EXHIBIT– 14

From:	John Hall
To:	"Perkins.Stephen@epamail.epa.gov"; "Dan Arsenault (Arsenault.Dan@epamail.epa.gov)"; Ellen Gilinsky <Gilinsky.Ellen@epamail.epa.gov> (Gilinsky.Ellen@epamail.epa.gov)
Cc:	"Ted.Diers@des.nh.gov"; "Peter H. Rice"; dean_peschel@yahoo.com; "Jennifer Perry"; Sean Greig (sgreig@newmarketnh.gov); Drew Serell; Dana Bisbee; jpeltonen@sheehan.com; Robert R. Lucic; E Tupper Kinder (ekinder@NKMLawyers.com); "David Green (david.green@rochesternh.net)"; "Gallagher, Thomas (Thomas.Gallagher@hdrinc.com)"; "Mancilla, Cristhian"
Subject:	RE: Supplemental Comments by the Great Bay Municipal Coalition re: Draft NPDES Permit No. NH0101311 for the City of Dover, NH; Town of Exeter, NH, NPDES Permit No. NH0100871; Town of Newmarket, NH, NPDES Permit No. NH0100196
Date:	Wednesday, August 15, 2012 6:16:59 PM
Attachments:	Exhibit 31.pdf Exhibit 32.pdf

Two additional PREP TAC studies confirming nitrogen changes did not cause system impairments as referenced in the correspondence below.

John

John C. Hall
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From: John Hall
Sent: Wednesday, August 15, 2012 6:13 PM
To: Perkins.Stephen@epamail.epa.gov; Dan Arsenault (Arsenault.Dan@epamail.epa.gov); Ellen Gilinsky <Gilinsky.Ellen@epamail.epa.gov> (Gilinsky.Ellen@epamail.epa.gov)
Cc: Ted.Diers@des.nh.gov; 'Peter H. Rice'; dean_peschel@yahoo.com; 'Jennifer Perry'; Sean Greig (sgreig@newmarketnh.gov); Drew Serell; Dana Bisbee; jpeltonen@sheehan.com; Robert R. Lucic; E Tupper Kinder (ekinder@NKMLawyers.com); 'David Green (david.green@rochesternh.net)'; 'Gallagher, Thomas (Thomas.Gallagher@hdrinc.com)'; 'Mancilla, Cristhian'
Subject: RE: Supplemental Comments by the Great Bay Municipal Coalition re: Draft NPDES Permit No. NH0101311 for the City of Dover, NH; Town of Exeter, NH, NPDES Permit No. NH0100871; Town of Newmarket, NH, NPDES Permit No. NH0100196

Dear Stephen:

These additional/supplemental comments regarding the above referenced permits are submitted on behalf of the Great Bay Municipal Coalition. These comments are based on information not available at the time the permit comment periods closed and therefore constitute timely comments pursuant to applicable NPDES rules and norms of administrative law.

Information Presented to EPA Headquarters Regarding the Proposed Permit Actions

As you are aware, since the publication of the draft NPDES permits for the above referenced facilities the affected communities requested intervention by EPA Headquarters regarding review of the scientific basis for the Region's proposed actions. The Region was copied on that correspondence and, to our knowledge, has received copies of all other information submitted in this context. If that has not occurred, please let us know and copies will be provided. Much of the information used to support that filing was based on documents released by NHDES pursuant to discovery requests which illuminated several documents previously released by EPA Region I under FOIA. These documents and the sworn testimony of several DES officials (Paul Currier and Philip Trowbridge) have further confirmed that there was not a defensible scientific basis for the Region's proposed permit actions. Information presented to the House Oversight Committee in June indicated that the Region's actions with respect to nutrient limitations and impairment designations were heavily influenced by threats of suit by CLF, rather than by a thorough assessment of the available scientific information. Under discovery, it was also revealed that numerous study results had been presented to both EPA and CLF showing (1) nutrient changes had not caused increased algal growth in the system, (2) system transparency was not significantly impacted by algal growth and (3) transparency had not apparently changed over the period of 1990 -2005 when concerns over eelgrass population changes were being raised by CLF and EPA. *These studies concluded that the typical paradigm: increasing nutrients result in increased algal growth causing reduced transparency and eelgrass loss* - was *not applicable to the Great Bay system*. This information and the supporting research (attached herein) were excluded from subsequent DES and EPA analyses and internal peer reviews that claimed "weight of evidence" supported the need to greatly reduce TN levels to protect eelgrass via improved transparency. The information derived under deposition also confirmed that the Region was not properly applying the state's existing narrative standard as the underlying information (e.g., 2009 Numeric Criteria) did not provide a cause and effect demonstration that nitrogen actually caused the decline in eelgrass or cultural eutrophication adversely impacting designated uses. Mr. Currier and Mr. Trowbridge both acknowledged that the existing state law required such a demonstration to find nutrients were causing narrative criteria violations and the 2009 document did not accomplish this requirement.

As noted above, this information was not readily available in the permit record or as part of EPA's earlier FOIA response. Moreover, the supplemental information is being actively considered by EPA Headquarters with regard to the proposed permit actions. Therefore, this correspondence, the referenced deposition testimony and all the supporting documentation should be considered as supplemental comments and supporting information with regard to the comments already provided to EPA Region I within the original comment period. The specific correspondence that we request to be incorporated as supplemental comments include:

1. May 4, 2012 letter to Administrator Jackson and Inspector General Arthur Elkins including all exhibits
2. Materials presented to EPA Headquarters as part of the June 28, 2012 meeting (which the Region attended by phone)
3. Follow up correspondence from the Mayors of Portsmouth and Dover to Ellen Gilinsky dated June 29, 2012

4. Follow up letter and emails (with exhibits) from John Hall to Ellen Gilinsky regarding the prior studies and current data showing nitrogen is not documented to be responsible for changes in eelgrass populations dated July 13, 2012 and August 2, 2012.
5. Testimony submitted by the Coalition representatives to the House Oversight Committee in advance of the June 4, 2012 hearing, supplemental comments (with attachments) submitted to the Committee on June 8, 2012 and the Committee Report issued in advance of the hearing.

As noted in our correspondence to Ms. Gilinsky, we are currently in the process of gathering all of the final deposition excerpts that are applicable to the recent correspondence sent to EPA (including documents provided on the day of the depositions). Those deposition excerpts will be provided to the Region by the end of next week with a specific explanation as to their applicability to the permit decisions that extensively relied on the prior DES studies and documents.

Other Deposition Highlights Applicable to EPA Decision Making

In addition to this information, as you are aware, EPA Region I was relying on Dr. Short to conclude that TN was the cause of eelgrass declines. The Region was copied on all of the correspondence between the Coalition and Dr. Short which confirmed that he had no objective scientific basis for his various claims that TN caused the decline of eelgrass in the Great Bay estuary, he conducted no specific studies on the causes of changing eelgrass populations in the Great Bay estuary to support such claims and under deposition he admitted these positions were based on his personal opinion. <u>This compilation of correspondence, in EPA's possession, is also to be included as part of the permit comment record for these facilities given the Region's acknowledged reliance on Dr. Short's representations in developing the NPDES permits.</u> These correspondence indicate that the Region's reliance on Dr. Short is not well founded.

Perhaps of greater significance, Dr. Short also acknowledged under oath that 1) Great Bay itself is not a transparency limited system, 2) the Squamscott/Lamprey Rivers are not suitable for eelgrass restoration, 3) he never advised on the ability to achieve better water clarity in these rivers and 4) he never recommended applying a 0.3 mg/l TN standard in these rivers to ensure eelgrass restoration. There had been considerable correspondence between EPA and DES on these topics, given EPA's primary role in providing technical assistance on nutrient criteria development which was excluded from both the permit record and the 2009 Criteria document. Nonetheless, Mr. Trowbridge confirmed that application of the 2009 draft criteria in the tidal rivers would not likely restore eelgrass due to other natural factors currently limiting transparency (CDOM and turbidity) and TN reduction would not materially improve those transparency levels. Therefore, the Region's application of the 0.3 mg/l TN criterion as required to attain the existing state narrative standard for nutrients and to allow eelgrass restoration in the tidal rivers and Great Bay not only lacks a credible scientific basis, its ecological need is actually refuted by the very "experts" who worked to derive those draft criteria. This information also confirms that there is no "eelgrass impairment" in the upper tidal rivers even though current eelgrass levels are below historical levels. The existing natural condition prevents eelgrass restoration and, as acknowledged by Mr. Trowbridge, natural conditions do not constitute impairment or a violation of narrative standards. Thus, EPA has no basis to claim any type of TN induced narrative criteria violation with respect to eelgrass in the upper tidal rivers where these facilities discharge. Please note that the depositions also discussed that macroalgae growth is not apparently impairing eelgrass resources/recovery in Great Bay or Little Bay proper and there is no documented macroalgae concern in the tidal rivers.   Therefore, the mere presence of macroalgae growth in the intertidal zone of Great Bay is not documented to be causing narrative criteria violations either. EPA's regulatory assumptions to the contrary are, therefore, not legally or technically defensible.

New Information from PREP

New information released by PREP, discussed in the August 2, 2012 email to Ms. Gilinsky, confirms that TN and, more importantly TIN levels have dropped dramatically in the estuary since 2008, and are now equivalent to 1980's levels. The current TIN levels are now well below those that existed in the estuary when eelgrass populations thrived throughout 1990-2005. Given this information, all of the load reduction analyses relied upon by the Region to assert that major point source TN decreases were needed to attain a protective level of water quality are misplaced. This change in TIN levels appears to be a function of more moderate rainfall conditions that occurred over the past three years (2005-2008 being the wettest four years in the past 100 years) and rebounding eelgrass populations. Please note that the 2009-2011 period was NOT a very low flow period – it simply returned to the range of more typical rainfall and tributary flows.   Our analysis of eelgrass response in Great Bay to increased freshwater flow (*which would be expected to have a cause and effect relationship since salinity is altered)* indicates that eelgrass populations in Great Bay are directly impacted by the level of freshwater entering the system, but not transparency. (See attachments – eelgrass versus 3 year moving average spring flows; transparency changes buoy data 2004-2008). Mr. Trowbridge acknowledged that the major flooding and rainfall events occurring in 2006 could have been the cause of the rapid eelgrass decline at that time. Moreover, the extreme flow conditions occurring in 2006 did have a dramatic effect on estuary wide water quality – as evidenced by the attached analysis of CDOM influencing system transparency levels. Nonetheless, in 2007-2008 when transparency rebounded to pre-2006 conditions (and better) eelgrass acreage did not change materially (as reported by Dr. Short). Please also note that May-July (and long term average) transparency levels in Great Bay (2004 to 2005) were well below the 22% incident light target used to derive the 2009 Numeric Criteria used by EPA in calculating the draft permit effluent limits, though eelgrass acreage was considered acceptable and the estuary was not considered impaired for eelgrass at that time. Thus, this multi-year data set, which is among the most detailed for the estuary, also does not appear to support a transparency theory for Great Bay, consistent with state expert testimony discussed earlier. This is the same conclusion was also reached by Dr. Morrison in his detailed 2008 report on factors influencing transparency in the Great Bay system.

Finally, it is noteworthy that eelgrass populations are continuing to rebound in both Great Bay and Little Bay since 2008. We have just received additional verbal reports from oyster farmers that eelgrass are growing throughout Little Bay (previously reported by Dr. Short to contain no eelgrass in 2010). Based on the 2011 survey, Little Bay now has more eelgrass growing than existed in 1996 when Great Bay reached a maximum of 2495 acres. Thus, it is inconceivable that such a recovery would be occurring if existing TN levels, transparency or macroalgae were preventing eelgrass growth as claimed by the draft permits. We also understand that eelgrass acreage in Great Bay continues to increase and may now be back to levels that are considered unimpaired. These conditions should be confirmed by the most recent eelgrass survey recently conducted by Dr. Short.

Based on this supplemental information, imposition of stringent TN reduction requirements under the theory that it is necessary to allow eelgrass restoration in the tidal rivers or Great Bay is not supportable, nor is any claim that nitrogen levels are somehow precluding eelgrass growth in either the tidal rivers or Great Bay/Little Bay. Since the permits are premised on these mistaken theories, they need to be withdrawn. In closing, the Coalition continues to be interested in a dialogue that is based on a review of the relevant site-specific information regarding the actual factors influencing system water quality dynamics, eelgrass populations and nutrient effects.

We look forward to the Region's consideration of this information.

John

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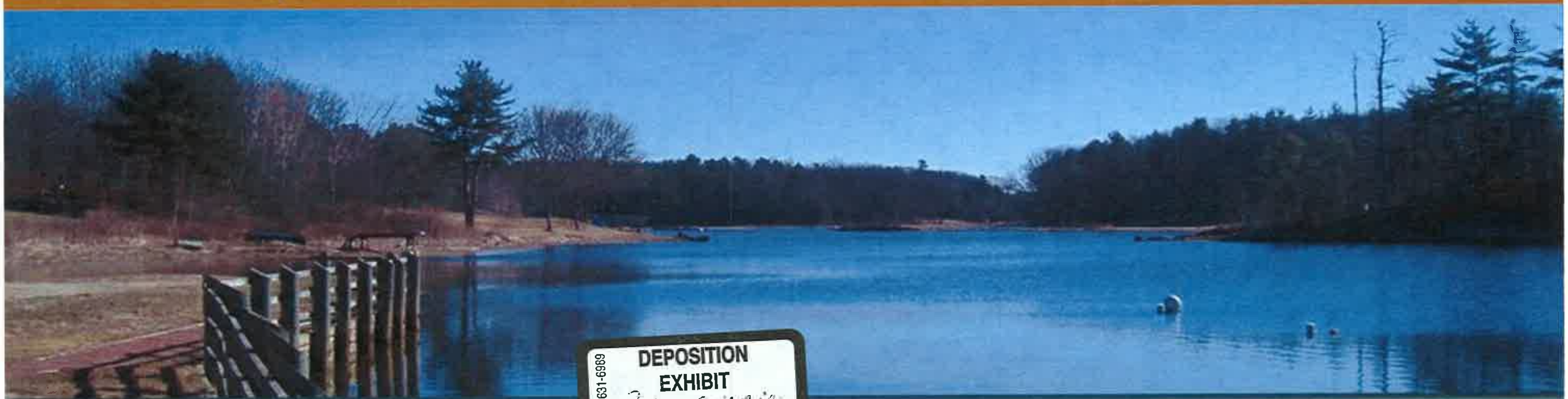
NewHampshire EstuariesProject



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6/12/17 MH
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NH Estuaries Project Environmental Indicators

Phil Trowbridge, P.E.
NHEP/DES Coastal Scientist

June 15, 2006

NewHampshire EstuariesProject

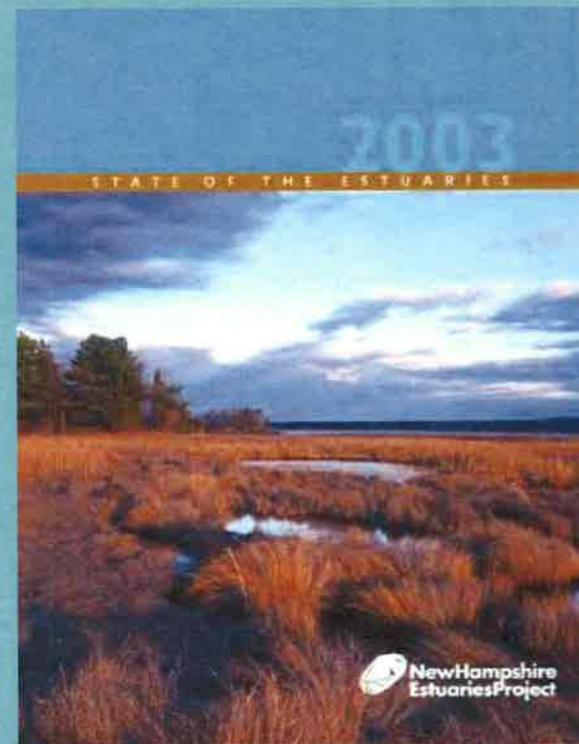
Environmental Indicator Reports

- **Reviewed by NHEP staff and Technical Advisory Committee**
- **Represents current scientific consensus**

NewHampshire EstuariesProject

State of the Estuaries Report

- Summary of 12 key indicators
- Additional indicators included as "side bars"
- Latest report in 2003
- Next version will be released in October 2006
- October 27, 2006 Conference

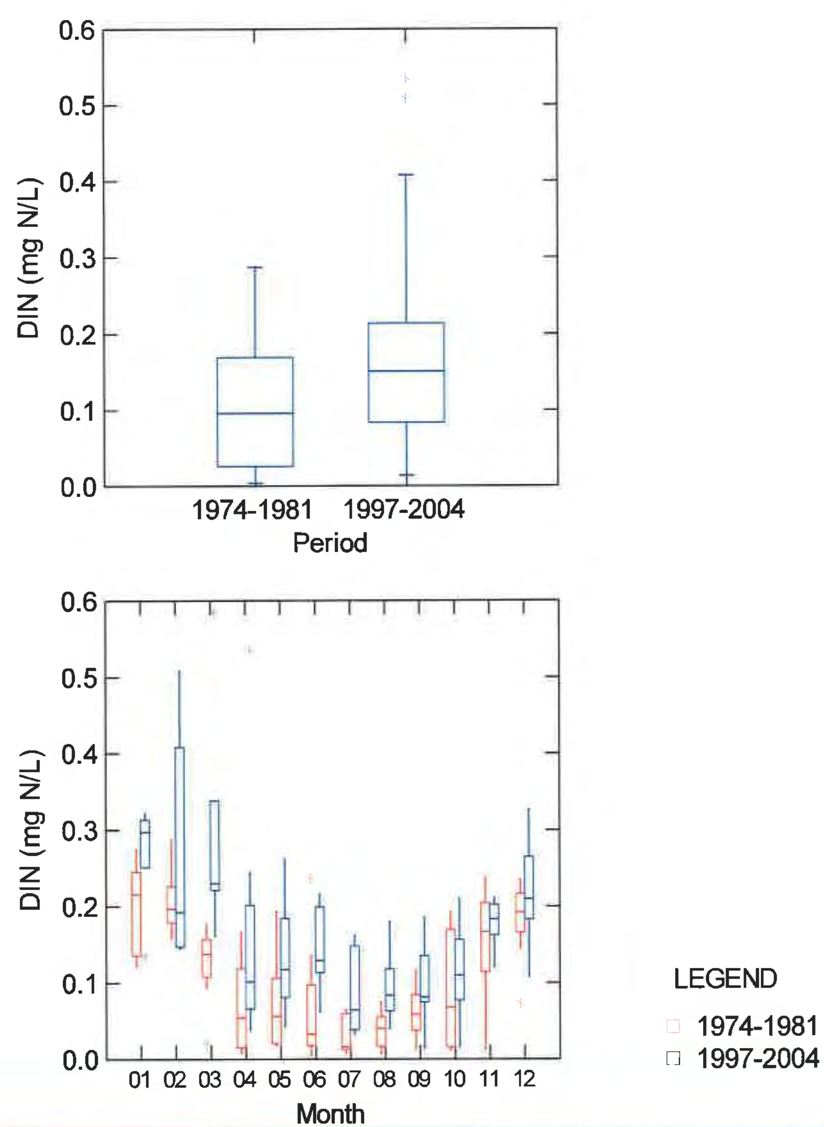


Nitrogen Trends

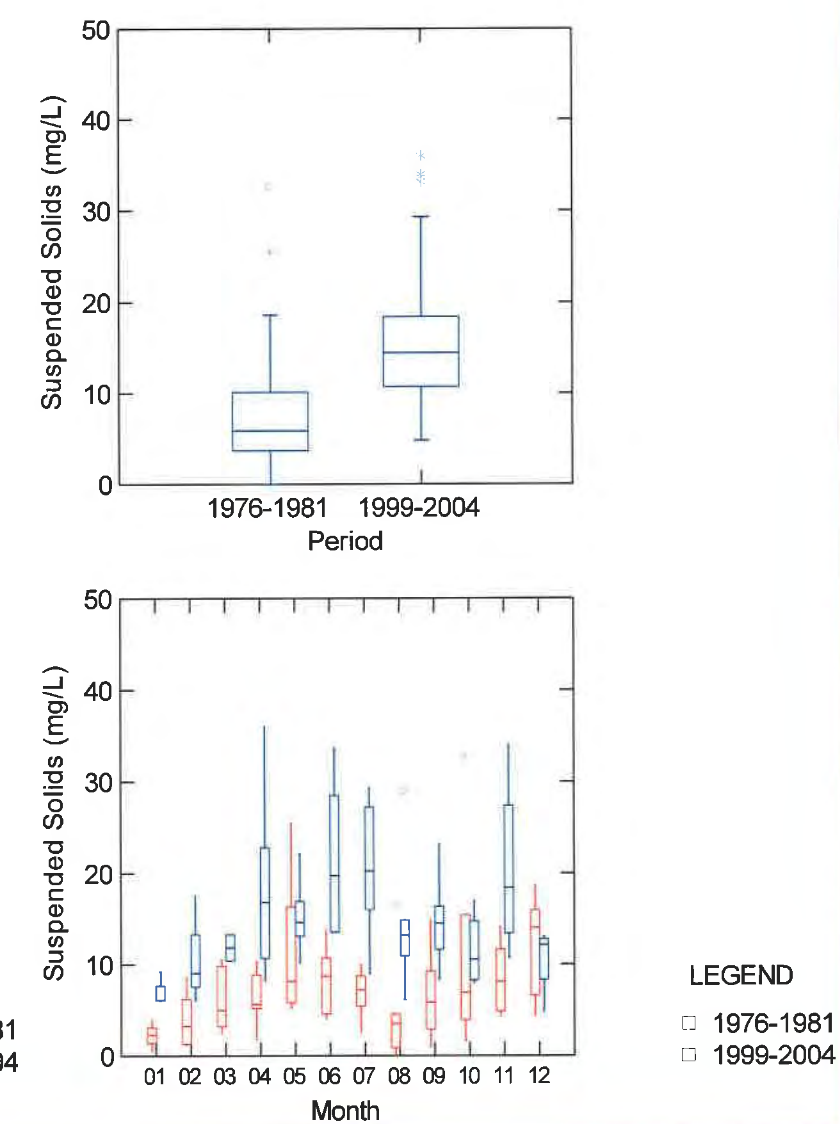
- Q: Have nitrogen concentrations in Great Bay changed significantly over time?

- A: Yes. Comparisons to historical data show that dissolved inorganic nitrogen concentrations have increased in Great Bay by 59% in the past 25 years. During the same period, suspended solids concentrations increased by 81%, although there are some questions about the appropriateness of the comparison. Trends over the past 15 years since the current monitoring program began are equivocal, with increasing trends evident at only a few stations for a few parameters.

Dissolved Inorganic Nitrogen at Adams Point at Low Tide



Suspended Solids at Adams Point at Low Tide



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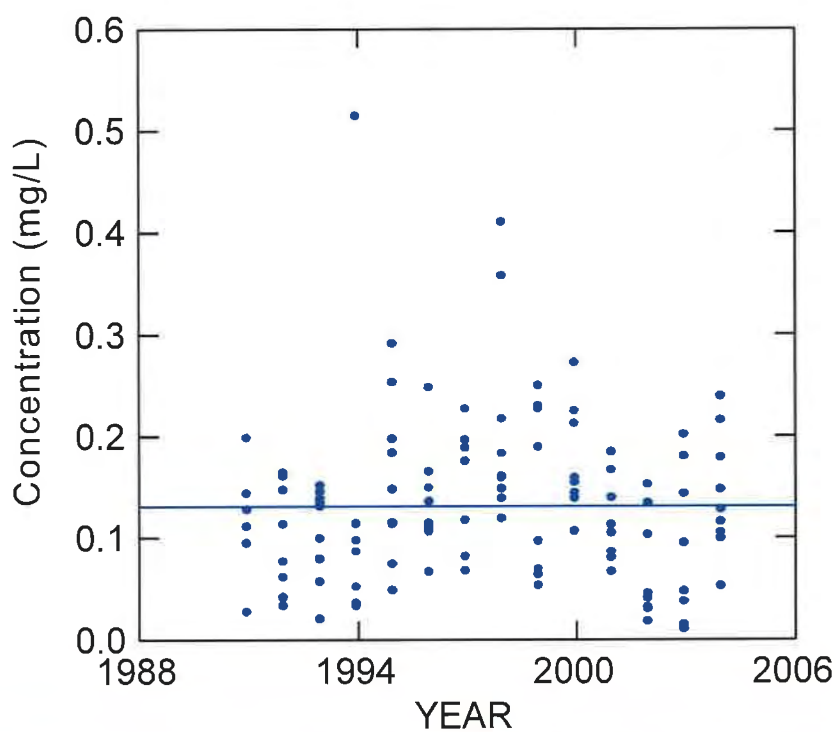
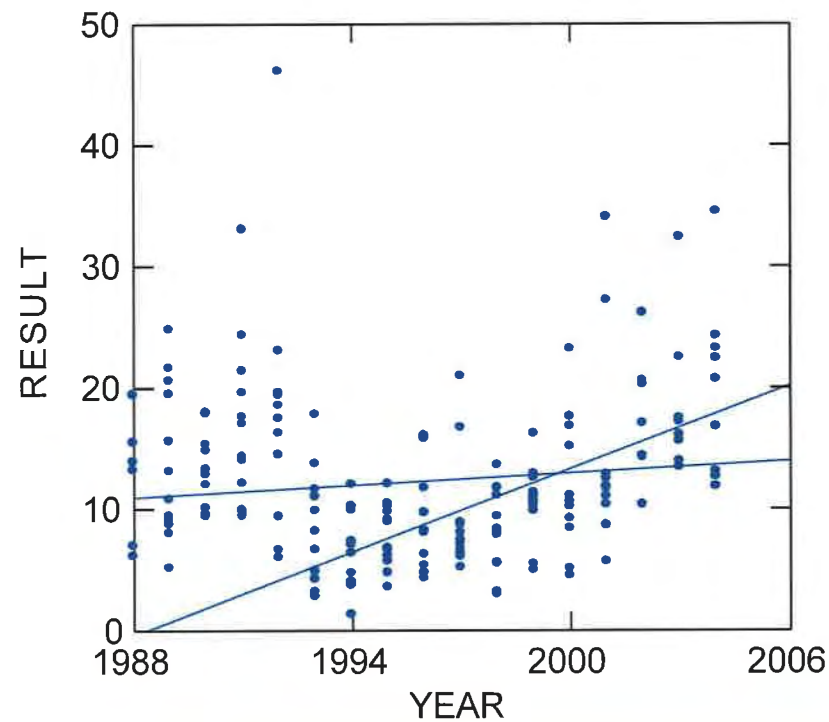
Nitrogen, Dissolved Inorganic

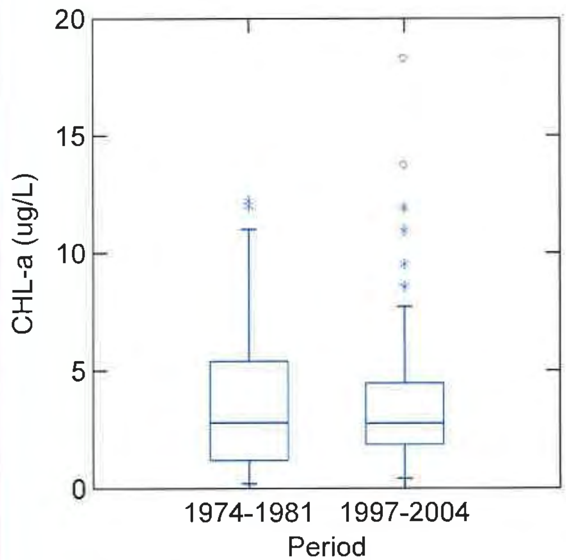


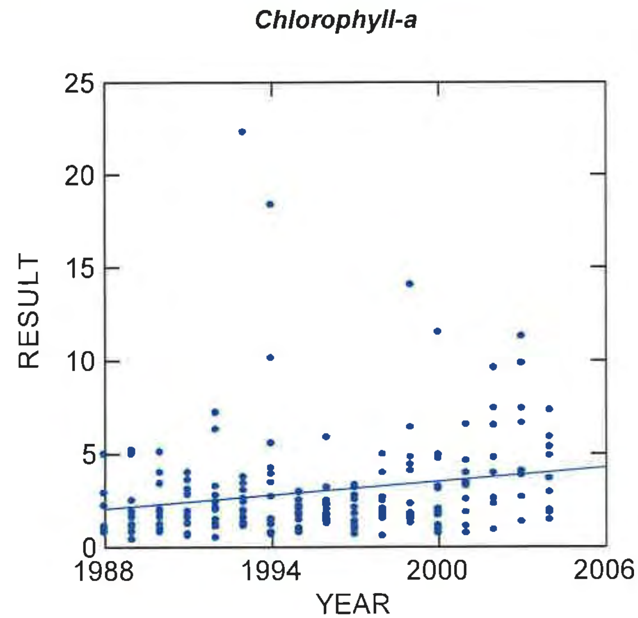
Total Suspended Solids

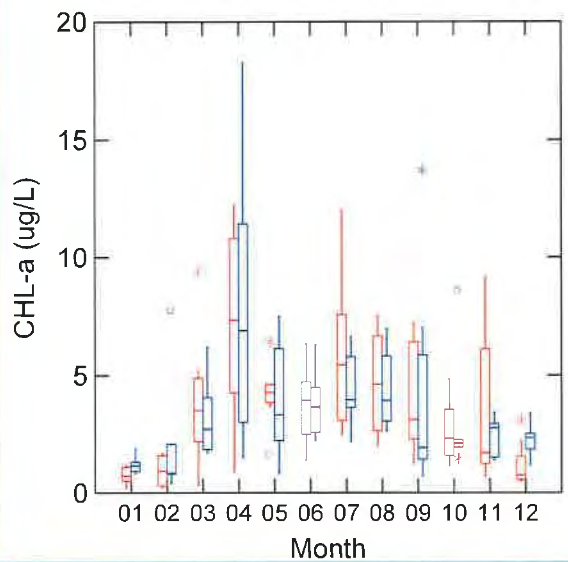


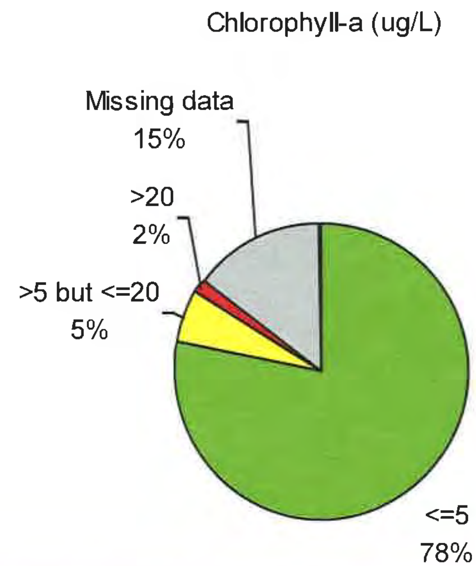
- Any increase in nitrogen concentrations has apparently not resulted in increased phytoplankton blooms. The only increasing trend for chlorophyll-a was observed at a station with very low concentrations already. Moreover, a probabilistic survey of the estuary in 2002-2003 found only 1.6% of the estuary to have chlorophyll-a concentrations greater than 20 ug/L.

Chlorophyll-a at Adams Point at Low Tide









- The total nitrogen load to the estuary in 2002-2004 was determined to be between 1,005 and 1,097 tons/year. This estimate is 30% lower than modeled values from the USGS SPARROW model.

