FLOOD MAP MODERNIZATION

BUILDING STATE CAPACITY

AND

FLOOD MAP UPDATE PROCESSES

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Introduction

Floods are the nation's most common and costly natural disaster. Responding to natural disasters in the United States is a State and local government responsibility with the Federal government playing a supporting role.[1] However, the occurrence of major floods in the Twentieth Century led to a gradually increasing Federal role in disaster response. Ultimately Congress enacted the National Flood Insurance Act in 1968, which established the National Flood Insurance Program (NFIP). The NFIP (presently administered by the Federal Emergency Management Agency - FEMA) makes flood insurance available to property owners in communities that adopt regulations to manage development in mapped floodplains in order to reduce future flood losses.

By 2002, the flood maps prepared to support the sale of flood insurance under the NFIP, and for regulating development in approximately 20,000 communities susceptible to flooding had become out-dated. With the support of a broad coalition of flood map users, Congress funded an effort called Flood Map Modernization to upgrade the federal Flood Insurance Rate Maps (FIRMs).

Federal government, through FEMA, has actively involved States in the administration of the NFIP since its inception because:

- disaster response and land use management fall under State police power authorities;
- States have inherent water management responsibilities under the Public Trust Doctrine;
- adequately monitoring local government implementation of land use regulations in the approximately 20,000 U.S. communities with NFIP mapped floodplains is not technically feasible by the Federal government alone[2];
- States have developed floodplain regulations that provide additional safety and protection beyond the federal minimum requirements; and
- States have created a variety flood control and stormwater management districts[3] with specific State legislated authorities. [Note: When this document refers to States, the intent is to also include these “districts” with State legislated district-wide stormwater and floodplain management authorities.]

This report highlights how FEMA is partnering with States in flood hazard mapping and identifies opportunities for enhancing those partnerships with States. Specifically, this report discusses:

- States authorities related to floodplain management,
- how FEMA is partnering with States (focusing specifically on Flood Map Modernization)
- existing State technical capacity, and
- how FEMA can more fully take advantage of State government technical capability.

Flood Map Users[4]

The flood maps serve diverse and numerous constituencies, including:

- the NFIP itself for program administration purposes, e.g., flood insurance rate making, establishing the minimum area where community floodplain management standards must be applied, etc.;
- mortgage lenders (and their agents, such as flood determination companies) to determine whether an insurable structure under the NFIP is in a designated Special Flood Hazard Area and therefore required to carry flood insurance as a condition of receiving a federally guaranteed mortgage loan[5];
- insurance agents to determine insurance premiums for the sale of flood insurance under the NFIP;
- approximately 20,000 communities participating in the NFIP to administer their regulatory permitting processes;
- homeowners, builders and realtors consult the maps before construction and purchase of homes;
- FEMA, the States and communities use the maps for individual and public assistance grants made under the provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended ("the Stafford Act")[6], and hazard mitigation grants made pursuant to the National Flood Insurance Act and the Disaster Mitigation Act of 2000[7];
- other federal agencies consult the flood maps in order to comply with the floodplain management requirements established by Executive Order 11988; and
- States and communities use the flood maps for planning purposes, e.g., comprehensive mitigation, transportation, development, emergency evacuation, etc.

State Authorities related to Floodplain Management

States responsibilities related to Public Health & Safety and the Public Trust Doctrine make managing land use (and especially land use that impacts navigable waters and tidelands) an inherent and natural function of State government.

Public Health & Safety –

The Tenth Amendment to the Constitution of the United States of America declares: "The powers not delegated to the United States by the Constitution, nor prohibited to it by the States, are reserved to the States respectively, or to the people." This residual power of the States may cover such matters as public safety, health, morals, certain aspects of race relations and general welfare.

Floodplain regulations are designed for public safety and flood damage reduction. New York's State statutes related to floodplain regulations summarize the intent:

Chapter 502.1 Purpose

(a) Recurrent flooding of large areas of the State presents serious hazards to, and causes adverse effects upon, the health, safety, welfare and property of the people of the State, both within and outside flooded areas. These adverse effects include loss of life; loss and damage to private and public property; disruption of lives and livelihoods; interruption of commerce, transportation, communication and governmental services; and unsanitary and unhealthful living and environmental conditions. Floodplain management is, therefore, a matter of State concern and the establishment of improved floodplain management practices is important to the health, safety and welfare of all of the State.

Licensing Professionals - In addition, States protect their citizens from marketplace fraud and physical injury via the licensing of professionals. Most applicable to the technical capabilities associated with floodplain mapping and maintenance are the States' licensing of Engineers and Land Surveyors.

Public Trust Doctrine –

The waterways were so vital for commerce and sustenance that the original thirteen states deemed surface waters to be within the public domain. The public value of waterways manifested through the development of State constitutions and federal legislation declaring national interests in navigability, and later health, of the nation's waters. Additionally, the Supreme Court in *Ill. Central RR Co. v. Illinois (1892),* firmly established the public trust doctrine in American jurisprudence, finding that "the ownership of and dominion and sovereignty over lands covered by tide waters, within the limits of the several States, belong to the respective States within which they are found," as a subject of public interest and concern. 146 U.S. 387, 435 (1892). The Court emphasized that this public interest cannot be alienated except in cases improving the interest without detriment to remaining lands, waters, and the public rights of navigation and fishing. *Id.* at 456.

Floodplain management involves water management and land use management. States have Constitutional authorities in both. And in the case of submerged lands, responsibilities that States cannot abdicate.

State Role and Authorities in the NFIP

The National Flood Insurance Act ("NFIA") contains a number of provisions that reveal the active role which States play in the implementation not only of the NFIP, but generally in enforcing water law and land use management laws and ordinances throughout the United States. There are many provisions of the NFIA which specifically refer to the role of States in the implementation of land use management statutes. These NFIA references include:

- 42 U.S.C. 4001(e) – relating to actions by State and local governments to restrict development in flood prone areas;
- 42 U.S.C. 4023 – relating to determinations by State and local governments of violations of land use laws in flood prone areas; and
- 42 U.S.C. 4102 – relating to the role of State and local governments in the determination of the adequacy of land use measures in flood prone areas.

