CHAPTER 7 – DRY FLOODPROOFING

7.1 Introduction

A dry floodproofed structure is made watertight below the level that needs flood protection to prevent floodwaters from entering. Making the structure watertight requires sealing the walls with waterproof coatings, impermeable membranes, or a supplemental layer of masonry or concrete (Figure 7-1).

CAUTION

Dry floodproofing may not be used to bring a substantially damaged or substantially improved residential structure into compliance with the community's floodplain management ordinance or law.

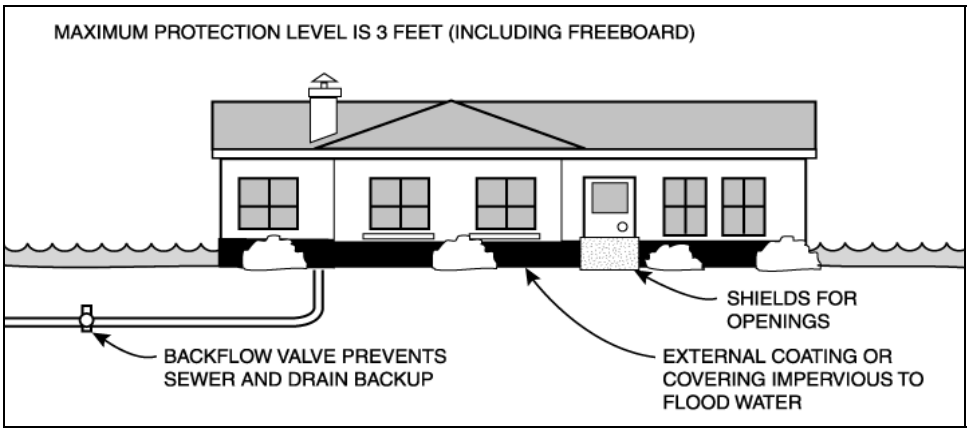

Figure 7-1. A typical dry floodproofed structure

(Source: FEMA 312)

Table 7-1 includes a summary of advantages and disadvantages for using dry floodproofing as a mitigation measure.

Table 7-1. Considerations for Using Dry Floodproofing

Advantages	Disadvantages
▪ Dry floodproofing is less costly than other retrofitting methods. ▪ Does not require the additional land that may be needed for levees and floodwalls. ▪ May be fundable under FEMA mitigation grant programs.	▪ May not be used to bring a substantially damaged or substantially improved residential structure into compliance with the community's floodplain management ordinance or law. ▪ Dry floodproofing requires human intervention and adequate warning to install protective measures. ▪ Does not minimize the potential damage from high-velocity flood flow and wave action. ▪ Ongoing maintenance is required. ▪ Flood shields may not be aesthetically pleasing.

Dry floodproofing a structure includes the following:

- Using waterproof membranes or other sealants to prevent water from entering the structure through the walls
- Installing watertight shields over windows and doors
- Installing measures to prevent sewer backup

7.1.1 Waterproof Membranes

Installing heavy plastic sheeting or waterproof membrane along a wall's exterior surface is an effective means of waterproofing (Figure 7-2). The waterproof membrane can be installed relatively quickly; however, it does require human intervention. The membrane is unsightly and cannot remain in place indefinitely. Furthermore, the plastic will deteriorate with continued exposure to solar radiation.

Figure 7-2. Photograph of membrane providing flood protection

(Source: U.S. Army Corps of Engineers)

7.1.2 Closures

In conjunction with a waterproof membrane, openings in the walls need to be closed, either with temporary closures or permanently sealed shut (Figure 7-3).

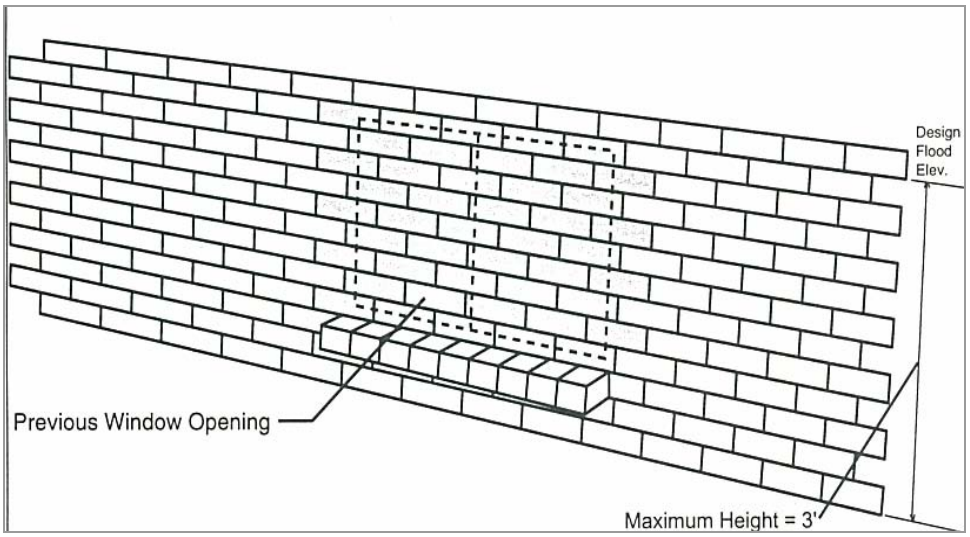

Figure 7-3. Permanently sealed opening

(Source: FEMA 259)

Low window openings at ground level can either have a pre-sized closure fitted over their surface or have a low wall constructed around the opening to a height above the flood protection elevation (Figure 7-4).

Figure 7-4. Low wall construction

Various closure systems can be manufactured to fit the individual openings, providing a way for it to be quickly closed and have a watertight seal. These types of closures can either be stored in a readily accessible location or permanently remain in place. Many of these closures have rubberized seals and other components that will require periodic care and maintenance (Figure 7-5).

Figure 7-5. Small patio gate

(Source: W.A. Wilson Consulting Services)

7.1.3 Sewer Backup Protection

Backup of sanitary sewers into a structure is a major concern due to the health hazards. Even after floodwaters have receded, contents and belongings that have been exposed to sewage are severely contaminated and can be nearly impossible to clean. The five main approaches to protect a structure against sewer backup are floor drain plugs, floor drain standpipes, overhead sewers, backup valves, and grinder pumps. For a detailed discussion of sewer backup protection, see FEMA 511, *Reducing Damage from Localized Flooding,* Chapter 10 (pages 10-9 to 10-11) and FEMA 259, *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures,* Section VI-D.

7.2 Technical Considerations

The flood characteristics that affect the success of dry floodproofing are flood depth, flood duration, flow velocity, amount of warning time, and floodborne debris.

7.2.1 Flood Depth

The depth of the floodwaters affects the hydrostatic pressure that is exerted on walls and floors. Because water is prevented from entering a dry floodproofed structure, the exterior pressure on walls and floors is not counteracted from the opposite side as it is in a wet floodproofed structure. The ability of walls to withstand the hydrostatic pressures depends partly on how the walls are constructed:

- Typical masonry and masonry veneer walls, without reinforcement, can usually withstand the pressure exerted by water up to about 3 feet deep.
- In flood depths exceeding 3 feet, unreinforced masonry and masonry veneer walls are much more likely to crack or collapse. An advantage of masonry and masonry veneer

walls is that their exterior surfaces are resistant to damage by moisture and can be made watertight relatively easily with sealants.

- Typical frame walls are likely to fail at lower flood depths, are more difficult to make watertight, and are more vulnerable to damage from moisture.

7.2.2 Structures with Basements

If a structure has a basement, the walls and floors must be specifically designed to resist hydrostatic pressure. Otherwise the risks associated with dry floodproofing a basement are high. Figure 7-6 illustrates how hydrostatic pressure operates on a structure during a flood. Structure "a" has no basement and the forces acting upon the structure are relatively small. However, for structure "b," the forces are significantly greater due to the presence of a basement.

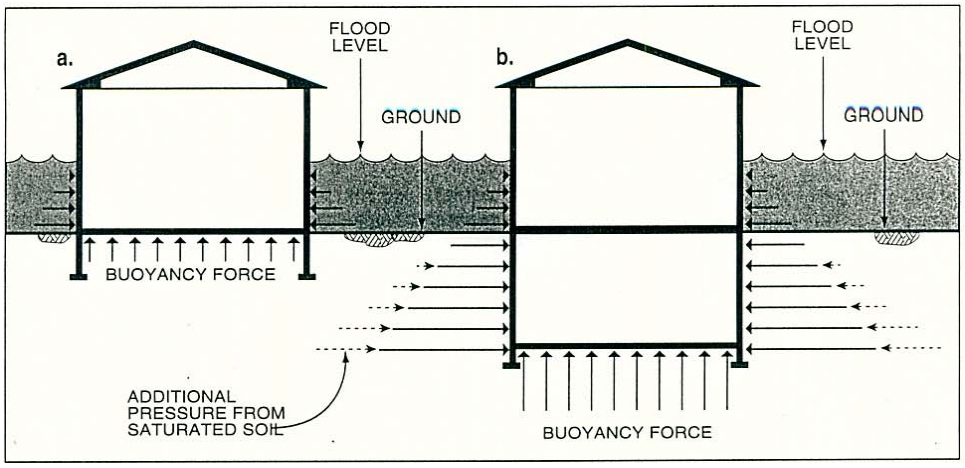

Figure 7-6. Hydrostatic pressures on a structure

(Source: FEMA 312)

7.2.3 Flood Duration

The longer a structure is exposed to floodwaters, the more likely it is that structural systems and floodproofing measures will begin to leak or fail. Most sealing systems will begin to allow some amount of seepage after prolonged periods of exposure to water. If the structure is in an area where high floodwaters can remain for days, a different retrofitting method should be used.

7.2.4 Flow Velocity

A seemingly "low" flow velocity of 1 or 2 feet per second can exert tremendous forces on a structure with only a few feet of flooding. Structures can be easily moved off of their foundations, which results in the total loss of the structure. Walls are easily damaged and subject to collapse by moving water.

7.2.5 Warning Time

Since dry floodproofing is often best suited for flooding conditions that last for a relatively short period of time, warning time and the time it takes to deploy the various components of a dry floodproofing system must be considered. Streams that are at flood levels for a short period of time generally reach flood levels quickly, thus the warning and preparation time is limited.

Incorporating any type of flood warning system into the project design will enhance its ability to perform properly.

7.2.6 Floodborne Debris

The impact forces from debris in the moving water, such as trees, can compound the hydrodynamic forces of the moving floodwaters.

7.3 Relative Costs

The relative cost ranking is based on the combination of the estimated costs for the dry floodproofing project and a determination of cost-effectiveness.

7.3.1 Estimated Cost

Dry floodproofing a structure is generally an inexpensive mitigation measure. The costs for dry floodproofing a structure will depend on the following factors: the size of the structure, the height of the Flood Protection Elevation (FPE), types of sealant and shield materials used, number of plumbing lines that have to be protected by check valves, and number of openings that have to be covered by shields.

Examples of cost estimating items that may need to be considered include the following:

- Analysis to determine the effective dry floodproofing method and design of the dry floodproofing method
- Dry floodproofing method selected, including:
    - Watertight shields for doors and windows
    - Reinforcing walls to withstand floodwater pressures and impact forces generated by floating debris
    - Drainage collection systems and sump pumps to control the interior water level, collect seepage, and reduce hydrostatic pressure on slab and walls
    - Membranes and/or other sealants to reduce seepage of floodwater through walls and wall penetrations
    - Anchoring the structure to resist flotation, collapse, and lateral movement
- Construction

To estimate the relative cost of a dry floodproofing project, examples of general cost estimates have been provided below and are included in FEMA 312, *Homeowner's Guide to Retrofitting: Six Ways To Protect Your House From Flooding* and FEMA 259, *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*.

The figures in Table 7-2 are example cost estimate numbers used in a study for the St. Louis Metropolitan Sewer District. These numbers were generated using the U.S. Army Corps of

Engineers' publication, *Flood Proofing - How to Evaluate Your Options,* and updated to 2002 and adjusted for the St. Louis area. It is important to note that the cost estimate numbers are location and time dependent.

Table 7-2. General Estimates of the Unit Costs for Typical Dry Floodproofing Projects

Dry Floodproofing	
Waterproofing a concrete block or brick-faced wall by applying a polyethylene sheet or other impervious material and covering with a facing material such as brick.	$3.50/square foot
Acrylic latex wall coating	$3.00/ square foot
Caulking/sealant − a high performance electrometric "urethane" sealant is recommended.	$2.50/linear foot
Bentonite grout (below grade waterproofing, 6 feet deep)	$20/linear foot

Appendix C, Cost Estimating, provides guidance and references for conducting a more detailed cost estimate. Additional cost estimates can be obtained from R.S. Means' *Contractor's Pricing Guide*. A blank preliminary cost estimating worksheet (Worksheet D) is provided in Appendix B.

7.3.2 Determination of Cost-Effectiveness

A component of the relative cost scoring is to include a determination of cost-effectiveness. Table D-1 in Appendix D, Determining Cost-Effectiveness, provides a quick screening for the cost-effectiveness of a project. The attributes included in the table are frequency of flood, level of damage, project cost, project benefits, and criticality (impact or loss of function). For example, if the frequency is the 10-year flood, the project will have a very high likelihood of cost-effectiveness.

Based on the combination of the estimated cost of the project and the likelihood of cost-effectiveness, a relative cost ranking will be assigned on Worksheet B, Appropriate Mitigation Measures. If the likelihood of cost-effectiveness is low, the ranking of relative cost will be either moderate or high, based on the estimated cost of the project. However, if the estimated cost is low and the likelihood of cost-effectiveness is very high or high, the relative cost ranking will be low.

7.4 Additional Considerations

Most floodproofing projects use more than one technique; this is especially true in dry floodproofing. A good dry floodproofing project can be enhanced through the use of small flood barriers or modifications to the structure's foundation drainage system. The small flood barriers will move the floodwaters away from the structure, thereby reducing the forces exerted on the subsurface portions of the structure. Additional considerations for using dry floodproofing are human intervention, annual maintenance, non-residential buildings, and structures without basements.

7.4.1 Human Intervention

Property owners must be able to install all flood shields and physically perform the activities required for the successful operation of the dry floodproofing system before floodwaters arrive.

7.4.2 Annual Maintenance

The components must be inspected and maintained on a regular basis. Because dry floodproofing has window and door closures as part of the system, closures must be available and in good condition. Some considerations to facilitate a successful maintenance schedule are as follows:

- Develop an inventory and location list of all flood shields and closures.
- Develop an inspection plan to ensure flood shields and closures fit properly.
- Check walls, floors, and floodproof coatings for cracks and potential leaks.

7.5 Available Resources

FEMA 259. *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*. See Chapters VI-D, Dry Floodproofing.

FEMA 312. *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding.* See Chapter 3, An Overview of the Retrofitting Methods and Chapter 7, Other Methods – Dry Floodproofing.

FEMA 511. *Reducing Damage from Localized Flooding*. See Chapter 10, Retrofitting.

The Louisiana State University (LSU) Extension Center website (http://www.louisianafloods.org) lists many retrofitting publications, provides advice on floodproofing methods, and flood insurance and links to online shopping for retrofitting products and contractors.

R.S. Means *Contractor's Pricing Guide.*

USACE. *Flood Proofing - How to Evaluate Your Options.*

Based on the combination of the estimated cost of the project and the likelihood of cost-effectiveness, a relative cost ranking will be assigned on Worksheet B, Appropriate Mitigation Measures. If the likelihood of cost-effectiveness is low, the ranking of relative cost will be either moderate or high, based on the estimated cost of the project. However, if the estimated cost is low and the likelihood of cost-effectiveness is very high or high, the relative cost ranking will be low.

8.4 Additional Considerations

8.4.1 Substantial Damage/Improvement

If the structure being elevated has been substantially damaged or is being substantially improved, the local floodplain management ordinance or law will generally restrict the structure from having a basement (as defined under the NFIP) if the structure is located within the mapped 100-year floodplain. For areas removed from the SFHA by the placement of fill, see FEMA Technical Bulletin 10-01, *Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe from Flooding*.

The NFIP regulations define a basement as "any area of the building having its floor sub-grade on all sides." If the structure has a basement, it must be filled in as part of any elevation project. The NFIP definition of basement does not include what is typically referred to as a "walkout-on-grade" basement, whose floor would be at or above grade on at least one side. Additional information on substantial damage requirements is included in FEMA 213, *Answers to Questions About Substantially Damaged Buildings.*

FEMA Technical Bulletin 11-01, *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas,* provides guidance on crawlspace construction and supports a policy decision to permit crawlspaces to be built up to 2 feet below the lowest adjacent exterior grade (LAG), provided that other considerations are met. Previously, these below grade crawlspaces were considered basements under NFIP regulations.

8.4.2 Access to the Structure by the Lifting Crew

Elevating a structure requires specialized heavy equipment and materials, ranging from large front-end loaders to long steel beams. Therefore, there must be enough room on the site from obstructions such as trees, adjacent structures, and utilities. The proximity of adjacent neighbors may also require obtaining agreements or temporary easements from them. Any repairs from damage to their property must be covered in a pre-construction agreement and completed promptly. The *Flood Risk and Mitigation Possibilities* tab in NT provides a check box to indicate whether adequate clearance exists at the site (Figure 8-5).

