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FLOOD MAP MODERNIZATION AND THE FUTURE OF THE NATIONAL FLOOD INSURANCE PROGRAM

HEARING

BEFORE THE

SUBCOMMITTEE ON
HOUSING AND COMMUNITY OPPORTUNITY

OF THE

COMMITTEE ON FINANCIAL SERVICES

U.S. HOUSE OF REPRESENTATIVES

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FLOOD MAP MODERNIZATION AND THE FUTURE OF THE NATIONAL FLOOD INSURANCE PROGRAM

Tuesday, July 12, 2005

U.S. HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON HOUSING AND
COMMUNITY OPPORTUNITY,
COMMITTEE ON FINANCIAL SERVICES,
Washington, D.C.

The subcommittee met, pursuant to call, at 10:00 a.m., in Room 2128, Rayburn House Office Building, Hon. Gary G. Miller [vice chairman of the subcommittee] presiding.

Present: Representatives Ney, Miller of California, Jones, Brown-Waite, Pearce, Neugebauer, Fitzpatrick, Davis of Kentucky, Waters, Miller of North Carolina, Scott, and Green

Mr. MILLER OF CALIFORNIA. [Presiding.] This hearing of the Subcommittee on Housing and Community Opportunity will come to order. Today's Subcommittee on Housing and Community Opportunity meets to continue its review and oversight of the National Flood Insurance Program. Specifically, today's hearing will focus on FEMA's program of updating flood maps and how this process affects the flood insurance industry and local communities.

Flood maps identify areas of greatest risk of flooding and provide the foundation for the National Flood Insurance Program. The maps are used by the communities to establish minimum building standards designed to reduce the effects of flooding and also guide FEMA in setting insurance rates. However, nearly 70 percent of the country's flood maps are more than 10 years old, according to FEMA, and reflect outdated data that could affect the ability to accurately identify flood hazard areas. As a result, the agency is in the middle of implementing a $1 billion, 5-year map modernization program to update its flood maps. I am hopeful that today's hearing will give us a better understanding of FEMA strategy and expected benefit of more accurate and accessible flood maps.

Floods have been and continue to be one of the most destructive and costly natural hazards in our Nation. In the aftermath of Hurricane Dennis this past weekend, I fear many communities in the South and Midwest will witness the unrelenting power firsthand, as a tropical depression continues to unload heavy flooding rains in the inlands.

The National Flood Insurance Program is a valuable tool in addressing the losses incurred throughout the country due to flood.

It assures that businesses and families have access to affordable flood insurance that would not be available in the open market.

As part of the passage of the National Flood Insurance Act of 1968, insurance companies generally did not offer coverage for flood insurance disaster because of the high risk involved. Today almost 20,000 communities participate in the National Flood Insurance Program. More than 90 percent of the companies sell and provide flood insurance policies. There are approximately 4.4 million policies covering a total of $620 billion. Last year's Flood Insurance Reform Act achieved significant reforms to the important Federal program.

And I look forward to hearing from all our witnesses today as we discuss FEMA's implementation of its flood mapping policies as well as determining whether new reforms and initiatives are in order to accomplish this work as we accomplish this year.

I now will yield to the Chairman.

Mr. NEY. Thank you. And I want to thank Congressman Miller for chairing this. And I will be in and out. But I will be back because of today's important testimony, and I think that Chairman Miller has summarized this in a right and adequate way, eloquently, what we are about here.

During the past year there have been three major floods in the district I represent in Ohio. All three of these incidents qualified for Federal flood relief and was granted by President Bush in January of this year, but it resulted in historic levels of damage and destruction in several local areas and also in some problems with the dams, especially, for example, Tuscarawas County. Three communities were forced to evacuate in Tuscarawas County and displaced 7,000 people in the snap of a finger.

I was able to, obviously, witness this terrible devastation not only in Tuscarawas, but in Guernsey County and Ross and other counties throughout the district.

I am going to actually hold a hearing, probably in Tuscarawas County, a field hearing next month to continue the subcommittee's oversight of the National Flood Insurance Program. And it is a valuable tool.

And I think we will hear some interesting testimony today about mapping. Mapping is important. It is important for the future. It is important for the flooding areas, and also, frankly, for where you can develop.

I just had a constituent come this week about a development, and they are in total dispute about how correct is the mapping or how incorrect is the mapping. And actually when you look at one of the maps, it shows that they should be able to do development, but it has kind of randomly been designated. There can't be development on that site. And I think those are issues that can be dealt with, frankly, and cleared up in a large part through technology.

So I want to thank both panels today and thank Mr. Miller for support of this issue. Thank you.

[The prepared statement of Hon. Robert W. Ney can be found on page 54 in the appendix.]

Mr. MILLER OF CALIFORNIA. Mr. Pearce from New Mexico.

Mr. PEARCE. Distinguished Chairman, I appreciate this hearing. Early in 2003 when I first arrived at Congress, one of the commu-

nities brought to my attention that they were not able to get development because the floodplain maps that were drawn had been expanded without consideration of many of the factors; for instance, a diversion dam that had been put upstream. The FEMA was very resistant to recalculation, and we are still in an ongoing process. But we will be very interested in listening to the testimony today, and I appreciate you having the hearing.

Mr. MILLER OF CALIFORNIA. Mr. Neugebauer, do you have an opening statement? Ranking Member Waters?

Ms. WATERS. Thank you very much, Mr. Chairman, I have been trying to learn information about floods and flood control and flood insurance. And today is a very important hearing because I suppose we are going to find out about—and I hope we will find out about FEMA's maps, whether or not they are modernized, whether or not they are adequate to be able to distinguish between those areas where people absolutely need insurance, and maybe those areas where people don't need insurance. So I am anxious to hear from our witnesses that will be here today.

And with that, I will yield back the balance of my time.

Mr. MILLER OF CALIFORNIA. Thank you.

Our panel today, we have David Maurstad. He is the Acting Mitigation Director and Federal Insurance Administrator for Emergency Preparedness and Response Directorate at the Department of Homeland Security. His area of oversight includes the National Flood Insurance Program, the National Earthquake Hazard Reduction Program, the National Dam Safety Program, and the National Hurricane Program.

You are a busy man, aren't you?

Previously, Mr. Maurstad served as Regional Director of FEMA's Region 8, where he coordinated FEMA's activities for six western States, including the State of Nebraska, where he has served as Lieutenant Governor. And we are looking forward to your testimony, sir.

STATEMENT OF DAVID I. MAURSTAD, ACTING MITIGATION DIVISION DIRECTOR AND FEDERAL INSURANCE ADMINISTRATOR, EMERGENCY PREPAREDNESS AND RESPONSE DIRECTORATE, DEPARTMENT OF HOMELAND SECURITY

Mr. MAURSTAD. Good morning, Mr. Miller, Chairman Ney, and Ranking Member Waters, and subcommittee members. I am David Maurstad, the Mitigation Division's acting director within the Department of Homeland Security's Emergency Preparedness and Response Directorate, which includes the Federal Emergency Management Agency. I appreciate the opportunity to appear today before the Subcommittee on Housing and Community Opportunity.

First, I would like to thank the subcommittee for its support of FEMA's flood map modernization program, a program to modernize the Nation's flood insurance rate maps over a 5-year period. The resources Congress has provided are resulting in products that increase flood risk awareness, stimulate dialogue among various levels of government and industry, and help communities mitigate against flood losses. As a result, we will continue to make this Nation less vulnerable to flooding.

FEMA and its partners provide flood hazard maps and data to support flood insurance and community floodplain management activities for the NFIP. Flood map modernization uses state-of-the-art technology, on-the-ground intelligence, and a strong set of mapping guidelines, specifications, and standards to deliver reliable data and maps in geographic information system format.

Digital flood maps provide many benefits. They provide a uniform structure for assessing our Nation's changing vulnerability to flooding, allowing us to monitor flood mitigation's effectiveness. The digital data, along with the platform to store, maintain, and distribute the information also can be used to support other activities such as preparedness, response, recovery, and local planning. Lastly, digital maps are easier to maintain and keep current.

Flood map modernization is well underway. Since 2003, Congress has appropriated $550 million for the program. In addition, under our Cooperating Technical Partner Initiative, we expect by the end of fiscal year 2005, our 212 active State, regional, and local community mapping partners will have added over $100 million in data and other resources. The CTP program has been very well received and continues to yield both short- and long-term benefits.

We have also engaged industry to help us develop solutions. That is, we have presented them with objectives and asked them how best to meet those, rather than the more traditional government approach of mandating a solution and asking them to work within it. This is being accomplished by the issuance of performance-based contracts both at the national and regional level.

We also regularly meet with industry to share ideas, stimulate growth, collect feedback, and collect feedback on technical procedures and practices. Using these practices, and through these partnerships, we have completed mapping projects in nearly 1,000 of our most at-risk communities. And flood mapping modernization projects are underway in over 2,100 other communities. Our goal is to have the Nation's flood map inventory modernized by 2010 with all maps in a GIS format and available online.

Equally important, we will have a comprehensive and robust risk identification and assessment system, allowing us to more readily track, over time, the Nation's ability to reduce its flood vulnerability. There is no one-size-fits-all solution to identify the Nation's flood hazards. The risks and the people they impact are diverse. For example, in the arid West, streambeds can lay dry for years, yet these innocuous features can release torrents of water without warning after a brief thunderstorm. On the other hand, in the East where it rains regularly and vegetation is thick, rivers that flow year round tend to take days before reaching their peak. Along our coasts, the hazards also vary widely. In the South Atlantic and Gulf, hurricanes strike quickly compared to long, drawn-out extra tropical storms that can pound the Northeast shores for days. In the Pacific, long highways tend to elevate water levels through processes that are entirely different than those of hurricanes.

The Nation's variability in landscape and flooding characteristics require State, tribal, and local governments to use a variety of floodplain management approaches to make their communities safer places to live, work, and do business.

As such, communities require and use different tools to collect that data needed to properly analyze their flood risks. Obviously, the Nation cannot resolve its natural hazards issues with a single universally applied approach. This country's geographic diversity, combined with its variety of natural hazards threats, requires us to apply, mix, and match a series of processes to effectively identify hazards, communicate risks, and reduce vulnerability.

We understand the ramifications of producing flood maps which do not accurately reflect the risk. We realize there are concerns regarding use of ground elevation data and other information that is potentially inaccurate. To offset the risk of error, we have implemented a risk-based approach to ensure quality, leverage industry best practices and lessons learned, and foster opportunity for community involvement.

This approach has been applied and proven successful in many areas around the Nation. For example, in our partnership with the State of Nebraska, U.S. Geological Survey topographic data are utilized in conjunction with field reconnaissance to develop flood hazard maps and data. In North Carolina we utilized detailed ground elevation information generated by the State's own laser technology. This data, in conjunction with automated hydraulic modeling techniques, helps to identify flood risk in moderately developed areas.

In Lincoln County, Ohio, we have partnered with the county to produce draft flood maps using aerial photographs, topographic data, and flood hazard information developed using local and State resources.

We have firmly committed to a clear quality standard for modernized maps to make sure that poor quality hazard information is not simply digitized from an old map. Developed with the support of our key stakeholders, this standard requires that, at the minimum, all the flood hazard boundaries on modernized maps will be evaluated and adjusted as necessary. Overall, this program's ability to meet the unique and diverse risks faced by a variety of stakeholders relies on a sound balance between efficiency and flexibility. We have done this by performing much of the work associated with flood hazard identification at the local level in a decentralized fashion while managing the work centrally using technology, earned value management techniques, and integrated performance teams.

Although we have a long way to go to modernize the Nation's flood map inventory, our progress to date shows we have focused initially on areas where there is the greatest flood risk, we have hit the ground running, and that our solution strikes a good balance between efficiencies through standardization and flexibility by allowing industry and State and local governments to tailor solutions to suit unique situations.

Again, I want to thank the subcommittee for its support of flood map modernization. We are well underway, and we look forward to making this Nation more disaster-resistant and better equipped to deal with the ever-present danger of floods.

I would be happy to answer any questions that you may have.

[The prepared statement of David I. Maurstad can be found on page 145 in the appendix.]

Mr. MILLER OF CALIFORNIA. Thank you. Without objection, your statement will be made a part of the record.

There are more than 92,000 flood maps currently available, and I think over 65,000 of those are more than 10 years old. A lot of them are inconsistent and inaccurate and nonstandardized data available in those.

Are these the maps that FEMA plans to digitize, or are there plans to replace this data?

Mr. MAURSTAD. Mr. Miller, I am sorry, I cannot hear you.

Mr. MILLER OF CALIFORNIA. Can you hear me now?

Mr. MAURSTAD. A little better.

Mr. MILLER OF CALIFORNIA. We will turn the volume up.

There are over 92,000 flood maps available, and over 65,000 of those are over 10 years old. They contain data that is inconsistent, inaccurate, and nonstandardized.

Are these the maps FEMA plans to digitize, or are there plans to replace those maps?

Mr. MAURSTAD. Not in every circumstance. What we are doing in the flood map modernization process is working with and through the regions with States as they have developed their State business plans to determine what areas of the State need additional work and what areas of the State where the previous data is still adequate and that can be digitized.

So it is important to understand that we are working very closely with the local partners in determining through the scoping process what their needs are and then working with the State in trying to fund those various efforts.

Mr. MILLER OF CALIFORNIA. How would the process go for State and local government to qualify for FEMA funds to go through this process?

Mr. MAURSTAD. How would the process—

Mr. MILLER OF CALIFORNIA. How would they go through the process to qualify? Can you describe the process they go through? If a local government or State wants to participate in this, how do they go through the process with FEMA to qualify for funds?

Mr. MAURSTAD. We have published the Multiyear Flood Hazard Implementation Plan that details and outlines the methodology by which we are going to fund various mapping efforts in the individual States. We provided assistance for the States to develop business plans. They submitted those business plans to the 10 FEMA regions. Those regions looked at those plans and have worked with the State to develop the process by which to proceed.

We at the national level have taken those plans and given the resources that are available, have provided the regions funding for them to work with the State partners on a prioritized basis—the highest risk areas being done first—for the digitization process to occur. So it is a bottoms-up process. But there is a very close working relationship between the regions and the States in determining how those States will be mapped.

Once those areas are identified within a State, the region will work along with the State and the communities in looking at—it is called the scoping process—what needs to be done to meet the standards that have been published, to bring those maps up to the GIS quality standards that we are looking for.

Mr. MILLER OF CALIFORNIA. We have had a lot of flooding in the last 2 years. Do you have any idea of what percentage of people were impacted by floods and claims that were not necessarily in flood hazard areas, and what percentage of the people do you think have flood insurance that were not in flood hazard areas? Do you have any idea what the numbers might be, the percentages?

Mr. MAURSTAD. No, I don't. Of course, there is—the whole mapping process is intended to try to delineate what one's risk is for flooding. And there is going to be, of course, there is a sliding scale for that. And there certainly are a number of flooding events that could happen in those areas that are, based on the maps, less vulnerable than those right alongside. There are a lot of factors that go into determining the risk, and so it is—everyone to a certain extent is at risk.

And what the mapping process is intended to do is delineate what that risk is, use that information to not only make land-use decisions at the local level, but provide the basis by which flood insurance can be appropriately priced and provide the basis for making sure the national flood insurance fund remains strong.

Mr. MILLER OF CALIFORNIA. Of the 92,000 maps we recently have, over two-thirds are out of date. Now we are going to update those. How do we prevent this from happening in the future? Do you have any idea on that? Is there a program that is going to be implemented to make sure they are updated on a regular basis so we don't have the same situation occur again?

Mr. MAURSTAD. The current plan certainly looks at making sure that all of the maps are updated, brought into the GIS world. We are along the way determining that there are areas where additional studies may need to be required. The plan is a fluid plan, one that is going to need to continually be assessed, which we do twice a year with our mapping partners. And so right now we are focused on the process of getting those maps up to date.

Certainly at the—our target is 2010.

As we approach the completion of this phase of our work, it would certainly—and it is a personal goal of mine that we, in fact, provide the mechanisms by which the maps can be maintained out into the future.

Part of that will be more possible in this environment than the old paper environment because this technology will allow for these maps to be updated far more easily. Our hope is that we will have willing partners at the local and regional level that will assume responsibility for updating and maintaining those maps. And that is certainly a part of the process that we are working on in this multiyear effort.

Mr. MILLER OF CALIFORNIA. Thank you.

Ms. Waters, you are recognized for 5 minutes.

Ms. WATERS. Thank you very much.

I have information that shows the average age of FEMA's flood maps is 18 years. Is it true that in many cases, FEMA's maps modernization program is digitizing old data?

Mr. MAURSTAD. Well, there are certainly some cases where that may be the fact. And it may very well be appropriate. Just because those maps are 18 years old, or the data is 18 or more years old, does not mean that that data is inaccurate. The topography may

very well be the same; the population may very well be the same. The factors that were in place when those maps were developed 18 years ago for the paper medium may, in fact, be the most accurate and the most needed information in the GIS basis.

If during the process it is identified that that data on the paper maps that is 18-plus years old is not accurate, then we are committed to making sure that those maps reflect the needed information so that State and—or so that local governments can, and individuals can make decisions, risk-based decisions, and so that it appropriately supports the National Flood Insurance Program.

Ms. WATERS. Well, several counties are complaining that due to the age of FEMA's maps, they have been forced to comply with regulations that at best do not serve or at worst harm their constituents. For example, in Collier County, Florida, county commissioners complain that the FEMA maps incorrectly show they have areas in harm's way, forcing residents to needlessly purchase flood insurance. Conversely, some Texas officials are complaining that they have areas that are in harm's way, yet FEMA's maps indicate no risk exists.

So my question is, and my allegation, perhaps, is not that you simply may be digitizing old maps, but I want to really understand what you do to ensure that that information is updated. Whether there has been development that has changed the topography or what, are we sure that we have all the information? And if old maps are being digitized and there is no problem, that is fine. But it is not fine if, in fact, there have been changes and they are not reflected in the new maps. That is what we are concerned about.

How can you assure us of that?

Mr. MAURSTAD. Certainly I understand that. I know firsthand, as a former mayor, that there are always going to be disagreements amongst individuals as to whether they should be in the floodway and required to buy insurance or not.

My experience as a regional director merely solidified that previous experience at the local level as I worked with communities in FEMA Region 8 in working with their citizens in making sure that there was confidence in the accuracy provided; that was, of the data being provided for those maps.

Again, what we utilized were the resources and the information at the local level. We seek that information. We want the maps to be accurate. We want there to be community buy-in for those maps. So we work very closely with the communities in developing these maps. It is to our mutual benefit that it be done.

So in this process, the scoping process, where we literally sit down at the table and work with the community and the individuals that are responsible for the local efforts and work through these various issues point by point—and, again, I would just say that we are committed to making sure that we use the best data available and that the maps are accurate, and that in those circumstances where there are difficulties, we will do what we have done in the past, and that is try to work as amicably as possible with the local communities.

Ms. WATERS. That is extremely important. There is a lot of controversy around this whole issue. I understand that there is a lawsuit. And I am not going to ask you to comment on the lawsuit,

but I am curious about something. Is this flood insurance intended to restore policyholders to pre-flood conditions, or is there something else different? What is the language in the policy?

Mr. MAURSTAD. As I indicated in my previous testimony dealing with the flood insurance program, the sale of insurance and flood insurance program, restoration of pre-flood condition is, in my review, in legislation, it is not in the flood insurance policy. It is not the intent that the flood insurance policy would provide policyholders or restore them to what—depending upon your definition of pre-flood condition—that is not the intent of the program from my analysis. The intent of the program, the intent of the insurance policy, was to assist the policyholders in the recovery from the financial effects of a flooding event.

Ms. WATERS. Has anyone—do you have, and can you get us a copy of the policy? This continues to be a real question. And I want to know exactly what is in the policy.

And I then I would like to, if I may, Mr. Chairman, just ask that you respond to a request that was made of you from Mr. Steve Kanstoroom. In May, he along with Representatives Hart, Davis, and Ruppersberger submitted document requests and questions to FEMA on the record that pertain to oversight of the National Flood Insurance Program. And since that time, they have not received any response.

And 2 weeks ago, of course, the Washington Post reported this $2 billion lawsuit was filed against FEMA and its insurance partners. Now, the suit goes to many of the same issues that are still—that are unanswered requests. I also understand that similar suits will be filed in additional States.

Can we expect that the answers to the questions from these gentlemen be given and the documents that they are requesting some time soon? Are you familiar with these requests?

Mr. MAURSTAD. Ma'am, we have responded or are in the process of responding to every congressional inquiry and question that has come to my office. The individual that you mentioned is a party of a lawsuit. Our Office of General Counsel is dealing with that lawsuit. But most importantly, we have responded—

Ms. WATERS. Sir, will you do me a favor? And if you think you have responded to him or if you are yet to respond, would you get back to this committee and let us know when you did respond or when you are going to respond to these requests?

Mr. MAURSTAD. I will check with the Office of General Counsel and we will certainly provide the information that we are able to to this committee, no question.

Ms. WATERS. All I want to know is, did you get them the information? And if it is something that their lawyers need to request formally, just let us know.

Thank you. Thank you, Mr. Chairman.

Mr. MILLER OF CALIFORNIA. Thank you. Consent to insert the written testimony in the record by the National Association of Realtors, without objection, so ordered.

Mr. Pearce, you are recognized for 5 minutes.

Mr. PEARCE. Thank you Mr. Chairman.

Mr. Maurstad, the idea that we have a plateau of funding 2 million, which damages don't exceed, we don't get help. Is that right?

The 2 million, is there a threshold of 2 million in your agency's responses? If the damage does not exceed 2 million, then it is left with the community?

Mr. MAURSTAD. I will to have get back to you on that, sir.

Mr. PEARCE. Okay. So you are not aware of any threshold that you all place for damages on events?

Mr. MAURSTAD. In response to a disaster?

Mr. PEARCE. Yes.

Mr. MAURSTAD. Well, could there—yes, but I think that I need to defer to the folks—

Mr. PEARCE. Is there a threshold, I guess, and whether it is 2 million or—

Mr. MAURSTAD. There is criteria which the President utilizes in determining whether a disaster declaration—a Presidential disaster declaration.

Mr. PEARCE. If there is a threshold, is there a weighted threshold? Because $2 million damage in a major city is completely different from $2 million in a small community in my district, and I wonder—and many times we do not reach the threshold for assistance. I am wondering, is there a weighted threshold?

Mr. MAURSTAD. Yes, there is. But I would prefer that I be able to respond to that.

Mr. PEARCE. I would appreciate that, if you get that for me. If you would get that response, I would appreciate it.

What about the idea that in 1993, the agency or whatever fund, that the NFIP was deemed to be insolvent and shortly after that—you had a questioning look. Was that not true? In 1993, the Clinton administration did not start rewriting the rules for FEMA or for expanding the floodplains?

Mr. MAURSTAD. I am not aware, sir. I can find that out.

Mr. PEARCE. It appears that about 1994 the floodplains were redrawn, redesignated, increasing them significantly because there appeared to be an insolvency in the NFIP. And I guess my question is how did the insolvency affect the floodplains? In other words, floodplains generally are pretty static and not correlated to financial activity, but they have some mobility; but many of our communities began to notice about that time that they couldn't get development because the floodplains had been redrawn, increasing—putting certain places in that had not previously been in. Do you have any opinions about that?

Mr. MAURSTAD. You know, that is not—that is not my understanding. The mapping efforts, to my knowledge, have not been correlated with the strength or lack thereof of the national flood insurance fund. Certainly the national flood insurance fund when I became the acting director a year ago was strong. It remains strong.

Mr. PEARCE. In several communities—

Mr. MAURSTAD. Excuse me. The mapping is done on a scientific basis to determine what the risk is for that particular area. It is not done for the purpose of generating additional premium for the national flood insurance fund. It is done to identify the risk so that individuals can make prudent decisions based upon that information.

Mr. PEARCE. There are no internal decisions? I am just confirming what you are telling me. There are no internal decisions to

change the flood mapping? In the mid-nineties there were no changed criteria?

Mr. MAURSTAD. Certainly none that I am aware of.

Mr. PEARCE. I would like for you to inquire in your agency and extend beyond what you are aware of, and if you can get back with me on that, on that particular thing, I would appreciate that.

One of the big elements here is you said you always want to work with States and communities to determine the risks. The community of Carlsbad spent quite a bit of its own money to determine that hydrology was a very important factor, yet FEMA continues to assert that hydrology is not a very important factor. When you have a disagreement like that, who wins in the dispute?

Mr. MAURSTAD. What we try to do in working through circumstances like that is to be able to rectify the difference in the experts' opinions. But in the end, if there is a difference between what the program believes is the most accurate data, it is our responsibility to act on that information in the administration of the program.

Mr. PEARCE. And in this case, the hydrology still seems to be disregarded. And I will tell you that the hydrology has put the town down in the floodplain with the highest point in Texas—I mean in New Mexico—but the highest point in Texas occurs about a mile across the border, and the pressure from water that falls on that highest point builds up, always putting tremendous pressure down at the bottom of the base of those geographic or geologic formations, tremendous hydrologic, hydrostatic pressure there. And I am not sure your agency has been extremely responsive.

Thank you, Mr. Chairman.

Mr. MAURSTAD. We will go back in and work with the region and try to see if we can come to a mutually acceptable decision in that circumstance.

Mr. MILLER OF CALIFORNIA. Mr. Miller from North Carolina is recognized for 5 minutes. You have no questions?

Mr. Neugebauer from Texas recognized for 5 minutes.

Mr. NEUGEBAUER. Thank you, Mr. Chairman. Thank you for having this important hearing.

One of the things that I have heard from some of the communities in my district as we go through this remapping process is that the initial grants were not enough money to really complete the entire community. And that, for example, I think in Abilene, I think was they could only study like three or four runoff areas, and I think there were 26.

We have been working to help get those funds to complete that. But one of the things that concerns me, I just wonder if that is going on around the rest of the country. And it appears to me a better strategy is if you are going to systematically remap communities, that partially completed flood maps don't really do you much good. You might as well have, you know, the old maps.

What are you doing to look at, you know, completing and making sure that what we leave a community here, what we leave a region, that we do have new, valid, updated maps?

Mr. MAURSTAD. Again, the regional office is working with the States to—of course, they are working with their communities to determine the process of when—what is going to happen where

within that particular State based upon the criteria that we set out in the guidelines. So, again, you have to go back to that specific situation and see what the circumstances are.

But most importantly, what we are doing now as this program is really getting into gear is taking a look at what we have learned from all these scoping meetings that have gone on around the country and seeing if we can develop some type of an analysis of what is being required when and what it costs so that we can then use that data to determine whether or not the—and how best to use the resources that Congress has provided us.

So we now have some information that was not available a couple of years ago to be able to assess how to continue to move forward.

Mr. NEUGEBAUER. I heard you talking a little bit about some of the technology you are using. And I know aerial surveying is a technology. And are we investing in that, and are we—is that an option for us to use on a broader basis than we are using it currently now?

Mr. MAURSTAD. We are looking at all technology. And the direction has been to use the technology that is most applicable to the circumstances. There are certainly areas of—in fact, in Region 6 where the technology we talked about is certainly applicable, it is certainly being used. It is being tested there, and we are using that information on a pilot basis to determine where it can be utilized. That technology does not work very well where there is a lot of vegetation. So there are some areas where it works very well and it is acceptable, certainly acceptable, some areas where it is not. The same can be said for other technology that is being used in the other circumstances.

So our primary mapping contractor is working with all the available technology and what works best in each particular circumstance.

Mr. NEUGEBAUER. We don't have the vegetation problem, as you know, in—

Mr. MAURSTAD. No, you don't. That is why it works out.

Mr. NEUGEBAUER. My second question is based on where you are in the program today and based on—obviously you had some cost estimates—what it was going to take to do this project. Do we have enough money? And if we don't have enough money, you know, do you have a feeling of what it really takes to complete this process in a timely manner so that these communities can have that data available to them, and people that are currently paying for flood insurance that shouldn't be, and those that aren't that should?

Mr. MAURSTAD. Yes. As my testimony indicated, we feel as though we are going to be able to meet what Congress outlined for us when the program started. Nonetheless, it is also prudent of us, as I indicated before, to analyze and provide actual hard data on what it costs to map certain areas and to be able to determine how best we can use those resources. So we are in the process of that analysis.

Mr. NEUGEBAUER. And is there a need to do this comprehensive remapping in every area? Are there areas of the country that—

Mr. MAURSTAD. No. There doesn't need to be a new study done on every area. And in fact, what was contemplated when map mod-

ernization began was not that there would be new studies done in every area. There are certainly some areas where the current data is certainly acceptable and what needs to be done is that data transferred from the paper—paper environment to the digital environment. There are some areas that are at risk and some areas that are certainly not at risk. And so it is perfectly appropriate that those maps would be digitized.

But the process itself also—that base map is going to be a better map than before. So there will be some changes in most all maps. Whether that changes the risk will differ from circumstance—again, circumstance to circumstance. It is very difficult when we are talking about 90,000 mapping areas to be—you know, make general statements, because virtually there are—most areas are different from the other areas. We try to put in place a process that is flexible enough to recognize all of that, have standards that are flexible enough to recognize that, and yet have quality maps throughout for the communities to use and for the programs to use.

Mr. MILLER OF CALIFORNIA. Gentleman's time has expired.

Mr. NEUGEBAUER. Thank you, Mr. Chairman.

Mr. MILLER OF CALIFORNIA. Thank you.

Mr. Fitzpatrick from Pennsylvania is recognized for 5 minutes.

Mr. FITZPATRICK. Thank you very much, Mr. Chairman.

Mr. Maurstad, I appreciate your commitment to flood map modernization. This is a Federal program as much as any other that impacts constituents, at least those who live within flood-prone areas, in a very significant and personal way.

Until January of this year I served as a county commissioner in a large county in southeastern Pennsylvania that has sustained many very serious floods in the last 9 months, and I am always amazed during the response, not so much the response, but in how many constituents didn't know they were in the flood area, weren't notified. And the problems, the calls that go to the emergency management office about the flood mapping process are always after the fact.

And then about 2 weeks ago I received a call from a constituent of mine, an elderly couple that lived in a home for a long period of time. The home had never been flooded, water never near the home. They are in the process of actually applying for and receiving what is called a reverse mortgage so that they can stay in their home during their senior years and have some resources to fix up the home and as part of that mortgage application process, found out that they are now in a flood designated area, even though the home had never been flooded. And it may be the condition that precludes them from getting this reverse mortgage, stops them from staying in their home during their senior years, the fact that they, according to these flood maps, now a mortgage company will now require a flood insurance policy for them, and they are not cheap. They don't come inexpensively.

So I guess my question is, as you pursue modernization, what can we do to help our constituents better understand that process? I know it is not something they think about every day when they get up. But is there a plan of public participation, a plan of public information that will closely bring in the local governments, the State emergency management organizations, to get the word out

there, specific contacts to individuals who are being moved into a flood mapped area or out of a flood? And that is important as well. People who have flood insurance continue to pay and then find out they are not in a floodplain area anymore and then get flooded.

So what is the plan of public participation and information that will help our constituents better understand what you do?

Mr. MAURSTAD. Let me respond first in a broader context. We have a public awareness campaign now—Flood Smart, that is—targeted to communicating more, all across the country, on the risks associated with floods, that floods can happen to any of us, and that floods are not covered under your homeowner's policy, and so you need to get a flood insurance policy to protect yourself from that possibility.

So we continue to do that. It has actually been successful. We have had 13 consecutive months of more policies than before. So we think we are reaching more people with the message not only that you need the protection, but raising overall awareness of the flood hazard vulnerability that we are prone to flood.

Secondly, and most importantly, in the circumstance it is required that there be community adoption of these flood maps. Now that process will certainly vary from community to community and State to State.

But there is a link—and I will get it for you—from the time that we issue preliminary maps until the time that those maps become final; it is a 12- to 18-month process, primarily because we require community notice, that there be community participation—I am not sure if it happens every time, so I want to have a caveat—where there is notice given to the property owners that they are going to be brought into the floodway.

So we need to work with and encourage our local officials and communities to make this awareness greater, that the public—potentially they go beyond the public notice in the newspaper that there is going to be a hearing to adopt the maps. So we are working with that.

In addition, part of the digitization process will be that this information will be online and more accessible to your constituents than the paper maps were that are housed in a warehouse somewhere.

So our hope is through the libraries, if they are elderly people—although most of the elderly people that I know now, most of them are online too—will be able to access this information, If you go on to the Flood Smart Web site, for example, and put in your zip code and address and you can find out what your flood risk is.

So we are committed to that communication component that you talked about. And it was certainly important in the past; it is even more important as we go through this map modernization process. And we are going to have more of these maps that are going to need to be adopted at this community level. This communication piece and the acceptance of the community is going to be critical as we move forward.

Mr. MILLER OF CALIFORNIA. Gentleman's time has expired.

Mr. Jones from North Carolina is recognized for 5 minutes.

Mr. JONES. Mr. Chairman, thank you very much.

And, Mr. Maurstad, I want to give you a situation that came to a satisfactory conclusion. When we talk about this new mapping

system and how it is going to impact on the people, I think in the long run it is going to be extremely helpful. I have the Outer Banks of North Carolina in my district, mostly a coastal area, with the exception of Wilmington, which is Congressman McIntyre. We are very interested in insurance as well as the new mapping system.

I got a call about a year ago from a constituent in Camden County who said, Congressman, I can't put a shed to put my new ride mower in my backyard. And I said, well, this sounds like it should be a county problem. He said no. He said, no, it is FEMA. And I said, FEMA?

And so then my staff and I looked into it. And obviously they were doing some of the mapping, digitized mapping systems. They were in the process. And this was what the problem was.

But the reason I bring that up, Mr. Chairman, is it came to a very satisfactory conclusion. And I want to compliment FEMA and Mr. Fabrizio, who I called, and he came down with my staff, along with the local officials in the State of North Carolina, and it was a satisfactory conclusion.

So I just wanted to bring it down to the people who pay the taxes and to give you just a little example of how this person—I think in the long run for that county, it is going to be very beneficial.

I think you have spoken to this, but I wanted to ask you to repeat. Once this modernization has taken place, we in eastern North Carolina, and I am sure any other coastal area of America, it seems like whether you live on the coast or you live inland of the coast, the insurance is just getting to be astronomical. And my good friend from New York was talking about older citizens. And they are the ones that primarily live in these inland counties close to the coastal areas.

Do you believe that the insurance industry itself, once this new, more sophisticated mapping is available, do you think that they will try to look at some method or some format to see if there is any way, based on the new mapping systems, that they can help bring the cost down for the consumer?

Mr. MAURSTAD. Well, I certainly am not in a position to speak for the industry, but I would say that, you know, we are—FEMA, the NFIP program, is committed to that direction in the NFIP reauthorization, that flood insurance be affordable. So when my staff, when the actuaries are developing the rates that we are going to require to make sure that the fund is strong, we certainly are very mindful that we need to make the insurance as affordable as possible.

And part of that certainly is the balance as to the extent of the coverage that can be provided with the cost associated with increasing coverage, increasing the provisions and the benefits under the policy. So we weigh that constantly also, and that is why there are deductibles and that is why contents are only covered on an actual cash value basis and why we don't have additional living expense provided under the standard flood insurance policy.

So we are very cognizant of that. Relative to the mapping, of course, we are hopeful that the map modernization process in those areas where additional work is being done, that that information will be able to be utilized by the fund to more accurately reflect the risks associated with the example of the individual that you had

before, what the cost of that insurance ought to be in relationship to the risk, and that that risk be able to be spread throughout the 4.6 million policyholders fairly.

But also, and it is not to—we don't map so that we get more people that have mandatory purchase. But we are hopeful that as the risk is better identified and people recognize what their risk is, they will take the same steps in addressing their flood risk as they will in addressing their fire risk or the risk that their roof will be hailed on in certain parts the country, et cetera; and by doing so, will be able to expand the number of policyholders, which will give us more people to spread the overall risk associated with the program amongst more individuals and be able to maintain affordability.

Mr. JONES. I thank the gentleman. Thank you.

Mr. MILLER OF CALIFORNIA. [Presiding.] Mr. Davis from North Carolina.

Mr. Davis, do you have any questions?

Mr. DAVIS OF KENTUCKY. Kentucky.

Mr. MILLER. Kentucky, I'm sorry.

Mr. JONES. Mr. Chairman, we will claim him.

Mr. DAVIS OF KENTUCKY. Mr. Chairman, although we have had very pleasant experiences in North Carolina, I am from the Commonwealth area.

One question that I am interested in: your perspective on integrating this overall with a homeland security management process, as well as dealing with flood issues. There are direct interoperability issues that I think are very relevant.

Do you see this as being a fully integrated network-centric mapping system similar to what the Department of Defense uses operationally to be able to provide instantaneous response capability to folks who are going to be participating and responding to disasters, as well as providing ease of update?

Mr. MAURSTAD. I think, while this is a flood map modernization initiative, and that is the focus, certainly as various local communities use this mapping opportunity, they will be able to have this data and this information available to them for a variety of reasons, whether that be local emergency management planning, mitigation planning. But the data that we are collecting is flood specific, so I am not—I am certainly not a technology expert. To the extent that that would be beneficial, just that data would be beneficial for security reasons. I am not—

Mr. DAVIS OF KENTUCKY. One of the reasons I prompt my question, we have regular flooding—I represent an Ohio River district, about 27 percent of the length of the river, but we have a lot of the tributary flooding, a serious problem in 1997—participated in flood relief, a major disaster in one of our counties. And accurate maps, particularly of meandering streams, different issues like that, really became a bit of a problem to get to responders and support elements who were coming in. So I was just curious from that perspective.

I am a big proponent of digitization. I was just curious about a wiser vision that you have for this.

Mr. MAURSTAD. I think certainly at the local level the maps could be utilized in developing their local emergency plans, their evacu-

ation plans, their response plans, as you have indicated, how you get from the ambulance from one part of the county to another during a flooding event. I mean, these maps all lend themselves to helping that decision-making process.

Mr. DAVIS OF KENTUCKY. Thank you.

I yield back, Mr. Chairman.

Chairman NEY. Gentlelady from Florida, Ms. Brown-Waite.

Ms. BROWN-WAITE. Thank you very much, Mr. Chairman.

First of all, I am delighted that you are having this hearing, and I want to say just a few kind words about the great work that FEMA does.

Many of my constituents were affected by the many hurricanes that hit Florida. One just this weekend was just there, and although it hit the Panhandle, certainly parts of my district had some high storm surges, I know. I talked to my husband, because I wasn't home, and he kept telling me how the water was rising, and believe me, I know that my constituents appreciate the fact that FEMA is there in time of need.

I just have a couple of questions about how well you are coordinating this mapping with local governments.

In Florida, as in other States, we have what is called a water management district. And the water management district has been engaging in GIS mapping for some time, using taxpayer dollars that they collect through the water management district.

I want to make sure that in areas where they have legitimate updating of the maps, that we are not going to reinvent the wheel. So that would be my first question.

Mr. MAURSTAD. Very much we are utilizing and leveraging those resources at the local level. And, in fact, water management districts in Florida are good examples of how we are working closely with them to make sure that we are not duplicating. In fact, this year I believe that we anticipated having participation at the local level and with our partners at $45 million and spent $60 million.

So certainly the funding plan that we have developed incorporates the contributions made at the local level and, in fact, builds upon them. We couldn't do what we are doing without what the local efforts, regional efforts are.

