



# Risk Mapping, Assessment, and Planning (Risk MAP) Multi-Year Plan: Fiscal Years 2010-2014

Fiscal Year 2009 Report to Congress  
March 16, 2009



Homeland  
Security

*Federal Emergency Management Agency*

# Message from the Acting Administrator

March 16, 2009

I am pleased to present the “Risk Mapping, Assessment, and Planning (Risk MAP) Multi-Year Plan: Fiscal Years 2010-2014,” which has been prepared by the Federal Emergency Management Agency (FEMA).

This document responds to the reporting requirements set forth in the Explanatory Statement which accompanies the Fiscal Year 2009 Department of Homeland Security Appropriations Act (P.L. 110-329).

The pages that follow outline FEMA’s plan for enhancing and maintaining the quality flood hazard data and maps produced in Flood Map Modernization, and building on that data to enable the vision of Risk MAP. The Risk MAP goals and objectives outlined in this plan are grounded in current authorities provided in the National Flood Insurance Reform Act of 1994; Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended; and the Water Resources Act of 1996. Any changes to these authorities and budget decisions may necessitate changes to Risk MAP goals and objectives.

Pursuant to congressional requirements, this report is being provided to the following Members of Congress:

The Honorable David E. Price  
Chairman, House Appropriations Subcommittee on Homeland Security

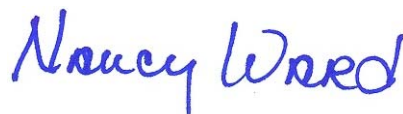
The Honorable Harold Rogers  
Ranking Member, House Appropriations Subcommittee on Homeland Security

The Honorable Robert Byrd  
Chairman, Senate Appropriations Subcommittee on Homeland Security

The Honorable George V. Voinovich  
Ranking Member, Senate Appropriations Subcommittee on Homeland Security

Inquiries relating to this report may be directed to me at (202) 646-3900 or to the Department’s Acting Chief Financial Officer, Peggy Sherry at (202) 447-5751.

Sincerely,



Nancy Ward  
Acting Administrator  
Federal Emergency Management Agency

# Executive Summary

The Federal Emergency Management Agency (FEMA) manages several risk analysis programs that assess the impact of natural hazards that lead to effective strategies for reducing risk. These programs support the Department of Homeland Security objective to “strengthen nationwide preparedness and mitigation against natural disasters.” FEMA is beginning Risk Mapping, Assessment, and Planning (Risk MAP) in Fiscal Year 2009 with funding from the National Flood Insurance Fund and Congressional appropriations for flood hazard mapping. The vision for Risk MAP is to deliver quality data that increases public awareness and leads to action that reduces risk to life and property.

This Risk MAP Multi-Year Plan outlines the goals, objectives, and strategies for Risk MAP. The major objectives of Risk MAP are:

- Assess Nation’s flood risk and use this information to increase public awareness of risk. This consistent, quantitative flood risk assessment will be used to track progress toward reducing flood risk and to target resources.
- Increase public awareness of risk from natural hazards and establish a baseline of local knowledge and understanding of risk management concepts.
- Ensure 80 percent of the Nation’s flood hazards are current – the flood hazard data are new, have been updated, or deemed still valid.
  - Provide updated flood hazard data for 100 percent of the populated coastal areas in the Nation.
  - Evaluate levee status information to ensure the appropriate flood hazards are depicted on Digital Flood Insurance Rate Maps for counties with levees, including those impacted by expiring Provisionally Accredited Levee status.
- Continue to meet statutory requirements of the National Flood Insurance Program through assessing on a watershed basis, the need to revise and update all floodplain areas and flood risk zones identified, delineated, or established.

FEMA will continue to engage with stakeholders in refining and developing these Risk MAP objectives, including assessing effectiveness of outreach efforts and ways to measure the success of these objectives. Prioritization of Risk MAP efforts to achieve these objectives will be aligned with risk. The process for developing and providing updated flood hazard data through a digital platform builds on the success of Flood Map Modernization. FEMA will continue to collaborate with local, state, regional, tribal, national and other federal partners in implementing Risk MAP. This will include developing synergies with Risk MAP products and processes to minimize duplication across the Federal Government.

Integrating these programs and products realizes amazing benefits. Good flood hazard data is key; therefore over 75 percent of the resources will be devoted directly to it. True risk assessments add tremendous value for a small investment. Fully engaged states and local communities develop sound, practical Hazard Mitigation Plans. Through engaging with stakeholders, both at a national and local project level, FEMA will more effectively communicate risk and show how it can be reduced. Fully implemented, Risk MAP will create a more informed public that takes action to reduce flood risk, and this Risk MAP framework and data can be used to reduce vulnerability from other threats.



# Risk Mapping, Assessment, and Planning (Risk MAP) Multi-Year Plan: Fiscal Years 2010-2014

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# I. Legislative Requirement

The Explanatory Statement which accompanies the Fiscal Year (FY) 2009 Department of Homeland Security Appropriations Act (P.L. 110-329) states as follows:

## FLOOD MAP MODERNIZATION FUND

The bill provides \$220,000,000 for the Flood Map Modernization Fund. FEMA is expected to focus on updating, reviewing, and maintaining maps that have already been modernized to ensure that flood maps maintain current to accurately reflect flood hazards. The goal shall be to review and, as necessary, update maps that are three years past their modernized dates, and to complete necessary updates no later than five years past their modernized dates to ensure maps are accurately maintained. To support this goal and to leverage the use of Federal resources for this activity, FEMA is directed that no less than 20 percent of the funds provided under this heading be made available for map maintenance conducted by Cooperating Technical Partners that provide a 25 percent cash match and have a strong record of working effectively with FEMA on floodplain mapping activities. Concurrent with the fiscal year 2010 budget submission, FEMA shall submit to the Committees on Appropriations a five year National Flood Map Maintenance Plan for fiscal years 2010-2014.

This report is provided in response to that requirement.

## II. Introduction

### **Risk Mapping, Assessment, and Planning (Risk MAP)**

Within the Department of Homeland Security (DHS), the Federal Emergency Management Agency's (FEMA's) mission is "to reduce the loss of life and property and protect the Nation from all hazards, including natural disasters, acts of terrorism, and other man-made disasters, by leading and supporting the Nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation."

To this end, FEMA's Mitigation programs benefit society by:

- Creating safer communities by reducing loss of life and property.
- Enabling people to recover more rapidly from floods and other disasters.
- Lessening the financial impact on the United States Treasury, states, tribes and communities.

To help deliver FEMA's mission, the Mitigation Directorate focuses on three business lines:

- **Risk Analysis** applies engineering and planning practices in conjunction with advanced technology tools to identify hazards, assess vulnerabilities, and develop strategies to manage the risks associated with natural hazards.
- **Risk Reduction** works to reduce risk to life and property through the use of land use controls, building practices, cost effective mitigation grants and other tools. These activities address risk in both the existing built environment and in future development, and they occur in both pre- and post-disaster environments.
- **Risk Insurance** helps reduce flood losses by providing affordable flood insurance for property owners and by encouraging communities to adopt and enforce floodplain management regulations that mitigate the effects of flooding on new and improved structures.

In the Nation's comprehensive emergency management framework, the analysis and awareness of natural hazard risk remains challenging. In order for communities to make informed risk management decisions and take action to mitigate risk, a consistent risk-based approach to assessing potential vulnerability and losses and tools to communicate the message are needed. Risk Mapping, Assessment, and Planning (Risk MAP), delivered through FEMA's Risk Analysis Division, aims to address this gap. By analyzing and depicting flood risk, communities and the American public can better understand their risk and will make informed decisions to reduce vulnerability.

Ultimately, through collaboration with state, local and tribal entities, Risk MAP will reduce losses of life and property through effective local mitigation activities enabled by quality flood hazard data, risk assessments, and mitigation planning. Risk MAP will establish an integrated

flood risk management approach that leverages the existing data from Flood Map Modernization. Risk MAP will provide an integrated national assessment of flooding risks based on digital flood hazard data and web-accessible data. This information will enable communities to develop mitigation plans and make informed risk management decisions that maximize loss reduction.

## **Building on Flood Map Modernization**

Reliable flood hazard data are the foundation of credible flood risk assessments, and these assessments serve a critical role as communities engage in the mitigation planning process. The Administrator of FEMA is required by statute to identify and map the Nation's flood-prone areas and to establish flood-risk zones in these areas. Early in the life of the National Flood Insurance Program (NFIP), Congress funded the initial flood hazard identification efforts. Throughout the 1980s and 1990s, inadequate funding for Flood Hazard Mapping allowed the flood hazard data on most NFIP maps to decay, no longer depicting the actual flood hazard. The lack of adequate, current maps of the Nation's flood hazard areas prompted Congress to direct FEMA to create the Technical Mapping Advisory Council (TMAC). In 2000, TMAC provided recommendations for how to improve NFIP maps:

- Develop strong partnerships in NFIP mapping.
- Increase public awareness and education of flood hazards.
- Use modern and emerging mapping technologies.
- Improve NFIP floodplain delineations.

*It is estimated that FEMA maps are used over 30 million times each year. Digital mapping products and distribution, enabled through Map Modernization, save businesses and local communities between \$100 and \$200 million annually through fewer errors and faster turnaround time in their work.*

Recognizing the connection between reliable flood maps and flood damage reduction, the United States Congress provided funding in FY2003 through 2008 for Flood Map Modernization. Flood Map Modernization made most of the Nation's 100,000 flood maps widely accessible through a digital platform. Flood Map Modernization significantly improved the horizontal accuracy of the flood hazard maps and made some focused investments in vertical accuracy. In many areas across the country, the mapping improvements were accomplished through Cooperating Technical Partnerships (CTPs) with state and local governments. By performing the work at the local level, FEMA has realized increases in the awareness of flood risk coupled with a greater acceptance in the products. Prior to Flood Map Modernization, 70 percent of the Nation's flood maps were more than a decade old. Flood Map Modernization makes flood hazard information more readily available, enabling the delivery of updated digital flood maps for 92 percent of the Nation's population. FEMA will be able to achieve the goals of Flood Map Modernization with funding received through FY2008.

*Flood hazard maps depict both horizontal and vertical data. The vertical data show the height of the water during the 1-percent-annual-chance flood. Accurate horizontal data ensures the floodplain accurately follows ground contours.*



### III. Summary of Commitments

In March 2004, the General Accounting Office (GAO) recommended that Flood Map Modernization “develop and implement useful performance measures that define FEMA’s progress in increasing stakeholders’ awareness and use of new flood hazard maps, including mitigation efforts and increased participation rates in purchasing flood insurance.” Then in August 2007 when speaking on Natural Hazard Mitigation, GAO stated “the Federal government could benefit from a comprehensive strategic framework, which could help to effectively identify national natural hazard risks, minimize the effects of hazards before they occur, and reduce overall future hazard losses to the Nation.” Risk MAP will address the program gaps identified in these recommendations, building on the success of Flood Map Modernization and FEMA’s other Mitigation Directorate programs. In the end, Risk MAP builds a broader foundation for Mitigation projects. These Mitigation activities have shown an overall benefit cost-ratio of 4:1 (Multi-hazard Mitigation Council, 2005).

