

March 1, 2006

Colonel Mark S. Held
District Engineer
U.S. Army Corps of Engineers
P.O. Box 889
Savannah, GA 31402-0889

Dear Colonel Held:

The Fish and Wildlife Service (Service) has completed a review of the report “Development of the Hydrodynamic and Water Quality Models for the Savannah Harbor Expansion Project” dated January 30, 2006 prepared by Tetra Tech, Inc. for the U.S. Army Corps of Engineers, Savannah District. The U.S. Geological Survey (USGS) is assisting the Fish and Wildlife Service (Service) in evaluating the hydrodynamic and water quality models for the Savannah Harbor Expansion Study. Copies of the USGS letter and review comments to the Service are enclosed for your review.

The three-dimensional hydrodynamic model selected for this project is based on the Environmental Fluid Dynamics Code (EFDC), a physics-based turbulence closure model that has been applied in a number of estuarine and riverine systems in the southeastern United States. The Savannah Harbor expansion version of the EFDC is based on the model originally developed by Tetra Tech for the Environmental Protection Agency to determine the total maximum daily load (TMDL) for dissolved oxygen in the lower Savannah River. This TMDL model has been improved with an enhanced grid and other modifications.

The Service letter of July 5, 2006 and the USGS letter dated June 28, 2005 identified concerns on the models and recommended approaches to address the concerns. Recommended approaches included additional explanation in the final report, additional sensitivity simulations, and recalibration/revision of the model. We anticipated that most of these concerns could be addressed with additional documentation for the report and sensitivity runs. At subsequent meetings and conference calls the Service reiterated the need to address these concerns and document the outcome in the final report. We are

disappointed that several of the concerns were not addressed in the final report (please see enclosed USGS letter).

The Service recommends that the following previously requested information be provided in a supplemental report:

- Convergence testing results at additional sites in Middle River, Back River and Little Back River
- Sensitivity analysis results at additional sites in Middle River, Back River and Little Back River
- Clarify whether NOAA or USGS data is used for approximation of the offshore boundary
- A chart providing relative contributions (from point sources, storm water, ocean, upstream and marsh) of biochemical oxygen demand and nitrogen loading input to the system.

Information in the final report indicates that water level and tidal and riverine dynamics in the upper reaches of the model have been significantly improved. Salinity predictions in the Middle River and Little Back River and Savannah National Wildlife Refuge have also been improved. If the supplemental report does not disclose any unforeseen significant model problems, we believe that salinity prediction performance is adequate to use in project planning. However, we must caution that there continues to be a limited understanding and modeling ability of the velocity and flow dynamics in the Middle River, Little Back River and Back River. This limitation will cause some uncertainty regarding salinity and water quality predictions for mitigation alternatives that involve channel modifications in the Savannah River system.

With regard to dissolved oxygen, the model has limited ability to simulate the variability and trends in the data. Fourteen of 17 sites have R^2 values of less than 0.5 (explain 50 percent of the variability of the data) and nine of 17 sites have R^2 values of less than 0.25. These results indicate a limited understanding and modeling ability of the dissolved oxygen dynamics for the Savannah River estuary. However, the dissolved oxygen model results are similar to results in other southeastern estuaries and reflect the difficulty in modeling these systems. As a result, a great deal of caution will be needed in utilizing model dissolved oxygen predictions.

Our July 5, 2005 letter stated that users must be cognizant that any model in a complex system, such as the Savannah estuary, will have limitations in how well it will predict reality. An adaptive management approach, as described in Corp's Environmental Circular 1105-2-409, "Planning in a Collaborative Environment", dated 31 May 2005, is a way to deal with uncertainty. This document discusses the necessity of a well designed monitoring program as a cornerstone to adaptive management. The document also discusses phased project implementation, in which the initial phase is constructed and

monitored, and a future phase may be constructed as planned, modified, or not constructed. The decision on the future phase is based on the monitoring results and defined decision criteria. If an environmentally acceptable alternative can be identified, we would recommend implementing an adaptive management approach.

Based on the information reviewed, we conclude that: (1) additional documentation is needed to address the Service and USGS concerns provided with our July 5, 2005 letter; (2) if the documentation does not disclose significant unforeseen problems, salinity and water level predictions have been improved and are adequate for impact analysis; (3) dissolved oxygen model predictions are highly uncertain and will need to be used with a great deal of caution; and (4) for any acceptable alternatives, an adaptive management approach is needed to deal with model uncertainty.

We appreciate the efforts of you and your staff to coordinate this project with the Service. If you have any questions or wish to discuss this issue, please contact Ed EuDaly at 843-727-4707 x 227.

Sincerely,

Tim Hall
Field Supervisor