

**Comment Response Document Regarding the Water Quality Analysis of
Eutrophication in Lower North Branch Patapsco River, Anne Arundel, Baltimore,
Carroll, and Howard Counties, and Baltimore City, Maryland**

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed Water Quality Analysis of Eutrophication in the Lower North Branch Patapsco River, Anne Arundel, Baltimore, Carroll, and Howard Counties, and Baltimore City, Maryland. The public comment period was open from May 21, 2009 through June 19, 2009. 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
Steve Stewart	Baltimore County Department of Environmental Protection and Resource Management	June 19, 2009	1 through 2

Comments and Responses

1. The commentor states that the focus of the eutrophication analysis is on chlorophyll *a* in the water column, yet for non-tidal streams, particularly, the lower order streams, the chlorophyll *a* of the benthic algal community may be more important. Filamentous green algae, or mats of other algal types can significantly reduce habitat available for the benthic macroinvertebrate community.

Response: The focus of the water quality analysis is not only on chlorophyll *a* in the water column. The main focus is on dissolved oxygen (DO) levels in the water column and the degradation of biological communities. As demonstrated by the analysis, in conjunction with the Biological Stressor Identification Analysis (BSID) results, neither DO levels nor aquatic life are being negatively affected by nutrient loadings to the stream. MDE assesses DO levels because the State has established numeric DO criteria in the Code of Maryland Regulations, which also provides narrative criteria for chlorophyll *a* in the water column, but not for benthic algae. The relationship between nutrient levels in the water and benthic algae growth has not yet been well-defined by scientific research. There are many factors affecting whether or not streams with high levels of nutrients can become impaired by algal growth (e.g., shading of the stream, gradient to allow re-aeration, bottom scouring events, etc.). The water quality analysis of DO and water column chlorophyll *a* in the Patapsco LNB, together with the BSID results, demonstrates that DO levels are appropriate for the designated uses of the stream

and that aquatic life is not being affected by nutrients, therefore concluding that nutrients are not impairing the designated uses of the Patapsco LNB.

2. The commentor states: It is not indicated at what time of day the dissolved oxygen concentrations were measured. Dissolved oxygen may undergo a daily cycle of dissolved oxygen concentrations, with high concentrations during the lowest concentrations at night just before dawn. This is related to the dynamics of oxygen generation and respiration of the algal community. While the chlorophyll *a* analysis would indicate that there is not a problem; because the analysis is limited to water column chlorophyll *a*, it may be missing a significant benthic algal community contribution.

Response: Dissolved oxygen concentrations are collected throughout the day by MDE field office staff, starting very early in the morning. As noted by the commentor, lowest concentrations of DO are measured just before dawn, but the data show that there are no extreme changes (DO swings) in the data collected from the early hours of the morning (6:00 am or earlier) into the afternoon hours, indicating that significant DO swings between night and day DO concentrations are unlikely, and therefore not a significant benthic algal community contribution to DO levels in the stream. See also Response to Comment #1.