

**Advisory Committee on Water Information (ACWI)
Subcommittee on Hydrology (SOH)
Extreme Storm Events Work Group (ESEWG)**

Workshop Questionnaire for States' Needs in Extreme Precipitation

Preamble: Extreme storm hydrometeorology studies impact extreme flood estimates and assessments for dams, nuclear power plants, levees, and other high-hazard structures within the United States. Additionally, environmental impacts from extreme storm events are of increasing concern. The Extreme Storm Events Work Group (ESEWG) is responsible for coordinating studies and databases for reviewing and improving methodologies and data collection techniques used to develop design precipitation estimates of large storm events up to and including the Probable Maximum Precipitation (PMP). The charter for the ESEWG states that it will develop a detailed scope of work/plan of study and determine the necessary funding requirements to update the *Catalog of Extreme Storms* and *Hydrometeorological Reports (HMR)*. The Work Group is also tasked with developing a list of individual Federal Agency extreme storm product needs. From ongoing discussions and recent advances to probabilistic methodologies for risk-assessment, it is evident that updates to the *Catalog of Extreme Storms* and *HMRs* may not fully address the national needs. Therefore, the purpose of this survey is to help the ESEWG identify States' needs for updating extreme storm products. The following questionnaire asks each State to critically evaluate their views, methods, data sources, tools, etc. regarding extreme storm events and to identify their needs and/or gaps in extreme storm event information. In a *Writing Workshop* scheduled for Spring 2014, the ESEWG will define extreme storm product(s) that meet the needs of the participating ACWI/SOH/ESEWG member agencies for deterministic and risk-informed infrastructure design. The ESEWG will consider the needs of the States, in part determined from State responses to this questionnaire, in defining extreme storm product(s). The product(s) with corresponding schedule(s) and resource cost(s) will be presented in a proposal to the ACWI/SOH. Based upon a recommendation from State dam officials, the ESEWG reviewed FEMA Document P-919, "Summary of Existing Guidelines for Hydrologic Safety of Dams" (2012) during preparation of the current questionnaire. The ESEWG considers its questionnaire to be more narrowly focused on Extreme Precipitation needs than the previous FEMA survey which more broadly addressed spillway sizing. Because of its merits, the ESEWG will utilize FEMA P-919 to inform the writing of the extreme storm product proposal.

1. Please discuss your State/agency's extreme precipitation needs for decision making, assessments, and designs (extreme precipitation is defined as those events with a return period of 1,000-years or greater up to and including PMP):
 - a. What agencies in your State use extreme precipitation data? (please provide contact information for other interested agencies, if possible)
 - b. What extreme precipitation data do you use in your decisions?
 - c. How is this extreme precipitation data used?

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- d. What is the scale and resolution of this data (regional, site-specific, watershed-specific)?
 - e. What is the spatial extent to which this data is applied?
 - f. Would it be beneficial if this data were updated? And why is that?
 - g. What are the current statutes, regulations, and court rulings regarding extreme precipitation data and methods that apply to your State/agency?
 - h. Would current statutes, regulations and court rulings allow use of extreme storm products other than NOAA HMR PMP?
 - i. If changes to law or regulations would be needed to allow new use of extreme storm products, describe the revision process.
 - j. Would your State/agency benefit from updated Federal guidelines regarding the application of new extreme storm products? (e.g. revised FEMA National Dam Safety Program guidelines for Spillway Sizing for dams)
2. Please comment on methods allowed or used by your State/agency to determine extreme precipitation for decision making, assessments, and designs. Please comment on the applicability of each method and on regulations governing each method:
- a. HMRs for PMP?
 - b. Frequency precipitation?
 - c. Site Specific PMP studies?
 - d. Probabilistic Flood Hazards Approach / Risk-informed decision making?
 - e. Streamflow frequency analysis?
 - f. Paleo-hydrology studies?
 - g. If possible, comment on the relevancy of FEMA Publication 919 "Summary of Existing Guidelines for Hydrology Safety of Dams" with respect to summarizing your State/agency's extreme precipitation methods and needs.
3. Please describe your State/agency's views and priorities regarding alternatives to traditional PMP:
- a. Continued use of PMP, or alternatives?
 - b. Have you attempted to use numerical models? Please provide any documentation of the analysis.
 - c. Assessment of radar accuracy?
 - d. Estimating probabilities of extreme rainfall?
 - e. Storm-based analyses?
 - f. Historical database of information on storms and floods?

Specifically regarding risk-based alternatives to traditional PMP, FEMA P-919 reports that 51% of respondents had concerns regarding the use of risk analysis to determine spillway size requirements for dams. At the same time, FEMA P-919 reports 31% of respondents agreed with the statement that designing for the PMP/PMF is unreasonably conservative. FEMA P-94, "Selecting and Accommodating Inflow Design Floods for Dams" (2013), recommends risk-informed decision making as one alternative approach to spillway sizing (NOTE: prescriptive application of the PMF is another recommended alternative), and FEMA P-919 reports that

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many States would be more receptive to adopting risk-based design criteria if Federal dam agencies could agree on standards.

