



Tennessee Valley Authority

Hydrology Status  
for  
Operating Reactor Fleet

July 7, 2010



# Agenda

0800	Introductions/Opening Statements	NRC
0815	Background	TVA
0830	Current Status of Hydrology Project	TVA
0945	Break	
1000	Open Discussion	ALL
1100	Public Comment Period	ALL
1130	Adjourn	

# Background

- In Feb 2008, NRC inspection of the quality assurance processes and procedures for the Simulated Open Channel Hydraulics (SOCH) model for the Bellefonte Combined License Application (COLA) resulted in violations regarding:
  - SOCH software was not in compliance with the procedure for software validation and verification
  - Design inputs for the hydrology model were not documented in accordance with procedure
  - Computer input files were not controlled in accordance with the procedure

- TVA utilized results from an updated hydrology calculation (*circa* 1998) for Bellefonte COLA
  - Primary subject of the Feb 2008 inspection
- This calculation was used as a basis for UFSAR Section 2.4 revisions
  - Watts Bar initiated UFSAR changes in 1998
  - Sequoyah initiated UFSAR changes in 2002
  - Browns Ferry did not initiate UFSAR changes

- TVA initiated hydrology project in March 2008 to
  - Validate and verify legacy hydrology software
  - Verify or regenerate all model inputs
- Probable Maximum Flood (PMF) calculation of Tennessee River System to Bellefonte was issued on December 30, 2009
  - Includes results for Watts Bar and Sequoyah for PMF only
    - Scope remains for Watts Bar, Sequoyah, and Browns Ferry

# Background

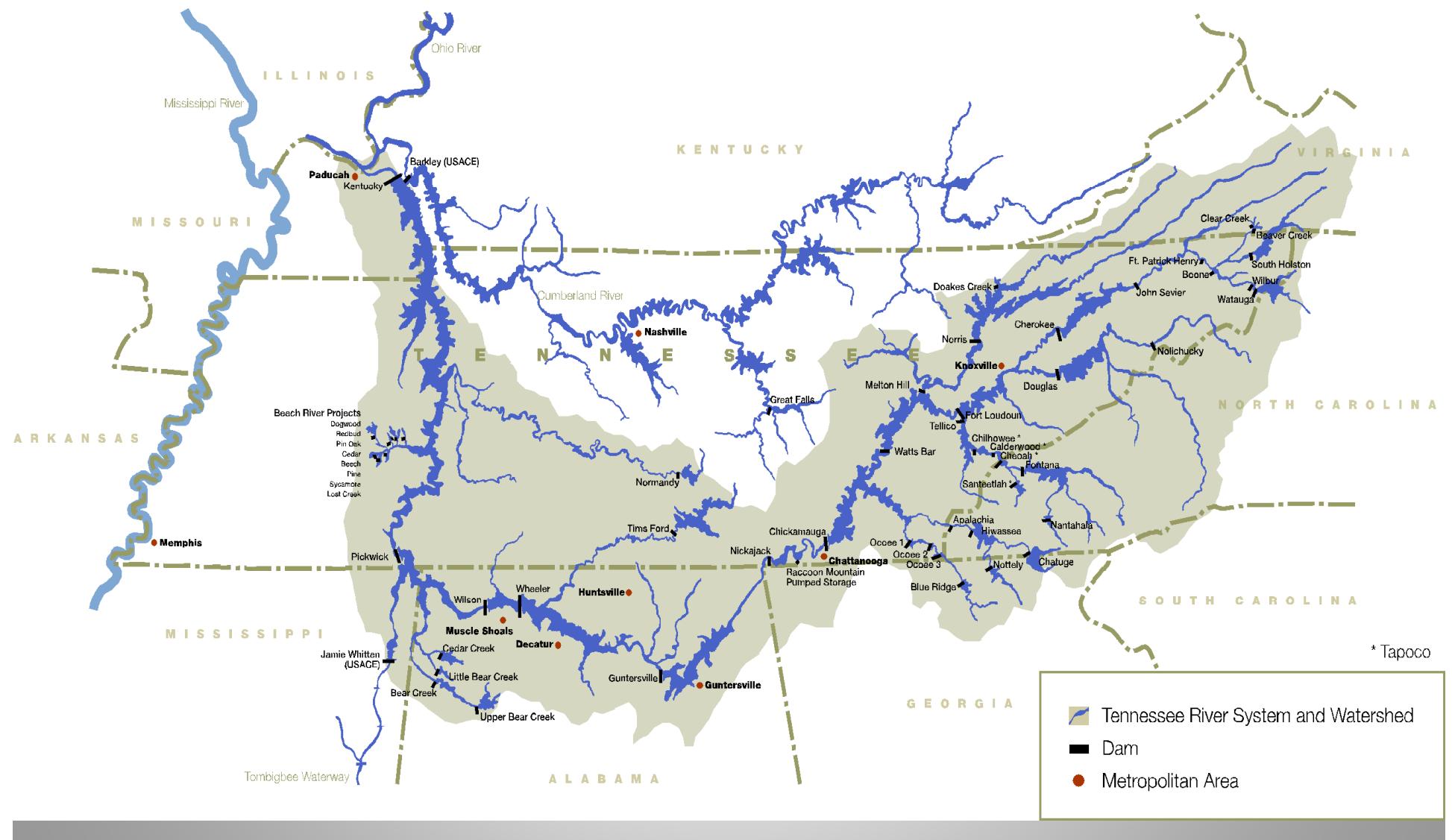
- Based on the PMF calculation results, Sequoyah submitted a Licensee Event Report (LER) for an unanalyzed condition
  - Between the years of 2002 - 2009, Diesel Generator Sets and Spent Fuel Pool Cooling Pumps had potential vulnerability from higher flood levels than calculated
    - Original analysis: PMF Elevation 722.6
    - 1998 PMF analysis results: PMF Elevation 719.6 (UFSAR changed in 2002)
    - Updated 2009 PMF analysis results: PMF Elevation 722.0

