

Flood Emergency Response Plan (FERP)

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Objectives

- Components of a Flood Emergency Response Plan
- Determining Flood Exposures to your Operations.
- Tools to allow you to monitor flood potential
- Protective features that can be implemented to reduce flood exposures





Basic Plan Requirements

- **1.** Risk Assessment understanding the exposure;
- 2. <u>Prevention, Protection, Preparation</u> steps taken to reduce exposure to campus, equipment, stock, personnel and students;
- **3.** <u>Flood recovery</u> identify key resources required to preserve property and restore/return site back to operations.





Designate a person responsible for the creation, maintenance, supervision and implementation of the plan, along with alternates.

- Develop a team to meet the demands of Assessment, Prevention, Protection,
 Preparation and Recovery
- Empower personnel, as appropriate, to help prevent property loss and business interruption associated with flooding.
- Establish needed resources outside of campus to provide needed support and recovery



Risk Assessment

Site specific assessment of the impact and probability of an event (flood) and what may be the causal factors leading to such an event.

- What Weather event might cause flooding, surface water or storm surge.
- Determine from where and how the flood water will enter the campus and/or facility.
- Obtain local flood maps identifying the campus location and the resultant flood exposure.
- Determine the type of flooding and the behavior of the water as it enters and exits the site.
 - high velocity? May affect type of flood protection and effectiveness
 - wave action? Storm collection ponds and lakes driven by wind
 - debris and contaminants onto the site? local tank farms, automotive operations, etc.
 - potential ice damming or debris created damming? winter or early spring floods
- How much warning time may you have before onset of flooding.
- How long might the flooding persist on the campus (flash flooding, storm surge, longer duration flooding, etc.).

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Risk Assessment

- How deep may the resulting flood water rise on property and within buildings, including 1 percent (100 year) and 0.2 percent (500 year or storm surge).
 - Obtain finished floor elevations of key buildings or infrastructure on campus (utilities, sewers, storm drains, fire pumps, generators) and compare them to the expected flood levels.



Understanding Elevations

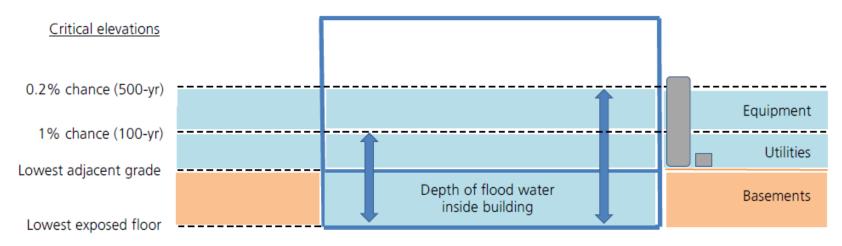
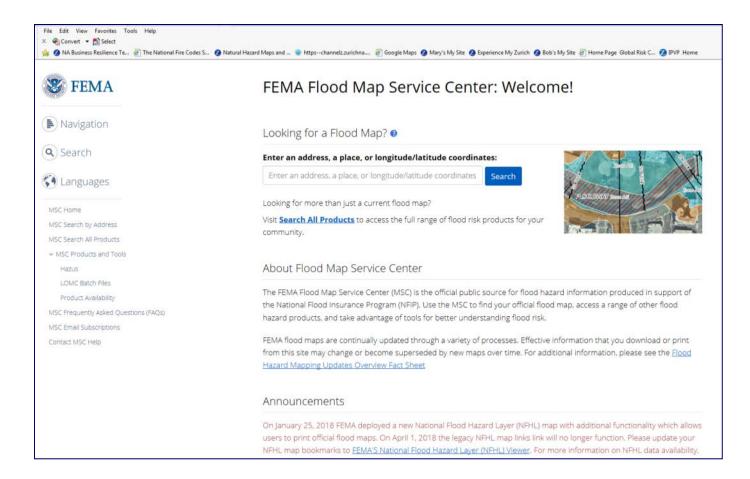


