

Sussex County



Carvel and Sharp Campuses



Hazard Mitigation Plan

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1. Hazard Identification and Risk Assessment

Campus Profile – Carvel Campus in Georgetown, Delaware

The University of Delaware campus in Georgetown, Delaware was established in 1941 as an agricultural experimental “substation”. Today, the campus has evolved into an influential, multi-faceted complex. The Elbert N. And Ann V. Carvel Research and Education Center has 52 full-time employees who are dedicated to innovations in research and programs that contribute to Delaware’s agricultural growth. The facility’s staff is responsible for conducting Cooperative Extension and Research Programs in the areas of: Agronomic and Vegetable Crop Production, Farm and Youth Safety, 4-H programs, Family and Consumer Sciences, Poultry Research and Diagnostic Programs, Master Gardener Education programs, Ornamental Horticulture, Water Quality and Nutrient Management, Expanded Food and Nutrition Programs and Economic and Community Development. Another key facility is the Lasher Laboratory. Built in 1970, this laboratory is the primary poultry diagnostic laboratory in the State of Delaware. It provides a progeny broiler challenge service for evaluating infectious disease and virus vaccination for the poultry industry. This facility is part of the National Animal Health Laboratories Network and routinely surveys and experiments for avian influenza and the exotic Newcastle disease. The UD Poultry Health System at the laboratory is well-recognized by the Delmarva poultry industry and growers as a trusted partner in supporting the vital export market for broiler meat products.

Campus Profile – Hugh R. Sharp Campus in Lewes, Delaware

University of Delaware College of Earth, Ocean, and Environment (CEOE)

Hugh R. Sharp Campus

The 62-acre Hugh R. Sharp Campus of the University of Delaware is located in the seaside city of Lewes. The campus serves as the southern Delaware research and teaching base for faculty in UD’s School of Marine Science and Policy, administered by the College of Earth, Ocean, and Environment. While the college has administrative, research and teaching space on the University’s main campus in Newark, the Sharp Campus’s setting along the Delaware Bay make it a tremendous asset for marine bioscience and oceanography programs.

The following is a brief listing of the state-of-the-art facilities that comprise the CEOE Sharp Campus: Cannon Laboratory (undergoing an extensive renovation in 2016); Smith Laboratory and the Marine Operations Building. The Marine Operations Building and adjacent harbor are home to CEOE’s fleet of sophisticated research vessels, including the 146’ flagship R/V Hugh R. Sharp, as well as the R/V Joanne Daiber and a fleet of smaller boats. [UD’s College of Earth, Ocean, and Environment](#) (CEOE) strives to reach a deeper understanding of the planet and improve stewardship of environmental resources. CEOE faculty and students examine complex information from multiple disciplines with the knowledge that science and society are firmly linked and solutions to environmental challenges can be synonymous with positive economic impact.

The college comprises the [School of Marine Science and Policy](#), [Department of Geography](#) and [Department of Geological Sciences](#). CEOE brings the latest advances in technology to bear on both teaching and conducting ocean, earth and atmospheric research. Current focus areas are ecosystem health and society, environmental observing and forecasting, and renewable energy and sustainability.

Other University of Delaware units (separate from CEOE) at the Sharp Campus

Hugh R. Sharp Campus Maintenance and Operations

<http://www.facilities.udel.edu/hughrsharpcampusmaintenanceandoperations.aspx>

University of Delaware Facilities, Real Estate & Auxiliary Services has a unit specifically tasked with maintenance and operations at the Hugh R. Sharp Campus. The staff in Lewes maintains the buildings, systems, grounds and equipment of the University’s physical facilities in Lewes.

John Penrose Virden Residence & Conference Center

<http://www.udel.edu/conferences/locations/lewes.html>

The Virden Center on the Sharp Campus is managed and operated by University of Delaware Conference Services. Capabilities include six meeting rooms, video conferencing, overnight lodging and all meals, plus registration and planning services.

Critical Facilities

For the purposes of assessing the vulnerability of the Lewes and Georgetown campuses of the University of Delaware, the label “critical facility” refers to buildings or other infrastructure that are vital to maintaining or restoring normal University services in the wake of a disaster, a facility that stores hazardous materials or a facility that houses a large number of occupants.

Between the two Sussex County campuses, six critical facilities were identified (see **Table 4.3-1**). The facilities represent the centers of operations for the campuses, as well as laboratory/research centers/infrastructure that, if damaged, could severely impact the mission of the campuses. Finally, the UD Lewes campus houses a lift station for the City of Lewes, making that facility critical for both the University and the town. Maps of both campuses (**Figure 4.3-1** and **4.3.2**) demonstrate the central location of the facilities to their respective campuses.

Table 4.3-1
University of Delaware – Georgetown and Lewes Critical Facilities

Campus	Building Name	Date Constructed	Area (sf)	Comments
Georgetown	Lasher Lab	1970 (2014 - renovation)	7950	Poultry disease research
	Carvel Research and Education Center	2006	26,000	Primary operational building
Lewes	Marine Operations Building	1975	12,647	Marine Research Facility
	Cannon Lab	1975	40,000	Research facility and laboratories
	Smith Lab	1979	22,000	Marine Research Facility
	Four Research Vessels and Dock Facility	n/a	n/a	Marine Research