- Sequoyah implemented compensatory measures for Diesel Generator Sets and Spent Fuel Pool Pumps at first indication of potential exceedance of the 1998 calculated PMF elevation prior to updated 2009 PMF calculation issuance
  - Compensatory measures remain in place
  - Permanent modifications are currently being studied

- Watts Bar also changed the UFSAR in 1998 based on the results of the 1998 calculation
  - Original analysis: PMF elevation 738.1
  - 1998 PMF analysis results: PMF elevation 734.9
  - Updated 2009 PMF analysis results: PMF elevation 738.8
- Although the updated Watts Bar PMF elevation exceeds the original licensed PMF elevation, margin exists to protect critical equipment



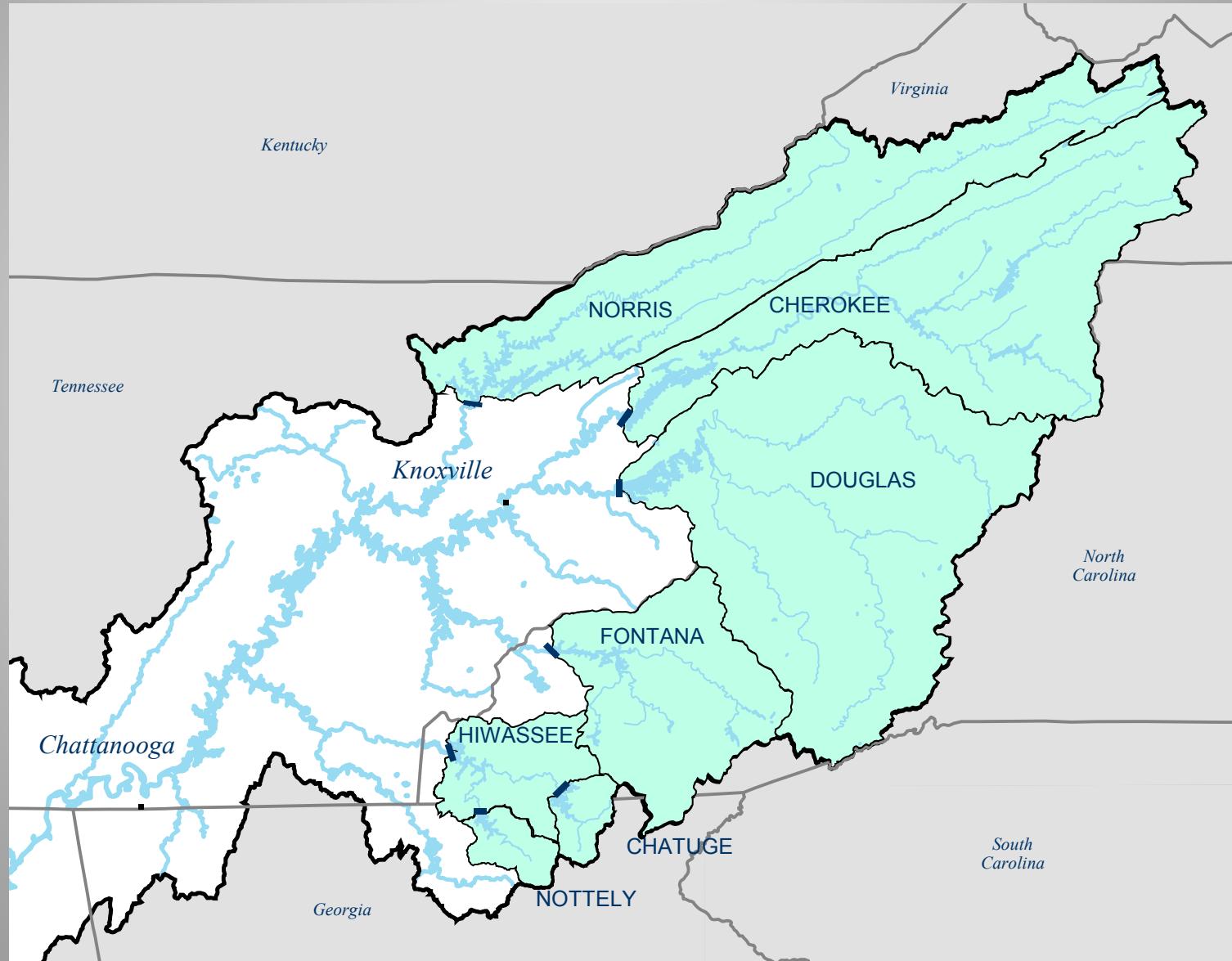
# Tennessee River System Overview





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## Major Tributary Projects



# Tennessee River System Overview

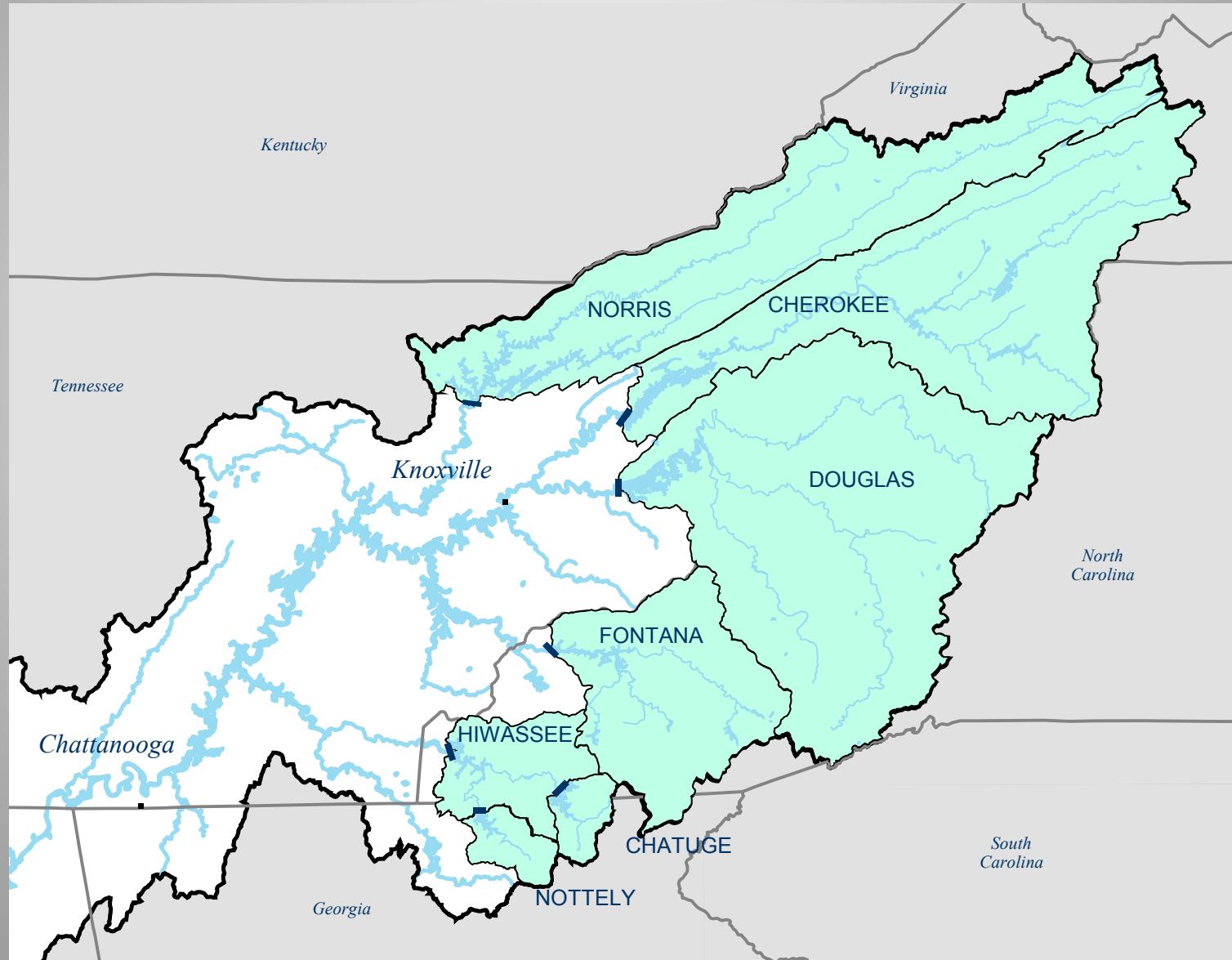
- Tennessee River system consists of
  - 28 dams above Watts Bar and Sequoyah
  - 31 dams above Browns Ferry
- TVA controls and/or schedules the releases from all flood storage dams above the nuclear sites as an integrated system
- Total storage capacity above nuclear sites
  - Summer ≈ 2 million acre-feet
  - Winter ≈ 6 million acre-feet