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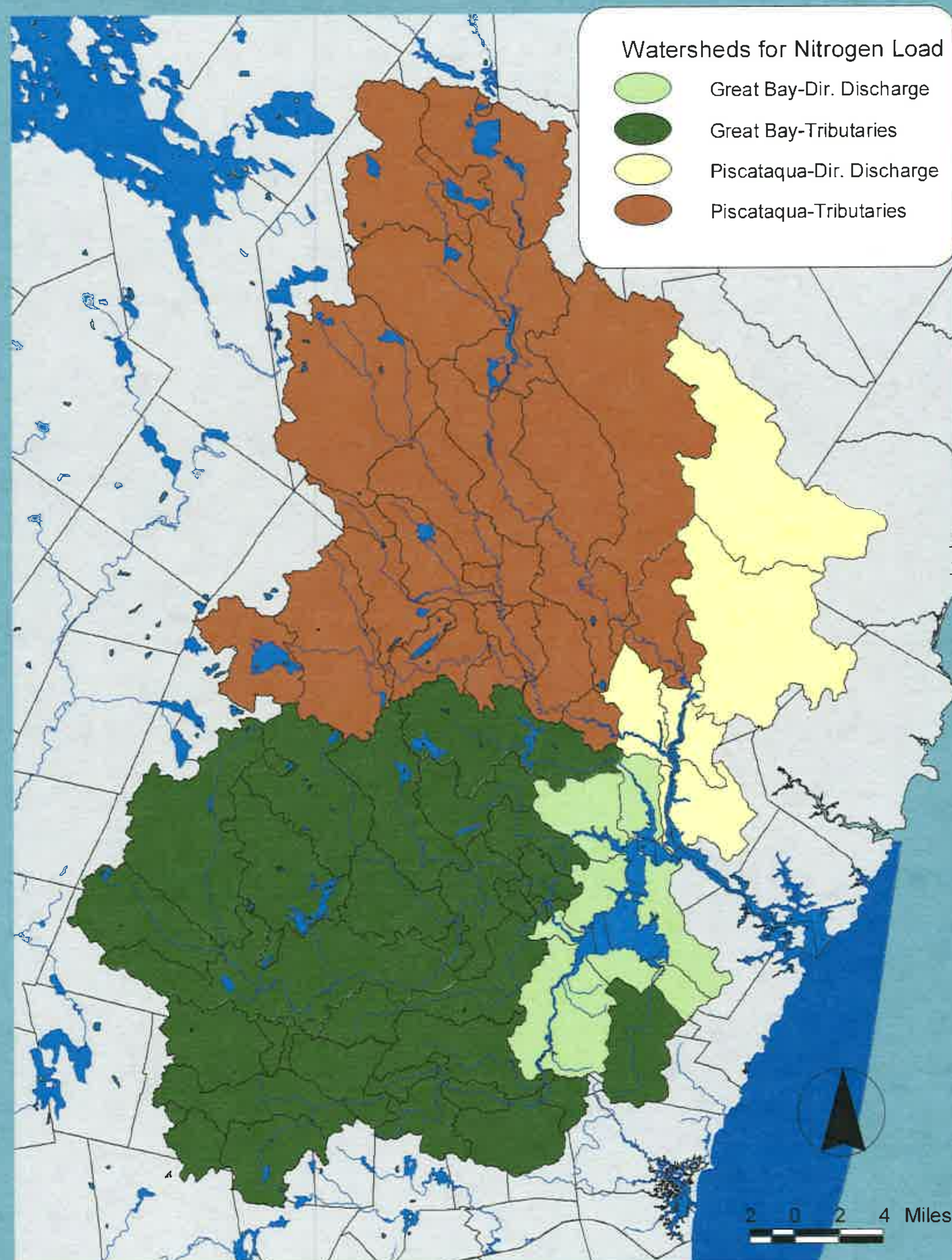
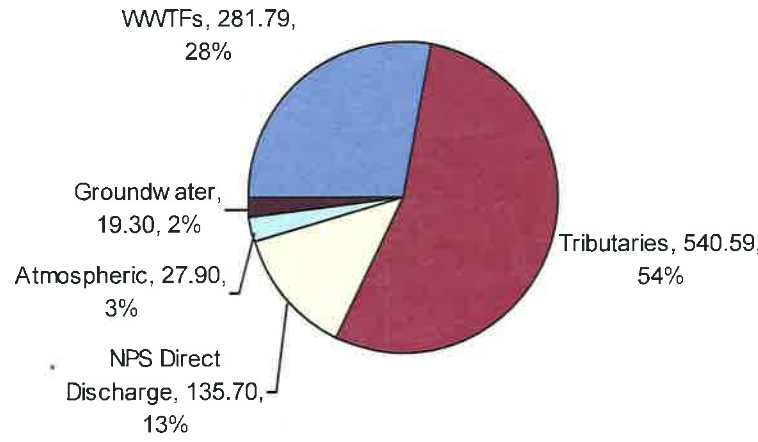


Without WWTFs in Piscataqua River

1,005 tons/yr

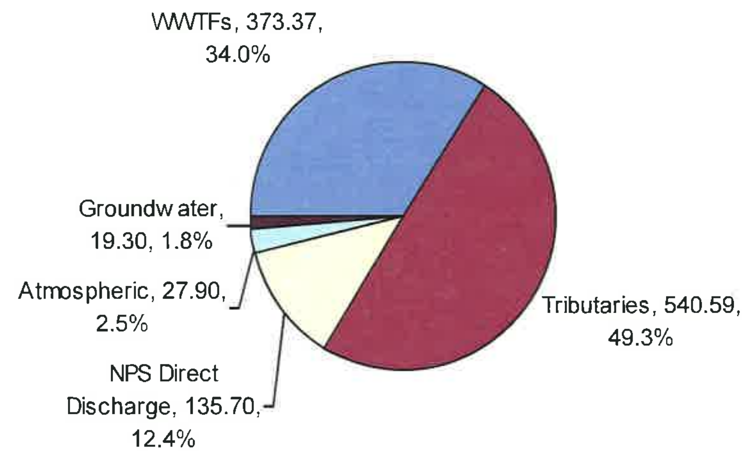
Great Bay and Upper Piscataqua River Estuary Total Nitrogen Loads in tons N per year



With 50% of WWTFs in Piscataqua River

1,097 tons/yr

Great Bay and Upper Piscataqua River Estuary Total Nitrogen Loads in tons N per year



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Correlations between N Load and Land Use in Watersheds

	Total N Load	NPS N Load
Population	0.943	0.922
Watershed Area	0.947	1.000
Developed	0.951	0.975
Agriculture	0.854	0.922
Forest	0.941	0.998
Wetlands	0.897	0.954
Open Water	0.934	0.987

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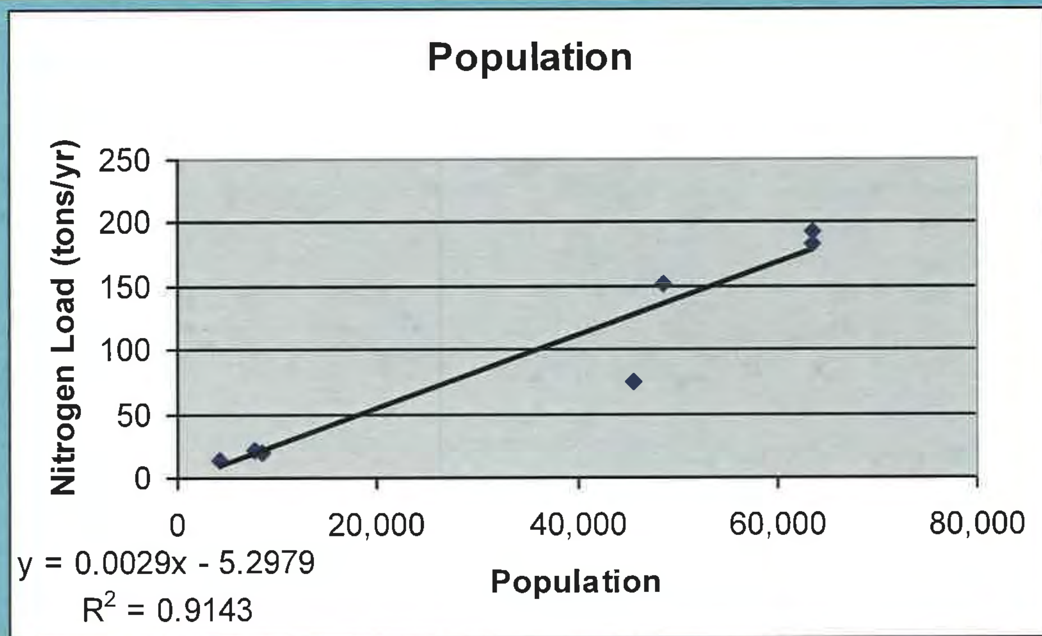
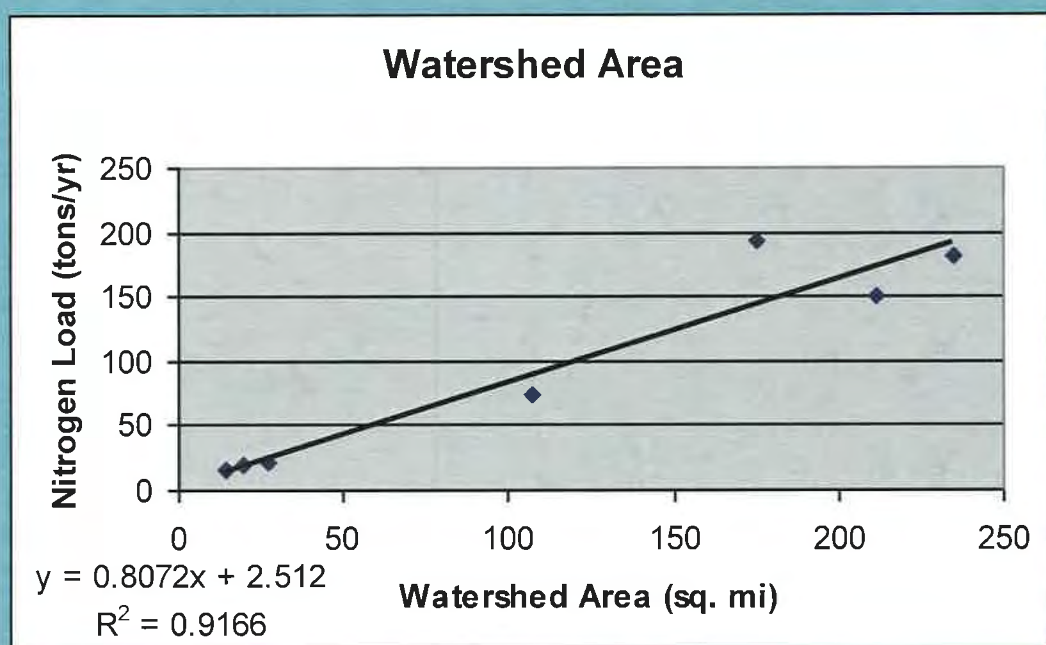




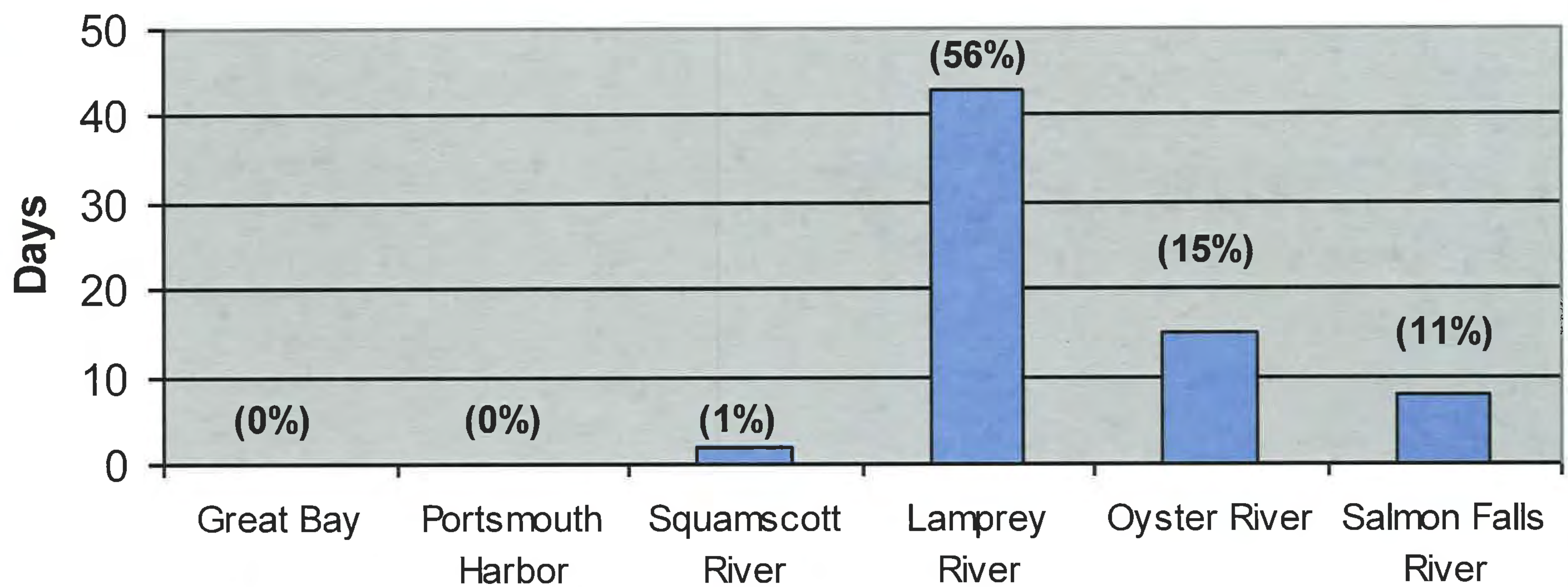
Dissolved Oxygen

- Q: How often do dissolved oxygen levels in the estuary fall below State standards?
- A: Dissolved oxygen in the tidal tributaries often falls below 75%. This occurs most often in the Lamprey River. Dissolved oxygen in Great Bay and Portsmouth Harbor always meets standards.

New Hampshire Estuaries Project

NewHampshire EstuariesProject

Number of Summer Season Days in 2002-2004 with Daily Average Dissolved Oxygen <75%



Numbers in parentheses are the percent of daily average DO measurements <75%

Eelgrass Distribution

- Q. Has eelgrass habitat in Great Bay changed over time?

- A. Yes. Eelgrass coverage in the Great Bay has been declining since 1996 except for one good year in 2001. Between 1992 and 2003, the eelgrass biomass in Great Bay declined by 71%.

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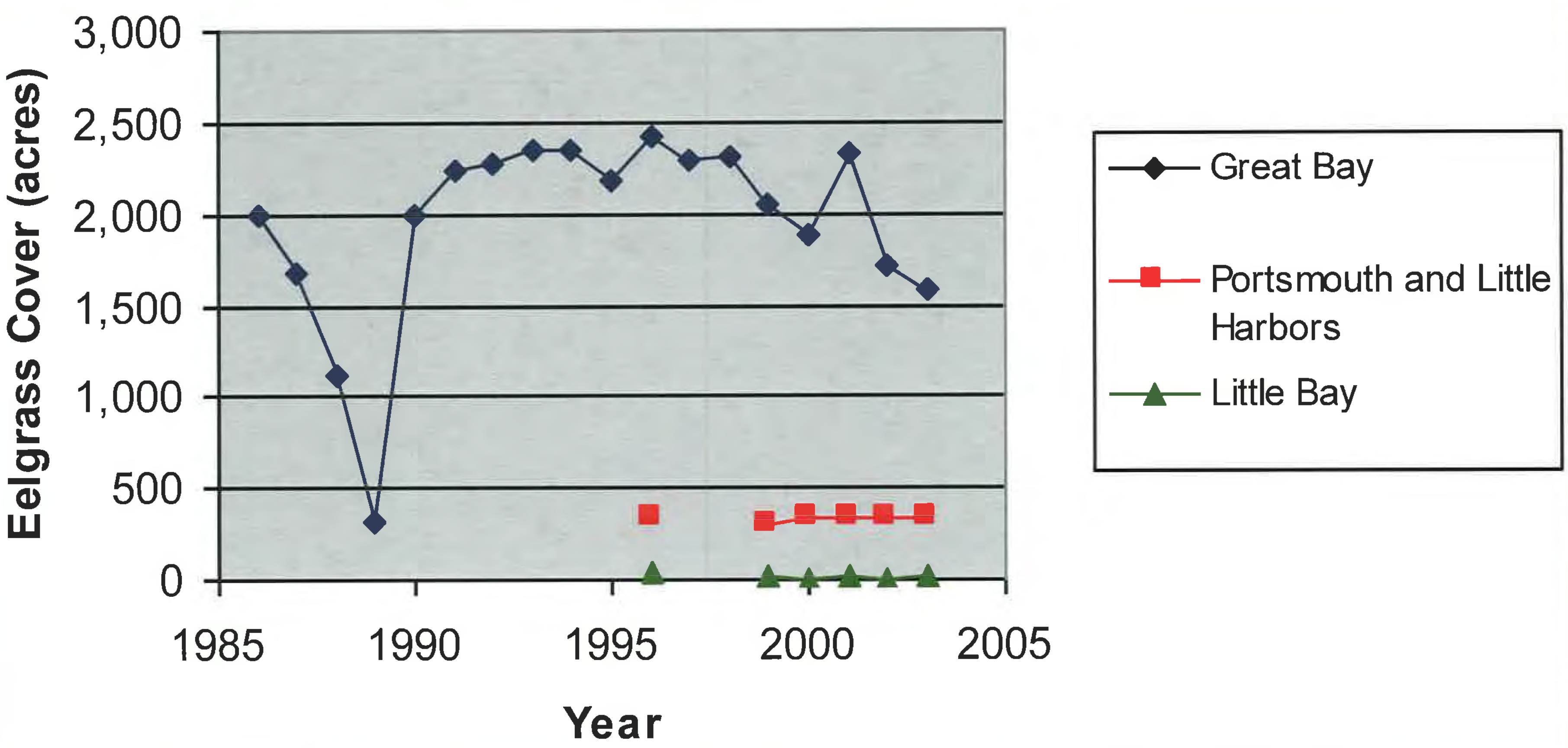
Eelgrass Coverage (1986-2003)



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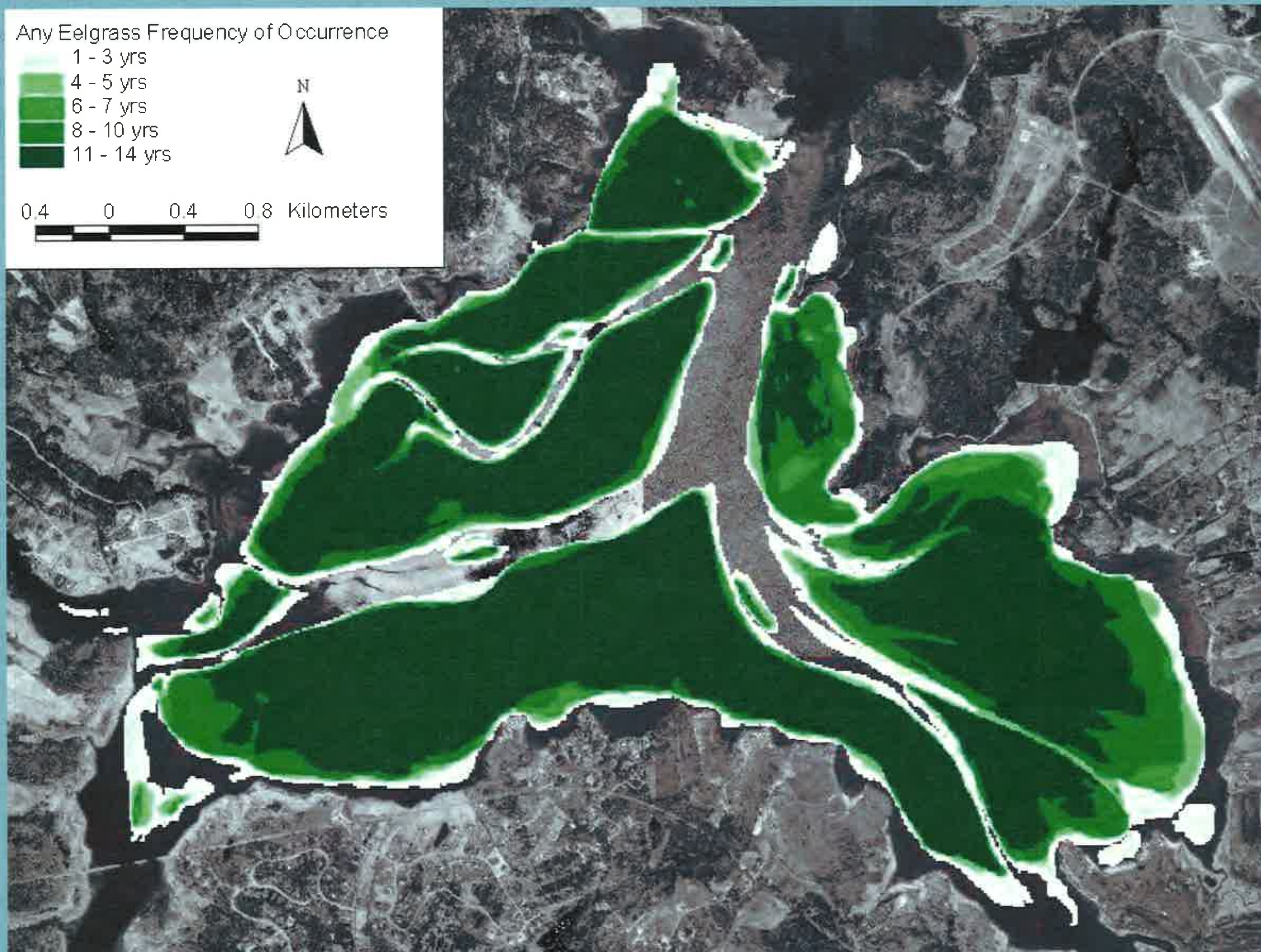
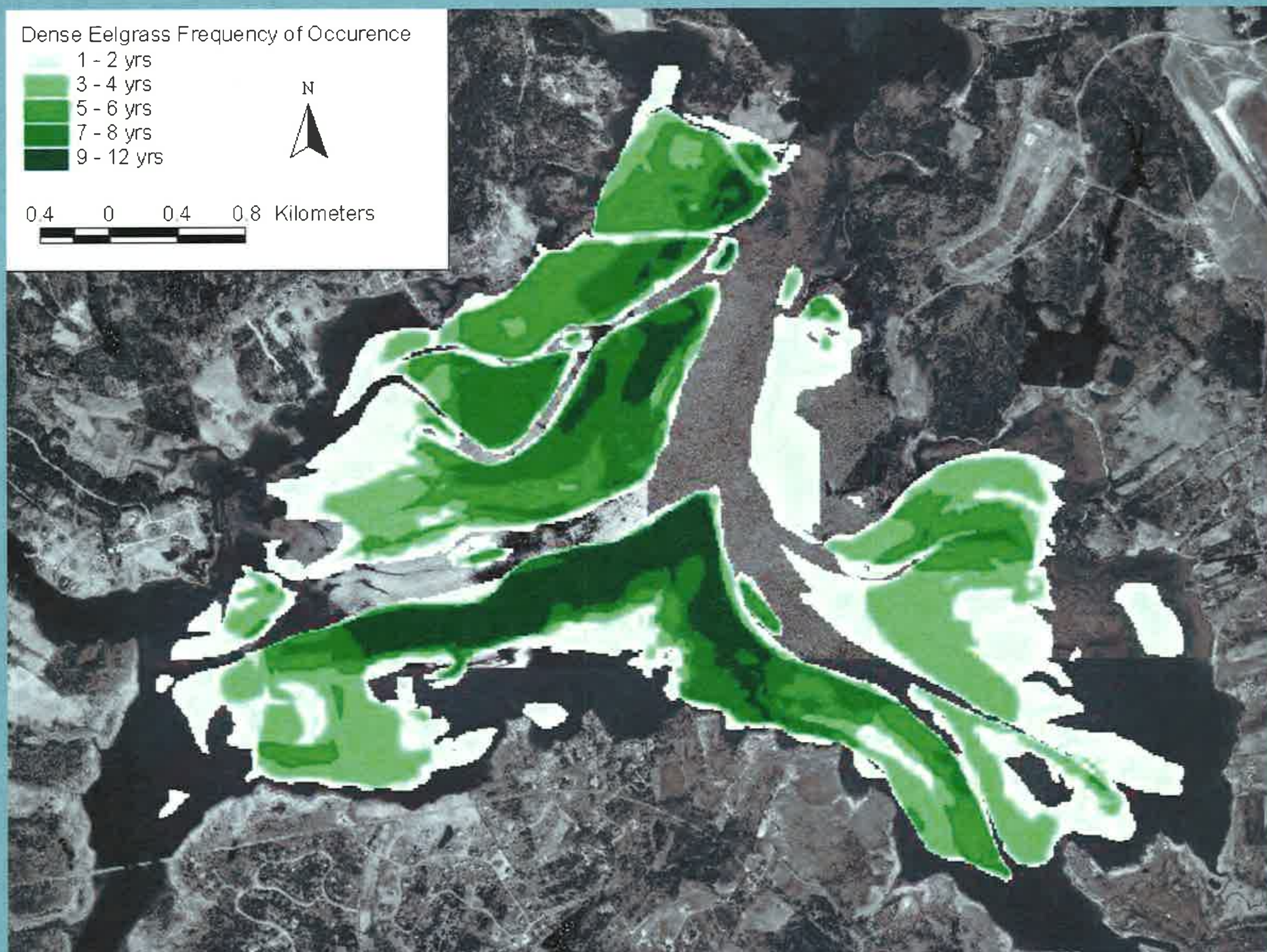
Eelgrass in Great Bay 1990-2003



New Hampshire Estuaries Project

Dense eelgrass in GB 1990-2003



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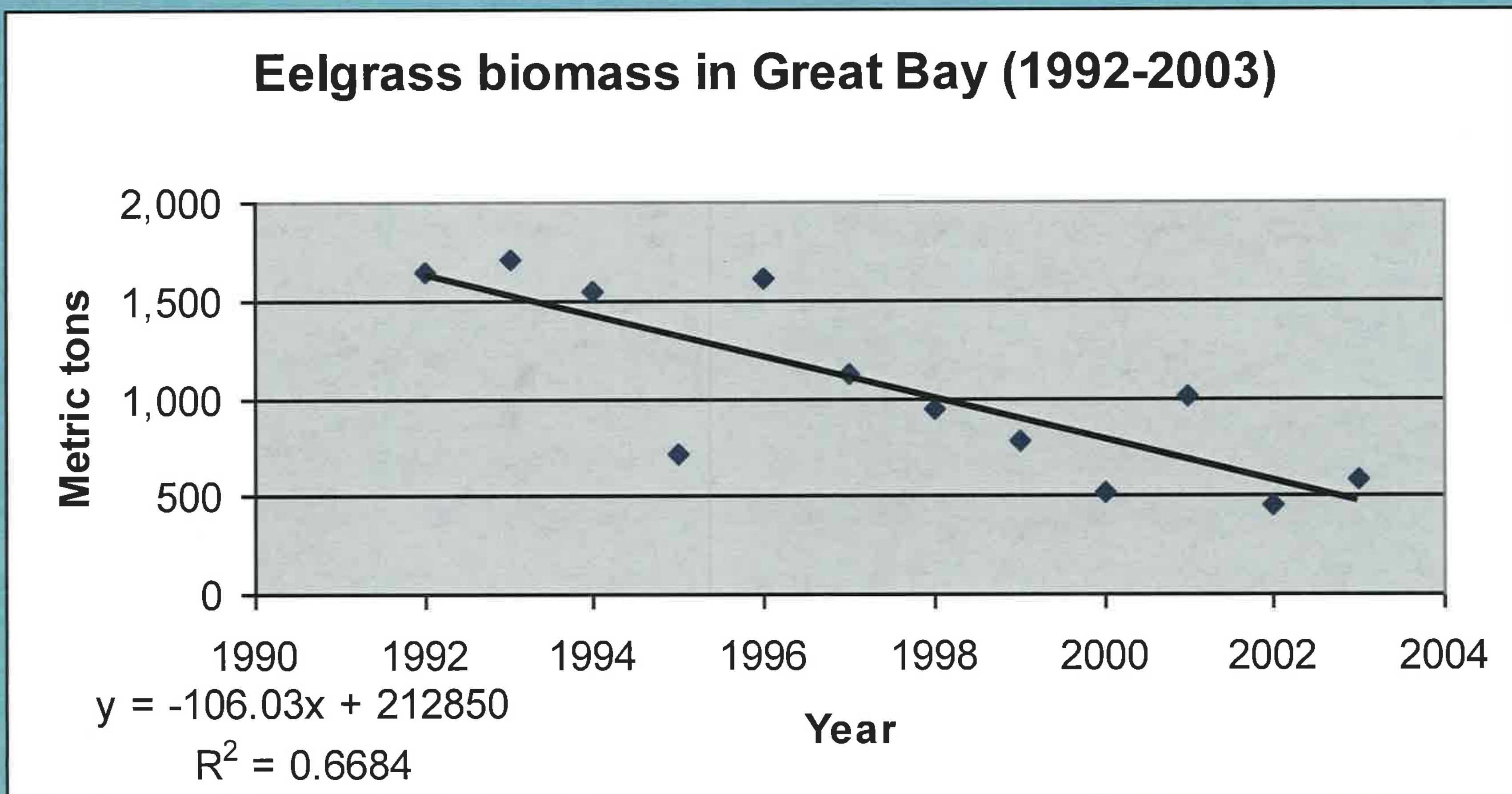
Trends in Eelgrass Biomass



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Summary

- Dissolved inorganic nitrogen has increased by 59% over the past 25 years.
- More recent trends in DIN are equivocal.
- No evidence for elevated chlorophyll-a.
- Low dissolved oxygen limited to tributaries
- Eelgrass has been declining for 10 years. Nitrogen load estimates are 30% lower than SPARROW, and are correlated with population and land area. WWTFs account for 28-34% of the load.

New Hampshire Estuaries Project

Summary of Light Availability and Light Attenuation Factors for the Great Bay Estuary

Phil Trowbridge, P.E.
NHEP Coastal Scientist
February 14, 2007

New Hampshire Estuaries Project

Water Quality Target

- Eelgrass viability is the target for numeric nutrient criteria development
- Factors affecting eelgrass
  - Light through water (water quality)
  - Light to leaf (epiphytes, macroalgae)
  - Disease

Focus on light through water as a first step

PENGAD 800-631-6989
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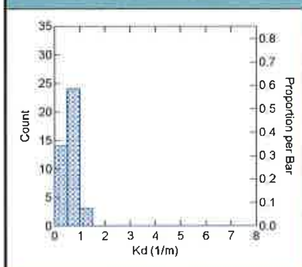
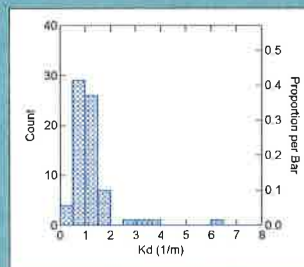
32 Currier
6/12/12 MH

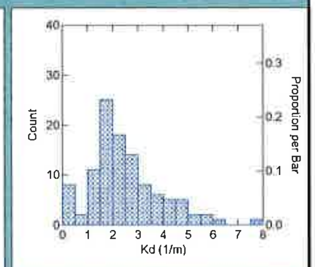
New Hampshire Estuaries Project

Measured Bulk Light Attenuation Through Water in Great Bay

Piscataqua River/ Portsmouth Harbor	Great Bay/ Adams Point	Tidal Tributaries







Piscataqua River/ Portsmouth Harbor	Great Bay/ Adams Point	Tidal Tributaries
n = 41	n = 70	n = 108
Median Kd = 0.58 m^{-1}	Median Kd = 1.01 m^{-1}	Median Kd = 2.17 m^{-1}
Mean Kd = 0.56 m^{-1}	Mean Kd = 1.19 m^{-1}	Mean Kd = 2.45 m^{-1}

New Hampshire Estuaries Project

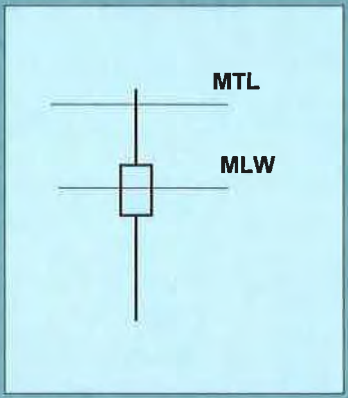
Predicted Depth Range for Eelgrass based on Measured Kd

- Piscataqua River/Portsmouth Harbor
  - Z= -1.2 to -2.6 m, Delta = 1.4 m
- Great Bay/Adams Point
  - Z= -0.9 to -1.5 m, Delta = 0.6 m
- Tributaries
  - None (Zmin>Zmax)

Assumes light requirement of 22% of surface light field for eelgrass survival and no effect of leaf epiphytes. Depth datum is MTL.