Ms. BROWN-WAITE. With all the development that is taking place in Florida, it is an ideal place for all the baby boomers to retire to—no income tax, usually great weather, except for a few months of hurricane problems. But overall, with the development that is taking place in Florida, certainly the water management districts and local governments that are engaging in updating their maps could use some funding.

Are you helping out the water management districts?

Mr. MAURSTAD. Yes. We help them develop plans on how to go about participating in the flood map modernization. And we, of course, through the State of Florida, provide funds for those areas within those management districts for the actual mapping and the digitization to occur. So we certainly are doing that in Florida.

Ms. BROWN-WAITE. I appreciate that.

The other question that I have is, I had lived in another part of another county further inland, and it was questionable whether or not I needed flood insurance.

Could you just estimate initially how many people you think, as a result of the remapping, will need flood insurance and how many of them who are currently paying for flood insurance—excluding me, who moved into a V-zone, so I certainly am paying flood insurance—how many people who are paying for flood insurance now would be alleviated of that cost?

So those who would be brought on, who would now require flood insurance? And those who are paying for flood insurance, who may be able to drop it?

Mr. MAURSTAD. No, I don't believe we have that information at this point in time. And part of the reason why it is important this map modernization continues is so that we can more accurately determine exactly what the point of your question is.

But I want to take this opportunity to also say we have got a circumstance where you have the mandatory requirement—mandatory purchase of flood insurance, and of course, this will affect that, those individuals that would be brought into a mandatory purchase zone and those that would be taken out of a mandatory purchase zone. But just because you are not in a special flood hazard risk area, I would not conclude that you no longer need flood insurance, that your risk may not be as great as what it was before, but I would contend that the need is still there.

It is going to be less expensive, but I am not—my point is this, that sometimes we stay focused solely on the mandatory purchase requirement, and those are the people that need flood insurance, those that are in special flood hazard zone areas. And if you are not in that special flood hazard zone area, you don't need flood insurance. I am trying to pop that balloon because you still need flood insurance, even though you may not be in the highest rated area and you may not be under the mandatory requirement to purchase.

Ms. BROWN-WAITE. One more question, Mr. Chairman, if I may. I know my time has expired. I will just go ahead and ask it.

Are you going to then notify the lending institutions for areas that now, as a result of the remapping, will require flood insurance? Because that is a great concern of many home owners, that I am not in a flood area now, but I may be, and is my bank going to be notified, and am I going to have to purchase that?

In other words, although they have a mortgage agreement with a lending institution, could this then be a requirement addendum to that loan?

Mr. MAURSTAD. Well, the 1994 Reform Act of the NFIP tightened up the mandatory purchase requirement so that the lenders were paying more attention to this requirement in the lending community. So I would say that that is not as a result of the Flood Map Modernization effort, but that is just a fact of what the law requires them to do before map modernization and now.

But I would say that we work closely with lending institutions. I met with those individuals about 2 months ago to talk about common interests and work on common solutions to difficulties that both of us have. So we have a relationship with them. We don't operate in a vacuum, and it certainly is important for us to continue to have strong cooperation from the lending community in this

mandatory purchase requirement for the benefit of the people that live in those high-risk areas.

Ms. BROWN-WAITE. Thank you.

Chairman NEY. [Presiding.] I thank the gentlelady. And I apologize for not being here for most of the time due to other commitments.

I had a question about—and this is something I personally witnessed—something we would contact, obviously, FEMA on. There are some inconsistencies.

For example, recently there was a flood area designated—it is actually down in Belmont County, Ohio, an area I am very familiar with—I was born in the city of Bellaire. Some water came up around a road, and now 22 acres have been designated as flood prone, never to have flooding, probably can't ever have flooding. And then the alternative is a 90-day appeals process where you have to disprove that as citizens. Of course, the constituents call us. I met on this last Thursday.

There are a lot of those inconsistencies out there where it is not a matter where we argue back, how did you do this; it is a matter of why don't you disprove what we had deemed. And I know you have had to run up on these, probably, congressional inquiries, maybe your office. How do you answer that type of thing?

Is there a better process versus you have made a determination? Why don't you prove why you determined that versus its coming back on the constituents or local governments to say, wait a minute, we have to hire all these engineers to say why maybe it was indiscriminately done?

Mr. MAURSTAD. Well, I will have to get back to you as to when the last time was that this process was evaluated. But I would say that there are a variety of ways where that can occur—through a letter of map revision, conditional letter of map revision. We try to recognize the difficulties that you have outlined and yet still not have a process by which everyone that does not want to be in a flood hazard area has the ability to opt out, so to speak. So it is part of the regulatory nature of the situation. We certainly would work with the committee and encourage you to get information from the residents on how we can make this process better.

I would allude to a comment that I made earlier, that you would not have heard, that our hope is through the flood map modernization process that we are able to find partners out there at the local level that are able to administer and revise these flood maps in this digital environment that would not have been possible in the old paper environment.

So we are hopeful that some of these maintenance issues, maintenance circumstances, could be—that that can be carried out by the local governments as an important aspect of this modernization process.

Chairman NEY. The other thing that has been raised, to be adequate about this, there are going to be companies that are out there that say, yes, it is been done correctly, the mapping; and other entities, other companies—and you could probably find two on each side, three on each side—that are going to say the process that is undertaken now is just taking the old way of doing it and digitizing the old way.

And I am sure you have heard that. Do you have a comment on that?

Mr. MAURSTAD. My comment would be that in some circumstances that would be appropriate; if the data that was used two decades ago was still accurate, was still pertinent, then it would be what we should do. In those circumstances where things have changed, then we need to update that data and not just merely digitize an outdated map that doesn't have the current information.

So we are committed to making sure that as we go through the modernization process, we have quality end products.

Chairman NEY. One other question I had that—I should know this, and I apologize for not knowing it in advance—but North Carolina, I am told, has digitized flood maps. We see Mr. Jones' family farm that has been there since the 1800s. And in Ohio we have got a lot of the old satellite photos.

I assume North Carolina paid some dollars, or did the Feds update North Carolina's system.

Mr. MAURSTAD. North Carolina has certainly been very aggressive in this environment. They certainly have made investments at the State and local level that we, again, are utilizing and leveraging as we move forward. So they have been a very model partner with the Federal Government in the modernization process.

Chairman NEY. So Ohio and other States that are not up to par, as North Carolina is, then they would have to make some local investment in it?

And can we find out—if you can give us information, how much North Carolina invested or how much Ohio—I mean, there are other States where we have interest. Obviously, I have interest in Ohio, but I would like to just know, do you get on a Federal kind of list that says Ohio is ready now to invest, or how do other States do that? Is there a priority list that the States will have to make a certain amount, percentage of commitment, do you know?

Mr. MAURSTAD. Well, we certainly are working with the States. We have the Cooperating Technical Partner program; we have over 200 Cooperative Technical Partners that we are working with that are making contributions of various levels on their own.

We will provide you that information on a State-by-State basis.

But, you know, we certainly—to those States and areas that are moving forward faster, we are certainly not getting in their way, we are wanting to assist them as they move at the rate that they want to move at.

Chairman NEY. Just in closing, I think the aim that I have in persons representing a district is for the good of the Nation, some consistency across the United States. How are we going to get to the best mapping and updated mapping? And also, what incentives are going to be out there, you know, for the States to come in, partnering with the Fed?

I think consistency would very good.

Mr. MAURSTAD. It certainly is a part of our standards and guidelines. And I would say that in the case of North Carolina, what they are doing is, they are going beyond what the requirements are for the National Flood Insurance Program, so they are able to uti-

lize what they are doing for other purposes and purposes that more specifically meet their needs.

So it is not that others aren't to that level; it is that they are going beyond what the requirements are that are put forth in the general guidelines of the Federal Map Modernization process.

Chairman NEY. So we would be able then as individual members to receive a breakdown of our States and what Ohio, for example, has put in or Georgia—whatever States are requested, how much they have put into the system, how much the Feds have put in, and what level we are at of modernization?

Mr. MAURSTAD. Some of it is a match at the local level, in kind; it is not necessarily all hard dollars. Sometimes it is utilizing the information that North Carolina or that Florida has already generated. They provide us with that data, then we are able to put it in the format that we need so that we have this uniformity across the Nation.

We will certainly look to see what we can provide for you.

Chairman NEY. I appreciate your time on this important issue. Thank you so much for your time.

I would note that some members may have additional questions for the panel, which they may want to submit in writing. Without objection, the hearing record will remain open for 30 days for members to submit written questions to the witnesses, and we will place their responses in the record.

And we will begin now with Panel II.

Ms. BROWN-WAITE. Mr. Chairman, while they are taking their seats, I would like to ask unanimous consent to submit an opening statement. I was on the floor actually speaking on another flood insurance bill.

Chairman NEY. I want to thank the gentlelady. Without objection.

[The prepared statement of Hon. Ginny Brown-Waite can be found on page 53 in the appendix.]

Chairman NEY. I want to thank the second panel for being here today.

William Jenkins served as Director of Homeland Security and Justice issues, U.S. Government Accountability Office. His area of responsibility includes emergency preparedness and response, elections of the Federal judiciary, sentencing and corrections, and bankruptcy.

Michael Bullock is the President of Intermap Federal Services, Inc., a wholly owned U.S. Subsidiary of Intermap Technologies Corporation. Intermap is located in Englewood,Colorado. Prior to joining Intermap in 1996, Mr. Bullock was a senior associate with Booz, Allen & Hamilton, Inc., a management and technology consulting firm.

I will now yield to Mr. Jones to introduce the next witness.

Mr. JONES. Mr. Chairman, thank you very much. And on behalf of my colleague, Congressman Howard Coble, I would like to welcome and introduce Scott Edelman. He is the president of Watershed Concepts, located in Greensboro, North Carolina. He is an authority on hydrologic and hydraulic engineering and computer programming.

Mr. Edelman currently serves as the principal in charge for the North Carolina Statewide Floodplain Mapping Project. Welcome.

Chairman NEY. I want to thank the gentleman.

The next witness is Cheryl Small, who is president of the National Flood Determination Association, a national nonprofit organization comprised of flood determination companies. Ms. Small is vice president of Specialty Markets, First American Flood Data Services, located in Highlands Ranch, Colorado.

Jim Williams is testifying today as the cochairman of the Mapping and Engineering Standards Committee, the Association of State Floodplain Managers. Mr. Williams is a hydraulic engineer with the Nebraska Department of Natural Resources in Lincoln, Nebraska.

I want to thank all the panelists for being here today and sharing your time. We will begin with Mr. Jenkins.

STATEMENT OF WILLIAM O. JENKINS, JR., DIRECTOR, HOMELAND SECURITY AND JUSTICE, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Mr. JENKINS. Mr. Chairman and members of the subcommittee, I appreciate the opportunity to participate in today's hearing on Flood Map Modernization. Floods are the Nation's most frequent and destructive natural disaster.

Up-to-date flood maps are a key means of identifying the boundaries of the areas at greatest risk of flooding. When we reviewed FEMA's Flood Map Modernization program last year, FEMA estimated that about 70 percent of the Nation's approximately 92,000 flood maps were more than 10 years old. Maps must be periodically updated because such things as erosion and development alter draining patterns and, thus, the boundaries of the areas at greatest risk of flooding.

FEMA develops flood maps to identify areas at risk of flooding, determine rates for national flood insurance policies, and provide information that can be used for floodplain management and mitigation.

FEMA expects that producing more accurate accessible flood maps will produce three major benefits. The first is that communities can use more accurate digital maps to reduce risk through effectively regulating development in areas of high risk. Middleburg, North Carolina, for example, has used revised maps to adapt and enforce building standards that it estimates will save over $300 million in future flood damage.

Secondly, accurate digital maps available on the Internet will facilitate identifying property owners who are statutorily required to or would benefit from purchasing flood insurance.

Third, FEMA expects that accurate and precise digital data will help national, State, and local officials accurately locate infrastructure and transportation systems to help mitigate and manage risk for multiple hazards. Houston has used the digital data from its maps to develop a model for projecting the path of a petroleum spill at a Houston oil refinery. North Carolina is using the digital data to develop a real-time flood inundation model that can be used to identify bridges and roads flooded and likely to flood during a storm and are, thus, unsuitable for evacuation.

FEMA faces three principal challenges in its flood modernization program. First is developing new, accurate maps across communities with different levels of flood risk while working with its State, local, and regional partners to maximize the effective use of Federal, State, and local resources.

Flood maps are no better than the accuracy of the data and analysis on which they are based, but not every area requires exactly the same level of data collection and analysis. Areas of lowest flood risk will require less intensive data collection and analysis than those at highest risk. We recommended that FEMA define the specificity and quality of data needed for communities with different levels of risk to ensure that similar data collection and analysis were done for communities in similar risk categories. In its 2004 multi-year risk hazard identification plan, FEMA has outlined some of the factors that it is going to consider in doing this.

With regard to resource sharing, FEMA's goal is that nationally, overall, its State and local partners will contribute 20 percent of the resources FEMA does. Actual experience to date across FEMA's ten regions has ranged from less than 10 percent to more than 40 percent. North Carolina, to date, for example, has contributed about $41 million, or about 65 percent of the cost of the flood mapping effort.

FEMA faces a challenge in leveraging its resources in partnership with communities who have few resources and little experience with flood mapping. FEMA's November 2004 plan does not directly address this challenge and how it plans to deal with it.

Secondly, developing partnerships with participating communities, lenders, and other stakeholders that will enhance the use of the new maps for mitigation or the purchase of flood insurance is a continuing challenge. This is important because FEMA has no direct authority to enforce community building code and mitigation regulations, and FEMA must rely upon Federal regulated lenders to ensure that property owners who are required to purchase flood insurance do so.

The third FEMA challenge is effectively overseeing and managing its performance-based flood modernization contract. As we recommended last year, FEMA has established performance goals for the map modernization project. They include the population that has digital GIS data, the percentage of the population that has adopted maps that meet FEMA's quality standards, the previously mentioned State and local resource contribution targets, and appropriated funds sent to its cooperative technical partners.

At the time of our review, FEMA faced a shortage of staff with the skills needed to effectively oversee its performance-based contract for map modernization, although it was making efforts to hire such staff. Staff with the appropriate skills are key to effective management and oversight of such a large, complex contract.

In conclusion, Mr. Chairman, FEMA has made progress in creating a structuring process for effective map modernization, but faces continuing challenges in successfully implementing this complex program.

That concludes my statement. I would be pleased to respond to any question you or other members of the subcommittee may have.

Chairman NEY. Thank you.

[The prepared statement of William O. Jenkins can be found on page 124 in the appendix.]

Chairman NEY. Mr. Bullock.

STATEMENT OF MICHAEL BULLOCK, PRESIDENT, INTERMAP FEDERAL SERVICES, INC., AND VICE PRESIDENT, INTERMAP TECHNOLOGIES, INC.

Mr. BULLOCK. Mr. Chairman and members of the subcommittee, it is a privilege for me to testify on this particular topic. I have prepared written testimony that I ask be submitted for the record.

Chairman NEY. Without objection.

Mr. BULLOCK. A national strategy is needed for topographic mapping to support the flood maps that are being produced under the FEMA Map Modernization program.

In year 2000, Britain faced serious flood mapping problems. There was severe flooding that caused over $1.5 billion worth of damage. The people there complained that the flood maps were not accurate and not only that, but they said that the risk that they were paying in terms of their premiums did not reflect the actual risk of flood.

I suspect that many of these themes ring true to you here today.

Now let's fast forward to 2004. Again, there was severe flooding late last year, but the new maps that were created in Britain accurately predicted the flood extent almost to the individual property—

Chairman NEY. I am sorry, the new maps created in Britain by—

Mr. BULLOCK. I will get to that in a second, sir.

How did they get there? How did they get to mapping an entire country in a few short years very accurately and very precisely?

The way that that was done is that the largest flood insurer in the country, Norwich Union Insurance, recognized they needed better topography for the country in order to support more accurate flood maps. They entered into a partnership with ourselves where we used the latest technology to map all of England, Wales, and Scotland—and this we did in 18 months, which is an unprecedented achievement. We used a new technology based on airborne radar that does direct measurements of the Earth's topography; it does it very effectively and very quickly. And when they produced these flood maps, they found that the data is king, that you can't produce accurate flood maps without accurate and current topography.

Now in the poster that you see off to the right, that is a depiction of the data that we created for England, Wales, and Scotland. It is complete; it is accurate; it is current.

Now today, the U.S. is also updating its flood maps into the Map Mod program, and it is an excellent program that will benefit our country for many years. However, there are concerns that all of us should have in regards to this program.

For some areas, there are concerns that we are digitizing and modernizing old data. And in those areas, particularly in the rural parts of the country, the policy of the Map Mod program is to update the flood maps using the best available topographic data. Well, for much of the country the best of the topographic data—

Chairman NEY. Sorry, just so we follow on track—and we won't take this off your time—the first map you had up there was Great Britain with the modern mapping. What is this map? Because we don't have the screens in the committee here. What is this map of?

Mr. BULLOCK. This map that you are seeing depicts FEMA Region 6.

Chairman NEY. This is not a mapping; this is just a map?

Mr. BULLOCK. The color coding is depicting the USGS data that is available for FEMA Region 6. Each color is a different era in terms of when it was produced, typically between 1940 and 1980.

And that chart speaks for itself. It is a random quilt work of various vintages and various accuracies.

Chairman NEY. This is the map that would be used today, then?

Mr. BULLOCK. For many areas under Map Mod, in the rural areas of the country, yes, the best topographic data is the USGS data.

Chairman NEY. I just want for the members to be on track.

Mr. BULLOCK. To use this data with various vintages, with various inaccuracies, it brings to mind the phrase, ″garbage in, garbage out.″

Mr. Chairman, we can and we must do better. The Map Mod program has a critical and dramatic need for updated topography for the country to support better and more accurate flood maps.

The next poster which is being shown is of a pilot project that we performed with FEMA Region 6 in the Texas area. And in that pilot project, it was very successful in terms of evaluating new airborne radar data in terms of creating new topography to support flood map generation. In comparison with the existing USGS data, it found the USGS data to be off by as much as 5 feet vertically and 170 feet horizontally; and when it comes to updating flood maps, those are huge errors.

Right now we are engaged—our company is engaged in mapping the United States just like we did in Britain. We are going to map the entire continental U.S.; we are going to do it in 4 years. We have already completed Mississippi, Florida, and in a few months we will have all of California completed. In the next 3 to 4 years we will have the whole continental U.S. mapped, the topography mapped, more accurately than has ever been achieved, just like we did in Great Britain.

Now our data alone is not a complete solution for FEMA. We recognize that. But for the sparsely vegetated areas of the country, roughly 60 percent of the country, it is a very effective solution. And then, using airborne LIDAR and other technologies for the vegetated areas, we can, in fact, have a solution that has accurate topography for the entire country.

The Map Mod program is in a critical phase right now, where many hundreds of counties are going to have their flood maps updated. We need to ensure that we are not simply digitizing and modernizing old data. And when we are updating the flood maps, we need to ensure we are using the most accurate topography that our technology or anybody's technology can provide.

And so, to sum up, a national strategy is required for collecting this topography to support the most accurate flood maps that are possible. Thank you.

Chairman NEY. I thank the gentleman.

[The prepared statement of Michael Bullock can be found on page 56 in the appendix.]

Chairman NEY. Mr. Edelman.

STATEMENT OF SCOTT K. EDELMAN, PRESIDENT, WATERSHED CONCEPTS, A DIVISION OF HAYES, SEAY, MATTERN & MATTERN, INC.

Mr. EDELMAN. Good morning, Chairman Ney, Ranking Member Waters, and members of the subcommittee.

I am Scott Edelman, president of Watershed Concepts, a division of Hayes, Seay, Mattern & Mattern, Inc. I appreciate this opportunity to appear before this Subcommittee on Housing and Community Opportunity.

Watershed Concepts has been involved with creating flood maps for FEMA since 1984. During this time, I have witnessed many changes within FEMA and the flood insurance program. I believe the current approach FEMA is taking to produce maps is highly effective. Drawing on this experience, I am honored to represent Watershed Concepts and to provide testimony on the topic of this hearing.

Specifically, I have been asked to provide my opinion to four questions contained in the July 1, 2005, letter from Chairman Ney to me. I have supplied detailed answers to the committee before giving this testimony, and I am summarizing my responses as follows.

The first question deals with how important is it for FEMA to keep the maps up to date and what are the negative consequences of delaying map modernization? I believe it is critical to keep the maps up to date and detrimental to the country if the maps are not kept current. The maps provide protection for 4.5 million policyholders and provide approximately $650 billion in coverage, with annual flood damages of approximately 1.1 billion.

If the maps are not updated, then the annual cost is likely to increase for two reasons. First, FEMA has not studied every stream in the Nation; FEMA has only studied about one-third of the streams. Many of the unstudied areas are on Federal lands and are unlikely to be developed. However, because of population growth and shifts in the Nation's population from one region to another, development will occur in areas that were not previously anticipated for development.

Second, as the watershed develops, more parking lots, building and road construction occurs. This creates additional storm water runoff that under natural conditions would have been absorbed by the soil. We have performed studies that show watershed development can increase water surface elevations along flooding sources by more than 10 feet. I believe that these are the two reasons why it is critical to keep the maps current.

The second question dealt with who decides which maps would be modernized and is the process sufficient. I observed that FEMA headquarters sets national policy with map modernization being implemented at the ten FEMA regions. Each region obtains considerable input from the States and local communities, but FEMA decides when the study will be performed and the scope of the study.

If the community wants to take on additional responsibilities once FEMA has made the basic decisions, it does allow for delegation of portions of the program to the partner. I believe this is an effective means to manage the program.

The third question dealt with the use of USGS maps as the best available topographic information. FEMA has strict guidelines and specifications for performing studies. These guidelines state that USGS quadrangle maps cannot be used for detailed study areas. These are medium- to high-risk flood-prone areas.

We do, however, consider USGS quadrangle maps for areas of low-risk flooding. These are typically rural America where growth is very small or negative and the population densities are small. We have performed pilot studies in these areas with emerging technologies to determine if a better product can be created within the limits of the set budget. These emerging technologies do offer the hope of creating a better flood map, but issues such as data licensing and evaluation of the actual benefit in low-risk areas may need to be done.

The fourth and final question dealt with FEMA's overall map modernization strategy. I have observed FEMA performing a comprehensive nationwide approach, upgrading standards, and evaluating new methodologies and technologies that may benefit the program. I believe that modernization is being effectively managed.

I want to again thank the subcommittee for this opportunity to address the members concerning this important topic. I am honored to be able to provide testimony as the subcommittee considers the most efficient methods to prevent or reduce flooding losses. I would be happy to answer any questions that you have, and with the permission of the committee, I would like for the detailed responses to my questions to be entered in the record.

Chairman NEY. Without objection. Thank you.

[The prepared statement of Scott K. Edelman can be found on page 107 in the appendix.]

Chairman NEY. Ms. Small.

STATEMENT OF CHERYL SMALL, PRESIDENT, NATIONAL FLOOD DETERMINATION ASSOCIATION

Ms. SMALL. Mr. Chairman, Ranking Member Waters, and members of the committee, thank you for your time to speak.

I am representing the National Flood Determination Association, and that is a professional association of companies which provides flood zone determinations to lenders for compliance with the mandatory purchase requirements of the NFIP. The association represents some two-thirds of the industry and is probably the most frequent user of the flood maps, with approximately 33 million determinations completed for lenders in the year 2003.

The NFDA is gratified that the Administration has recognized the real need to update and modernize the flood maps. I would like to convey to this committee NFDA's full and complete support for the Map Modernization initiative. Seventy percent of the flood maps are 5 years and older, with 57 percent at least 20 years old. And several thousand flood-prone communities remain without flood hazard maps. About 20,000 maps require updates since they have outdated or inadequate flood hazard data.

In the near term, many of the new maps will be just a digitized version of the current updated flood map. In those cases, the maps will not incorporate Letter of Map Amendment updates. If the Letter of Map Amendment update revalidation process is delayed, then home owners may have to seek insurance coverage when, in fact, their property has been exempted from the mandatory purchase requirement.

In 2004, 40,000 Letters of Map Amendments were issued. In recent years, processing these consumed about 80 percent of the funds from mapping fees generated—for mapping generated by fees. When a revised map is issued, enormous cost is incurred by all parties as it initiates the life of loan tracking processes and procedures developed by lenders and flood companies to ensure compliance with flood regulations and secondary market requirements. This process involves notification to lenders by flood determination companies and then lenders contacting borrowers and home owners regarding insurance-related matters. In 2003, our industry was tracking 97 million loans for map changes.

Flood determination companies are in a somewhat unique position of understanding the issues involved with the development and deployment of the maps. We have regular communication with home owners and lenders who are directly affected by the release of new maps into the communities. In 2003, our member companies fielded in excess of 1.3 million calls from home owners and lenders discussing compliance and mapping-related matters.

In 2003, we organized the technical mapping meetings with FEMA, NFDA, and FEMA's mapping partners. This forum was created as a way for all parties to discuss and resolve technical mapping issues, receive updates on the progress of map modernization, and voice any concerns about the direction of the program.

FEMA and their mapping partners have gained a better understanding of how the determination industry uses the flood maps and how a seemingly minor change on their part can have significant impacts to lenders and borrowers, as was played out with the North Carolina paneling schema. At this point, it is not clear whether our input has been taken into account, and if it has not been, then there could be serious problems for our industry lenders and their borrowers and their home owners.

We understand that meetings have taken place concerning some important items for our industry, but we have not received information on the outcomes. If the determination industry is not kept in the loop on these matters, the result would be a slowdown in the closing of real estate transactions.

NFDA is concerned that all involved appear to be focused on fulfilling the program metrics rather than considering an adjustment of the time and money needed to produce accurate digital maps based upon updated topographic base data and updated flood studies. Map modernization is more complex, extensive, and costly than originally estimated. Updates require more time and investment, and this raises a concern that insufficient analysis is being undertaken in order to complete actual amounts more quickly. Until the program was under way, certain factors affecting costs and time estimates were not realized.

We would not want the new maps to be simply digital maps produced from existing flood information. To do justice to the national investment and good flood-risk maps, there may need to be some adjustments to the quantitative standards by which the program is evaluated, and it may not be possible to complete the job in the projected 5 years.

NFDA applauds FEMA's commitment to produce easier-to-use and easy-to-update digital maps. We expect a significant number of maps to be released under the Map Modernization initiative in September. And once we begin to work with the new data, we will have more facts on which to base our opinions on whether map modernization is achieving its goals.

We would appreciate an opportunity to address this committee in the future about the issues that may reveal themselves over the course of the next few months. NFDA recommends that FEMA establish an stakeholder advisory group and model it after the successful Technical Mapping Advisory Council established by the Flood Insurance Reform Act of 1994.

That concludes our testimony.

Chairman NEY. Thank you.

[The prepared statement of Cheryl Small can be found on page 154 in the appendix.]

Chairman NEY. Last witness, Mr. Williams.

STATEMENT OF JAMES R. WILLIAMS, COCHAIRMAN, MAPPING AND ENGINEERING STANDARDS COMMITTEE, ASSOCIATION OF STATE FLOODPLAIN MANAGERS, INC.

Mr. WILLIAMS. Thank you, Chairman Ney, Ranking Member Waters, members of the subcommittee.

My name is Jim Williams. I am the project manager for Nebraska's floodplain mapping program.

Just to give you an idea of where we are coming from, we have mapped more than 10,000 miles, stream-miles, in the State of Nebraska, and we have mapped it at the lowest cost in the Nation. And I am here testifying on behalf of the Association of State Floodplain Managers.

I am going to address all four of the bullet points, the questions that were in our invitation letter.

The first question was, how important is it to update the flood insurance rate maps? The sad truth is, it is not important to anybody until our next flood. People have very short-term memories when it comes to disasters; however, after the next flood people are going to want to know yet again how did it happen, why wasn't I warned, who is going to pay for my losses. And we all know who they are going to be writing and calling when that happens.

So the NFIP protects citizens and their property from losses due to flooding. Map Mod is in the process of making maps so people can be aware of what their risk is.

The second question was in reference to who makes decisions about what projects go forward during any one fiscal year. I have got kind of a two-part answer to that. Overall, it is the FEMA regional engineers and the various regional offices that make those decisions. During early years of Map Mod, we believe some serious mistakes were made. The emphasis was based on hitting popu-

lations in counties with high populations, and so populous counties with acceptable paper maps received new Map Mod funding, while new, completed county-wide studies could not move forward; they sat on the shelf waiting for publication money.

In the State of Nebraska, we had over a dozen completed studies that were delayed 1 to 2 to 3 years. We couldn't hit the print button because we were throwing big dollars at Lincoln and Omaha, which already had useful paper maps.

However, I do want to emphasize, we believe FEMA is getting back on track on this. They are making decisions in more of a partnering mode. Regional personnel are working with State and local authorities to properly prioritize what projects move forward.

The third question was, what value is there in comparing flood zones to 40-year-old USGS topo maps? Well, I believe that this guidance, which is in section 7 of FEMA's plan, Multihazard Implementation Plan, was written to address two things. First of all, you can quickly judge the quality of a map by superimposing it on one of these old topo maps. If it doesn't fit the old topo map, you have no business digitizing that old map. If it is bad enough, throw it out; do a new study.

Secondly, many study contractors insisted they could delineate Approximate Zone A flood zones on digital elevation models. Well, the problem is that the DEMs are derived from the USGS topo maps; therefore, the quality is degraded. DEMs do not represent the best available topo. Based on my experience, the topo maps are adequate for modeling and delineation in rural areas. They should be double-checked in towns. They are not accurate enough for detailed studies. And the topo requirements are very clearly spelled in out in FEMA's guidelines and specifications.

The fourth and the last item was a request for an overall assessment of FEMA's Map Mod strategy. Overall, I am going to give FEMA a thumbs-up on this issue.

I could talk to you all day long about some of the good things that are happening with Flood Map Modernization, but I am close to out of time, so I am going to mention the one main thing I want to leave with you: There isn't enough money.

We now know that $1 billion is not going to do the job; it is going to take maybe three times that amount, based on State business plans. You might be asking, are we looking for gold-plated maps? No. We are looking for just a simple, usable map that passes what we call the red-face test. How did we get the numbers so wrong? There are lots of reasons, but quite frankly, we didn't know how bad the maps were. We had to go into Map Mod 1 to 2 years to start seeing some of these things come out. And we now know that it is going to take probably $3 billion to do the job that our citizens need to have done.

Thank you for your time.

[The prepared statement of James R. Williams can be found on page 160 in the appendix.]

Chairman NEY. Thank you.

I want to ask you a question based on something you said about—from my understanding what you are saying is, we don't need gold-plate mapping everywhere. Also, in the rural areas, who would determine and separate out—let me give you an example.

There are some areas where nothing is developed, nothing has changed, so therefore one would say, well, we don't need the gold-plate mapping in that area because there is not enough money. But what do you do in some of the rural areas—I will give you an example where we have had long—are you familiar with underground mining? And in underground mining, they don't have to get rid of you to permit. They go under your house, and as you know, sometimes it disrupts an aquifer, it disrupts flows, and you could have different patterns which might affect a creek, and you might have flash flooding where you never had it before. But technically, to the eye, you don't have any type of development in that area, but you could have a situation which could create possibly some changes that might lead to flooding or redirection of creeks or something like that. As you know, that could happen with that.

Now how do you separate that type of area out, that it doesn't need maps, from an area that does need maps? How would do you that in rural areas? I mean, I understand in the desert you don't need probably million dollar mapping, because what is going to change there, particularly, but—

Mr. WILLIAMS. The short answer is, we don't know. Let me give you a little bit more on that.

My subcommittee with the State Floodplain Managers is actively addressing this, and we hope to work in partnership with FEMA. We know that we don't need to map large portions of national parks and other Federal properties, bombing ranges.

It is my opinion that every town needs a map. Some people within FEMA are not yet convinced that every town needs a map. Their point is if you are not in the National Flood Insurance Program, you don't deserve a map.

Well, we have got a chicken-and-an-egg problem here. Many communities in Nebraska haven't joined the program because they don't have a map; they don't know they have risk. So my opinion is, every incorporated community, and perhaps some zone outside of that community, needs, at a minimum, an Approximate Zone A map.

My next point is that areas that are growing need a detailed study. Overall, there is huge cost savings when developers know exactly what the risk is in those areas. But there is that gray area that is in between communities and growing areas versus the Federal lands, and that is something we have got to hammer out together. We haven't answered that question.

Chairman NEY. That is a good, honest answer. You don't have the answer yet, because I can think of other places in the district where we have bedroom communities—now Columbus, Ohio, that did not have huge development, and now they have constant development because people are living there and working in—for example, in Columbus, Ohio, so that is creating more runoff, water runoff, things that we haven't dealt with before.

I guess what you are saying is, we don't know yet how to separate out; this doesn't ever need mapping for the short term and this does. We still just don't know how to do that.

Mr. WILLIAMS. That is correct.

There is another aspect I would like to introduce to this. I think that every community that gets a floodplain map, obviously that

panel is going to get published. There are going to perhaps be large portions of that panel not close to the community. How are we going to map those? If it is Zone D, unstudied, the insurance is going to be pretty expensive there. Are we going to map it as shaded Zone X?

My point is that it is a very complicated question, and it has huge fiscal impact.

Chairman NEY. Mr. Jenkins, the question I have, are most people, do you think, generally—are aware, unaware, whether they have to get flood insurance? Is there a consistent mechanism where people know, yes, that they are aware that they have to have flood insurance or not, or should have it or not?

Mr. JENKINS. I think they—the answer to that is, no, in terms of consistency. In prior work that we have done, there does seem to be a problem.

As you know, mortgages shift—mortgage servicers shift from the original person you get the mortgage from; somebody else takes it over. And there seems to be problems there with consistency in terms of them knowing that this person needs flood insurance. So there seems to be some problem in whether or not people really do know.

There are some examples in the current flood mapping process where they have taken quite a bit of trouble to try to notify people when a map has been proposed to send notification to every person that would either come into the floodplain and would have to be required to purchase flood insurance or would move out of the floodplain and would not be required to buy insurance.

So that is an important part of the flood mapping process, that at the time that the map is proposed and sent out that a company notify everybody that would be affected by a change in the boundaries.

Chairman NEY. Thank you.

The gentlelady from California.

Ms. WATERS. Thank you very much, Mr. Chairman.

Mr. Bullock, am I to understand that you are representing here today that you have the state-of-the-art technology by which to do mapping in a way that would give us the information that we need in order to determine whether or not we need to change the maps that are not used—the old, not digitized, just old data? Is that what you are telling us?

Mr. BULLOCK. That is correct. And again, we are not a solution for the entire country, but this is what we learned again in Britain. The existing Government topographic data was not good enough to have consistent, accurate flood maps for the entire country. And so that is when our technology was employed; and in 18 months we mapped all of England, Wales, and Scotland to a very consistent and complete topography that was then later used to generate new flood maps for those three entire countries.

And as a result, 600,000 properties were now available and qualified for flood insurance. Premiums for many of those property owners have decreased or gone away entirely. And so Britain is now the most accurately flood-mapped nation on the face of the Earth. And there is an opportunity to employ those same practices and technologies here for much of the country to improve the topog-

raphy—again, topography that data is king in terms of the accuracy of the resulting flood maps.

Ms. WATERS. So are you contracting with FEMA now for anything?

Mr. BULLOCK. No. FEMA Region 6 did sponsor a small pilot study in Texas which—I showed you the results in my testimony—which was very successful. As of right now, we don't have any contracts with FEMA, although Region 6 has expressed interest in not using the USGS data as a result of that pilot study and in using our data in certain counties. But right now we are not under contract.

Ms. WATERS. I see. I guess—I don't know if this is an appropriate question or not to Mr. Jenkins.

Are you familiar with Intermap Federal Services, Inc., of Englewood, Colorado?

Mr. JENKINS. No, not really. I did have some information that they sent me about what they do and what their product is and so forth, but we are not particularly familiar. And in the work we did, we didn't really assess different technologies and the merits of different technologies for mapping.

What we did focus on is consistency and approach and making sure that they have some way of identifying and assessing that the maps are accurate and that they are accurate for the purpose of which they are intended, which is identifying accurate flood boundaries.

Ms. WATERS. Well, the question that appears to surface here today is whether or not we are going to digitize old information. What do you think about that?

Mr. JENKINS. Well, I think there is an issue that hasn't been raised about digitizing old maps, existing paper maps.

Assuming, as Mr. Maurstad said, that one has determined that that data is still sufficiently reliable in terms of identifying floodplains, there is the potential that the map itself has errors in it, that is, that the data from the survey was transferred onto the map, errors were made doing that. So, at the very least, if you decide that that map is sufficient and you have done an analysis to decide that the map is sufficient, you need to at least make sure that you are digitizing correct data, that you are not digitizing errors that were inadvertently placed on the map to begin with.

Ms. WATERS. Are you convinced—while you said you did not look at the technology, you haven't evaluated the technology that is being utilized to determine whether or not they can get the correct information to make the corrections. Is that a fair statement?

Mr. JENKINS. That is right. We did not really look at the technology. We did visit a number of locations that were doing Map Modernization, that used extensive LIDAR in both North Carolina and Houston. Most of that LIDAR was paid for locally, not by FEMA. So we looked at the kinds of technologies that they were using, but we didn't assess whether or not they were the right technologies.

Ms. WATERS. I see.

May I just ask Ms. Small and Mr. Williams, do you know anything about this technology and whether or not we are using the

appropriate technology to get the information to make sure that we are not digitizing old maps?

Mr. WILLIAMS. I do believe that we should look closer at it. We would like to evaluate some of the data from the pilot study. I would like to try out my own software and tools on that data.

There are large portions of Nebraska for which this technology appears that it would be useful. It is—as Mr. Bullock said, it is not appropriate everywhere, and I understand this. Understand that in Nebraska we are in a unique situation in that we have the USGS contours already electronic—″in the can,″ so to speak. There are large portions of the country where the cost of moving from paper to the computer is equivalent to the cost of getting brand new data from this new technology, and in those areas it should be looked at more closely.

Ms. WATERS. Ms. Small.

Ms. SMALL. I am not familiar with the technology from Intermap, but we do—as an organization that uses the maps 33 million times in 1 year, we do realize the importance of having the latest, updated topographical-based data because it certainly allows us to make accurate determinations that are rendered of whether a home owner is required to have flood insurance in response to the mandatory purchase requirement.

Ms. WATERS. Mr. Chairman, I don't think there is anyone here who could answer for me whether or not the cost of new technology that may be much more accurate than what we are using now is prohibitive or whether or not the amount of dollars that is allocated toward the remapping would be sufficient to pay for this technology, but I think it is something we need to find out about.

Chairman NEY. Homeland Security—or can anybody answer that?

Ms. WATERS. Mr. Bullock.

Mr. BULLOCK. The current practice in rural parts of the country for developing new topography is done county by county in cooperation with local communities, and it is a good thing to cooperate with the local communities. But to map a country county by county would be like carpeting your home 1 square foot at a time, buying that carpet from different stores and then piecing it together.

There are economies of scale when you employ new technology to map entire States, entire countries, do it simultaneously instead of over decades; and that is what we did in the U.K. And that is what I talk about, when we need a national strategy to collect this topographic data to support the Map Mod program.

We need to do that; we need to start it now because when you consider the schedule and the course of the Map Mod program, it is unlikely they are going to avail themselves of this type of technology on a wide scale practice before the program is done, and we will end up with a lot of new flood maps based on old and inaccurate data.

Ms. WATERS. How many companies are there that do what you do? Do you have any idea?

