Hazard Mitigation process the university has come to a much greater level of understanding of the flood risks presented by the river, and has concluded that a greater level of pre incident planning and post incident response preparation is warranted. The elements of this planning are summarized in our 4 main sub elements captured above.

Taken together these elements will allow us to:
Section 7: Mitigation Identification and Prioritization

- Better monitor river conditions continuously on a real time basis

- Formalize our University Flood Response Plan, and increase the level of planning and communication with City and County authorities during times of high water flow on the Flint River.

- Implement Flood Mitigation planning actions such as providing physical berm protection of the William S. White building, and protection of other potentially vulnerable areas of the campus during developing high water flow situations.

A key factor in our ongoing effort to reduce flood risk will be our interaction with city and county officials. Within this mitigation goal Priority Action 3-2(PR) calls for participation with these officials as they further develop the community wide flood mitigation plan.

The University supports the City of Flint’s ongoing monitoring efforts of the condition of the Hamilton Dam and will remain engaged as a key community stakeholder in discussions related to future plans involving Hamilton Dam.

E. Goal Priority 5: Mitigation Goal-Hardening of DPS Operations Locations

Examine options for realignment of DPS operations including possible relocation, and additional security for the central operations location and the remote dispatch centers

**Lead Departments- DPS and Vice Chancellor for Business and Finance**

**Rationale for the goal**
Safety and Security for the 10,000 Students, Faculty Staff and visitors is the highest societal risk mitigation priority for the university. The university is located downtown Flint, and the City’s downtown area experiences far less crime than surrounding areas. This is due in part to the vigilance of the Departments of Public Safety from UMF, Mott Community College and the City police actively patrolling. The city of Flint has one of the highest violent crime rates in the country while having also experienced one of the largest reductions in its public police force in Michigan.

University DPS operations are critically important to maintaining a safe and secure campus environment, and have shown their effectiveness as evidenced by the improved Clery Act statistics over the past several years. At the same time the DPS is challenged by the zero clearance urban environment that exists at the university, and especially in light of the local crime rate and reduction in the public police force.

At present UM-Flint DPS operations are distributed across several facilities on the campus. Primary and back up dispatch locations are located in remote campus locations. These dispatch centers are important operations locations that are not currently secured or constructed for their use profile.

Due to the fact that the DPS mission is critical, and will not be reduced in scope for the foreseeable future it is important that DPS operations be configured in a modern, secure, and appropriate configuration that fits the mission of the department. Overall greater levels of security, consolidation of essential operations, and facility security should be considered in an effort to determine the most economically feasible approach to a reconfiguration of DPS operations.
At present the university is in the process of examining options for reconfiguration of DPS operations. This activity is in its initial phase-facility identification. Several locations are being examined across the university as potential candidates for a proposed new DPS operations center. Implementation of the approach summarized here and under consideration by the university will require substantial funding.

F. Goal Priority 6: Mitigation Goal - IT Business Continuity Plan Enhancements

Improve the UM-Flint ITS Business Continuity Plans, and infrastructure resiliency as part of the overall upgrade to the Universities BCP.

Lead Department- ITS

Rationale for the goal

Information Technology is one of the most key and critical functions performed at the university. In order for the university to operate and serve the needs of Students, Faculty and Staff IT platforms and applications need to have disaster recovery plans in place. Resiliency and elimination of Single Points of Failure for the ITS data centers, and data/network communications support equipment is also critical.

Specific attention should be given to establishment and implementation of a BIA process that will address establishment of operations driven Recovery Time Objectives, and Recovery Point Objectives, critical platform and application support, and establishment of network availability requirements.

Efforts to establish an off site operations capability should be continued in concert with ITS leadership at UMAA and UMD. University operations are somewhat unique in that different areas of operations are critical at different times during the year. When operations ITS needs are aggregated it is likely that one or more areas of operations are extremely critical at any given time. On this basis it is felt that a need for an off site back up location exists virtually 100% of the time, however this should be examined via the BIA activity discussed above.

G. Goal Priority 7: Mitigation Goal- Building Level Risk Mitigation Improvements

Prioritize and implement action plans to address building level risk mitigation measures; including building level issues identified as part of the Hazard Mitigation Planning process, and support for the prioritization and completion of the FM Global process recommendations

Lead Department- Facilities and Operations

Rationale for the goal

Members of the AHPT take an active role in the mitigation of risk through their participation on the planning team. It is important for AHPT members to understand the building level risks that may exist and expose their operations to loss. This initiative is intended to place the AHPT members into a position of determining building level mitigation priorities, make them more aware of the hazards of operations in the facilities where they are housed.

More than 20 mitigation items have been identified that should be considered for review, prioritization and completion by the AHPT. FM Global currently has more than 10 recommendations for risk mitigation on their current risk control report (most of which apply to specific buildings).
Section 7: Mitigation Identification and Prioritization

It is understood that implementation of mitigation will many times involve capital expenditures, and Facilities & Operations support, project management for completion. Even so the AHPT can provide valuable assistance with prioritization of these building level mitigation items.

This initiative addresses a major subcomponent of the overall risk mitigation approach we pursued during the Hazard Mitigation Plan development process. This portion of the effort addresses building specific risks.