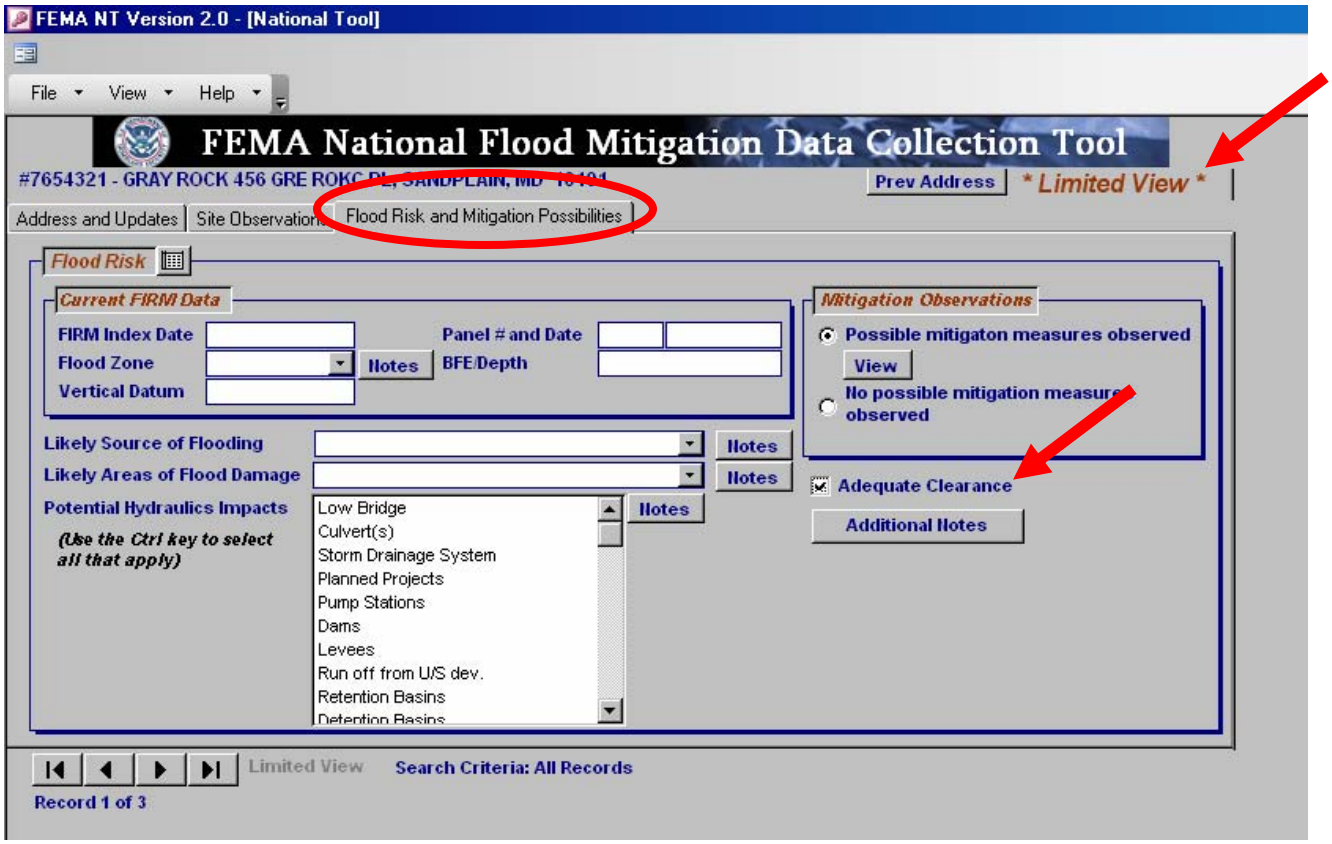

Figure 8-5. ***Flood Risk and Mitigation Possibilities*** **tab - Adequate Clearance**

8.4.3 Access to the Structure Following Elevation

An elevated structure is harder to access due to the height. If the structure is a residence, the age and physical condition of the occupants must be taken into consideration. Ramps, stairs and elevators can been used for entryways on many elevated residences (Figure 8-6). Refer to the Americans with Disabilities Act (ADA) and FEMA Technical Bulletin 4-93, *Elevator Installation for Buildings Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program*, for additional information.

Figure 8-6. Elevator provides access to elevated structure

8.4.4 Codes and Ordinances

The local building code and the community's floodplain ordinance must be followed. The *Additional Site Information* tab should list any pertinent regulatory requirements or standards (Figure 8-7):

- Floodplain location requirements
- Local and state permits
- Design wind speeds and seismic loadings
- Snow loads
- Frost depths
- Height restrictions
- Restrictions on size or types of foundations
- Lowest floor requirements
- Heat duct elevation requirements
- Foundation venting requirements
- ADA requirements

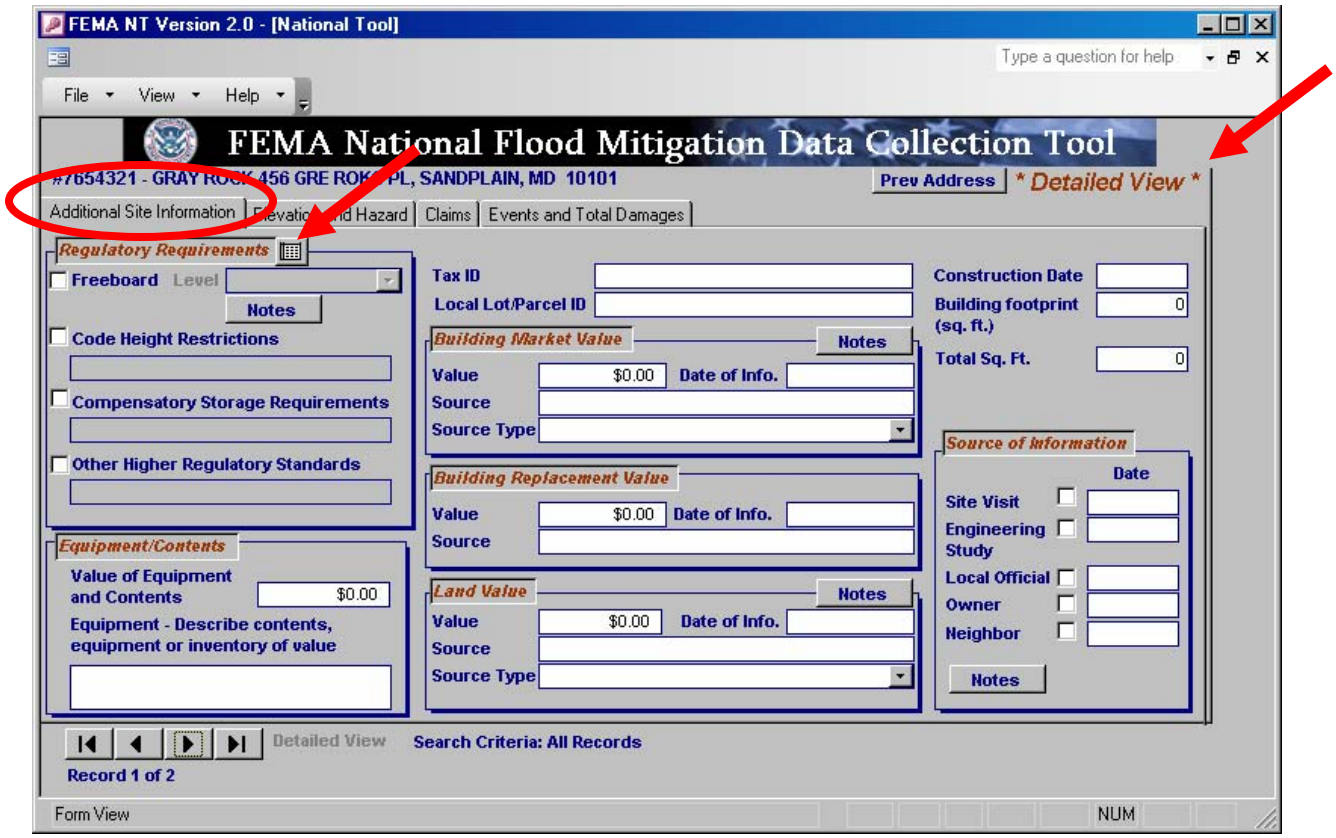

Figure 8-7. ***Additional Site Information*** **tab - Regulatory Requirements**

8.4.5 Historic Preservation

Structures placed on or designated as eligible for the National Register of Historic Buildings have historic value to the nation and are protected by legislation. As such, structural modifications to them, even for the purpose of protecting them from flooding, may be limted or not allowed. This is particularly true for changes that affect the exterior of the structure. Many communities have local historic preservation commissions and State Historic Preservation Officers (SHPOs) that can identify historic buildings and historic districts or neighborhoods (see Appendix G for a list of SHPOs).

8.4.6 Housing of Occupants

During the elevation process, the occupants of a residential structure will need to be temporarily relocated. Most elevation projects will result in the residents being relocated for 1 to 3 months.

8.4.7 Aesthetics

The visual aspect of an elevated structure is vitally important to both the property owner and the neighborhood, especially for residential structures. If the proposed project is perceived to be an "eyesore," it can be difficult to convince the property owners to proceed with the project, despite being protected from flooding. Additionally, a neighborhood eyesore can lead to criticism of the project itself and possible non-participation in future mitigation initiatives. Small cosmetic changes can greatly improve the looks of an elevated structure, such as:

- Landscaping and shrubbery
- Fill placed along the foundation wall, giving the appearance of the structure being located on a small knoll
- Extending siding down over the foundation walls

Figures 8-8 and 8-9 illustrate the contrast between a structure without cosmetic improvements and a structure with improvements.

Figure 8-8. House elevated 8 feet, but lacking landscaping, producing a stark look

Figure 8-9. House elevated over 5 feet with retaining wall, porch, and landscaping

8.5 Available Resources

FEMA 85. *Manufactured Homes in Flood Hazard Areas: A Multi-Hazard Foundation and Installation Guide*. See Chapter 8, Methods for Mitigating Flood Hazards 8.1 Elevation

FEMA 213. *Answers to Questions About Substantially Damaged Buildings*.

FEMA 259. Engineering Principles and Practices of Retrofitting Floodprone Residential Structures. See Chapter VI-E, Elevation.

FEMA 301, *NFIP's Increased Cost of Compliance Coverage Guidance for State and Local Officials.*

FEMA 312. *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding.* See Chapter 3, An Overview of the Retrofitting Methods and Chapter 5, Elevating Your House.

FEMA 347. *Above the Flood: Elevating Your Floodprone House*.

FEMA 348. *Protecting Building Utilities from Flood Damage*. See Chapter 4, Existing Buildings.

FEMA 511. *Reducing Damage from Localized Flooding*. See Chapter 10, Retrofitting.

FEMA Technical Bulletin 1-93. *Openings in Foundation Walls for Buildings Located in Special Flood Hazard Areas*.

FEMA Technical Bulletin 4-93. *Elevator Installation for Buildings Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program.*

FEMA Technical Bulletin 10-01 *Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe from Flooding.*

FEMA Technical Bulletin 11-01. *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas: National Flood Insurance Program Interim Guidance*.

The Louisiana State University (LSU) Extension Center website (http://www.louisianafloods.org) lists many retrofitting publications, provides advice on floodproofing methods and flood insurance, and links to online shopping for retrofitting products and contractors.

USACE. *Flood Proofing - How to Evaluate Your Options.*

USACE. *Raising and Moving the Slab-on-Grade House with Slab Attached.*

R.S. Means'. *Contractor's Pricing Guide*.

CHAPTER 9 – RELOCATION

9.1 Introduction

Relocation involves lifting and placing a structure on a wheeled vehicle to transport it to the new site outside the SFHA (Figure 9-1). This method is one of the most effective mitigation measures. If space permits, it may be possible to move the structure to another location on the same piece of property.

Figure 9-1. Structure placed on a wheeled vehicle for relocation to a new site

Relocation is most appropriate in areas where the flood conditions are characterized by one or more of the following:

- Deep water
- Short warning time (flash flooding)
- High flow velocity
- Wave action
- Significant quantity of debris in floodwaters

Table 9-1 includes a summary of advantages and disadvantages for using relocation as a mitigation measure.

Table 9-1. Considerations for Using Relocation

Advantages	Disadvantages
▪ Removes flood problem since the structure is relocated out of the floodprone area. ▪ Allows a substantially damaged or substantially improved structure to be brought into compliance with a community's floodplain management ordinance. ▪ May be fundable under FEMA mitigation grant programs.	▪ Cost may be prohibitive. ▪ Additional costs are likely if the structure must be brought into compliance with current code requirements for plumbing, electrical, and energy systems.

For a detailed discussion of the relocation process, see FEMA 312, *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding*, Chapter 7 or FEMA 259, *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*, Chapter VI-R. Additional references are included in Section 9.5, Available Resources.

9.2 Technical Considerations

Technical considerations for a relocation project include structure type, condition, and size.

9.2.1 Structure Type

Structures that are easiest to elevate, such as a single-story wood-frame structure over a crawlspace or basement foundation with a simple rectangular shape, are also the easiest to relocate. Concrete, masonry, or brick faced structures require special attention to ensure that the structure is not damaged during the process. For a structure with wood-frame construction, with a brick veneer, the brick could be removed and then reapplied once the relocation process is complete.

9.2.2 Structure Condition

Structures best suited for relocation are those in good condition. All structural members and their connections must be able to withstand the stresses imposed when the structure is lifted and moved. A structure that is in poor condition, especially one that has been damaged by repeated or severe flooding, may need so much structural repair and bracing that relocation would not be practical.

Prior to beginning, a thorough analysis of both the existing site and structure and the new site must be made. The examination of the structure should be done by a licensed structural engineer, with particular attention given to the building's floor support system (i.e., joists, plates, and flooring) to ensure that it will remain intact. If these components are not in good structural condition, the structure may not be a good candidate for relocation.

9.2.3 Structure Size

Large rambling structures, buildings constructed of extremely heavy materials, and multi-story structures require special attention before they are relocated.

9.3 Relative Costs

The relative cost ranking is based on the combination of the estimated costs for the relocation project and a determination of cost-effectiveness.

9.3.1 Estimated Cost

Relocation is a relatively expensive mitigation measure. In order to determine the estimated cost of a relocation project, contact one or more house movers. Provide basic data on the structure, such as wall and foundation type and size, and information on the distance to the new site. The movers should be able to provide a general cost estimate.

Examples of cost estimating items that may need to be considered include the following:

- Analysis of existing site and structure
- Site selection and analysis and design of the new location (i.e., adequacy of the new location for the structure, utility connections, permits, etc.)
- Analysis and preparation of the moving route, including items such as the width of the road, obtaining approval and permits, and route preparation
- Preparation of the structure prior to the move, such as disconnecting utilities, preparing the structure for the lift, and separating the structure from its foundation
- Moving the structure to the new location
- Preparation of the new site
- Construction of the foundation at the new location
- Connection of the structure to the new foundation
- Restoration of the old site

To estimate the relative cost of a relocation project, examples of general cost estimates are included in FEMA 312, *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding* and FEMA 259, *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*.

Appendix C, Cost Estimating, provides guidance and references for conducting a more detailed cost estimate. Additional cost estimates can be obtained from R.S. Means' *Contractor's Pricing Guide*. A blank preliminary cost estimating worksheet (Worksheet D) is provided in Appendix B.

9.3.2 Determination of Cost-Effectiveness

A component of the relative cost scoring is to include a determination of cost-effectiveness. Table D-1 in Appendix D, Determining Cost-Effectiveness, provides a quick screening for the cost-effectiveness of a project. The attributes included in the table are frequency of flood, level of damage, project cost, project benefits, and criticality (impact or loss of function). For example, if the frequency is the 10-year flood, the project will have a very high likelihood of cost-effectiveness.

Based on the combination of the estimated cost of the project and the likelihood of cost-effectiveness, a relative cost ranking will be assigned on Worksheet B, Appropriate Mitigation Measures. If the likelihood of cost-effectiveness is low, the ranking of relative cost will be either moderate or high, based on the estimated cost of the project. However, if the estimated cost is low and the likelihood of cost-effectiveness is very high or high, the relative cost ranking will be low.

9.4 Additional Considerations

9.4.1 Annual Maintenance

The ownership of the original site may be transferred to the local community, which then has the maintenance and security responsibilities associated with the vacated site. If several relocation projects are undertaken within the same community, the result may create an undesirable patchwork of empty lots for the community to maintain.

9.4.2 Moving a Structure Between the Old and New Sites

Analysis and preparation of the moving route is accomplished by the contractor. Permits for a move and the new site will likely be required from the local government. If the move entails more than one community, a moving permit from each community will be required. On the day of the move, any obstructions need to be temporarily removed or positioned out of the way: power lines are either disconnected or simply lifted above the moving structure; fire hydrants close to the street may need to be disconnected and temporarily removed; and roads checked for possible obstructions to the passage of the structure. Narrow roads, restrictive load capacities on roads and bridges, and low clearances under bridges and power lines can make it necessary to find an alternative route. When no practical alternatives are available, the moving contractor may have to cut the structure into sections, move them separately, and reassemble the structure at the new site.

9.4.3 Access to Site

The Adequate Clearance box in the *Flood Risk and Mitigation Possibilities* tab in NT indicates whether there is sufficient clearance to permit equipment access to the site (Figure 9-2). The box should be checked if the structure is clear by approximately 20 feet on each side.

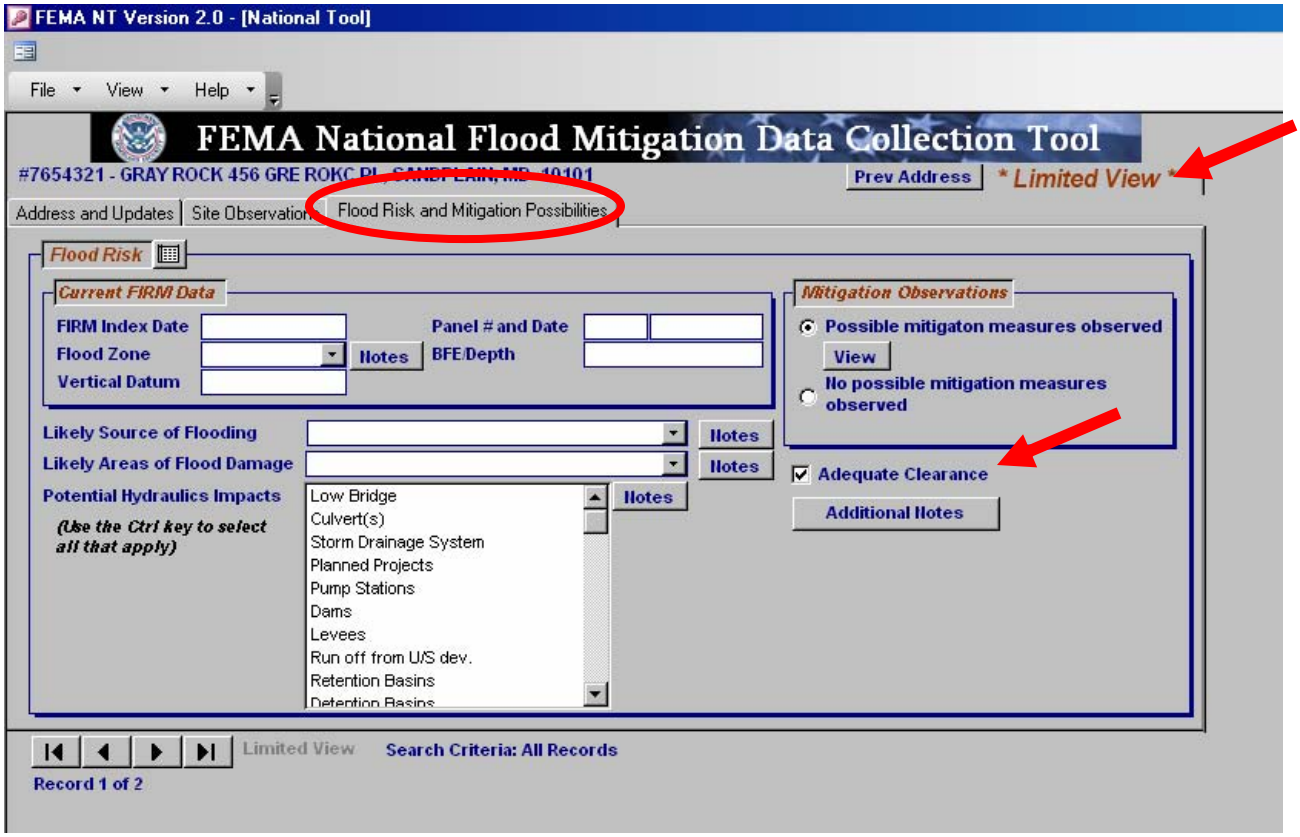

Figure 9-2. ***Flood Risk and Mitigation Possibilities*** **tab - Adequate Clearance**

9.4.4 Housing of Occupants

Relocation is a disruptive mitigation method for the occupants of the structure. Before the structure can be lifted, all utility systems must be disconnected. The structure becomes uninhabitable at this point, and the property owner will not be able to move back in until the structure has been placed at the new site and all utility systems have been reconnected. Until then, the property owner will need to find temporary lodging and a place to store furniture and other belongings.