Mr. BULLOCK. Currently, we are the only company that uses this technology specifically for flood mapping. But again, we can't do the whole country for flood mapping accuracy. We have a solution that we believe fits for about 60 percent of the country, the agri-

culture and sparsely vegetated, but that is a good start. And then, using other companies that have LIDAR and other technologies, we can, in fact, develop a national topographic database just like was done in the U.K. and again have the most accurate flood maps on the Earth.

Ms. WATERS. Well, you answered my question, because that is precisely where I was going, whether or not you in cooperation with other companies could put together that kind of a strategy that could be looked at for dealing with what I think is a very complicated problem that we really don't have a handle on.

I have not been satisfied, just listening today, that we will not be simply digitizing our maps. I think—the testimony we have heard leads me to believe that that is precisely what we are going to do unless we come up with a different, more comprehensive strategy that perhaps everybody here is suggesting in one way or the other, and I am certainly supportive of that, yes.

Mr. WILLIAMS. Ms. Waters, if I may, I have to emphasize that it is not FEMA's task or duty to come up with topographic data. It is not cheap, and it is not particularly easy, especially on a piecemeal basis.

But trying to do flood maps without good topographic data is like trying to clean the room without the lights on; it is like trying to drive without headlights. It is the fundamental basis of what we are about here, and however we get to it, we need to have a good strategy for accurate topo delineations in towns and in rural areas. And there are various costing levels that are appropriate.

And I don't know the answer of how to fund that, but you have hit on the key item here, yes.

Ms. WATERS. Thank you very much, Mr. Chairman.

Chairman NEY. Thank you.

The gentleman from New Mexico, Mr. Pearce.

Mr. PEARCE. Thank you, Mr. Chairman.

I was close to Sonora, Texas, a couple years ago, and the water was running about 11 foot deep, and it was over the overpass there along the main highway.

In my own hometown a couple years ago we typically hit 9 inches of rain a year. We got that all in about 45 minutes, and it washed the pavement out of many of the streets in town.

So when we want to disregard the flat desert, it is not. Mr. Bullock, what was the cost of providing the maps to Britain.

Mr. BULLOCK. We did that in a partnership with Norwich Union Insurance where they provided about half—

Mr. PEARCE. I just wondered the total cost if I wanted to get a comparative basis.

Mr. BULLOCK. The total cost was approximately $7 million, and the area that was mapped is roughly 1/40th the size of the continental U.S.

Mr. PEARCE. So for $280 million, do you think you could do that?

Mr. BULLOCK. That includes the topographic mapping as well as all of the flood mapping, creation of the new flood maps. Now they use a different technique than what FEMA contractors would use, but that is roughly what the level of investment was.

Mr. PEARCE. Do you think for 280 million you might be able to do the U.S.?

Mr. BULLOCK. I would just speak to the topographic portion of that, since I don't do the creation of the flood map—

Mr. PEARCE. That is all right. The FEMA made a comment that you are willing to sell maps, but are not willing to allow the public use of these maps. What is that all about?

Mr. BULLOCK. Well, the reason why we are able to do it so inexpensively is we license the data. We are going out and mapping the United States right now using our own investment, and then we spread the cost of that data across multiple users and multiple agencies.

Mr. PEARCE. And every time they access it they pay a fee or something?

Mr. BULLOCK. No. Once they buy a license they have that in perpetuity. They can use it—

Mr. PEARCE. What would a small town pay for a license, say a town of 12,000 in New Mexico?

Mr. BULLOCK. Well, typically it is only $10 a square kilometer. A small town might be 500 square kilometers, so it might be $5,000. Very affordable.

Mr. PEARCE. Mr. Jenkins, as we discussed the whole process of FEMA, does FEMA ever pay claims? People rebuild and within a year or two they pay the same claims on the same spot?

Mr. JENKINS. Yes, they do. They do.

Mr. PEARCE. How does that work? I thought FEMA in previous testimony, their idea was to get protection and tell us where not to build. How does it—

Mr. JENKINS. Where not to build. We did testify, and I have some information I can share with you for the record about repetitive loss properties. But that is the issue. There are properties where—repetitive loss properties are primarily located in Texas and Louisiana. They are more in those two States than any other places. They are places that have filed, you know, more than one loss. In some cases, the loss is greater than the value of the property; that is, the payouts are greater than the total value of the property.

And of course that was one of the things the Flood Insurance Reform Act of 2004 was designed to try to address was repetitive losses. But they are a big problem, and they are a major portion of the total payout in flood insurance.

Mr. PEARCE. Does FEMA have a process to identify if they get multiple claims?

Mr. JENKINS. Yes. It a process for that.

Mr. PEARCE. And does the process then begin to limit that? How—in other words, I watch—I don't live on the coast, but I watch all the TV with houses being washed away from the coastline, and yet it appears when I go to the coast those things are rebuilt.

Mr. JENKINS. There is a point at which you are not eligible for disaster assistance because of that and other things as a way to encourage you to either elevate the property or move out of the floodplain.

Mr. PEARCE. What is that point, that point of discouragement?

Mr. JENKINS. I don't exactly remember. I have it in my office—

Mr. PEARCE. If you would submit that it would be interesting to see that because it to me seems a lot of times we simply do the same things over and over again, and I would appreciate that.

Mr. JENKINS. I will send you that information.

Mr. PEARCE. I see my time is about to elapse, Mr. Chairman. Thanks.

Chairman NEY. Mr. Fitzpatrick.

Mr. FITZPATRICK. Thank you, Chairman Ney. I appreciate the testimony of everybody on the panel. I know that those of us who represent districts who are victimized by habitual flooding find your information very helpful. It also sounds like everybody agrees we need better coordination with our local partners, with our State governments and local governments. I know as a county commissioner for Bucks County, Pennsylvania, for 10 years, every week county governments and local governments are signing contracts to not only update their flood maps, but they are signing contracts for high resolution aerial photography. They are buying new hardware, upgrading their software, GIS systems. And in my view, we need new incentives and better incentives with local governments.

I was wondering if anybody on the panel has any suggestions for new incentives that the Federal Government could use that would draw in that new data that is being generated every single day and recognizing as we create a new incentive and part of the incentives may be to, you know, to encourage local governments to use not only Homeland Security dollars, Federal dollars, and State dollars, but start using some of their own local resources, which many governments are willing to do, use their own local resources and maybe move those governments to the top of the list for quicker flood map modernization. And if you do that, again, you have to recognize—and I heard a little bit today about standardization. I am looking at that map down here, and that is everything but standardization. But the fact is that there are 3,000 counties in the United States, and all those counties have their own contracts and they are getting different kinds of data.

So on the one hand, we all appreciate the benefits of standardization. We have to recognize there are local governments and county governments out there getting their own data and different kinds of resolution of data, and so what kind of incentives can we give local governments to spend some of their own dollars so that with the $1 billion we talked about—and, Mr. Williams, I think you indicated that is not enough—encourage the local governments to help out, and what does that do to standardization and flood mapping around the country?

To any of the members of the panel.

Mr. EDELMAN. Maybe I can go first. FEMA is embarking upon a digital system, and they are putting all their information into a managed information platform, mapping information platform, MIP, mapping information platform. This allows data to be built upon. So that, for instance, in your Bucks County, if they came up with better topo information after FEMA has done their study they will be able to incorporate that information easier and update the flooding information more efficiently and faster as time goes on.

So there has been a lot of talk about how we are going to move forward. What I believe FEMA is doing is FEMA is getting us to

that base layer of instead of getting us out of the paper world and into the digital world such that once you are in digital world updates become a lot more efficient and a lot more effective and a lot more timely as new information becomes available. There are plenty of counties across the United States that get new topo information once every 2 or 3 years, and it would be really nice to be able to update the maps in these growing areas to do that.

So a lot of emphasis is going on on how the partnership can work with local communities to take this data in to provide the updates.

Mr. BULLOCK. If I might respond. Again, I think it is important to cooperate with the local communities, but to rely on them to provide the topographic data on a county by county basis, I believe that is a flawed approach.

If that was the approach we had taken in the United Kingdom, we would still be talking about the program instead of already having the best flood maps that exist.

I believe that a lot of the initial reliance on the local communities was due to budget concerns and trying to help them fund the collection of this data, but with new technology that exists today that is no longer as much as of a problem because we can, in fact, collect data for the entire country in just a couple of years. And it would be consistent, complete. Instead of having a patchwork that you see on that poster there, you have a consistent database. And then you share that with the local community so they have the access to that high accuracy data as well.

Thank you.

Mr. JENKINS. I think one thing in our work that we noticed is that it really does help; it is not so much giving the community an incentive but it is an understanding of how the digitized data can benefit them and the things that they can use it for.

One of the things that they can use it for is emergency planning. Houston has been using their data to be able to deal—for quick response model and do a quick response under different conditions; that is, you know, high or low tide, et cetera, for hazardous waste spills in Houston's ship channel, and to be able to then develop evacuation plans on the basis of that; that is, that it is going to be here in an hour and we need to get these people out because it has this lethal plume and the topographical data then can be used for plume analysis, for things like chlorine emissions, a tanker car that has liquid chlorine in it and gets breached.

So there are a number of things that it can be used for that are beyond flood mapping. That is more difficult for them to use it when it is not digitized because the location of the particular facilities is much less precise. You can use it, as North Carolina is, to try to identify evacuation routes in areas that are likely to be flooded so people are not going to be able to get through and get away from the coastal areas. They are developing a realtime Web based flood inundation system that can be used and that can be accessed by radio and television stations: Don't go to this bridge; don't go to that road; it is going to be flooded; you can't get out that way.

So the more they understand the multiplicity of uses the data has for them, the more likely they are going to be able to see value in it.

Mr. FITZPATRICK. Mr. Chairman, I see my time has expired.

Chairman NEY. I have a question, and after that if either gentlemen would have other questions, please feel free.

I just want to see if I am on the right track of the thinking here. Basically, Mr. Bullock, you are agreeing—or Mr. Williams agreed with you—that there are certain or—I am sorry. You are agreeing with Mr. Williams. I assume there are certain portions of the country that just cannot be mapped. Is that correct?

Mr. BULLOCK. No.

Chairman NEY. I mean cannot be mapped as accurately as other portions. Because you see 16 percent.

Mr. BULLOCK. Yes, and that is for our particular technology. And there are other technologies again that need to be part of the solution such as airborne lasers, and so forth, but—

Chairman NEY. I am sorry, maybe Mr. Williams said there wasn't enough money to map correctly—I mean, to map everything. Is that correct?

Mr. WILLIAMS. There is two types of mapping I think that we are discussing here. For topographic mapping, some other technologies other than radar may be more appropriate, such as laser methods or advanced photogrammetric methods. The other mapping would be the floodplain mapping itself. And my point is perhaps we do not need to do floodplain mapping in Federal areas. We should concentrate on towns and elsewhere.

Chairman NEY. So, Mr. Bullock, I am assuming you cannot probably accurately map forests in certain regions. Is that correct?

Mr. BULLOCK. That is correct.

Chairman NEY. Go back to the question about natural forests. Should we even map them in the first place with the most up-to-date technology?

Mr. BULLOCK. And that is fair. That is a fair statement. But I would add that, for example, in Ohio, we looked at—it is our understanding that there is no plans for your particular district, Mr. Chairman, for collecting extensive new topographic data, whereas technology such as ours could map it very quickly, very completely, to produce better and more accurate flood maps for that entire congressional district. And under the current progress of the plan I don't see that changing unless this committee takes some action to change how we collect our topographic data on a nationwide basis.

Chairman NEY. Following up on that, let me ask Mr. Jenkins a question appropriate for you.

Based on what Mr. Bullock just said, is it FEMA's responsibility to, you know, update areas like my district or the State of Ohio or other States? Is it their responsibility.

Mr. JENKINS. It is definitely FEMA's responsibility under the Flood Mapping Modernization Program to determine what the—they have put every county into a risk category, and to determine for those risk categories what the appropriate level of analysis is for those different categories, what is the type of data that is needed, what is the specificity of data that is needed, what is the quality of data that is needed in order to produce a flood map of, quote, acceptable quality, and it is also FEMA's responsibility to define what ″acceptable″ is. So in that sense it is their responsibility.

Chairman NEY. Just for my own clarification, Mr. Edelman, do you use a different, your company use a different technology than Intermap?

Mr. EDELMAN. We are an engineering firm that utilizes the products of Intermap and other companies, and we are the company that actually did the pilot for FEMA utilizing Intermap's data in Texas.

Chairman NEY. You utilized Intermap data?

Mr. EDELMAN. Yes, we did.

Chairman NEY. So the two companies worked together to produce a product?

Mr. EDELMAN. Yes, we have. It is my opinion that the data that Intermap is providing would be useful for the program, anywhere from west of the Mississippi and east of the Rocky Mountains, about the same area that Mr. Bullock had mentioned. However, in all these areas we are talking about we have to come back that FEMA will not use USGS quads in any areas that are medium or high risk. In those areas we are currently working on perhaps maybe 60 or 70 active countywide studies. We are not using any USGS quads in any medium or high risk area.

Chairman NEY. I am sorry. What does that mean?

Mr. EDELMAN. Okay. FEMA has ranked—there are about 3,100 counties across the Nation. Okay? And there are different areas within counties that you can get a risk classification on. The higher risk is the number of people who live in the floodplain, the density, number of policies, number of flood damages, things of that nature.

The USGS topo maps are only considered for the very lowest of low risk categories, okay. These are counties that have declining populations or almost no population at all, and that is where the USGS quads have traditionally been used before.

Now would I prefer to use better, newer data? Of course I would. Okay, however, you have to balance that with the benefit of the cost of the newer and better data, and is it better to spend it there or someplace else.

Chairman NEY. I want to defer to my colleagues, but I want to come back to that cost question in a second. Mr. Pearce.

Mr. PEARCE. Thank you.

If we were to pursue that line of thought, Mr. Edelman, we are in the process of spending a billion dollars; we have already spent maybe 550 million of it. Do we have to even do that cost-benefit ratio that you are talking about that USGS uses if we simply redid it more or less with more thorough technology?

Mr. EDELMAN. Okay. The first counties that FEMA has performed are their highest risk counties. Typically, these are the high population counties. They are the ones that were ranked first. As they are working through the 5-year program, the lower risk counties are the ones that are being done later in the program.

An evaluation would really need to be looked at to determine is the cost valid—

Mr. PEARCE. Well, my point is that we have got 450 million in unexpended funds. Mr. Bullock says he can do it for 280 million for 60 percent of the country. My point is why are we going to proceed ahead if the data is somewhat unusable?

Mr. EDELMAN. Okay. Now I had the privilege of meeting one of the engineers who performed the study for Great Britain. The engineering methods that they used there are not acceptable and do not meet FEMA's minimum guides and specifications.

Mr. PEARCE. USGS stuff meets—they are using USGS data.

Mr. EDELMAN. Typically the cost of the topo data is just one small piece of an entire study. The topo data may run anywhere from 10 to 20 percent of the cost of the entire study. So just because you get new topo doesn't mean the cost ends there, and the procedures that were used in Great Britain are completely different than what the minimum standards FEMA has set for the industry in the United States.

Mr. PEARCE. Does FEMA reach its minimum standards in the United States?

Mr. EDELMAN. Yes.

Mr. PEARCE. Why do the charts that Mr. Bullock showed there show a fairly large deviation on the USGS maps? Why?

Mr. EDELMAN. What the USGS—what that is showing is that the age of the USGS topographic maps, just because data is old doesn't necessarily mean it is inaccurate. There were very—there were a lot of different contractors—

Mr. PEARCE. I will go ahead and reclaim my time.

Mr. Bullock, why don't you address the other side and save time for Mr. Jenkins? I would like for him to kind of weigh in on this.

Mr. BULLOCK. I agree with Scott that the techniques used in the U.K. are different from what is typically used here, but the fundamental fact is they have a complete flood map for the entire country instead of just focusing on high risk, medium, or so forth, on a county by county. Floods do not obey county boundaries. You have to map by watersheds and stream, river courses, and so forth. And so they found a tremendous value in having a complete topographic map of the entire country that was collected near simultaneously, that is accurate, consistent, and calibrated, which we do not have here.

Mr. PEARCE. Mr. Jenkins, do you want to weigh in on this? And before you get right to the point, is this an accurate—does this—this map kind of conveys a sense of disarray and chaos. Is that an accurate reflection?

Mr. JENKINS. Well, it represents topographical data. It is not a representation of the accuracy or the age of flood maps. Some of the flood maps are newer than this data. So it is the topographical data, represents the age of the USGS topographical data, which is, as has been said, is one input into a flood map. It is not the only input. You will need, you know, hydrological data and so forth.

One of the things that has been said here that is true is one of the reasons FEMA approaches things by counties is because that is where the governance structure is. The governance structure is not by watershed. It crosses watersheds. So in terms of being able to get—they also have to get buy-in from localities and so forth. The way you get buy-in is you have to go through what the governance structure is.

It is true that there are places where counties have gone together to try to pool their resources and work with FEMA to map entire watersheds, but that is simply not the norm. It is not the average

way in which they approach things, but it is certainly an option in the way in which they can approach things. The topographical data is one element, and it is certainly an important element. It is one of the—and the flatter the terrain, the more important it is that that be accurate because the smaller gradations affect the way that the water runs.

So it is sort of a complex process in terms of how you put it together. But it is also true that, as I said in my oral statement, that you want the most accurate maps that you can get that are necessary to identify the floodplains for people, and the topographical data, good topographical data, is a key component of that.

Mr. PEARCE. Mr. Chairman, I see my time has elapsed. As we are dealing with the problem that governance is the problem in mapping, I am not sure that Mr. Jenkins is suggesting—I am not sure I would suggest it, but it sounds like a PATRIOT act for floodplains is needed.

Chairman NEY. Mr. Fitzpatrick.

Mr. FITZPATRICK. Mr. Jenkins, I want to follow up on a question Mr. Pearce was pursuing earlier about repetitive loss properties. You testified today that FEMA doesn't have the ability to control local building codes and local land development decisions.

Mr. JENKINS. No, it does have the ability to do that, and that is the principal way in which it does that, and the other way is to buy out the property itself.

Mr. FITZPATRICK. We talked a little bit about incentives to local governments. How about disincentives to building within the floodplain? Once flood insurance, FEMA comes in and maps a particular community, and that community then—and I have seen this happen in Pennsylvania communities—will go in—when I was county commissioner—buy out properties, elevate other properties while the local government was approving building permits for the empty lot next door. While we are buying one property and removing it, you know, a modular structure is being placed in the flood fringe or in the floodplain next door. And we contacted FEMA about that. Within FEMA, what—my understanding is FEMA can go in and basically tell a local government, we are going to take you out of the National Flood Insurance Program if you continue that. What is the experience of FEMA in actually pursuing that in policing their floodplains and actually coming down hard on local governments that violate.

Mr. JENKINS. Well, you are absolutely correct. They can basically say, if you are not enforcing your codes, you know, the codes that you have to adapt once the floodplains are identified, you can be taken out of the program. But we haven't actually looked at the experience of how often they do that or what happens, you know, if a community is not enforcing or is inconsistently enforcing those regulations. So I don't really have a good sense of what the experience has actually been.

Mr. FITZPATRICK. Are you aware of FEMA receiving complaints about local governments? This program costs us a lot of money.

Mr. JENKINS. Very often they receive complaints simply by citizens saying, I can't believe they are letting Joe do this.

Mr. FITZPATRICK. Exactly. But presently FEMA does not have a sort of strategy of coming down hard on local governments? Since

this is costing us money, we don't have enough money to adequately map what we have in part because we are spending so much in bailing out properties that are just flooded on a repetitive basis.

Mr. JENKINS. To tell you the truth, because we haven't really looked at this systematically, I really don't have a good sense of exactly how they approach this, what their strategy is, what the enforcement policy is. You get something like three strikes and you are out kind of approach, and we just haven't done enough work on that for me to give you a good answer.

Mr. FITZPATRICK. Thank you.

Chairman NEY. Thank you. Question: I want to get back to costs. Well, I want to get back, first of all, to the minimum standards and Great Britain. Now, if Intermap, and Mr. Edelman, you said also your company, Watershed Concepts, has worked with Intermap before on some mapping.

If you or in conjunction with other companies have basically like the most up-to-date data, and if you showed what you showed us, the map of Great Britain, and that is state of the art, is that correct? Mr. Bullock.

Mr. BULLOCK. Yes.

Chairman NEY. So Great Britain's standards are less than ours? We are requiring more state of the art? Or can you comment on the minimum standards required by the United States?

Mr. BULLOCK. Well, I would say on a nationwide basis they have the most accurate topography and the most accurate flood maps on a nationwide basis.

Chairman NEY. Great Britain?

Mr. BULLOCK. Yes. Here in the United States when we do detail studies, that accuracy can very well surpass what they have on a national, a nationwide. But they saw the value of just studying certain communities and doing lesser studies for the rest of the country was not the right approach for them. And that is the approach they have taken.

And I would like to add one more point. Mr. Williams made a very important comment earlier when he said that to take the USGS data, whether it be 40 years old or 25 years old, it still requires efforts in terms of digitizing or correcting blunders or whatever in terms of engineering work. And in many cases that cost can be higher than the cost of using new technology to collect new data that is already in a digital form.

Chairman NEY. I want to get back to—Mr. Pearce has asked I think some very good questions. I want to get back to the question he had asked earlier about the proprietary rights. You had answered that question. I want to ask a question of GAO—actually not, Mr. Bullock. The question Mr. Pearce had asked was about the proprietary rights, and I understand from Mr. Bullock that his company people could, you know, click in and buy forever or until it is updated again for X amount of dollars. And I think the comparison was like 12,000 community, for about 5,000 or something. And asking GAO, has anybody looked at that? Because right away when the question was asked, it was like, okay, well, yours is not available, although FEMA would say use your mapping, but it is only available to communities if they pay a certain amount of

money for the proprietary rights, I guess, or copyright is the right word. Having said that, rather than communities developing their own whole plans of spending all this money or county spending money, has anybody—this is a question for GAO—has anybody looked at what this company or companies can do, and maybe it is cheaper at the end of the day if we would utilize that and people get the copyrighted material through incentives or if we save a lot of money through the United States Government through incentives? Has anybody looked at that, how they copyright it, and utilizing it, and would it be maybe cheaper at the end of the day, or maybe it wouldn't or maybe it would be a wash. Has anybody looked at that versus recreating the wheel in all these counties?

Mr. JENKINS. Not that I know of. I don't know that anybody has looked at that specifically and the actual costs. The information that Intermap provided to us is that they would provide FEMA a national subscription for $15 million, which is about $4.90 a square mile.

Chairman NEY. Could a community buy the maps and then FEMA utilize them? Would that be possible, a community would do that?

Mr. JENKINS. It might. Acually it depends on how, you know, the Intermap prices it. But as they point out in the material they provided to us, it is usually less expensive to provide it—to purchase it for large areas. And so it may be less expensive for FEMA to purchase it and then—if this information is correct than for localities to purchase it for small pieces.

Chairman NEY. Obviously, that would be a lot of numbers scratched out here, et cetera. I am trying to get a concept has anybody looked at the cost, and you are answering no. But Mr. Williams, do you have any comment on all of this? Or anybody else, frankly, on the panel. But start with Mr. Williams. If we would look at that type of concept of communities, you know, would it be worth it to look at the costs of communities clicking in and purchasing the upgraded or state of the art material?

Mr. WILLIAMS. I think I have one major comment in regard to the licensing issue. We have looked at it closely in our department. We don't have a problem with the license. It is the way software is sold. It is the way songs and movies are now being sold. So a particular license, as long as everybody understands what the license is about and how it limits it, we would be perfectly happy with it. In fact, we like Intermap's licensing agreement because it allows anybody in our department to use it for any purpose, even though it would be originally purchased for floodplain mapping.

Having said that, and to expound upon what I earlier said to Ms. Waters, I think a nationwide topographic program would be important, and it would be the most efficient way to handle this. However, there are areas where LIDAR, or advanced photogrammetric techniques, are perhaps more useful than the IFSAR technology. There are vast areas of this country where the IFSAR technology is important. And we need to look at both limitations on the technology, vegetation, for instance, as well as the necessary accuracy. For example, in Nebraska we need to achieve very high accuracy in our very flat areas next to the Platte River. So those are all

things that come into this. But a nationwide strategy would be very useful.

Chairman NEY. Anyone else?

Mr. BULLOCK. Mr. Chairman, if I might just add, in regard to the issue of data licensing, the National Academy of Sciences generated a report last year in regard to licensing of geospatial data, and we would be happy to forward a copy to the committee to look at that. But in summary, they found that data licensing can be beneficial, reducing costs to the users. It doesn't work for everybody, but it can be a very beneficial approach to getting accurate geospatial data out there at a lower cost.

Chairman NEY. My time has expired, and Mr. Pearce has another question. I will be glad to entertain it. Take a generic question to ask of anybody on the panel. I think we have got a lot of valuable information here. From what I am hearing it is not all apples and apples and oranges and oranges. There are certain technologies used for certain things, and I think I hear basically everybody agree to that, and other technologies are appropriate.

Where should the next step be for this committee getting this information? Does anybody have an idea what the next step would be in interacting with FEMA or with the groups and the people that are concerned about this issue? Anybody have any ideas on that?

Mr. EDELMAN. What I have witnessed FEMA doing in the past is when they are about to go into a study, they meet with the local officials. They meet with the local people. Before they decide how they are going to do anything, they sit down and they have a detailed scoping meeting. At that point in time, that community tells them what their needs are. Those needs are prioritized, and based on that the scope of work done is tailored towards that individual community to work going through there. So that is the time to buy the information, when you need it.

For instance, we have some counties in the United States that had a population of 2,000 people in 1980. It has dropped to 1,500 people in 1990. Okay? The cost of doing the study in that particular county would probably exceed FEMA just buying flood insurance policies for everybody who remained within that county. Okay? So there is a balance that you have to have between utilizing the best data. And as an engineer, I would always want to use the best data available, but you have to balance that with where would the information be used or the dollars or the resources be put to the best use to have the biggest impact on the Nation.

Whereas, a lot of talk has been talked about Great Britain here, the technology that is used by Great Britain. I would probably submit that FEMA's program is superior to Great Britain's because in all the medium and high risk zone areas, the information that was developed in Great Britain would not meet standard. The elevations would have a higher degree of uncertainty than they do in the United States.

Mr. BULLOCK. I would like to offer that I believe that a national strategy is needed for collecting a new and accurate topographic base layer for the entire country, just as was done in Great Britain, which would benefit FEMA and other Federal agencies.

As a company, we are going out, and we are doing it. We are doing it right now. We are flying in Texas today, and in the next 4 or 5 years we will have a topographic database for the entire country.

Chairman NEY. Let me ask you something about that. Are you doing that on your own, or is this another branch of the Government?

Mr. BULLOCK. We are doing it based on our investor funds just like we did in Great Britain. We will create this database, and then we license the data to multiple users. So far we have three U.S. Federal Government agencies that have indicated they are going to use this data, and it is somewhat ironic that we don't have FEMA on board for this where they could directly benefit more than just about any of the other Federal agencies.

Chairman NEY. So what you are saying is within 4 years you are going to be sitting here and you will say here it is. If you want to click in and pay the fee you can have it. And if the United States Government—well, FEMA I should say—if FEMA has not caught up to pace, it is irrelevant; it will be here?

Mr. BULLOCK. It will be here. And if FEMA goes in the present course, doing it county by county, then there is a very good risk that they won't be able to utilize this data to the extent that they could.

We are going to have the entire State of California done in about 2 months, mapped to one meter vertical accuracy, and I would believe that for much of that State that is going to be superior to the USGS data that is available and may be used for some of these flood map programs.

Chairman NEY. Gentleman from New Mexico.

Mr. PEARCE. Mr. Bullock, do you have any comment when Mr. Edelman says that your standards would not be suitable for the high and medium risk areas?

Mr. BULLOCK. Well, he is the expert. I focus on the data. He does the engineering, and he is correct that there is a difference in terms of the engineering approach that was used in Britain and what is being used here in the U.S. Remember, in Britain this was done by Norwich Union. It was not a Government program, and so they did what they felt was the appropriate level of engineering to meet the application. And it was still far superior than the Government provided flood maps that existed in Britain. But the same techniques that Mr. Edelman uses here under FEMA of course can be adopted and used on this data just like they did in the pilot project in Region 6, and I think he would say that that produces very good results.

So it is not a failing in the data. It is just a difference in technical approaches that was used in Britain versus in the U.S.

Mr. PEARCE. Mr. Jenkins, you had talked about the costs of some of the mapping and some of the relative costs. Do you know if the FEMA process ever counts the opportunities lost? For instance, there is about $20 million worth of development back in the community of Carlsbad that I was talking about that was delayed for 10 or 15 years. And when Mr. Edelman suggests that we need to prioritize and get to those low population areas last, is there any

way to assess the cost to communities when are drawn incorrectly and the cost to not be able to develop?

And by the way, I have lived my whole life in that area. One bank of the river was developed and the other one wasn't. And when they got the map somewhat redrawn last year or the year before, the development was just blowing down the one side; it has never been developed.

Mr. JENKINS. I would say that in what we looked at, we certainly didn't look the sort of opportunity costs lost. They looked at cost of—at the time they started the process, what did they think they would be gathering and what it would cost to do that. So they weren't really looking at, if you will, what you are talking about, which is the cost of delays and delays to the community. So not to my knowledge was that taken into account.

Mr. PEARCE. Thank you, Mr. Chairman.

Chairman NEY. Yes, Mr. Williams?

Mr. WILLIAMS. I wanted to go back and address your question of what to do about this topographic situation. I think that it is important to recognize at this point that the $1 billion for Map Mod is not going to be enough, that we need the 3 billion. If we are just going to spend 1 billion, of which we have another 450 million left, then we might as well blindly carry on as we have been carrying on. But if we know we have got another 5 to 10 years at similar funding levels so we can do the whole thing right, that is the point at which we need to create a national strategy.

I would suggest that we direct FEMA to come up with a cost and strategy, and I think their way of doing it would be to put together a committee with their national service provider, State and local officials, probably team up with other Federal agencies such as the USGS. We would need a topographic inventory. We need to know what data is out there, what exists, come up with a needs assessment and a strategy to deal with this perhaps as soon as the 2006 funding.

Mr. PEARCE. Mr. Williams, with your permission, you said we need to do this right. If you were to evaluate from your perspective the $550 million worth of investment so far in whatever 1,000 or 2,000 areas that were remapped, on a scale of 0 to 100, what is the accuracy and the completeness of the data in those remapped areas, of those digitized areas where we were taking data?

Mr. WILLIAMS. I would give it about a 75 percent effort to date.

Mr. PEARCE. So those are areas that are pretty well completed. You are saying with more money we can make it, but we assume we have reached the highest level of capacity that we can and you are encouraging us to spend another $2 billion on top of 1, and we are reaching 75 percent accuracy?

I am not sure I want to reinvest. Thank you.

Mr. WILLIAMS. I would like to emphasize that FEMA's guidelines and specifications create accurate maps. My big fear, as was stated earlier, is that not all the reaches that should be studied are being studied, and that is the problem.

Mr. PEARCE. You are sure it is the process. Whether or not their standards are set high enough is not the complete question. Whether or not they thoroughly and adequately address all of the areas—and it is still a question of process and still a question if you invest

1 billion and you get 75 percent performance, you still have some loss. And if you get 3 billion, you have proportionately more loss. So I don't know. That 75 percent seems a very low rating score for me.

Thanks.

Mr. WILLIAMS. I would like to emphasize that I think Map Mod is a fantastic program, and it has done an awful lot of good.

Chairman NEY. I want to thank you very much. I think this has been an extremely informative panel on a very important issue in the country, and we want to take it from here somehow, maybe looking at price costs, working with GAO, or working with the people that are interested in this issue.

So I want to thank you and thank the members for your time.

The Chair notes that some members may have additional questions for this panel which they may want to submit in writing. Without objection, the hearing record will remain open for 30 days for members to submit written questions to these witnesses and to place their response in the record.

The hearing is adjourned. Thank you.

[Whereupon, at 12:40 p.m., the subcommittee was adjourned.]

A P P E N D I X

July 12, 2005

Opening Statement of the Honorable Michael Oxley
Chairman, Financial Services Committee

Hearing on Flood Map Modernization and the Future of the National Flood Insurance Program

Tuesday, July 12, 2005

Good morning. Today we will be focusing on an issue that this Committee has been following closely for many years – the National Flood Insurance Program (NFIP). Each year, flood-related catastrophes are responsible for lives and livelihoods lost across the country, along with billions of dollars spent on flood damages. Although the Federal Emergency Management Agency (FEMA) is not able to prevent flooding from occurring, their administration of the National Flood Insurance Program is essential to preparing for and recovering from floods.

Flood maps identify areas of greatest risk of flooding and provide the very foundation of the National Flood Insurance program (NFIP), yet well over 50 percent of all flood maps are more than 10 years old. In order for the NFIP to remain actuarially sound, FEMA must ensure the efficient use of the limited

resources available for flood map modernization. For this purpose, the President requested and Congress approved $1 billion over a period of 5 years for FEMA to modernize the nation's flood maps.

Today we will be taking a close look at FEMA's map modernization efforts. In particular, the Committee is interested in FEMA's strategy for working with other Federal agencies, state and local governments, and mapping experts in a way that is fiscally responsible and effective. We will also be assessing how FEMA plans to continue to manage this program in the future, and how property and Federal funds can be saved through flood mapping.

I would like to welcome the Director of the NFIP, David Maurstad (MORE-stad), as well as representatives from the Government Accountability Office (GAO) the mapping industry, and the associations whose members deal every day with flood prevention. I am pleased that FEMA has begun this modernization program, and I look forward to

hearing our witness's suggestions on how the program can be made more efficient.

Finally, I look forward to working together with ranking member Barney Frank on a bipartisan basis as we continue to work towards helping to protect citizens across the country from future flood losses.

Opening Statement for Housing Subcommittee Hearing **July 12, 2005**
Congresswoman Brown-Waite (FL05)

Thank you Mr. Chairman for holding this hearing today.

The west coastline of my Congressional District is commonly referred to as the "Nature Coast." Residents of the area are not owners of beachfront property; they live proudly as I do overlooking pristine swampy, wetlands. While the view is breathtaking, living in this area, even miles inland, can cause flooding problems even during the lightest rainstorms. And anyone who has ever visited the so-called "sunshine state" knows that rainstorms are the norm in the afternoons.

My Congressional District is one of the fastest growing in the nation, as many commute from my small towns to neighboring Tampa and Orlando. The lower-cost homes and quiet neighborhoods attract young families and retirees. However, I am concerned that these residents are unfairly denied Federal Flood Insurance because outdated maps do not show that they indeed live in flood-prone areas.

Congress established the Federal Flood Insurance Program to help residents in high-cost flood-prone areas so others on surrounding lands would not have to absorb those costs. And after 25 years of enactment, the legislation has worked. Therefore, it makes no sense today to use out-dated maps that do not accurately reflect risk.

I commend FEMA in their flood map modernization effort, but I am concerned the agency may not have the resources needed to complete their efforts. I look forward to hearing from FEMA today, to alleviate those concerns.

Thank you Mr. Chairman.

Opening Statement of the Honorable Bob Ney
Chairman, Subcommittee on Housing and Community Opportunity

Hearing on

"Flood Map Modernization and the Future of the National Flood Insurance Program"

Thursday, July 12, 2005

Today the Subcommittee on Housing and Community Opportunity meets to continue its review and oversight of the National Flood Insurance Program. Specifically, today's hearing will focus on FEMA's program of updating flood maps and how this process affects the flood insurance industry and local communities.

Flood maps identify areas at greatest risk of flooding and provide the foundation for the National Flood Insurance Program. The maps are used by communities to establish minimum building standards designed to reduce the affect of flooding and, also, guide FEMA in setting insurance rates.

However, nearly 70 percent of the country's flood maps are more than 10 years old, according to FEMA, and reflect outdated data that could affect the ability to accurately identify current flood hazard areas. As a result, the agency is in the middle of implementing a $1 billion, 5-year map modernization program to update its flood maps. I am hopeful that today's hearing will give us a better understanding of FEMA's strategy and the expected benefits of more accurate and accessible flood maps.

Floods have been, and continue to be, one of the most destructive and costly natural hazards to our nation. In the aftermath of Hurricane Dennis this past weekend, I fear many communities in the South and Midwest will witness this unrelenting power firsthand as the tropical depression continues to unload heavy, flooding rains inland.

During this past year, there have been three major floods in my district in eastern Ohio. All three of these incidents qualified for federal relief granted by the President. Recent flooding in January of this year resulted in historic levels in several local dams, and, in Tuscarawas County, three communities were forced to evacuate, which displaced 7,000 people. I was able to witness this devastation first-hand when I toured damaged properties in both Tuscarawas and Guernsey counties. Also, I am planning to hold a field hearing in Tuscarawas County next month to continue the Subcommittee's oversight of the National Flood Insurance Program.

The National Flood Insurance Program is a valuable tool in addressing the losses incurred throughout this country due to floods. It assures that businesses and families have access to affordable flood insurance that would not be available on the open market.

Prior to the passage of the National Flood Insurance Act in 1968, insurance companies generally did not offer coverage for flood disasters because of the high risks involved. Today, almost 20,000 communities participate in the national flood insurance program. More that 90 insurance companies sell and service flood policies. There are approximately 4.4 million policies covering a total of $620 billion.

Last year's Flood Insurance Reform Act achieved significant reforms to this important federal program and I look forward to hearing from all of our witnesses today as we discuss FEMA's implementation of its flood mapping policy, as well as determine whether new reforms and initiatives are in order to compliment the work we accomplished last year.

Thank you.

TESTIMONY

OF

MICHAEL BULLOCK
PRESIDENT, INTERMAP FEDERAL SERVICES, INC.
AND
VICE PRESIDENT, INTERMAP TECHNOLOGIES, INC.

BEFORE THE

SUBCOMMITTEE ON HOUSING AND COMMUNITY OPPORTUNITY
COMMITTEE ON FINANCIAL SERVICES
U.S. HOUSE OF REPRESENTATIVES

JULY 12, 2005

2128 RAYBURN HOUSE OFFICE BUILDING

Mr. Chairman and Members of the Subcommittee on Housing and Community Opportunity, we deeply appreciate the opportunity to testify before you today on the 5-year flood map modernization program being carried out by FEMA.

I am Michael Bullock, President of Intermap Federal Services Inc., and Vice President of Intermap Technologies, Inc., both of which are based in Englewood, Colorado. Intermap creates and sells high accuracy digital elevation models and value added mapping products derived from our proprietary airborne Interferometric Synthetic Aperture Radar (IFSAR), which are mounted on various aircraft, including a Lear 36A jet, a Rockwell Turbo Commander, and a King Air 200T. Intermap operates its IFSAR systems throughout the world for domestic and international customers, including the U.S. government defense and intelligence interests.

Intermap Technologies Inc. is a commercial, publicly traded remote sensing company with its global headquarters domiciled in Englewood, Colorado with international offices in Europe, Asia, and Canada. Intermap is a Small Business that employs in excess of 250 people and continues to increase its high-tech work force in the US.

Why we are testifying

The U.S. Federal Emergency Management Agency (FEMA) estimates that 75 percent of the nation's flood hazard maps are outdated, which greatly limits their value in reducing flood losses to lives and property. Many of these maps are based on inaccurate and out-of-date topographic data sources. Traditional methods of studying and mapping floodplains rely on time-consuming manual processes, which have been hindered by limited funding.