H. Goal Priority 8: Mitigation Goal- Training

Develop and Implement a more structured approach towards training of Students, Faculty and Staff who may be required to perform specific tasks as part of a plan or program. Plans or programs may be required by governmental regulation, university best practices, or university operations policies.

Lead Departments- EHS, University Relations, DPS

Rationale for the goal

The concept of further developing and implementing a cohesive “training program” that builds upon the:

- Successful existing student orientation forums
- Classroom student/faculty interactions
- Employee health and safety training programs
- Seasonal drills and exercises to convey this important preparedness planning information...

Is arguably the most important mitigation activity that can reduce loss of life and injury during a major incident where we have to implement any of our Emergency or Crisis related plans.

Training that reinforces maintaining a campus culture of preparedness and emphasizing our shared responsibility in being alert, engaged, prepared, knowledgeable and empowered to make the best decisions during an emergency incident.

I. Goal Priority 9: Mitigation Goal-Improve the University Continuity Plans

Expand and improve of the Universities Business Continuity Plans including IT resiliency. Develop a Business Continuity Management approach at the university in order to integrate all aspects of risk mitigation and continuity of operations planning.

Lead Department- EHS

Rationale for the goal

The university maintains plans on several levels throughout the organization both for general Emergency Response, and specific event scenarios that may occur. At present the Campus Emergency Response Plan is undergoing a complete revision. Additionally, individual departments have developed their own planning documents and manuals. Many other Planning documents continue to be refined, updated and distributed within the campus community in an effort to encourage and maintain a Campus of Preparedness. These other documents include but are not
limited to such as evacuation maps, emergency guideline posters as well as Emergency Response Guidelines Quick Reference Flip Chart.

During the course of the Hazard Mitigation Plan development the issue of Business Continuity Planning was discussed by the project leadership team in the context of risk mitigation, and crisis communications. It is vital for the university to be able to respond to emergencies in an effective manner, but also be able to provide sustainable operations under adverse conditions and return to normal mode of operations as quickly as practical.

The university’s current continuity plans are department/unit specific and further enhancement is required to Move these to the next level that better allows University Leadership and the CMT to address and sustain campus wide critical operations that support core functions and operational needs. The care based upon a template that was first developed to document plans for response to a Pandemic event. We have not conducted a comprehensive Business Impact Analysis by department, and we need to further evaluate critical processes in the context of determining our most critical operations planning requirements.

The university’s continuity planning process has proven effective and was put into practice during the H1N1 pandemic flu activities recently. However, the planning documents are based primarily upon a Word Documents and PDF formatted documents that does not fully exploit the technological enhancements available from a web based plan. At the request of the UM Flint Chancellor, the Flint Campus has been audited by the UM Ann Arbor Auditors during 2010-11 and several potential improvements to campus continuity plans have been identified. Prior to the audit, the campus was already considering how the continuity planning process plans might evolve to a web based system in order to make continuity planning and response capability more effective.

With the initial web resources that have been developed as part of the Hazard Mitigation Plan, the university can look at the feasibility of expanding and further using this platform for enhancing the institutions Continuity planning and management process documentation.

J. Goal Priority 10: Mitigation Goal - Improvement of the Contagious/Infectious Disease Control Program

Lead Department- EHS, Campus Health Officer

Rationale for the goal

The university is a diverse community consisting of approximately 8,000 commuter, and non-commuter students, and over 2,000 faculty and staff who utilize the campus facilities and dormitories. The university has international students from every continent, and across virtually every region on the globe. As with any such community there is always a degree of concern as respects public health issues, and is a daily focus of concerns.

Student populations are well known as vulnerable to infectious disease due to the high degree of interaction and commonality of facility use. These factors coupled with stress, lack of attention to health, and less than optimal nutrition patterns make the student population susceptible to contagious disease outbreak. Faculty and staff are no less exposed when issues of facility commonality and proximity are considered.

To date the UM-Flint has not had what could be termed a contagious disease outbreak. There has been one instance of TB, and there is a constant process of peer monitoring in place that provides a degree of incident identification.
The university also has a form of Contagious disease control program in place via EHS and the campus Emergency Response Plan, however it is felt that it could be made more formal via the process of establishing the university as a Closed Point of Distribution with the Genesee County Health Department.

The Urban Health and Wellness Clinic is recognized by the GCHD as a pseudo Point of Distribution at present. In the past flu immunizations have been coordinated via the UHWC but it is not considered a formal Closed Point of Distribution. The UHWC is not a Student Health Center per se. Some students are seen through the UHWC but it is by no means the exclusive center that sees all students at UM-Flint. This same statement applies to the faculty and staff who for the most part do not use the facility as their primary care outlet.

The UHWC offers a valuable resource for the university in many ways, not the least of which would be as a venue for the Point of Distribution concept. The presence of the UHWC can act as one of the key elements of the Point of Distribution on site at the university, and would need to be integrated into the overall Point of Distribution plan in order for it to gain approval with the GCHD.

One important aspect of input that has been obtained from the GCHD is relative to international students. The GCHD has recommended that the university consider stronger screening of international students as they enter the university, and as they return from any trips home during their career at UM-Flint.

