



**Testimony of  
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on behalf of  
MAPPS  
before the  
Subcommittee on Housing and Community Opportunity  
House Committee on Financial Services  
Hearing on  
H.R. 1682, The Flood Insurance Reform and Modernization Act of 2007  
June 12, 2007**

Madam Chairman, members of the Subcommittee, I am Dave Maune, a member of MAPPS, a national trade and professional association of more than 160 of the nation's leading mapping, geospatial and geographic information firms. MAPPS member firms span the entire spectrum of the geospatial community, including Member Firms engaged in surveying, photogrammetry, satellite and airborne remote sensing, aerial photography, hydrography, aerial and satellite image processing, GPS, and GIS data collection and conversion services. MAPPS also includes Associate Members, which are companies that provide hardware, software, products and services to the geospatial profession in the United States and other firms from around the world.

I am a Remote Sensing Project Manager for Dewberry in Fairfax, VA. We are a major user of digital elevation data, and I personally specialize in independent quality assurance/quality control of digital elevation data produced by others. I previously served 30 years as an Army officer in the U.S. Army Corps of Engineers where I last served as Director of the U.S. Army Topographic Engineering Center at Fort Belvoir, VA. I previously served as a principal author of Appendix A, *Guidance for Aerial Mapping and Surveying*, to FEMA's "Guidelines and Specifications for Flood Hazard Mapping Partners." I recently served as a member of the National Research Council's Committee on Floodplain Mapping Technologies. And I serve on the MAPPS Task Force that has been reviewing the FEMA flood mapping program.

H.R. 1682, the Flood Insurance Reform and Modernization Act of 2007, overhauls the National Flood Insurance Program (NFIP) and, among other things, directs FEMA to develop more comprehensive and updated flood maps and ensure they reflect accurate risks to home owners.

H.R. 1682 is a good start in addressing reforms within the NFIP. While MAPPs supports many of the provisions in H.R. 1682, we have developed a series of reforms we believe will help make the program run more efficiently, and most importantly, will ensure accurate mapping data reaches those entities and individuals impacted everyday. We urge their inclusion in H.R. 1682, or other legislation the Committee develops to reform the nation's flood mapping effort.

The full listing of MAPPs recommendations may be found at the end of this testimony. Permit me to highlight a few major points --

- Where needed, FEMA should collect accurate ground elevation data using the latest, state-of-the-art commercial geospatial technologies. Language should also provide that hydrologic and hydraulic (H&H) modeling be created to support all flooding sources.
- FEMA should re-establish the Technical Mapping Advisory Council (TMAC). Membership should include individuals from the private sector topographic mapping profession.
- FEMA should be permitted to access the Master Address File (MAF) maintained by the Census Bureau for floodplain management, as well as disaster response.
- FEMA should place a new emphasis on vertical positioning, lowest floor and lowest adjacent grade (LAG) elevations, in addition to the traditional focus on horizontal (latitude and longitude) coordinate data.
- FEMA should create a National Levee Inventory with a "geospatial" component – X, Y and Z geo-referenced coordinate data – included for each levee in the inventory.
- FEMA should transform the program to fully embrace digital products with the goal of eliminating paper products by 2010.

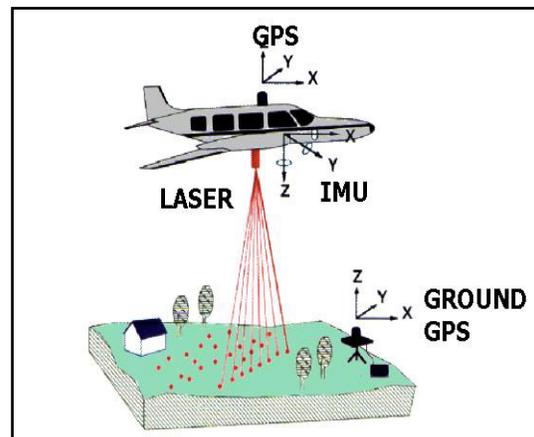
The National Research Council study report, soon to be published in final form, supports the objectives of H.R. 1682 by:

1. Identifying the current mapping technologies being used by FEMA to develop flood hazard maps;
2. Identifying mapping technologies that are currently available; and
3. Determining if newer technologies are appropriate and would be of additional benefit to floodplain mapping.