9.5 Available Resources

FEMA 85. *Manufactured Homes in Flood Hazard Areas: A Multi-Hazard Foundation and Installation Guide*. See Chapter 8, Methods for Mitigating Flood Hazards 8.3 Relocation.

FEMA 259. *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*. See Chapter VI-R, Relocation.

FEMA 312. *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding.* See Chapter 3, An Overview of the Retrofitting Methods and Chapter 7, Other Methods - Relocation.

FEMA 511. *Reducing Damage from Localized Flooding*. See Chapter 9, Redevelopment.

The Louisiana State University (LSU) Extension Center website (http://www.louisianafloods.org) lists many retrofitting publications, provides advice on floodproofing methods and flood insurance, and links to online shopping for retrofitting products and contractors.

R.S. Means' *Contractor's Pricing Guide.*

CHAPTER 10 – ACQUISITION

10.1 Introduction

Acquiring and demolishing or simply demolishing a floodprone structure is the most successful means of ensuring that a structure will not accumulate additional losses from future flood events (Figure 10-1). There are two options for what to do with the site after the structure is gone:

1. The property site can be purchased by a government agency or appropriate organization that, after demolishing the structure, will keep the land in an open space use in perpetuity.
2. If the lot remains in private ownership after the building is demolished, a new structure can be built on the lot, provided it is constructed to meet all local building and flood protection code requirements.

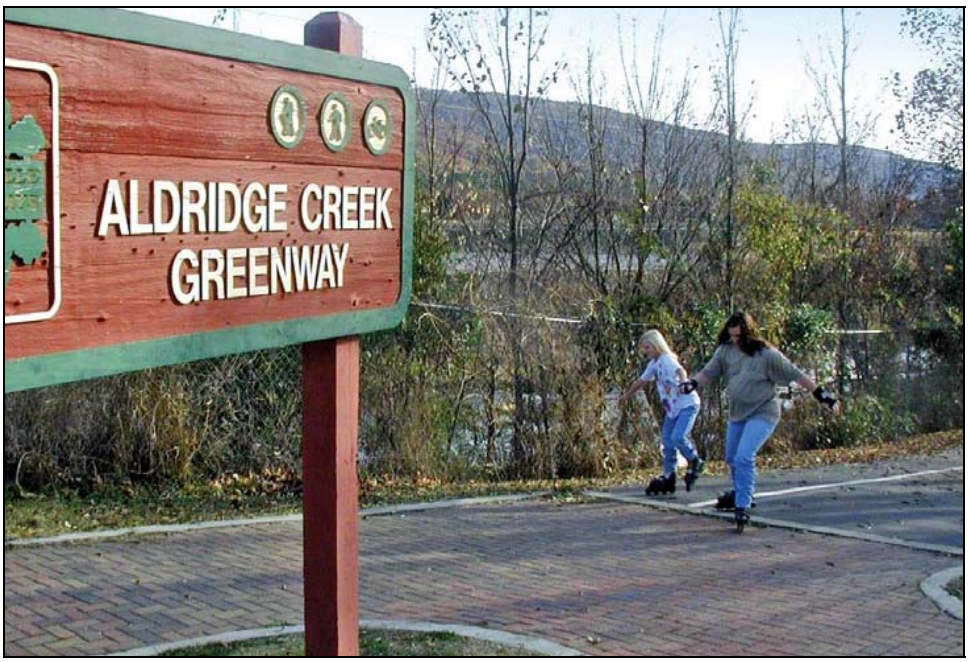

Figure 10-1. The Aldridge Creek Greenway in Huntsville, AL, is expanded as floodprone homes are acquired and cleared.

(Source: FEMA 511)

Table 10-1 includes a summary of advantages and disadvantages for using acquisition as a mitigation measure.

Table 10-1. Considerations for Using Acquisition

Advantages	Disadvantages
• Permanently removes problem since the structure no longer exists. • Allows a substantially damaged or substantially improved structure to be brought into compliance with the community's floodplain management ordinance or law. • Expands open space and enhances natural and beneficial uses. • May be fundable under FEMA mitigation grant programs.	• Cost may be prohibitive. • Resistance may be encountered by local communities due to loss of tax base, maintenance of empty lots, and liability for injuries on empty, community-owned lots.

10.2 Technical Considerations

Property acquisition is a complex process. The procedures for property title transfer from a private owner to the government are detailed and extensive. Every precaution is made to protect the private property owner's and renter's rights and to ensure they are fully aware of all aspects of the transaction. The acquisition process involves the following: disconnect and cap utility lines, tear the structure down, remove debris, restore old site and building, or buying a new structure. First the utility company must turn off all services to the structure and the demolition contractor will then disconnect the utility lines. If another structure will not be built on the site, the contractor will cap the lines permanently or remove them according to the requirements of the utility company. The structure is then relocated, salvaged or demolished, and debris removed as required by Federal, State, and local regulations. Site restoration includes demolishing and removing any paved surfaces, grading the property, and stabilizing the site.

Eligibility Requirements. In order for a community to qualify for FEMA grants for acquisition projects, three basic requirements must first be met:

1. The local community must inform the property owners interested in the acquisition program that the community will not use its condemnation authority to purchase their property and that participation in the program is strictly voluntary.
2. The subsequent deed to the property to be acquired will be amended such that the landowner will be restricted from receiving any further Federal disaster assistance grants, the property shall remain in open space in perpetuity, and the property will be retained in ownership by a public entity.
3. Any replacement housing or relocated structures will be located outside of the 100-year floodplain.

10.3 Relative Costs

The relative cost ranking is based on the combination of the estimated costs for the acquisition project and a determination of cost-effectiveness.

10.3.1 Estimated Cost

Acquisition is a relatively expensive mitigation measure. The cost of tearing a structure down can vary widely, depending on the amount of debris, whether it must be hauled to a licensed disposal site, and if a dumping fee is required. The major costs associated with the acquisition method are for purchasing the structure and land. Examples of cost estimating items that may need to be considered include the following:

- Purchase of structure and land
- Demolition
- Debris removal, which includes any landfill processing fees
- Grading and stabilizing the property site
- Permits and plan review

10.3.2 Determination of Cost-Effectiveness

A component of the relative cost scoring is to include a determination of cost-effectiveness. Table D-1 in Appendix D, Determining Cost-Effectiveness, provides a quick screening for the cost-effectiveness of a project. The attributes included in the table are frequency of flood, level of damage, project cost, project benefits, and criticality (impact or loss of function). For example, if the frequency is the 10-year flood, the project will have a very high likelihood of cost-effectiveness. Conversely, if the frequency is the 50 to 100-year flood, the likelihood of cost-effectiveness is low.

Based on the combination of the estimated cost of the project and the likelihood of cost-effectiveness, a relative cost ranking will be assigned on Worksheet B, Appropriate Mitigation Measures. If the likelihood of cost-effectiveness is low, the ranking of relative cost will be either moderate or high, based on the estimated cost of the project. However, if the estimated cost is low and the likelihood of cost-effectiveness is very high or high, the relative cost ranking will be low.

10.4 Additional Considerations

10.4.1 Historic Preservation

A community may not acquire, relocate or floodproof any structure prior to FEMA satisfying its compliance review required by Section 106 of the National Historic Preservation Act. Typically, the community must submit photographs of each property under consideration along with a description of the anticipated flood mitigation project. If FEMA determines, in consultation with the State Historic Preservation Office (SHPO) or Tribal Historic Preservation Office (THPO), that the property is listed or eligible for listing on the National Register of Historic Places (historic properties), FEMA must determine the effect of the proposed mitigation project on the identified property or properties. Historic properties include buildings, sites, structures, objects, and districts. If FEMA, in consultation with the SHPO/THPO and any other consulting parties, determine that the proposed project will adversely affect the historic property and properties, FEMA, the SHPO/THPO, and other consulting parties must agree on measures to avoid,

alleviate, minimize, or otherwise compensate for the adverse effect(s). These treatment measures are outlined in either a Memorandum of Agreement or Programmatic Agreement.

Early coordination between the applicant and the SHPO/THPO is helpful in understanding the historic significance of a particular area and avoiding potential adverse effects. A list of SHPOs/THPOs can be found through the National Park Service's web page and is included in Appendix G. Keep in mind though that FEMA is still required to formally identify and evaluate historic properties as part of the Section 106 review process. In many States, FEMA has negotiated programmatic agreements with the SHPO and state emergency management agency to exclude routine activities from further review, accelerate time periods for consultation between FEMA and the SHPO, and provide for other procedures to minimize delays during disaster recovery. These agreements often are extended to cover flood mitigation projects that occur during non-disaster periods, particularly for repetitive loss and substantially damaged structures. For example, most agreements allow for the administrative action of property acquisition to proceed before Section 106 review is initiated.

Properties identified as historic may be marked on the *Address and Updates* tab on the Limited View (Figure 10-2). An example of a historic structure is included in Figure 10-3.

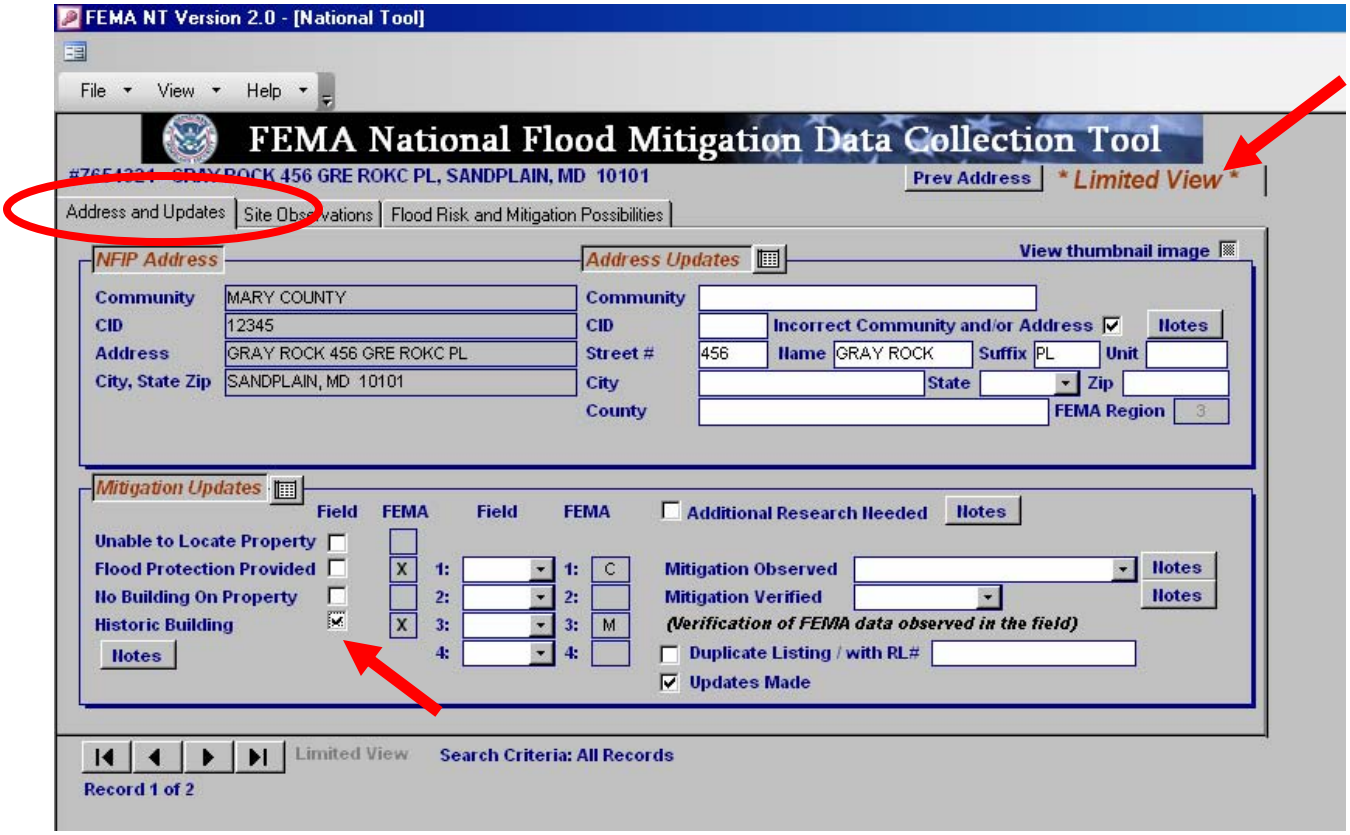

Figure 10-2. *Address and Updates* Tab - Historic Building Check

Figure 10-3. Historic Structure

10.4.2 Hazardous Materials

Existing owners must certify that the property is free of hazardous materials and contaminants or that the site has been cleaned to Federal standards. The sellers of any suspected agricultural/commercial properties must indemnify FEMA (if FEMA funding is involved), the State, and local governments from liability resulting from contamination of the site. If there is still suspicion regarding the acceptability of the site for the acquisition program, an environmental assessment may be required. Using FEMA funds to purchase contaminated properties is prohibited.

A review of a property's past uses must ensure that no hazardous materials are likely to be encountered. Research may need to be done to identify previous uses of the site as well. For example, a commercial site that is currently used as an office or retail space may have been used as a dry cleaner or screen printer shop, both of which are known for hazardous materials issues, especially when located in a floodprone area.

The *Site Observations* tab indicates whether the structure is currently used for commercial or industrial purposes, where the presence of hazardous materials could be a concern (Figure 10-4, number 1). In addition, the *Site Observations* tab contains a checkbox to indicate if flooding at this site will have community-wide implications (Figure 10-4, numbers 2a and 2b), with "contains hazardous materials" as one of the choices if this is true.

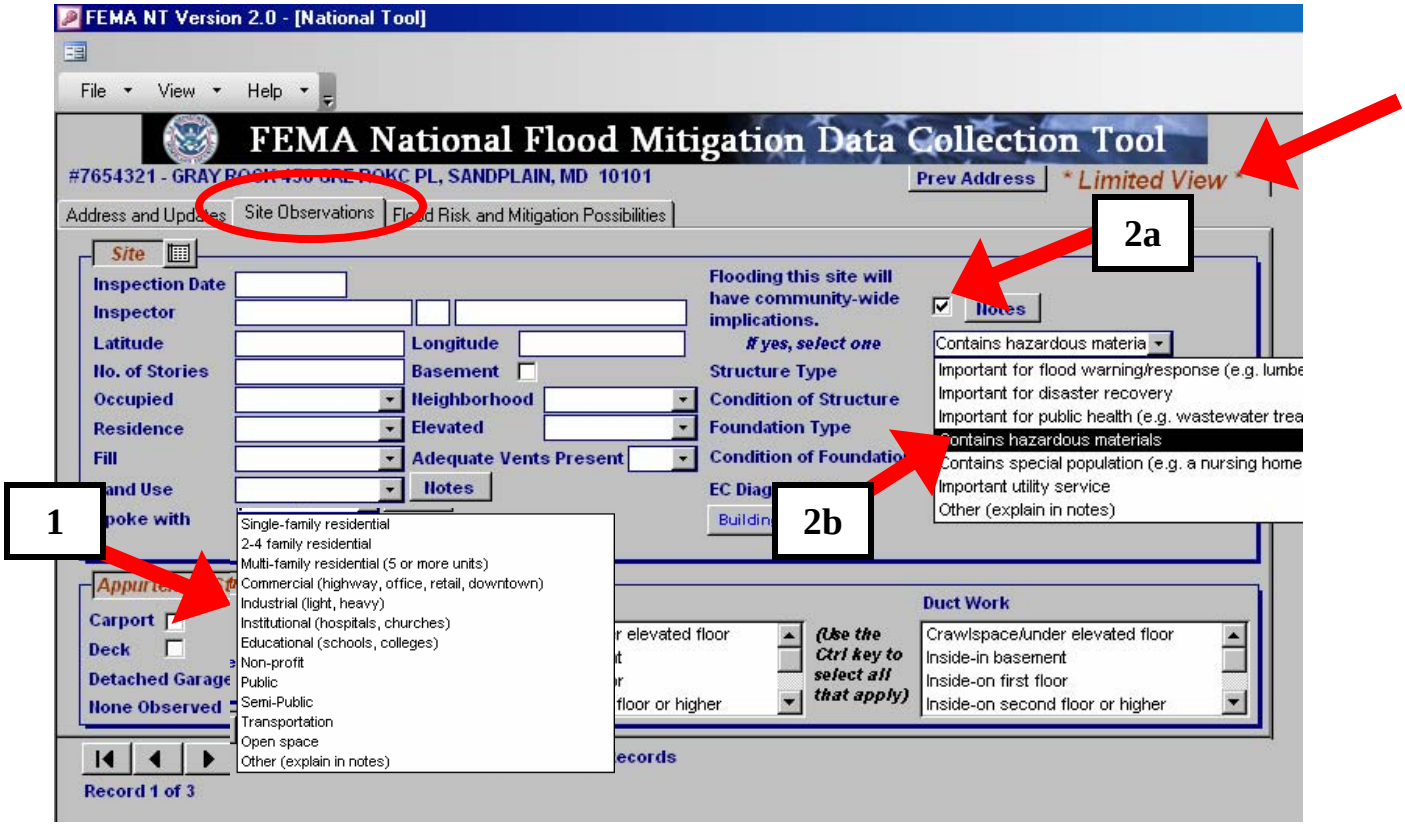

Figure 10-4. *Site Observations* tab - Hazardous materials site indicators

10.5 Available Resources

FEMA 312. *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding.* See Chapter 3, An Overview of the Retrofitting Methods and Chapter 7, Other Methods - Demolition.