#### **Risk MAP Vision**

Risk MAP will deliver quality data that increases public awareness and leads to action that reduces risk to life and property.

#### **Risk MAP Goals and Objectives**

With the experience of Flood Map Modernization’s program success and collaborative efforts with affected federal, state and local stakeholders, FEMA developed the following goals and objectives for Risk MAP:

- **Goal 1: Address gaps in flood hazard data to form a solid foundation for flood risk assessments, floodplain management, and actuarial soundness of the National Flood Insurance Program.**
  - Initiate Risk MAP flood map update projects to address gaps in required engineering and mapping for high flood risk areas impacted by coastal flooding, levees, and other flood hazards (e.g. lakes, rivers, ponds).
  - Ensure state and federal resources aimed at identifying flood hazards are aligned with flood risk, data needs, and partner contributions.
  
- **Goal 2: Ensure that a measurable increase of the public’s awareness and understanding of risk management results in a measurable reduction of current and future vulnerability to flooding.**

- Implement a comprehensive national outreach strategy that provides stakeholders with targeted messaging using innovative outreach tools that increases understanding of risk and promotes actions to reduce those risks.
  - Establish a baseline, and measure progress annually, of local understanding of flood risk.
  - Develop a process to conduct the risk assessment routinely and measure the reduction of current and future vulnerability.
- **Goal 3: Lead and support states, local and tribal communities to effectively engage in risk-based mitigation planning resulting in sustainable actions that reduce or eliminate risks to life and property from natural hazards.**
- Integrate hazard mitigation planning with other planning processes already in place at the federal, state, tribal and local levels.
  - Communicate the benefits of the hazard mitigation planning process to help states, local and tribal entities to develop, adopt and implement FEMA-approved hazard mitigation plans.
  - Evaluate hazard mitigation plans to demonstrate that mitigation actions are being effectively implemented at the state, local and tribal levels, resulting in risk reduction.
- **Goal 4: Provide an enhanced digital platform that improves management of limited Risk MAP resources, stewards information produced by Risk MAP, and improves communication and sharing of risk data and related products to all levels of government and the public.**
- Use technology efficiently to manage Risk MAP investments and identify, quantify, store, share and enhance risk analysis information.
  - Leverage advancements in national geospatial data production, quality and availability to improve Risk MAP products.
  - Enhance existing systems and tools, leveraging advances in geospatial information systems and data, to help Risk MAP producers and end users take a geographic approach to risk analysis and facilitating Risk MAP in providing the right information, to the right audience, at the right time.
- **Goal 5: Align Risk Analysis programs and develop synergies to enhance decision-making capabilities through effective risk communication and management.**
- Expand flood hazard mapping guidelines to include data needed to support flood risk assessment.
  - Develop ways to share risk assessments, encourage integrated planning, and coordinate plans for communicating with the public.
  - Create forums for federal, state, local, tribal and business community entities to discuss risk.
  - Identify synergies at all levels, including interagency coordination, programmatic decisions, and day-to-day activities.
  - Facilitate the expansion of a risk management approach beyond flood to other threats.

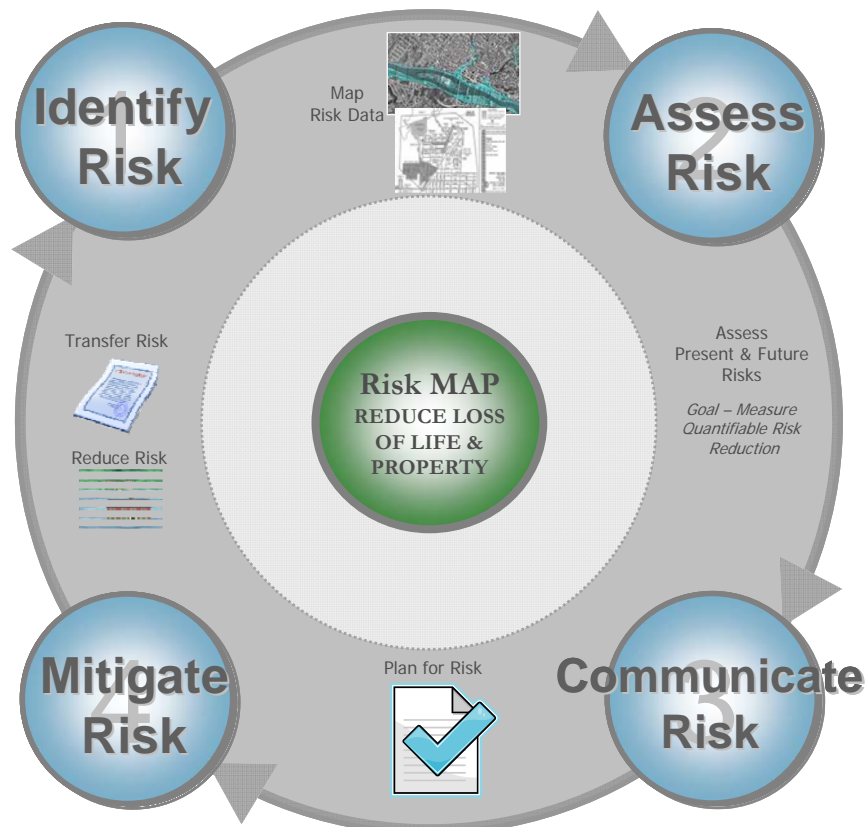
## Major Commitments

In order to achieve the goals and objectives of Risk MAP, FEMA identified the following major commitments. In some cases, the list of commitments below for Risk MAP may require revisions to programmatic regulations, guidance, and procedures.

- Increase public awareness of risk through Risk MAP outreach and establish a baseline of local knowledge and understanding of risk against which progress is being measured annually.
- Ensure 80 percent of the Nation's flood hazards are current – the flood hazard data are new, have been updated, or deemed still valid.
  - Provide updated flood hazard data for 100 percent of the populated coastal areas in the Nation.
  - Evaluate levee status information to ensure the appropriate flood hazards are depicted on Digital Flood Insurance Rate Maps (DFIRMs) for counties with levees, including those impacted by expiring Provisionally Accredited Levee status.
- Continue to meet statutory requirements of the NFIP by keeping flood risk zones current.
- Assess Nation's flood risk and provide data to increase public awareness as well as inform Risk MAP efforts.
- Increase the awareness of the flood risk for areas affected by levees through the completion of the Mid-Term Levee Inventory. These efforts are in coordination with the United States Army Corps of Engineers' (USACE) development and population of the National Levee Database.
- Demonstrate how hazard mitigation plans result in actions that effectively reduce risk.
- Integrate hazard mitigation planning efforts with other planning processes already in place at the federal, state, tribal and local levels.
- Collaborate with federal, state, local, regional, tribal, national and other federal partners in implementing Risk MAP, building on the successful partnerships developed in Flood Map Modernization and other Risk Analysis Programs.
- Enhance existing systems and tools, leveraging advances in geospatial information systems and data, to help Risk MAP producers and end users take a geographic approach to risk analysis and provide the right information, to the right audience, at the right time.
  - Upgrade the physical and digital library systems to maintain a robust technical model for data and information archiving and retrieval.

- Develop flood depth grids and multiple return frequency analyses as standard deliverables of the DFIRM process to better communicate and quantify flood risks.
- Provide additional national natural hazard data sets (e.g., annualized wind-loss study and annualized earthquake-loss study for the Nation) as geospatial layers through the Mapping Information Platform (MIP).
- Maintain the engineering capability in the private sector to develop these Risk MAP products – sustaining jobs and stimulating the economy.

Continual involvement and collaboration with stakeholders is essential to the success of FEMA's Risk Analysis Programs. FEMA has engaged stakeholders in the development of Risk MAP goals and objectives and the efforts of local, state, regional, tribal, national and other federal partners will be key to achieving a broader understanding of risk and enabling actions to reduce losses.



**Figure 1 – Risk Mapping, Assessment, and Planning (Risk MAP) Lifecycle**

## IV. Strategic Planning Approach

### **Risk MAP Potential Activities**

In collaboration with federal, state and local stakeholders, FEMA developed specific cross-cutting goals aligned with the Risk MAP vision to provide a well-defined pathway for the future. This strategy moves away from the focus on individual Risk Analysis component missions to a much broader and integrated structure. In order to be successful, Risk MAP efforts must be combined and resources used efficiently towards a common strategic direction. These objectives drive FEMA's Mitigation Directorate staff effort, FEMA collaboration with partners, and program delivery to impacted communities and work toward an integrated Risk MAP effort.

In delivering Risk MAP, FEMA will utilize engineering and mapping contractors and Cooperating Technical Partners (CTPs, state and local partners receiving grant funds to produce products) in the update of flood hazard data and maps. To ensure that the updated information is used in making informed decision regarding flood risk requires FEMA to rely on local communities, regional entities, tribes and state agencies.

The goals fits into three categories: flood hazard data currency; measuring risk reduction; and integrating program delivery to most effectively communicate risk to the public. These objectives were developed in coordination with and vetted through national, state and local entities, other federal agencies, and Risk MAP industry partners.

#### ➤ **Goal 1: Address gaps in flood hazard data to form a solid foundation for risk assessment, floodplain management, and actuarial soundness of the National Flood Insurance Program.**

FEMA must continue to maintain the quality of the flood hazard data used in support of the NFIP. Leveraging successes from Flood Map Modernization, FEMA must take the next step to refresh more of the underlying engineering data depicted on the flood map. Part of the success of Flood Map Modernization was establishing a foundation for easier information depiction and distribution of the mapped flood hazard. To complete the evolution of the process, it is imperative to maintain the integrity and credibility of the engineering data for reliable risk identification, and ensure the information can be leveraged to improve mitigation activities beyond the minimum federal requirements for participation in the NFIP.

In the near term, Risk MAP will:

- Initiate Risk MAP flood map update projects to address flood hazard data needs in high flood risk areas affected by coastal flooding, levees and other riverine flood hazards.
- Develop flood depth grids based on updated or validated engineering flood studies for use in risk communication outreach products and flood risk assessments

- Improve flood map update investment process by standardizing criteria for validating that the flood hazard information on FIRMs reflects existing conditions and is aligned with risk.
- Update and streamline Data Capture Standards and DFIRM Database requirements.
- Upgrade physical and digital library systems to maintain a robust data and information archiving and retrieval system.