Before going any further today, I would like to provide background information, including explanations of terminology that I will use:

- "Topography" is elevation data normally expressed in terms of topographic contours or digital elevation models.
- "Contours" are lines of equal elevation drawn on a topographic map. If any member of this subcommittee ever served in the Army or Marine Corps, you probably took a course in map reading and learned how to read contours so that you could visualize the shape of the terrain, determine slopes, and use your understanding of the terrain to your advantage.

- The “contour interval” determines how accurate the elevations are; 90% of tested elevations are accurate within one half the contour interval.
- 1-ft contours are twice as accurate as 2-ft contours; 2-ft contours are twice as accurate as 4-ft contours, etc.
- Computers don’t read or interpret contours. Instead, computers use various forms of digital elevation models (DEMs) for such things as hydrologic modeling of watersheds and hydraulic modeling of floodplains. The accuracy of DEMs can still be expressed in terms of their equivalent contour interval accuracy where 90% of test points are accurate within one-half the contour interval.
- For flood hazard mapping, FEMA has guidelines and specifications for elevation data equivalent to 2-ft contours in flat floodplains and 4-ft contours for floodplains in hilly to mountainous terrain.
- For decades, elevation data, including contour lines, were mapped using aerial photography and a technology called “photogrammetry.”
- Today, high density digital elevation model data points are produced by a technology called LiDAR (Light Detection and Ranging), an aerial mapping technology that emits over 100,000 laser pulses per second to map the bare earth terrain beneath the trees, as well as tops of trees and buildings. It is common to have LiDAR points so dense that there is approximately one elevation point for every square meter on the ground. Multiple technologies enable these ground elevations to be very accurate.
- A DFIRM is a Digital Flood Insurance Rate Map.



FEMA routinely uses LiDAR data whenever such data are available. FEMA’s goal is to make reliable flood maps as efficiently as possible. In many cases the FEMA lead determines that the best use of the budget is to focus on the flood data update rather than the new elevation data. But when the elevation data is poor and the flood risk is very high, FEMA will fund the collection of new elevation data as part of a study. FEMA’s funding is focused on hydrologic and hydraulic modeling and DFIRM production and procession, so FEMA usually uses the “best available” elevation data. Other federal agencies have the mission and technical expertise to provide basic mapping services including topography, but they too lack the funding necessary to produce and maintain accurate mapping data.

With further regard to the National Research Council’s evaluation of FEMA’s use of technology for flood hazard mapping, the NRC panel concluded that FEMA effectively uses technology, including LiDAR data; but for the most part FEMA is an elevation data user – not an elevation data producer. Furthermore:

- Our Nation’s “best available” elevation data are inadequate to support many of FEMA’s Flood Map Modernization requirements, as specified in Appendix A, *Guidance for Aerial Mapping and Surveying*, to FEMA’s “Guidelines and Specifications for Flood Hazard Mapping Partners.”
- Many “best available” elevation datasets do not satisfy FEMA’s needs for accuracy and currency.
- Based on considerable testimony, we believe that FEMA needs elevation data that are reasonably up-to-date; accurate to 4-ft contours in hilly to mountainous terrain; accurate to 2-ft contours in most other areas (minus sparsely populated areas of low priority); and accurate to 1-ft contours in very flat coastal or inland floodplains, including areas subject to subsidence. For hurricane storm surge and evacuation planning, Florida is currently acquiring LiDAR data equivalent to 1-ft contours in the flat coastal areas of that state; 2-ft contours are simply not accurate enough for such areas “flat as a pancake.” Determining what is “reasonably up-to-date” requires informed judgment on a variety of factors.
- Solutions would require significant expense for those agencies (Federal, state, and local) responsible for acquiring/producing such elevation data.
- *Elevation for the Nation* is needed and would have many beneficial uses beyond floodplain mapping and mapping. There are hundreds of users, other than FEMA, who similarly need elevation datasets that are more accurate and up-to-date than data in the National Elevation Dataset – often decades old and accurate to 10-ft contours instead of the 2-ft or 4-ft contours needed.

