Comment Response Document
Regarding the Total Maximum Daily Load of Nutrients/Biochemical Oxygen Demand (BOD) in the Anacostia River Watershed, Montgomery and Prince George's Counties, Maryland and The District of Columbia

The Maryland Department of the Environment (MDE) and The District Department of the Environment (DDOE) have conducted a public review of the proposed Total Maximum Daily Loads (TMDLs) of Nutrients/BOD in the Anacostia River Watershed, Montgomery and Prince George's Counties, Maryland and The District of Columbia (DC). The public comment period in DC was open from February 28, 2008 through March 31, 2008. The public comment period in MD was open from March 6, 2008 through April 7, 2008. DDOE and MDE received five sets of written comments. (The first set is in two parts, numbered 1-8 and 9-20.) Certain comments were directed specifically to a particular jurisdiction, while others are applicable to both jurisdictions. Of the latter, either a single response is given jointly for both, or, where the responses of the jurisdictions differ, separate responses are provided for each.

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 and DDOE's responses. [Note: An undated letter from Anacostia Watershed Citizens Advisory Committee was forwarded indirectly by email to MDE and DDOE on April 25, 2008, after the close of the comment period. No hard copy of the letter was received by MDE or DDOE prior to that date. The letter's comment has been addressed by the response to comment #30 below.]

List of Commentors

Author	Affiliation	Date	Comment Number
Jennifer C. Chavez, et al.	Earthjustice (on behalf of Friends of Earth, National Resources Defense Council)	March 31, 2008	1 through 8
Dr. Peter deFur et al.	On behalf of Earthjustice	March 31, 2008	9 through 20
Leonard Benson, Acting Chief Engineer/Deputy General Manager	District of Columbia Water and Sewer Authority	March 31, 2008	21 through 22
Samuel B. Moki, Associate Director	Prince George's County Department of Environmental Services	April 4, 2008	23 through 24
Robert G. Hoyt, Director	Montgomery County Department of Environmental Protection	April 7, 2008	25 through 28
Melanie Shepherdson/ Lee Epstein/Jennifer Chavez	Natural Resources Defense Council/Chesapeake Bay Foundation/Earthjustice	April 7, 2008	30 through 31

Comments and Responses

1. The commentors summarize their concerns that under the general statement that the proposed TMDLs do not comply with the Clean Water Act (CWA) and implementing regulations, in particular by failing to 1) implement applicable water quality standards; 2) provide adequate margins of safety; 3) include wasteload allocations for individual point sources; and 4) provide meaningful implementation assurances.

Response: (1) The proposed TMDLs set allowable loading caps for nutrients and BOD that require substantial reductions of these pollutants in order to meet and maintain applicable water quality standards in the Anacostia River. (2) The draft TMDL includes an adequate margin of safety (MOS) for both nutrients and BOD. An MOS can be expressed explicitly as unallocated assimilative capacity or implicitly as conservative analytical assumptions used in establishing the allowable pollutant load. The draft nutrients TMDL provides an explicit MOS that sets aside 5% of the available loading capacity as non-allocable, a widely-accepted approach in many established TMDLs both in Maryland and across the nation. The draft BOD TMDL provides an implicit MOS by using conservative assumptions based on the fact that no exceedance of BOD criteria was allowed, even though EPA guidance incorporated in both MD and DC regulations allows up to 10% exceedance of DO criteria over time and space in determining criteria attainment using biologically-based reference curves. See also the Response to Comment #6 below. (3) Annual wasteload allocations are provided for individual point sources in MD and DC in a technical memorandum accompanying the TMDL report, as well as monthly and seasonal loads for continuous discharge facilities. (4) Reasonable assurance of implementation is provided in broad terms, with an overview of considerable resources and programs that are available and will be brought to bear in a long-term, adaptive, and iterative approach to implementing these TMDLs in the face of very challenging conditions. Federal regulations at 40CFR103.2(i) and 130.7 do not require TMDLs to develop an implementation plan. Specific implementation planning is not required as part of a TMDL and is beyond the scope of the TMDL analysis and report. Implementation planning and activities will begin upon approval of the TMDLs, as a partnership effort of the State and local governments, watershed advocates and stakeholders, environmental organizations, and concerned citizens. Also see DC Response to Comment #31.

2. The commentors state that the proposed limits will also fail to meet the explicit goals set forth in the draft TMDL report, i.e., reducing high chlorophyll *a* concentrations that reflect excessive algal blooms, maintaining DO at a level supportive of the designated uses in the Anacostia, addressing water clarity problems and associated impacts to aquatic life caused by eutrophication and excess algal growth, and in so doing also be protective of water contact recreation and aesthetic quality in the Anacostia.

After citing the CWA and implementing regulations on statutory and regulatory requirements for TMDLs; the designated uses in the Anacostia; and the most stringent (DC's) applicable numeric DO standards and narrative standards for protection of water quality, the commentors set forth a number of specific failings of the TMDL model and document. These will be enumerated here in a sequence of separate numbered comments, allowing for point-by-point responses.

The first purported failing of the TMDL, failing to ensure implementation of all applicable water quality standards, is elaborated by the commentors in three specific areas. First, the commentors state that the draft document does not demonstrate how the proposed daily BOD loads (which allow as much as 27% of the total annual load to be discharged on a single day) are sufficiently low to prevent all violations of the applicable water quality standards, including the instantaneous and 7-day DO standards. The commentors cite an analysis by Dr. Peter deFur, attached in support of, and incorporated into, their comments. This analysis argues that very high peak daily BOD levels, allowed by the proposed TMDLs, create conditions that are directly linked to fish kills in the Anacostia. The commentors cite DC's 2003 Draft TMDL for BOD in Fort Davis Tributary in support of this statement, and conclude that for these reasons the draft TMDLs are inadequate and cannot be adopted in their present form.

Response: MDE and DDOE believe that the draft TMDLs meet all applicable standards, including the instantaneous and 7-day DO water quality standards. MDE and DDOE do not agree with the comment that the TMDLs are inadequate or that they cannot be adopted in their present form. Continuous simulation modeling was used to demonstrate that TMDL loadings will result in compliance with the 7-day DO standard. The instantaneous DO standard was also addressed by utilizing daily DO predictions from the continuous simulations and applying an adjustment to these predictions to estimate minimum daily DO concentrations. The selected TMDL scenario complies with this interpretation of the instantaneous DO standard as a TMDL target as well as the 7-day DO standard, as documented in Section 4.3.2 and Appendix C of the TMDL report. The TMDL scenario (and hence the resulting external loads) was specifically designed to comply with all of the identified numeric TMDL targets.

