3. FLOOD PREPAREDNESS

Figure 3.1 Flooding along Skagit River. (WA)

Flood fighting is an art, and can be extremely difficult to execute. There is no absolute method that one can apply to guarantee success. However, failure to react in a timely manner and apply proven flood fighting techniques greatly increases the risk of failure. Although each flood is unique, there are many common elements from one flood to the next, and plans and preparations will improve your response time and success.

Public sponsors of flood control works are responsible for project maintenance and flood fighting activities during high water events. To be ready for these tasks, sponsors are responsible for establishing flood fight plans, conducting training, stockpiling needed materials, and for other flood preparations. Disaster preparedness and flood fighting training are necessary for project inclusion in the U.S. Army Corps of Engineer's Rehabilitation and Inspection Program (RIP). This chapter outlines some basic preparedness activities that will help insure that your flood responses will be timely and effective.

3.1 Flood Fight Equipment and Supplies

Figure 3.2 *Sandbag storage in a levee pumping station. (OK)*

As the local project sponor, it is your responsibility to stockpile and maintain the necessary supplies and equipment needed to respond to typical high-water events. In a flood, the stockpiled materials will allow you to quickly provide an initial flood response while additional materials and equipment are being delivered. The specific requirement for supplies varies depending on the size of your FCW and on past flood events. The best way to determine the quantities that are needed is to look at the supplies that were needed during previous floods. For example, if you typically use 1,500 sandbags in a flood response, then you should maintain a stockpile of 1,500 sandbags in a secure location within the protected area.

a. Sandbags

As stated above, it's your responsibility to maintain an adequate supply of sandbags to allow you to respond to typical high-water events. Burlap sandbags have a limited shelf life (usually about 8 years if humidity is controlled) and should be inspected annually and replaced when necessary. The stockpile of sandbags should be stored in a dry, secure location that does not expose the sandbags to sunlight. Continued sunlight and weather will rapidly deteriorate the sandbag material.

b. Plastic Sheeting

There are many applications for plastic sheeting during flood fights. If it is one of the things that typically gets used in your community during a flood fight and there is any doubt about it's availability during an emergency, it should be stockpiled in preparation of an event. 6 mil polyethylene sheeting is the minimum thickness recommended for flood fighting applications.

c. Shovels/ Sandbag Filling Machines

If you've identified places that you know you're going to need a lot of sandbags, then you need to have a reliable method for filling them, and you may want to consider investing in some equipment that will let you do it more quickly. Some Corps districts own sandbag filling machines and can lend them out during emergencies. If these machines are needed, you should contact your State. Since the availability of these machines changes, your State may need to coordinate and prioritize these requests before passing them to the Corps. See Appendix D for details on sandbagging operations and other tools that have been used.

d. Emergency Lighting

Unfortunately, flood fight operations don't stop at night. It is strongly recommended that you plan ahead to find some emergency lighting which would be readily available for use during flood fights.

e. Communications System

A reliable communication system is extremely important for coordinating flood fighting efforts and for calling for assistance when needed. Cell phones work very well but are limited in their capacity for communicating with multiple people at one time, which can be important during emergencies. You may also experience dead spots or non-availability of service if the phone traffic is very heavy. Because of these problems, two-way radios are preferable because they are extremely reliable for short distances and have the capability to broadcast to several people at once. Without a reliable communication system, any flood fighting effort will be much more difficult and will probably require additional man power.

f. Riprap for Erosion

It is recommended that you develop plans to address erosion that may occur during a flood emergency. It might not always be necessary to stockpile riprap, but you should at least know the location and emergency telephone numbers of local quarries capable of supplying riprap if it's needed. Some levee districts choose to keep a supply of gravel on hand, so they can maintain the levee access routes during an emergency.

g. Floatation Vests.