Our major recommendations are as follows:

1. *Elevation for the Nation* should employ LiDAR as the primary technology for digital elevation data acquisition. LiDAR is the technology most capable of producing the (bare-earth) elevation accuracy that meets FEMA’s requirements for national floodplain mapping in all terrain types (while simultaneously satisfying other user requirements as well). The panel also acknowledged there are other technologies that can also contribute to the effort.
2. A seamless nationwide elevation model produced with LiDAR has application beyond the FEMA Map Modernization program. As part of *Elevation for the Nation*, federal, state, and local mapping partners should have the option to request “buy up” data that exceed minimum specifications if they pay the additional cost of data collection and processing required to achieve higher accuracies.
3. The new data collected in *Elevation for the Nation* should be disseminated to the public as part of an updated National Elevation Dataset maintained by the U.S. Geological Survey (USGS).

Following the release of the draft NRC study in January of 2007, USGS hosted a forum focused on obtaining *LiDAR for the Nation*. Participants included members of the National Digital Elevation Program (NDEP) as well as many others. Participants were unanimous in agreeing to the need for *LiDAR for the Nation*. The major issues are: (1) who should acquire and maintain the data? ... and how do we pay for it? No single agency has the funding for such a nationwide LiDAR mapping program, although all participants see the need for such a vital program.

There is a tier of federal producers and/or users who have legitimate but unfunded needs for elevation data equivalent to 5-ft contours. These include USGS and perhaps the USFS, BLM, USDA/NRCS, and NASA. Could and should these agencies obtain funding authorizations and appropriations necessary to map the entire U.S. with LiDAR data accurate to 5-ft contours? What would this cost?

Next, there is a tier of federal, state and local producers and/or users who have legitimate needs for elevation data equivalent to 2-ft contours, but only in areas that are relatively flat. These include FEMA and USACE for flat floodplains, NOAA for coastal areas, NGA for 133 cities, and some states. Note: North Carolina has already paid for statewide LiDAR data accurate to 2-ft contours, and several other states have similar programs in progress. Could and should FEMA, NOAA, USACE and NGA obtain authorizations and appropriations necessary to pay the additional costs for “buy up” from 5-ft to 2-ft contour accuracy? What would this cost? FEMA cannot afford to take this “out of hide. They need every penny of their proposed appropriated funds for their engineering analyses. However, if FEMA received additional funding specifically for this purpose, they would be in a position to provide USGS (or whoever is responsible) with funding to influence decisions on where to upgrade from 5-ft to 2-ft contours. Without any contributions to NDEP funding, FEMA is in no position to influence “buy up” decisions needed to ensure elevation data satisfy FEMA requirements for accuracy and currency.

Lastly, there is another tier of users who need elevation data equivalent to 1-ft contours. They should only have to pay the differential costs between 1-ft accuracy and 2-ft or 5-ft accuracy data required by others listed previously. Florida is currently acquiring LiDAR data equivalent to 1-ft contours along coastal areas, and California is doing so for subsidence areas in the Central Valley.

Although funding options such as this are currently under consideration by the NDEP participants, it is clear that FEMA needs elevation data better than the best currently available. Other federal agencies need funding to support *LiDAR for the Nation*, and FEMA needs additional funding to “buy up” in selected areas where higher accuracy elevation data are needed. Under no circumstances should FEMA be expected to pay for such LiDAR data “out of hide” because that would undermine the effective steps that FEMA is already taking to modernize its flood hazard maps.

