

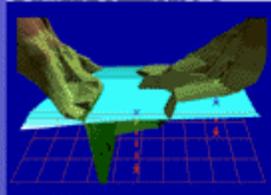
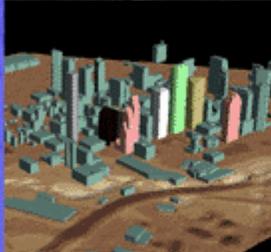
F I N A L R E P O R T

Technical Mapping Advisory Council

Final Report to
The Honorable
James Lee Witt,
Director,
Federal Emergency
Management Agency

A Summary of
Accomplishments and
Recommendations

1995-2000



BACKGROUND OF THE TECHNICAL MAPPING ADVISORY COUNCIL

The Technical Mapping Advisory Council to the Federal Emergency Management Agency (FEMA) was created by Congress in the National Flood Insurance Reform Act of 1994 (NFIRA). The Act mandated that the Council be comprised of a designee of the Director of FEMA and ten other members appointed by the Director or his designee. The membership must include:

- the Under Secretary of Commerce for Oceans and Atmosphere (or his or her designee);
- a member of recognized surveying and mapping professional associations and organizations;
- a member of recognized professional engineering associations and organizations;
- a member of recognized professional associations or organizations representing flood hazard determination firms;
- a representative of the U.S. Geological Survey;
- a representative of state geological survey programs;
- a representative of state national flood insurance coordination offices;
- a representative of a regulated lending institution;
- a representative of the Federal Home Loan Mortgage Corporation (now named Freddie Mac); and
- a representative of the Federal National Mortgage Association (now named Fannie Mae).

The Charter for the Council was based on the provisions of NFIRA. As required by Federal Advisory Committee regulations, it was filed with House and Senate oversight committees, the General Services Administration, and the Library of Congress and was formally adopted by the Council. The duties and objectives of the Council as specified in its Charter are to:

- Evaluate the production, distribution, and use of Flood Insurance Rate Maps (FIRMs) and other mapping products prepared by FEMA in support of the National Flood Insurance Program (NFIP) and make recommendations to the Director for the improvement of these products;
- Make recommendations to the Director regarding cost-effective improvements in the accuracy, quality, utility, and distribution of FIRMs and other mapping products and on standards and guidelines for use in preparing and revising FIRMs and other mapping products; and
- Submit an annual report to the Director containing a description of the Council's activities, an evaluation of the status and performance of FEMA's mapping products and activities to revise and update these products, and a summary of the Council's recommendations.

The Act stipulated that the Council terminate its activities after five years.

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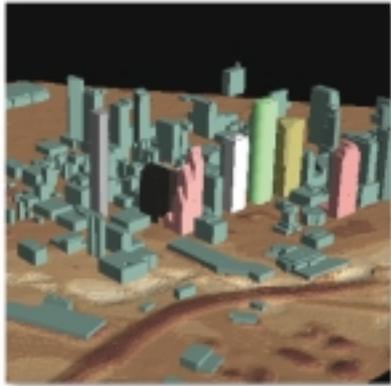
Council's Annual Reports and meeting minutes can be found on FEMA's Web site at:
http://www.fema.gov/mit/tsd/tmc_main.htm



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TECHNICAL MAPPING ADVISORY COUNCIL TO FEMA FINAL REPORT 1995–2000

INTRODUCTION

This report is being prepared to encapsulate five years of work by a council created by Congress through the 1994 National Flood Insurance Reform Act (NFIRA). The eleven members of the Technical Mapping Advisory Council (the Council) to the Federal Emergency Management Agency (FEMA) represent federal agencies, financial institutions, and professional organizations. They are users of, or data providers for, the floodplain maps that serve as the regulatory tools for the National Flood Insurance Program (NFIP).

In 1968 Congress created the NFIP in an attempt to reduce to taxpayers the escalating costs of recovery from flooding disasters. This shift from structural control of flooding to regulatory methods of floodplain management initiated the sharing of responsibility among all units of government, the private sector, and individual citizens. Over time, this nonstructural approach has integrated floodplain management into land-use planning, economic development, habitat protection, and other locally driven activities.

The cost associated with flood damages is now estimated to be between \$4 billion and \$6 billion each year. Some of the escalation in cost is due to inflation and rising property values, but a significant contributing factor is the inability of communities to identify floodprone areas and to regulate development appropriately because they lack proper flood mapping. New development in floodplains occurs, in part, because current maps do not always correctly delineate areas prone to flooding prior to development in those areas. This lack of adequate, current maps of our nation's flood hazard areas prompted Congress

Maps depicting flood hazard areas are not only the foundation of the National Flood Insurance Program, but also the basis of sound floodplain management policies.

to include directions to FEMA to create the Council. The Council's mandate was to evaluate and recommend improvements to the production, distribution, and use of Flood Insurance Rate Maps (FIRMs) and other mapping products prepared by FEMA in support of the NFIP.

High-Priority Recommendations of the Technical Mapping Advisory Council

The eleven members of the Council represent both the private sector and governmental organizations. These organizations historically offered different perspectives reflecting their varied interests. Nevertheless, the membership of the Council agreed on four areas that FEMA must pursue if the nation's floodplain maps are to be improved. Although this report includes numerous recommendations, the four recommendations listed immediately below are deemed by Council consensus as the most important:

- Acquiring additional financial and technical resources for map programs;
- Building constituent interest and public support for modernizing the mapping program using a process that includes public education and public outreach;
- Building partnerships among various federal, state, and local governments, universities, and the private sector to accomplish NFIP objectives; and
- Creating a fully digital environment for floodplain mapping and all related information.

SUMMARY AND STATUS OF THE COUNCIL'S RECOMMENDATIONS FROM 1995 TO 2000

The Council was created in November 1995 and began its work in May 1996 at its first official meeting. The Council has produced five annual reports, each containing specific recommendations to FEMA. Each recommendation, if implemented, will improve the maps and the mapping processes. FEMA has made great strides to implement those recommendations that have been possible within its existing budget. FEMA has also prepared a plan to implement the remaining recommendations and has requested the resources necessary to implement its Map Modernization Plan (MMP). At the time of this report, FEMA has not yet been provided with those funds.

Flooding is a natural phenomenon. Maps will not prevent floods from occurring, but they are an essential tool in avoiding or minimizing the damage to property and loss of life caused by floods. Without accurate flood maps

local officials face serious difficulties in guiding development away from hazardous areas or in ensuring that proper mitigation is provided as part of the development.

Maps depicting flood hazard areas are not only the foundation of the NFIP, but also the basis of sound floodplain management policies at the local, state, and federal levels. Adequate, accurate, and current maps are essential for the program to function. If the area is not mapped or if an area is outside a flood hazard area, a local government has no basis on which to regulate new development under its floodplain zoning ordinance. The sale of flood insurance is not mandated by law or regulation in areas outside mapped floodplains. Without adequate, accurate, and current maps, neither construction nor the insurance regulatory elements of the program can be effective.

All Council recommendations from its five-year term are contained in Appendix 3 of this report. The following is a summary of the recommendations formally adopted by the Council for improvements to the FIRMs and the mapping processes.

Partnerships

The Council recommended that FEMA seek partnerships with other federal agencies, states, and local governments, universities, and private interests to improve both the FIRMs and the mapping processes.



FEMA seeks partnerships to improve both the FIRMs and the mapping processes.

FEMA has begun developing partnerships with other federal agencies and states and local units of government in the production of FIRMs. These partnerships minimize duplication of effort and result in much improved maps at lower cost to the NFIP.

FEMA has actively participated in the Federal Geographic Data Committee (FGDC), which is developing standards for digital mapping. FEMA has adopted these standards for its digital FIRMs, while coordinating its efforts with the U.S. Geological Survey (USGS) in developing standards for FIRMs that will employ USGS Digital Orthophoto Quadrangles (DOQs) as the base map. In addition, FEMA is coordinating with the National Geodetic Survey (NGS) of the National Oceanic and Atmospheric Administration (NOAA) to make greater use of the Global Positioning System (GPS) in the mapping processes. FEMA has begun to coordinate with the Federal Energy Regulatory Commission (FERC) to use information generated for licensed hydropower dams in Flood Insurance Studies (FISs). A wealth of hydrologic and hydraulic data have been generated by FERC-licensed utilities that would reduce the costs of FISs.

Perhaps most significantly, FEMA has begun to develop partnerships with state, local, and regional governments in establishing a framework to delegate the maintenance of the FIRMs. FEMA's Cooperating Technical Communities (CTC) initiative holds great promise for turning over the reins of a major federal responsibility to communities that have the resources and the interest in updating and maintaining maps of their flood hazard areas. Nurturing partnerships with state, local, and regional governments will be possible only if FEMA has sufficient resources to contribute to the process and fulfill its commitments. Some CTC agreements have not been fully implemented because of the lack of resources. Where FEMA's partners are willing to improve their maps, they and FEMA must make the necessary resources available.

Public Awareness and Education

The Council recommended that FEMA expand current public involvement efforts by developing a proactive, long-term, public awareness and educational program that focuses on the need for improved mapping of flood hazard areas. Funding is needed for a well-designed program to educate the public about the risks posed by flood hazards and the values and benefits of good mapping and to foster support for improving and updating maps of flood hazard areas.

Base Maps

The Council made several recommendations relative to base maps, the part of a FIRM that shows the location of landmark features, including roads and buildings, relative to flood hazard areas. The primary focus of the recommendations was



USGS DOQs are now the default standard base map.

for FEMA to adopt and adhere to a minimum base map standard that will result in a FIRM that is geographically referenced, positionally accurate, reproducible, and inclusive of the necessary features and attributes that make maps useful documents.