Measured Depth Range for Eelgrass in Great Bay

- Merged 2004 eelgrass coverage with bathymetry
- Percentiles of eelgrass depth (MTL)
  - 95th: 0.21 m
  - 75th: -0.64 m
  - 50th: -0.90 m
  - 25th: -1.19 m
  - 5th: -2.33 m

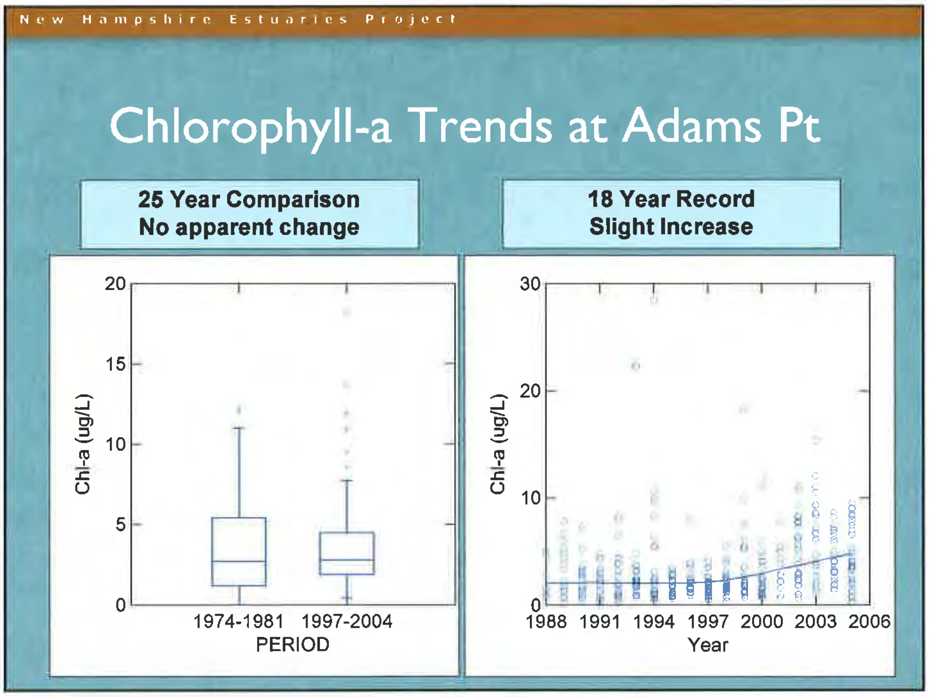


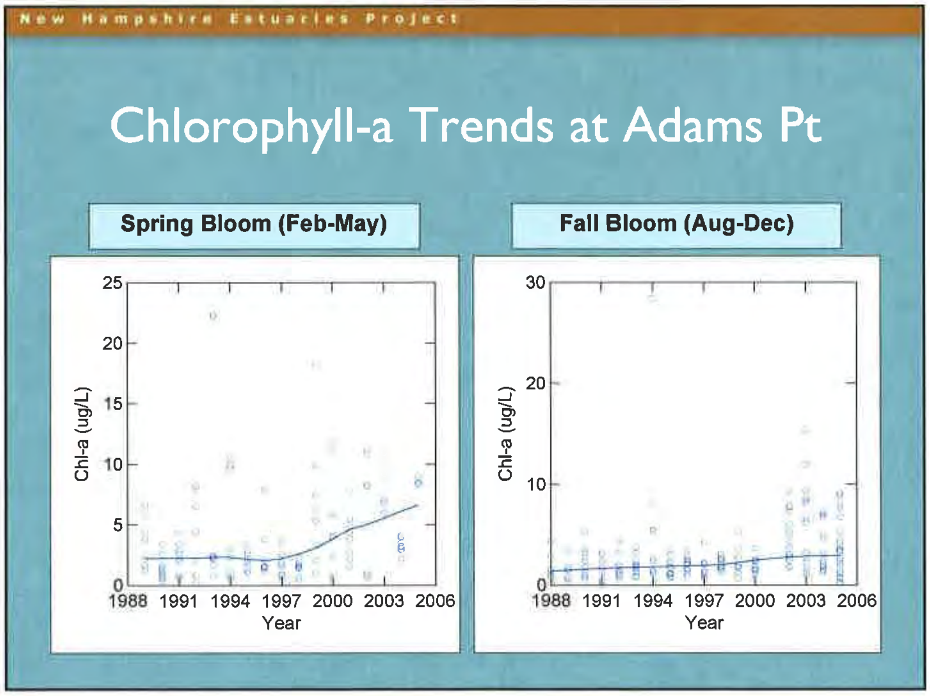
New Hampshire Estuaries Project

Factors Influencing Light Attenuation

- Phytoplankton (chlorophyll-a)
- Suspended sediments/turbidity
- Colored dissolved organic matter (CDOM)
- Water itself (assumed to be constant)

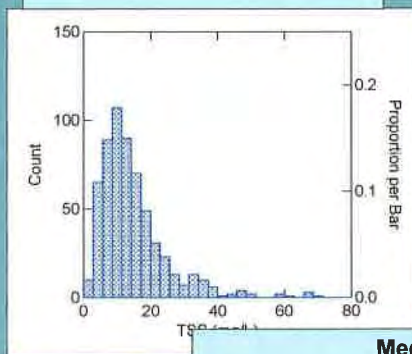
Assumption: If eelgrass viability is changing, one of these factors must also be changing.


New Hampshire Estuaries Project
Chlorophyll-a Trends at Adams Pt
25 Year Comparison
No apparent change
18 Year Record
Slight Increase
Chl-a (ug/L)
1974-1981
1997-2004
PERIOD
Year
1988 1991 1994 1997 2000 2003 2006

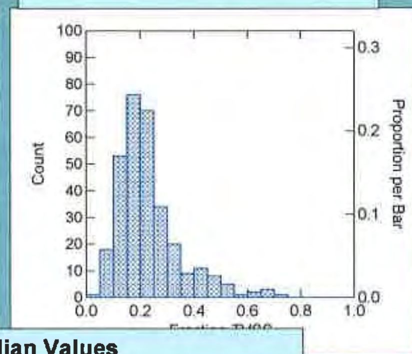

New Hampshire Estuaries Project
Chlorophyll-a Trends at Adams Pt
Spring Bloom (Feb-May)
Fall Bloom (Aug-Dec)
Chl-a (ug/L)
1988 1991 1994 1997 2000 2003 2006
Year

Composition of Suspended Solids

Total Suspended Solids (mg/L)



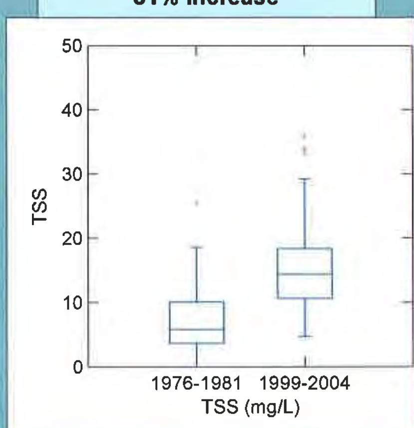
Fraction of solids that is organic matter



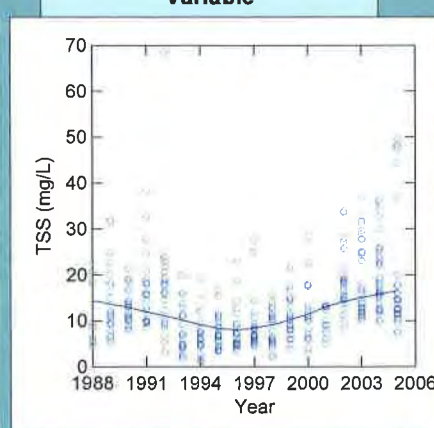
Median Values	
TSS (mg/L)	12.3 mg/L
Part. Organic Matter (mg/L)	1.9 mg/L
Part. Organic Carbon (mg/L)	0.8 mg/L

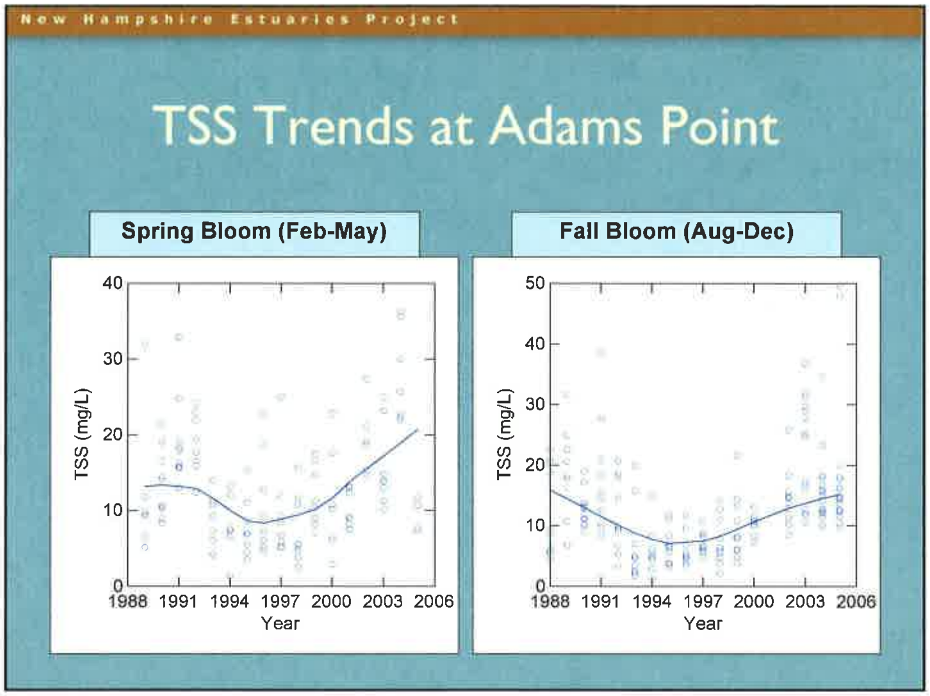
TSS Trends at Adams Point

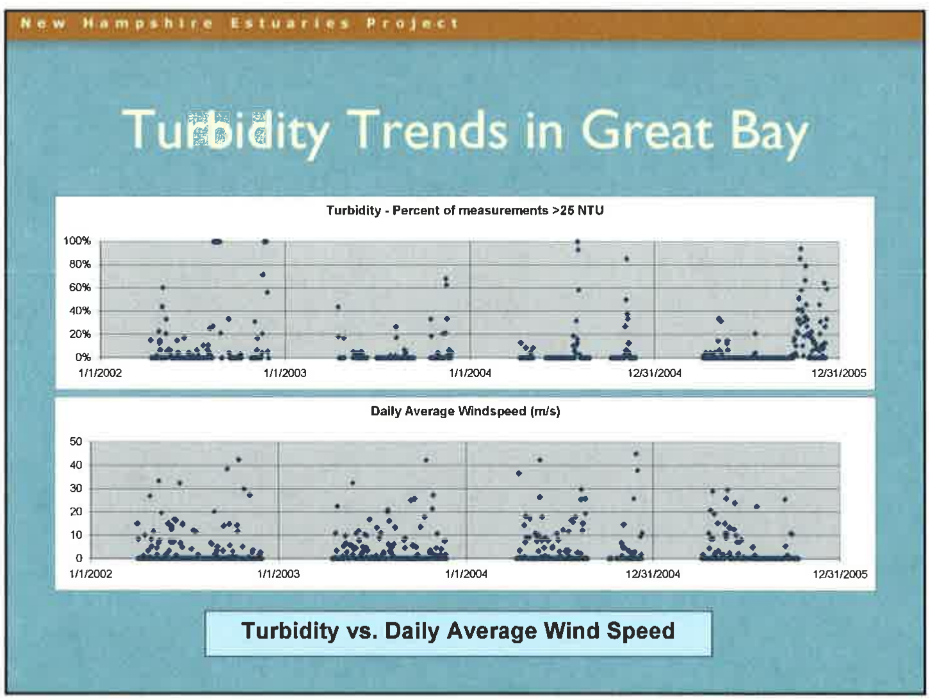
25 Year Comparison
81% increase



18 Year Record
Variable

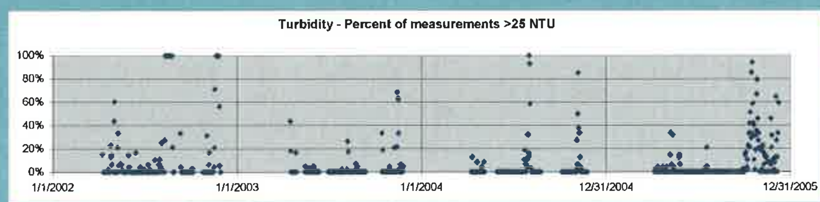


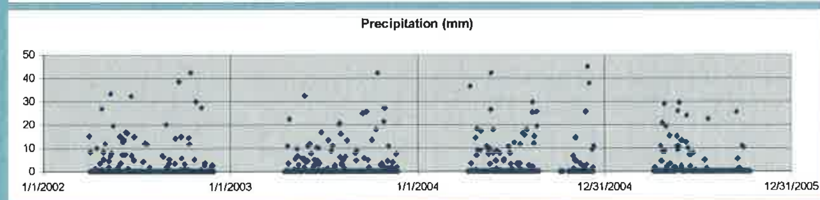

New Hampshire Estuaries Project
TSS Trends at Adams Point
Spring Bloom (Feb-May)
Fall Bloom (Aug-Dec)
TSS (mg/L)
Year
1988 1991 1994 1997 2000 2003 2006


New Hampshire Estuaries Project
Turbidity Trends in Great Bay
Turbidity - Percent of measurements >25 NTU
Daily Average Windspeed (m/s)
1/1/2002 1/1/2003 1/1/2004 12/31/2004 12/31/2005
Turbidity vs. Daily Average Wind Speed

New Hampshire Estuaries Project

Turbidity Trends

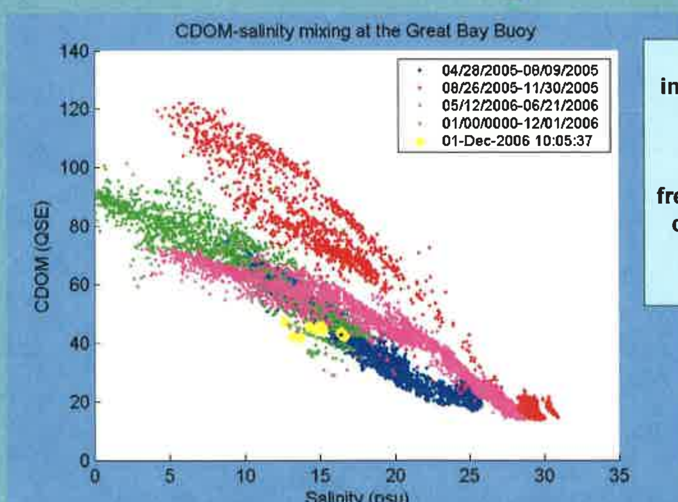




Turbidity vs. Daily Precipitation

New Hampshire Estuaries Project

Colored Dissolved Organic Matter



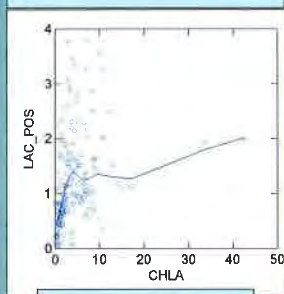
CDOM is inversely related to salinity because it is loaded with freshwater and is conservatively diluted by seawater.

Data from UNH Coastal Ocean Observing Center

New Hampshire Estuaries Project

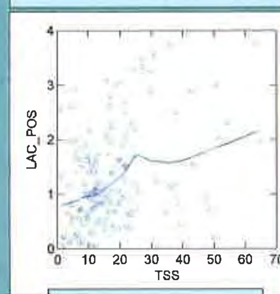
Univariate Regression of Kd vs. Water Quality Parameters

Kd vs Chlorophyll-a



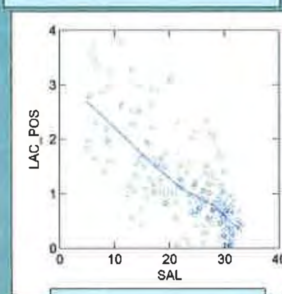
N = 184
R^2 = 0.07

Kd vs TSS



N = 176
R^2 = 0.13

Kd vs Salinity (CDOM)

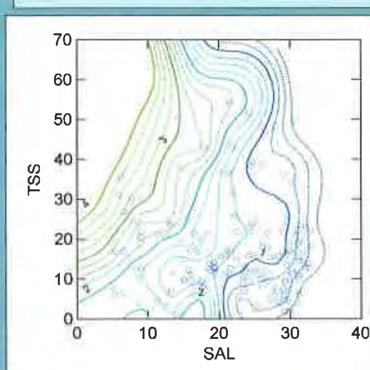


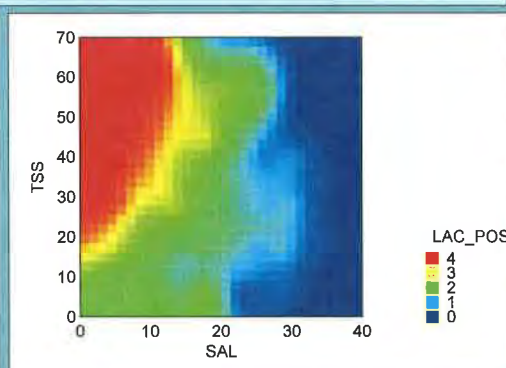
N = 209
R^2 = 0.54

New Hampshire Estuaries Project

Multivariate Regression of Kd vs. Water Quality Parameters

Multivariate Regression of Kd vs. TSS, Chla, and Salinity (CDOM)
TSS and Salinity are significant, R^2 = 0.61, n=176





New Hampshire Estuaries Project

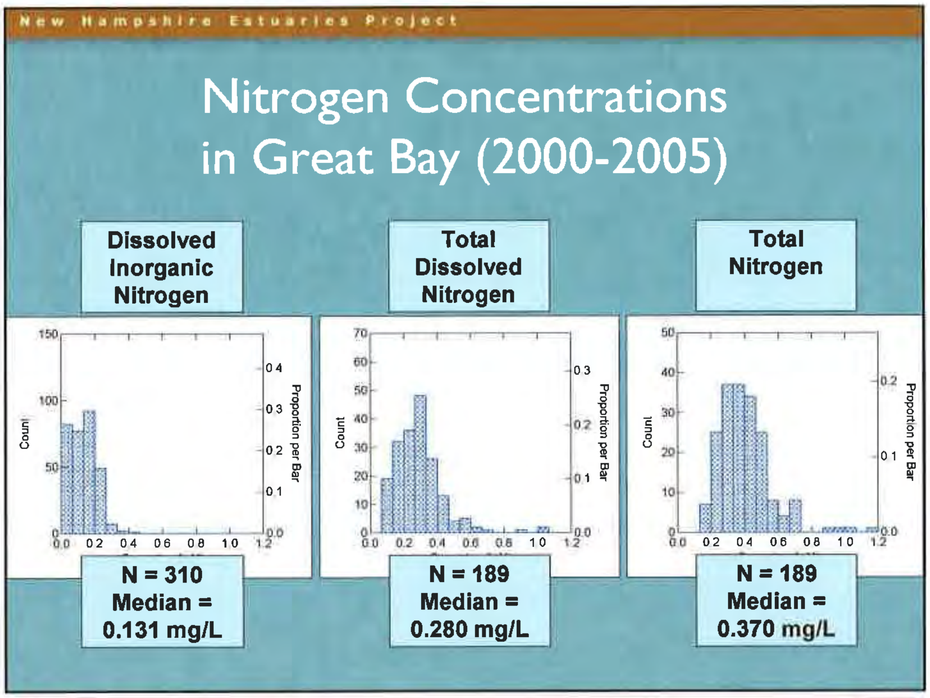
CDOM Observations

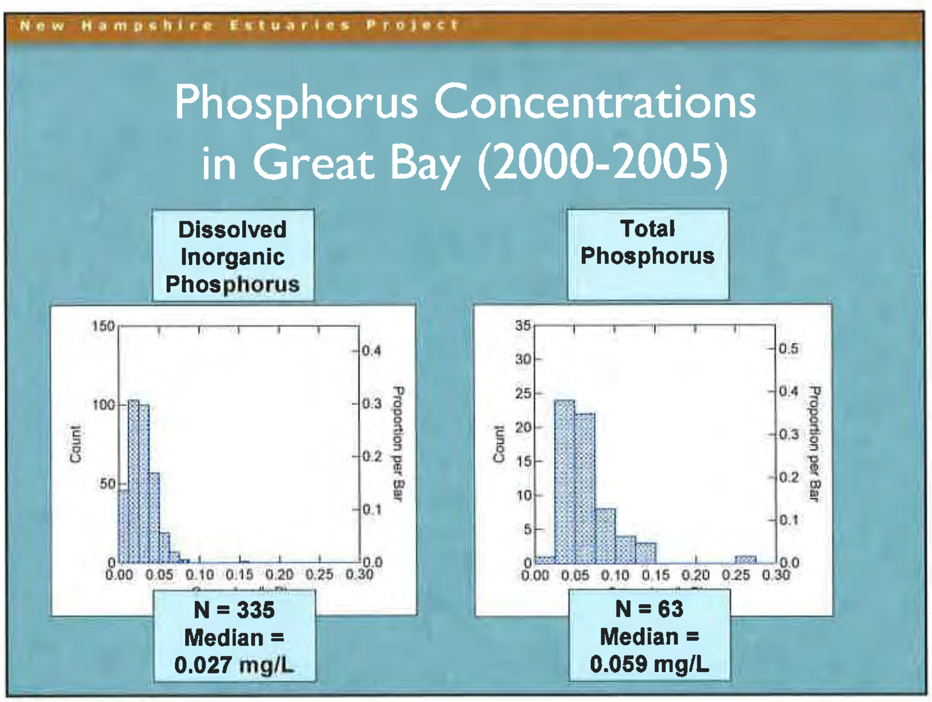
- CDOM accounts for ~50% of the light attenuation in Great Bay.
- Light attenuation by CDOM is a more complicated process than the "nitrogen > phytoplankton > shading model" (Roulet and Moore, 2006, Nature).
- Need changes to buoy instrumentation to build better regression equations.

New Hampshire Estuaries Project

Factors Influencing Water Quality

- Nutrient concentrations / limiting nutrients
- Nutrient loads
- Suspended sediment loads

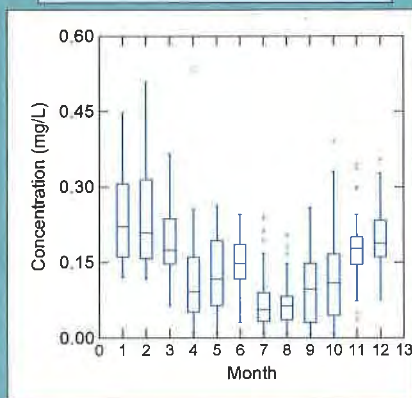

New Hampshire Estuaries Project
Nitrogen Concentrations in Great Bay (2000-2005)
Dissolved Inorganic Nitrogen
Total Dissolved Nitrogen
Total Nitrogen
Count
Proportion per Bar
N = 310
Median = 0.131 mg/L
N = 189
Median = 0.280 mg/L
N = 189
Median = 0.370 mg/L


New Hampshire Estuaries Project
Phosphorus Concentrations in Great Bay (2000-2005)
Dissolved Inorganic Phosphorus
Total Phosphorus
Count
Proportion per Bar
N = 335
Median = 0.027 mg/L
N = 63
Median = 0.059 mg/L

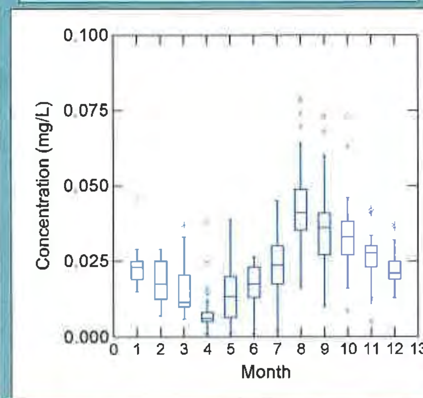
New Hampshire Estuaries Project

Dissolved Nitrogen and Phosphorus Seasonal Trends

Dissolved Inorganic Nitrogen



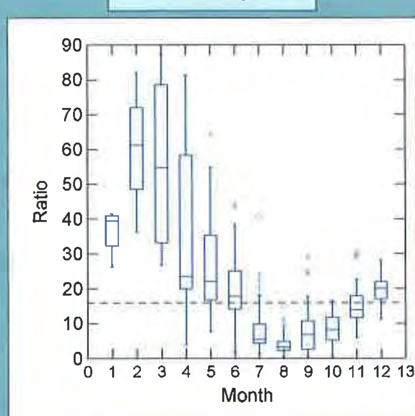
Dissolved Inorganic Phosphorus



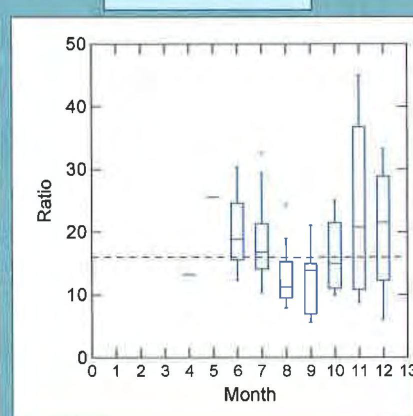
New Hampshire Estuaries Project

Nitrogen to Phosphorus Molar Ratios in Great Bay 2000-2005

DIN:DIP

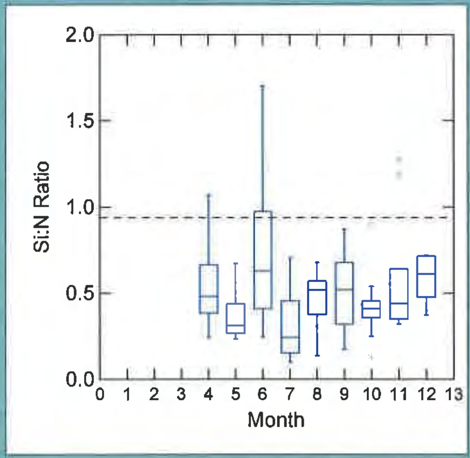


TN:TP



New Hampshire Estuaries Project

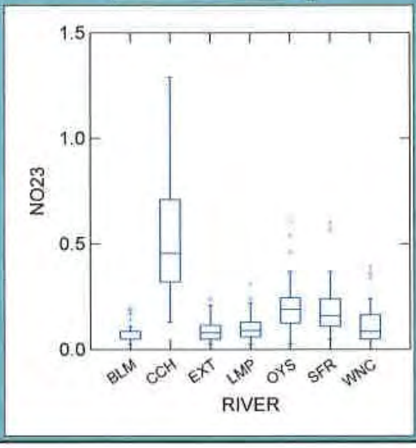
Silica to Nitrogen Molar Ratio in Great Bay 2004-2005



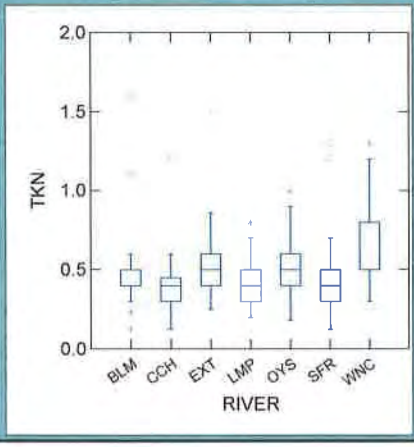
New Hampshire Estuaries Project

Nitrogen Species Concentrations in Great Bay Tributaries

Nitrate (mg/L)



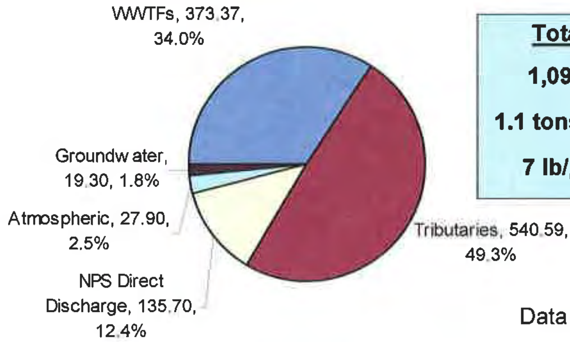
TKN (mg/L)



New Hampshire Estuaries Project

Nitrogen Loads to the Great Bay Estuary

Great Bay and Upper Piscataqua River Estuary
Total Nitrogen Loads in tons N per year

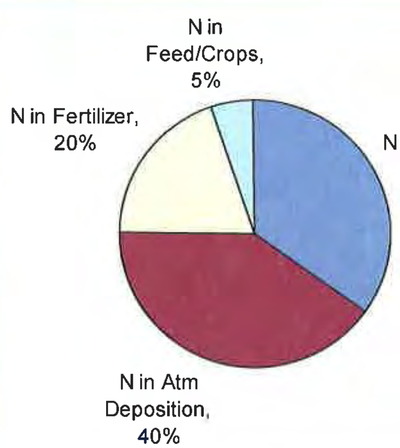


Total N load
1,097 tons/yr
1.1 tons/yr/sq. mile
7 lb/person/yr

Data Source: NHEP

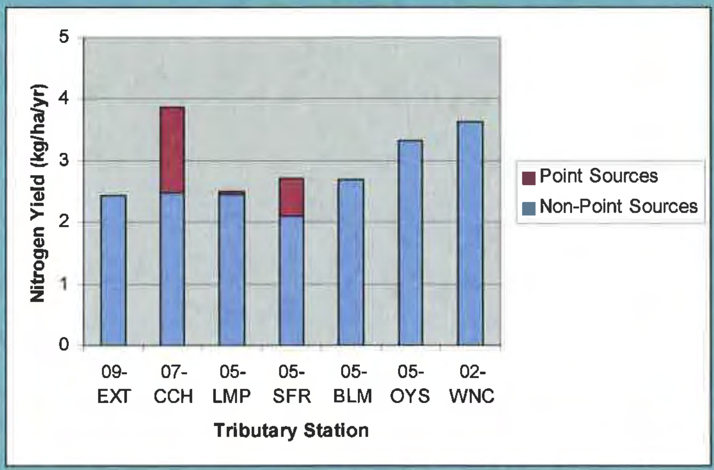
New Hampshire Estuaries Project

Nitrogen Sources in the Great Bay Watershed



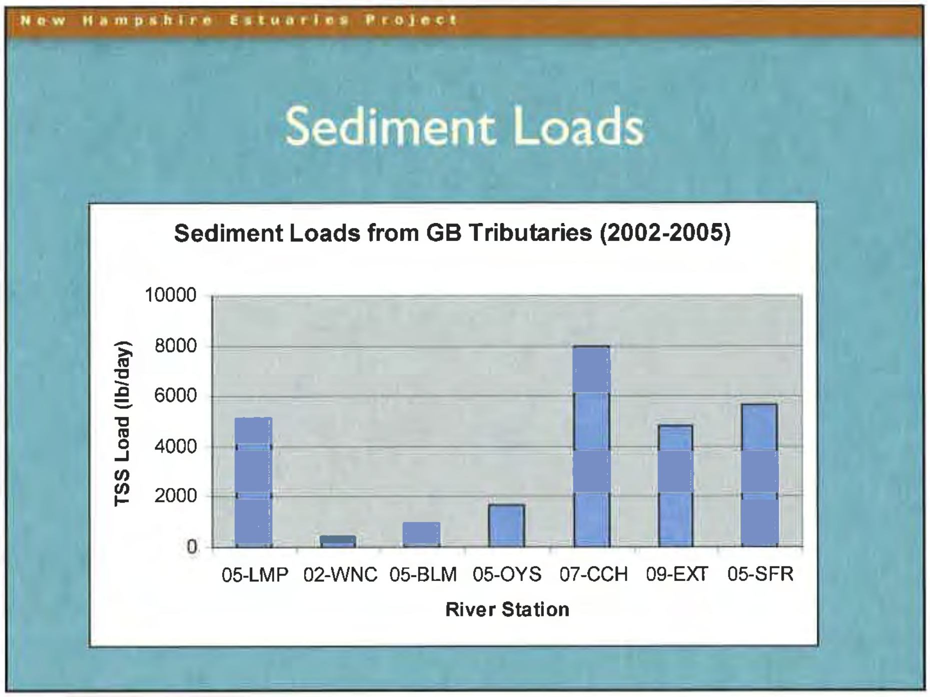
From: Driscoll et al. (2003) *Bioscience*