Image source: Zurich



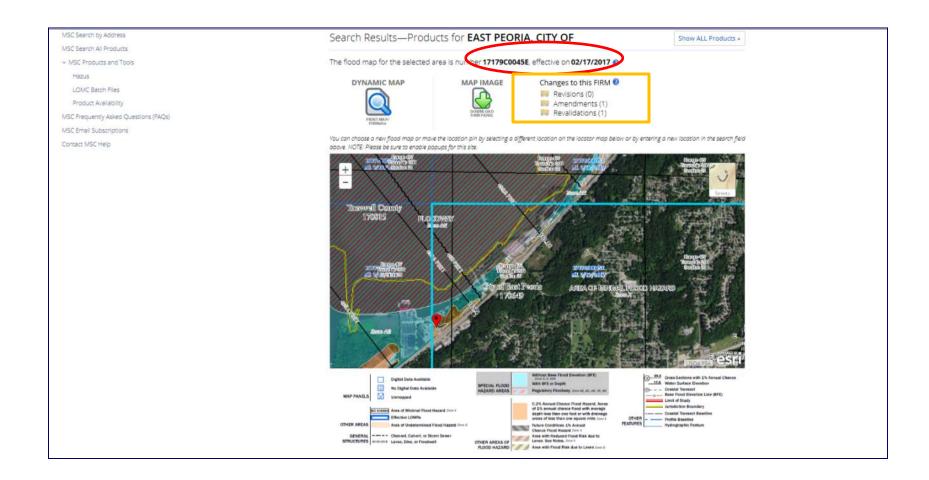
Flood Exposure Determination



https://msc.fema.gov/portal



Flood Exposure Determination





Plan Development

- Determine the best means to protect high value, important/critical buildings and infrastructure (flood walls, flood proofing, sandbags, etc.)
- Identify decisions required by higher levels of management may be needed to actuate certain activities (shut down of facilities or vulnerable processes.)
- Staffing should be allotted to complete the emergency actions on all shifts/days.
 - Determine time requirements for specific tasks.
 - Consider important holidays and vacation seasons
- Resources and supplies should be readily available or staged for the emergency response team members.
- Develop well thought out and developed "Triggers" for action steps.
 - Develop concise actions with assignment to specific individuals and teams.
 - Concise actions steps to help prevent water entry into buildings, relocate stock or important equipment.
 - Prioritize actions and efforts to protect the most important and most valuable operations, stock or equipment at your facility.



Plan Development

- Develop checklists and action items that can be printed off and used in the field
- Consideration should be developed for potential loss of power and denial of access in the affected area.
- Flash type flooding will likely have a short window of time for effective emergency response, so more staffing or more permanent and reliable mitigation modifications to the site or the building may be needed.
- Identify service providers to work with in recovery stages
- Formalize the plan in writing, dry-run the entire plan and provide regular training exercises for staff and equipment.



Plan Details and Operation

 Develop a tiered action plan for the FERP. Each level should be well developed and thought out as to the time frame and exposure that exists. Keep in mind time frames can change rapidly depending on threat development.



 At each level develop actions, steps and activities that must be taken and assign those to specific individuals and teams.



Watch

- Fill fuel tanks serving emergency generators and other vital services
- Verify dewatering pumps are in service and working
- Verify outside drains and catch basins are clean
- Verifying all fire protection systems are in service
- Inspect and ensure proper staging of emergency equipment in safe locations
- Discuss with staff the flood potential ensure proper staffing and equipment
- Dry run critical tasks
- Check in with local emergency services and any recovery companies
- Stay in contact with service providers on status and potential future needs



Warning

- Protect or relocate vital business records
- Remove all loose outdoor storage or equipment
- Anchor portable buildings or trailers to the ground
- Secure outdoor storage or equipment that cannot be moved
- Start the installation of manual protection systems such as flood gates
- Raise critical equipment off floor
- Move critical equipment from below grade areas
- Initiate an orderly shutdown of equipment and systems that rely upon normal power.
- Turn off fuel gas services.
- Turn off non-essential electrical systems.



Action

- Monitor systems installed to prevent flooding
- Ensure fueling is maintained for pumps/generators
- Monitor drains for proper flow and remove blockage
- Monitor interior of buildings for water seepage or leaks
- Ensure back flow prevention is operating and valves are closed where needed.
- Maintain Safety of Staff!!



Recovery

- Work with service providers to aid in cleaning and recovery
- Survey extent of damage and develop a strategic plan or priorities to restore the most important areas or processes first.
- Initiate clean-up operations when safe to do so
- Utilize additional personnel and specialized contractors and vendors to help speed the clean-up and recovery operations.
- Have all utilities checked by qualified personnel before use
- Contact utility companies to restore services
- Verifying all fire protection systems are in service



Off Season Activities

• Review:

- Review the plan and determine if there are any changes needed from past floods.
- Ensure proper staffing and training is provided
- Any additional buildings or infrastructure developed or planned
- Maintain and Inspect:
 - Inspect all flood control walls, exercise critical valves, inspect flood exposures and debris build-up.
 - Ensure replacement of consumable materials and replacement parts
 - Test all pumps ensure proper maintenance and fueling levels.

Test; Maintain/Inspect; Repeat!!



Pre-Season Activities

- 1. Test
- 2. Maintain/Inspect
- Repeat!!

Flood Emergency Response Program



Flood Monitoring

- Flooding can occur in any season but is normally a spring/summer event.
- Develop a method of obtaining Severe Storm, Water Levels and Flood Warnings:

General Severe Weather Monitoring Weather Underground:

https://www.wunderground.com/severe.asp

NOAA Storm Prediction Center:

General Information: http://www.spc.noaa.gov/

To Obtain Email Alerts: http://www.weather.gov/subscribe

This is an excellent resource with local state and national services to obtain weather alerts for storms and severe weather.