In the long term, Risk MAP will:

- Ensure 80 percent of the Nation's flood hazards are current – the flood hazard data are new, have been updated, or deemed still valid.
- Provide updated flood hazard data for 100 percent of the populated coastal areas in the Nation.
- Evaluate levee status information to ensure the appropriate risk premium rate zone is depicted on DFIRMs for counties impacted by expiring Provisionally Accredited Levee status.
- Continue to meet statutory requirements of the NFIP through assessing on a watershed basis, the need to revise and update all floodplain areas and flood risk zones identified, delineated, or established.

### **Flood Map Update Investment Process**

Flood Map Modernization transformed the flood hazard mapping inventory to 21st century digital technology and restored confidence in the reliability of floodplain boundaries, while making some updates to the underlying engineering data. However, the dynamic nature of floodplains will require updated analysis of flood hazards on a periodic basis to maintain a reliable inventory.

Three principal factors drive the need for updated flood hazard analyses:

1. Physical changes: such as manmade influences which may include new bridges, culverts, and levees in the floodplain as well as development that may influence watershed characteristics as well as natural changes which may include erosion and wildfires.
2. Climate changes: such as changing rainfall data as well as hurricane patterns and intensities.
3. Engineering methodology changes: such as improved computer models and better understanding of the physics governing storm surges and major flooding events.

Failing to keep pace with the changing and dynamic nature of watersheds ultimately leads to unwise decisions that place homeowners and communities at increased risk of flooding. Conversely, overstated hazards can result in potentially unnecessary construction costs and incorrect insurance rating decisions. Sound, reliable flood hazard information is a necessary component of ensuring the fiscal soundness of the NFIP.

As FEMA implements Risk MAP in FY2009, the next five-year assessment of NFIP maps will begin. FEMA will work with stakeholders to ensure that flood hazard information on FIRMs reflects existing conditions and is aligned with flood risk. FEMA will document the engineering gaps that require a map update based on the three principal factors mentioned above. A watershed-based Coordinated Needs Management Strategy (CNMS) will be used to track the assessment process, document engineering gaps and their resolution, and aid in prioritization for using flood risk as a key factor for areas identified for flood map updates. The level of FEMA's flood and beyond efforts in FY2010 and beyond will be based on available federal resources and potential cost share from state and local stakeholders. Now that the majority of the NFIP map inventory is in digital format, most map updates need to occur only for flood map panels where hazards are changing through a Physical Map Revision rather than at a countywide level.

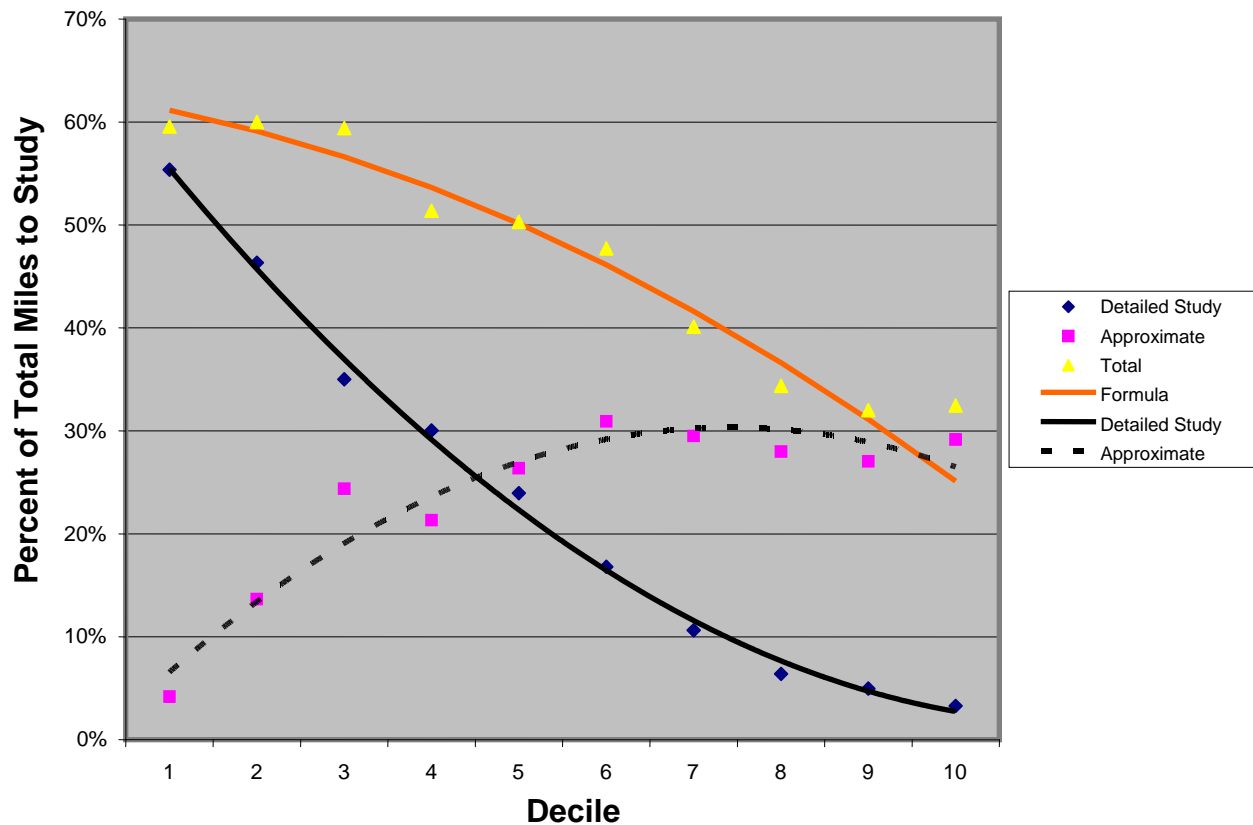
***Countywide Revision:*** Large-scale revision for the entire geographic area of a county, including the incorporated communities, typically involving updates to topography, base map, and/or updated hydrology and hydraulics for numerous streams within the county. During Flood Map Modernization, countywide revisions made up the vast majority of mapping products because of the cost efficiencies from converting paper products to digital.

***Physical Map Revision (PMR):*** Small-scale revision to a DFIRM using the same process, technology, and methods used to develop a countywide revision. However; because of the limited changes in flood hazards, only the affected area(s) of the county require updating. In many cases, due to the small scale of the changes and the low number of communities affected, PMRs often go into effect faster.

Communities with “un-modernized” flood hazard mapping products (not currently included in the National Flood Hazard Layer) will be addressed using risk-based and cash-match sequencing criteria.

Throughout FY2011 to 2014, FEMA will continue to evaluate flood hazard information on FIRMs to ensure it reflects existing conditions in order to complete the five-year assessment of NFIP maps.

The flood map update sequencing process for Flood Map Modernization was based on a national assessment of flood risk. Areas at flood risk were calculated, based on parameters determined through collaboration with flood mapping stakeholders, by deciles at the Census Block Group level. The national flood risk assessment was used to determine distribution of appropriated flood mapping funding to the 10 FEMA regional offices that manage flood map production. In Flood Map Modernization, the distribution between detailed and approximate flood studies to identify flood hazards aligned with the flood risk of the area, as indicated in the figure provided on the following page.



**Figure 2 – Flood Study Type Distribution by Risk**

FEMA will collaborate with Risk MAP stakeholders to refine the flood map update investment process by using more robust flood risk assessment data. This process will help ensure resources for flood map updates align with risk while improving upon the national flood risk assessment from Flood Map Modernization. States and communities can affect this sequencing by demonstrating a change in the risk level of the area or by offering cash-match to the project.

The flood map update prioritization approach for FY2009 and FY2010 addresses gaps in required engineering and mapping for high flood risk areas affected by coastal flooding, levees, and other riverine flood hazards. FEMA anticipates that flood map update efforts to address coastal and levee needs will extend to FY2013 and FY2014, respectively, based on available resources.

### **Coastal Flood Hazard Mapping**

Through Flood Map Modernization, FEMA updated the methodology for identifying and mapping coastal flood hazards along the Pacific, Atlantic, Gulf of Mexico, and Great Lakes coastlines. During Risk MAP, FEMA will use the updated methodologies to study the entire



populated United States coast in detail, including new storm surge modeling and topographic information. FEMA also initiated a study examining the potential impact of climate change on the flood hazard identification process. The results of the climate change study may drive additional changes to the methodologies.

As Hurricane Katrina demonstrated, quality flood hazard data are central to any public education endeavor in coastal areas. Without accurate, quality data, the public often makes ill-informed decisions that place lives and property in jeopardy. In Risk MAP, FEMA will identify and prioritize coastal study needs and develop a comprehensive coastal study strategy. Coastal studies will be prioritized based on a number of factors including, such technical factors as age of analysis and validity of the effective study methods and results. Other non-technical factors will also be used for prioritization such as completion of ongoing studies and partner contributions. In FY2009, FEMA will fund coastal studies along portions of the Pacific, Atlantic, Gulf of Mexico and Great Lakes coastlines including studies in all eight of FEMA's coastal Regions. These studies account for approximately 20 percent of the populated coastline. FEMA anticipates that updated DFIRMs for these areas will be issued during Fiscal Years 2010-2012 depending on the complexity of the studies.

FEMA will partner with state and local communities during the mapping process to improve communication to community members about coastal hazards. This approach increases public buy-in and acceptance of the updated coastal flood hazard information. Community meetings and distribution of information and locally focused fact sheets can help facilitate this process. Local leaders can distribute information about technical issues, insurance implications, and risk-reduction action plans. FEMA will launch this effort in FY2009 and spend five years to complete the update for the entire populated coastline, pending available resources.

The coastal flood hazard will continue to be mapped in FY2011 through 2014 by issuing and finalizing DFIRMs for coastal areas. The focus of the coastal mapping effort through FY2014 is to update 100 percent of the Nation's populated shoreline to ensure that individuals living along the coast have their coastal flood risk identified using the same level of detail.

### **Levee Flood Hazard Mapping**

The Nation faces flood hazards in communities that are partially or entirely protected by levee systems. Levees are located in over one-quarter of the counties where new digital flood hazard maps are being provided through Flood Map Modernization. With a better understanding of the levee-affected areas and the scope of the levee issues nationwide, FEMA will focus on the following activities during Risk MAP:

- Addressing Provisionally Accredited Levees.
- Completing the Mid-Term Levee Inventory.
- Revising programmatic regulations, guidance, and procedures.
- Providing effective communication of the unique threat associated with flooding where levees exist.

FEMA continues to learn more about the Nation's levees through coordination with federal, state, regional and local agencies. In FY2009 and future years, FEMA will fund the review and update of DFIRMs to ensure the flood hazards and risk premium zones associated with levees are accurate based upon that increasing knowledge base. The review and update will include counties affected by the expiration of Provisionally Accredited Levees. The determination on whether a levee-affected area needs to be analyzed and potentially remapped will be based on whether levee owners provide the necessary technical data needed to accredit the levee system. To update the flood hazard maps affected by levees, FEMA will perform updated hydraulic analysis and issue updated DFIRMs. Where necessary, funding will be used to analyze and map interior drainage hazards within the areas protected by levee systems. It is projected that this Provisionally Accredited Levee-related work will extend until FY2012.