The maximum daily loads presented in the TMDL are an expression of the loads associated with the TMDL scenario and represent a critical (worst-case) condition that was directly extracted from the continuous loading inputs to the water quality model. A large fraction, such as 27%, of the BOD loading occurring on a single day does not reflect a condition where water quality standards are not met. The maximum daily loads in this case simply represent the critical (i.e., worst-case) daily loading condition for the selected 3-year simulation period. In addition, continuous simulation modeling was used in developing the TMDL scenario to insure compliance with all of the selected TMDL water quality targets. As described in Appendix D of the TMDL report, these maximum daily loads cannot be guaranteed to never be exceeded, since all TMDL studies require that

assumptions be made regarding the characterization of the critical period and the expression of daily loads for TMDLs. In this case, a representative 3-year simulation period was chosen in order to capture annual and seasonal variability in hydrology and loading conditions. Therefore, the selected continuous simulation period encompasses representative critical conditions (as also described in the Executive Summary of the TMDL report) that are appropriate for determining whether or not the water quality model predictions for the TMDL scenario comply with applicable standards. As such, MDE and DDOE believe continuous simulation to be an appropriate and protective approach for TMDL development. For this TMDL, MDE decided to express the daily loads for the worst-case daily condition, while DDOE decided to also express the average daily loads so that the public might better understand that there is variability in the assimilative capacity of the river.

With respect to large BOD loadings being associated with fish kills in the Anacostia River, we note that the TMDL reduces BOD loads for all source categories from the baseline conditions determined for the 3-year continuous simulation period. Peak daily BOD loads are substantially reduced from baseline conditions for all source categories. This includes CSO loads that correspond to the EPA-approved Long Term Control Plan (LTCP) for the District of Columbia. Implementation of the LTCP will eliminate most CSO loading events to the Anacostia River and reduce the expected loading for those events that do occur. While there may still be what the commentors refer to as "very high peak BOD" loads, the continuous water quality modeling results demonstrate that these occur during critical condition periods within the 3-year TMDL scenario simulation where they do not cause violation of the TMDL targets.

3. The 2nd area of failure in ensuring implementation of standards is declared by the commentors as a failure to account for all inputs and impacts of relevant pollutants. These are four in number: a) groundwater and the related factor of nutrient retention and transport (nutrient cycling); b) atmospheric sources, discussed at length in the deFur analysis; c) oxygen saturation, which the commentors state must be addressed in addition to concentration; and d) turbidity, standards for which the commentors state are not met by the TMDL, citing Fig. 13 of the report as proof of this deficiency.

Response: The TMDL accounts for all significant sources of BOD, TN, and TP in the Anacostia watershed. Loads in groundwater have been included in the model. Each land use source has been assigned a groundwater load based on its contribution to baseflow, for tributaries, or recharge, for direct drainage in tidal areas. Atmospheric deposition over the watershed is an implicit or explicit input to land use sources: for forest and agricultural land, atmospheric deposition is an explicit input; for developed land, atmospheric deposition is an implicit input since loads from developed land has been calibrated to targets based on MS4 monitoring data and in-stream water quality monitoring data. Direct deposition of nitrogen to the tidal river is an insignificant source, accounting for less than 1% of

the total load. Percent oxygen saturation is not part of the DO criteria in either MD's or DC's water quality standards and therefore is irrelevant to the TMDL. See also Response to Comment #13. The commentors assert that Figure 13 shows that the water quality standard for turbidity has not been met. Figure 13 does not show turbidity. Figure 13 compares median Secchi depth, for the relevant location and time period, with the DC and MD standards for water clarity. The figure clearly shows that the relevant median Secchi depth is greater than the comparable standard and that therefore, MD's and DC's water clarity standards are met by the TMDL.

With regards to turbidity, it should be noted that the District's turbidity standard is set to protect water quality from short-term localized impairment such as construction and/or dredging activities. However, in response to comments an analysis of Secchi depth vs NTU (turbidity metric) was conducted with measurements in the tidal Anacostia from 1995-2002, and is shown in the graph attached to this document. The analysis shows that generally with a Secchi depth of 0.8 the turbidity levels remain under 20 NTU on a long-term basis. Similarly, the graph indicates MD's turbidity standards are also generally met when the 0.8 Secchi depth criterion is attained.

4. The commentors articulate a third area of failure arising from the previously stated shortcomings, i.e. failure to protect overall water quality. The commentors cite DC and MD water quality standards, stating that the standards "require the final nutrient limits, *inter alia*, to protect the propagation of fish, shellfish, and wildlife; to be free of discharges of untreated sewage, and litter; and to be protective of water contact recreation and aesthetic quality in the Anacostia River and its tributaries." The commentors state that nowhere does the draft document demonstrate how the proposed TMDLs will be sufficient to protect all of the foregoing standards and uses, and to prevent interference of discharges of BOD with the aesthetic quality of the Anacostia and its tributaries. The commentors note further that high daily BOD contributes to algae blooms that are unsightly and contribute to odor and other negative impacts on aesthetics.

Response: The purpose of this TMDL is to reduce BOD and nutrient loads so that Anacostia River supports its aquatic life use. The draft document for the nutrients/BOD TMDL demonstrates that the loading caps it calculates for TN, TP, and BOD will result in the attainment of the criteria that protect the designated use of supporting aquatic life. The various requirements of the several applicable standards are addressed by other TMDLs developed to address impairments that impact particular conditions. For instance, the TMDL for fecal bacteria will protect the Anacostia so that it is swimmable; a planned trash TMDL will protect the river from litter. It is a reasonable assumption that the significant reductions of nutrients and BOD required for this attainment will have the added benefit of substantially diminishing algal growth such that the designated use of primary contact recreation and aesthetic quality will also be protected. In any event, these additional uses involve non-numerical and narrative criteria whose attainment is

somewhat subjective and based on best professional judgement. In addition, it should be noted that MDE and DDOE will continue to monitor the water quality as load reductions take place in the watershed. If it is determined through implementation of the TMDL that additional reductions are necessary to attain aesthic and recreational uses, then the TMDL can be revised and further reductions applied to meet water quality standards.

5. The commentors state that the TMDLs fail to provide an adequate margin of safety (MOS). The explicit 5% margin reserved for the nutrient loads are not supported by explanation or reasoned analysis, which the commentors state is required by the CWA [Section 303(d)(1)(C)] and without which it is impossible to verify that the MOS meets statutory requirements.

