EXHIBIT 30 (AR C.8)

UNIVERSITY of NEW HAMPSHIRE

NH Water Resources Research Center (WRRC)
Department of Natural Resources and the Environment
114 James Hall, 56 College Road
Durham, New Hampshire 03824-2500
Fax: 603-862-4976

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U.S. Environmental Protection Agency
Office of Ecosystem Protection
5 Post Office Square, Mail Code – OEP06-1
Boston, Massachusetts, 02109

Dear U.S. EPA Representative:

Thank you for the opportunity to comment on Newmarket, NH's draft wastewater treatment facility (WWTF) permit no. NH0100196. We have seen data on the dissolved oxygen (DO) impairment in the tidal Lamprey and the significant eelgrass loss in Great Bay and its tidal tributaries. We agree with NH Dept. of Environmental Services (NH DES) and EPA that nitrogen loading to the bay must be reduced to improve water quality and restore aquatic health. Numerous estuaries around the world have experienced eutrophication and contain dead zones due to increases in human activity and nitrogen loading to the estuary (Diaz and Rosenberg 2008). In estuaries, all forms of nitrogen can impair aquatic health. Particulate N (PN) and dissolved organic nitrogen (DON) can block light and both dissolved inorganic nitrogen (DIN) and DON can fuel eutrophication. Therefore, we agree that setting total nitrogen (TN) standards for Great Bay is entirely appropriate and necessary.

Reports by NH DES document that the current N Load is to the Great Bay system is 1405 tons/yr and 27% of the load is from point sources, 73% is from non-point sources (Trowbridge 2010). Because non-point sources are the biggest contribution to the TN load, several municipalities and other stakeholders have questioned why "WWTFs need to bear the brunt of the load reduction and the corresponding financial burden when they are not the biggest part of the problem". Assessing what fraction of the non-point source nitrogen is potentially manageable would be useful in the Great Bay watershed where much of the watershed is only moderately impacted by human activity and some non-point nitrogen exists from natural sources. Because the point-sources of nitrogen are directly from human sources, we can consider all point sources to be manageable. Comparing the total point source nitrogen to the potentially manageable non-point source nitrogen would better emphasize which sources are important to target for reduction. We will illustrate this approach using data from the Lamprey watershed.

The NH Water Resources Research Center has studied the freshwater portion of the Lamprey River for 12 years and we have paid particular attention to the change in nitrogen concentrations over time and the variation in nitrogen concentrations in sub-basins of the watershed that drain a range of land uses and land cover types. Since there is only one minor WWTF in the freshwater portion of the Lamprey River, data that we have collected are useful in assessing non-point sources of nitrogen in the watershed. Our data show that non-point DIN clearly responds to human activity in the watershed (Daley et al. 2010) and is therefore potentially manageable. However, DON in sub-basins with no significant WWTF input does not respond to the level of the human footprint and therefore, non-point DON is not manageable. Instead, DON is controlled mainly by the amount of wetlands in the sub-basin (Daley et al. 2010).

Based on weekly and storm event stream samples collected from the Lamprey River at the Packers Falls gaging station in Durham, NH (LMP73; 5 river kilometers upstream from the head of tide) from 2000-2009, we can estimate the fraction of non-point N in the Lamprey that is potentially manageable. The discharge-weighted mean TN concentration at LMP73 was 0.40 mg N/L. Particulate N, DON and DIN were 0.07, 0.21 and 0.12 mg N/L respectively. We have no data on the spatial variability of PN and how it relates to human activity, but PN concentration and load does increase with increasing stream flow. Particulate N at LMP73 is the lowest PN concentration among all the tidal tributary data collected at the 8 head of tide NH DES stations; therefore, we conclude that reductions in non-point PN in the Lamprey are not likely. In our most pristine site in Pawtuckaway State Park, DIN is 0.03 mg/L and we conclude that DIN cannot be reduced below this level. Based on these thresholds, the maximum reduction in non-point TN at LMP73 is 0.09 mg/L or 23% of TN (PN and DON not manageable and remain unchanged; DIN reduced from 0.12 to 0.03 mg/L). This maximum 23% percent reduction in non-point TN assumes that ALL of the human influence is removed and the watershed condition is returned to a completely undeveloped state. Based on the Trowbridge 2010 report, if WWTF permits are established at 3 mg/L at design flow, non-point nitrogen in the Lamprey watershed would need to be reduced by 13% to protect DO levels in the tidal Lamprey and restore eelgrass downstream in Great Bay.

