

Probable Maximum Precipitation Study for Virginia

Applied Weather Associates, LLC

Bill Kappel

Project Manager and Chief Meteorologist

Jake Rodel

GIS Analyst

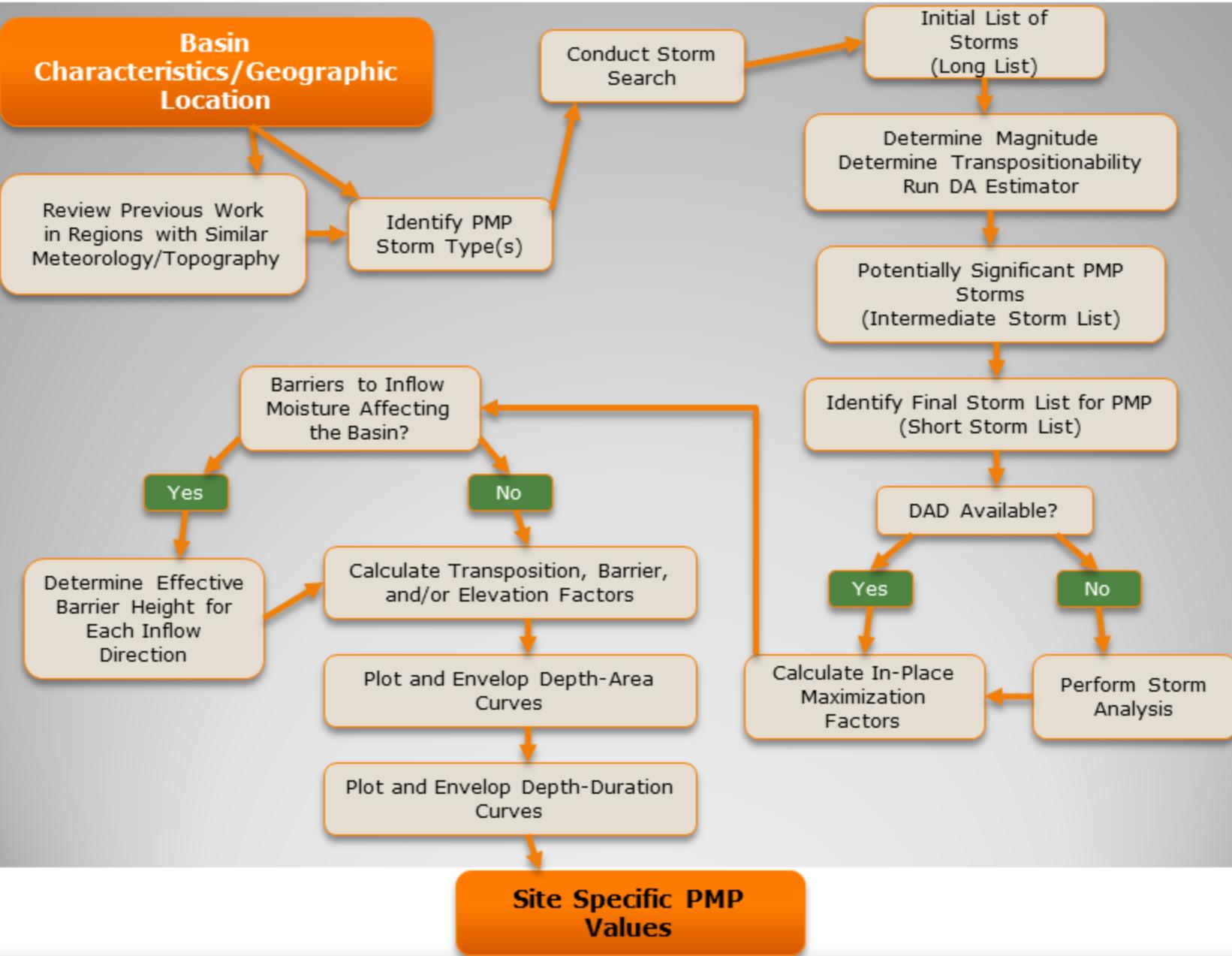
Fourth Virginia PMP Meeting

Richmond, Virginia

October 6-7, 205



Probable Maximum Precipitation Determination Flowchart



Probable Maximum Precipitation

Definition: The theoretically greatest depth of precipitation for a given duration that is physically possible over a given storm area at a particular geographic location at a certain time of year (HMR 59, 1999)



