Workshop Steering Committee: **Bill Ball**: Bill is Executive Director of the Chesapeake Research Consortium (CRC), where he has been since January 2015, and also continues as professor of environmental engineering at Johns Hopkins University, where he has been since 1992. Bill's research revolves around physical-chemical processes controlling water quality. **Peter Claggett:** Peter is a Research Geographer with the USGS and has worked at the Chesapeake Bay Program (CBP) since 2002. Peter coordinates the CBP Land Use Workgroup and leads the CBP Land Data Team that conducts research on land change characterization, analysis, and modeling in Chesapeake Bay Watershed. **Lora Harris:** Lora is an associate professor at the University of Maryland Center for Environmental Science Chesapeake Biological Laboratory (UMCES CBL) where she has worked since 2007. Lora's research interests revolve around marine systems ecology, theoretical ecology, ecosystem modeling and primary production variability. **Raleigh Hood (Workshop Chair):** Raleigh is a professor at UMCES Horn Point Laboratory (UMCES HPL) where he has worked since 1995. He is also the program manager and steering committee chair of the Chesapeake Community Modeling Program (CCMP), and chair of the Community Surface Dynamics Modeling System's Chesapeake Focus Research Group (CSDMS/CFRG). Raleigh's research interests revolve around coupled physical-biogeochemical and ecosystem modeling. **Tom Ihde:** Tom is a staff scientist at the NOAA Chesapeake Bay Office (NCBO) where he has worked since 2009, and he is also currently a member of the CBP Scientific and Technical Advisory Committee (STAC). Tom has worked in marine fisheries on a wide variety of subjects and he is currently working on the development and application of a full ecosystem simulation model (Atlantis) in Chesapeake Bay. **Lewis Linker:** Lewis Linker is the CBP Modeling Coordinator, and works with colleagues throughout the CBP to develop linked models of the airshed, watershed, estuary, and living resources of the Chesapeake region. **Gary Shenk (Workshop co-Chair):** Gary is a hydrologist with the USGS and has worked at the CBP since 1995. Gary leads the watershed model development and application team at the CBP. **Chris Sherwood:** Chris is an oceanographer with USGS in Woods Hole where he has worked since 2001. He is also the Chair of the CSDMS Interagency Working Group (IAWG). Chris' research interests revolve around measuring and modeling sediment and contaminant transport in the coastal ocean. **Lisa Wainger:** Lisa Wainger is a research professor at UMCES CBL where she has worked since 1997, and she is also currently the chair of the CBP STAC. Lisa's research interests revolve around regional-scale ecological and economic modeling.

Endorsed by: CCMP; CRC; CSDMS/CFRG

Description of Workshop: CCMP, CSDMS/CFRG, CRC, and the CBP propose a three-day STAC workshop in 2017 to undertake a comprehensive review of the status of the current CBP management modeling system and discuss future directions for management modeling in the CBP with a view toward developing a roadmap for future CBP modeling beyond 2018. This workshop will be guided by the following overarching questions:

1. *Description of needs:* What are the mandates and the scientific, computational, and data management challenges the CBP faces in the coming years and what critical changes and upgrades will have to be made to the CBP modeling system to meet these challenges?
2. *Review of advice:* How can information and recommendations from previous workshops and committee reports and organizations like the STAC, National Research Council (NRC), CCMP and CSDMS be brought to bear to address these needs?
3. *Description of resources:* What human and infrastructure resources are going to be available to meet these future needs and challenges? How can resources be used more efficiently and collaboration among government, private, and academic partners be maximized? What additional resources might be needed and how might the various stakeholders and partners work most effectively to find these?
4. *Visioning for 2018 and beyond:* Can a well-informed, realistic, and unified vision for future CBP modeling be created to guide us into the future?

This meeting will begin with a full day plenary session that will review the purpose of the CBP models, the current state of the CBP modeling system, and the goals of the workshop. In this plenary there will also be presentations and discussion related to overarching considerations, like how new

technologies and modeling approaches can be used to address CBP modeling needs. The second day of the workshop will be spent in breakout sessions, organized around each of the major components of the CBP modeling system (land use, watershed, airshed, estuarine physics and water quality, living resources, and socio-economic). These breakout groups will address all four of the overarching workshop questions. A final full day plenary session will consist of concise reports from the breakouts and a discussion of the compatibility between proposed components, with a view toward formulating a realistic and unified vision for future CBP modeling that can be used to guide us into the future.