In addition to these references in the Act, FEMA's regulations contain numerous provisions which also recognize the leadership role that State governments play in the implementation of the NFIP and the enforcement of water law and land use management statutes. For example,

- 44 CFR 59.22(a)(2) refers to State land use laws and regulations;
- 44 CFR 59.23 lists the considerations to be used for selecting communities to be studied – the first consideration listed is (a) Recommendations of State officials;
- 44 CFR 60.1 (d) indicates that any floodplain management regulations adopted by a State or community which are more restrictive … are encouraged and take precedence;
- 44 CFR Part 60.25 Designation, duties, and Responsibilities of State Coordinating Agencies contains a list of duties and responsibilities, including:
  (b)(6) assist in the delineation of riverine and coastal flood-prone areas … and
  (c) Other duties and responsibilities, which may be deemed appropriate by the State … may be carried out with prior notification of the Administrator.
- 44 CFR 60.3(a)(2) addresses the role that States play in the enforcement of section 404 of the Clean Water Act;
- 44 CFR 63 refers to State certification of structures subject to imminent collapse (related to the Upton-Jones amendment which allowed payment of claims for demolishing or relocating NFIP-insured houses in imminent danger of collapse from erosion that was in effect from 1988 to 1995) and
- 44 CFR 65.7(b) recognizes State jurisdiction over the floodway.

When all of these statutory and regulatory provisions are read as a whole, they underscore the State role in the implementation of the NFIP.

In addition, States have developed floodplain regulations that provide additional safety and protection beyond the federal minimum requirements. These more restrictive State regulations are encouraged by the federal government and take precedence over the minimum federal floodplain regulations.

> **Subpart A—Requirements for Flood Plain Management Regulations**
> **§ 60.1 Purpose of subpart.**
> (d) The criteria set forth in this subpart are minimum standards for the adoption of flood plain management regulations by flood-prone, mudslide (i.e., mudflow)-prone and flood-related erosion-prone communities. … any flood plain management regulations adopted by a State or a community which are more restrictive than the

criteria set forth in this part are encouraged and shall take precedence. [41 FR 46975, Oct. 26, 1976. Redesignated at 44 FR 31177, May 31, 1979, as amended at 48 FR 44552, Sept. 29, 1983; 49 FR 4751, Feb. 8, 1984]

FEMA partners with States

The Federal government, through FEMA, has implemented a number of programs to actively involve States in the administration of the NFIP.

Community Assistance Program – State Support Services Element (CAP-SSSE)

FEMA's Community Assistance Program – State Support Services Element (CAP-SSSE) funds States to help ensure that communities participating in the National Flood Insurance Program (NFIP) are achieving the flood loss reduction objectives of the NFIP. CAP-SSSE funds States to provide floodplain management technical assistance and perform community monitoring and compliance activities. CAP-SSSE has prompted all 50 States to designate State floodplain managers (listed at the end of this document as Appendix 1).

CAP-SSSE has effectively increased State involvement in floodplain management. Visiting communities to assess community needs and provide technical assistance has been identified by FEMA as a key activity to improve the effectiveness of community floodplain management. States conducted over 80% of the Community Assistance Visits in FY2007. (see Appendix 2 for the complete breakdown of CAP-SSSE activities in FY2007).

State Involvement in Map Production

States have been involved in how the maps are produced and in some cases in actually producing floodplain maps for decades[8]. FEMA recognized this capability and actively partnered with States when the initial floodplain maps were being developed to support the NFIP and conduct Flood Insurance Studies during the 1980s and 1990s. In the early 1990s, FEMA began providing grants to States that were using geospatial technologies to upgrade their floodplain maps. One of the first of these projects was the ***Winnebago County, WI Floodplain Remapping Project.***

> ***Winnebago County, WI Floodplain Remapping Project*** *– In 1992, FEMA provided WI DNR with a $20,000 grant to remap the floodplains based on 2 foot contour data developed by the county.* ***Equitable Floodplain Zoning*** *was the headline in a University of Wisconsin publication that summarized the public reaction to the improved floodplain mapping developed. This project not only provided the county with better maps – it developed technical capacity at WI DNR that helped enable them to manage Flood Map Modernization in Wisconsin. This case study highlights how FEMA has shared flood map production funding*

with States through grants and cooperative agreements and in the process strengthened State floodplain management programs.

***Leverage -** When Winnebago County's needs were evaluated for Flood Map Modernization, the leverage associated with the maps produced by this project was valued at $420,000.*

***Benefits to county residents -** The county estimated that the increased property value and reduced expenses for those now shown out of the floodplain at $14 million. For those that had previously been shown as out of the floodplain, there was now more potential that they would have flood insurance. Assuming an average loss of $10,000 per building, the reduction in uninsured losses would amount to over $13 million.*

***Building State Capacity** - Using the benefits derived from the Winnebago County Floodplain Redelineation Project, WDNR developed a $1.5 million budget initiative to improve the information technology infrastructure and provide geospatial tools for developing flow estimates and base flood elevations. The Wisconsin Waters Initiative also funded 7 new State water management positions including 3 water management engineers.*

FEMA has supported Wisconsin DNR's partnership with Flood Map Modernization by having WDNR manage the majority of the Flood Map Modernization projects in Wisconsin. As a result, WDNR has been able to hire 3 additional permanent and 9 project positions to support Flood Map Modernization. Below is a breakdown of the additional positions the State has approved:

Table 1 – Wisconsin Flood Map Modernization Staff

Type of Position	Engineer	GIS Spec	Planner	Surveyor	Other	Total
Permanent	1	1			1*	3
Project w/ benefits	2	4	3			9
Limited Term/ Employee		4				4
Contractor (part of staff)	1					1
Total	4	9	3		1	17

***** Project Manager

A complete write-up on this project is included in Attachment 1.

In 1999, FEMA expanded this effort via an initiative called the Cooperating Technical Communities (later Partners) Program or "CTP Program".[9] Under the CTP Program, in

addition to States, local governments as well as some non-government entities, with expertise in floodplain mapping were funded to create and update floodplain maps. For CTP Program details, go to http://www.fema.gov/plan/prevent/fhm/ctp_main.shtm .

Map Modernization Management Support – MMMS

When Flood Map Modernization was funded, FEMA initially offered States supplemental CAP-SSSE funding to develop State flood hazard mapping needs assessments. However, many States were unable to qualify for the supplemental funding because the CAP-SSSE program requires a 25% State match. In those instances, FEMA hired private contractors to develop the State needs assessments with State input.

FEMA subsequently created a separate funding mechanism called Map Modernization Management Support **(**MMMS) that did not require a State match. In addition, the funding was increased so that it now is adequate in most States to support a dedicated position. FEMA has also (to the extent possible) indicated that the funding would be consistent through the entire Flood Map Modernization effort.

This greatly increased the amount of State involvement and some States have used the funding to hire dedicated Flood Map Coordinators. Appendix 3 is a listing of State Flood Mapping Coordinators.

Following is a listing of activities fundable under MMMS:

Table 2. Description of MMMS Activities.