Probable Maximum Precipitation Study for Virginia

Task 1

Review of previous studies for applicability

1. AWA PMP studies (Virginia, Ohio, Tarrant, Quad Cities, etc)
2. HMRs 33, 51, 52, 53, etc
3. TVA HMRs 41, 45, 47, 56
4. USACE and USGS storm and flood analyses



Probable Maximum Precipitation Study for Virginia

Task 2

Storm Search and Short List Development

- Complete a storm search to identify the most significant storms that could have occurred over the region where storms are transpositionable to Virginia
- Identify storms used in HMRs and other PMP studies
- Identify the most significant flood events that have occurred in region
- Identify extreme rainfall-producing storm types and seasons associated with those storms
- Use SPAS to analyze extreme rainfall events that have not previously been analyzed
- Use SPAS to reanalyze extreme rainfall events



Probable Maximum Precipitation Study for Virginia

Task 3

SPAS Storm Analysis

All storms used for PMP develop analyzed with SPAS

SPAS produces gridded rainfall analysis and required data sets

USACE storms will need to be re-analyzed



Probable Maximum Precipitation Study for Virginia

Task 4

Storm Maximizations/Transpositioning/Orographics

- Utilize the updated maximum dew point climatology for use in storm maximization and transpositioning
- Maximum average dew point values
 - 6-hour
 - 12-hour
 - 24-hour
- SST climatology for some events



