



|                          |             |             |  |         |          |             |             |  |
|--------------------------|-------------|-------------|--|---------|----------|-------------|-------------|--|
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
|                          |             |             |  | a. None |          | \$ -        | \$ -        |  |
| <b>Total Project BCR</b> | <b>\$ -</b> | <b>\$ -</b> |  |         | <b>0</b> | <b>\$ -</b> | <b>\$ -</b> |  |

**Structure Type**

|                 |    |       |
|-----------------|----|-------|
| a. None         | \$ | -     |
| b. Green Open S | \$ | 2.57  |
| c. Riparian     | \$ | 12.29 |

Ecosystem service benefits may be included for acquisition projects funded by the FEMA HMA grant programs.

The benefits may be included when a project Benefit Cost Ratio (BCR) is 0.75 or greater. The tool on the following tab provides for a quick method to include these benefits while the Benefit Cost Analysis toolkit is being updated to include this functionality.

To include environmental benefits, the structure lot size must be known. This is typically available on the property tax card or tax assessment. Other sources that are reasonable are acceptable to document lot size. A professional land survey is not required.

To convert acres to square feet, multiply acres by 43,560 or use the simple tool below

$$\begin{array}{rcccl} \text{Acres} & & & & \text{Total Square Feet} \\ \hline \boxed{\phantom{000}} & \times & 43,560 & = & \boxed{0} \end{array}$$

Also, the post mitigation land use type must be identified at time of application. For the purpose of including environmental benefits, two post mitigation land use types were quantified. The values provided have been discounted at the OMB required 7% for 100 years (the project useful life of acquisitions). These values are:

Green Open Space @ \$2.57 per square foot  
Riparian Areas @ \$12.29 per square foot

Green Open Space can be defined as land that will be allowed to revert to a natural state or be converted into park areas or meet the general definition of open green space.

Riparian Areas are similar to Green Open Space but the lot is located along a water feature such as lake, stream, creek, river, ocean, or other body of water.

Riparian Areas generate more benefits than Green Open Space because of the number and value of ecosystem service benefits these areas provide. Also only one ecosystem can be used as to not doublecount benefits.

A user will enter the name of the structure from the toolkit, the current benefits, the current costs, and the tool will calculate the current BCR. The user will then select the appropriate post mitigation land use type and enter in the total lot size in square feet.

The tool will then recalculate the BCR which will include benefits calculated by the benefit cost toolkit and add the environmental benefits associated with the post mitigation land use type. Total project benefits, costs, and revised BCR are calculated at the bottom of the sheet and also displayed at the top of the spreadsheet for convenience.

The tool is protected from formatting as there are formulas imbedded in the tool. However, the sheet can be unprotected to insert additional rows if needed. There is no password for the sheet.

The updated benefits should be entered into eGrants or NEMIS (depending on grant program) and/or used on paper applications when utilized.

The tool is not the only way that the environmental benefits can be calculated. If all the post mitigation land use type is the same, then the total square footage of all the lots combined can be multiplied by the appropriate ecosystem service per square foot value as identified in the policy.

This tool is not required to calculate the environmental benefits but is provided for convenience. Other state, local, tribal, or territorial governments may provide their own tool, since including the environmental benefits is a simple multiplication of lot size by the appropriate ecosystem service value.



# FEMA

## MITIGATION POLICY – FP-108-024-01

### **I. TITLE:**

Consideration of Environmental Benefits in the Evaluation of Acquisition Projects under the Hazard Mitigation Assistance (HMA) Programs

### **II. DATE OF ISSUANCE:**

**JUN 18 2013**

### **III. POLICY STATEMENT:**

FEMA will allow the inclusion of environmental benefits in benefit-cost analyses (BCA) to determine cost effectiveness of acquisition projects.

### **IV. PURPOSE:**

The purpose of this policy is to identify and quantify the types of environmental benefits that FEMA will consider in the BCA for acquisition projects.