FEMA's five-year Multi-Year Flood Hazard Identification Plan (MHIP), launched in 2003, is overhauling the nation's flood hazard mapping system and developing the framework and partnerships to enable future multi-hazard mapping. FEMA

and its partners are developing a premier data collection and delivery system that involves improving information technology, engineering tools and processes, and coordination related to the development, use, and maintenance of flood hazard maps. Updated nationwide digital flood hazard data, maps, and related tools and information will be more easily accessible through web-based systems.

In addition to providing vital risk identification, communication, and mitigation across the nation, the program's tools and processes offer substantial improvements in efficiency for civil engineers nationwide. These include:

1. Improved planning and coordination for engineering projects because of FEMA's first-ever public release of a five-year rolling plan and budget;

2. Technical tool sets that automate many mapping production and quality control processes;

3. Availability of credible maps based on current and accurate data;

4. A Web-based delivery system;

5. The opportunity to move communities closer to genuine multi-hazard risk assessment.

The reason that we are testifying involves item number 3, the "Availability of credible maps based on current and accurate data." The Map Modernization Program has a dramatic and critical need for more up to date and accurate terrain data to achieve the program goals. Currently, the only nationwide data available for mapping is the USGS terrain data base.

The data was collected between 1940 and 1980, and many maps are now over 40 years out of date. The technologies used to prepare many of the original maps did not permit the accuracies now required by today's applications. Time has moved the watercourses and changed the floodplains in such a manner as to negate the use of these data for today's applications. The use of this data can

result in erroneous flood zone determinations, it adversely impacts the flood insurance premiums paid by citizens, it puts the public at risk, and is an inappropriate use of taxpayer's monies.

FEMA needs to have access to more accurate and up to date terrain data to achieve the stated Map Modernization goals. Technology has provided new and more cost effective methods to collect and produce the terrain data needed. These methods are being applied in some cases, but the need is to have a more comprehensive approach to ensure the mapping effort is not creating new maps from old inaccurate data thus rendering the program ineffective.

Intermap Technologies, Inc

Intermap's mission is to facilitate better decision-making in government and industry by supplying high-quality, low-cost digital elevation mapping products. Intermap provides digital elevation models (DEMs) and orthorectified radar images (ORI's) to customers and partners who need accurate topographic data to produce consistent, cost-effective solutions to terrain mapping anywhere in the world.

Intermap meets the challenge of our mission through the use of our proprietary Interferometric Synthetic Aperture Radar (IFSAR) technology. IFSAR provides an economical means of generating highly accurate regional and national mapping products. Intermap's initial IFSAR sensor was designed by the Defense Advanced Research Projects Agency (DARPA) and built by The Environmental Research Institute of Michigan (ERIM) and the NASA Jet Propulsion Laboratory (JPL). Since the commercialization of this technology in 1996, Intermap has continued to invest significantly in research and development, resulting in improvements in both sensor technology and processing tools and workflows have enabled us to obtain extraordinary achievements in the quality and

accuracy of the data, and enabled us to keep our costs very low and our products affordable.

Formed in 1996 from the 30 year-old-mapping firm Intera Information Technologies, Intermap began as a traditional contract service mapping firm, deriving its revenues from fee-for-service projects wherein a single customer paid the entire project costs. This industry-wide business model resulted in a significant price barrier to wide-spread user access to detailed terrain information. The situation spurred Intermap to define a new business model within the mapping industry. While continuing to provide contract services business, the company is now well on its way to establishing its vision of creating widely-shared high-value terrain data sets through rapid collection of country sized geographic areas referred to as NEXTMap®.

Intermap has developed state-of-the-art "STAR" technology in airborne radar systems for detailed mapping, which advances the technology base of the US. The Intermap STAR Systems are unique National Assets and were initially developed by DARPA for mapping large areas of geography quickly and economically. The first system was commercialized by Intermap under a DoD technology transfer program in 1996 with all technology improvements being funded by Intermap private investment.

The "STAR" technology is an Interferometric Synthetic Aperture Radar (IFSAR) that provides high-resolution Digital Elevation Models (DEMs). A DEM is a highly accurate 3D representation of the area that was imaged. In conjunction with the DEM, a 1-meter pixel Orthorectified Radar Image (ORI) that resembles a black and white photograph is generated.

Intermap's commercial customers are international in scope and the mapping efficiency of the "STAR" system has allowed Intermap to successfully collect, process and archive over 1.55 million square miles in the last few years.

Additionally, Intermap has provided time critical mapping imagery and elevation data to the US Government to support the war on drugs and more recently to support Operation Enduring Freedom (OEF), the global War on Terrorism.

With the increasing awareness of Homeland Security issues; agencies that control and manage border areas, critical infrastructure, coastlines, and transportation "choke-points" are in need of an accurate, consistent topographic base map, and corresponding high-resolution image.

The current maps and imagery available to agencies concerned about Homeland Security issues do not provide an appropriate level of situational awareness for policy development, planning, operational organization and action.

High-level security decisions need to be made with the most accurate and current information available. Because of the inherent geographic nature of any issues related to Homeland Security, any updated information must include the best available topography and imagery.

Intermap's exceptional expertise in production and processing capability was utilized to process about 70% of the NASA Shuttle Radar Topography Mission. The SRTM program was a joint project between NGA and NASA. The objective of this project was to produce digital, low-resolution topographic data for 80% of the Earth's land surface (all land areas between 60° north and 56° south latitude) and was a tremendous engineering feat and overall success for NASA and for Intermap. Intermap's successful processing of the SRTM data resulted in every delivery occurring ahead of schedule, with no rejections or defects and on budget.

Applications

The DEM and ORI products satisfy a number of application and operational requirements for both commercial and government customers. Generally speaking, these requirements include:

- High Resolution DEM's that exceeds DoD, DTED Level 3
  - Highest contiguous vertical accuracy (1 meter or better)
- High Resolution Imagery (1.25m)
- Void fill for SRTM
- High Resolution Image and DEM that allows quick and easy orthorectification of "other" imagery layers, such as commercial Satellite and Aerial Photography
- Ability to sharpen medium resolution imagery (LANDSAT, Spot, etc) to a 1.25 meter pixel
- Allows for co-registration of imagery for automated change detection and spectral signature analysis.
- One contiguous, homogeneous dataset

Intermap Products and Services

Intermap is a leading provider of radar mapping elevation and imagery products. Intermap has acquired over 1.55 million square miles of IFSAR data since 1997. The following are several unique points:

- GGI Prime Contractor: Intermap has been awarded National Geospatial-Intelligence Agency (NGA) GGI Prime Contractor Status, #HM 1574-04-D-0003.
- Experience: Intermap has been operational and growing since its inception in 1996. The extent of Intermap's global experience is unique among mapping companies.
- Quality: Intermap data has been independently verified and validated by over 12 US Government agencies including NGA and Army-TEC, with well-proven and documented processes and standards for data collection, production and

delivery through ISO 9001-2000 certification (Intermap has been ISO certified since 1996).

- Schedule: Intermap operates with a phased delivery schedule, allowing customers to begin utilizing the first deliverables within 30 days following the first data acquisition mission.
- Technology: Intermap has been a leading-edge developer of IFSAR technology since 1996. Its unique data acquisition, processing and editing technology has created a superior process flow and wide product range.
- Mission Capability: Intermap currently utilizes three (3) jet and jet-prop aircraft platforms for data acquisition. The ability to mobilize, collect and deliver in a rapid manner and on a global basis is fundamental to the commitment that Intermap makes to its customers.

Intermap is digitally remapping entire countries, building unprecedented regional and national databases of highly accurate 3-D digital maps. Demand for Intermap' 3-D maps is growing as new commercial applications emerge, including geographic information systems, engineering planning, automotive and aircraft navigation, flood plain mapping and modeling, hydrological modeling, environmental management and planning, telecommunications network planning, public and infrastructure security, aviation simulation and 3-D visualization. Internet applications include virtual tours, topographic maps and computer games. The products are also used to add interactive intelligence to airborne and satellite images.

Intermap has undertaken some of the world's largest mapping projects and has performed custom and licensed mapping in more than 85 countries. The company's data covers more than 1.55 million square miles on six continents. The Intermap IFSAR technology has been used to map entire countries, including Great Britain. This unprecedented initiative has been named NEXTMap Britain®.

Due to the unparalleled success of the NEXTMap Britain program, NEXTMap USA®, the mapping of the entire continental United States, is now underway. The program began in the fall of 2004 and to date there are over 600,000 square miles processed and archived. This initiative currently includes the States of California, Florida and Mississippi, as well as portions of Michigan, Louisiana, West Virginia, and Alabama.

NEXTMap Britain® (See Poster on Display)

An industry landmark in national mapping and an industry benchmark in elevation data accuracy and affordability.

Background:

- The first time an entire country has been mapped to 1 meter accuracy in high detail, consistent accuracy and without seam lines
- NEXTMap Britain includes England, Scotland and Wales, a total of 145,000 square miles.
- Instantly available off-the-shelf data (elevation models and associated imagery)
- Whole country data-licenses are available to national agencies at about 12% of the project cost
- Completed in 2003
- Program commenced with initial contract by Norwich Union Insurance (NUI) to map England and Wales
- The NUI requirement was driven by a need to provide a scientifically valid method for determining flood risk at address specific level detail
- Exceeded accuracy goal by 15%
- Product offerings include Digital Surface Models Digital Elevation Model (DEM) and Orthorectified Radar Imagery (ORI)
- Externally validated/verified by two independent authorities

Applications:

- Floodplain Mapping
- Storm Surge Modeling
- Telecommunication, tower placement, line of site
- Image rectification
- Base mapping
- Three-dimensional visualization
- Flight simulation
- Precision farming and forestry
- Surface analysis/Watershed analysis
- National Defense related security issues

The NEXTMap Britain Floodplain Program

- Approximately 6 million people (10% of the population) of England, living on 2 million properties, are within areas potentially at risk from flooding [1].
- Property worth over $386 billion is located within these areas potentially at risk [2].
- Between 950,000 and 1.2 million properties are built on inland floodplains in the UK [4].
- October 2000 floods cost the UK insurance industry $1.75bn and Norwich Union $ 375m [5].

The insurance industry in Great Britain is increasingly concerned about the financial risks associated with flood events. The issue of risk assessment and the pricing of flood risk insurance is a serious business issue. The assessment and management of flood exposure affects not only underwriters of domestic insurance but also those covering industrial and commercial risk. Indirect

financial loss attributable to flood is also a risk to insurers who have no connection with property in the inundated area. Serious business interruption can result in affected areas. The economic costs of flood events are generally estimated at many times the insured losses.

Flood risk is rising with time as a result of a number of disparate factors including: increasing development on floodplains, increasing affluence, climate change and increasing rates of insurance coverage. Insurers and re-insurers in Great Britain face a political issue of whether or not to provide flood coverage. The insurance industry in Great Britain has traditionally worked with government to ensure a satisfactory level of protection in the interests of economic well-being. With mounting costs associated with flood events the insurance industry is re-considering their role vis-à-vis flood insurance.

All decisions regarding flood risk coverage and premiums are underpinned by flood risk models quantifying frequency and depth of floods. Flood risk models can be as simple as the intersection of a hypothetical water surface with a digital elevation model to full hydrological and hydraulic models. Whatever modeling scenario is adopted, it is dependent on Digital Elevation Models (DEM's) of appropriate character, density and accuracy. Distilling character, density and accuracy into an applicable specification was the subject of extensive debate in Great Britain. Direct insurers were concerned with insurance ratings that were consistent across the nation. Accordingly they were looking for high resolution input data over the entire area. Direct insurers required that risk be assessed for individual properties whereas previous work had all been done to the zip code level, an area involving an average of 17 properties. Re-insurers were interested in aggregated data at a lower resolution. Ultimately, a density of 5 meters and a vertical accuracy of 1 meter RMS was determined to be an appropriate cost / benefit compromise and to be consistent with the other input datasets, namely flood depth and flow rate.

IFSAR elevation data was chosen to provide the elevation component for the flood models over 91,000 mi^2, encompassing all of England, Wales and Scotland. The Environment Agency of England and Wales acquired the same elevation dataset in order to update the government "indicative flood plain" and "extreme flood outline" maps. The Environment Agency tested the IFSAR elevation data against 322 GPS sites and 595 LIDAR sites totaling approximately 2 million points throughout the country. The elevation data was deemed to be consistent with the 1 meter RMS accuracy specification throughout the area and to a 50 cm specification in an area of approximately 21,600 mi^2 surrounding London.

Very substantial differences were found between the new flood extents and depths and those previously calculated based on digitized maps. In many cases the maps carried only a 20 foot contour interval. It was determined that the previous flood models often overstated the risk and attributed that risk to all of the addresses within a given zip code. The new models were able to calculate extent and depth relative to individual addresses. Norwich Union Insurance estimated that as many as 600,000 properties would now qualify for insurance, or would benefit form reduced premiums, as a result of the improved accuracy and resolution of the new flood modeling. NUI together with Intermap will be launching a new internet service late this year to allow all property owners, prospective buyers, tenants, and professionals involved in property management and transactions to access the flood risk information on an address specific basis for a nominal fee.

References:

Sanders R., Shaw F., MacKay H., 2002, National Flood Modeling for Insurance Purposes: Using IFSAR for Flood Risk Estimation in Europe.

Duncan, A., Kerridge, B., Michael, J., Strachan, A., 2004, The National Flood Mapping Program: Using IFSAR for Flood Modeling in England and Wales. Presented at the Association of State Floodplain Managers Annual Conference, Biloxi Mississippi, May 2004.

Footnotes and Credits:

[1] *National Appraisal of Assets at Risk from Flooding and Coastal Erosion, DEFRA, July 2001*

[2] *National Appraisal of Assets at Risk from Flooding and Coastal Erosion, DEFRA, July 2001*

[3] *Environment Agency, 2000*

[4] *Association of British Insurers, 2000*

[5] *Norwich Union Insurance, 2003*

The NEXTMap USA® Program

The NEXTMap USA Program has been designed using the knowledge and experience of almost ten years of Intermap's IFSAR data acquisition, processing and successful delivery. This new high resolution elevation and imagery data set directly addresses one of the cornerstones of the Multi Year Flood Hazard Identification Plan (MHIP) in that it permits FEMA to "improve the quality and accuracy of the national flood hazard data" by constructing the new flood map based upon current, accurate base information

The purpose of NEXTMap USA is to collect, process and deliver a high accuracy Digital Elevation Model (DEM) for the Continental US (CONUS). These products are offered under license so as to spread the cost of the NEXTMap USA data across many users, thus allowing Intermap to offer the data to individual agencies and clients at a fraction of the typical price of a custom mapping project. Intermap's IFSAR systems permit data acquisition at approximately

30,000 feet above ground and allow for the continuous acquisition of hundreds of square miles of data per mission, and unlike optical satellite systems, can collect data through cloud cover and at night. These systems routinely allow us to acquire approximately 20,000 mi^2 of data in two to three weeks.

NEXTMap USA data lends itself to very careful consideration because:

1. The data exceeds the accuracy of any existing nationwide data set, allowing much more area to be studied, with better results and less risk.
2. The data is current, being acquired now and capable of being delivered today, increasing the value and accuracy of the map results.
3. NEXTMAP USA is very economical when acquired in large areas.
4. Intermap's IFSAR data has been independently validated for flood mapping applications in past projects.

The NEXTMap USA Product Package

The NEXTMap USA program provides clients with a well designed Product Package that was developed for our successful NEXTMap Britain program. The following are the three core products included in our NEXTMap USA Product Package: a digital surface model (DSM), a digital terrain model (DTM) and an orthorectified radar image (ORI).

The Digital Surface Model (DSM) contains measurements of the first reflective surface as illuminated by the sensor. The elevation points are derived from radar energy returned to the antenna from the first surface it encounters. The surface may be that of structures such as buildings or towers, or of vegetation such as trees or crops. In the case of 'soft' surfaces, as implied by vegetation, the returned signals are reflected by the tree canopy itself, as well as by the

branches and tree trunks within the canopy. The NEXTMap USA DSM is a 5 meter posted DEM accurate to 1 meter (or better)

The Digital Terrain Model (DTM) is the 'bald-earth' model that references the elevation measurements of the bare terrain. The DTM product is a result of subtracting the measurement of the height of the majority of structures and discernable vegetation from the DSM product. The Intermap DTM product is produced using TerrainFit™, Intermap's proprietary and automated process whereby a bald-earth DTM is derived from the DSM. In areas where spatially extensive structures or forests exist (*e.g.* greater than 100 meters two directions), the DTM will deviate further from the true ground elevation measurements than in areas having less surface obstructions. The stated product accuracies will not apply to these large areas with dense canopy or structures. The NEXTMap USA DTM is also a 5 meter posted DEM, vertically accurate to 1 meter (or better)

The Orthorectified Radar Image (ORI) is a spatially correct map-accurate product comprised of black and white (grey scale) radar imagery at 1.25 meter pixel resolution orthorectified to a horizontal accuracy of 2 meters. This imagery accurately depicts terrain features and can be used as a primary source for feature maps at scales from 1:500,000 to 1:10,000. This ortho-image product is also an excellent source for planimetric control of other maps that FEMA may need to acquire. This new image product will prove invaluable to FEMA for other hazard mitigation purposes. In addition, this image is very similar to a black and white photograph and is easily integrated in the current mapping environment with little or no additional training.

Justification Used to Procure Intermap Products and Services

Intermap is the world's leading provider of radar mapping elevation and imagery products. Intermap has acquired over 1,550,000 mi^2 of IFSAR data since 1996. The following are several unique points:

- Experience – In the last 12 months, Intermap has acquired and supplied to satisfied clients over 500,000 square miles of combined elevation and imagery products.
- Quality – Intermap is the only IFSAR provider whose data has been independently verified and validated by over 12 government agencies including NASA, USDA, USGS, NGA, DOD, and other civil and international academic entities. Intermap has been ISO certified since 1996 (ISO 9001-2000). We have well-proven and documented processes and standards for data collection, production and delivery.
- Technology – Intermap has been the leading developer of IFSAR technology since 1996. Its unique data acquisition, processing and editing technology has created a superior process flow and wide product range.
    - Mission Capability – Intermap currently utilizes three (3) jet and jet-prop aircraft platforms for data acquisition. The ability to mobilize, collect and deliver in a rapid manner and on a global basis is fundamental to the commitment that Intermap makes to its customers.

Data Solutions

The Multi-Year Flood Hazard Identification Plan (MHIP) document (2004) states that the main components of any flood hazard study are: Topographic (or "terrain") data, survey methodology, and flood hazard identification techniques (modeling and mapping). The topographic data are noted to be available via remote sensors such as LIDAR and IFSAR. Currently, FEMA hopes that the data for Terrain will come from the communities. This is not happening in an adequate manner. Also, many communities will not be providing the data needed, thus the data used will be the "best available" USGS data. This data is generally old and out of date, inaccurate due to time and method and although appears to be free, actually costs more to render usable than buying new IFSAR data. The data made available by various communities is of different times and qualities and does not lend itself to being used quickly. Many hours are required

to develop the elevation data set for the engineering. Even then, the accuracy of the entire area is not clear. The best method for doing a large program such as Map Mod is to have a large uniform and accurate data set to minimize preparation time and result in a good final flood map product.

A Pilot Study was conducted in Texas for FEMA Region VI to test the accuracy of the IFSAR data for flood mapping applications. The hope was that IFSAR would provide more accurate, up to date terrain data that was seamless in nature and available for large portion of the nation. This would allow methods to be standardized, saving time and funding in flood studies and mapping product development.

The pilot project encompassed two counties (Randal and Potter) in North Texas on the north and south side of Amarillo. Following the data acquisition and processing by Intermap, it was delivered to FEMA contractors Michael Baker and Watershed Concepts for the use and evaluation as a terrain data source for FEMA's Map Modernization Program.

Background on Terrain Data Sources and those used in the Pilot:

The best historical method for flood plain delineation in the past has been the use of Photogrammetry based on stereo aerial photography. This method is less frequently used, as it is too costly for today's needs. In the Texas Pilot, the City of Amarillo had some high quality elevation data of this kind to be used as ground truth.

Results of the Pilot Test using IFSAR in Texas:

The Pilot included comparisons of the three terrain data sets. The work in involved principally, the creation of cross sections, hydraulic modeling, and Flood plain mapping. The IFSAR and photogrammetric data correlated well horizontally

for the stream channel definitions. The USGS terrain data were displaced horizontally up to 200 feet from the other two. Vertically, the IFSAR cross sections were more reflective of the photogrammetric data than were those of the USGS terrain data.

The following observations and conclusions were derived from this Pilot:

- Using the high precision photogrammetric data from the City of Amarillo data as being the most accurate actual information:
- IFSAR derived elevation data provided more accurate information than the USGS terrain data;
- The cross section differences graphically illustrate how the IFSAR data can assist in developing a more accurate depiction of the Floodplain Boundary. The IFSAR derived data more closely followed what is actually on the ground, therefore fewer properties will be improperly mapped within the floodplain

    - The Study Contractor had a positive experience working with the data sets provided by Intermap. There is value in having a consistent, reliable data set over an entire study area, which translates to cost and schedule efficiencies in the mapping process.

    - Although variances between the City of Amarillo and the IFSAR were observed, in general, the difference was not significant. In the few cases where there was some difference, it was attributed to IFSAR data currency. The IFSAR data was acquired several years after the Amarillo aerial photography, and correctly depicted areas of change along the riverbanks.

    - IFSAR is an evolving technology and further improvements in the algorithms and editing process that derive the data continue to positively affect the final elevation model quality.

- From a FEMA Region VI perspective, IFSAR technically appears to be a viable alternative to provide better data in counties where only USGS data is available. The X-band IFSAR will be more directed to arid regions and agricultural lands where tree cover is minimal or where trees are distributed in small blocks. This would focus the use of IFSAR for use in Region VI primarily to large areas of central and west Texas, western Oklahoma, New Mexico and, possibly, eastern portions of Arkansas.

FEMA Map Modernization Program

Work is currently underway in several of the FEMA Regions to provide new Digital Flood Insurance Rate Maps (DFIRM) as an integral part of the FEMA Map Modernization Program.

Flood Insurance Rate Map (FIRM Users) (Excerpt from FEMA website Hardcopy map products are distributed to a wide range of users. Private Citizens, insurance agents, and brokers use FIRMs to locate properties and buildings and identify their risk to flood damage. Community officials use the products to administer floodplain management regulations and mitigate flood damage. Lending institutions and Federal agencies use the products to locate properties and buildings to determine whether flood insurance is required when making loans or providing grants for the purchase or construction of buildings. *http://www.msc.fema.gov/hardcopy.shtml*

These maps indicate the extent of the relevant floodplains and show all affected parcels of land that are either subject to flooding or bordering outside (above) the floodplain. Those parcels determined to be potentially affected by flooding are subject to increased insurance costs and those deemed to be unaffected are not entitled to FEMA flood insurance.

The mapping process is constrained by available funding and therefore FEMA has directed that the "best available" source of topographic data be used as the key component of the process. The "best available" source of topographic data is frequently the existing USGS topographic data. The accuracy and reliability of the topographic data is the single most critical component in the map production process. This has been proven by the experience in the United Kingdom and by numerous engineering floodplain studies undertaken on behalf of FEMA. The adage "garbage in – garbage out" is unfortunately, for the American taxpayer, sadly true. The use of the "best available" data frequently yields floodplain boundaries that are in-correctly positioned. This erroneous position provides for disastrous results:

1. Many homes and livelihoods are catastrophically affected due to annual flooding.

2. Many of these citizens learn too late that they had no insurance because the DFIRM erroneously showed their property not subject to potential flood.

3. Many others pay higher insurance premiums for flooding that will likely never occur.

Work undertaken for FEMA Region 6 in Amarillo Texas (color poster on display) provides a simple but stark glimpse into the magnitude of this very real problem. This poster shows that had FEMA Region 6 used the USGS topographic data for the definition of the floodplain the resulting boundary would be displaced in some areas by as much as *200 feet. When the result of this study was presented at the recent Association of State Floodplain Managers conference in Madison WI, several members of the audience commented on similar discrepancies that have been noted in other States. Had FEMA Region 6 not chosen to allocate scarce funds for new Flood Insurance Rate Maps many homes on the northern fringe of this city would be incorrectly portrayed relative to the potential floodplain boundary. The use of "best available" data may have proven catastrophic for those homeowners with little or no flood insurance. The regulatory boundary could easily have been incorrectly positioned thereby denying insurance to those most in need after a potential flood; while at the same time charging thousands of dollars in needless flood insurance premiums to many other citizens.*

The Nationwide Need for New, Accurate Terrain and Spatial Data

Intermap understands that over the life of MHIP and Map Modernization, FEMA intends to provide flood maps and data for communities nationwide that are more accurate, easier to use, and more readily available than ever before. In our

review of the program's goals and initiatives, we note that virtually all would be strengthened by the inclusion of updated high quality nationwide digital terrain and spatial data.

The USGS DEM data, which has been the source data for many of FEMA's map products, is out of date, with many products being older than 15-40years) and inaccurate with a vertical accuracy of 5-7 meters and a post interval of 30 meters or an interpolated post spacing of 10 meters. The inaccuracy of the data is compounded by the age of the DEM, this results in several features being shown inaccurately if at all. Further, while this data has been available to FEMA and FEMA CTPs at no charge, there is a cost to the taxpayer to make the data 'ready for use'.

In summary, we believe the challenge to FEMA is to cost effectively increase the quality of its source data and hazard information for the broadest area of the country and population. There are technologies available (*e.g.*, Lidar, photogrammetry) that are capable of providing quality source data, but at an unacceptably high cost. However, when combined with our IFSAR technology, this suite of technologies provides a real solution for updating the accuracy of FEMA's flood maps.

IFSAR will map large areas quickly and economically with a high level of accuracy. The accuracy of our data has been validated in the United Kingdom by several independent organizations. Furthermore, Intermap recently completed a pilot project for Map Mod in Region VI and this data has been tested by Watershed Concepts. A representative from Watershed Concepts will be testifying on this examination later in this hearing. (See appendix)

The IFSAR Data Set: NEXTMap USA

It is our intent to share a vision of the far-reaching benefits of a coordinated initiative to provide the Map Modernization program with nationwide or large area

coverage of Interferometric Synthetic Aperture Radar (IFSAR) data. Intermap's IFSAR technology has enabled a new era in topographic mapping. For the first time, entire nations can be mapped to a very high accuracy in a short amount of time and at a very reasonable cost. This is the basis of Intermap's NEXTMap USA® program. Launched in 2004, this program is producing a new geospatial database of vertical and horizontal data covering the entire lower 48 states over a four year period, with the program to be complete in 2009. Data deliveries are being staged throughout the program, with data being delivered now. Once the entire nation is collected, map updates will be available in the areas where changes dictate new data.

IFSAR is an "all weather, day or night tool" and as such has become the modern tool of choice for providing highly accurate terrain and spatial data quickly at a low cost. IFSAR can help FEMA and FEMA's partners achieve their goals in areas of cost efficiency, map accuracy, and risk reduction, save the American taxpayer an enormous sum of tax dollars, and save homeowners money on flood insurance premiums based on inaccurate, outdated data.

The NEXTMap USA program is producing three key products:

- Digital Surface Model (DSM) (vertically accurate to better than 1m RMSE)
- Digital Terrain Model (DTM) (vertically accurate to better than 1m RMSE)
- Orthorectified Radar Image (ORI) (similar to a black & white aerial photograph with 1.25m resolution)

These three products comprise what is known as the "NEXTMap Data Package". National coverage of this data can be provided to FEMA in a timely and cost effective manner through a subscription program.

NEXTMap USA Data Helps Meet FEMA's Goals and Needs:

The FEMA goals most influenced by the NEXTMap USA data set are listed in summary form below, with key effects noted.

- Goal: Reduce processing time and cost of map updates and increase accountability for spending via systems and standards and communication for all users.

  This is a major area of contribution as the "off the shelf" availability of the NEXTMAP USA data will mean better accuracy than any other available data, at a very low cost. The vertical and horizontal accuracy and GIS integrity of the NEXTMAP USA data is better than any existing nationwide data set, again, allowing higher confidence in a digital data source. This means that there will be less reliance on old questionable data, increasing the quality of the engineering and mapping in those areas. This will also allow the engineering and mapping work to start with less delay for data planning, data collection and data preparation. In addition, sequencing of counties becomes more flexible as the on the shelf availability of NEXTMAP USA data makes it easy to move the mapping effort to another county immediately if a delay is encountered.

- Goal: Continue to improve the quality and accuracy of national flood hazard data by developing Geographic Information Systems (GIS)-based products with reliable technologies that meet the enhanced technical standards.

  The seamless, accurate NEXTMap USA data set is a perfect solution for GIS tasks in map preparation as well as a tool for validating existing maps for both vector and elevation accuracy. The accuracy and coverage combined with low cost will allow a much larger area of the nation to be mapped with new data increasing the coverage of medium and low population areas.

This data can be seamlessly integrated with topographic data already being collected by FEMA for urban and rural studies using other, higher cost technologies, such as LIDAR and photogrammetry. NEXTMap USA will reduce

FEMA mapping costs and risks while increasing accuracy, timeliness and completeness of the final map products; and thus allow increased coverage of the USA mapped with new data. These benefits will be most strongly realized in the rural regions of the USA, where there is a need for low cost, high accuracy topographic data.

The NEXTMap USA data set can be obtained most cost effectively by a large volume purchase, and using this method, the cost can be hundreds of millions of dollars less than the cost of using older less accurate data. Included with purchase of NEXTMap USA data is the opportunity for FEMA to exert influence on priority and schedule to maximize the availability of data desired by FEMA.

Background

The FEMA Map Modernization program will produce a new generation of maps of the United States in regard to the major hazards that we face. Producing new maps with a higher degree of accuracy and currency requires new geospatial data, not the costly digitizing of outdated data, .

Intermap understands that FEMA is evaluating the need for new terrain data and image data mapping, encompassing large areas of the United States. It is widely understood that the USGS maps are on average about 20 years out of date and the elevation data in the maps and DEMs is on average 40 years old. The USGS data is often out of synchronization with rapid change in population growth even when less than ten years old. Furthermore, the timing and methodologies used to create the USGS data often leads to both vertical and planimetric discontinuities at the edge of the tiles. These discontinuities require that FEMA, or its contractors, correct the mapping prior to its use in any application spanning more than one map tile. This adds up to a considerable cost when the amount of data involved is considered. Figure 1 (Section 3.2, Page 6), makes the point that considerable detail is missed in USGS topographic data when compared to Intermap's NEXTMap USA data set.

There are several ways to create new high performance elevation and image data that can be the base for this flood mapping and hazard mapping. Lidar produces very accurate elevation data, but is very expensive and relatively slow for large areas. While Lidar is an excellent solution for urban centers, the budget planned for the Map Modernization effort does not allow Lidar to be a solution for large regions of the nation due to the technology's cost and schedule requirements.

Therefore, there exists a dilemma with regard to the geospatial data for the large rural regions of the United States. Our experience in the United Kingdom has shown that about 40% of all claims from flood damage occur in rural areas. New terrain data is needed to replace the older, inaccurate USGS terrain data. However, available funding and the program schedule do not permit the application of such technologies as Lidar and photogrammetry. Another solution is needed that is accurate, cost effective and proven to support FEMA's applications.

The Suitability of IFSAR Data for FEMA

IFSAR is a powerful new mapping technology, and yet is a well proven technology. Over the past several years, Intermap has demonstrated to the United States Geological Survey and NASA, NGA, NOAA and other U.S. Government agencies that we have unique technology and production processes, which make it possible to create highly accurate, uniform digital map quality data for very large regions, on a cost effective basis.

The figure below illustrates the point that USGS DEMs do not contain the information required for effective modeling of flood hazards. There is significant detail not shown in the USGS DEM that is shown in the IFSAR DEM. The missing detail is critical to accurate flood modeling and analysis.

In 2003, Intermap completed the first nation-wide high accuracy mapping program for all of Great Britain. This program, known as NEXTMap Britain®, proved that Intermap's technology, program management and production facilities are capable of performing nation-wide mapping. One of the key applications for this data set was flood insurance. This current data set predicted with remarkable accuracy the flooding of several thousand homes in northern England in recent weeks, whereas the previous data set and identical flood models were not able to identify the homes at risk. This illustrates the importance of constructing the FEMA's new accurate flood hazard maps upon current, not dated, elevation datasets.

IFSAR is well suited to the open landscape found in the western US and the agricultural areas of the mid west. This was proven in mapping the UK. The heavy continuous forested areas in the eastern US will make the IFSAR less effective there for topographic mapping, hence we propose FEMA undertake a subscription for the NEXTMap USA data in the West and Central parts of the USA. However, there is great value in the DEM and ORI for other FEMA applications (*e.g.*, landslide analysis, hazardous plume modeling, evacuation planning, *etc.*) and FEMA may desire to obtain the NEXTMap USA data for the entire continental United States.

The Value of NEXTMap USA to FEMA and FEMA Partners

There are many important goals of the Map Modernization effort. We have listed in an abbreviated form many key FEMA goals and needs as listed in the MHIP document. Because of the number of goals and needs, we have listed most of the key goals and made a short specific comment regarding that goal and how NEXTMap directly supports that goal. A careful examination shows that virtually all FEMA Map Modernization goals are influenced positively by acquiring new high performance, digital terrain and image data of a large portion of the USA.

The following is a list of specific FEMA and FEMA partner goals and needs from the MHIP Document:

FEMA Goal as stated in MHIP	NEXTMap USA Support
1. Create safer communities by providing more accurate, readily available and easier to use flood maps and data for communities nationwide.	NEXTMap USA data effectively addresses this need.
2. Map complete watersheds (not just flood plains) by working with Partners and others and merging the stream data to a digital GIS basemap of the entire county or larger area.	NEXTMap USA data supports this goal by providing low cost, suitably accurate terrain data for large areas of the USA.
3. Age of maps is a significant concern to FEMA Partners. Currently, 54 % of the maps are 15 years of age or more. The goal is to reduce the age of maps and to maintain a more current data set.	Inexpensive, NEXTMap USA data will allow mapping with new data over much larger areas of the country, reducing the reliance on older, less accurate data.
4. While the quality of the final digital products will be superior to current maps, stakeholders have expressed concern that products may be developed by simply digitizing existing maps.	NEXTMap USA data addresses this need by providing current, inexpensive, yet accurate elevation data resulting in better quality map products.
5. Decision to publish BFEs is a function of the reliability of source data and the accuracy of the FFEs.	New high quality data allows more BFEs to be published with greater confidence in data accuracy.
6. Manage the program wisely, saving money with new cost saving methods and operating in a cost efficient manner.	NEXTMAP USA saves on initial mapping costs relative to other mapping technologies and will provide savings in map production processes.
7. Create a new digital GIS Base for hazard mapping with new cost effective technology, transportable file formats and web technology.	NEXTMap has a horizontal accuracy of 2 m RMSE. This digital data set is nationwide.
8. Provide for easy ingestion of base data and eliminate costly data preparation.	NEXTMap USA data formats are immediately compatible with Map Mod tools.
9. Have a faster response and support for LOMC reference and subsequent corrections.	NEXTMap will be an accurate GIS and DEM base and will support checking and logging LOMC decisions.
10. Apply Flood Map Modernization resources and results to help general Multi-Hazard Mapping.	NEXTMAP USA data will serve later mapping needs as it is complete coverage of area, includes roads, rail lines, slope, built up and other vectors.

11. Increased reliability and reduced risk: key factors include topographic data, model parameters, validation routines and final mapping.	NEXTMap will give accurate, seamless complete coverage for mapping and quality control.
12. To provide accurate mapping for more than 85% of the population of the nation even to approach the 100% goal.	This is an area of great value for FEMA as NEXTMap USA will allow studies for low and medium population areas to be based on new accurate data at a very low data cost with high mapping efficiency.
13. Structures and vegetation impact flow. Need, a reliable means of calculating of the N value.	The image and DSM data can be used to help generate a value of surface roughness.
14. Study costs depend on the availability of existing data (Map Mod costs increase as a result of custom terrain data acquisition efforts).	NEXTMap USA coverage and low cost drives mapping costs down, while providing suitable accuracy, shortening time frames and lending flexibility on studies.
15. Reduce costs.	NEXTMap USA is low cost, relatively accurate and easy to use elevation data which reduces program costs.
16. Quality control of mapping and map products. And correction processes to eliminate errors. Reduces the extra labor by senior engineer to check to see if the study is correct.	NEXTMap USA is a seamless GIS base with 2 meter horizontal accuracy and better than 1 meter vertical accuracy. Can be used for pre and post mapping QC.
17. Coverage: Desire to do more than the 90,000 panels now in existence.	Low cost of the NEXTMap data allows high efficiency of use and coverage allows high quality low risk results in mapping of previously unmapped areas.
18. Revised topographic re-delineation is better served with new topographic data.	NEXTMap data would be available and allow better results and confidence.

NEXTMap USA directly addresses FEMA Goals and Needs

The above listed goals and needs have been stated because they are all supported in important ways by the acquisition of new high quality NEXTMap USA terrain data:

- The NEXTMap USA data set will be the first seamless data set ever available for the 48 lower states. It will allow confidence in national data that has up until now has not been possible. NEXTMap USA will be a seamless data base of the nation having precision better than 2 meters horizontal and 1 meter vertical (RMSE).
- All of the Map Modernization work can be made more effective by having current, high quality terrain data on the shelf to allow significant time savings to complete the site or area studies, and to reduce costs while increasing flexibility of work.
- This data would allow mapping to be done with new maps over areas that will not be mapped in any reasonable period of time if not acquired by FEMA. It will allow the completion of a much larger portion of the USA, in the low and medium population areas at a very low cost.
- This would allow new digital maps from new digital elevation and vector data, not from the old maps or the out of date USGS elevation data. This would reduce risk for homeowners, save taxpayers money, and provide real accuracy for FEMA stakeholders – the American people.
- Revised topographic delineation, quality control of existing and newly produced maps, and general mapping procedures would be improved or made better with this data set available.
- One of the areas where this might be very useful is in the orthorectification of other image products that are obtained for mapping purposes. Often high resolution imagery is not positioned well and may have distortion over areas with elevation. With a good DEM and the control provided by the ORI, images can be made map accurate for a low cost.

The value of all of these benefits is higher, and the cost of the data is lowered as a volume purchase allows this to occur.

Under the Map Modernization program, certain areas of the USA are being mapped with Lidar due to the density of population and the need to have very

accurate data in the presence of trees (where X-band IFSAR is not as effective). However, this leaves a majority of the area of the country where the population is less dense and the terrain is not heavily forested. Furthermore, the existing USGS data is not as accurate, not as current and not as easy to use as NEXTMap USA data. It is these larger areas of the nation that NEXTMap is ideally suited to supply the data for Map Mod work. Users of the USGS topographic data have found that there is a significant cost and a time delay getting the data ready for use in mapping and modeling software. NEXTMap data is digital and it is delivered in a form that allows ingestion by any type of applications software used in the Map Modernization effort.

This analysis leaves NEXTMAP USA as the only remaining practical approach for getting new reliable data of the larger part of the country within the Map Mod Time frame and budget. This proposal offers the data for the continental United States in 4 years. Areas collected by Lidar can be fused with the NEXTMAP USA to make one seamless data base for modeling and other applications. The Budget of the Map Mod Effort will not allow large area mapping of the USA with any approach except as provided by the NEXTMap USA program.

