Acquisition Technical Review

This Job Aid supplement covers the requirements associated with the technical reviews for acquisition projects funded by Hazard Mitigation Assistance. FEMA will also conduct an Environmental Planning and Historic Preservation review of each project. Refer to the Acquisition and Relocation: Information Required for Environmental Review and Acquisition and Demolition: Information Required for Environmental Review Job Aids.

This Technical Review Supplement provides additional information, examples and potential sources of documentation for items listed in the job aids to help communities applying for Hazard Mitigation Assistance grants comply with application requirements.

- All Hazard Mitigation Assistance (HMA) applications must comply with the requirements outlined in the HMA Guidance.
- According to the guidance, in addition to a general programmatic review, an EHP review and a technical review will be performed by FEMA for each proposed project.
- The technical review will verify that a project demonstrates feasibility, effectiveness and cost-effectiveness. This document is intended for technical reviews of applications only.
- For assistance completing EHP compliance reviews, see the EHP Supplement Job Aids.

Introduction

The following provides a review of the information that should be provided with the grant application, including recommended documentation and a list of supplementary information to assist FEMA when conducting technical reviews of the project application. Technical resources are identified throughout this supplement to provide clarifying information on specific project application components. The final section provides a comprehensive list of resources identified throughout this supplement.

The project-specific guidance in this supplement does not provide all the information necessary to apply for funding through an HMA program and must be read in conjunction with all other relevant guidance documents.

Additional Resources

- Hazard Mitigation Assistance Guidance (HMA Guidance)
- Hazard Mitigation Assistance Guidance Addendum, Part A
- Benefit-Cost Analysis Reference Guide and Supplement to the Benefit-Cost Analysis Reference Guide
- Hazard Mitigation Assistance Application Development – Acquisition
- Sample Engineering Case Study for Acquisition

A list of all resources referenced is provided at the end of the supplement.

Summary of Steps

- ☐ STEP 1: Provide a Scope of Work
- ☐ STEP 2: Provide Structure-Specific Details
- ☐ STEP 3: Provide a Project Schedule
- ☐ STEP 4: Provide a Project Cost Estimate
- ☐ STEP 5: Provide a Project Site Map
- ☐ STEP 6: Provide Property Location Information
- ☐ STEP 7: Document the Flood Risk
- ☐ STEP 8: Cost-Effectiveness Analysis
- ☐ STEP 9: Environmental and Historic Preservation Considerations

Important Terms

Acquisition/Demolition: The voluntary acquisition of an existing flood-prone structure and, typically, the underlying land and conversion of the land to open space through the demolition of the structure. The acquired property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.

Acquisition/Relocation: The voluntary physical relocation of an existing structure to an area outside of a hazard prone area, such as the Special Flood Hazard Area (SFHA) or a regulatory erosion zone and, typically, the acquisition of the underlying land. Relocation must conform to all applicable state and local regulations. The acquired property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.

Base Flood Elevation (BFE): The elevation as shown on the Flood Insurance Rate Map (FIRM) for Zones AE, AH, A1–A30, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, AR/AO, V1-V30 and VE that indicates the water surface elevation resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year.

Flood Insurance Rate Map (FIRM): An official map of a community on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study (FIS): A compilation and presentation of flood risk data for specific watercourses, lakes and coastal flood hazard areas within a community. When a flood study is completed for the National Flood Insurance Program (NFIP), the information and maps are assembled into an FIS. The FIS report contains detailed flood elevation data in flood profiles and data tables.

Lowest Floor: The lowest floor of the lowest enclosed area (including a basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor, provided that such enclosure is not built to render the structure in violation of the applicable non-elevation design requirements of 44 CFR Part 60.3.

Lowest Floor Elevation (LFE): The elevation of the top of the lowest finished floor in a building.

Special Flood Hazard Area (SFHA): The land in the floodplain within a community subject to a 1% or greater chance of flooding in any given year. An area having special flood, mudflow, or flood-related erosion hazards and shown on a Flood Hazard Boundary Map or a FIRM as Zone A, AO, A1-A30, AE, A99, AH, AR, AR/A, AR/AE, AR/AH, AR/AO, AR/A1-A30, V1-V30, VE or V.

Technical Review Components

To complete a successful project application, a minimum amount of technical information is required for review. The following is a step-by-step approach to addressing the major components of an acquisition project. Data collected in these steps will provide reviewers with the necessary information to determine whether a project is feasible and effective.

The data requirements in the following steps should be compiled in an attachment to the project application. If the project impacts multiple structures, the structure-specific information must be provided for each.

STEP 1: Provide a Scope of Work

Description: Provide a project narrative clearly identifying the proposed mitigation action and structure(s) to be mitigated, describing the proposed activities and explaining how the project will mitigate risk. The SOW should include key milestones and coincide with the design information, project schedule and cost estimate.

References: When preparing a SOW, refer to the following:

- For guidance, see HMA Guidance Part IV, Section H: Scoping Narrative: Scope of Work, Schedule, and Cost Estimate and Addendum to the HMA Guidance, Part A: Property Acquisition and Structure Demolition or Relocation for Open Space.
- For an example narrative for an Acquisition Project, see the HMA Application Development – Mitigation Project Subapplication Scope of Work Examples and Sample Engineering Case Study for Acquisition.