Our overall Mitigation Initiative is rolled into a single item which will serve to enhance our internal contagious/infectious disease control program, and formalize our connection with the GCHD as respects planning for response to an emerging public health emergency.

K. Goal Priority 11: Mitigation Initiative- GIS Systems Expansion, Enhancement and Integration

Continue development of the risk based GIS system that was initially begun as part of the Hazard Mitigation planning process, and make it a usable tool in the context of the day to day management of risk.

**Lead Departments- EHS, University Outreach, Facilities & Operations**

**Rationale for the goal**

As part of the Hazard Mitigation Plan development process several GIS layer maps were developed in conjunction with the Campus Architect, University Outreach staff, EHS as well as an ERS faculty member with expertise in GIS mapping. These maps have been used in the plan in various areas to describe the layout and hazards associated with the university’s operations.

At present the map layers have been developed and integrated into the plan, however the full capabilities of them have not been exploited. The GIS layer maps can be used to create linkage to data and information attributable to a particular aspect of operations, for example generator fuel tank size and location.

As a next step in the enhancement of the university’s continuity planning activities, the GIS layer maps could be developed to be utilized to produce a secure graphical web-based user interface for select stakeholders with point and click capability to key attribute information. This will aid in both planning and response, and is a logical extension of the GIS capability that was set up during the Hazard Mitigation Plan development.
Section 7: Mitigation Identification and Prioritization

Once fully implemented a GIS information linkage capability could be integrated into the electronic platform being planned for safety and security systems, utility mapping and inspections, and the university Continuity Plans.

VI. Mitigation Goal Rating Criteria and Detail

A. Rating Criteria

The following risk improvement areas were used to develop the system we used to create a numerical ranking of mitigation goal priority.

1. Improves life safety for Students, Faculty and Staff
2. Increases the level of Public Safety and Security for Students, Faculty, and Staff
3. Increases the level of Property Protection and lessens the likelihood and/or severity of property damage or operations interruption
4. STAPLEE score
5. Cost to Complete
6. Frequency/Severity

The detail behind this rating criterion and the point scoring attributes associated with each one is summarized on the following pages. These criterion were carefully chosen to best reflect the overall goals for the process.

B. Rating Points Detail

1. **Improves Life Safety for Students, Faculty and Staff**
   - 10 Points-Major improvement in Life Safety
   - 5 Points-Moderate improvement in Life Safety
   - 1 Points- Low improvement in Life Safety

2. **Increases the level of Safety and Security for Students, Faculty, and Staff**
   - 10 Points- High Degree of Improvement
   - 5 Points- Moderate Degree of Improvement
   - 1 Point- Low Degree of Improvement

3. **Increases the level of Property Protection and lessens the likelihood and/or severity of property damage or Operations Interruption**
   - 10 Points- High Degree of Improvement
   - 5 Points- Moderate Degree of Improvement
   - 1 Point- Low Degree of Improvement

4. **STAPLEE Score**
   - 10 Points-STAPLEE Score 7
   - 8 Points- STAPLEE Score 5 or 6
   - 6 Points- STAPLEE Score 3 or 4
   - 4 Points- STAPLEE Score 1 or 2
   - 0 Points- STAPLEE Score 0
Section 7: Mitigation Identification and Prioritization

5. Cost to Complete

- 10 Points - <$25,000 or staff time
- 8 Points - $25 to $100,000
- 6 Points - $100,001 to $500,000
- 4 Points - $500,001 to $999,999
- 2 Points - >$1,000,000

6. Frequency /Severity

- 50 Points - High Frequency/High Severity
- 40 Points - Low Frequency/High Severity
- 30 Points - High Frequency/Low Severity
- 20 Points - Low Frequency/Low Severity

C. Rating Criterion Discussion

The reasoning behind each of the rating criteria is listed below. For each mitigation initiative we considered the factors outlined in the discussion below as we were assigning a point rating.

1. Life Safety

Our students, faculty and staff are our greatest asset. Without them we would have no reason to exist and the protection of their wellbeing is of highest importance. A large part of our ongoing efforts to manage risk are directed at enhancing the Lifesafety across the university. We differentiate between Lifesafety and Public Safety in that Public Safety is being judged more from a security standpoint, while Lifesafety applies to not only security issues but also factors in the level of safety across our built environment and the greater campus itself.

2. Increases the level of Public Safety and Security for Students, Faculty, and Staff (Safety and Security Enhancement)

The Public Safety and Security of Students, Faculty and Staff is of highest importance to the university and the AHPT. Any severe event involving these groups—particularly in the areas of Safety and Security has the potential to impact the university reputation along with potentially producing financial and legal impacts.

3. Increases the level of Property Protection and lessens the likelihood and/or severity of property damage or operations interruption (Property Protection Enhancement)

Our operations venue supports over 10,000 Students, Faculty and Staff. As such it is critical that we provide the maximum practical level of protection for our facilities to ensure that they are available in support of our operations.

