



## Modeling Workgroup Conference Call

September 22, 2016

10:00 AM – 12:00 PM

Event webpage: <http://www.chesapeakebay.net/calendar/event/24331>

### AGENDA

**SAVE THE DATE:** October 4-5, 2016 Quarterly Review  
December 13-14, 2016 Quarterly Review (note date change)

#### Status of Phase 6 Watershed Model Beta 3 Refinements – Gopal Bhatt, PSU and Gary Shenk, USGS

##### [Attachment A](#)

- Gopal outlined the four major tasks that are underway for the Beta 4 agenda: improving nitrogen calibration (denitrification), investigating the simulation of chlorophyll in Beta 3, the incorporation of Conowingo infill in Phase 6, and determining the impacts of climate change for a 2025 scenario using long term trends.
- The processes and next steps for these issues was also further discussed
- The outline for the climate approach was also more thoroughly explained for the evaluation of climate trends as they apply to a 2025 scenario.
- Raleigh Hood asked if the modeling team also accounted for temperature changes.
  - Gopal said that the modeling team was using CMIP5 scenarios for temperature changes and applying the resultant alterations to potential evapotranspiration and stomatal conductance.

#### Nutrient Attenuation in Chesapeake Bay Watershed Onsite Wastewater Treatment Systems – Victor D’Amato, Tetra Tech

##### [Attachment B](#)

- Dave outlined the motivation behind the presentation, referencing the expert panel report that studied how to represent the base condition of an initial system of septic rather than the effectiveness of a BMP. The Modeling Workgroup is charged with reviewing an Expert Panel’s findings on the latest science estimating nitrogen attenuation from onsite wastewater treatment systems (OWTS) for incorporation into the Phase 6 Model.
- Vic introduced the topic by reviewing the initial BMP report that was approved for the on-site sector to replace the original suite of BMPs in February 2014.
- The group originally developed two classes of BMPs, in-situ (practices that could be implemented to improve performance of the soil treatment unit) and ex-situ (anything that happens before you get into the soil treatment unit). A large question was the concept of baseline and attenuation of 20% across the board for soil treatment units.
- The first draft report was released on August 31, and the panel outlined the baseline assumptions for using variable nutrient (TN and TP) attenuation rates.
- The panel is thoroughly occupied with the nitrogen question, phosphorus has been put off until nitrogen is resolved. No recommendations have been made for phosphorus for the near future.

- A great deal of input from partners both inside and outside of the watershed has also helped to contribute to the findings of the report as well.
- This panel primarily looked at conventional systems. BMPs were examined a few years ago, but current BMP panels are also addressing how to deal with BMPs as a result of the variable baseline proposed.
- The panel did not address Zone 2 (Vadose Zone) reductions, and assumed that they would be low in comparison to other zones so no recommendations were provided. Recommendations were provided for other zones based on factors like hydrogeomorphology.
- It was implied within the Zone 3 (Groundwater Zone) results and recommendations that there are low decay rates, slow travel times, or both. Peter Claggett has also been looking at soil types in Zone 1 (Soil-Based Treatment Zone) and hydrogeomorphic regions in Zone 3, adding that to census blocks, and aggregating this information up to the spatial scales available.
- Feedback has generally been positive, and Vic further outlined additional work to be completed that will be added to the final report, technical comments provided by MDE, and questions of representation.
- Vic expressed that he wants the approach used for generalizing soil types across a region to be tied together with the SSURGO dataset. It would be nice to have a linkage or verification between the SSURGO dataset that characterizes the entire soil column and the way in which BMPs are actually implemented.
  - Lew pointed out that the SSURGO dataset is on a finer scale than the WSM land-river segments, and can be aggregated to the land segment scale.
- Gopal suggested that to ensure that there is some texture information for all SSURGO polygons provided, which are much finer than the NHD reach scale, the Modeling Team could average the data over the entire column. This data could be made available for review at the SSURGO polygon scale and NHD column ID scale.
  - Vic said that it would be interesting to see, but Gopal pointed out that SSURGO does not guarantee that there will be a reported value for each of those soil horizons.
- Vic noted that the group is talking about taking this approach at a very general scale rather than system by system to see if the overall trends match.
- Vic also said that the topic of utilizing a hybrid approach including both distance and hydrogeomorphic region was discussed at the Wastewater Treatment WG meeting, and that partners were looking for the Modeling WG's input as well.
  - Lew stated that there is already a precedent set that MD used wherein distance is equated with time. Larger distances to streams from onsite treatment systems are made equal to longer travel times, and thus larger attenuation rates. Overall in MD, there was an estimated aggregate 60% attenuation rate but the estimated difference of streams to onsite treatment systems varied spatially. This can be done again, and the Modeling Team would feel most comfortable if MD could take on that task by determining Zone 1 and Zone 3 attenuation rates with the same sort of distance methodology. This would add one additional GIS overlay to SSURGO soils, Land River segment blocks, and hydrogeomorphic regions.
  - Gary suggested that with this approach medium distances would have a factor of 1, short distances would have a factor greater than 1, and longer distances would

have a factor less than 1. Overall, the weighted average would have to be 1. The report that the Modeling Team has in hand was checked with SPARROW to determine the relatively correct overall effect of septic. The factors would have to incorporate an overall effect of differentiating near from far distances.