Approach: The following items should be included in the SOW:

- Provide narrative of the flood risk being mitigated, including flood event history in the project area, if available.
- Include mitigation project alternatives, which are required as part of application development. Document at least two alternatives that were considered as part of the planning or design phase. Clearly indicate which alternative is the preferred mitigation project and discuss why it is the most practical, effective and environmentally sound alternative. One alternative is often considered the “no-action alternative” and reflects conditions expected to exist if a mitigation project is not completed. This is a key step to ensure an efficient EHP review process. For additional guidance, see the Acquisition and Demolition EHP Review and Acquisition and Relocation EHP Review.
- Clearly explain the proposed mitigation activity, specifying the deliverables, identifying the tasks required to complete the proposed activity and defining the tasks to be accomplished in clear, concise and meaningful terms. All cost elements must match tasks and provide sufficient detail for FEMA to determine whether the application is eligible. The scoping narrative (including SOW) will become part of the conditions of the award.

- Describe the existing conditions of the structure(s) to be acquired. Specific details and documentation to support the narrative are described in **Step 2.**
- Describe demolition or relocation activities:
  - Debris removal
  - Removal of underground improvements (e.g., septic tanks)
  - Removal of utilities
  - Site grading
  - Permitting
  - Future land use of the property being acquired. Provide a statement that the property will be deed-restricted as open space in perpetuity.
  - For relocation projects, this should include:
    - A description of the relocation site
    - A thorough description of the relocation process, how it was selected, and why.
    - Indication that utilities, infrastructure and foundation at the relocation site will comply with any relevant codes and design standards
    - The proposed level of protection of the relocated structure(s) (e.g., the house will be relocated outside of the 500-year floodplain)
    - Description of how each structure will be physically relocated
    - Description and maps of what route will be used to move each structure to its new location and identification of any known infrastructure that will need to be moved during the relocation, such as power lines and street signs
    - Information on who will bear responsibility for the relocation
    - If not all components of the building can be relocated, describe the final disposition of those building elements

For further information about programmatic requirements, see the HMA Guidance Addendum, Part A and 44 CFR Part 80.

STEP 2: Provide Structure-Specific Details

Description: Provide detailed information about each structure included in the project.

Approach: Provide the following information about the structure; if there are multiple structures, this information must be provided and documented for each.

- Date structure was built
- Building type (e.g., single family residential, apartment, police station, hospital, mobile home)

- Structure information, including the square footage, number of stories, existence of attached garage and description of outbuildings if present
- Describe the construction type (e.g., wood frame, masonry, concrete) and existing condition.
- Describe the foundation (see **Figure 1**).

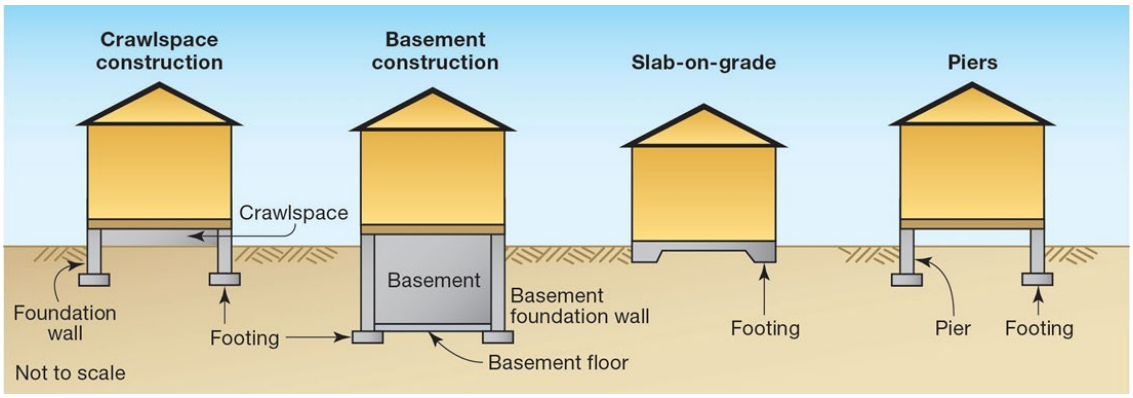
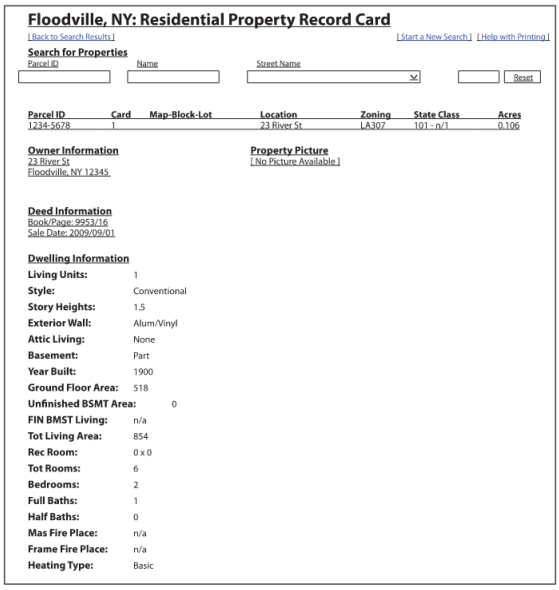


Figure 1. The four foundation types represented in this figure are crawlspace construction, basement construction, slab-on-grade, and piers.