### **V. SCOPE AND APPLICABILITY:**

This policy applies to the Pre-Disaster Mitigation (PDM) and the Flood Mitigation Assistance (FMA) Programs for which the application period is open on or after the date of this policy and to the Hazard Mitigation Grant Program (HMGP) for major disasters declared on or after the date of issuance of this policy. Further, the policy only applies to property acquisitions for the purpose of open space and subsequent relocations or demolitions.

### **VI. AUTHORITY:**

Sections 203 and 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) (42 U.S. Code [U.S.C.] §§ 5133; 5170c) authorize the PDM Program and HMGP, respectively. Section 1366 of the National Flood Insurance Act of 1968 (NFIA), as amended by the Biggert-Waters Flood Insurance Reform Act of 2012, (42 U.S.C. § 4104c) authorizes the FMA Programs. Regulations that implement the HMGP can be found at Title 44 Code of Federal Regulations (CFR) §§ 206.430–206.440. The FMA Program regulations can be found at Title 44 CFR Part 79. Regulations for property acquisition and relocation for open space can be found at Title 44 CFR Part 80. General requirements for BCA can be found in the Office of Management and Budget's (OMB) Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*.



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## MITIGATION POLICY – FP-108-024-01

### VII. OBJECTIVE:

The objective of this policy is to incorporate environmental benefits into the BCA used to demonstrate cost effectiveness for acquisition projects funded by FEMA's HMA Programs.

### VIII. DEFINITIONS, ABBREVIATIONS, AND FORMATTING:

**Benefit-Cost Analysis:** A quantitative procedure that assesses the cost effectiveness of a hazard mitigation measure by taking a long-term view of avoided future damages as compared to the cost of a project.

**Benefit-Cost Ratio (BCR):** A numerical expression of the cost effectiveness of a project calculated as the net present value of total project benefits divided by the net present value of total project costs.

**Environmental Benefits:** Environmental benefits are direct or indirect contributions that ecosystems make to the environment and human populations. For FEMA BCA, certain types of environmental benefits may be realized when homes are removed and land is returned to open space uses. Benefits may include flood hazard reduction; an increase in recreation and tourism; enhanced aesthetic value; and improved erosion control, air quality, and water filtration.

**Greatest Savings to the Fund (GSTF) Methodology:** The GSTF methodology measures the expected savings of a mitigation project over a specific time period, such as 30 years. This methodology is based on actual National Flood Insurance Fund (NFIF) losses for severe repetitive loss properties.

**Green Open Space:** Green open space is land that does not directly touch a natural body of water such as a river, lake, stream, creek, or coastal body of water.

**HMGP 5-percent Initiative:** Some mitigation activities are difficult to evaluate using FEMA BCA methodologies. Up to 5 percent of the total HMGP funds may be set aside by the Grantee to pay for such activities.

**Property Acquisition and Structure Demolition:** The voluntary acquisition of an existing at-risk structure and, typically, the underlying land, and conversion of the land to open space after the demolition of the structure. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.

**Property Acquisition and Structure 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. Relocations must conform to all applicable state and local regulations. The property must be deed-restricted in perpetuity to open space uses to restore and/or conserve the natural floodplain functions.



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**Riparian Area:** The land that directly abuts a natural body of water such as a river, lake, stream, creek, or coastal body of water.

**Special Flood Hazard Areas (SFHAs):** The land in the floodplain within a community subject to a 1-percent or greater chance of flooding in a given year. An area having special flood, mudflow, or flood-related erosion hazards, and shown on a Flood Hazard Boundary Map or a Flood Insurance Rate Map (FIRM) (e.g., Zones A and V).

**Substantial Damage Waiver Policy:** For acquisition and structure demolition or relocation projects only, structures identified in a riverine SFHA on the current effective FIRM and declared by a local authority having such jurisdiction to be substantially damaged by flooding, property acquisition and structure demolition or relocation is considered cost effective and a BCA is not required to be submitted for the structure.

