Great Bay Municipal Coalition Presentation To SWA

August 3, 2011

Great Bay Municipal Coalition

- Dover, Durham, Exeter, Newmarket, Portsmouth, and Rochester
- Wastewater Treatment Plants
- NPDES permits

Issue at Hand

- Nitrogen has been identified as contaminant adversely impacting estuary resources
- NHDES asserts increased nitrogen has caused
  - Increased chlorophyll a
  - Low DO
  - Reduced transparency
  - Loss of eelgrass
  - Proliferation of macro algae

Areas of Agreement

- Nitrogen levels in the estuary have increased
- Eelgrass has declined in the estuary
- Oyster resources in the estuary are decimated
- It is reasonable to lower the nitrogen load to the estuary
- It is now time to begin nitrogen reduction efforts

Points of Contention

- EPA has issued draft NPDES permit to Exeter with 3 mg/l, TN limits
- Numeric Nutrient Criteria document fails to prove a causative relationship between Nitrogen and
  - low DO
  - Reduced transparency
  - Loss of eelgrass
- Extent to which nitrogen needs to be reduced

Peer Review

- GB Municipal Coalition identified major data gaps and uncertainties
- Requested Peer Review of Draft Criteria
- Interim Program for WQ Improvements Proposed (WWTP upgrades, BMPs and studies)
- State agreed to peer review to ensure scientific approach is correct - Jan 2011
- State and Coalition agreed that development of hydrodynamic model of the estuary better use of funds and signed MOA - June 2011

Memoranda of Agreement

- Develop hydrodynamic and water quality model for Squamscott
- Collect field data needed to calibrate and validate the model – Aug 2011
- Provide data and model to NHDES
- Use model to propose N site specific nutrient criteria and WWTP limits in Squamscott -Jan 2012

Memoranda of Agreement

- Initiate a process including NHDES, SWA, and/or PREP to address uncertainties with transparency, macroalgae, and epiphytes lines of evidence of the nutrient criteria for eelgrass loss
- Begin design process to meet 8 mg/l permit limit for WWTP's discharging to Great Bay
- Other WWTP's discharging to estuary commit to optimizing N reduction with existing infrastructure

Hydrodynamic Model

- Prepare a hydrodynamic and water quality computer model of estuary
  - Initial focus Squamscott River and Great Bay
  - Initiate field sample program to collect data for the model calibration and verification
- Calibrate the model
- Run model simulations that predict DO conditions in the river and Great Bay as Nitrogen inputs are varied

Great Bay Municipal Coalition Objectives

- Protect Estuary resources
  - Understand the science
  - Invest in solutions that address cause of resource degradation to the extent necessary

WWTP Permit Limits Matter

Table 8: Nitrogen loads and water discharge from WWTFs in the watershed of the Great Bay Estuary

WWTF	Discharge Location	Ave. TN Conc. (mg/L)	Data Source[1]	Annual Ave. Flow 2002 (MGD)[2]	Annual Ave. Flow 2003-2004 (MGD)	Annual Ave. Flow 2005-2006 (MGD)	Atten-uation Loss[3] (%)	Delivered TN Load in 2003-2004 (tons/yr)	Delivered TN Load in 2005-2006 (tons/yr)
Durham	Oyster River (tidal)	7.63	NHEP (2008)	0.939	0.952	1.108	0.00%	11.04	12.85
Exeter	Exeter River (tidal)	14.43	NHEP (2008)	1.500	1.792	2.250	0.00%	39.30	49.36
Newfields	Exeter River (tidal)	17.78	Estimated	0.038	0.049	0.066	0.00%	1.31	1.78
Newmarket	Lamprey River (tidal)	30.10	NHEP (2008)	0.701	0.670	0.697	0.00%	30.66	31.90
Dover	Upper Piscataqua River (tidal)	22.33	NHEP (2008)	2.693	2.837	3.343	0.00%	96.30	113.49
South Berwick	Salmon Falls River (tidal)	9.95	Municipality	0.343	0.327	0.405	0.00%	4.95	6.13
Kittery	Lower Piscataqua River	15.99	NHEP (2008)	1.067	1.023	1.271	0.00%	24.86	30.88
Newington	Lower Piscataqua River	17.78	Estimated	0.122	0.128	0.154	0.00%	3.46	4.16
Portsmouth	Lower Piscataqua River	13.34	Municipality	5.029	4.886	5.902	0.00%	99.09	119.70
Pease ITP	Lower Piscataqua River	8.74	Municipality	0.455	0.529	0.795	0.00%	7.04	10.56
Farmington	Cocheco River	12.97	Municipality	0.174	0.218	0.382	37.60%	2.68	4.70
Rochester	Cocheco River	30.11	NHEP (2008)	2.585	3.462	3.918	17.32%	130.98	148.23
Epping	Lamprey River	17.78	Estimated	0.161	0.235	0.314	29.75%	4.46	5.96
Berwick	Salmon Falls River	16.68	NHEP (2008)	0.400	0.387	0.425	3.87%	9.44	10.37
Milton	Salmon Falls River	17.78	Estimated	0.061	0.069	0.116	28.80%	1.32	2.23
Rollinsford	Salmon Falls River	17.78	Estimated	0.089	0.099	0.115	0.95%	2.65	3.07
Somersworth	Salmon Falls River	4.95	NHEP (2008)	1.108	1.201	1.628	3.76%	8.70	11.80
North Berwick	Great Works River	17.78	Estimated	0.139	0.143	0.149	23.63%	2.96	3.08
Total				17.74	19.14	23.16		481.20	570.25

1. For "NHEP (2008)", the concentration is the average of 10 grab samples collected during 2008. For "Municipality", the concentration is the average of samples collected by the municipality during 2008. For "Estimated", no data were available for this WWTF. The average TN concentration from NHEP (2008) was assumed.
2. The flows in this table are annual averages. The monthly average flows from NPDES discharge monitoring reports were averaged.
3. Attenuation loss estimated using the travel time for water between the WWTF outfall and the estuary and a first order loss coefficient of 0.343 $days^{-1}$. On this table, the delivered load for WWTFs discharging to the Lower Piscataqua River is shown to be equal to the discharged load since the discharge is directly to the estuary. However, for other calculations, it has been assumed that only 50% of the discharged load from these WWTFs is delivered to the Great Bay/Little Bay and Upper Piscataqua River estuaries.

WWTP estimated cost to reduce N

- Dover 2.8 mgd 96 tons N/yr

Limit mg/l	% red.	Tons red.	Cost	Cost/ton
8	64%	61	$10mil	$164K
3	86%	83	$30mil	
	22%	22	$20mil	$909K

WWTP estimated cost to reduce N

- Newmarket .7 mgd 31 tons N/yr

Limit mg/l	% red.	Tons red.	Cost	Cost/ton
8	73%	23	$13mil	$573K
3	90%	28	$18mil	
	17%	5	$5mil	$1mil

Nitrogen Sources

- Point Sources 20 – 30%
  - WWTP
- Non point Sources 65 – 75%
  - Septic systems
  - Run off (impervious surfaces)
  - Fertilizer application
  - Agriculture

Plan that makes sense

- Best use of scarce resources
- Addresses point and non point sources
- Monitor progress and adapt