4. STAPLEE score

FEMA publication 386-3: Developing the Mitigation Plan suggests an approach known as STAPLEE analysis when it comes to evaluation of various mitigation opportunities. There are seven aspects to STAPLEE as listed in the table that follows and we have applied these to each of the Mitigation Initiatives listed in the table at the end of this section. The STAPLEE criteria are as follows:
Table 7-15 STAPLEE Criteria

<table>
<thead>
<tr>
<th>Socially Acceptable</th>
<th>Is the proposed activity acceptable to the university community? Is the activity compatible with present and future university values? Are there disparity issues that would leave one of the university community adversely affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technically Feasible</td>
<td>Will the proposed activity be effective in the long run? Will it create negative secondary impacts? Will it create more problems than it solves? Will it solve the problem or only address a symptom?</td>
</tr>
<tr>
<td>Administratively Possible</td>
<td>Does the university have the capability to implement the proposed activity? Is there someone who will coordinate, implement, and maintain the activity?</td>
</tr>
<tr>
<td>Politically Acceptable</td>
<td>Is there political support to implement the proposed activity? Is there enough university and/or community support to ensure the success of the activity?</td>
</tr>
<tr>
<td>Legal</td>
<td>Does the university have the authority to implement the proposed activity? Is there a clear legal precedent, and are there any potential legal consequences of the activity?</td>
</tr>
<tr>
<td>Economically Sound</td>
<td>Are there current sources of funding to implement the proposed activity? Do the benefits outweigh the costs of the activity? Is the activity compatible with other economic goals of the university</td>
</tr>
<tr>
<td>Environmentally Sound</td>
<td>How will the proposed activity affect the environment? Will the activity comply with local, state and federal environmental laws and regulations? Is the activity consistent with university environmental goals?</td>
</tr>
</tbody>
</table>

5. **Cost to Complete**

The cost to complete a mitigation initiative has a major influence on the Universities ability to provide additional levels of protection for both life and property. We have assigned a higher level of priority based upon a lower cost to implement as this will tend to raise the priority level of lower cost items. This was done ensure that we did not skew the prioritization rankings towards higher cost items, and to account for the economic realities facing Universities today.

6. **Frequency/Severity**

For most risks it is difficult to assign a numerical probability for occurrence frequency. Impact potential is easier to judge once an assumption is made that an event can occur. Natural hazards events lend themselves to some degree of probability evaluation, however as cited earlier in our plan our largest natural hazards exposure (Flood) defies evaluation on the basis of pure probability. In order to factor in frequency and severity we have made educated value judgments as respects each factor and have rated them against the four quadrants of a typical risk matrix. Our judgments are based upon what has happened in the past or could happen in the future along with our view of the impact potential that might result.

7. **Judgment**

To arrive at our final priority rankings we first looked at our total risk scores then evaluated the order of priority resulting from the purely numerical analysis. In some cases we have moved a lower scored item to a higher place in the prioritization. The factors that we used to make these decisions are based upon:
Section 7: Mitigation Identification and Prioritization

- Severity of impact especially in the areas of Lifesafety and Public Safety
- Better alignment of one initiative vs. another with our AHPT Mission and Goals
- Best sense of the AHPT members based upon a close look at all of the evaluation criteria

VII. Building Level Mitigation Summary

As part of the FEMA Hazard Mitigation Planning process Green Oak Solutions toured each of the facilities covered by the scope of the FEMA grant. Full reports covering these surveys have been placed into Section 6 of the Hazard Mitigation Plan.

The FEMA process requires an examination of a wide range of risks. In order to accomplish this, the process must draw on various sources of information, among them an “on ground view” of building level hazards. The onsite survey process along with our interview process served to accomplish this aspect of the risk assessment.

A. Building Level Summary and the FEMA Process

The summary that follows captures a listing of the key building level risks that warranted comment or a mitigation recommendation. The summary was developed on a building by building basis.

The risks from the FEMA list were examined at each building and the listed risks/impact exposure items rise to the level of warranting some level of consideration, direct mitigation or risk mitigation action as part of the on-going AHPT process.

In some cases recurring issues have been identified. The AHPT review of this information and subsequent use of it to prioritize mitigation initiatives will be a valuable component of the Hazard Mitigation Effort.

While each building covered by our hazard planning grant was evaluated, some buildings had no mitigation items appearing on the building level summary.

*FM Global input*- In addition to the mitigation opportunities cited in the tabulation there are other existing processes underway to reduce building level risk. The Factory Mutual Global property risk control efforts as part of the universities risk management program is the most notable example of this. FM Globals’ mitigation suggestions are addressed through existing processes at the university involving Facilities and Operations, EHS and others. As Green Oak toured the facilities we had the opportunity to consult with the university on the FM recommendations. As a result of that process the FM risk control efforts are considered a part of the overall Hazard Mitigation Plan; they referred to in the summary below where applicable.
## Section 7: Mitigation Identification and Prioritization