NEXTMap USA Subscription Programs

National Subscription: The NEXTMap USA program is national in concept design and execution. Intermap recommends FEMA consider a subscription to the national program. This will provide FEMA a national data set with sufficient accuracy, consistency and currency to support the mandate of Map Mod. The eastern US has more vegetation cover, making IFSAR elevation data less effective for flood mapping in that part of the country. However, the NEXTMap data is extremely well suited for other FEMA applications such as the validation of other map sources, analysis of hazards other than flood, transportation/evacuation corridor mapping, *etc.*

Central & Western US Area Subscription: Another approach that will provide tremendous benefits to FEMA involves a subscription to the NEXTMap USA program that would cover the West and Central portions of the USA. This would involve the purchase of FEMA Regions 6, 7, 8, 9, and 10 and the states of Illinois and Indiana in Region 5, this area is calculated as being 2,107,793 square miles. The subscription to this smaller data set would have a slightly higher cost per square mile, but it allows FEMA to purchase the NEXTMap USA data that is best suited for flood hazard mapping.

FEMA Region Area Acquisition: FEMA may subscribe to NEXTMap USA on a region by region basis.

State Area Acquisition: Intermap is focused on the acquisition of large geo-political regions that would be of interest to many other clients. Should FEMA commit to the acquisition of any single state larger than 80,000 mi^2 then this decision would influence our data acquisition schedule.

FEMA can order data for individual counties or enable significant reductions in unit price by ordering data in regions or larger multi-state groupings. Data ordered by individual counties will incur the highest unit cost.

The significant disadvantage to FEMA of individual county requisition is the risk of not having the required county on-line, or immediately available. This risk is mitigated by forward planning where Intermap and FEMA jointly schedule the acquisition and processing of data such that FEMA's mapping needs are met before he engineering community needs the data for the county flood study. This does not require any pre-purchase but rather a commitment to purchase that is tasked and ordered with sufficient lead time to ensure delivery. Intermap is currently able to schedule large block acquisition and processing to enable delivery in ninety days given the appropriate snow cover and weather conditions.

Appendix

TX Results – Appendix "a"

Intermap Past Projects-Appendix "b"

Appendix A – FEMA Pilot Project

June 16, 2005

A REPORT ON A PILOT PROJECT USING IFSAR DATA (A NEW TERRAIN AND PLANIMETRIC DATA PRODUCT) FOR MAP MOD APPLICATIONS

Jack Quarles, FEMA Region VI; Dan Hoecker, Michael Baker Jr., Inc.; David Key, Watershed Concepts, and Marc Wride, Intermap Technologies

1. What is IFSAR:

IFSAR is the acronym for Interferometric Synthetic Aperture Radar. This is a process through which radar technology is used to produce imagery and elevation data quickly and inexpensively over large areas. The radar sensor is usually installed in an aircraft, though can be installed in orbiting satellites. In this Pilot Project, the specific IFSAR is referred to as X-band IFSAR, and this was used by Intermap Technologies to create the elevation and image products. X-band IFSAR does not penetrate through the closed canopy created by continuous vegetation coverage. Intermap is successfully able to remove the effects of vegetation in the digital terrain model where the vegetation is not continuous or where the stands of trees are linear or less than 100 meters wide in all directions. The Intermap IFSAR system is referred to as STAR-3i and it is mounted in a highly modified Learjet 36. Two radar antennas are located on the aircraft such that one antenna transmits a radar beam, and then both antennae receive the radar beam reflected from the earth surface. These signals and the aircraft positional information and supporting GPS data are processed into two complex images, which are then formed into an interferogram allowing production of an elevation product and an orthorectified image. See the picture of the STAR-3i and the graphic of the data flow below. The initial products from IFSAR are generated in a complex computational environment with very little human interaction. Following the initial processing that converts the radar signals to map domain there are image mosaicing and editing steps required to create the final products. At the completion of these steps elevation models and ortho-rectified images are ready for users.

2. Why is IFSAR a Good Terrain Data Collection Tool?

IFSAR is an "all weather, day or night tool" and as such has become the modern tool of choice for providing highly accurate terrain and spatial data quickly at a low cost. The data come from the computer processing steps accurate vertically to between 18 to 40 inches RMSE and approximately 6 feet horizontally. These characteristics and accuracy specifications allow IFSAR to be used for the collection of the entire continental USA in a 4-year period as described in the following chapter on NEXTMap USA. This new complete coverage can be used to assist in addressing the terrain data needs of FEMA and their Cooperating Technical Partners and to do so at low cost and high levels of efficiency, map accuracy, and risk reduction.

3. The IFSAR Pilot Study - Data Collected:

The Pilot was designed to test the IFSAR data as a large area terrain data solution for flood mapping. This tool would provide more accurate, up to date terrain data that was seamless in nature and potentially available for large portion of the nation allowing methods to be standardized saving time and funding in flood studies and mapping product development.

The Pilot was to cover two counties (Randal and Potter) in North Texas on the north and south side of Amarillo. See graphic provided. Two types of data were tested:

1. Type I, at 0.5 meters vertical RMSE, the most accurate standard terrain data available from the Intermap System.
2. Type II, at 1.0 meters vertical RMSE, the second most accurate standard product in terms of vertical accuracy.

Both Counties were covered with both types of products and the data processed and edited using standard methodology for these products. There are three individual sets of data in each product suite comprised of:

1. A DSM, a digital surface model, referred to by Intermap as a DSM.
2. A DTM, a "bald earth" digital elevation model, referred to by Intermap as a digital terrain model.
3. An ORI or ortho-rectified radar image that is very similar in appearance to a black and white ortho-photo map.

The ORI was produced for both counties. This ORI has a pixel size of 1.25 meters and a horizontal accuracy of 2 meters RMSE. The ORI is a standard product from the IFSAR and is used to support the use of the DTM and can be used in the mapping activities to ensure proper spatial location of roads and other vectors. The role of the ORI in Map Modernization was not the purpose of the Pilot, but it was expected that some observations on the value of the image data in mapping might come from the testing.

After the data were processed and edited by Intermap, they were delivered to FEMA contractors Michael Baker and Watershed Concepts for the use and evaluation as a terrain data source for FEMA's Map Modernization Program.

4. IFSAR Specifications for the Pilot:

The following specifications for IFSAR come from Intermap Technologies Core Product Book. These specifications were used in the pilot, as the IFSAR data were being made available by Intermap for the entire USA in a program called NEXTMap USA. This data development program would allow inexpensive availability of IFSAR terrain data for

flood mapping if the data proved accurate enough to replace the currently available USGS data, the likely map data source for large areas of flood map data products through the FEMA Map Modernization Program. More information is provided in that chapter, but these are the key assumptions that drove the need to do a pilot using the IFSAR data:

1. The data exceeds the accuracy of any existing nationwide data set, allowing much more area to be studied, with better results and less risk.
2. The data is current, being acquired now and capable of being delivered today, increasing the value and accuracy of the map results.
3. NEXTMap USA IFSAR terrain data is available for a relatively low cost, allowing collection for each county to be a small part of the cost for flood mapping studies. When IFSAR is acquired in large volume, it can be obtained for less than $25 per square mile. If purchased in large volumes and through the shared costing model of the NEXTMap program, the cost for the three products described in this chapter can be reduced to the less than 5 dollars per square mile.
4. Intermap's IFSAR data has been independently validated for flood mapping applications in past projects in the USA and the United Kingdom, increasing the probability that IFSAR data will be useful for FEMA's requirements.

Table for Specifications of IFSAR in FEMA Pilot:

Orthorectified Radar Imagery (ORI):
There is one image resolution available.

Pixel Size (m)	Horizontal Positional Accuracy RMSE (m)	Positional Accuracy CE95 (m)
1.25	2.0	4.0

(Data specifications are described in Intermap's Product Handbook and Quick Start Guide).

Digital Surface Model (DSM):
Height postings are every 5 meters.
(Data specifications are described in Intermap's Product Handbook and Quick Start Guide).

Product Type	RMSE	95%
I	0.5	1.0
II	1.0	2.0

Digital Terrain Model (DTM):
Height postings are every 5 meters. The accuracy may approach the DSM specification due to the generally barren terrain.

Product Type	RMSE	95%
I	0.7	1.5
II	1.0	2.0

(Data specifications are described in Intermap's Product Handbook and Quick Start Guide)

5. The Intermap Accuracy Testing of the IFSAR Data:

Intermap Verification and Validation team tested the Randall and Potter Counties elevation data and determined that the vertical accuracy of the Type II product exceeded the vertical accuracy specifications. Intermap was supplied with approximately 250 vertical control points surveyed by the City of Amarillo. These points were compared with the elevation models and the elevation models were found to be within 55 cm of the ground control points.

6. "NEXTMap USA" IFSAR Coverage of the United States:

IFSAR is a tool that allows collection of precise elevation and planimetric data very quickly and very inexpensively. IFSAR technology has enabled a new era in topographic mapping: for the first time, entire nations can be mapped to a very high accuracy in a short amount of time and at a very reasonable cost. This capability is the basis of Intermap's "NEXTMap USA®" program. Launched in 2004, this program is producing a new geospatial database of vertical and horizontal data covering the entire lower 48 states over a four year period, with the program to be complete in 2008. Data from NEXTMap USA data is available now for parts of California, Florida and Mississippi, these states and other areas will be completed by the fall of 2005. Once the entire nation is collected, map updates will be available in the areas where changes dictate new data.

The NEXTMap USA program will produce three key products:

- Digital Surface Model (DSM) (vertically accurate to better than 1m RMSE)
- Digital Terrain Model (DTM) (vertically accurate to better than 1m RMSE)
- Orthorectified Radar Image (ORI) (similar to a black & white aerial photograph with 1.25m resolution)

These three products comprise what is known as the "NEXTMap Data Package". National coverage of this data can be provided to FEMA in a timely and cost effective manner through a subscription program.

These core products have been defined and their details and technical specifications published in the *Product Handbook and Quick Start Guide*. This guide can be found at www.intermap.com. These three core products provide FEMA with the fundamental building blocks of terrain data and image data suited to all hazard mitigation exercises, not just flood mitigation. Examples of these products are found in the Appendix and Figure 3.1.

The Digital Surface Model (DSM) contains measurements of the first reflective surface as illuminated by the sensor. The elevation points are derived from radar energy returned to the antenna from the first surface it encounters. The surface may be that of structures such as buildings or towers, or of vegetation such as trees or crops. In the case of 'soft' surfaces, as implied by vegetation, the returned signals are reflected by the tree canopy itself, as well as by the branches and tree trunks within the canopy. The NEXTMap USA DSM is a 5 meter posted DEM accurate to 1 meter (or better) vertical RMSE.

The Digital Terrain Model (DTM) is the 'bald-earth' model that references the elevation measurements of the bare terrain. The DTM product is a result of subtracting the measurement of the height of the majority of structures and discernable vegetation from the DSM product. The Intermap DTM product is produced using TerrainFitTM, Intermap's proprietary and automated process whereby a bald-earth DTM is derived from the DSM. In areas where spatially extensive structures or forests exist (*e.g.* greater than 100 meters all directions), the DTM will deviate further from the true ground elevation measurements than in areas having less surface obstructions. The stated product accuracies will not apply to these large areas with dense canopy or structures. The NEXTMap USA DTM is also a 5 meter posted DEM accurate to 1 meter (or better) vertical RMSE. The DTM will be vertically accurate to 1 meter RMSE or better.

The Orthorectified Radar Image (ORI) is a spatially correct map accurate product comprised of black and white (grey scale) radar imagery at 1.25 meter pixel resolution orthorectified to a horizontal accuracy of 2 meters RMSE. This imagery accurately depicts terrain features and can be used as a primary source for feature maps at scales from 1:500,000 to 1:10,000. This ortho-image product is also an excellent source for planimetric control of other maps that FEMA may need to acquire. In addition this current image product will prove invaluable to FEMA for other hazard mitigation purposes. This image is very similar to a black and white photomap and it is easily integrated in the current mapping environment with little or no additional training.

7. Comparative Analyses:

Comparisons were made between the IFSAR data and both the City of Amarillo topographic data and USGS 10 meter DEMs. The topographic data for the City was derived photogrammetrically from 1998 aerial photographs. The created map scale was 1"=200' and had a 2 foot contour interval. This data is considered the most accurate available for the area and provides a good basis of comparison for both the horizontal and vertical accuracies of the IFSAR data. The USGS 10 Meter and 30 Meter DEMs are frequently the only digital topographic data readily available for use in flood studies.

To give a broad view of the IFSAR data versus the other data sources, four comparisons were made. The comparisons included direct data using DEM subtraction, and generated results using the data including cross section, floodplain mapping, and hydraulic modeling. DEMs for each source were initially created. A stream basin was then selected which was fully contained within the boundaries of the DEMs. Finally, a section of Tributary C within that basin was selected for modeling.

The DEM Comparison involved taking the IFSAR elevations for grid locations within a given area and subtracting the comparable location elevations obtained using the City of Amarillo data and then the 10 Meter DEMs. The visual and analytical review of the IFSAR versus Amarillo comparison reflects a generally high level of agreement. In several cases there are very close fits between the Amarillo and IFSAR datasets. There are differences and the greatest elevation differences occurred primarily in the vicinities of large buildings in highly urbanized areas. In addition, there were several locations where thick vegetation along a stream resulted in significant elevation differences. It was also noted that several locations were identified with significant elevation differences where excavation activities had actually changed the local topography since the aerials had been flown. In general, the majority of the comparison area reflects elevation differences of +/- 4 feet or less. In the visual and analytical review of the IFSAR versus 10 Meter DEM comparisons a much larger area reflects significant elevation differences. This is in part due the horizontal displacement of topographic features between the two data sets. The largest areas of significant elevation differences are found along the well defined streams in the northwest area of comparison. To the west of the stream the IFSAR elevations could be 6 to over 15 feet lower than the 10 Meter DEMs while to the east of the same feature the elevations are 6 to 15 feet higher. However, within the highly urbanized areas there are large areas of significant differences. In the central business district, which consists of several tall buildings, the IFSAR data are not as accurate. This is possibly what contributed to the elevation differences.

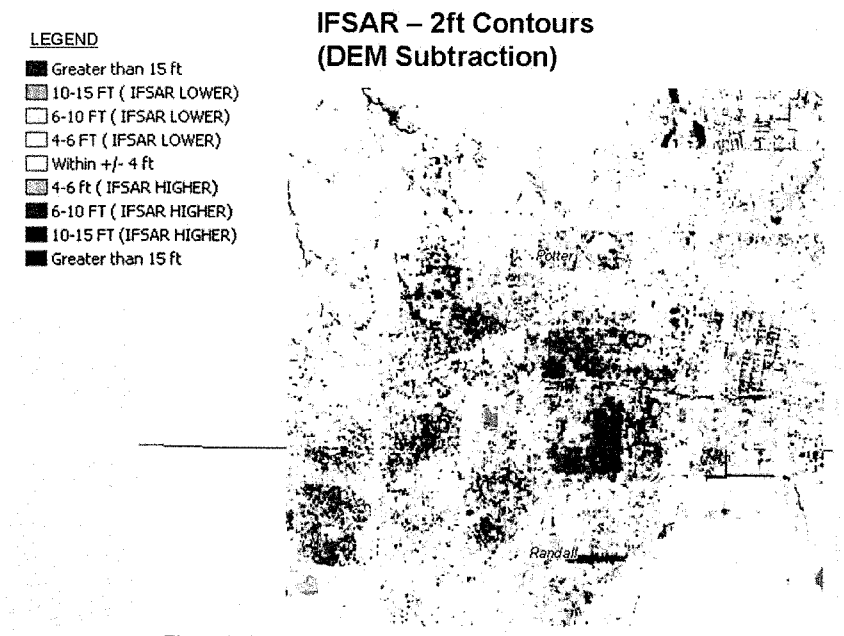
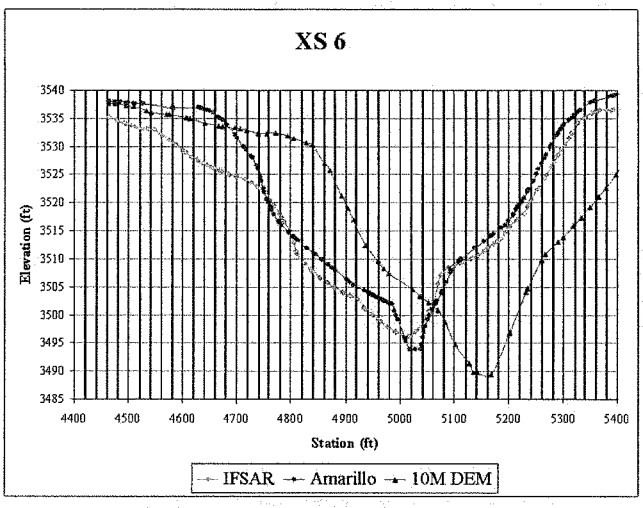


Figure 1: DEM Difference Analysis (IFSAR vs. 2ft Contours)

The Cross Section Comparison involved the selection of a stream segment within the study area. It was decided to select a stream that was located in a more rural portion of the City. Due to the time difference between the aerial photos and the IFSAR flight, the thought was to minimize the chances of any recent construction skewing the results. A total of 15 cross sections were delineated for the analysis. In general, the IFSAR and the City data correlated well horizontally in almost all of the channel definitions. The 10 Meter DEM cross sections were displaced horizontally up to +150 feet. Vertically, the IFSAR cross sections were generally more reflective of the Amarillo data than were those created using the 10 Meter DEM data.

Potter County Mapping Comparisons



WatershedConcepts 13

Figure 2: HEC-RAS Cross Section Comparison

The Hydraulic Modeling Comparison was made to determine how much impact the use of each DEM would have on the resulting flood elevations and ultimately the flood boundaries. All parameters typically obtained by automated procedures, including drainage area, channel lengths, and cross section parameters were derived from their respective DEM. In regard to just the comparison of the IFSAR to the Amarillo data, the differences in computed discharges were within 7 to 10%. Therefore, the DEMs were generating different values for the regression equation coefficients. However, those differences were of minimal impact on the results. A much greater impact is seen as a result of the cross section parameters. The maximum elevation difference of 12.9 feet was observed at cross section 1 of the model. The deepest area of the IFSAR generated cross section was over 10 feet less than that observed in the Amarillo data. In addition, the next four cross sections generated were at least 5 feet higher in elevation. Starting with cross section 6 and working upstream, the computed water surface elevations using the two data sets were within 3.1 feet or less.

The Mapping Comparison involved utilizing each DEM to create the resulting flood boundaries. As would be expected, the boundary widths for each data source differed from the other two. However, the general locations and their respective shapes were very similar. The IFSAR and the Amarillo boundaries were the most closely matched of the three. The 10 Meter DEM boundaries reflected the offset noted in the cross sections.

Because the IFSAR more closely followed what is actually on the ground, it could be assumed that fewer properties will be improperly mapped within the floodplain.

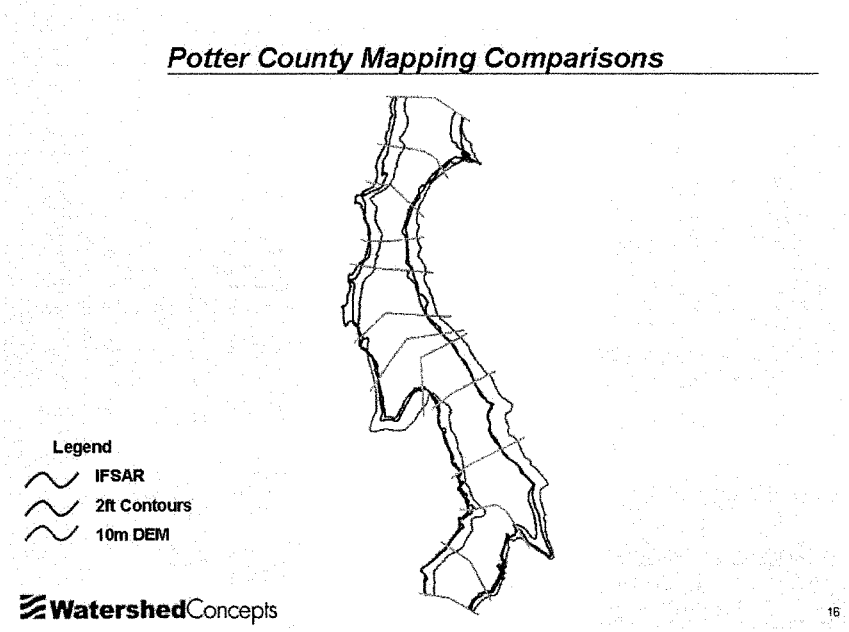


Figure 3: Floodplain Boundary Mapping Comparisons

8. Observations and Conclusions:

The following observations and conclusions were derived from this Pilot:

- Assuming the City of Amarillo data as being the most accurate actual information:
  a. It appears that IFSAR provided more accurate information than the USGS 10 meter DEM.
  b. The cross section differences graphically illustrate how the IFSAR data might assist in developing a more accurate depiction of the Floodplain Boundary.

- The Study Contractor had a positive experience working with the data sets provided by Intermap. There is value in having a consistent, reliable data set over an entire county, which may translate to cost and schedule efficiencies in the mapping process.

- Although variances between the City of Amarillo and the IFSAR were observed, in general, the difference was not large or significant. In the few cases where the difference was larger, it could be explained after a closer examination of the data. The IFSAR data acquired several years after the Amarillo aerial photography depicted areas of change along the riverbanks, while some small areas of trees also induced differences.

- IFSAR is an evolving technology and further improvements in the algorithms and editing process that derive the data continue to positively affect the final elevation model quality.

- From a FEMA Region VI perspective, IFSAR technically appears to be a viable alternative to provide better data in counties where only USGS data is available. The X-band IFSAR will be more directed to arid regions and agricultural lands where tree cover is minimal or where trees are distributed in small blocks. This would focus the use of IFSAR for use in Region VI primarily to large areas of central and west Texas, western Oklahoma, New Mexico and, possibly, eastern portions of Arkansas.

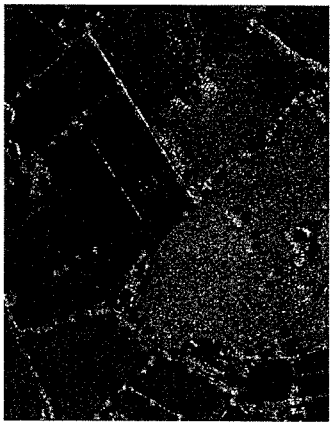
Appendix B – Past Experience

NEXTMap Britain

Problem: Flood maps of Great Britain were inaccurate and inconsistent. The maps had been created at different times, with varying levels of accuracy and quality. The poor quality of data left the insurance industry exposed to large losses.

Solution: Intermap's NEXTMap Britain program began with a pilot project undertaken in 1998/99. Intermap acquired elevation data in the River Thames drainage basin for use in a new flood risk analysis system. The STAR-3*i* system was used to collect approximately 22,000 Km² of DEM and image data in support of the pilot project. Intermap's ability to use IFSAR for large data collections in a short time, and at an affordable price made the project an unqualified success. Subsequently, every insurer with commercial or residential property portfolios in the Thames basin made use of the risk analysis system.

Norwich Union Insurance (NUI) approached Intermap about flying all of the rivers and coastal areas in the country, as they were dissatisfied with the inconsistent data coverage and accuracies available from traditional data sources. Intermap began the mapping program in 2002. The entire DEM and imagery products for England, Wales, and Scotland have been delivered to NUI (approximately 231,326 km$^{2)}$. Intermap has also been able to resell the licensed to data set to numerous clients including The Environment Agency (UK), The British Geologic Survey, The Scottish Executive, The National Assemble of Wales, TRANSCO and a number of other public and private sector clients. The entire country was mapped at a vertical accuracy of 1 meter, RMSE, with 56,000km^2 surrounding the London area mapped at .5 meter RMSE.



NEXTMap USA

Problem: Maps of the USA are inaccurate and inconsistent. Existing maps have been created at different times over several years, with varying levels of accuracy and quality. The poor quality of available data causes frustration and increases workloads for public sector agencies and private sector firms working with geospatial data and inhibits growth in technologies including location based services, navigation systems and more. With the increasing awareness of Homeland Security issues; agencies that control and manage border areas, coastlines and critical infrastructure are in need of an accurate, consistent topographic base map.

Solution: The NEXTMap USA program is the only program of its kind wherein a private sector firm is investing in the creation of a new seamless consistent and highly accurate elevation map and image database of the forty eight contiguous states and Hawaii. Acquisition began in the fall of 2004. To date Intermap has been able to map all of Florida and Mississippi and significant portions of California, Louisiana, Alabama and West Virginia, as well as smaller portions of Michigan and Texas. Customers include NOAA, West Virginia Dept. of Environmental Planning, Kings County (CA), and more. FEMA has tested the data in two counties in northern Texas with solid results which were recently presented by FEMA, Michael Baker, Watershed Concepts and Intermap at the 2005 ASFPM Conference.

NGA – Indonesia

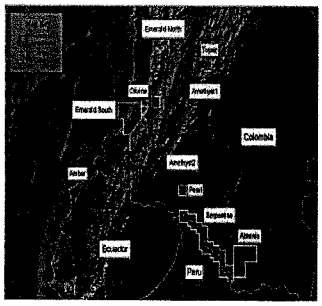
Problem: The objective for this project was to collect high resolution IFSAR data and process it into a Digital Elevation Models (DEM) and an Orthorectified Radar Imagery (ORI) for selected islands in Indonesia. This is a high priority NGA crisis response program and the data was used by NGA for creating a new series of 1:50,000 Topographical Line Maps (TLM) for an area of approximately 380,000 km^2, and for other planning and visualization purposes by the requesting Command. The area has persistent cloud cover throughout the year, making traditional satellite imagery and aerial photography impractical. Intermap's scope of work also included an option to produce 1:50,000 TLM maps from the IFSAR source data for NGA, and provide technical interchange and training for NGA personnel in feature extraction and mapping from IFSAR data.

Solution: Intermap mobilized a Lear Jet IFSAR platform and a Turbo Aero Commander IFSAR platform to Indonesia to acquire IFSAR data for the areas of interest. Intermap utilized its international commercial mapping experience to negotiate all the necessary permits and approvals with the Indonesian government to conduct the mapping program. Intermap has over 25 years of radar mapping experience in Southeast Asia, including a major project in Indonesia in 1996. Intermap dedicated two IFSAR aircraft and dedicated processing systems in Denver, Ottawa, and Munich to process the data on a priority basis in order to satisfy the demanding schedule. The IFSAR data met Intermap's Type III data specification, providing a DEM with a 3 meter vertical accuracy, and an ORI with a 1.5 meter or better pixel resolution, suitable for TLM mapping at scales of 1:25,000 or 1:50,000. Intermap achieved a 99% acceptance rate on this project.

NGA – South America

Problem: The objective for this project was to collect high resolution IFSAR data and process it into a Digital Elevation Model (DEM) and an Orthorectified Radar Imagery (ORI) for areas in South America. The data was used by NGA for creating a new series of 1:100,000 Topographical Line Maps (TLM) for an area of approximately 100,000 km^2, and for other planning and visualization purposes by the using Command. The area has persistent cloud cover throughout the year and rugged terrain, making traditional satellite imagery and aerial photography impractical. Intermap's scope of work also included a task order to produce TLM maps from the IFSAR source data for NGA.

Solution: Intermap mobilized a Lear Jet based IFSAR platform to collect IFSAR data for the areas of interest. Intermap dedicated the IFSAR aircraft and processing systems in Denver and Ottawa to process the data in order to satisfy a demanding schedule. The IFSAR data provided met Intermap's Type III specification, providing a DEM with a 3-meter vertical accuracy, and an ORI with a 2.5-meter pixel resolution, suitable for TLM mapping at scales of 1:50,000 or 1:100,000.

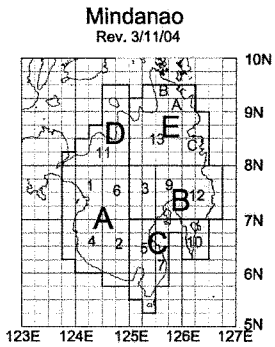


NGA – Philippines

Problem: The objective for this project was to collect high resolution IFSAR data and process it into a Digital Elevation Models (DEM) and an Orthorectified Radar Imagery (ORI) for selected areas of the Philippines. This is a high priority NGA crisis response program and the data will be used by NGA for creating a new series of 1:50,000 Topographical Line Maps (TLM) and for other planning and visualization purposes by the requesting Command. The area has persistent cloud cover throughout the year, making traditional satellite imagery and aerial photography impractical. Intermap's scope of work also includes an option to produce 1:50,000 TLM maps from the IFSAR source data for NGA, and provide technical interchange and training for NGA personnel in feature extraction and mapping from IFSAR data.

Solution: Intermap mobilized an IFSAR platform to the Philippines to acquire IFSAR data for the areas of interest. Intermap utilized its international commercial mapping experience (over 25 years of radar mapping experience in Southeast Asia) to negotiate all the necessary permits and approvals with the Philippine government to conduct the mapping program. Intermap will dedicate an airborne IFSAR sensor and processing systems in Denver, Ottawa, and Munich to process the data on a priority basis in order to satisfy the demanding schedule.

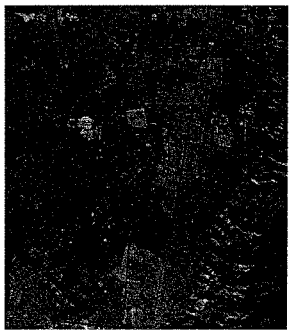
The IFSAR data will meet Intermap's Type III data specification, providing a DEM with a 3 meter vertical accuracy, and an ORI with a 1.5 meter or better pixel resolution, suitable for TLM mapping at scales of 1:25,000 or 1:50,000. Intermap will provide experienced mapping resources to produce 1:50,000 scale TLM maps from IFSAR DEMs and source imagery, as required. Intermap was able to achieve a 99% acceptance rate on this project.



NGA – Colombia

Problem: The objective for this project was to collect high resolution IFSAR data and process it into a Digital Elevation Model (DEM) and an Orthorectified Radar Imagery (ORI) for areas in Colombia. The data was used by NGA for creating a new series of 1:50,000 Topographical Line Maps (TLM) for an area of approximately 100,000 km^2, and for other planning and visualization purposes by the using Command. The area has persistent cloud cover throughout the year, making traditional satellite imagery and aerial photography impractical. Intermap's scope of work also included an option to produce 1:50,000 TLM maps from the IFSAR source data, and provide technical interchange and training for NGA personnel in feature extraction and mapping from IFSAR data.

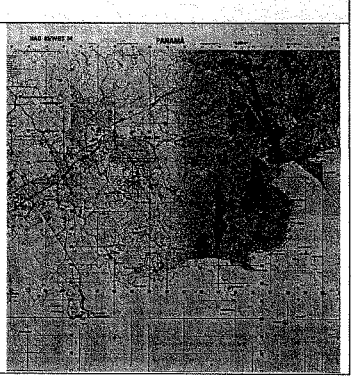
Solution: Intermap mobilized a Lear Jet based IFSAR platform to collect IFSAR data for the areas of interest. Intermap dedicated the processing systems in Denver and Ottawa to process the data in order to satisfy a demanding schedule. The data provided met Intermap's Type III data specification, providing a DEM with a 3-meter vertical accuracy, and an ORI with a 2.5-meter pixel resolution, suitable for TLMs at scales of 1:25,000 or 1:50,000. Intermap provided experienced mapping resources to produce 1:50,000 scale TLM maps from IFSAR DEMs and source imagery.



NGA – Panama Canal

Problem: Due to the urgency of the US returning the Panama Canal to the Panamanians during 1998, Intermap was tasked to create up-to-date maps of the region. As a result of the constant cloud cover inherent to the region, it was impossible to acquire data with traditional cameras or optical sensors.

Solution: Intermap mobilized the STAR-3*i* system within 10 days and the collected 30,000 km^2. The imagery was delivered within 6 weeks and the DEM was delivered within 9 weeks. Intermap also created 1:50,000 scale TLMs for the entire area.



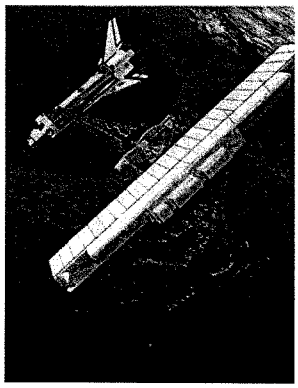
NGA & NASA – SRTM Data Processing, Production and DEM Void Fill

Problem: NGA and NASA/JPL teamed to acquire the Space Shuttle IFSAR data, but had no production system developed to do large volumes of DEM editing and DTED formatting required.

Solution: Intermap teamed with Boeing Autometric to create innovative software tools and workflows to process and create data products for NGA. Initial tasks include design of software tools, processes, and system architecture for processing SRTM data. In the follow on task orders data production & finishing have occurred. The team has received recognition for superior performance, as a result some work in Eurasia was taken from the other contractor and given to Boeing / Intermap (1,101 Eurasia Cells). The team has been able to maintain data acceptance rates of 96% with only 4% rework required.

Problem: During the processing of the SRTM data in the Production contract, it was observed that there are voids in the data due to the characteristics and performance of the SRTM radar system. These voids diminish the accuracy and utility of the SRTM data set to NGA and others.

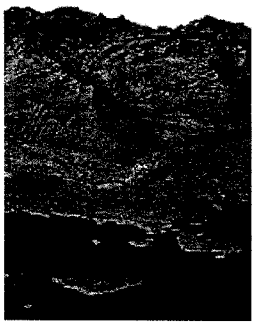
Solution: Intermap teamed with Boeing Autometric to create innovative software tools and workflows to process and create void filled data products for NGA. The software tools assisted the user in taking data from a third party DEM and filling the void with the new DEM data. Production was finished during the spring of 2005.



NASA & FAA – Alaska, Mapping of Terrain Challenged Airports

Problem: This project supported NASA and FAA efforts in synthetic vision and other applications. Many airports in Alaska are among the most terrain challenged and dangerous in the nation. The FAA and NASA have been funding efforts aimed at improving flight safety, especially for terrain challenged facilities. These efforts run the gamut from improved charts to in-cockpit synthetic vision displays and better simulation tools for training.

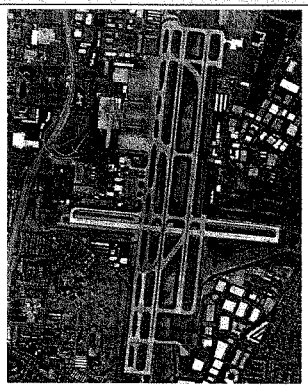
Solution: Intermap provided the client with DEMs and Imagery for several target areas (roughly a 30 square mile area) to support various efforts. The DEMs are accurate to 2m RMSE (vertically) and the imagery has a 2.5m resolution. This data combined with other data sources will provide pilots a new level of comfort and security as they approach these difficult airports.



NASA & FAA – Synthetic Vision Testing, Reno, Nevada

Problem: The US lacks an accurate digital elevation data set for aircraft approaches into terrain-challenged airports.

Solution: In the summer of 2003, NASA and the FAA, in conjunction with cutting-edge aerospace companies, initiated testing of a Synthetic Vision platform. The NASA 757 test bed was used initially for the study. Reno, Nevada was used as the test site due to its dramatic terrain, challenging approach, and density altitude issues. Intermap provided high-resolution digital elevation data of the Reno area for the study.



USGS – High Plains (CO WY MT)

Problem: In 2003 the Department of Interior (USGS) was in need of high resolution maps of the Bighorn Basin, Wind River Basin and an area in North Texas.

Solution: In 2003 Intermap was engaged by USGS to these critical areas with IFSAR. The project required delivery of digital elevation models and orthorectified radar imagery. The digital elevation models are accurate to 1-meter RMSE or better.

USGS – National Petroleum Reserve-Alaska (NPRA)

Problem: USGS (National Mapping Agency for the USA) had tried for many years to update mapping of Alaska. Their efforts were inhibited by the short flying season and the consistent cloud coverage over many areas, as well as the remoteness of many areas.

Solution: USGS has tasked Intermap annually to collect and process IFSAR data over the period from 2000 through 2005. The client's area of interest now exceeds 60,000 km^2. The task orders were contracted through Aerometric (Sheboygan, WI). Intermap has provided USGS with Type II Digital Elevation Models (accurate to 1.0m vertically RMSE) and Orthorectified Radar Imagery (ORI) with a resolution of 1.25 meters. Intermap was also tasked by USGS to provide a fused image product, STARPlus, consisting of the Intermap ORI and Landsat imagery

USGS – Hayman Fire Area (CO)

Problem: In 2003 USGS engaged Intermap to map the area of the Hayman Fire in Colorado. The project required delivery of digital elevation models and orthorectified radar imagery.

Solution: Intermap collected digital elevation models are accurate to 1-meter RMSE or better and orthorectified radar imagery. The IFSAR data of the area was acquired as soon as the fire was contained. IFSAR was the only sensor able to penetrate the thick smoke and haze from the fire, enabling Intermap to create a detailed and accurate terrain model of the burn area. This data set was used by many agencies (Federal, State & Local Government) and their contractors in the post fire recovery efforts. A key focus of these efforts was shoring up the slopes and mitigating future erosion surrounding Cheeseman Reservoir, a major source of drinking water for the Denver. CO metropolitan area.

USGS – High Plains (CO WY MT)

Problem: In 2003 the Department of Interior (USGS) was in need of high resolution maps of the Bighorn Basin, Wind River Basin and an area in North Texas.

Solution: In 2003 Intermap was engaged by USGS to these critical areas with IFSAR. The project required delivery of digital elevation models and orthorectified radar imagery. The digital elevation models are accurate to 1-meter RMSE or better.

NSF & USGS – Past Exp PT Barrow AK

Problem: The National Science Foundation was in need of a high-resolution elevation data set for climate modeling and hydrologic studies over Pt. Barrow Alaska through the University of Colorado at Boulder.

Solution: Intermap Technologies Inc. acquired IFSAR data over the Pt. Barrow, Alaska area during the fall of 2002. The total area collected was approximately 2,176 km^2 at the 1-meter vertical accuracy specification. ORIs were delivered to the client as well. The National Science Foundation funded this research project, and the data under this particular purchase is licensed to all NSF researchers. Subsequently, the data has now been purchased by the USGS as well.

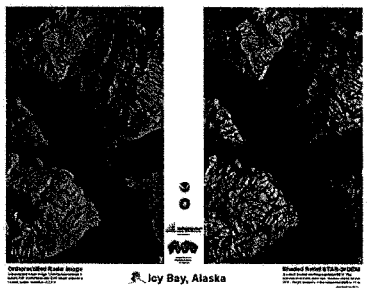
Los Angeles County, Planning Dept. – Countywide DTM

Problem: mPower3 Emerge completed a countywide digital aerial photography project on behalf of the County of Los Angeles, California, but did not have an appropriate elevation data set for orthorectification.

Solution: Intermap collected STAR-*3i* IFSAR data of the entire 4,000 square miles of Los Angeles County in less than three weeks in March 2001. The data was processed to vertical accuracy of +/- 1m RMSE, post spacing of 5m). The final 7.5' x 7.5' DTM tiles were delivered before the end of July 2002.

NOAA – Past Exp Icy Bay Alaska

Problem: NOAA lacked accurate up-to-date maps of the region. NOAA had attempted to create maps of the area using traditional means like aerial photogrammetry. The nearly constant cloud cover prevented use of optical instruments.
Solution: Intermap mobilized a Star IFSAR platform to acquire data during August 2000. A critical goal of the project was to collect data at or near low tide levels. Intermap provided orthorectified radar imagery (ORI) with 2.5 m pixels and a 5 m posted DSM accurate to 2.0 meters vertically RMSE. The area mapped was 1,015 km^2.