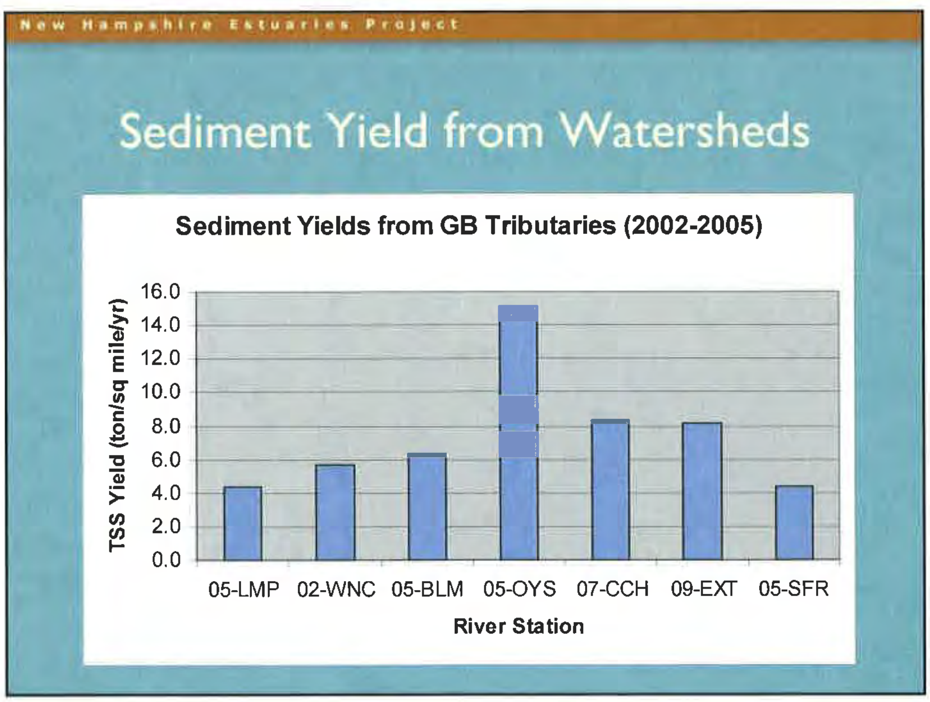
Nitrogen Yield from Watersheds



Nitrogen Yield from Watersheds

- Overall nitrogen yield for Great Bay watershed was 3.9 kg/ha/yr.
- Albemarle-Pamlico Study (1992)
  - TN yield for forest was 2.3 kg/ha/yr
  - TN yield for developed land was 7.5 kg/ha/yr

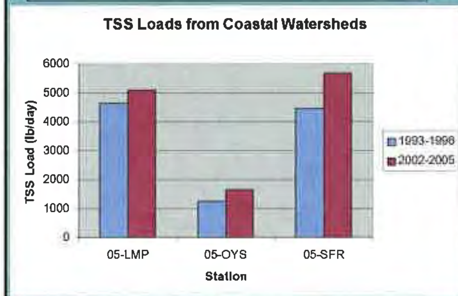

New Hampshire Estuaries Project
Sediment Loads
Sediment Loads from GB Tributaries (2002-2005)
TSS Load (lb/day)
10000
8000
6000
4000
2000
0
05-LMP
02-WNC
05-BLM
05-OYS
07-CCH
09-EXT
05-SFR
River Station


New Hampshire Estuaries Project
Sediment Yield from Watersheds
Sediment Yields from GB Tributaries (2002-2005)
TSS Yield (ton/sq mile/yr)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
05-LMP
02-WNC
05-BLM
05-OYS
07-CCH
09-EXT
05-SFR
River Station

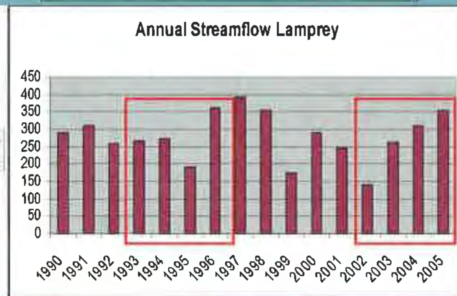
New Hampshire Estuaries Project

Sediment Load Trends

Trends in Mean TSS Loads



Trends in Annual Streamflow



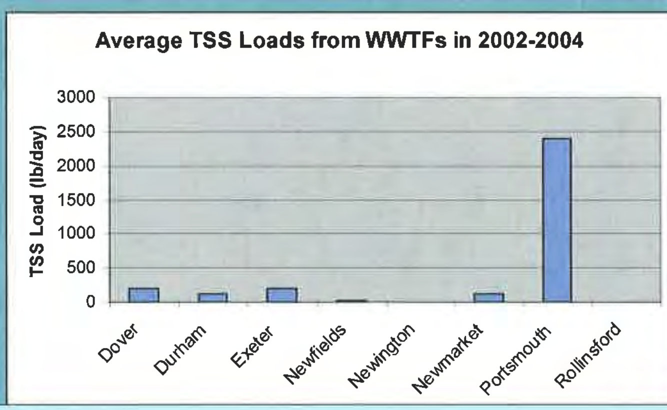
Relative Change 1993-96 vs 2002-05

Lamprey River	**9%**
Oyster River	**32%**
Salmon Falls River	**27%**

*Differences not statistically significant

New Hampshire Estuaries Project

Sediment Loads from WWTFs



Note: The measured load for the Cocheco River was 8,000 lb/day. The WWTF loads are all much smaller than the river loads.

New Hampshire Estuaries Project

Observations

- Measured Kd values accurately predict eelgrass presence/absence.
- The best predictor of Kd was CDOM (salinity).
- Obvious water quality trends were not apparent.
- Phosphorus is the limiting nutrient during winter-spring. Nitrogen is the limiting nutrient in summer-fall.
- Sediment yields were highest for the Oyster River watershed.

New Hampshire Estuaries Project

Questions

- If CDOM is the major factor in attenuation, how is it related to nutrients and human processes in the watersheds?
- Is epiphytic growth on eelgrass a significant factor?
- How do you deal with the probable effects of macroalgae?
- Are sediment loads relevant?
- Where do we go from here?

EXHIBIT– 15

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August 30, 2012

VIA U.S. FIRST CLASS MAIL & E-MAIL

Stephen S. Perkins
Director, Office of Ecosystem Protection
U.S. Environmental Protection Agency - Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912

RE: Supplemental Comments in Response to Proposed Draft NPDES Permits for the City of Dover, NH – NPDES Permit No. NH0101311, Town of Exeter, NH NPDES Permit No. NH0100871 and Town of Newmarket, NH NPDES Permit No. NH0100196

Dear Mr. Perkins:

The Great Bay Municipal Coalition (the Coalition) is an organization dedicated to the establishment of appropriate and cost-effective restoration measures to protect Great Bay and its resources. The Coalition represents the six major communities whose wastewater flows into various parts of the Great Bay system – Dover, Durham, Exeter, Newmarket, Portsmouth, and Rochester.

Per my email dated August 15, 2012, I am submitting supplemental comments (attached) based on information not previously available at the time permit comments were due for the proposed draft NPDES permits referenced above. This letter provides the specific references to sworn testimony given by Philip Trowbridge, Dr. Fred Short, and Paul Currier that confirms, *inter alia*, there are no data or studies showing nitrogen induced cultural eutrophication of Great Bay has occurred. This testimony also confirms that EPA has misapplied the state's narrative criteria in developing the proposed permits and in concluding that nitrogen reduction is necessary to allow for eelgrass propagation in this system. Copies of full depositions with exhibits will be submitted to EPA by local counsel for the permittees. Copies of the deposition transcripts are being provided electronically with this filing.

Thank you for your consideration of these supplemental comments.

Sincerely,

John C. Hall

Enclosures

cc: Coalition Members
Ted Diers, DES

Supplemental Comments of the Great Bay Municipal Coalition

The following information, not previously available at the time permit comments were due, is hereby submitted in response to the proposed draft NPDES permits for the cities of Dover, Exeter and Newmarket. As discussed below, this new information demonstrates that the proposed stringent nitrogen limitations are not scientifically justified and fail to reflect applicable state narrative standards that were purported to be the basis for developing the draft permits. Given this new information, most based on sworn testimony, the need for stringent nitrogen limitations is not legally or technically justified. Consequently, the proposed permits should be withdrawn.

1. Use of the Draft 2009 Criteria Did Not Implement Existing State Narrative Criteria or Demonstrate Narrative Criteria Violations Existed.

Currently, the only duly promulgated New Hampshire water quality criteria addressing nutrients in estuaries are found at Env-Wq 1703.14(b), which states:

> Class B waters shall contain no phosphorus or nitrogen *in such concentrations that would impair any existing or designated uses*, *unless naturally occurring*. (emphasis supplied). The regulations continue:
>
> Existing discharges containing either phosphorus or nitrogen which encourage cultural eutrophication shall be treated … to ensure attainment and maintenance of water quality standards. Env-Wq 1703.14(c).
>
> "Cultural eutrophication" is defined as "human-induced addition of wastes containing nutrients to surface waters which results in excessive plant growth and/or a decrease in dissolved oxygen." Env-Wq 1702.15.

DES also has a narrative standard regarding "aquatic community integrity," which indicates, in relevant part, that "differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function." Env-Wq 1703.19(b).

The key evidentiary component of the narrative nutrient criterion is that a violation is only found when it is demonstrated that nutrients *are causing* the impairment (*e.g.*, "in such concentrations that would impair"; "human-induced addition of … nutrients … which results in"). As discussed below, this essentially requires a "cause and effect" demonstration to find a violation of the narrative criteria. In issuing the draft permits, EPA indicated that it was relying on the states existing narrative criteria as the basis for (1) finding nutrients were the cause of impairments and (2) using the 2009 Numeric Nutrient Criteria as a "narrative translator." Our prior comments noted that to claim a nutrient limitation is necessary to eliminate use impairments and protect ecological resources under the state's narrative standard, EPA must first demonstrate that the nutrient at issue (nitrogen) caused the impairment, otherwise defined as "cultural eutrophication" (excessive algal growth causing impairment such as DO violations – Env-Wq 1702.15) under state law. Moreover, any "narrative translator" must be based on a system-specific defined "cause and effect" relationship showing the nutrients have caused such "cultural eutrophication." The permit action is premised on the *assumption* that the waters are nutrient impaired, which itself was based on application of the 2009 Criteria in the Section 303(d) process. The Coalition noted that because the 2009 Criteria, at best, demonstrated a correlation and did not prove causation (and was not based on a demonstrated site-specific causal relationship for Great Bay estuary), such criteria could not be used as a proper "narrative translator" or as a scientifically defensible basis for demonstrating that the waters were actually nutrient impaired in violation of the narrative criteria. Moreover, it was further noted that algal levels had not changed despite the claimed increase in DIN levels in the system. (State of Estuaries Reports 2000, 2003, 2006 and 2009) Thus, there was no indication that "cultural eutrophication" has occurred as a result of the alleged changing DIN levels and thus no evidence of narrative criteria violations. The data evaluation for the 2012 SOE also confirmed no significant change in algal levels in 40 years despite a 60 percent increase then 40% decrease in inorganic nitrogen levels. (Exh.1- Long term average nutrient and algal levels at Adams Point)

a) Deposition Testimony Confirm No Cause and Effect Demonstration

Mr. Paul Currier of DES confirmed that any claim of narrative criteria violations requires a documented *causal relationship* between nutrients and excessive plant growth adversely impacting designated uses (*See* Currier Dep. at 18, 19, 134)[1]. Both Mr. Trowbridge and Mr. Currier confirmed that the 2009 Criteria is not based on a demonstrated causal relationship for either transparency or DO. (See, Currier Dep. at 77, 80, 147; Trowbridge Dep. at 413-416, 445-446; Short Dep. at 173-175) The relationships were only correlations – a fact EPA itself knew in 2008. (Trowbridge Dep. Exh. 88) Thus, the 2009 Numeric Nutrient Criteria, cannot be a proper translator of the existing narrative criteria, as a correlation does not establish that a causal relationship exists and the narrative criteria requires a causal demonstration. Id. Moreover, both Mr. Currier and Mr. Trowbridge noted that merely exceeding values contained in the 2009 Criteria does not provide a demonstration that a narrative violation exists. (Currier Dep. at 80; Trowbridge Dep. at 332-333) Thus, in designating the waters nutrient impaired in 2009 and thereafter, DES had made this presumption which is now admitted to be insufficient to actually declare those waters as nutrient impaired or to calculate permit requirements to meet narrative standards.

[1] Full copies of the Currier, Short and Trowbridge Depositions, plus exhibits have been provided to EPA by the Coalition's local counsel. Due to the voluminous nature of those documents they are not being resubmitted with these comments.

Based on these sworn acknowledgements on how state law is intended to operate, it was improper for EPA to presume that the exceeding the 2009 Criteria levels will or has caused eelgrass or DO impairment anywhere in the system. It was equally improper for EPA to presume that attaining compliance with the numeric values contained in the draft 2009 Numeric Criteria document, was necessary to avoid violating the state's narrative criteria. Finally, it was also improper to presume that, the 2009 Criteria accurately reflected the level of scientific demonstration required by the existing narrative standard to designate waters as nutrient impaired. In short, the 2009 Criteria reflected a series of unproven assumptions on conditions that may occur in estuaries but are not proven to be occurring in Great Bay estuary. Such speculation is not a basis for narrative criteria implementation and does not constitute "weight of evidence" that nutrients have triggered narrative criteria violations as assumed in EPA's proposed permitting action.

b) Available DES Analyses Confirmed No Narrative Criteria Violation Existed

EPA's permit action is premised on the assumption that nitrogen has caused narrative criteria violations and major nutrient levels are necessary to restore this system. These presumptions are also in error. There is no nitrogen-related eelgrass impairment demonstrated by any of the available site-specific data for this system. Mr. Trowbridge indicated that his prior research confirmed that nitrogen was not causing adverse water quality in Great Bay estuary. (See, Dep. Exh., 31, 32, 71 and 72) In particular, the following "findings" resulted from these data assessments and analyses:

- Nitrogen increased but algal levels did not change in the system.
- Algal levels are a minor component influencing system transparency; turbidity and color are the most important factors;
- There is no indication that transparency changed from 1990 through 2007 during the period of nutrient concentration increases.

EPA had been provided with these results via PREP and NHEP, but chose not to include them in rendering a determination that nitrogen reduction was required to address a narrative criteria violation associated with "transparency" and restore eelgrass populations. Mr. Trowbridge presented EPA with a PowerPoint review of his analyses confirming no such TN-algal-transparency connection existed for the Great Bay estuary in March 2008. Mr. Trowbridge acknowledged the assessment presented was accurate. Therefore, the subsequent "weight of evidence" analysis performed by EPA and DES in support of nutrient reduction that ignored these critical findings was deficient and entirely misplaced.[2] Elevated levels of

[2] It is apparent that both the state and EPA knew that these numeric criteria were based on confounded correlations that did not show TN caused the claimed changes in either transparency or DO (*See* Exh. 71, 72

TN can, but do not necessarily cause transparency impairments by stimulating excessive algal growth indicated by elevated chlorophyll-a concentrations. In the case of Great Bay, while TN increased 59% since 1980 through 2008, there was no corresponding increase in algal growth (Exh. 1 and Trowbridge Dep. 121-127). Accordingly, cultural eutrophication (i.e., documented negative impacts on uses due to excessive nutrient inputs), did not occur in Great Bay or the Piscataqua River up to 2007 as confirmed by Mr. Trowbridge (*See* Trowbridge Dep. at 326-328, 355-356, 433-434 and Currier 62-63, 69). Moreover, the 2007 transparency study completed by Morrison (Trowbridge, co-author) for Great Bay, concluded transparency was sufficient to support eelgrass in Great Bay and Little Bay and therefore other factors must be limiting eelgrass declines in the system. (Trowbridge Dep. at 235-236). This critical finding was left out of the 2009 Criteria document (Trowbridge Dep. at 436-438).

The analysis of algal growth for Great Bay, Adams Point, recently released by Mr. Trowbridge to the PREP Technical Advisory Committee, further confirms that no material change in algal level occurred since 1970s, despite increasing then decreasing DIN levels. (Exh. 1 - PREP 2012 Nutrient and Algal Charts for Adams Point) As no causal relationship has been documented between TN and algal growth adversely impacting transparency or low DO, there is no documented narrative criteria violation for nutrients (with no induced change, there can be no "cultural eutrophication"). Therefore, EPA's reliance on the impaired waters listings (that in turn relied on the 2009 Criteria) was misplaced and all permit calculations and requirements based on that impairment presumption are flawed. There is no demonstrable causal relationship between TN/TIN and algal growth, eelgrass loss, transparency decrease or minimum DO anywhere in the system. In summary, there are no documented cases, anywhere in the estuary, where increased nutrient levels have (1) caused eelgrass losses via any possible mechanism and (2) where transparency has been significantly decreased due to increased algal growth stimulated by increased nutrient loadings. The data and available studies (Jones, Pennock, HydroQual) do not show that algal growth is a significant contributor to low DO that occurs in virtually every tidal river. Absent, such information and a demonstration of a direct relationship to increased nutrient loadings, there can be no claim that narrative criteria violations are caused by nutrients from POTWs or that nutrient reduction will materially improve these conditions.

---

and 88 – Trowbridge Dep.). This admission paired with the absence of legitimate scientific evidence renders the proposed TN criterion unsupportable as a narrative criterion implementation method. It also provides clear evidence that EPA intentionally overlooked the relevant scientific information in asking DES to claim that narrative criteria violations were caused by nutrient loads to the system. (Currier Dep. Exh. 34). Mr. Currier noted in his deposition that the 2009 Criteria would have been pulled back if the peer reviewers had concluded the analysis did not demonstrate cause and effect but was merely a correlation. (Currier Dep. at 147.) Thus, this was a very material, intentional omission from the technical reports used by EPA to claim stringent TN requirements are necessary.

2. Narrative Violation Related to Eelgrass Has Not Occurred in Tidal Rivers.

As noted in the prior comments and the regulatory citations listed above, changes in ecology due to natural conditions do not constitute narrative criteria violations or system impairments. EPA has proposed a transparency-based TN criterion be applied in the tidal rivers of Great Bay for the purpose of restoring eelgrass in these areas. As noted earlier, EPA assumed that algal growth had a major influence on transparency in the tidal rivers, again relying on the 2009 Criteria document – rather than looking at the relevant site-specific information for each of the tidal rivers. EPA claims this is necessary because eelgrass historically existed in these areas. The Coalition presented data from the tidal rivers confirming that TN negligibly impacts transparency and low tidal river transparency is a naturally occurring condition due to turbidity and CDOM occurring in those waters (e.g., Squamscott, Lamprey and Upper Piscataqua Rivers). Therefore, it would be improper to apply a TN criterion based on transparency, or to find any eelgrass impairment exists in such waters. Where natural transparency limits eelgrass growth in the tidal rivers or the effect of TN is negligible, there can be no "nutrient related" eelgrass/transparency" violation occurring in these waters. Therefore, EPA's application of the transparency-based TN criteria to set permit limits for the various tidal river facilities was unsupported factually and unnecessary to ensure compliance with the existing narrative standards.

Under deposition, Mr. Currier acknowledged that the mere historical presence of eelgrass in an area is not a sufficient basis to regulate nutrients. (Currier Dep. at 130-131). He further noted that it would be improper to apply the 2009 Numeric Nutrient Criteria to protect eelgrass if the data confirmed other factors were limiting eelgrass propagation. Id at 136-137. Based on a review of the very data submitted by the Coalition in its permit comments (Short Dep. Exh. 20-22), Mr. Trowbridge acknowledged that transparency is too poor in the major tidal rivers (Squamscott, Lamprey, Upper Piscataqua) to support eelgrass growth, due to the amount of color and turbidity present. (Trowbridge Dep. at 409-10, 421-428, 431-434). He acknowledged that both factors are naturally occurring in the watersheds. Id. at 427-431. With regard to the Exeter permit, Mr. Trowbridge agreed that reducing TN would have no meaningful effect on improving transparency in this tidal river. Id. He acknowledged that these available data not previously analyzed by DES in developing the 2009 Criteria document shows that (1) the effect of algal growth on transparency is negligible (2) CDOM and turbidity are the key factors controlling transparency in the tidal rivers system, (3) CDOM and turbidity in the tidal rivers come from natural sources and are not caused by nitrogen loadings and (4) regulating TN in the tidal rivers will not result in any demonstrable improvement in transparency. These are *precisely* the type of data and finding that Mr. Currier stated would obviate the need to achieve the recommendations contained in the 2009 Numeric Nutrient Criteria document. As such, imposition of the transparency-based TN criterion by EPA to restore eelgrass in any of the tidal rivers is scientifically unsupported and not demonstrated necessary to comply with the applicable narrative standards. Given this testimony and the available data, there is no reasonable basis to impose nutrient reduction measures to protect eelgrass populations that do not and cannot exist due to factors unrelated to nutrients. It is per se unreasonable for EPA to seek to impose a TN criteria based on a transparency target (Kd of 0.75/m) that cannot and will not be achieved in the tidal rivers due to a host of factors unrelated to nutrient levels. Generally speaking, a State is the sole arbiter of its own regulations. *See United States Corp. v. Train*, 556 F.2d 822, 837-39 (7th Cir. 1977) (Federal courts and agencies are without authority to review the validity of requirements imposed under state law or in a state's certification). Moreover, it is per se legal error for EPA to implement the state narrative criteria in a manner inconsistent with the states interpretation of its own laws. *Kentucky Waterways Alliance v. Johnson*, 540 F.3d 469, 493 n.1 (6th Cir. 2008) ("In interpreting a state's water quality standard, ambiguities must be resolved by consulting with the state and relying on authorized state interpretations") (concurring opinion of Judge Cook relied on by Court, 540 F.3d at 469)

As eelgrass in the tidal rivers will not and cannot be restored due to natural conditions unrelated to nutrients or the degree of algal growth or nutrients present, nutrient regulation in these waters is not permissible based on eelgrass protection under either the aquatic community integrity or the narrative nutrient criteria.

3. Post 2006 Eelgrass Population Decreases in Great Bay and Lower Piscataqua River Could Not Possibly Have Been Due to Nitrogen

The main factor influencing the call for stringent nutrient regulation was the post-2005 decline in Great Bay and lower Piscataqua River eelgrass populations. Prior to this time, neither area was considered impaired for eelgrass (See, Trowbridge Dep. at 356; Currier Dep. at 62-63, 69; Short Dep. at 120-125; see also, figures presented in Trowbridge March 2008 presentation to USEPA showing stable eelgrass acreage in both areas) . The Section 303(d) listing record confirmed that the post-2005 dramatic eelgrass decreases in Great Bay and Lower Piscataqua River and litigation threats by CLF were the driving factors for claiming Great Bay was impaired and TN was the cause. (Currier Dep. at 78-79, 97 and Dep. Exh. 34 - internal DES email stating EPA requested the impairment listing change to avoid CLF suit). NOTHING in the record at that time or since then shows that nitrogen had anything to do with the dramatic eelgrass decline in 2006/2007. (Trowbridge Dep. at 370-372). There is no evidence showing nutrients triggered any type of significant water quality change affecting eelgrass, and, given the rapid decline, this would have been virtually impossible to be a nutrient induced impact. [3]

With regard to the rapid decrease in eelgrass post 2005, it was acknowledged that rainfall and flooding could have been the cause of the decreased eelgrass populations. (Trowbridge Dep. at 381-384, 436). This hydrologic condition greatly influenced system salinity (CDOM and salinity are inversely correlated) and low salinity does have a direct and immediate impact on eelgrass health. (See, www.SeagrassLI.org/ecology/physical_environment/salinity.html) At lower salinity levels (10-20 ppt), eelgrass growth decreases sharply. Id. The attached figures shows how CDOM levels in Great Bay increased during these extreme rainfall years and therefore, salinity levels in the system decreased substantially. Increased CDOM due to the flooding events also cause a major decline in light transmission for Great Bay in the Spring of 2006, which has improved since then. Exh. 2- Changing CDOM Levels in Great Bay 2005-2011 and Exh. 3 - Changing Light Transmission in Great Bay 2004-2008. It should be noted that, the reduced transparency in the system in 2006 was NOT due to an explosion in algal growth. The attached figure shows eelgrass decline as a function of freshwater inflow to the system and the changing transparency condition in Great Bay due to the 2006 floods. Id. This poor level of water clarity occurring in the peak growing season along with lower salinity would have adversely impacted eelgrass growth. Similar storm/flood related eelgrass declines have been reported in other systems. (see, *Managing Seagrasses for Resilience to Climate Change*, Bork, Short, Mcleod and Beer, International Union for Conservation of Nature (2008)) at 18. Multiyear (three year or more) recovery to such natural events have been documented and would be expected in this system also. Id.

Similar to flood impacts documented in other systems, the multi-year depression in eelgrass growth (2006-2008) is most likely attributed to changing conditions related to increased fresh water flows, decreased salinity and poor light transmission occurring in the higher rainfall years and in particular the spring of 2006. (See, Exh. 4 – Changing Great Bay Eelgrass Acreage and Flow; Exh. 5 - Chart of May-July Flows Versus Eelgrass Acreage). Since the extreme rainfall has abated, eelgrass populations have rebounded in both Great Bay and Little Bay for 2010-2011. Id. Therefore, at this point there is no rational basis to conclude

[3] EPA's position that nitrogen was the cause of eelgrass declines rested on claims made by Dr. Short. There is no objective basis for relying on Dr. Short's claims. He testified that he did not conduct studies of Great Bay or the Lower Piscataqua River designed to determine why eelgrass declines had occurred in those areas. (Short Dep. at 16, 20-22, 24-25, 83-85) He also testified that he did not conduct any evaluation of the available water quality data to ascertain whether or not nutrients had triggered any changes in water quality impacting transparency. (Id.) Thus, his "claims" were simply unsupported speculation. He also acknowledged that he did not know why eelgrass populations in Little Bay failed to "rebound" while Great Bay eelgrass populations fully recovered after the 1988 wasting disease event that decimated eelgrass populations in the area. Id. Thus, none of Dr. Short's claims regarding the cause of fluctuating eelgrass populations are objectively demonstrated for the Estuary.

that anything other than natural conditions (in particular floods and extreme rainfall occurring in 2006) has caused the rapid decline in 2006 eelgrass acreage that persisted for three years. A multiyear recovery period would be expected as necessary to allow for pre-flood eelgrass populations to again occur, which is also reflected in the Great Bay/Little Bay eelgrass record. EPA's assertion that this was a nitrogen induced impact has no objective scientific basis for this estuary and no explainable ecological mechanism. Changing eelgrass populations in the Lower Piscataqua River and the Bays is not related to nitrogen impacts but is most likely due to events surrounding the floods occurring in 2006.

4. The Transparency Concern in Great Bay is Misplaced and Unsupported

The proposed nutrient standards are based on a presumed transparency impairment in Great Bay. However, transparency in Great Bay has been consistent and supportive of eelgrass propagation. As previously mentioned, Great Bay transparency was fairly constant from 1990-2005 and 2007-2011. This level of transparency has been sufficient to sustain eelgrass in Great Bay. DES, EPA, and Dr. Fred Short have all agreed that Great Bay is not a transparency limited system because eelgrass populations receive sufficient light during the course of the tidal cycle (Trowbridge Dep. at 177, 211-212, 360-361 and Short Dep. at--- as discussed in numerous emails between DES, EPA and Dr. Short). Moreover, the 2007 transparency study completed by Morrison for Great Bay concluded transparency was sufficient to support eelgrass in Great Bay and Little Bay and therefore other factors must be limiting eelgrass declines in the system. (Trowbridge Dep. at 235-236). In other words, eelgrass populations in Great Bay generally receive ample light at low tides, unless conditions become severe (as in 2006 floods and extreme rainfall). These critical findings were left out of the 2009 Criteria document. Id at 436-437. Because Great Bay transparency is sufficient for eelgrass growth, application of the 2009 Numeric Nutrient Criteria to derive the permit limits is not legally or scientifically defensible.

5. The Current and Historical Water Quality in Great Bay Has Been Sufficient to Support Eelgrass.

The Coalition previously observed that an evaluation of historical data indicate that water quality conditions in the Great Bay in excess of the 2009 Numeric Nutrient Criteria have been conducive and sufficient for eelgrass growth. Eelgrass populations thrived from 1990 through 2005 under the elevated TN conditions and existing transparency conditions documented in Great Bay and Piscataqua River. For example, the database presented by Mr. Trowbridge to EPA in March 2008 confirmed that the average Kd for Great Bay was above 1.0 and TN above 0.42 mg/l prior to 2006 when eelgrass were considered healthy. This proves that a 0.75 Kd, and 0.3 mg/l TN criteria as presented in the 2009 Numeric Nutrient Criteria are not necessary to ensure adequate eelgrass growth in this system.

Deposition testimony has confirmed that the Coalitions position is supported. Mr. Currier indicated that conditions occurring prior to 2004 were sufficient to protect eelgrass resources (Currier Dep. at 69). Mr. Trowbridge also acknowledged the same position through 2005. (Trowbridge Dep. at 356) Mr. Trowbridge also acknowledged that the major regrowth of eelgrass also indicates that existing water quality supports healthy eelgrass propagation. (Trowbridge Dep. at 182-183 240-241) Finally, federally funded research (2008- Morrison) on Great Bay confirmed that (1) existing light conditions were sufficient for eelgrass growth (2) changes in eelgrass populations are not related to transparency and (3) other causes require investigation (Currier, Trowbridge Dep. at 236, 360-361). Existing transparency levels are as good, if not better than the levels present during the Morrison study. (Exh. 3- Showing Kd at Adams Point 2004-2008) Given this testimony, there is no objective basis to assert that existing water quality and nutrient levels are inadequate to support the eelgrass resource or that transparency and nitrogen levels violate narrative criteria.

Epiphytes have been raised as an issue of concern for Great Bay eelgrass. Epiphytes grow on the surface of the eelgrass and attenuate the light reaching the eelgrass. This can hinder eelgrass growth to varying degrees. However, Mr. Trowbridge agreed with Dr. Short's assertion that epiphytes pose negligible risk to Great Bay eelgrass populations (Trowbridge Dep. at 7-11-12 pg. 348-349).