Perhaps it would be “cleanest” for everyone if the members of the National Digital Elevation Program would come up with a total cost estimate to acquire *LiDAR for the Nation* to satisfy the total needs for initial acquisition and subsequent maintenance of such data at the required levels of accuracy. The National Academy of Sciences study already proposed a methodology for determining areas with different accuracy needs. OMB would need to propose a total funding package to avoid the need for perhaps 10 federal agencies working with 10 congressional committees to justify funding for 10 parts of the total package, especially when many of those requirements are duplicative. We would be most effective and efficient if we had a total package, rather than piecemealed parts thereof.

In conclusion, FEMA is doing an excellent job with resources available. They are attempting to map the 500-year floodplain, to map risks to those behind levees and those downstream from dams that could fail. Anything that Congress can do to get FEMA the accurate and current elevation data they need will support the overall objective to more-accurately map the true flood risks to home owners.

But there are additional improvements when MAPPS recommends, beyond elevation data and the funding to support that effort.

H.R. 1682 includes a provision, in Section 21, regarding Flood Insurance Rate Maps (FIRM) that directs the FEMA Director to establish a program within FEMA to review, update, and, maintain Flood Insurance Program Maps. However, Section 21 omits language regarding topographic data accuracy and the use of modern commercial geospatial technologies to satisfy FEMA standards and requirements. MAPPS suggests that language be added to this provision providing for FEMA to work with the U.S. Geological Survey and other Federal agencies for their collection of accurate ground elevation data utilizing technologies to include but not to be limited to LiDAR, IFSAR, Photogrammetry or other commercial geospatial technologies. The language should also provide that hydrologic and hydraulic (H&H) modeling be created to support all flooding sources, which can be automated and easily updated as changes occur. “Accurate ground elevation data” should be defined as data that meets the requirements of Appendix A, *Guidance for Aerial Mapping and Surveying*, to FEMA’s “Guidelines and Specifications for Flood Hazard Mapping Partners.” This provides some guidance and standards for FEMA with regard to focusing on the professional and technical accuracy of data, rather than an arbitrary control on the age of data. In some cases, older data is adequate, if it meets the standard in Appendix A. In other cases, the collection of new data is needed if the existing data is not adequate to meet the accuracy standard. Whereas FEMA is a user of accurate topographic data for the most part, the U.S. Geological Survey, National Oceanic and Atmospheric Administration, and U.S. Army Corps of Engineers have the expertise and mission to provide such topographic data, but they too lack the requisite funding.

H.R. 1682 includes a provision, in Section 21, to re-establish the Technical Mapping Advisory Council (TMAC). However, the listing found in Section 21 does not include representation on the TMAC by individuals representing mapping and engineering organizations. MAPPS supports the re-establishment of the TMAC. Membership should include individuals from the private sector topographic mapping profession.

FEMA should investigate means for presenting flood risks to individual homeowners based on the elevations of their lowest adjacent grade (LAG) and/or lowest floor elevations compared with water surface elevations computed for standard flood frequencies. By showing the probability of flooding to various depths for individual structures, we believe many more homeowners would recognize that their risk of flooding is serious and may even be more probable than their risk from other hazards (e.g., fire). LiDAR technology, in particular, is ideal for determining the elevations of

LAG elevations for automated comparison with water surface elevations for 100-year and 500-year floods that have 1% and 0.2% annual chance of occurring each year.

The following are not specific to H.R. 1682, but are important recommendations from the MAPPS Task Force which we believe will help address issues important to the success of the FEAM flood mapping effort.