Base maps form the foundation for FIRMs; they significantly impact the usefulness of the maps for flood insurance and land-use regulations. FEMA is not a mapping agency per se; FEMA is responsible, however, for providing floodplain information that can be displayed as an overlay onto other existing maps.

FEMA has adopted a base map standard that meets the Council's recommendations. USGS DOQs are now the default standard base map. For this standard to be practical, however, every participating community must be included in a current USGS DOQ. Where USGS DOQs have not yet been produced, increased emphasis on completing coverage in that community will be necessary.

Some local governments have invested considerable resources to produce maps for their own use, often with more detail and at a larger scale than USGS DOQs. Where such maps meet the minimum standards, they can and should be used as the backdrop for a FIRM. FEMA's acceptance of this recommendation is significant and demonstrates flexibility in adopting this policy. Its decision to use locally produced base maps needs to be supported both politically and financially.

Updating the stock of old outdated maps using new base maps will require cooperation with USGS and NGS and increased funding for these agencies.

Flood Insurance Rate Map Updating and Maintenance

The Council has recommended that FEMA update and maintain FIRMs to reflect current conditions, corporate boundaries, and flooding sources. Maps must be produced in a digital environment, with the flood hazards properly referenced to a known geographic coordinate system that accurately relates physical features to the floodplain. The Council also recommended that, where appropriate, future-conditions hydrologic analyses be used for updating FIRMs. Use of future-conditions hydrology will extend the maps' shelf life and reduce the costs of map maintenance. It will also provide an additional degree of assurance that new structures will be protected from flooding.



This is an issue that is beyond FEMA's capabilities given current funding limitations. The mapping budget has held steady at \$48 million annually since 1995. The demand for Letters of Map Amendment (LOMAs) and Letters of Map Revision (LOMRs) has risen from about 5 percent in 1990 to nearly 35 percent of the annual mapping budget. Additionally, the increasing number of disaster declarations pulls headquarters and regional staff members away from other important functions, including duties related to map maintenance. As one means of supplementing the mapping budget, the Council recommended that FEMA seek authorization to use disaster funds to update maps following a disaster declaration. In the FY 2001 appropriations bill, FEMA is authorized to use up to \$15 million from the Disaster Relief Fund for this purpose. This funding serves as a first step toward public acknowledgement of the far-reaching implications of current, accurate flood hazard mapping, but complete funding of the Map Modernization Plan must occur for the full benefits to the nation and cost-effectiveness for FEMA to be realized.

Archiving FIRMs

The Council recommended that FEMA create and maintain, in perpetuity, a complete archive of maps produced under the NFIP. The archives must include the supporting background information and studies used to create and update the map products.

FIRMs and their predecessors, Flood Hazard Boundary Maps, have been used for flood insurance and land-use regulation for more than 30 years. Decisions regarding building permits and the purchase of flood insurance have been made on the basis of maps that, in some instances, are no longer retrievable. It is critical that superseded maps be archived and retrievable in the event questions or legal challenges arise. FEMA has made some progress toward the development of a retrievable archive, but much more needs to be accomplished. Compilation of a complete archive of existing and superseded FIRMs is one element of FEMA's Map Modernization Plan. Funding to compile and maintain archives must be provided.

Multiple Flood Hazards

The Council recommended including flooding sources not usually depicted on FIRMs and expanding information about the types and causes of floods. FEMA has concluded that the law requires the purchase of flood insurance only in areas subject to floods that can reasonably be determined as 1%-annual-chance flood events. Consequently, real, and potentially catastrophic, flood events that occur less frequently are seldom shown on FIRMs. These events should be depicted, if for no other reason than for public awareness.

Tsunamis, caused by undersea earthquakes, create flood events primarily along the west coast and in Alaska and Hawaii. With very little warning, massive waves can flood land 100 feet or more above sea level. Entire communities have been



Maps are essential tools in avoiding or minimizing the damage to property.



Erosion of coastal shorelines must be addressed and mapped.

devastated by tsunami-induced flooding, yet such hazard areas are typically not depicted on FIRMs. There are insufficient data to predict the frequency of tsunamis, but we can reasonably predict which communities are most at risk, and this warning should be made public on the maps.

Dams can cause flooding by either improper operation or a sudden catastrophic failure. The Western Governors' Association in its report to Congress in 1999 (www.westgov.org) highlighted improper or inadequate operation of dams and the resultant flooding. The report stated that dam-induced flooding is a significant problem that has been ignored for too long; inadequate operation can be documented, and flooding that would result from a sudden catastrophic dam failure can be predicted and mapped and should likewise be depicted on FIRMs. In many instances, studies performed by FERC-licensed utilities are readily available and could be displayed. The data would be crucial in planning and executing emergency responses and could be used to guide new development away from hazardous areas.

Debris and ice jams cause flood levels to reach heights well above the calculated Base Flood Elevation (BFE). But the increases in BFEs caused by debris and ice jams are seldom taken into account when flood studies are planned, even though the study guidelines provide criteria to be followed to identify the extent of these risks. In establishing scoping for FISs, greater attention must be paid to these hazards so that where they have occurred, or are likely to occur, they can be taken into account and properly depicted on the FIRM.

Erosion of riverbanks and coastal shorelines must be addressed and mapped. A recent study, *Evaluation of Erosion Hazards* (www.heinzcenter.org), conducted by The Heinz Center recommends that because coastal erosion is a serious issue, it should be depicted on FIRMs, if for no other reason than to raise public awareness. The Council supported these recommendations. The Senate Appropriations Committee, in its FY 2001 report, indicated its support of the recommendations in The Heinz Center report and has directed FEMA to develop a plan for mapping coastal erosion hazards.

Rapid and catastrophic erosion of unstable riverbanks should be included when FISs are conducted and areas subject to erosion hazards are mapped. Unless prohibited by state law or local regulations, it is currently possible to construct and insure buildings in areas susceptible to high rates of erosion that can damage or destroy a structure quickly.

Alluvial fans are depositional landforms located at topographic breaks and are composed of streamflow or debris-flow sediments. Floodplains associated with alluvial fans are different from floodplains associated with rivers and streams. Because many rapid-growth areas of the country include alluvial fans, it is important that the mapping of flood hazards in and adjacent to alluvial fans meets the needs of local, state, and federal authorities. In addition, it is important that the relationships among the mapping of these hazard areas, the regulation of the hazard areas, and the provision of insurance within the hazard areas be clear and strong.

Unnumbered A-Zones

The Council recommended that FEMA take steps to improve the floodplain delineations depicted as Unnumbered A-Zones and to avoid, where possible, adding new Unnumbered A-Zones.

Of all the miles of rivers and lake shorelines that have been mapped by FEMA, fewer than 40 percent have been mapped using detailed study methods. Detailed study methods provide BFEs and more accurate floodplain delineations than studies done by approximate methods. For some Unnumbered A-Zones, supporting technical backup data may be available to explain and support how the flood-



Problems persist in areas that have been mapped as Unnumbered A-Zones.

plain boundaries were determined; that information should be made available to the community. The remaining miles of rivers and lake shorelines have been mapped by approximate study methods that do not result in the determination of the BFE. These rivers and lakes are mapped as Unnumbered A-Zones.

Several problems persist in areas that have been mapped as Unnumbered A-Zones:

- Communities cannot provide guidance to ensure that new development is properly elevated, and the cost to determine the BFE for a single structure is often prohibitive, particularly for a single-family residence;
- Flood insurance cannot be rated according to the risk, again because the basic flood elevation data necessary to properly write a policy are not available;
- Methods used to estimate the limits of the floodplain for Unnumbered A-Zones are not as accurate as detailed study methods, which leads to questions of map credibility for both local officials and lenders; and
- Technical information is generally not available from FEMA to guide the planning and design of flood-protection measures to lessen the risk.

Recent technical innovations, improved computer capability, and the growing availability of USGS DOQs make it possible to enhance existing Unnumbered A-Zones and create new and improved maps. Nationwide improvement of existing Unnumbered A-Zones is an objective of FEMA's Map Modernization Plan that must be initiated to reduce the continuing difficulties created by the present situation.

Unmapped Flood Hazard Areas

All flood hazard areas need to be mapped in order for the NFIP to fulfill its potential for reducing the rate of flood-related disaster costs.

There are a large number of flood hazard areas that have not been delineated. The Council recommended that flood hazard areas that do not appear on any FIRM be identified, prioritized in terms of the need, appropriately studied, and properly mapped.

Unmapped flood hazard areas present a serious threat to people who may choose to buy or build within them. The most pressing problems exist in or near communities that are growing, but this is not the only place of

concern. The lack of flood hazard area mapping has major consequences. Without maps identifying all flood hazard areas, communities cannot properly regulate new development. Continuing unwise development in unmapped flood

hazard areas results in a growing number of properties at risk, thereby escalating expenditures for disaster assistance.