Similarly, macroalgae can overgrow eelgrass beds and prevent eelgrass proliferation. Yet, Mr. Trowbridge did not oppose Dr. Short's findings that current macroalgae growth has not been demonstrated to prevent eelgrass restoration anywhere in Great Bay (Trowbridge Exh. 58; Trowbridge Dep. at 104-105). It should be noted further, that macroalgae in Great Bay grow predominantly on tidal flats that do not support eelgrass. Regardless of macroalgae levels, eelgrass populations in Great Bay rebounded roughly 40% from 2007-2011 Trowbridge Dep. at 156-157, 240-241). Clearly, macroalgae growth has minimal, if any, effect on Great Bay eelgrass and the growth of these plants has not been documented to be causing use impairment. Id.

Thus, available data indicate current and historical water quality conditions support eelgrass growth and that existing nutrient levels do not pose a present threat to eelgrass survival. Therefore, imposing stringent nutrient reduction requirements, as proposed in the draft permits, is unnecessary and unwarranted to support eelgrass growth in Great Bay.

6. The Cause of Eelgrass Decline is Unknown.

EPA and DES have claimed to understand causes of eelgrass decline. Contrary to EPA and DES claims, available data indicate eelgrass decline is not linked to increased TN levels in Great Bay. However, the true cause of eelgrass decline remains unknown. Mr. Phil Trowbridge confirmed that causes of Great Bay eelgrass decline from 2006-2008 are not understood (Trowbridge Dep. at 82-83, 370-372). This is attributable to the fact that no site-specific research has been completed to evaluate the cause of eelgrass declines anywhere in the Great Bay system (Trowbridge Dep. at 120-125, 135-136, 149-150, 152, 408; Short Dep. at 16, 20-25). Instead, the development of the proposed nutrient criteria relied heavily upon studies of the Chesapeake Bay, a considerably different system than Great Bay. Without understanding the underlying causes of Great Bay eelgrass decline, imposing nutrient criteria is unsupportable.

7. Low DO in Tidal Rivers is Not Demonstrated to be Caused by Algal Growth.

EPA has claimed the low DO in Great Bay tidal rivers is caused by excessive algal growth. The Coalition comments note that the available studies specifically determined that there was no direct relationship between periodic low DO and elevated algal levels in the rivers that were evaluated (i.e., Lamprey and Squamscott) The recent HydroQual report indicated that elevated algal levels exhibit no direct relationship with low DO (Trowbridge Dep. at 31-32). Prior State of the Estuary reports indicated that natural conditions may cause the low DO. Mr. Trowbridge acknowledged several natural conditions contribute to low DO in the tidal rivers, including tidal interchange, stratification, and sediment oxygen demand (Trowbridge at Dep. at 39-46). Mr. Trowbridge also acknowledged that the relative impacts of algal growth versus all other factors influencing low DO have not been assessed. Id. Without such assessments, algal growth cannot and has not been pinpointed as the primary or even a significant cause of low DO in Great Bay tidal rivers. Without such basic information the need for stringent nitrogen reduction cannot be determined. Applying nutrient criteria to limit algal growth as a means to increase DO in Great Bay tidal rivers is scientifically unsupportable at this time, particularly given the data showing that prior apparent increases in inorganic nitrogen levels did not produce a significant change in algal growth in the system.

8. EPA Peer Review and Permit Issuance Failed to Consider the Relevant Scientific Information for Great Bay.

EPA has claimed the peer review conducted for Great Bay was adequate to demonstrate application of stringent nutrient criteria were necessary to protect the Bay's eelgrass resources. However, the Coalition asserted that the peer review failed to consider the relevant scientific information previously developed for Great Bay estuary. The depositions confirmed that critical site-specific information in the possession of DES and EPA was excluded from the 2009 Numeric Nutrient Criteria and therefore, was not made available to the peer reviewers. (Trowbridge Dep. at 436-440) The various DES analyses (discussed earlier) that confirmed (1) TN increases did not cause changes in transparency, algal levels or DO (2) a "cause and effect" relationship between TN and transparency/DO did not exist, (3) Dr. Short's conclusion that Great Bay is not a transparency-limited system and (4) the findings of the Morrison report concluding existing conditions (transparency/TN) did not limit eelgrass populations were all excluded from the technical information presented in the 2009 Numeric Nutrient Criteria support documents "weight of evidence" analysis. Consequently, the peer reviewers had no basis to know that the assumptions underlying the development of the criteria, were actually proven to be unsupported or false by the available site-specific data. Moreover, the effect of the extreme weather on eelgrass populations was never presented, though it was acknowledged that it could have caused the eelgrass losses. (Trowbridge Dep. at 381-385, 436) Excluding such essential and relevant information, rendered the peer review a fatally flawed and biased process. This information confirms that the concerns identified in the Coalition's May 14, 2012 Science Misconduct letter to EPA Headquarters were well supported.

9. Extreme Rainfall Skewed Nitrogen Impacts Analysis.

As part of the Coalition's comments, it was noted that the time period used to evaluate the degree of nutrients entering the system was atypical and not reflective of the expected range of nitrogen loadings. In particular, EPA was relying on a DES 2010 draft WLA Report that considered system loadings from the 2006-2008. The depositions confirmed that this was an extreme rainfall period (Trowbridge Dep. at 436) and more recent water quality data (released by PREP) confirmed that nutrient levels have declined by approximately 40% in the past three years. (Exh. 1 showing 1970- 2011 inorganic and total nutrient levels at Adams Point) As noted previously, this change in weather patterns has been accompanied by eelgrass regrowth in Little Bay and Great Bay. The external loading of nitrogen has dropped substantially based on the most recent PREP analysis from 1560 tons per year to about 1200 tons per year (see, Draft 2012 State of Estuary report).

State criteria do not have to be met under extreme conditions akin to once in 100 year events. Those would be considered extreme natural disturbances. Based on this information, *assuming arguendo*, that nutrient reductions are needed, the degree of nutrient reduction required to attain the 2009 Criteria is far less than originally believed by EPA. In fact, it appears that the existing TN level in Great Bay, is actually at or below the level intended to regulate macroalgae growth ~ 0.37 mg/l TN. Since Great Bay does not have a phytoplankton/transparency issue – it is only this level of water quality that could be considered needed to protect eelgrass uses at this time. Based on this latest information on nutrient levels in the system, EPA necessarily must reconsider its claim that limits of technology TN reductions to 3 mg/l TN is required to protect the resources of Great Bay.

10. Draft Criteria Were Misapplied (7/Q/10-mixing zone)

The Coalition comments noted that EPA had misapplied the 2009 Numeric Nutrient Criteria by imposing restrictive mixing zones and by applying the criteria under rare low flow conditions. The depositions confirmed both of these errors (See Trowbridge Dep. at 441-445; Currier Dep. at 103). In particular, the application of the numeric criteria under short-term, rare low flow conditions and at the end of a reduced mixing zone was completely at odds with the development of the criteria, which were based on long- term, median (multiyear) conditions in ambient exposure levels. Id. Therefore, the Region misapplied the criteria and the calculations that were used to assess the degree of impact from the discharge, were all in error (assuming that the nutrients being discharged were actually causing demonstrable adverse impacts).

11. Improper Impairment List Based on CLF Influence and Further Verification of Science Misconduct in the Development of the Permit Requirements

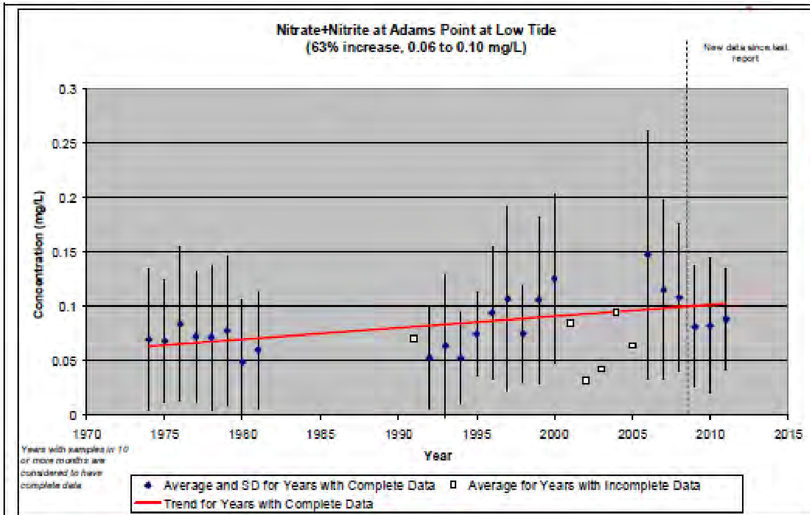
The Coalition had raised concerns regarding the claims that Great Bay was eelgrass impaired due to nutrients and why the impairment listing changed prior to the opportunity for the public to formally comment on the legal and technical basis of the draft 2009 Numeric Nutrient Criteria. Mr. Currier acknowledged that the 2009 Criteria changed and set new water quality requirements for Great Bay. (Currier Dep. at 100-101, 140). Absent the application of the 2009 Criteria, the waters would not have been designated nutrient impaired. DES acknowledged that had planned to formally adopt the criteria prior to use in designating waters impaired or in setting permit limitations. (Currier Dep. at 143, 148-149). Under deposition, it was revealed that (1) EPA told DES to call the numeric criteria "translators" and thereby avoid the criteria adoption/approval process and (2) EPA pushed DES to declare Great Bay and the estuary nutrient impaired, because it wanted to avoid a lawsuit with CLF. (Currier Dep. at 78-79, 108-110). Both of these actions were highly inappropriate and demonstrate that EPA has been acting improperly in promoting nutrient reduction for Great Bay, in opposition to the requirements of the Act.

Impairment designations are required to be based on objective data, not avoidance of lawsuits. 40 CFR 130.6. The objective information presented to EPA at that time by DES, was that there was no cultural eutrophication and there was no nutrient induced transparency problem occurring in Great Bay. EPA was aware that the numeric nutrient criteria required adoption to conform to CWA requirements; however, EPA informed DES that it should violate the law by simply calling the numeric criteria a "narrative translator." This was a gross violation of the Coalition community's due process rights for public participation in criteria adoption as well as mandatory provisions of the Act (Section 101(e) and 303(c)). EPA needs to withdraw these permits promptly and request that DES begin the standards adoption process if it wishes to use these criteria to declare waters impaired and set permit requirements.

Based on the above supplemental comments it is requested that the proposed permits for Exeter, Newmarket and Dover be withdrawn.

ATTACHMENTS

Figure NUT2-3: Nitrate+nitrite concentration trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
(black circle with white plus sign)

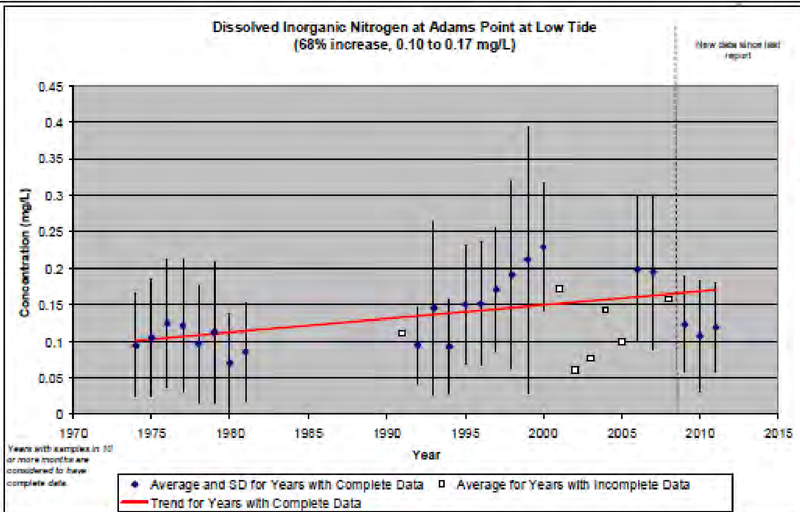
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 0.084 mg/L

Long Term Trend: 63% increase, 0.06 to 0.10 mg/L

Recent Change: Lower

Figure NUT2-4: Dissolved inorganic nitrogen concentration trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
(black circle with white plus sign)

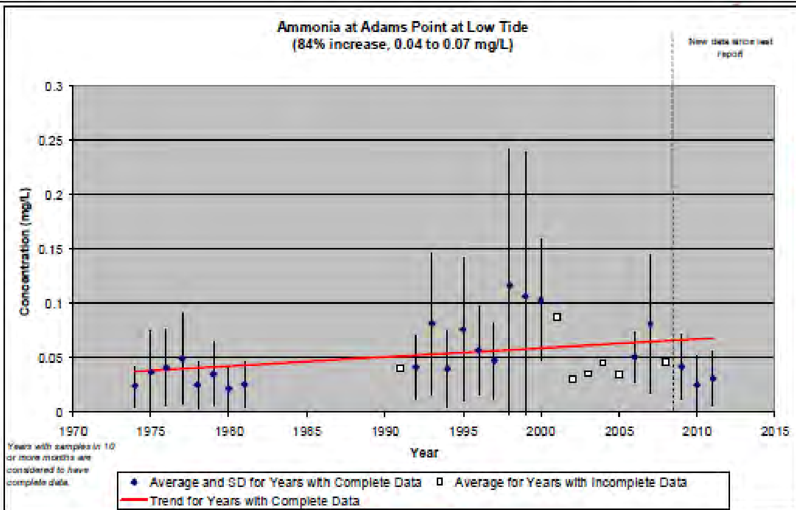
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 0.116 mg/L

Long Term Trend: 68% increase, 0.10 to 0.17 mg/L

Recent Change: Lower

Figure NUT2-2: Ammonia concentration trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
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Station: GRBAP (Adams Point between Great Bay and Little Bay)

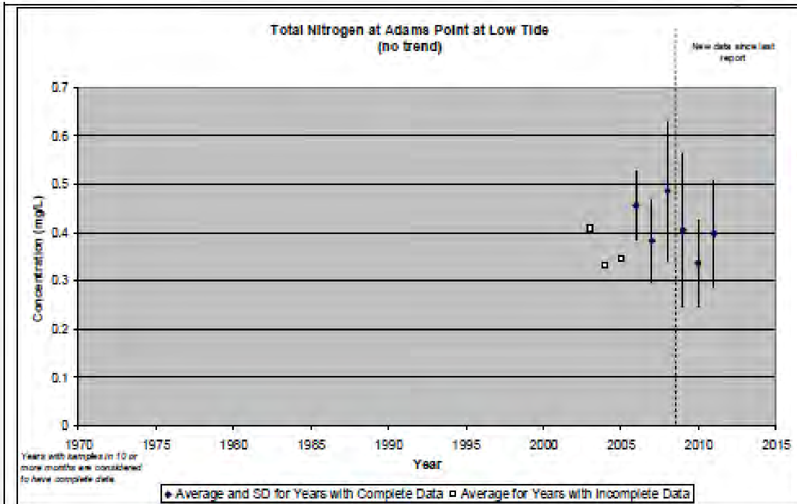
Average Concentration in 2009-2011: 0.033 mg/L

Long Term Trend: 84% increase, 0.04 to 0.07 mg/L

Recent Change: Lower

PREP

Figure NUT2-6: Total nitrogen concentration trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
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Station: GRBAP (Adams Point between Great Bay and Little Bay)

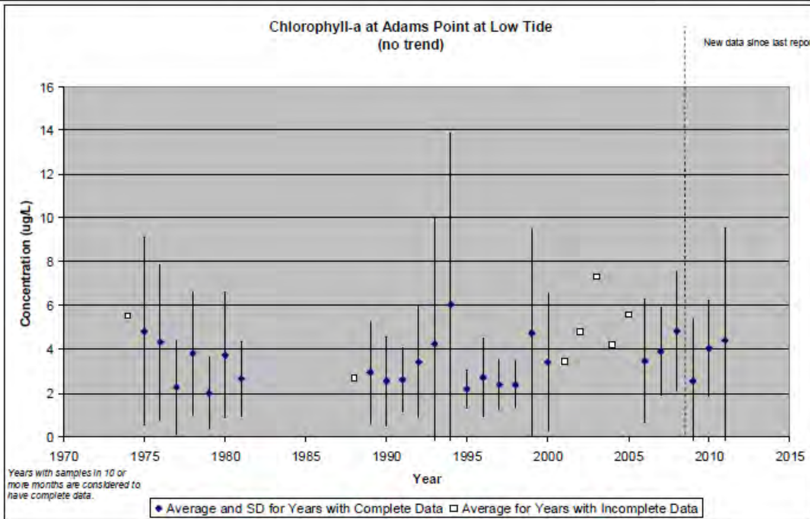
Average Concentration in 2009-2011: 0.380 mg/L

Long Term Trend: No significant trend

Recent Change: Lower

PREP

Figure NUT3b-2: Chlorophyll-a trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
(black circle with white plus sign)

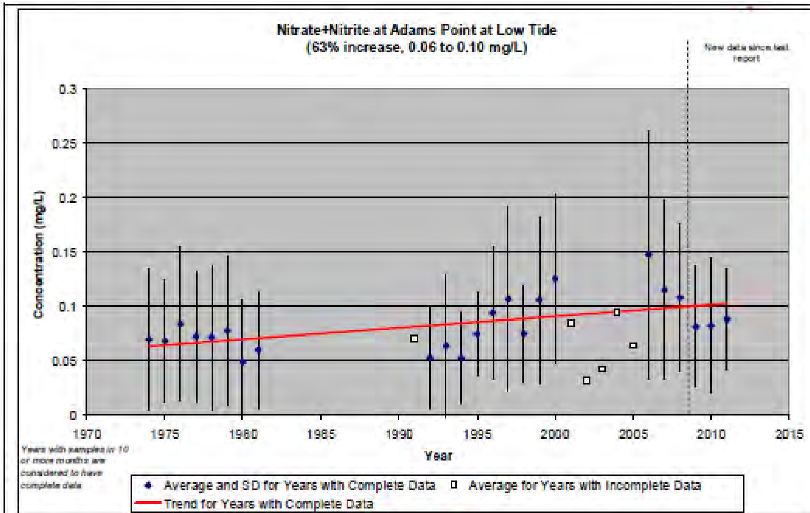
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 3.6 ug/L

Long Term Trend: No significant trend

Recent Change: None

Figure NUT2-3: Nitrate+nitrite concentration trends at stations in the Great Bay Estuary



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Recent Change: Lower

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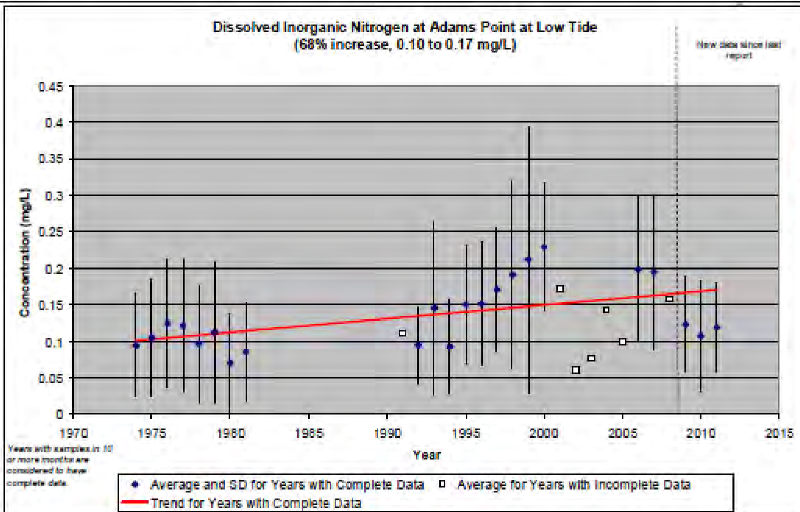

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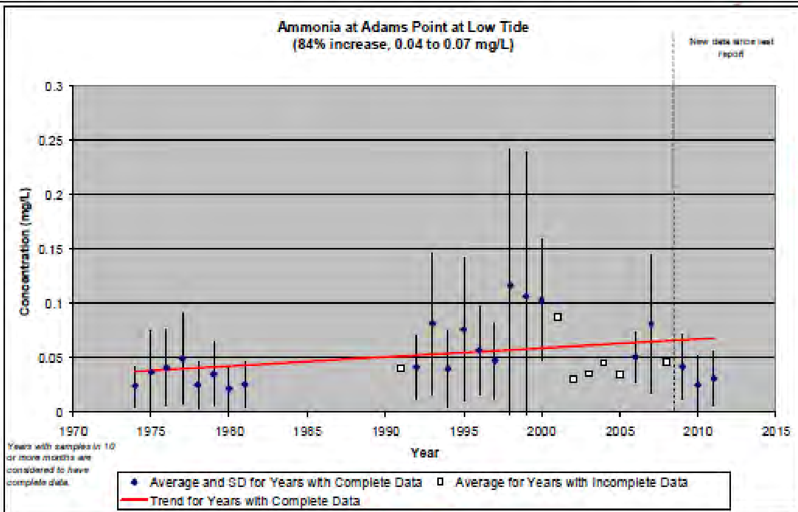


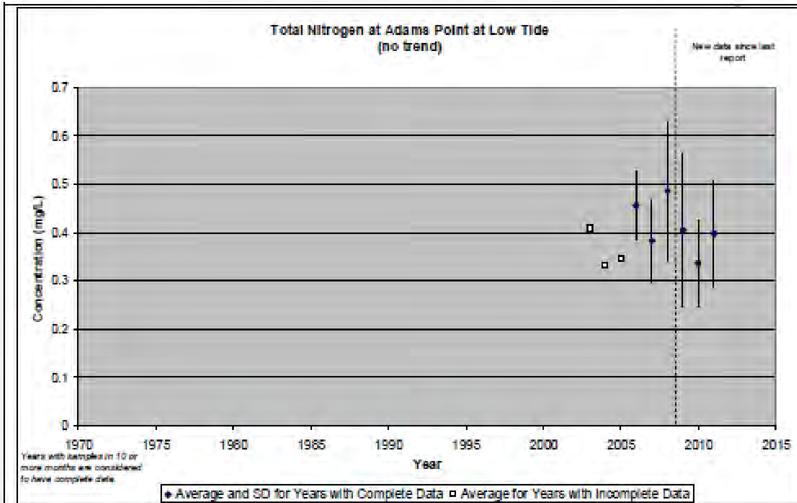
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 0.033 mg/L

Long Term Trend: 84% increase, 0.04 to 0.07 mg/L

Recent Change: Lower

Figure NUT2-6: Total nitrogen concentration trends at stations in the Great Bay Estuary



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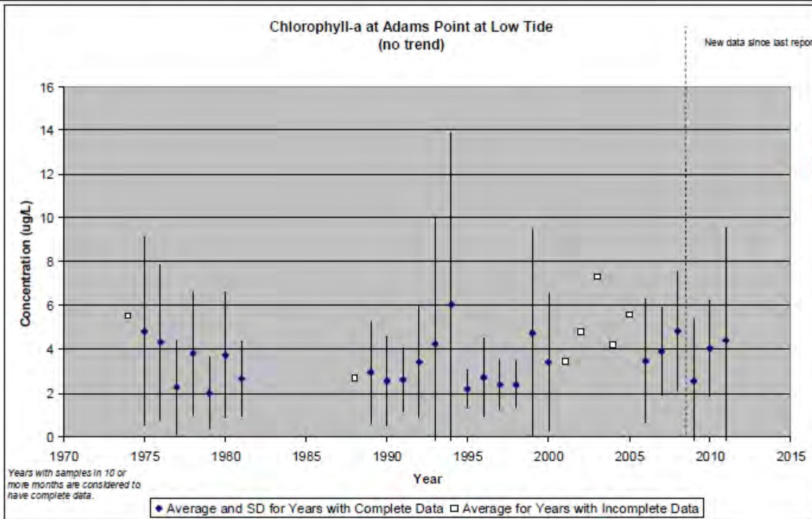

Monitoring Location (GRBAP)
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Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 3.6 ug/L

Long Term Trend: No significant trend

Recent Change: None

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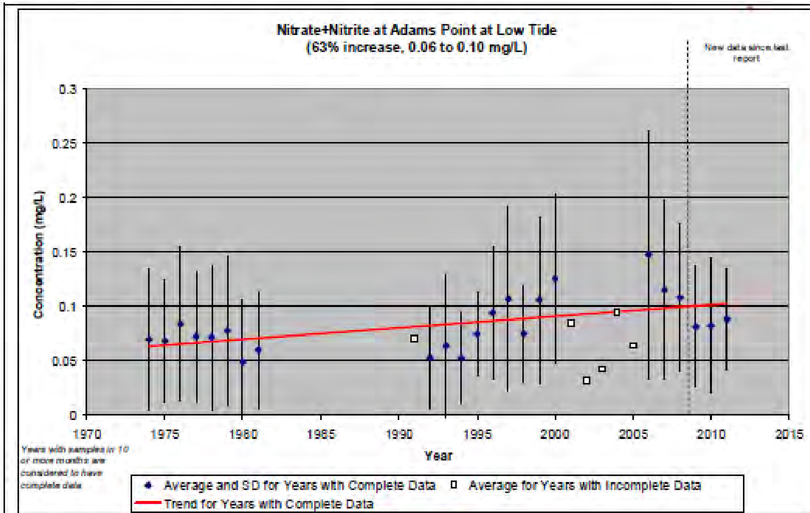

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Recent Change: Lower

PREP

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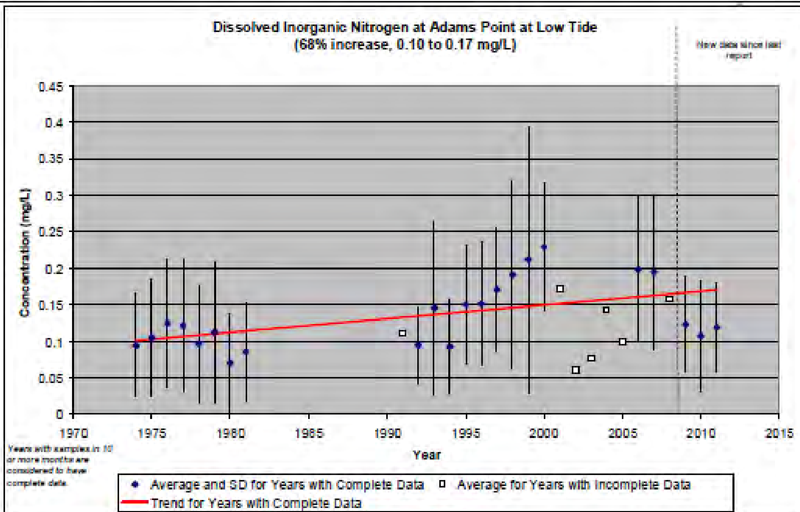

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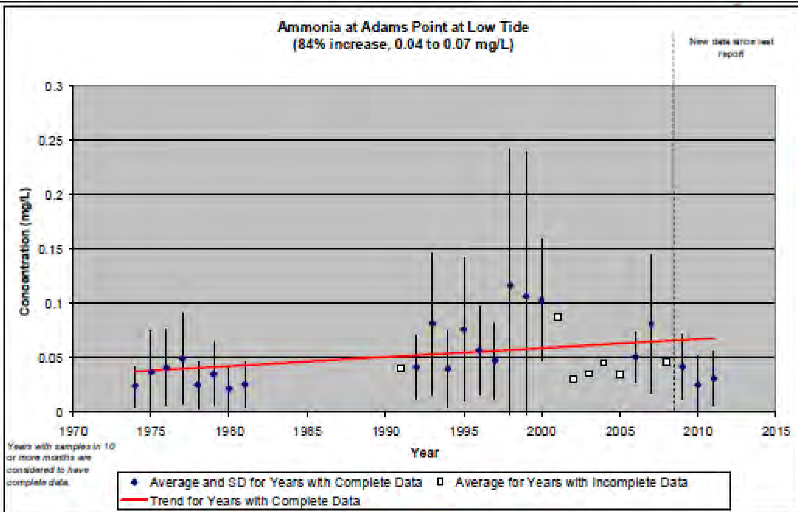

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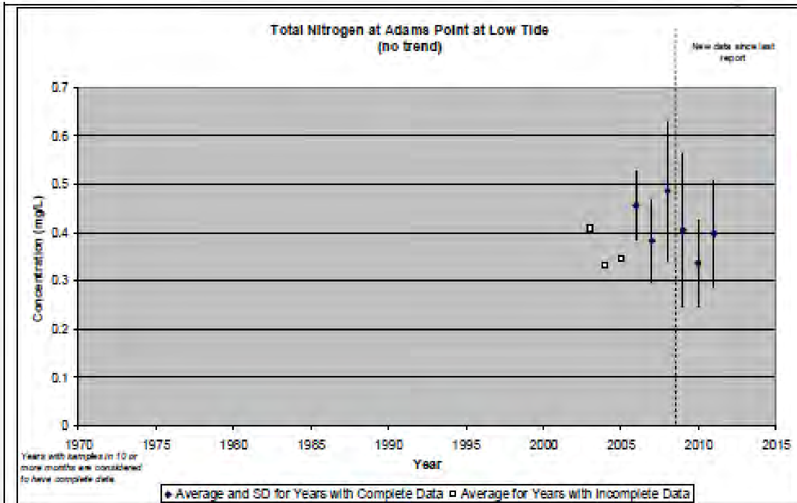
Recent Change: Lower

Figure NUT2-6: Total nitrogen concentration trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
(black circle with white plus sign)

Station: GRBAP (Adams Point between Great Bay and Little Bay)

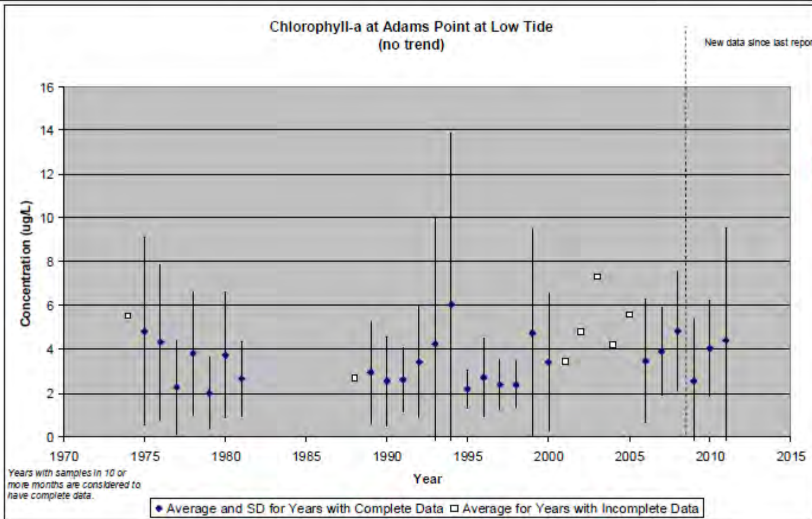
Average Concentration in 2009-2011: 0.380 mg/L

Long Term Trend: No significant trend

Recent Change: Lower

PREP

Figure NUT3b-2: Chlorophyll-a trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
(black circle with white plus sign)

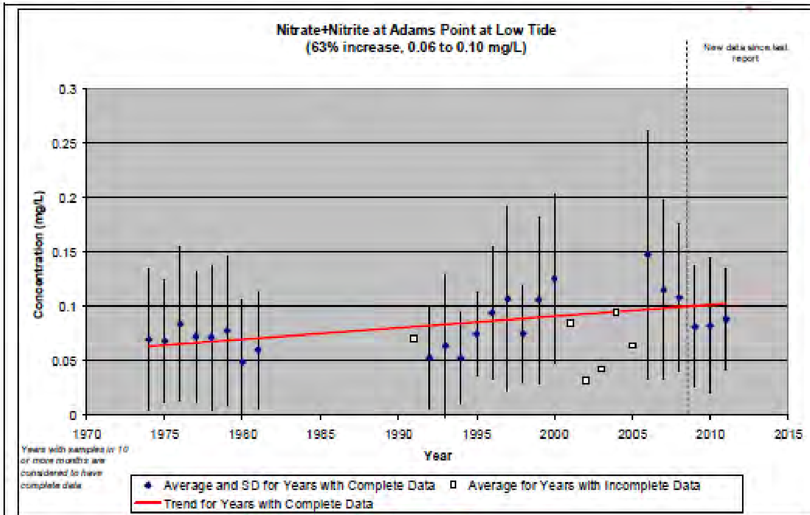
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 3.6 ug/L