Probable Maximum Precipitation Study for Virginia

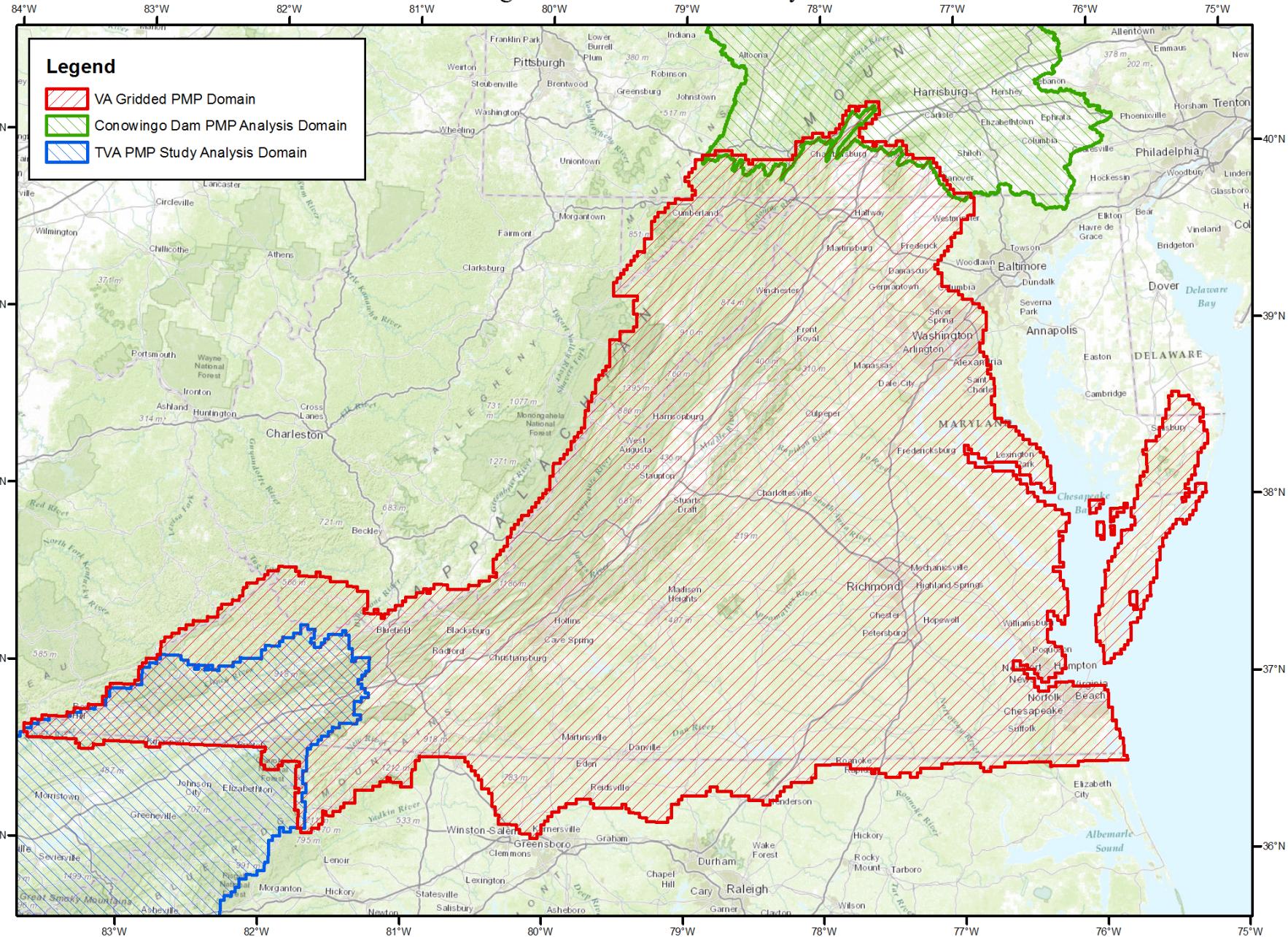
Task 5

Develop PMP Values

- Utilize gridded basis
- Pre-run for known basins
- How to apply
- How information is structured/made available

