

MEMORANDUM FOR RECORD

SUBJECT: Savannah Harbor Expansion Project;
Summary of 4 March Meeting of the Interagency Water Quality Team

1. Attendees:

USGS	Paul Conrads
GA DNR-EPD:	Roy Burke III & Paul Lamarre
SC DHEC	Wade Cantrell & Larry Turner
COE:	Doug Plachy; Bill Bailey & Ken Derickson
	Sung-Chan Kim
EPA	Jim Greenfield & Steve Whitlock
Harbor Committee	Larry Neal & Margaret Tanner

2. The meeting was held to determine whether those reviewing the ATM/GPA Final Calibration Reports for the Hydrodynamic & Salinity and Dissolved Oxygen Models need additional information or clarifications before they are able to reach their decisions on the models.

3. I opened the meeting by reviewing the purpose for the meeting and providing an agenda. I reiterated that these two documents are intended to be ATM's final reports on development of their models and that the Project is not envisioning another round of Comment / Response with the reviewers. I asked that each agency reviewer summarize their findings and explain any concerns they may have so far.

4. Dr. Kim (USACE-ERDC) led off the discussion. He explained that [transport](#) of mass is very important in the models. For the vertical mixing used in BFHYDRO, the report states that the diffusivity is based on the tidal range. He stated that the formulas used to calculate the diffusivity are empirical – and are not physics based. The equations use two sets of coefficients, one developed from 1997 data and the other from 1999, [which was not documented in the report](#). Because of the [inconsistent method](#) used to calculate the diffusivity, Dr. Kim believes the application of the models should be limited to only those time periods over which the data was collected.

Dr. Kim also stated that the Hindcast evaluation was not conducted properly. It did not prove that the vertical mixing approach works for different channel depths.

Because of these two items, Dr. Kim believes that the mixing scheme is not defensible for extrapolation beyond conditions observed during the data collection periods (both in time and in bathymetry).

5. Paul Conrads (USGS) that described the findings of his review of the vertical mixing described in Appendix Q. He explained that the mixing was driven by the tidal range, and was calculated using Equation 5. He described how the equation was implemented – that there were two sets of coefficients for the different years over which ATM collected data. The manner in which the equation was implemented was not described in the ATM report, but instead in a spreadsheet that ATM subsequently provided to Paul. He explained that offsets were added to the values calculated for mixing. Offsets were added twice, once within the formula and another time to the highest of the values calculated from the two equations.

Paul explained some sensitivity work he had conducted on the tidal smoothing that ATM had used. He showed how the order in which the smoothing is performed resulted in a 14 percent difference in the model results at the peaks. The conclusion was that this model results are very sensitive to the vertical mixing approach.

Paul mentioned that he had consulted other modelers within USGS [in the review of the vertical mixing approach](#). [After their independent review of the model, they also expressed strong reservations about the defensibility of the vertical mixing when used for making predictions of harbor deepening.](#)

6. Jim Greenfield (EPA Region 4) then explained his findings. He started by saying that he had brought in a modeler from EPA’s research lab in Athens to review the model. That reviewer had expressed concerns about the vertical mixing approach used in the model. Jim explained that the Hydro Model used a backwater calculation [for the riverine portion of the model domain](#). He said that WQMAP [using this river formulation](#) had not been applied previously in riverine conditions and not previously defended. He stated that the procedures used were not sufficiently well defined in these Final Reports for him to be able to sufficiently defend results produced by the model.

Jim stated that in the D.O. Model, the SOD rates were quite high and that the reports did not sufficiently justify the BOD decay rates that were used.

He stated that the reports did not fully describe how or why ATM decided to use only 2/3 of the data that they had previously provided in the WRDB database. That database had about 31,000 records, but ATM used on 18,000 in their present reports.

7. Roy Burke (GADNR-CRD) then stated his findings. He reminded the group that he thought one goal was to develop a “legacy model” that the states could use to evaluate other proposed actions. He believes that the ATM models are too complicated and take too long to run. Roy praised the Federal agencies for their detailed review of the vertical mixing. He stated that any other model must perform equally as well, or better.

Concerning BOD, he said that (1) the model did not describe the marsh loading well, (2) that the instream decay rates had been changed from [0.06 to 0.09](#), with insufficient explanation given, and (3) that the marsh loads are very important in this system.

He said that the calibration appeared to be OK, except for the main river section where D.O. problems occur (Front River from Fort Jackson to the Houlihan Bridge). He said the balance between SOD and reaeration were not described well.

Roy stated that the State of Georgia had been left out of meetings that the Federal agencies had concerning this model. He believes the State should have been informed of those meetings and provided an opportunity to participate in those technical discussions on the models. He requested the States be informed in the future about scheduled meetings, their purposes, and then their outcomes. I apologized for leaving him out and said that although the Federal Cooperating Agencies felt a high level of responsibility for the conduct of the technical work performed as part of the project, we would include him in the future. To provide an example of work that had occurred during what the State perceived as a long period of inactivity (silence), Roy mentioned the Expectations Document that the Federal agencies had prepared in 2001. For ready reference, he requested a copy of that document, which we distributed during the meeting.

Roy concluded by stating that ATM's Final Reports did not address many of the issues that were discussed at the August 2003 meeting with ATM and GPA.

8. For the purposes of this record, I will continue with the review comments, although the group heard a presentation on another topic at this point in the meeting.

9. Larry Turner (SC DHEC) then provided some of their thoughts on the models. Larry concurred in the importance of the ability of the States to use the model in the future. He supported Roy Burke's desire to be kept in the loop on review of the models, but also expressed staff limitations and did not want to be overwhelmed with just this project. He explained that salinity in the National Wildlife Refuge is important to SC, as is any area where a change in use would occur as a result of the project. He reiterated that salinity was a very important parameter in this system.

Wade Cantrell (SC DHEC) then continued by stating that the reports did not sufficiently describe why the CBOD decay rates of 0.09 were used, when previous meetings a value of 0.06 had been discussed.

Wade said that the reports did not sufficiently support why 10 percent of additional flow had been added to those recorded at Clyo. He said it appeared that in 1999 that the flow volumes used in the model may have been reduced by 10 percent. The reduction is about 10 percent at the beginning of the 1999 simulation, but then it declines steadily to 0 percent at the end of the simulation, when the model inflow equals measured flow at Clyo.

10. Larry Neal (MACTEC for the Harbor Committee) then discussed his review comments. He said he had reviewed the D.O. Calibration Report only and had trusted the Federal and State agencies to assess the adequacy of the Hydro & Salinity Model.

Larry suggested using the CBOD measured decay rates. The measured range was 0.03 to 0.08. He believes the 0.09 decay rate used in the model substantially overstates the impact of the point source dischargers which have much lower measured decay rates.

Larry said that sensitivity tests are needed for CBOD levels used for the offshore boundary.

Larry stated that the reaeration rates are probably too high. He stated that the empirical reaeration equations are based on tidally averaged velocity and mean depth. He suspected that the model may incorrectly use instantaneous velocities and depths, rather than averaged ones. The reaeration rates in the report range from 0.35 to 1.6, while those in EPA literature range from 0.08 to 0.65 for tidal rivers and estuaries, with the rates calculated in this model about 3 to 4X those used in other tidal river and estuarine projects (including Savannah).

He believes the D.O. calibration started from the wrong point, levels of D.O. in the system that are too high and not realistic. He believes the modelers then adjusted SOD, the offshore boundary values, and the BOD decay rates to improperly balance the D.O. in the system. He stated that he found no sensitivity testing on ocean boundary BOD or percent DO saturation assumption of 75 percent.

During application, Larry recommended not using a combination of all critical conditions, since the probability of those events occurring simultaneously would be very small.

11. I then asked each reviewer if they needed any more information from ATM/GPA before they could reach their conclusions about these models. They uniformly said “No”.

I agreed to send the agencies an email restating the question(s) that I wanted each agency to answer concerning the ATM/GPA models.

12. I asked each reviewer to state their overall assessment about the models at this time. This is a summary of their responses:

EPA

- The vertical mixing approach makes the Hydro Model unacceptable.

USACE-ERDC

- The vertical mixing approach in the Hydro Model is unacceptable.
- The approach used limits the application to the 1997 and 1999 data collection periods.
- Hydro Model could be used to evaluate water surface elevation and velocities, generally within the range of flows observed during the data collection periods.
- The approach used renders the application unusable to evaluate the effects of changes in channel depth.

USGS

- The vertical mixing approach in the Hydro Model is unacceptable.
- Hydro Model could be used to evaluate water surface elevation within the general range of flows observed during the data collection periods.

Harbor Committee

- The D.O. calibration is unacceptable.
- They will rely on the Federal and State agencies for the Hydro Model.

SC DHEC

- [Based on the questions raised concerning the defensibility of the vertical mixing scheme and the conclusions of the Federal review agencies, the ATM Models cannot be used for the expansion project.](#)

GADNR-EPD

- The BOD mass balance is insufficiently documented.
- The D.O. Model is unacceptable in its defensibility.

13. The group heard a presentation by EPA's contractor (Steve [Davie](#) from TetraTech) on the Plan B Hydro Model. They distributed a Calibration Report for that model. TetraTech had worked with both a coarse and a fine grid. The coarse grid performed reasonably well, so the statistics in the Calibration Report are based on use of that coarse grid. The coarse grid is 6 layers deep and 3 wide in the navigation channel. The document describes their efforts and overall findings with the fine grid. They extended the ocean boundary out to 18 miles from the entrance.

Steve described the work they had done to include the marsh volumes in the model. They adjusted the shape of the marsh cells to ensure they did not go dry, but maintained the total flow volume into those cells.

For vertical mixing, they adjusted one parameter from the standard settings. That parameter is the one that the technical paper describing the mixing approach said could be adjusted without compromising the underlying assumptions. Their adjustment is within the bounds described in the original technical paper.

For salinity at the offshore boundary, they evaluated many different levels and approaches. They settled on a constant 33.5 at the boundary, which matched the observed data at Fort Pulaski well.

For Calibration, they used a single run covering from 1996 through 1999. The statistics are reported for the entire 4-year period, as well as for the 2-week periods described in the Expectations Document. They did not add to the river flows measured at Clio. For their Validation, they used the same set of input data, but compared the model results to a different set of observations – those recorded at the continuously recording USGS stations. TetraTech's Hydro Model with a coarse grid takes about 3 hours to do a 12-month run, 11 hours for a 4-year run. The fine grid takes about 6 hours for a 12-month run.

14. EPA provided the group with a brief update on the status of the RIV1 model. EPA is continuing to add recent point source discharge data into the model. ATM used the RIV1 model for their 1999 calibration runs. EPA intends on using the RIV1 model for the 1997-2000 period during calibration of their D.O. Model.

15. I agreed to review the previous agency letters and let the reviewers know where the need that I had quoted in my Feb 20 email for Evaluation of Impacts to Mixing Zones for Point Source originated.

16. Concerning the scheduling of future work and coordination, EPA expects to have their D.O. Model complete by the end of May. EPA would like to meet fairly regularly between now and then to keep the group of the status of that model development process. The group agreed to meet back at EPA at 10:00 on April 15th. *Subsequently, that date was revised to April 20th.*

I requested the reviewers send me an email with their preliminary findings on TetraTech's Hydro Model Calibration Report **by the end of March.**

Savannah District would like an agency letter expressing their position on the ATM/GPA models **by 5 April.** The Project's Executive Management Group (heads of EPA, USFWS, NMFS, Savannah District, and GPA) will be meeting on 7 April to discuss these models and one other issue.

William Bailey
Environmental Resources Branch