### Table 7-16: Building Level Mitigation Summary

<table>
<thead>
<tr>
<th>Building</th>
<th>Hazards Requiring Additional Mitigation</th>
<th>Priority Low/Medium/High</th>
<th>AHPT Department Representative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CENTRAL ENERGY PLANT &amp; UTILITY TUNNELS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td>High</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td>High</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td>Business Interruption</td>
<td></td>
<td>High</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td>High</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td><strong>FIRST STREET RESIDENCE HALL</strong></td>
<td></td>
<td>Extremely High. This exposure rises to the level of Major Mitigation goals for the university</td>
<td>Housing and Residential Life, DPS, F&amp;O-major mitigation initiative</td>
</tr>
<tr>
<td>Life Safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DAVID M. FRENCH HALL &amp; THEATER</strong></td>
<td></td>
<td>High</td>
<td>F&amp;O, and representative from Theatre</td>
</tr>
<tr>
<td>Fire</td>
<td></td>
<td>High</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>Fire-Fire Pump</td>
<td></td>
<td>Medium</td>
<td>F&amp;O</td>
</tr>
<tr>
<td><strong>HARRISON STREET PARKING RAMP</strong></td>
<td></td>
<td>Medium due to location</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>Fire</td>
<td></td>
<td>High</td>
<td>F&amp;O</td>
</tr>
<tr>
<td><strong>HUBBARD</strong></td>
<td></td>
<td>High</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td>High</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td>High</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td>High</td>
<td>DPS</td>
</tr>
</tbody>
</table>
# Section 7: Mitigation Identification and Prioritization

<table>
<thead>
<tr>
<th>Building</th>
<th>Hazards Requiring Additional Mitigation</th>
<th>Priority Low/Medium/High</th>
<th>AHPT Department Representative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR MURCHIE SCIENCE BUILDING &amp; WILSON PARK</td>
<td>Fire</td>
<td>High</td>
<td>F&amp;O</td>
</tr>
<tr>
<td></td>
<td>Fire-Fire Pump</td>
<td>Medium</td>
<td>F&amp;O</td>
</tr>
<tr>
<td></td>
<td>Laboratory Safety</td>
<td>High</td>
<td>F&amp;O, Laboratory Supervisors</td>
</tr>
<tr>
<td></td>
<td>Laboratory Safety</td>
<td>Med-high</td>
<td>F&amp;O, Laboratory Supervisors, EHS</td>
</tr>
<tr>
<td>RECREATION CENTER</td>
<td>Fire-Fire Pump</td>
<td>Medium</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>HARDING MOTT UNIVERSITY CENTER &amp; McKINNON PLAZA</td>
<td>Life Safety</td>
<td>Medium</td>
<td>Rec. Svcs., EHS</td>
</tr>
<tr>
<td></td>
<td>Fire</td>
<td>Medium</td>
<td>F&amp;O</td>
</tr>
<tr>
<td></td>
<td>Fire</td>
<td>High</td>
<td>F&amp;O</td>
</tr>
<tr>
<td></td>
<td>Fire</td>
<td>Medium</td>
<td>F&amp;O</td>
</tr>
</tbody>
</table>
## Section 7: Mitigation Identification and Prioritization

<table>
<thead>
<tr>
<th>Building</th>
<th>Hazards Requiring Additional Mitigation</th>
<th>Priority</th>
<th>AHPT Department Representative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire-Fire Pump</td>
<td></td>
<td>Medium</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>UNIVERSITY PAVILION, ANNEX, OUTDOOR RINK, &amp; PARKING DECK</td>
<td>Emergency Power</td>
<td>High</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>Life Safety</td>
<td></td>
<td>Medium</td>
<td>EHS</td>
</tr>
<tr>
<td>Slips, Trips, Falls</td>
<td></td>
<td>Medium</td>
<td>EHS</td>
</tr>
<tr>
<td>WILLIAM S. WHITE BUILDING</td>
<td>Fire</td>
<td>Medium</td>
<td>F&amp;O</td>
</tr>
<tr>
<td>Life Safety</td>
<td></td>
<td>Medium</td>
<td>F&amp;O, Urban Health and Wellness</td>
</tr>
<tr>
<td>Communications</td>
<td></td>
<td>High</td>
<td>F&amp;O, ITS</td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td>High</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td>INTERNATIONAL INSTITUTE</td>
<td>Fire</td>
<td>Low</td>
<td>F&amp;O, DPS, EHS</td>
</tr>
<tr>
<td>Life Safety</td>
<td></td>
<td>Low</td>
<td>F&amp;O, DPS, EHS</td>
</tr>
</tbody>
</table>
### Section 7: Mitigation Identification and Prioritization

<table>
<thead>
<tr>
<th>Building</th>
<th>Hazards Requiring Additional Mitigation</th>
<th>Priority</th>
<th>AHPT Department Representative(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>F&amp;O, DPS, EHS</td>
</tr>
<tr>
<td>Water Damage</td>
<td>The roof is currently leaking which could lead to water damage should the university purchase or occupy this building.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Repair or replace the roof covering to eliminate water leakage.</td>
<td>Low</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td>Mill Street Parking Ramp</td>
<td>Security of Primary Alarm Monitoring and Dispatch Center</td>
<td>High</td>
<td>F&amp;O, DPS</td>
</tr>
<tr>
<td></td>
<td>Alternatively the existing facility could be evaluated and &quot;hardened&quot; via provision of a more robust perimeter.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VIII. Additional Background on Mitigation Goals and Actions

A. Department of Public Safety/Security Operations Enhancements

*Mitigation Actions under the goal:*

- **Upgrade Video Camera Quality for better Monitoring capability**
  - Systematic replacement of aging cameras to support better video monitoring of the campus. This should be considered for how wireless camera technology might be integrated into the overall future approach towards video monitoring.