For FY2009, FEMA will initiate the update in more than 110 counties affected by expiring Provisional Accredited Levees. Depending on proposed funding for FY2010, FEMA will address more than 270 counties affected by levees. The update will include counties affected by the expiration of Provisionally Accredited Levee status as well as counties facing significant flood hazards affected by levees. To ensure there are not significant delays in these remapping efforts, FEMA will implement an intensive outreach strategy focused on these areas and show the effects of the changes to the community earlier in the mapping process.

To gain a full understanding of the scope of the levee issues nationwide and to continue efforts initiated in Flood Map Modernization, FEMA will complete the identification and inventory of all of the Nation's levees reflected on DFIRMs within the Mid-Term Levee Inventory. The Mid-Term Levee Inventory (MLI) is a database containing information on each levee identified, including the type of levee structure, the location of the levee and whether the levee is mapped as providing protection on the DFIRM. The MLI is a coordinated effort with USACE and leverages the format and data in the National Levee Database, which USACE is developing concurrent to the MLI.

In addition to continued efforts to complete the MLI and address the status of expiring Provisionally Accredited Levees nationwide, FEMA will evaluate the need to revise program regulations, guidance and procedures related to certification of levees.

In the longer term, FEMA will evaluate and develop strategies to revise the procedures for mapping associated with non-accredited levees. Currently, mapping of levee-impacted areas is dependent on whether or not the levee provides 1-percent-annual-chance (100-year) protection. An option being considered would enable mapping to be dependent upon the specific level of protection a levee affords. The identification of the hazard associated with the levee would be more driven by the level of protection provided by that specific levee. FEMA will continue its close collaboration with USACE in the implementation of the levee analyses.

➤ **Goal 2: Ensure that a measurable increase of the public’s awareness and understanding of risk results in a measurable reduction of current and future vulnerability to flooding.**

Today, FEMA’s flood maps show areas subject to flood hazards. Individuals and communities use these maps to determine flood risk for specific locations and properties. The traditional flood hazard map update identifies the hazard, but does not quantify the risk to people and property. Risk MAP will provide sound flood hazard data to enable broader flood risk communication. Risk assessments systematically combine science, engineering, mathematical modeling, and technology to quantify potential physical, social, and economic losses from natural hazards. Flood risk assessments, developed with credible flood hazard data, will enable FEMA to increase stakeholders’ awareness of their flood risk and use of flood hazard data and maps in their economic and planning decisions. Actions taken based on flood risk assessments ultimately result in reducing the risk to life and property from flooding.

During Risk MAP, as flood studies are completed and risk assessments are a product of the updated analyses, the risk assessment will be valuable in conveying the flood risk. Local officials and emergency planners can use this information to develop mitigation strategies needed for the hazard mitigation planning process, the development of hurricane evacuation plans; and to increase public awareness.

In the near term, FEMA will implement an overarching Risk MAP outreach strategy that:

- Conveys risk in terms of consequences and probability, and conveys the social impacts of flood risk.
- Follows the entire Risk MAP life cycle from the continuous update of flood hazard data to the continuous update of a jurisdiction’s hazard mitigation plan.
- Establishes a baseline of local understanding of local risk. Communities can use this baseline to measure progress annually.
- Keeps the message simple so that the information is easily conveyed to the public.
- Includes National Dam Safety and National Hurricane Program related messages.

Specifically for the National Dam Safety Program, FEMA must effectively communicate dam failure risk so that communities and the American public can understand their risk and make informed decisions to safeguard or avoid that risk. It is imperative that dam safety public awareness and dam failure risk communication become a major component of the program. By linking risk communication efforts, FEMA can leverage the diverse stakeholder communities to further the message of dam failure risks. This information must be easily accessible to local officials in communities affected by dams; this can be delivered through the Risk MAP systems.

Within Risk MAP, FEMA will take advantage of collaborative meetings (e.g. scoping meetings) to communicate other program areas such Hazard Mitigation Planning, and National Dam Safety and National Hurricane Programs. There are limited opportunities to meet with local officials one-on-one and this time will be leveraged as much as possible.

Through leveraging geospatial data, with minimal additional resources, FEMA can digitally display and analyze (package) the data into new products. These products will produce relevant, targeted information to a broader user community. As FEMA revises its database specifications and visual specifications for the Digital Flood Insurance Rate Map the data will generate improved flood zone information with geospatial coordinates so that flood determination companies can more efficiently make flood insurance determinations. With no additional expense, the same data can generate a richer detailed flood risk map that provides informative descriptions of flood risk for use by a homeowner and community building officials.

FEMA will find innovative ways to communicate risk through visualization tools and demonstrate the consequences of flood risk. FEMA will increase access to public hazard and risk information and increase use of different media for distributing information.

In the long term, FEMA will enhance the overarching Risk MAP outreach strategy to:

- Better communicate flood risk.
- Ascertain variables important to risk communication that stakeholders need.
- Develop a risk communication plan in collaboration with other federal agencies to ensure a common and consistent federal message.
- Expand the conversation beyond implications of the 1-percent-annual-chance flood and discuss with the public the impact of other flood frequency events.
- Ensure communities have the communication materials needed to inform the public of the risk of flooding.
- Bring communities together to discuss joint risks and consequences around a shared watershed.
- Explain how risk can be tracked, managed and reduced by communities.

➤ **Goal 3: Lead and support states, local and tribal communities to effectively engage in risk-based mitigation planning resulting in sustainable actions to reduce or eliminate risks to life and property from hazards.**

Mitigation planning has a variety of customers (states, local and tribal entities) through which effective mitigation to reduce losses to life and property can be achieved. Mitigation planning is the foundation of effective risk reduction, and therefore necessitates integration at all levels. In the Mitigation Planning program area, FEMA will seek opportunities to create synergies with flood hazard mapping and flood risk assessments, as well as other related functions and missions.

In the near-term, Risk MAP will:

- Assist states, local and tribal entities to develop, adopt, and implement FEMA-approved hazard mitigation plans.
- Support FEMA hazard mitigation assistance grant programs that require a hazard mitigation plan as a condition of eligibility.

- Communicate the benefits of mitigation planning messages in an overarching Risk MAP outreach strategy.
- Develop a national integrated Mitigation Planning program database to manage, analyze, and report status of mitigation plans.
- Promote the integration of mitigation planning into other state, tribal and local planning processes.

In the long-term, Risk MAP will:

- Evaluate the effectiveness of hazard mitigation plans in reducing risk.
- Provide risk assessment resources and technical assistance for all hazards, including the most recent flood mapping data.
- Improve implementation of mitigation planning during post-disaster field operations.
- Coordinate with other federal agencies with planning requirements to identify opportunities to reduce duplicative planning processes and improve efficiencies.

The sections below further describe the activities of the Mitigation Planning program area through continued coordination with hazard mitigation assistance programs, while also enhancing mitigation planning through Risk MAP mapping and assessment partners.

**Assist states, local and tribal entities to develop, adopt and implement FEMA-approved hazard mitigation plans.**

As Risk MAP goes forward, communication of mitigation planning requirements, as well as the continued coordination both within mitigation and across other programs, as appropriate, is necessary to effectively administering the Mitigation Planning program. FEMA needs to provide clear and concise mitigation planning information for consistent national implementation of hazard mitigation plan development, adoption and execution leading to reducing the Nation's vulnerability from hazard events.

**Support FEMA hazard mitigation assistance programs that require a hazard mitigation plan as a condition of eligibility.**

The Mitigation Planning program area must continue to support the mission of the FEMA mitigation programs that require a hazard mitigation plan as a condition of eligibility. Activities related to program delivery include mitigation plan review and approvals, coordination of national policy and guidance, as well as delivery of technical assistance, training, and outreach supporting plan development and updates. Over the next five years, plans affecting every state, and more than 18,000 jurisdictions, will expire. Resources will be required at every level of government to update these plans.

**Communicate the benefits of mitigation planning messages in an overarching Risk MAP outreach strategy.**

Of critical importance to the continuing success of mitigation planning is the ability of FEMA to communicate the benefits of mitigation planning efforts. An overarching Risk MAP

communications and outreach plan will target stakeholders, identify appropriate messages and develop the necessary outreach products, services and tools to achieve the objectives of all Risk MAP programs. For example, the Mitigation Planning program area will identify and showcase communities that have completed models of mitigation planning, or “best practices,” as a method of communicating examples that other communities can understand and apply to their own mitigation plans. Integration activities with flood mapping and flood risk assessment will continue to evolve over the next several years however; in the near-term FEMA will see successes as it relates to enhanced communication and outreach to state, local and tribal governments.

**Develop a national integrated Mitigation Planning program database to manage, analyze, and report status of mitigation plans.**

Risk MAP will support the development of the Mitigation Planning database which will provide the ability to store, track, and manage mitigation plans. In the near-term, Risk MAP will show plans data geographically through a geospatial information system (GIS) based map of the nation and all FEMA-approved mitigation plans, available via the FEMA website. In the long-term, mapping, risk assessment and planning databases may be integrated to allow simpler user access to community level information under all Risk MAP programs.

**Promote the integration of mitigation planning into other State, Tribal and local planning processes.**

Mitigation planning since 2002 has had a tremendous penetration rate in a very short time, largely due to the eligibility of pre- and post-disaster funding. However, mitigation plans developed by local emergency managers frequently do not include land-use, zoning and development officials, nor do they coordinate with other local planning processes that impact land-use. Risk MAP provides a suite of land-use decision-making tools for communities, and will inform communities of the benefits of integrating hazard mitigation into ongoing state and local planning processes and plans such as comprehensive plans, land-use plans, capital improvements plans, economic development plans, transportation plans, critical area plans, etc. In the near-term, FEMA is working with the American Planning Association (APA) to develop and disseminate a Planning Advisory Service report called “Integrating Mitigation into Local Planning Processes.” FEMA’s partnership with APA over the last 10 years provides a dissemination point to over 40,000 local planning officials nationally. In the long-term, this strategy will continue to evolve to target other professional organizations, as well as advancing professional curriculums through universities with hazards programs.

**Evaluate the effectiveness of hazard mitigation plans in reducing risk.**

The measurement and documentation of the effectiveness of mitigation plans is critical to the Mitigation Planning program area, as well as Risk MAP. Currently, FEMA reports the population and number of plans approved, but does not have an established mechanism to demonstrate the effectiveness of the plan itself; this measurement takes place on an ad hoc basis. A measure of the success of mitigation planning is the demonstration that plans are being effectively implemented at the state, local and tribal levels, either through funded mitigation

projects, losses avoided or damages avoided, or other measures. In the long-term, objective evaluations of mitigation plans and the Mitigation Planning program will also direct future activities. For example, by piloting criteria to determine feasibility for planning evaluation requirements based upon an ordinal system, the program may determine that procedural, guidance or regulation changes are warranted for more effective plans.