The Tennessee River watershed is complex and is managed as an integrated system by TVA

## Sequoyah and Watts Bar

- Potential Dam Failures (UFSAR Section 2.4.4)
  - Re-evaluation of the controlling dam combinations from the original analysis
    - Norris Dam Failure for Load Case OBE +  $\frac{1}{2}$  PMF
    - Fontana Dam Failure for Load Case OBE +  $\frac{1}{2}$  PMF
    - Fontana, Hiwassee, Appalachia, and Blue Ridge Dam Failures for Load Case OBE +  $\frac{1}{2}$  PMF
    - Norris, Cherokee and Douglas Failures for Load Case SSE + 25 year flood
  - PMF (UFSAR Section 2.4.3) elevations have enveloped the calculated Potential Dam Failure elevations in previous analyses; Potential Dam Failure analyses have determined warning times in previous analyses

# Status – Remaining Hydrology Scope



- Sequoyah and Watts Bar
  - Warning Time Re-assessments
    - Seasonal - winter and summer assessments are required
  - Loss of Water Supply Due to Failure of a Downstream Dam
  - Wind Wave
    - Watts Bar complete using calculated PMF elevation for current Chickamauga Dam configuration
    - Sequoyah remaining scope

- Sequoyah and Watts Bar
  - Chickamauga Lock Modification
    - New lock will remove 5 of 18 spillway gates from service permanently
    - Current projected schedule 2016 for lock completion
    - PMF elevations with lock modification is complete
    - Potential Dam Failure elevations with lock modification is remaining scope
    - Loss of downstream dam (Chickamauga) with lock modification for Sequoyah