Long Term Trend: No significant trend

Recent Change: None

Figure NUT2-3: Nitrate+nitrite concentration trends at stations in the Great Bay Estuary



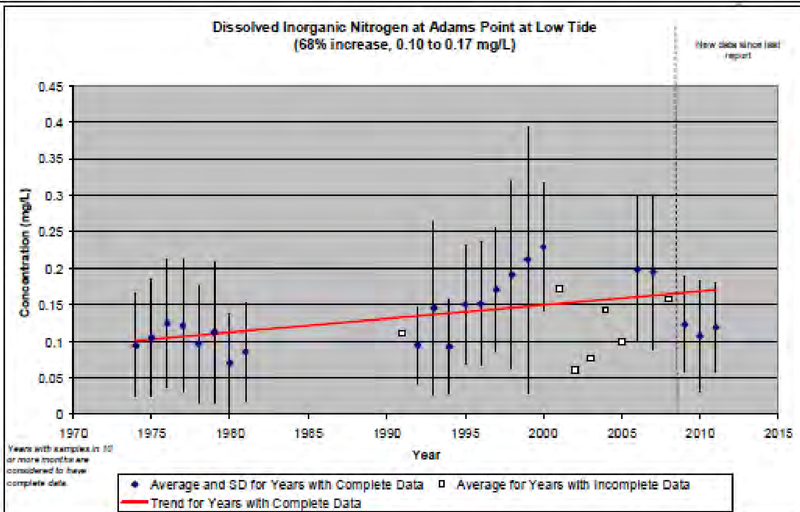
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 0.084 mg/L

Long Term Trend: 63% increase, 0.06 to 0.10 mg/L

Recent Change: Lower

Figure NUT2-4: Dissolved inorganic nitrogen concentration trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
(black circle with white plus sign)

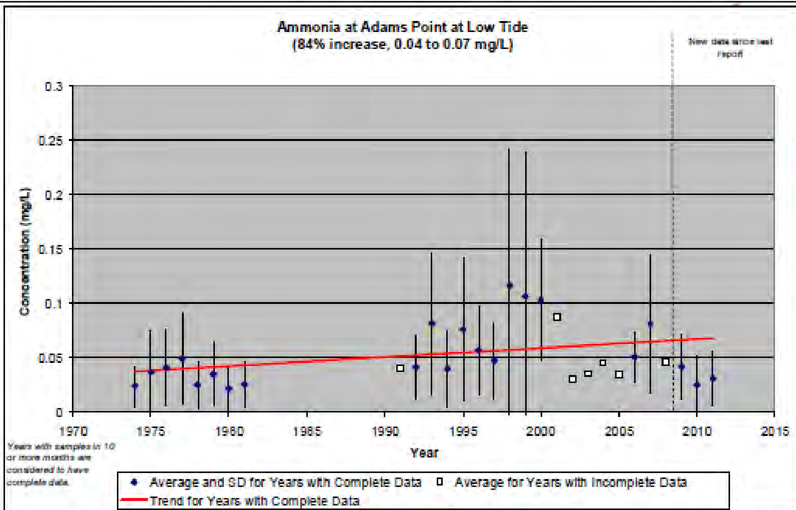
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 0.116 mg/L

Long Term Trend: 68% increase, 0.10 to 0.17 mg/L

Recent Change: Lower

Figure NUT2-2: Ammonia concentration trends at stations in the Great Bay Estuary



Monitoring Location (GRBAP)
(black circle with white plus sign)

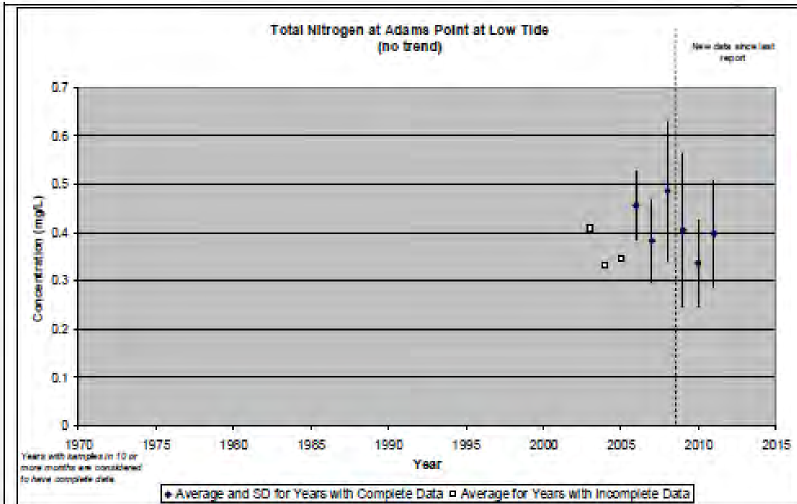
Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 0.033 mg/L

Long Term Trend: 84% increase, 0.04 to 0.07 mg/L

Recent Change: Lower

Figure NUT2-6: Total nitrogen concentration trends at stations in the Great Bay Estuary



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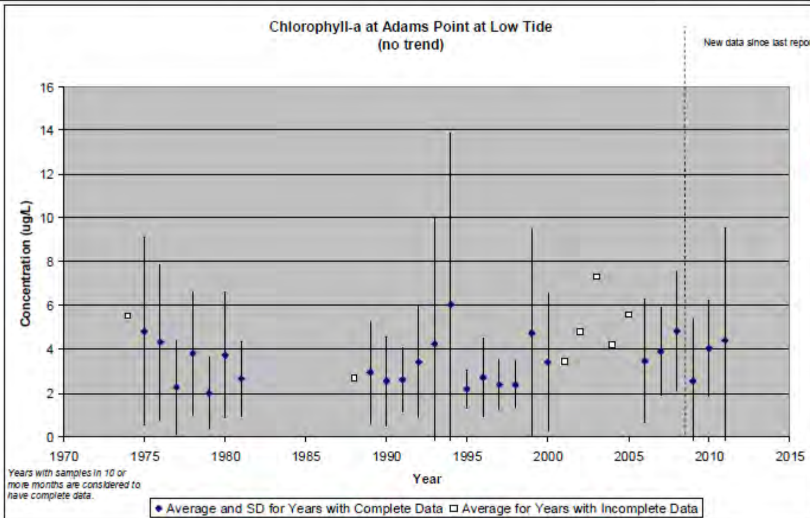

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Recent Change: None

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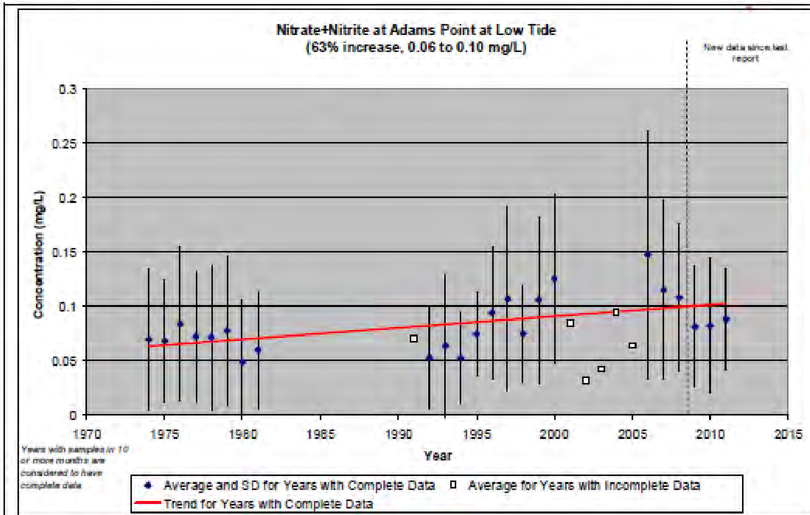

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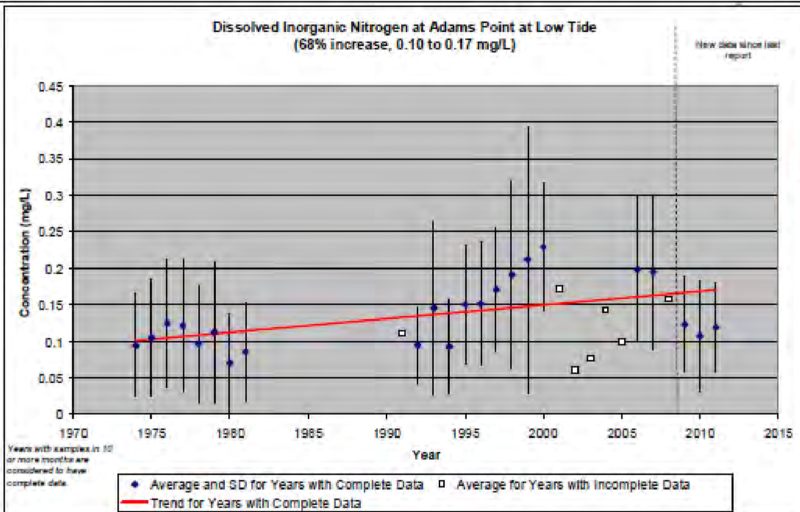

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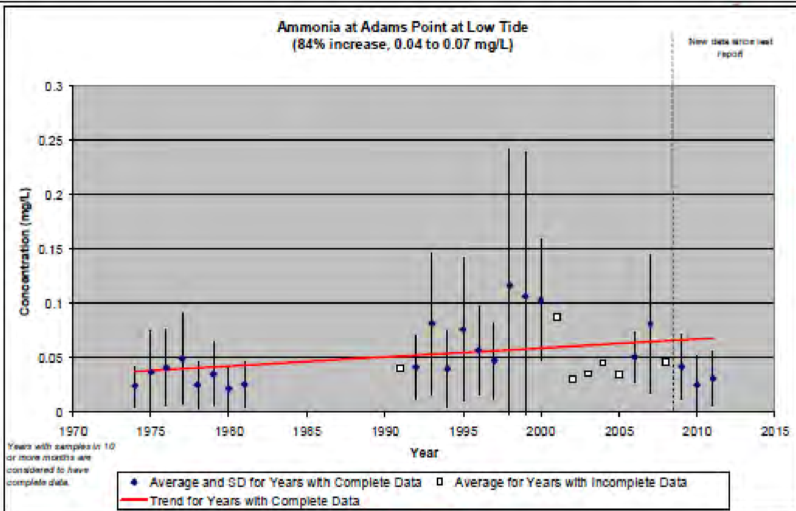

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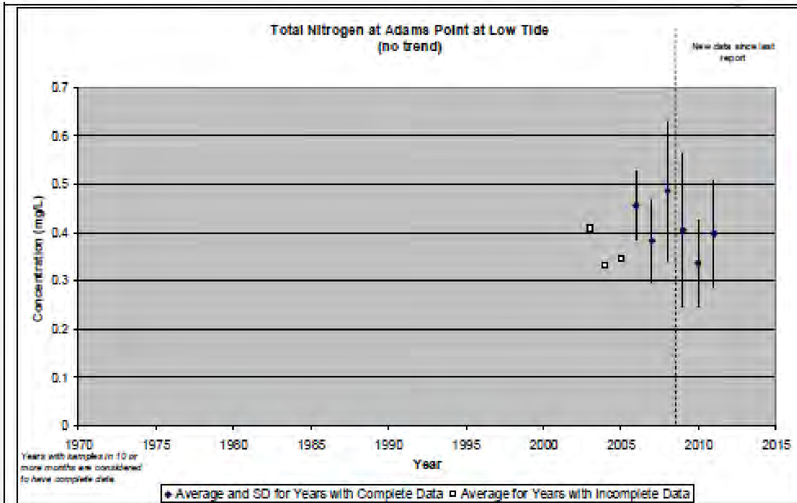

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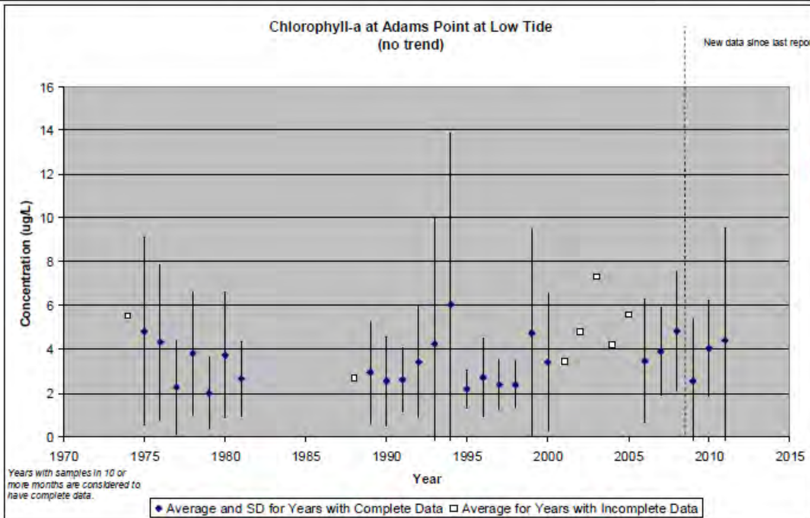

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Station: GRBAP (Adams Point between Great Bay and Little Bay)

Average Concentration in 2009-2011: 3.6 ug/L

Long Term Trend: No significant trend

Recent Change: None

EXHIBIT– 16

HALL & ASSOCIATES

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August 30, 3012

VIA EMAIL & FIRST CLASS U.S. MAIL
Lisa Jackson, Administrator
Arthur A. Elkins, Jr., Inspector General
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

RE: Great Bay Nutrient Criteria and Permit Development - Documentation of Apparent Scientific Misconduct and Agency Bias; Request for Transfer of Matter to Chesapeake Bay Office for Independent Review

Dear Administrator Jackson and Inspector General Elkins:

As you are aware, on May 4, 2012 the Great Bay Municipal Coalition requested an independent review of actions by EPA Region I with respect to nutrient regulation for the Great Bay Estuary. That letter provided considerable documentation of actions that the Coalition believed constituted since misconduct. Since that initial submission, we had requested that the Inspector General's (IG's) Office defer a formal investigation pending discussion of the matter with the Office of Water. It was hoped that those discussions would lead to an agreement that another, independent peer review would be supported by EPA Headquarters. Unfortunately, despite Congressional support for such action as a means to resolve the matter and the group's proffer of sworn deposition testimony confirming the basis of our original request was well founded (see, July 13, 2012 letter to Ellen Gilinsky), no response has been forthcoming. We therefore ask that the IGs Office initiate its review of the serious improprieties that were documented in our original correspondence and confirmed by the depositions of key state officials. (See, attachments, including deposition transcripts)

As discussed in the attached supplemental permit comments, these depositions confirmed that:

1. EPA first informed the state it must formally adopt the new numeric nutrient criteria and then, after CLF threatened to sue EPA if Great Bay wasn't listed as nutrient impaired, EPA told the state criteria adoption wasn't needed. This plainly violated federal law and local due process rights.

2. EPA was under contract to assist the state on nutrient criteria development and was fully aware of the studies showing nitrogen increases in the estuary had not caused adverse impacts on water quality parameters such as algal levels or transparency. EPA asserted nutrient criteria had to be developed in any event and promoted a transparency approach nonetheless.

3. The nutrient criteria document developed by DES with EPA assistance did not include the prior information and findings of studies confirming that nitrogen had not caused adverse impacts. Rather, the analysis was based on a claimed nitrogen transparency relationship that was known to be in error and not represent a "cause and effect" relationship. Consequently, the "peer review" conducted by the Region was purposefully biased to avoid disclosure of information confirming the criteria were not scientifically defensible.

4. Although available data did not show the Great Bay was nutrient impaired, EPA asked DES to change the impairment listing to "nitrogen impaired" to avoid a potential lawsuit with CLF.

In summary, the depositions confirm that scientific and regulatory misconduct has occurred, as originally claimed by the Coalition. Critical scientific information was purposefully excluded from the "weight of evidence" criteria that EPA had a primary role in developing for the Great Bay estuary. Moreover, that information was knowingly shielded from both public and peer review to avoid a finding that the proposed criteria were technically flawed. Wholly improper and unsupported listing decisions were promoted by EPA to appease CLF – regardless of the fact that no objective scientific information from Great Bay supported the position that increasing nitrogen levels had caused a loss in eelgrass populations. Finally, to justify the changed impairment listing, EPA recommended that the state violate federal law by using an unadopted (and scientifically fraudulent) draft numeric criteria to support that action.

Given this information, confirmed by sworn testimony of state officials and local experts familiar with these events, we ask that the IG's office proceed with its investigation, as it is apparent that the Office of Water has no intention of rectifying these serious violations of ethical duties, statutory mandates and administrative law.

Please do not hesitate to contact me if you have any question regarding the enclosed information or allegations contained herein.

Respectfully submitted,

/s/

John C. Hall

Enclosures

cc: Coalition Members
Curt Spaulding, Administrator of EPA Region I
Thomas Burack, Commissioner of NH DES
Gov. John Lynch
Rep. Frank Guinta
Sen. Jeanne Shaheen
Sen. Kelly Ayotte
Rep. Darrell Issa

EXHIBIT– 17
(no document)

EXHIBIT– 18

From:	John Hall
To:	Perkins.Stephen@epamail.epa.gov; Dan Arsenault (Arsenault.Dan@epamail.epa.gov); Ellen Gilinsky <Gilinsky.Ellen@epamail.epa.gov> (Gilinsky.Ellen@epamail.epa.gov)
Cc:	Ted.Diers@des.nh.gov; "Peter H. Rice"; dean_peschel@yahoo.com; "Jennifer Perry"; Sean Greig (sgreig@newmarketnh.gov); Drew Serell; Dana Bisbee; jpeltonen@sheehan.com; Robert R. Lucic; E Tupper Kinder (ekinder@NKMLawyers.com); "David Green (david.green@rochesternh.net)"; "Gallagher, Thomas (Thomas.Gallagher@hdrinc.com)"; Mancilla, Cristhian; Tonja Scott; Keisha Sedlacek
Subject:	RE: Supplemental Comments by the Great Bay Municipal Coalition re: Draft NPDES Permit No. NH0101311 for the City of Dover, NH; Town of Exeter, NH, NPDES Permit No. NH0100871; Town of Newmarket, NH, NPDES Permit No. NH0100196
Date:	Wednesday, September 12, 2012 4:30:22 PM
Attachments:	Salinity Readings Great Bay Buoy 2005-2011.pdf Causes of Periodic Low DO Unknown - Trowbridge Deposition - 6-23-12.pdf Elevated TN Did Not Cause Increased Algal Growth Impacting Transparency - Trowbridge Deposition - 6-23-12 - 7-11-12.pdf Exclusion of Prior Studies from Record - Trowbridge Deposition - 7-11-12.pdf Experts Confirm Great Bay NOT Transparency Limited System - Trowbridge Deposition - 6-23-12 - 7-11-12.pdf Macroalgale Impacts on Eelgrass in Great Bay Not Apparent - Trowbridge Deposition - 6-23-12 - 7-11-12.pdf TN Control Ineffective in Tidal Rivers - Trowbridge Deposition - 7-11-12 - Pages 421-434.pdf

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Dear Stephen

In our supplemental comments we noted that eelgrass populations plummeted in Great Bay and the lower tributaries in 2006 when extreme rainfall events and prolonged wet weather occurred. This was documented, in part by changing CDOM levels which prior DES and UNH studies confirmed was a surrogate for salinity. In further support of this observation and confirmation that, in 2006, salinity levels were below the level considered necessary for healthy eelgrass growth, please find the attached exhibit showing salinity variation at the Great Bay buoy from 2005-2011. It should be noted that 2006 was the only period in the record that salinity averaged below 10 PPT for approximately 35 days during the peak growing season for eelgrass. While other years had wet weather events, they were earlier (typically April) and far less severe and therefore far shorter in duration. As noted previously, during 2006, transparency in the Bay (and therefore in the lower tidal river) was also extremely poor due to the extreme runoff events occurring. This combination of events could certainly account for and was most likely the cause of the dramatic eelgrass decline occurring in 2006. Attributing that decline to nitrogen induced transparency changes is unsupportable given this information. Please add these graphs to the permit record as they expand on comments previously submitted and were only recently generated from the achieved data.

In earlier correspondence we provided full copies of deposition transcripts and related cite references that addressed critical admissions confirming that there is no objective scientific basis to conclude TN caused the changing eelgrass populations in the system or periodic low DO in the tidal rivers. These transcripts also confirmed, *inter alia*, the deficiencies in the 2009 criteria, EPA's peer review and that TN reduction could not materially improve transparency in this system. As a courtesy, we are providing selected excerpts of the transcripts, with highlights, to ensure that there is no misunderstanding with regard to the statements made by DES which confirm that the Coalition's positions are well supported.

Thank you for your ongoing consideration of this information in the permit process.

John

John C. Hall
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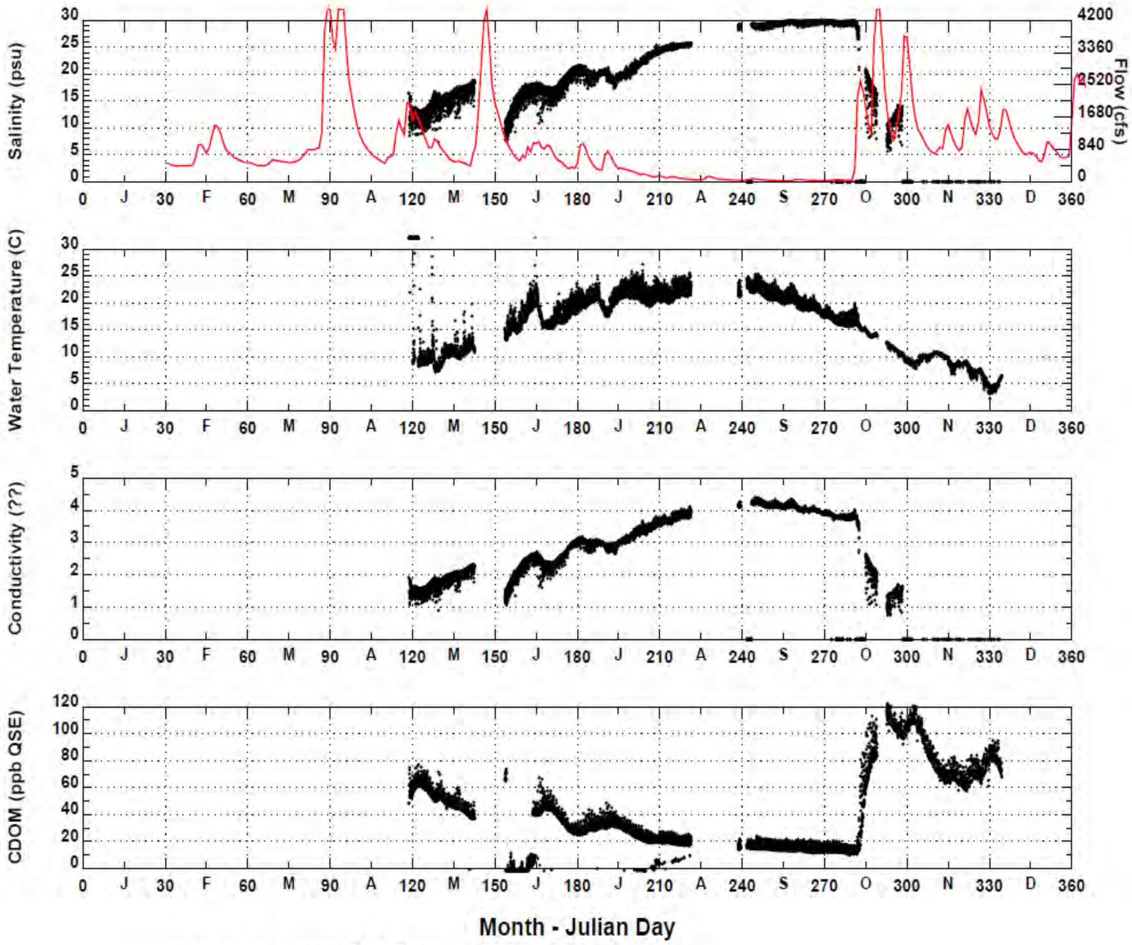

Figure 1a. Great Bay Buoy 2005 Measurements

/coral1/haas0040/wq/pgb_buoy_1yy.gdp
DATE: 7/16/2012 TIME: 16:26:22

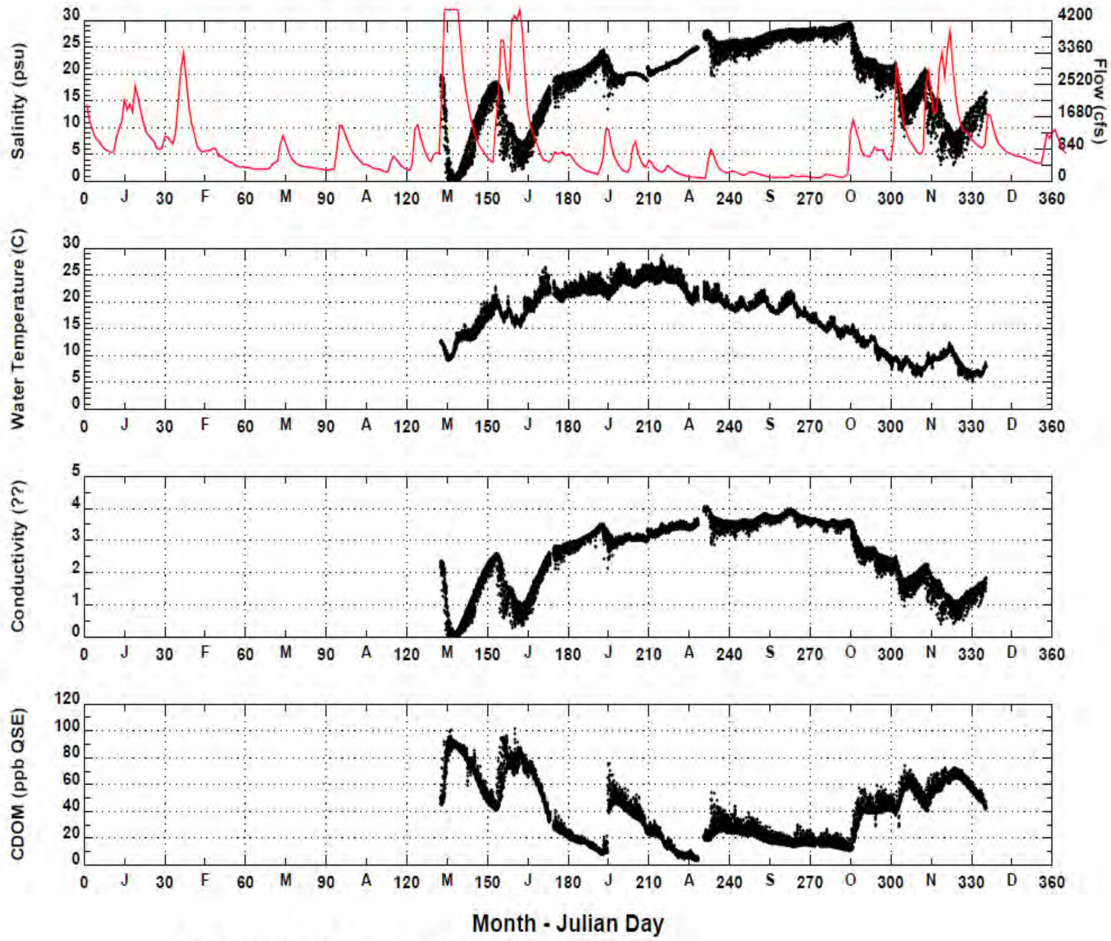

Figure 2a. Great Bay Buoy 2006 Measurements

/coral1/haas0040/wq/pgb_buoy_1yy.gdp
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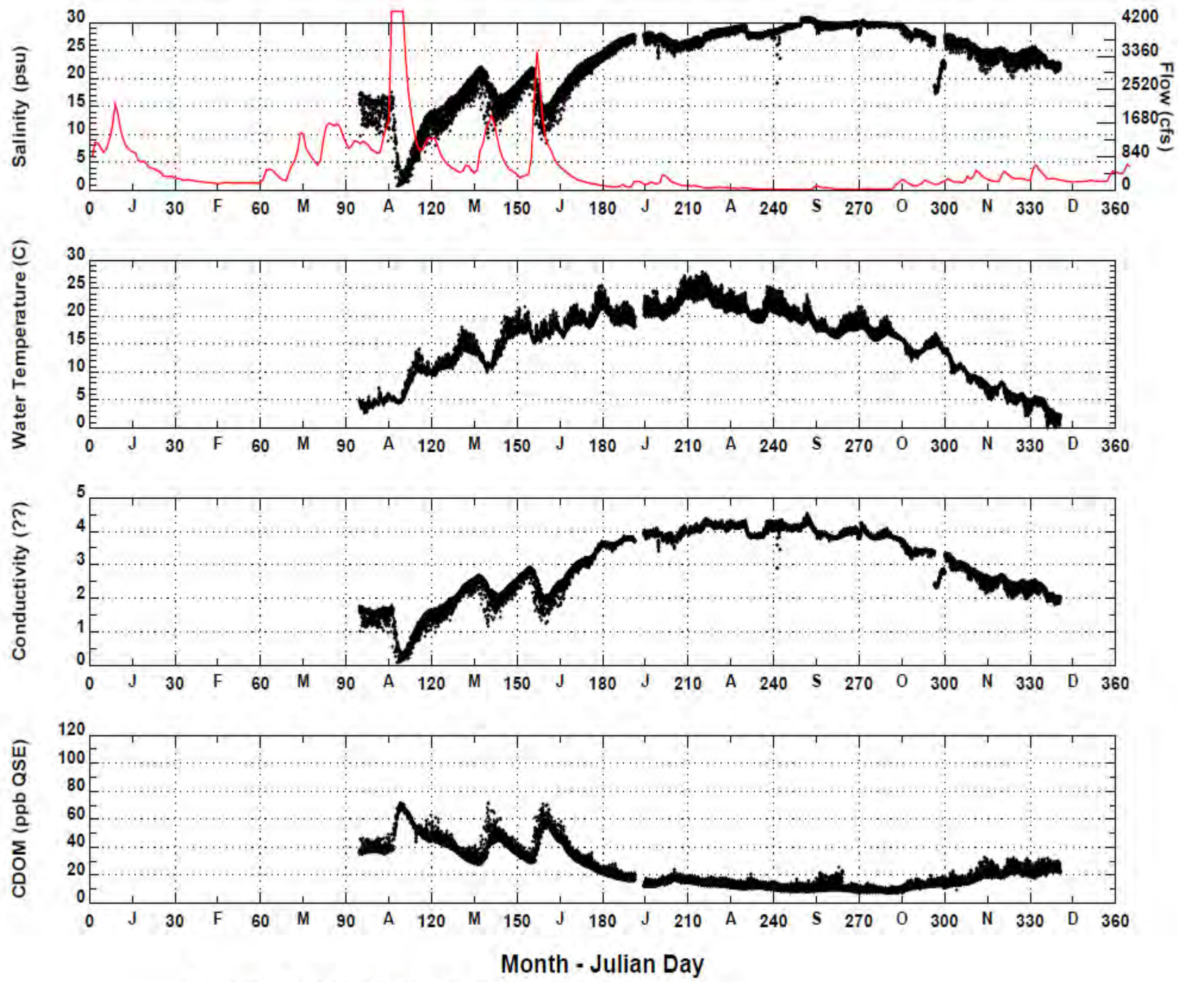

Figure 3a. Great Bay Buoy 2007 Measurements

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DATE: 7/16/2012 TIME: 16:26:30