**Provide risk assessment resources and technical assistance for all hazards, including the most recent flood mapping data.**

Risk MAP will provide states, local and tribal jurisdictions with the most recent flood mapping data for use in mitigation plans. Risk MAP will continue to support FEMA's risk assessment and loss estimation tool, Hazards United States Multi-Hazard (HAZUS-MH), as related to flood, earthquake and hurricane wind hazards. However, since mitigation planning is multi-hazard and not exclusively flood, FEMA will also identify and coordinate with other federal agencies to improve information exchange of data sets, research and studies that augment locally derived risk data for natural hazards.

**Improve implementation of mitigation planning during field operations.**

Mitigation plans are a condition of certain post-disaster assistance, and plans are frequently completed post-disaster when the need is most pressing and the capacity is strained. To help states and communities during these periods, FEMA frequently assists through Joint Field Offices and Disaster Assistance Employee staff support. In the long-term, the Mitigation Planning program will support the development of staff capacity and capabilities to ensure that program delivery is efficient and effective during field operations.

**Coordinate with other federal agencies to identify opportunities to reduce duplicative planning processes and improve efficiencies.**

Other federal agencies administer programs or initiatives for state, tribal and local communities related to hazards or natural resource planning. For example, coastal zone management through National Oceanic and Atmospheric Administration, watershed planning through Environmental Protection Agency, or wildfire management through Bureau of Land Management have land-use elements that may align with the planning processes set forth under FEMA's Mitigation Planning program. Synergies will be identified and coordination initiated to improve the efficiencies of shared objectives.

➤ **Goal 4: Provide an enhanced digital platform that improves management of Risk MAP, stewards the information produced by Risk MAP and improves the communication and sharing of risk data and related products with all levels of government and the public.**

The NFIP Flood Hazard Mapping Program is the largest civilian thematic mapping program in the world. The inventory of flood hazard information represents a significant national asset. The digital platform for Risk MAP is made up of program management tools; flood hazard data

production tools; a content management system; digital flood hazard information; related technical data; and tools for finding, displaying, printing, and analyzing hazards and risk. FEMA's technology investments in Flood Map Modernization were crucial to implementing proper management of this asset and will be vital to monitoring and measuring the performance of Risk MAP. FEMA's digital platform also provides the management and stewardship of this asset to preserve its value. The digital products and tools substantially increase FEMA's ability to communicate hazards and risk in a more flexible and powerful way, targeted specifically to the audience, and enables users to leverage FEMA's digital products in their own work. Building on the success of Flood Map Modernization, FEMA will implement a major change to product distribution at the start of FY2010. FEMA has transitioned away from producing paper map products to digital delivery of all products except for a single paper copy for each community whose map is updated. FEMA's work on the digital platform in FY2009 will help lay the groundwork for this significant milestone. It is estimated that this change will result in direct savings of \$3.5 million annually.

The specific objectives to meet this goal are to:

- Use technology (e.g., Mapping Information Platform) to manage Risk MAP investments and identify, quantify, store, share and enhance risk analysis information.
- Leverage advancements in national geospatial data production, quality and availability to improve Risk MAP products.
- Enhance tools to benefit from a geographic approach, making them more user-focused, and expanding their use to other Risk MAP components.

The short-term strategy for these objectives includes:

- Improve tracking of state and local hazard mitigation plans.
- Improve map production tools.
- Find and invest in accurate digital geospatial data to support improved flood hazard and flood risk analyses.
- Continue implementation of the National Flood Hazard Layer.
- Perform comprehensive usability and requirements analysis for end-user tools.

### **Improve Production Tools**

New production contractors for Risk MAP have been required to provide production tools for their own operations as well as to support CTPs and other mapping partners assisting with production. FEMA will share these tools in FY2009. This will allow Risk MAP to retire the government-maintained and supported production tools, and achieve additional efficiencies.

FEMA will conduct a user needs assessment and usability analysis for its current digital flood data tools in order to enhance and tailor them to meet user needs. This includes advanced tools for customizing maps and analyzing GIS data and tools for viewing DFIRMS that can map images and producing printable FIRMette products. These tools must be easy to use for everyone regardless of their comfort with computers.



FEMA's current systems include a workflow-based component that tracks the hundreds of currently active flood map projects. Tracking and monitoring more than 18,000 mitigation plans set to expire and be renewed in FY2009 and FY2010 will present a challenge. FEMA will adapt existing workflow tools to build a system to track the local mitigation plans with minimal additional investment. The development of this system will allow a closer alignment with the flood map project sequencing efforts and map assessments with the mitigation planning cycles. This alignment will allow local, state, tribal and federal officials to better sequence and organize their work and communications.

## **Leverage Geospatial Data**

Addressing levee, coastal, and other engineering flood hazard update needs creates a greater need for accurate geospatial data to support new analysis. FEMA will redouble its efforts to coordinate with federal, state, tribal and local partners to identify and use the increasing supply of existing high-quality geospatial data. FEMA will invest more in producing new elevation data to support the coastal and other engineering analyses that require it. Technology has reduced the cost of new elevation data, making these investments practical in more cases. The Risk MAP Multi-Year Plan does not include a comprehensive elevation data acquisition strategy. Where data are not available through partners, FEMA may need to acquire these data.

FEMA will fully transfer the management of base map imagery to the United States Geological Survey (USGS) to eliminate redundancy and allow FEMA to focus on production and management of the flood hazard and flood risk layers. FEMA will implement standards for geospatially enabled collection and management of flood study supporting models and data to improve the availability and utility of this information for flood hazard data updates and variety of applications.

Light Detection and Ranging (LiDAR) technology is significantly changing the way the surface of the Earth and buildings, vegetation, and other features on it are mapped. These details are central to accurately identifying flood hazards. The rapid decline in the cost of the technology and the increase in public awareness of the benefits have led to a significant increase in the amount of area mapped. Several statewide LiDAR programs have been completed or are underway. Federal and state organizations are discussing a national LiDAR program that would provide updated ground elevations, but also detailed information about vegetation, buildings and other land cover details. While FEMA requires these improved elevation data, other federal and state agencies may be better positioned to acquire and steward these data. This richer, more accurate view of Earth will enable advanced visualization tools that will increase the understanding of hazards and risks. For flood maps, the results will be more accurate and better reflect current conditions. These data will make it possible to map flood depths in other flood inundation areas besides the 1-percent (100-year) and 0.2-percent (500-year) annual chance event shown on current maps. FEMA could show the 10-percent (10-year) or 2-percent (50-year) event, show specific historic events that a user would recognize, like the 1993 Midwest floods or the 1996 Red River of the North flood or other views that might have special meaning to the users. These improved elevations will dramatically improve the quality of risk assessments possible with HAZUS by making the depth of flooding at each structure much more accurate and improving the accuracy of the floodplains generated by HAZUS.

Similar to the improvement in HAZUS risk assessments, the same benefits will improve FEMA's ability to calculate losses avoided. These data will substantially improve the modeling and mapping of hurricane surge zones, dam inundation areas, areas of protection behind levees, hurricane surface winds, and many other details of hazards.

The advancements in the analysis of hazards and risk, combined with advances in the tools for analyzing and viewing these data, will lead to major changes. Maps may be shown in three dimensions where viewers can move through realistic views of their community and choose to cycle through a variety of scenarios to understand hazards and the risks. Users might view the 1-percent-annual-chance flood, the flood of record for their community, a worst-case view of the outcome if a particular storm had taken a slightly different path, or the expected magnitude of a forecast event.

Some of these tools will be driven by FEMA as user needs are assessed and addressed. Many others will be developed commercially and adapted for use on Risk MAP. Google Earth™ is already demonstrating the ability of the private sector to push the cutting edge of technology and simplify complex tools for use by general users. This trend will continue. Moreover, because FEMA is making its hazard and risk data available through open web interfaces, more and more third-party information services will incorporate these data and they will become a more routine data point for consumers of information online.

As the development of risk assessments increases, some local communities will have more accurate risk assessment data than the national baseline information developed by FEMA. With proper standards developed, FEMA would accept the local data provided by communities and slowly replace the national base data provided. This allows flexibility for those communities that need federal risk assessment assistance while supporting and encouraging those that provide more advanced and accurate risk data.

### **Continue Implementation of the National Flood Hazard Layer**

FEMA has begun delivering flood hazard information organized in a single integrated product – the National Flood Hazard Layer. FEMA will continue to implement this product in FY2009 and FY2010 as the remaining Flood Map Modernization projects conclude with the delivery of updated digital flood hazard data.

In FY2009 FEMA will streamline its specifications to increase the ability to automate production and improve the utility of digital products and tools. This will enable straightforward maps for basic NFIP purposes and maps that communicate risk more effectively and focus less on a single “in-or-out” floodplain decision. FEMA plans to create tools that allow users to choose which view of data they need and to define their own areas of interest for maps they generate. This on-demand approach will increase options for users and eliminate costly manual production steps at the same time. This will be a major shift from finished products that are prepared in advance with fixed content, tiling scheme, scale, and other specifics and where updates are distributed separately. Instead users can create products as needed, with flood hazard information that is current as of the day it is generated, centered on users' areas of interest, at a scale appropriate to their task, and with additional data provided by the users.

## **Integrate Tools**

FEMA's digital platform includes sophisticated geospatial capabilities including a map viewer and web mapping services. With this base functionality, different risk layers can be displayed in a web browser or accessed through a web mapping service (to leverage viewers such as Google Earth™). Using HAZUS, FEMA has developed an annualized wind-loss study and an annualized earthquake-loss study for the United States. In Risk MAP, FEMA will also develop a national flood-loss study. In the short-term, these data sets could be delivered as geospatial layers through the Mapping Information Platform (MIP). This would, for the first time, allow local planners, officials, and citizens to use geospatial capabilities such as an address search to overlay not only their flood hazard data but basic flood, wind, and earthquake risk assessment information. By providing this information, those communities with lesser capabilities will have easy access to this valuable risk assessment information. In the longer term, coordination with other Federal agencies will only strengthen the risk information and the multitude of available risk layers available to locals.

In the short-term, FEMA needs to ensure that DFIRM products are fully compatible with HAZUS and support risk assessments as an integral part of flood hazard data updates. This will likely include making a depth grid and multiple return frequency analysis standard deliverables for applicable updated flood hazard analysis. FEMA will plan how to better integrate geospatial technology into the operations of the National Hurricane and Dam Safety programs and how to integrate these data into community risk assessments and mitigation plans. FEMA will produce a flood risk layer in addition to the flood hazard layer.

## **Leverage Technology**

In the longer term, work in Risk MAP will continue to leverage technology in support of the three key objectives of making operations more efficient, leveraging digital geospatial data to improve the flood hazard information, and improving products to take advantage of a geographic approach to risk analysis and deliver users the information they need when they need it.

