



Sequoyah Nuclear Plant (SQN)  
Responses to NRC Request for Additional Information  
(RAI) Regarding License Amendment Request (LAR) for  
Hydrological Analysis Update

July 16, 2020

# Agenda

- Introduction
- Background
- Proposed Responses to NRC RAIs (Non-Proprietary)
- Schedule for Submittal
- Proposed Responses to NRC RAIs (Proprietary)

# Introduction

- Purpose of the meeting is to resolve questions raised by the NRC Quality Assurance and Vendor Inspection Branch (IQVB) regarding the TVA LAR for the SQN Hydrologic Analysis.
- Resolution of these questions is important to not only the SQN LAR, but also the planned WBN Hydrology LAR.
- Portions of the NRC RAI and proposed TVA responses contain proprietary information and will be discussed during the closed session.

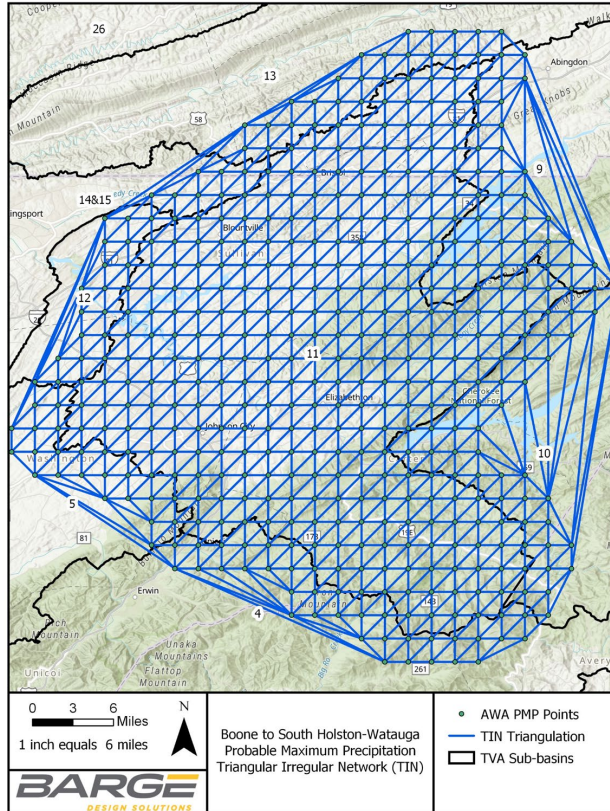
# Background

- TVA LAR for the SQN Hydrologic Analysis submitted to NRC on 1/14/2020 (ML20016A396 and ML20016A397).
- Supplement to the LAR submitted on 2/18/2020 (ML20049H184).
- Responses to NRC IQVB RAIs submitted on 5/14/2020 (ML20135H065).
- Second round RAIs from NRC IQVB received on 7/1/2020 (ML20189A211).

# NRC Question 1.1

“TVA stated that the ArcGIS software uses gridded shapefile data to create a Triangular Irregular Network (TIN) surface that is used via a polygon volume tool to compute the sub-basin average Probable Maximum Precipitation (PMP) depths. In contrast, the QGIS alternate methodology utilizes the nearest neighbor geoprocessing tool to generate a raster surface that then uses a grid statistics tool to generate the nearest neighbor geoprocessing tool. It is unclear what the technical difference is between methodologies used to create a TIN surface and a raster surface and between the polygon volume tool and nearest neighbor geoprocessing tool used to create the sub-basin average PMP depths. **Therefore, the NRC staff requests TVA to clarify how these two methodologies are technically different such that the use of these alternate calculation methodologies can be credited to prevent the same erroneous outputs in both GIS tools.**”