Potential Sources: Structure information may be verified through city or county property records or from building permit information. This information can often be found from publicly available websites such as tax assessor website. Some cities and counties have parcel databases with this information. Alternatively, online mapping programs with measuring features and high-quality aerial photographs may be used to estimate the size of the building.

Example: One-story residential building, slab-on-grade, without a basement, no outbuildings, built in 1900; see **Figure 2**, Residential Property Record Card for documentation.



Floodville, NY: Residential Property Record Card

[Back to Search Results] [Start a New Search] [Help with Printing]

Search for Properties

Parcel ID | Name | Street Name | Reset

Parcel ID	Card	Map-Block-Lot	Location	Zoning	State Class	Acres
1234-5678	1		23 River St	LA307	101 - n/1	0.106

Owner Information
23 River St
Floodville, NY 12345

Property Picture
[No Picture Available]

Deed Information
Book/Page: 9953/16
Sale Date: 2009/09/01

Dwelling Information

Living Units:	1
Style:	Conventional
Story Heights:	1.5
Exterior Wall:	Alum/Vinyl
Attic Living:	None
Basement:	Part
Year Built:	1900
Ground Floor Area:	518
Unfinished BSMT Area:	0
FIN BMST Living:	n/a
Tot Living Area:	854
Rec Room:	0 x 0
Tot Rooms:	6
Bedrooms:	2
Full Baths:	1
Half Baths:	0
Mas Fire Place:	n/a
Frame Fire Place:	n/a
Heating Type:	Basic

Figure 2. An example of a Residential Property Record Card that can be used for documentation of the structure's details.

STEP 3: Provide a Project Schedule

Description: Include a detailed project schedule for all tasks identified in the project cost estimate and SOW. The schedule identifies major milestones, with start and end dates for each activity. Project schedules must show completion of all activities (including the construction period) within the period of performance (POP) allowed by the relevant HMA program. Sufficient details must be provided so FEMA can determine whether the proposed activities can be accomplished within the POP.

References: HMA Guidance Part VI, Section D.4: Program Period of Performance and Part IV, Section H: Deliverables, Key Milestones, and Schedule

Approach: Ensure that the information in the schedule supports the SOW and aligns with the project cost estimate.

STEP 4: Provide a Project Cost Estimate

Description: Include a detailed line-item cost estimate for all tasks identified in the project schedule and SOW. Allowable costs are costs that are necessary and reasonable for the proper and efficient performance and administration of the federal award. All costs included in the subapplication should be reviewed to verify they are necessary, reasonable and allocable consistent with the provisions of 2 Code of Federal Regulations Part 200. Include sufficient detail so that FEMA can determine whether costs are reasonable based on proposed activities and level of effort. Costs incurred prior to award may be considered pre-award costs and may be eligible for reimbursement. Eligibility may depend on the date they occurred and the grant program. Refer to HMA guidance and the Notice of Funding Opportunity for specifics.

References: For more detailed information on eligible and ineligible costs for acquisition projects, refer to the Addendum to the HMA Guidance Parts A.3.2 and A.3.3.

Approach: Ensure that the information in the cost estimate supports the SOW and aligns with the schedule.

Allowable costs are costs that are necessary and reasonable for the proper and efficient performance and administration of the federal award and may include, but are not limited to:

- Property purchase costs (pre-event or current, as appropriate), including necessary fees
- Removal of demolition debris and household hazardous wastes, including disposal fees
- Abatement of asbestos and/or lead-based paints, including disposal fees
- Removal of all underground improvements (septic, foundation)
- Removal of utilities
- Site grading and leveling
- Structure relocation costs and fees

STEP 5: Provide a Project Site Map

Description: Provide a map showing the project location. If the project includes multiple structures, show the project boundaries, including the staging area. **Figure 3** provides an example of a project site map.

Reference: Supplement to the Benefit-Cost Analysis Reference Guide Section 5: Available Technology Aids

Approach: Provide a map showing the project location, including structures, flooding source, map scale and location information. For any maps provided, ensure that a scale bar is shown, and the map is clearly labeled to identify the project boundaries.

Potential Sources: Official site survey, assessor maps and topographic maps obtained from the project engineer or planner; maps created using a web-based service such as Google Maps. Flood maps can be downloaded at FEMA's Flood Map Service Center.