ACTIVITY	DESCRIPTION
Digital Base Map Inventory	The MMMS Partner performs an investigation and provides an inventory of base maps meeting FEMA specifications for NFIP communities in a particular region or State.
Digital Base Map Data Sharing	The MMMS Partner shares an existing base map for use in production. The base map will comply with FEMA minimum accuracy requirements and be distributable by FEMA to the public in hard copy and electronic formats.
DFIRM Maintenance Management	The MMMS Partner assumes responsibility for long-term, periodic maintenance of the DFIRM. This can include base map and/or flood hazard information.
Hydrologic and Hydraulic Review Management	The MMMS Partner manages the reviews of hydrologic and hydraulic studies prepared for FEMA-funded flood data updates and/or map revisions processed under Part 65 of the NFIP regulations.
Assessment of Community Mapping Needs *(to support FEMA's Mapping Needs Update Support System - MNUSS)*	The MMMS Partner performs a detailed community-by-community assessment of mapping needs for every mapped (including flood data updates and map maintenance) and unmapped NFIP community within its jurisdiction.
Managing Updates to the FEMA Levee Inventory System (FLIS)	The MMMS Partner assumes responsibility for ensuring that required updates to the FLIS are made in an accurate and timely manner. The FLIS can be found at http://flis.pbsjdfirm.com/.
Information Technology Systems	The MMMS Partner develops and maintains an information technology system to archive, organize, distribute, and otherwise manage effective DFIRMs, preliminary DFIRMs, and/or underlying backup data such as DFIRM database, engineering

	models, etc). The system should distribute this data in an electronic format (e.g., web-based, CD-ROM, etc) to the public.
Quality Standards	The MMMS Partner participates in activities that support the implementation of the Floodplain Boundary Standards.
Management Efforts	The MMMS Partner participates in activities to assist CTP partnerships in the management of cost and schedule.
Levee Certification Strategy	The MMMS Partner identifies a strategy for levee certification for up-coming studies. This includes the methods that will be used to certify levees or identifying the consequences of not certifying the levees and a strategy to combat these consequences.

FEMA requested each State to develop a “State Business Plan” for Flood Map Modernization. The State Business Plans describe each State’s vision, approach, and capabilities for participation in Flood Map Modernization.

Map Maintenance

Map maintenance items include changes to Base Flood Elevations (BFEs), floodplain and floodway boundaries, corporate limits, streets and street names, general structures (bridges/culverts/dams), base orthophotographs, and elevation reference marks (ERMs).

Letters of Map Change - LOMCs

When affected stakeholders either challenge the map boundaries on an existing FEMA map or provide updated information, FEMA can issue Letters of Map Change (LOMCs). LOMC’s include specific revisions to the effective map through the process of either a Letter of Map Revision (LOMR), or a Letters of Map Revision – based on Fill (LOMR-F). Map maintenance involves incorporating LOMRs rountinely into the FIRMs to keep maps updated for changes such as, but not limited to: structure replacement, channel realignment, and new development.

Conditional Letters of Map Change (CLOMCs) are for proposed changes within the floodplain. These include Conditional Letters of Map Revision (CLOMR) and Conditional Letters of Map Revision – Fill (CLOMR-F). Ensuring these CLOMCs are incorporated into the mapping after they are constructed is also a map maintenance issue.

Letters of Map Amendment are for situations when a building is shown in the mapped flood hazard area but the building is above the BFE. To be eligible for a LOMA – an elevation certificate showing that the lowest adjacent grade (the lowest ground touching the structure) is at or above the BFE. LOMAs are not easily incorporated into new mapping because they usually only involve an individual lot and the elevation certificate only provides the elevation of the building and does not show the floodplain delineation for the lot. (For a listing of terms and LOMC processes see Appendix 5, Pages 3, 4 and 5).

LOMA – Case Study – Clark County, WI

Clark County provides a service to land owners in the preparation of Elevation Certificates. When the county surveys the property they provide a flood contour on the lot in addition to the elevation of the lowest adjacent grade. Appendix 4 shows how a series of LOMAs on Lake Meade were incorporated into the FIRMs being developed for Clark County.

Physical Map Revisions (PMRs)

In addition to LOMCs, there are Physical Map Revisions (PMRs). PMR's are new community-wide or basin-wide, floodplain studies resulting in new Base Flood Elevation's (BFEs) and/or floodway boundaries from new hydrology and/or hydraulics.

Subdivisions

Many States require the subdivision of land to be approved by the State and/or local government. The subdivision map usually includes the flood contour. The subdivision map is often developed with improved topographic data (more detailed than used to develop the Flood Insurance Rate Maps). These subdivision maps can be an additional source of information that can be used to update and maintain the Flood Insurance Rate Maps.

The State of Michigan - In an effort to provide consumer protection and minimize losses due to flooding, the Land Division Act (formerly the Subdivision Control Act), Act No. 288, Public Acts of 1967 as amended, requires that preliminary plats for subdivisions be submitted to the Michigan Department of Environmental Quality (DEQ) for review. (Other parts of the act involving subdivisions are administered by the Department of Labor and Economic Growth. Further information can be found at http://www.michigan.gov/dleg.)

The Act requires the proprietor to submit the preliminary plat to the Michigan DEQ if any of the subdivision lies wholly or in part within the floodplain of a river, stream, creek, or lake. The 100-year floodplain must be shown on the final plat. All lots shown on the plat must have 3,000 square feet of buildable area above the 100-year floodplain elevation and be served by streets within the proposed subdivision having surfaces not lower than 1 foot below the elevation of the line defining the floodplain limits. Permits are needed from the State for any filling, dredging, or construction within the floodplain, wetland, or below the ordinary high water mark of any inland lake, stream, creek, or drainage course.

FEMA has proposed to enhance the partnership with States

LOMC Devolvement Meeting – December 9, 1998

On December 9, 1998, FEMA conducted a one-day meeting regarding Letter of Map Change (LOMC) devolvement to States, local communities, and the private sector. The attendees were FEMA stakeholders: members of the various FEMA branches and divisions, other Federal agencies, professional associations (such as the American Society of Civil Engineers, the Association of State Floodplain Managers [ASFPM], and the American Congress on Surveying and Mapping), the lending community, map determination and certification firms, State representatives from South Carolina, and individuals from the private sector. The purpose of the meeting was as follows:

- To discuss with stakeholders the advantages, disadvantages, and feasibility of LOMC devolvement;
- To inform stakeholders of FEMA's process for reviewing a potential policy change regarding devolving the LOMC process; and
- To obtain stakeholders' reactions, concerns, and suggestions prior to development of a new policy.