FEMA 317. *Property Acquisition Handbook for Local Communities.*

FEMA 511. *Reducing Damage from Localized Flooding*. See Chapter 9, Redevelopment.

The Louisiana State University (LSU) Extension Center website (http://www.louisianafloods.org) lists many retrofitting publications, provides advice on floodproofing methods and flood insurance, and links to online shopping for retrofitting products and contractors.

CHAPTER 11 – WORKING WITH PROPERTY OWNERS

11.1 Introduction

The evaluation process in Chapter 3 outlined steps designed to identify some of the mitigation approaches appropriate for further consideration. This section provides recommendations on how to work with the property owners who will be affected by the proposed mitigation measures.

11.2 Presenting Appropriate Mitigation Measures

There are several options for how to present the results of the selection process to the property owners and other decision-makers. The options include:

- Package the results of the evaluation process (as described in Chapter 3) and meet with the property owners to discuss the process, the findings, and their preferences. The information provided in Chapters 4 through 10 for each mitigation measure may be used as a reference for any mitigation measures that were identified as appropriate during the evaluation process.
- Prepare a recommendation for a specific mitigation measure along with the appropriate justification. It is strongly recommended that all work is shown and copies of all the worksheets are provided to the property owners.

The following documentation should be used to prepare for the initial meetings with the property owners:

- NT Basic Report
- Technical Considerations Scorecard (see Worksheet A)
- Appropriate Mitigation Measures (see Worksheet B)
- Initial Consultation with Property Owner (see Worksheet C)

During the meeting, the following issues should be discussed between the State or local officials and the property owner:

- The property owner should be aware that there is no guarantee the project will be funded.
- The property owner should be aware of what the project will look like after completion.
- The property owner should be aware of their responsibilities concerning operations and maintenance and determine if they are capable of fulfilling them.
- Cost-sharing is an option. This issue is addressed in Appendix E, Hazard Mitigation Assistance Programs.

At the end of the meeting, the State or local officials should have a preliminary idea of the property owners' interest in any of the mitigation measures. There may be concerns that will need to be addressed.

Worksheet C: Initial Consultation with Property Owner

Date Prepared: _____ Consultation Date: _____
Property Owner Name: _____
Property Address:_____
Repetitive Loss Property Locator Number:_____
Prepared by: _____

Instructions to complete Worksheet C: Initial Consultation with Property Owner

1. Record recommended mitigation measures (mitigation measure(s) with lowest score from Worksheet B) and include any comments for the discussion with the property owner.
2. Record property owner's response to recommended mitigation measure(s).
3. If an appropriate mitigation measure has been agreed upon, record it under "Property Owner Preferred Mitigation Measure(s)". A detailed cost estimate and/or benefit/cost analysis will be necessary to ensure the preferred mitigation measure is appropriate. The cost analysis and additional required actions are recorded under "Action Items for Follow Up."

Recommended Mitigation Measure(s)

☐ Drainage Improvements
☐ Barriers
☐ Dry Floodproofing
☐ Wet Floodproofing
☐ Elevation
☐ Relocation
☐ Acquisition

Comments

_____
_____
_____
_____

Response from Property Owner

_____
_____
_____

Property Owner Preferred Mitigation Measure(s)

_____

Action Items for Follow Up

_____
_____
_____

11.3 Addressing Property Owner Concerns

Not all property owners will accept the proposed measure that is presented to them, regardless of how the risk to natural hazards can be overcome. The results of the process in Worksheets A and B should be discussed with the property owner to explain how the decision was made to recommend a particular mitigation measure or measures. Typical property owner concerns are included in a report titled, *Implementing Floodplain Land Acquisition Programs in Urban Localities.* See Section 11.5 for information on accessing this report.

11.3.1 Evaluation Process

The concerns of the property owner regarding the proposed mitigation measure should be taken into consideration and addressed by using the following:

- **Show all work**. By demonstrating the decision-making process of how certain mitigation measures were eliminated from consideration, the property owner will be able to gain an understanding of the steps involved and the rationale used to select or eliminate from consideration a specific mitigation measure.
- **Solicit feedback.** The property owner can provide additional information that may be necessary to determine if alternative measures are more suitable for acceptance.
- **Address concerns.** The property owner may have an objection to a particular mitigation measure for a variety of reasons: cost, aesthetics, or displacement. Working closely with the property owner and demonstrating the range of options available allows the property owner to determine which of the remaining mitigation measures will best suit their needs.

11.3.2 Property Owners' Preference

There are four main areas of concern that influence the property owner's preference for a particular mitigation measure:

- How they will be affected by the mitigation project
- How secure they will be from future flood damage
- Their responsibilities to the project, including maintenance
- The appearance of the property

Mitigation project concerns include:

- The cost of the project to the property owner
- Administration of the contract with the contractor
- Additions or modifications to the structure during the project
- Vacating the property during the project and for how long

Security concerns include:

- Degree of safety from flooding as a result of the mitigation project
- Occupying the structure during a flood event

It is important to convey to the property owner that only acquisition and demolition will provide total security from any future flood event. A project can fail if the flood exceeds the project's design level, the owner did not adequately maintain the project, or the property owner did not properly implement the measure during a flood event (e.g., did not install a closure or was not home when the structure was flooded). Although the project is designed to reduce damage to the structure, the property owner will still need to take safety and health precautions during a flood. If the building is flooded, it should not be occupied, especially if the floodwater is deep or fast.

The property owner's responsibility concerns include project maintenance and how much the property owner can remodel the structure in the future. The property owner is ultimately responsible for the maintenance of the mitigation measures and needs to be aware that the project will only work if he or she assumes this responsibility.

Appearance concerns are most often the issue that stalls many potential mitigation projects, particularly elevation. Property owners will regard any change to the appearance of their home with a very critical eye. If the property owner is subject to criticism (or perceives that they will be) since the project may be an eyesore, he or she will not be willing a participant in the floodproofing project. It would be beneficial to provide the property owner with before and after photographs of similar mitigation projects completed in an aesthetically pleasing manner.

11.3.3 FEMA Buyout Study Findings

There may be situations in which the only appropriate mitigation measure is an acquisition project. The property owner may not be receptive to this alternative. FEMA and the National Science Foundation (NSF) commissioned a study in 2003 to examine why property owners did or did not participate in an acquisition (also known as a buyout) program. The findings are included in the report, *Implementing Floodplain Land Acquisition Programs in Urban Localities.*

According to the results in the buyout study, the key factors that influenced a homeowner's decision to participate in a buyout program included the perception of risk, neighborhood attachment, and buyout factors, including timing, communication, trust, and pressure.

Perception of risk. While the buyout staff defined "risk" in terms of the probability of future flooding, the residents and other agencies perceived risk as financial debt, affordable housing, and losing social networks. Community officials and buyout staff perceived themselves as sympathetic to residents' concerns; however, many residents reported that they felt pressured to participate in the buyout program.

Neighborhood attachment. Many residents considered their neighborhood to be as important, if not more important, than the probability of future flooding in deciding whether or not to participate in a buyout program. Residents stated that their neighborhood provided a sense of

community and home, and access to familiar resources such as transportation, shopping, employment, recreation, and places of worship.

Buyout factors. Residents and buyout staff reported several factors that contributed to the difficulties during the buyout process: lengthy delays before settlement, miscommunication, lack of trust in buyout staff, and a feeling of pressure to participate in buyout program.

11.4 Next Steps

Finally, one of two steps remains for follow-up:

1. **The property owner accepts the proposed mitigation measure**. Both the community official and the property owner explore options for accomplishing this mitigation measure. A design professional should be consulted to determine the exact cost of the mitigation measure and how then to proceed with construction. Applicable hazard mitigation assistance programs (see Appendix E) should be researched to determine which ones might provide funding opportunities for the mitigation project. A benefit/cost analysis should be conducted to determine whether the project is eligible for FEMA funding.

2. **The property owner rejects the proposed mitigation measure based on personal preference, cost, or other reasons.**

    a. Record the property owner's concerns regarding the proposed mitigation measure on Worksheet C, Initial Consultation with Property Owner.

    b. Review Worksheet B with the property owner to determine whether other appropriate mitigation measures might warrant additional consideration. The process described in Section 3.5, Evaluating the Mitigation Measures, should be followed to determine whether any of the available mitigation measures preferred by the property owner are appropriate for the flood risk and construction characteristics of the structure.

11.5 Available Resources

Fraser et al. *Implementing Floodplain Land Acquisition Programs in Urban Localities*. Report prepared for the Federal Emergency Management Agency (FEMA) and the National Science Foundation (NSF). http://www.unc.edu/~fraser18/publications/Floddplain%20Project%20Report.Final.pdf

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Selecting Appropriate Mitigation Measures for Floodprone Structures

Information Packet

This information packet includes the following documents:

- Technical Considerations Scorecard (Worksheet A)
- Appropriate Mitigation Measures (Worksheet B)
- Initial Consultation with Property Owner (Worksheet C)
- Preliminary Cost Estimating Worksheet (Worksheet D)
- NT Basic Report

SAMPLE

Date Prepared: July 24, 2006 Date Property Visited: July 13, 2006

Property Owner Name: Janet Wilson

Property Address: 19000 Main Street, Roanoke, VA 20202-6689

Repetitive Loss Property Locator Number: 1234567

Prepared by: Bryant Shea

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SAMPLE

Worksheet A: Technical Considerations Scorecard

Date Prepared: July 24, 2006 Date Property Visited: July 13, 2006
Property Owner Name: Janet Wilson
Property Address: 19000 Main Street, Roanoke, VA 20202-6689
Repetitive Loss Property Locator Number: 1234567
Prepared by: Bryant Shea

Legend
- ■ Mitigation measure is not appropriate.
- ▒ Mitigation measure may be appropriate and requires additional consideration.
- □ Mitigation measure is appropriate.

NT Reference indicates where the information may be found in the National Tool.

Instructions to complete Worksheet A: Technical Considerations Scorecard

1. For each of the questions, based on the property information, put a check mark in the appropriate box in the "Response" column.
2. For the row with a check mark in the "Response" column, check all boxes that are not blacked out.
3. After completing the questions, review each of the mitigation measures columns. Select the "Appropriate Mitigation Measures" box only for those columns that do not have any blacked out boxes in the selected response row.

Question	Response	Drainage Improvements	Barriers	Wet Floodproofing	Dry Floodproofing	Elevation	Relocation	Acquisition	Comments
1. What is the structure type? *NT Reference - Limited Data View, Site Observations* tab	☐ Wood Frame/ Metal/ Other	☐	☐	☐	▒	☐	☐	☐	
	☒ Concrete/ Masonry/ Brick Faced	☒	☒	☒	☒	▒	▒	☒	Could be expensive, requires bracing
	☐ Manufactured Home	☐	☐	■	■	☐	☐	☐	
2. What is the condition of the structure? *NT Reference - Limited Data View, Site Observations* tab	☒ Good	☒	☒	☒	☒	☒	☒	☒	
	☐ Fair	☐	☐	▒	▒	▒	▒	☐	
	☐ Poor	▒	▒	■	■	■	■	☐	
3. What is the foundation type? *NT Reference - Limited Data View, Site Observations* tab Diagram numbers refer to Elevation Certificate found in the NT.	☐ Slab-on-grade (Diagram 1, 3, 6, or 7)	☐	☐	☐	☐	▒	▒	☐	
	☒ Basement/ Split level (Diagram 2 or 4)	☒	▒	☒	☒	☒	☒	☒	Pressure could cause foundation damage
	☐ Piers, Posts, Columns, or Crawlspace (Diagram 5 or 8)	☐	☐	☐	■	☐	☐	☐	

SAMPLE

Question	Response	Drainage Improvements	Barriers	Wet Floodproofing	Dry Floodproofing	Elevation	Relocation	Acquisition	Comments
4. What is the number of stories? *NT Reference - Limited Data View, Site Observations* tab	☒ 1-2	☒	☒	☒	☒	☒	☒	☒	Structure has two stories
	☐ 3 or more	☐	☐	☐	☐	☐	☐	☐	
5. What is the building footprint? *NT Reference - Detailed Data View, Additional Site Information* tab	☒ < 2,500 sq ft	☒	☒	☒	☒	☒	☒	☒	Building footprint is 2,000 sq ft.
	☐ > 2,500 sq ft	☐	☐	☐	☐	☐	☐	☐	
6. What is the flood protection depth? *NT Reference - Detailed Data View, Elevation and Hazard* tab	☒ Deep (> 6ft)		☒			☒	☒	☒	Depth of 100 yr flood is 7 ft, plus 1 ft freeboard
	☐ Moderate (3 to 6 ft)	☐	☐	☐		☐	☐	☐	
	☐ Shallow (<3 ft)	☐	☐	☐	☐	☐	☐	☐	
7. Does flash flooding occur at the project site? *NT Reference - Detailed Data View, Elevation and Hazard* tab	☒ Yes	☒	☒	☒	☒	☒	☒	☒	Source is NOAA website
	☐ No	☐	☐	☐	☐	☐	☐	☐	
8. What is the flood velocity? *NT Reference - Detailed Data View, Elevation and Hazard* tab	☒ Fast (>5 fps)	☒	☒	☒	☒	☒	☒	☒	
	☐ Slow/Moderate (<5 fps)	☐	☐	☐	☐	☐	☐	☐	
9. Is the structure located in the floodway? *NT Reference - Detailed Data View, Elevation and Hazard* tab	☐ Yes	☐	☐	☐	☐	☐	☐	☐	
	☒ No	☒	☒	☒	☒	☒	☒	☒	
Appropriate Mitigation Measures		☐	☒	☐	☐	☒	☒	☒	

fps = feet per second

ft = feet

sq ft = square feet

SAMPLE

Worksheet B: Appropriate Mitigation Measures

Date Prepared: July 24, 2006 Date Property Visited: July 13, 2006
Property Owner Name: Janet Wilson
Property Address: 19000 Main Street, Roanoke VA 20202-6689
Repetitive Loss Property Locator Number: 1234567
Prepared by: Bryant Shea

Instructions to complete Worksheet B: Appropriate Mitigation Measures

1. List the mitigation measures from the "Appropriate Mitigation Measures" row from Worksheet A, Technical Considerations Scorecard (all checked boxes in last row of Worksheet A).
2. Using information from Chapters 4 through 10 of FEMA 551, *Selecting Appropriate Mitigation Measures for Floodprone Structures,* rank each measure as High, Moderate, or Low. See "Tips to Rank Mitigation Measures" on the next page for additional information.
3. Check the appropriate box (High, Moderate, or Low) under each of the decision factors.
4. Total the points for each mitigation measure. **The LOWEST total points indicates the most appropriate mitigation measure(s).**
5. Include notes describing how the determination was made for a particular ranking.

*NOTE: Since Technical Considerations and Relative Costs are more significant in selecting appropriate mitigation measure(s), they are weighted higher than Human Intervention and Annual Maintenance.

Decision Factors – LOWEST score is most appropriate – See Reverse for Notes

Mitigation Measures	Technical Considerations*	Relative Costs*	Human Intervention	Annual Maintenance	Total Score
Barriers	H ☒ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☒ (2 pts)	H ☒ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☒ (2 pts) L ☐ (1 pts)	13 pts
Elevation	H ☒ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☒ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☒ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☒ (1 pts)	12 pts
Relocation	H ☐ (6 pts) M ☒ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☒ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☒ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☒ (1 pts)	10 pts
Acquisition	H ☐ (6 pts) M ☐ (4 pts) L ☒ (2 pts)	H ☐ (6 pts) M ☒ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☒ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☒ (1 pts)	8 pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts

SAMPLE

Tips to Rank Mitigation Measures (Worksheet B Cont.)

Technical Considerations

Use the responses in Worksheet A, Technical Considerations Scorecard, to determine a ranking of High, Moderate, or Low for each mitigation measure.

- If there are no grayed out boxes checked for a mitigation measure, the technical consideration ranking is Low.
- If there are 1 or 2 grayed out boxes checked for a mitigation measure, the technical consideration score is Moderate.
- If there are 3 or more grayed out boxes checked for a mitigation measure, the technical consideration score is High.

List any considerations in the implementation process that could be a limiting factor or clear constraint in the Notes section.

Relative Costs

Rank each of the mitigation measures based on the estimated cost to address the flood risk and the likelihood of cost-effectiveness. Chapters 4 through 10 and Appendix D include information to rank each mitigation measure based on FEMA 312, *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding*, and FEMA 259, *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*. Low relative cost indicates Low ranking and high relative cost indicates High ranking.

Need for Human Intervention

This reflects the need for human intervention to operate the mitigation measure and the warning time to conduct the required activity. Generally, the more "passive" the system (i.e., requiring the least human interaction), the more reliable the system will be over time, thereby resulting in a Low ranking. Mitigation measures that require human intervention, such as barriers and dry floodproofing, receive a High ranking,.

Need for Annual Maintenance

This reflects the level of effort of annual maintenance required by each mitigation measure. Similar to human intevention, less annual maintenance results in a Low ranking.

NOTE: If two or more mitigation measures tie with the lowest score, other decision factors should be considered in determining the most appropriate mitigation measure(s). These considerations include, but are not limited to aesthetics; access to site; housing of occupants during the project; compliance with all applicable codes, ordinances, and regulations; historic preservation concerns; and availability of contractors.

The other decision factors should be listed in the Comments section of Worksheet C.