Figure 4.3-1

University of Delaware – Georgetown Campus

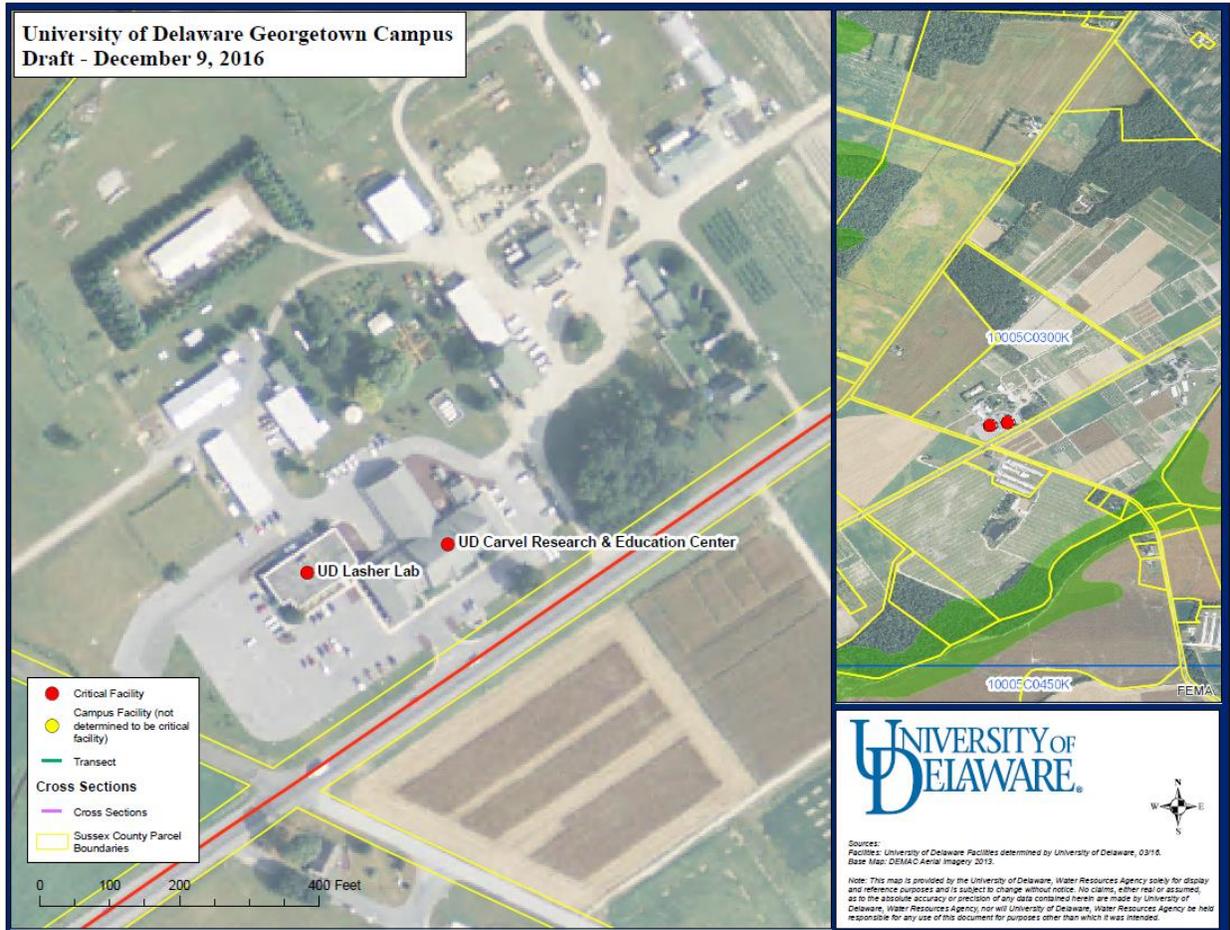
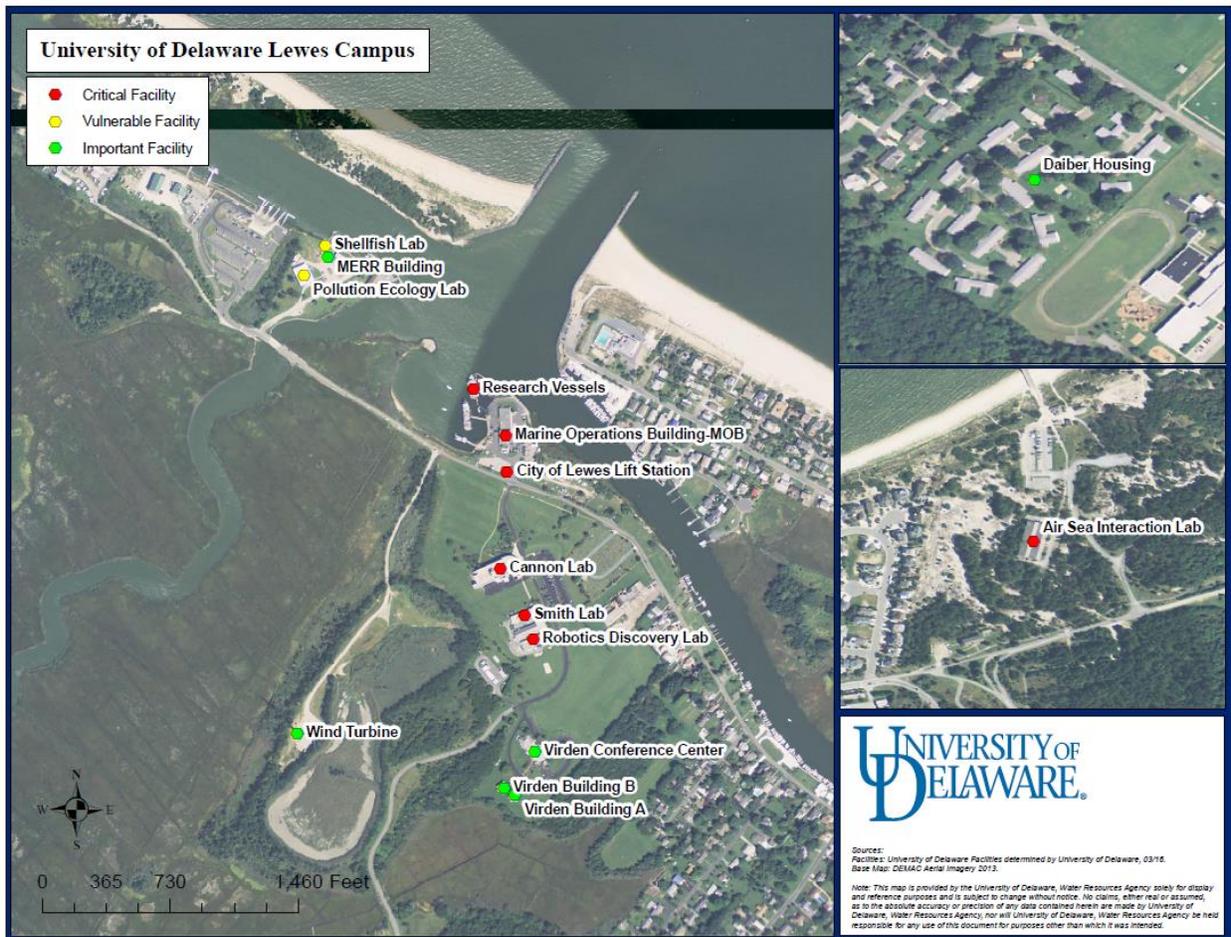


Figure 4.3-2
University of Delaware – Lewes Campus



Flood

In May 2015, FEMA released a new set of preliminary digital flood insurance rate maps (dFIRMs) of Sussex County, complete with a 1% annual chance flood polygons created with state-of-the-art methods. Because this data was available and generally accepted as authoritative (even though the maps were preliminary), it was used as the basis for the flood vulnerability assessment. In addition, flood depth grids for Sussex County were created, to give an indication of the depth of flood water in a 1% annual chance event. There was no attempt made to quantify the individual building level predicted losses. However, the results below (**Table 4.3-2**) represent the range of base flood elevations (BFEs) and depth value associated with each critical facility.

**Table 4.3-2
1% Chance Flood Impacts on UD – Georgetown and Lewes Critical Facilities**

Campus	Building Name	BFE Range	Flood Depth Range (ft.)
Georgetown	Lasher Lab	N/A	N/A
	Carvel Research and Education Center	N/A	N/A
Lewes	Marine Operations Building	AE9	0.11 – 3.13
	Cannon Lab	X – AE8	N/A
	Smith Lab	X	N/A
	Research Vessels	N/A	N/A

At the Georgetown campus (**Figure 4.3-3**), there is a 1% chance floodplain surrounding Stoney Branch, the stream to the southeast of campus. It poses no risk to the UD facilities. At the Lewes campus (**Figure 4.3-4 & Figure 4.3-5**), the story is quite different. The Marine Operations Building will be quite vulnerable in a 1% annual chance event. The base flood elevation is estimated to be 9 ft. about MSL, which yields a range of 0.11 ft. to 3.13 ft. of flood depth in the footprint of the Marine Operations Building. The Cannon Lab is right on the edge of the 1% annual chance floodplain, in AE8 zone. Thus, the flood depth model does not predict measurable water depth in the building itself. The Smith Lab is predicted to be out of the 1% chance zone and we assume that the research vessels would be removed to a safer harbor if a 1% chance flood was predicted.

Figure 4.3-3

FEMA 1% Annual Chance Flood Zone near UD Georgetown



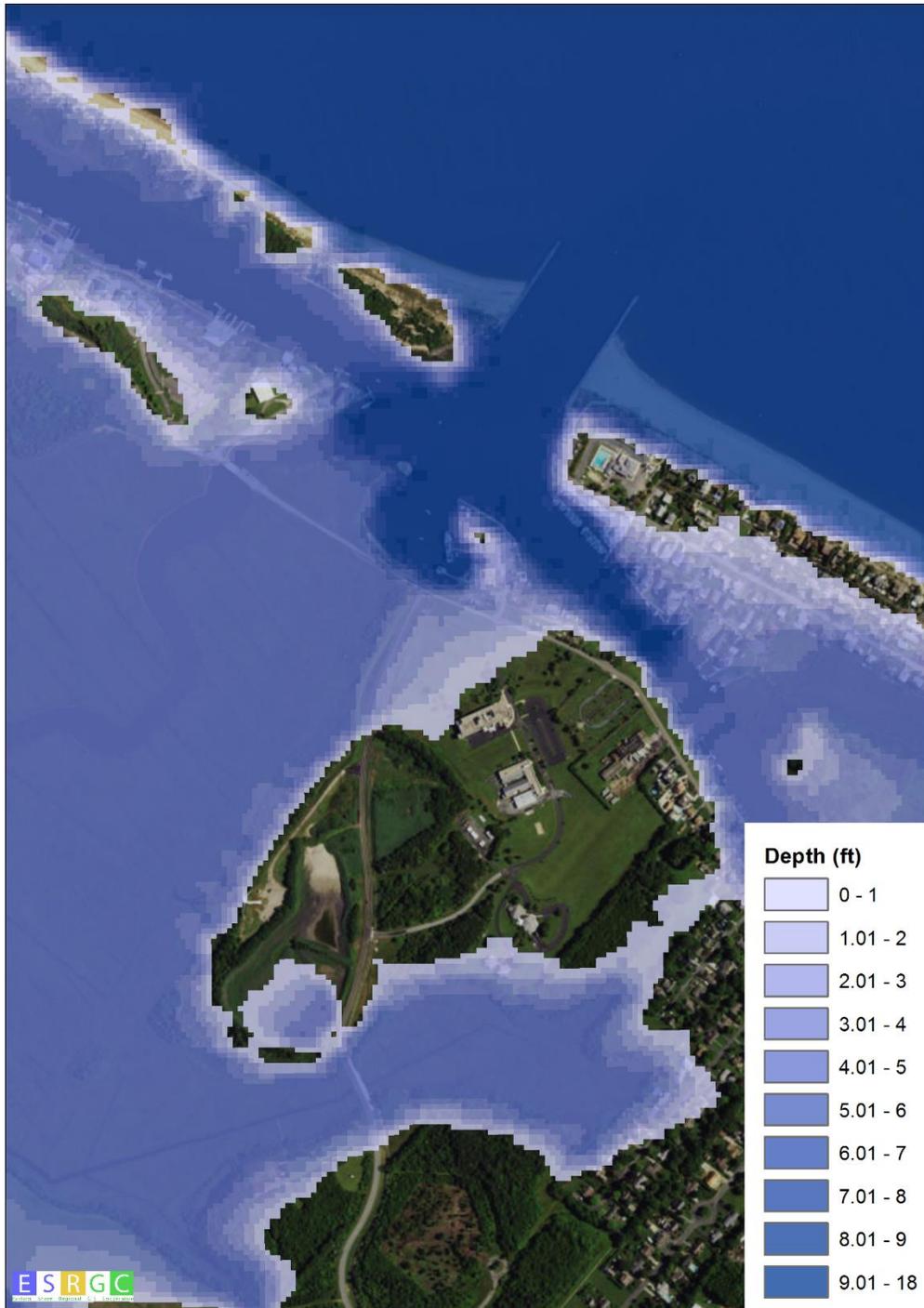
Figure 4.3-4

FEMA 1% Annual Chance Base Flood Heights at UD Lewes



Figure 4.3-5

1% Annual Chance Event Flood Depth at UD Lewes



**Table 4.3-3
Potential Damage to Critical Facilities from Flood by Jurisdiction**

Campus	Total Number of Critical Facilities	1% Chance Flood		
		Moderate Damage*	Slight Damage	Negligible Damage
Georgetown	2	0	0	2
Lewes	4	2	0	2
TOTAL	6	2	0	4

