Virginia Tech Hazard Mitigation Plan

Executive Summary

Purpose of the Plan
Disasters can impact universities in a multitude of ways. In addition to the damage to the physical plant, daily operations may be disrupted for a day to weeks or months. These disruptions can negatively impact research activities, causing a loss of future funding and, if severe enough, may lead students or faculty to leave the institution, causing a loss of educational continuity for students.

This plan represents the first in a series of proactive steps on the part of Virginia Tech to reduce the impact of disasters and to avoid future losses and disruption. The plan will help to guide the campus in making better land use and development decisions for new buildings, facilities, and utilities, as well as in the renovation of existing buildings and development.

The Virginia Tech Hazard Mitigation Plan identifies the hazards that may affect the university, and assesses campus buildings’ vulnerability to these hazards. Mitigation strategies have been developed and prioritized to address the vulnerabilities identified in the plan. The plan also includes an assessment of the university’s existing capabilities to implement a hazard mitigation plan. The plan concludes with implementation and maintenance procedures.

Planning Process
Virginia Tech was one of thirty-one universities to receive funding under the Federal Emergency Management Agency’s Fiscal Year 2003 Disaster Resistant University program. Virginia Tech modeled its planning process on the Building a Disaster-Resistant University guide published in August 2003 by the Federal Emergency Management Agency. The process included:

- Convening a University Advisory Committee comprised of representatives from various university administrative departments, academic departments, student organizations and the local community. The committee worked with a consultant throughout the process to develop the mitigation plan.
- Developing a university profile and capability assessment to determine existing capabilities.
- Gathering and analyzing information on past and potential future impacts of hazards on the university.
- Creating goals and mitigation strategies to address the risks and vulnerabilities identified in the planning process.
- The University Relations and Student Affairs offices organized community forums to publicize the work of the University Advisory Committee and gather input from a broad group of stakeholders.
University Profile

Founded in 1872 as a land-grant college named Virginia Agricultural and Mechanical College, Virginia Polytechnic Institute and State University (Virginia Tech) is now a comprehensive research university with more than 100 campus buildings, a 2,600-acre main campus, and a 1,700-acre agriculture research farm. The university offers more than 70 bachelor's degree programs and about 120 masters and doctoral degree programs.

The university is located in the town of Blacksburg in Montgomery County, Virginia. Route 460 runs through the western portion of the campus and provides a direct connection to Interstate-81, a major north-south highway that runs from Tennessee to Pennsylvania.

Virginia Tech has the largest full-time student population in Virginia with 25,629 on-campus students and a total enrollment of 27,619. The university employs 1,250 full-time instructional faculty members. Virginia Tech has the capacity to house 8,765 undergraduates and 160 graduate students in university-owned housing.

Virginia Tech receives significant external support for research, instruction, extension, and outreach projects. In FY 2003, the campus received 2,111 awards totaling more than $159,000,000.

Capability Assessment

Key points of the capability assessment that should inform the remainder of the mitigation planning process are:

- Virginia Tech currently has the human resources through staff, faculty and students needed to implement hazard mitigation projects.
- Hazard mitigation projects may provide opportunities for the university to achieve the objectives outlined in the university’s strategic plan. For example, hazard mitigation projects may provide students with opportunities to get involved in leadership roles. In addition, possible funding opportunities may be available for hazard mitigation-related research.
- Virginia Tech has already outlined funds needed for projects related to hazard mitigation through the 2006—2012 Capital Plan. These projects include building renovations, building construction, and safety code updates.
- Although the university’s emergency operation plan appears to be adequate and comprehensive, it is in the best interest of the university to continue training staff and students on how to implement the plan as well as to continue to assess the plan.
- Virginia Tech has the opportunity to collaborate and coordinate hazard mitigation projects through local and state planning efforts.
- Due to existing budget constraints, the university may need to pursue outside funding options for hazard mitigation projects not already included in the university’s annual budget.
Hazard Identification and Risk Assessment

The purpose of the Hazard Identification and Risk Assessment (HIRA) is to:

- Identify what hazards could affect Virginia Tech.
- Profile hazard events and determine what buildings and university assets are the most vulnerable to damage from these hazards.
- Estimate losses and prioritize the potential risks to the university.

The hazards were ranked to determine which ones are most likely to impact the university. The hazards that were determined to have significant impact were analyzed in a quantitative manner to determine the likely magnitude of future events and the vulnerability of individual university buildings to these events. Hazards that were ranked as limited significance to the university were analyzed in a qualitative manner. Table I-1 shows which hazards were identified and what type of analysis was conducted.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Ranking</th>
<th>Type of Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood</td>
<td>Significant</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Winter &amp; Severe Storm</td>
<td>Significant</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Wind (Hurricane &amp; Tornado)</td>
<td>Limited</td>
<td>Qualitative</td>
</tr>
<tr>
<td>Drought</td>
<td>Limited</td>
<td>Qualitative</td>
</tr>
<tr>
<td>Karst/Sinkhole</td>
<td>Limited</td>
<td>Qualitative</td>
</tr>
<tr>
<td>Landslide</td>
<td>Limited</td>
<td>Qualitative</td>
</tr>
<tr>
<td>Wildfire</td>
<td>Limited</td>
<td>Qualitative</td>
</tr>
<tr>
<td>Earthquake</td>
<td>None</td>
<td>N/A</td>
</tr>
<tr>
<td>Man-Made</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arson/Building Fire</td>
<td>Significant</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Hazmat</td>
<td>Significant</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Terrorism</td>
<td>Limited</td>
<td>Qualitative</td>
</tr>
</tbody>
</table>