A summary of the meeting is included as Appendix 5.

State Level of Participation in Flood Map Modernization – April 2002

FEMA Regional Offices contacted States and identified 3 potential levels of participation in Flood Map Modernization – Cooperating, Coordinating and Mapping. See Appendix 6.

Cooperating State: A State not in a position to provide additional staff resources for refinement of mapping needs, mapping schedule, nor coordination with local governments.

Coordinating State: A State in a position to accomplish the majority of the detailed map needs assessment, outreach and scoping activities including conducting final meetings. This State would conduct most of the coordinating activities, short of actual mapping.

Mapping State: A State that would take responsibility for part or all of the map production via a CTP agreement, including map activity statements.

As Flood Map Modernization was implemented, States were asked to identify the level of State involvement in their State Business Plans for Flood Map Modernization. Though a number of States expressed interest in being "Mapping States", FEMA has yet to systematically work with States to increase the States level of involvement based on the interest they have expressed.

Map Mod Task Force Meeting – Emmitsburg, MD – November 13-14, 2002

FEMA held an off-site task force meeting in Emmitsburg, MD to discuss Map Modernization implementation with FEMA Regional Office staff and stakeholders. One of the break-out sessions focused on State and Local Roles and Responsibilities. Table 3 below is a listing of Federal/State and local roles associated with floodplain mapping.

Table 3 – Federal, State and Local Roles in Floodplain Mapping

Activity	Federal	State	Local
Evaluate mapping needs		X	X
Adopt local and state codes		X	X
Use maps for issuing permits			X
Make flood determinations			X
Acquire base maps			X
Display for public viewing			X
Develop digital basemap data			X
Negotiate contracts	X	X	
Revise detail analyses	X	X	
Conduct due process activities	X	X	
Publish effective information	X	X	
Establish consistent program and business rules	X	X	
Conduct time & cost meetings		X	
Scope activities		X	
Resolve appeals		X	
Conduct a QA/QC review		X	
Conduct engineering review of models		X	
Produce digital workmaps		X	
Develop models		X	
Incorporate all LOMCs		X	
(digitally) Archive models and data		X	
Conduct final meetings		X	
Audit compliance		X	
Identify data partners		X	
Select projects		X	
Distribute mapping products		X	
Identify maintenance schedule for data		X	
Address objections of non-digital partners		X	
Build database related to the maps		X	
Build the interoperable IT infrastructure		X	
Replicate US mail (digitally relate to due process)		X	
Obtain funding for project	X		
Create guidance and specifications	X		
Report to oversight authorities	X		
Streamline due process	X		
Monitor congressional activity	X		
Establish minimum standards	X		
Decide on the digital file specs	X		
Help build state capabilities	X		
Create flexible process to accept partner data	X		
Reshape CTP to accommodate additional needs	X		

In this meeting FEMA again expressed interest in increasing State involvement in flood mapping activities and flood map maintenance.

Flood Map Maintenance Pilot Projects

FEMA has funded pilot projects to begin addressing flood map maintenance. The pilot projects have laid an excellent foundation for expanding State involvement in flood map maintenance. Following are brief summaries of a few of these pilot projects:

- Denver Urban Drainage and Flood Control District
- The State of North Carolina
- Harris County Flood Control District and
- The State of Vermont.

Denver Urban Drainage and Flood Control District (District)

In 2001 FEMA and the District entered into an agreement for the District to review requests for MT-2 LOMCs. The District retained Icon Engineering, Inc. (Icon) to provide technical review and drafting support for the CLOMR and LOMR requests.

In 2005 this pilot project was expanded to include a Physical Map Revision pilot for the City and County of Broomfield, Colorado. In this pilot, Icon Engineering provided detailed documentation of the technical processes associated with tie-ins of base map and flood hazard changes into the effective FIRM within FEMA's Map Information Portal (MIP).

A "generic" technical processes document with specific references to Broomfield, Colorado removed is included as Attachment 2.

North Carolina Floodplain Mapping Program LOMC Pilot Delegation Program

The State of North Carolina is a Mapping State and has developed all of the floodplain mapping in North Carolina under Flood Map Modernization.

On July 1, 2006, FEMA and the State of North Carolina Floodplain Mapping Program (NCFMP) entered into an agreement to conduct a pilot project that called for the State to review requests for MT-2 Letters of Map Change (LOMCs). North Carolina retained Dewberry & Davis, Inc. (Dewberry) to provide technical review, processing and programmatic support.

NCFMP prepared detailed documentation of the administrative processes developed with FEMA during the pilot project. They also developed mechanisms to evaluate performance and identified benefits of LOMC review being delegated to the State.

One of the benefits highlighted is titled:

DOT related LOMC Request: *Includes completed, proposed, or in-progress projects that correlate to DOT activities. The DOT has indicated LOMC activity to increase based upon pending and active projects. The State's larger role in MT-2 issues has raised awareness of the State and Federal regulations governing floodplain development and management.*

The NCFMP and NFIP staff took part in meetings between the Federal Highway Administration and the NCDOT. The outcome of this meeting led to a series of coordination meetings and efforts, including several training sessions of NCDOT staff.

North Carolina has developed their own data system that has a web interface for access and downloading floodplain mapping and topographic data. They have developed mechanisms to upload data to and download data from FEMA's Mapping Information Portal.

The State of North Carolina has requested full delegation of the flood mapping activities including MT-1 LOMCs, Physical Map Revisions (PMRs), and new or revised Flood Insurance Studies. NCFMP has developed a detailed policies, processes, and procedures manual for both LOMCs and Restudies.

Harris County Flood Control District

The Harris County Flood Control District (HCFCD), a Cooperating Technical Partner (CTP), completed a county-wide Flood Insurance Study restudy for Harris County, Texas (Houston, Texas) known as the Tropical Storm Allison Recovery Project (TSARP) on June 18, 2007.

Harris County recently conducted a pilot project to develop processes to keep floodplain models used to develop the floodplain maps current and accurate. The goal of Model Management at HCFCD is to manage a master set of current and accurate hydrologic and hydraulic models and their supporting data for watersheds in Harris County.

The Harris County Flood Control District's Model and Map Management (M3) System is a web interface that allows registered users to request the final FEMA effective models and supporting data that were released on June 18, 2007. The Flood Control District entered into an agreement with FEMA that allows the District to distribute the FEMA effective models and supporting data for Harris County. All model requests within Harris County must be processed through the M3 system. To check out a model within the M3 system, the user must identify the purpose of model check-out, select a desired study

area, select the appropriate models and supporting data for that area and generate a request for the retrieval and delivery of the models and data.

