



Modeled Reaches of Tennessee River and Tributaries

Client: Tennessee Valley Authority

Services Provided:

- ✓ Hydraulic Modeling
- ✓ Model Analysis and Refinement
- ✓ Modeling Support
- ✓ Data Analysis
- ✓ Model Calibration

Project Objective

The Tennessee Valley Authority (TVA) provides electricity to 9 million people in seven southeastern states. Hydroelectric dams on the Tennessee River, and its many tributaries, generate a significant portion of the electricity that TVA delivers and also provide flood control and recreational benefits. The flow releases from the dams are controlled and managed to balance these objectives. TVA uses a combination of both hydraulic and reservoir models to predict the impacts of a range of management scenarios for each of the dams. A HEC-RAS model of the Tennessee River Watershed was developed by TVA as part of an Emergency Action Plan and associated inundation mapping to simulate the impacts of a probable maximum flood (PMF) and dam failure. The PMF model was segmented into reaches between each dam and adapted to investigate river responses throughout a range of operational flows for observed and forecasted flows. However, the operational models were not optimized and/or calibrated for the long-term operational range of flows. Geosyntec analyzed, revised, and calibrated two of the segmented models using long-term historical data collected at the dams to make the models more functional and better predictors of flow and stage in the river under the normal range of operational conditions.

Geosyntec's Scope of Services

Geosyntec's scope of services included:

- Analyze HEC-RAS model files to determine accuracy and stability of the models and diagnose problems causing dysfunctionality, instability, or poor prediction of observed flow and stage data
- Identify improvements or refinements to the models
- Analyze flow and stage data from the dams and gages in the system, locate and correct errors in the data, and fill data gaps using analytical data management
- Refine the numerical models to provide stability over the expected range of operational flows
- Demonstrate the stability of the models and calibrate the models to the observed long-term historical data
- Demonstrate the calibrated models are functional and well-suited for the PMF event
- Develop a technical report discussing the model changes and the improvement in model performance

Notable Accomplishments

Geosyntec was specifically selected for this task because of our ingenuity and thorough understanding of hydraulic modeling techniques. Of the model segments that needed to be calibrated, Geosyntec addressed the model segments which were not functional for unknown reasons and which were more difficult to update and calibrate. In addition to modifying the models for functionality and calibration, Geosyntec located and corrected errors in the observed data and important infrastructure that had been omitted from the models in order to further improve the model performance.