In New Orleans, flooding was so severe that the utility of aerial photography and satellite imagery use could have been greatly enhanced if the Title 13 address privacy restrictions were not in place. Imagery acquired immediately after Katrina showed that road network maps were rendered virtually useless, as the imagery showed only rooftops. Emergency response (by boat or helicopter, due to the inundation of roads) was hampered by the lack of an accurate address map layer, which could have been overlaid on the imagery to give first responders valuable information as to the location of people in need. The accurate address map layer and data was in the possession of Census, but the Title 13 restriction prohibited the sharing of this data between Census and FEMA, creating a hurdle in a life and death situation. FEMA should consult with the Census Bureau and the private geospatial community to determine whether the Title 13 restriction on Census address data can be revised in an emergency response situation, to permit first responders access to Census address data for life saving activities in a declared emergency, or whether the restriction is generally no longer needed.

To facilitate the above recommendation, Congress should remove the Title 13 restriction on FEMA's use of the Census Master Address File (MAF) data to link street addresses to geographic coordinates of structures with known LAG elevations. This would assist FEMA by better identifying flood risk, improving the flood insurance coverage rate, and enhance flood insurance processing. It would also improve emergency response by allowing first responders to access the data for life saving activities in a declared emergency. If, due to committee jurisdiction issues, a change in the law is not feasible, MAPPS recommends that Congress authorize a study of this matter.

MAPPS strongly recommends that Congress create in FEMA a suite of multiple-award, indefinite delivery/indefinite quantity (IDIQ) contracts for geospatial services, competed and awarded in advance and stood up on a contingency basis (ready and available in virtually a moment's notice). They should develop a time-sensitive process for enhancing the utilization of geospatial assets in protecting lives and property during catastrophic events and having contracts pre-positioned to provide certainty and efficiency in the emergency response process and to utilize the contracts for mitigation, preparedness and ongoing geospatial requirements. Contracts should be awarded by FEMA on a national or regional basis or delegated to another agency (such as the Corps of Engineers or USGS), and all Federal, state and local government requirements for geospatial services related to an emergency should be coordinated through FEMA for tasking under these contracts to prevent duplication. Contracts and subcontracts for geospatial mapping services should be awarded in the same manner as a contract for architectural and engineering services is selected, awarded and negotiated under chapter 11 of title 40, United States Code. The term "mapping" or "geospatial" should be taken

to mean “contracts and subcontracts for services for collecting, storing, retrieving, or disseminating such graphical or digital data depicting natural or man made physical features, phenomena and boundaries of the earth and any information related thereto, including but not limited to surveys, maps, charts, remote sensing data and images and aerial photographic services.” The goal of developing a pre-awarded competitive contracting process for enhancing the utilization of geospatial assets (aerial photography, satellite imagery and geographic information or “geospatial” activities for emergency response) was also recently endorsed and recommended by the National Research Council in the report, “Successful Response Starts With a Map.”

Previous legislation attempted to create a National Levee Inventory. MAPPS supports the creation of such an inventory and recommends that a “geospatial” component – X, Y and Z geo-reference coordinate data – be included for each levee in the inventory.

Previous legislation included a provision requiring digital mapping. To help bridge the “digital divide” by transforming the program to utilize and make available digital mapping, MAPPS supports the digital mapping provision.

Lastly, MAPPS member firms recommend establishing a national licensing program, in place of the current patchwork of state-by-state programs, to license photogrammetrists as a prerequisite for working on FEMA, USGS, NOAA, USACE, USDA or any other Federal mapping program that will contribute data to the National Spatial Data Infrastructure that could be merged or integrated with the FIRM. Many states now define photogrammetry and geographic information systems (GIS) creation as the practice of surveying. However, the licensing requirement differs from state-to-state. This inhibits “national” mapping programs, as surveyors performing photogrammetric mapping must meet different state standards rather than a national standard. Moreover, photogrammetric mapping firms engage in commerce across state lines, thus they are engaged in interstate commerce, the regulation of which is constitutionally a Federal, not state, government responsibility. Finally, while the traditional land and boundary survey law varies from state to state, photogrammetric mapping is conducted in accordance with the same “laws of science” – the same in every state. Therefore, a national licensing program is necessary and desirable.

Madam Chairman, thank you for the opportunity to present our views.