The State of Vermont

Flash flooding represents the most frequent natural disaster mode in Vermont, resulting in the greatest magnitude of damage suffered by private property and public infrastructure. While inundation-related flood loss is a significant component of flood disasters, the predominant mode of damage in Vermont is fluvial erosion. Fluvial erosion hazards (FEH) are associated with the often catastrophic physical adjustment of stream channel dimensions and location during storm events.

The Vermont Agency of Natural Resources River Management Program's (RMP) Fluvial Erosion Hazard (FEH) project works to prevent development from further encroaching onto the river corridor, preserves the river's floodplain assets, and allows streams the room they need to achieve a stable condition. With funding support from FEMA, the RMP piloted the use of fluvial geomorphic assessment data to create floodway maps that indicate the magnitude or frequency that fluvial adjustment can be anticipated within the river corridor. These maps promote local land use planning and zoning options that recognize erosion hazards and limit development in those highly vulnerable areas. A recent landmark Vermont Supreme Court decision affirmed the responsibility of the State to include fluvial erosion hazards to public safety in the regional and State level review of land development projects.

Mapping Standards and Program Guidance

Until 2002 two separate documents were maintained by FEMA to guide flood map preparation: Guidelines and Specifications for Study Contractors and Guidelines and Specifications for Technical Evaluation Contractors. The former document provided guidance to study contractors primarily with regard to technical standards for preparing the draft floodplain maps. The latter document provided guidance to the two to three engineering firms which reviewed the draft flood maps for FEMA, prepared the maps for final publication by the Government Printing Office, and assisted FEMA in providing the appeal periods to communities under
44 CFR Part 67.

As the CTP program evolved, the roles of FEMA's contractors and the CTP program partners blurred, and in 2002 all program guidance was consolidated into a document entitled Guidelines and Specifications for Flood Hazard Mapping Partners. This document", appears on line at http://www.fema.gov/library/viewRecord.do?id=2206. It defines specifications and associated coordination and documentation activities required for the preparation of flood hazard maps under the NFIP. It also is used by FEMA contractors and CTP program participants, as well as appellants challenging FEMA flood hazard maps. "The Multi-Year Flood Hazard Identification Plan (MHIP)

describes the strategy, schedule, and budget developed by FEMA for producing flood hazard data and maps to administer the … NFIP. It is a document that is updated annually through a collaborative process that engages the States to varying degrees."[10]

In summary, the specifications, procedures, and allocated funding for producing FEMA flood hazard maps are well documented and are designed to facilitate map production by diverse mapping partners, including State governments.

Enhancing the Federal/State Partnership

Numerous decisions and actions spanning several years precede completion of a published FEMA flood hazard map[11]. These essential functions include:

1. determining what potential flood hazard (floodplain) areas are to be studied, or restudied, as well as the methodologies to be employed in their analyses;
2. allocating available funding (Federal, State, and local) among various flood hazard mapping tasks;
3. preparing floodplain maps in accordance with NFIP mapping standards;
4. performing required coordination with communities that are impacted by the flood hazard mapping studies as required by NFIP regulations at 44 CFR, including the provision of appeal periods to the owners and lessees of property impacted by the flood hazard maps;
5. resolving flood map appeals by impacted owners and lessees of property (as provided for in 44 CFR Parts 65, 67, 70, and 72, i.e., Letters of Map Revision (LOMRs), floodway revisions, flood elevation appeals and protests, Letters of Map Amendment (LOMAs), and review of proposed projects impacting floodplain delineations (Conditional letters of Map Revision – CLOMRs), respectively;
6. finalizing base (1% annual chance) flood elevations in accordance with 44 CFR Part 67;
7. distributing floodplain maps in accordance with NFIP requirements; and
8. archiving and distributing the information used to prepare the maps.

FEMA states that -
"*One of the most exciting and revolutionary aspects of the Map Modernization Plan is that it will facilitate ownership of the flood maps by State and local entities through greatly increased involvement in the flood mapping process. This will be achieved through cooperative agreements with State or local partners whereby FEMA will provide flood mapping funds, technical assistance, and mentoring to the State or local partner, which will develop and maintain all or a component of its flood map*." (FEMA, 2001)

FEMA's has involved States in the NFIP via CAP-SSSE, MMMS, Flood Map Production and Flood Map Maintenance Pilot Projects. To "facilitate ownership of the flood maps by State and local entities" opportunities should be provided for increased State decision making in each of the eight (8) mapping functions listed above.

Opportunities

As indicated earlier, some States have more restrictive standards than the NFIP. Two specific higher standards are worth highlighting: floodways and future conditions. The technical issues related to these more restrictive standards are highlighted below.

Floodway standard

> *"Rivers need room."* Dr. Eng. Martin Grambow made this statement in June 2007 when speaking at the Multi-State Work Group in Madison, WI. Dr. Grambow is the head of the Division of Water Management for the Bavarian State Ministry for the Environment, Public Health and Consumer Protection in Munich, Germany. The Free State of Bavaria is noted for its water resources management and is working to move development out of the floodway.

Riverine floodplains are comprised of the floodway and the flood fringe. The natural floodway is the channel and adjacent over bank areas necessary to convey floodwaters. The flood fringe includes lands at or below the BFE that store, but do not effectively convey floodwaters. Lands that compose the flood fringe will be inundated during a 1% chance flood event, but due to physical characteristics of the floodplain do not effectively convey floodwaters.

The line separating the floodway from the flood fringe is determined by hydrologic and hydraulic analyses. The process begins with the calculation of the Base Flood Elevation (BFE) of the 1% chance flood using hydraulic analysis techniques. This involves the establishment of the river's natural floodway limits.

The "regulatory floodway" that FEMA maps on Flood Insurance Rate Maps (FIRMs) is defined in 44 CFR 59.2 as " as the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a set height.". This is also sometimes called the floodway surcharge.

FEMA's standard for establishing floodways while conducting a Flood Insurance Study (FIS) is to assume the cumulative reduction in conveyance will result in an increase in the BFE of 1.0 foot. The Guidelines and Specifications for Mapping Partners directs the engineer conducting the study to calculate the increase by inserting encroachment stations on both sides of the river, throughout the entire community or study reach, such that the BFE will rise by 1 foot.

What complicates the issue is that the flood elevations and floodplain limits mapped on the Flood Insurance Rate Map (FIRM) are based on the natural floodway calculations that are made prior to making the regulatory floodway calculations. For example, if the BFE, based on the natural floodway limits, is calculated to be 50.00' (NAVD 88) at a

point on the river that is the elevation that is used to map the limits of the floodplain at that location and that is also the elevation shown on the FIRM. The floodway will be mapped based on an assumed 1.0' rise in the BFE, or 51.00', but the FIRM will not show this elevation.