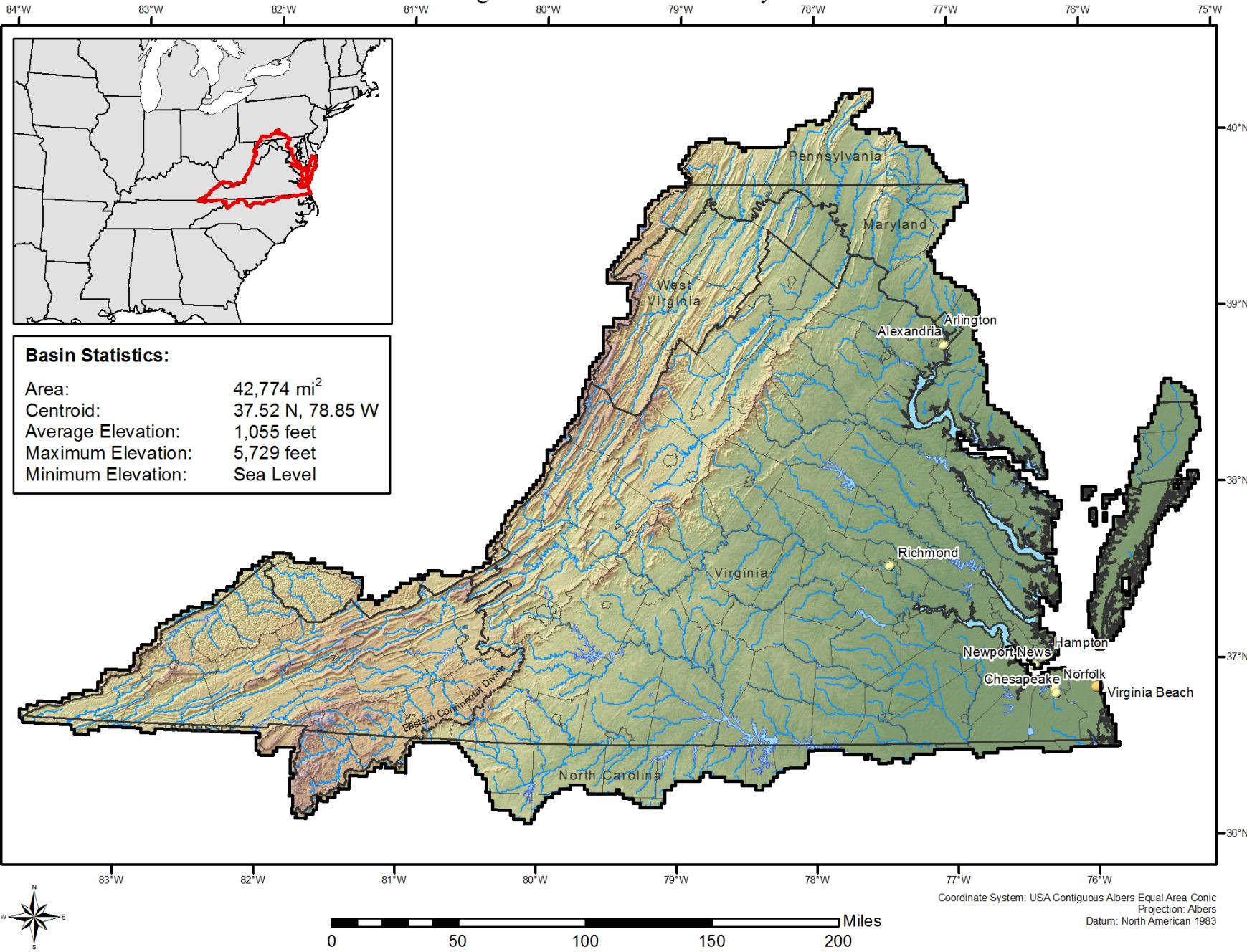


Gridded PMP Analysis Domain Virginia Statewide PMP Study



Elevation Statistics

Virginia Statewide PMP Study



Probable Maximum Precipitation Study for Virginia

Task 6

Quality Control and Sensitivity

- Compare results
 - HMR PMP values
 - NOAA Atlas 14 precip frequency data
- Discuss sensitivity of various parameters and assumptions on the final PMP values



Probable Maximum Precipitation Study for Virginia

Task 7

Review Meetings

- Present and review the approach and procedures to be used as well as work completed
 - Pre-meeting packages will be provided to reviewers prior to each meeting
- Conference calls with reviewers and Virginia Dam Safety are planned between formal meetings to discuss technical issues
- A final meeting to present the results and provide discussions on the draft final report