*Moderate: 5 to 30 percent damage, Slight: 1 to 5 percent damage, Negligible: less than 1 percent damage

A repetitive loss property is an NFIP-insured property that has had at least four paid flood losses of more than \$1,000, or has had two paid flood losses within 10 years that, in aggregate, equal or exceed the value of the property, or has had three or more paid losses that, in aggregate, equal or exceed the value of the property. There are no repetitive loss properties on the two campuses of the University of Delaware.

Coastal Wind

One means of gauging the vulnerability at UD to coastal wind was the vulnerability of critical facilities to the 1% chance per year and 0.2% chance per year wind return periods. During a 1% chance per year wind event, neither of the critical facilities at the Georgetown campus have more than a 50% chance of sustaining minor, moderate, or severe damage, but each of the critical facilities at the Lewes campus have a 50% chance of sustaining moderate damage. In a 0.2% chance per year wind event, those same 5 facilities have a better than 50% chance of sustaining severe (10 to 50% damage) (Table 4.3-4).

**Table 4.3-4
Potential Damage to Critical Facilities from Hurricane Winds by Jurisdiction¹**

Campus	Total Number of Critical Facilities	1% chance per year Wind			0.2% chance per year Wind		
		>50 % Chance of Minor Damage	>50 % Chance of Moderate Damage	>50 % Chance of Severe Damage	>50 % Chance of Minor Damage	>50 % Chance of Moderate Damage	>50 % Chance of Severe Damage
Georgetown	2	0	0	0	0	0	0
Lewes	4	0	4	0	0	0	4
TOTAL	6	0	4	0	0	0	4

Tornado

Historical evidence shows that Sussex County is vulnerable to tornadic activity. This particular hazard may result from severe thunderstorm activity or may occur during a tropical storm or hurricane. Because it cannot be predicted where a tornado may touch down, all buildings and facilities at the University of Delaware are considered to be exposed to this hazard, and could potentially be impacted.

¹ The definitions used are as follows. Minor: less than 2 percent damage. Moderate: 3 to 10 percent damage. Severe: 10 to 50 percent damage.

Drought

Although the State of Delaware as a whole is vulnerable to drought, estimated potential losses are somewhat difficult to calculate because drought causes little damage to the built environment, mostly affecting crops and farmland. Therefore, it is assumed that all buildings and facilities at UD are exposed to drought but would experience negligible damage in the occurrence of a drought event. However, it is possible that some of the agricultural experiments at the Georgetown Campus could be negatively impacted by drought, even though irrigation systems are installed to make sure water delivery is consistent across seasons.

Hail

The State of Delaware is minimally vulnerable to hail storms. Hail does occur in the Mid-Atlantic but is usually not large enough nor widespread enough to cause any significant damage to the built environment. It does, however, have the potential of harming crops in the agricultural areas of Sussex County. The overall vulnerability to UD is negligible. The definitions used are as follows. Minor: less than 2 percent damage. Moderate: 3 to 10 percent damage. Severe: 10 to 50 percent damage.

Winter Storms

Historical evidence shows that Sussex County is quite vulnerable to winter storms, with several occurring each year. Because winter storms generally impact large areas, all buildings and facilities are considered to be exposed to this hazard and could potentially be impacted. It is also not possible to estimate the number of residential, commercial, and other buildings or facilities that may experience losses. Additionally, it is important to note that for winter storms, some factors that contribute to a community's actual and perceived losses are not reflected in this analysis, such as removal of snow from roadways, debris clean-up, some indirect losses from power outages, etc. For the University of Delaware, there is a concern regarding winter storm events and the accumulation of snow and ice on the flat roof of the Marine Operations Building on the Lewes campus.

Thunderstorm Wind

Sussex County, according to historical records, is affected by severe thunderstorms several times a year. The strong winds and lightning generated from severe thunderstorms pose a threat to the residents, the built environment, and particularly the trees within the County. However, because severe thunderstorms are not spatially-constrained, one must consider the entire County at risk. In addition, the extent of damage from severe thunderstorm wind may be either localized or widespread but it is rarely consistent across space. Therefore, it is impossible to predict if certain areas of the county may be more vulnerable than others and even to estimate the number of buildings that may suffer loss from a severe thunderstorm wind. Because it cannot be predicted where a severe thunderstorm may hit, all critical facilities at the University of Delaware are considered to be exposed to this hazard and could potentially be impacted.

Earthquake

While Sussex County has felt earthquakes every so often, none have been significant enough to cause any damage for well over 100 years. The coastal plain of the Mid-Atlantic is notorious for being a seismically quiet zone. However, if a serious earthquake were to occur, the losses would likely be significant. **Table 4.3-5** shows potential damage to critical facilities from earthquake events by UD Campus. None are predicted to suffer more than negligible damage in either a 1% or 0.2% chance per year earthquake.

**Table 4.3-5
Potential Damage to Critical Facilities from Earthquake per Jurisdiction²**

Campus	Total Number of Critical Facilities	100-year Earthquake			500-year Earthquake		
		Moderate Damage	Slight Damage	Negligible Damage*	Moderate Damage	Slight Damage	Negligible Damage*
Georgetown	2	0	0	2	0	0	2
Lewes	4	0	0	4	0	0	4
TOTAL	6	0	0	6	0	0	6

Dam/Levee Failure

There are no dams or levees that could fail and impact either of the UD campuses.

Terrorism; Weapons of Mass Destruction and Chemical/Radiological/Biological Agents

The Disaster Mitigation Act of 2000 requires, at a minimum, an evaluation of a full range of natural hazards. An evaluation of human-caused hazards (i.e. technological hazards, terrorism, weapons of mass destruction, etc.) is encouraged, yet not required for the Plan approval. This Plan focuses on natural hazards because the 2015 University of Delaware Enterprise Risk Management has other working groups addressing these hazards.

Other Hazards

Though communities in the State of Delaware recognize that the state is vulnerable to other hazards such as wildfire, erosion, sinkholes, landslides pipeline failure, and tsunamis, a high-level detailed risk assessment was not completed for the University of Delaware in Sussex County due to the low level of risk and/or vulnerability for these hazards within the area as a whole as compared with other hazards.

Conclusions on Hazard Risk

The risk from natural hazards on the Georgetown and Lewes campuses of the University of Delaware can be rated on a scale of Minor, Moderate or High for each identified natural hazard based upon predicted losses and expected frequency of occurrence (**Table 4.3-6**). Because of the nature of human-caused hazards and the nature in which risk and vulnerability is presented for human-caused hazards, it is not possible to rank them fairly in direct comparison with natural hazards. In summary, all human-caused hazards addressed in this section—terrorism (chemical, radiological and biological agents), hazardous materials incidents (HazMat), and energy pipeline failures—warrant an overall rating of low risk for UD.

In order to create a final overall risk ranking per hazard for the University of Delaware, the previous hazard analysis (Section 4.2) and the risk assessment are combined (**Table 4.3-6** through **4.3-8**). A number of analyzed hazards were deemed to be of little consequence to the University. They are added to the risk ranking as low risk but unranked. Other hazards, such as extreme heat/cold, generate no direct monetary losses and are excluded from the risk assessment. However, their frequency of occurrence and their potential to cause injuries and death warrants them to be ranked at a medium level of risk. The final risk ranking demonstrates that flooding and coastal storms, with the potential for power failure, are the two most critical threats to the University of Delaware population and built environment.

² The definitions used are as follows. Negligible: less than 1 percent damage. Slight: 1 to 5 percent damage. Moderate: 5 to 30 percent damage. Extensive (where applicable): 30 to 60 percent damage.