WatershedConcepts
A Total Water Resource

TESTIMONY

Watershed Concepts,
a Division of Hayes, Seay, Mattern & Mattern, Inc.

before the
Subcommittee on Housing and Community Opportunity
House Committee on Financial Services

FLOOD MAP MODERNIZATION AND THE FUTURE OF THE NATIONAL FLOOD INSURANCE PROGRAM

presented by
Mr. Scott K. Edelman, President

July 12, 2005

Introduction

Watershed Concepts, a Division of Hayes, Seay, Mattern & Mattern, Inc., is a recognized leader in the water resources field. Members of Watershed Concepts' staff have been conducting water resources studies and analyses for more than 20 years, including: hydrologic and hydraulic studies, development and revision of Flood Insurance Rate Maps, and the design and development of customized Geographic Information Systems software.

Watershed Concepts plays a leading role in the production of automated hydrologic and hydraulic studies for projects in throughout the nation. Generally, the firm uses its proprietary Watershed Information System (WISE)® to perform engineering analysis and mapping. Watershed Concepts has worked closely with FEMA headquarters staff and FEMA Regional staff, as well as state and local authorities.

Watershed Concepts also has considerable experience working with the State of North Carolina, the country's first Cooperating Technical Partner with FEMA, in the North Carolina Floodplain Mapping Project. This project is a great example of collaboration between FEMA and the State.

Drawing upon this experience, Watershed Concepts is honored to provide testimony on the topic of this hearing, the National Flood Insurance Program (NFIP) and the flood map modernization strategy of the Federal Emergency Management Agency (FEMA).

This document addresses the questions submitted to Watershed Concepts, as listed below, and constitutes the written statement of the proposed testimony. Each individual question within a numbered item is addressed by a subsection of this document.

1. How important is it to update the Flood Insurance Rate Maps, and what negative consequences may result from delaying modernization?
2. Who makes the decisions about which of the approximately 92, 200 maps to modernize and how the modernization is achieved on a practical level? How much of the decision making is done by FEMA, and how much is left to local authorities? Is this the most efficient means of reaching the ultimate goal of a completely modernized set of flood maps for the United States?
3. According to FEMA, the map modernization program, as currently implemented, is using "the best available topographic information." For much of the country, however, the best available topographic data is U.S. Geological Survey information that can be up to 40 years old. What value is there in updating these maps when the basic topography depicted could have undergone fundamental changes from the time they were first issued?
4. Please assess FEMA's overall map modernization strategy. Is FEMA effectively coordinating with their regional personnel, local authorities, industry, and other potential partners? Are resources being expended as efficiently as possible?

1. How important is it to update the Flood Insurance Rate Maps, and what negative consequences may result from delaying modernization?

National Flood Insurance Program Goals Provide Insurance against Loss and Reduce Future Flood Damages

The two key objectives of the National Flood Insurance Program are to provide insurance protection against losses from flooding and to reduce future flood damages. The program currently protects more than 4.5 million policy holders and provides $650 billion in coverage. Flood damages need to be reduced because losses are estimated at $1.1 billion annually. Without flood map updates, Watershed Concepts believes the damages are likely to grow.

FIRM Age Interferes with the Goals of the Program

Flood Insurance Rate Maps (FIRMs) are the critical tools used to accomplish these two objectives. The average age of these FIRMs is over 15 years old (FEMA, 2004) and hundreds more of these FIRMs are over 20 years old. Even more importantly, much of the data that is used to develop these maps is older still. In general, Watershed Concepts believes that maps greater than six years old begin to lose their usefulness unless they are verified.

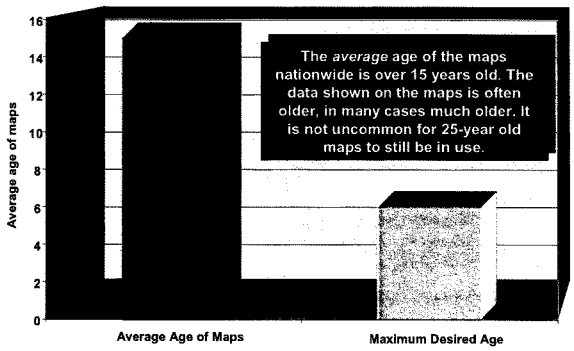


Figure 1 – Old Maps defeat program goals.

One clear indicator that aging maps hinder program objectives is the number of citizens requesting changes to the maps through the amendment and revision process. When citizens find their property inaccurately depicted in the floodplain, they request that the maps be amended or revised to reflect actual conditions. As can be seen in the following figure, the number of requests has steadily risen, from an average of less than 15,000 requests in 2000, to over 23,000 requests in 2003—over a 50 percent increase in just three years. Watershed Concepts believes that modernized maps will reverse this trend, and reduce the large costs to homeowners and FEMA related to resolving these mapping inaccuracies.

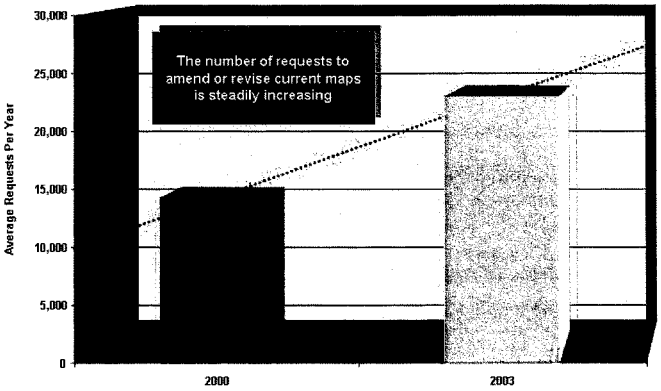


Figure 2 – Requests for map changes are increasing.

Inaccurate Maps Create Hardships

Inaccurate maps can cause citizens economic hardship. For example, the map shown below shows houses located in a floodplain in Clay County, Florida. These homeowners, potentially including retired couples on fixed incomes, discovered that the homes they had just purchased were in the flood zone. The insurance premiums were sometimes as high as $2,000, an unexpected and substantial annual expense.

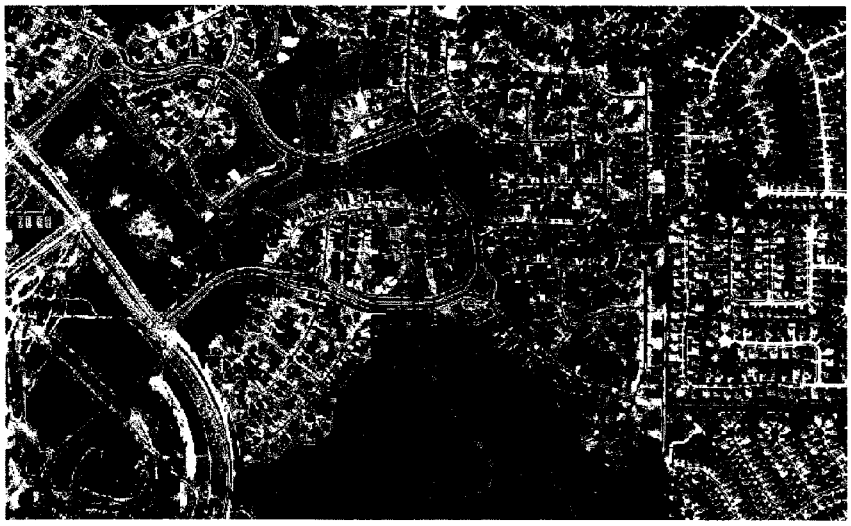


Figure 3 – Inaccurate maps can have serious consequences to homeowners.

Watershed Concepts View of Mapping Updates

Watershed Concepts believes that the flood maps (FIRMs) will need to be continually updated because of the following:

1. **FEMA has not studied every flooding source in the nation.** FEMA has studied one third of the possible streams in the nation. Many of the remaining areas will never need to be studied because they are on Federal lands, and development is unlikely to occur. However, as the population grows and shifts from one region of the country to the next, pressure is applied to develop in areas that were never considered for potential development. In order to prevent future flood losses, these new areas need to be studied to provide developers with proper guidance to allow for responsible development.
2. **FEMA may need to upgrade the existing studies to take development into account.** FEMA's flood maps have been created using a wide range of different procedures to allow for low-cost analyses to be performed in low-risk areas, while reserving medium and high-cost analyses for medium and high-risk areas. It is very difficult to predict growth patterns more than a few years into the future. In addition, FEMA's maps are used for insurance purposes, which must reflect existing land use conditions. As a watershed develops, more pavement is added, which reduces the amount of rain water that can be absorbed by the soil, and leads to increased flooding in the streams and rivers. Watershed Concepts has performed studies that show that

development within a watershed can create an increase in flood elevation of more than ten feet. Therefore, as growth occurs in areas that were not anticipated, or within the watershed in general, the engineering studies that created the flood maps may need to be upgraded to a higher level of analysis.

Watershed Concepts believes that the success of the NFIP hinges on accurate and up-to-date, modernized, (digital) flood insurance rate maps (DFIRMs). New technologies allow for cost-effective use of more accurate data than was available in the past. It is important to update the maps, not just to keep up the status quo, but to leverage technological advances to provide a better, more accurate product.

The result:

- Citizens understand their risk.
- Actuarial rates are based on a sound foundation.
- Communities institute sound floodplain management policies to further reduce future flood loss.

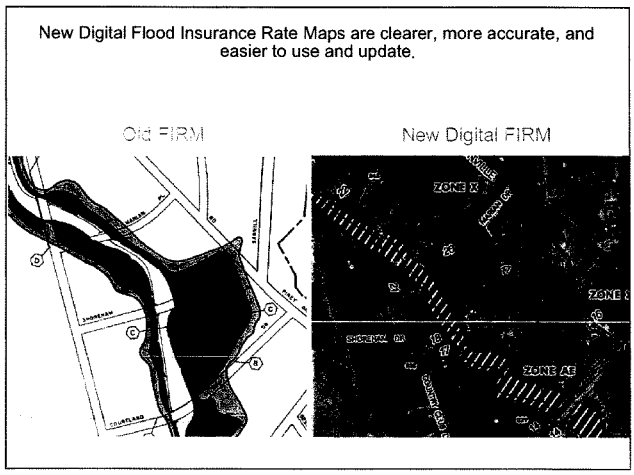


Figure 4 – Comparison of Old FIRM Map to New DFIRM Map Generated by Watershed Concepts

Delaying Modernization would have Negative Consequences

Delaying modernization would have severe negative consequences. Without new FIRMs, the maps would age and become less accurate, to the point where the user community would lose confidence in the maps. The large investment made since the program began would be in jeopardy.

- Using the maps to set insurance rates would become increasingly difficult.
- The engineering and planning community would no longer trust the maps, and would undertake duplicate efforts to map the floodplain, at great cost.
- The number of challenges and appeals to the maps would increase.
- Citizens who are at risk for flood damages would not be made aware. Others, who might be at minimal risk would needlessly be paying for flood insurance.
- Future flood losses would increase.
- The many areas across the country currently undergoing rapid development would not have the necessary tools needed for sound floodplain management.

Good mapping is essential to the goals of the NFIP. The current maps are becoming increasingly less useful for our communities and their citizens. Delay will only worsen the situation and increase the cost of fixing the problem.

2.a Who makes the decisions about which of the approximately 92,200 maps to modernize and how the modernization is achieved on a practical level?

Watershed Concepts has directly observed FEMA perform the following actions when determining who makes the decisions to modernize the maps:

1. FEMA Headquarters (HQ) sets the overall guidelines and goals for the entire program. It is the responsibility of FEMA HQ to divide the study money between the ten FEMA Regions based on flood risk, and to monitor the actions of each of the FEMA Regions.
2. The FEMA Regions prioritize the specific projects within their region to meet the national goals. This generally dictates which fiscal year a study will be funded. The FEMA Region sets the budget of the individual study. FEMA then meets with the local stakeholders. The local stakeholders inform FEMA which areas need to be restudied due to changes in the watershed, and which areas need to be studied because of anticipated growth. The local stakeholders prioritize their needs, and then the FEMA Region finalizes the budget for the community that will conform to meeting their highest priorities. Rarely does FEMA fund all of the local needs.

Watershed Concepts believes that setting the national goals and decisions through FEMA headquarters and implementing the program at the FEMA Region level, with input from local stakeholders, is the most efficient manner to determine which areas should be studied.

As the caretakers of the $1 billion, 5-year Flood Map Modernization effort, it is critical for FEMA to define a management program that ensures the most efficient use of that money over the 5-year period. It is imperative to prioritize and address critical studies first. While the direction and goals of Flood Map Modernization are formulated and directed at FEMA headquarters, FEMA is aware that effective implementation of the dollars spent must come at the FEMA region level. Only at the regional level could effective decisions be made that would address the necessary priorities.

Given the sheer magnitude (almost 93,000 maps to modernize, plus mapping of counties that have never been mapped), a nationwide consistent approach for all communities would lead to the certain demise of the Flood Map Modernization Program. Additionally, the diversity of needs amongst the regions — coastal flooding vs. riverine flooding vs. arid region concern, etc.,— dictated that a regional approach be implemented. Therefore, a decentralization of the decision making process was executed, pushing the implementation down to the regional level. This regional approach allows FEMA to:

- Set the priorities of the regional efforts. Regional staff members are the most knowledgeable about the needs of their states and how those needs should be addressed.
- Work closely with state representatives to identify each state's needs. States have the opportunity to voice their needs and priorities, which can then be incorporated at the regional level. The needs of all states and all communities must be coordinated at the regional level to ensure that everyone benefits from Flood Map Modernization.

- Maintain a big picture view of spending in each region. This helps ensure that each state receives a fair share of Flood Map Modernization resources.
- Make the key decisions about how funding is utilized. Only at the regional level can decisions be made about the distribution of funds that will properly address the priorities of the entire region.
- Leverage other local resources. With FEMA currently unable to meet all of the Flood Map Modernization needs at the current funding levels, it is even more important that local resources are leveraged to the maximum level. Knowledge of the resources comes at the regional level.

2.b How much of the decision-making is done by FEMA, and how much is left to local authorities?

Watershed Concepts has observed that FEMA is the final decision authority on all of the contracted projects. FEMA does include other stakeholders in this process. FEMA requests that all of the states and regional water authorities provide detailed business plans for their areas of interest. FEMA uses this additional information in the planning of the overall program. The result of this planning is an annual report entitled, *Multi-Year Flood Hazard Identification Plan* (MHIP). FEMA utilizes the MHIP as an outlet to inform the user community when a particular county-wide study will be performed. The decision about when a study is done is the responsibility of FEMA.

When a specific project is initialized, Watershed Concepts has observed that FEMA sets the budget for the local project, but the local authorities provide significant input about where the specific studies within the community should occur. FEMA then determines the type of analysis that is required for a specific project area. In many cases, FEMA mixes the type of study with respect to the flood risk related to loss of property and life. Therefore, it is very common to have a mixture of study types within one county study. Watershed Concepts agrees with this approach. This approach allows FEMA to allocate funds to the highest risk areas within a particular study. FEMA sets the budget and type of studies that will be performed while getting information from the local communities about where within the community the specific study should be performed.

Watershed Concepts believes that the key to success for Flood Map Modernization is the ability of the regional FEMA offices to make the key implementation decisions. With needs currently outpacing the resources necessary to address them, it is crucial that FEMA regional staff construct and implement a strategy of modernizing their regional maps on a prioritized basis, addressing those areas deemed most critical to protecting life and property. Regional staff members are the best equipped to make decisions about how their local allotment of funding is utilized. While input from state and local community officials is important, it is the FEMA regional office that must make the final decisions about how best to fulfill the needs of all the states within their region.

2.c Is this the most efficient means of reaching the ultimate goal of a completely modernized set of flood maps for the United States?

Watershed Concepts believes that FEMA has implemented the most efficient means of reaching the ultimate goal of modernizing maps. FEMA has implemented a Mapping Information Platform (MIP). The MIP allows for the most efficient and consistent method for producing Digital Flood Insurance Rate Maps (DFIRMs) by providing all mapping partners access to state-of-the-art tools. These tools include the Watershed Information System™ (WISE) software, the DFIRM Production tools, and other tools. Available through the Internet, these tools assist mapping partners in the engineering analyses and mapping tasks associated with the production of DFIRMs.

In addition, FEMA is currently developing a DFIRM production management console for the MIP that will allow FEMA to track the performance of every Flood Insurance Study in the nation at a task level. The management console will use a concept of dashboards that will enable FEMA to easily and visually identify the status of those studies and determine those which may require additional attention and resources. Since FEMA has nearly 1,000 active studies, Watershed Concepts believes that this will be an invaluable innovation to help FEMA to better manage these studies with fewer management staff.

3.0 According to FEMA, the map modernization program, as currently implemented, is using "the best available topographic information." For much of the country, however, the best available topographic data is U.S. Geological Survey information that can be up to 40 years old. What value is there in updating these maps when the basic topography depicted could have undergone fundamental changes from the time they were first issued?

Accuracy of U.S. Geological Survey Information

FEMA requires that all studies performed for the National Flood Insurance Program conform to the standards outlined in the *Guidelines and Specifications for Flood Hazard Mapping Partners*. These guidelines state the minimum topographic requirements for FEMA's detailed studied streams. The areas that receive detailed study are the areas that have a moderate to high risk of flooding. According to FEMA specifications, USGS quadrangle maps do not meet FEMA's minimum specifications, and can not be used for the hydraulic calculations or mapping in these areas. USGS quadrangle maps, however, can be used in very low flood risk areas for approximate analyses. These are areas that have negative or very little population growth, and have no indicators for flood risk potential.

Watershed Concepts has performed over 18,000 miles of flood studies under the Flood Map Modernization program. In areas of moderate to high risk, Watershed Concepts has never used USGS quadrangle maps for the hydraulic analysis or mapping. However, Watershed Concepts has used USGS quadrangle maps for hydraulic analysis and mapping in areas of very low flood risk. In these areas, we have used USGS quadrangle maps to perform approximate analyses.

Use of Best Available Topography

FEMA has a very limited budget to perform studies. In the course of performing studies, Watershed Concepts has observed that FEMA focuses its resources in areas that are moderate to high risk, and that have a high return on their investment. Accordingly, FEMA does not implement "best available topography" universally. Watershed Concepts is currently performing studies for FEMA in moderate to high risk areas where the best available topographic data would not result in the level of accuracy required. In these areas, FEMA is obtaining new detailed topographic data. In many areas of moderate to high risk, however, the local community already has detailed topographic data that can be used. For these areas, FEMA leverages this local data to create the flood maps. This is one area in which the Cooperating Technical Partners Program (CTP) is of potentially greater benefit to the communities. The communities typically supply topographic data as a non-monetary contribution toward their CTP obligations. Many communities utilize this type of data for purposes other than flood mapping, and therefore have an interest in the development and verification of the produced data. This allows the primary Federal funding to go toward the actual study rather than the base data.

If FEMA were to state that high accuracy topographic data be required for all areas within the nation, then the majority of FEMA's entire budget would be used to create new topographic maps. Funds would not be available to perform the hydraulic and hydrologic

studies and subsequent flood mapping. If the topographic data is only used for the FEMA program, then this strategy would result in a significant amount of funding being spent in areas with a very low return on the investment.

Evaluation of Topographic Alternatives for Areas of Low Flood Risk

Traditionally, in areas of low risk, where the local community does not have any topographic data, USGS quadrangle maps would be used. Even though USGS quadrangle maps do not meet the FEMA standards for detailed study, FEMA has determined that using the USGS quadrangle maps to show these low risk areas is beneficial to the program's goals of reducing flood loss and preventing loss of life.

Watershed Concepts has performed studies for FEMA using immerging technologies to determine if the engineering analyses and floodplain mapping can be improved upon using other low-cost sources of topographic information. One of these studies was a comparison of USGS topographic data with Interferometric Synthetic Aperture Radar (IFSAR) developed by Intermap Technologies Corporation. It is important to note that IFSAR is not suited for areas requiring detailed study (moderate to high risk areas), or for areas that are covered by vegetation (trees or brush). Therefore, the Watershed Concepts study was intended for the application of IFSAR generally for areas west of the Mississippi River and east of the Rocky Mountains that have sparse vegetation cover.

The result of the analysis showed that IFSAR data does result in a better final product than the USGS topographic information. However, before IFSAR can be utilized as the standard in selective portions of the Country, the following items need to be resolved:

1. **IFSAR is a Licensed Dataset.** FEMA generally utilizes datasets and expends funds on tasks that can be made available to the public free of charge. Watershed Concepts has attended meetings with FEMA and Intermap in which it was made clear that the users of the map data will not have free access to the source topographic data unless a higher cost is paid. If the source data is not made available to the users, then these low risk areas, which are generally in rural America, will have an additional financial burden placed upon them while other areas of the country will not. This has been an open issue for approximately two years.
2. **IFSAR Cost/Benefit.** The result of IFSAR data is clearly better than the USGS data under certain conditions. However, what is not clear is the benefit of the better analysis to the community or the nation. If better flood analyses are performed in areas where development is not likely to occur, then the benefit is very limited. A case-by-case evaluation should be made with the local community for the applicability of IFSAR to a study area.

Watershed Concepts performed an analysis during a recent study to compare results of using different topographic data sources on the final flood map. The sources utilized in the evaluation included data obtained from the City of Amarillo, Texas, USGS and IFSAR. (Note that the data from Amarillo met the FEMA specifications for use in studies of moderate to high risk areas.) The results of the study on the flood boundary are shown in the

following diagram. In general, the IFSAR data produced more accurate results than the USGS data.

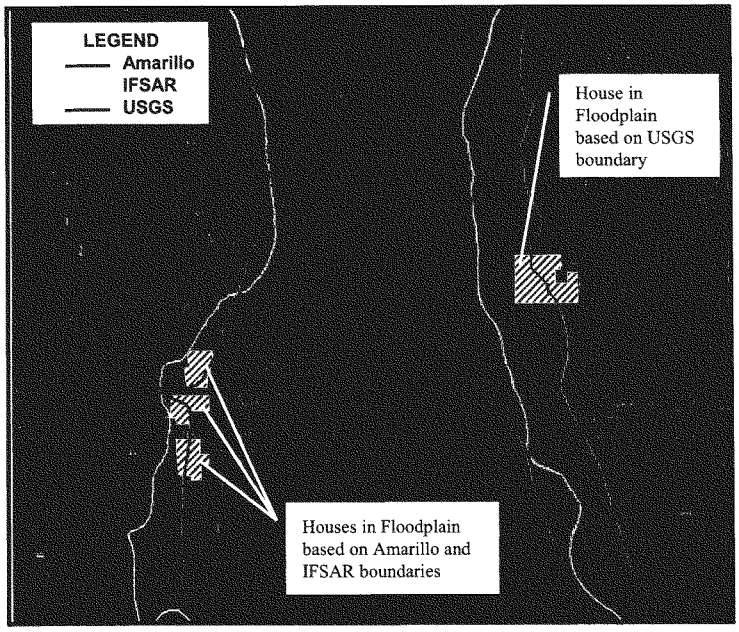


Figure 5 – Impacts of Amarillo, IFSAR, and USGS Data on Floodplain Boundaries

4.a Please assess FEMA's overall Map Modernization strategy.

FEMA's Flood Map Modernization Strategy brings the NFIP up to Accepted Standards

The National Flood Insurance Program (NFIP) was initiated in 1968, and over these intervening years, flood mapping has evolved in a piecemeal fashion, responding to new techniques and methods that have periodically become available. However, this incremental approach to defining flood hazard areas has not been efficient or cost-effective. Faced with rising damage costs from flood disasters, and a growing population with ever-increasing land development pressures, FEMA has decided to modernize the mapping program in one unified effort. Central to this effort is the incorporation of modern computer technology and methods in the map production process. Watershed Concepts believes many of these computer-oriented changes (such as GIS mapping and Internet-based platforms) are already familiar to NFIP communities and the public; so in many respects, the flood map modernization strategy is intended to bring the NFIP up to standards currently accepted by end-users. Watershed Concepts believes FEMA is taking a reasonable approach by applying uniform standard to the products produced under Flood Map Modernization.

Comprehensive Approach to Modernizing the Nation's Flood Maps will save Money over Time

Watershed Concepts believes that under the Flood Map Modernization program, the conversion of the mapping process from a paper product to a digital product will lead to significant cost-savings. Given the proliferation of the use of the Internet in recent years, FEMA's objective to make flood maps available online will increase the distribution of maps with minimal increased costs. Watershed Concepts' opinion is that FEMA's nationwide approach to Flood Map Modernization is reasonable.

Flood Map Modernization Approach to New Technologies and Methodologies

In addition to mapping, Flood Map Modernization involves efforts to update methodologies and technologies used for performing flood studies. Watershed Concepts has participated in, and has observed FEMA's careful application of immerging technologies. For example, the following cases highlight FEMA's approach:

1. Watershed Concepts recently assisted FEMA with the preparation of new guidelines and specifications for study contractors to perform coastal flood studies and mapping along the Pacific Ocean as part of Flood Map Modernization. This was an intensive review process to obtain the best knowledge in the industry.
2. Watershed Concepts has assisted FEMA in applying new techniques and standards to allow automated computerized methods for delineating flood hazards in lower risk areas. This has resulted in an improved product for the public.
3. Watershed Concepts performed a detailed evaluation of new techniques for obtaining topographic data for low-risk areas through the use of IFSAR data. This was a detailed study that compared the results of more costly and less costly techniques.

Watershed Concepts has experienced FEMA's approach to new technologies and techniques first-hand, and is supportive of the process that FEMA has adopted.

Watershed Concepts' Assessment of FEMA's Strategy

Watershed Concepts supports FEMA and Flood Map Modernization. Watershed Concepts feels strongly that the nation will greatly benefit from this effort. As a matter of fact, one of the more prevalent comments made by local stakeholders is that there is a need for even more studies in their communities. FEMA is left to balance the needs of the local communities with the available resources.

4.b Is FEMA effectively coordinating with their regional personnel, local authorities, industry, and other potential partners?

Watershed Concepts believes that FEMA is reaching out to all stakeholders who are involved with Flood Map Modernization in a very effective manner. Watershed Concepts has observed the manner in which FEMA coordinates with these stakeholders through programs such as the Cooperating Technical Program. FEMA achieves this goal by involving the industry and by participating in a large array of coordination meetings ranging from conferences to specialty.

One of the more critical aspects of Flood Map Modernization—FEMA's Cooperating Technical Partners (CTP) Program—was developed to provide communities with a more formal method to actively participating in the flood hazard mapping program. This program essentially divides the responsibilities of mapping projects between FEMA and a CTP, from the initial Scoping Phase of a study through the map adoption phase at the conclusion of a study.

Coordination between the local communities and various other government agencies with FEMA's regional staff (including FEMA's study contractor) has always been a fundamental factor in the success of a flood study. However, with the CTP Program, the roles played by the potential partner have definitely expanded beyond being just a source of data.

Watershed Concepts has direct experience working with CTPs by working as a contractor for North Carolina, South Carolina, Mississippi and the Southwest Florida Management District. This direct experience demonstrates how FEMA can transfer control on portions of the program and communicate very effectively with the state and local officials.

4.c Are resources being expended as efficiently as possible?

Watershed Concepts has been involved with creating maps for FEMA since 1984. During this time, the firm has witnessed many changes within FEMA and the Flood Insurance Program. Watershed Concepts believes that the current approach that FEMA is taking to produce maps efficiently is highly effective. FEMA did not use this program to grow internally, but rather to leverage the industry and partners' abilities.

Foundation of Flood Map Modernization Built on Partnerships to Leverage Resources

Historically, FEMA flood maps and other flood insurance products were produced somewhat independently of the end-users, as stand-alone efforts to establish flood zones, fulfilling FEMA's traditional mandate to provide the insurance industry with a basis to establish actuarial insurance rates. It appears that FEMA remains committed to this mandate to serve the insurance industry; however, FEMA products have found many uses over the years from disciplines as varied as fisheries to land use planning. Watershed Concepts has seen that FEMA has recognized this and has made a concerted effort to establish partnerships with potential end users of new flood maps produced through Flood Map Modernization. These partnerships are central to the ability of FEMA to expend resources as efficiently as possible.

The Cooperating Technical Partner (CTP) Program leverages the capabilities and expertise of local agencies and officials. From our work with CTP's, and in comparison to the traditional FEMA approach to floodplain mapping projects, Watershed Concepts feels that this program has essentially provided the end user with more influence and leverage into the floodplain mapping process than ever before.

With CTP projects, FEMA is allowed to oversee and provide assistance to the project at an upper management level, and the CTPs are responsible for coordinating the operational details. Watershed Concepts has witnessed instances where the familiarity of the CTP staff with community officials reduced time-consuming bureaucracy, which would otherwise have delayed the project schedule. The acceleration of certain tasks due to the involvement of the CTP is always an asset when facing a myriad of other potential delays.

Level of Flood Risk Paired with Commensurate Level of Effort to Obtain Flood Mapping

Watershed Concepts has witnessed that FEMA recognizes that the risk of flooding varies substantially across the nation and even within a given watershed. Accordingly, significant efforts have been made to pair the level of effort in establishing flood hazard zones with the level of flood risk to insured structures and to the public. This has resulted in a systematic process whereby flood study mapping efforts of varying levels of detail are assigned to efficiently expend resources required for mapping. For example, in heavily developed urban areas, detailed flood studies are prioritized to update flood risk zones where numerous insured structures and human activity exist. Conversely, in rural areas where structures and human inhabitants are sparse, limited detailed flood studies, which rely more on lower cost automated computerized methods, may be appropriate to define flood zones.

Conclusion

Watershed Concepts is honored to be able to provide testimony based on our experience with the Federal Emergency Management Agency and with the National Flood Insurance Program as the Subcommittee considers the most efficient methods to prevent or reduce flooding losses.

For more information or for any questions concerning this testimony, contact Scott Edelman, President, (336) 855-8422, (sedelman@watershedconcepts.com).

United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on Housing and Community Opportunity, Committee on Financial Services, House of Representatives

For Release on Delivery
Expected at 10:00 a.m. EDT
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FLOOD MAP MODERNIZATION

Federal Emergency Management Agency's Implementation of a National Strategy

Statement of William O. Jenkins, Jr., Director
Homeland Security and Justice Issues

GAO-05-894T

July 2005

GAO
Accountability·Integrity·Reliability

Highlights

Highlights of GAO-05-894T, a report to Subcommittee on Housing and Community Opportunity, Committee on Financial Services, House of Representatives

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Federal Emergency Management Agency's Implementation of a National Strategy

Why GAO Did This Study

Floods inflict more damage and economic losses upon the United States than any other natural disaster. During the 10 years from fiscal year 1992 through fiscal year 2001, flooding resulted in approximately $55 billion in damages. The Federal Emergency Management Agency (FEMA) is responsible for managing the National Flood Insurance Program (NFIP). The program uses flood maps to identify the areas at greatest risk of flooding and make insurance available to property owners to protect themselves from flood losses. According to FEMA, many of the nation's flood maps are more than 10 years old and no longer reflect current flood hazard risks because of erosion and changes in drainage patterns. Moreover, because many flood maps were created or last updated, there have been improvements in the techniques for assessing and displaying flood risks.

This testimony is based on GAO's findings and recommendations in its March 2004 report related to (1) how map modernization intended to improve the accuracy and accessibility of the nation's flood maps, (2) what the expected benefits of more accurate and accessible flood maps are, and (3) to what extent FEMA's strategy for managing the map modernization program support the achievement of these benefits.

www.gao.gov/cgi-bin/getrpt?GAO-05-894T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact William O. Jenkins, Jr. at (202) 512-8757 or jenkinswo@gao.gov.

What GAO Found

Through map modernization, FEMA intends to produce more accurate and accessible flood maps by using advanced technology to gather accurate data and make the flood maps available on the Internet. For example, displaying map data in digital Geographic Information Systems format permits consistent, accurate display, and ready electronic retrieval of a variety of map features, including elevation data and the location of key infrastructure, such as utilities.

FEMA expects that by producing more accurate and accessible digital flood maps through map modernization, the nation will benefit in three ways. First, communities can use more accurate digital maps to reduce flood risk within floodplains by more effectively regulating development through zoning and building standards. Second, accurate digital maps available on the Internet will facilitate the identification of property owners who are statutorily required to obtain or who would be best served by obtaining flood insurance. Third, accurate and precise data will help national, state, and local officials to accurately locate infrastructure and transportation systems (e.g., power plants, sewage treatment plants, railroads, bridges, and ports) to help mitigate and manage risk for multiple hazards, both natural and man-made.

At the time of GAO's review, FEMA had not yet established clear standards for the types, quantity, and specificity of data collection and analysis associated with different levels of flood risk. We recommended that FEMA develop standards to better ensure that data collection and analysis is consistent for all communities with similar risk and that it is using its resources efficiently while producing maps that are accurate and useful for communities at different levels of flood risk. In November 2004, FEMA issued its Multi-Year Flood Hazard Identification Plan. The plan describes FEMA's strategy for addressing GAO's recommendation by using varying types of data collection and analysis techniques to develop flood hazard data in order to relate the level of study and level of risk for each county.

GAO concluded that FEMA's performance measures would not effectively measure the extent to which the agency's map modernization program would result in its primary intended benefits. As a result, GAO recommended that FEMA develop and implement useful performance measures. In response to GAO's recommendation, FEMA has set target percentages in its Multi-Year Flood Hazard Identification Plan for four key performance indicators in fiscal years 2006 through 2009. FEMA's four indicators are (1) Population with Digital GIS Flood Data Available Online, (2) Population with Adopted Maps that Meet Quality Standards, (3) Percent of Effort Leveraged; that is, state and local resources provided for map modernization as a percentage of FEMA resources provided, and (4) Appropriated Funds Sent to Coordinating Technical Partners.

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to participate in today's hearing to discuss the Federal Emergency Management Agency's (FEMA) national flood map modernization program.[1] My testimony is primarily based on our March 2004 report on FEMA's map modernization efforts.[2]

Floods inflict more damage and economic losses upon the United States than any other natural disaster. During the 10 years from fiscal year 1992 through fiscal year 2001, flooding caused over 900 deaths and resulted in approximately $55 billion in damages.[3] Since its inception 36 years ago, the National Flood Insurance Program (NFIP) has combined the development of flood maps to identify the areas at greatest risk of flooding with mitigation[4] efforts to reduce or eliminate flood risks to people and property and the availability of insurance that property owners can purchase to protect themselves from flood losses. The flood insurance program has paid about $12 billion in insurance claims, primarily from policyholder premiums, that otherwise would have been paid, at least in part, from taxpayer-funded disaster relief.

Accurate flood maps that identify the areas at greatest risk of flooding are the foundation of the NFIP. The maps are principally used by (1) the approximately 20,000 communities participating in the NFIP to adopt and enforce the program's minimum building standards for new construction within the maps' identified floodplains, (2) FEMA to

[1]Prior to March 2003, FEMA was an independent agency whose Federal Insurance and Mitigation Administration was responsible for managing the flood insurance program. The Homeland Security Act of 2002, P.L. 107-296 (Nov. 25, 2002), transferred FEMA and all its responsibilities to the Emergency Preparedness and Response Directorate within the new Department of Homeland Security. This transfer was effective March 1, 2003. Currently, the Mitigation Division within FEMA is responsible for the flood insurance program, including flood map modernization.

[2] GAO, *Flood Map Modernization: Program Strategy Shows Promise, but Challenges Remain*, GAO-04-417, (Washington, D.C.: March 31, 2004)

[3]Data are from the U.S. Army Corps of Engineers in cooperation with the National Weather Service.

[4] Mitigation is defined by the Federal Emergency Management Agency as sustained action that reduces or eliminates long-term risk to people and property from hazards and their effects.

develop accurate flood insurance policy rates based on flood risk, and (3) federally regulated mortgage lenders to identify those property owners who are statutorily required to purchase federal flood insurance. Under the National Flood Insurance Act of 1968, as amended,[5] property owners whose properties are within the designated floodplain and have a mortgage from a federally regulated financial institution are required to purchase federal flood insurance.

Flood maps can become outdated for a variety of reasons, such as erosion or community growth and development that can affect the drainage patterns of rainwater. Thus, flood maps must be periodically updated to assess and map changes in the boundaries of floodplains that result from community growth, development, erosion, and other factors that affect the boundaries of areas at risk for flooding.

With congressional support and funding, last year FEMA embarked on a $1 billion, 5-year effort to update the nation's flood maps. Today, I am here to discuss the findings and recommendations of our March 2004 report. My remarks today will focus on (1) how map modernization is intended to improve the accuracy and accessibility of the nation's flood maps; (2) what the expected benefits of more accurate and accessible flood maps are; and (3) to what extent FEMA's strategy for managing the map modernization program supports the achievement of these benefits.

To answer these questions, we analyzed available information from FEMA on the program's purpose, objectives, and status and met with agency officials in headquarters and in the regional offices to discuss the program's progress. We also conducted site visits to states and communities that have already begun to modernize their flood maps and interviewed industry organizations such as the Association of State Flood Plain Managers, the National Association of Flood and Stormwater Management Agencies, and the National Emergency Management Association. We conducted our work from April 2003 to March 2004 in accordance with generally accepted government auditing standards.

[5] See 42 U.S.C. 4001 et seq.

Summary

In summary, we found:

- Through map modernization, FEMA intends to produce more accurate and accessible flood maps by using advanced technology to gather accurate data and make the flood maps, and the digital information on which they are based, available on the Internet. For example, displaying map data in digital Geographic Information Systems (GIS) format permits consistent, accurate display, and ready electronic retrieval of a variety of map features, including elevation data and the location of key infrastructure, such as utilities. According to FEMA, nearly 70 percent of the nation's approximately 92,222 flood maps were more than 10 years old at the time of our review. Many of these maps no longer reflect current flood hazard risks because changes such as erosion and development can alter drainage patterns and, thus, the areas at highest risk of flooding. Moreover, since many flood maps were created or last updated, there have been improvements in the techniques for assessing and displaying flood risks.

- FEMA expects that by producing more accurate and accessible digital flood maps through map modernization, the nation will benefit in three ways. First, communities can use more accurate digital maps to reduce flood risk within floodplains by more effectively regulating development through zoning and building standards. Second, accurate digital maps available on the Internet will facilitate the identification of property owners who are statutorily required to obtain or who would be best served by obtaining flood insurance. Third, accurate and precise data will help national, state, and local officials to accurately locate infrastructure and transportation systems (e.g., power plants, sewage treatment plants, railroads, bridges, and ports) to help mitigate and manage risk for multiple hazards, both natural and man-made.

- FEMA's strategy for managing map modernization is designed to support the expected program benefits, but FEMA's approach to implementing the strategy raised several concerns that we concluded could hamper the agency's efforts. FEMA's implementation approach is based on four objectives: (1) establish and maintain a premier data system, (2) expand outreach and better inform the user community, (3) establish and maintain effective partnerships, and (4) achieve effective program management.