If we apply the percent PN, DON and DIN of TN (17, 53 and 30% respectively) at LMP73 to the total non-point load to the tidal Lamprey as reported by Trowbridge (204.1 tons/yr; 2010), we estimate that a 59% reduction in potentially manageable non-point N (Table 1) would be necessary at a WWTF permit of 3 mg/L. Given the diffuse nature of non-point sources, more than a 50% reduction in potentially manageable non-point nitrogen is unlikely and available technology should be used to maximize reduction of point sources of nitrogen necessary to restore aquatic health in Great Bay. Reduction of point sources is especially important during the summer months when water temperatures are warmer making DO impairments more likely, eelgrass is the most sensitive to nitrogen loading and non-point source nitrogen inputs are at their lowest due to low stream flow.

Even though we are supportive of using available technology to reduce point source contributions of nitrogen, we do have a few concerns. One concern is that the draft permit limits the TN concentration in the effluent and the corresponding load at design flow. We are told by municipal coalition members that most WWTFs do not operate at or near design flow and thus we urge EPA to focus enforcement efforts on the TN load allowed. If enforcement is based on the WWTF TN load, slightly higher concentrations in the effluent may be allowed when discharges are well below design flow. For example in Newmarket, if the WWTF operated at or below 0.5 MGD instead of the 0.85 MGD allowed, an effluent concentration of 5 mg/L would keep the TN load at or below the 21 lbs/day limit established in the permit. Because there are significant financial and carbon (footprint) costs associated with reducing TN from 5 mg/L to 3 mg/L in WWTF effluent, we urge EPA and Newmarket to consider other approaches to reducing point source TN load, particularly in the summer months. Perhaps treating the effluent to 5 mg N/L and land-applying effluent during the summer months on golf courses or upslope vegetated areas would achieve the desired N reduction needed at a reduced cost when compared to discharging 3 mg/L effluent directly to the tidal Lamprey. Or perhaps there is a way to generate biofuel from the effluent to help offset treatment costs. We recognize that one unintended consequence of establishing WWTF permits at the limit of technology is that the associated increased water and sewer rates could promote sprawl in unsewered areas and innovative approaches must be considered to reduce this undesired outcome.

In summary, we applaud the efforts of EPA and NH DES to protect the health of Great Bay which is a vital part of our local economy and heritage. Given that a significant portion of the non-point TN load in the Lamprey is not manageable, significant reductions in point sources of nitrogen are needed to restore DO levels in the tidal river and protect eelgrass in Great Bay. Innovative approaches to managing point sources should be considered to help offset some of the financial costs associated with WWTF upgrades and efforts must also be made to reduce non-point sources.

Table 1. Current nitrogen loads to the tidal Lamprey River, the potentially manageable fraction of point and non-point nitrogen sources and N reductions needed to protect DO levels in the tidal Lamprey and eelgrass downstream in Great Bay. Trowbridge 2010 data in **bold**, our data in *italic*.

	Current Load (tons/yr)	% Potentially Manageable	Potentially Manageable Load (tons/yr)	Targeted N Load (tons/yr) to Protect DO in Tidal Lamprey and Eelgrass Downstream with 3 mg/L WWTF permit	N Load (tons/yr) Reduction Needed with 3 mg/L WWTF Permit	% Reduction of Manageable N Needed
Point sources	**34.7**	*100%*	*34.7*	**5.2**	**29.5**	*85%*
Non-point sources	**204.1**	*23%*	*45.9*	**177.2**	**27**	*59%*
Total Load	**238.9**		*80.6*	**182.4**	**56.5**	

Sincerely,

William H. McDowell
Professor of Water Resources Management
Presidential Chair
Director, NH Water Resources Research Center (WRRC)
Phone: 603-862-2249
Email: bill.mcdowell@unh.edu

Michelle L. Daley
Research Scientist II
Associate Director, NH WRRC
Phone: 603-862-1794
Email: michelle.daley@unh.edu