UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 18 2011

OFFICE OF WATER

MEMORANDUM

SUBJECT: Science Advisory Board Nutrient Criteria Review Panel Request for Information

FROM: Elizabeth Behl, Director
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TO: Stephanie Sanzone, Designated Federal Official
Science Advisory Board

This memorandum is in response to the request for information from the U.S. Environmental Protection Agency Science Advisory Board (SAB) on the proposed methods and approaches to derive numeric criteria protective of downstream estuaries in Florida. In the SAB teleconference call on February 7, 2011, we indicated that there were several approaches that could be used to allocate nutrient loads among stream reaches within an estuarine watershed for the purpose of computing downstream protective values (DPVs). We provided one of those approaches to the Panel as an illustrative example at the SAB meeting in December (Option A below). EPA also is considering several other options, described below, including two (Options C and D) which take into consideration initial feedback EPA received from the SAB in December 2010.

Options for Distributing Loads

Option A: Distribute Load in Proportion to Flow. This option would distribute the watershed load among stream reaches according to the fraction of the total watershed discharge contributed by that reach, thereby addressing the fact that higher nutrient loading is often associated with higher freshwater flow. In developing this option, EPA also considered in-stream processing of nutrients, computing the aggregate loss and/or retention of nutrients within the stream network. Criteria derived using this approach could be higher for streams for which a significant quantity of transported nutrients are lost or retained before reaching estuaries. EPA described this approach in the Methods and Approaches document submitted to the EPA SAB for review.

Option B: Distribute Load in Proportion to Area. This option would distribute the watershed load among stream reaches according to the fraction of the total watershed area that is drained via that reach. DPV concentrations could be computed by dividing the loading limit for each reach by the average freshwater discharge from the respective reach. EPA does not intend to consider this approach further, recognizing that it does not take into account differences in freshwater yield (i.e., runoff per area), an important factor affecting nutrient transport from watersheds. Freshwater yield varies significantly among watersheds due to both natural and

anthropogenic causes. For example, a watershed with high relief (i.e., slope) or significant impervious surfaces may have higher freshwater yield than a low-relief, forested watershed. DPV criteria derived using this approach could be much lower for high-runoff watersheds, and in some cases could be unreasonably low.

Option C: Distribute Load In Proportion to Natural or "Background" Loading. This option distributes the load among terminal reaches in a watershed in proportion to an estimate of the loading that would occur from each watershed in the absence of anthropogenic influence, which we refer to as "background loading." These estimates could be derived using the Loading Simulation Program in C++, or LSPC. This option would enable EPA to consider a diverse array of environmental information (such as slope, natural land cover type, soil types, local rainfall) in deriving numeric criteria. As an example, if the watershed TN or TP loading rate for an estuary is, in aggregate, 20% more than the estimate of background loading, the watershed load distributed to each terminal stream reach would be 20% more than the respective background load. DPV criteria could be computed by dividing the distributed loading by the average freshwater discharge. Since the estimates of these loads consider hydrological and other landscape factors, the DPV estimates will also reflect these factors. DPV criteria for upstream reaches could be determined recursively using the same process. DPV criteria derived using this approach limit loading to estuaries to the watershed load and DPVs criteria reflect a range of natural factors that impact nutrient concentrations in watersheds.

Option D: Distribute Load in Proportion to Existing Loading. This option distributes the watershed load among the terminal reaches in a watershed based on both the average background loading (as described above) and average existing loading (e.g., 1997-2009), recognizing that the difference between the estimate of existing loading and background loading is an estimate of anthropogenic loading. For example, if the aggregate watershed loading to the estuary is 30% less than the current loading rate, DPV criteria would be computed based on 100% of the background loading plus a fraction of anthropogenic loading, such that the total loading is equal to the watershed load. DPV criteria would be computed by dividing the divided load by the average freshwater flow. DPVs for unmodified watersheds with low nutrient yields would be relatively low, whereas DPVs for sub-watersheds with developed or agricultural lands would be expected to be higher, but lower than existing concentrations. DPV criteria derived using this approach limits loading to estuaries to the watershed load and DPVs reflect both natural and anthropogenic factors that impact nutrient concentrations in watersheds.