The advancement of geospatial technology enables the enhanced approach to natural hazards risk management that underpins the Risk MAP concept. The DFIRM products produced through Flood Map Modernization provide a digital geospatial data platform that makes it possible to analyze flood risk over large areas by synthesizing the digital flood hazard information with other geospatial data representing people, structures, infrastructure, and other things at risk. This comprehensive view of hazards and risk was not feasible prior to the advent of the geospatial data and tools now available. FEMA will enhance DFIRM products and geospatial tools in FY2009 and FY2010 to make sure they meet the core business needs of NFIP stakeholders. But this is just the beginning. Risk MAP provides tremendous opportunities to produce richer and more powerful data and develop more advanced and easier-to-use tools for using these data. These capabilities will make Risk MAP more effective by improving stakeholders' ability to assess, manage, and communicate risk.

These enhancements to the Risk MAP digital platform will allow FEMA to realize the vision of providing the right information to the right audience at the right time. Use of Risk MAP information will become more routine and integrated into regular business processes in the community and decision making by the public. This will improve people's ability to understand their risk, plan strategies to mitigate those risks, and implement those strategies to make themselves and their communities safer.

➤ **Goal 5: Align Risk Analysis programs and develop synergies to enhance decision making capabilities through effective risk communication and management.**

**Alignment and Synergies within Risk Analysis Programs**

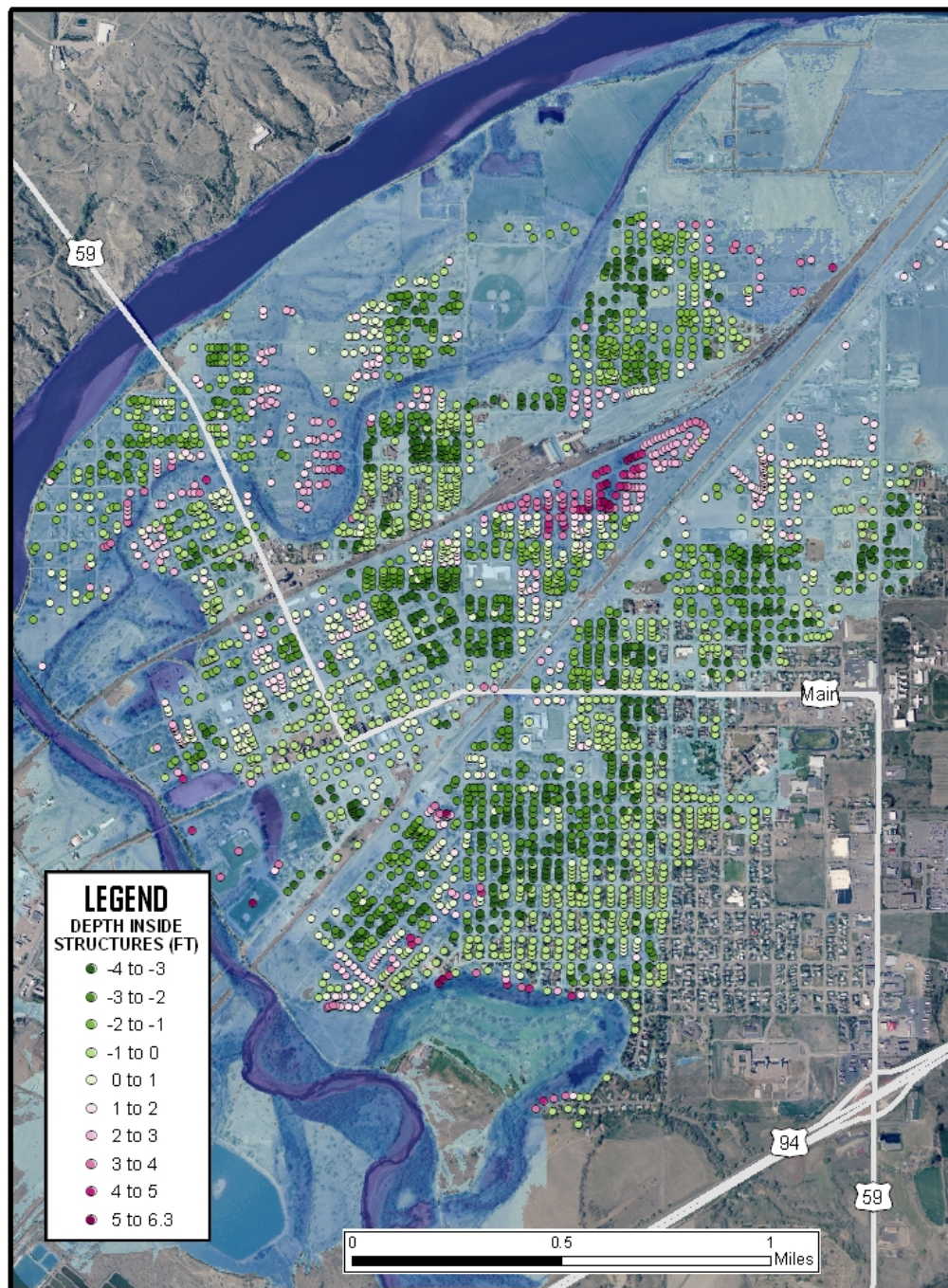
Risk assessments are the fundamental linkage between flood mapping and mitigation planning. Accurate risk assessment is the greatest challenge that State and local government face when preparing mitigation plans. Risk MAP can begin to meet that challenge in terms of addressing flood events and demonstrating how risk can be managed for other hazards.

Risk MAP allows the integration of multiple programs by bringing together mapping, assessment, and planning. This interaction creates synergies so that the combined effect is greater than the sum of each individual program. The GAO recommended (GAO 04-417, dated March 2004) that FEMA evaluate the benefits of increasing stakeholders' awareness and use of flood hazard data and maps in their economic and planning decisions. Risk MAP aims to bring these sometimes disparate elements into an integrated whole – where flood hazard data becomes the basis of a rigorous risk assessment and that assessed risk drives communities' planning and floodplain management efforts to exceed minimum NFIP participation requirements.

In FY2008, FEMA performed integration pilot projects in several regions. The projects varied in scope but were all designed to better understand how flood mapping, risk assessments, and mitigation planning best intersect and how to best integrate the programs and communicate risk to the public. An example highlighted below is Miles City, Montana:

Miles City, Montana sits at the confluence of the Yellowstone and Tongue Rivers. Through its pilot project in Miles City, FEMA demonstrates the value of risk assessment and communication when combined with the use of new technologies (e.g., GIS, LiDAR, DFIRM, and HAZUS-MH risk assessment tool).

For Miles City, the modernized flood map (preliminary DFIRM data showing the effects of a de-accredited levee) and the HAZUS-MH tool were used together to develop and display a water depth and loss estimation information. The depth grid overlaid with enhanced site-specific building data and HAZUS loss estimations illustrates the variations in risk across the community. This type of information begins to clearly communicate risk, as well as potential mitigation strategies that are being incorporated into the communities planning efforts.



**Figure 3: Flood Loss Analysis for Miles City, Montana**

Based on lessons learned from these pilot projects, Risk MAP will expand this alignment of flood hazard mapping, risk assessment, and mitigation planning. Successful integration addresses the following areas:

- Share knowledge gained from FY2008 integration pilots.
- Update guidance to:
  - Expand coordination and communications with local communities, specifically scoping and final meetings.
  - Develop data required for risk assessment during DFIRM process.
- Develop specification for risk assessments and recommended formats to use for risk communication.
- Explore incentives to increase integration.
- Assess ability to synchronize mapping process and mitigation planning cycle.

### **Expanded Coordination – Scoping and Final Meetings**

The flood map program requires close coordination and communication with local communities. In fact, each flood map project begins with a scoping meeting with local officials and concludes with a final meeting with the community to adopt the flood map. This provides a tremendous opportunity to communicate with local officials and citizens about their area's natural hazard risks. Through implementation of the goals and objectives proposed in Risk MAP, marrying flood risk data with risk assessment tools brings together probabilities and consequence and ultimately a product that conveys risk in a clear and targeted way.

Bringing together local officials to review their local mitigation plan and current flood maps and discuss the scope for revising a flood map can create alignment during flood scoping meetings. This begins a more comprehensive dialogue about risk and mitigation within communities. Scoping meetings are also an opportunity to identify local data that can improve the quality of a flood map. In the long-term, meeting structure and supporting systems could collect local data that improves the quality of risk assessments, such as building stock, street maps, population information and other hazard data.

Integration opportunities at the final flood map meetings abound. Rarely is there another opportunity to address local citizens and officials in a common setting. The flood map processes final meeting is such an opportunity. These meetings typically address the changes to the communities' flood maps (flood zone and flood depths). In the near-term, with a few adjustments, local newspaper notifications can broaden the audience to invite citizens interested in not only the flood map changes but their communities' mitigation plans and natural hazard risks. These meetings could allow citizens to review their flood map changes as required by regulation but also see their local risk assessments (ultimately through visualization and simulation tools) and discuss their local mitigation plans. These small adjustments will improve the awareness levels of citizens of their true risks and what they can do to reduce them. Over time, communities would be more likely to hold active meetings where all stakeholders participate. This would tie in components of the flood insurance program and Federal mitigation grant programs along with general citizen preparedness. Ideally, these local meetings would



occur no less than every five years as both the required assessment of flood maps and local mitigation plans follow a five-year review cycle.

### **Updated Specifications**

HAZUS is FEMA's geospatial risk assessment tool; its flood modules are based on approved flood hazard mapping hydraulic models. In the near-term, Risk MAP will look to pilot HAZUS to generate approximate flood map studies which may allow the modernization of flood maps with minimal costs. If these pilots prove successful, in the longer term Risk MAP may look to leverage the synergies between HAZUS and the flood map program to more cost effectively modernize the remaining paper-based NFIP maps.

To ensure the successful integration of flood hazard data and the development of a risk assessment, specifications need to be updated to ensure that the depth grid and the establishment of additional frequencies are standard Risk MAP deliverables. This change in the process will better leverage the data coming out of an updated mapping effort and enable the development of risk assessments. In the near-term, FEMA will adapt product specifications to ensure both the delivery of a flood risk map that meets regulatory standards for flood determinations and delivers a flood map that communicates risk to the average community leader and citizen. In the longer term, where applicable and where needs exist, frequencies and depth grids will be developed through the flood mapping process. The frequencies and depth grids will be developed in a standard that easily meets the proposed risk assessment standards and the HAZUS-MH toolset. Ultimately, the outputs will be used in communicating risk to citizens and providing information to local planners through simulation and visualization tools.