A STAC workshop is an appropriate vehicle for the proposed activity because this workshop will synthesize the results from several previously funded STAC workshops and because the recommendations from this workshop will provide direct guidance to the CBP Modeling Working Group (MWG).

Justification for Proposed Topics and Management Implications: The CBP's reliance on the modeling system as a planning tool to inform strategic management decisions and adaptation toward Bay restoration will continue into the foreseeable future. Yet it has been more than a decade since STAC has convened a dedicated workshop to discuss future directions for modeling in the CBP (see http://www.chesapeake.org/pubs/modbay2010report.pdf).

Moreover, there have been rapid advances in physical process understanding, computer science, and modeling techniques in recent years. There have also been several workshop activities and resulting reports that have provided recommendations for how the CBP MWG should consider evolving the modeling system in the future to keep up with the state-of-the-art in land use, watershed, airshed, estuarine, living resources, and socio-economic modeling for its restoration efforts. These include STAC sponsored workshops on multiple/ensemble modeling, shallow water modeling and uncertainty assessment. They also include an NRC-motivated report and recommendations from the Modeling Laboratory Action Team (MLAT) on how the CBP might reorganize its modeling infrastructure. In addition, the CCMP has long advocated that the CBP should continue efforts to more fully adopt open-source and community modeling approaches. There have also been two recent NSF-funded projects in Chesapeake Bay on the development of approaches for engaging stakeholder communities in the model development process. And, finally, the NSF-funded CSDMS CFRG brings state of the art modular modeling approaches and tools to the table along with the CSDMS IAWG, which seeks to engage federal, state, and local agencies in model development efforts. All of these new technologies, approaches and recommendations should be considered in planning for the future.

Looking back on the last visioning workshop and the subsequent developments, it is clear that it is time to motivate another workshop along these lines. Indeed, based on past workshop experience and what has been learned since, we believe that this workshop will be highly successful in formulating a vision for future CBP modeling that can be used to guide us into the future.

Key Linkages with Bay Program Goals, Strategies and Priorities: The Bay Program modeling system has become the primary tool for evaluating if the partnership's implementation of BMPs achieves the load reductions required in the Bay Total Maximum Daily Load (TMDL) and if those reductions are sufficient to achieve water quality standards.

The CBP has long recognized the importance of the CBP's modeling tools, with many priorities focused on improvements to the modeling system. The CBP has also acknowledged the importance of working toward adopting modern modeling approaches, which include community and open-source modeling, modular and multiple (ensemble) modeling, shallow water modeling and uncertainty assessment. Moreover, significant challenges are now emerging related to the need to better engage stakeholders in the application of the CBP modeling tools in management planning. And the CBP must consider the possibility that the modeling infrastructure (i.e., CBP modeling groups, advisory committees and funding structures) might need to be changed in the future to achieve its goals.

The CBP's Phase 6 modeling effort for setting nutrient reduction targets and TMDLs is well underway with the 2017 Midpoint Assessment (MPA) looming, which will continue through all of 2018. Immediately after the MPA the CBP MWG will begin the next phase of the development of its modeling

system using the latest science, data, tools, and modeling approaches. Although the CBP is understandably focused on the 2017/2018 MPA, it is now time to start thinking about how the CBP's modeling suite should be changed and upgraded beyond 2018 to meet future management needs.

Potential Speakers: The Steering Committee will identify potential speakers that have expertise in (1) the Bay Program's modeling system (and/or other similar models), (2) multiple/ensemble modeling, (3) shallow water modeling, (4) uncertainty assessment, (5) open source and community modeling, (6) stakeholder engagement and social science, (7) modular modeling approaches and (8) CBP management needs for a post 2018 modeling system. In addition, the Steering Committee will invite speakers who were/are members of the CSDMS CFRG, the NRC-motivated MLAT and the CSDMS IAWG. The selected speakers will address the workshop objectives and will be asked to significantly contribute to the workshop products. The Committee will specifically seek experts from regions outside of the Chesapeake Bay watershed to offer new perspectives and knowledge to the workshop.