This procedure results in increasing flood damages. First, this approach yields a map that will allow development to occur that will result in a one foot rise in the BFE. Second, buildings that are constructed in conformance with FEMA's model ordinance provisions will be subject to increased depth of flooding as the BFE rises.

Finally, as the flood elevations rise due to development in the mapped flood fringe (which includes part of the natural floodway) the floodplain limits will expand. As the flood elevation rises with development - flooding will extend further from the stream onto lands outside the mapped Special Flood Hazard Area (SFHA) inundating buildings that were constructed with no consideration of this predictable flooding. Depending on the terrain, the amount of land subject to flooding outside the SFHA could be extensive.

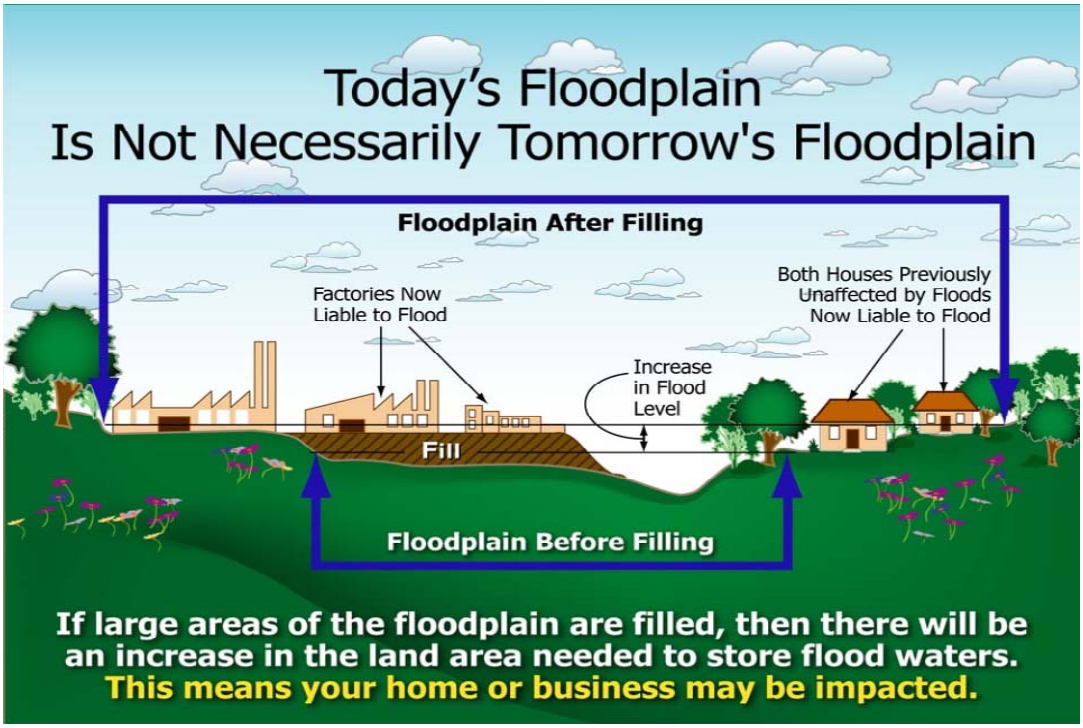


Figure 1 – Impact of Encroaching into Floodway

James Goddard prepared a white paper in 1978 (Attachment 3) that provides a history of the NFIP floodway. It also highlights States that require developments in the floodplain to demonstrate to State engineers that encroachments into the floodplain will

not exceed the State's higher safety standards - to ensure that conveyance will not be restricted – that the rivers aren't blocked. States listed include: Colorado, Illinois, Indiana, Mass., Maryland, Michigan, Minnesota, Ohio, and Wisconsin.

CRS Credit for technical review of a flood study

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. The independent review of flood studies is one of the activities included under CRS.

At the request of the CRS Task Force, ASFPM reviewed State floodplain management programs and identified six states that have a history of conducting technical reviews of flood studies that would qualify for CRS credit. The findings are summarized in Table 4.

Table 4. – Technical Review of Flood Studies

STATE	Hydrology	Hydraulics	Floodplain Mapping	Year Technical Review Began
Illinois	X	X	X	1975
Indiana	X	X	X	1982
Michigan	X	X	X	1968
Minnesota	X	X	X	1980
New Jersey	X	X	X	1962
Wisconsin	X	X	X	1968

State Engineering Reviews – other than technical review of flood studies

An Association of State Floodplain Managers 2003 report that summarized State and local floodplain management programs in the United States (ASFPM, 2003) indicates that 19 States have engineering staff that conduct technical reviews of the hydrologic and hydraulic modeling associated with proposed development in the floodplain.

In addition, the State of Vermont has regulations that require floodways be determined in consideration of inundation hazards as delineated by NFIP maps **and** in onsideration of fluvial erosion hazards.

Future Conditions Hydrology –

It was the expressed intent of the U.S. Congress, in enacting the Housing and Urban Development Act of 1968 (commonly referred to as the National Flood Insurance Act of 1968), to ‘‘encourage State and local governments to make appropriate land use adjustments to constrict the development of land which is exposed to flood damage and minimize damage caused by flood losses, and guide the development of ***proposed future construction****, where practicable, away from locations which are threatened by flood hazards * * * ’’ 42 U.S.C. 4001(e).*

Historically, flood hazard information presented on NFIP flood maps has been based on the existing conditions of the floodplain and watershed. Buildings have a life expectancy of 75 to 100 years (Anderson, 1978). Issuing building permits based on existing conditions, ignores the changing nature of the watershed and makes this new development vulnerable to flooding as the watershed develops. Sauer et al (1983), indicate that if a watershed is fully developed the one-percent-chance (base) flood discharge is about 2.5 times the base flood discharge under rural or undeveloped conditions. A watershed study in Charlotte-Mecklenburg, North Carolina determined that development in the upstream watershed would increase the BFEs by over 2.5 feet.