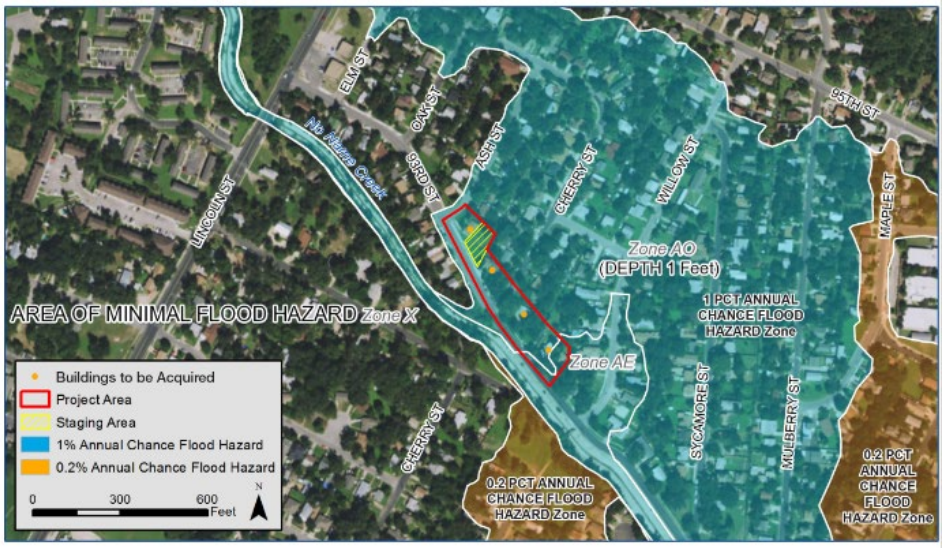


Figure 3. Example of a project site map. Map clearly shows the buildings to be acquired, the project area, the staging area, the flood zones and flood source and the base flood elevation for the project site. The map includes a north arrow and a scale.

STEP 6: Provide Property Location Information: Address and Latitude and Longitude

Description: Provide both the physical address and the latitude and longitude of each structure in the project application. For projects with multiple properties, tables containing all relevant information by property can be helpful.

PROPERTY ADDRESS

Approach: Provide property address(es) of each structure involved in the mitigation project. This includes street name and number; city, county or parish; state; and zip code. A post office box number is not an acceptable address.

If the address provided does not clearly match up with the structure(s) to be acquired, provide pictures or a site map with the structure(s) footprint(s) clearly identified.

Potential Sources: Property owner, local building inspector, tax assessor records, deed to the property, engineering plans

Example: 456 River Road NE, Martinsburg, Berkeley County, WV 25409

LATITUDE AND LONGITUDE

Approach: Provide the latitude and longitude of each structure involved in the mitigation project. The latitude and longitude should be taken at the center of the property. The latitude and longitude can be provided in either decimal degrees (e.g., 27.9807, -82.5340) or degrees, minutes and seconds (27° 58' 50.5'' N, 82° 32' 2.4'' W).

If your global positioning system (GPS) or mapping application provides degrees, minutes and seconds, you will need to convert this into decimal degrees to enter it into FEMA Grant Outcome (GO) (Building Resilient Infrastructure and Communities and Flood Mitigation Assistance applications only). Several free tools are available on the Internet for this conversion. Enter "coordinate converter" into a search engine to find one of these tools.

Potential Sources:

- GPS device
- Free online map tools or search engines (that generate latitude and longitude when an address is supplied)

Example: 27.9807, -82.5340 or 27° 58' 50.5'' N, 82° 32' 2.4'' W

STEP 7: Document the Flood Risk

Description: There are two ways to demonstrate the risk of flooding to a hazard-prone structure: using engineering analysis to estimate the risk or using historical information to demonstrate the risk. In many flood prone -areas, FEMA has performed an engineering analysis of the risk that can be found in an FIS and accompanying FIRMs. In some areas, it may be possible that an engineering professional has performed an independent study of the flood risk and has prepared an engineering report documenting the results. If the area has not been studied in detail, flood risk can be demonstrated through documentation of a flood event history.

References: FEMA's How to Find Your FIRM and Make a FIRMette and FEMA's Flood Map Service Center

Approach: The following steps should be taken to document flood risk:

1. If an FIS and FIRM are available for the project area, provide a copy of the map with the project location and impacted structure(s) footprint(s) outlined on the map and a copy of the associated information in the FIS. Ensure that the flood zone in which the structure is located is clear. Note whether the structure is in the SFHA (the 100-year floodplain) and if located in a regulatory floodway.

   Note that if an FIS and FIRM exist for the project area, this documentation should be provided whether or not an independent flood analysis or historical flood information was used to assess the project.

2. If an independent engineering study exists and is being used to assess the flood risk for the project, provide a copy of the professionally certified report. The report should include hydrologic and hydraulic (H&H) calculations

used to determine flood elevations for four events with varying flood recurrence intervals such as the 10-year, 50-year, 100-year or other interval. If these calculations were completed using modeling software, the engineering report should document all model inputs and outputs. Inundation maps are also recommended to support the analysis and document which structures are at risk.

3. If detailed flood analysis is not available, provide a list of historical flood events along with the following information:
   - Specific date of each flood event
   - Measured or estimated high water marks from the event in the vicinity of the project area, if available
   - Size of the event (flood recurrence interval such as the 10-year, 50-year or other), if known. See Supplement to the Benefit-Cost Analysis Reference Guide.
   - A list of physical damages to the structures included in the project application and the associated repair costs. Actual insurance claims may be available through the homeowner or BureauNet if the properties are flood repair insured. See Supplement to the Benefit-Cost Analysis Reference Guide.
   - Number of volunteer hours spent at the project site to assist in repair/recovery activities such as damaged material removal, if any
4. If acquisition is intended to mitigate a landslide or erosion risk, document the expected time to failure using engineering analysis or measured erosion rates.

STEP 8: Cost-Effectiveness Analysis

Description: Cost-effectiveness of an acquisition project must be demonstrated to obtain FEMA funding. FEMA has provided an approach to demonstrating cost-effectiveness based on pre-calculated benefits which requires minimal documentation if certain requirements are met (see **Step 8B**). If it is not possible to meet those requirements, a BCA is required to assess the cost-effectiveness of the project.