As flood risk assessments are developed through the flood mapping process, the risk assessment results can be reflected in the Flood Insurance Study (FIS) report. The FIS report is a document developed at the time of a map update and reflects the results of the detailed flood hazard assessment performed for a community. The primary components of the FIS report are descriptive narrative, data tables, photographs, and flood profiles. By adding the results of the flood risk assessment in the FIS report, it begins to provide a publicly accessible place to house this information and, over time, show how the risk is changing and why.

### **National Flood Loss Study**

A National Flood Loss Study that analyzes and compares the flood risk across regions of the United States is needed, as well as a process to reassess the Nation's flood risk on a periodic basis. In Risk MAP, FEMA will finalize a study estimating the economic losses due to the 100-year flood event, and the results of this study can be leveraged to:

- Improve the understanding of the flood risk throughout the United States.
- Provide a baseline for the development of flood-related policies.
- Provide a basis from which the discussion regarding 100-year risk assessment vs. average annualized risk assessment can occur in the flood community.
- Support the adoption and enforcement of flood provisions of building codes.
- Support pre-flood planning and response and recovery considerations.

As Risk MAP matures and there is an established process to reassess the Nation's flood risk on a periodic basis, FEMA will explore how the National Flood Loss Study can be leveraged. One example of leveraging the information is to use it in distributing funds to the Regions and the sequencing of flood mapping projects at the regional level.

### **Alignment of Mapping Process and Mitigation Planning Cycle**

Better integration of the flood mapping and update process with risk assessments and mitigation planning is a logical next step. FEMA believes focusing on these elements will improve the ability to measure flood risk reduction progress. In the near-term, information regarding the update of a flood map can be shared with other appropriate agencies to assess resources needed to mitigate and reduce risk. FEMA will utilize every opportunity to align mapping with the risk assessment and mitigation planning processes. If it is determined that the processes should be in alignment then, the appropriate revisions will be made to guidance and potentially regulations.

### **Synergies with the National Dam Safety Program**

The National Dam Safety Program receives direct funding through a separate appropriation. Synergies are apparent in the activities of the program and the nature of the flood hazards that this program is working to reduce. To capitalize on these synergies, FEMA will:

- Include dam safety messages within an overarching national outreach strategy for Risk MAP.

Through the National Dam Safety Program, FEMA must effectively communicate dam failure risk so that communities and the American public can understand their risk and make informed decisions to safeguard or avoid that risk. It is imperative that dam safety public awareness and dam failure risk communication become a major component of the program. By linking risk communication efforts, FEMA can leverage the diverse stakeholder communities to further spread the message of dam failure risks.

- Share expertise and methodologies related to addressing dam failure risks.

In order to effectively communicate flood risk, appropriate standards and tools are needed to develop ways to accurately convey hazards. The National Dam Safety Program will develop standards to accurately reflect dam failure inundation analysis and methodologies for dam failure risk assessments. In addition, through Risk MAP, in coordination with the National Dam Safety Program, HAZUS-MH provides a mechanism to perform risk assessments for dam failure risk. With this information community officials and dam owners can better inform the public of the consequences of a dam failure.

- Ensure hazard mitigation planning activities address dam failure risk and dams identified within a mitigation plan have emergency action plans (EAPs).



Today, only half of state-regulated high hazard potential dams in the United States have EAPs. EAPs are one of the primary safeguards against the loss of life that can result from the failure of a dam.

### **Synergies with the National Hurricane Program**

The National Hurricane Program receives specific funding through another appropriation. Synergies exist between the program areas in terms of risk communication efforts and the data and tools needed to better communicate the risk related to hurricanes. Specifically, FEMA will:

- Include National Hurricane Program messages in an overarching Risk MAP outreach strategy.

The Risk MAP outreach strategy can be leveraged to further communicate to community officials and the public their potential risk from hurricanes and tropical storms, and help protect them from these hazards.

- Leverage the coastal analysis being performed under Risk MAP for activities within the National Hurricane Program.

As outlined in Goal 1 – Enhancing Flood Hazard Identification, FEMA will dedicate significant funding to addressing gaps in required engineering and mapping for high flood risk areas affected by coastal flooding. It is important to leverage that analysis within the National Hurricane Program. These updated analyses may be leveraged as hurricane evacuation studies are conducted.

- Enhance FEMA’s risk assessment tool, HAZUS-MH, to address surge inundation areas.

In order to effectively communicate the risk associated with storm inundation, the right tools are needed. In Risk MAP, HAZUS-MH will provide the ability to run risk assessments on hurricane surge areas. This information is invaluable in better informing community officials and the public of possible consequences. The information can be leveraged to provide clarity to the National Hurricane Program’s hurricane evacuation studies.

As Risk MAP matures, FEMA will continually seek opportunities to create synergies within the Risk Analysis Division as well as across the Mitigation Directorate. Through the Mitigation Planning program there are already established points of integration with the Risk Reduction Division, but as new Risk MAP products and processes are developed FEMA needs to explore broader points of integration with both the Risk Reduction and Risk Insurance Divisions.

## **Developing Additional Synergies**

### **Synergies with Post-Disaster Activities**

A number of Risk MAP-related products can be developed immediately following a disaster in order to contribute significantly to stronger recovery and support Risk MAP goals. While the operational Risk MAP products outlined here are not funded through the Disaster Relief Fund, the tools and processes developed through Risk MAP will be funded and used in post-disaster environments. Given the significant investment to develop these tools, the Disaster Relief Fund will put these tools to use rather than create stand-alone projects. Information about the magnitude of a disaster event allows affected communities to understand the true scope of the hazard and make prudent decisions about safe rebuilding. In many cases there are significant pressures to rebuild quickly and avoid burdening people who have already experienced major losses and disruptions of their lives. A detailed understanding of the true hazard can help balance these pressures and guide better choices for safe rebuilding. Data that can be collected immediately following a disaster includes detailed topographic data, flood high-water marks, and stream flow information. These data can support recovery maps that communicate the scope of the hazard to community officials and residents. These data can also support the development of improved Risk MAP products in the future.

Quality risk assessments are also a valuable tool in a post-disaster environment. These assessments can help identify the potential magnitude of damage and help inform the resources needed to be deployed to disaster sites. Post-disaster planning provides an opportunity to execute mitigation plans, using mitigation activities such as buy-outs and new building standards. Comparing the results of a quality risk assessment and a disaster event also provide the opportunity to reassess the mitigation plans in affected communities.

### **Synergies with other Federal Agencies**

FEMA has placed a high priority on coordination with federal, state, tribal and local partners, and in particular has engaged other federal agencies in productive partnerships that benefit each entity. FEMA will build on those partnerships and develop new synergies with Risk MAP products and processes to minimize duplication across the Federal Government.

The following list provides opportunities to continue or expand FEMA's coordination with other federal agencies in areas such as geospatial data coordination, data development in disaster and non-disaster time, and specific coordination on coastal and levee flood hazards.

- FEMA participates actively in National Digital Orthophoto Program (NDOP) and National Digital Elevation Program (NDEP). These groups work to maximize coordination of federal mapping, focusing on two key data themes of ground elevation data and ortho-imagery (aerial photo base maps).
- FEMA completed a Cooperative Agreement with National States Geographic Information Council to

*To date, FEMA has documented over \$60 million in existing federal, state and local framework mapping data (i.e. topography and orthophotos) that have been used for Flood Map Modernization.*

link its data inventory with FEMA's enterprise system and the NDOP and NDEP project coordination systems.

- FEMA has an agreement with USGS to fully transfer the management of base map imagery to the USGS to eliminate redundancy and allow FEMA to focus on the production and management of the flood hazard and flood risk layers.
- FEMA has a Memorandum of Understanding with the Census Bureau to share its inventory of local GIS data.
- FEMA has a liaison relationship with National Geodetic Survey to exchange technical expertise and align flood hazard mapping and Height Modernization. Height Modernization is a program that uses the Global Positioning System and other new technologies to increase the accuracy of elevation measurements that comprise the vertical portion of the National Spatial Reference System.
- FEMA coordinates with National Weather Service to share flood hazard mapping data with the National Weather Service Inundation Mapping Program.
- FEMA coordinates with the NOAA Ocean Service on coastal mapping standards, coastal science issues, and participation on the Interagency Working Group on Ocean and Coastal Mapping.
- FEMA coordinates with USACE and its Flood Risk Management Program.
- FEMA has expanded its coordination with USACE to implement a section of the Water Resources Development Act (WRDA) of 2007. The collaboration will focus on the establishment of the National Levee Safety Program and population of the National Levee Database, as well as a study of the damages to the United States from flooding.
- FEMA coordinates with USACE on technological and scientific advances in storm surge and wave height analysis.
- FEMA has an agreement with the United States Fish and Wildlife Service to ensure that Coastal Barrier Resource Systems that affect the availability of federal flood insurance and other federal funds are accurately depicted on FIRMs.

FEMA will ensure federal resources are leveraged and will continue to be active in multi-agency coordination and work one-on-one with major partners to maximize cooperation.

## **Stakeholder Roles and Responsibilities**

As part of delivering Risk Analysis Division Programs, FEMA communicates with states, tribes, local communities, regional entities and national organizations impacted by flood map updates, mitigation planning, dam safety, and hurricane program-related activities. As FEMA implements Risk MAP, the emphasis on communication at all levels will continue.

FEMA has engaged with Risk MAP stakeholders to develop the vision, goals, and objectives outlined in this document. FEMA has provided information on strategic planning for Risk MAP at stakeholder conferences and through the FEMA website. A document entitled “FEMA’s Flood Map Modernization – Preparing for FY2009 and Beyond: Integrated Flood Data Update, Risk Assessment, and Mitigation Planning,” dated June 1, 2007, was posted on FEMA’s website. A follow-up document, “FEMA’s Risk MAP Strategy - Integrating Mapping, Risk Assessment, and Mitigation Planning, was posted, and dated February 20, 2008.

Similar to the Multi-Year Flood Hazard Identification Plan (MHIP) process followed in Flood Map Modernization, continuous collaboration with stakeholders will be essential. It was stakeholder feedback that resulted in adjustments to Flood Map Modernization objectives in 2006 to enhance quality of flood map products for high flood risk areas. The vision, goals, and objectives in this Risk MAP Multi-Year Plan build on previous concepts and identify steps to current and future implementation, based on available resources. FEMA will continue to engage with stakeholders in refining and developing these objectives, including assessing effectiveness of outreach efforts and developing a comprehensive national Risk MAP outreach strategy, and developing ways to measure the success of these objectives.

In delivering Risk MAP, FEMA will utilize engineering and mapping contractors and CTPs in the update of flood hazard data and maps, but rely on local communities, regional entities, tribes and state agencies to ensure that the updated information is used in making informed decision regarding flood risk.