**Table 4.3-6
Estimated Level of Risk by Hazard for the University of Delaware (High, Moderate, Low)**

Campus	Flood	Coastal Wind	Tornado	Drought	Hail	Winter Storm	Thunderstorm	Earthquake
Georgetown	Minor	Minor	Minor	Negligible	Negligible	Negligible	Negligible	Negligible
Lewes	Moderate	Moderate	Minor	Negligible	Negligible	Minor	Negligible	Negligible

**Table 4.3-7
Overall Risk Ranking for the University of Delaware
Georgetown Campus, Sussex County**

Rank	Based on Likelihood of Occurrence	Based on Impact to the University
1	Thunderstorm	Coastal Wind
2	Power Failure	Hazmat Incident
3	Winter Storm	Terrorism
4	Coastal Wind	Pipeline Failure
5	Fire	Fire
6	Flood	Flood
7	Tornado	Tornado
8	Pipeline Failure	Power Failure
9	Hazmat incident	Winter Storm
10	Extreme Temperatures	Thunderstorm
11	Terrorism	Extreme Temp
12	Drought	Drought
13	Dam Failure	Dam Failure
14	Earthquake	Earthquake

**Table 4.3-8
Overall Risk Ranking for the University of Delaware
Lewes Campus, Sussex County**

Rank	Based on Likelihood of Occurrence	Based on Impact to the University
1	Thunderstorm	Flood
2	Power Failure	Coastal Wind
3	Winter Storm	Terrorism
4	Flood	HazMat Incident
5	Fire	Pipeline Failure
6	Coastal Wind	Fire
7	Tornado	Tornado
8	Pipeline Failure	Power Failure
9	Hazmat incident	Winter Storm
10	Extreme Temperatures	Thunderstorm
11	Terrorism	Extreme Temp
12	Drought	Drought
13	Dam Failure	Dam Failure
14	Earthquake	Earthquake

2. Capability Assessment

The capability assessment helps to identify existing gaps, conflicts and/or shortcomings that may need to be addressed through future mitigation actions and helps to ensure that proposed mitigation actions are practical, while considering the University's capacity to implement these actions. It also examines completed or in-progress actions that merit continued support and enhancement through future initiatives. The mitigation capability assessment comprises two components:

1. University Capability Assessment. This includes an analysis of the University's capacity from a planning, policy, staffing and training standpoint.
2. Document Review. This includes a review of the University' existing plans and policies and suggestions for incorporation of mitigation principles in these documents.

Capability Assessment Update

Throughout the University's planning process, various individuals were contacted to ensure that a broad spectrum of key University stakeholders were consulted. Additionally, a review of existing plans and documents previously produced by the University were reviewed. During this stage, a review of the University's existing All-Hazards Mitigation Plan was undertaken. Existing and new plans, studies, reports and technical information were reviewed for incorporation into the planning process. Key personnel were asked to evaluate their own fiscal, technical and administrative capabilities. This information, while not gleaned from a formalized survey, serves as a good source of introspection for those departments wishing to improve their capability, as identified gaps, weaknesses or conflicts may be recast as opportunities for future mitigation actions.

In addition to the outreach efforts during the planning process, an inventory of some previously completed hazard mitigation projects at the University were reviewed as part of this assessment. Documenting past mitigation measures can also serve to help assess the degree to which the University is willing to adopt future mitigation actions. Examples of significant progress include, but are not limited to, the following:

- Cannon Lab Renovation. Located at the Sharp Campus, the Cannon Lab serves multiple research and academic functions. Upgrades are currently underway to address several building weaknesses that were identified in a 2000 Vulnerability Assessment. Improvements include a new HVAC and electrical system; new emergency generator; addition of a new chemical waste handling/storage facility and selective lab upgrades. There are other recommended improvements (i.e. storm shutters; anchoring of HVAC equipment, etc.) that will need to be addressed should funding permit in the future.
- FEMA Pre-Disaster Mitigation Grant Program Application for the Marine Operations Building. Also, located at the Sharp Campus, the Marine Operations Building is located within the 100-year floodplain immediately adjacent to the Delaware Bay. The building houses the university team that supports the school's sea-going research activities and the University's three research vessels. The University has applied for FEMA funds to allow for the construction of a dry flood proofing system at the Marine Operations Building at the Sharp Campus.

Capability Assessment Findings

The University continues to work with Federal, State and local officials in the assessment of major vulnerabilities. As part of the planning process, meetings were conducted with key emergency management stakeholders from the State of Delaware Emergency Management Agency and the Sussex County Emergency Management Office. In fact, significant coordination with Sussex County on the All-Hazards Mitigation Plan has been conducted as both the University and Sussex County were in the process of updating their plans in 2016. A cooperative effort and frequent communications have ensured due consideration of all major concerns with regard to potential hazards.

Administrative Capability

Tracing its origins to 1743, the University is a land-grant, sea-grant and space-grant university. As a major research center, the University has a robust administrative infrastructure and significant experience with administrative matters and management. The University is accredited by the Middle States Commission on Higher Education.

Fiscal Capability

The University's Budget Office maintains strong financial stewardship and provides timely and accurate financial reporting and statistical analysis at all levels of the University. A state-assisted institution, the University also pursues research sponsored by governmental and non-governmental agencies. During the past decade, external funding for UD research steadily increased and now exceeds \$138 million a year.

Technical Capability

The University is well-known for its highly technical resources and regularly shares these resources for the common benefit of internal and external stakeholders. As an example, the University's faculty and staff at the Delaware Geological Survey (DGS) are a science-based, public-service driven organization that conducts geologic and hydrologic research, service and exploration for the benefit of the citizens of Delaware. The DGS, and other academic units at the University, regularly utilize Geographic Information Systems (GIS) and these tools are readily available to analyze natural hazards and develop meaningful actions to reduce their impact. A good example of this is the research of the Delaware Sea Grant Program located at the University's Sharp Campus in Lewes. This program, now celebrating 40 years of research, provides vital economic, social and recreational opportunities while supporting the development of resilient coastal communities that sustain diverse and vibrant economies, effectively respond to and mitigate natural hazards and function within the limits of their ecosystems.

Regional Planning

The University routinely participates in State and local planning efforts, including transportation planning, emergency response planning, and a variety of drills and exercises. In fact, the University has recently hosted table top exercises and simulations on topics such as bio-chemical terrorism, mass casualty disasters and health-related (i.e. Ebola) disasters.

Summary of Findings

Overall, there is a good understanding of the importance of all-hazards mitigation as demonstrated by the plans, actions, and exercises that have been in place for a considerable period of time. Faculty and staff are well-informed and well-versed in hazard mitigation and project management, and clearly understand the importance of implementing hazard mitigation considerations in their day-to-day activities. The challenge is often in maintaining this heightened sense of awareness amongst the study body who are frequently a transient population who are on campus for a very limited time (in some cases for only a few months). The University is an excellent community

partner and works well with Federal, state and local stakeholders as well as internal and external constituencies at all levels of the government and community.

Conclusion

The University is well served by a commitment to emergency management, hazard mitigation, proactive planning, and community participation.

On the following pages, a summary of key initiatives, projects and practices have been summarized in tabular format. This is not an all-inclusive inventory, rather, a summary of the major efforts that have been established to help mitigate the effects of natural, man-made and technological hazards on the Sharp and Carvel campuses in Sussex County, Delaware.

Strategy	Description	Effectiveness	Potential Changes	Carvel = C Sharp = S	Notes
Flood Management Plan 2015 for the Sharp Campus	<ul style="list-style-type: none"> Identify buildings and infrastructure known to be exposed Provide a method of tracking flood sources and flood events Define the roles and responsibilities of on-site personnel Establish an open line of communication with first responders Establish the procedure to alert the public and all persons within the Campus to the nature of the emergency, appropriate protective action needed, and any other information. Establish proper procedures for protecting the environment 	Effective as a practice to date	Changes are reflected in Plan updates	S	Plan updated March 2015; Responsible Office: UD Office of Risk Management
Information Technology Disaster Recovery Plan	The University maintains an Information Technology Disaster Recovery Plan.	Need to raise awareness of the Plan and contents.	N/A	C/S	Plan is confidential and not for public review.
Surveillance Cameras (Carvel)	Surveillance cameras provide monitoring capabilities of the perimeter of the campus.	Effective as a practice to date	N/A	C	
Surveillance Camera (Sharp)	One surveillance camera is located on the Marine Operations Building (MOB).	Effective as a practice to date	N/A	S	Limited view of the area surrounding the MOB
VoIP Phone Systems	VoIP phone systems replaced all traditional analog phone systems in 2013.	Effective as a practice to date	N/A	C&S	VoIP Central Servers have indefinite backup power per Dan Grim
Campus planning and practices emphasize minimal impact upon the environment for new construction/renovation projects	The University complies with established Executive Orders and Acts of Federal, State and local governments.	Effective as a practice to date	N/A	C&S	Examples include Clean Water Act; Protection of Wetlands; National Historic Preservation Act, etc.