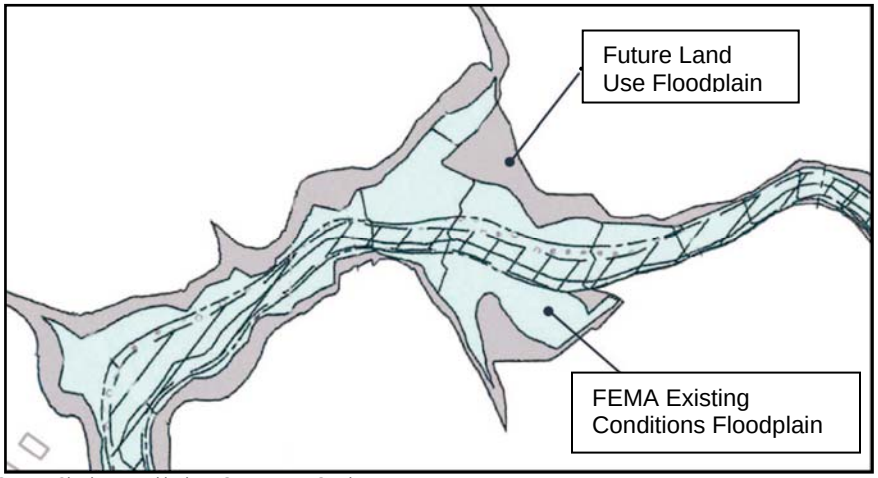
New Jersey

New Jersey requires land use decisions on new development to be based the flow used on FEMA maps plus an additional 25 percent. These maps developed by New Jersey provide some additional protection from flooding to these new structures as the watershed develops. It demonstrates a proactive approach by the State to protect new development that does not require extensive hydrologic modeling.

Mecklenburg County, North Carolina

Mecklenburg County has developed Floodplain Land use Maps (FLUM) that are more restrictive that FEMA and are used for new development. The floodway is developed using existing land use and a 0.1’ surcharge and the BFEs and floodplain limits are developed using future (ultimate) development in the watershed.

Figure 2: Expanded Floodplain Boundary for Regulating New Construction in Mecklenburg County, North Carolina



Source: Charlotte-Mecklenburg Storm Water Services.

Technical Capabilities/Requirements

The Federal Emergency Management Agency (FEMA) has indicated that for State or local government to be eligible to manage a portion of the flood hazard mapping program they must have the following:

- Processes and/or systems in place that support mapping or data collection activities that contribute to flood hazard identification and that are not federally funded;
- Demonstrated capability to perform a given mapping activity; and
- In-house staff capabilities in the appropriate technical area for the given mapping activity OR if any portion of a project or activity is contracted, have the in-house staff capability to monitor the contractor and to approve completed products.

At the Emmitsburg Stakeholder meeting, one technical expertise was highlighted as a particular challenge – H&H Technical Expertise. Hydrology and Hydraulics (H&H) is a very specialized branch of water resources engineering. There was considerable discussion at this meeting that there are not enough engineers in the US versed in hydrology and hydraulics to support a nationwide flood remapping effort. As indicated previously, a substantial number of States have engineers on staff versed in H&H due State higher standards.

Partnering with States has its advantages

1. States have a strong stewardship ethic and are continuously engaged with communities and land owners with no contract term limit.

2. States Public Trust responsibilities reduce the potential for inappropriate land use management.

3. States are involved in stormwater management, water regulation, wetland protection, and other programs closely related to floodplain management.

4. Many State have institutional memory – Illinois, Michigan, Wisconsin, New Jersey are some examples of States with engineers on staff that reviewed the initial Flood Insurance Studies in the 1980s.

5. States have established relationships with regional and local governments.

6. States are knowledgeable about the type and extent of local data available and often have established data sharing agreements.

7. Many States have higher standards than the federal minimum.

8. The number of communities (20,000) makes it extremely difficult for FEMA to manage flood risk without State assistance.

9. States are the government entity that licenses Professional Engineers, Registered Land Surveyors, Building Inspectors, Real Estate Agents and Insurance Agents. eLOMAs must be completed by a registered Professional Engineer or Land Surveyor. The State has authority to revoke and/or suspend professional licenses if actions would warrant censure. (see Appendix 5 Page 5 for additional background on this issue)

10. Congress included a requirement (Sec 584) in the National Flood Insurance Act that highlights the value of partnering with States to help ensure compliance with State and local laws and regulations.

> ***SEC. 584. RELATION TO STATE AND LOCAL LAWS.***
> This title and the amendments made by this title may not be construed to preempt, annul, alter, amend, or exempt any person from compliance with any law, ordinance, or regulation of any State or local government with respect to land use, management, or control.

Ensuring LOMR – Fs comply with State law

FEMA's Floodplain Management Section's Fiscal Year 2007 Community Activity Report includes the following summary:

> ***Letter of Map Change Violation Memos:*** *Action on a Letter of Map Change (LOMC) request that indicates a potential floodplain management violation is suspended and the potential violation is referred to the Region for resolution. Common types of violations uncovered in the LOMC process include fill in the floodway, buildings with their lowest floors below BFE, and buildings built on fill in V-zones. LOMCs provide another means of monitoring compliance by communities and identifying communities that need technical assistance. In FY07,* ***78*** *LOMC violation memos were sent to Regions and* ***22*** *LOMC cases were reported as resolved.*

States have environmental, Public Trust and stormwater management responsibilities in addition to floodplain management responsibilities. Having States with the technical capabilities process LOMRs reduces the potential for LOMC violations.

Additional Benefits of State Involvement

Ancillary benefits of maps extend beyond FEMA and FIA that the states are more aware of because of their association with their communities and agencies and include:

Environmental Protection and Natural Resources Management

- Non-point source and environmental protection planning, including wildlife habitat
- Wetland and Aquatic habitat designation
- Planning for soil erosion and sedimentation control for example riverbank stabilization
- Stormwater runoff planning (hydrology)
- Identifying above ground storage tanks that require anchoring
- Locating sewage treatment plants and domestic water treatment plants
- Planning for irrigation diversion and conveyance structures

Transportation Planning

- Traffic safety hazard identification and management
- More rapid addition of new transportation structures and facilities to maps
- Estimation of cuts and fills
- Freeboard estimations
- Route location planning
- Storage loss estimations
- Many of the data inputs that go into an updated flood map such as water surface elevations, hydrographic data, and river cross sections are instrumental in engineering design for transportation projects, especially bridges. Updating floodplain maps brings the latest pertinent data together into a single product.

Recreational planning

Flood hazard mitigation planning

- Greater visibility for states' floodplain management programs.
- Opportunities for incorporating state initiatives into the mapping products – i.e. future conditions hydrology mapping, stormwater management, etc.
- Promote "Smart Growth" and other sustainable community initiatives.
- Increase state staff capabilities through training and experience in a mapping program.
- Increase the number of people working on Floodplain Management and the quality and availability of the tools they can use for Floodplain Management

Funding

FEMA has been authorized to collect fees to process LOMRs and PMRs. The fee schedule for map changes is included as Table 5.