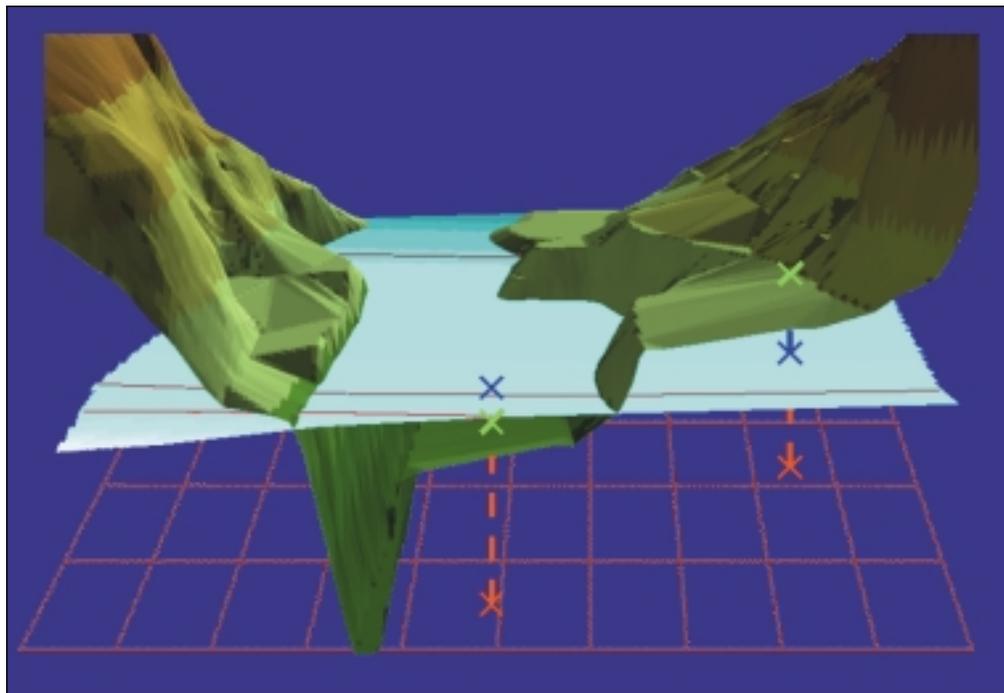
Without maps, lenders are not obligated to require that properties are insured against flood risk. Federal law requires certain loans to be covered by flood insurance, but if flood hazards are not identified, properties within high-risk areas will likely not be insured. Uninsured property places lenders at risk. Without maps, developers lack the necessary guidance to avoid flood-prone areas, increasing the number of buildings at risk and increasing the demand for disaster assistance. Likewise, the need for flood protection is unknown, and proper mitigation is not taken.

All flood hazard areas need to be mapped in order for the NFIP to fulfill its potential for reducing the rate of flood-related disaster costs. Full implementation of FEMA's Map Modernization Plan will help achieve this important goal.

Modern Mapping Technologies

The Council recommended that modern methods be employed to create and update FIRMs.

When the NFIP was created in 1968, computers and computer-aided drafting programs did not generally exist. Scribing on acetate overlays and photographic



Geographic Information Systems enable users to perform a variety of engineering functions.

reproduction was state-of-the-art map preparation. Scribing has been replaced by computers in almost every segment of the engineering and mapping industry. Some progress is being made. New maps are being made electronically, and an initiative is under way to digitize the current stock of maps. Nevertheless, the progress is too little and too slow. Electronically created maps are more economical to store, update, and distribute. Digital floodplain information would also be far easier to use for other community purposes. The Geographic Information System, which enables users to perform a variety of planning and analysis functions on all types of digital, map-related data, is commonly used in communities throughout the country. The addition of digital floodplain information to this system would be extremely valuable in planning and designing flood protection projects and analyzing and enhancing water quality and riparian habitat.

To date, however, FEMA has been forced to continue to use outdated technologies because the cost of a wholesale conversion to an electronic, geographically referenced map product inventory is beyond its means. Full implementation of the Map Modernization Plan would remedy this problem and address the Council's recommendations.

Use of Emerging Technologies

For the NFIP to remain cost-effective in the future, new technology for the creation and distribution of map data must be employed in a timely manner.

New technology for the creation and distribution of map data must be employed in a timely manner.

Floodplain mapping and the determination of BFEs are more useful and accurate when referenced to a common, well-known coordinate system. The National Spatial Reference System (NSRS) has been defined nationwide and should be used as the basis for georeferencing FIRMs and related digital products. Reliance on the NSRS, coupled with advances in use of the Global Positioning System (GPS) and emerging

remote sensing technologies, can enable FEMA and its partners to achieve greater efficiency and economy to support FIRMs and the mapping process.

One new method to acquire imagery of the earth is Light Detection and Ranging (LIDAR), an active remote sensing system used in a wide variety of applications, including assessing post-storm damage to beaches, mapping the Greenland ice sheet, and measuring heights within forest timber stands. FEMA is working with other federal partners to develop LIDAR capabilities for shoreline and floodplain mapping. Other developing remote sensing technologies such as synthetic aperture radar and hyperspectral imagery also offer the promise of increased mapping efficiencies that can support the NFIP.

Web-based technology that allows the application and distribution of flood hazard mapping data is also becoming a reality. The distribution of data over the Internet, even large data sets, offers an alternative to FEMA to the storage and distribution of large numbers of paper FIRMs and associated information.

The challenge FEMA faces is funding these new technologies to update its stock of outdated maps and to distribute new maps and information.

FUTURE DIRECTIONS

Options for Continuing the Work of the Council

The Technical Mapping Advisory Council to FEMA officially ended its term on November 24, 2000, in accordance with the National Flood Insurance Reform Act of 1994, P.L. 103-325, Title V, Section 576.

As exemplified by this Final Report, the Council has achieved a great deal of success as a partner with FEMA in living up to the Charter. However, the Council believes there are still significant issues that must be addressed. Although FEMA has made great progress in implementing many of the Council's recommendations, implementation is incomplete. The Council presents several options for continuing its work and for keeping the lines of communication open among FEMA and its stakeholders.

The Council identified the need for the continuation of communication with FEMA and with each other about NFIP-related issues.

1. Through FEMA's Office of the General Counsel, seek reauthorization of the Technical Mapping Advisory Council. The Council would then recommend updating the Charter to reflect accomplishments of the past five years and would also recommend modifying the membership of the Council to include representatives from the U.S. Army Corps of Engineers (USACE), National Association of Flood and Stormwater Management Agencies (NAFSMA), the Flood Insurance Servicing Companies Association of America, Inc. (FISCAA), and the National Emergency Management Association (NEMA).
2. Establish a chartered Advisory committee, under the Federal Advisory Committee Act, to continue the work of the Council and to keep the lines of communication open. Under this scenario, the Council would also recommend updating the Charter of the newly formed committee and modifying its membership to include, at a minimum, representatives from

those organizations named in number 1, in addition to the organizations currently represented on the Council.

3. Form a subcommittee under the Federal Geographic Data Committee to specifically address stakeholder issues related to the NFIP and coordinate federal, state, and local flood mapping issues.
4. Convene an annual forum to maintain an informal relationship between a group of National Flood Insurance Program (NFIP) stakeholders and FEMA. Although this group would not serve in an official capacity, it could provide a way to keep the lines of communication open.

During discussion of these options, the Council members identified the need for the continuation of communication with FEMA and with each other about NFIP-related issues. In response to this need, the Council recommends that the Director of FEMA convene an annual forum of invited stakeholders, including representatives from organizations currently included on the Council, as well as representatives from USACE, NAFSMA, FISCAA, and NEMA. This annual roundtable discussion would provide a forum for FEMA to report on the progress of the MMP and recommendations made by the Council. Stakeholders could also discuss their viewpoints on the further improvement, distribution, and utilization of FIRMs.

Closing Perspectives

The Council includes eleven representatives of professional, financial, and governmental organizations, including a representative of FEMA. The Council was supported by Technical Advisors who represented other key stakeholders. The Closing Perspectives of each of these representatives is included at the end of this report. Although there are differences in viewpoints and recommendations for the future among these perspectives, four themes were consistent. Council members

The Council believes there are still significant issues that must be addressed.

agreed that achieving these four objectives is critical to the improvement of the nation's inventory of floodplain maps.

1. Additional resources for floodplain maps. FEMA and its federal partners must build constituent support by increased reliance on outsourcing. Efforts to facilitate mapping contracts will focus attention on developing private sector capabilities, improving government contracting processes, accelerating acquisition of floodplain mapping data, and increasing Congressional awareness.

Funding from all potential sources must be increased to prepare more and better floodplain mapping. The funding for flood hazard mapping has fallen on the people who purchase flood insurance for too long. In addition to a significant increase in the federal investment in floodplain mapping, state and local

governments must also take the responsibility for finding resources for the preparation, maintenance, and revision of maps under their jurisdiction. Better mapping requires more than just an investment of dollars; it must also include sharing of technical expertise and data. In addition, the federal government should provide appropriate incentives or consequences to encourage individuals and the private sector to take appropriate actions and decisions to improve maps, thereby further reducing flood losses. A small investment in mapping can result in huge savings in flood-related disaster assistance in the future.

A small investment in mapping can result in huge savings in flood-related disaster assistance in the future.

2. Building interest and support for modernizing the mapping program. FEMA must involve the general public and all players in the land use planning and land development process in floodplain management to raise awareness of the dangers of unwise land use and construction. An educated public and educated professionals better understand the need for regulations and restrictions. They will recognize the hazards and severity of infrequently encountered but always possible flooding events. In all communities, not just those participating in *Project Impact*, citizens, builders, developers, and local officials must understand the relationship of floodplain management to land use planning and decisions and participate in the move toward building disaster-resistant, sustainable communities. When citizens, community officials, and state and federal elected representatives fully comprehend the far-reaching effects of sound floodplain management, the need to better identify flooding hazards will be clear.

3. Building partnerships to accomplish NFIP objectives. Flooding is not only an insurance concern. Sound floodplain management is important to other activities such as land use planning, economic development, public safety, habitat protection, cultural preservation, and many other locally and regionally driven activities. With that broad base of effects, the groups and organizations most interested in each of them should be brought into the improved management of floodplains. Research facilities, environmental and historic protection organizations, community activists, state and local governments, and private interest groups should all be called on to partner in the improvement of floodplain studies and mapping. Continuation and expansion of the Cooperating Technical Community (CTC) initiative will foster and support these partnerships.

