Comment Response Document
Regarding the Total Maximum Daily Load (TMDL) of Nutrients (Phosphorus) for the Antietam Creek Watershed, Washington County, Maryland

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed Total Maximum Daily Load (TMDL) of Nutrients (Phosphorus) in the Antietam Creek Watershed. The public comment period was open from July 16, 2012 through August 15, 2012. MDE received three sets of written comments from Ms. Julie Pippel and Mr. Elmer Weibley of Washington County and Ms. Marian Norris of the National Park Service.

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

Author	Affiliation	Date	Comment Number
Mr. Elmer Weibley	**Washington County Soil Conservation District**	**8/15/2012**	**1**
Ms. Julie Pippel	**Washington County Div. of Environmental Mgmt**	**8/15/2012**	**2 – 6**
Ms. Marian Norris	**National Park Service**	**8/16/2012**	**7 – 8**

Comments and Responses

Comment 1: Section 2.1, Geography/Soils needs to be updated to reflect current soils information from the 2003 Soil Survey for Washington County. The update is included below for your use in the Phosphorous TMDL.

The soils in the watershed are primarily in the Hagerstown-Duffield-Ryder Association and are derived from the underlying limestone, impure limestone and calcareous shale limestone respectively. They range from moderately deep to very deep; all are considered well drained with moderate permeability.

These soils are some of the most productive in Washington County. However, limestone outcrops impede some agricultural operations, and sinkholes post a great threat to water quality. Agricultural conservation operations such as injection of animal manures and contour strip cropping to improve agricultural production and water quality are not practical on most farms in this watershed.

The soils of South Mountain are in the Thurmont-Braddock-Trego Association, on the footslopes, and in the Bagtown-Dekalb-Weverton Association on the steeper side slopes and ridge tops. They are all derived from quartzite and phyllite. The Thurmont-Braddock-Trego Association soils are well drained to moderately well drained. They are all very deep and range from moderate to slow permeability. They are well suited to crop production on their gently sloping areas. The Bagtown-Dekalb-Weverton Association soils are also well drained to moderately well drained. They range from very deep to moderately deep with permeabilities ranging from slow to rapid. This association is well suited to tree production and unsuitable for most agricultural and urban uses because of the

steep slopes and surface stones. Underlaying the soils in Antietam Creek is a Karst geology shaped by the dissolution of a layer or layers of soluble bedrock, which is limestone.

Response: The Geography/Soils section in the report will be revised to reflect the more current soils information for Washington County provided by the commentor.

Comment 2: In Ross Mandel's PowerPoint presentation, Slide #5 "Phosphorus Loads" indicates the following sources of phosphorus:

Agriculture: 61%
Point Sources: 22%
Developed: 13%
Forest: 4%

On Slide #10 "BSID Results - Stressors and Sources Identified", for "Total Phosphorus", the "source" is listed as "Urban 65%."

Then, at Slide #27 "Antietam Creek Phosphorus TMDL", the category that would correspond with urban stormwater (WLA: MS4) is tagged with the highest percentage reduction (21%), while the agriculture category is only assigned a 4% reduction.

MDE/ICPRB needs to do a much better job of clearly explaining the rationale for these proposed reductions; the first question from the government bodies represented at the meeting will be "How is it that the agricultural sector is responsible for 61% of the phosphorus load in Antietam Creek, but the "developed/urban" sector is targeted for larger reduction (both in terms of percentage and pounds) in the proposed TMDL?. If the agricultural sector is the largest contributor, wouldn't it make sense to make them responsible for the greatest reduction, at least in pounds?"

Please provide clarification on this item.

Response: The commentor is correct in asserting that agriculture is the dominant source of phosphorus in the Antietam watershed. Phosphorus allocations, however, were based on an equal percent reduction of controllable load. Controllable load is defined, as in it in the Chesapeake Bay TMDL, as the difference in load between the No Action Scenario of the P5.3.2 Watershed Model and the “Everything Everywhere by Everyone” (E3) Scenario. The former represents the loads that would occur if no BMPs or other nutrient controls were implemented; the latter represents full implementation of nutrient controls. The percent reduction, as reported in the TMDL documentation, is with respect to Baseline loads. Because baseline loads represent current conditions, which include the existing implementation of BMPs, an equal percent reduction of controllable loads gives credit to sectors like agriculture which have already taken actions to control nutrients. In other words, for the sake of equity, every sector in the TMDL must reduce their controllable loads by the same percent. That

reduction can be divided into two parts: the reduction in controllable loads already made under current conditions and the reduction from current or baseline conditions required to meet the TMDL. It is the latter which requires a 4% reduction from agriculture and a 21% reduction from regulated stormwater.

