

Charge Questions for Updated State/Local Peer Review on the Numeric Nutrient Criteria for the Great Bay Estuary

July 30, 2013

Question 1. The report titled “Numeric Nutrient Criteria for the Great Bay Estuary” (hereafter the “DES 2009 Report”) was developed over a five-year period starting 2004. Is the “conceptual model” used in the DES 2009 Report (at 4 and Appendix B) to interpret the nutrient criteria reasonably supported by the data and studies for the estuary, the relevant scientific literature and the subsequent information/analyses available for the estuary? Specifically,

- a) Given the available data, is transparency an important factor in the presence/absence of eelgrass in the various segments of the Estuary including the upper tidal rivers, Great Bay, Little Bay, the Piscataqua River, and/or Portsmouth Harbor? If yes, is it the controlling factor?
- b) Given the available data/studies, is nitrogen an important factor in the presence/absence of eelgrass in various segments of the Estuary (Please be specific in terms of the impact or lack of impact in the tidal rivers, Great Bay, Little Bay, the Piscataqua River, or Portsmouth Harbor)? If yes, is it the primary factor?
- c) Does the available information indicate that increased algal growth is causing or significantly contributing to a loss of eelgrass and that nitrogen reductions will significantly improve the conditions for eelgrass growth and/or restoration?
- d) Does the available information indicate that algal growth is the reason for low DO conditions in the tidal rivers and that nitrogen reduction will significantly improve DO in the tidal rivers that flow into the Great Bay Estuary?
- e) Were the statistical methods used to derive the numeric thresholds based on acceptable scientific methods? Are the results of those analyses reliable for predicting responses to nitrogen in this system (including DO, transparency, eelgrass, macroalgae, phytoplankton, etc.)?

Question 2. The DES 2009 Report uses a “weight of evidence” approach to identify a range of possible values for a TN threshold between 0.20 and 0.38 mg/l to protect eelgrass resources. TN thresholds of 0.25 to 0.30 mg/l were selected for areas with eelgrass, based on the regression of transparency to TN and depending on the restoration depth. The DES 2009 Report selected 0.45 mg/l to maintain instantaneous DO concentrations greater than 5 mg/l. Specifically

respond to the following:

- a) Is “weight of evidence” a reasonable approach to selecting final thresholds for areas with eelgrass impairments and low DO?
- b) Does the “weight of evidence” (i.e., an assessment of available data and studies for this estuary) support the conclusion that excess nitrogen was the primary factor that caused (1) the decline of eelgrass populations or inability of eelgrass to repopulate specific areas, and (2) low DO in the tidal rivers?
- c) Does the DES 2009 Report and/or subsequent data reasonably assess the potential reasons for eelgrass loss besides cultural eutrophication in the various areas?
- d) Are the selected TN criteria for eelgrass protection consistent with (1) data/studies available for this estuary and (2) TN levels found to be protective in other Northeast estuarine systems?
- e) Does the available information demonstrate that, for the protection of eelgrass habitat, the annual median total nitrogen concentration should be less than or equal to 0.25-0.30 mg N/L depending on the eelgrass restoration depth? Will attaining these values achieve the desired restoration depth for transparency?

Question 3. The DES 2009 Report established thresholds for TN concentrations. In this estuary, is TN the correct form of nitrogen on which to focus to address cultural eutrophication? Assuming that the excessive growth of macroalgae and/or epiphytes is one of the primary concerns, what form of nitrogen should be the focus, given detention times in the system? Is the form of nitrogen that should be controlled the same for Great Bay, the Piscataqua River, and Portsmouth Harbor? Based on the available evidence, is it likely that dissolved organic nitrogen is converted to dissolved inorganic nitrogen to a significant degree within this estuary and watershed.

Question 4: The DES 2009 Report was published nearly five years ago. To ensure ongoing protection of estuarine resources and water quality based on the latest scientific understandings, the DES 2009 Report may be updated in the future.

- a) If you were charged with updating the DES 2009 Report, what approach would you take given the information now available?
- b) Would a reference waters approach to establish a TN threshold based on various eutrophic responses such as macroalgae growth, low dissolved oxygen, and eelgrass loss be appropriate and feasible for the Great Bay Estuary? If so, how

would you recommend such an approach be developed?

- c) Are there other approaches that you would recommend as alternatives for setting site specific nutrient criteria for the tidal Piscataqua and Cocheco Rivers?
- d) Do you have any recommendations for the long-term (10- year) monitoring and evaluation of the estuary to assess changes in conditions over time?