4. Creation of a fully digital environment for floodplain mapping. The environment within which floodplain maps and accompanying reports are prepared, distributed, and interpreted must be changed from a paper environment to a digital one. Currently, most FIRMs are distributed and interpreted on paper. Much of the source material for these maps was prepared on paper.

FEMA should make its maps and data digital without delay.

Revisions of these maps take place on paper. The entire process should take place digitally. Creating such a digital environment will clearly require increased funding for FEMA. However, the technologies exist now, and, because the process will lower

data maintenance, storage, and distribution costs, FEMA should make its flood maps and data digital without delay.

Council Members' Closing Perspectives

Mark Riebau, Council Chair, American Society of Civil Engineers (ASCE)

The Council and its Technical Advisors represent a broad cross-section of agencies and organizations, all of whom were very knowledgeable about the NFIP. Some members brought technical knowledge regarding the production of FIRMs; others brought knowledge and experience from the lending and insurance perspective. Each member, however, contributed to the education of the other members and caused the Council and the organizations and agencies each represented to have a greater appreciation of the importance that accurate, current FIRMs have in reducing the escalating costs of flood-related disasters.

It is this meeting of the minds of a diverse group of people that I believe is the most important product of the Technical Mapping Advisory Council. It is now up to all of those organizations and agencies to voice their support for the funding necessary at all levels of government to modernize flood hazard maps and mapping processes.

FEMA needs funding to implement its MMP. The USGS needs funding to complete the job of producing DOQs for the nation, the new base map standard, and will need continued funding to maintain and update DOQs at reasonable intervals. The USGS also has other key responsibilities that support FEMA in its flood hazard mapping work, including establishing and maintaining a nationwide system of streamflow-gaging stations, flood frequency analyses based on the streamflow-gaging stations, and developing digital elevation models for the nation. All of these activities are critical to FEMA's flood hazard mapping program, but they also support a myriad of other users at the local, state, and federal levels. The National Geodetic Survey needs the authorization and funding to establish a National Height System (NHS) based on the Global Positioning System (GPS) and continued funding to sustain it. This NHS will be essential for users of flood hazard maps.

States need to follow the lead of North Carolina and contribute in a meaningful way to improving flood hazard maps for their communities and citizens.

Likewise, local and regional governments need to emulate the leadership of the Louisville/Jefferson County Metropolitan Sewer District, Washington County, Minnesota, and the Denver Urban Drainage and Flood Control District and become active partners with FEMA in the flood hazard mapping process through the Cooperating Technical Communities initiative.

As a nation we have the ability and the capability to produce better maps of our flood hazard areas. We also have a responsibility, particularly to future generations, to help guide development so that it is less prone to flooding and other natural disasters. What we need is the will and the foresight to accomplish and achieve this goal.

Michael Buckley, Federal Emergency Management Agency (FEMA)

As the only official FEMA representative on the Technical Mapping Advisory Council, I am in a unique position to reflect on what the Council has meant to FEMA. The importance of having all of our stakeholders at the table in helping to guide the future direction of our nation's flood hazard mapping program cannot be overstated. The job ahead in fully updating and modernizing the flood maps is a daunting challenge made easier by the support and dedication of the members of the Council and its Technical Advisors. The unselfish commitment these people made in attending the meetings, debating the issues, and devoting so much personal time thinking, writing, and rewriting is a testament to how critically important they and the organizations they represent consider accurate and accessible flood hazard data and maps are to reducing future losses and the sustainability of our communities. It is also noteworthy that nine of the eleven members remained to represent their organizations for the five-year duration of the Council.

The members of the Council are diverse in their interests and personal opinions. However, the process was good and Mark Riebau, the Council Chair, deserves special acknowledgement for his leadership and perseverance on difficult issues. With few exceptions, the consensus process prevailed, obviating the need to rely on voting.

With all that has been accomplished over the past five years, there is still much more to do. Funding for the map modernization initiative will be difficult, but certain programmatic issues remain to be resolved, and new ones will arise as well. FEMA is committed to seeking input from the organizations represented on the Council and other stakeholders as we tackle these issues. Also, I expect that there will be Congressional hearings on the flood mapping program, if not this year then next year. I look forward to these hearings and hope that the Council will be called on to testify.

In closing, I would be remiss if I did not acknowledge the support from Director Witt and Associate Director Mike Armstrong for the mapping program initiative.

Their leadership and willingness to fight hard on difficult budget issues has been essential. Finally, two members of my staff deserve special recognition for their hard work in making sure that the Council functioned in an effective and efficient manner: Sally Magee for her perseverance in resolving difficult scheduling, funding, and contractor problems and Matt Miller for his keen insight into the numerous complex issues addressed by the Council and his ability to moderate divergent viewpoints.

Peggy Bowker, National Flood Determination Association (NFDA)

The National Flood Determination Association (NFDA) is the youngest organization that is represented on the Council. We represent the professionals who provide flood zone determinations to lenders, the insurance industry, and others who require information regarding the flood-prone status of properties. Our members review over 60,000 properties every working day and field about 2,400 questions daily regarding the maps and the NFIP. Our profession revolves around the NFIP and reading the maps that are produced to identify special flood hazard areas.

It has been a privilege to represent the NFDA on the Council and to work with a group of people who are also intimately involved with the NFIP. All of us view the importance of Flood Insurance Rate Maps and the National Flood Insurance Program from differing perspectives, and yet members of each of our organizations and their input are essential to the success of the program.

NFDA members assist the lenders in their role mandated by the NFIP to be assured that purchasers of property located within Special Flood Hazard Areas obtain flood insurance. The accuracy of the maps and their base mapping is important to the credibility of any requirements placed upon property owners. Currently determinations in some areas must be made from scaling from street intersections, section lines, or other reference marks that are printed on the maps from various sources. Letters of Map Change also affect determinations of a property's status, and their availability to determination providers is crucial.

Progress toward implementing the Council's recommendations concerning base mapping, Letters of Map Change, and archiving of data will serve the NFIP well and will ensure that needed information is more readily available. NFDA looks forward to continuing to work with FEMA and the other groups represented on the Council as FEMA attempts to implement the goals that have been set for the MMP. We believe that our daily use of the maps and the extensive digital information, which many of our member companies have developed, provides a needed insight into possible ways to improve the currently available information.

The NFDA compliments FEMA on the many changes that it has managed to implement within the agency's limited budget. We are committed to working

with the agency to further the work that has begun during the term of the Council. The inclusion of the NFDA in forums and focus groups has opened a long sought dialog and will provide a vehicle for us to actively participate in the modernization and improvement of the maps and the program. We realize that the flood mapping program will continue to evolve as mapping technology and telecommunication continue to improve. We look forward to offering our expertise in many areas and to further discussions regarding the possible use of information already developed by our members as a cost-effective means of achieving some of the MMP goals more rapidly.

I am proud of the work that has been done by the Council and the devotion to our charge exhibited by all of our members and their diligence in performing appointed tasks for such an extended period. I believe that we have been successful in providing sound recommendations, which could be implemented immediately, and in helping FEMA draft a well-considered path into the future.

Charles Challstrom, National Oceanic and Atmospheric Administration (NOAA)

Participation with the Council has reinforced the importance of the National Spatial Reference System, with particular emphasis on the opportunities to support expanded use of the Global Positioning System (GPS) for improved height determination. The Council has helped to identify advancements in positioning and remote sensing that assist with the technology side of map modernization, but the more daunting task of funding the information infrastructure remains.

While focusing primarily on the technical issues associated with FEMA's mapping products, the Council has also recognized the importance of building constituent interest and public support for modernizing the mapping program. As with other members of the Council, NOAA remains committed to assisting FEMA with building partnerships among various federal agencies, state and local governments, and the private sector to implement technology applications for more accurate digital elevation models and floodplain analyses, automated hydraulic modeling, and efficient determinations of flood risks and insurance needs. These partnerships and visible demonstrations of mapping progress in communities across the nation will lead to increased public confidence and Congressional support.

Kari Craun, U.S. Geological Survey (USGS)

From the USGS perspective, the most important accomplishment of the Technical Mapping Advisory Council to FEMA has been to bring NFIP stakeholders together from all levels of government and the private sector. Council meetings have provided an open forum for members, Advisors, and the general public to participate in a process designed to improve flood hazard mapping for the benefit of all concerned.

Another very important accomplishment during the tenure of the Council has been the initiation of new partnerships between FEMA and other federal agencies and state and local governments. Specifically related to the USGS, FEMA has begun to participate in the National Digital Orthophoto Program, an interagency partnership designed to pool resources for the development of orthorectified images nationwide. FEMA has also begun to work with USGS and other federal partners to combine requirements for the production of high-accuracy, high-resolution digital elevation data. In addition to these new partnerships, FEMA continues to collaborate with and support the work of USGS hydrologists in hydrologic modeling research and refinement and in the maintenance and improvement of the national streamgaging network.

Finally, a critical accomplishment of the Council and FEMA in the past five years has been the emphasis on adoption of minimum base-map standards and the Federal Geographic Data Committee (FGDC) metadata standard. The use of these standards is key to enabling appropriate, widespread use of FIRMs and related digital products.

In summary, USGS applauds the work of the Council and looks forward to continuing a productive working relationship with FEMA and other NFIP stakeholders in the future.