  - *Establish and maintain a premier data system:* Although FEMA's efforts to establish a new data system could result in more accurate flood maps and make it easier to access and use the revised flood

maps, at the time of our review, FEMA had not yet established clear standards for the types, quantity, and specificity of data collection and analysis associated with different levels of flood risk. FEMA had ranked the nation's 3,146 counties from highest to lowest flood risk. According to FEMA, communities at the highest risk of flooding require the most extensive, detailed data and analysis, but the same level of data collection and analysis may not be necessary to create accurate, useful maps for communities with lower flood risks. Defining the level of data collection and analysis for different levels of risk are important because obtaining and analyzing flood map data is time-consuming and expensive, and the more detailed and specific the data, generally the greater the effort and costs required to obtain it. By identifying the types, quantity, and specificity of the data and analysis needed for communities based on their risk, we concluded that FEMA could better ensure that data collection and analysis is consistent for all communities with similar risk and that it is using its resources efficiently while producing maps that are accurate and useful for communities at different levels of flood risk. FEMA acknowledged the need to develop such standards, but, at the time of our review, had not yet developed draft standards or included this task into its map modernization implementation plan. In November 2004, FEMA issued its Multi-Year Flood Hazard Identification Plan. The plan describes FEMA's strategy for addressing our concerns and discusses the varying types of data collection and analysis techniques the agency plans to use to develop flood hazard data in order to relate the level of study and level of risk for each county.

- *Expand outreach and better inform the user community*: FEMA's planned expanded outreach efforts are intended to increase public awareness and obtain community acceptance of the updated flood maps because the updated information could potentially identify changes in floodplain boundaries and, therefore, affect property owners, including whether or not their property's location may require them to purchase federal flood insurance. FEMA's intended outcome for these outreach efforts is to reduce community vulnerability to natural and man-made hazards and increase participation in the flood insurance program. Because FEMA does not have the authority to require that affected property owners take steps to protect their properties against flood risks or to ensure that owners whose properties are in the floodplain purchase flood insurance, effective outreach is essential to ultimately achieve these benefits.

- *Establish and maintain effective partnerships*: FEMA's objective for building and maintaining mutually beneficial partnerships is designed to facilitate and support the efficient production and effective use of maps. FEMA recognizes that local, state, and federal agencies that have been working on mapping activities for years, have the resources and potential to positively affect the quality and quantity of the data collected and improve the way these data are used. In addition, these partnerships can enable FEMA to leverage its resources and reduce the federal costs of map modernization. FEMA had developed a strategy for partnering with these agencies to encourage greater involvement in map modernization, including the contribution of resources. However, we concluded that the overall effectiveness of the agency's partnering efforts was uncertain because FEMA had not yet developed a clear strategy for partnering with communities that have few resources, limited mapping capability, and little history of flood mapping activities. FEMA's Multi-Year Flood Identification Hazard Plan (the Plan) does not explicitly address such strategies. For fiscal year 2004, the Plan notes that, nationwide, dollars leveraged from local, non-FEMA sources substantially exceeded the target level of 20 percent, with 36 percent of the effort leveraged from other partners. In 4 of the 10 FEMA regions the leverage exceeded 40 percent. However, in 3 of the 10 FEMA regions the leverage was less than 10 percent. This experience, along with a projected 50 percent increase in the total cost of the program, supports the need for strategies to address disparities and maximize map modernization stakeholders' contributions to the program.

- *Achieve effective program management*: In March 2004, FEMA awarded a performance-based contract to a single contractor to oversee map modernization that includes performance measures to gauge the success of its efforts. Through a staffing analysis, FEMA had determined that it needed 75 staff with specific, identified skills to effectively monitor and manage the contract and overall map modernization program. As of March 2004, FEMA had hired 1 of the 75 staff, and had developed plans to hire or transfer 43 others, but had not yet determined how it would acquire the remaining 31 positions. In addition, we found that FEMA had not clearly defined performance measures related to whether (1) the revised maps meet any established standards for accuracy and (2) outreach efforts are successful in increasing the community and individual awareness and use of flood maps. In response to our recommendation, FEMA's set goals in its November 2004 Multi-Year Flood Hazard Identification Plan for key performance indicators. FEMA's four indicators are (1) Population with Digital GIS Flood Data Available Online, (2) Population with Adopted Maps that Meet Quality

Standards, (3) Percent of Effort Leveraged; that is, state and local resources provided for map modernization as a percentage of FEMA resources provided, and (4) Appropriated Funds Sent to Cooperating Technical Partners (CTP). To track its progress of map modernization annually, FEMA set target percentages for achieving these performance indicators in fiscal years 2006 through 2009.

Map Modernization Intends to Use Advanced Technologies to Produce More Accurate and Accessible Digital Flood Maps:

Through map modernization, FEMA intends to produce more accurate and accessible flood maps by using advanced technology to gather accurate data and make the resulting information available on the Internet. Many of the flood maps in FEMA's inventory do not accurately reflect the true flood hazard risks because over time, new development and other factors altered watersheds and floodplains faster than the maps could be updated. Prior to fiscal year 2004, the $35 million to $50 million in annual flood insurance policy fees had been the only source of funding for updating flood maps, and according to FEMA, the agency had not been able to keep the maps updated with the funds available. As a result, at the time of our review, nearly 70 percent of the nation's approximately 92,222 flood maps[6] were more than 10 years old and many contain inaccurate data, according to FEMA.

Over time, physical conditions in watersheds and floodplains can change, and improvements in the techniques for assessing and displaying flood risks are made. FEMA plans to use the latest technology, such as GIS, to create accurate digital flood maps. GIS technology provides the foundation for achieving FEMA's goals of melding different types and sources of data to create the new digital flood maps and making the new digital flood maps available to a variety of users over the Internet. The primary function of GIS is to link multiple digital databases and graphically display that information as maps with potentially many different types of "layers" of information. When layers of information are formatted using the same standards, users can potentially overlay various layers of information about any number of specific topics to examine how the layers interrelate. Each layer of a GIS map represents a particular "theme" or feature, and one layer could be derived from a data source completely different from the other layers. For example, one theme could represent all the streets in a specified area. Another theme could correspond to the topography or elevation data of an area, and others could show aerial photography and streams in the same area. These

[6] The 92,222 flood maps represent nearly 20,000 communities.

themes are all key elements needed to create flood maps that accurately depict floodplains and can be used to identify properties in these areas. In preparing for full-scale implementation of map modernization, FEMA had established standards and graphic specifications for digital flood maps created with GIS.

GIS technology also enables the creation of more accurate and accessible maps than would be possible with older mapping methods and technology. The majority of FEMA's flood map inventory was produced using manual techniques that have inherent accuracy and accessibility limitations. For example, in creating traditional paper flood maps, field measurements taken by surveyors would have been transferred by hand to paper base maps. If the paper base map contained any inaccuracies, then the field-survey data could be shown in the wrong place on the final flood map. This would then result in floodplain boundaries being shown in the wrong place.

By their nature, paper flood maps have limited accessibility as compared with a digital map that can be made available on the Internet. The expansion of Internet connectivity in recent years has substantially enhanced the potential value of digital maps created with GIS because now it is possible to locate and connect data from many distinct GIS databases to develop analytical information on almost any topic that is associated with physical locations. Digital flood maps created according to FEMA's standards are intended to provide users not only with the ability to determine the flood zone and base flood elevations for a particular location, but also with the ability to access other information like road, stream, and public land survey data. Communities could use this information for a variety of purposes, including decisions on future development and evacuation routes.

As part of map modernization, FEMA has promoted the use of a variety of advanced technologies to improve the accuracy of flood maps. In recent years, for example, where it deems it appropriate, FEMA has promoted the use of Light Detection and Ranging (LIDAR) remote sensing technologies to generate highly detailed, digital elevation data.

Elevation data are a key component needed to determine flood risk and identify floodplain boundaries. According to FEMA, for very flat areas where small changes in elevation can have a large impact on where flood plain boundaries are drawn, LIDAR can provide the level of detail needed to accurately delineate these boundaries. Communities can also use

detailed, digital elevation data for planning and land development purposes.

FEMA Expects Map Modernization to Increase the Likelihood Maps Will Be Used for Risk Management

FEMA expects map modernization to increase the likelihood that the more accurate and accessible maps will be used for risk management purposes. Specifically, FEMA expects the new maps to be used to (1) improve flood mitigation, (2) increase flood insurance participation, and (3) improve "multi-hazard" mitigation and risk management capabilities. First, FEMA expects communities to be able to use these new and revised maps to better manage and mitigate flood risk by regulating floodplain development through building codes, ordinances, and regulations. Second, the new maps also have the potential to help increase flood insurance participation because they will more accurately identify those properties that are in the floodplain and whose owners would be required to purchase flood insurance. Third, the data and infrastructure developed by map modernization is also expected to help national, state, and local officials mitigate and manage risk from multiple hazards, both natural and man-made. Accurate digital maps can provide more precise data on such things as the location of hazardous material facilities, power plants, railroads, and airports to state and national officials for planning development as well as to assess internal weaknesses and evacuation routes.

Map Modernization Is Expected to Improve Flood Mitigation

The more accurate and updated flood hazard information produced through map modernization is expected to help improve flood mitigation in participating communities. The NFIP requires participating communities to adopt and enforce building standards based on the floodplain boundaries and base flood elevations when maps are updated. For example, the lowest floor of structures in new construction must be elevated to at least the base flood elevations identified on the maps. FEMA's policy is to monitor communities to ensure that they have adopted building standards that meet the minimum NFIP criteria and to ensure that they are effectively enforcing these standards. If communities fail to establish and enforce minimum NFIP flood plain building standards, FEMA can suspend availability of federal flood insurance.

Communities also may use updated flood hazard data to take actions to mitigate flooding that go beyond adopting the building standards required by the NFIP. For example, communities may use the data from the maps to identify where to conduct capital improvement projects designed to mitigate flooding of structures in the floodplain. In addition, FEMA has

established a Community Rating System that provides discounts on flood insurance premiums for those communities that take mitigation actions beyond those required by the NFIP.

Map Modernization Is Expected to Help Increase Flood Insurance Participation

Map modernization has the potential to help increase flood insurance participation. The accuracy of the new maps should better identify at-risk property owners who would be best served by obtaining flood insurance whether or not the owners would be required to purchase insurance under the NFIP's mandatory purchase requirement. Moreover, the digital, GIS-based maps should make flood risk information more accessible to a variety of users such as lenders and community officials who could conduct targeted outreach to these property owners.

It is important to note, however, that FEMA, states, and communities do not have the authority to ensure that property owners who are subject to the mandatory purchase of flood insurance requirement actually purchase flood insurance. It is the federally regulated lenders' responsibility to ensure that borrowers purchase flood insurance and that the insurance policy is maintained throughout the loan's life as each new lender servicing the loan becomes aware that the affected property is at risk for flooding. Furthermore, owners of properties without mortgages or properties with mortgages held by unregulated lenders are not required to purchase flood insurance, even if the properties are in floodplains.

Map Modernization Is Expected to Improve Multi-Hazard Mitigation and Risk Management Capabilities

FEMA expects that the data developed, collected, and distributed through map modernization will help national, state, and local emergency managers mitigate and manage risk posed by other natural and man-made hazards. Accurate digital base maps provide more precise data to state and national officials for planning, such as the location of hazardous material facilities, power plants, utility distribution facilities, and other infrastructure (bridges, sewage treatment plants, buildings, and structures). According to FEMA, map modernization will also support DHS's overall goal to reduce the nation's vulnerability to terrorism by providing GIS data and capabilities to other departmental functions. For example, more accurate information on transportation systems such as railroads, airports, harbors, ports, and waterways should be helpful in assessing internal weaknesses and evacuation routes.

FEMA's Strategy for Map Modernization Shows Promise, but Challenges Remain

FEMA's strategy for managing map modernization is intended to support the achievement of the expected program benefits of improved flood mitigation, increased NFIP insurance participation, and improved multi-hazard mitigation and risk management capabilities. However, in reviewing FEMA's approach to implementing the strategy, we identified several challenges that could hamper the agency's efforts. FEMA's approach is based on four objectives. Two objectives FEMA hopes to achieve through map modernization—building and maintaining a premier data collection and delivery system and expanding outreach and better informing the user community—have the potential to improve the use of flood maps for improved flood mitigation and increased NFIP participation, as well as multi-hazard risk management. The other two objectives—building and maintaining mutually beneficial partnerships and achieving effective program management—are intended to facilitate the achievement of the first two objectives and their intended benefits efficiently and effectively.

In Its Efforts to Establish a New Data System, FEMA Had Not Yet Established Data Standards for Different Levels of Risk

The goal of FEMA's objective to develop a new data system using the latest technology is more efficient production, delivery and, thereby, the use of flood maps. As discussed previously, FEMA hopes to accomplish this by using geographic information systems technology that provides the foundation for the production and delivery of more accurate digital flood maps and multi-hazard data that is more accessible over the Internet.

In developing the new data system to update flood maps across the nation, FEMA's intent is to develop and incorporate flood risk data that are of a level of specificity and accuracy commensurate with communities' relative flood risks. According to FEMA, there is a direct relationship between the types, quantity, and detail of the data and analysis used for map development and the costs associated with obtaining and analyzing those data. FEMA believes it needs to strike a balance between the relative flood risk faced by individual communities and the level of analysis and effort needed to develop reliable flood hazard data if it is to update the nation's maps efficiently and effectively.

FEMA ranked all 3,146 counties from highest to lowest based on a number of factors, including, among other things, population, growth trends, housing units, flood insurance policies and claims, repetitive loss properties, and flood disasters. On the basis of this ranking, FEMA established mapping priorities. However, at the time of our review, FEMA had not established standards on the appropriate data and level of analysis required to develop maps based on risk level. FEMA had historically

applied the same minimum standards for all flood maps and supporting data.[7] FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners provided guidance for selecting the level of analysis and effort to produce flood hazard data and the guidelines had generally been used on a case-by-case basis.[8] We found that the guidelines do not specify standards to be used for all mapping projects within a given risk category and concluded that, without establishing standards for different categories of risk, FEMA could not ensure that it uses the same level of data collection and analysis across all communities within the same risk category. These standards could also provide a consistent basis for estimating the costs of developing maps in each risk category. At the time of our review, FEMA had not yet developed draft standards or incorporated this task into its implementation plan. As a result, we recommended that FEMA develop and implement data standards that would enable FEMA, its contractor, and its state and local partners to identify and use consistent data collection and analysis methods for communities with similar risk.

In November 2004, FEMA issued its Multi-Year Flood Hazard Identification Plan. The plan describes FEMA's strategy for updating flood maps used for NFIP purposes and discusses the varying types of data collection and analysis techniques the agency plans to use to develop flood hazard data in order to relate the level of study and level of risk for each county.

FEMA's Objective to Expand Outreach Efforts Recognizes the Agency Must Rely on Others to Achieve Map Modernization Benefits

FEMA's objective to expand the scope and frequency of its outreach efforts is intended to increase community and public acceptance of revised maps and use of those maps. Historically, FEMA has only contacted communities when initiating remapping and again when preliminary maps are completed. These expanded outreach efforts reflect FEMA's understanding that it is dependent on others to achieve the benefits of map modernization. For example, under the structure of the NFIP, FEMA is dependent on communities to adopt and enforce FEMA's minimum building standards and on mortgage lenders to ensure compliance with mandatory flood insurance purchase requirements. To expand the scope of its outreach efforts, FEMA plans to involve a wide variety of community participants—e.g., mayors, emergency managers,

[7]For example, FEMA implemented digital base map standards in 1998 and LIDAR standards in 2000.

[8]These guidelines describe detailed methods of analysis used for high-risk areas and less detailed methods used for low-risk areas.

lenders, property owners, insurance agents, and developers—in the mapping process. To expand the frequency of outreach, FEMA intends to increase community involvement, awareness, and participation throughout the entire flood mapping process. Through a continual education process, FEMA's goal is to inform property owners and others potentially affected by remapping efforts of steps they can take to mitigate the risk of flooding, the types of damage and costs caused by flooding, and the benefits of flood insurance.

According to FEMA, if a community is involved in and understands the map modernization process, the community is more likely to accept and trust the accuracy of the final, revised maps and is more likely to use the maps' hazard data to mitigate natural and man-made disasters. Conversely, if affected property owners do not understand why their communities are being mapped (or remapped) or why their property is now in a flood zone, the unexpected additional expense of new or increased flood insurance premiums can form the basis of significant community opposition to map modernization activities and lead to formal appeals, litigation, and delays in implementing map changes.

FEMA's expanded outreach efforts are intended to educate the public of the potential flood risk in communities and to encourage them to take action. Communities that participate in the NFIP are required to establish floodplain management ordinances that require new and substantially improved structures in newly designated floodplains to meet NFIP building standards. However, if a property was not located in the floodplain in the old map but is in the floodplain in the new revised map, NFIP floodplain management regulations do not require those owners to implement mitigation measures unless they make substantial improvements to the structure.[9] FEMA cannot compel affected property owners to take steps to protect their properties against flood risks or to purchase flood insurance. Under current notification requirements, federally regulated lenders, not FEMA, serve as the primary channel for notifying property owners whose mortgaged properties are subject to flood insurance requirements. When property owners seek new financing, through purchase or refinancing, federally regulated mortgage lenders are required to determine if the property is in the floodplain and, if so, require

[9] If a community determines that the cost of improvements to a home or business equals or exceeds 50 percent of the market value of the building, the building is considered a "substantial improvement" and must meet the NFIP's minimum requirements.

the purchase of flood insurance. Lenders are not required to monitor map changes or to notify property owners with existing mortgages whose properties are identified in a floodplain by remapping if they are not aware of the change in status.[10]

Nonetheless, if federally regulated lenders become aware of flood map changes that affect properties for which they hold mortgages through FEMA notifications or flood zone determination companies,[11] then they must notify the property owner and require the purchase of flood insurance. The information that must be provided to property owners is limited to notifying property owners that their structure is in a floodplain, providing a definition of a flood plain, and requiring the purchase of flood insurance if they live in a participating NFIP community. As a result, FEMA's outreach efforts are important for supplementing the formal requirements for notifying communities and property owners of map changes.

FEMA's Strategy for Partnering with States and Local Communities Does Not Include Communities with Few Resources to Assist in Flood Mapping

FEMA's objective for building and maintaining mutually beneficial partnerships is intended to facilitate and support the efficient production and effective use of flood maps. According to FEMA, local, state, and federal partners that have invested resources and assisted in managing mapping activities have the potential to positively affect the detail, accuracy, and quantity of the data collected and improve how these data are used. As part of their strategy for partnering, FEMA provides guidance to the states on how to develop "business plans" that document planned efforts to develop states' and communities' capability and capacity to oversee the collection, analysis, and implementation of flood data in their state and community and to justify funding for these efforts. According to FEMA, 38 states had begun drafting such plans. FEMA intends to use these state business plans to help prioritize its continuing efforts to develop map modernization partners.

[10] In making loans, federally regulated lenders are required to ensure that property owners purchase flood insurance if their mortgages are secured by a structure located in a floodplain. Lenders are also required to check the flood hazard status of a property when triggered by statutory tripwires, such as loan renewal or extension.

[11] Many lenders use flood zone determination companies to determine whether properties require flood insurance as a result of loan origination, loan assumption, or map changes. These companies use FEMA flood maps and other data to ascertain if properties are situated in flood zones.

Through its CTP program, FEMA has developed partnerships with a variety of states and communities that have developed their own data and provided their own funds to help update local flood maps. Since 2000, FEMA has leveraged millions of dollars in funding from 171 partners (states and local communities) for producing maps through its CTP program. For example, from fiscal years 2000 to 2002, FEMA used $70 million of its federal map modernization funding along with state and local funds to develop what FEMA has estimated to be more than $155 million worth of new mapping data. According to FEMA, partnering has other benefits as well. For example, in the long-term, those states and communities with whom FEMA has established partnerships may be more likely to accept final map changes, expand their capabilities, and assume greater responsibility for periodically developing and incorporating updated flood data, resulting in cost savings to FEMA.

Some states and communities with few resources and technical capacities or little history of flood mapping activities are likely to pose a challenge to FEMA's ability to fund and implement mapping activities. For example, we talked with flood management officials in several smaller communities in Montgomery County, Texas; Santa Cruz County, Arizona; and Larkspur, Colorado. These officials said that their communities lacked either the funding needed to develop flood data, the technological capability to develop digital flood data and use geospatial information systems, or, in some cases, the community support needed to conduct mapping activities. One approach for obtaining additional resources, capabilities, and community support would be for FEMA to facilitate coordination with other agencies within the state that have a stake in, or could benefit from, mapping activities. For example, state departments of transportation can benefit from information in FEMA's geospatial information system, such as elevation data, in planning and building state roads and bridges. North Carolina was able to get its state transportation department to help fund the development of elevation data used for flood maps. At the time of our review, FEMA had not yet developed a strategy for how to partner with communities that do not have the resources, capabilities, or motivation to initiate and sustain mapping activities. Such a strategy could focus on how to assist these potential partners in garnering community resources and developing technological capabilities, how to coordinate with other agencies in their state, and how to integrate these efforts with FEMA's community outreach efforts to gain community support for mapping activities. As a result, we recommended that FEMA develop and implement strategies for partnering with state and local entities with varying levels of capabilities and resources. FEMA's Plan does not explicitly address such strategies. For fiscal year 2004, the Plan notes that,

nationwide, dollars leveraged from local, non-FEMA sources substantially exceeded the target level of 20 percent, with 36 percent of the effort leveraged from other partners. In 4 of the 10 FEMA regions the leverage exceeded 40 percent. However, in 3 of the 10 FEMA regions the leverage was less than 10 percent. This experience, along with a projected 50 percent increase in the total cost of the program, supports the need for strategies to address disparities and maximize map modernization stakeholders' contributions to the program.

Program Management Contract Is Performance-Based, but FEMA May Have Difficulty Overseeing the Contract and Measuring Achievement of Program Objectives:

In March 2004, FEMA awarded a performance-based contract to obtain assistance from a nationwide mapping contractor to manage tasks associated with the significant expansion of the map modernization program. Unlike many traditional government service contracts, which emphasize inputs rather than outcomes, a performance-based contracting approach gives the contractor the flexibility to determine how best to achieve the outcomes and links payment to the contractor's ability to achieve these outcomes—an approach supported by our past work in federal contracting. Overseeing these types of contracts requires agency staff with the knowledge, skills, and abilities to monitor the contractor's efforts using performance measures that accurately measure agreed-upon outcomes.

We concluded that FEMA might be limited in its ability to effectively manage the contract, as well as the significant expansion of tasks associated with a five-fold increase in funding and related mapping activities that will continue to be performed by agency staff. These tasks include managing grants for many new mapping partners and administering contracts with independent firms to develop and process a significantly larger quantity of flood data to support local efforts. A staffing needs assessment completed by FEMA in December 2003 identifies a need for an additional 75 staff with additional skills, including contracting and program management capabilities. In appropriating fiscal year 2004 map modernization funds, Congress included a provision that would allow FEMA to use up to 3 percent, or $6 million, for administrative purposes. As of March 2004, FEMA had filled 1 of the 75 positions by reallocating existing resources. At the time of our review FEMA planned to fill another 33 positions using the administrative funding identified in the fiscal year 2004 budget. In addition, FEMA also planned to fill an additional 10 positions by moving staff from other FEMA departments or filling vacancies. However, at the time of our review, FEMA had not yet established a plan for filling the remaining 31 headquarters and regional positions. As a result, we recommended that FEMA ensure that it has the

staff capacity to effectively implement the nationwide mapping contract and the overall map modernization program.

One element of effective program management is establishing performance measures to determine how well FEMA is achieving its map modernization program objectives. FEMA had established performance measures for all four of its program objectives. However, we concluded that FEMA's measures for two of those objectives that directly support the use of flood maps for risk management—to develop a premier data system and to expand and better inform the user community were not clearly defined or fully developed. FEMA's principal measure for developing and maintaining a premier data collection and delivery system is the percent of the national population with community-adopted, GIS data-based flood maps. However, this measure does not indicate whether the maps themselves meet any FEMA-established standards for accuracy (because FEMA had not yet defined the minimum level of data collection and analysis for communities with similar risk).

To measure the progress and success of expanding and better informing the user community, FEMA established performance measures related to the percent increase in communities' awareness and use of new maps. FEMA plans to use surveys as the primary means of measuring increased community awareness and use of the new maps. However, FEMA had not yet fully developed an operational definition of how it plans to measure "awareness" or "use," for example, that reflect mitigation steps taken or the purchase of flood insurance. Because the link between revising maps and the use of maps in terms of increased NFIP participation is not direct, we recognized that it may be a challenge to develop a performance measure that accurately reflects the impact on NFIP participation rates of efforts to expand and improve outreach. Nonetheless, without developing such a measure (or measures), we concluded that FEMA would be less able to ensure that its map modernization program will have resulted in one of FEMA's primary intended benefits. As a result, we recommended that FEMA develop and implement useful performance measures that define FEMA' s progress in increasing stakeholders' awareness and use of the new maps, including improved mitigation efforts and increased participation rates in purchasing flood insurance.

In response to our recommendation, FEMA's set goals in its November 2004 Multi-year Flood Hazard Identification Plan to improve public safety through the availability of reliable flood risk data. Specifically, FEMA plans to increase the safety for at least 85 percent of the U.S. population through availability of accurate flood risk data in GIS format. To achieve

this goal, FEMA has set targets for key performance indicators (KPI) through fiscal year 2009 (production is scheduled for completion in fiscal year 2010). FEMA's four KPIs are (1) Population with Digital GIS Flood Data Available Online, (2) Population with Adopted Maps that Meet Quality Standards, (3) Percent of Effort Leveraged; that is, state and local resources provided for map modernization as a percentage of FEMA resources provided, and (4) Appropriated Funds Sent to CTPs. To track its progress of map modernization annually, FEMA set target percentages for achieving these performance indicators in fiscal years 2006 through 2009.

Mr. Chairman and Members of the Committee, this concludes my prepared statement. I would be pleased to answer any questions you and the Committee Members may have.

Contact and Staff Acknowledgements

For further information about this statement, please contact William O. Jenkins, Jr. Director, Homeland Security and Justice Issues on (202) 512-8777 or jenkinswo@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributors to this testimony included Grace Coleman, Christopher Keisling, Raul Quintero, and John Vocino.

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Testimony of
David Maurstad
Acting Director
Mitigation Division
Federal Emergency Management Agency
Emergency Preparedness and Response Directorate
Department of Homeland Security
before
The U.S. House of Representatives
Financial Services Committee
Subcommittee on Housing and Community Opportunity
July 12, 2005

Good morning Chairman Ney, Ranking Member Waters, and Subcommittee Members. I am David Maurstad, the Mitigation Division's Acting Director within the Department of Homeland Security's Emergency Preparedness and Response Directorate, which includes the Federal Emergency Management Agency (FEMA). I appreciate the opportunity to appear today before the Subcommittee on Housing and Community Opportunity.

First, I would like to thank the Subcommittee for its support of FEMA's Flood Map Modernization program – a program to modernize the Nation's flood insurance rate maps over a five-year period. The resources Congress has provided are resulting in products that increase flood risk awareness, stimulate dialog among various levels of government and industry, and help communities mitigate against flood losses. As a result, we will continue to make this Nation less vulnerable to flooding.

Background and Benefits

FEMA's Mitigation Division manages the National Flood Insurance Program (NFIP) – the cornerstone of the Nation's strategy to prepare communities for flood events. The NFIP was created to reduce our Nation's vulnerability to flooding by identifying flood risks, encouraging sound floodplain management practices, and providing a mechanism through which people can insure their investments.

FEMA and its partners provide flood hazard maps and data to support flood insurance and community floodplain management activities. Flood Map Modernization uses state-of-the-art technology, on-the-ground intelligence, and a strong set of mapping guidelines, specifications, and standards to deliver reliable data and maps in geographic information system (GIS) format.

Digital flood maps provide many benefits. They provide a uniform structure for assessing our Nation's ever-changing vulnerability to flooding – allowing us to monitor flood mitigation's effectiveness. The digital data, along with a platform to store, maintain, and distribute the information, also can be used to support other activities such as preparedness, response, recovery, and local planning. Lastly, digital maps are easier to maintain and keep current.

The Map Modernization Vision and Status

Flood Map Modernization is well underway. Since 2003, Congress has appropriated $550 million for the Program. In addition, under our Cooperating Technical Partner (CTP) initiative, we expect, by the end of FY05, our 212 active State, regional, and local community mapping partners will have added over $100 million in data and other resources. The CTP program has been very well received and continues to yield both short- and long- term benefits. As an example, many of our partners, like Licking County, Ohio, are contributing both data and in- kind resources toward current mapping projects. For many of them, this partnership is resulting in a motivation to stay involved and provide long- term support for maintenance of the maps, which is the case for the Ohio Department of Natural Resources, Maricopa County, Arizona, North Carolina, and many others. The CTP program also enables us to leverage Federal dollars and helps communities take ownership of the flood maps.

We have also engaged industry to help us develop solutions. That is, we have presented them with objectives and asked them how best to meet them rather than the more traditional government approach of mandating a solution and asking them to work within it. This is being accomplished through issuance of performance-based contracts both at the national and regional level. We also regularly meet with industry to share ideas, stimulate growth, and collect feedback on technical procedures and practices.

Using these practices and through these partnerships we have completed mapping projects in nearly 1,000 of our most "at-risk" communities, and Flood Mapping Modernization projects are underway in over 2,100 other communities.

Our goal is to have the Nation's flood map inventory modernized by 2010, with all maps in a GIS format and available online. Equally important, we will have a comprehensive and robust risk identification and assessment system, allowing us to more readily track – over time – the Nation's ability to reduce flood vulnerability.

Making Flood Maps – One Size Does Not Fit All

There is no "one size fits all" solution to identifying the Nation's flood hazards. The risks, and the people they impact, are diverse. For example, in the arid West, streambeds can lay dry for years, yet these innocuous features can release torrents of water, without warning, after a brief thunderstorm.

On the other hand, in the East, where it rains regularly and vegetation is thick, rivers that flow year-round tend to take days before reaching their peak.

Along our coasts, the hazards also vary widely. In the South Atlantic and Gulf, hurricanes strike quickly compared to long, drawn out, extratropical storms that can pound the northeastern shores for days.

In the Pacific, long, high waves tend to elevate water levels through processes that are entirely different than those of hurricanes.

The Nation's variability in landscape and flooding characteristics requires State, tribal, and local governments to use a variety of floodplain management approaches to make their communities safer places to live, work, and do business. As such, communities require and use different tools to collect the data needed to properly analyze their flood risks.

Obviously, the Nation cannot resolve its natural hazard issues with a single, universally applied approach. This country's geographic diversity – combined with its variety of natural hazard threats – requires us to apply, mix, and match a series of processes to effectively identify hazards, communicate risks, and reduce vulnerability.

Partnerships

State, tribal, and local officials, with their knowledge and experience, are a necessary and valuable component of a comprehensive flood study. For example, through planning and project scoping processes, State, tribal, and local officials help us identify areas where flood risk is greatest, and they direct and point us to data and analyses that can increase quality, reduce costs, and ensure that flood hazard data is effectively used in daily decision making. State, tribal, and local officials also help communicate risks to citizens threatened by flooding, thereby stimulating action and influencing decisions regarding insurance purchases, new development, and the strengthening and elevating of existing homes and buildings. Ultimately, the

role of State, tribal, and local officials in the flood map production process leads to more informed decisions and stronger communities.

At the national level, we have developed a comprehensive set of guidelines, specifications, and standards that enable us to collect data and produce information that is easily shared, maintained, and improved. Further, we have engaged our Federal counterparts at the U.S. Geological Survey, the U.S. Army Corps of Engineers, and the National Oceanic and Atmospheric Administration, and our digital data specifications comply with Federal Geographic Data Committee recommendations. We are active members of the National Digital Elevation and Orthophoto Programs. Through these and other federal partnerships we are sharing data, eliminating redundancies, and taking advantage of similarities in mission.

Quality

We understand the ramifications of producing flood maps which do not accurately reflect the risk. Inferior products or miscommunication can have devastating impacts on families, businesses, and communities that rely on the information produced through the Flood Map Modernization Program. We realize there are concerns regarding the use of ground elevation data and other information that is potentially inaccurate. To offset the risk of error, we have implemented a risk-based approach to ensure quality, leverage industry best practices and lessons learned, and foster opportunity for community involvement.

In areas of high risk, we utilize data that has been field-checked and coordinated closely with local officials to ensure results are accurate, meet professional standards, and have the appropriate certifications on all engineering and survey data. Because of the tremendous value of ground elevation data for a variety of other purposes, in these high-risk areas, we tend to find and use a significant amount of current, detailed, good-quality data that has been produced by others.

In moderate and low-risk areas we use aerial photographs to identify potential problem areas, spot check data, and perform field reconnaissance at suspect sites, but rely more heavily on the professional certification and community coordination aspects of the process. When errors are found, we work with our partners to resolve the issues and explore cost-sharing avenues when the data needed to correct the problems has significant benefits beyond the mission of flood hazard identification.

This approach has been applied and proven successful in many areas around the nation. For example, in our partnership with the State of Nebraska, U.S. Geological Survey topographic data are utilized in conjunction with field reconnaissance to develop flood hazard maps and data. In North Carolina, we utilized detailed ground elevation information generated by the State's own laser technology. This data in conjunction with automated hydraulic modeling techniques helped to identify flood risk in moderately developed areas. In Licking County, Ohio, we partnered with the county to produce draft flood maps using aerial photographs, topographic data, and flood hazard information developed using local and State resources.

We have firmly committed to a clear quality standard for modernized maps to make sure that poor quality hazard information is not simply digitized from an old map. Developed with the support of our key stakeholders, this standard requires that at a minimum all the flood hazard boundaries on our modernized maps will be evaluated and adjusted as necessary.

Conclusion

Overall, this program's ability to meet the unique and diverse risks faced by a variety of stakeholders relies on a sound balance between efficiency and flexibility. We have done this by performing much of the work associated with flood hazard identification at the local level in a decentralized fashion, while managing the work centrally using technology, earned value management techniques, and integrated performance teams.

Striking this balance comes with its own set of challenges. Too much flexibility can lead to complacency and a lack of accountability. Conversely, not enough can lead to maps and data that are unreliable which leads to improper or poor decision making. Further complicating the mission is the fact that technology, the hazards themselves, and the built environment are constantly in motion, thus requiring continuous care to ensure our processes, data, and products stay relevant and reliable.

Although we have a long way to go to modernize the Nation's flood map inventory, our progress to date shows we have focused initially on areas where there is the greatest flood risk, we have hit the ground running, and that our solution strikes a good balance between efficiencies through

standardization and flexibility by allowing industry and State and local governments to tailor solutions to suit unique situations.

I again want to thank this Subcommittee for its support of Flood Map Modernization. We are well underway and we look forward to making this Nation more disaster-resistant and better equipped to deal with the ever-present danger of floods. I would be happy to answer any questions that you may have.

National Flood
Determination Association

Testimony

Presented to
House Committee on Financial Services
Subcommittee on Housing and Community Opportunity
on the
Flood Map Modernization Initiative

by
Cheryl Small, President
National Flood Determination Association
9249 S. Broadway 200-435
Highlands Ranch, CO 80129

July 12, 2005

The NFDA is a professional association of companies which provide flood zone determinations to lenders for compliance with the mandatory purchase requirements of the NFIP. The association represents some two-thirds of the industry and has implemented a certification program containing standards for flood zone determination companies. Because the FEMA flood maps are the official documents for compliance with the NFIP, flood determination companies are probably the most frequent users of the maps. A survey of the NFDA membership revealed that it had completed approximately 33,000,000 determinations in the year 2003.

Flood maps are used to determine which properties are in or out of a Special Flood Hazard Area (SFHA) and also are used by county and community officials to plan development and to reduce future risk.

Approximately 70 percent of the flood maps are five years and older, with 57% at least 20 years old, and more than 2,200 flood prone communities remain without flood hazard maps. The current process utilized by FEMA to produce an updated map is 58 months. More than 20,000 map panels have been identified as requiring updates, meaning they have outdated or inadequate flood hazard data requiring updates through field reconnaissance, engineering analysis and floodplain mapping utilizing improved analysis methodologies. The detailed flood studies will include "approximately studied" and "unstudied" flood-prone communities. There are more than 40,000 maps with adequate flood hazard data but inadequate non-engineering data and reference features such as roads. New elevation reference marks will be developed and implemented emphasizing the use of GPS surveying technology and a network of approximately 580K benchmarks.

The NFDA has been extremely gratified that the Administration has recognized the real need to update and modernize the flood maps. The NFDA fully supports Flood Map Modernization program. We do however have some concerns about the update component.

Updating the maps, particularly in high growth areas, requires a full restudy which includes engineering, surveying, hydrology and hydraulics. It should be noted that such extensive restudy is not needed everywhere as the water flow and retention properties may not have changed much over the years. Because the updates require more time and investment, we are worried that insufficient analysis is being undertaken in order to complete action on maps more quickly. The quantitative requirements by which map modernization is judged may be moving the project away from the restudies and toward limited revisions and may

be focused on an extensive effort to digitize the existing map inventory. Many of the maps in the existing inventory require updates and maintenance. In many cases, these changes will not be made until a future date, so the "new map" will just be a digitized version of the current "outdated" flood map. This type of newly issued map, with a new date, can be very misleading. Flood determinations completed using these "new" maps will continue to generate complaints.

In 2004, FEMA issued over 40,000 Letter of Map Amendments (single address change updates) affecting thousands of properties. What this statistic does not represent is the time and money spent by property owners, lenders, community officials, and others in appealing the maps. If inaccurate maps are released, this time consuming and expensive process will increase and one of the points of map modernization is to substantially reduce the need for this. When a map is issued with a new date it invokes the life of loan process. This is a process where the flood status of a property is tracked and the lender is notified of changes to the flood hazard status of a property. If this process is invoked and the only change is an old map digitized with a new date then enormous cost is incurred by all parties. If the Letter of Map Amendment re-validation process is delayed, then homeowners may have to seek insurance coverage when in fact their property has been exempted from the mandatory purchase requirement. The following is a brief review of the life of loan process.

In 2003, the flood determination industry was tracking 97,000,000 loans for map changes. That number is obviously staggering when put in context with the map revisions expected over the next five years because in theory, all of these properties would need to be looked at a second time. When a map is revised and becomes effective, the following process is initiated with the determination companies, the lenders, and their borrowers:

1. All properties affected by the revision are pulled out of the individual databases. For example, the recent Letter of Map Revision for Sacramento, CA affected the flood insurance requirement for 50,000 houses.
2. The determination companies review every property record to determine whether the properties flood status was affected by the map revision. The determination companies have on average sixty days to review these properties. FHLMC and FNMA require institutions servicing their loan portfolios to have flood insurance in place within 120 days of the effective date of the new map.

3. Any property whose flood status changed from "In the Special Flood Hazard Area" (SFHA) to "Out of the SFHA" as well as any property whose flood status changed from "Out of the SFHA" to "In the SFHA" will generate a notice to the lender.
4. The lender then sends a letter to the borrower/homeowner notifying them of these flood hazard changes. In the above cases, the borrower/homeowner will either be required to purchase flood insurance as a condition of their loan or will be notified that flood insurance is no longer a requirement of the loan.
5. The borrower/homeowner then begins the process of purchasing flood insurance and has 45 days to secure coverage and provide proof to the lender.
6. If the borrower does not purchase flood insurance within the 45 day timeframe, then the lender will be required to purchase insurance on their behalf and charge the borrower for the cost of the insurance.

As service providers to local, regional and national lenders, as well as the independent insurance agent community, the flood zone determination companies are in a somewhat unique position of understanding the issues involved with the development and deployment of the maps and having direct communication with homeowners and lenders who are directly impacted by the release of new maps into a community.