NOAA Weather Radio: http://www.nws.noaa.gov/nwr/

Accuweather: https://alert.accuweather.com/accualert/index

Flood Emergency Response Program



NOAA Weather Service River Forecasts

This service allows you to obtain information on many local rivers to determine if flood potential may develop.

By using this website you can create your own site for the river that is exposing your facility. You can save this data as a favorite on your browser which will allow you to monitor the river levels and at present but also to see predictions as to future river levels which will allow planning for potential flooding. The website allows you to create customized information to monitor upstream gage locations. Additional information also includes Flood Stage elevations, historic data, and information on Flood Impacts at specific water elevations.

http://water.weather.gov/ahps/forecasts.php

Flood Emergency Response Program



Ensure there is a reliable method of Receiving Flood Warnings

The National Weather Service provides data on many rivers and streams.

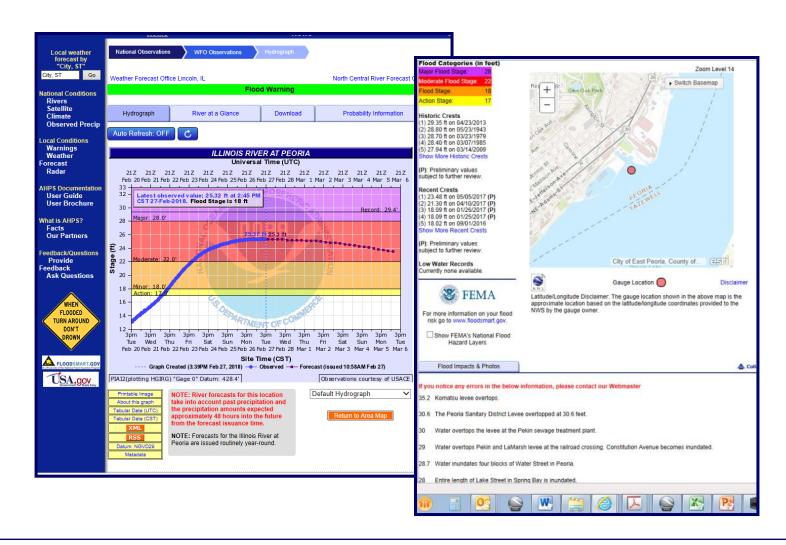
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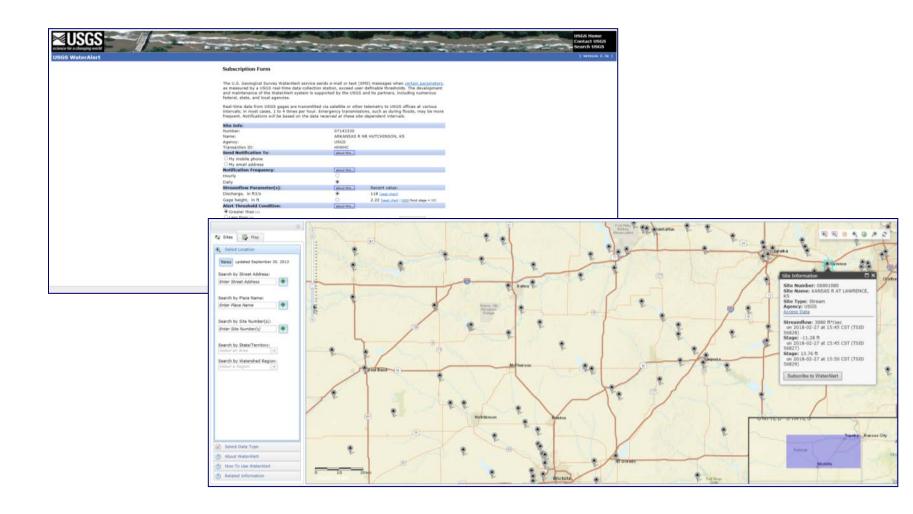
River Level Monitoring and Historical Data





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USGS Water Alert





Flood Proofing

- Dry flood-proofing Protection designed to mitigate flood hazards can be grouped into three categories:
 - Passive
 - Active
 - Manual
- Examples of passive protection include:
 - Grading
 - Berms
 - Fixed flood walls
 - Permanent physical barriers to direct water away
 - Automatic flood gates (hydrostatic)
 - Levees**
- Examples of active protection include:
 - Mechanical de-watering methods (e.g. sump pumps serving basement levels, truck docks, and similar low lying areas).
- Examples of manual protection include:
 - Flood gates/shields or flood barriers (set in place when heavy rain or storm is anticipated).
 - Sand bags
- Flood protection should be designed for the 500 year flood level plus 2 ft. of freeboard

Manual Flood Protection





Modular Panel (lift-out)



Bolt-on



Lift Out



Swinging (hinged)



Sliding



Thank you!!

Questions/Comments