Hazard indices and vulnerability assessments for flood, wind, building fire and hazard materials release were developed for the buildings on the Virginia Tech campus. The hazard indices evaluated the extent to which the buildings are at risk from a particular hazard. The vulnerability assessments estimated the potential impacts if a particular building were affected by a specific hazard. The hazard index and vulnerability assessments were then combined to create a mitigation priorities index for each hazard that the University Advisory Committee used to guide the development of mitigation goals and strategies.
Flood

**Key Considerations**

- Stream flooding from Tom’s and Stroubles Creeks and nuisance flooding due to poor drainage affects the university.

- Flooding can impact the utility lines that run in tunnels under the Virginia Tech campus. In addition, there are underground electric vaults throughout campus that are potentially subject to flooding from daylight entry points.

- The FEMA floodplain maps currently are being updated to reflect development and environmental changes that may affect the extent of the floodplain. It is likely that both the 100-year and 500-year floodplain delineations will be expanded and additional buildings will be within the new boundaries.

**Mitigation Focus**

- Eggleston Hall
- Graduate Life Center at Donaldson Brown
- Owens Hall
- University Bookstore
- War Memorial Gym
- Wright House
Building Fire

Key Considerations

• Over an eighteen year period, there have been thirty fires at Virginia Tech that resulted in almost $2 million in total insurance claims.

• All of the residence halls have a sophisticated fire detection system that monitors and provides 24-hour fire protection for the buildings. Also approximately one-third of the residential buildings have a sprinkler system in place.

• Approximately 69 percent of the buildings on campus have no sprinkler systems in place and 56 percent of the buildings do not have alarm systems in place. Virginia Tech has pursued an aggressive campaign to ensure the fire safety of residence halls and other high-occupancy buildings by installing fire protection systems including sprinklers in existing buildings. The risk to these buildings is therefore greatly reduced.

Mitigation Focus

• Sixty-three buildings with “high” mitigation potential including:
  - Burruss Hall
  - Owens Dining Hall
  - Newman Library

• Ninety-nine buildings with “medium-high” mitigation potential including:
  - Air Conditioning Facility
  - Power Plant
  - Veterinary Hospital
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Winter Storm

Key Considerations

• Power outages due to winter storm conditions have the potential to cause severe campus-wide impacts. In the past, these types of events have caused loss of electricity-dependent services (e.g., heating, refrigeration, email and telephone services) for hours.

• Communication Network Services (CNS) is particularly vulnerable to winter storms because of its infrastructure’s location within underground tunnels and its switching stations in the basements of various buildings.

• Capacity and reliability of the current Virginia Tech campus heat plant is a major concern. Plans are in development for an expanded campus heat plant.

• In the event of a winter storm, the university may have to shelter not only on-campus students but off-campus students and the staff needed to provide dining and other vital services to shelterees.

Mitigation Focus

- Thirty-one buildings with “high” ranking include:
  - Burruss Hall
  - Center For Molecular Medicine & Infectious Diseases
  - The President’s House - The Grove

- Power House
- War Memorial Chapel

- Sixty-three buildings with “medium-high” ranking include:
  - Air Conditioning Plant
  - Various Virus Holding and Isolation Buildings
  - Visitors Center

HAZMAT Release

Key Considerations

• Virginia Tech is in close proximity to Interstate 81, a major north-south corridor that is used as a trucking route as well as U.S. Route 460. Trucks carrying certain materials routinely use Route 460 because they are not allowed to use the tunnel on Interstate 77.

• The National Response Center’s database contained fourteen reports of hazardous materials spills in or near the town of Blacksburg between 1990 and 2005. Four of the reports directly involved the university.

• The university’s emergency operations plan provides detailed response procedures in response to hazardous material spills. In addition, the plan includes information regarding the types and locations of various hazardous materials stored on campus.

Mitigation Focus

- Fifty-four buildings show “high” mitigation potential including:
  - Bioinformatics Facility
  - College of Veterinary Medicine
  - Davidson Hall
  - Derring Hall

- Thirty-six buildings have “medium-high” mitigation potential
Other Hazards

Terrorism. The College of Veterinary Medicine has received past threats from animal rights groups. Different types of events (athletics activities) and research endeavors have the potential to become a target for terrorist actions.

Wind. Major hurricanes such as Jeanne (September 28, 2004), Floyd (September 15, 1999), and Hugo (September 10, 1989) have caused extensive damage to Virginia Tech property though no named storms have tracked directly through the Town of Blacksburg.

