

## **Appendix A: Deposition Excerpts**

The key DES officials involved in the process of developing the 2009 Numeric Nutrient Criteria document were deposed in connection with *City of Dover v. N.H. Dep't of Env'tl. Services*, Docket No. 217-2012-CV-00212. The officials deposed were Philip Trowbridge and Paul Currier. In addition, Dr. Fred Short, University of New Hampshire eelgrass scientist, whose studies DES heavily relied upon in developing the document was deposed. The full depositions were previously submitted to EPA. The following are key the excerpts taken from these depositions.

### **1. Elevated TN did not cause increased algal growth impacting transparency in Great Bay.**

**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.** And where do you have data, in Great Bay, do you have data showing increased nitrogen levels caused phytoplankton blooms which reduced water clarity in Great Bay? \*\*\* **A.** We don't have that information related to nitrogen causing phytoplankton blooms in the Great Bay Estuary.

Trowbridge Deposition Vol. 1 at 230 ln 16-19, 123 ln 19 – 124 ln 1.

**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.

Trowbridge Deposition Vol. 1 at 124 ln 22 – 125 ln 1.

### **2. Phytoplankton levels in the Estuary have not materially changed over the last 30 plus years despite the apparent increase in nitrogen levels known to stimulate algal growth.**

**Q.** ... [F]or 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.

Trowbridge Deposition Vol. 1 at 127 ln 15-22.

### **3. Through 2005, the consensus was that eelgrass populations in Great Bay and the Lower Piscataqua River were healthy (though Little Bay eelgrass populations had never fully recovered from the 1988 wasting disease that decimated eelgrass throughout the system).**

**Q.** ... So up through 2005 there's no narrative criteria violation for what – I guess what you call ecological impacts for Great Bay or Portsmouth Harbor; right? **A.** Correct. **Q.** Okay. **A.** And I think it's import to – for Great Bay, that report did conclude that Great

Bay was determined to be threatened, but based on, I guess, preliminary data for eelgrass in 2006 and 2007. **Q.** Right. That's why I'm just- I'm just sticking with what happened. I'm trying to ask ourselves, just so you get the idea where we're going on this, Mr. Trowbridge, I'm asking ourselves what did we know about the system prior to 2005. **A.** Sure. All right. **Q.** Eelgrass was not impaired, and not listed as impaired in Great Bay; right? **A.** correct. **Q.** Eelgrass was not listed as impaired in Portsmouth Harbor? **A.** Correct. **Q.** No significant change in chlorophyll levels in these areas up through this period? **A.** Uhm-hh. **Q.** Right? **A.** Right. **Q.** There was a change in suspended solids, which you've explained is maybe related to some eelgrass thinning in the system; right? **A.** Yes. **Q.** Okay. And as far as we know, there was no change in transparency throughout this time frame of 1990 to 2005, to the degree we have data or information available on that; right? **A.** Right. ...

Trowbridge Deposition Vol. 2 at 354 ln 2 – 355 ln 14.

**4. DES admitted that it knew that system transparency had never changed when it proposed the stringent transparency-based TN standards.**

**Q.** ... So you plotted the water quality -- water clarity data over time and then you showed some of the same regressions. And you showed the preliminary results, the Ru Morrison study, that chlorophyll-a is only eight percent of the transparency affecting the system. Now let's go to the conclusions. Can you read the first conclusion? **A.** Eelgrass biomass declining in Great Bay but no apparent decline in water clarity. \*\*\* **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 quality changed over this 15-year period in the Piscataqua River and Great Bay where most of your eelgrass resources were? **A.** No. \*\*\* **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.** So let me see if I understand this. You had specific data on Great Bay that said experts are telling you Great Bay's not a transparency issue, you have specific -- the only data set you have for the entire system saying transparency didn't even change over time, you have other information confirming that the nitrogen loads did not even cause a significant change in phytoplankton growth, and you ignored all of that information and simply claimed you had a weight of evidence of something else unrelated to this system that said you needed to have these stringent numbers in place? Is that what you're telling me? I mean, I just need to understand because you've got specific data and analysis and you did it repeatedly -- **A.** Hmm. **Q.** -- and it doesn't show up in that statement. **A.** Uh-huh.