The safety of workers and volunteers should always be the highest priority during a flood fight. Floatation coats or vests (PFD) are recommended and should be worn at all times when working near the riverward crest of the levee, on the riverward side slope, or near fast moving water. Floodwaters can quickly sweep a person downstream, and hypothermia can set in quickly in cold water conditions.

h. Pumps

Like sandbags, pumps are also a critical part of any flood fighting effort. Pumps are used to control interior drainage and seepage through the levee. Those communities that experience frequent flooding should consider purchasing one or more high capacity pumps. If additional pumps are needed during a flood fight, you should contact your State, because your local Corps district office may have pumps available, but your State may need to coordinate and prioritize these requests before passing them to the Corps.

Figure 3.3 *Portable pumps supplied by the Corps of Engineers during an emergency.*

i. Sources of Borrow Material

Sources of borrow material should be located prior to a flood event. Several borrow areas should be identified in advance, because wet or sloppy weather could unexpectedly limit access to some sites. Carefully consider the access points to your levee when you choose the sites for the borrow material.

3.2 Plans

It is a local sponsor's responsibility to develop and maintain a minimal level of written plans, and to keep those plans up to date. The extent of the plans depends on the specific FCW. Large systems with multiple pumps and drains would require more detailed plans than smaller systems. Documented plans ensure that the information needed to address known problem areas will be available during a flood, even if the main supervisor is unavailable. As a minimum, every sponsor should maintain at least an organizational chart or roster, and lists or maps of important project features. Additional planning is also recommended, and some guidance is presented to help you develop these plans.

As you read through this section, you'll see that there's a large amount of planning that can be done in advance of a flood. While it would clearly take a substantial amount of time to collect and update all of the information described, don't be discouraged and assume that this planning is too big of a chore to ever begin. Instead, try to prioritize the work, remembering that every piece of information you assemble and every decision you can make before an actual flood will potentially make your response that much more effective during a real emergency.

a. Organizational Chart / Roster

You need to keep an updated list of project supervisors, inspectors, and other personnel, including their detailed contact information. The list should clearly indicate which people would be contacted during a flood emergency.

Additionally, it's strongly recommended that you compile a directory including telephone numbers for your Corps district's Emergency Operation Center, local contractors, flood fight supply and equipment vendors, the Red Cross, Salvation Army, hospitals, railroad/ highway departments, the police and fire departments, local and state Emergency Operations Centers, and other critical numbers.

b. List of Important Project Features

As a minimum requirement for planning, you need to develop and maintain either a bullet-point list or annotated map that describes each project feature and areas of concern during a flood event. The list should clearly note things such as:

- Low areas
- Areas subject to boils
- Areas of known seepage
- Areas of recent rodent activity
- Alternate access points to the levee (should one become impassible)
- Locations of drains that should be checked for closure
- Available sources and locations of sandbags, pumps and other supplies

Along with this information, you should develop and maintain a detailed table of all of the locations of project features that may need to be closed, such as

- Floodgates
- Flap gates
- Other closures

In this table, you should indicate the river level or other indicator that would signal that each of these project features needs to be closed. Remember that the highway or railroad departments need to be contacted prior to closing roads or railroad tracks running through levees and floodwalls.

c. Flood Response Plan

It is strongly recommended that you supplement the previously mentioned rosters and lists of project features with a site specific flood response plan. This plan does not have to be long and shouldn't be wordy, but should outline the things that need to be done during a flood fight, and indicate when they need to be done. Ideally, it would also delegate responsibilities for the tasks, and this information would be updated as necessary to account for changes in personnel. Your plan should identify necessary information such as potential assembly or staging areas for flood fights, and the location of earth borrow sites, and should address procedures for maintaining records of equipment, manpower, and supplies used during a flood fight. The records are key items for obtaining assistance for flood and post flood activities. Flood fighting plans should acknowledge that it may not be feasible to protect entire communities, based on economic or time and equipment considerations; therefore, evacuation of certain areas may be a necessary fact of an emergency operation. There should be a plan of evacuation for all areas lying in the flood plain, in case the need develops. See the following chapter of this manual for additional information on flood response plans.

d. Short Term Planning Elements

In addition to your long-term planning, it is your responsibility to have an understanding of the FCW and the ability to address any short term situations that may arise during the life of the project. For example, if a culvert that runs through a levee is being replaced, then you need a plan for what to do in case there's a flood during the construction, when the levee integrity is lacking.

e. Continued Plan Management

Your flood response plan should be reviewed annually and after each event where flood levels reach half of the levee or wall height, or where an unusual or unexpected incident has occurred.