NOTES:

Mitigation Measures	Technical Considerations
Barriers	Technical considerations include depth and velocity of flood and flash flooding (see Worksheet A). Estimated cost of constructing a floodwall or levee will be low and the likelihood of cost-effectiveness is High for small barrier – relative cost ranking is Low (approximately $25,000 for a 4-foot levee and $35,000 for a 4-foot floodwall based on FEMA 312). Human intervention is High since the property owner must be able to install flood gates as a flood event occurs and adequate warning time must be provided. Flash flooding occurs at the project site, therefore barriers will be ranked as High for human intervention. Annual maintenance is required by the property owner to check the barrier for leaks and will be Moderate.
Elevation	Technical considerations include structure type (masonry), foundation type (basement), and flood velocity (> 5 fps) (see Worksheet A). Estimated cost to elevate 8 feet to BFE is Moderate (approximately $83,000) based on the estimate from FEMA 312 and the likelihood of cost-effectiveness is Moderate – relative cost ranking is Moderate. Little or no human intervention is required once the structure has been elevated and is therefore ranked Low. Annual maintenance of an elevated structure will be minimal; ranking is set as Low.
Relocation	Technical considerations include structure type (masonry) (see Worksheet A). Relative cost to relocate a masonry structure on a basement foundation to a site less than 5 miles away on the same type of foundation is Moderate (approximately $128,000) and the likelihood of cost-effectiveness is Moderate – relative cost ranking is Moderate. Human intervention is not required once the structure has been relocated from the floodprone site. Low ranking. Annual maintenance for a relocated or acquired property includes maintenance of the abandoned site by the community, ranking is Low.
Acquisition	Technical considerations – none. Low ranking (see Worksheet A). Estimated cost is High (see Worksheet D for sample cost estimate) and the likelihood of cost-effectiveness is High – relative cost ranking is moderate. Human intervention is not required once the structure has been acquired. Low ranking. Annual maintenance for a relocated or acquired property includes maintenance of the abandoned site by the community, ranking is Low.

SAMPLE

Worksheet C: Initial Consultation with Property Owner

Date Prepared: July 24, 2006 Consultation Date: August 1, 2006
Property Owner Name: Janet Wilson
Property Address: 19000 Main Street, Roanoke, VA 20202-6689
Repetitive Loss Property Locator Number: 1234567
Prepared by: Bryant Shea

Instructions to complete Worksheet C: Initial Consultation with Property Owner

1. Record recommended mitigation measure(s) with the lowest score from Worksheet B and include any comments for the discussion with the property owner.
2. Record property owner's response to recommended mitigation measure(s).
3. If an appropriate mitigation measure has been agreed upon, record it under "Property Owner Preferred Mitigation Measure(s)". A detailed cost estimate and/or benefit/cost analysis (BCA) will be necessary to ensure the preferred mitigation measure is appropriate. The cost analysis and additional required actions are recorded under "Action Items for Follow-Up."

Recommended Mitigation Measure(s)

- ☐ Drainage Improvements
- ☐ Barriers
- ☐ Dry Floodproofing
- ☐ Wet Floodproofing
- ☐ Elevation
- ☐ Relocation
- ☒ Acquisition

Comments

Acquisition is the recommended mitigation measure. Elevation and relocation are alternate mitigation measures. In order to select the most appropriate mitigation measure, the following decision factors should be discussed with the property owner: aesthetic concerns, housing of occupants during the project, compliance with all applicable codes, regulations and ordinances, and access to the site.

Response from Property Owner

Property Owner Preferred Mitigation Measure(s)

Action Items for Follow-Up

1. Develop detailed cost estimate for each preferred mitigation measure
2. Conduct BCA
3. Determine funding sources

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.Worksheet D: Preliminary Cost Estimating Worksheet

Date Prepared: July 24, 2006 Date Property Visited: July 13, 2006
Property Owner Name: Janet Wilson
Property Address: 19000 Main Street, Roanoke VA 20202-6689
Repetitive Loss Property Locator Number: 1234567
Prepared by: Bryant Shea

Mitigation Measure: Acquisition and demolition of 19000 Main Street

Cost Component	Unit	Unit Cost	Quantity	Total
Acquisition of Structure		$275,000	1	$275,000
Acquisition of Land		$149,000	1	$149,000
Certified Real Estate Appraisal		$500	1	$500
Disconnect Utilities		$500	1	$500
Surveying		$1,000	1	$1,000
Title Search, Deed Preparation, Attorney Fees, Permits and Plan Review Costs		$1,100	1	$1,100
Installation of Erosion Controls		$600	1	$600
Demolition		$7,000	1	$7,000
Grading and Restabilization		$1,500	1	$1,500
Uniform Relocation Assistance (URA)		$6,500	1	$6,500
Other (Environmental Report, Advertising)		$1,000	1	$1,000
Subtotal Retrofitting Measure(s)				$443,700
Contractor's Profit (10%)				$44,370
Design Fee (10%)				
Loss of Income (optional)				
Displacement Expenses (optional)				
Contingency				
Subtotal Other Costs				$44,370
Total Costs				$488,070

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Basic Report

Property Locator / Rep Loss # 1234567

Community Name/CID # ROANOKE COUNTY * #510090

Address: 19000 MAIN STREET , ROANOKE, VA 20202-6689

Latitude: **Longitude**

Tax ID:

Local Lot/Parcel ID:

Foundation Type:

Basement with walkout

Condition of Foundation: Good (optional minor repairs)

Structure Type: Unreinforced masonry

EC Diagram No

2. Basement

Condition of Structure: Good (optional minor repairs)

Bldg Mkt Value: $275,000.00 **Land Value:** $149,000.00

Currently Occupied: Yes **Occupancy:** SINGLE FMLY

Residence: **Land Use:** Single-family residential

Flood Zone: AE A1-30

Top of Bottom Floor: 100.00 ft. **BFE/Depth** 107

Top of Next Higher Flr: 107.00 ft.

Lowest Adjacent Grade: 100.00 ft.

Bottom of Lowest Horizontal Structural Member:

Pre or Post FIRM: Pre **Total Sq. Ft.:** 3100

Date of Construction: 1/1/1982 **No. of Stories:** 2

Likely Source of Flooding:

Stre[illegible]rce of riverine fl[illegible]g

[illegible]tes:

Likely Areas of [illegible] Damag[illegible]

[illegible]er in areas belo[illegible]rade-[illegible]ding is a bile[illegible] split le[illegible] or has [illegible]ish[illegible] a[illegible] below grade

N[illegible]seme[illegible]

Potential Hydraulics Impacts:

Notes:

Mitigation Observations

☑ **Possible mitigaton measures observed**

Pendi[illegible] Actions:

No[illegible]

Struct[illegible] may be protected wit[illegible] retrofitting projec[illegible]

Structu[illegible]ay be: elevated; prote[illegible]aoqu[illegible]

Notes:

Flooding may be relieved by a flood control project:

Notes:

Most Recent Claims and Summary

Current Insured's Name: JANET WILSON

Name of Last Claimant: MICHAEL S JOHNSON

No. of Claims per BureauNet: 4

	Building	Contents	Total
Total Payments Made:	$118,833.00	$23,489.00	$142,322.00

Date	Building	Contents	Total
2/10/1988	$5,731.00	$0.00	$5,731.00
1/18/1993	$19,472.00	$2,591.00	$22,063.00
6/25/1996	$37,138.00	$9,304.00	$46,442.00
7/22/1999	$56,492.00	$11,594.00	$68,086.00

Mitigation Updates

	Field	FEMA	Field	FEMA
Unable to Locate Property	☐	☐		
Flood Protection Provided	☐	☐	1	1
No Building on Property	☐	☐	2	2
Historic Building	☐	☐	3	3
			4	4

Notes:

☐ **Updates Made** ☐ **Duplicate Listing / with RL #:**

☐ **Additional Research Needed**

Notes:

Mitigation Observed:

Notes:

Mitigation Verified:

Notes:

9/21/2006 FEMA-NT Page 1 of 1

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Selecting Appropriate Mitigation Measures for Floodprone Structures

Information Packet

This information packet includes the following documents:

- Technical Considerations Scorecard (Worksheet A)
- Appropriate Mitigation Measures (Worksheet B)
- Initial Consultation with Property Owner (Worksheet C)
- Preliminary Cost Estimating Worksheet (Worksheet D)
- NT Basic Report

Date Prepared: _____ Date Property Visited: _____

Property Owner Name: _____

Property Address:_____

Repetitive Loss Property Locator Number: _____

Prepared by: _____

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Worksheet A: Technical Considerations Scorecard

Date Prepared: _____ Date Property Visited:_____
Property Owner Name: _____
Property Address: _____
Repetitive Loss Property Locator Number: _____
Prepared by: _____

Legend
- ■ Mitigation measure is not appropriate.
- ▒ Mitigation measure may be appropriate and requires additional consideration.
- □ Mitigation measure is appropriate.

NT Reference indicates where the information may be found in the National Tool.

Instructions to complete Worksheet A: Technical Considerations Scorecard

1. For each of the questions, based on the property information, put a check mark in the appropriate box in the "Response" column.
2. For the row with a check mark in the "Response" column, check all boxes that are not blacked out.
3. After completing the questions, review each of the mitigation measures columns. Select the "Appropriate Mitigation Measures" box only for those columns that do not have any blacked out boxes in the selected response row.

Question	Response	Drainage Improvements	Barriers	Wet Floodproofing	Dry Floodproofing	Elevation	Relocation	Acquisition	Comments
1. What is the structure type? *NT Reference - Limited Data View, Site Observations tab*	☐ Wood Frame/ Metal/ Other	☐	☐	☐	▒	☐	☐	☐	
	☐ Concrete/ Masonry/ Brick Faced	☐	☐	☐	☐	▒	▒	☐	
	☐ Manufactured Home	☐	☐	■	■	☐	☐	☐	
2. What is the condition of the structure? *NT Reference - Limited Data View, Site Observations tab*	☐ Good	☐	☐	☐	☐	☐	☐	☐	
	☐ Fair	☐	☐	▒	▒	▒	▒	☐	
	☐ Poor	▒	▒	■	■	■	■	☐	
3. What is the foundation type? *NT Reference - Limited Data View, Site Observations tab* Diagram numbers refer to Elevation Certificate found in the NT.	☐ Slab-on-grade (Diagram 1, 3, 6 or 7)	☐	☐	☐	☐	▒	▒	☐	
	☐ Basement/ Split level (Diagram 2 or 4)	☐	▒	☐	▒	▒	☐	☐	
	☐ Piers, Posts, Columns, or Crawlspace (Diagram 5 or 8)	☐	☐	☐	■	☐	☐	☐	

Question	Response	Drainage Improvements	Barriers	Wet Floodproofing	Dry Floodproofing	Elevation	Relocation	Acquisition	Comments
4. What is the number of stories? *NT Reference - Limited Data View, Site Observations tab*	☐ 1-2	☐	☐	☐	☐	☐	☐	☐	
	☐ 3 or more	☐	☐	☐	☐	☐	☐	☐	
5. What is the building footprint? *NT Reference - Detailed Data View, Additional Site Information tab*	☐ < 2,500 sq ft	☐	☐	☐	☐	☐	☐	☐	
	☐ > 2,500 sq ft	☐	☐	☐	☐	☐	☐	☐	
6. What is the flood protection depth? *NT Reference - Detailed Data View, Elevation and Hazard tab*	☐ Deep (> 6ft)		☐			☐	☐	☐	
	☐ Moderate (3 to 6 ft)	☐	☐	☐		☐	☐	☐	
	☐ Shallow (<3 ft)	☐	☐	☐	☐	☐	☐	☐	
7. Does flash flooding occur at the project site? *NT Reference - Detailed Data View, Elevation and Hazard tab*	☐ Yes	☐	☐	☐	☐	☐	☐	☐	
	☐ No	☐	☐	☐	☐	☐	☐	☐	
8. What is the flood velocity? *NT Reference - Detailed Data View, Elevation and Hazard tab*	☐ Fast (>5fps)	☐	☐	☐	☐	☐	☐	☐	
	☐ Slow/Moderate (<5 fps)	☐	☐	☐	☐	☐	☐	☐	
9. Is the structure located in the floodway? *NT Reference - Detailed Data View, Elevation and Hazard tab*	☐ Yes	☐	☐	☐	☐	☐	☐	☐	
	☐ No	☐	☐	☐	☐	☐	☐	☐	
Appropriate Mitigation Measures		☐	☐	☐	☐	☐	☐	☐	

fps = feet per second

ft = feet

sq ft = square feet

Worksheet B: Appropriate Mitigation Measures

Date Prepared:_____ Date Property Visited:_____
Property Owner Name: _____
Property Address:_____
Repetitive Loss Property Locator Number:_____
Prepared by: _____

Instructions to complete Worksheet B: Appropriate Mitigation Measures

1. List the mitigation measures from the "Appropriate Mitigation Measures" row from Worksheet A, Technical Considerations Scorecard, (all checked boxes in last row of Worksheet A)
2. Using information from Chapters Four through 10 of FEMA 551, *Selecting Appropriate Mitigation Measures for Floodprone Structures,* rank each measure as High, Moderate or Low. See "Tips to Rank Mitigation Measures" on next page for additional information.
3. Check the appropriate box (High, Moderate or Low) under each of the decision factors.
4. Total the points for each mitigation measure. **The LOWEST total points indicates the most appropriate mitigation measure(s).**
5. Include notes describing how the determination was made for a particular ranking.

*NOTE: Since Technical Considerations and Relative Costs are more significant in selecting appropriate mitigation measure(s), they are weighted higher than Human Intervention and Annual Maintenance.

Decision Factors – LOWEST score is most appropriate – See Reverse for Notes					
Mitigation Measures	**Technical Considerations***	**Relative Costs***	**Human Intervention**	**Annual Maintenance**	**Total Score**
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts
_____	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (6 pts) M ☐ (4 pts) L ☐ (2 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	H ☐ (3 pts) M ☐ (2 pts) L ☐ (1 pts)	__ pts

Tips to Rank Mitigation Measures (Worksheet B Cont.)

Technical Considerations

Use the responses in Worksheet A, Technical Considerations Scorecard, to determine a ranking of High, Moderate, or Low for each mitigation measure.

- If there are no grayed out boxes checked for a mitigation measure, the technical consideration ranking is Low.
- If there are 1 or 2 grayed out boxes checked for a mitigation measure, the technical consideration score is Moderate.
- If there are 3 or more grayed out boxes checked for a mitigation measure, the technical consideration score is High.

List any considerations in the implementation process that could be a limiting factor or clear constraint in the Notes section.

Relative Costs

Rank each of the mitigation measures based on the estimated cost to address the flood risk and the likelihood of cost-effectiveness. Chapters 4 through 10 include information to rank each mitigation measure based on FEMA 312, *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding*, and FEMA 259, *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*. Low cost indicates Low ranking and high cost indicates High ranking.

Need for Human Intervention

This reflects the need for human intervention to operate the mitigation measure and the warning time to conduct the required activity. Generally, the more "passive" the system (i.e., requiring the least human interaction), the more reliable the system will be over time, thereby resulting in a Low ranking. Mitigation measures that require human intervention, such as barriers and dry floodproofing, receive a High ranking,.

Need for Annual Maintenance

This reflects the level of effort of annual maintenance required by each mitigation measure. Similar to human intevention, less annual maintenance results in a Low ranking.

NOTE: If two or more mitigation measures tie with the lowest score, other decision factors should be considered in determining the most appropriate mitigation measure(s). These considerations include, but are not limited to aesthetics; access to site; housing of occupants during the project; compliance with all applicable codes, ordinances, and regulations; historic preservation concerns; and availability of contractors.

The other decision factors should be listed in the Comments section of Worksheet C.

NOTES:

Mitigation Measures	Technical Considerations

Worksheet C: Initial Consultation with Property Owner

Date Prepared: _____ Consultation Date: _____
Property Owner Name: _____
Property Address:_____
Repetitive Loss Property Locator Number:_____
Prepared by: _____

Instructions to complete Worksheet C: Initial Consultation with Property Owner

1. Record recommended mitigation measure(s) with the lowest score from Worksheet B and include any comments for the discussion with the property owner.
2. Record property owner's response to recommended mitigation measure(s).
3. If an appropriate mitigation measure has been agreed upon, record it under "Property Owner Preferred Mitigation Measure(s)". A detailed cost estimate and/or benefit/cost analysis (BCA) will be necessary to ensure the preferred mitigation measure is appropriate. The cost analysis and additional required actions are recorded under "Action Items for Follow-Up."

Recommended Mitigation Measure(s)

☐ Drainage Improvements
☐ Barriers
☐ Dry Floodproofing
☐ Wet Floodproofing
☐ Elevation
☐ Relocation
☐ Acquisition

Comments

_____
_____
_____
_____

Response from Property Owner

_____
_____
_____
_____

Property Owner Preferred Mitigation Measure(s)

_____

Action Items for Follow-Up

_____
_____
_____

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Worksheet D: Preliminary Cost Estimating Worksheet

Date Prepared: _____ Date Property Visited:_____
Property Owner Name: _____
Property Address:_____
Repetitive Loss Property Locator Number:_____
Prepared by: _____

Mitigation Measure: _____

Cost Component	**Unit**	**Unit Cost**	**Quantity**	**Total**
Subtotal Retrofitting Measure(s)				
Contractor's Profit (10%)				
Design Fee (10%)				
Loss of Income (optional)				
Displacement Expenses (optional)				
Contingency				
Subtotal Other Costs				
Total Costs				

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APPENDIX C – COST ESTIMATING

C.1 Introduction

A cost estimate for each property's selected mitigation measure should be developed to make a decision on the most appropriate mitigation measure. The cost estimate describes all anticipated costs associated with the proposed mitigation measure and represents the approximate price of the proposed activity. The cost estimate should typically reflect the activities described in the scope of work prepared for the activity and be prepared with adequate documentation.

The cost estimate documentation should include the following:

- Detailed information for all project costs, including materials, labor, equipment, and subcontract costs, in addition to maintenance costs over the useful life of the project
- The source of the estimate (e.g., documented local cost, previous similar projects, bids from qualified professionals, published national or local cost-estimating guides, etc.) and documentation supporting each source
- Other related construction, demolition, relocation, maintenance, environmental, and/or historic preservation costs (i.e., survey, permitting, site preparation, and material disposal)
- Base year of all cost estimates provided
- Anticipated date of construction
- Potential impacts to estimated costs resulting from any delay to the anticipated start of construction

NOTE: Some situations will require more complicated comparisons (e.g., comparing the cost of implementing a regional solution barriers or drainage improvements - with the cost of mitigation measures on a structure by structure basis). In this case, it is recommended that accurate cost estimates be performed so that a comprehensive decision can be made.

C.2 Options to Creating a Cost Estimate

The following options should be used to develop preliminary cost estimates for each appropriate mitigation measure. These options are listed in order of increasing cost and level of effort based on the reliability and level of detail of the cost estimate. For example, the first option is the least expensive way to conduct a cost estimate; however, it only provides an approximate cost of the project.

- **Determine costs for similar projects in the area**. Consulting with contractors and building permit officials may yield a list of similar projects in the area. Verify that site and structure conditions are similar before using these costs.
- **Determine costs for similar projects per staff at the State Hazard Mitigation Office or FEMA Regional Office**. State and Federal level staff are involved with a number of

mitigation projects funded by Federal programs (see Appendix E, Hazard Mitigation Assistance Programs) and may be able to provide cost information for similar projects. As with the first option, ensure that the projects are similar in nature.