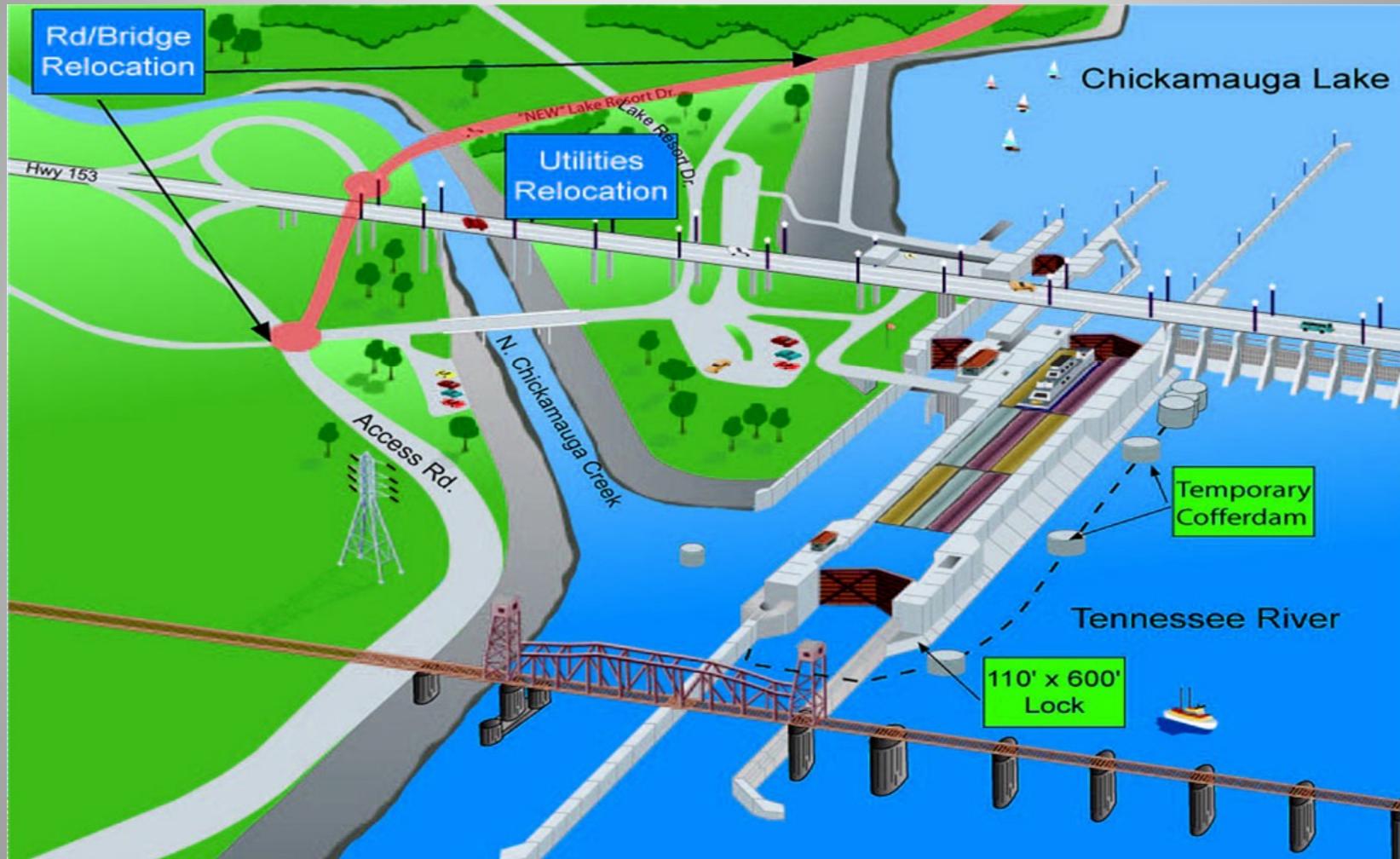
# Status – Remaining Hydrology Scope

Current Chickamauga Lock Configuration



# Status – Remaining Hydrology Scope

Future Chickamauga Lock Configuration



- Sequoyah and Watts Bar

After analyses are complete:

- Permanent modifications to gain margin
  - Permanent modifications will include final Chickamauga Lock Configuration
- UFSAR updates

- Browns Ferry
  - PMF Analysis
    - Updates to the remaining model inputs
    - PMF analysis for three possible controlling storms for Browns Ferry site
    - Re-evaluation of the wind wave
    - To date, hydrology model study runs have been completed with the updated model inputs available and some vintage input data; these study runs have shown no increase to the original calculated PMF elevation

- Browns Ferry
  - Potential Dam Failures
    - Multiple dam failures were not controlling for Browns Ferry in past analyses as documented within the Browns Ferry UFSAR
    - Potential Dam Failures model for Bellefonte is routed to Wheeler Dam with results indicating these combinations of dam failures are still not controlling for Browns Ferry
    - Based on this information, no further analyses will be performed
  - UFSAR Update

- TVA River Operations

- PMF analyses of the remaining Tennessee River System for Dam Safety
- Permanent modifications to prevent overtopping of earthen embankments on four dams (Cherokee, Fort Loudoun, Tellico, Watts Bar)
- Structural Finite Element Analyses of Cherokee and Douglas

- Significant Hydrology Scope remains
  - TVA's remaining scope has been presented in order of priority
    - Sequoyah and Watts Bar
    - Browns Ferry
    - TVA River Operations
  - Full TVA project currently projected to extend into 2016, mostly for Dam modifications