Karst. The university’s Blacksburg campus is underlain with karst features. Building construction standards, however, are in place to address the challenges presented by the karst topography. These standards include steel pilings driven to bedrock, caissons, or spread foundations, depending on site conditions.

Business Process Analysis

The purpose of the business process analysis was to gather and analyze data related to the university’s business continuity and recovery capabilities. Data were gathered primarily during on-campus meetings with key university officials over the course of three days. The meetings led to an increased awareness regarding the need for business continuity planning and the process for developing such plans.

The need for a business continuity planning staff position has been identified but has not yet been funded. Business continuity planning is a full-time function for the university, and filling this position should be addressed as a university priority. While several departments (i.e., Communications Network Support) have adequate continuity of operations plans in place, many university departments need assistance with developing their departmental business continuity plans. In addition, there is a need to orient new staff to these plans and exercise the plans to increase overall familiarity with the plans.

Mitigation Goals and Strategies

The findings of the HIRA, the capability assessment and the business process analysis were used by the University Advisory Committee to understand the risks and vulnerabilities facing the university as well as the capabilities that the university had available to address them. Using this information, the committee developed long-term and general statements known as goals. The committee then considered a range of mitigation strategies, which are detailed and specific methods to meet the goals.

The University Advisory Committee used the STAPLE/E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria to select and prioritize the most appropriate mitigation alternatives for the University. Actions were given a ranking of high, medium or low.
Mitigation Goals

The goals identified by Virginia Tech are:

1. Reduce impacts of natural and man-made hazards (specifically flood, winter storm, fire and hazardous materials spills) on the Virginia Tech campus.
2. Ensure that the university’s mission of teaching, research and public service is maintained in the event of a natural or man-made disaster.
3. Raise awareness on campus regarding hazards and motivate the campus community to take timely steps necessary to protect themselves.
4. Integrate mitigation principles into university decision-making and ensure risk reduction strategies are integral to future planning, policy and practice.
5. Capitalize on external partnerships to implement the mitigation plan.

High Priority Strategies

- Implement findings of buffer zone protection plan for athletic complex (including Lane Stadium and other sports facilities).
- Develop comprehensive access control policies and oversight (especially for research and perimeter facilities).
- Protect critical infrastructure (e.g., IT network, other utilities) located within steam tunnels.
- To extent possible, create redundancy in utility and other critical systems (e.g., IT, electric power telecommunications).
- Work with Town of Blacksburg to create a series of stormwater detention ponds to reduce peak-flow especially during 100-year event.
- Continue to develop and improve business continuity plans for critical University business, financial and other key operations to allow them to resume activity within a predetermined time.
- Create an awareness program on natural and human-caused hazards for students, faculty and staff.
- Hire or appoint an emergency planner(s) who can be responsible for overseeing all emergency management-related planning (e.g., evacuation).
- Develop budget priorities and strategies that address vulnerabilities as identified in the university hazard mitigation plan.
- Establish and implement consistent protocols to plan and respond to large-scale events on campus.
- Develop a campus evacuation plan including staged departures and designated alternate routes to ensure a safe and orderly evacuation of campus in coordination with the Town of Blacksburg, Montgomery County, VDOT and VA State Police. Key component is public information for students, faculty and staff.
- Consider vulnerabilities when making space utilization decisions.
- Prepare a flood study with flood elevations based on 100% build-out to ensure proper flood protection over time.
- Continue dialogue between university and town officials regarding fire and emergency response capacity.
Plan Implementation and Maintenance

The long-term success of Virginia Tech’s Hazard Mitigation Plan depends first on the success in implementing the plan and, second, in establishing a process to ensure that the plan is monitored, evaluated, and updated on a periodic basis.

Responsibility for the overall implementation and maintenance of the university hazard mitigation plan rests primarily with the Disaster Resistant University Advisory Committee (DRU Committee), which is comprised of senior university officials. Departments responsible for implementing the high priority strategies will develop measures of success that will be used to gauge how well the plan is being implemented and if the actions are achieving their intended purpose.

University officials will continue to participate in the implementation and updating of the New River Valley Hazard Mitigation Plan and the Commonwealth of Virginia State Hazard Mitigation Plan and will work to ensure that the information contained in the university plan is integrated into the state and local mitigation plans.

The DRU Committee will be responsible for monitoring and updating the plan. The committee will review annual progress reports submitted by the departments responsible for implementing mitigation actions. In addition, the committee will review the overall plan and determine what, if any, changes are needed to the plan. At a minimum, the plan will be updated every five years. Major changes to the plan will be submitted to the state and to FEMA Region III.

The university will strive to involve the public in the implementation and evaluation of the mitigation plan. The university website as well as media outlets will be used to publicize the planning process. In addition, an annual event will be held to publicize progress on implementing the mitigation plan. Finally, the DRU Committee also should provide an annual update to the university’s Board of Visitors to keep them informed about plan implementation.