Kevin Hickey, Fannie Mae

I was nominated by my employer, Fannie Mae, to represent our company on the Council. My role on the Council was to share the secondary mortgage market's perspective in understanding the important role that accurate current maps of our nation's floodplains play in the effort to reduce the rate of the increase in flood damages. I now have a greater understanding of the challenges FEMA faces when trying to provide new maps and revise outdated maps and how these challenges apply to the mortgage lending community.

Fannie Mae requires that any mortgage secured by a property located in a Special Flood Hazard Area (SFHA) have adequate flood insurance when the mortgage is originated. The coverage must be continuously maintained for as long as the mortgage is outstanding. We also require flood insurance coverage for a mortgage when the remapping of an area results in the security property being in a SFHA (even though no flood insurance would have been required when the mortgage was originated).

This means that mortgage loan servicers must actively monitor all flood map and community status changes and take appropriate action as changes occur. Servicers may choose to monitor flood zone remappings themselves or use a flood zone determination company to perform the monitoring. It is also important for servicers that acquire Fannie Mae-owned or securitized mortgages through a transfer of servicing to have in place appropriate procedures for performing

due diligence with respect to flood insurance coverage and the monitoring of changes in flood maps and community designations.

My role on the Council has given me a greater understanding of the challenges faced by our lenders, servicers, and third-party service providers in their efforts to comply with our requirements and those of the NFIP. The various issues presented by the representatives of the Council have given me a greater perspective on how to address future mortgage standards in this area of mortgage lending compliance. As the Council ends its term, Fannie Mae will continue to work with FEMA in any future, ongoing Council-type functions in an advisory role. I would also like to personally thank the FEMA staff and all of the Council members and Technical Advisors for all of their assistance and guidance provided to me during my tenure on the Council.

Don Hull, Association of American State Geologists (AASG)

The Flood Insurance Rate Maps provide a principal tool for informing and educating the public about floods. Lenders, insurers, builders, homebuyers, floodplain managers, and others use these maps for long-term decisions. For this reason the maps should show not only conventional riverine and coastal flood hazards but also other natural hazards that can cause or exacerbate human and economic losses due to flooding. For example, the impacts of coastal flooding can be a direct outgrowth of coastal erosion, landslides, and earthquakes. Similarly, riverine flooding can result from landslides, debris flows, erosion, ice dams, and other impacts to the stream channel. Thus, the future extent of flooding can be more accurately portrayed to the map user if the collateral hazards are identified and described on the map and related reports. The conversion of mapping to a digital format offers a special opportunity to broaden the utility and accuracy of FIRMs by adding information on a variety of geologic and meteorological hazards that are related to flooding, thereby lessening future insurance losses, saving lives, and protecting property. The Council's recommendations on multiple hazards, riverine erosion, and coastal erosion, when implemented, will result in a better portrayal of the complex interrelationship of various natural processes that contribute to or cause flooding.

Brian Hyde, Association of State Floodplain Managers (ASFPM)

ASFPM was created, in large part, to provide a unified voice for state floodplain managers regarding the quality and accuracy of floodplain maps. Improving the maps has always been a major goal of ASFPM. The Association has been honored to be involved in the work of the Technical Mapping Advisory Council and pleased by the progress that the work of the Council and FEMA has brought about. ASFPM has noted the better communication and improved willingness to work together between FEMA and the data users/providers. The stage has now been set for funding from Congress to translate the proposals of the MMP into real changes in the way FIRMs and FISs are prepared, distributed, and used.

There are some specific areas for future efforts. First, the work in partnerships, cooperation, and communication must continue. States, local governments, regional agencies, universities, and private interests can and must do far more to accomplish the necessary mapping changes. One minor example is the current inability of CTC communities to perform LOMR review, approval, and physical mapping. FEMA's present fiscal practices do not allow CTC communities to receive LOMR fees to pay for the cost of LOMR work. Such obstacles must be overcome in order to make partnerships meaningful.

Second, the conversion from a paper map culture to a digital information culture must be implemented. Most digital FIRMs (DFIRMs) available today are paper maps that have gone through some digital treatment only to be converted back to paper maps. A cooperative effort among FEMA, other federal agencies, state and local governments, and private entities must be undertaken to accelerate the arrival of truly digital floodplain information. All phases (initial preparation, distribution, revision/updating, and integration of floodplain information with other forms of geographic information) must be accomplished digitally. Map maintenance activities such as updating streets and corporate limits, incorporating LOMRs that have already been approved, and correcting or supplementing survey control data should be easy to accomplish digitally. The digital preparation and incorporation of new hydraulic information (engineering revisions) should be much easier than the current paper process. The details of how this will happen will be critical to success.

An example of the need for truly digital maps occurred in September 2000 in a rapidly growing state with the incorporation of a new municipality with a population of more than 100,000 people. Six DFIRM panels are affected, and eleven streams with mapped floodplains are involved. Because FEMA's stated position is that "we will not issue LOMRs/PMRs (Physical Map Revisions) for only changes in corporate limits," that new municipality will not be shown on the countywide DFIRM until other changes (i.e., a restudy or numerous LOMRs) occur. On a truly digital FIRM, the procedure for making such a cartographic change should be straightforward. A process should be in place to encourage the affected community or the state to acquire an electronic version of the DFIRM, make such a drafting change, and then submit CD-ROMs to FEMA. The digital technology is available to accomplish such tasks, and most parties concerned are ready for the change.

Third, ASFPM is committed to the objective of no adverse impact due to development activities in the floodplain. Three mapping changes can further this goal: 1) converting from optional preparation of floodplain information based on future-conditions hydrology to mandatory preparation of such information, 2) replacing a 1-foot rise floodway with a zero-rise floodway, and 3) adopting an appropriate freeboard to address sedimentation and debris accumulation due to future watershed development and implementation of appropriate debris blockage assumptions at bridges and culverts.

Finally, the relationship of FEMA maps to all aspects of floodplain management, not just the NFIP, must be kept in mind. Some FIRMs serve other purposes besides determining whether flood insurance is required or not. An appropriate question to ask is “What are all the means by which these maps, if suitably improved, can lessen the risk of future flood losses?” Compatibility, in terms of technical content, technical format, and presentation style, with the needs of those pursuing public education, structural flood protection, non-structural flood mitigation, and river corridor and coastal environment enhancement is a must. These maps can and should serve most of those who want to use the information they contain, no matter what the specific purpose.

ASFPM, and specifically the Mapping and Engineering Standards Committee, will pursue these concerns with others. We trust that FEMA will create a mechanism to continue the valuable and necessary work of the Technical Mapping Advisory Council.

Wendy Lathrop, American Congress on Surveying and Mapping (ACSM)

In looking back through the five years of the Council’s existence, the greatest accomplishments are those that have affected more than any single constituency of the Council’s membership, so that many stakeholders in the NFIP have benefited as a result. The most outstanding of these changes have been:

- Increased communication between FEMA decisionmakers and the technical users and providers of data;
- Increased trust on the part of these technical people, based on perceived willingness to acknowledge program problems and initiate changes to resolve them;
- Resulting real changes that have improved data products and services (e.g., better form distribution, prototypes for new map base, such as DOQ); and
- Increased willingness of technical users to participate in NFIP improvement.

But, the progress since the inception of the Technical Mapping Advisory Council must not end with the legislated sunset of this Advisory group. For past momentum to continue, for new initiatives to be raised, and for improved protection of our citizenry from the hazards of flooding, there is more the future must bring:

- Continuation of the dialog between all stakeholders and FEMA on all issues surrounding Flood Insurance Rate Maps.
- Documentation must continue to be available for old and new map products, to ensure accurate reconstruction of the original datum and to ensure the retention of quality in all new work based on old data.

- Resolution of discrepancies in NFIP regulations, such as definitions (e.g., habitable area or crawl space, lowest reference floor), or when certain variances from NFIP regulations are allowed.
- Consistent enforcement of NFIP regulations in all regions at all levels of government. This includes ensuring that community governments comply with federal NFIP regulations and citizens comply with local and federal rules. Communities that do not uphold their own ordinances or comply with federal regulations should suffer sanctions, since they do not act in the best interest of either local or regional concerns.

ACSM and its members hope to continue assisting FEMA to improve NFIP mapping and regulatory enforcement, test new products, launch pilot programs, and educate data providers and users. We intend to remain active catalysts in the modernization of the flood mapping program and floodplain management in general and to continue alliances discovered through participation in the Council to achieve these goals.

Albert LeQuang, Freddie Mac

Participating in the Technical Mapping Advisory Council allowed me to see, for the first time, the tremendous amount of work performed, the expertise engaged, and the diverse forces at play before a flood map comes into the public domain. It also reminds me of the heavy responsibility that FEMA carries in ensuring the accuracy of this map and assuring users of its reliability. After all, the mortgage lender (whose industry is in great part influenced by the corporation that I represent on the Council):

- Only wants to know whether the dwelling, which is part of the security for the mortgage, is in a Special Flood Hazard Area as shown on the flood map;
- Does not concern itself with what went into the making of the flood map or what must be done to optimize such map; and
- Totally relies on FEMA for the flood map's accuracy and reliability.

In today's marketplace, the mortgage lender is even further removed from flood maps as the process of plotting properties' locations on such maps is contracted out to specialized flood zone determination companies.

From such a perspective, I can see why FEMA must be given the resources necessary to accomplish its mission of ensuring that the nation's flood hazards are and remain accurately identified.

Michael Moye, Bank of America

The resulting body of the Council's work as shown in each Annual Report and this Final Report validates the reasonableness of establishing such groups. Following are some observations and comments followed by suggestions for the future.