- **Conduct Preliminary Cost Estimates using assistance from local community agency staff,** if available.
- **Conduct Preliminary Cost Estimates using qualified consultants.**

One of these methods may identify the appropriate mitigation measure. However, if this is not the case, it may be necessary to perform some level of benefit/cost analysis (BCA) to comparatively evaluate mitigation measures (see Appendix D, Determining Cost-Effectiveness).

C.3 Process to Develop a Cost Estimate

Table C-1. Steps to Develop a Cost Estimate

	Step	Task
1.	**Break out the work into smaller tasks**	Smaller tasks can be quantified in terms of materials and/or labor requirements. This can be organized by using a tool such as the *Preliminary Cost Estimating Worksheet* in Appendix B.
2.	**Estimate the quantities of materials and labor**	For example, tasks required to elevate a structure include: ▪ Design, engineering, and permitting ▪ Mobilization ▪ Site preparation (including establishing access, disconnecting utilities) ▪ Excavation ▪ Demolition and hauling ▪ Jacking and cribbing ▪ Masonry or cast-in-place concrete ▪ Carpentry ▪ Utility hook-ups ▪ Site restoration and landscaping
3.	**Determine the unit cost for materials and labor for each task**	Use a resource such as the *RS Means Building Construction Data* or *Marshall and Swift* (see also Subsection C.4, Available Resources)
4.	**Record costs on the Preliminary Cost Estimating Worksheet**	
5.	**Compute cost per task and the total cost estimate**	

For each of the five steps, there are associated labor, material, and equipment costs. Indirect costs required to complete a project can include administrative costs. These costs are allowable under FEMA hazard mitigation assistance grants and can be a significant determination factor in

selecting the preferred mitigation activity. For example, relocation costs for residents involving temporary displacement or moving to another structure should be included in the cost estimate. The relative cost of replacement housing in the area should be considered, particularly where acquisition is the preferred alternative. Also remember the contractor needs to earn a profit. Thus an estimate of cost should include a profit-factor of about 10 to 15 percent of the total estimated cost.

As much detail as possible must be included when preparing a construction cost estimate. Pertinent details for a construction cost estimate can include the amount of dirt to be removed (in cubic feet), weight of steel to be purchased (in tons), amount and type of lumber needed (in linear feet), and type and quantity of concrete needed (in cubic yards).

C.4 Available Resources

Detailed construction cost estimating appears to be a time-consuming task. However, there are two reliable estimating handbooks to help streamline the process.

The RS Means' *Building Construction Cost Data* is an industry standard. It covers every aspect of construction pricing needed to prepare detailed project estimates, including the following:

- Unit costs (lists construction items from site work to finish work)
- References (includes backup information on how the costs are developed and what they include)
- Unit costs for thousands of residential building components
- Location cost adjustment factors
- Daily productivities and standard crews
- Overhead and profit guidance

Additional information on RS Means products and order forms may be found on the website: http://www.rsmeans.com/.

The Marshall & Swift's *Residential Cost Handbook* provides an in-depth description of the costs involved in different types of residential structures, including site-built and modular housing. With six classifications for building quality, ranging from low to excellent, this extensive handbook helps eliminate the guesswork of construction quality with corresponding descriptions and photographs. The *Residential Cost Handbook* and additional resources are found on the Marshall & Swift website (http://www.marshallswift.com/).

NOTE: RS Means and Marshall & Swift also produce cost estimating handbooks for other types of construction (e.g., heavy construction of dams).

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APPENDIX D – DETERMINING COST-EFFECTIVENESS

D.1 Introduction

At its most basic level, benefit/cost analysis (BCA) determines whether the cost of investing in a mitigation project today (the "cost") will result in sufficiently reduced damage in the future (the "benefits") to justify spending money on the project. If the benefit is greater than the cost, then the project is cost-effective; if the benefit is less than the cost, then the project is not cost-effective. Thus, the benefit/cost ratio (BCR) should have a value of 1.0 or greater.

A BCA is conducted in the same way for each type of hazard mitigation project; the difference is in the types of data used in the calculations. Refer to the document *What is a Benefit*, located on FEMA's Mitigation BCA Toolkit (currently Version 3.0), for additional information.

Why should a BCA be conducted?
A determination of cost-effectiveness is required by FEMA if a proposed project is to be considered for Federal funding. If the proposed project is determined to be cost-effective (i.e., has a BCR of 1.0 or greater), funding from FEMA's grant programs, such as the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance Program (FMA), Pre-Disaster Mitigation Program (PDM), Repetitive Flood Claims (RFC) Program, and others could be used to reduce the cost of the project to the property owner. For additional information on these programs and others that fund eligible projects, refer to Appendix E, Hazard Mitigation Assistance Programs.

D.2 Process to Assess Cost-Effectiveness

There are two different methods for assessing cost-effectiveness: 1) a quick screening to determine whether the project is likely to be cost-effective and 2) a BCA using software available through FEMA.

Quick Screening to Determine Cost Effectiveness

With some experience, a community official can look at key project data, before doing any analysis, and determine whether the project is likely to be cost-effective. Table D-1 shows how to quickly screen a project for cost-effectiveness based on these attributes, as well as the damages expected from various types of floods. In Table D-1, the damages refer to losses to structures or residences, contents of these structures, displacement costs (temporary housing), and the loss of critical public services and infrastructure (e.g., hospitals, electricity, schools, roads, bridges, etc.). The more frequent the flood, the more damage can be expected, and the more cost-effective the project is likely to be, as it protects against those damages. It is important to understand that "quick screening" will not yield a conclusive cost-effectiveness determination and should be used only as a preliminary indicator of the appropriateness of the project.

Table D-1. Quick Screening to Determine the Likelihood of Cost-Effectiveness

	Likelihood of Cost-Effectiveness			
Attribute	Very High	High	Moderate	Low
Frequency of Flood	10-year flood	10- to 25-year flood	25- to 50-year flood	50- to 100-year flood
Level of Damage	Very high damage	High damage	Limited damage	Minor damage
Project Cost	Low relative to damages	Moderately-low relative to damages	Close to cost of damages in frequent floods	High relative to damages in frequent floods
Project Benefits	Very high	High	Moderate	Low
Criticality (impact or loss of function)	Very high, broad damages to community	High damages to key facility; community	Moderate loss of certain functions limited impact	Little or no loss of functions; minor impact

(Source: *How to Determine Cost-Effectiveness of Hazard Mitigation Projects*, Chapter 3 from FEMA's Mitigation BCA Toolkit Version 2.0)

Benefit/Cost Analysis

FEMA's Mitigation Benefit/Cost Toolkit includes BCA modules, which address both riverine and coastal flooding. The riverine software includes three levels of BCA: Very Limited Data Module, Limited Data Module, and Full Data Module. These modules are described in detail in *How to Determine Cost-Effectiveness of Hazard Mitigation Projects* (also referred to as the "Yellow Book") located on FEMA's Mitigation BCA Toolkit. The toolkit itself may be obtained free of charge by contacting the BC Helpline at 1-(866) 222-3580 or bchelpline@dhs.gov.

The procedures required by FEMA for performing a BCA are specific and well defined. Without previous experience with FEMA-compliant BCAs, there are two options:

- **Get training**. FEMA offers extensive training opportunities through the Emergency Management Institute (EMI). Contact the State Hazard Mitigation Office or FEMA Regional Office for information on how to obtain training.
- **Get help**. Consultants with BCA experience are effective, especially with more complicated projects.

APPENDIX E – HAZARD MITIGATION ASSISTANCE PROGRAMS

NOTE: By the end of FY 2007, FEMA will offer five hazard mitigation assistance programs as described below. All five programs have unique statutory authorities, program requirements, and triggers for funding. All of the programs have the common goal of providing funds to States, Territories, Tribal governments, and communities to reduce the loss of life and property from future natural hazard events. These programs as described below are subject to revision. Check with the FEMA Regional Office for the latest information (http://www.fema.gov/about/contact/regions/).

NOTE: The mitigation reconstruction project entails demolishing the floodprone house and then reconstructing a new elevated, code-compliant house on the same site. These projects are most often justified through application of the following criteria:

- When the cost of a standard elevation or acquisition project approximates or exceeds the cost to construct a new structure, or
- When a standard elevation or acquisition project is not possible or feasible due to the condition of the structure or some other structural impairment.

CAUTION

If a mitigation reconstruction method is selected, FEMA grant program funding may not be available. In instances where traditional mitigation options are not programmatically feasible, check with the State Hazard Mitigation Officer to determine if funding may be available for the mitigation measure selected before proceeding.

E.1 Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) was created in 1988 by Section 404 of the Robert S. Stafford Disaster Relief and Emergency Assistance Act, as amended (amendments include the Hazard Mitigation and Relocation Assistance Act of 1993, the Disaster Mitigation Act of 2000, and the Post Katrina Emergency Management Reform Act of 2006). The HMGP assists States, Territories, Tribal governments, and communities in implementing long-term hazard mitigation measures for all hazard types following a major disaster declaration. A key purpose of the HMGP is to ensure that the opportunity to take critical mitigation measures to protect life and property from future disasters is not lost during the recovery and reconstruction process following a disaster.

The program's objectives are to:

- Significantly reduce or permanently eliminate future risk to lives and property from severe hazards
- Provide funds to implement projects previously identified in State, Tribal, or local hazard mitigation plans

- Enable mitigation measures to be implemented during the immediate recovery from a disaster

HMGP funds can be made available based on a percentage of the estimated Federal funds to be spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster. These grant funds may be used to fund up to 75 percent of the eligible project costs. The non-Federal match does not need to be in cash; in-kind services or materials may be used.

Eligible mitigation measures under the HMGP include acquisition or relocation of floodprone structures, elevation of floodprone structures, seismic rehabilitation of existing structures, constructing "safe rooms" inside schools or other buildings in tornado-prone areas, and strengthening of existing structures against hurricane force winds. Additionally, up to 7 percent of HMGP funds, available from any disaster, may be used to develop State and/or local mitigation plans.

The State, as grantee, is responsible for administering the HMGP. Communities develop HMGP project applications and apply for funds through the State. The State notifies potential applicants of the availability of funding, defines a project selection process, ranks and prioritizes projects for funding, and forwards projects to FEMA for approval. The applicant, or subgrantee, carries out approved projects. The State, local government, or the property owner must provide a 25 percent match, which can be from a combination of cash and in-kind sources.

In response to flood hazards, FEMA's primary emphasis is on nonstructural hazard mitigation measures. Nonstructural measures include the acquisition and demolition, relocation, elevation, and floodproofing of flood-damaged or floodprone properties.

For more information on the HMGP, contact the State Hazard Mitigation Office or the FEMA Regional Office. Detailed information about managing the program can be found in FEMA's *HMGP Desk Reference* (FEMA 345) at http://www.fema.gov/government/grant/hmgp/index.shtm. To order a copy, call 1-(800)480-2520.

E.2 Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) program provides funding to assist States and communities to accomplish flood mitigation planning and implement measures to reduce future flood damages to structures insured under the National Flood Insurance Program (NFIP). This program was created as part of the National Flood Insurance Reform Act of 1994 (42 United States Code [USC] 4101).

The FMA program provides annual funding for planning and project grants. Eligible activities for planning grants include conducting local planning meeting to obtain citizen input; contracting for engineering or planning technical assistance; surveying structures at risk of flooding; and assessing repetitive losses. Only projects for mitigation activities specified in an approved flood mitigation plan are eligible for project grants. For example, a community may determine in its plan that acquisition of structures would be the preferred alternative for floodway areas, while elevation may be a more appropriate solution in other areas of the floodplain.

The purpose of FMA project grants is to assist States and communities in implementing flood mitigation projects to reduce the risk of flood damage to NFIP-insured structures. Eligible types of projects include:

- Elevation of residential structures and elevation or dry floodproofing of non-residential structures in accordance with 44 Code of Federal Regulations (CFR) §60.3.
- Acquisition of structures and underlying real property.
- Relocation of structures from acquired or deed restricted real property to sites not prone to flood hazards.
- Dry floodproofing of non-residential structures.
- Demolition of structures on acquired or deed restricted real property.
- Beach nourishment activities that focus on facilitating natural dune replenishment through the planting of native dune vegetation and/or the installation of sand fencing. Placement of sand on beach is not eligible.
- Minor physical flood control projects that do not duplicate the flood-prevention activities of other Federal agencies that address localized flood problem areas such as stabilization of stream banks, modification of existing culverts, or creation of small stormwater retention basins. Major structural flood control structures, such as levees, dams, and seawalls are not eligible.

Any State agency, participating NFIP community (including tribal governments), or qualified local organization is eligible to participate in the FMA program. Communities that are suspended or on probation from the NFIP are not eligible. Individuals wishing to participate in the FMA program should contact their community officials.

A project must, at a minimum, be:

- Cost-effective
- Cost beneficial to the NFIP
- Technically feasible
- Physically located in a participating NFIP community, or must reduce future flood damages in an NFIP community

A project must also conform to:

- The minimum standards of the NFIP floodplain management regulations
- The applicant's flood mitigation plan
- All applicable laws and regulations, such as Federal and State environmental standards or local building codes

FEMA distributes funds to States, which in turn provide funds to communities. The State serves as the grantee and program administrator for the FMA. The State:

- Sets mitigation priorities
- Provides technical assistance to communities applying for FMA funds

- Evaluates grant applications based on minimum eligibility criteria and State priorities
- Awards planning grants
- Works with FEMA to approve projects and awards funds to communities
- Ensures that all community applicants are aware of their grant management responsibilities

For more information on how to apply for a FMA grant, contact the State FMA Point of Contact (POC) or call the nearest FEMA Regional Office for the name of the State's POC. A list of FEMA Regional Offices and contact information are included in Appendix F and are available from http://www.fema.gov/about/contact/regions/. Additional information on the FMA program may be found at the FEMA website at http://www.fema.gov/government/grant/fma/index.shtm.

E.3 Pre-Disaster Mitigation Program

The Pre-Disaster Mitigation (PDM) program was authorized by Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Stafford Act), 42 U.S.C., as amended by Section 102 of the Disaster Mitigation Act of 2000 (DMA 2000).

Funding is provided to assist States, Tribes, and communities in implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, damage, and destruction of property. FEMA provides PDM grants to states which, in turn, provide sub-grants to local governments for mitigation activities such as planning and the implementation of projects identified through the evaluation of natural hazards.

Only the State emergency management agencies or a similar office (i.e., the office that has emergency management responsibility) of the State as well as federally recognized Indian tribal governments are eligible to apply to FEMA for assistance as applicants under this program.

Guidance materials for all Hazard Mitigation Assistance programs such as model scopes of work, Benefit/Cost Analysis Guidelines, and engineering case studies are currently available on the FEMA webpage at http://www.fema.gov/government/grant/pdm/index.shtm or from the FEMA Regional Office.

E.4 Repetitive Flood Claims Program

The Repetitive Flood Claims (RFC) grant program provides funding to reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP that have had one or more claim payments for flood damages, through mitigation activities that are in the best interest of the National Flood Insurance Fund (NFIF). RFC funds may only mitigate structures that are located within a State or community that can not meet the requirements of the FMA program for either cost share or capacity to manage the activities.

The RFC program was authorized by Section 1323 of the Act, 42 U.S.C. 4030, as amended by the Flood Insurance Reform Act (FIRA) of 2004, Public Law 108-264.

The RFC program provides funding up to $10 million a year with up to 100 percent Federal funding (no non-Federal match requirement). Current eligible activities include the acquisition of

severe repetitive loss (SRL) properties and non-residential properties that meet the same claim thresholds as defined SRL properties. Planning grants are not available under the RFC. There is currently no local plan requirement for participation.

A project must, at a minimum, be:

- Cost-effective
- Cost beneficial to the NFIP
- Technically feasible
- Physically located in a participating NFIP community
- Insured under the NFIP

A project must also conform to:

- The minimum standards of the NFIP floodplain management regulations
- All applicable laws and regulations, such as Federal and State environmental standards or local building codes

Any State agency, participating NFIP community (including Tribal governments), or qualified local organization is eligible to participate in the RFC program. Communities that are suspended or on probation from the NFIP are not eligible. Individuals wishing to participate in the RFC program should contact their community officials. Only those States or communities that can not meet the requirements of the FMA program for either cost share or capacity to manage the activities are eligible to apply under the RFC program.

Guidance materials and application forms, such as grant administrative forms, project sub-applications, and management costs sub-applications (for Grantees), are available at any FEMA Regional Office or on the FEMA web page:
http://www.fema.gov/government/grant/rfc/index.shtm.

E.5 Severe Repetitive Loss Program

The Severe Repetitive Loss (SRL) program provides funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss properties and the associated drain on the NFIF from such properties. See Appendix I – Glossary, for a definition of SRL properties.

The SRL program was authorized by Section 1361A of the Act, 42 U.S.C. 4102a, as amended by the Flood Insurance Reform Act (FIRA) of 2004, Public Law 108-264.

FEMA is currently developing regulations for the SRL program. The FEMA web page http://www.fema.gov/government/grant/srl/index.shtm will be updated with information on the availability of funds, application periods, and other program requirements periodically.

The SRL program currently provides funding up to $40 million annually until 2009 with 75 percent Federal funding (minimum 25 percent non-Federal match requirement). A reduced match (10 percent non-Federal funding) is allowed for States with approved State mitigation plans meeting the hazard mitigation planning requirements under Section 322 of the Robert T. Stafford

Disaster Relief and Emergency Assistance Act (42 USC 5165) that specifies how the State reduces the number of severe repetitive loss properties.

Allocations to eligible applicants (States, Territories, and Tribal governments) will be based on the number of severe repetitive loss properties in each State or Territory. A set-aside amount of 10 percent is reserved for communities that receive little or no assistance under the allocation formula.

Current eligible activities include:

- Acquisition, structure demolition, or structure relocation with the property deed restricted for open space uses in perpetuity
- Elevation of structures
- Floodproofing of structures
- Minor physical localized flood control projects
- Mitigation and reconstruction

E.6 Additional Information

- Contact information for State Emergency Management Directors through the National Emergency Management Agency, http://www.nemaweb.org/State_Contacts/index.cfm
- Contact information for State Hazard Mitigation Officers through the State Offices and Agencies of Emergency Management, http://www.fema.gov/about/contact/statedr.shtm
- Public Assistance (PA) Program, http://www.fema.gov/government/grant/pa/index.shtm

The objective of FEMA's PA Grant Program is to provide assistance to States, local governments, and certain non-profit organizations to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President.

Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations.

The Federal share of assistance is not less than 75 percent of the eligible cost for emergency measures and permanent restoration. The grantee (usually the State) determines how the non-Federal share (up to 25 percent) is split with the subgrantees (eligible applicants).