Response: See Response to Comment #1, item (2).

6. The commentors continue to fault the MOS, stating that the approach taken to define an implicit MOS for BOD "is absurd, and lacks scientific or legal basis." The commentors do not accept an implicit MOS for BOD based on allocations that were "determined without permitting any exceedance of the standards," noting that the EPA guidance on the use of biologically-based reference curves, allowing an exceedance of up to 10% of DO standards, pertains to setting water quality criteria, not to developing TMDLs. Further, the commentors state that EPA cannot allow water quality conditions that exceed State-adopted standards. For these reasons, this approach fails to create a valid MOS and contravenes DC water quality standards.

Response: Both DC's and MD's water quality standards incorporate by reference the 2003 U.S. EPA Chesapeake Bay Program (CBP) guidance document, "Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and its Tidal Tributaries (EPA 903-R-03-002)" and the "Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and its Tidal Tributaries—2004 Addendum (EPA 903-R-04-005)." [See COMAR 26.08.02.03-3C(8)(g) and DCMR 1104.8] Thus, the EPA CBP guidance is an intrinsic part of MD's and DC's standards. The guidance recognizes that DO criteria can be "exceeded" to a limited extent in both space and time with no discernible impact to designated uses. The guidance calls for the development of biologically-based reference curves that identify the extent in space and time that criteria can be exceeded and still support designated uses. In contrast, in the Anacostia BOD TMDL, no exceedance of the DO criteria in either space or time was allowed in determining the TMDL allocations; therefore, the TMDL is stricter than necessary to protect aquatic life designated uses. This conservative approach to determining the conditions under which water quality standards are met justifies the implicit MOS for BOD. The text of the main report, Section 4.6 Margin of Safety, has been revised to include the amplified explanation above.

7. The commentors state that the TMDLs fail to provide adequate assurance of implementation, because the document does not provide any evidence of actual planned reductions in loadings, e.g. through structural or operational changes from the present conditions. Merely alluding to governmental programs does not provide a reasonable assurance that the TMDL limits will be implemented.

Response: See Response to Comment #1, item (4). Also see DC Response to Comment #31.

8. The commentors conclude by stating that the draft TMDL document fails to include specific daily load limits for individual point sources, adding that such specific individual limits need to be included in the body of the final TMDL document to ensure the TMDLs are implemented, and to comply with TMDL regulations. Further, the commentors add, it is not sufficient to merely allocate loads to categories of point sources (e.g., "municipal storm sewers"), since regulations require separate WLAs for each individual point source.

MD Response: It is MD's position that daily load expressions of the long-term average annual allocations are sufficiently provided as overall maximum daily loads for the categories of stormwater (MS4-WLA), other (municipal and industrial) point sources (Other PS-WLA), and the LA for nonpoint sources. Separate annual, seasonal, and monthly WLAs are provided for the individual continuous discharge facilities in the point source technical memorandum. EPA guidance allows for an aggregate allocation to stormwater sources, in acknowledgement of the uncertainties in estimating loads from these sources.

DC Response: For the District, daily limits for major source categories, including stormwater (the MS4 permit), CSOs, and other industrial point sources, have been provided in the body of the TMDL document. In addition, further breakdowns of WLAs for minor individual sources are also provided in the point source technical memorandum.

9. The commentors append an analysis by Dr. Peter deFur in support of their contentions. The following additional comments on the Anacostia nutrients/BOD model are drawn from the deFur document and transcribed herein. First, the commentor states that the "conceptual model" for the TMDL is not supported by the monitoring data, i.e., there is little empirical evidence for any of the assumptions in the document, which are therefore likely to be unsupported or incorrect. The commentor states that the model relies almost exclusively on TSS to make predictions. The commentor also states that nutrient cycling is not addressed by the model, and the link between nutrients and BOD is oversimplified. The commentor proposes a revised TMDL that includes a complete conceptual model that resolves the major problematic issues with the TMDL.

Response: As described in Section 4.2 in the main TMDL report, and elaborated in the modeling report (Mandel et al., 2008) made available for public comment as well as in the referenced documentation, the TAM/WASP modeling framework is a set of inter-related computer simulation programs developed over a period of years to simulate sediment transport, eutrophication, oxygen dynamics, and the fate and transport of nutrients. The foundation of TAM/WASP model is the WASP eutrophication model, an EPA-supported continuous water quality simulation model, which, in its standard form, simulates the generally-recognized nutrient transformation processes: nitrification, denitrification, mineralization, algal uptake, and the release of nutrients from algae in respiration and decay. Please see Ambrose et al. (1993) for further details on the basic kinetic processes found in WASP. Over a number of years, the WASP model has been modified to make it better able to fulfill its primary role in TMDLs: to link pollutant input loads with water quality responses so that the pollutant loads compatible with water quality standards can be identified. In particular, WASP was changed to minimize the assumptions that have to be under TMDL simulation, so that the water quality response to a change in loading rates could be predicted from the calibrated model by changing the input loads alone. For example, the TAM/WASP model simulates sediment oxygen demand based on the BOD deposited in the course of the simulation, rather than at a fixed rate that would have to be altered independently of the input loads under alternative management scenarios. Water clarity, as measured by Secchi depth, is simulated based on both simulated sediment and chlorophyll concentrations. Under alternative scenarios, if sediment or Chla concentrations change, the simulated water clarity will change. The feedback between light extinction and algal growth is thus simulated directly in the model. Like almost all computer simulation models used to develop TMDLs, the TAM/WASP model is calibrated by adjusting model parameters to optimize the agreement between observed and simulated constituent concentrations. In this manner, the modeling framework incorporates observed data. The TAM/WASP model is no more a “conceptual model” than any other EPA-approved computer simulation models. Its predictions certainly do not rely almost exclusively on TSS, but on a complex web of relations between water quality constituents that attempts to capture the corresponding complexity of natural systems.

10. The commentor identifies the simulation of station ANA08 as the final calibration scenario. The commentor states that the model performs poorly in nearly every calibration scenario and does not predict current conditions. Specifically, the commentor notes (1) an overprediction of 2-4 mg/l in DO; (2) a general overprediction of BOD by as much as 5 mg/l, but an underprediction of BOD in 2002; and (3) an underprediction of nitrate spikes. The commentor suggests that model’s poor performance, in particular the failure to predict nitrate peaks is caused by the neglect of ground water nutrient loads and the long residence time of groundwater constituents.