- **M Card Access Program -**
  - Support implementation of building level security enhancements including the planned system wide implementation of M Card access for all buildings across the campus. This aspect of the initiative is a high priority for DPS going forward.

- **Assess Call Box Locations -**
  - Conduct a baseline assessment and implement a program for systematically improving call box coverage.

- **Hearing Impaired Emergency Notification Services -**
  - Provide sign/message boards for hearing impaired students at strategic locations across campus.

- **Improved PA Notification Capabilities -**
  - Expand the existing PA system to include the ability to prerecord more than the current 5 or 6 messages. Conduct feasibility and needs assessment for installation of an outdoor PA notification/siren capability that would be incorporated into the already existing indoor network of building PA systems.

- **External Wi-Fi System Implementation to Support DPS Operations -**
  - Work with ITS to define expansions to the campus Wi-Fi system. This involves implementation of an external Wi-Fi system that DPS officers can use to access their PC based network applications from their squad cars.

B. First Avenue Residence Hall Sheltering

*Mitigation Actions under the goal:*

1. **Develop Additional Options for Sheltering -** DPS and EHS work with Facilities and Operations to develop additional sheltering facility alternatives or enhancements for consideration.

   This might include drawing up rough plans for construction of a storm shelter in order to establish the costs of construction, and/or development of a strategy that can be used to integrate plans for a shelter into any expansion of the residence hall.

C. Power Reliability/Emergency Power Improvements

*Mitigation Actions under the goal*

1. **Emergency Power Working Group -** Assemble a working group at the university consisting of Facilities and Operations, EHS, DPS and Purchasing to spearhead a review of the options for providing greater levels of emergency power coverage during major widespread power outages, and explore additional pre planning with Consumers Energy related to pre incident risk mitigation and post incident response.

   This refers to the university gaining additional assurances on how Consumers spares for key substation transformers and switching equipment, estimating the duration and scope of an outage if either of the universities primary power supply substations are substantially destroyed.
and exploring emergency power provision options the university might consider during an extended outage.

2. **Response Planning with Consumers Power for Extended Outages** - Conduct additional preplanning directly with Consumers Energy on specific large scale scenario response to power outages both North and South of the river.

   Planning should focus upon the university working groups identified priorities, and preplanning specific and detailed emergency response actions on the part of Consumers and the university if either of the university's primary power supply substations (north and south of the river) are substantially destroyed.

   Preplanning could be wide in nature and involve provisions such as obtaining large truck mounted diesel or natural gas powered generators to be placed at the CEP and pig tailed into the primary power supply switching equipment.

D. **Flood Mitigation**

**Mitigation Actions under the goal**

1. **Real Time River Monitoring** - Facilitate installation of a USGS river gage adjacent to the university to enhance the university and the City of Flints' ability to monitor developing flooding situations, and respond accordingly.

2. **Formalize Flood Mitigation Planning and Response** - Develop a University Flood Mitigation Plan as part of the Emergency Response Plan revision. This plan should include pre incident planning for river monitoring protocols and communications, possible deployment of mitigation resources to protect low lying areas, communications with Students, Faculty and Staff, and coordination with key public officials at the City of Flint Water Department and the Genesee County Emergency Management and Homeland Security Office.

3. **Physical Barrier at William S. White Building** - Examine the possibility and if feasible construct a berm near the William S White building to provide protection against a potential 200 year flow event in the Flint River. The area surrounding the WSW building is the most exposed location upstream of the dam, and is subject to flooding if flows reach the noted frequency.

4. **Community Wide Planning** - Extend university planning to include involvement with Flood Mitigation planning underway at the city and county level. Planning already occurs with both the City and County, and has proven vital in ensuring a timely university response during high flow events on the Flint River. The City and County are jointly working on a more coordinated Flood Response plan and the university should be a part of that planning. This can include being supportive of local efforts to repair, replace or improve the Hamilton Dam to better ensure the health, safety and wellbeing of the campus community.
E. Hardening of DPS Operations Locations

**Mitigation Actions under goal**

1. **DPS Central Office Operations** - Conduct an evaluation of DPS operations with focus upon determining the costs and feasibility of relocating the DPS Central Offices to another available location on campus that can be dedicated to DPS operations, provided with perimeter security, and configured as a modern law enforcement operations location suitable to accommodate day to day DPS operations for the university.

2. **Primary and Back Up Dispatch Centers** - Conduct an evaluation of DPS dispatch operations with a focus upon determining the costs and feasibility of relocating the primary center to the new DPS Central Operations location. Due to the importance of DPS operations, and the need to maintain operations 24x7x365 the present back up dispatch center should be maintained, and considered for additional modernization as part of the overall DPS facilities realignment.

3. **Develop and Summarize Preferred Operations Reconfiguration** - Prepare a summary of the options for relocation of both the central office location and the dispatch center, along with a preferred approach to operations reconfiguration. Develop costs for reconfiguration and consider avenues for funding either internally or through grant funding.

The current arrangement of having the primary dispatch center located in and generally open to the public presents a security concern in that the university’s primary alarm monitoring and dispatch is located in a relatively non secured area. DPS routinely handles suspects and known perpetrators in the course of their operations and they should have a more secured and segregated environment in which to conduct their operations.