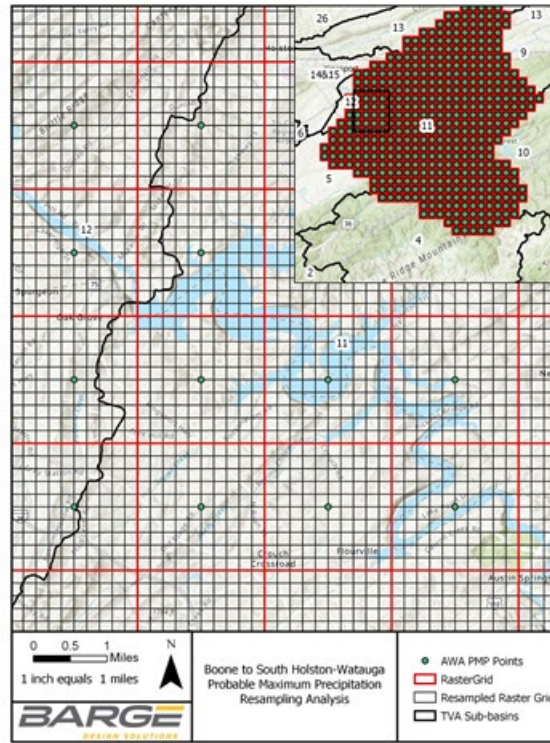
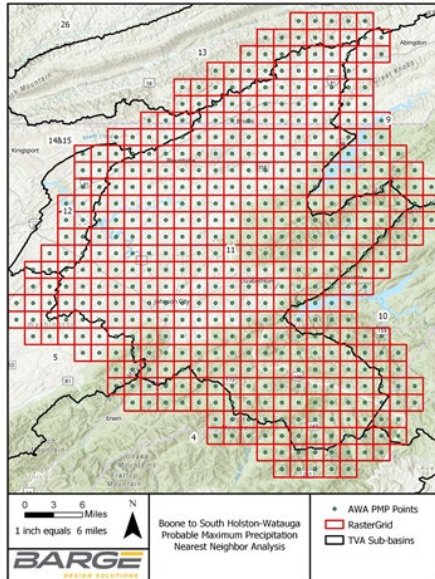
# TVA Response to NRC Question 1.1



- ArcGIS Methodology

- PMP Evaluation Tool outputs gridded PMP depth data along a uniform grid with resolution 0.025 by 0.025 decimal degrees
- ArcGIS triangulation to create a Triangular Irregular Network (TIN) surface representing PMP Depth over basin where depth is interpolated along triangle edges
- **Average basin precipitation depth =**  
Volume of PMP Surface above the basin boundary divided by basin area

# TVA Response to NRC Question 1.1



## QGIS Methodology

- PMP Evaluation Tool depths used to create Raster through QGIS Nearest Neighbor tool.
- Only grid cells with centroid in basin utilized.
- Improved accuracy by bilinear interpolation by resampling tool
- **Average basin precipitation depth**= sum of cell volumes divided by area of basin boundary

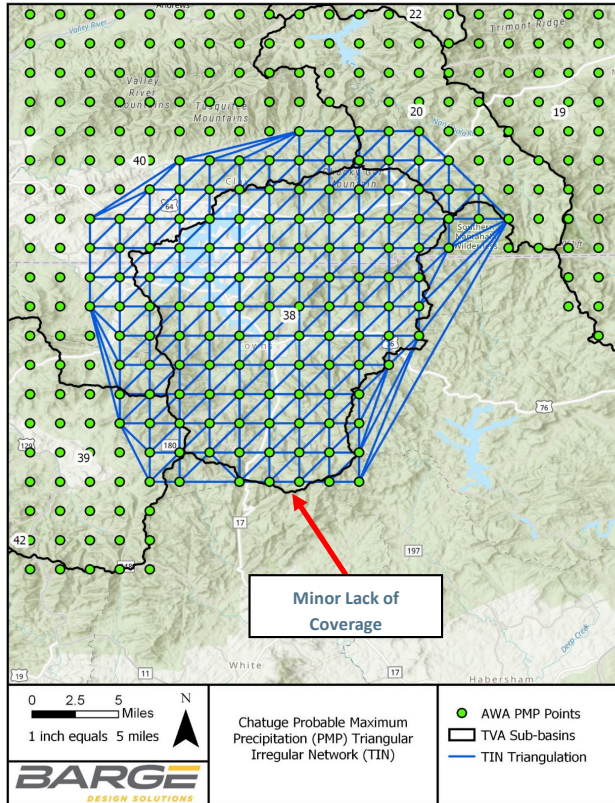
## Differences in Methods

- Triangulation vs Bilinear interpolation
- Polygon volume vs Arithmetic averaging of grid cells