- Individual Assistance Programs,

  http://www.fema.gov/media/fact_sheets/individual-assistance.shtm

When the President declares a disaster and authorizes providing Individual Assistance, FEMA's Individuals and Households Program (IHP) can help homeowners and renters affected by the disaster with housing needs and necessary expenses.

To be considered for IHP housing assistance, the affected home must be the individual's primary residence and it must be located in the disaster area designated for Individual Assistance. To be considered for IHP assistance for necessary expenses or serious needs, the loss must have occurred in the disaster area designated for Individual Assistance. An individual or a pre-disaster member of the household must be a United States citizen, a non-citizen national, or a qualified alien.

When a disaster is declared and Individual Assistance is authorized, affected individuals are directed to register with FEMA and to make sure that the information they provide is complete and correct.

Disaster assistance is money or direct assistance to individuals, families, and businesses in an area whose property has been damaged or destroyed and whose losses are not covered by insurance. It is meant to help you with critical expenses that cannot be covered in other ways. This assistance is not intended to restore your damaged property to its condition before the disaster.

While some housing assistance funds are available through FEMA's IHP, most disaster assistance from the Federal Government is in the form of loans administered by the Small Business Administration (SBA).

E.7 Housing Needs

- **Temporary Housing** (a place to live for a limited period of time). Money is available to rent a different place to live, or a government provided housing unit when rental properties are not available.

- **Repair.** Money is available to homeowners to repair damage from the disaster to their primary residence that is not covered by insurance. The goal is to make the damaged home safe, sanitary, and functional.

- **Replacement.** Money is available to homeowners to replace their home destroyed in the disaster that is not covered by insurance. The goal is to help the homeowner with the cost of replacing his or her destroyed home.

- **Permanent Housing Construction.** Direct assistance or money for the construction of a home. This type of help only occurs in insular areas or remote locations specified by FEMA, where no other type of housing assistance is possible.

Money is available for necessary expenses and serious needs caused by the disaster. This includes:

- Disaster-related medical and dental costs.
- Disaster-related funeral and burial costs.
- Clothing; household items (room furnishings, appliances); tools (specialized or protective clothing and equipment) required for your job; necessary educational materials (computers, school books, supplies).
- Fuels for primary heat source (heating oil, gas, firewood).
- Clean-up items (wet/dry vacuum, air purifier, and dehumidifier).
- Disaster damaged vehicle.
- Moving and storage expenses related to the disaster (moving and storing property to avoid additional disaster damage while disaster-related repairs are being made to the home).
- Other necessary expenses or serious needs as determined by FEMA.
- Other expenses that are authorized by law.

Moving and storage expenses related to the disaster (moving and storing property to avoid additional disaster damage while disaster-related repairs are being made to the home).

- Other necessary expenses or serious needs as determined by FEMA.
- Other expenses that are authorized by law.

- U.S. Small Business Administration (SBA), http://www.sba.gov

  http://www.fema.gov/assistance/process/sba_assistance.shtm

The SBA was created in 1953 as an independent agency of the Federal Government to aid, counsel, assist and protect the interests of small business concerns; preserve free competitive enterprise; and maintain and strengthen the overall economy of our nation.

The SBA provides various types of loans for businesses of all sizes and homeowners and renters in the event of a disaster. This includes physical disaster loans, economic injury loans, military reservists' loans, and home and personal property loans. These loans help people recover from disasters and rebuild their lives by providing affordable, timely, and accessible financial assistance to homeowners, renters, and businesses.

APPENDIX F – FEMA REGIONAL OFFICES

http://www.fema.gov/about/contact/regions.shtm

Location	FEMA
Region I: (CT, MA, ME, NH, RI, VT)	FEMA 99 High Street, 6th Floor Boston, MA 02110 (617) 956-7559
Region II: (NJ, NY)	26 Federal Plaza, Suite 1311 New York, NY 10278-0002 (212) 680-3600
Caribbean Office (PR, VI)	*Mailing address*: FEMA Caribbean Division P.O. Box 70105 San Juan PR 00936-0105 (787) 296-3500 *Physical address*: New San Juan Office Building 159 Calle Chardon Avenue Sixth Floor Hato Rey, PR 00918

Region III: (DC, DE, MD, PA, VA, WV)	One Independence Mall, 6th Floor 615 Chestnut Street Philadelphia, PA 19106-4404 (215) 931-5608
Region IV: (AL, FL, GA, KY, MS, NC, SC, TN)	Koger Center - Rutgers Building 3003 Chamblee-Tucker Road, Room 270 Atlanta, GA 30341 (770) 220-5200
Region V: (IL, IN, MI, MN, OH, WI)	536 S. Clark Street 6th Floor Chicago, IL 60605 (312) 408-5500
Region VI: (AR, LA, NM, OK, TX)	Federal Regional Center 800 North Loop 288 Denton, TX 76201-3698 (940) 898-5399
Region VII: (IA, KS, MO, NE)	Suite 300 9221 Ward Parkway Kansas City, MO 64114-3372 (816) 283-7002
Region VIII: (CO, MT, ND, SD, UT, WY)	Building 710 Denver Federal Center P.O. Box 25267 Denver, CO 80225-0267 (303) 235-4800
Region IX: (AZ, CA, HI, NV, Guam, American Samoa, Mariana Islands)	1111 Broadway, Suite 1200 Oakland, CA 94607-4052 (510) 627-7100
Region X: (AK, ID, OR, WA)	Federal Regional Center 130 228th Street, S.W. Bothell, WA 98021-9796 (425) 487-4600

Regional Repetitive Loss Coordinators

As of June 9, 2006

Region	Contact Name	Contact Phone #	Backup Contact	Supervisor
I	Daisy Sweeney*	(617) 832-4788		Mike Goetz
II	Pat Griggs	(212) 680-3625	Scott Duell* (212) 680-3630	Mary Colvin
III	Dave Odegard	(215) 931-5506		Gene Gruber
IV	David L. Thomas II	(770) 220-5457	Robert Durrin (770) 220-5428	Brad Loar
V	Eric Kuklewski	(312) 408-5230		Terry Fell
VI	Mark Price	(940) 898-5359	Ross Richardson (940) 898-5143	Frank Pagano
VII	Joe Chandler	(816) 283-7071	Georgia Wright	Kathy Strange
VIII	Bonnie Heddin*	(303) 235-4739		Robert Ives
IX	Mike Hornick*	(510) 627-7260		Michael Shore
X	Denise Atkinson	(425) 487-4677	Bruce Knipe	Mark Carey

* Region's FMA coordinator

Headquarters Contact

Errol Garren (202) 646-3678

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APPENDIX G – STATE AND TRIBAL HISTORIC PRESERVATION OFFICES

The following contact information is subject to change. For a current list of State Historic Preservation Offices, see http://www.ncshpo.org/stateinfolist/FullList.htm
For a complete list of Tribal Historic Preservation Offices, see http://www.cr.nps.gov/hps/tribal/thpo.htm

State Historic Preservation Offices

Alabama

Col. John Neubauer, Executive Director & SHPO
Alabama Historical Commission
468 South Perry Street
Montgomery, AL 36130-0900
(334) 242-3184, Fax (334) 240-3477

Alaska

Judith Bittner, SHPO
Alaska DNR, Office of History & Archaeology
550 West 7th Avenue
Suite 1310
Anchorage, AK 99501-3565
(907)269-8721, Fax (907)269-8908
judy_bittner@dnr.state.ak.us

American Samoa

John Enright, HPO
Executive Offices of the Governor
AS Government/Historic Preservation Office
Pago Pago, American Samoa 96799
(684) 699-2316, Fax (684) 699-2276
enright@samoatelco.com

Arizona

James W. Garrison, SHPO
Arizona State Parks
1300 West Washington
Phoenix, AZ 85007
(602) 542-4174, Fax (602) 542-4180
jgarrison@pr.state.az.us

Arkansas

Cathie Matthews, SHPO
Department of Arkansas Heritage
323 Center Street
Suite 1500
Little Rock, AR 72201
(501) 324-9150, Fax (501) 324-9154
cathie@arkansasheritage.org

California

Milford Wayne Donaldson, SHPO
Office of Historic Preservation
Department of Parks & Recreation
P.O. Box 942896
Sacramento, CA 94296-0001
(916) 653-6624, Fax: (916) 653-9824
mwdonaldson@parks.ca.gov

Colorado

Georgianna Contiguglia, SHPO
Colorado Historical Society
1300 Broadway
Denver, CO 80203
(303) 866-3355, Fax (303) 866-4464

Connecticut

Jennifer Aniskovich, Executive Director
Connecticut Commission on Culture and Tourism
755 Main Street
One Financial Plaza
Hartford, CT 06103
(860) 566-4770, Fax (860) 566-5078
janiskovich@ctarts.org

Delaware

Timothy A. Slavin, SHPO
Division of Historical and Cultural Affairs
21 The Green
Dover, DE 19901
(302) 739-5313, Fax (302) 739-6711
timothy.slavin@state.de.us

District of Columbia

SHPO
Historic Preservation Office
801 North Capitol Street, NE.
3rd Floor
Washington, DC 20002
(202) 442-8800, Fax (202) 741-5246

Florida

Frederick Gaske, SHPO & Division Director
Division of Historical Resources,
Department of State
500 South Bronough Street
Room 305
Tallahassee, FL 32399-0250
(850) 245-6300
fgaske@dos.state.fl.us

Bureau of Historic Preservation
(800) 847-7278
(850) 245-6333, Fax: (850) 245-6437

Georgia

Noel A. Holcomb, SHPO
Historic Preservation Division/DNR
34 Peachtree Street NW
Suite 1600
Atlanta, GA 30303-2316
(404) 656-2840, Fax: (404) 651-8739

Guam

Lynda B. Aguon, SHPO
Guam Historic Preservation Office
Department of Parks & Recreation
490 Chalan Palasyo
Agana Heights, Guam 96910
(671) 475-6294/6295/6272
Fax: (671) 477-2822
laguon@mail.gov.gu

Hawaii

Peter T. Young, SHPO
Department of Land & Natural Resources
601 Kamokila Boulevard
Suite 555
Kapolei, HI 96707
(808) 548-6550, Fax (808) 587-0018

Idaho

Keith Peterson Interim Director
Idaho State Historical Society
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(208) 334-2682
kpeterson@ishs.idaho.gov

Illinois

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Associate Director
Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, IL 62701-1512
(217) 785-4512, Fax (217) 524-7525

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Indiana Government Center South
Room W256
Indianapolis, IN 46204
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Iowa

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State Historical Society of Iowa
Capitol Complex
East 6th and Locust Street
Des Moines, IA 50319
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6425 Southwest 6th Avenue
Topeka, KS 66615-1099
(785) 272-8681 x210
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Frankfort, KY 40601
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Louisiana

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Department of Culture, Recreation & Tourism
P.O. Box 44247
Baton Rouge, LA 70804
(225) 342-8200, Fax (225) 342-8173

Maine

Earle G. Shettleworth, Jr., SHPO
Maine Historic Preservation Commission
55 Capitol Street
Station 65
Augusta, ME 04333
(207) 287-2132, Fax (207)287-2335
earle.shettleworth@maine.gov

Marshall Islands, Republic of the

Lenest Lanki, HPO
Secretary of Interior and Outer Islands Affairs
P.O. Box #1454
Majuro Atoll, MH 96960
(011) 692-625-4642
Fax (011) 692-625-5353

Maryland

J.. Rodney Little, SHPO
Maryland Historical Trust
100 Community Place
3rd Floor
Crownsville, MD 21032-2023
(410) 514-7600, Fax (410) 514-7678
RLittle@mdp.state.md.us

Massachusetts

Brona Simon, DSHPO & Acting Executive Director
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220 Morrissey Boulevard
Boston, MA 02125
(617) 727-8470, Fax (617) 727-5128
Brona.Simon@state.ma.us

Michigan

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Michigan Historical Center
702 West Kalamazoo Street
P.O. Box 30740
Lansing, MI 48909-8240
(517) 373-1630, Fax (517) 335-0348
conwaybd@michigan.gov

Micronesia, Federated States of

Rufino Mauricio, FSM HPO
Office of Administrative Services
Division of Archives and Historic Preservation
FSM National Government
P.O. Box PS 70
Palikir, Pohnpei, FM 96941
(011) 691-320-2343
Fax: (011) 691-320-5634
hpo@mail.fm

Minnesota

Dr. Nina Archabal, SHPO
Minnesota Historical Society
345 Kellogg Boulevard West
St. Paul, MN 55102-1906
(651) 296-2747, Fax (651) 296-1004

Mississippi

H.T. Holmes, SHPO
Mississippi Department of Archives & History
P.O. Box 571
Jackson, MS 39205-0571
(601) 576-6850

Missouri

Doyle Childers, SHPO
State Department of Natural Resources
(573) 751-4732, Fax (573) 751-7627

Montana

Dr. Mark F. Baumler, SHPO
State Historic Preservation Office
1410 8th Avenue
P.O. Box 201202
Helena, MT 59620-1202
(406) 444-7719, Fax:(406) 444-6575
swilmoth@mt.gov

Nebraska

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Nebraska State Historical Society
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Lincoln, NE 68501
(402) 471-4745, Fax (402)471-3100
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Nevada

Ronald James, SHPO
Historic Preservation Office
100 North Stewart Street
Capitol Complex
Carson City, NV 89701-4285
(775) 684-3440, Fax (775) 684-3442

New Hampshire

James McConaha, SHPO & Director
New Hampshire Division of Historical Resources
19 Pillsbury Street
2nd Floor
Concord, NH 03301-3570
(603) 271-6435, Fax:(603) 271-3433
TDD: (800)735-2964
James.McConaha@dcr.nh.gov

New Jersey

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Department of Environmental Protection
401 East State Street
P.O. Box 402
Trenton, NJ 08625
(609) 292-2885, Fax (609) 292-7695

New Mexico

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407 Galisteo Street
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Santa Fe, NM 87501
(505) 827-6320, Fax: (505) 827-6338
katherine.slick@state.nm.us

New York

Bernadette Castro, SHPO
Parks, Recreation & Historic Preservation
Agency Building #1
Empire State Plaza
Albany, NY 12238
(518) 474-0443

North Carolina

Dr. Jeffrey J. Crow SHPO
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4610 Mail Service Center
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jeff.crow@ncmail.net

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State Historical Society of North Dakota
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(701)328-2666, Fax:(701) 328-3710
mpaaverud@nd.gov

Northern Mariana Islands, Commonwealth of

Mary Margaret (Maggie) Sablan, Acting HPO
Department of Community & Cultural Affairs
Division of Historic Preservation, Airport Road
Saipan, MP 96950
(670) 664-2120/2125, Fax: (670) 664-2139
cnmihpo@vzpacifica.net

Ohio

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Ohio Historic Preservation Office
Ohio Historical Society
567 East Hudson Street
Columbus, OH 43211-1030
(614) 298-2000; Fax (614) 298-2037
rtooker@ohiohistory.org

Oklahoma

Dr. Bob L. Blackburn, SHPO
State Historic Preservation Office
Oklahoma Historical Society
Oklahoma History Center
2401 North Laird Avenue
Oklahoma City, OK 73105-7914
(405) 521-6249, Fax (405) 522-0816

Oregon

Tim Wood, SHPO
Oregon Parks & Recreation Department
725 Summer Street, NE.
Suite C
Salem, OR 97301

Palau, Republic of

Victoria N. Kanai, HPO
Ministry of Community & Cultural Affairs
P.O. Box 100
Koror, PW 96940
(011) 680-488-2489
Fax: (011) 680-488-2657

Pennsylvania

Barbara Franco, SHPO
Pennsylvania Historical and Museum Commission
300 North Street
Harrisburg, PA 17120
(717) 787-2891

Puerto Rico, Commonwealth of

Aida Belen Rivera Ruiz, SHPO
State Historic Preservation Office
P.O. Box 9066581
San Juan, PR 00906-6581
(787) 721-3737, Fax (787) 721-3773
abrivera@prshpo.gobierno.pr

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APPENDIX H – NFIP STATE COORDINATING AGENCIES AND STATE HAZARD MITIGATION OFFICERS

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APPENDIX I – GLOSSARY

A Zones	A Zones are areas within the Special Flood Hazard Area identified on FIRMs as an area that has a 1 percent or greater annual chance of flooding. The A Zone may be identified on a FIRM with one of the following designations: AE, A1-30, AO, AH, or A. These areas include riverine floodplains, lacustrine (lake) floodplains, and coastal floodplains landward of V Zones.
Approximate A Zones	Areas not studied by detailed hydrologic/hydraulic methods. These areas are shown on a FIRM as "unnumbered A zones" and "approximate 100-year flood zones" on the Flood Boundary and Floodway Map (FBFM).
Base Flood Elevation (BFE)	The water surface elevation resulting from the base flood, (i.e., a flood that has a 1 percent chance of equaling or exceeding that level in any given year [100-year flood]).
Construction Type	
Concrete	Walls constructed of concrete block
Frame	Walls constructed of wood or light gauge metal studs, with wood, vinyl, or aluminum siding
Masonry	Walls constructed of brick
Manufactured home	Prefabricated frame structure constructed on a transportable frame
Disaster Mitigation Act of 2000 (DMA 2000)	The impetus for states and communities to undertake natural hazard mitigation planning was given a significant boost on October 30, 2000, when the President signed the Disaster Mitigation Act of 2000 (Public Law 106-390). To maintain eligibility for pre- and post-disaster grant funds, communities need to have a mitigation plan approved by FEMA that identifies risks from natural hazards and includes a strategy to address these problems.
Dry floodproofing	Measures that eliminate or reduce the potential for flood damage by keeping floodwaters out of the structure. Examples include installation of watertight shields for doors and windows, reinforcement of walls to withstand the hydrostatic and hydrodynamic pressures and debris impact, and use of sealants to reduce seepage of floodwaters through walls.