This section provides guidance on the following:

- **Step 8A:** Substantial Damage Waiver
- **Step 8B:** Pre-Calculated Benefits for Acquisition Projects in the Special Flood Hazard Area
- **Step 8C:** Benefit-Cost Analysis Tool – Modeled Damages
- **Step 8D:** Benefit-Cost Analysis Tool – Historical or Professional Expected Damages
- **Step 8E:** Additional Benefits for a Benefit-Cost Analysis

All BCA inputs must be **justified and documented**. When appropriate FEMA standard values are used, it should be clearly stated.

A BCA is a quantitative procedure that assesses the cost-effectiveness of a hazard mitigation measure over the useful life of the project by comparing the potential avoided damages (benefits) associated with the mitigation measure to the cost of the project in current dollars. **Figure 4** and **Table 1** help illustrate this concept.

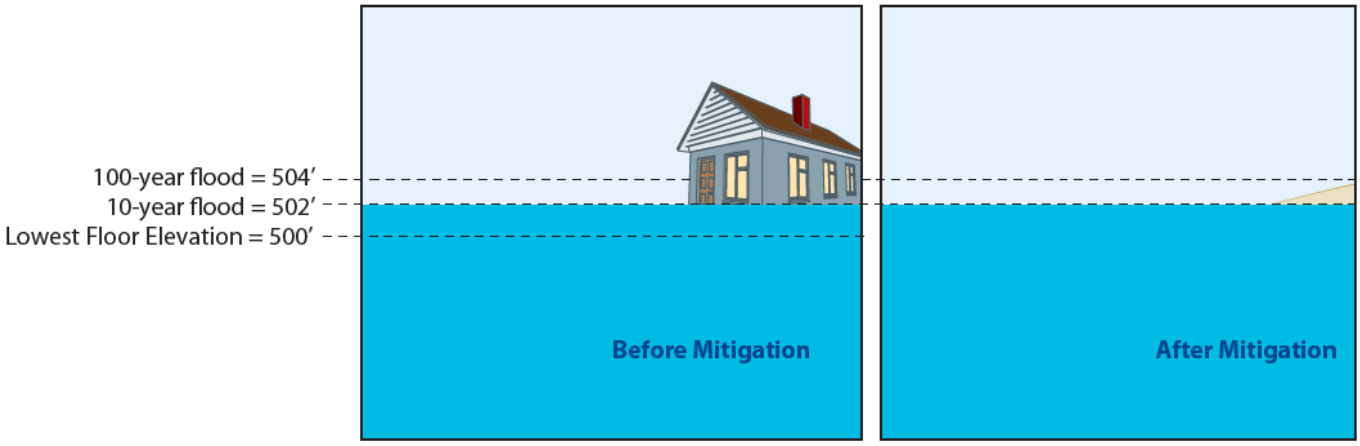


Figure 4. Before and after acquisition mitigation.

Table 1. Comparison of mitigation benefits.

Recurrence Interval	Expected Damages Before-Mitigation	Expected Damages After-Mitigation	Damages Avoided (Benefits)
10-year flood	$1,981	$0	$1,981
100-year interval	$17,121	$0	$17,121

Before-mitigation, the structure's lowest floor elevation is at 500 feet. At this location, the 10-year flood event is estimated to be 502 feet, causing an estimated $1,981 in damages to the structure, and the 100-year flood event is estimated to be 504 feet, causing an estimated $17,121 damages to the structure. After-mitigation, when the structure has been acquired and either demolished or relocated, there is no longer risk to the structure at this location. Therefore, the expected damages after-mitigation are $0 for both flood events and the Damages Avoided (the benefits of the mitigation project) are equal to the estimated damages from before-mitigation.

FEMA will only consider applications that use a FEMA-approved methodology to demonstrate cost-effectiveness. FEMA provides a BCA Tool that allows applicants to calculate a project benefit-cost ratio (BCR). The BCR is a calculation of the project benefits divided by the project costs. Projects for which benefits exceed costs (a BCR of 1.0 or greater) are generally considered cost-effective. Benefits may include avoided damage, loss of function and displacement. In the case of acquisition projects, benefits include:

- Avoided physical damage to the building and contents
- Avoided displacement costs – the costs required to move to and reside in a temporary location while repairs are performed on the building
- Avoided mental stress and lost productivity (for residential properties)
- Avoided loss of net revenue (for commercial properties)
- Avoided loss of public services (for public properties)
- Avoided volunteer labor time that typically supports cleanup and repair work

- Environmental benefits value of improved ecosystem services through the creation of open space

There are several benefits that could be counted for a project, and any or all benefits can be included in a BCA when analyzing cost-effectiveness. The approaches outlined in **Step 8C** and **Step 8D** of this supplement are focused primarily on avoided physical damage (building and contents). It is recommended that the applicant start a BCA using these types of benefits as they are typically the largest benefits for acquisition projects. If the BCR does not exceed 1.0 or is only slightly over 1.0 after following **Step 8C** or **Step 8D**, move to **Step 8E** and find additional methods of calculating potential benefits for the project.