Response: There is only one baseline or calibration scenario. The figures in Appendix B compare observed and simulated data at the major ambient monitoring stations, ANA0082, ANA030, ANA01, ANA08, ANA14, and ANA21, whose location is shown in Figure 4 in the main report, as discussed in Section 2.3.1. It is not clear to what extent the commentor's confusion influenced his judgment of the quality of the calibration. As discussed in Section 4.3.1 in the main TMDL report and in the accompanying modeling report, the general calibration strategy for DO was conservative: simulated DO concentrations were required to be at least as low as the lowest observed concentrations at each ambient monitoring station location on an annual basis. Figures B.1 through B.6 show the goals of the calibration were met. As the commentator notes, winter DO concentrations are sometimes oversimulated by 2-4 mg/l, but, since both observed and simulated DO concentrations are well above the DO criteria, the oversimulation is irrelevant to the TMDL. Otherwise, simulated DO concentrations capture the trends in the observed data quite well. Although Figures 19 through 24 appear to show that water column BOD is oversimulated, on average, BOD is undersimulated, as described in the accompanying modeling report, Mandel et al. (2008), which was made available during the public comment period along with other TMDL documents. The large "spikes" in BOD represent storm events. Generally speaking, there is no regular ambient monitoring during storm events, so the same signal does not appear in the observed tidal monitoring data, though a significant increase in BOD concentrations with flow has been observed at the NEB and NWB gages. The cause of the undersimulation of BOD, as discussed in Mandel el al. (2008) is the necessity of uniformly converting tributary loads, measured in 5-day BOD, to ultimate BOD, the WASP state variable. The simulation of nitrate follows the trends in the observed data, as shown in Figures B.31 through B.36 for the years 1998-2002, but undersimulates concentrations 1995-1997. There does appear to be a shift in the range of the observed data between 1997 and 1998 that the model was not able to capture. This is not a symptom of missing groundwater loads, as nitrate loads in groundwater are included in the model. See Response to Comments #3 and #12.

11. The commentor states that trendlines of predicted chlorophyll and Secchi depth values do not match actual conditions well at all. The commentor suggests that is because the model relies on TSS data to calculate Secchi depth, but chlorophyll concentrations would alter Secchi depth values, thus the model performs poorly in this area. Further, the commentor states that the inability to predict chlorophyll concentrations is a critical flaw, since algae growth and decomposition are driving factors in eutrophication and BOD. The commentor concludes that a model that cannot predict algae blooms cannot be a viable model for predicting BOD.

Response: The commentor does not offer any reasons why he believes that trendlines of predicted chlorophyll and Sechhi depth do not match actual conditions well at all, except to appeal to Figures B.10 and B.16. As discussed in Section 4.3.1 and in Mandel et al. (2008), the goal of the Chla calibration is that,

on an annual basis, the maximum simulated Chla concentration should be no less than the maximum Chla concentration observed at the primary monitoring stations ANA0082, ANA030, ANA01, ANA07, ANA14, and ANA21, July through September, when the DC Chla criteria are in effect. This goal embodies a conservative calibration strategy, because if the simulated Chla always matches or exceeds the observed annual maximum, the TMDL will have to reduce simulated baseline Chla concentrations by at least as much as the observed concentrations will need to be reduced. As Figures B.7 through B.12 (including B.10 through B.12) show, the calibration goal was met. Simulated Chla captures the seasonal trend in the observed values quite well although it does underpredict Chla in winter months when DC's Chla criteria are not in effect and the simulated values are irrelevant to determining whether water quality standards are met. Simulated Secchi depth is a function of both Chla concentrations and non-algal solids, not just sediment. It may be difficult to interpret the comparison of simulated and observed Secchi depths because Secchi depths are measured at tenth meter intervals; nevertheless, as shown in Figures B.14 through B.18, simulated Secchi depths capture the trend in their observed counterparts reasonably well. Simulated Secchi depth may appear to conservatively underestimate observed Secchi depth, but it should be noted that, like BOD, the simulated time series includes storm events with higher than average turbidity, which are not routinely sampled by ambient monitoring programs. The calibration of Secchi depth was taken from the Anacostia sediment TMDL. Figure 1 below from the sediment TMDL modeling report (Schultz et al., 2007) shows the overall agreement between median simulated and observed Secchi depth by segment.