Probable Maximum Precipitation Study for Virginia

Task 8

Final Report

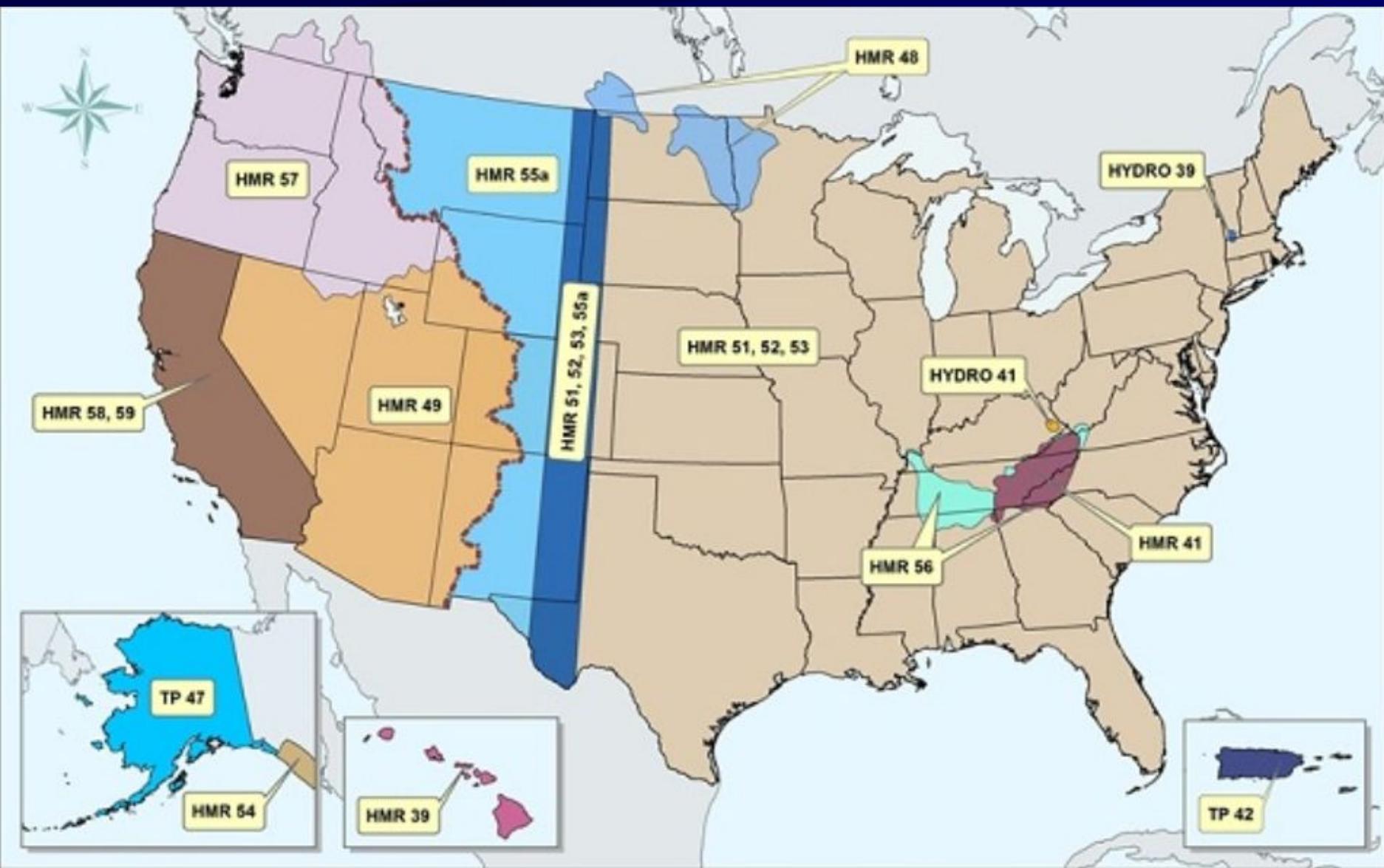
- A Draft final report will be submitted for review
- Review comments will be incorporated into a comprehensive final report as appropriate
- An appendix will be provided with all storm details and calculations used to determine the PMP values throughout the Virginia region
- Maps of PMP values will be provided both in the report as well as in GIS format



Extra Slides



Coverage of HMRs



Probable Maximum Precipitation

Virginia

Transposition Limits

- Homogeneous meteorology and topography from original location to area of interest (HMR 51 Section 2.4)
 - Transposition not permitted across Appalachians
 - Tropical storm rainfall not transposed w/out additional adjustment
 - Region of large elevation difference, transposition restricted to narrow elevation band (usually 1000 feet of the elevation of the storm center)
- Eastward limits of Central US storms was first upslopes of Appalachians
- Southern limits to transposition not define since other storms produced higher values



Probable Maximum Precipitation Virginia

Transposition Limits

- Subjective judgment is used
- Most choices obvious, it's the “gray” area that matter
- Let the data talk to us
 - OTF very helpful



Smith et al. 1996

The influence of topographic features on Rapidan rainfall has significant implications for engineering hydrometeorology procedures used for design of high-hazard structures, in particular Probable Maximum Precipitation (PMP) procedures [see *World Meteorological Organization (WMO)*, 1986; Hansen, 1987]. A cornerstone of PMP analyses is the storm transposition procedure. Transposition of the Rapidan storm to any other location is physically implausible. This brings into question the practice of transposing storms, like the August 19–20, 1969, Virginia storm, that exhibit strong links to topographic features but for which details of storm structure and evolution are not available.