F. IT Disaster Recovery & Business Continuity Plan Enhancements

**Mitigation Actions under the goal**

1. Continue IT Business Continuity Planning including implementation of off-site back up recovery locations, and on campus resiliency measures that might increase systems reliability.

2. Complete a user driven IT Business Impact Analysis (BIA) in support of the University Continuity Plan upgrades described in Mitigation Initiative titled “Improve the University Business Continuity Plans”.

3. Expand the existing Wi-Fi capability to include access to the WiFi system in open exterior areas across the campus. This would involve installation of exterior WiFi equipment, and the primary purpose of this would be to enable the Department of Public Safety to access the data network from their patrol vehicle located PC’s.

4. Provide a back up fiber optic connection to Merit and the data cloud. This would involve installation of fiber optic cable running at a substantial cost (estimated to be $250,000). This additional cloud connection would provide a more resilient capability for access to data.

5. To provide for cooling within the newly expanded data center at part of which is required due to the U of M Ann Arbor requesting space for their off site location.
of back up IT equipment, additional cooling equipment should be added. It is estimated that one additional chiller unit is needed to accomplish cooling for the additional equipment that will be housed in this critical facility.

G. Building Level Risk Mitigation Improvements

**Mitigation Actions under the goal**

1. Develop and implement action plans for completion of mitigation suggestions identified in building level surveys. This may involve work between the primary building occupant, and/or Facilities & Operations in order to develop and prioritize completion of the mitigation items covered in the summary report that has been provided to the AHPT members. A separate summary of these building level improvements has been developed, and captures several key risk mitigation actions that should be considered for implementation.

2. Integrate the AHPT with the completion/resolution process for the FM Global recommendations. At present FM Global has submitted several recommendations that can be considered for immediate resolution through the existing process of review at the university. Some of these recommendations directly impact the fire safety of the buildings that house AHPT member operations so it is important for AHPT members to be engaged with the risk discussion related to the FM Global process.

3. Develop a template for F&O and DPS to conduct building level risk surveys on a routine basis (once per year?) in hopes to identify conditions that can be corrected before escalating into a potential hazard or emergency incident.

4. F&O and DPS can bring the completed surveys with AHPT members to discuss building level risk mitigation items to the attention of the overall committee for review, and prioritization for completion.

H. Training

**Mitigation Actions under the goal**

1. Develop a three pronged training and educational outreach program to promote emergency preparedness and enhance campus members’ engagement in the preparedness planning and ability to respond… personal safety and preparedness, departmental preparedness and safe response and community wide preparedness and integrated response.

2. Incorporate website and social media in the education and preparedness planning promotion. Utilize branding concepts to better promote preparedness and understanding of emergency planning and mitigation of risks and hazards.

3. Establish a work group to solely focus on emergency preparedness planning education and outreach. Be to ensure to address critical populations… GEC, UHWC, ECDC, Housing, international students, individuals with special needs, and others.

4. Develop emergency preparedness and response training modules for target groups… i.e. students, staff, faculty, Deans/Directors, visitors, contractors working on campus, etc.

I. Improve the University’s Business Continuity Plans

**Mitigation Actions under the goal**

1. Conduct a Business Impact Analysis with a first step of identifying and prioritizing critical business operations and processes for each Executive Officer Operations area.
2. Expand the scope of the campus wide BCP template beyond the existing template which was first established for Y2K, expanded for Pandemic Flu Planning, and later implemented as an All Hazards planning tool. Departmental plan enhancements should include additional action planning for critical process recovery, IT outage workarounds, establishment of maximum acceptable downtime for critical operations, and documentation of specific actions that will be taken at the operations level at the time of an incident.

3. Further enhance the University’s Continuity Planning initiatives for the campus. This effort would move the existing programming to a higher level of sophistication that would allow the institution to integrate all of the risk mitigation, continuity of operations planning efforts such as the integration of the Emergency Response Plan, departmental and institutional Continuity Plans, and Risk Mitigation efforts under a single cohesive and well-coordinated effort.

4. A further enhanced University Continuity Planning program could be developed in conjunction with the expansion and further refinement of departmental continuity plans and would be best located on a web based platform that could be securely accessed by a wide range of select internal stakeholders. With further web development, the webpage built to support the Hazard Mitigation Plan could be used as a platform for building a single repository of information related to University Continuity and Risk Management for the UM Flint Campus.

J. Improve Contagious/Infectious Disease Control Program

**Mitigation Actions under the goal**

1. Enter into discussions/negotiations with the GCHD with the goal being establishment of a “Closed POD” on university property at the Urban Health and Wellness Clinic.

   - A Closed POD is a Closed Point of Distribution for public health agencies to utilize in support of vaccine or other medical remedy distribution to a given population, in this case the Students-Faculty-Staff of the university.

   - This would give first preference to the university population during situations where mass inoculation is needed. It would also raise the profile of the university with the GCHD for all matters related to control of contagious/infectious disease.

   - As part of this process the GCHD has defined protocols for what is expected on the part of a Closed Point of Distribution operator. Adherence to these protocols will raise the level of preparedness at the university on this issue, and may drive additional best practices internally at UM-Flint. The GCHD is ready and willing to enter into more formal planning discussions with the university as noted in our 1/27/12 teleconference with them.