Emergency Notification System	UDPD has ability to send a mass notification alert campus-wide. Messages are sent to recipients via phone; email and SMS (text).	Effective as a practice to date	N/A	C&S	There are approximately 35,000 subscribers of the system
College of Agriculture & Natural Resources maintains a Master Plan	This Master Plan, written in 2013, is focused upon continuous improvement and addresses the grand challenges in agriculture and natural resources 25 years into the future.	Effective as a practice to date	The Master Plan is a "living document" and subject to change	C	
Campus Executive Enterprise Risk Management Council (EEMRC)	The University EEMRC provides central coordination of exposure identification, risk evaluation, risk control and risk financing. In 2015, a new Council was formulated with several meetings with newly identified university critical risks and risks ratings developed.	Effective as a practice to date	The work of the Council is ongoing	C&S	
Federal, State and Local Regulations and Rules are closely monitored and the university maintains a high degree of compliance	The University maintains strict compliance with all applicable federal, state and local regulations pertaining to hazardous materials, select agents and biological materials.	Effective as a practice to date	N/A	C&S	A UD Biosafety Manual, Radiation Safety Manual and a Chemical Hygiene Plan are maintained. Note: There are no select agents being utilized on the Sharp or Carvel Campuses.
University Safety Committees	Various safety committees have been established on campus. The committees provide important communications and initiatives related to facility inspections; safety trainings; compliance with policies and procedures and disaster planning.	Effective as a practice to date	New committees are developed as needs arise and are coordinated with UD EHS	C&S	Carvel- One Safety Committee; Sharp - Two Safety Committees
University Emergency Operations Plan (EOP)	The University maintains a Plan to manage all-hazards incidents. The Plan's goal is to protect lives and property in the event of a natural, technological or man-made disaster.	Effective as a practice to date	The Plan is updated by the Emergency Management Coordinator annually.	C&S	
University Communicable Disease Response Plan	The University maintains a Plan to manage incidents which involve	Effective as a practice to date	N/A	C&S	

	communicable diseases (Ebola, H1N1, etc.).				
University functional and table-top exercises	The University proactively plans and participates in functional and table-top exercises to assure a high degree of preparedness for all-hazards that could confront the University.	Effective as a practice to date	Exercises are scheduled each year with emphasis upon contemporary topics	C&S	Carvel Campus has scheduled an Active Shooter Training exercise for August 2016.
University-wide Training	The University proactively conducts FEMA NIMS and ICS training for key university employees.	Effective as a practice to date	Trainings are scheduled each year with an emphasis on contemporary topics	C&S	Campus representatives are attending NIMS/ICS training in August 2016.
Radiological Emergency Plan	Only very small amounts of radioactive materials are used and this is limited to the Sharp Campus.	Effective as a practice to date	N/A	S	University EHS is responsible for incident management and response.
University Constable/Security Services Department (Sharp Campus)	The University provides campus security and first responder services to all emergencies on the Sharp Campus.	Effective as a practice to date	N/A	S	Carvel Campus relies upon State Police and Fire Service via 911
Annual fire drills and inspections of all fire alarm systems.	The University conducts annual fire drills and testing of the fire alarm system on all campuses.	Effective as a practice to date	N/A	C&S	
The University proactively seeks federal/state disaster mitigation funds	The University retains an Emergency Management Director whose responsibility includes proactively identifying and applying for Federal, State and local funding to implement mitigation activities. The University also maintains a portal which lists funding sources for building resilient communities. Portal address: https://www.sppa.udel.edu/research-public-service/ddfrc .	Effective as a practice to date	N/A	C&S	The University has recently applied (2016) for Federal Disaster Assistance funds and has also applied for the FY 16 FEMA Pre-Disaster Mitigation Grant
Emergency Generators	The University maintains four emergency generators to ensure redundant power sources. Testing occurs on a weekly basis. Smith and Cannon have “stand-by” generators which activate automatically.	Effective as a practice to date	N/A	C&S	University has a maintenance plan to ensure serviceability of the generators

3. Mitigation Goals and Objectives

Prevention and Natural Resource Protection

Goal #1 - Protect the health, safety and wellbeing of our student body, faculty and staff from negative impacts of a disaster through the implementation of mitigation projects at all our campuses.

- Objective 1.1: Protect existing natural resources and open-space within the floodplain and watersheds.
- Objective 1.2: Evaluate vulnerabilities of the University's infrastructure located within the 100-year floodplain and develop plans to minimize flood damage or improve resistance to flood hazards.
- Objective 1.3: Incorporate mitigation planning into University-sponsored construction.

Property Protection

Goal #2 – Protect UD property from the adverse effects of disasters through mitigation projects at all our campuses.

- Objective 2.1: Support funding reasonable mitigation projects which look to improve safety and reduce loss to the University.
- Objective 2.2: Encourage the incorporation of reasonable mitigation projects and concepts into new construction on UD campuses.
- Objective 2.3: Ensure the redundancy of power systems that affect buildings, equipment, and research projects.
- Objective 2.4: Ensure that any new construction and renovation of buildings makes them resistant to one or more hazards and considers future risk such as climate change and sea-level rise.
- Objective 2.5: Improve the disaster resistance (especially related to wind and flood) of existing buildings, structures, critical facilities, as well as other infrastructure (e.g. docking facilities) whether new construction, expansion, regular maintenance, or renovation.
- Objective 2.6: Protect the University's valuable and irreplaceable property in 'safer' areas within buildings.
- Objective 2.7: Reduce potential impacts to critical facilities and make them less vulnerable to hazards.
- Objective 2.8: Continue and maintain established connections/collaborations with local power, water, and wastewater utilities to promote hazard risk reduction for UD infrastructure (e.g. evaluate and possibly further fortify their systems and reduce power outages and related losses caused by natural hazards).
- Objective 2.9: Protect critical computer and network infrastructure.
- Objective 2.10: Protect valuable research samples, specimens and live animals.
- Objective 2.11: Protect vital functions that support teaching and research activities.

Outreach and Coordination

Goal #3 – Incorporate mitigation aspects into existing University partnerships with the State of Delaware and Sussex County.

- Objective 3.1: Build and support local capacity to enable the public to better prepare for, respond to, and recover from disasters.
- Objective 3.2: Improve public awareness and education on hazard risks and available mitigation techniques for reducing hazard risks.
- Objective 3.3: Increase the overall preparedness level of the University community through outreach and training of both the student and the employee population.

Other (Emergency Services/Emergency Management)

Goal #4 – Help reinforce and augment the University’s mission to prepare for, respond to, and recover from disaster events affecting any of our campuses.

- Objective 4.1: Encourage emergency response planning on both the academic and administrative sides of the University.
- Objective 4.2: Continue to foster existing emergency planning and response partnerships with all levels of government.
- Objective 4.3: Improve coordination and notification procedures during emergencies.

The mitigation actions from the 2011 University Plan were updated at a workshop held at the University on 9 January 2015. In addition to the meeting, University departments were contacted via phone and email and requested to review and update the actions from previous plan updates. The status of these actions is included below.

2011 Actions Status

Action	Description	Status (Started, Not Started, In Progress)
University of Delaware - Georgetown and Lewes Campuses		
1	Ensure implementation of retrofit, redevelopment, and abatement programs to strengthen existing structures, especially those vulnerable to wind, flooding and other hazards.	Started
2	Evaluate all UD structures currently located in special flood hazard areas, and consider retrofits to meet current minimum FEMA NFIP standards, including all foundations, utilities, fuel systems, electrical systems, and sewage management systems (e.g. Pollution Ecology Lab).	Started
3	Modify existing structures to protect them from a hazard or remove them from a hazard area (e.g. move/rebuild UD structures that are currently in special flood hazard areas).	Not Started
4	Evaluate the engineering feasibility of the following: 1) Elevation of the structures in flood prone areas; 2) the design and installation of flood proofing retrofits to vulnerable infrastructure; 3) the design and installation of structural retrofits to roofs and other infrastructure to minimize wind damage and; 4) the design and installation of wind protection for windows -- e.g. storm shutters or wind-resistant glass.	Started
5	Prioritize targeting of flood prone buildings for retrofits to minimize damage and disruption.	Not started
6	Increase the overall preparedness level of the University Community through continued outreach and emergency response training and exercises for both the student and employee population.	Started
7	Assess and Evaluate communications enhancements and warning systems. Procure advanced emergency notification systems to include an exterior Public Address System; an in-classroom emergency notification system in academic buildings and a dedicated non-university redundant website for emergency notifications in the event the www.udel.edu site becomes overwhelmed by a disaster situation.	Not started