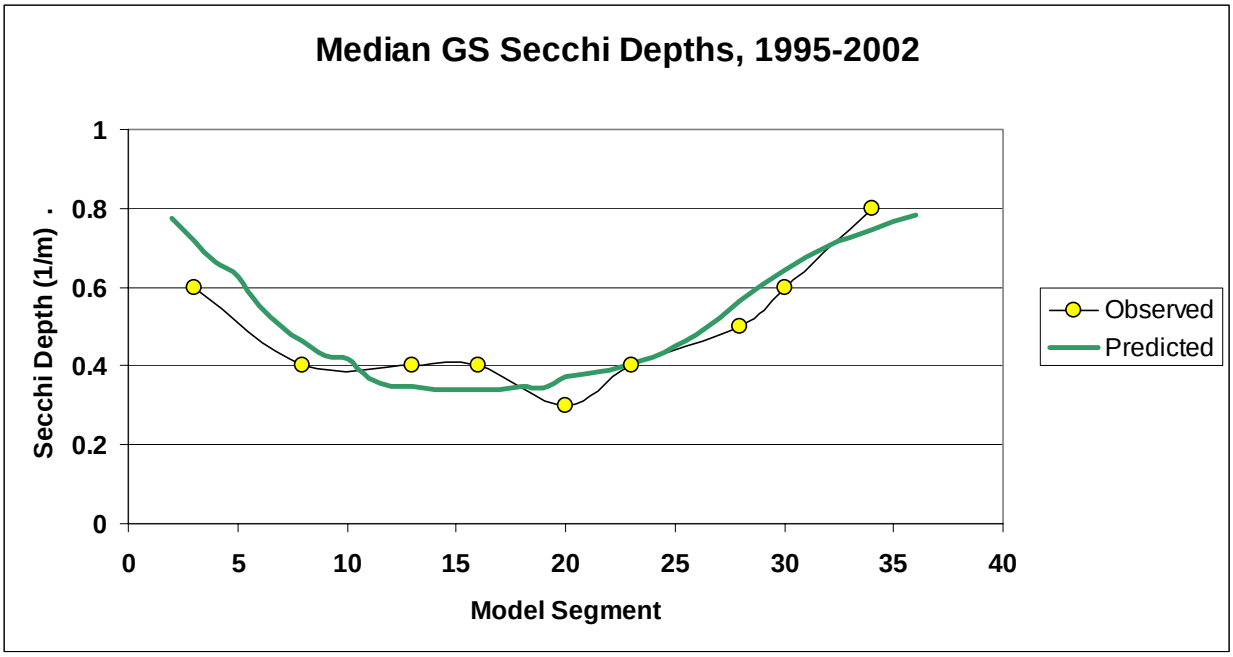


Figure 1. Longitudinal profiles of predicted and observed median Secchi depths

12. The commentator asks whether subsurface flows, mentioned in Section 2.2 in the main report, includes baseflow and groundwater flow. The commentor states that it is not evident that nitrogen loadings from groundwater have been accounted for in the TMDL. The commentor further states that nitrates from groundwater can be expected to be a major source of nutrient loadings in the Anacostia. Further, the commentor states that the poor performance of the model in every calibration scenario can be attributed to the failure to address groundwater sources. The commentor concludes that the TMDL needs to acknowledge a six-year lag time in nitrate inputs from groundwater and consequently must significantly lower all loading limits if the TMDL is to be successful.

Response: Subsurface drainage includes loads associated with interflow, shallow subsurface flow, and groundwater. BOD, nitrogen, and phosphorus loads in groundwater have been accounted for in the TMDL. Chapter 2 of the modeling report (Mandel et al., 2008), which was referenced in the main TMDL document and made available to the public with the main document, describes the determination of watershed loads in detail. Groundwater loads have been explicitly simulated for Lower Beaverdam Creek and Watts Branch in the HSPF models, which represent those tributaries. Groundwater loads for the tidal areas have also been explicitly simulated. Groundwater loads in the NEB and NWB are implicitly represented through the calculation of daily loads in ESTIMATOR, which calculates loads based on daily flow, including the groundwater component. These loads have been assigned to sources based on the explicit simulation of groundwater loads in the HSPF models of the NWB and NEB. Groundwater lag time is irrelevant to setting TMDLs. A TMDL identifies the maximum pollutant load compatible with water quality standards; how long it takes the pollutant to arrive at the waterbody, or for changes in the watershed to have their impact, while important in evaluating the effectiveness of BMPs, for example, does not affect the assimilative capacity of a waterbody.

13. The commentor states that the more biologically relevant value of oxygen saturation must be considered and addressed, in addition to dissolved oxygen concentrations, in order to achieve the stated water quality goals of the TMDLs.

Response: The DO criteria that are part of MD and DC water quality standards are not expressed in terms of percent oxygen saturation and therefore the TMDL does not attempt to analyse effects on DO saturation. Although the evaluation of the adopted standards falls outside the scope of TMDL, it should be noted that the commentor does not offer any evidence for the assertion that the percent DO saturation is more relevant to protecting aquatic life than concentrations. MD and DC have adopted the DO criteria and associated designated uses for the Chesapeake Bay and its tidal tributaries, including the Anacostia, developed by the EPA's Chesapeake Bay Program Office, based on available scientific research. CBPO (2003) documents the scientific basis for the recommended water quality standards and the justification that the recommended criteria are sufficient to protect aquatic life.

14. The commentor states that the HSPF is an old model written in FORTRAN (an ancient computer language), which raises questions about its suitability to accurately predict values for these TMDLs.

Response: Many, if not most, water quality simulation programs recommended by the EPA for TMDL development, including WASP, EFDC, SWAT, CE-QUAL-W2, and ICM, are written in FORTRAN, which remains the language of choice for much scientific programming. While all computer models have their positive points and drawbacks, the HSPF model is an appropriate and widely accepted model that has been used in many approved TMDLs in EPA Region III. The EPA has sponsored the development of the software package, BASINS, to make it easier to apply HSPF in TMDLs. The HSPF model, however, played a fairly minor role in the development of the Anacostia nutrient and BOD TMDLs. The USGS software, ESTIMATOR, was used to determine baseline daily loads in the NEB and NWB, the largest tributaries to the tidal Anacostia River. A modified version of the WASP model was used to simulate oxygen dynamics and eutrophication in the tidal Anacostia, and to simulate the TMDL Scenario, which determined the maximum BOD and nutrient loads compatible with water quality standards.

15. The commentor states that it is not clear how the TMDL got to daily loadings from monthly values based on USGS stream flow monitoring gages, a key question that must be explained explicitly before adoption of a final TMDL.

Response: The USGS software, ESTIMATOR, was used to determine daily baseline loads for NEB and NWB. These daily loads were used as inputs to the TAM/WASP model. ESTIMATOR is a statistical model based on observed monitoring data and daily flow. It calculates the total daily load but cannot determine the source of the load. HSPF models of NEB and NWB were developed to determine how to assign the ESTIMATOR loads to sources. These HSPF models were calibrated to monthly ESTIMATOR loads. See the modeling report that accompanies the Anacostia nutrients/BOD TMDL (Mandel et al. 2008).

16. The commentor states that DO data more frequent than averages for periods of months need to be presented for analyzing DO data on a daily basis and as a function of temperature.

Response: The monthly periods of February through May and June through January represent the periods in which the Migratory Fish and Spawning Season Designated Use and Open Water Designed Use, respectively, apply. These are the seasonal periods most relevant to DO standards in the Anacostia. Figure A.6 in Appendix A shows the daily average, maximum, and mean DO concentrations for each day that the continuous monitoring data was operating at Benning Road in 1997, and illustrates the seasonal effect of temperature on mean, minimum, and maximum daily DO.

17. The commentor states that the figures in Appendix A raise some serious questions about the relationships among BOD, N, P, and Chla: the sequence and timing of increases in Chla and decreased oxygen are not as expected in a standard conceptual model for eutrophication. The data show significant oxygen problems before the Chla peak.

Response: The commentor seems to assume that the primary cause of low DO concentrations is the consumption of DO in the decomposition of algae. This is not the case in the Anacostia. Although algal decomposition contributes to low DO, the decomposition of allochthonous or external organic matter from tributaries, CSOs, and storm sewer systems directly draining to the Anacostia is sufficient by itself to cause low DO concentrations. This is why hypoxia in the tidal Anacostia precedes the algal blooms, which tend to occur later in the summer. As shown in Figures B.1 through B.6 in Appendix B to the main TMDL report, the TAM/WASP model accurately predicts the timing and magnitude of hypoxia in the tidal Anacostia because it simulates the contribution of deposited allochthonous material to sediment oxygen demand. In more general terms, the TAM/WASP model successfully performs its primary function of linking constituent input loads—in this case BOD—to the water quality responses—DO concentrations--in terms of which the applicable water quality standards are measured.