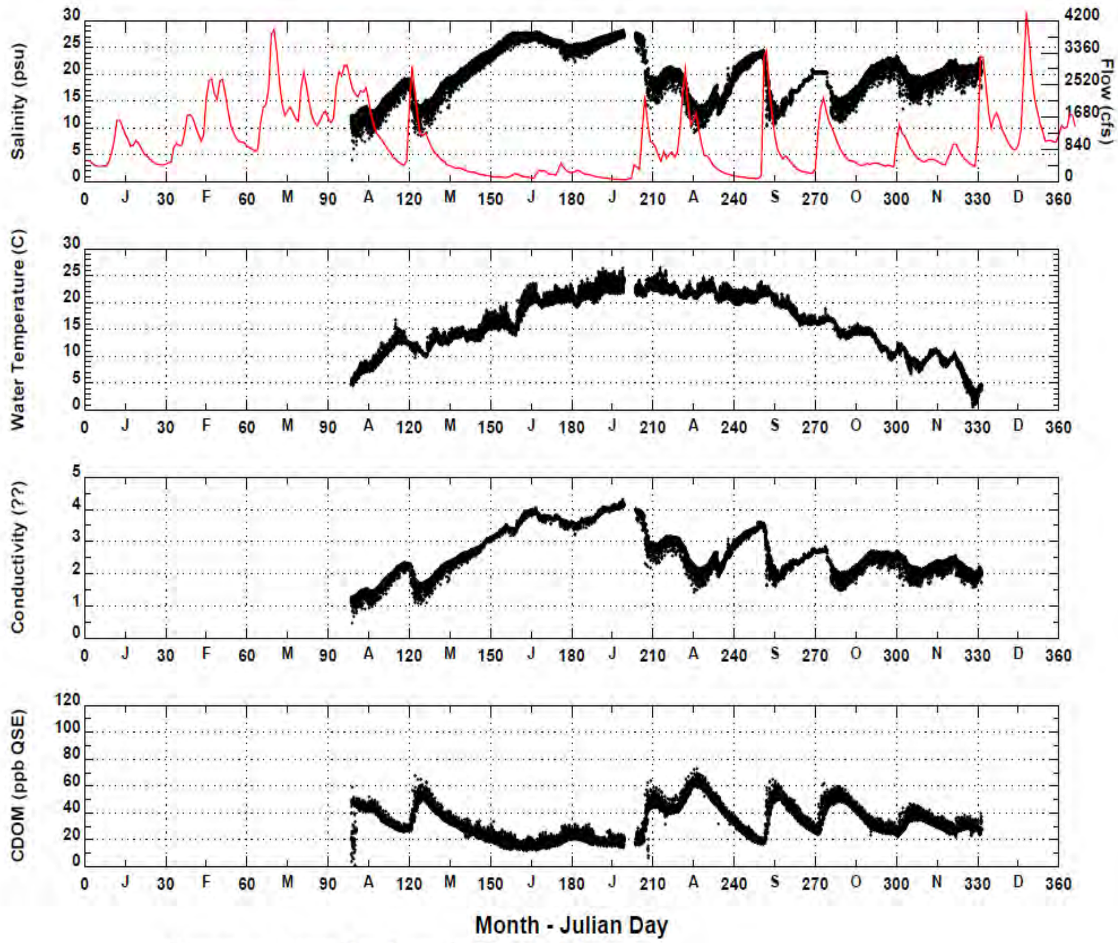

Figure 4a. Great Bay Buoy 2008 Measurements

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DATE: 7/16/2012 TIME: 16:26:34

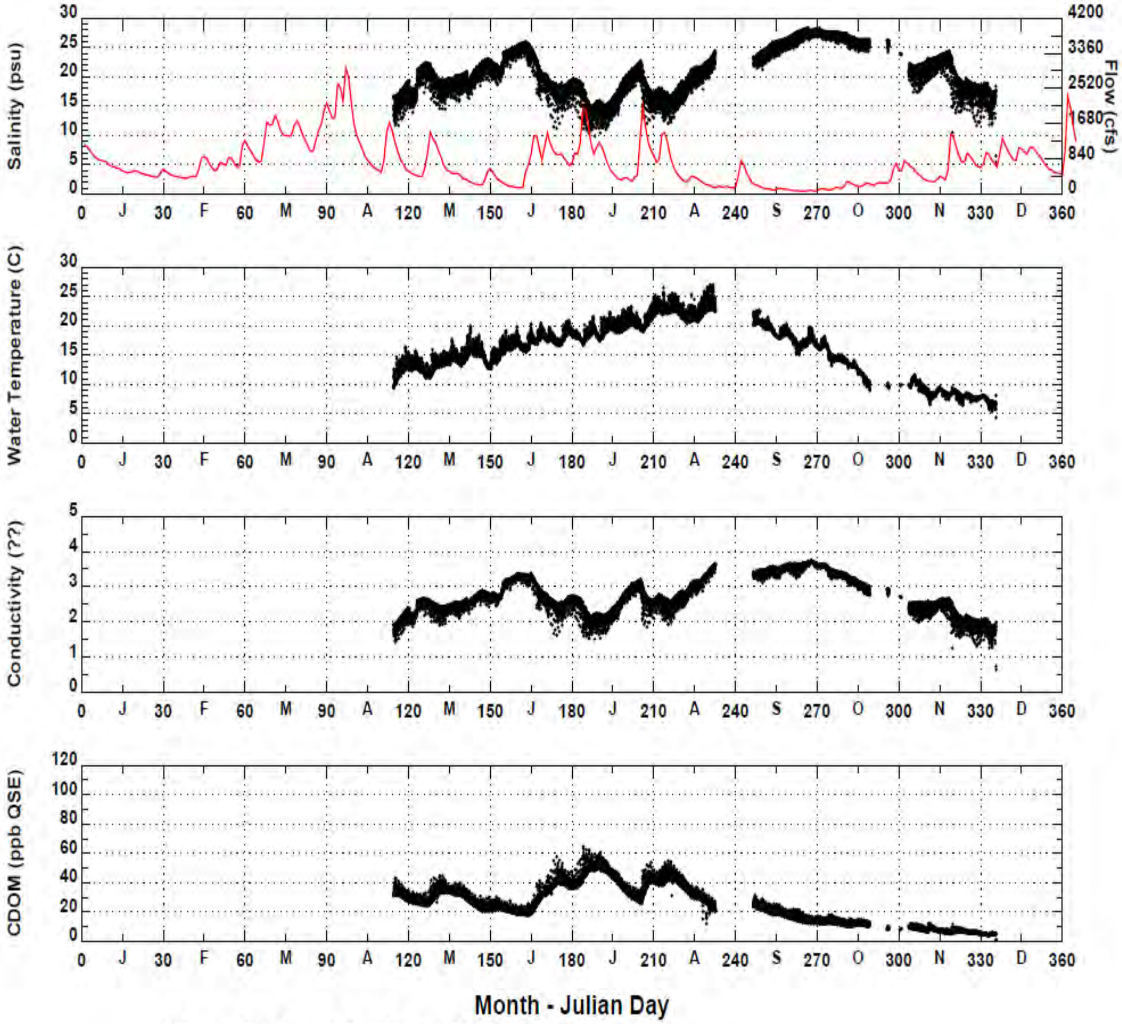

Figure 5a. Great Bay Buoy 2009 Measurements

/coral1/haas0040/wq/pgb_buoy_1yy.gdp
DATE: 7/16/2012 TIME: 16:26:37

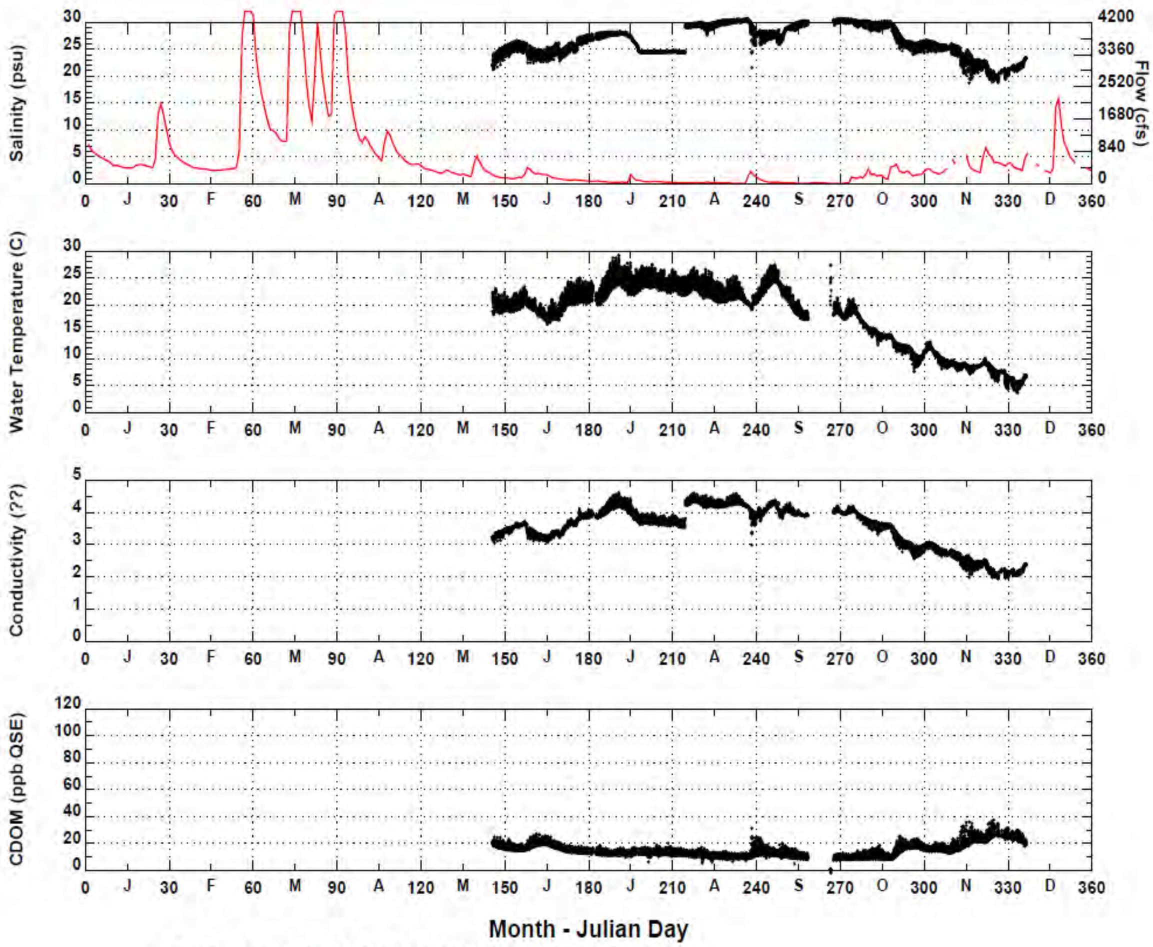

Figure 6a. Great Bay Buoy 2010 Measurements

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DATE: 7/16/2012 TIME: 16:26:41

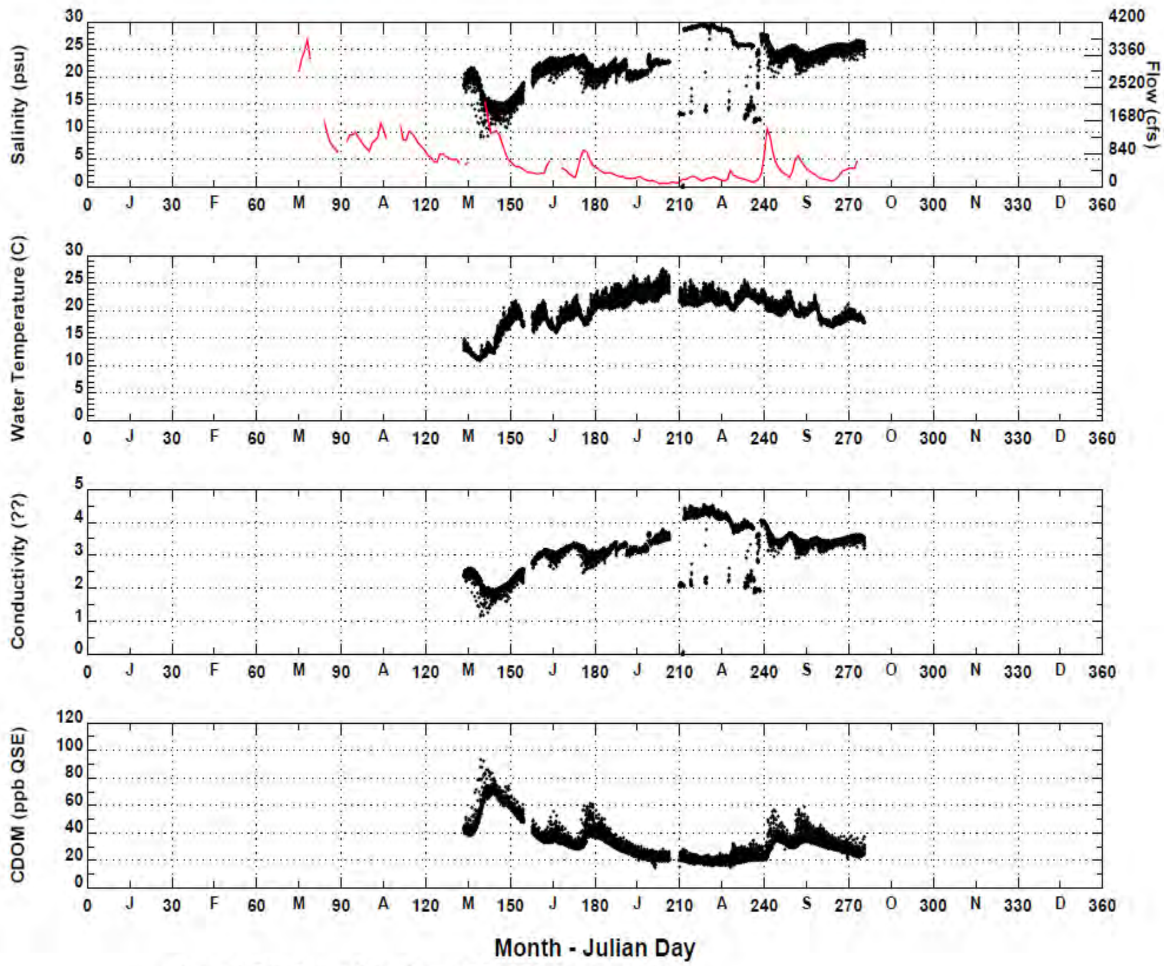

Figure 7a. Great Bay Buoy 2011 Measurements

/coral1/haas0040/wq/pgb_buoy_1yy.gdp
DATE: 7/16/2012 TIME: 16:26:44

statement?

MR. HALL: The possible reasons or causes of sporadically low DO concentrations are not known and, in some cases, the low concentrations may be a natural phenomenon.

A. Uh-huh. Yes, there's been some more recent studies on the Lamprey River that indicate that there is a -- some salinity stratification that affects dissolved oxygen in the Lamprey River.

Q. Is that directly caused by algal blooms, that salinity stratification?

A. The stratification itself is not caused by algal blooms.

Q. Is the stratification a natural condition in that system?

A. Do you consider a dam to be a natural condition?

Q. It's part of the existing setting. Yeah, let's leave the dam as part of the natural condition.

A. I would argue that's not natural, it's the existing condition. I guess flushing is an important consideration related to salinity.

Q. Which nonnatural factor is controlling the stratification in the system?
A. I don't know.
Q. Do you know if any nonnatural factor is controlling stratification?
A. I don't know. I -- the reason I'm raising the issue of flushing is that it's just a factor that needs to be considered related to stratification.
Q. So when you're raising this issue, you're just guessing because you just told me --
A. No.
Q. -- you don't know, right?
A. I am explaining the factors that are involved in making that kind of assessment.
MR. MULHOLLAND: Can we take a short break?
MR. HALL: Absolutely.
MR. KINDER: Yup.
(Recess taken from 9:50 a.m. until 9:54 a.m.)
MR. HALL: We're back on the record.
Where were we on the last question?

(The question and answer were read by the reporter.)

BY MR. HALL:

Q. Regarding the statement that some of the DO conditions in these tidal rivers, I presume, may be caused by natural conditions, can you provide a little more explanation as to what -- what was meant by that statement, if you know?

A. Yeah, I don't know.

Q. Can you tell me what kind of natural -- what type of natural condition could cause low DO in the system?

A. I think there are many, but I'm not sure exactly.

Q. Well, tell me what they are. I mean, you were very happy to give us the list of all these other things that you thought were impacted, the stratification in the system, so you're the scientist that they hired to do the analysis of the technical data. Give me an idea of what you know on natural conditions that can cause low DO in a tidal estuary.

A. There can be low DO in some salt marshes.

Q. And how can that affect the DO in the rivers?
A. It can affect the river in some cases.
Q. How does that happen? I mean, what -- what allows a marsh to affect the river?
A. Tidal interchange.
Q. Okay. And when you say tidal interchange, you mean the water flows into the marsh at a higher DO, the marsh causes the DO to drop, and then when the water ebbs back out of the marsh, the water exiting the marsh is then -- has low dissolved oxygen and that drops the DO in the river, correct?
A. That's one pathway that that can happen.
Q. Okay. Can you give me another pathway?
A. Groundwater.
Q. Okay. Could you explain how that happens?
A. Water moves through the ground or the vadose zone and then enters the estuary through subtidal exchange.
Q. Okay. Anything else that you can think of that can cause a -- how and why does

stratification trigger a low DO condition in a tidal system? Can you explain that to us?

A. Stratification results in stagnant water in which the oxygen can be depleted without being refreshed.

Q. Okay. And where -- where does this oxygen deletion occur? Does it occur through the entire water column in the river or does it just occur in the area where the stratification is occurring?

A. It occurs in the area where the stratification exists.

Q. Okay. Which of the tidal rivers experience significant stratification, do you know? I mean, when I talk about tidal rivers -- let's go one by one.

Do you know if the Squamscott River experiences any significant stratification?

A. I don't know.

Q. Okay. What about the Lamprey?

A. The Lamprey does experience stratification under certain conditions.

Q. Okay. Oyster, Oyster River?

A. I don't know.
Q. Bellamy?
A. I don't know.
Q. Winnicut?
A. I don't know.
Q. Cocheco?
A. I don't know.
Q. Upper Piscataqua?
A. I don't know.
Q. Okay. Is the -- can you explain the reason you don't know? Is it -- is it because research hasn't been done on that issue for those rivers or you're just not familiar with what research has been done for the area on that question?
A. To my knowledge, detailed studies of stratification have not been done on those other rivers.
Q. Okay. Is -- the only river with the detailed study on stratification is the Lamprey?
A. Yes.
Q. Okay. In terms of factors affecting oxygen loss in a river system, are some of those factors that can -- one of them is sediment oxygen

demands, correct?

A. Yes.

Q. Okay. Is sediment oxygen demand affected by natural as well as manmade sources?

A. It can be.

Q. Okay. For -- let's go river by river.

For the Squamscott River, do you know how much of the sediment oxygen demand in that river -- well, first question is do you know how much the sediment oxygen demand is in that river?

A. No.

Q. Okay. This will be an easy one. Have sediment oxygen demand studies been done on any of the major tidal rivers to the estuary, to your knowledge?

A. Not to my knowledge.

Q. Okay. And -- all right. So we don't have sediment oxygen demand studies.

Do we have any idea of how much sediment oxygen demand could be caused by algal growth in those systems at this time?

A. No.

Q. No. Do we know how much sediment

oxygen demand is caused by the -- what I'll say the natural runoff, leaf material and other things that happen in these systems from the watershed?

A. No.

Q. Okay. So it -- if you don't know the sediment oxygen demand and you -- and we don't -- let's take the Squamscott as an example. If we don't know the sediment oxygen demand and we don't know the stratification question, how do you determine the Squamscott River, how much of the low DO is caused by algal growth versus other natural factors -- or other factors, just make it, natural or not.

A. Uh-huh. You're asking to determine the causes of the low DO?

Q. No. Yeah. There's low DO in the Squamscott River, right?

A. Yes.

Q. And it can be caused by a number of factors, correct?

A. Yes.

Q. All right. How can we know at this point in time how much of that low DO is caused by algal growth versus other factors if we haven't analyzed the other factors that affect DO in the system?

A. We don't have the information to do that analysis.

Q. All right. That's what I thought. I mean, it's -- and that was one of the reasons why the HydroQual study was initiated, right, to try to gain some further insight as to what was affecting the DO regime in the Squamscott River?

A. I don't know why that study was done. I mean, I know it was part of a plan for the Squamscott River, but I don't know the exact motivation.

MR. HALL: Evan, could we go outside for one more minute?

MR. MULHOLLAND: Okay.

MR. HALL: Off the record.

(Off-the-record discussion.)

MR. HALL: We're back on the record. I think counsel for Mr. Trowbridge may have refreshed his recollection as to the -- what may have occurred for the -- on the last question.

Could you please read that question

MR. KINDER: Yeah.

BY MR. HALL:

Q. As I said, start at the mouth. Start at the mouth and work your way up. Tell me where you got the information showing nitrogen has caused elevated algal growth that significantly affected water clarity in that area of the system. Start at the mouth.

A. Uh-huh.

Q. Now. Please.

Did it happen at the mouth, at Portsmouth Harbor?

THE WITNESS: I -- all right. Can I -- can I talk to you because I need to figure out how to --

MR. HALL: You can certainly take a --

THE WITNESS: I'm having a technical issue with this.

MR. MULHOLLAND: Okay.

(Recess taken from 11:48 a.m. until 11:54 a.m.)

THE WITNESS: All right.

MR. MULHOLLAND: Back on the record.

Do you remember the question?
THE WITNESS: Yes, I remember the question.
A. So you asked for areas where we have data showing chlorophyll affecting light attenuation. And the other area where we have definitive data on that is at the Great Bay coastal buoy, which was the study that -- or the report that was written either with this grant or with a related grant.
MR. HALL: Can you read back my question, please.
(The question was read by the reporter.)
BY MR. HALL:
Q. Answer the question. Start at the mouth.
A. Start at the mouth?
Q. I don't care where your only other data set is. Answer the question. Start at the mouth.
A. Okay. So at the mouth we don't have that information.
Q. So at the mouth, you do not have data showing that increased nitrogen levels caused

phytoplankton blooms which reduced water clarity, right?

A. Correct.

Q. Lower Piscataqua River, do you have data showing it there?

A. No.

Q. Do you have data showing it in the Upper Piscataqua River?

A. No.

Q. Do you have data showing it occurred in the Lamprey River?

A. No.

Q. Do you have data showing that it occurred in the Cocheco River?

A. No.

Q. Do you have data that show that occurred in Little Bay?

A. No.

Q. And where you do have data, in Great Bay, do you have data showing increased nitrogen levels caused phytoplankton blooms which reduced water clarity in Great Bay?

A. There's two aspects to that question.

We have the data that shows that phytoplankton blooms are a significant component of the light attenuation, which is what we have from the Great Bay buoy study, and total nitrogen was not measured as part of that study.

Q. Answer the question that I posed.

A. Can we read it again?

Q. You like to answer the piece of the question that you want to answer and don't want to answer the piece of the question that you don't want to answer.

Answer the full question, please.

MR. MULHOLLAND: I'll object to the extent it's a compound question. He tried to answer the part --

MR. HALL: He answered it ten times before. Not -- I'm sorry, that's an over -- seven times before. I suspect he can answer it the eighth time.

MR. MULHOLLAND: Go ahead.

A. All right. I explained the information that we have. We don't have that information related to nitrogen causing phytoplankton blooms in the Great

Bay Estuary.

BY MR. HALL:

Q. You don't have that information or do you have information that confirms nitrogen did not cause significant increase in algal levels in Great Bay?

A. I have information that it did not cause it?

Q. Yeah.

A. I don't have that information either.

MR. HALL: I want to break because I want to ask the judge to hold the witness in contempt because I've got a dozen documents written by him that says that's exactly what the data show.

MR. MULHOLLAND: All right.

MR. KINDER: Let's take a break for lunch and come back.

MR. MULHOLLAND: Good luck finding the judge.

MR. PELTONEN: We have --

MR. HALL: Let me submit the documents into the record first.

MR. KINDER: Wait, wait, wait, wait,

John. Let's come back.

MR. MULHOLLAND: Are we on the record or off the record?

MR. KINDER: Let's take a break for lunch and come back.

MR. MULHOLLAND: All right. So off the record?

MR. KINDER: Yup.

MR. MULHOLLAND: Thank you.

(Lunch recess taken from 11:58 a.m. until 1:03 p.m.)

BY MR. HALL:

Q. Okay. So we're back on the record. We're trying to cover the issue on Great Bay. And, Mr. Trowbridge, you indicated that there were significant chlorophyll-a data for Great Bay and I was asking you whether or not those data and other -- whether or not there's any data that you've collected on Great Bay that show that the statement made in exhibit -- have we marked that exhibit yet? Why don't we mark it now before I forget to do it.

(Trowbridge Exhibit No. 58 was marked for identification.)

BY MR. HALL:
Q. Okay. Mr. Trowbridge, doesn't the available data for Great Bay also confirm that that statement is true?
A. I guess one point of clarification.
Are we talking about trend type data or are we talking about site-specific, I guess, detailed analysis data.
Q. Let's go for -- let's do both.
A. Okay. For trend data in Great Bay, depending on how you analyze for chlorophyll, you either see no trend or you'd see some trends. You'll see an increasing trend, depending on what statistical test you do.
Q. Okay. But let's -- for the data that are available, does it support the hypothesis that nitrogen is causing phytoplankton blooms which are reducing water clarity to a great degree? Do the data show that?
A. The data -- the trend analysis, which doesn't show any kind of increased trend, does not support that hypothesis.
Q. We may just have a -- does not

A. That can happen, yes.
Q. Yeah. Okay. So Conclusions, let's look at the conclusions.
Traditional concepts for nitrogen eelgrass relationships do not work for Great Bay.
By the way, who wrote these conclusions? Was this a collaborative effort between you -- between the folks listed on this presentation or was it -- were these just your conclusions?
A. This was certain -- certainly collaborative. It wouldn't have everyone's name on it if they didn't review it.
Q. Okay. Just checking.
So the traditional conceptual models for nitrogen eelgrass relationships do not work for Great Bay.
Which models were you talking about? Was it the loading model or was it the ...
A. Those were -- I can't remember exactly, but it would -- I think the loading models were one that was in this presentation, some of the other research that's been done in the Chesapeake Bay, for instance.

Q. Was it also the model that says phytoplankton -- excessive phytoplankton growth is going to lead to significant decreases in transparency when you increase nutrient loads? Isn't that also one of the conceptual models you're talking about there?

A. Yes.

Q. Okay. So you need to do something different. So you said we need a different model which includes tidal amplitude, sediment resuspension and macroalgae. So you needed something a little bit more complex than just a light attenuation value, right? That's what this is implying.

A. Yes. There's also information -- yes.

Q. Okay. I'd like to show you another email -- now, I understand Fred was a little bit upset. I'm not quite sure why he was a little upset at what you said, but you did some further analysis after that. Do you recall being invited by Phil Colarusso to some kind of eelgrass meeting to do a presentation in March of 2008?

A. Yes.

Q. Can you tell me, what was that meeting

location. So they're kind of a mixture.
Q. No, it's not. It's in two locations?
A. All right. Well --
Q. You've got water on the Piscataqua River which showed it didn't change over time. The only available data -- do you have any other available data other than these data showing whether water clarity changed over this 15-year period in the Piscataqua River and Great Bay where most of your eelgrass resources were?
A. No.
Q. Okay.
A. There was some data collected in Portsmouth Harbor, same -- it's the same group, the same volunteer group.
Q. So the only available data you have shows water clarity didn't change in the Piscataqua River and in Great Bay, right?
A. Right.
Q. All right. Why did you ignore that result in issuing the 2009 criteria documents in claiming that transparency needed to be improved in Great Bay and in the Piscataqua River and in Little

increased dramatically. I don't know by other types of algae, like macroalgae.

Q. I'm only talking about phytoplankton. The nitrogen went up but the phytoplankton levels didn't change?

A. In the place where we have long-term records, which is Adams Point.

Q. So if the phytoplankton levels didn't change, phytoplankton could not have caused a change in transparency; correct?

A. Uhm, yes.

Q. "Yes," meaning correct; right?

A. Yes.

Q. Okay. So back to the -- remember we used the term "cultural eutrophication" before about causing, something about causing excessive or increased aquatic plant growth; right? I think that's how the term's used?

A. I believe so.

Q. So with regard to, and I'll just say phytoplankton, up through 2006 at least, there wasn't any indication that narrative criteria were being violated for nutrients; right?

(Recess.)

BY MR. HALL:

Q. Mr. Trowbridge, I've got a few more questions about the 2009 criteria document, and then ask you some weight-of-evidence questions, hopefully, and then we will go on from there. That should be pretty much closing.

2009 criteria document that you developed, that's a -- you said you used a weight-of-evidence analysis to come up with the criteria in that report; right?

A. Yes.

Q. Did you include in that report the evidence that indicated that transparency was not the cause of eelgrass loss in the system that you had developed in any of your earlier analyses?

A. What are you referring to for an earlier analysis?

Q. That transparency, or analysis of transparency had not changed over time; was that included anywhere in that report?

A. No.

Q. What about all the statements that Great Bay is not a transparency-controlled system, from EPA and Dr. Short, and those are the ones you and I walked through in your first round of the deposition. Did you include the statements that Great Bay was not transparency-controlled?

A. I'm not sure; I don't believe so.

Q. Okay. What about the -- did you include the statements that the cause of eelgrass losses and changes in the system were unknown, statements that were contained in the various 303d listing documents?

A. Uhm, I have to look through. I'm not sure. I'm not seeing it here.

Q. Did you include any of Morrison's conclusions that the major factors controlling transparency in the system were, in fact, turbidity and color-dissolved organic matter, and not chlorophyll?

A. I believe we included equations from the Morrison study.

Q. Did you highlight the Morrison study concluded that the transparency level of Great Bay was acceptable, and that you needed to look at something else as the cause of eelgrass demise?

A. I'm not sure if we have that statement in here.

Q. It's a pretty important statement, isn't it? It made your report.

Did you -- well, did you include any discussion about how the primary graphs that you were using to develop the transparency and nitrogen relationships were merely correlations and did not demonstrate causation?

A. I don't believe so.

Q. Actually, let me ask you a quick question on that. With regard to the low DO relationship to chlorophyll-a, and your transparency relationship to total nitrogen, both of those graphs are just correlations, right; they do not show causation?

A. That is correct.

Q. Is there anywhere in that document that you assessed the other factors, other confounding factors that impact the DO regime, such as sediment, oxygen demand, river flow, low DO coming in from swamp areas? Did you assess that anywhere in this analysis?

A. No.

Q. What about the factors that are controllable in tidal rivers; did you assess whether or not CDOM, turbidity or any of the other factors that are significantly influencing the transparency level in the tidal rivers, is there any assessment of that anywhere in that document?

A. Uhm, can you clarify? Assessment of what?

Q. Of how those factors influence and control transparency in the tidal rivers?

A. So in the tidal rivers specifically.

Q. In the tidal rivers specifically.

A. No.

Q. Is there any assessment about how the change in rainfall patterns could have influenced the eelgrass losses or the transparency occurring in the system anywhere in that document?

A. Sorry. You said rainfall and what?

Q. Just how rainfall patterns influenced transparency in eelgrass populations in the system?

A. I don't believe so.

Q. Okay. Does that report include any of the case-specific analyses you did and evaluations that confirmed TN did not cause any excessive algal growth in the system or alter transparency in the system over time?

A. You say case-specific analyses. What are those?

Q. Your March 2008 presentation to EPA that said it's not a transparency issue. Does that -- was that analysis reflected in this assessment?