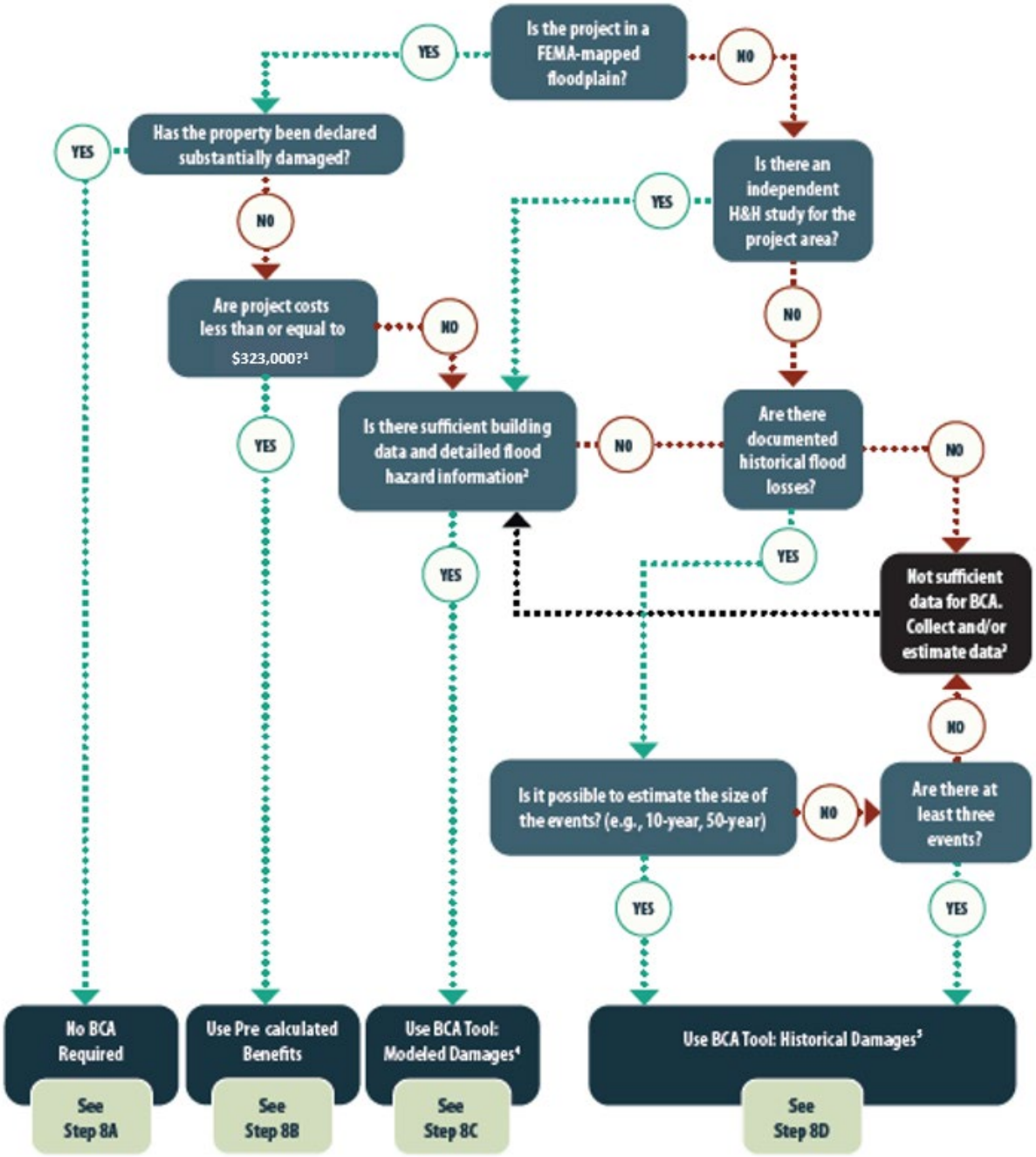
This supplement only provides a recommended approach to documenting cost-effectiveness. For detailed guidance on using the FEMA BCA Tool, refer to FEMA BCA Reference Guide and FEMA Supplement to the BCA Reference Guide. For additional questions, contact the BC Helpline at ***bchelpline@dhs.gov*** or at ***1-855-540-6744***.

Approach: There are several methods to evaluate cost-effectiveness. The method used will depend on the data collected in the previous steps of this supplement. Use the flow chart provided in **Figure 5** to analyze the data available for the project site and determine the recommended approach.

The FEMA BCA Tool includes embedded Help Content. Click on the information button within the tool to access the Help Content.

Figure 5 shows a flowchart to aid applicants in determining which BCA methodology to select. The flowchart starts with the question: Is the project in a FEMA-mapped floodplain? If yes, has the property been declared substantially damaged? If yes, then No BCA is Required, see Step 8A, and the project may be funded using a Substantial Damage Waiver. If the property has not been declared substantially damaged, but the project costs are less than or equal to $276,000, no BCA is required and pre-calculated benefits may be used, see Step 8B. For projects that contain multiple structures, the average cost of all structures in the project must meet the criteria of the pre-calculated benefit. Additionally, the specific geographic location of structures can greatly increase project costs, and the benefits identified may be adjusted using locality multipliers that are included in industry-accepted cost and pricing guides for construction – for more information refer to HMA Guidance Part IV. I.7. If project costs are greater than $276,000, or the project is not in a FEMA-mapped floodplain and there is an independent hydrologic and hydraulic study for the project area, determine if there is sufficient building data and detailed flood-hazard information, including information on four events and the lowest floor elevation. If there is sufficient building and flood hazard information, use Modeled Damages in the BCA Tool, see Step 8C. If there is not sufficient building data and detailed flood hazard information, or there is not an independent hydrologic and hydraulic study, determine if there are historical flood loses. If there are no historic flood losses, then building data and detailed flood hazard information must be collected in order to perform the BCA. If there are documented historic flood losses, and the recurrence interval is known for the events or there are at least three events of unknown recurrence intervals, then the

historical damages module of the BCA Tool may be used, see Step 8D.