Observations and Comments. Council Members and Technical Advisors represented diverse groups, each with a unique perspective on the mapping process. The participants ranged from those who know intimately the complex process for identifying and mapping flood risk to those who interpret and/or rely on the accurate graphic depiction of that risk.

The Council recognized the need for additional Advisors from groups not initially included as members under the Charter. Representatives from such groups were enlisted, and the Council's work benefited from their participation.

The Council and FEMA quickly grew to trust and respect each other, making discussion and deliberation open, honest, and focused on solutions rather than personal agendas. Individual members and Advisors came to appreciate other perspectives. New working alliances have developed as a result of the Council's work. New operating networks and channels of information and exchange exist that might not otherwise exist without the Council.

In these five years, the Council and FEMA have been able to lay a sound foundation for the betterment of map creation and maintenance.

Suggestions for the Future. While the Council and FEMA have been able to develop a general agreement on much of what must be done, there remains some disagreement and cloud over how it must be done. More collaboration on the process of risk identification, map generation, and map maintenance needs to be carried forward.

FEMA, with the aid of those groups represented on the Council and among the Advisors, needs to continue efforts to find a proper balance for work effort and financial responsibility. They need to involve government at the federal, state, and local levels to aid in finding that balance.

Some framework for continued dialog with those entities represented on the Council along with its Advisors needs to be established to maintain the thread of benefit that now exists.

Technical Advisors' Closing Perspectives

Bill DeGroot, National Association of Flood and Stormwater Management Agencies (NAFSMA)

NAFSMA appreciates the Council's invitation to provide a Technical Advisor to the Council to represent the state, regional, and local governments that use the Flood Insurance Rate Maps (FIRMs) on a daily basis.

The work of the Council, along with the preparation of the Map Modernization Plan by FEMA staff, has set the stage for a dramatic improvement in the preparation, distribution, updating, and use of FIRMs. However, these dramatic improvements will be delayed or denied unless the federal government, and perhaps other users, provides the necessary funding to make them happen. Funding of the National Flood Insurance Program should not continue to fall on the shoulders of the flood insurance policyholders alone. Too many others benefit from the availability of good maps.

We encourage FEMA to continue and expand the creation of partnerships, particularly the Cooperating Technical Communities initiative. As the Council has seen, implementation of a comprehensive floodplain management effort goes far beyond the 100-year floodplain. It involves the entire watershed and requires the active involvement of the local jurisdictions to achieve the maximum impact. Partnerships will improve the quality of the nation's floodplain management efforts.

Dennis W. Lawlor, National Emergency Management Association (NEMA)

The National Emergency Management Agency (NEMA) appreciates the invitation and opportunity to provide a Technical Advisor to the Technical Mapping Advisory Council.

Accurate floodplain maps are essential not only for emergency response but also for planning the reduction of future emergencies. Floods have caused a greater loss of life and property and have disrupted more families and communities in the United States than all other natural hazards combined. It is essential to mitigate future flood losses, and the starting point is the Council's recommendations.

One of NEMA's long-term goals is to substantially increase public awareness of natural hazard risk and to significantly reduce the risk of loss of life, injuries, economic costs, and the disruption of families and communities caused by flooding. With FEMA's help and the implementation of the Council's recommendations along with the Map Modernization Plan, this long-term goal can be and will be realized.

Larry W. Palmer, Flood Insurance Servicing Companies Association of America, Inc. (FISCAA)

The Flood Insurance Servicing Companies Association of America, Inc. (FISCAA) appreciates the honor of participating as a Technical Advisor to the Technical Mapping Advisory Council and the opportunity to learn from and contribute to this exceptional Council, established through the National Flood Insurance Reform Act of 1994.

FISCAA was established in 1992 as a tax-exempt corporation dedicated to protecting and enhancing the flood insurance industry's ability to provide the public with coverages, services, and information relative to the National Flood Insurance Program (NFIP). The significance of flood maps in general, particularly the modernization of those maps for our industry, and the objective of our mission statement as outlined in the first sentence of this paragraph cannot be underestimated. Our membership of Write-Your-Own companies currently represents over 51 percent of the 4.1 million NFIP policies issued throughout our great nation. We rely solely on the accuracy of all FEMA Flood Insurance Rate Maps (FIRMs) and their special flood hazard designations and related elevations to accurately recommend and issue federal flood policies within the underwriting regulations promulgated by the NFIP. Furthermore, the reputations and credibility of our insurance industry, our agents and brokers, city officials, and lenders are collaterally affected by the accuracy of the FIRMs.

The flood maps and related zone determinations in many cases are the primary factors in determining whether or not a particular property requires coverage under the NFIP Act and are the very first step in the policy issuance process that determines the basis for the correct rates and related elevations within the NFIP and validation and enforcement of floodplain management guidelines and mitigation regulations. Millions of homeowners and businesses are directly affected economically in the form of premium payments and, conversely, the program's exposure to the risk and the adequacy of the premium collected relative to the actual risk exposure depicted on FIRMs. Thus, as we believe, if the mapping data are inaccurate or outdated, then we have a major point of failure in the process at the very beginning.

Collectively, our membership is supportive of any effort that will result in flood maps made easier to read and to determine precisely the location of a particular structure relative to a specifically designated flood zone and, if applicable, base flood elevation. To this end, we recognize that until 1994, most FIRMs were developed with measurements and technologies developed over thirty years ago with corresponding inaccuracies. Through our participation on this Council, we have learned of the technological advances that have enhanced the ability to improve map accuracy and predict with equal accuracy future flooding occurrences. Armed with this new technology and more accurate FIRMs, the possibilities are limitless for developing safer communities, structures, and agricultural and recreational areas throughout our country's floodplains in general and riverine and coastal areas in particular. The problem remains as to who will pay for this expensive technology that will modernize the maps and move forward into the twenty-first century. This Council may be the catalyst for this effort.

Edward Pasterick, Federal Insurance Administration (FIA)

The Council has made several recommendations for improvements to NFIP Flood Insurance Rate Maps and the process for their distribution that will have a direct bearing on insurance. Accurate, accessible map information, reflecting the true risk associated with flooding, is critical to the NFIP to achieve its goal of actuarial soundness. Furthermore, public acceptance of the reasonableness and wisdom of NFIP policies to foster flood-safe construction and development decisions and to promote sound decisions on individual financial protection is heavily dependent on providing credible risk information to the public. That is the most important element underlying the Council's recommendations.

During its five-year term the Council has participated in work groups that were formed to address many of those improvements, most of which are reflected as objectives in FEMA's Map Modernization Plan (MMP).

The perspective that each Council member brings from the cross-section of organizations and agencies that are represented will improve cost-effectiveness and promote more responsive policies and procedures for all FIRM users. The recommendations made by the Council through the MMP will certainly improve mapping, but many cannot be implemented without the funds and resources to carry them out.

The work of the Council is very much appreciated. FEMA and all NFIP constituents have benefited from the Council's work, and many have gained a new appreciation of the widespread use and effects of FIRM data. The charge now is to find the means and the most efficient way to follow through and carry out the recommendations made.

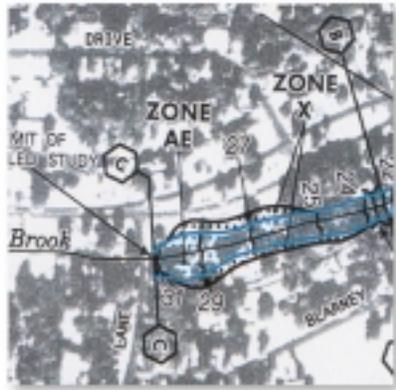
Ken Zwickl, U.S. Army Corps of Engineers (USACE)

The U.S. Army Corps of Engineers has actively supported the National Flood Insurance Program (NFIP) since the program's inception in 1968. In the early stages of the NFIP, the Corps provided technical data from approximately 2,000 Corps Flood Plain Information reports to the NFIP for its use in promoting wise floodplain management practices in participating communities. In addition, over the past 30 years the Corps has performed over 3,000 Flood Insurance Studies for the NFIP on a reimbursable basis.

NFIP mapping finds its way into the everyday business of the Corps as well. During the conduct of flood damage reduction studies, the Corps often uses the flood insurance maps as an initial indicator of potential flooding problems in a community. At the conclusion of a Corps study, the technical data from the Corps study is made available to the community for its use in updating the flood insurance maps, if necessary. It is through the above actions that the Corps and the NFIP have enjoyed an excellent working relationship over the years.

The Corps' participation in FEMA's Technical Mapping Advisory Council as a Technical Advisor was a natural extension of this relationship. The importance of accurate, current flood insurance maps cannot be over-emphasized. The Council has worked hard to first understand the mapping process and then make strong recommendations to FEMA to improve that process. These recommendations served to shape, to direct, and especially to validate the efforts by FEMA under its Map Modernization Plan. Through the Council's efforts, in both making these recommendations and participating in public forums to gather information on the need for mapping reforms, the level of awareness of problems and opportunities in the mapping process has been raised to a significant height. Although the Council's term will expire with this report, the public awareness garnered by its work should ensure that map modernization will continue long after the Council's charge has been completed.

The Council's hard work has led to many changes in the mapping process that will make cost-effective improvements in the accuracy, quality, utility, and distribution of flood insurance maps and products. It has been a pleasure to work beside such dedicated representatives from a broad cross-section of agencies and organizations.



APPENDICES

1.0 Charter

Federal Emergency Management Agency Charter of the Technical Mapping Advisory Council

Establishment

The Director of the Federal Emergency Management Agency (FEMA) hereby establishes the Technical Mapping Advisory Council (hereinafter referred to as the Council), as directed under the National Flood Insurance Reform Act of 1994, P.L. 103-325, Title V, Section 576. The Council is established in accordance with the Federal Advisory Committee Act, 5 U.S.C. App. 2.