Trowbridge Deposition Vol. 1. at 227 ln 3-12; 230 ln 4-11 16-19; and 232 ln 22 – 233 ln 17.

**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.

Trowbridge Deposition Vol. 2. at 344 ln 8-13.

**5. DES does not know what caused the eelgrass changes in this system.**

**Q.** . . . There was a major decrease in eelgrass populations in Great Bay; right? **A.** You mean in 2006, 2007, 2008? **Q.** Yeah. Big Drop-off? **A.** Yes. **Q.** I mean, actually, would you describe that as a relatively dramatic drop-off? **A.** It was a - - I just say it's a large change. It was a large decrease. **Q.** A large decrease that happened quickly; right? **A.** Uhm-hmm. **Q.** Okay. That decline in eelgrass was basically used as the basis for updating the impairment listings for 2009 and thereafter to call Great Bay eelgrass – impaired for eelgrass; correct? **A.** Yes. . . .  
\*\*\* **Q.** Here's the question: That major decline you don't know what caused that in 2006, '7 and '8; right? **A.** Uhm-hmm. Yes. We do not know. **Q.** . . . do we know what caused the decline in Portsmouth Harbor? **A.** No. **Q.** Okay. Do we have data showing that there's major increases in algal growth in Great Bay or the Portsmouth Harbor area occurring during this time? I suppose the answer's no, or we might have tagged that as a indicator of what was happening; right? **A.** You're referring to phytoplankton? **Q.** Phytoplankton, yeah. **A.** For phytoplankton, no, there's no information.

Trowbridge Deposition Vol. 2 at 369 ln 16 – 370 ln 8; 371 ln 16 – 372 ln 10.

**6. DES stated that it was this specific eelgrass decline that lead to the estuary being listed as impaired for eelgrass.**

**Q.** And there's a statement in the middle paragraph, second paragraph, "DES identified these impairments using the numeric nutrient criteria that DES published for Great Bay Estuary in June 2009 and updated eelgrass cover assessments that reflect the new data from 2006 to 2008." Is that a correct statement of how the revised impairment listing was done? **A.** Yes.

Currier Deposition at 106 ln 11-19.

**7. DES and EPA specifically concluded in November 2007 that the "conceptual model" (increasing nutrients will cause reduced transparency) was not supported for this system.**

**Q:** ...By the way, who wrote these conclusions? Was this a collaborative effort ... or was it -- were these just your conclusions? **A.** This was ... certainly collaborative. It wouldn't have everyone's name on it if they didn't review it. **Q:** So [Conclusion] "The traditional conceptual models for nitrogen eelgrass relationships do not work for Great Bay." Which models were you talking about? ... Was it also the model that says phytoplankton -- excessive phytoplankton

growth this 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.

Trowbridge Deposition Vol. 1 at 222 ln 6 – 223 ln 7.

**8. Great Bay is not a light-limited system.**

**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? **A.** None.

Trowbridge Deposition Vol. 1 at 211 ln 18 – 212 ln 3.

**9. Great Bay is not even a transparency limited system because plants receive sufficient light at low tide.**

**Q.** 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- 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.

Trowbridge Deposition Vol. 1 at 177 ln 8-18.

**10. Tidal Rivers cannot support eelgrass populations.**

**Q.** ... Regardless of why the eelgrass are not there [in the tidal rivers] at this point in time, the transparency data shows it [i.e., the tidal rivers] cannot possibly support eelgrass at this time; right? That's what this data indicates? **A.** Uhm, at a – yes. ...

Trowbridge Deposition Vol. 2 at 429 ln 12-16.

**11. There is no analysis showing TN control is significant to eelgrass restoration in the tidal rivers:**

**Q.** Back to my last question, though. Have you ever seen an analysis that shows regulating nitrogen for the tidal rivers, and I'll say upper Piscataqua, Squamscott and Lamprey will, in fact, result in a significant improvement in the transparency such that eelgrass can be restored? Has anybody ever showed you a site-specific analysis of the data for those sections that show that? **A.** No. **Q.** Okay. I hadn't seen it either. That's why I thought you might have seen it. **A.** I'm fairly sure it doesn't exist.

Currier Deposition at 137 ln 12 – 138 ln 1.

**12. Data for the tidal rivers shows that transparency cannot be achieved regardless of TN reductions by wastewater treatment facilities due to natural conditions, algal growth impact on transparency in tidal rivers is negligible and TN control will not materially improve transparency in the tidal rivers.**

**Q.** ... 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.** No.

Trowbridge Deposition Vol. 2 at 423 ln 1-13.

**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 the Squamscott.

Trowbridge Deposition Vol. 2 at 432 ln 20 – 433 ln 1.

**13. If transparency levels are low naturally, an impairment cannot exist.**

**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.

Trowbridge Deposition Vol. 2 at 431 ln 1-3.

**Q.** If the transparency level in the Squamscott and Lamprey River were naturally low due to color dissolved organic matter and turbidity in those systems, would that transparency be considered a violation of state standards? **A.** No.

Currier Deposition at 87 ln 7-12.

**14. Tidal rivers have naturally low transparency.**

**Q.** ... 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 the system. **A.** Correct; that's a natural condition.

Trowbridge Deposition Vol. 2 at 427 ln 6 – 248 ln 2.

**15. Low dissolved oxygen (“DO”) is naturally occurring in the system and the causes of the periodically low DO is unknown.**

**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.** ... 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.

Trowbridge Deposition Vol. 1 at 39 ln 10-14, 44 ln 21 – 45 ln 4.

**16. Mr. Trowbridge, under oath, acknowledged that it was the flood itself (a natural event) that could have caused the major, rapid decline in eelgrass populations but he never evaluated the effect of that event.**

**Q.** We actually submitted – HydroQual developed that analysis and submitted that information to you. **A.** Yeah. **Q.** Did you not look at it? **A.** I probably did. I don’t recall right now whether it coincides. **Q.** If increased- would increased tributary flows, could that be a direct and immediate cause, a direct and immediate adverse effect on eelgrass growth? **A.** It could. **Q.** Can you tell me why? **A.** There’s a number of reasons: Increased nitrogen loads, increased sediment loads, increased- . **Q.** Dissolved organic matter? **A.** Yes. **Q.** And that increase could have reduced the transparency, possibly, very rapidly in the system; right? **A.** Are you talking about color-dissolved matter or – **Q.** No, turbidity. I mean, the turbidity and color-dissolved organic matter would have an immediate effect on the transparency in the system, wouldn’t it? **A.** Yes.

Trowbridge Deposition Vol. 2 at 382 ln 5 – 383 ln 5.

**17. Narrative criteria violations and implementation must be based on a cause-and-effect demonstration that the nutrient in question caused “cultural eutrophication” which in turn caused an impairment to the system biota.**

**Q.**...If the situation were that transparency were poor but wasn’t caused by the nitrogen component, you could say that you have an eelgrass impairment but not a nitrogen- induced eelgrass impairment... **A.** That’s correct ...you would have to do further causation analysis to figure out what was causing the lack of eelgrass.

Currier Deposition at 133 ln 22 – 134 ln 11.

**A.** ... [T]his rule basically applies to cultural eutrophication, and the end point is the excessive plant growth. **Q.** ...Suppose I had nitrogen or phosphorus discharge into the water body and it didn’t cause a change in plant growth. Would that

nitrogen or phosphorus be considered in violation of this provision in any event?

**A.** No.

Currier Deposition at 19 ln 4-13.

**Q.** Okay. Is it your understanding that a narrative criteria violation for nutrients only occurs if the nutrients are causing some demonstrated adverse effect? **A.** Yes.

Trowbridge Deposition Vol. 2 at 326 ln 4-8.

**18. The 2009 Numeric Criteria were based on the “assumption” that TN caused a major change in transparency due to increased algal growth, not a “cause and effect” demonstration that such events actually occurred.**

**Q.** Mr. Currier, you indicated that this analysis of light attenuation versus total nitrogen at trend stations, that this analysis doesn't prove causation, correct? **A.** Yes. **Q.** Okay. So is this analysis sufficient in your mind to determine that nitrogen is causing a violation of the narrative standard in that it doesn't demonstrate causation? **A.** It's not sufficient, no.

Currier Deposition at 80 ln 14-23.

**Q.** Can I, can I just make a statement and see if you agree with this? That the wasteload allocation and the 2009 criteria have a presumption that the nitrogen level does significantly control the transparency that's occurring in various areas, correct? **A.** Yes. ...

Currier Deposition at 136 ln 6-12.

**19. Speculation that TN reduction “can only help” to better transparency in the bay is irrelevant to whether or not a narrative violation presently exists.**

**Q.** Okay. So the fact that some eelgrass may or may not be growing in some of the deepest areas is not a basis for to claim impaired; correct? **A.** That's correct.

Trowbridge Deposition Vol. 2 at 362 ln 11-14.

**20. DES lied to cover its tracks as Mr. Trowbridge readily admitted under oath that the evaluations presented in the 2009 Criteria did not really reflect “cause and effect”.**

**Q.** ... Does that regression prove nitrogen caused that change in light attenuation? **A.** Does it prove it? **Q.** Does that regression prove causation? **A.** It does not prove causation.

Trowbridge Deposition Vol. 1 at 234 ln 11-15.

**21. Mr. Currier noted that a weight of evidence analysis should not produce results contrary to the actual data collected.**

**Q.** Well, didn't we – I'm just saying, assuming that you have data that shows that chlorophyll-a levels did not change in the system, would you use a weight-of-evidence analysis to reach a conclusion that you have to regulate nutrients anyway under the theory that it did cause a change in the system? **A.** No. . . .

Currier Deposition at 90 ln 14-21.

**22. There is no data showing eelgrass loss caused increased macroalgae growth.**

**Q.** . . . 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.

Trowbridge Deposition Vol. 1 at 156 ln 21 – 157 ln 5.

**23. There is no macroalgae impairment in Great Bay.**

**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.** What about the Piscataqua, Upper or Lower, excessive macroalgae? **A.** I'm not sure. \*\*\* **Q.** . . . 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.

Trowbridge Deposition Vol. 1 at 149 ln 21 – 150 ln 4; 150 ln 22 – 151 ln 1; 152 ln 13-16.

**24. Mr. Short acknowledged that his studies were not intended to ascertain the factors causing eelgrass populations to fluctuate in the system, only to document how those populations fluctuated.**

**Q.** . . . When you conducted these eelgrass mapping studies, were these studies designed to address the causes for changing eelgrass populations in the bay? **A.** No. They were just to give an annual assessment of how eelgrass was doing.

Short Deposition at 16 ln 18-23.

**25. The 2009 Numeric Criteria did not implement the state narrative standard.**

**Q.** . . . Does this numeric nutrient criteria document from June 2009, is it DES's position that this document constitutes a demonstration that the narrative criteria for nutrients have been violated within the Great Bay estuary? **A.** Does that

document? **Q.** Uhm-hmm. **A.** Demonstrate a violation? **Q.** Yeah; of the narrative standard? **A.** No.

Trowbridge Deposition Vol. 2 at 332 ln 22 – 333 ln 8.

**26. Since 2005, EPA was demanding that DES adopt new numeric nutrient criteria for Great Bay.**

**A.** Well, there were two reasons. EPA was encouraging states to develop numeric nutrient criteria in fact for all water body types and had put forth various guidance and was seeking agreements and timetables with us and other states to do that. ...

Currier Deposition at 21 ln 3-7.

**27. Mr. Trowbridge testified the 2009 criteria were never demonstrated to be “necessary” for the Great Bay Estuary.**

**Q.** Back to the question I started with. What specific data for Great Bay – I’m not asking you what they concluded on Chesapeake Bay or how they came up with the 22 percent elsewhere. What specific data for Great Bay confirmed that without 22 percent light, the eelgrass are not going to be able to grow and reproduce in Great Bay? **A.** There are no specific studies on that.

Trowbridge Deposition Vol. 1 at 239 ln 3-10.

**Q.** ... Is there any Great Bay-specific information that you have or that’s been presented to you confirming that a 22 percent light level is necessary to ensure the health and survival of eelgrass anywhere in this system? **A.** Anywhere in the Great Bay estuary system? So you’re asking has any evidence been or any information been provided to me? **Q.** Great Bay-specific information. **A.** Great bay-specific. No.

Trowbridge Deposition Vol. 2 at 364 ln 4-13.

**28. When developing the 2009 Numeric Criteria document confounding factors analyses were never assessed to determine if other factors were at play.**

**Q.** ... With regard to the low DO relationship to chlorophyll-a, and your transparency relationship to total nitrogen, both of these graphs are just correlations, right; they do not show causation? **A.** That is correct. **Q.** Is there anywhere in the 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.

Trowbridge Deposition Vol. 2 at 438 ln 11-21.

**Q.** What about the factors that are controllable in tidal rivers; did you assess whether or not CDOM, turbidity or any of the other actors that are significantly influencing the transparency level in the tidal rivers, is there any assessment of that anywhere in that document? ... **A.** No.

Trowbridge Deposition Vol. 2 at 438 ln 11 – 439 ln 10.

**29. It was EPA that insisted DES continue to develop the 2009 criteria, despite knowing that the “conceptual model” (transparency decrease due to nutrient induced excessive algal growth) was not applicable to this system.**

**Q.** Do you have a basis to agree with Mr. Liebman that since Great Bay eelgrass community is mostly intertidal, the response is different than the water quality conceptual model that you were applying – I’m sorry – water clarity conceptual model you were applying? **A.** Do I have a reason to object to that? Is that --. **Q.** Is that a – is that statement wrong? **A.** I think it’s valid.

Trowbridge Deposition Vol. 1 at 198 ln 8-17.

**30. DES simply decided to ignore its own detailed assessments showing transparency was not the issue.**

**Q.** Okay. Was this moored array report part of the studies that you considered in order to determine what was affecting transparency in the system and why? **A.** Yes. **Q.** Did you include this as a reference in that 2009 criteria document? **A.** Yes. **Q.** Okay. I’m going to read it. Are you an author on this study? **A.** Yes. **Q.** I’m going to read you a quote from the report, page 51. The results of the – the results suggest that water clarity in Great Bay, Little Bay, and Lower Piscataqua River were sufficient for eelgrass growth. The virtual absence of eelgrass from all but Great Bay suggests that other processes apart from light restricted growth and are important for limiting eelgrass survival. Is that a false statement in this report? **A.** No.

Trowbridge Deposition Vol. 1 at 235 ln 18 -236 ln 17.

**31. EPA informed the state that they should apply the draft 2009 Criteria and call it a “narrative translator” to avoid concerns of illegal application of a new unadopted, numeric criteria.**

**Q.** ... In terms of differences in regulatory effect, what’s the difference in regulatory impact between calling those numeric nutrient criteria versus calling them a narrative criteria translator? **A.** The one that I’m most aware of is bound to the Clean Water Act. The process for water quality standards provides that, for EPA to approve them, and once they are approved they become enforceable as federal regulation, and a translator because it’s not adopted by, under the state

rulemaking or statutory process is not directly federally enforceable as a federal rule. **Q.** Okay. Let me reword the question. Actually, who told you that was true? **A.** I'm not sure, but Ann Williams may have. **Q.** So EPA is the one that came up with the idea of calling this a narrative criteria translator so it could be used immediately in the 303(d) process to generate impairment listings? **A.** This is – again, this is my understanding based on written EPA guidance, which is nationwide, is that in our conversations with the Region One folks is that this was an acceptable way from EPA's point of view for us to move in the direction of adopting nutrient criteria.

Currier Deposition at 109 ln 12 – 110 ln 14.

**Q.** ... Even if we call this a numeric or, rather, a narrative translator, the 2009 document, if it's a narrative translator, it's a new narrative translator, right? I mean, the public -. **A.** Yes.

Currier Deposition at 140 ln 7-15.

**32. The 2009 Numeric Criteria was used by DES to develop the 2010 Wasteload Allocation Report and that report was submitted to EPA to serve as the basis for setting more restrictive effluent limitations for the permits:**

**Q.** So the, again, the purpose of the wasteload allocation report was to determine how much reductions in nitrogen would be needed to meet the 2009 criteria? **A.** Yes.

Trowbridge Deposition Vol. 1 at 285 ln 11-14.

**Q.** And I'd like you to go back to the first page, where it's your e-mail where you're saying, "Hi Carl and Brian. Attached is a draft of the wasteload allocation." It's the very first thing. "I hope it will be useful in our consideration of the Exeter and subsequent permits." Was it—one of the purposes of developing this wasteload allocation was that it could be considered as a basis for setting the, whatever more restrictive permit limitations might be necessary in the next round of permitting? **A.** Yes.

Currier Deposition at 139 ln 10-21.

**33. The relevant information DES/PREP analyses that evaluated whether (a) TN increases had caused changes in transparency, algal levels or DO and (b) a "cause and effect" relationship between TN and transparency/DO existed, were excluded from the technical information presented in the 2009 Numeric Criteria document and, therefore, were never presented to EPA's peer review panel.**

**Q.** ... 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 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.

Trowbridge Deposition Vol. 2 at 436 ln 8 - 438 ln 9.

**34. EPA was also responsible for preventing the Coalition from pointing out these issues to the peer reviewers.**

**Q.** Oh. Now, it says there was going to be a peer review. So a peer review was supposed to occur with regard to the draft, the June 2009 numeric criteria? **A.** (Deponent nodded.) **Q.** Okay. Do you know if the public was supposed to be involved or excluded from that peer review? **A.** That peer review was through the EPA N-STEPS process. And I am not familiar with the details of it, but that's what happened. **Q.** Well, did DES ask for the public to be excluded from the peer review process? **A.** No. **Q.** No. Did you ask for the public to be included in the peer review process as a result of the comments and questions submitted by, I think primarily through Tupper Kinder's offices to DES? **A.** We certainly transmitted all of that to EPA and did our best to accommodate the concerns. **Q.** But it just didn't happen, right? **A.** Again, EPA has this N-STEPS process which they offered to us basically free as an independent peer review, and we took advantage of it. **Q.** Did EPA ever tell you that they didn't want to deal with the questions raised by the Great Bay Municipal Coalition or others with regard to the numeric nutrient criteria via the N-STEPS process? **A.** Not that I recall. **Q.**

Did you have any discussions with Carl DeLoi, who I imagine was the decision-maker, on excluding the municipalities in the peer review process? **A.** No. **Q.** Do you know why EPA excluded them? **A.** I – well- **Q.** I am not asking you to – I’m not asking you to speculate. I’m asking you like in your discussion do you know what happened? **A.** No, no. My understanding is that the N-STEPA process was already fairly well along when the municipalities’ concerns were put forward, and that was a factor.

AR D.4.i.1 at 144 ln 3 – 145 ln 20.

**35. Philip Trowbridge deposition going into further detail confirming the lack of data related to the periodically low dissolved oxygen in the Great Bay estuary.**

**Q.** 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.** So you’re telling me that the dam on the Lamprey River causes the stratification in the system? **A.** No. I’m asking for clarification on what you mean by natural. **Q.** Mr. Trowbridge, I asked you whether or not the stratification was a natural condition, then you said about the dam. That’s not natural. Then I asked you if the dam causes the stratification. You said, no not really. So do you want to tell me why you brought up the dam as a relevant point to my question when you knew the dam did not have an effect on stratification? ... **A.** I – I was asking you for clarification of what you meant by natural condition. ... **Q.** ... Is the stratification condition in the Lamprey River a natural condition? Yes or no. **A.** As I asked before, what are you considering to be natural? Is it natural that there’s a dam there? **Q.** What specifically affects stratification in the Lamprey River, do you know? **A.** Stratification -. **Q.** – Yeah. **A.** - is affected by flushing, it’s affected by topography and - **Q.** Let’s go one at a time. Every time you – stratification. Is flushing- is that a natural condition? The amount of tidal exchange into the system, is that natural? **A.** The amount of tidal exchange is natural. **Q.** Okay. Let’s go to the next one, topography. The topography where the stratification occurs, is it natural? **A.** Uh-huh. **Q.** What else? What other things affect the stratification in that system? **A.** The freshwater inflow. **Q.** And that comes down through the system? **A.** Uh-huh. **Q.** Okay. And you have data showing that the freshwater inflow to this system controls whether and how the stratification will

occur under typical conditions in the Lamprey River? **A.** I am saying that, in general, freshwater inflow is an important factor in terms of stratification. **Q.** I'm asking for this particular system. Under the conditions where we've got the low DO occurring in the Lamprey River, are you telling me that the freshwater flow is what's controlling that low DO occurring? **A.** What I'm saying is that's a factor that's part of the answer. **Q.** Okay. Now, which of these things, which non-natural factor, is causing the stratification to occur in the Lamprey River, which is causing the low DOs to occur in the Lamprey River, which non-natural factor? **A.** Are you asking about the stratification or about the low DO? **Q.** A combination. Let's start with stratification. **A.** Okay. **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 in the system? **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. ... **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 conditions 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 the 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 of 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 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 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.** 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.

Trowbridge Deposition Vol. 2 at 33 ln 2 – 45 ln 4.

**36. At the depositions, DES concocted a theory that the eelgrass loss “must be due to TN” since it was the only factor that DES “believes” has changed.**

**Q.** ... can you read that one highlighted sentence then? **A.** Sure. The sentence is, “This decision is supported by the scientific consensus that eelgrass should be present in Great Bay, Little Bay, and the Upper Piscataqua River, but more research is needed to determine whether eelgrass restoration is an appropriate or feasible goal for the tidal rivers.” **Q.** Okay. Do you remember writing that document? **A.** It would help me if I had a date, but obviously I did write it. I’m just not sure which version of the document it is. **Q.** The only thing I can tell you, sometime in 2009, but I guess the question really goes to do you know if more research was done to confirm- what’s the last part of the sentence if I may read it – to confirm whether eelgrass restoration is an appropriate or feasible goal for the tidal rivers? **A.** If more research was done- **Q.** If – yea. It says more research is needed? **A.** Yeah. **Q.** So do you know whether more research was ever done to determine whether eelgrass restoration is an appropriate or feasible goal for the tidal rivers? **A.** not knowing the date of that, it’s hard for me to answer. Uhm- **Q.** From 2009 forward do you know if any more research was done to show if it was an appropriate or feasible goal for the tidal rivers? **A.** I don’t believe so. **Q.** Okay. Can you explain to me why, then, in August of 2011, DES sent a letter to EPA saying it was appropriate to apply the eelgrass criteria in the lower sections of the Squamscott and Lamprey River if the research wasn’t done to show it was either appropriate or feasible to have eelgrass in those areas? **A.** I guess I may be getting tripped up on the term “research.” If research means a field study, something was not done, but if research means to review the data that we had and to discuss it more thoroughly amongst ourselves, then we certainly did that. **Q.** You- you have data showing it’s reasonable, feasible, and/or appropriate to apply the nutrient criteria for eelgrass restoration in those segments of the rivers? If there’s such an analysis, we did not receive it under discovery so I’d like to know. **A.** Well, what I am referring to there is discussions about what could have changed and the parameters around, like, color-dissolved organic matter that shouldn’t have changed. There’s been no change in, or there should be no change in that. So it was deemed that it was feasible to restore. **Q.** Do you have an analysis demonstrating that nitrogen control will dramatically improve transparency in either the Lamprey or the Squamscott River? ... **A.** We do not have such analysis. **Q.** Then why would you put nitrogen criteria applicable in those areas? I mean, I’m trying to understand this because it’s pretty clear that eelgrass is gone. And it’s pretty clear people understood that there were water quality factors that were preventing it, but you picked out nitrogen as the one to control. **A.** Uhm-hmm. **Q.** Why? **A.** And you’re asking about the impairment determinations? Because I thought your first question was about permits or --. **Q.** No. The water quality

numbers. Why did you pick nitrogen as the basis for controlling transparency in the tidal rivers? **A.** Because of our review of the scientific literature on this topic that there – based on that, we have a conceptual model of what’s affecting eelgrass in the system, and nitrogen is the dominant factor.

Trowbridge Deposition Vol. 2 at 407 ln 17 – 410 ln 22.

**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 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 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.

Trowbridge Deposition Vol. 2. At 425 ln 5 – 428 ln 2.