Table 5 - Fee Schedule for Map Change Requests

Requests for Single-Lot, Single-Structure Map Change	**Fee**
Single-Lot or Single-Structure LOMA	**Free**
Single-Lot/Single-Structure CLOMA and CLOMR-F	**$500**
Single-Lot/Single-Structure LOMR-F	**$425**
Single-Lot/Single-Structure LOMR-F Based on As-Built Information (CLOMR-F previously issued)	**$325**
Requests for Multiple-Lot,/Multiple-Structure Map Changes	
Multiple-Lot/Multiple-Structure LOMA	**Free**
Multiple-Lot/Multiple-Structure CLOMA	**$700**
Multiple-Lot/Multiple-Structure CLOMR-F and LOMR-F	**$800**
Multiple-Lot/Multiple-Structure LOMR-F Based on As-Built Information (CLOMR-F previously issued)	**$700**
Requests for Map Change Requiring Special Technical Review	
CLOMR Based on New Hydrology, Bridge, Culvert, Channel, or Combination Thereof	**$4,400**
CLOMR Based on Levee, Berm, or Other Structural Measures	**$5,500**
LOMR/PMR Based on Bridge, Culvert, Channel, or Combination Thereof	**$4,800**
LOMR/PMR Based on Levee, Berm, or Other Structural Measures	**$6,500**
LOMR Based on As-Built Info (CLOMR previously issued)	**$4,800**
LOMR/PMR Based Solely on Submission of More Detailed Data	**Free**
LOMR/CLOMR Based on Structural Measures on Alluvial Fans	**$5,600 Initial fee + $60/hr**

Source: http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm (Accessed April 2008)

The fees are intended to support the costs for processing LOMCs. By devolving LOMCs processing to States and allowing the State to collect all or a portion of the fees, no ongoing cost to the national treasury is incurred.

Summary

FEMA's flood hazard maps provide the foundation for floodplain management in the US. Flood Map Modernization will provide the nation with improved flood hazard maps that are easier to use and easier to maintain. FEMA has enhanced State floodplain management programs by partnering with States in managing the National Flood Insurance Program (CAP-SSSE) and managing the production of flood hazard maps (Mapping grants to State, CTP, MMMS, and map maintenance pilot projects).

These partnership efforts have successfully established map maintenance processes and increased State involvement in flood map production and flood map maintenance. There are numerous advantages to delegating flood map maintenance to States.

Building on these established partnerships provides opportunities for improving and maintaining the nation's inventory of floodplain maps.

Recommendations:

1. FEMA should aggressively work to imbed floodplain management into existing State water management programs.
2. FEMA should more fully utilize State technical capabilities. Approximately a third of the States have engineering staff familiar with hydrology and hydraulics. In some cases, FEMA is paying contractors to conduct engineering reviews of flood engineering studies (FISs and LOMRs) that have already been reviewed by State engineers. By having a separate FEMA contractor review of flood engineering studies there is a potential that FEMA could approve a study that violates State standards.
3. FEMA should delegate the review and issuance of LOMCs to States with demonstrated technical capabilities and willingness to accept these authorities. The current pilot programs should have the pilot designation removed and the programs extended to qualified and willing States.
4. FEMA should delegate authorities (see above listing) in addition to responsibilities. For example, FEMA could allocate funding to the State and give the State the authority to allocate funding within the State (provided certain metrics were achieved).

Notes and References

[1] The White House's February 2006 report The Federal Response to Hurricane Katrina, Lessons Learned, Chapter Two: National Preparedness – A Primer, pages 11 – 19 provides an excellent discussion of the Federal, State, and local governments' roles in providing disaster assistance. A relevant history and discussion of the role of FEMA is also included. A complete copy of the report is available at: http://media.govtech.net/Sprint_RC/katrina-lessons-learned.pdf (accessed on 03/23/2008).

[2] FEMA's regulations are explicit in requiring the participation of the States in administration of the NFIP. See 44 CFR Part 60.25 Designation, duties, and Responsibilities of State Coordinating Agencies at http://www.dcr.virginia.gov/dam_safety_and_floodplains/documents/44cfr60subp-c.pdf (accessed on 03/23/2008). This section contains a list of duties and responsibilities, including:

> (b)(6) assist in the delineation of riverine and coastal flood-prone areas … and (c) Other duties and responsibilities, which may be deemed appropriate by the State … may be carried out with prior notification of the Administrator.

[3] Examples include: Stormwater Management Districts, Watershed Management Districts, Drainage Districts, Stormwater Utilities, Urban Drainage and Flood Control Districts, Conservation Districts, etc. While counties, boroughs and parishes usually do not have jurisdiction in incorporated communities, these "districts" are usually provided certain authorities across their district and often are granted taxation authorities and/or the ability to collect fees. Some counties also have been provided stormwater management authorities countywide (e.g. Northern Illinois).

[4] For an overall summary of the National Flood Insurance Program and its flood hazard mapping program, see "Improving FEMA's Coastal Risk Assessment through the National Flood Insurance Program: An Historical Overview", by Mark Crowell, Emily Hirsch, and Tom L. Hayes, *Marine Technology Society Journal*, Spring 2007, Volume 41, Number 1.

[5] Section 102 of P.L. 93-234, 42 U.S.C. 4012a.

[6] P.L. 93-288, as amended, 42 U.S.C. 5121 et seq.

[7] P.L. 106-390.

[8] The State of New Jersey has been mapping floodplains based upon 125% of the Q100 since 1974.

[9] The first "formal" CTP agreement was signed with the Lower Colorado River Authority in May 1999. Go to http://www.fema.gov/plan/prevent/fhm/ctp_news.shtm (accessed on 10/10/2007) for information on CTP program participants by State.

[10] http://www.fema.gov/plan/prevent/fhm/dl_mhip.shtm (accessed on 09/24/2007).

[11] Flood hazard maps currently produced by FEMA are identified as Flood Insurance Rate Maps, or FIRMs. The digital version of a FIRM is termed a "DFIRM".

References:

Anderson, C.M. 1978. Final Report – Coastal Residential Structures Life Time Determination, Federal Insurance Administration Department of Housing and Urban Development, p. 87 and Appendices.

Association of State Floodplain Managers. 2004. *FLOODPLAIN MANAGEMENT 2003 State and Local Programs.* Madison,WI. 112 p. Available for downloading free from the Association of State Floodplain Managers' website: http://www.floods.org

Federal Emergency Management Agency. 2001. *Modernizing FEMA's Flood Hazard Mapping Program: Recommendations for Using Future-Conditions Hydrology for the National Flood Insurance Program.* November 2001. p. 1. Washington D.C.: FEMA.