Comment 3: As was pointed out at the meeting, the concept that the main stem of the Antietam is okay but the tributaries are impaired is hard to grasp. A large portion of the City of Hagerstown's storm drainage system discharges directly into Antietam Creek without first flowing through 1st, 2nd, or 3rd Order streams - does that mean that the largest concentration of urban development in Washington County doesn't need to do anything to reduce phosphorus in Antietam Creek?

Please provide clarification.

Response: Based on DNR's CORE/TREND data, the water quality in the mainstem of Antietam Creek is good, so the phosphorus loads discharging directly to the mainstem of the Antietam Creek from the City of Hagerstown storm drainage system are not impacting the biological communities in the 1st through 4th order streams of the Antietam Creek watershed, which is the scope of this TMDL. Therefore, reductions of phosphorus loads from any source sector discharging directly into the mainstem of the Antietam Creek are not required for this TMDL. Nevertheless, phosphorus reductions from this source may still be required under the Bay TMDL to restore water quality in the Bay. The first stage of implementation of the Antietam Creek phosphorus TMDL will be the implementation of the phosphorus reductions under Chesapeake Bay TMDL. MDE is urging localities to focus on local implementation benefits while making progress on meeting the goals of the Bay TMDL.

Comment 4: During the meeting, MDE/ICPRB indicated that algae is an indicator of phosphorus loads. We feel that MDE/ICPRB needs to more clearly explain the thought that algae is an indicator/symptom of phosphorus loads. While from a scientific perspective this may be clear, from a layman perspective the picture of "algae" is the green filamentous stuff in farm ponds which is not seen very much in Antietam Creek on the main stem. Therefore in trying to build support on the TMDL and its implementation it is difficult to base it upon something that the general public cannot see.

Response: Filamentous algae are generally considered a nuisance species and therefore accepted as an obvious sign of excess eutrophication. Excess eutrophication (i.e. excess primary production) can involve other species of algae and less obvious impacts. In 1st through 4th order streams, algae grow primarily in mats attached to rocks or other substrate. When these mats become excessive, they can make the habitat unsuitable for benthic macroinvertebrates. Excess algal growth can also alter food web dynamics, leading for example, to the dominance of species of benthic macroinvertebrates that graze on algae. Some scientists

even advocate using shifts in diatom species as a measure of eutrophication. Other more familiar impacts of excess primary production include diurnal swings in DO and pH. These impacts are not associated exclusively with filamentous algae.

Some states, such as Kentucky, have adopted protocols for assessing the type and extent of algal growth as part of their habitat assessments. These protocols require reporting the thickness and extent of algal mats as well as the presence and extent of filamentous algae. Though generally speaking, collecting additional data is usually helpful, this type of assessment does not necessarily lead to conclusive determination of a nutrient impairment. Storm flows can scour algal mats, so the state of the algal community may reflect only the time since the last storm event. Grazers can also effectively control the amount of algae.

The role of nutrients in aquatic ecology of free-flowing streams is an active area of scientific research. MDE intends to incorporate advances in our understanding of nutrient impacts in re-evaluating nutrient impairment in Antietam Creek, doing so after full implementation of the Chesapeake Bay TMDL has been achieved (2025).

Comment 5: In the text portions of the "Technical Memorandum on Significant Phosphorus Point Sources in the Antietam Creek Watershed," you refer to 4 major WWTPs, which include Funkstown WWTP. However, in Table 1, Funkstown is not listed in as a major but as a minor (which is correct). In the table, Boonsboro is listed as the fourth major.

Please review and provide appropriate corrections.

Response: The commentor is right. Funkstown was listed as a major by mistake in the text portions of the Technical Memorandum. It has been replaced to reflect that the fourth major WWTP in the watershed is Boonsboro WWTP.