8	Develop procedures and documentation for the Information technology recovery staff to ensure seamless operation of the Disaster Recover site thereby facilitating uninterrupted computer operations university-wide.	Started
9	Utilize university administrative and academic resources for emergency management related projects.	Started
10	Improve access to required annual safety trainings for faculty, staff, and students as well as tracking laboratory activities such as lab inspections, chemical inventory, etc.	Not started
11	Continue to work closely with the State of Delaware, Sussex County, and the Town of Lewes to ensure that the mitigation actions are coordinated effectively and are in harmony with that of the State, Town and County.	Started
12	Consider raising utilities in flood prone areas (Incident command/lift station/Cannon and Smith labs are vulnerable).	Not started
13	Mitigate the effects of frequent coastal flooding and storm surge at the Hooper Marine Operations Building located at Lewes's Sharp Campus Mitigation by dry flood-proofing the exterior perimeter of the building. Use FY-16 FEMA Pre-Disaster Mitigation Grant Program as a source of funding.	Started
14	Develop procedures to ensure research vessels are moved to a safer harbor if a 1% chance flood is predicted.	Started
15	During snow/ice storms, develop a procedure for consistent removal of snow and ice that accumulates on the flat roof of the Marine Operations Building at the Lewes Campus.	Not started
16	Consider relocating the Lewes Campus incident command center from the Marine Operations Buildings to higher ground	Not started
17	Continue to educate the campus community on the importance of storm water management and the maintenance of storm water infrastructure. Begin to educate the campus community regarding flood prevention and preparedness.	Started
18	Raise awareness of faculty and students regarding the procedures for managing emergencies involving fire, chemical and biological incidents.	Started

Mitigation Actions Proposed in the University of Delaware 2011 Hazard Mitigation Plan

University of Delaware - Georgetown and Lewes Campuses		
No.	Action	Status
1	Evaluate the susceptibility, of rooftop equipment and appurtenances, stone ballast or walkway pavers on flat roofs, and wall mounted lights and camera with extended mountings, to displacement or blow-off, resulting in possible roof breaching, roof structure damage, and/or wind-born missiles.	Not started
2	Evaluate features for wind resistance and possible effects on creating an open structure (towers).	Not started
3	Develop a protocol to ensure doors are closed during a high wind event.	Not started

4. Mitigation Strategy

		HAZARD RISK		
		Low	Moderate	High
OVERALL CAPABILITY	High		X	
	Moderate			
	Limited			

A detailed implementation plan for each mitigation action is included below. Each action identifies:

- a. **Category:** Type of mitigation action
- b. **Action Item:** Specific actions that, if accomplished, will reduce vulnerability and risk in the impact area. Actions are linked to the mitigation goals and objectives.
- c. **Hazard(s):** The hazard(s) the action attempts to mitigate.
- d. **Lead Agency/ Department Responsible:** The local agency, department or organization that is best suited to accomplish this action.
- e. **Estimated Cost:** The approximate cost to accomplish the mitigation action.
- f. **Funding Method:** How the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets (General Revenue), a previously established contingency fund (Contingency/Bonds), or a federal or state grant (External Sources).
- g. **Implementation Schedule:** When the action will begin, and when the action is expected to be completed.
- h. **Priority:** 1) High priority—short-term immediate—reducing overall risk to life and property; 2) Moderate priority—an action that should be implemented in the near future due to political or community support or ease of implementation; 3) Low priority—an action that should be implemented over the long term that may depend on the availability of funds.

University of Delaware Mitigation Action 1	Ensure implementation of retrofit, redevelopment, and abatement programs to strengthen existing structures, especially those vulnerable to wind, flooding and other hazards.
Category:	Property Protection
Hazard(s) Addressed:	All Hazards (focus on floods and wind)
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA; University Funds
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	48 months

University of Delaware Mitigation Action 2	Evaluate all UD structures currently located in special flood hazard areas, and consider retrofits to meet current minimum FEMA NFIP standards, including all foundations, utilities, fuel systems, electrical systems, and sewage management systems (e.g. PEL Lab)
Category:	Property Protection
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA; University Funds
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	48 months

University of Delaware Mitigation Action 3	Modify existing structures to protect them from a hazard or remove them from a hazard area.
Category:	Property Protection
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Low
Estimated Cost:	To be determined
Potential Funding Sources:	FEMA; University funds
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	48 months

University of Delaware Mitigation Action 4	Evaluate the engineering feasibility of the following: 1) Elevation of the structures in flood prone areas; 2) the design and installation of flood proofing retrofits to vulnerable infrastructure; 3) the design and installation of structural retrofits to roofs and other infrastructure to minimize wind damage and; 4) the design and installation of wind protection for windows -- e.g. storm shutters or wind-resistant glass.
Category:	Property Protection, Prevention
Hazard(s) Addressed:	Flooding, Wind
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Cost of engineering study
Potential Funding Sources:	FEMA; University funds
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	48 months

University of Delaware Mitigation Action 5	Prioritize targeting of flood prone buildings for retrofits to minimize damage and disruption.
Category:	Property Protection and Emergency Services
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	Low
Estimated Cost:	Staff time
Potential Funding Sources:	FEMA; University funds
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	48 months

University of Delaware Mitigation Action 6	Increase the overall preparedness level of the University Community through continued outreach and emergency response training and exercises for both the student and employee population.
Category:	Outreach and Coordination
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$25,000
Potential Funding Sources:	University General Fund
Lead Agency/Department Responsible:	Emergency Management, Campus and Public Safety, Environmental Health and Safety, Communications and Public Affairs, Student Life
Implementation Schedule:	12 months

University of Delaware Mitigation Action 7	Assess and evaluate communications enhancements and warning systems to complement the UD Alert system. Procure advanced emergency notification systems to include an exterior Public Address System.
Category:	Emergency Services, Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Low
Estimated Cost:	\$500,000
Potential Funding Sources:	FEMA; University Funds
Lead Agency/Department Responsible:	Emergency Management, Campus and Public Safety
Implementation Schedule:	48 months

University of Delaware Mitigation Action 8	Develop procedures and documentation for the Information technology recovery staff to ensure seamless operation of the Disaster Recover site thereby facilitating uninterrupted computer operations university-wide.
Category:	Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff Time
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	Information Technology and Emergency Management, Campus and Public Safety
Implementation Schedule:	12 months

University of Delaware Mitigation Action 9	Utilize university administrative and academic resources for emergency management related projects.
Category:	Emergency Services
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	\$250,000
Potential Funding Sources:	University General Fund; University Capital Fund; FEMA -- Pre-disaster Mitigation Grant, Hazard Mitigation Grant Program
Lead Agency/Department Responsible:	Emergency Management, Campus and Public Safety
Implementation Schedule:	18 months

University of Delaware Mitigation Action 10	Improve access to required annual safety trainings for faculty, staff, and students as well as tracking laboratory activities such as lab inspections, chemical inventory, etc.
Category:	Outreach and Coordination
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Initially estimated at \$140,000, annual subscription renewal estimate of \$30,000
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	Environmental Health and Safety and Emergency Management, Campus and Public Safety
Implementation Schedule:	24 months

University of Delaware Mitigation Action 11	Continue to work closely with the State of Delaware, Sussex County, and the Town of Lewes to ensure that the mitigation actions are coordinated effectively and are in harmony with that of the State, Town and County.
Category:	Prevention, Outreach and Coordination
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	Emergency Management, Campus and Public Safety
Implementation Schedule:	24 months

University of Delaware Mitigation Action 12	Consider raising utilities in areas vulnerable to flooding including the Incident command, lift station, and Cannon and Smith labs.
Category:	Property Protection, Prevention
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	To be determined
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	36 months

University of Delaware Mitigation Action 13	Mitigate the effects of frequent coastal flooding and storm surge at the Hooper Marine Operations Building located at Lewes's Sharp Campus Mitigation by dry flood-proofing the exterior perimeter of the building. Use FY-16 FEMA Pre-Disaster Mitigation Grant Program as a source of funding.
Category:	Property Protection, Prevention
Hazard(s) Addressed:	Coastal Flooding
Priority (High, Moderate, Low):	Low
Estimated Cost:	Cost to conduct an engineering study
Potential Funding Sources:	
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services and Emergency Management, Campus and Public Safety
Implementation Schedule:	Ongoing

University of Delaware Mitigation Action 14	Develop procedures to ensure research vessels are moved to a safer harbor if a 1% chance flood is predicted.
Category:	Property Protection, Emergency Management
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff time
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	University of Delaware Hooper Marine Operations Staff
Implementation Schedule:	12 months

University of Delaware Mitigation Action 15	During snow/ice storms, develop a procedure for consistent removal of snow and ice that accumulates on the flat roof of the Marine Operations Building at the Lewes Campus.
Category:	Property Protection, Emergency Services
Hazard(s) Addressed:	Winter Storms
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time
Potential Funding Sources:	University funds
Lead Agency/Department Responsible:	University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	12 months

University of Delaware Mitigation Action 16	Consider relocating the Lewes Campus incident command center from the Marine Operations Buildings to higher ground.
Category:	Property Protection, Emergency Management
Hazard(s) Addressed:	All Hazards (primarily flooding)
Priority (High, Moderate, Low):	High
Estimated Cost:	To be determined
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	Emergency Management, Campus and Public Safety; University of Delaware Facilities, Real Estate and Auxiliary Services
Implementation Schedule:	36 months

University of Delaware Mitigation Action 17	Continue to educate the campus community on the importance of storm water management and the maintenance of storm water infrastructure. Begin to educate the campus community regarding flood prevention and preparedness.
Category:	Outreach and Coordination
Hazard(s) Addressed:	Flooding
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff time
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	Environmental Health and Safety, Communications and Public Affairs, Student Life
Implementation Schedule:	36 months

University of Delaware Mitigation Action 18	Raise awareness of faculty and students regarding the procedures for managing emergencies involving fire, chemical and biological incidents.
Category:	Outreach and Coordination, Prevention
Hazard(s) Addressed:	All Hazards
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff time
Potential Funding Sources:	University Funds
Lead Agency/Department Responsible:	Environmental Health and Safety and Emergency Management, Campus and Public Safety
Implementation Schedule:	Ongoing

5. Prioritization

Once the mitigation actions and implementation plan were finalized, the Steering Committee developed a set of criteria: Social Considerations, Administrative Considerations, and Economic Considerations. The following questions were asked to evaluate criteria for project prioritization.