18. The commentor also states that if the monitoring data includes pH these should be provided since pH tells a great deal of the nature of the developing process.

Response: Observed pH at the major ambient monitoring stations (ANA0082, ANA01, ANA08, ANA14, ANA21, and ANA30) in the Anacostia, 1995 through 2005, does not indicate that pH is a factor in water quality impairment. The mean value of observed pH is 7.2, with a standard deviation of 0.4, showing that pH observations are fairly tightly clustered around neutral conditions.

19. The commentor states that the baseline scenario for water clarity must include chlorophyll concentrations along with TSS. The commentor states that it is a major assumption of this TMDL that TSS account for the majority of water clarity issues in a system with an incredible amount of nutrient enrichment, and this assumption is not backed up with any data.

Response: As noted in Section 4.2 of the main TMDL report, the TAM/WASP model includes a modification of the WASP5 so that light extinction and Secchi depth are calculated on the basis of (1) sediment or non-algal solids and (2) Chla concentrations. This modification is implemented in both the Baseline Scenario and the TMDL Scenario. The time series of sediment concentrations by model segment are taken from the corresponding scenarios from the Anacostia sediment TMDL. The Chla concentrations are calculated internally in the modified WASP model. The point of this modification is to make the WASP model's water clarity predictions directly responsive to changes in sediment and nutrient loading rates

and therefore make it better able to fulfill its function as the link between pollutant input loads, on the one hand, and water quality responses, on the other. Schultz et al. (2007) describes in more detail the modified light extinction simulation. The relative contribution of non-algal TSS and Chla was determined through model calibration for the sediment TMDL and the claim that sediment is the dominant factor in determining light extinction is based on the results of the sediment TMDL, where it was shown that an 85% reduction in sediment loads would be necessary to meet water clarity standards. The nutrient TMDL Scenario assumes this reduction and therefore, with lower sediment concentrations, algae are more likely to play a greater role in determining light extinction.

20. The commentor states that Figure 13 shows that the TMDL fails to meet water clarity standards.

Response: See Response to Comment #3.

21. The commentor notes that the TMDL uses rainfall in the climate period 1995-1997 to develop the TMDL for all sources, while DC's Long Term Control Plan (LTCP) was developed using the period 1988-1990. Based on this period, the LTCP was approved and permit conditions were developed to assess compliance and to evaluate performance of CSO controls against projections made in the LTCP during post construction monitoring. The commentor states that a method needs to be developed and included in the TMDL to assess LTCP compliance under the proposed TMDL, which is based on a different climate period.

DC Response: The loads assigned to the CSOs in this TMDL are consistent with the LTCP. Although the LTCP was developed based on a different climate period than the TMDL, the LTCP scenario was used in the TMDL analysis for the CSO load allocation. DDOE believes that the DCWASA permit can be established and/or modified to include a method that would allow the results of CSO monitoring to be used to assess the performance of the CSO controls against predictions established as part of the LTCP and relevant TMDL development. It is not necessary to include a method in the TMDL document for determining compliance for the LTCP.

22. The commentor notes that, for each parameter, the tables in the TMDL specify annual average, maximum daily and daily average loads for CSOs. The commentor states that it is unclear if the daily average loads are allocations or are provided for information. The commentor further states that since CSOs are intermittent discharges, daily average loads are not applicable and therefore recommends deleting daily average loads from the TMDL for CSOs. If daily averages are included, the commentor requests clarification that the values are provided for information and that loads are not to be allocated on a daily average basis.

DC Response: The EPA Draft Guidance document "Options for the Expression of Daily Loads in TMDLs" (June, 2007) was followed for developing daily loads for various sources in the watershed. As daily loads from a source vary over the simulation period, the CSO average daily loads were presented along with the maximum daily loads to provide a better understanding of the range of daily loads for the particular source. DDOE recognizes that CSOs are intermittent discharges and it is important to take into account pollutant/waterbody dynamics, pollutant sources and behavior for implementation of the TMDL.

23. The commentor feels that the average annual loadings for BOD/TN/TP should be presented in a way that shows the non-MS4 and MS4 estimated loads. The commentor recommends that the annual WLAs in the Summary TMDL Tables (pp. ix-xi of the Executive Summary and Tables 23-25 in the main report) be shown as annually-based maximum daily loads like those presented in the Tables on pp. xii-xvi. The commentor notes that the non-MS4 and MS4 loads can be calculated from the loads presented in Table 1 of the Point Source Technical Memorandum. The commentor adds that inclusion of the MS4 and non-MS4 WLAs will allow local governments to evaluate implementation options and anticipate resource needs required to achieve load reductions, and to anticipate and plan for the impact of new growth on MS4 loads by having an explicit MS4 cap.

Response: Since separate, detailed allocations for stormwater, both county MS4s and "other" stormwater sources by major tributary, are provided in the point source technical memorandum, it is not necessary to provide this level of detail in the main report. The main report provides the summary WLA and LA for each of MD's impaired listed segments as the overall maximum allowable loads for each pollutant. These summary loading caps are the essential targeted goals that must be reached in order to achieve the overall TMDL of each pollutant and thus attain applicable water quality standards in the Anacostia River. The breakdown of sub-allocations in the technical memorandum provides more detailed targets for implementation efforts. DC has chosen to separate its wasteload allocations in the summary tables in order to distinguish CSO loads from stormwater and other point sources. The format described above is consistent with that used in the approved Anacostia Sediment/TSS TMDL.

24. The commentor states that Prince George's County Department of Environmental Resources supports the proposed iterative approach to implementation. An iterative approach will assure progress toward water quality standard attainment and allow for more systematic implementation. The commentor adds that, as BMPs are implemented, it provides time to assess water quality improvements relative to achieving load reductions and make modifications in a cost-effective logically based manner. The commentor recommends including a table similar to Table 12 in the Anacostia River Sediment TMDL, showing a comprehensive summary of monitoring and restoration activities in the watershed.

Response: A table that provides a summary of DC, Prince George's County, and Montgomery County restoration activities in the Anacostia watershed has been added to the Assurance of Implementation section of the TMDL report.

