

Outfall Monitoring Science Advisory Panel Meeting Minutes

Bays Eutrophication Model Evaluation Group

Conference Call Wednesday, March 14, 2001

FINAL Summary

Participants: : Eric Adams (MIT), Bob Beardsley (WHOI), and John Paul (EPA).

Summary prepared by: Cathy Coniaris (MADEP) and Mike Mickelson (MWRA).

Purpose

The Model Evaluation Group (MEG) reviewers met to discuss comments on the draft HydroQual report "Preliminary Calibration of the Massachusetts and Cape Cod Bays Hydrodynamic Model: 1998-1999". Jim Fitzpatrick and Rich Isleib (HydroQual) were contacted during the conference call to answer questions

Background

Over the past decade, the Massachusetts Water Resources Authority (MWRA) has been working with colleagues to develop and utilize two models, the Hydrodynamic Model and Bays Eutrophication Water Quality Model (BEM) for Massachusetts and Cape Cod Bays. The Hydrodynamic Model was recently transferred from USGS to HydroQual. The draft report under review describes preliminary model runs conducted after this transfer. In 2002, both models will be moved to U. Massachusetts Boston where they will be maintained and utilized by MWRA and others.

Recognizing the need for independent peer review, the MEG was formed in 1995 to provide outside advice and recommendations during model development. In 1999, the Outfall Monitoring Science Advisory Panel reconvened the MEG to review 1992-1994 BEM runs. In early 2001, the MEG was contacted to review recent Hydrodynamic Model runs.

MEG Review

In general, the MEG reviewers believe that this draft report, "Preliminary Calibration of the Massachusetts and Cape Cod Bays Hydrodynamic Model: 1998-1999", is a step in the right direction. However they feel that there are several areas in the report that require more information. HydroQual is in the process of preparing a more detailed report that will be provided to the MEG in the April/May 2001 time frame. MEG's comments fall into several categories, listed below.

Heat Flux

- Show more information on implementation of the new heat flux formulation. Include equations
- Show some results using the old heat flux formulation. Use a case-study layout to show runs that needed further attention, and how they were improved.
- Explain rationale for change in heat flux formulation.

- Excerpt heat flux descriptions from Cole and Buchak (1994) and Ahsan and Blumberg (1999), page 2-5.
- Was the treatment of the long and short-wave radiation separated?
- Are the choices of extinction coefficients realistic for long-wave radiation?
- Is the heat flux spatially variable?
- The description of TR on page 4-7 and 4-9 is a bit confusing. We recommend shortening it to say TR is the (longer wavelength) fraction of shortwave radiation which is unable to penetrate beyond the first layer. Our experience with lake modeling is that TR should be of order 0.5; thus it is confusing as to why they chose 0. Is there a value of TR implicit in the WQ model or is this irrelevant since the upper layer of the WQ model is much thicker?
- Were the values of k_e chosen based on a calibrated relationship with turbidity or other measure of water clarity?

Obtaining Boundary Conditions

- Explain the boundary condition methodology. What is the interpolation method?
- Were the quality and quantity of data enough to obviate the need for a GOM model run?
- One suggestion to test the adequacy of the boundary condition interpolation is to subtract data and see if the MatLab program can replicate the results.
- Is table 4-1 specific for temperature and salinity data?
- Explain how the timing of the boundary conditions may be modified (page 4-7, paragraph 3). MEG recommendation #2 dated 6/13/00 regarding spatial resolution is relevant here (MEG report located at: <http://www.epa.gov/region01/omsap/meg1299.html>).

Changes from Previous Model Runs

- Document all changes from previous years' runs.
- Were heat flux and boundary interpolation the only changes?
- Describe the effect of these changes.
- What parts of the model were added by HydroQual?
- Compare model results before and after any changes. This could be done using schematic diagrams or a list, whichever is less time consuming.

Posterity and Thorough Documentation

- This report could evolve to become the definitive description of the use of the Hydrodynamic Model. Therefore it would be useful to excerpt other reports rather than just use citations. HydroQual can add these sections as an appendix or as part of the main text.

- The appendix of monthly boundary station locations is useful but it is not possible to determine if there has been a significant change in available data compared to earlier model runs. Please provide this information for the planned addendum to the 1992-94 report.
- Table and figure legends need to be more explicit.
- What is meant by "realistic" on page 2-1, line 5?
- Please clarify "For this study, Z_o was assumed to be uniform throughout the domain...." (page 2-4, line 4 from bottom). Does this mean Z_o can be varied?
- How was the number for Z_o determined? Most drag coefficients are stated at 1m above the surface. Was the Z_o number chosen to produce more realistic tides?
- Provide a more detailed specification of the temporal and spatial variability of the open ocean boundary conditions including the flow field.
- Is <http://crusty.er.usgs.gov/mbayospen/mbayopen.html> identical to the Signell citation you listed or should it be added?
- Provide a list or table like the sample below of all the model inputs and highlight those that can be subjectively adjusted:
Example: Description of model input variables
 - Z_o is fixed at 0.003. This value was chosen to provides realistic tides.
 - Wind stress is measured every hour and assumed to be spatially uniform.
 - Solar radiation is measured every hour and assumed to be spatially uniform.
 - Boundary values of temperature and salinity are specified at monthly intervals and linearly interpolated from mid-month to mid-month. The monthly value may be adjusted to improve model fit.
 - etc.

Subjectivity

- Which parameters are adjustable and which are not?
- Are any boundary conditions subjectively adjusted?
- Can the velocity field be adjusted?
- Were any of the subjective steps transferred from USGS or changed?

Transfer from USGS

- The MEG believes it is important to learn more about the transfer of the Hydrodynamic Model from USGS to HydroQual. Describe the handoff, including what was actually transferred to HydroQual.
- Request that Rich Signell (USGS) review the next draft of this report if he is to be kept as an author.

Results versus Data

- How do we know when the model is good enough?

- With the limited information presented in this report, the MEG cannot determine whether this model run was better or worse than previous ones. Please include more comparisons in the next draft.
- How close were prior runs? Demonstrate this by including some of the previous figures for the same stations. What is the skill of the present model with present conditions compared to the skill of the previous model with previous conditions? This information will help the MEG address the questions listed on page 4-9.
- What are the vertical lines in figures 3-5 and 3-6? Also note the reversed legends in some figures.