Chesapeake Bay Program
SCIENTIFIC AND TECHNICAL ADVISORY COMMITTEE
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February 9, 2018

RE: STAC Chesapeake Bay Water Quality Sediment Transport Model (WQSTM) Review

James Edward, Interim Chair, Chesapeake Bay Program Management Board
U.S. Environmental Protection Agency
410 Severn Avenue, Suite 109
Annapolis, MD 21403

Cc: Management Board; Water Quality Goal Implementation Team; Scientific Technical Assessment and Reporting (STAR); Modeling Workgroup

Dear Acting Director Edward,

I am pleased to attach for your consideration the STAC review report: *Scientific and Technical Advisory Committee: Chesapeake Bay Water Quality and Sediment Transport Model Review.*

The 2017 version of the Water Quality Sediment Transport Model (WQSTM) is the most recent in a series of increasingly refined versions of coupled hydrodynamic and water quality models of the Chesapeake Bay that have been guiding Chesapeake Bay Program (CBP) management decisions for the past three decades. New aspects of the current WQSTM include improved representation of the bioavailability of particulate organics, and improved ability to simulate Conowingo infill and climate change in tidal waters. Refinements to the shallow water simulation include attenuation of nutrient and sediment loads through tidal wetlands, the representation of shoreline loads of nutrients, and the explicit representation of oyster aquaculture, sanctuaries, and wild populations.

The CBP, though the Modeling Workgroup, requested a STAC-sponsored independent review of the newer WQSTM modeling aspects noted above, specifically, to evaluate the reasonableness and objectivity of the model within the context of the available science for use in implementation for the 2017 Mid-Point Assessment. In addition to addressing nine main charge questions, the review panel was also encouraged to make recommendations for future work by the CBP partnership or recommend alternative modeling approaches, needed research, and/or data gathering needed for the longer term. A panel of eight individuals with appropriate expertise performed the requested review in the spring and summer of 2017.

Overall, the review panel found the approaches taken and changes made to the 2010 version of the model to be sufficiently scientifically defensible and appropriate for preliminary application for the Mid-Point Assessment. Review recommendations focus largely on suggesting additional model-related analyses to provide insights into the dominant factors affecting water quality in shallow waters, and multiple modifications and updates that must be made as soon as possible to ensure that an improved estuarine model can be successfully recalibrated and its key elements introduced and reviewed in time for 2025.

In summary, the panel recommends that the CBP should:

- Provide a comprehensive documentation of the WQSTM, including a complete description and rationale of model development and sensitivity analyses used to support decision-making.
- Conduct further review and refinement (if necessary) of the current modeling of Conowingo loads is needed after better documentation has been developed and well before the intended 2025 implementation.
- Investigate inconsistencies in the impact of sea level rise on upper Bay bottom salinity estimates between the current simulation and previously published literature.
- Re-examine assumptions relating to climate change (e.g., oxygen solubility, phytoplankton growth rate-temperature relationships, and future changes in river and shelf water temperatures) for long-term management use and carefully explain differences in results from those previously published in the literature.
- Include a more mechanistic and dynamic treatment of wetland accretion and erosion in the future, and consider the differences in wetland types in regard to ecological consequences.
- Pursue a higher resolution model to further improve the shallow water quality simulations, including estimates of shoreline erosion nutrient loads and nutrient attenuation by tidal wetlands.

We hope the Management Board, Goal Implementation Teams, and various workgroups find the recommendations outlined in this review report to be useful, and we look forward to your feedback. STAC respectfully requests a written response from the Modeling Workgroup by May 9, 2018.

Please direct any questions you may have about this report and its recommendations to Rachel Dixon, Coordinator of the Chesapeake Bay Program's Scientific and Technical Advisory Committee, or Damian Brady (University of Maine) and Joseph DePinto (Limnotech, retired), co-chairs of the review panel.

On behalf of the entire STAC, thank you again for your consideration.

Sincerely,

Brian Benham
Chair, Chesapeake Bay Program's Scientific and Technical Advisory Committee