Objectives and Duties

1. The Council's objective is to evaluate the production, distribution, and use of Flood Insurance Rate Maps (FIRMs) and other mapping products prepared by FEMA in support of the National Flood Insurance Program (NFIP) and to make recommendations to the Director for the improvement of these products.
2. The Council shall make recommendations to the Director in the following areas:
 - a. cost-effective improvement in the accuracy, quality, utility, and distribution of FIRMs and other mapping products; and
 - b. standards and guidelines for use in preparing and revising FIRMs and other mapping products.
3. The Council must submit an annual report to the Director containing the following:

- a. a description of the Council's activities;
 - b. an evaluation of the status and performance of FEMA's mapping products and activities to revise and update these products; and
 - c. a summary of the Council's recommendations.
4. The Council may hold hearings; receive evidence and assistance from federal, state, or local government agencies or private firms and individuals; and conduct research as necessary to meet its objectives. The Council may draw on the expertise of its members as well as other sources when making recommendations to the Director.
 5. To ensure that the Council's recommendations are consistent to the extent practicable with national digital spatial data collection and management standards, the Council's Chairperson shall consult with the Chairperson of the Federal Geographic Data Committee established under Office of Management and Budget Circular A-16.
 6. The Council functions solely as an Advisory body and will comply fully with the provisions of the Federal Advisory Committee Act.

Membership and Chairperson

1. The Council shall consist of a designee of the Director and 10 additional members appointed by the Director or his designee. Under P.L. 103-325, the membership must include:
 - a. the Under Secretary of Commerce for Oceans and Atmosphere (or his or her designee);
 - b. a member of recognized surveying and mapping professional associations and organizations;
 - c. a member of recognized professional engineering associations and organizations;
 - d. a member of recognized professional associations or organizations representing flood hazard determination firms;
 - e. a representative of the U.S. Geological Survey;
 - f. a representative of state geological survey programs;
 - g. a representative of state national flood insurance coordination offices;
 - h. a representative of a regulated lending institution;
 - i. a representative of the Federal Home Loan Mortgage Corporation (now known as Freddie Mac); and
 - j. a representative of the Federal National Mortgage Association (now known as Fannie Mae).

2. The Director's designee requested nominations for membership from the agencies or organizations listed above. From the submitted nominations, members were selected based on their demonstrated knowledge and competence regarding surveying, cartography, remote sensing, GIS, and the technical aspects of preparing and using FEMA's mapping products. Members were notified of their appointment by letter on November 24, 1995.
3. The members of the Council shall elect one member of the Council to serve as Chairperson.
4. The Chairperson may appoint officers to assist in carrying out the duties of the Council.

Administrative Procedures

1. The Council shall meet no less than twice each year at the request of the Chairperson or a majority of its members.
2. The Council may take action by a vote of the majority of the members.
3. At the request of the Chairperson, the Director may detail, on a nonreimbursable basis, FEMA personnel to assist the Council in carrying out its duties.
4. Council members shall not receive additional compensation for their service on the Council.
5. The annual cost to FEMA of operating the Council is \$100,000.

Duration of the Council

P.L. 103-325 stipulates that the Council terminate its activities after 5 years. The Council will terminate its activities five years after the date when all members of the Council were appointed under Section 576.2(k)(b)(1) indicated above as November 24, 1995.

April 9, 1996

/S/ James L. Witt

2.0 Participants in the Technical Mapping Advisory Council

During the past five years, Council members' activities and deliberations were supplemented by participation of nonvoting Technical Advisors, FEMA staff members, and Map Coordination Contractors. Council meetings were attended by members of the public and cooperating agencies. Technical presentations were invited to further the knowledge of Council members.

2.1 Members

Members are mandated by the authorizing legislation and appointed by the Director or his designee. The membership must include:

- the Under Secretary of Commerce for Oceans and Atmosphere (or his or her designee): **Lewis Lapine** (1995-1996) and **Charles Challstrom** (1996-2000);
- a member of recognized surveying and mapping professional associations and organizations: **Wendy Lathrop**, for the American Congress on Surveying and Mapping;
- a member of recognized professional engineering associations and organizations: **Mark Riebau** for the American Society of Civil Engineers; Mr. Riebau served as chairperson for the duration of the Council;
- a member of recognized professional associations or organizations representing flood hazard determination firms: **Peggy Bowker** for the National Flood Determination Association;
- a representative of the U.S. Geological Survey: **Kari Craun**;
- a representative of state geological survey programs: **Don Hull** for the Association of American State Geologists;
- a representative of state national flood insurance coordination offices: **Brian Hyde** for the Association of State Floodplain Managers;
- a representative of a regulated lending institution: **Michael Moyer** for NationsBank/Bank of America;
- a representative of the Federal Home Loan Mortgage Corporation (now named Freddie Mac): **Albert LeQuang**; and
- a representative of the Federal National Mortgage Association (now named Fannie Mae): **Patrick Sullivan** (1995-1996), **Jeffrey Aust** (1996-1997) and **Kevin Hickey** (1997-2000).

The Director of FEMA appointed **Michael K. Buckley** as the Designated Federal Officer for, and the FEMA representative on, the Council.

2.2 Technical Advisors

- **Bill DeGroot** of the National Association of Flood and Stormwater Management Agencies;
- **Kenneth Zwickl** of the U.S. Army Corps of Engineers;
- **Maureen W. Bryant** and **Larry W. Palmer** of the Flood Insurance Servicing Companies Association of America, Inc.;
- **Edward Pasterick**, **Lynn Sawyer**, and **Robin Williamson** of the Federal Insurance Administration, FEMA; and
- **Brian Dunnigan**, **Randal Strauss**, and **Dennis Lawlor** of the National Emergency Management Association.

2.3 FEMA Staff

Michael Armstrong, Don Bathurst, Don Beaton, Doug Bellomo, Bill Blanton, Paul Bryant, Vince Brown, Mary Colvin, Mark Crowell, Cindy Croxdale, Bill Cumming, Michael Dawson, Vince Fabrizio, Anne Flowers, Lois Forster, John Gambel, Michael Grimm, Gene Gruber, Katie Hayden, Mike Herman, Gil Jamieson, Alan Johnson, Richard Krimm, Raymond Lenaburg, Bill Locke, Sharon Loper, Mary Anne Lyle, Sally Magee, Mike Mahoney, Tom Majusiak, Bel Marquez, Tere Martin, Kathy Miller, Matt Miller, Karl Mohr, Virginia Motoyama, Mary Jean Pajak, Robert Reynolds, Jack Quarles, Michael Robinson, Jay Scruggs, Priscilla Scruggs, Fred Sharrocks, Sam Smith, Lena Thompson, Mary Jo Vrem.

2.4 Contractor Staff

- **Logistics support contractors:** Melba Gandy, David Hill, Janet Meleney, Hazel Rathbun.
- **Dewberry & Davis:** Tony Hake, Tim McCormick, Patty McDermott, Norman Miller, Zekrollah Momeni, Larry Olinger, Jennifer Shrieves, Jerry Sparks, Jeff Sparrow.
- **Michael Baker, Jr.:** Jeff Booth, Meredith Francoise, Joe Linden, Monther Madanat, Jim Murphy, Mike Pavlides, Beatriz Perez, Massoud Rezakhani, Albert Romano, Janice Roper, Tom Smith, Al Tavacoli, Jeff Tornatore, David Ward, Dick Wild.
- **PBS&J:** Vincent DiCamillo, Paul Rooney.
- **Zimmerman Associates Inc.:** Mary Blevins, Donna Fleming, Brenda Walguarnery.

2.5 Other Presenters and Visitors

Virginia Albrecht, Foundation for Environmental and Economic Progress
Mike Aslaksen, NOAA
Bill Baar
Jon Bailey, NOAA
Brian Belcher, FMSM Engineers
John Beyke, Louisville/Jefferson Co. Metropolitan Sewer District and NAFSMA
Steve Bickel, FMSM Engineers
Nancy Blyler, USACE
Jeff Booth, Transamerica Flood Hazard Certification
John Bossler, Ohio State University
Curt Bynum, LOGIC
John Caldron
Edward Carlson, NOAA
Joe Chapman, Hayes, Seay, Mattern & Mattern
Page Cockrell, ACSM
Tom Connolly, USGS
George Cotton, Earth Surface Systems, Inc.
Ted DeBaeno, Owen and White, Inc.
Scott Edelman, Hayes, Seay, Mattern & Mattern
John Fisher, Hayes, Seay, Mattern & Mattern
Verlin Fisher, EagleScan
Bill Frye, Special Data Institute
Susan Gilson, NAFSMA
Greg Goldstein, National Multi-Hazard Council and National Apartment Assoc.
Joe Gramann, NOAA
Derek Guthrie, Louisville/Jefferson Co. Metropolitan Sewer District
Ahmad Habibian, ASCE
Mark Haskins, Illinois Dept. of Natural Resources
Lisa Holland, ASFP
Merrie Inderfurth, NFDA
Scott Jerdan, NOAA
Angie Karel, Oregon Dept. of Geology and Mineral Industries
Brad Kearse, NOAA
Kija Kim, Harvard Design and Mapping
David Knowles, ACSM
John Kohl, ACSM
Don Kostecki, NEMA
Fred Lamutt, Earth Surface Systems, Inc.
Arnold Lanckton, Synectics Corp.
Larry Larson, ASFP
James Latchaw, FMSM Engineers
Alan Lullof, Wisconsin Dept. of Natural Resources
Robert Mason, USGS
May Maniam, Fannie Mae
Ed McKay, NOAA
Steve McKinley, FMSM Engineers
Dennis Milbert, NOAA
John Moeller, DOI/FGDC
A.J. Myers, ACSM
Ken Osborn, USGS
Bruce Parker, NOAA
Brian Parsons, ASCE
Howard Pike, NYSDEC
Roger Platt, National Realty Committee
Russell Riggs, National Association of Realtors
Milo Robinson, DOI/FGDC
Don Seaborn, National Association of Home Builders
Becky Shumaker, NOAA
Cheryl Small, NFDA
Bob Smith, Louisville/Jefferson Co. Metropolitan Sewer District
Curt Smith, NOAA
Bill Stein, National Imagery and Mapping Agency
Frank Thomas
Gus Tjoumas, FERC
Grady Tuell, NOAA
Steven Vogel, NOAA
Charles Walter (facilitator)
Bob Watson, Wisconsin Dept. of Natural Resources
Carey Wilson
Tom York, USGS
Dave Zilkoski, NOAA
10 members of the public