4. Considering the previously mentioned information from FEMA, if a probability or risk-based extreme storm product is developed:
 - a. Would your State/agency be receptive to implementing the new product?
 - b. Would your State/agency still need updated PMP?
 - c. How important would it be that risk-based products could be readily used by your existing staff without requiring additional expertise?
 - d. How important would it be that such products be accompanied by new Federal guidelines for application (e.g. Risk-based guidelines for spillway sizing)?

5. Please describe the importance your State/agency places on having a consistent national standard for extreme storm products and having Federal guidelines for such products:
 - a. In regard to methods and data, is there a need for a national standard? Is there a need for Federal guidelines?
 - b. In regard to interpretation of risk, is there a need for national standards and Federal acceptance?
 - c. In regards to Site Specific PMP studies, is there a need for national standards and Federal guidelines?
 - d. In regards to consistent instructions on how to use and apply extreme storm products?
 - e. In regards to the need for extreme storm products to have a consistent level of risk across spatial domains (both between states and within states)?

6. Please discuss applicability of current Federal extreme precipitation publications, databases and tools:
 - a. Hydrometeorological Reports
 - i. Which HMR do you use most frequently?
 - ii. What information do you glean from the HMRs? And how do you use this information exactly?
 - iii. Which information is most useful?
 - iv. Do you use the spatial and temporal storm patterns provided?
 - v. Do you use the DAD tables?
 - vi. Do you use the HMRs to compute PMP?
 - vii. Do you use the HMRs to compute a percentage of PMP? Which percentage and what is the basis for reducing PMP?
 - viii. Do you use the areal reduction factors provided in the HMRs?
 - ix. Do you consider storm seasonality in your studies?
 - x. Are the HMRs easy to use? If not, why?
 - xi. What would you change about the HMRs when/if updated?
 - xii. What additional information would you want to see included?
 - xiii. Do you associate a probability to PMP? If so, describe your methodology.

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- xiv. Is updating the HMRs a priority to your State/agency?
- xv. Would your State/agency be interested in contributing to a Federal effort to update PMP? (Data, technical, financial, review, etc.)
- b. Precipitation-frequency products:
 - i. NOAA Atlas 14 is being updated to include the Northeastern States (from TP40). Funding has not yet been found to update estimates for Texas (from TP40) or the Northwestern states (From NA2). How important is it to your State/agency to have NOAA Atlas 14 volumes for Texas and the Northwestern states?
 - ii. Do you consult NOAA Atlases 2 and 14? For what reason, exactly?
 - iii. Which return period(s) is most useful for your studies?
 - iv. Do you extrapolate beyond the 1,000-year return period (not recommended by NWS)? If so, how?
 - v. Do you currently compute areal estimates based on the point values from NOAA Atlas 2 or 14? If so, how? And where/how do you obtain your areal reduction factors if you use that method?
 - vi. Does your State feel there is a need to update areal reduction factors for frequency storms?
 - vii. To what extent is NOAA Atlas 14 information incorporated into design guidance or regulations that govern what you do?
 - viii. Are there elements in NOAA Atlas 2 or TP 40 missing in NOAA Atlas 14?
 - ix. Is NOAA Atlas 14 easy to use? How could it be improved?
 - x. Do you input latitude/longitude values into the web interface?
 - xi. Do you consult the isopluvial maps of precipitation frequency estimates for a particular exceedance probability and duration? If so, what value do they provide beyond the GIS compatible grids of the same information?
 - xii. Of what value are the temporal distribution curves in NOAA Atlas 14?
 - xiii. Of what value are the seasonal curves in NOAA Atlas 14?
 - xiv. There is a difference between precipitation frequency estimates more frequent than about 15-20 years ARI for estimates derived from annual maximum series and estimates derived from partial duration series. How important is it for NOAA Atlas 14 to provide both? Which of the two is your preference and why?
 - xv. Do you consult the report documentation of NOAA Atlas 14 for any purpose?
 - xvi. Do you use any of the background information that the NWS used to compute the precipitation frequency estimates? If so, what exactly? (e.g., gauge data, clusters)
- 7. What other extreme precipitation resources does your State/agency utilize?
 - a. Non-Federal technical documents on extreme storms or PMP?
 - b. Other non-Federal documents?
 - c. Data?
 - d. Software?

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8. Please describe ongoing and planned efforts in your State to update PMP or develop new extreme storm products?

9. Please discuss any gaps or further needs:
 - a. What precipitation/extreme storm information do you need that you don't have now?
 - b. For data gaps, what is the most pressing piece of information that needs to be created or updated?

10. Please identify State's representatives and other attendees willing to participate in the Extreme Storm Events Workgroup's Writing Workshop, currently scheduled for May 15-16, 2014, in Washington, D.C., either on-site or remotely via webinar? Please include contact information. The current Workshop agenda includes time for the States to share their perspectives on current applications of extreme precipitation data and methods, and there will be opportunities for State input to help define extreme storm product needs and possible State contributions.