25. The commentor recommends that the tables for average annual BOD/TN/TP loads on pp. ix-xi be modified to show WLAs by the same categories shown for the annually-based maximum daily loads in the tables on pp. xii-xiv, which show loads for MS4 and non-MS4 point sources separately. Also, the explanatory text and headings for the tables on daily loads need to better identify the connection between the numbers in the second column for "Upstream (max:avg)" with the total daily loads shown in the subsequent columns.

Response: See Response to Comment #23. The upstream loads are explained in the text preceding the average annual TMDL summary tables, and represent the same contributions in the daily loads tables, i.e. the upstream loads are those loads from upstream listed segments that are added into the subsequent downstream segment. There are two exceptions noted: The MD non-tidal segment has a upstream load from DC sources that drain to that segment; and, similarly, loads from MD's portion of Watts Branch and Lower Beaverdam Creek are added to the DC Tidal Upper segment to which they flow. The same relationships of these upstream loads hold for the maximum daily load tables.

26. The commentor notes that daily load values for the MS4 and non-MS4 point sources can be calculated from the loads shown in Table 1 of the Point Source Technical Memorandum.

Response: See Response to Comment #8.

27. The commentor notes that the numbering of the tables is out of sequence.

Response: The error in table numbering has been duly noted and corrected, along with corrections of textual references to various figures in the report.

28. The commentor states that additional separation of the loadings by subwatershed or county may prevent the implementation of the most cost-effective reduction techniques available. If the loadings are presented based on contributing land use area within subwatershed and by county, there is an implication that pollutant reduction strategies must be equally implemented within each subwatershed, even though the non-tidal reaches are already achieving water quality standards.

Response: While EPA guidance recommends aggregate or "single number" MS4 allocations, it also recommends different WLAs, as information allows, for "different identifiable categories." As with the approved Anacostia River Sediment/TSS TMDL, information allowed the determination of the stormwater loads by each jurisdiction's contribution in each of the four major subwatersheds. Information also allowed other stormwater discharges not under the Counties'

MS4 jursidictions to be separated from the MS4-WLAs in an aggregate "Other Stormwater WLA." Separate WLAs at this level are intended to help rather than hinder implementation, by providing each jurisdiction with reduction goals for their portions of the major tributaries in the Anacostia River watershed.

29. The commentor agrees with the iterative approach to implementation and tracking as proposed by MDE. The commentor recommends inclusion of a table like Table 12 from the Anacostia Sediment TMDL with a comprehensive summary of monitoring and restoration activities with the watershed.

Response: A table that provides a summary of DC, Prince George's County, and Montgomery County restoration activities in the Anacostia watershed has been added to the Assurance of Implementation section of the TMDL report.

30. The commentors state that the TMDL must include separate Waste Load Allocations to each point source with a NPDES permit. The commentors note that MDE and DC actually calculated separate WLAs for the three MS4s (DC, Prince George's County, and Montgomery County), which are "buried in the technical appendix." The commentors assert that the agencies thus have no plausible justification for having a single WLA for all MS4s. The commentors state that at the public meeting held on March 14 in DC, MDE representatives indicated that MDE has a policy not to include the separate WLAs in the body of the TMDL itself so that MDE is not bound to include these allocations in the NPDES permits issued to individual NPDES permit holders. The commentors state that this statement reveals why it is crucial to revise the final TMDL to include separate WLAs to the three MS4s: 1) the TMDL must include separate WLAs to mandate reductions in nutrient and BOD loadings in revised NPDES permits; and 2) it needs to be clear to permittees and permit writers what they need to do to implement the TMDL.

MD Response: From EPA's November 2002 guidance: "EPA recommends expressing the wasteload allocation in the TMDL as either a single number for all NPDES-regulated storm water discharges, or when information allows, as different WLAs for different identifiable categories, e.g., municipal storm water as distinguished from storm water discharges from construction sites or municipal storm water discharges from City A as distinguished from City B. These categories should be defined as narrowly as available information allows (e.g., for municipalities, separate WLAs for each municipality and for industrial sources, separate WLAs for different types of industrial storm water sources or dischargers)."

MDE, following the EPA guidance cited above, has determined separate Stormwater WLAs to the extent that "information allows," in this case among the three jurisdictions within which the Anacostia River watershed lies. Further, as in the approved Anacostia Sediment TMDL, MDE has broken out each jurisdiction's stormwater WLAs by major tributary and also delineated from the

MS4 loads an "Other Stormwater WLA" category that includes any NPDES-regulated stormwater dischargers and entities that are not within the jurisdiction of the Counties' MS4s. All of these sub-allocations of the stormwater WLA were calculated on the basis of percentage of impervious land, since the entire stormwater contribution is based on this category of land use. Providing WLAs at a level commensurate with available information is intended to be consistent with EPA guidance and interpretation of regulatory requirements for TMDLs. MDE also acknowledges that this method of calculating stormwater loads is imprecise and based on estimates; therefore, Maryland reserves the right to revise these allocations and re-allocate loads as more detailed information becomes available, provided that such revisions are reasonably calculated to achieve water quality standards.

MDE has used technical memoranda in many of its TMDLs for a number of years. For the Anacostia nutrients/BOD TMDL, sub-allocations for each county and each major subwatershed are provided in the technical memorandum for point sources, which is part of the entire TMDL documentation package that is subject to EPA approval. MDE provides these allocations in separate technical memoranda for practical reasons. In the event that, during implementation, these sub-allocations are found to require revision due to uncertainties in the modeling estimates, in a manner that does not change the overall TMDLs established in the main document, then only the revised technical memorandum will require re-opening for another round of review and approval. MDE's intent in anticipating such a development is to streamline the process to minimize any hindrance to implementation.