Social Considerations – Life/Safety Impact

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

Administrative Considerations – Administrative/Technical Assistance

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

Economic Considerations – Project Cost

- What is the approximate cost of the project?

For each criterion, the level of importance (high, medium, or low) was determined based on the total number of points.

Prioritization Categories

- High priority – Total score of 14+
- Medium priority – Total score between 10 and 13
- Low priority – Total score >10

Prioritization Criteria

Criteria	Points (High Score)	High Score (H)	Points (Moderate Score)	Moderate Score (M)	Points (Low Score)	Low Score (L)
Life/Safety Impact	10	Significant impact on public safety for businesses, residents, properties	6	Direct impact on businesses, residents, properties	2	Minimal/negligible impact on businesses, residents, properties
Administrative/Tech Assistance	5	No additional staff or technical support needed to implement action	3	Additional staff and technical support needed to implement action	1	Significant administrative and technical support needed to implement action
Project Cost	5	Low cost to implement (<\$25,000)	3	Moderate cost to implement (\$25,000-\$100,000)	1	High cost to implement (>\$100,000)

Prioritization Matrix

University of Delaware - Georgetown and Lewes Campuses						
Action	Description	Life Safety	Admin/ Tech	Cost	Total Score	Priority
1	Ensure implementation of retrofit, redevelopment, and abatement programs to strengthen existing structures, especially those vulnerable to wind, flooding and other hazards.	6	1	1	8	Low
2	Evaluate all UD structures currently located in special flood hazard areas, and consider retrofits to meet current minimum FEMA NFIP standards, including all foundations, utilities, fuel systems, electrical systems, and sewage management systems (e.g. Pollution Ecology Lab).	6	3	2	8	Mod
3	Modify existing structures to protect them from a hazard or remove them from a hazard area (e.g. move/rebuild UD structures that are currently in special flood hazard areas).	6	1	1	8	Low
4	Evaluate the engineering feasibility of the following: 1) Elevation of the structures in flood prone areas; 2) the design and installation of flood proofing retrofits to vulnerable infrastructure; 3) the design and installation of structural retrofits to roofs and other infrastructure to minimize wind damage and; 4) the design and installation of wind protection for windows -- e.g. storm shutters or wind-resistant glass.	6	3	2	8	Mod
5	Prioritize targeting of flood prone buildings for retrofits to minimize damage and disruption.	3	3	1	7	Low
6	Increase the overall preparedness level of the University Community through continued outreach and emergency response training and exercises for both the student and employee population.	6	5	3	14	Mod
7	Assess and Evaluate communications enhancements and warning systems. Procure advanced emergency notification systems to include an exterior Public Address System; an in-classroom emergency notification system in academic buildings and a dedicated non-university redundant website for emergency notifications in the event the www.udel.edu site becomes overwhelmed by a disaster situation.	7	1	3	11	Low
8	Develop procedures and documentation for the Information technology recovery staff to ensure seamless operation of the Disaster Recover site thereby facilitating uninterrupted computer operations university-wide.	4	4	3	8	Mod
9	Utilize university administrative and academic resources for emergency management related projects.	4	5	3	12	Mod
10	Improve access to required annual safety trainings for faculty, staff, and students as well as tracking laboratory activities such as lab inspections, chemical inventory, etc. The new BioRaft lab management program will enhance lab inspections, chemical inventory and training and will be widely promoted for enhanced acceptance and use.	6	5	2	13	Mod
11	Continue to work closely with the State of Delaware, Sussex County, and the Town of Lewes to ensure that the mitigation actions are coordinated effectively and are in harmony with that of the State, Town and County.	8	5	2	15	High
12	Consider raising utilities in flood prone areas (Incident command/lift station/Cannon and Smith labs are vulnerable).	6	1	3	10	Mod

13	Mitigate the effects of frequent coastal flooding and storm surge at the Hooper Marine Operations Building located at Lewes's Sharp Campus Mitigation by dry flood-proofing the exterior perimeter of the building. Use FY-16 FEMA Pre-Disaster Mitigation Grant Program as a source of funding.	6	1	1	8	Low
14	Develop procedures to ensure research vessels are moved to a safer harbor if a 1% chance flood is predicted.	4	5	3	12	Mod
15	During snow/ice storms, develop a procedure for consistent removal of snow and ice that accumulates on the flat roof of the Marine Operations Building at the Lewes Campus.	5	5	4	14	High
16	Consider relocating the Lewes Campus incident command center from the Marine Operations Buildings to higher ground. One suggested location is the existing Instructional Television (ITV) classrooms on campus (Cannon 202 and 203).	5	5	4	14	High
17	Continue to educate the campus community on the importance of storm water management and the maintenance of storm water infrastructure. Continue to raise awareness about general preparedness, sea level rise and other key environmental issues that impact our campuses.	2	5	3	10	Mod
18	Continue to raise awareness of faculty and students regarding the procedures for managing emergencies involving fire, chemical and biological incidents.	6	5	3	14	High

APPENDIX A

Acronyms

Acronyms

BFE	Base Flood Elevation
CEOE	College of Earth, Ocean and Environment
dFIRM	Digital Flood Insurance Rate Map
DGS	Delaware Geological Survey
EEMRC	Executive Enterprise Risk Management Council
EHS	Environmental Health and Safety
EOP	Emergency Operations Plan
GIS	Geographic Information Systems
HVAC	Heating, Ventilation, & Air Conditioning
ICS	Incident Command System
MOB	Marine Operations Building
MSL	Mean Sea Level
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
PEL	Pollution Ecology Lab
SMS	Short Message Service
VoIP	Voice over Internet Protocol

APPENDIX B

Agenda

University of Delaware
ALL HAZARDS MITIGATION PLAN UPDATE

28 January 2016

AGENDA

Steering Committee Meeting

Introductions – Mark Seifert, Emergency Management Coordinator, University of Delaware

- Steering Committee Members
- Consultants
 - Deepa Srinivasan, President, [Vision Planning and Consulting, LLC](#)
 - Mike Scott, ESRGC, Salisbury University

PowerPoint Presentation – Deepa Srinivasan

- Overview of the Hazard Mitigation Planning Process
- Schedule and Deliverables

Discussion of Hazards, Risks, and Vulnerability – Mike Scott

Discussion of 2011 Plan Goals and Objectives

Discussion of 2011 Mitigation Actions

Wrap-up

- Questions and Answers

MEETING SIGN-IN SHEET	
Project: Hazard Mitigation Planning	Meeting Date: January 28, 2016
Facilitator: Mark W. Seifert	Place/Room: MOB/Lewes, DE

Name	Department	Proxy For?	Phone	E-Mail
Joe Thomas	Sussex County, Director, Emergency Management		302-855-7801	jthomas@sussexcountyde.gov
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Ed Tyczkowski	DEMA		302-659-2204	ed.tyczkowski@state.de.us
Arthur Paul	DEMA		302-659-2253	Arthur.Paul@state.de.us
Deepa Srinivasan	Vision Planning & Consulting		240-893-8719	Dsrinivasan@vision-pc.net
Michael Scott	Vision Planning & Consulting		410-548-6456	msscotte@salisbury.edu
Bruce Campbell	Assistant Director, Maintenance and Operations, Lewes Campus		302-542-3211	BACAMP@UDEL.EDU
Joe Scudlark	Assistant Director, Research Facility Operations, Lewes Campus		(302) 645-4308	scudlark@udel.edu
✓ Lt. Donna Simpson	University Police, Lewes Campus			DONNA.SIMPSON@UDEL.EDU
Norris Waller Jr.	Utilities Technician, Georgetown Campus		302-841-1412	bwaller@udel.edu
(Sick) Mark Isaacs	Assistant Professor, Plant & Soil Science, Georgetown Campus			
Victor Green	Researcher, Plant & Soil Science, Georgetown Campus			
Krista Murray	Assistant Director, EHS		302-831-1433	KLMurray@udel.edu
Barbara Scott	Research Associate III, Plant & Soil Science, Georgetown Campus		302-850-7303 x512	bascott@udel.edu
Harold Taylor	Manager, Conference Services, Lewes Campus			
Wendy Carey	Marine Advisory Specialist III, Lewes Campus		415-4258	wcarey@udel.edu
Mark Seifert	Campus & Public Safety		831-7394	Seifert@UDEL.EDU

APPENDIX C

Presentations

2016 All-Hazards Mitigation Plan Update UD Sussex County Campuses

**Steering Committee Meeting – University of Delaware
28 January 2016**

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



Project Purpose

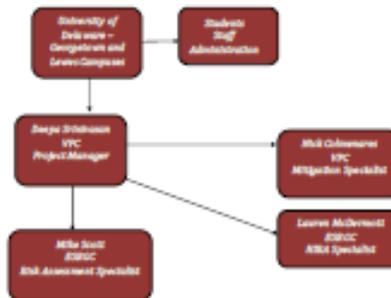
To update the all-hazards mitigation plan to improve the University of Delaware – Georgetown and Lewes Campuses Sussex County campuses' resistance to natural hazards by identifying actions to reduce the impact of various hazards to people and property.

