Partnership and Jurisdictional Review of the Suite of Chesapeake Bay Program Partnership Models: A Proposal

Below please find a proposal for dividing up and assigning responsibilities for reviewing the calibrations and model responsiveness to early versions of a suite of ranging scenarios across the full suite of Chesapeake Bay Program Partnership models. This proposed approach is based on a series of conversations with a number of involved partners and their requests and recommendations.

Phase 6 Watershed Model

Dividing Up and Assigning Responsibilities

- Ask each of the technical support and source sector workgroups to take on the responsibility for: 1) ensuring the collective partnership-based decisions have been fully carried out, and 2) evaluating model calibration outputs specific to their respective land uses
    - Modeling Workgroup
        - Review watershed model documentation chapters 2, 4, 7, 9 and 10
        - Review summary findings and implications of the Chesapeake Bay Program Office Modeling Team's report out on their detailed review of calibration results for each calibration station, looking for any anomalies or patterns
        - Evaluate any significant changes in overall model calibration results over changes in the spatial scale
    - Watershed Technical Workgroup
        - Review watershed model documentation chapter 3
        - Conduct sensitivity analyses of the Phase 5.3.2 vs. Phase 6 watershed model responses to varying levels of BMP implementation
    - Land Use Workgroup
        - Review watershed model documentation chapter 5
        - Review loading rates from specific land use dominated land river segments to ensure consistency with partnership approved target loading rates
    - Agriculture Modeling Subcommittee
        - Review watershed model documentation chapters 3 and 6
        - Review calibration results for agriculture dominated watersheds
        - Review sensitivity analyses based on running model responses to individual agricultural BMPs, multiple BMPs, and stacked BMPs
    - Urban Stormwater Workgroup
        - Review watershed model documentation chapter 2
        - Review calibration results for suburb/urban development dominated watersheds

        - Review sensitivity analyses based on running model responses to individual stormwater management BMPs, multiple BMPs, and stacked BMPs
    - Forestry Workgroup
        - Review watershed model documentation chapter 2
        - Review calibration results for forest dominated watersheds
        - Review sensitivity analyses based on running model responses to individual forestry management BMPs, multiple BMPs, and stacked BMPs
    - Wastewater Treatment Workgroup
        - Review watershed model documentation chapter 8
        - Review sensitivity analyses based on running model responses to varied levels of wastewater treatment
        - Review sensitivity analyses based on running model responses to varied levels of on-site treatment systems

- Ask the jurisdictions to take on the responsibility for:1) evaluating how well the model simulates watershed loads at key stations and watersheds, and, 2) reviewing results from the early versions of a suite of ranging scenarios comparing outputs from Phase 5.3.2 and Phase 6 specific to their jurisdiction
    - Focus on calibration results from: 1) relevant river input monitoring stations; 2) the subset of monitoring stations which best capture loads leaving each individual jurisdiction; and 3) selected stations which characterize watersheds for which implementation levels are well known, therefore, calibration outputs can be used to understand how well the model is working
    - Comparison of Phase 5.3.2 and Phase 6 scenario outputs for a suite of ranging scenarios like 1985, Phase II WIPs, E3, All Forested, and recent progress runs specific to their jurisdiction

<u>Enhancement of Model Review Tools</u>[1]

- Expand the existing Tableau watershed model input data review tool to now include the same functionality for reviewing and evaluating Phase 6 watershed calibration and preliminary scenario results at the full array of available scales and cross comparisons
    - Provide functionality for evaluating output and making cross comparisons all the way down to the individual county and the land river segment scales
    - Break out the incremental loads on the 'way to delivery to tidal waters'—edge of field, edge of small streams, larger rivers, and delivered to tidal waters—so that the progression of attenuation can be viewed and understood
    - Charting capacity to easily cross compare from one county to another, from one watershed to another

[1] Reflects the direct input and ideas from a number of partners called and consulted prior to drafting this proposed approach to model review by the Partnership and the jurisdictional partners.

  - Ability to compare relative loads across source sectors, by major land uses
  - Expand years beyond just the calibration period—need to be able to view calibration data/early ranging scenario results for the entire record 1985-2016 so we can see how well the model captures long term trends and responses to management action with a particular focus on the post 2013 years
  - Build off the county level framework that Sucharith Ravi has already set up
  - Set up ability to conduct evaluations of the Partnership's old (Phase 5.3.2) and new (Phase 6) approaches to simulating nutrient management approaches as well as other specific significant changes between the two phases of the watershed model

- Build into the CAST user interface the ability to easily and rapidly run a series of sensitivity scenarios to fully understand the model's responses to individual BMPs, multiple BMPs, and stacked BMPs

- Expand the comparison of WRTDS calculated loads with Phase 6 WSM simulated loads to include all monitoring stations with a sufficient temporal record of observations that supports the WRTDS calculations

- Generation of summaries of the extensive and detailed calibration data analyses (50+ pages of calibration documentation per station) at scales of interest to the jurisdictions

- Expand the capability to geographically map out/visualize watershed model calibration outputs and the output of early ranging scenarios at the full range of spatial scales supported by the model and enable side by side comparisons between different scenarios

Chesapeake Bay Water Quality/Sediment Transport Model

<u>Dividing Up and Assigning Responsibilities</u>

- Ask the Modeling Workgroup to take on responsibility for ensuring: 1) the collective partnership-based decisions have been fully carried out; 2) the estuarine hydrodynamic, water quality, and lower trophic level processes and rate functions are consistent with the current scientific understanding; and 3) the review of summary findings and implications of the Chesapeake Bay Program Office Modeling Team's report out on their detailed review of calibration results for each calibration station, looking for any anomalies or patterns

- Ask Maryland, Virginia, Delaware and the District to take on the responsibility for: 1) evaluating how well the model simulates tidal water quality conditions over time at key stations and segments within their jurisdiction, and 2) reviewing results from early versions of a suite of ranging scenarios comparing outputs from the Phase 5.3.2 and Phase 6 versions of the Bay Water Quality/Sediment Transport Model relevant to their jurisdiction.

Enhancement of Review Tools

- Take the Maryland Department of the Environment's developed approach to summarizing and graphing Water Quality/Sediment Transport Model calibration output and enhance it to generate results for all calibration stations and all 92 segments
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Chesapeake Bay Airshed Models

Dividing Up and Assigning Responsibilities

- Assign the Modeling Workgroup with responsibility for reviewing outputs of the enhanced versions of the Penn State Chesapeake Bay deposition model and the national CMAQ model
    - Ensure the collective partnership-based decisions have been fully carried out in upgrading both the Penn State deposition model and the CMAQ model
    - Compare the wet and dry atmospheric deposition loading rates direct to the watershed and tidal waters and the fraction of those loads that reach tidal waters between the Phase 5 and Phase 6 versions of both models under a range of early scenarios

Process for Cataloging and Resolving Identified Issues

- Communicate all identified model calibration issues to the appropriate Chesapeake Bay Program Office Modeling Team lead—Gary Shenk: watershed model, Lew Linker: water quality sediment transport model; and Lew Linker: airshed models—for cataloging.

- Gary Shenk/Lew Linker will then assign each issue to the appropriate technical/source sector workgroup or Chesapeake Bay Program Office team for resolution.

- Circle back through the appropriate workgroup(s) and the WQGIT, if needed, to confirm partnership support for the proposed issue resolution.

- Chesapeake Bay Program Office staff will then document resolution of each identified model calibration issue and subsequent workgroup/WQGIT concurrence.