- The Modeling WG would probably need to see some more substantial documentation demonstrating that the factors make sense. Vic agreed, and noted that there is a great deal of research that can also be referenced within the report put out by the panel.
- Dave suggested moving the discussion to the context of the time frame. Programmatically the Modeling WG is supposed to say that at this point inputs should be in. This process could be done with soils and the average attenuation rates for Beta 4 if the workgroup agrees. Otherwise, the Modeling WG may repeat what was done before in falling back to 60% attenuation rates everywhere. It is an important point for MD, and it may be best for the Modeling Team and MD to work together to develop a base approach in Beta 4 and then devise a credible strategy to be implemented after Beta 4 under the assumption that the stopgap Beta 4 approach is a fatal flaw.
  - Lew agreed and noted that the main problem is getting on the GIS team's meeting agenda, and it may be a matter of days or a week or two until this is wrapped up.
  - This approach was also satisfactory for Vic and Greg, who also volunteered to help with GIS efforts.
  - Dinorah said that she had previously discussed this with Lee Currey who also agreed with the stated approach.
- Dave asked if anybody else had concerns about the expert panel report.
  - Ping asked if attenuation would decrease with time.
  - Lew said that there are two aspects to this question. There are particular BMPs that have been reviewed that have a certain life cycle, but the assumption is that there is no degradation over time with respect to septic systems reviewed by this expert panel. Many states have standby septic fields as standard operating procedure in the event that the first is filled
  - Ning confirmed that this was one of the assumptions and it was recognized that there are some failing septic systems. A survey a few years ago found that 2-5% of septic systems had failed. If it is found that this is an important issue then this could warrant further investigation.
- Dave asked a clarifying question with regards to small stream factors to move loads from edge of small stream to small stream.
  - Lew said that he does owe Vic the Zone 4 attenuation, and discussed where the attenuation was specifically picked up within HSPF.
- Vic said that he thinks the approach is replicable, and hoped that other jurisdictions and areas can follow what was done and then customize for it their own location. There is still work to be done surrounding this issue.
- Dave summarized the discussion and returned back to the original decision point: whether the Modeling WG agrees that the substance of the expert panel report will be applied in Beta 4 and that the caveats relative to Maryland's additional work between now and Beta 4 will be pursued.
  - **DECISION:** The Modeling WG approved this course of action with no objections.

## Mass Balance Estimate for Ammonia Emission Controls – Gary Shenk, USGS

### Attachment C

- Gary discussed the motivations behind the decisions that were made and the impetus for the changes that were made to develop a consistent method to handle changes in ammonia emissions. Some BMPs increase ammonia emissions while others decrease emissions. There were originally no changes in delivery of emissions to the Bay.
- It was decided at the August 9 quarterly meeting that the Modeling Team was going to look at the assumptions used to come up with numbers, and then bring back improved numbers to this presentation today.
- The Modeling Team is trying to calculate how much deposition changed and how much would have made it to the Bay, before applying that change as a credit or an additional load to land uses that would be most appropriate for the BMP.
- Aggregate transfer functions are based on the CMAQ model and they represent the number of kilograms received per ton emitted.
- It is generally known that NO<sub>x</sub> travels further than ammonia, and an analysis of how much is returned was completed as well.
  - Approximately 25% of ammonia is brought in from outside the watershed, and by assuming that 20% of NO<sub>x</sub> emissions are deposited within the watershed it is possible to apply the function outlined for each constituent to determine ammonia that stays within the watershed and ammonia that leaves the watershed.
- Analyses were also completed to determine what amount that is deposited within the watershed and what emissions travel to the Bay.
- The final Modeling Team recommendation is to use the total delivered emissions that are calculated.
  - As an example, a BMP that increases ammonia volatilization (like composting) is implemented would then increase the load.
  - For any change in NH<sub>3</sub> deposition based on a BMP, the methodology will apply the ‘Total Delivered’ percentage as a pound increase or decrease to the most relevant land use.
- Ted Tesler asked about the CMAQ data used. Gary clarified that this data come from CMAQ data that were presented in January 2013, and the analysis that was done at some point in 2012. Jesse Bash is planning on providing new CMAQ data at the December quarterly review.
- Jeremy Hanson asked if the numbers shown for ammonia also applied to NO<sub>x</sub>, and Gary said that it would be relatively simple to carry out this same methodology for NO<sub>x</sub>.
- Ken Staver asked, in terms of calculation about the deposition of ammonia on the land, how well the numbers produced matched NADP values.
  - NADP numbers represent the total amounts, and these numbers represent the percentages of what goes down and what comes up. It would probably be much lower, since NADP incorporates data from all states. In order to make this comparison, you would have to multiply by total state emissions within the state and from outside the watershed.
  - Jesse clarified what was being asked by explaining that Gary is presenting the sensitivity of the model to determine what fraction being emitted by state is being deposited by the state. Jesse is asking how well the wet deposition is being

captured. There have been many evaluations of the model completed, and generally the model performs quite well within about 20% of NADP for annual emissions.

- Gary noted that Ken made a good point as there's more analysis that can be done in the far future based on how far ammonia travels from different sources.
- Abel Russ asked if this could be partly due to the fact that this is a combination of wet and dry deposition.
- Jesse said that there is no dry deposition monitoring network, but what has been done in CMAQ model development is to focus on ammonia deposition over agricultural areas and derive processes based on specific measurements.
- Lew summarized by stating that this number will be refined, but the estimates that the Modeling Team has today are considerably better than what was used previously.
- Dave brought up the decision to be made with regards to using these numbers presented by Gary in the Beta 4 model. In using these values, the expert panels won't have to change their recommendations in any way, they will only have to specify how much more emissions go up.
  - **DECISION**: No objections were raised to using these values in Beta 4.

## MEETING ATTENDANCE

MEMBERS			
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