NOTES

1. For projects that contain multiple structures, the average cost of all structures in the project must meet the stated criterion. Additionally, the specific geographic location of structures can greatly increase project costs, and the benefits identified may be adjusted using locality multipliers that are included in industry-accepted cost and pricing guides for construction. Refer to HMA Guidance Part IV, I.7.
2. Described in **Step 7** (Approach 1 or 2), the project must have information on 4 events. Building information must include LFE.
3. Review the BCA Reference Guide and Supplement prior to data collection to ensure that sufficient and relevant data for a BCA is collected for before-mitigation and after-mitigation conditions. Note that at least one known-frequency event or three unknown-frequency events are required for historic flood losses. Once data is collected, return to process flow to determine the appropriate BCA approach.
4. For projects with multiple structures, consider using the Professional Expected Damages.
5. Consider using Greatest Savings to the Fund (GSTF) (Refer to HMA Guidance Part IV, I.5).

Figure 5. Flowchart for Determining the Appropriate BCA Frequency and Damage Relationship.

STEP 8A: Substantial Damage Waiver

Description: In accordance with HMA Guidance Part IV, Section I.1, the acquisition of structures that have been declared Substantially Damaged and located in a riverine SFHA on a preliminary or effective FIRM is considered cost-effective. If the Substantial Damage Waiver is used, the project application should include a certification that the structures meet these conditions.

If cost-effectiveness is met through Substantial Damage Waiver, no further cost-effectiveness analysis is required.

Approach: Provide NFIP substantial damage determination letters for each structure.

STEP 8B: Pre-Calculated Benefits for Acquisition Projects in the Special Flood Hazard Area

Description: For acquisition projects located in the SFHA, HMA Guidance Part IV, Section I.7 describes the pre-calculated benefits that may be used to demonstrate cost-effectiveness for acquisition projects, including the specific documentation required.

If the acquisition of a structure located in the 100-year floodplain has a total project cost equal to or less than $323,000, then the project is cost-effective. For projects that contain multiple structures, the average cost of all structures in the project must meet the stated criterion. Additionally, the specific geographic location of structures can greatly increase acquisition costs, and the pre-calculated benefit of $323,000 may be adjusted using locality multipliers that are included in industry-accepted cost and pricing guides for construction.

If cost-effectiveness is met through pre-calculated benefits, no further cost-effectiveness analysis is required.

Approach: Ensure that documentation requested under Steps 1 through 7 of this supplement is provided. A BCA is not required. Ensure that the flood maps provided clearly identify the structures as located in the SFHA.

STEP 8C: Benefit-Cost Analysis Tool – Modeled Damages

Description: The BCA Tool can utilize Modeled Damages to analyze proposed mitigation projects by comparing estimated flood elevations for various flood events to the structure's LFE. The BCA Tool then uses the depth of each scenario flood event above (or below in some instances) the structure's LFE and establishes depth-damage curves to estimate damages to the building based on a percentage of the Building Replacement Value (BRV). Additionally, it uses the same depth-damage curves to estimate damage to building contents, displacement from the building and loss of use of the building. Using Modeled Damages is recommended for BCAs when users have detailed flood hazard information (using **Step 7,** Approach 1 or 2) and structural data (using **Step 2**).

References: FEMA's Benefit-Cost Analysis Reference Guide, Supplement to the Benefit-Cost Analysis Reference Guide, and FEMA BCA Tool (including Help Content within the tool)

Approach: The following describes the essential flood hazard and structural data required to estimate avoided physical damages using Modeled Damages in the BCA Tool. If **Step 1** through **Step 7** of this supplement were followed and all data gathered, there should be minimal data collection needed to complete the BCA:

1. Structural information:
    - Building information (**Step 2**)
    - Lowest Floor Elevation (LFE)
2. Project useful life: The project useful life for acquisition projects is 100 years.
3. Building Replacement Value (BRV)
4. Annual maintenance cost associated with maintaining the effectiveness of the acquisition
5. Flood Hazard Information – **Step 7** (Approach 1 or 2)

Table 2. Flood hazard information for coastal and riverine project types.

Coastal Projects	Riverine Projects
Ground surface elevation	Stream bed elevation
BFE or 100-year elevation with wave action	Flood elevations for the 10-, 50-, 100- and 500-year recurrence intervals (RI) (alternative recurrence intervals are acceptable when using an H&H studies)
Stillwater elevation (for the 10-, 50-, 100- and 500-year RIs). Alternative RIs are acceptable when using a non-FEMA H&H study	Flood discharge rates for the 10-, 50-, 100- and 500-year RIs (riverine flood hazard analysis only, alternative RIs are acceptable when using an H&H study)

Although the information listed above is required to calculate avoided building damages, the Modeled Damages approach will use FEMA standard values to automatically calculate avoided loss to contents and avoided displacement costs (the costs required to move and stay in a temporary location while repairs are performed on the structure). If additional benefits are to be calculated, go to **Step 8E**.