Detailed Description of Workshop Products: The workshop will generate specific recommendations for CBP MWG to consider for how the CBP's modeling suite might be changed and upgraded beyond 2018 to meet future management needs. The workshop will develop recommendations specific to each component of the CBP modeling system (land use, watershed, estuarine physical and water quality, living resources, and socio-economic). These recommendations will include consideration of the potential benefits of state-of-the-art modeling approaches and the potential need for changing the CBP modeling infrastructure. The recommendations, along with a justification and priority for each, will be developed into a workshop report and submitted to the CBP within 90 days of the workshop.

Logistics: The workshop will be invitation-only, and we estimate that 40-50 participants will attend. The workshop will be held over a three-day period in Fall/Winter of 2016/2017 (this timeline is firm). Selected STAC and CCMP members will be invited along with selected NRC MLAT, and CSDMS CFRG and IAWG members. The workshop steering committee, STAC, CRC and the CCMP will contribute to the selection of people to attend. The workshop steering committee is considering locations near Annapolis, MD, and VIMS, Gloucester Point, VA.

Estimated Budget: Venue - $2000; Catering - $5000; Travel for invited speakers/participants - $12,000; Commitment for match from EPA-CBP - $2,000; Commitment for match from USGS-VA/WV - $2000; Pending (likely) commitment for match from National Science Foundation (via CRC) - $5000; **Total requested from STAC- $10,000.** The $4,000 of EPA and USGS funds can only be used for conference facilities such as room rental, etc. They cannot be used for catering. The pending funds from the National Science Foundation have no such constraints and are budgeted toward subsidizing student and early-career researcher attendance ($3,000) and partial support of catering ($2,000). The requested STAC budget will be used primarily toward a combination of balancing the facility and catering costs ($5,000) and for the travel expenses of major invited speakers ($5,000). We expect such costs to average roughly $800 per speaker including lodging, and that 6 or 7 outside speakers will be invited. A 3-day duration and associated costs are justified because this workshop is a synthetic activity that will review several previous STAC workshops and related efforts and, at some level, it combines multiple separate workshops on the different CBP modeling system components. Accordingly, we anticipate that there will be considerable interest and that it will take 3 days to achieve our goals.

Previous relevant STAC-Funded workshops: *Chesapeake Bay Hydrodynamic Modeling: A Workshop Report* (Hood and Shenk); *The Role of Natural Landscape Features in the Fate and Transport of Nutrients and Sediment* (Claggett); *Multiple Models for Management in the Chesapeake Bay* (Hood and Shenk); *Management Effects on Water Quality Trends* (Shenk); *Assessing Uncertainty in the CBP Modeling System* (Shenk); *Conowingo Infill Influence on Chesapeake Water Quality* (Linker); *The Development of Standardized Climate Projections for Use in CBP Assessments* (Linker); *Integrating the Social Sciences into Chesapeake Bay Restoration* (Wainger); *Critical Issues in Implementing Nutrient Trading Programs in the Chesapeake Bay Watershed* (Wainger); *Assessing the Chesapeake Bay Forage Base: Existing Data and Research Priorities* (Ihde).

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The Johns Hopkins University
The University System of Maryland
Smithsonian Institution
Old Dominion University
Pennsylvania State University
Virginia Institute of Marine Science

Scientific and Technical Advisory Committee (STAC)
c/o Chesapeake Research Consortium
645 Contees Wharf Road
Edgewater, MD 21037

Dear STAC Members:

On behalf of the Chesapeake Research Consortium, I offer my continuing support to the workshop proposal titled: ***Modeling Beyond 2018 Visioning Workshop.*** The proposed workshop objective -- to seek a well-informed, realistic, and unified vision of a future Chesapeake Bay Program (CBP) modeling approach – is directly relevant to STAC's mission of promoting the best available science to support robust decisions. It also provides an important means of following up, in a real and practical way, on other past workshops and reviews, including those related to uncertainty analysis, adaptive management, and climate change. I also believe that the workshop will provide important opportunity to consider (and perhaps advance) some of the concepts of multiple model application, model inter-operability, and "transparency" of modeling approaches that have been promoted by past STAC reviews and by the Chesapeake Research Consortium through its Chesapeake Community Modeling Program (CCMP). I think that the timing of the workshop is excellent, in that it will be occurring soon after completion of several formal STAC reviews of various elements of the CBP modeling system. In addition, it will be an important follow-up to other reports related to a major National Research Council (NRC) recommendation regarding the need for enhanced support for community modeling related to Chesapeake Bay.