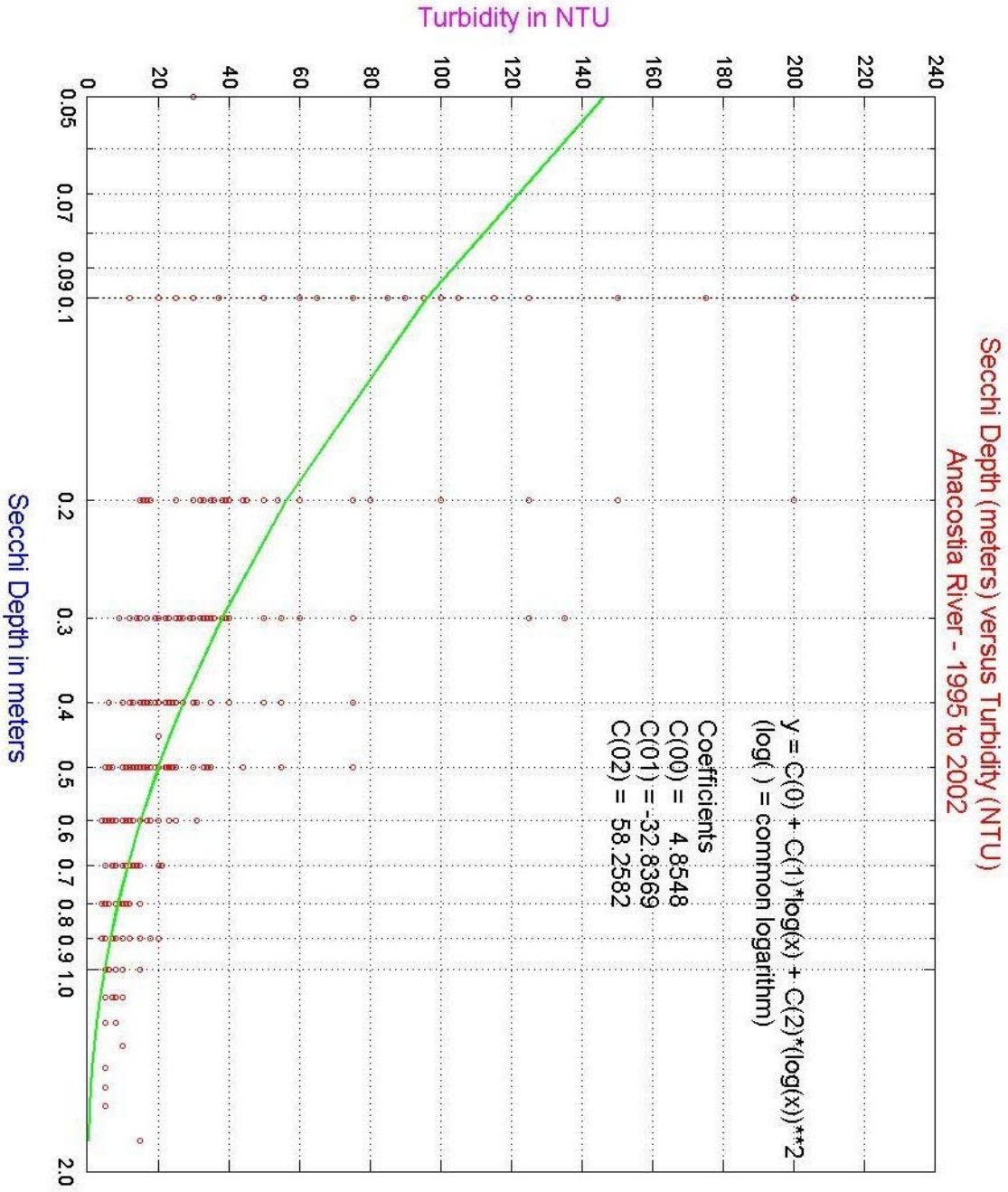
It is a misstatement of MDE policy to suggest that the use of technical memoranda is intended to evade the inclusion of allocations in NPDES permits. All stormwater permits issued by Maryland are required to be consistent with waste load allocations in approved TMDLs for the receiving waters. Maryland follows the EPA guidance that allows "water quality based effluent limits (WQBELs) for NPDES-regulated stormwater discharges that implement WLAs in TMDLs to be expressed in the form of best management practices (BMPs)." Thus, there is no reason to evade inclusion of WLAs in permits; the technical memoranda, in addition to their practical use as implementation planning tools, simply underscore the fact that these estimated numeric values are not necessarily an appropriate basis for translation into numeric limits in stormwater permits. In any event, EPA incorporates technical memoranda with the main TMDL report in their formal Decision Rationale, issued when they approve the TMDL; as such, any revisions to LAs and WLAs stated in the technical memoranda are subject to EPA review and approval.

DC Response: The District considers all the appendices and technical memoranda are part of the TMDL document. DC believes any changes in the TMDL allocation (MD or DC) must go through a full-scale public review and approval process. Also see DC response to Comment #8.

31. The commentor states that the TMDL must include an implementation plan that spells out how it will achieve the TMDL's goals, not just a discussion of implementation concepts. The commentor adds that the agencies need to include a timetable for implementation of nutrient/BOD reduction measures for each specific source and source category, along with "implementation benchmarks that indicate the actions that are to be taken by each responsible party or government entity by a date certain."

MD Response: Reasonable assurance of implementation is provided in broad terms, with an overview of considerable resources and programs that are available and will be brought to bear in a long-term, adaptive, and iterative approach to implementing these TMDLs in the face of very challenging conditions. Specific implementation planning is not required as part of a TMDL and is beyond the scope of this TMDL analysis and report. DC and MD will begin further implementation planning upon approval of the TMDLs, as a partnership effort of the State and local governments, watershed advocates and stakeholders, environmental organizations, and concerned citizens.

DC Response: The District is aggressively implementing various programs to reduce pollutants and help restore the Anacostia. The District is currently implementing the CSO Long Term Control Plan in the Anacostia watershed costing approximately a billion dollars, which when completed will significantly reduce BOD and nutrient loads from the combined sewer area. In compliance with the MS4 permit requirements, the District has developed a TMDL implementation plan for the MS4 area in the Anacostia watershed for a number of pollutants, including BOD and nutrients. Under the MS4 permit, the District has also established a regular monitoring program to set baseline conditions and evaluate progress. As discussed with the EPA and MDE, the District of Columbia, Maryland and local jurisdictions will meet to discuss development of an inter-jurisdictional implementation plan following EPA approval of the watershed-wide TMDLs, including the BOD/nutrient TMDL. The District anticipates that a meaningful comprehensive implementation plan for the entire watershed will be developed in the very near future for rapid restoration of the river.


Secchi Depth (meters) versus Turbidity (NTU)
Anacostia River - 1995 to 2002
Turbidity in NTU
Secchi Depth in meters
y = C(0) + C(1)*log(x) + C(2)*(log(x))**2
(log( ) = common logarithm)
Coefficients
C(00) = 4.8548
C(01) = -32.8369
C(02) = 58.2582
0
20
40
60
80
100
120
140
160
180
200
220
240
0.05
0.07
0.09
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
2.0