Annual plan updates should include verification that sources of emergency equipment, contact names and telephone numbers are current, review of evacuation routes and emergency shelter locations.

After a flood or flood exercise, closely examine the events and actions taken to determine whether they were effective and efficient. Because floods may occur decades apart, it's important that information be recorded for use in future planning efforts. Debriefing sessions, with all participants represented, provide valuable feedback on the lessons learned. Note which actions worked well, and identify the reason for their success. Note which actions could be improved upon, and solicit suggestions to correct the problems. Collect data on the response effort, such as necessary materials, equipment, man-hour estimates, weather reports, and monitoring reports. Compare the planned responses with the actions taken, and incorporate the information learned into the plan.

Updated information should be forwarded to the Corps and to your local and state Emergency Operations Center.

3.3 Training and Exercises.

As the public sponsor, you are responsible for training personnel to operate, maintain, and patrol your FCW. The Corps encourages you to hold training or flood control exercises at least once a year. There are many reasons to hold these exercises. First, they show new personnel how to do things like operate the closure structures, respond to sandboils and patrol the FCW during a flood. Second, none of the plans you've developed for a flood response are any good unless they're practiced and communicated to those who need them. Training exercises also let you know how much time and manpower is necessary to complete certain tasks. Important practical considerations and physical limitations that could be easily overlooked in a plan become clearly exposed during an actual exercise.

At a minimum, these exercises should include:

- Physical operation of project features such as sluice gates, pumping stations, and closure structures
- Notification of emergency response personnel
- Testing communications/ backup communications system
- Mobilization of monitoring teams, and monitoring project features
- Basic flood fight techniques, such as how to ring a sandboil
- Coordination and control (between volunteers, patrols, operators, nearby levee districts, the highway department, the state Emergency Operations Center, the Corps, etc.)
- Dissemination of information to the public

The exercises can also be more elaborate, to include other emergencies that may take place during a flood such as car accidents or gas spills occurring when interior streets are flooded or evacuation routes are flooded. The exercises should be tailored to your community. Representatives from agencies or organizations that would actually be called upon, such as medical personnel, public works, and the mayor's office might be involved in planning more complex exercises. You are encouraged to involve the local and state Emergency Operations Center in these events, and your local Corps district can also provide technical assistance for training and exercises as needed.

Documentation of the exercise is important to identify where any shortfalls exist in planning and coordination, training, personnel, equipment, and facilities. Debriefing sessions held with all participants can provide valuable feedback on the effectiveness of policies and procedures, identification of areas of improvement and suggestions to correct deficiencies. Lessons learned during the exercise should be incorporated into the project operations plan and local emergency operations plan.

3.4 Relations with Local and State Partners

There are usually many ways that your county and state can assist you during a flood. For example, states may provide trucks, tractors, radios, helicopters for emergency inspections, support from the National Guard, or financial assistance. If you run out of supplies needed for a flood fight, you should try to find the needed supplies at the local and state level, before requesting this aid from the federal government. The Corps expects counties and states to be involved with the levee districts, and provides support only when state resources are being fully utilized. For these reasons, you are strongly encouraged to maintain relations with the Emergency Managers at your local and state Emergency Operations Center and to contact them at least once annually, well in advance of a flood. You should keep them informed on the condition of your project, and send them ongoing situation reports during a flood response. It's very important that you know what kinds of support the state can provide, and that you know who to call in order to get the support you need.