### IX. POLICY DETAILS:

#### A. Background

Statutes that authorize mitigation programs (FMA at 42 U.S.C. 4104c, PDM at 42 U.S.C. 5133, and HMGP at 42 U.S.C. 5170c) require that FEMA provide funding for mitigation measures that are cost effective or are in the interest of the NFIF. FEMA has specified minimum project criteria via regulation (44 CFR 79 and 44 CFR 206.434), including that Applicants must demonstrate mitigation projects are cost effective. The determination of cost effectiveness is typically demonstrated by the calculation of the BCR, or the division of the net present value of the benefits by the net present value of the costs. Projects where benefits equal or exceed costs are considered cost effective.

To assist States and local communities, FEMA has developed a toolkit that standardizes the evaluation of cost effectiveness and quantifies the financial and social benefits of a proposed mitigation activity. Typical mitigation project benefits are derived from avoided damage to structures and contents, avoided deaths and injuries, and avoidance of other quantifiable losses that a mitigation project can significantly reduce or eliminate.

To integrate environmental benefits into the BCA Toolkit, it was important to determine which mitigation activity would best achieve these benefits. One prime example is property acquisition. Acquisition projects are funded by the FEMA's FMA, HMGP, and PDM Programs to mitigate flood hazards. To date, 38 percent of all HMA funds have been allocated for acquisition-related activities.

The inclusion of environmental benefits in the evaluation of acquisition projects supports the use of ecosystem-based management, which is encouraged by the Federal Insurance and Mitigation Administration (FIMA) and the U.S. Army of Corps of Engineers as part of the Federal Interagency Floodplain Management Task Force. In this context, incorporating environmental



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benefits into the overall quantification of project benefits for acquisition projects supports FIMA's mission of risk reduction, environmental compliance, and the preservation of the natural and beneficial functions of the floodplain.

FEMA collaborated with private, public, and academic sectors to develop an Environmental Benefits Analysis Report (EBAR), which identifies benefits produced by deed-restricted open space. The EBAR contains peer-reviewed academic journal articles, agency analysis, and private studies examining the economic value provided by lands both inside and outside the SFHAs. These studies provide a sound basis for generating economic values useful to FIMA. The results of the EBAR were used to develop FIMA's quantification of environmental benefits for open green space and riparian areas in the BCA Toolkit.

Regional variations in dollar values as well as differences in rural and urban areas were considered, but it was concluded that normalizing the environmental benefits through the value transfer method used in the BCA Toolkit was appropriate. While there will be a need in the future to re-study both green open space and riparian environmental benefits, FEMA believes the economic valuation used in the EBAR and in this policy are reasonable to be included in a BCA.

### **B. Environmental Benefits**

Since FIMA has a primary mission to reduce or eliminate future damage from natural hazards where possible, project benefits from acquisitions must be derived primarily from avoided future damage, displacement, and other direct damage. Acquisition-related mitigation activities have proven to be the most effective example of hazard mitigation; therefore, FEMA has incorporated an environmental benefits methodology into its BCA Toolkit for acquisition-related mitigation activities. Acquisition-related activities permanently remove at-risk structures from the most vulnerable areas of the floodplain, thereby eliminating the cycle of damage, reconstruction, and repeat damage. Additionally, the inclusion of environmental benefits into the BCA Toolkit for acquisition-related activities supports floodplain management recommendations to restore and maintain the natural and beneficial functions of the floodplain.

The BCA Toolkit will automatically include environmental benefits for projects calculated to have BCRs of 0.75 or greater using traditional benefits. The environmental benefits for green open space or riparian areas are based on the size (in square feet) of the land (lot) being acquired. The inclusion of environmental benefits into the BCA does not apply to acquisition projects that are approved under the following methodologies:

- The Substantial Damage Waiver policy
- The Savings to the NFIF Methodology (GSTF)
- The HMGP 5-percent Initiative



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Table I shows the types and values of environmental benefits included in the BCA for acquisition-demolition or acquisition-relocation projects:

Table I: Annual Estimated Monetary Benefits per Acre per Year

| <b>Environmental Benefit</b>    | <b>Green Open Space</b> | <b>Riparian</b> |
|---------------------------------|-------------------------|-----------------|
| Aesthetic Value                 | \$1,623                 | \$582           |
| Air Quality                     | \$204                   | \$215           |
| Biological Control              | --                      | \$164           |
| Climate Regulation              | \$13                    | \$204           |
| Erosion Control                 | \$65                    | \$11,447        |
| Flood Hazard Reduction          | --                      | \$4,007         |
| Food Provisioning               | --                      | \$609           |
| Habitat                         | --                      | \$835           |
| Pollination                     | \$290                   | --              |
| Recreation/Tourism              | \$5,365                 | \$15,178        |
| Storm Water Retention           | \$293                   | --              |
| Water Filtration                | --                      | \$4,252         |
| <b>Total Estimated Benefits</b> | <b>\$7,853</b>          | <b>\$37,493</b> |

Table II shows total estimated benefits per acre per year and the total estimated benefits per-square-foot for green open space and riparian land use; the benefits can accrue for any lot size. The green open space and riparian values used in this policy are calculated per square foot per year using the OMB-approved 7 percent discount rate applied over the project useful life. The environmental benefits accrue over a projected 100-year lifespan of the acquisition-related activity. For green open space, the accumulated benefit is estimated as \$2.57 per square foot per year. For riparian areas, the accumulated environmental benefit is estimated as \$12.29 per square foot per year.



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Table II: Green Open Space and Riparian Benefits Allowed in the BCA Toolkit

| Land Use         | Total Estimated Benefits   | Total Estimated Benefits (projected for 100 years with 7 percent discount rate) |
|------------------|----------------------------|---------------------------------------------------------------------------------|
| Green Open Space | \$7,853 per acre per year  | \$2.57 per square foot                                                          |
| Riparian         | \$37,493 per acre per year | \$12.29 per square foot                                                         |

### C. Limitation

Because the fundamental purpose of the HMA Programs is to reduce future damage to property, environmental benefits are not included in the BCA unless the project BCR is 0.75 or greater. Additionally, the inclusion of environmental benefits in the BCA is limited to acquisition-related activities until further study of other mitigation activities (e.g., detention basins) can be completed.

### X. ROLES & RESPONSIBILITIES:

Roles and responsibilities herein for all Federal, Grantee/Applicant, and subgrantee/subapplicant participants are consistent with those outlined in 44 CFR Parts 13, 79, 80 and 206 subpart N (for HMGP Projects), and the HMA Unified Guidance.

### XI. MONITORING AND EVALUATION:

The performance of an awarded grant will be monitored in accordance with the financial and performance reporting requirements outlined in 44 CFR Parts 13, 79, 80, and 206 subpart N (for HMGP Projects), as well as the HMA Unified Guidance. In addition, all awarded grants must comply with the administrative and audit requirements of 44 CFR Parts 13 and 206 subpart N (for HMGP Projects), as well as the terms and conditions of the grant award agreement.

### XII. RESPONSIBLE OFFICE:

FIMA, Risk Reduction Division, Grants Data Analysis and Tools Branch

### XIII. SUPERSESSION:

This policy does not supersede any other policy on this subject.



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## MITIGATION POLICY – FP-108-024-01

#### XIV. ORIGINATING OFFICE:

FIMA, Risk Reduction Division

#### XV. REVIEW DATE:

This policy will not automatically expire, but will be substantively reviewed on or before 3 years from the date of issuance.

A handwritten signature in blue ink, appearing to read "David L. Miller", written over a horizontal line.

David L. Miller  
Associate Administrator  
Federal Insurance and Mitigation Administration

This policy represents FEMA's interpretation of a statute or regulation. The policy itself does not impose legally enforceable rights or obligations but sets forth a standard operating procedure or agency practice that FEMA employees follow to be consistent, fair, and equitable in the implementation of the agency's authorities.