Goals, objectives, and mitigation actions will be included in Sussex County's 2016 Plan Update.

Key Players

- University of Delaware – Georgetown and Lewes Campuses
- Sussex County Emergency Operations Center
- Consultants
 - Deepa Srinivasan, President, Vision Planning & Consulting
 - Dr. Mike Scott, ESRGC-Salisbury University
- Delaware Emergency Management Agency (DEMA)
- Federal Emergency Management Agency (FEMA)

Project Organization



Steps - Planning Process

1. Convene Steering Committee and conduct workshop
2. Assess hazards, risks, vulnerability
3. Assess departmental capabilities
 - Existing Plans, Programs, Policies
 - Local Codes and Zoning Ordinances
 - Current and Proposed Projects
4. Develop goals and objectives and mitigation actions
 - Preventative Measures
 - Projects
 - Natural Resource Protection
 - Outreach and Communication
 - Other Mitigation Actions

Steps - Planning Process (cont'd)

5. Write mitigation plan and prioritize projects (using Evaluation Criteria)
 - Social
 - Technical/Administrative
 - Economic
6. Develop implementation plan
 - Priorities for Mitigation Actions
 - Short-, Medium-, or Long-Range
 - Potential Funding Sources
 - Responsible Entities
 - Target Completion Dates
 - Five-Year Plan Maintenance Cycle

Context Review from 2011 Plan

- Sharp Campus in Lewes
 - 69 acres, classrooms, offices, 2 labs, library, conference center
 - Housing complex is 2 miles from campus
 - Research vessels, Marine Operations building
 - No flooding from surge has ever occurred
- Carvel Center in Georgetown
 - 347 acres, SE of the center of Georgetown
 - Carvel Center, Lasher Lab



Hazard Analysis from 2011 Plan

- Flood, Riverine and Coastal
- Severe (Tropical) Wind
- Thunderstorm Wind
- Tornado
- Wildfire
- Drought
- Extreme temperatures
- Hail
- Winter Storms
- Coastal Erosion
- Dam Failure
- Earthquakes
- No known damage to UD Sussex County facilities reported in 2011 Plan

Vulnerability Analysis 2011

- Critical Facilities
 - Lewes: Marine Operations & Virdin Center
 - Georgetown: None
- Flooding – No potential damage
- Severe Tropical Wind – All potentially damaged
- Thunderstorm Wind – All potentially damaged
- Tornado – All potentially damaged
- Drought – Low potential, but ag research may be affected
- Winter Storms – Snow load on Marine Operations

2011 HMP Overall Risk Ranking Lewes Campus

Ranking	Likelihood of Occurrence	Impact to the University
1	Thunderstorm/Hail	Flood
2	Power Failure	Hazmat Incident
3	Flood	Terrorism
4	Winter Storm	Pipeline Failure
5	Coastal Erosion	Fire
6	Pipeline Failure	Coastal Erosion
7	Fire/Hurricane	Force Winds
8	Tornado	Tornado
9	Hurricane Force Winds	Power Failure
10	Extreme Temperature	Winter Storm

2011 HMP Overall Risk Ranking Georgetown Campus

Ranking	Likelihood of Occurrence	Impact to the University
1	Thunderstorm/Hail	Flood
2	Power Failure	Hazmat Incident
3	Flood	Terrorism
4	Winter Storm	Pipeline Failure
5	Pipeline Failure	Fire
6	Fire	Hurricane Force Winds
7	Tornado	Tornado
8	Hurricane Force Winds	Power Failure
9	Extreme Temperature	Winter Storm
10	Terrorism	Thunderstorm/Hail

For the 2016 Plan...

- Has there been any hazard occurrences in the past 5 years?
- Are there any new facilities at the two sites?
- What are the future development plans at either site?
- Is the flood threat being appropriately considered in Lewes?
- Are there truly no critical facilities in Georgetown?
- Are there other critical facilities in Lewes, such as research labs or vessels?
- Are there any buildings particularly vulnerable to wind hazards?
- Is the ag research in Georgetown not vulnerable to drought or hail?

2015-2016 University of Delaware HMP Update Goals and Objectives

Goal #1 - Protect the health, safety and wellbeing of our student body, faculty and staff from negative impacts of a disaster through the implementation of mitigation projects at all our campuses.

- Objective 1.1: Support funding reasonable mitigation projects which look to improve all aspects of safety on UD campuses.

Goal #2 - Protect UD property from the adverse effects of disasters through mitigation projects at all our campuses

- Objective 2.1: Support funding reasonable mitigation projects to reduce loss to the University.
- Objective 2.2: Encourage the incorporation of reasonable mitigation projects and concepts into new construction on UD campuses.
- Objective 2.3: Ensure the redundancy of power systems that affect buildings, equipment, and research projects.

2015-2016 University of Delaware HMP Update Goals and Objectives

Goal #3 - Incorporate mitigation aspects into existing University partnerships with the State of Delaware and Sussex County.

- Objective 3.1: Partner with various levels of government (State, Sussex County, Georgetown, Lewes) on disaster awareness, education and outreach initiatives to multiple audiences.

Goal #4 - Help reinforce and augment UD's mission to prepare for, respond to and recover from disaster events affecting any of our campuses.

- Objective 4.1: Encourage emergency response planning on both the academic and administrative sides of the University.
- Objective 4.2: Continue to foster existing emergency planning and response partnerships with all levels of government.

Sample Goals

Property Protection

- Ensure that any new construction and renovation of buildings makes them resistant to one or more hazards.
- Ensure that any new construction and renovation of buildings considers future risk, for example, climate change.
- Protect the University's valuable and irreplaceable property in "soft" areas within buildings.

Emergency Services

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

Structural Projects

- Ensure regular maintenance of the University's infrastructure within the 100-year floodplain.

Natural Resource Protection

- Protect existing natural resources and open-space within the floodplain and watershed.

Public Information

- Improve public awareness and outreach during hazard events through education.

Sample Mitigation Actions

- Ensure buildings slated for renovations incorporate hazard mitigation principles and implement the mitigation actions listed for specific buildings in this section
- Work in collaboration with Sussex County to improve University's and County's disaster resistance - conduct regular meetings with County EMA to mobilize funds through County Hazard Mitigation Plan
- Work with Office of Alumni Affairs to identify alumni who can:
 - assist through fundraising
 - serve as valuable technical resources for retrofit and modernization projects
 - serve in positions to influence government and nonprofit resource allocation
- To alleviate flooding and minimize damages in flood-prone areas, consider:
 - Install check valves in floor drains at all buildings in flood-prone areas
 - Install tideflex where storm drain system discharges
 - Raise utilities in flood-prone area
 - Construct walls or provide other flood proofing mechanisms

Sample Mitigation Actions

- Utilities in the basement including sump pumps - During power outages, water could get into the electrical system and short the building, requiring power to be disconnected - Install a small generator to pump the water up during power outage and keep the basement from flooding
- Network hub in the basement - prone to flooding
 - Consider moving the hub to higher ground
 - Improve site drainage as necessary
 - Re-grade as necessary
 - Extend downspouts as necessary
 - Install sump pump as appropriate
- Utilities 3-4 feet below grade
 - Consider relocating these utilities to higher ground
 - Install check valve on mechanical room underdrain

Sample Mitigation Actions

- Trees on campus that are close to buildings - Monitor and prune trees around buildings regularly and examine tree bases for early signs of uprooting. Avoid planting of large trees adjacent to buildings
- Older buildings on campus - Conduct a structural inspection (5 or 10-year cycle) of the structural elements and access to buildings
- Install generators
- Identify an alternate EOC - include a spot where communication lines could come in and introduce a back up data network connection in the building

Thank You!