## NRC Question 1.2

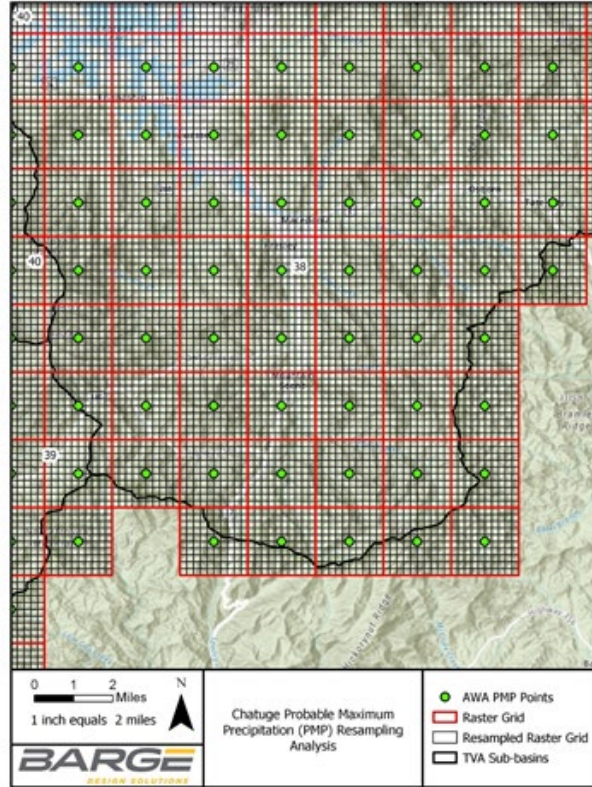
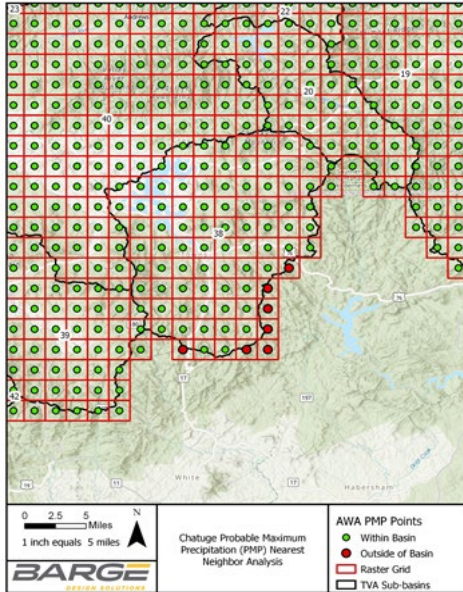
“In Enclosure 3, “Gridded PMP Development Calculation” of the RAI response, Appendix A “GIS PMP Event Depth Computations,” Section 6.5, states “Review of computed PMP depths across the ArcGIS and QGIS platforms identified a project PMP depth above Chatuge as an outlier. Analysis indicated areas around the sub-basin boundary with zero depth as the PMP points from the [Applied Weather Associates (AWA)] tool did not provide adequate coverage during TIN creation for the single sub-basin. PMP depths utilized for Chatuge are based on QGIS analysis to eliminate results without the complete PMP coverage.” Since QGIS is used to verify the results of ArcGIS and their results are dissimilar for Chatuge, it is not clear what the basis is for using the output of QGIS instead of ArcGIS for this area. In addition, since the TVA determined that ArcGIS did not provide adequate coverage for Chutage, it is not clear how the output of QGIS is determined to be correct for this area. **Therefore, the NRC staff requests TVA to justify the use of the QGIS output for the Chatuge sub-basin.**”

# TVA Response to NRC Question 1.2



- Alternate calculation check of ArcGIS calculations in QGIS led to additional review of results
- Review showed Triangulation in ArcGIS had an area of 0.88 square-miles less than QGIS, equating to less than 0.5% of the total 189.1-sq.-mi. Chatuge basin area without TIN coverage
- The alternate calculation check in QGIS via the alternate methodology ensures full coverage of PMP depth data points over the basin by use of the QGIS resample tool to provide a grid of PMP depths at a 0.0025 by 0.0025 decimal degree grid

# TVA Response to NRC Question 1.2



- Over 2,500 individual PMP surfaces were checked in QGIS with only those surfaces associated with a Chatuge PMP resulting in differences greater than 0.6% for the Chatuge sub-basin average.
- Application of the adjacent grid point depths to the small uncovered area by the ArcGIS method result would approximate the QGIS result, providing the alternate calculation comparison and justification of the QGIS result for the Chatuge basin

# Schedule for Submittal

- NRC Requested that TVA respond to the RAI within 45 days
- TVA plans to submit the RAI response no later than August 14, 2020
- NRC is expected to approve the LAR by February 2022