In 2002, we organized our first ever technical mapping meeting between representatives of FEMA, NFDA, and FEMA's mapping partners. This forum was created as a way for all parties to discuss and resolve technical mapping issues that were important to our industry. These meetings have typically occurred twice a year and many positive changes have resulted. In addition, this forum has provided an opportunity for us all to understand how we can better work together. FEMA and their mapping partners have had an opportunity to gain a better understanding of how the determination industry uses their maps and how a seemingly minor change on their part can have significant impacts to lenders and their borrowers. An example of this was the recent remapping in North Carolina. The state made a change in the paneling schema for the maps that seemed small but unfortunately, the determination industry didn't know this occurred until the maps were released. Our industry has developed systems over time to deal with the standards set forth by FEMA but in this instance, the state deviated from this standard. The result was an enormous amount of work on the industry to accommodate this change.

This forum has also been the NFDA's opportunity to receive updated information on map modernization as well as providing the determination industry an opportunity to voice concerns about the direction of the program. At this point it is not clear whether this input has been taken into account and if it has not been, there could be serious problems for the determination industry and our lenders and their homeowners. We understand that meetings have taken place concerning some important items for our industry, i.e. the national paneling schema, but we have received no information on the outcomes. If the flood determination industry is not kept in the loop on these matters, the result could be a slow down in the closing of real estate transactions.

The result of our recent survey showed that the determination industry fielded in excess of 1.3 million calls in 2003 from homeowners and lenders discussing compliance and mapping related matters. A single revision in a community has material impact on homeowners, lenders and the flood determination providers. Maps with no change to the flood boundaries create an enormous burden for these parties. Therefore, we would recommend that FEMA contribute more time and funds toward the communication needed to smooth the impact of map modernization on the general public.

To do justice to the national investment in good flood risk maps, there may need to be some adjustment to the quantitative standards by which the program is evaluated. It may not be possible to complete the job in the originally projected five years. Based upon feedback from States which have formulated map modernization plans as partners with FEMA, the National Program Metrics which prescribes that 90% of the Nation's population will have adopted digital mapping by 2009, does not allow for the time or resources necessary to achieve the objective of providing accurate digital flood maps with updates for the entire country.

It has become clear to FEMA, industry stakeholders and state and local partners that the Map Modernization program is more complex, extensive, and costly than originally estimated. A number of the assumptions that FEMA made to produce the original cost and time estimates were shown to underestimate the scope of mapping needs, but became obvious only after the project began. For example, the need to retain the old maps for critical referencing data, and the need to address storage and accessibility requirements for these old maps within the new digitized format were not realized until the program was underway. Unfortunately, these types of unforeseen factors only become apparent after an initiative is underway and can lead to delays and cost increases.

The NFDA is concerned that all involved appear to be focused on fulfilling the program metrics rather than considering an adjustment of the time and money needed to produce accurate, digital maps based upon updated topographic, base data and updated flood studies. We would not want the new maps to be simply digital maps produced from the existing flood information. As a key stakeholder and primary user of FEMA's mapping products, the NFDA applauds FEMA's commitment to produce easier to use, easier to update digital maps. The NFDA however joins other trade organizations and individuals that compose the Flood Map Coalition in its concern that simply digitizing the existing maps does not address many of the real problems that exist with the present flood maps.

In addition, NFDA would also recommend that FEMA establish a stakeholder advisory group. It is essential that the map modernization process and product reflect the needs and requirements of map users for the reasons above. This could be modeled on the successful Technical Mapping Advisory Board established for five years as a result of the Flood Insurance Reform Act of 1994.

NFDA is concerned that Communities may not adopt newly released maps because they do not resolve their flood map problems or improve what they have currently. The homeowners (taxpayers) will be dissatisfied with spending nearly one billion taxpayer dollars for maps that fail to identify hazards and slow down or delay property transactions. Our concern is that these flood map problems may create a backlash that may occur that could impair future funding for technically correct maps.

It is important to note that as of this writing, our industry has seen no updated maps produced from the map modernization effort. We believe the first of those will be effective in September 2005. Once we receive these maps and begin to work with the new data, we will have more facts on which to base our opinions of whether map modernization is achieving its' goals. At this point, we would reserve the right to address this committee in the future about issues that may reveal themselves over the course of the next few months.

ASSOCIATION OF STATE FLOODPLAIN MANAGERS, INC.
2809 Fish Hatchery Road, Suite 204, Madison, Wisconsin 53713 www.floods.org
Phone: 608-274-0123 Fax: 608-274-0696 Email: asfpm@floods.org

TESTIMONY

Association of State Floodplain Managers, Inc.

before the
Subcommittee on Housing and Community Opportunity
House Committee on Financial Services

IMPLEMENTATION OF FEMA'S FLOOD MAP MODERNIZATION PROGRAM

presented by

James R. Williams, P.E., CFM,
Hydraulic Engineer, Nebraska Department of Natural Resources, and

Co-Chair, ASFPM Mapping and Engineering Standards Committee

July 12, 2005

INTRODUCTION

The Association of State Floodplain Managers, Inc. (ASFPM), and its 21 Chapters represent over 8,000 state and local officials and other professionals who are engaged in all aspects of floodplain management and hazard mitigation, including management, engineering, planning, community development, hydrology, forecasting, emergency response, water resources, and insurance. ASFPM members are concerned with working to reduce our nation's flood-related losses. Our state and local officials are the federal government's partners in implementing programs and working to achieve effectiveness in meeting our shared objectives. Many of our members are designated by their governors to coordinate the National Flood Insurance Program (NFIP). For more information on the Association, please visit http://www.floods.org.

The ASFPM is enthusiastic that the Committee has exercised its authority to monitor the implementation of FEMA's Flood Map Modernization Program. We are appreciative of Congress' support of the Map Modernization Program, which will result in many benefits to the nation. Thank you for inviting us to offer our views on the implementation of Map Mod. As requested by Chairman Bob Ney, in his letter dated July 1, 2005, the following testimony primarily addresses the following four items:

A. Map Modernization Importance, Expectations and Outcomes
B. Mapping Project Decisions and Competing Priorities
C. Topographic Information and Quality
D. Overall Mapping Strategy and Efficiency

The Mapping and Engineering Standards Committee of the ASFPM has identified five overarching concerns regarding Floodplain Map Modernization. These concerns will be addressed as part of our testimony on the four items identified above:

- Quality – floodplain maps should reliably depict flooding hazards.
- Scope – maps should adequately cover populated areas.
- Cost – mapping should be as efficient as possible, utilizing contributions from state and local partners.
- Communication – FEMA should continue to make a special effort to communicate with and provide training to all stakeholders.
- Map Maintenance – now is the time to begin discussing the ongoing maintenance of floodplain maps after the initial period of Floodplain Map Modernization.

A. MAP MODERNIZATION IMPORTANCE, EXPECTATIONS AND OUTCOMES

The importance of Floodplain Map Modernization cannot be understated. Flooding continues to be the nation's most costly natural hazard, and affects citizens in all geographic areas of the country.

Map Modernization must meet the expectations and vision originally laid out for the program. FEMA's 1997 "Modernizing FEMA's Flood Hazard Mapping Program: A Progress Report" indicated that FEMA's map modernization plan will improve map accuracy and completeness, map utility, map production, and public awareness (in that order). The plan identified that nearly 25,000 of 100,000 existing flood map panels would include flood data updates. It also indicated that flood hazard data would be developed for approximately 13,700 new flood hazard map panels for an estimated 2,740 flood prone communities without flood

hazard maps. All of this would occur at a projected cost of $1.1 billion (1997 dollars).

What were the expected results of the effort? The primary result was to be a set of maps that pass the "red face" test. In other words, maps that the public would have confidence in their accuracy, maps that wouldn't show a home 40 feet up a hillside as being in the floodplain. Map Modernization was to create a nationwide set of flood maps that would identify previously unidentified flood risks, and update the existing older flood studies that were no longer accurate. That was the original vision – one that FEMA proposed, Congress believed in, and a diverse Flood Map Coalition supported.

Today's vision has a different focus that could lead to a dramatically different outcome if not corrected. The current guidance document for Map Modernization, the Multiyear Flood Hazard Identification Plan (MHIP), identifies that FEMA, through Map Modernization, will: Network the nation using the latest internet technology to provide access to general flood hazard information; maximize the use of local state, and Federal resources and transfer ownership and use of maps and data to localities and states by building and maintaining effective partnerships; reduce processing time and cost of map updates; communicating with mapping partners; and continue to improve the quality and accuracy of national food hazard data (in order as published). Total cost of the mapping effort was identified at $1.25 billion.

The current vision is a seemingly subtle yet substantial change. The priority in the current vision is "accessible" and "reliable" flood maps. It is focused on having digital flood maps available to the public, and is much less focused on map quality than the 1997 vision was. What happens if what we do is simply create digital flood maps that are more readily available without

addressing updating the accuracy of the flood maps? We will have maps that will fail the "red face" test more quickly because the user was able to get the information faster over the Internet. We will not have addressed the fundamental expectation that the flood maps would be accurate, complete, and correct. Although there is now a quality standard in the MHIP that we fully support and applaud FEMA's efforts in placing it in the document, it will be difficult to meet it under the current program constraints.

The ASFPM submits that there isn't enough money to meet the expectations of Congress, the Map Coalition, and the original vision of Map Modernization. How did this happen? First, FEMA used the very best information it had when detailing the original Map Modernization vision. After it appeared that Congress was supportive of the program and it was in its earliest stages, FEMA also correctly requested that states develop "business plans" that identified the costs of map modernization in each state based on a needs assessment approach. An ASFPM analysis of the state business plans indicates that the state-projected cost of updating the flood maps was typically two to three times the funding allocated to the state in the MHIP. So, by extension, the ASFPM believes that Map Modernization is a $2-3 billion program. This is not the fault of FEMA—refined data showed a more accurate cost estimate—but the cost issue must be recognized as significant.

For the cost identified in the state business plans, the ASFPM believes that we can have a nationwide set of flood maps that meet the "red face" test. Flood maps that wouldn't necessarily be the top-of-the-line ("Cadillac") version, but they would be dependable, accurate, and generally reflective of the flood risk in a given area. So, a choice must be made now. The

ASFPM hopes that the Committee will continue to be committed to its original expected outcome: the result of Map Modernization should be that we have an accurate and complete set of flood maps nationwide that are digitally available and comparatively simple to maintain. This will require a dedication of resources beyond the 5-year funding period but will be well worth the investment.

Therefore, Flood Map Modernization should be primarily concerned with correcting existing maps or providing maps where none exist but are needed. Fixing the maps may include matching the flood data to existing topography, new studies to address developing areas, and/or addressing changes or mistakes that are not reflected on the current maps. Failure to address the current conditions of the maps can have significant impact on property owners by incorrectly identifying their flood risk. Those who are mistakenly identified as being located in a floodplain are required to carry flood insurance and may have significant regulatory restrictions placed on their properties. Conversely, there are property owners who are not identified as being in the floodplain but should be. Their risk will go unidentified until the maps are modernized, and will probably not have flood insurance if flooded.

The following example (Table 1) demonstrates the potential size of the problems due to incorrect maps. DuPage County, Illinois, is a small, urbanized county in suburban Chicago and is one of the counties that were completed during the first two years of Flood Map Modernization. While there still is a need perform new studies for much of the County, the level of risk is more correctly identified and the public is better protected from flood losses.

Table 1. Effects of Inaccurate Mapping, DuPage County, Illinois.

	Prior To Map Mod	After Map Mod
Total Tax Parcels	280,168	280,168
Parcels With Flood Risk	18,854	23,249
Parcels Incorrectly Located In Flood Zone	3,360	0
Parcels Incorrectly Located Out of Flood Zone	3,755	0

MAPPING PROJECT DECISIONS AND COMPETING PRIORITIES

Past priorities. Map modernization decisions for funding during FY2003 and FY2004 appeared to have been made primarily by FEMA Regional offices. These project decisions were driven primarily by FEMA's Key Performance Indicators (KPIs, formerly known as Mapping Metrics). Therefore, early mapping decisions were almost entirely based on population. State and local priorities appear to have been taken into account to a greater degree for contracting FY2005 funding.

In the past, FEMA has spent considerable effort collecting and reviewing state and local mapping priorities. During 2002 many states completed a Mapping Needs Assessment. During 2004 many states completed a Business Plan or Business Case, which was updated during 2005. These documents contained state mapping priorities. However, as stated above, state and local priorities appeared to be ignored, in favor of strict population-based allocations.

There are many factors that should be weighed when prioritizing Map Modernization projects. A population center with adequate (but older) maps should probably not have precedence over a rapidly-growing area with no map at all. In some cases, studies are best delayed until a particular dam or levee project is completed or a large-scale detailed study is

finished.

Preferred priorities. ASFPM supports past Congressional mapping directives and the mapping priorities listed in Federal regulations. Congress has repeatedly directed (as part of the original Flood Insurance Act, and certain subsequent reauthorizations) that all special flood hazards in the United States should be identified within a five-year period (42 USC Chapter 50 Section 4101). After the initial five-year identification period, an additional time frame was allotted for additional risk-based studies. Mapping priorities for risk-based floodplain studies, as listed in 44 CFR 59.23, include:

(a) Recommendations of State officials;
(b) Location of community and urgency of need for flood insurance;
(c) Population of community and intensity of existing or proposed development of the flood plain, the mudslide (i.e., mudflow) and the flood-related erosion area;
(d) Availability of information on the community with respect to its flood, mudslide (i.e., mudflow) and flood-related erosion characteristics and previous losses;
(e) Extent of State and local progress in flood plain, mudslide (i.e., mudflow) area and flood-related erosion area management, including adoption of flood plain management regulations consistent with related ongoing programs in the area.

During 2003 an ad hoc two-day meeting was held in Atlanta that included FEMA personnel and representatives of a large number of stakeholders groups. A ten-point project prioritization list, known as the *Atlanta Factors,* was assembled during the meeting. (The Atlanta Factors included the five regulatory factors listed above.) While the Atlanta Factors have often been mentioned in regard to project prioritization, they do not appear to have been utilized to date.

Future Priorities. ASFPM is supportive of FEMA's Multi-Year Flood Hazard Identification Plan (MHIP). One key achievement of the MHIP is that it is a long-range plan

guiding floodplain map updates. The MHIP is intended to be a rolling five-year plan, updated biannually.

Some of the KPIs that were in the initial MHIP (version 1) have been eliminated from the current MHIP (v. 1.5, DRAFT June 2005). These metrics are important to stakeholders because they recognized stakeholder contributions (also referred to as leverage). State and local contributions to Flood Map Modernization have been significant. Metrics that encourage State and local contributions should have an increased focus, and not be eliminated. The current MHIP indicates that an update to the funding allocation will not be included in this version of the MHIP. We strongly recommend that funding allocation be vetted with stakeholders prior to the next MHIP update.

Guidance for the scope of future projects needs to be developed as soon as possible. During the first years of Map Modernization populous counties were being mapped, and therefore all maps were published as countywide studies. During future years, counties with lower populations are going to be mapped, and there will be difficult decisions made regarding which flooding hazards should be addressed.

The project scope needs to address the levels of risk and address the needs of each situation. For example, it is probably not necessary for large portions of public lands (such as National Parks) to be mapped for flooding hazards. On the other hand, at a minimum, all incorporated communities should have any flooding hazards identified. Streams that have roads anywhere nearby should have a flood hazard map so that new development in the floodplain may be properly managed. Some individuals would argue that all incorporated communities deserve to

have published Base Flood Elevations and floodways either identified or updated.

A number of tools are available to provide a process for identifying the miles of stream that need to be mapped in a county during the current round of mapping. The national scope as listed in the MHIP should reflect which stream miles (or extent of a watershed) will be mapped under this initiative.

TOPOGRAPHIC INFORMATION AND QUALITY

Do 40-year-old topographic maps have value with regard to Map Modernization? They certainly do have value, primarily for restudying or digitizing Approximate Zone A studies. A complete answer requires some background information.

Quality is the cornerstone to the success of Flood Map Modernization. The initial key to quality is for the flood zones to match topography. This is referred to as *passing the red-faced test.* In other words, floodplains should not be mapped on the sides of hills while adjacent low areas are mapped as risk-free. In Section 7 of the MHIP FEMA has committed to ensuring the modernized maps are quality products. Flood Maps that do not meet the quality standards of Section 7 should not be considered modernized.

The problem is that some maps have been considered modernized, when the flood zones depicted *are not as accurate as the 40-year-old topographic maps.* As originally conceived, Map Modernization was to consist largely of digitizing existing maps. We now know that many earlier maps were not spatially accurate (to modern Geographic Information System standards). Therefore, a first test of accuracy is to compare the digitized flood zone with a topographic map. Another test is to compare the flood zone with a recent aerial photograph, to determine if stream channels have moved or been modified after the original map was created. Therefore, the requirement to match the best available topographic data should eliminate digitizing of spatially inaccurate maps.

Some study contractors have delineated flood zones based on digital elevation models

(DEMs). DEMs are an approximation of the USGS topographic maps, and are therefore not the best available topographic data. DEMs should not be used to delineate flood zones.

In rural areas without development pressure USGS topographic maps are usually adequate for delineation of Approximate Zone A areas. Within communities, or in areas of detailed studies, older topographic maps are usually not accurate enough.

Many communities and counties are contracting for better resolution topographic information that is being shared with the mapping program. Where available, this improved topographic information should always be utilized, rather than digitizing polygons based on older topography.

ASFPM is concerned that the Section 7 topographic compliance standard was not developed and implemented until late in Year 2 of Map Modernization. It may be that many studies completed in the first two years of Map Mod will not meet the quality standard and should not be identified as modernized. This will necessitate plans for modernizing these maps to bring them into compliance with the quality standards under a future map maintenance program.

OVERALL MAPPING STRATEGY AND EFFICIENCY

ASFPM is hopeful about the Floodplain Map Modernization program. The nation is already beginning to receive benefits from modernized maps, and we may expect the benefits to increase exponentially as the number of maps increases and better map delivery systems are implemented. In general, FEMA partnerships are working well and are providing great value to

the general public at risk for flooding. ASFPM also generally supports FEMA's strategy for Map Mod as described in the MHIP. However, we recommend that it clearly articulate that a primary goal of Map Modernization is accurate and complete flood maps. To do this the MHIP must identify the "true" cost of modernizing the nation's maps and lay out a longer term plan to achieve the original Map Modernization vision. The ASFPM would support the MHIP containing alternative scenarios and costs – running the gamut from doing nothing, to mapping every stream in the nation. This would show the relative value of the Map Modernization program.

Comprehensive Floodplain Map Modernization may not be complete in a total of five years. The five-year period of Map Mod is analogous to the 5-year period first identified in the original Flood Insurance Act. Modernizing existing maps does not recognize that the initial mapping of flood hazards was never finished. An additional five to ten years (at current funding levels) will be required to adequately complete risk-based studies (detailed studies) in areas where hazards are great and large populations are at risk. We need to get out ahead of development, identifying flood risks where populations are rapidly growing.

Long-term map maintenance procedures need to be addressed. One way to address long-term maintenance is to involve state and local partners. Many state and local governments have shown a long-term commitment to floodplain management. Because local government is responsible for land use management, developing floodplain maps that match local base mapping is crucial. In addition, they often have developed topographic mapping and infrastructure inventories of their bridges and culverts. Both are very important components of floodplain

mapping projects. Bridges and culverts and their associated roads often block flow significantly impacting upstream property owners.

FEMA may increase the quality of and shorten the time frame for studies if mechanisms for better communication with partners, including Cooperating Technical Partners (CTP), can be put in place. These partnerships provide real tangible benefits for local, state, and regional mapping partners and provide an avenue for insuring buy-in to Flood Map Modernization. There are numerous examples of CTPs from across the nation that have provided significant effort the Flood Map Modernization initiative. The CTPs offer multiple opportunities for cost savings and leverage.

CONCLUSION

Flood Map Modernization is here, it is exciting, and the ASFPM stands committed to assist FEMA to make the program successful. At the same time Map Modernization is at a crossroads. It is up to this Committee, the Congress, OMB, and the Department of Homeland Security to ensure that Map Modernization is fully funded and that the original vision – which is achievable – is kept. The bottom line question is are you and your constituents satisfied with the mapping products? If we continue with the current scope (dollars and time) we will not modernize the nation's flood maps. The ASFPM as well as the broader Flood Map Coalition recognizes the need to have the nation's flood maps modernized for all its users.

Thank you for the opportunity to provide our thoughts on these important issues. The ASFPM and its members look forward to working with you as we move towards a common goal

of reducing flood losses.

For more information, contact:

Larry Larson, Executive Director, (608) 274-0123, (larry@floods.org), or

Rebecca Quinn, Legislative Officer, (410) 267-6968 (rcquinn@earthlink.net), or

Pam Pogue, ASFPM Chair, (401) 462-7048, (pam.pogue@ri.ngb.army.mil).

Jim Williams, Mapping & Engineering Standards Committee Co-Chair, (402) 471 – 3936, (jwilliams@dnr.state.ne.us).

NATIONAL ASSOCIATION OF REALTORS®

The Voice For Real Estate®

500 New Jersey Avenue, N.W.
Washington, DC 20001-2020
202.383.1194 Fax 202.383.7580
www.realtors.org/governmentaffairs

Al Mansell, CRB
President

Terrence M. McDermott
EVP/CEO

GOVERNMENT AFFAIRS
Jerry Giovaniello, Senior Vice President
Walter J. Witek, Jr., Vice President

STATEMENT OF THE NATIONAL ASSOCIATION of REALTORS®

Submitted To
The House Financial Services Committee
Housing and Community Opportunity Subcommittee

On
The Floodplain Maps and the National Flood Insurance Program

July 12, 2005

REALTOR® is a registered collective membership mark which may be used only by real estate professionals who are members of the NATIONAL ASSOCIATION OF REALTORS® and subscribe to its strict Code of Ethics.

EQUAL HOUSING OPPORTUNITY

Thank you for the opportunity to submit a statement presenting the views of the NATIONAL ASSOCIATION of REALTORS® (NAR) on the National Flood Insurance Program (NFIP) and the flood map modernization initiative. The more than 1.2 million members of NAR wish to thank Chairman Ney for holding this hearing on a subject that is of great importance to REALTORS®.

It is often said that REALTORS® don't sell homes, we sell communities. The members of the NATIONAL ASSOCIATION of REALTORS® are concerned and active members of our communities. We recognize and support the important role the National Flood Insurance Program plays in managing the risk of flooding which affects so many of our communities.

The NFIP is a unique partnership between three levels of government. It enables property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. As a result, federal expenditures for disaster assistance and flood control are reduced.

The National Flood Insurance Program partners with over 19,000 communities nationwide and holds 4.4 million policies representing $623 billion in insurance coverage. It provides over 90% of all flood insurance nationwide and close to 100% of flood insurance coverage for individually-owned properties and small- to mid-size commercial properties. Ninety-one insurance companies write flood insurance, either under the Write Your Own program or through direct sales. In FY 2002, the program generated $1.4 billion in written premiums, with an average premium of $393, average coverage of $142,204, and an average pay out of $24,551. By providing affordable flood insurance that is unavailable in the private market, the NFIP helps our citizens achieve the American dream of homeownership.

There are two issues concerning the National Flood Insurance Program that are important to the real estate industry:

1. A financially solvent and actuarially rigorous NFIP; and
2. The value of updated and modernized floodplain maps.

A Financially Solvent and Actuarially Rigorous NFIP

Given the importance of the NFIP in communities across the country, it is critical that the program remains on a stable financial and actuarial foundation. Congress, FEMA and industry stakeholders, working together, can make a number of changes to ensure this program rests on a solid footing well into the future.

Phasing out repetitive loss properties is a critical component of a comprehensive strategy to ensuring a healthy NFIP. Currently, 45,000 insured properties nationwide have incurred two or more flood losses over a ten-year period. These properties cost the flood insurance program over $200 million annually. The top 10,000 structures alone cost the program over $65 million annually.

Repetitive loss properties inflict serious economic harm to the flood insurance program by driving up the premiums for all other policyholders, and by allowing the entire system to rest upon an unsustainable actuarial foundation. These properties are not paying premiums that adequately reflect their exposure to the risk of flooding.

NAR applauds Congress for addressing the issue of repetitive loss properties by passing the Flood Insurance Reform Act in the summer of 2004. However, for this Act to be effective, Congress must fully fund the Repetitive Loss Pilot Program that was promulgated in that legislation. This Pilot Program will ensure that the "worst-of-the-worst" repetitive loss properties are phased out of the program.

Floodplain Maps

Our second area of concern is FEMA's Flood Insurance Rate Maps. Flood maps determine whether a property is located in a floodplain, and thus whether flood insurance is required in order to secure a mortgage. When maps are inaccurate, properties incorrectly included in a floodplain are unnecessarily required to have flood insurance coverage. Similarly, properties incorrectly excluded from a floodplain are exposed to flood risk without the benefit of insurance coverage. During a property transaction, correction of an inadvertent inclusion - through FEMA's Letter of Map Amendment process - adds unnecessary cost and delay to the transaction.

Flood maps serve a number of other important functions. The National Oceanographic and Atmospheric Administration estimates that the cost of flood damage in the 1990s exceeded $5 billion annually, with an average of 100 deaths per year due to flooding. To limit the costly impact of floods, flood maps help communities develop flood management strategies, implement more effective land use and building codes, develop disaster preparedness plans, and incorporate disaster planning into regional economic development strategies.

Currently, FEMA is in the middle of an initiative to modernize its floodplain maps by replacing the existing paper maps with computerized maps that are more accurate, more accessible, and easier to keep current. FEMA's map modernization program goes beyond simple replacement of paper maps with digital ones. Digital technology will allow FEMA to collect new and better data.

NAR was pleased that Congress recognized the importance of accurate and dependable floodplain maps and provided FEMA with an additional $200 million in FY 2003, '04 and '05 to initiate its map modernization program. That is just the beginning, however, and additional funds are needed. For FY 2006, FEMA has requested $200 million to continue its map modernization program. We strongly encourage Congress to appropriate the full amount so that FEMA can continue this important project.

However, this map modernization program must be completed the right way. Because the FIRMs form the basis of the National Flood Insurance Program and play a vital role in keeping our communities safe from flooding, it is imperative that these maps are accurate. Unfortunately, given the current timeframe for completion and limited resources, we are concerned that FEMA may be sacrificing quality for quantity by updating as many maps as possible instead of updating the maps in a technologically and scientifically sound manner.

A key parameter for evaluating the initiative was progress toward a goal of mapping 100% of the population in five years. Yet, as the Map Modernization Initiative has proceeded, it has become clear to FEMA and state, local and industry stakeholders that the project is more complex, extensive, and costly than originally estimated. A number of the assumptions that FEMA made to produce the original cost and time estimates underestimated the scope of mapping needs, but became obvious only after the project began. For example, it was not until the project had moved forward that all stakeholders appreciated the need to retain the old maps for critical referencing data, and needed to address storage and accessibility requirements for these old maps within the new digitized format. These are the kinds of unforeseen factors that become apparent after a project has started, and can lead to delays and cost increases.

In some areas of little growth, the existing data may continue to be accurate. In many areas, it is not. Some early maps have caused concern because the floodplain does not match the existing topographic data. Creating, digitizing and making available inaccurate maps fails to solve the initial problems associated with outdated maps and will continue to have far-reaching implications. First, communities will remain at risk and its citizens will be placed in harm's way if a flood map identifies the floodplain and its associated landforms incorrectly. Communities will balk at adopting these maps, because they do not resolve their flood map problems or improve what they have currently. Taxpayers will be dissatisfied with spending nearly one billion taxpayer dollars for maps that fail to identify hazards and slow down or delay property transactions. When Congress becomes aware of these flood map problems, a backlash may occur that could impair future funding for technically correct maps.

The first of the modernized (but not necessarily updated) flood maps are beginning to come out of the pipeline, and FEMA estimates that maps covering areas that are home to 80 million people will be released by the end of September, 2005. After extensive discussion with members of the National Flood Map Modernization Coalition, FEMA has adopted a quality assurance procedure that provides for matching the best available topographic data or reflects current conditions, for all the maps going forward.

NAR believes a three-pronged approach is the best way to focus on the concerns regarding FEMA's Map Modernization project.

- The timeframe for creating and digitizing the new maps needs to be adjusted. Instead of mapping 100% of communities in the first five years of the program, which could mean rushing the process and producing inaccurate maps, FEMA should refocus on mapping a smaller percent of the most at-risk communities with high quality maps. As new surveys and engineering studies are more expensive and time-consuming than digitizing existing data, this refocusing strategy will require additional time to complete all of the necessary updates but will ensure a better quality output. The objectives of an extended map modernization program can be fulfilled at the current level of annual funding if those annual appropriations are allowed to be extended over a longer period of time.

- The maps that need to be updated should be reprioritized. FEMA should conduct a new prioritization process to determine which maps need to be restudied, and when. Not all stream miles in all communities will need to be studied, nor will all the hydrologic/ hydraulic data need to be updated. In addition, a reprioritization process will create efficiencies in the program that will help create new maps where they are needed most.

- Maps issued prior to the implementation of the quality assurance standard will need to be re-evaluated and completed to ensure the data they contain is the most updated and accurate.

Thank you for allowing the NATIONAL ASSOCIATION of REALTORS® an opportunity to share our views on the National Flood Insurance Program. We urge the Subcommittee to undertake a bi-partisan effort and pursue improvements that will strengthen the program and make it even more effective. We look forward to working with you in support of this effort.

United States Government Accountability Office
Washington, DC 20548

February 24, 2006

The Honorable Robert Ney
Chairman
Subcommittee on Housing and Community Opportunity
House Committee on Financial Services

Dear Mr. Chairman:

During a hearing before the Subcommittee regarding Flood Map Modernization and the Future of the National Flood Insurance Program (NFIP) on July 12, 2005, I promised to provide the following additional information for the hearing record.

On June 30, 2004, President Bush signed into law the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (FIRA), Pub. L. No. 108-264, to reauthorize the NFIP through September 30, 2008. Section 102 of the law provided for the creation of a pilot program for mitigating flood damage to severe repetitive loss properties.

Under the law, a severe repetitive loss property (SRLP) is defined as an NFIP-insured single-family property that meets one of two triggers: four or more claims of at least $5,000 that cumulate (total) to more than $20,000; or at least two claims with the cumulative amount exceeding the value of the property. FEMA is required to define by regulation SRLP for multi-family properties.

FIRA authorized FEMA to provide financial assistance to participating states and communities to carry out mitigation activities or to purchase severe repetitive loss properties. During the pilot program, policyholders who refuse a mitigation or purchase offer that meets program requirements would be required to pay increased premium rates. Specifically, the premium rates for these policyholders would increase by 150 percent following their refusal and another 150 percent following future claims of more than $1,500, up to the applicable actuarial premium rate for the property.

In addition, the National Flood Insurance Reform Act of 1994, Pub. L. No. 103-325, established a general prohibition against the provision of federal disaster relief assistance made available in a flood disaster area to make a payment (including any loan assistance payment) to a person for repair, replacement, or restoration for damage to any personal, residential, or commercial property if that person at any

time has received flood disaster assistance that was conditional on the person first having obtained flood insurance under applicable federal law and subsequently having failed to obtain and maintain flood insurance as required under applicable Federal law on such property. The provision is codified at 42 U.S.C. § 5154a.

Sincerely yours,

William O. Jenkins, Jr.
Director
Homeland Security and Justice Issues

Response to Question from Congressman Stevan Pearce
House Subcommittee on Housing and Community Opportunity
Hearing on FEMA's Mapping Modernization Program
July 12, 2005

Representative Pearce appears to be referring to a minimum threshold of $1 million in damages to public facilities as one of the criteria considered in evaluating a request for a major disaster declaration and eligibility for assistance under FEMA's Public Assistance Program. 44CFR §206.48, **Factors considered when evaluating a Governor's request for a major disaster declaration,** outlines the primary factors considered. The portion of that regulation relevant to Representative Pearce's question appears below:

When we review a Governor's request for major disaster assistance under the Stafford Act, these are the primary factors in making a recommendation to the President whether assistance is warranted. We consider other relevant information as well.

(a) *Public Assistance Program.* We evaluate the following factors to evaluate the need for assistance under the Public Assistance Program.

(1) *Estimated Cost of Assistance.* We evaluate the estimated cost of Federal and non-federal public assistance against the statewide population to give some measure of the per capita impact within the State. We use a figure of $1 per capita as an indicator that the disaster is of such size that it might warrant Federal assistance, and adjust this figure annually based on the Consumer Price Index for all Urban Consumers. We are establishing a minimum threshold of $1 million in public assistance damages per disaster in the belief that we can reasonably expect even the lowest population States to cover this level of public assistance damage.

The $1 million threshold is only one of several factors used in evaluating a request for Federal assistance under FEMA's Public Assistance Program. Other factors considered include the impact of the disaster at the county and local government level, the amount of insurance coverage in force, the extent to which State and local government contributed to disaster damage reduction, disaster history within the last 12-month period, and the availability of other Federal agency programs.

Response to Question from Congressman Robert Ney
House Subcommittee on Housing and Community Opportunity
Hearing on FEMA's Mapping Modernization Program

	MMMS FY04	MMMS FY05	July 12, 2005 Best Practices FY05	FY04 KPI 4 (Funds sent to CTPs from FEMA by State)	FY05 KPI 4 (Funds sent to CTPs from FEMA by State)	State Totals
Region 1	**$600,000**					
Connecticut	**$100,000**	$102,000	$0	$0	$0	**$202,000**
Maine	**$100,000**	$140,000	$50,000	$220,000	$215,000	**$725,000**
Massachusetts	**$100,000**	$0	$0	$210,000	$0	**$310,000**
New Hampshire	**$100,000**	$183,000	$0	$739,838	$355,821	**$1,378,659**
Rhode Island	**$100,000**	$75,000	$0	$0	$0	**$175,000**
Vermont	**$100,000**	$100,000	$0	$0	$99,840	**$299,840**
Region 2	**$400,000**					
New Jersey	**$100,000**	$100,000	$0	$0	$0	**$200,000**
New York	**$100,000**	$175,000	$0	$2,000,000	$2,000,000	**$4,275,000**
Puerto Rico	**$100,000**	$75,000	$0	$0	$0	**$175,000**
US Virgin Islands	**$100,000**	$50,000	$0	$0	$0	**$150,000**
Region 3	**$600,000**					
DC	**$100,000**	$30,000	$0	$0	$0	**$130,000**
Delaware	**$100,000**	$100,000	$0	$181,000	$100,000	**$481,000**
Maryland	**$100,000**	$200,000	$0	$2,399,000	$480,000	**$3,179,000**
Pennsylvania	**$100,000**	$70,000	$0	$1,127,000	$650,000	**$1,947,000**
Virginia	**$100,000**	$100,000	$0	$1,425,000	$550,000	**$2,175,000**
West Virginia	**$100,000**	$100,000	$0	$0	$730,000	**$930,000**
Region 4	**$1,100,000**					
Alabama	**$137,500**	$200,000	$120,000	$3,166,000	$3,996,000	**$7,619,500**
Florida	**$137,500**	$528,000	$220,000	$4,455,000	$6,412,000	**$11,752,500**
Georgia	**$137,500**	$150,000	$60,000	$2,458,000	$3,153,570	**$5,959,070**
Kentucky	**$137,500**	$150,000	$0	$366,000	$2,570,000	**$3,223,500**
Mississippi	**$137,500**	$156,000	$79,000	$2,567,000	$3,324,000	**$6,263,500**
North Carolina	**$137,500**	$280,578	$80,000	$13,816,000	$9,289,000	**$23,603,078**
South Carolina	**$137,500**	$149,534	$120,000	$3,256,000	$4,117,000	**$7,780,034**
Tennessee	**$137,500**	$86,000	$0	$0		**$223,500**

Response to Question from Congressman Robert Ney
House Subcommittee on Housing and Community Opportunity
Hearing on FEMA's Mapping Modernization Program

	MMMS FY04	MMMS FY05	July 12, 2005 Best Practices FY05	FY04 KPI 4 (Funds sent to CTPs from FEMA by State)	FY05 KPI 4 (Funds sent to CTPs from FEMA by State)	State Totals
Illinois	**$100,000**	$100,000	$0	$1,135,000	$3,184,585	**$4,519,585**
Indiana	**$100,000**	$100,000	$111,100	$1,079,000	$2,509,363	**$3,899,463**
Michigan	**$100,000**	$100,000	$0	$1,389,000	$205,000	**$1,794,000**
Minnesota	**$100,000**	$100,000	$112,695	$465,000	$1,288,526	**$2,066,221**
Ohio	**$100,000**	$100,000	$0	$90,000	$99,958	**$389,958**
Wisconsin	**$100,000**	$100,000	$0	$1,808,000	$551,190	**$2,559,190**
Region 6	**$300,000**					
Arkansas	**$60,000**	$122,500	$0	$0	$399,000	**$581,500**
Louisiana	**$60,000**	$0	$0	$363,000	$0	**$423,000**
New Mexico	**$60,000**	$122,500	$0	$348,000	$0	**$530,500**
Oklahoma	**$60,000**	$122,500	$0	$150,000	$0	**$332,500**
Texas	**$60,000**	$132,500	$0	$8,076,000	$1,390,000	**$9,658,500**
Region 7	**$400,000**					
Iowa	**$0**	$0	$0	$0	$0	**$0**
Kansas	**$133,333**	$133,333	$0	$1,789,360	$1,419,180	**$3,475,206**
Missouri	**$133,333**	$133,333	$100,000	$0	$1,005,842	**$1,372,508**
Nebraska	**$133,333**	$133,334	$0	$491,000	$757,924	**$1,515,591**
Region 8	**$600,000**					
Colorado	**$100,000**	$281,490	$0	$1,482,770	$2,017,317	**$3,881,577**
Montana	**$100,000**	$105,628	$0	$0	$878,386	**$1,084,014**
North Dakota	**$100,000**	$141,950	$0	$0	$1,382,263	**$1,624,213**
South Dakota	**$100,000**	$52,082	$0	$0	$396,413	**$548,495**
Utah	**$100,000**	$120,000	$0	$0	$971,351	**$1,191,351**
Wyoming	**$100,000**	$78,850	$0	$390,000	$0	**$568,850**
Region 9	**$400,000**					
America Samoa	**$0**	$0	$0	$0	$0	**$0**
Arizona	**$100,000**	$120,000	$0	$49,000	$1,000,000	**$1,269,000**
California	**$100,000**	$240,000	$100,000	$3,484,000	$103,982	**$4,027,982**

Response to Question from Congressman Robert Ney
House Subcommittee on Housing and Community Opportunity
Hearing on FEMA's Mapping Modernization Program

	MMMS FY04	MMMS FY05	July 12, 2005 Best Practices FY05	FY04 KPI 4 (Funds sent to CTPs from FEMA by State)	FY05 KPI 4 (Funds sent to CTPs from FEMA by State)	State Totals
Hawaii	**$100,000**	$120,000	$0	$0	$0	**$220,000**
Nevada	**$100,000**	$120,000	$0	$0	$0	**$220,000**
Northern Mariana Islands	**$0**	$0	$0	$0	$0	**$0**
Region 10	**$400,000**					
Alaska	**$100,000**	$75,000	$0	$357,000	$45,000	**$577,000**
Idaho	**$100,000**	$80,000	$0	$0	$0	**$180,000**
Oregon	**$100,000**	$120,000	$120,000	$50,000	$100,000	**$490,000**
Washington	**$100,000**	$125,000	$0	$1,715,000	$1,954,150	**$3,894,150**
				Total		**$136,051,536**