3.0 Technical Mapping Advisory Council Recommendations

1996 Technical Mapping Advisory Council Recommendations

1. **Retention of Maps and Map Information.** Establish an archival system for maintaining in perpetuity, for historic and legal purposes, all Flood Insurance Rate Maps (FIRMs) and supporting technical data.
2. **Distribution Processes.** Distribute Letters of Map Change (LOMCs) with each map ordered; individuals or companies that subscribe to automatic updates should automatically receive copies of pertinent LOMCs.
3. **Forms.** Distribute, via the Internet, certification forms required for map revision requests.
4. **H.R. 3340.** Develop a position on legislation that would delegate authority to issue LOMCs to entities other than FEMA.
5. **Scribing.** Implement newer technologies than the scribing method for the production and dissemination of FIRMs.

1997 Technical Mapping Advisory Council Recommendations

1. **Flood Insurance Studies (FISs).** Improve the FIS process by shortening the Study Contractor (SC) process; permitting multi-year contracts to SCs; ensuring agreement on base map among SC, Map Coordination Contractor (MCC), the state, FEMA, and the community earlier in the process; and providing for intermediate reviews of mapping elements.
2. **Base Maps.** Improve base maps and review and update existing standards, in consultation with the Federal Geographic Data Committee (FGDC). Ensure strict adherence to the standards.
3. **Base Mapping Partnerships.** Pursue base mapping partnerships with other public, private, and nonprofit entities, such as the Census Bureau; U.S. Geological Survey (USGS); and state, local, and regional agencies to achieve cost efficiencies and exchange technical expertise.
4. **Digital Flood Insurance Rate Map (DFIRM).** Digitally prepare, produce, and make available all new map products resulting from studies or restudies and physical map revisions.
5. **Community Involvement.** Hold community meetings before, during, and after preparation of a new map product, such as a map digitized for the first time or one being converted to a countywide product, to enable community and state input to and participation in mapping issues and activities.

1998 Technical Mapping Advisory Council Recommendations

- 1. Map Availability and Accuracy.** Implement programmatic changes to improve accuracy, reliability, and availability of digital and graphic map data.
- 2. Minimum Base Map Standards.** Revise and ensure adherence to minimum base-map standards, consistent with FGDC standards.
- 3. Mapping Needs Assessment Process.** Continue interaction with other entities; share and publicize preliminary results. Obtain approval from the Office of Management and Budget to collect needed data.
- 4. Public Awareness.** Devote education efforts to increasing public awareness of the real possibility of flooding beyond the Special Flood Hazard Area (SFHA) in any given year.
- 5. Stream Gages.** Preserve and maintain existing stream gages and increase density of the streamgaging system. Consider incorporating rapid telemetry of gage data into existing and future stations.
- 6. Maintenance of Flood-Control Projects.** Work with U.S. Army Corps of Engineers (USACE) to review permitting process under Section 404 of the Clean Water Act and to develop 404 permit regulations that exempt maintenance of FEMA-credited, flood-control projects.
- 7. Collaboration in Flood Hazard Mapping.** Be more proactive in involving communities and state organizations in the flood mapping process from its inception through completion.
- 8. Post-Disaster Verification of Flood Hazard Data.** Allocate funds specifically for post-disaster verification activities.

1999 Technical Mapping Advisory Council Recommendations

- 1. Future-Conditions Hydrology.** Support and encourage the use of future land-use conditions in determining the hydrology for floodplain delineations.
- 2. Unnumbered A-Zones (No Base Flood Elevations).** Strive to improve or eliminate all Unnumbered A-Zones without Base Flood Elevation (BFE) data.
- 3. Alluvial Fans.** Encourage formal adoption of the *Guidelines for Determining Flood Hazards on Alluvial Fans* by states, local governments, and professionals who map alluvial fans; relate the maps to regulations and to insurance requirements; and initiate a cooperative public information and education program.
- 4. Multiple Hazards Affecting Flood Risks.** Include multiple hazards that pose flood risks that can cause loss of life and property in DFIRM products and continue participation in the Open GIS Consortium to

provide links to other sites containing hazard data affecting flood risks for retrieval by users.

5. **Distribution of Data:** Archiving, Map Availability, and Accuracy. Set up a retrieval system for archived data both in FEMA's possession and housed elsewhere, including an index for location of historic FIRMs, LOMCs, and technical backup data for flood studies.

2000 Technical Mapping Advisory Council Recommendations

1. **Public Awareness.** Fund a study leading to recommendations for effective nomenclature to be used in referring to flood potential and severity. After a Presidential Major Disaster Declaration, use a portion of available funds for documentation, information, and public recognition of those floods.
2. **Partnerships to Implement the Map Modernization Plan.** Continue to develop and support partnerships with other federal agencies, states, local and regional governments, citizens, and other organizations in the development, updating, and revision of FIRMs.
3. **Unnumbered A-Zones.** Collaborate with professional organizations representing surveyors and engineers to ensure quality and competence in interpretation of Unnumbered A-Zones and BFE determinations through an educational and training process. Ensure that all future FISs for communities where Unnumbered A-Zones will be newly designated or revised are fully documented to include information about topography, hydrology, and hydraulics.
4. **Unmapped Flood Hazard Areas.** Collaborate with states and utilize MNUSS to help determine priorities for unmapped areas and communities.
5. **Coastal Erosion.** In collaboration with federal and state agencies, develop and distribute standards on coastal erosion rate mapping techniques to ensure credibility of erosion maps and collect coastal erosion rate information for all new or restudied FIRMs on the Atlantic, Gulf of Mexico, Pacific, and Great Lakes coasts.
6. **Riverine Erosion.** In cooperation with other federal agencies, state and local governments, private entities, and interested universities, promote the findings of the *Riverine Erosion Hazard Areas, Mapping Feasibility Study* in addressing riverine erosion risks within the NFIP.
7. **Ice and Debris Jams.** Urge communities and states that have experienced problems with ice jam flooding or debris blockage to adopt and enforce a free board to account for these problems. Provide specific technical guidance for study contractors studying flood risks in communities where ice jam flooding is a concern. Subsequent to all Presidential Major Disaster Declarations, require and fund detailed documentation of blockages experienced during those floods. FIS reports should include discussion about debris blockage history, impact, and locations.

- 8. Flood Insurance Study Reports.** Reissue all out-of-stock FISs in digital format. Reinvent the FIS report by renaming it Flood Hazard Study report, revamping the format, documenting study methods, and preparing the reports in digital format available on the Internet.
- 9. Letters of Map Change.** Develop a process to delegate LOMA and LOMR-F authority to local jurisdictions and qualified professionals and reviews of requests for LOMRs and CLOMRs to CTCs.

GLOSSARY OF ACRONYMS

AASG	Association of American State Geologists
ACSM	American Congress on Surveying and Mapping
ASCE	American Society of Civil Engineers
ASFPM	Association of State Floodplain Managers
BFE	Base Flood Elevation
CBRS	Coastal Barrier Resource System
CLOMR	Conditional Letter of Map Revision
CRS	Community Rating System
CTC	Cooperating Technical Community
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Map
DOQ	Digital Orthophoto Quadrangle
DTM	Digital Terrain Model
ERM	Elevation Reference Mark (or Monument)
Fannie Mae	formerly, Federal National Mortgage Association
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FGDC	Federal Geographic Data Committee
FIA	Federal Insurance Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FISCAA	Flood Insurance Servicing Companies Association of America
Freddie Mac	formerly, Federal Home Loan Mortgage Corporation
GIS	Geographic Information System
GPS	Global Positioning System
IFSAR	Interferometric Synthetic Aperture Radar
LIDAR	Light Detection and Ranging
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
LOMR-F	Letter of Map Revision based on Fill
MCC	Map Coordination Contractor
MICS	Monitoring Information on Contracted Studies
MMP	Map Modernization Plan; published as: <i>Modernizing FEMA's Flood Hazard Mapping</i> , November 1997
MNUSS	Mapping Needs Update Support System
MSC	Map Service Center
NAFSMA	National Association of Flood and Stormwater Management Agencies
NDOP	National Digital Orthophoto Partnership
NEMA	National Emergency Management Association
NFDA	National Flood Determination Association
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act of 1994
NGDC	National Geographic Data Committee
NGS	National Geodetic Survey
NOAA	National Oceanic and Atmospheric Administration
NSDI	National Spatial Data Infrastructure
NSRS	National Spatial Reference System
SC	Study Contractor
SFHA	Special Flood Hazard Area
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey