

Status Report
Modeling Technical Review Group (MTRG)
Savannah Harbor Expansion Project
September 18, 2002

A meeting was held on Tuesday, September 18, 2002 at 10 AM in Atlanta, GA at the EPA offices. The following persons attended the meeting and participated in the MTRG discussions:

Matt Goodrich	ATM	843-884-8750	mgoodrich@appliedtm.com
Daniel Mendelsohn	ASA	401-789-6224	dmendelsohn@appsci.com
Roy Burke	GAEPD	404-675-1665	roy_burke@mail.dnr.state.ga.us
Paul Conrads	USGS	803-750-6140	pconrads@usgs.gov
Bob Scanlon	Harbor Committee	912-644-7778	bscanlon@ci.savannah.ga.us
William Bailey	USACE	912-652-5781	william.g.bailey@sas02.army.mil
Bo Ellis	ATM	843-884-8750	boellis@worldnet.att.net
Wade Cantrell	SCDHEC	803-898-3548	cantrewm@columb32.dhec.state.sc.us
Larry Neal	LAW-Harbor Comm.	770-499-6791	lneal@lawco.com
David Sample	LAW-Harbor Comm.	770-421-7046	dsample@lawco.com
Steve Whitlock	EPA-R4	404-562-9242	whitlock.steve@epa.gov
Eduardo Yassuda	ASATM Brazil	843-884-8750	eyassuda@asatm.com.br

Comments on the Hydrodynamic and Salinity Model Approval Package

Bill Bailey requested that any remaining comments on the Hydrodynamic and Salinity Model Approval Package be sent to him. The USACE will compile the comments into a single document.

Presentation of the Water Quality Model Approval Package

Eduardo Yassuda and Matt Goodrich presented the status of the water quality model calibration, including the Water Quality Model Approval Package dated 9-13-02. The complete model setup was presented, including the rates & constants, the boundary concentrations and the point source loads. The model results were presented, including:

- the distribution of ultimate oxygen demand (UOD), carbonaceous oxygen demand, ammonium, nitrate, organic nitrogen, organic phosphorus, inorganic phosphorus along the river;
- time series of DO saturation, DO concentration and DO deficit.
- longitudinal percentiles of DO concentrations; and
- DO concentration error statistics.

The results indicate that the model tends to underpredict DO concentration, particularly in near the river entrance. Additionally, the model does not replicate the semidiurnal range in DO. However, as shown by the longitudinal plots of DO concentration percentiles, the model is capable of reproducing the system wide trends of DO.

Eduardo stated that the upriver boundary for the model will be provided by the EPA/GAEPD river model, which has not yet been delivered to ATM. The present model calibration uses constant concentration boundary values.

Discussion of the Water Quality Model Approval Package

Some MTRG representatives commented that the overall results of the model calibration appeared reasonable, but would need some further sensitivity testing and additional refinements. Roy Burke explained that the GAEPD river model was originally calibrated to 1990 data and is presently being set-up to simulate the 1999 conditions. GAEPD has transferred the model to the EPA. The model application by EPA is still in progress and no schedule was determined for completion of the modeling task.

As recommended at the last MTRG meeting and subsequent workshop, the model offshore boundary CBOD was increased until the model was able to replicate the high UOD values measured at GPA-26. Larry Neal questioned as to whether such a high boundary value (6.9 mg/l) is justified for an ocean boundary.

Roy Burke recommended that a 90% dissolved oxygen saturation value is more appropriate for the offshore boundary than the 100% saturation used in the present model.

Larry Neal noted that the SOD rates might be high because the measured values are in water depths shallower than the navigation channel (max. depth of 20 ft versus 42 ft) and off to the side of the channel. The sample locations would be on muddier substrate than in the regularly dredged navigation channel bottom.

Larry Neal asked if the Kerr McGee 004 outfall was included in the model. It is not included in the present model calibration because flow rates were not available. LAW provided measured concentrations, but flow rates are needed to calculate the mass loading rate.

The MTRG suggested that the geometric mean line be added to the input loading plots in the Approval Package report.

Stormwater flows and loads were not included in the model calibration. The City of Savannah may have stormwater flow and water quality data available, which would be provided, if available. Several of the larger stormwater outfalls include tide gates and high flow pumps.

The reaeration in the model is based on the depth of the entire water column. Eduardo explained that using just the top layer results in too much reaeration, and using the entire depth results in too little reaeration.

Bill Bailey noted that mixing resulting from the passage of ships (~22 trips per day) is not included in the model. The ships occupy 1/5th of the navigation channel width and nearly all of the depth.

The group made the following recommendations for improvements to the report:

- Add a column of literature values to the table of model input rates;
- Add a glossary of acronyms;
- Add boundary values to longitudinal plot of UOD (e.g., list the offshore CBOD and NBOD on the left axis, list the upriver CBOD and NBOD on the right axis);
- Perform sensitivity analysis with CBOD deoxygenation rate, $K_d = 0.03 \text{ day}^{-1}$;
- Expand on assumptions used to determine boundary values. Include these explanations in the table of input values (e.g., the offshore boundary NH₃ was based on the geometric mean of the measured high water slack tide samples at station GPA-26);
- Do not plot negative O-P values. These values are meaningless;
- Zoom in y-axis scale on plots of DO saturation;
- Compare GPA-26 percent saturation to offshore boundary percent saturation;

- Add description of error statistics (e.g., RMSE is the root mean square error: show how it is calculated);
- Use SOD = 0.3 for offshore areas and SOD = 0.4 for navigation channel bottom. The offshore bottom is typically sandy and should use a lower SOD value. Also, the measured samples were taken to the side of the navigation channel in approximately 20 feet of water. The MTRG considered that the side of the channel may be a muddier bottom (and therefore a higher SOD value) than the recently dredged channel bottom;

Larry Neal recommended that the following text be added to the report: "This present model calibration assumes all CBOD sources (point and nonpoint) decay instream at the same rate. Further model refinement is being coordinated with USEPA to accommodate the use of two or more CBOD decay rates for purposes of establishing total maximum daily loads."

The MTRG consensus was that additional refinement of the water quality model calibration was necessary to reflect a more appropriate balance of the specified loads from the various boundary conditions. ATM will develop a series of status reports prior to the next MTRG meeting with preliminary results from the recommended model calibration tasks.

Action Items

The following list of Action Items to be accomplished before the next meeting were generated based on the MTRG discussion:

- (1) LAW will provide the flow rate to use for the calculation of the mass loading rate at the Kerr McGee 004 point source discharge.
- (2) EPA will provide 1999 output from their Savannah River model that will be the basis for developing the upriver boundary for the Savannah Estuary WQ model. No schedule set for delivery.
- (3) The City of Savannah will determine the recommended flows and loads to use for the stormwater discharges to the river during rainfall events.
- (4) ATM will make the following changes to the WQ model:
 - The offshore boundary CBOD will be adjusted to be within the range of measured data.
 - Set upriver CBOD to minimum measured at Clio.
 - The SOD input will be revised to a lower value for the offshore region, and a lower value for the dredge navigation channel.
 - The offshore boundary will be revised to allow specification of percent saturation. The boundary should be set to approximately 90 percent saturation.
 - The reaeration formula will be adjusted by using a different number of layers to represent the depth term in the reaeration formula (based on results thus far, 1 layer results in too much reaeration, and the entire water column results in too little reaeration).
 - A sensitivity analysis will be performed to on the CBOD oxidation rate.
 - ATM will implement the upriver boundary condition specified by the EPA RIV1 model.

Future Activity

Comments and questions related to this Status Report should be directed to Chris Ahern of ATM (cahern@appliedtm.com). The MTRG will meet again on October 31st, 2002 in the Atlanta Federal Building. Please contact Chris Ahern if you have any comments or recommendations for the next meeting.