   - A secondary part of the process is coordination and response planning that the GCHD will need to do with the university in order to establish the POD plan. This coordination will tend to formalize how the GCHD will work with the university during public health emergencies and not just in situations where a mass distribution of drugs needs to occur.

   - Additionally see section 5 of the Hazard Mitigation Plan for additional details on how the GCHD views the university environment and the key issues they see as important in public health planning.

K. GIS Systems Expansion, Enhancement and Integration

**Mitigation Actions under the goal**

1. Form a working group consisting of the PRP groups to establish the overall GIS approach and how it can be integrated into the university Continuity Planning program.
Section 7: Mitigation Identification and Prioritization

2. Identify a GIS process owner who will be responsible for maintaining the information as current.

3. Identify the hardware and software needs for users of the GIS information, and identify ways to create a seamless interface between the GIS software and the users' typical desktop environment.

4. Identify additional information that can be linked within the GIS layers to further enhance information access on key risk attributes across the university. This would involve reviewing each layer and defining specific information that could be linked to the layer, and who that information would be obtained from.

5. Work with the AHPT to integrate the expanded GIS capability with the web based university Continuity Planning documentation platform.
Section 8: Plan Maintenance Procedures

I. Introduction

The Hazard Mitigation Plan development was undertaken between August of 2010 and Spring of 2012 culminating with the approval of the plan by the Emergency Management Division of the Michigan State Police and FEMA.

The plan was developed in conjunction with faculty, staff, and students of the University under the direction of Environment, Health and Safety and with the active involvement of the All Hazards Planning Team members.

This section of the plan is intended to provide a summary of the plan ownership, as well as define procedures for updating and maintaining the plan. The other key elements to ensuring that the plan remains current and effective are...

- Process for updating the plan
- Executing that process effectively
- Distribution of the plan to parties that may be able to use it in their day to day efforts to reduce risk at the University

Formal Update Cycle is 5 years—While the formal updates and recertification of the plan will occur every 5 years, it is important that the plan be revisited regularly and updated. The university recognizes that new risks and mitigation opportunities may surface at any time and for this reason, the plan is considered a fluid document and may be subject to incremental updates from time to time.

EHS and the AHPT will continue to provide ongoing oversight for the hazards mitigation planning process and monitor progress on the major mitigation goals that have been developed.

II. Plan Ownership, Distribution, Maintenance and Updating

A. Plan Ownership Categories

There are two categories of ownership in the plan.

1. The Administrative Owner is the Director of EHS, who is responsible for ensuring that the plan is widely distributed, communicated and incorporated into the ongoing risk mitigation efforts, preparedness planning and risk management initiatives at the University.

2. The Content Owners are the various subject matter experts, all represented on the AHPT, that have contributed to the development of the plan, and may be responsible for initiating and managing mitigation projects developed as part of the plan.
Section 8: Plan Maintenance Procedures

B. Plan Elements and Content Ownership of the Hazard Mitigation Plan

- The Hazard Mitigation Plan consists of several elements but can be broken down into the sections that make up the plan.

- Some sections of the plan come under general content ownership for the AHPT. These are the background elements found in Sections 1-4 of the plan and these elements will require less frequent updating than sections related to risk mitigation.

- Sections 5- Hazard Identification & Risk Analysis, 6- Vulnerability Assessment, and 7-Mitigation are all tied together and will be most closely influenced by Facilities and Operations, DPS, EHS, Housing, and ITS. For this reason this group may be called the primary content owners for these sections.

- Sections 8 - Plan Maintenance and Section 9 - Appendices and Resources are best owned by the Director of EHS from a content standpoint.

C. Administrative and Content Ownership Responsibilities

1. Administrative Ownership Responsibilities - Monitoring the Plan

   The general responsibilities of the Administrative Owner are as follows:

   a) Ensure that the plan is initially recognized, widely distributed, incorporated into campus planning and risk management activities.

   b) Act as focal point for ongoing identification of risk issues that may need to be brought into the plan from time to time. As head of the AHPT the EHS Director is the logical Administrative owner of the plan.

   c) Identify further grant opportunities that may now exist due to the University having an approved Hazard Mitigation Plan.

   d) Ensure that the content ownership responsibility of each element of the plan is understood by the various teams that are identified for this role.

   e) Coordinate revisions to the plan at least every 5 years or more frequently, if deemed necessary.

   f) Manage and direct the electronic storage and retrieval capability for the master plan copy.

2. Content Ownership Responsibilities - Evaluation and Updating the Plan

   The responsibilities of the content owners are as follows:

   a) Ensure that the content within a given section of the plan is up to date and current. Execute plan reviews, revisions, and updates at the direction of the Administrative Owner.

   b) Provide updates to the Administrative Owner for information that may have changed within a given section of the plan. It is anticipated that the most fluid portions of the
document will be sections 5, 6, and 7 along with certain mapping elements that may be under more frequent revision than the rest of the document.
Section 9: Resources and References

I. FEMA Flood Insurance Rate Maps
Figure 9-1: FEMA Flood Insurance Rate Map 1

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov.
Figure 9-2: FEMA Flood Insurance Rate Map 2