Because this workshop will include breakout discussion of all elements of the partnerships' modeling system (including elements of land use, watershed, airshed, estuarine physics and water quality, living resources, and socio-economic influences), it should allow good opportunity for serious input and discussion from a very diverse group of stakeholders, including research investigators from numerous engineering, natural science, and social science disciplines and involving research institutions and management agencies throughout the region. Toward this end, I will be pleased to use the outreach mechanisms available to me through the CRC to help the organizing committee find and engage an appropriately diverse group of expert participants.

Finally, I think that the principal sponsor for this workshop, Dr. Raleigh Hood, is especially well positioned to serve as the Steering Committee lead and I have good confidence in his ability to promote a successful event with useful outcomes and products. Dr Hood has worked successfully with the CRC for several years as member and then chair of the Steering Committee for the aforementioned CCMP and has done an excellent job with this task. He is very familiar with all aspects of the CBP modeling system and has given considerable thought to these issues for over two years. Working closely with Mr. Gary Shenk and others on his Steering Committee, he is very well positioned for success toward what I expect to be an important and productive workshop.

Sincerely,

William P. Ball

William P. Ball, P.E., Ph.D.
Executive Director, Chesapeake Research Consortium
Executive Secretary, STAC
Professor of Environmental Engineering, Johns Hopkins University

Scientific and Technical Advisory Committee
645 Contees Wharf Road
Edgewater, MD 21037

Dear STAC Members:

The Bay Program modeling system has become the primary tool for informing decisions regarding the Bay TMDL. Estimates of load reductions are used to set goals, develop implementation plans, and assess progress in achieving 2-year load reduction milestones and associated 2017 and 2025 water-quality outcomes in the Bay Watershed Agreement. STAC has sponsored several workshops in the recent past that provide recommendations for how the CBP Modeling Workgroup should consider evolving the modeling system to keep up with the state-of-the-art in land use, watershed, estuarine, living resources, and socio-economic modeling for its restoration efforts. Yet it has been more than a decade since STAC has convened a dedicated workshop to discuss and synthesize future directions for modeling in the CBP. Looking back on the last visioning workshop, its useful recommendations and the subsequent developments, it is clear that it is time to motivate another workshop along these lines.

We support the proposal for the STAC workshop titled ***Modeling Beyond 2018 Visioning Workshop*** and look forward to incorporating the workshop's recommendations to enhance the Parnership's decision-support tools.

Sincerely,

David Montali and Lee Currey
Modeling Co-Chairs

SIGNED BY EMAIL

University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE
HORN POINT LABORATORY

1-25-16

Scientific and Technical Advisory Committee
645 Contees Wharf Road
Edgewater, MD 21037

Dear STAC Members:

I am writing this letter to confirm the endorsement by the Chesapeake Community Modeling Program (CCMP) and the Community Surface Dynamics Modeling System's Chesapeake Focus Research Group (CSDMS/CFRG) of the STAC workshop proposal titled: ***Chesapeake Bay Program Modeling Beyond 2018: A Proactive Visioning Workshop.***

The CCMP and the CSDMS/CFRG, along with the Chesapeake Bay Program Modeling Workgroup and the Chesapeake Research Consortium, propose a three-day STAC workshop in 2016 to undertake a comprehensive effort to review the status of the current CBP management modeling system and discuss future directions for management modeling in the CBP with a view toward developing a roadmap for future CBP modeling beyond 2018.

This workshop will be a synthetic activity that will review several previous STAC workshops and related efforts concerning multiple and ensemble modeling, shallow water modeling, uncertainty assessment, open source and community modeling, stakeholder engagement and social science, and modular modeling approaches. In addition, the workshop will include participants and speakers who were/are members of the NRC-motivated Modeling Laboratory Action Team and the CSDMS Interagency Working Group.

The workshop will generate specific recommendations for the CBP Modeling Workgroup to consider for how the CBP's modeling suite might be changed and upgraded beyond 2018 to meet future management needs.

Given that it has been more than a decade since the last visioning workshop, and the fact that there have been rapid advances in physical process understanding, computer science, and modeling techniques in recent years, it is clear to me that it is time to motivate another workshop along these lines. I believe that this workshop will be highly successful in formulating a vision for future CBP modeling that can be used to guide us into the future.

Sincerely,

Raleigh Hood
CCMP Chair and Program Manager
CSDMS/CFRG Chair