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January 29, 2019

Federal Emergency Management Agency
RiskPlan Review/ Annual Review for 2018
Via FEMA.GS@riskmapcds.com, and
FEMAMapSpecialist@riskmapcds.com

Federal Emergency Management Agency
500 C Street S.W.
Washington, D.C. 20472

Ladies and Sirs:

The Natural Hazard Mitigation Association is pleased to provide comments on the Federal Emergency Management Agency's review of RiskPlan, part of the 2018 set of maintenance and upgrading activity.

The NHMA membership includes a diverse group of practitioners, academics, government officials and students. Many NHMA members and officers have decades of experience in disaster response, emergency management, and relevant agencies, Federal, State and local.

The NHMA is intended to be a catalyst for societal change by elevating the value of hazard mitigation so that natural hazards do not cause disasters, and suffering and misery to people, property, the environment and taxpayers. Our organization promotes education, policies and activities that mitigate current and future disaster losses, costs and human suffering caused by unsafe development practices.

The NHMA is managed by a 14-member Board of Directors and has eleven committees that focus on the areas of disaster reduction, hazard mitigation planning and education, among others. Except for a two-person part time administrative staff, NHMA is all volunteers.

Concerning the RiskMap project, we find this to be a matter of very serious public concern and an issue affecting the safety of people, property, and all manner of investments. Unfortunately, the Base Flood Elevations are designed to be, unlike any other engineering product we or Scott Edelman of the Technical Mapping Advisory Commission know of (Edelman 2016), accurate to a 50% level of confidence. As Mr. Edelman said to the Senate Banking Committee, if bridges were built to that standard, every other truck would destroy the bridge.

Fifty percent confidence is the answer to a question that apparently no one else is asking.

NHMA recognizes that the current statutory and regulatory requirements were political compromises made decades ago, and that

some requirements must be updated before RiskMap can realize the full potential to become what people think it is now and what people are using.

The essential problem is that very few people know the purpose of the standards set for the establishment of Base Flood Elevations in USGS Bulletin 17B which was establishing actuarial calculations for flood insurance. In such a calculation, under the typical actuarial theory that a half-right; half-wrong calculation is quite sufficient for determining insurance rates (see testimony of Scott Edelman of TMAC). However, unlike the original theory of BFE calculation, now the BFEs are taken as normal engineering, or for short-hand, true maps, not insurance-serving maps. They are used in building design, building codes, land use regulation, evacuation planning, transportation and infrastructure design...And they are treated as true maps by governments and investors at all levels.

The name "RiskMap" suggests that this sort of miscalculation is reasonable but it is a grossly misleading determination of risk which leads to a false sense of security and a false sense that Engineers and Architects are designing and building safely, as their professional ethics demand while they are not.

As Dr. Arthur C. Nelson has pointed out, the lifespan of residential buildings now exceeds on average more than 100 years (Nelson 2017). It is bad enough that the public thinks a 1% AEP (annual exceedance probability) is 1%, rather than 26% over the life of a 30-year mortgage, and 63% over 100 years. It is even worse that outside FEMA and a few others, the public thinks they are looking at true maps, and selling and buying on that basis, putting the future at risk, and all taxpayers who are funding disaster relief and recovery.

It is also important the documentation of the very low costs and high benefits of mitigation has been more firmly established than previously, by the Multihazard Mitigation Council, Mitigation Saves. With good knowledge of the risks, the wisdom mitigation becomes more obvious, for retrofit as well as new construction. The lack of true maps may mean that minor investments that would have saved huge losses will not be made.

In reality, there is an enormous demand for true maps of an enormous range of subjects, judging by the explosion of GIS work in the majority of agencies and governments at almost all scales, and the tremendous progress in availability and usability demonstrates the demand for GIS, and its utility.

But, privately supplied GIS, and some government-supplied GIS is widely qualified as to quality, maintenance, and accuracy. For many purposes, quality is adequate and higher quality at higher expense might be undesirable and inefficient. Finding an address need not be the same as locating a property boundary.

Another huge expansion in mapping services has arisen in risk estimations, for purposes of planning and dealing with uncertainties in the future.

For decades, the USGS commanded worldwide respect for its scientific rigor and quality. Yet here, the Work Group appears to disregard federal and federally-funded research findings and internationally critical issues as changes in watersheds are not examined, and there is no guidance for climate variability, except to request observations (App. 3).

On pages 1 and 2 of the Bulletin:

"These Guidelines describe the data and procedures for computing flood flow frequency where systematic stream gaging records of sufficient length (at least 10 years, with an

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informative regional skew and [or] record extension) to warrant statistical analysis are available. The procedures do not cover watersheds where flood flows are appreciably altered by reservoir regulation, watershed changes, or hydrologic nonstationarities, or where the possibility of unusual events, such as dam failures, must be considered.”

Later, it is noted that it is hard to find a watershed not altered, but no guidance for what should occur. If reality demands judgement calls, procedures should be supported by judgment aids (see CAKE and US Adaptation Toolkit).

Looking backward is strongly implied by pp 3 and 4 of the Bulletin, valuing data quality over data relevance. “[...Confining] to stations where available records are adequate to allow reliable statistical analysis of the data.” ... almost misses the risk of climate variability increases and uncertainties on which such data by definition is not available.

In an example of modern mapping using best-available data, Wing et al., 2018, applied FEMA standards to map the 1% AEP floodplain, evaluate occupation, and estimate future changes in occupation and investment. Demography provides such information, often for free from a state agency. Wing and his colleagues found that by FEMA definition of the 1% AEP area, occupation now is not FEMA’s 13 million, but actually 41 million. The new standard of accuracy is said to be strict (American Society for Photogrammetry and Remote Sensing), but if it is applied to a 50% confidence level, it will still be an answer to the wrong question.

On page 19, the use of estimates from precipitation data or estimates is discouraged without “at least adequate climatic data and a valid watershed model for converting precipitation to discharge.” Some agencies using watershed models calibrated to particular watersheds are mentioned. But if the calibration is based on backward-looking data sets, and do not include climate risk. A few models have been used for forward-looking, such as Bureau of Reclamation models for the Colorado River Basin, but these are rare and increasingly require upgrading and modification (e.g. there is no question about the effects of dust on snow, but it was not in many early modeling efforts as it was not known well enough, and it is still hard to model).

Similarly, page 19 discusses use of rainfall-runoff models – they must be properly calibrated and take into account observations from the watershed. Then perhaps they can be calibrated for extreme flood observations with an uncertainty analysis. Better, but re-thinking the essentials of the calibration is non-trivial; substantial efforts have been and are being made, in climate change science, but none of that is acknowledged or mentioned.

Also on page 19, atmospheric circulation patterns and climate indices may be coupled with streamflow records to gain insight into flood-causing mechanisms and flood variability, but the reference is 1999 – far behind many National Research Council products and other science.

A common answer is the constraints of politics and highly complex procedures. There may also be constraints from working with the wrong tools.

“The conventional assumptions for a statistical analysis are that the array of flood information is reliable and it is a representative time sample of random, homogeneous events. Assessment of the adequacy and applicability of flood record is, therefore, a necessary first step in flood frequency analysis. This section discusses flow measurement errors, **randomness** of events, mixed populations, **watershed changes**, and **climate variability and change** considerations for flood frequency analysis.” (Emphasis added.) P. 20, Bulletin 17C.

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Watershed changes, and climate variability and change are the problem, so it would be good to address these issues. But on page 23, regarding watershed changes (historical, to say nothing of future), “The Work Group did not evaluate methods to account for watershed changes and makes no particular recommendation, as additional work is needed in this area.”

Also on page 23:

“There is much concern about changes in flood risk associated with climate variability and long-term climate change. Time invariance was assumed in the development of these Guidelines. **In those situations where there is sufficient scientific evidence to facilitate quantification of the impact of climate variability or change in flood risk, this knowledge should be incorporated** in flood frequency analysis by employing time-varying parameters or other appropriate techniques. All such methods employed need to be thoroughly documented and justified.” (Emphasis added).

Uncertainty is the problem, and defaulting to data known to be misleading is not an adequate answer. Many of the references were old and have since been updated.

In conclusion, RiskMap should become an effort to map risks, as the public and many professionals expect. The FEMA Technical Mapping Advisory Council has given excellent guidance.

We hope to be of assistance in pursuit of our mutual goal of improving public well-being, safety, and maximizing the long-term return on investments. As NHMA has described in its Disaster Risk Reduction Curriculum and many other publications on our website, (nhma.info) short-term benefits for the few have been the rule, rather than the exception. Our goal must be clarity and quality of information that supports long-term benefits and meets the public expectation of furthering the safety and well-being of all.

Sincerely,



Erin Capps, JD
President
Natural Hazard Mitigation Association

References from Comment and Additional references that we expected to see, and some additional source as illustration of work on-going and in progress/

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NOTE: New URL (accessed 01 MAR 18):

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THE FUNDAMENTALS ON CLIMATE VARIABILITY AND IMPACTS AND RISKS FOR U.S. AND FUTURE CONDITIONS

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Recommended: U.S. Climate Resilience Toolkit <https://toolkit.climate.gov/tools> [Presents information about 18 different land-use tools for adaptation planning. This does not include hundreds of other planning manuals, tools, models, and recommendations; consult the Climate Adaptation Knowledge Exchange (CAKE), a compendium maintained by EcoAdapt (an NGO that also produces the National Adaptation Forum, next in April 2019. <https://www.cakex.org/> and www.nationaladaptationforum.org

Persons concerned with future conditions and changes in climate variability may also wish to explore the Intergovernmental Panel on Climate Change, which has produced numerous reports that are internationally central to climate mitigation negotiations, in which the U.S. government has previously participated. <https://www.ipcc.ch>

Also recommended: U.S. Department of Agriculture, Office of the Chief Economist, Regional Assessments produced by U.S.D.A. Climate Hubs as examples of topically-focused regional assessments. www.climatehubs.oce.usda.gov/ There are also U.S. Department of the Interior Landscape Conservation Cooperatives, which may be accessible to the USGS, as USGS officials are involved in many. With Georgetown University, DOI operates the Adaptation Clearinghouse, which introduces elements of the US DOI conservation and adaptation programs, including 8 Regional Climate Science Centers, and Landscape Conservation Cooperatives. <https://www.adaptationclearinghouse.org/organizations/u-s-department-of-the-interior-doi.html>
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A small quick sampling from the very large literature that has been published since the Fourth National Climate Assessment, to illustrate that there are very active efforts to provide useful answers to questions that the USGS Guidelines Work Group did not address (e.g., changes in watersheds, future conditions, climate variability and

extremes). NOTE: there is also an extraordinary amount of material on climate adaptation, including a great deal of material from U.S. federal agencies including a great deal more than is represented here.

NOTE: A systematic survey of relevant work on the issues in future conditions and future climate variability would involve dozens of journals, all the way from Meteorology to Planning and Demography, on dozens of topics. That is why the author teams and reviewer teams in the major assessments are so large. This comment is from a small all-volunteer group with limited time for a survey, and so is a small sample from a few journals. Water journals are central.

FLOOD POLICY

Javeline, Debra, Nives Dolsak and Aseem Prakash, 2019, Adapting to Water Impacts of Climate Change – Introduction to Special Issue of Climatic Change. Climatic Change - on-line as of 26 Jan 19, this introduction only: <https://doi.org/10.1007/s10584-018-2349-1> [Special Issue is forthcoming; introduction was published; issue will include articles on U.S. flood insurance, U.S. flood zone maps, U.S. managed retreat buyouts, homeowner risk reduction, U.S. beach nourishment, and cyclone evacuation behavior. This should be of special interest to FEMA and USGS. Will include:

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- Pralle, Sarah, forthcoming, Drawing Lines, FEMA and the Politics of Mapping Flood Zones, Climatic Change.
- Siders, A.R., forthcoming, Who Stays and Who Goes? Transparency and Social Justice in U.S. Managed Retreat Buy-Out Decisions. Climatic Change.
- Javeline, Debra and TracyKijewsk-Correa, forthcoming, Coastal Homeowners in a Changing Climate, Climatic Change.
- Mullins, Megan, Martin Smith and Dylan McNamara, forthcoming, Paying to Save the Beach: Effects of Local Finance Decisions on Coastal Management. Climatic Change.
- Das, Saudamini, forthcoming, Evaluating Climate Change Adaptation Through Evacuation Decisions: A Case Study of Cyclone Management in India. Climatic Change.

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of accepting fundamentally normative judgements in flood risk reduction. Perverse incentives and political judgements rather than scientific.]

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The Natural Hazard Mitigation Association (NHMA) promotes steps to reduce the risk and consequences of natural events with a special emphasis on protecting the most vulnerable populations in our communities using a "Whole Communities" approach. NHMA is a 501(c)(3) educational & charitable organization. Contributions are tax deductible in accordance with IRS rules and regulations.

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World Weather Attribution -- <https://www.worldweatherattribution.org/about/> [These scientists are refining techniques for attribution of climate change influence on extreme weather events – to what extent are they different from pre-change events? A partnership including core members National Center for Atmospheric Research (USA), Environmental Change Institute, University of Oxford (UK), University of Princeton (US), Royal Netherlands Meteorological Institute (Netherlands), Laboratoire des Sciences du Climat et de l'Environnement (France), and Red Cross Red Crescent Climate Centre (multinational). Most recently, it has reported on Super Typhoon Mangkhut, Hurricane Florence, and exceptionally high monsoon rainfall in Kerala, and exceptionally high rainfall in Japan.]

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PLACE SPECIFIC EXAMPLES OF WEATHER CHANGES

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[Literature survey found 467 pathways from climate change to human harm, in high quality literature.]