FINAL

Comment Response Document for the Total Maximum Daily Loads (TMDLs) of Nitrogen and Phosphorus to Swan Creek in Harford County, Maryland

Introduction

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed Total Maximum Daily Load (TMDLs) for nutrient loadings in Swan Creek. The public comment period was open from November 16, 2001 to December 17, 2001. MDE received one set of written comments.

Below is a list of commentors, their affiliation, the date comments were submitted, and the numbered references to the comments submitted. In the pages that follow, comments are summarized and listed with MDE's response.

List of Commentors

Author	Affiliation	Date	Comment Number
Elizabeth A. Weisengoff	Harford County Department of Public Works, Division of Engineering and Construction	December 5, 2001	1 through 6

Comments and Responses

1. The commentor stated that a note should be included in Section 2.2 regarding the impact of Hurricane Floyd on the sampling data collected on September 23, 1999.

   Response: The Department agrees with this comment. A notation regarding the impact of Hurricane Floyd will be added.

2. The commentor stated that figure references in the last sentence of the last paragraph in Section 2.3 should be Figures A13 and A14.

   Response: The Department agrees with this comment. The figure references in the last sentence of the last paragraph in Section 2.3 will be corrected as indicated.

3. The commentor stated that the last sentence of Section 4.8 indicates that MDE added an additional Margin of Safety (MOS) in the average annual TMDL, given the projected maximum chlorophyll *a* concentration of 45 μg/l; however the MOS shown for the average annual TMDLs in Section 4.8 still represent 5% of the load allocation.

   Response: A margin of safety (MOS) is required in a TMDL analysis to account for uncertainties in a manner that is protective of the environment. EPA provides no strict guidance on selecting a (MOS). Their guidance suggests that an MOS may be

expressed as an explicit value or as conservative assumptions built into the analysis, or a combination of both. MDE has elected to use a combination of both approaches.

As a point of clarification, we believe that the commentor intended to cite Section 4.7. In that section, we indicated that a lower peak chlorophyll *a* target of 45 µg/l was used to set the TMDL, rather than the typical target of 50 µg/l, for the average annual TMDL. This provides a built-in margin of safety.

Three factors led us to include the explicit MOS, computed as 5% of the NPS load. First, the loss of one of three sets of data due to a hurricane event introduced some additional uncertainty in the analysis. Second, the model leads us to suspect that the chlorophyll *a* in this system is fairly sensitive to nutrient inputs. A small increase in loads could cause a jump in chlorophyll *a*. Finally, the low flow TMDL is premised on an NPS load that has a 5% MOS. We recognize that wet weather loads have a role in affecting the sediment nutrient flux properties of the low flow TMDL. Although the steady-state model cannot explicitly link the low flow season with the affects of wet weather loads, we attempt to account for this by treating the average NPS loads in a consistent manner as was done for the low flow NPS loads. If future studies find that the MOS is overly conservative, we could re-consider shifting some of the MOS to a Future Allocation.

4. The commentor stated that Figures A2 through A7 should include a note about discarding the September 23, 1999 data.

   Response: The Department agrees with this comment. A notation regarding the impact of Hurricane Floyd (to explain why the September 23, 1999 data was not used) will be added.

5. The commentor questioned whether the model estimates nutrient inputs from tidal waters beyond the lower boundary of the modeled segments. The commentor stated that it seems reasonable that nutrients entering the slow-moving tidal portion of Swan Creek from the mainstem would aid in algal production within Swan Creek, after which remaining biomass would fall to the bottom sediments and contribute to the nutrient flux within the system.

   Response: The model used for Swan Creek, the Water Quality Analysis Simulation Program version 5.1 (WASP 5.1), is distributed by U.S. EPA's Center for Exposure Assessment Modeling, and provides a generalized framework for modeling contaminant fate and transport in surface water. The steady state and contiguous box-model approach used in the model assumes nutrients being exchanged between the adjacent model segments (boxes) and instantaneous mixing within the box (segment). To consider the nutrient input beyond the model segment, the nutrient data near the mouth of Swan Creek in the 1999 water quality survey were used as the boundary conditions representing the constant nutrient fluxes entering the lower boundary of the model segment in Swan Creek through tidal dispersion.

On the other hand, the time-variable deposition of sediments - due to changes in stream flow - was not simulated explicitly. The steady-state application of the model used for this TMDL analysis did account for bottom sediment chemistry. The roles of bottom sediments, including the effects of prior sedimentation, were addressed in two ways in this TMDL analysis. First, baseline bottom chemistry was estimated on the basis of research literature and knowledge of the characteristics of the subject waterbody, accounting for previously deposited sediments. Second, an estimation of the change in bottom chemistry occuring as a result of changes in nitrogen and phosphorus concentrations was made, affecting the concentration of chlorophyll *a* and organic nitrogen and phosphorus, i.e., the amount of organic matter settling to the bottom sediments.

To put the Department's choice of using a steady-state model into the proper context, sediment transport and fate processes are rarely simulated for eutrophication problems even when time-variable simulations are conducted. First, the ability to accurately simulate those processes, though improving, is limited. Second, many researchers think that the simulation of those processes for assessing eutrophication does not necessarily improve the analysis results. As an alternative, the simulation of an active sediment layer, modeling the evolving sediment chemistry, but not the stream bed sediment movement, is generally the next level of sophistication beyond what was done in the present analysis. The latter analytical approach is typically applied in situations where organic matter and nutrients in the bottom sediments accumulate over a long period, and one is interested in assessing the long-term recovery of the system. However, even to conduct this refined analytical approach, which would not simulate stream bed sediment transport, sediment properties must be measured using non-routine methods that would entail significant costs and delay of this and other TMDLs.

Given the questionable benefits of explicitly simulating the stream bed sediment transport in this case, and EPA' approval of this methodology for similar TMDL analyses, the Department elected to conduct the analysis as it did.

6. The commentor stated that, given the level of uncertainty associated with model results based on two samples, a significant argument cannot be made to either support or refute the benefits of this TMDL.

   Response: The nutrient TMDL analyses are based on meeting both the low DO and the chlorophyll *a* goals, independent of each other. Chlorophyll *a* can cause low DO due to decay, and diurnal DO fluctuations. The minimum DO associated with diurnal fluctuations typically occurs during the early morning after many hours in which no photosynthesis has occurred. It is likely that the DO values presented in the document are not the minima associated with diurnal fluctuations.

   As noted by the commentor, a number of chlorophyll *a* samples indicated values slightly above 50 µg/l. We concur with the commentor's observation that the current water quality impairment is not extreme; however, the TMDL has been developed to

account for future treatment plant flows. Despite its uncertainties, we are confident the TMDL analysis will be beneficial in guiding the management of nutrient loads to assure restoration and future protection of the water quality. (See Comment #3 for a discussion of the margin of safety).