Elevation Datum	Elevation datum, or datum plane, is an arbitrary surface that serves as a common reference for the elevations of points above or below it. Elevations are expressed in terms of feet, meters, or other units of measure and are identified as negative or positive depending on whether they are above or below the datum plane. Three common elevation datum are mean sea level (msl), National Geodetic Vertical Datum (NGVD), and North American Vertical Datum (NAVD).
Erosion	The removal of soil that lowers the ground surface elevation across an area.
Flash flood	A flood that rises and falls very quickly and is usually characterized by high flow velocities. Flash floods often result from intense rainfall over a small area and can also occur in highly urbanized areas where pavements and other impervious improvements increase the volume and speed of runoff.
Flood fringe	The portion of the floodplain that lies beyond the floodway and serves as a temporary storage area for floodwaters during a flood. This section receives waters that are generally shallower and of lower velocities than those of the floodway.
Flood Hazard Boundary Map (FHBM)	An official map of a community published by FEMA that delineates the approximate boundary of the floodplain. An FHBM is generally the initial map provided to the community and is usually eventually superseded by a FIRM.
Flood Insurance Rate Map (FIRM)	An official map of a community, on which the Federal Emergency Management Agency has delineated both the special hazard areas and the risk premium zones applicable to the community. The map shows the extent of the base floodplain and may also display the extent of the floodway, as well as other relevant information such as Base Flood Elevations.
Flood Insurance Study (FIS)	An engineering study developed in conjunction with the FIRM. The FIS, also known as a flood elevation study, frequently contains a narrative of the flood history of a community and discusses the engineering methods used to develop the FIRM. The study also contains flood profiles for studied flooding sources and is used to provide accurate Base Flood Elevations for some areas.
Floodplain	Any land area susceptible to being inundated by the 1 % flood.
Floodplain Management Regulations	Regulations for development and land use within floodprone areas. Floodplain management regulations in communities that participate in the National Flood Insurance Program must be compliant with the NFIP requirements described in 44 CFR 60.3.

Flood Protection Elevation (FPE)	Elevation of the highest flood, including freeboard that a retrofitting method is intended to protect against.
Floodway	The channel of a river or other watercourse and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without cumulatively increasing the water surface elevation more than a designated height (usually 1 foot).
Foundation Type	
Basement	Any area of the building having its floor subgrade (below ground level) on all sides.
Crawlspace	Low space below the first floor of a house, where there has not been excavation deep enough for a basement, but where there is often access for pipes, ducts, and utilities.
Pier	An upright support member of a building with a height limited to a maximum of three times its least lateral dimension. It is designed and constructed to function as an independent structural element in supporting and transmitting building and environmental loads to the ground.
Pile	An upright support member of a building, usually long and slender in shape, driven or jetted into the ground by mechanical means and primarily supported by friction between the pile and the surrounding earth.
Post or Column	Upright support units for a building, set in pre-dug holes and backfilled with compacted material. Posts are usually made of wood and columns are usually of concrete or masonry construction.
Slab-on-grade	A structural design where the first floor sits directly on a poured concrete slab, which sits directly on the ground.
Freeboard	An additional amount of height above the Base Flood Elevation used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or local community floodplain management regulations.
Hazard Mitigation	Any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.
Hydraulics	Hydraulics is used to determine how a quantity of water will flow through a channel or floodplain. Hydraulic analysis combines: • Flood hydrology, or discharges,

	• Cross-section data on how much area there is to carry the flood, and • Stream characteristics such as roughness, slope, locations, and sizes of structures.
Hydrodynamic Loads	Forces imposed on an object, such as a structure, by water moving around it. Among these loads are positive frontal pressure against the structure, drag effect along the sides and negative pressure on the downstream side.
Hydrology	Hydrology deals with the distribution and circulation of water in the atmosphere, on land surfaces, and underground, and is used to determine flood flow frequencies. A hydrologic analysis determines the amount of rainfall that will stay in a watershed and the rate at which the remaining amount of rainfall will reach the stream.
Hydrostatic Loads	Forces imposed on a surface, such as a wall or floor slab, by a standing mass of water. The water pressure increases with the square of the water depth.
Increased Cost of Compliance (ICC)	NFIP flood insurance coverage for expenses that a property owner must incur, above and beyond the cost to repair the physical damage the structure actually sustained from a flooding event, to comply with mitigation requirements of state or local floodplain management ordinance or laws. Acceptable mitigation measures are elevation, floodproofing, relocation, demolition, or any combination thereof (*Flood Insurance Manual*, May 2003 [revised May 2004]).
Levee	Manmade structures, usually an earthern embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide protection from temporary flooding.
Map Modernization	Efforts being made by FEMA to update flood maps for the Nation to digital format and streamline FEMA's responses to requests to revise them.
Market Value	The value of a structure based on the estimated price it would be sold by a willing seller to a willing buyer in the current real estate market.
Mitigation	Any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.
Mitigation Planning	Hazard mitigation planning is the process of figuring out how to reduce or eliminate the loss of life and property damage resulting from natural hazards like floods, earthquakes, and tornadoes**.**

National Flood Insurance Program (NFIP)	Established in 1968 to help flood victims recover from the effects of flooding (Pub. L. 90-448, 42 U.S.C. 4001 et seq.), the NFIP is administered by FEMA. The NFIP is a government program that provides public benefits that go beyond what private sector insurance could achieve. Those who are at risk pay toward their own recovery so the financial burden is shifted away from disaster assistance programs funded by the general taxpayer. Flood insurance premium payments go into the National Flood Insurance Fund (NFIF), which in turn is used to pay claims resulting from flood damages. Those individuals with a flood insurance policy can receive the resources needed to clean and repair or replace their damaged property. The concept of the NFIP is that flood insurance is made available in communities that regulate development in flood-hazard areas. In return for adoption and enforcement of the minimum NFIP regulations, the NFIP insures existing buildings with "subsidized" rates (i.e., flood insurance premium rates below the true risk based cost of the insurance coverage). The program has proven successful in reducing flood losses, especially to buildings constructed after communities began enforcing their regulations. It is estimated that over $1 billion in damage is avoided each year because of the NFIP. The program has also saved disaster assistance programs billions of dollars. For additional information on the NFIP, see the NFIP website address, http://www.fema.gov/business/nfip/index.shtm.
Post-FIRM structure	For insurance rating purposes, a post-FIRM building was constructed or substantially improved after December 31, 1974, or after the effective date of the initial Flood Insurance Rate Map of a community, whichever is later. A post-FIRM building in a participating community is required to meet the National Flood Insurance Program's minimum Regular Program flood protection standards.
Pre-FIRM structure	For insurance rating purposes, a pre-FIRM building was constructed or substantially improved on or before December 31, 1974, or before the effective date of the initial Flood Insurance Rate Map of the community, whichever is later. Most pre-FIRM buildings were constructed without taking the flood hazard into account.
Repetitive Loss Properties	Repetitive Loss Properties are properties where two or more claims of more than $1,000 have been paid by the NFIP in any consecutive 10-year period since 1978.

Scour	The removal of soil around objects that obstruct flow, such as foundation walls.
Severe Repetitive Loss Properties	Severe repetitive loss properties are defined in the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 as insured repetitive loss properties that have received multiple flood insurance claims: 1. Single-family properties. In the case of a property consisting of one to four residences, such term means a property that: a. Is covered under a contract for flood insurance made available under this title; and b. Has incurred flood-related damage: i. For which four or more separate claims payments have been made under flood insurance coverage under this title, with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or ii. For which at least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the value of the property. 2. Multifamily properties. In the case of a property consisting of five or more residences, such term shall have such meaning as the Director shall by regulation provide.
Special Flood Hazard Area (SFHA)	An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100-year floodplain); represented on Flood Insurance Rate Maps by shaded areas with zone designations that include the letter A or V.
Substantial Damage (SD)	Substantial Damage is defined as damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damage conditions would equal or exceed 50 percent of the market value of the structure before the damage occurred.
Substantial Improvement (SI)	Substantial Improvement is any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before to the “start of construction” of the improvement. This term includes structures that have incurred “substantial” damage, regardless of the actual repair work performed.

V Zones	V Zones are areas identified on FIRMs as Zones VE, V1-30, or V. These areas, also known as Coastal High Hazard Areas, are areas along the coast that have a 1 percent or greater annual chance of flooding from storm surge and waves greater than 3 feet in height, as well as being subject to significant wind forces.
Wet floodproofing	Permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding by allowing floodwaters to enter the structure. Such measures include the design of openings for intentional flooding of enclosed areas below the DFE, use of flood-resistant building materials below the DFE, and protection of the structure and its contents (including utilities).

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APPENDIX J – ACRONYMS

ADA	Americans with Disabilities Act
APA	American Planning Association
BCA	Benefit/Cost Analysis
BCR	Benefit/Cost Ratio
BFE	Base Flood Elevation
CFR	Code of Federal Regulations
CIS	Community Information System
CR	Claims Representative
CRS	Community Rating System
CSB	Community Status Book
DFE	Design Flood Elevation
DFIRM	Digital Flood Insurance Rate Map
DHS	Department of Homeland Security
DMA 2000	Disaster Mitigation Act of 2000
EC	Elevation Certificate
EMI	Emergency Management Institute
FBFM	Flood Boundary and Floodway Map
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Map
FHWA	Federal Highway Administration
FIRA	Flood Insurance Reform Act
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Mitigation Assistance
FPE	Flood Protection Elevation
fps	feet per second
ft	feet

FY	Fiscal Year
GIS	Geographic Information Systems
H+H	hydraulics and hydrologic
HMGP	Hazard Mitigation Grant Program
HUD	Department of Housing and Urban Development
HVAC	heating, ventilation, and air conditioning systems
ICC	Increased Cost of Compliance
IHP	Individuals and Households Program
LAG	lowest adjacent exterior grade
LSU	Louisiana State University
msl	mean sea level
NAVD	North American Vertical Datum
NCDC	National Climatic Data Center
NFIF	National Flood Insurance Fund
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
NFMDCT	National Flood Mitigation Data Collection Tool ("National Tool")
NGVD	National Geodetic Vertical Datum
NHC	National Hurricane Center
NOAA	National Oceanographic and Atmospheric Administration
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NSF	National Science Foundation
NT	National Tool (see also NFMDCT)
PA	Public Assistance
PDM	Pre-Disaster Mitigation
PNP	Private Non-Profit
POC	Point of Contact
RFC	Repetitive Flood Claims

RL	Repetitive Loss
SBA	Small Business Administration
SD	Substantial Damage
SFHA	Special Flood Hazard Area
SFIP	Standard Flood Insurance Policy
SHMO	State Hazard Mitigation Officer
SHPO	State Historic Preservation Office
SI	Substantial Improvement
sq ft	square feet
SRL	Severe Repetitive Loss
THPO	Tribal Historical Preservation Office
TVA	Tennessee Valley Authority
URA	Uniform Relocation Assistance
USACE	U.S. Army Corps of Engineers
USC	United States Code
USGS	U.S. Geological Survey
WYO	Write-Your-Own

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APPENDIX K – REFERENCES

FEMA Publications

FEMA publications can be ordered from the FEMA Publications warehouse, by any of the following methods.

Mail:
FEMA Distribution Center
P.O. Box 2012
8231 Stayton Drive
Jessup, MD 20794-2012
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Fax: (301) 362-5335

FEMA 55	*Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing and Maintaining Residential Buildings in Coastal Areas Volume I, II and III.* (June 2000) http://www.fema.gov/rebuild/mat/fema55.shtm
FEMA 85	*Manufactured Homes in Flood Hazard Areas: A Multi-Hazard Foundation and Installation Guide*. (August 2005) http://www.fema.gov/hazard/flood/pubs/lib85.shtm
FEMA 102	*Floodproofing Non-Residential Structures*. (May 1986) http://www.fema.gov/library/viewRecord.do?id=1413
FEMA 114	*Design Manual for Retrofitting Floodprone Residential Structures* (1986) http://www.fema.gov/library/viewRecord.do?id=1414
FEMA 213	*Answers to Questions About Substantially Damaged Buildings.* (May 1991) http://www.fema.gov/hazard/flood/pubs/lib213.shtm
FEMA 234	*Repairing Your Flooded Home*. (August 1992) http://www.redcross.org/static/file_cont333_lang0_150.pdf
FEMA 259	*Engineering Principles and Practices of Retrofitting Floodprone Residential Structures* (June 2001) http://www.fema.gov/hazard/flood/pubs/lib259.shtm
FEMA 265	*Managing Floodplain Development in Approximate Zone A Areas*. (July 1995) http://www.fema.gov/library/viewRecord.do?id=1526

FEMA 301	*National Flood Insurance Program's Increased Cost of Compliance Coverage Guidance for State and Local Officials.* (September 2003) http://www.fema.gov/business/nfip/icc.shtm http://www.fema.gov/library/viewRecord.do?id=1532
FEMA 312	*Homeowner's Guide to Retrofitting: Six Ways to Protect Your House From Flooding* (June 1998) http://www.fema.gov/rebuild/mat/rfit.shtm
FEMA 317	*Property Acquisition Handbook for Local Communities* (October 1998) http://www.fema.gov/government/grant/resources/acqhandbook.shtm
FEMA 345	*Hazard Mitigation Grant Program Desk Reference* (October 1999) http://www.fema.gov/government/grant/hmgp/index.shtm http://www.fema.gov/library/viewRecord.do?id=1472
FEMA 347	*Above the Flood: Elevating Your Floodprone House* (May 2000) http://www.fema.gov/rebuild/recover/fema347.shtm
FEMA 348	*Protecting Building Utilities from Flood Damage* (November 1999) http://www.fema.gov/hazard/flood/pubs/pbuffd.shtm
FEMA 386-1	*Getting Started: Building Support for Mitigation Planning* (September 2002) http://www.fema.gov/plan/mitplanning/howto1.shtm
FEMA 386-2	*Understanding Your Risks: Identifying Hazards and Estimating Losses* (August 2001) http://www.fema.gov/plan/mitplanning/howto2.shtm
FEMA 386-3	*Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies* (April 2003) http://www.fema.gov/plan/mitplanning/howto3.shtm
FEMA 386-4	*Bringing the Plan to Life: Implementing the Hazard Mitigation Plan* (August 2003) http://www.fema.gov/plan/mitplanning/howto4.shtm
FEMA 386-6	*Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning* (May 2005) http://www.fema.gov/plan/mitplanning/howto6.shtm
FEMA 386-7	*Integrating Manmade Hazards Into Mitigation Planning*. (September 2003) http://www.fema.gov/plan/mitplanning/howto7.shtm

FEMA 386-8	*Multi-Jurisdictional Mitigation Planning* (August 2006) http://www.fema.gov/plan/mitplanning/howto8.shtm
FEMA 480	*National Flood Insurance Program (NFIP) Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials* (February 2005) http://www.floods.org/Certification/FEMA_480_TOC.asp
FEMA 497	*National Flood Mitigation Data Collection Tool Guide* (May 2005) http://www.fema.gov/plan/prevent/floodplain/data_tool.shtm
FEMA 499	*Home Builder's Guide to Coastal Construction Technical Fact Sheet Series* (August 2005) http://www.fema.gov/rebuild/mat/mat_fema499.shtm
FEMA 511	*Reducing Damage from Localized Flooding* (June 2005) http://www.fema.gov/hazard/flood/pubs/flood-damage.shtm
FEMA 550	*Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundations* (July 2006) http://www.fema.gov/library/viewRecord.do?id=1853
FEMA TB 1-93	*Openings in Foundation Walls for Buildings Located in Special Flood Hazard Area* http://www.fema.gov/fima/techbul or http://www.fema.gov/pdf/fima/job2.pdf
FEMA TB 4-93	*Elevator Installation for Buildings Located in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program* http://www.fema.gov/fima/techbul or http://www.fema.gov/pdf/fima/job8.pdf
FEMA TB 7-93	*Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas* http://www.fema.gov/fima/techbul or http://www.fema.gov/pdf/fima/job14.pdf
FEMA TB 10-01	*Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe from Flooding* http://www.fema.gov/fima/techbul or http://www.fema.gov/pdf/fima/tb1001.pdf

FEMA **TB 11-01**	*Crawlspace Construction for Buildings Located in Special Flood Hazard Areas: National Flood Insurance Program Interim Guidance.* http://www.fema.gov/fima/techbul or http://www.fema.gov/pdf/fima/tb1101.pdf

USACE Publications

To obtain copies of these publications, visit the USACE National Floodproofing Committee website http://www.usace.army.mil/inet/functions/cw/cecwp/NFPC/nfpc.htm or write to the following address:

U.S. Army Corps of Engineers
Publications Depot
Attn.: CEIM-IM-PD
2803 52nd Avenue

Hyattsville, MD 20781-1102

USACE	*Flood Proofing - How to Evaluate Your Options* (July 1993) http://www.usace.army.mil/cw/cecw-p/NFPC/fphow/ace8toc.htm
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USACE	*Raising and Moving a Slab-on-Grade House with Slab Attached (1990)* http://www.usace.army.mil/cw/cecw-p/NFPC/fpslab/ace2toc.htm

Other Publications

ASFPM	*No Adverse Impact: A Tool Kit for Common Sense Floodplain Management* (2003) http://www.floods.org/NoAdverseImpact/NAI_Toolkit_2003.pdf
FEMA	*Promoting Mitigation in Louisiana: Performance Analysis* (2002) www.fema.gov/pdf/casestudys/performance.pdf
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Schwab, et. al	*Planning for Post-Disaster Recovery and Redevelopment.* (1998) *American Planning Association (APA) Planning Advisory Service Report Number 483/484* http://www.planning.org/APAStore/Search/Default.aspx?p=2406

Websites

American Planning Association	http://www.planning.org/
Association of State Floodplain Managers	http://www.floods.org/home/default.aspwww.floods.org
FEMA	http://www.fema.gov/
FEMA Map Service Center	http://store.msc.fema.gov
FEMA National Flood Insurance Program (NFIP)	http://www.fema.gov/business/nfip/
FEMA NFIP Answers to Questions About the NFIP	http://www.fema.gov/business/nfip/qanda.shtm
FEMA Planning Resource Center	http://www.fema.gov/plan/mitplanning/index.shtm
FEMA Region Offices	http://www.fema.gov/about/contact/regions.shtm
Federal Highway	http://www.fhwa.dot.gov/engineering/hydraulics/index.c

Administration (FHWA) Hydraulics Engineering	fm
Louisiana State University's (LSU) Extension Center	http://www.louisianafloods.org
National Climatic Data Center – Storm Events	http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms
National Conference of State Historic Preservation Officers	http://www.ncshpo.org/stateinfolist/FullList.htm
National Hurricane Center – Tropical Prediction Center	http://www.nhc.noaa.gov
National Oceanographic and Atmospheric Administration – Flooding Page	http://www.noaa.gov/floods.html
National Park Service Tribal Historic Preservation Officers	http://www.cr.nps.gov/hps/tribal/thpo.htm
Tennessee Valley Authority	http://www.tva.gov
U.S. Army Corps of Engineers (USACE) Divisions and Districts	http://www.usace.army.mil/divdistmap.html
USACE National Flood Proofing Committee	http://www.usace.army.mil/cw/cecw-p/NFPC/nfpc.htm
United States Geological Survey Water Resources of the United States	http://water.usgs.gov/index.html