Comment 6: The TMDL document references the use of the Chesapeake Bay Model land use data as a basis to develop the loading allocations in the document. We want to go on record that the Bay model has public acknowledgement from EPA and MDE that it is not accurate at the local level. Therefore, any issues with the Bay model land use has now been incorporated into this document and may need to be reopened to reflect these changes and/or revised to reflect better data.

Response: The Chesapeake Bay Watershed Phase 5.3.2 model was developed primarily for estimating nutrient and sediment loads to the Bay; however, the refinement of spatial scale from Phase 4 to Phase 5 allows Bay Program States to consider its use in localized TMDLs. An advantage of using the same model for local and Bay TMDL development is that it's a consistent method to compare the

loading rate required to meet local water quality as compared to downstream tidal water quality.

The Phase 5 Watershed Model development process considered all available data at the finest consistent scale possible within the Bay watershed. Consistent is defined here as a comparable level of accuracy for all watersheds, where these data include precipitation and landscape characteristics such as slope, land cover, land use, nutrient applications, monitoring data, etc. So that while it can be said that the Phase 5 Model accuracy improves with aggregation and increased spatial scale, the use of Phase 5 for local TMDLs has the merit of the best available information consistently applied at the local scale. The alternative local scale approach is incorporation of additional local data at a more localized scale into a separate model, but that has the tradeoff of inconsistent analyses among different local jurisdictions. Given the relative merits of the two approaches, we believe that local allocations should be evaluated on a case-by-case basis, which is what Bay Partner States are doing.

For example, in Maryland, the unit of TMDL assessment is at a watershed scale the same size or larger than the Phase 5 river-segments. The Phase 5 river-segments were designed to facilitate representation of the Maryland watersheds (the so called "8-digit" watersheds). As part of its contribution to the Phase 5 model development, MDE collected monitoring data to calibrate Phase 5 at the scale of the 8-digit watersheds. Consistency of the scale of analysis among local TMDLs and between local TMDLs and the regional Bay TMDL is considered to be an important advantage.

MDE continues to work with the Chesapeake Bay Program to improve the model even further. Any improvements made to the model will be taken into account when the status of the Antietam Creek phosphorus impairment is reviewed after the Bay TMDL has been fully implemented.

Comment 7: Regarding the assumption that septic systems contribute insignificant amounts of phosphorus: While this may be true now, with the implementation of requirements for nitrogen reducing septic tanks to meet the Chesapeake Bay TMDL requirements will presumably lead to the quantity of phosphorus flowing from septic systems to exceed that of nitrogen, potentially tipping the TN:TP ratio to a point where phosphorus is no longer the limiting factor. Would the amounts of phosphorus from septic systems still be insignificant in such a situation? Assuming all other sources as described in the report are successfully controlled....

Response: TP loads from septic systems are negligible because phosphorus tends to strongly adsorb to soil particles. Nutrient limitation applies to a water body as whole, not individual sources. Even if nitrogen exported from septic systems is significantly reduced, it is unlikely to make nitrogen the limiting nutrient in 1st to 4th order streams. Because the median TN:TP ratio is considerably higher in this watershed, it would require significant nitrogen

reductions, beyond the reductions required by the Bay TMDL, to lower the ratio to the 5:1 level indicative of nitrogen limitation.

Comment 8: The TN:TP ratio is used as the rationale for addressing phosphorus primarily in this report to reduce the biological impairments which may be due to BOD and eutrophication effects, but could the quantity of nitrogen be directly affecting the biota in some instances? A blue aquatics syndrome?

Response: As the commentor suggests, this TMDL primarily addresses the adverse impacts which excess phosphorus associated with eutrophication can have on stream aquatic life. In addition, Maryland has adopted water quality criteria to protect aquatic life from the toxic affects of excess nitrogen, specifically ammonia. These criteria for ammonia have been incorporated in the BSID analysis, which did not identify ammonia as a stressor in this watershed. Other than ammonia toxicity, the toxic effects of other forms of nitrogen like nitrate have not been scientifically established. MDE is prepared to adopt criteria should future scientific research establish, for example, that nitrate concentrations above a threshold induce methemoglobinemia or "blue baby syndrome" in fish or other aquatic life.