## V. Appendix: Portfolio of Risk Analysis Division Programs

The Federal Emergency Management Agency (FEMA) manages several risk analysis programs that assess the impact of natural hazards, providing people with information to enable the development of effective strategies for reducing risk. These programs support the Department of Homeland Security (DHS) objective to “strengthen nationwide preparedness and mitigation against natural disasters” (Objective 4.1 of the DHS Strategic Plan for Fiscal Years 2008-2013). Further, the programs support FEMA’s goals to enable communities to “reduce loss of life and property” through identifying hazards, assessing risks, and planning to reduce vulnerabilities to natural hazards.

This section provides a background on the following program areas within the Risk Analysis Division, including the authorities and current status.

- Flood Hazard Mapping
- Risk Assessment
- Hazard Mitigation Planning
- National Dam Safety
- National Hurricane

### **Flood Hazard Mapping**

The Flood Hazard Mapping Program is a key component of the National Flood Insurance Program (NFIP), which reduces flood damages by identifying flood hazards, encouraging sound community floodplain management, and providing insurance to help individuals manage their flood risk.

Up-to-date digital flood maps provide many benefits: accurate flood hazard information for establishing appropriate actuarial rates; standards for flood hazard and other data sets; land use planning; and hazard data that inform emergency management and environmental planning. The National Flood Insurance Reform Act of 1994 (P.L. 103-325) requires FEMA to assess the need to revise and update all floodplain areas and flood hazard zones at least once every five years. The five-year cycle ensures the NFIP flood map inventory adequately reflects today’s flood hazards.

Through Flood Map Modernization, FEMA is transforming the Nation's flood maps into more reliable, easier-to-use, and readily available digital products. Funding through FY2008 will enable FEMA to achieve the goals of Flood Map Modernization:

- Build a digital geospatial information system (GIS) platform for flood hazard map production and accessibility, as demonstrated through the National Flood Hazard Layer.
- Develop flood hazard maps for 92 percent of the Nation’s population available through the new platform.

- Ensure 75 percent of the flood hazard boundaries meet the standards for horizontal accuracy.
- Refresh 30 percent of the flood hazard data, ensuring that the maps represent current conditions.

Digital flood maps are easier to use and provide increased capabilities for automation and analysis. Community officials, floodplain managers, emergency managers, homeowners, lenders, and financial institutions use the maps approximately 30 million times each year to make critical decisions. FEMA estimates this improved usability results in overall efficiencies that save approximately \$175 million each year.

FEMA's 10 Regional offices manage flood map production for their geographic areas, utilizing Regional, state and local flood mapping partners, including Cooperating Technical Partners and mapping contractors. FEMA Headquarters and Regional staff coordinate flood mapping efforts with national, state, regional, tribal and local stakeholders impacted by NFIP mapping. FEMA Headquarters provides Flood Hazard Mapping policy and guidance in accordance with the NFIP, and coordinates extensively with Regional offices to ensure consistency in implementation. FEMA Headquarters and Regional staff monitor and report flood hazard mapping progress based on program management data provided by flood mapping partners.

## **Risk Assessment**

A risk assessment identifies hazards and their associated risks, including threats to public health and safety, property damage, and economic loss. The assessments combine the probabilities with the consequences in a way that quantifies risk. Quantifying the risk is a powerful way to communicate the threat, determining the key factors which cause it to be high and ultimately perform trade off analyses to determine the most effective way to reduce, avoid, or otherwise control it.

Within the context of Risk MAP, the assessment answers the question, "What would happen if a natural disaster occurred?" Risk assessments can include information such as: a description of the type, location and extent of natural hazards; the jurisdiction's vulnerability to the hazards; and the type and numbers of buildings, infrastructure and critical facilities located in identified hazard areas. Providing risk information will enable local governments and policymakers to understand how their decisions increase or reduce risk.

For NFIP purposes, the ability to compare flood risk across states and regions is critical. At the state and community levels, flood risk information helps community leaders with planning, evaluating costs and benefits associated with building codes, and other preventative measures. An understanding of the flood risk is important to risk management for businesses and industries that may be located within or near the floodplain. Finally, understanding the scope and potential consequences of flooding is critical to developing emergency management plans for catastrophes.

Flood risk assessments systematically analyze the people and property in a community or watershed that would potentially be affected by flood hazards in order to quantify physical,

social, and economic losses. One tool that can perform this type of analysis is FEMA's Hazards United States Multi-Hazard (HAZUS-MH) program. A nationally applicable standardized methodology and software program, HAZUS-MH combines science, engineering, mathematical modeling, and GIS technology to estimate the potential losses from natural hazards.

Since its inception, HAZUS has leveraged advances in technology and today offers loss estimation analyses for multi-hazards including, earthquake, flood and hurricane winds. These estimates are essential for decision-making at all levels of government, and are a basis for developing mitigation plans and policies, emergency preparedness, and response and recovery planning.

## **Mitigation Planning**

Hazard mitigation planning is the process used by state, tribal and local governments to identify risks, assess vulnerabilities, and develop long-term strategies for protecting people and property from the effects of future natural hazard events. The process results in a mitigation plan that offers a strategy for breaking the cycle of disaster damage, reconstruction, and repeated damage; and a framework for developing feasible and cost-effective mitigation actions.

Under Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended, state, tribal and local governments are required to develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance. The National Flood Insurance Act of 1968, as amended, made hazard mitigation plans a condition for receiving assistance through the National Flood Insurance Fund.

Specifically, FEMA assistance programs that require a hazard mitigation plan as a condition of eligibility are as follows:

### Stafford Act Grant Programs

- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation Program (PDM)
- Public Assistance Program (PA), Categories C-G
- Fire Management Assistance Grant Program (FMAG)

### National Flood Insurance Act Grant Programs

- Flood Mitigation Assistance Program (FMA)
- Repetitive Flood Claims Program (RFC)
- Severe Repetitive Loss Program (SRL)

The planning process promoted is as important as the resulting plan because it encourages jurisdictions to integrate mitigation with day-to-day decision-making regarding land-use planning, floodplain management, site design and other functions.

Mitigation planning includes the following elements:

- Organize Resources. The first phase of the mitigation planning process:
  - Assess readiness to plan
  - Establish a planning team

- Secure political support
- Engage the community
- Assess Risks. The second phase:
  - Identify and evaluate natural hazards
  - Prepare damage loss estimates
  - Know where hazards can affect the built environment and the likely outcome of damages and losses resulting from a hazard event to help focus on the most important assets first. This will build the scientific and technical foundations of the mitigation strategy.
- Develop Mitigation Strategies. The third phase:
  - Develop mitigation goals and objectives
  - Focus on identified risks and potential losses
  - Identify mitigation measures to help achieve the goals and objectives and reduce future disaster-related losses
  - Write a plan
- Implementation. The fourth phase:
  - Adopt plan
  - Implement plan
  - Monitor plan
  - Review plan. Periodic review of the plan by the community or state will help keep the plan current, reflecting the changing needs of the jurisdiction.

Mitigation planning enables local leaders to make good decisions based on sound hazard identification and risk assessment data in order to reduce risks from future hazards. FEMA coordinates Mitigation Planning with state, local and tribal partners to develop and implement plans. FEMA Headquarters Mitigation Planning staff focuses on national policy, provides guidance and training, and reports on and coordinates planning efforts. FEMA Regional Mitigation Planning staff delivers technical assistance, training, and outreach and reviews and approves all state, local and tribal mitigation plans. FEMA Mitigation Planning staff, working in FEMA Joint Field Offices and Long-Term Recovery Offices under the direction of FEMA Regional offices, coordinates with state, tribal and local governments to manage post-disaster planning efforts.

Since 2002, when FEMA published regulations implementing the mitigation plan requirement under 44 Code of Federal Regulation Part 201, FEMA has approved state mitigation plans for all 50 states, the District of Columbia and 7 territories. As of September 30, 2008, there are mitigation plans representing approximately 18,000 jurisdictions covering an estimated 75 percent of the Nation's population.

### **National Dam Safety Program**

As the lead federal agency for the National Dam Safety Program, FEMA coordinates the federal and state efforts to secure the safety of dams throughout the United States. The program makes



Federal funds available to the states, which are primarily responsible for protecting the public from dam failures of non-federal dams, and pursuing initiatives that enhance the safety of dams posing the greatest risk to people and property. The responsibility for efforts to coordinate dam safety was established by Executive Order 12148 in 1979. The Water Resources Act of 1996 (P.L.104-303, Section 215) established the National Dam Safety Program and named the Director, now Administrator, of FEMA as its coordinator.

The National Dam Safety Program includes grant assistance to the states, which provides vital support for the improvement of the state dam safety programs that regulate more than 90,000 dams in the United States; training for state dam safety staff and inspectors; and a program of technical and archival research, including the development of devices for monitoring dam safety.

The safety and security of a dam can affect people and property across local, state and national borders. A dam failure in one area can affect commerce, navigation, power generation and distribution, and property damage well beyond the initial area of the event. The far-ranging effects require a federal role to coordinate combined efforts of federal, state and local agencies to keep dams safe and secure.

Many Americans living downstream of a dam are unaware of the potential risk of failure. Americans who live near a high-hazard dam usually are not aware of the emergency action plan (EAP) that is in place that outlines warning and evacuation in the event the dam fails. In some cases, there is no EAP, but people living downstream are not aware of this deficiency. FEMA will develop tools and materials to communicate the risks of dam failure to the downstream population, state and local decision makers, planners, emergency managers and first responders.

Under the direction of the DHS, FEMA, dam safety experts, federal agencies and others are developing and providing coordinated and data-driven dam safety programs. The National Dam Safety Program is working with states—individually and through national stakeholders—and federal agencies to encourage individual and community responsibility for dam safety.

## **National Hurricane Program**

Established in 1985, the National Hurricane Program (NHP) conducts hurricane evacuation studies to help protect the public from hurricanes. State and local communities establish evacuation plans by determining the probable effects of a hurricane, predicting public response to the threat and advisories, and identifying appropriate shelters. The program is a multi-agency partnership involving FEMA, the National Oceanic and Atmospheric Administration, the National Weather Service, the United States Department of Transportation, and United States Army Corps of Engineers.

The NHP has produced hurricane surge analysis for both hurricanes and tropical storms. The studies predict probable storm surge and wind effects, analyze the existing transportation system, assess shelter availability and capacity, use behavioral analysis to anticipate public

*Since 1985, over 40 completed “modern” Hurricane Evacuation Studies or Restudies (used by state and local governments to make hurricane evacuation/protective action decisions/plans).*

reaction during evacuations, and calculate clearance times—how much time is required to evacuate the public before gale force winds arrive in areas affected by storm surge.

Based on these studies, the NHP provides targeted communities with recommendations for evacuation zones, which help determine where and when the public should be ordered to evacuate as a storm approaches. This recommendation is negotiated among decision-makers within each community. Once the evacuation zones are established, the NHP provides each community with corresponding evacuation maps and suggested clearance times for different types of storms. Communities determine how best to use these tools and recommendations when they develop evacuation plans.