STEP 8D: Benefit-Cost Analysis Tool – Historical or Professional Expected Damages

Description: The BCA Tool Damage Frequency Assessment (DFA) module calculates project benefits and costs for proposed mitigation projects for any hazard. The tool compares user-entered damages/losses and the frequency that they occur in the pre-project scenario versus the post-project scenario to calculate benefits based on avoided losses. The DFA module is recommended for BCAs when using historic flood information (**Step 7**, Approach 3) or for projects with multiple structures using Professional Expected Damages (**Step 7**, Approach 2).

References: FEMA's Benefit-Cost Analysis Reference Guide, Supplement to the Benefit-Cost Analysis Reference Guide, and FEMA BCA Tool (including Help Content within the Tool)

Approach: The DFA module calculates project benefits for proposed hazard mitigation projects based on either documented historic damages or professional expected damages from at least one known-frequency event. If recurrence intervals are not known and there are historical damage data from at least three events, the DFA module can estimate a recurrence interval. Otherwise, additional data collection or analysis will be needed. The calculation compares pre- and post-project conditions:

- **Before-Mitigation:** Based on existing conditions at the site. To demonstrate the current risk, actual historical damages or professionally expected damages for certain severity events (e.g., the 10-year flood, the 50-year flood) can be entered in the DFA module to perform a BCA.
- **After-Mitigation:** The same scenario flood events should result in reduced damages due to the mitigation project. The post-project damages should be estimated based on the level of protection provided by the project. For acquisition/demolition projects, post-project damages are $0. These projects are the only mitigation projects that do not have any residual risk.

For an acquisition project, the DFA module is most typically utilized when there is no detailed H&H analysis for the project area and the risk to the project site is demonstrated through past flood damages to the structure. Information regarding each of the scenario events was described in **Step 7** of this supplement. For each damage event, the corresponding recurrence interval information is needed. If recurrence intervals are not available, the BCA Tool will calculate a recurrence interval when historical damage data from at least three events are provided.

Potential Sources:

- Insurance claims, receipts from repair of flood damages, FEMA Public Assistance Worksheets, BureauNet data, documentation of loss of service from a utility provider, Public Works Department
- Property owner affidavit, estimated from damage functions

Example: The attached insurance claim information shows $12,000 in damages to flooring and air conditioning on June 10, 1998, from riverine flooding. The recurrence interval was estimated from gage information to be a 10-year event.

FEMA also allows for the use of the Greatest Savings to the Fund (GSTF) data and methodology to demonstrate cost-effectiveness. The GSTF calculation measures the expected savings of a mitigation project over the project useful life. Using past NFIP claims, the total expected future insurance claims can be projected. GSTF is calculated by subtracting total expected future insurance premiums from expected future claim payments.

STEP 8E: Additional Benefits for a Benefit-Cost Analysis

Description: There are several benefits that could be counted for a project. Any or all benefits can be used to demonstrate that a project is cost-effective, or, in other words, has a BCR greater than 1.0. Once the initial BCA information is collected and a preliminary analysis is performed, additional benefits may be analyzed if needed.

Approach:

Answer the following questions:

1. Is the building residential? If yes, how many residents reside in each building? If not readily available, use averages from Census data related to the municipality or county.
2. Does the building include any rental property for which the owner receives rental income?
3. Is there a business run out of the building or home?
4. Are there any non-critical governmental services provided from the building such as a permit office or library?
5. Are there any critical services provided by the building such as police, fire or medical services?
6. Does the project eliminate or reduce the need for volunteer labor?
7. What is the total project area/parcel size being acquired? What is the land use after the project is complete?

STEP 9: Environmental and Historic Preservation Considerations

Environmental and historical preservation compliance will need to be considered as part of the application process. Please refer to Acquisition and Demolition EHP Review and Acquisition and Relocation EHP Review.

Resources

Below is a list of resources identified throughout this supplement. Not all resources are necessary for every acquisition project but are provided to ease in identification of source material.

PROGRAM AUTHORITIES

- The National Flood Insurance Act of 1968, As Amended, 42 U.S.C. 4001 et seq.
- The Robert T. Stafford Disaster Relief and Emergency Assistance Act, As Amended, 42 U.S.C. 4001 et seq.
- 44 Code of Federal Regulations
- 2 Code of Federal Regulations Part 200

PROGRAM GUIDANCE

- FEMA Hazard Mitigation Assistance Guidance and Addendum to the Hazard Mitigation Assistance Guidance
- Benefit-Cost Analysis Reference Guide and Supplement to the Benefit-Cost Analysis Reference Guide

ADDITIONAL TOOLS AND RESOURCES

- FEMA's How to Find Your FIRM and Make a FIRMette
- FEMA's Map Service Center
- Benefit-Cost Analysis (BCA) Tool
- Cost Estimating Principles for HMA Applications
- FEMA's National Flood Hazard Layer
- Hazard Mitigation Assistance Application Development Scope of Work Examples
- Hazard Mitigation Assistance Application Development Engineering Case Studies

- Acquisition and Demolition EHP Review and Acquisition and Relocation EHP Review
- FEMA Hazard Mitigation Assistance Job Aids