A. So you're talking about, like, the -- either the presentations or the interim reports?

Q. Correct.

A. Were they reflected in this report?

Q. Uhm-hmm.

A. I would say the interim analyses are not included in the report; no. They were not included in the final report. What was included was the final analyses.

Q. The final analysis which left out all of these prior analyses that indicated transparency wasn't controlled by chlorophyll-a or nitrogen. Hmm. Okay.

Let's talk weight of evidence for a moment. I don't have any further questions on that. Here's a -- darn it, what did I do with it? Ah, right here.

MR. HALL: Can we mark this as Exhibit 89, please?

(Trowbridge Exhibit 89 marked for

Dr. Short is trying to give you some insight as to what's happening in these type locations and why.

It says, I think monitoring eelgrass in the system would be a good indicator for habitat assessment, but we have got to be careful to look at the conditions in Great Bay itself differently than those in Little Bay and Piscataqua River.

Quote, Great Bay is dominated by extensive eelgrass meadows that are intertidal that receive enough light at low tide to satisfy their light requirements.

Do you have any reason to disagree with that observation made by Dr. Short?

Do you have -- no, let's -- let's let the question stand. Do you have a basis, a scientific basis, to disagree with that position expressed by Dr. Short?

A. No. I will say that I think the term intertidal here is used incorrectly because I think what he means here is these are beds that are -- where the eelgrass reaches the surface at low tide. True intertidal would be beds that are rooted between the low tide line and the high tide line.

MR. HALL: You know, Evan, he's not just not answering the question again. And I know he hates to answer questions when he can't answer them other than to say, you're right, I had no information that showed the experts were wrong. That we've gone through several times. But we're going to ask the question or I'll just certify this one to the judge.

BY MR. HALL:

Q. You said you were not an expert on eelgrass ecology, right?

A. That's correct.

Q. All right. You said Dr. Short was an expert on eelgrass ecology, right?

A. That's correct.

Q. You said Phil Colarusso was an expert, some type of expert on eelgrass ecology, right?

A. That's correct.

Q. You've got emails from Dr. Short, Phil Colarusso, Jim Latimer, I don't know what he's an expert on, all saying the same thing, the system is not a light-limited system, Great Bay. What information did you have that demonstrated that expert advice was incorrect?

MR. MULHOLLAND: Just that specific question.

A. None.

MR. HALL: Thank you. We've got about half an hour.

MR. MULHOLLAND: That's great.

MR. HALL: I'd like to bring to your attention some evaluations you yourself did on this question of transparency and its effect on the system.

Let's mark this as Exhibit 71.

(Trowbridge Exhibit No. 71 was marked for identification.)

BY MR. HALL:

Q. Mr. Trowbridge, I've given you an email, this is a little bit of an email chain, and then there's an attached -- it looks like it's a PowerPoint that was done for the New Hampshire Estuaries Project. It's a PowerPoint that's dated November 8th, 2007 and entitled Toward a New Conceptual Model for Nutrient Criteria Development in a New Hampshire Macrotidal Estuary. Phil Trowbridge, Ru Morrison, Jim Latimer, John Pennock, Rich Langan

Dr. Short is trying to give you some insight as to what's happening in these type locations and why.

It says, I think monitoring eelgrass in the system would be a good indicator for habitat assessment, but we have got to be careful to look at the conditions in Great Bay itself differently than those in Little Bay and Piscataqua River.

Quote, Great Bay is dominated by extensive eelgrass meadows that are intertidal that receive enough light at low tide to satisfy their light requirements.

Do you have any reason to disagree with that observation made by Dr. Short?

Do you have -- no, let's -- let's let the question stand. Do you have a basis, a scientific basis, to disagree with that position expressed by Dr. Short?

A. No. I will say that I think the term intertidal here is used incorrectly because I think what he means here is these are beds that are -- where the eelgrass reaches the surface at low tide. True intertidal would be beds that are rooted between the low tide line and the high tide line.

pretty good gap in the macroalgae data and it wasn't until 2006, 2007 or after that time frame that more attention was paid to that issue, correct?

A. Right. More data was collected, I believe, starting in 2008.

Q. Okay.

A. Yes.

Q. All right. I'd like to show you, it's an email from Fred Short to you and it's got a whole -- a pile of emails attached to it and I didn't exclude the ones that -- that are not relevant to our discussion.

I'd like to bring your attention to under .3 -- and it's from Fred. It's talking about Great Bay and, I guess, in part, macroalgae. It says, Re: Pre-proposal on macroalgae. It's dated November 30th, 2007.

It says, and since we have not found any areas of nuisance macroalgae overgrowing eelgrass beds as we have documented in areas like Waquoit Bay, Massachusetts, for example, the results of our analysis are only applicable where nuisance macroalgae has proliferated to the extent to prevent the reestablishment of eelgrass from seed.

Do you have any reason to doubt the accuracy of Fred Short's statement that they have not found -- as of this time frame, they have not found areas of nuisance macroalgae overgrowing eelgrass beds?

A. I don't know. I mean, I don't know what he was thinking when he wrote this.

Q. But do you have any reason to doubt the accuracy of the statement? I mean, Fred Short's the person that goes out and looks at the eelgrass beds every year, right?

A. Yes.

Q. Okay. So he's the one that's out there looking at the situation and then he says, we have not found any areas of nuisance macroalgae overgrowing eelgrass beds.

Again, any reason to believe that that's an inaccurate statement from Dr. Short?

A. No.

Q. No.

Was Dr. Short's main concern, and I think he's got it stated below, that he was only can read it here.

Q. Okay. Do you recall whether or not Dr. Short was -- or anyone else was able to give you an answer as to why macroalgae were being found in Great Bay but not in Little Bay, being right next door to each other?

A. I don't recall an answer from Fred Short, but I do recall that the ultimate maps of macroalgae were limited to Great Bay because that's where the data had been able to be ground truthed.

Q. So we just didn't have any macroalgae data for Little Bay or anywhere else in the system?

A. No ground truth data, no.

Q. No ground truth data. So they did try to do some -- what was this, area mapping again that they were using?

A. The macroalgae was mapped using hydrospectral aerial photography and needed to be ground truthed.

Q. What about macroalgae impairments? Are they -- are they documented in the Squamscott River, excessive macroalgae in the Squamscott, have you seen a report on that?

A. No.

Q. How about the Lamprey?

A. No.

Q. Oyster?

A. Oyster, there's been studies done.

Q. So there's some excessive macroalgae in the Oyster River?

A. There were some studies done in the '70s and '80s by Art Mathieson and his students and I believe those studies were followed up in more recent years by Art Mathieson and his students.

Q. Are you guessing that it covered the Oyster River or are you thinking that as part of the river where the Oyster comes into Little Bay? Do you recall?

A. I don't know exactly where it is, but I think it is part of the Oyster River.

Q. What about the Cocheco; any data on excessive macroalgae in the Cocheco River?

A. No.

Q. What about the Piscataqua, Upper or Lower, excessive macroalgae?

A. I'm not sure.
Q. What about the harbor?
A. Again, I'm not sure, because there's different types of studies that are done by different people and I know there's a lot of monitoring in the mouth of the harbor related to invasive species colonization and macroalgae data may be collected as part of that.
Q. In the 2009 nutrient criteria document, the only area for concern of macroalgae, I believe, was Great Bay; is that correct?
A. That's the only area where we had information for macroalgae for that report.
Q. Do you know if the physical conditions of the tidal rivers allowed for the growth of macroalgae to occur, given the tidal velocities that go through there?
A. I don't know.
Q. Okay. Who would you go to if you had to ask that question?
A. I would consult with Art Mathieson.
Q. Okay. Has Art Mathieson ever told you that any of the Squamscott, Lamprey, Upper or Lower

Piscataqua, Cocheco, the harbor, has he ever told you that any of those areas are suffering from excessive macroalgae growth?

A. I don't recall every conversation I've had with him, so I'm not sure.

Q. It doesn't ring a bell, though?

A. Art has provided us some written comments relating to macroalgae particularly in Great Bay, so that's what I'm most familiar with.

Q. But that's what I was asking. You know, you're -- you're on the PREP group and, of course, you work for DES. You do these indicator reports. Have any of the indicator reports ever addressed the extent of macroalgae growth in the system and whether or not it's causing an impairment?

A. No.

Q. Okay. Do you know why?

A. Lack of data.

Q. I guess this is an obvious question. Is there information from 1990 to 2000 for Great Bay showing that macroalgae is adversely impacting eelgrass growth in Great Bay?

A. No studies that I'm aware of.

Q. Do you know if there's any data showing that macroalgae are preventing eelgrass from re -- reestablishing themselves in any area of Great Bay?
A. You're asking if there are studies --
Q. Yeah.
A. -- of that?
Q. Studies or information showing that it's preventing the eelgrass from reestablishing itself in Great Bay.
A. The maps that were made in 2007 showed pretty significant areas that had been converted to macroalgae which would prevent the recolonization of eelgrass.
Q. You think that prevents the recolonization by eelgrass? Do you have data or studies that would tell us that that would prevent it?
A. The review papers on this topic show that as a cause or a -- show that as a way macroalgae affects eelgrass.
Q. Don't -- I guess I'm asking for Great Bay. And go a little bit from your recollection full on this one.

In 2007, the eelgrass populations had declined significantly from 2005, hadn't they? We could go through the individual data. I think it was somewhere around 1,200 -- 1,200 acres might be the number for 2007?
A. Yeah, I don't recall exactly.
Q. Okay. Do you want me to show you a document that will refresh your recollection?
A. Well, why don't we just go on with the question.
Q. All right. What's the eelgrass population in Great Bay as of 2010, 2011, do you know? It's higher, right?
A. Let's just look at the table.
Q. And which report are you looking at?
A. I'm looking at the 2012 303(d) technical support document which has eelgrass data through 2010.
Q. That's -- he is looking at Exhibit 47. And, okay, so we've got it through 2010. And have the eel -- what page are you looking on of this report?
A. Page 14.

Q. Page 14. And can you please tell us from 2007 to 2010, what was the change in the eelgrass acreage?
A. From 2007 to 2010. So in 2007 -- in Great Bay you're talking about?
Q. Yeah, because that's where you had the eelgrass maps, correct? I'm sorry, the macroalgae maps.
A. So in 2007, 1,245 acres.
Q. Uh-huh?
A. In 2010, 1,722 acres.
Q. So, roughly, it increased by 500 acres -- I said roughly because it's a little bit less than 500, between 2007 and 2010. Do you have any -- you had eel -- you had macroalgae data from 2007?
A. Uh-huh.
Q. Do you have any macroalgae data since then that shows the macroalgae prevented the eelgrass from restoring themselves in areas where the macroalgae previously had been?
A. No. 2007 was the only data we had for macroalgae.

Q. Okay. Question on macroalgae. Do the macroalgae cause the loss of eelgrass or do the eelgrass decline and then macroalgae fill in the habitat that the eelgrass had been in? How does it work, do you know?

MR. MULHOLLAND: Objection; compound.

Q. And I realize, you know, you're not a biologist, so I'm just curious in terms of your -- what you've been informed about that topic and then maybe you can tell me who's informed you about it.

MR. MULHOLLAND: I just want to make an objection. Compound question.

Go ahead.

A. The best information we have about that is from the review papers on the topic, which would be Burkholder, et al, from 2007, McGlathery, et al, I think it's 2008, where they talk about the sequence of eutrophication in shallow estuaries where there's a growth of macroalgae which affects the eelgrass and then leads to the eelgrass loss.

Q. Okay. Do you know if in this system the growth of macroalgae is what caused the eelgrass loss?

A. No.
Q. Okay. And whatever macroalgae were growing, they apparently did not prevent 500 acres of eelgrass from recovering, did it?
A. No.
Q. Okay. I'd like to show you -- you prepared a macroalgae literature survey in, I believe, December of -- I'll get an exact date, December of 2011. It's noted as Diers Exhibit 51.
MR. MULHOLLAND: Here you go.
THE WITNESS: Thank you.
BY MR. HALL:
Q. Is that -- do you recognize that document?
A. Yes.
Q. Okay. Can you please tell me why it was prepared?
A. Right at the beginning we described the purpose. The purpose of this literature view -- sorry.
The purpose of this literature review was to compile the -- sorry, the draft stamp is on it -- compile the -- I can't read it, something

Q. In any manner, form, any way that Dr. Mathieson gave you data or gave you an analysis that showed the increase in nitrogen in the system caused eelgrass declines, direct or indirect?

A. We've just received comments from Dr. Mathieson on our 303d list talking about how increases in nitrogen have caused increases of macroalgae, which affect eelgrass. So I guess the answer would be yes.

Q. Do you know that we covered that exact document in your last deposition and I asked you whether or not that document confirmed macroalgae caused eelgrass losses and you said no, it didn't? Do you want -- would you like to change your answer or am I going to have to certify that -- would you like to alter your answer?

MR. MULHOLLAND: Which answer?

MR. HALL: That Dr. Mathieson's comments have confirmed that nitrogen caused eelgrass losses in Great Bay by stimulating macroalgae?

A. I'm just reporting what his thing said to us. It's his report. It's not --

Q. That's what you believe his report said to you?

A. Well, maybe we should look at his report. Do you have it?

Q. This is Exhibit --

MR. MULHOLLAND: Sixty-three.

Q. -- 63.

Do you want to tell me where in that document it confirms nitrogen caused macroalgae changes which caused eelgrass losses in Great Bay?

A. Well, here's one section. It's the first bullet, bullet number 1. It says -- I'll read it slowly.

MR. SERELL: Are you on a certain page number? I'm sorry.

THE WITNESS: I'm on the first page.

Extensive ovoid green algae, Ulva species, or green tides have begun to dominate many of these estuarine areas during the past 15 to 20 years, particularly within Great Bay proper, which is the citation for Nettleton, et al, 2011. Such massive blooms of foliose green algae can entangle, smother and cause the death of eelgrass.

Q. Hold it. Stop right there. Can entangle.

Does it say did entangle, have entangled? It says can. Are you telling me that statement says eelgrass demise has been caused by macroalgae growth in Great Bay?

MR. MULHOLLAND: Could I have a second with my witness? Could we a short break? Thirty seconds.

(Recess.)

MR. MULHOLLAND: Thank you.

MR. HALL: Okay. Could you read back my question and would you please answer it?

(Record read as requested.)

MR. MULHOLLAND: That's a yes-or-no question.

THE WITNESS: I'm sorry, I was going to answer differently. Can you read it back again? Sorry.

(Record read as requested.)

MR. MULHOLLAND: Objection; compound.

THE WITNESS: Yes. No, it does not -- it says "can entangle," it does not say that it did entangle. It does not prove causation.

BY MR. HALL:

Q. So this document does not provide a basis for concluding that macroalgae have caused eelgrass losses

in Great Bay; correct?
A. Correct.
Q. Okay. Enough. Let's stop there.
Now, a moment ago you mentioned something about needing to do -- looking at studies from other estuaries to see what caused eelgrass loss; correct?
A. Yes.
Q. Okay. Those other studies, in other estuaries, they have confirmed, they have analyzed that certain water quality caused eelgrass losses; correct? I mean, how could those studies have concluded that the water quality caused eelgrass loss? They must have done something to evaluate that; right?
A. Yes.
Q. Okay. Was that same evaluation done for Great Bay?
A. Uhm, I would say the evaluations done in some of these other studies, just observational, that if you have areas of eelgrass that are completely smothered by macroalgae, then that is the cause of the eelgrass loss. So I think we have done some of those observations in Great Bay. Just not, maybe, to the same degree in some areas.

numeric criteria on the permits.

(Counsel conferred with the witness.)

Q. Mr. Trowbridge, are you aware that Dr. Short testified that he never recommended applying the numeric nutrient criteria in the tidal rivers?

A. No.

Q. This is Short Exhibit 20. That's a graph of Kd transparency measurement versus chlorophyll-a. Okay. Have you seen that grant before, Mr. Trowbridge?

A. I think so.

Q. Doesn't that graph demonstrate that regulating nitrogen to control chlorophyll-a levels in the Squamscott River will not and cannot assure attainment of the transparency level contained in the June 2009 numeric criteria document?

A. I'm not sure. So the graph is light attenuation measured at these two stations versus chlorophyll?

Q. Uhm-hmm. Does, first off, does the graph show that the light attenuation values claimed necessary in the numeric criteria document are attained in the Squamscott River, at either Chapman's Landing or the further downstream station?

A. No.

Q. It's not even close; right?

A. Right.

Q. These are large excedences of that value?

A. Yes.

Q. Okay. Does the analysis show that controlling chlorophyll-a will bring, even if you take the chlorophyll-a down to near zero in Squamscott River, that that will allow this system to attain the nutrient -- the transparency targets set in the 2009 criteria document?

MR. MULHOLLAND: Object to form. I don't understand it, but maybe Phil does.

Q. Look at the lower panel.

A. The lower panel.

Q. The one you just --

A. And this is a -- these box and whisker plots on the lower panel, what are they?

Q. They're the data averaged from the plot above.

A. Oh.

Q. Same type of thing you've done.

A. Yeah, okay. This graph doesn't show a relationship with chlorophyll and light attenuation.

Q. Right. So controlling nitrogen to control chlorophyll in this system will not allow this water body to even come close to attaining the transparency level that is contained in the 2009 criteria; right?

A. Based on this analysis, no.

Q. All right. This data had been submitted to you and to EPA. Is there any basis that you know for claiming that the analysis presented in this graph is incorrect?

A. I'm not sure.

Q. You've not seen any analysis that shows it's incorrect, have you?

A. No.

Q. Okay. Doesn't this analysis tell you it's something else other than chlorophyll controlling the transparency level in the Squamscott River?

A. Based on this data, yes; this graph, yes.

Q. Okay. Do you know if these other factors that are controlling -- if it's not chlorophyll, there's only two other factors that it can be, other than the water itself. It's color-dissolved organic matter or it's nonalgal-related turbidity; right?

A. Or it's organic matter that's not chlorophyll.

Q. Right. Well, when I -- I said nonalgal turbidity, so anything that could cause turbidity but not related to algae?

A. Not related to living phytoplankton, you mean, because that's what chlorophyll measures. There's other types of organic matter that's in the water.

Q. Right. Correct.

A. You know, that's pieces of macroalgae, that's dead phytoplankton, it's --

Q. In the Squamscott River, pieces of macroalgae? I mean, let's stop talking theoretical, what this could be. I'm taking about the Squamscott River, Mr. Trowbridge. So let's not just go off on things that we know don't even exist in the Squamscott River. These data say it's one of those two other factors: something turbidity-related or something color-dissolved organic matter; right?

A. Right. And what I'm trying to distinguish is turbidity can include organic matter as well as inorganic matter.

Q. So reducing the Exeter discharge to zero nitrogen, is that going to allow this water body to attain the transparency level you're claiming is

necessary to allow eelgrass to inhabit that system?
A. Uhm, I'm not sure.
Q. What do you mean you're not sure?
A. I'm not sure. There's a lot of factors.
Q. And you're telling me there's something else in the Exeter discharge that's causing transparency impacts?
A. Like I said, I am not sure. Eelgrass existed in this system at some time in the past.
Q. What does that have to do with whether or not the nitrogen is going to improve the transparency level?
A. Because the CDOM levels probably have not changed. And if that's -- so one factor that has changed is the nitrogen.
Q. Okay. Look, you're under oath, Mr. Trowbridge. You've already testified I don't know how many times that there's only four factors affecting light transmission. Nitrogen is not one of those factors; right? Nitrogen does not directly affect light transmission; right?
A. Yeah. Nitrogen molecule does not directly affect light transmission.
Q. Okay. So we've determined, from this graph,

and there are two more just like it, that it's chlorophyll -- chlorophyll-a control in this system will not allow the transparency level to be improved to where it can support eelgrass; right?

A. I've already said that.

Q. Okay. So how is it that regulating nitrogen from the Exeter discharge, which is almost all dissolved inorganic, is going to bring this system into compliance with the transparency levels you claim are needed for eelgrass growth?

A. Give me a minute to think about this. I think I go back to the fact that the criteria we use for our assessments or the thresholds we use for our assessments are based on a variety of different mechanisms in which nitrogen affects eelgrass. It's different in different parts of the estuary, and it's different at different times. Light attenuation is one of those factors but it's not the only one. Shallowing, and shallower areas overcomes --

Q. Can you stop. You're not answering my question. I'm asking about transparency. I'm not asking about overgrowth of the macroalgae, I'm not asking about toxicity of nitrogen, which you throw into your CALM response. I'm asking about transparency. How is controlling Exeter going to significantly improve the transparency in the Squamscott River, based on this graph?

A. Based on this graph, it would not.

Q. It's not. Thank you. Based on the Morrison report you know CDOM is originating from the tidal rivers; right?

A. Yes.

Q. Okay. Are the CDOM concentrations much higher in the tidal rivers than they are in the bay?

A. Yes.

Q. They have to be, right, because that's where they're coming from and they're not yet diluted into the rest of the bay. Do you know if the tidal rivers tend to be turbid because of the high exchange of saltwater into the system?

A. Sometimes, yes.

Q. If the turbidity -- I'm sorry, if the poor light levels in the Squamscott River are due to, one, the CDOM coming down the system and, two, the turbidity caused by the tidal exchange, isn't that a natural condition, regardless of what the light transmission level is in that system?

A. Correct; that's a natural condition. The question I have is why was eelgrass there earlier.

Q. Well, you know, Mr. Trowbridge, that, to me, is an extraordinarily interesting question. I think the data for the -- wasn't the data on eelgrass being present in the Squamscott, that was based on some anecdotal chat that Fred Short had with a Mr. Chapman; right?

A. No. It was based on maps made by a UNH masters student who did a survey of the tidal rivers and portions of Great Bay and portions of the Piscataqua River.

Q. I'm thinking of the earlier one, the 1948 extent, I believe, was claimed to be based on a discussion with Mr. Chapman?

A. No. The 1948 was the masters thesis that was published by UNH.

Q. Is it conceivable that some kind of physical conditions in the tidal rivers have changed since 1948?

A. I don't know.

Q. Do you know if they filled in at all?

A. Uhm, hard -- it's hard to say. Sediment budgets is a complicated thing that we've been trying to study.

Q. Okay. Do you know if any of the tidal rivers have filled in? I thought a number of them had.

A. Well, the Oyster has had some sedimentation issues because there's been discussions about dredging.

Q. Do you know if the level of the sea has changed since 1948?

A. According to -- yes, it has changed, but I don't know by how much.

Q. All right. So, but here's the point: Regardless of why the eelgrass are not there at this point in time, the transparency data shows it cannot possibly support eelgrass at this time; right? That's what this data indicates?

A. Uhm, at a -- yes. What that data indicates is that at a two-meter restoration depth, that would be too deep. So the question is, there maybe shallower areas where it could survive. That's another way of looking at it.

Q. Well, we don't have any eelgrass anywhere in this system; right?

A. Correct.

Q. So if you can't fix this via nitrogen control, why would it be considered a nitrogen-impaired system? If my statement is true, if you can't fix it via nitrogen control, that there's other factors that you cannot change because they're naturally occurring at this point, would it still be considered a nitrogen-impaired system?

A. So you're asking if we were to do a new 303d assessment and it was conclusively proven that the eelgrass loss in this system was not due to nitrogen would it still be impaired for nitrogen?

Q. Why would one have to conclusively prove something's not caused by nitrogen when you know the transparency is insufficient to allow eelgrass growth regardless of the nitrogen controls put on the system?

A. I think we're mixing issues. There's the issue of an assessment versus the issue of permitting.

Q. I'm talking about a narrative criteria violation. If that transparency level is natural, can't be controlled --

A. Oh, so you're talking about as naturally occurs?

Q. Yeah.

A. In terms of the narrative standard of "as naturally," if it was determined this was naturally occurring, then it would not be an impairment.

Q. And there would be no point in regulating nitrogen, right, because you wouldn't be able to change it; right?

A. Yeah. That's not really our call, because we don't write the permits, but the point would be -- the question related to us is the "as naturally occurs" clause of our standard.

Q. All right. I'm going to show you Exhibit 21 from Fred Short, Fred Short's deposition, Lamprey River. Does this, in Lamprey River, with Kd versus transparency level versus nitrogen -- I'm sorry, versus chlorophyll-a, does this data show a similar pattern as the Squamscott River, that transparency levels are poor in this system even at very low levels of chlorophyll-a content?

A. For the most part; yes.

Q. So will regulating nitrogen to control chlorophyll-a in this system ensure that the transparency level is achieved in the Lamprey River? When I say "transparency level," that's the level necessary to support eelgrass?

A. Based on this data, no.

Q. Okay. Do you have -- oh, this is -- when we say "this data," this is data that came out of your system.

Do you know if there's any, any data that shows, for the Lamprey River, that nitrogen control can assure a sufficient transparency level is attained to allow eelgrass to be restored?

A. And you're talking about data from the Lamprey River?

Q. Oh, yeah.

A. Uhm, sorry. Can you say the question again, please?

MR. HALL: Could you repeat that back, please?

(Record read as requested.)

A. All right. So I think what you're asking is: Are there any other data besides these?

Q. Data or analyses that show you control nitrogen, you're going to fix that transparency problem, transparency issue in the Lamprey River?

A. The answer is I don't believe so. It's the same issue as with the Squamscott.

Q. Okay. Could I have both of those back, please? And I just want to say, shock of shocks, we've got one more of these which is the Upper Piscataqua River. This is Fred Short Exhibit 22.

A. Yes.

Q. I bring your attention to two things. First, look at chlorophyll-a levels, annual median, in the Piscataqua River, Upper Piscataqua. Does that level of chlorophyll-a occurring in the Upper Piscataqua indicate to you that there's cultural eutrophication occurring in the Piscataqua?

A. We haven't defined cultural eutrophication in terms of chlorophyll-a level.

Q. That's a pretty low chlorophyll-a level, though; right? I mean, it's -- other than there's 2003 data that average above five, the rest of the time we're in the one and a half to three range. That's not much chlorophyll growth, is it?

A. As an annual median, yeah. I don't know what the individual points look like here.

Q. But your transparency criteria is based on annual median considerations; right?

A. Yes.

Q. Okay. Look at the Kd chart right below there, same thing. Kd measurements. Do those, from this chart, do they indicate that they're significantly affected by the chlorophyll-a level in the Upper Piscataqua River?

A. They're not well-correlated.

Q. There's a minimal impact; right?

A. Uhm, based on this analysis; yes.

Q. Okay. That's the same conclusion that the Morrison report came to, right; that chlorophyll had a minimal impact on the water transparency, right?

A. Well, it had a -- it said it was a smaller factor. It didn't say minimum, I don't think.

Q. I think somewhere around 12 percent is, I think, what Morrison had; right?

A. Somewhere around there.

Q. Okay. Does this data indicate that if you regulate nitrogen to control chlorophyll-a you will meet the transparency target that is being applied to the Upper Piscataqua River?

A. Not based on this analysis.

Q. By the way, look at 2006. Did the

EXHIBIT– 19

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Subject:	RE: Supplemental Comments by the Great Bay Municipal Coalition re: Draft NPDES Permit No. NH0101311 for the City of Dover, NH; Town of Exeter, NH, NPDES Permit No. NH0100871; Town of Newmarket, NH, NPDES Permit No. NH0100196
Date:	Monday, September 24, 2012 12:06:42 PM
Attachments:	Little Bay Eelgrass Phone notes-9-20-12 .pdf

Dear Mr. Perkins:

As you are aware, the Great Bay communities have yet to receive any response from EPA Region I or EPA Headquarters regarding the Region's assertion that stringent nitrogen reduction requirements must be employed to allow recovery of eelgrass resources in the Great Bay system. In the supplemental comments previously submitted, we reported that eelgrass populations in Little Bay (and elsewhere) are recovering, despite a transparency level that is well below that claimed to be essential for eelgrass growth and survival by DES and EPA. As noted in prior comments, the historical information and DES analyses for Great Bay confirmed that eelgrass populations received adequate light at a Kd of 1.0/m. We have been attempting to obtain further, independent verification that the transparency level that governed the derivation of the numeric TN criteria used by EPA are more restrictive than necessary. We have sought recent eelgrass mapping results from UNH, EPA and DES and are awaiting the release of that information, not presently available to the public. Because such data were not available, the Coalition has hired experts to verify the extent of eelgrass populations present in several areas. These data should show whether or not eelgrass populations are increasing in areas where transparency is less than the level assumed necessary to protect eelgrass. Once we have that information and the 2012 aerial survey, we will submit it as part of supplemental comments on the above referenced proposed permit actions.

In the meanwhile, we are submitting notes of a phone conversation with NH Fish and Game that describes where eelgrass are now growing in several areas. This information further supports the Coalition's position that the transparency targets chosen by DES and supported by EPA are not necessary to allow improvement in eelgrass populations. (Attached) This discussion confirmed that (1) eelgrass are recovering in Little Bay in areas where suitable habitat is present and (2) eelgrass populations in Little Bay extend down to 15 feet below mean water. Earlier comments submitted to EPA provided data showing that transparency was about 1.1/m when eelgrass populations were considered unimpaired. These site-specific data confirm that a seasonal transparency level lower than 0.75/m is not required to allow healthy eelgrass populations to exist, even in the deeper waters of Little Bay. DES previously estimated that eelgrass would only occur 6 ft below mean water by assuming that a 22% light level was essential to allow eelgrass growth. Eelgrass growth information from Little Bay confirms that assumption is not correct. There is an explanation for this difference between projections and reality. The Chesapeake Bay program information relied upon by DES to estimate the necessary light level, concluded that a seasonal average 15% incident light level was sufficient and then *increased* the value to account for the epiphyte load on the leaves in that system. (*Chesapeake Bay Submerged Aquatic Vegetation Water Quality, Habitat Requirements and Restoration Targets – A Second Synthesis (2000) at Table 1).* This was covered in the deposition of Mr. Trowbridge previously provided to EPA as supplemental comments. Epiphytes in this system, however, are not documented to be at a significant concern and therefore, the need for 22% incident light versus 15% is not established for this system. Moreover, given the lower nutrient levels and the generally colder water present in this system (compared to Chesapeake Bay) epiphytes could be expected to be growing at a lesser level. In any event, it is apparent that the eelgrass are receiving sufficient light (at a lower incident light level) in Little Bay and therefore the TN criteria based on ensuring a 22% incident light level are misplaced. Failure to meet such light levels therefore cannot constitute a violation of existing narrative criteria given this and prior site-specific information.

Thank you for your consideration of this information that supplements prior submissions.

John

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Dean Peschel – Peschel Consulting , LLC

Telephone Conference with Bruce Smith, NH Fish & Game -9/20/12 regarding the scope and location of eelgrass populations in Little Bay based on visual monitoring reports.

Little Bay Eelgrass

Upper Bay:

Western Shore has most eelgrass. Muddy bottom. Shallower and more gradual, Depth limit is 15 feet. Only one oyster farm on western side, Fat dog oyster farm is located on edge of channel.

Eastern side eelgrass is present but to a lesser degree. Coarser sediment bottom and deeper. Currents are stronger and less conducive to eelgrass.

Lower Bay:

Lower Little Bay has recently checked for eelgrass on either side of Scammel bridge and did not find eelgrass. Durham side was just off State parking area and other location was 200 yards off shore near McCooy property on Dover end of Scammel bridge.

Found eelgrass seedlings in Broad cove upstream of the marina along Newington town owned property shoreline in shallows and Hen Island.

Bellamy River Eelgrass:

Has seen eelgrass along river channel at Royal Cove and up stream and near horse farm. His observations extend only upstream as far as power lines and were a few years ago.

Piscataqua River Eelgrass:

Believes eelgrass must still exist in the coves along the river.

General:

He knows Fred's methods are from aerial photos with very limited field checking.

Bruce has copies of John Nelson's 1981 eelgrass mapping and CF Jackson eelgrass report from the 1940's and will make copies available to us. These are the documents used to establish the historical limits of eelgrass which eelgrass impairments are based on.