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STATE OF NEW HAMPSHIRE

Response to Public Comment on the Draft 2018 Section 303(d) List of Impaired Waters and the Draft Consolidated Assessment and Listing Methodology

August 8, 2019

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

STATE OF NEW HAMPSHIRE

Response to Public Comment on the Draft 2018 Section 303(d) List of Impaired Waters and the Draft Consolidated Assessment and Listing Methodology (CALM)

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A. INTRODUCTION

On January 24, 2019, the New Hampshire Department of Environmental Services (NHDES) released the Draft 2018 303(d) List of impaired waters and the Draft Consolidated Assessment and Listing Methodology (CALM) for public comments. Downloadable copies of the draft 303(d) list and CALM were made available on the NHDES website for review. Public comments were accepted through the close of business on March 15, 2019. Upon preliminary review of the comments received NHDES determined that it was appropriate to list Mill Pond as impaired for cyanobacteria in the 2018 303(d). An additional comment period for the added Mill Pond impairment was released on March 26, 2019. In addition to posting both notices of comment opportunity at multiple locations on the NHDES website, direct notification by email was sent to nearly 1,500 stakeholders including but not limited to:

Federal agencies
State agencies in New Hampshire and abutting states
Municipal officials
DPW Directors of the MS4 Communities
County Conservation Districts
Regional Planning Commissions
Nonprofit interest groups
Volunteer monitoring groups
New England Interstate Water Pollution Control Commission
University of New Hampshire

The following sections contain the comments received, NHDES' responses to comments and supporting information. The sections are organized as follows:

A. Introduction
B. Response to Public Comment (Note: This section contains NHDES' responses to all of the comments received. The responses are organized by reference number. A reference number refers to a specific section of a comment letter in Section D.)
C. References used in Section A & B.
D. Public Comment on the Draft 2018 303(d) List of Impaired Waters (Note: This section contains the full text of all comments received. Each individual comment in the letters has been assigned a reference number. The reference number corresponds to the responses in Section B.)

While the bulk of the comments text is provided in this document the full original comments and attachments received on the January 24, 2019, draft are on the department's FTP site;

1. Go to this address using a web browser: ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/Draft_CALM_303d_Comments
2. At the login window, click on the box in the lower left hand corner labeled "Login Anonymously."
3. The user name will then be automatically filled in with the word "Anonymous."
4. Type in your email address in the "Email Address" block.
5. Then click on the "Log On" button.

Table 1: Comment Letters Received by NHDES and the Designated Comment Letter Number.

COMMENTER	RECEIVED	COMMENT #
Andrew Kohlhofer, Fremont, NH resident	1/24/2019	#1
Leslie Bergum, Ammonoosuc River - Volunteer River Assessment Program	2/21/2019	#2
Michele L. Tremblay, Upper Merrimack River Local Advisory Committee	3/12/2019	#3
Fred Quimby, New Durham, NH resident	3/13/2019	#4
Sarita S. Croce, Town of Merrimack	3/14/2019	#5
Melissa Paly, Conservation Law Foundation (CLF)	3/15/2019	#6
Meredith A. Hatfield, Conservation Law Foundation (CLF)	3/19/2019	#7
John B. Storer, City of Dover	3/15/2019	#8
Ken Moraff, United States Environmental Protection Agency (EPA)	3/15/2019	#9
Dean Peschel, Great Bay Municipal Coalition (GBMC)	3/15/2019	#10
Terry Desmarais, City of Portsmouth	3/15/2019	#11
Peter C. Nourse, City of Rochester	3/15/2019	#12

B. RESPONSE TO PUBLIC COMMENT ON THE JANUARY 24, 2019 DRAFT

RESPONSE TO COMMENT #1: Andrew Kohlhofer, Fremont, NH resident

***NHDES RESPONSE* to 1- 1**

The commenter is concerned that EPA and NHDES do not have the authority to make assessment decisions on state surface waters as they do not meet the definition of "interstate navigable waters." Although these comments are not specific to the 2018 draft CALM or 303(d) List, and therefore do not require a response, NHDES would like the commenter to know that EPA defines the term waters of the United States to include navigable waters and their tributaries, interstate waters, and intrastate lakes, rivers and streams (40 CFR 122.2). The intent of the definition is to cover all possible waters within federal jurisdiction under the Commerce Clause of the Constitution. The definition has been interpreted to include virtually all surface waters in the United States, including wetlands and ephemeral streams. For the latest information on EPA's interpretation of waters of the United States, visit the Waters of the United States Rulemaking webpage. Furthermore, New Hampshire Statutes Chapter 485-A:2, XIV defines "Surface waters of the state" as perennial and seasonal streams, lakes, ponds, and tidal waters within the jurisdiction of the state, including all streams, lakes, or ponds bordering on the state, marshes, water courses, and other bodies of water, natural or artificial.

***NHDES RESPONSE* to 1- 2**

The commenter is concerned that NHDES does not have the authority to make assessment decisions on state surface waters as it has not been directed to do so by the legislature. Although these comments are not specific to the 2018 draft CALM or 303(d) List, and therefore do not require a response, NHDES would like the commenter to know that the Federal Water Pollution Control Act [PL92-500, commonly called the Clean Water Act (CWA)], as last reauthorized by the Water Quality Act of 1987, requires each state to submit a list of impaired waters to the US Environmental Protection Agency (USEPA) every two years. The document is typically called the "303(d) List," so named because it is a requirement of Section 303(d) of the CWA. Furthermore, New Hampshire Statutes Chapter 485-A:4.XIV requires the Department of Environmental Services to "formulate a policy relating to long-term trends affecting the purity of the surface waters or groundwaters of the state. Insofar as practicable and necessary, a continuing program of sampling and subsequent chemical or biological analysis, or both, shall be conducted to establish patterns and reveal long-term trends to serve as a basis for formulating such policy."

RESPONSE TO COMMENT #2: Leslie Bergum, Ammonoosuc River - Volunteer River Assessment Program

***NHDES RESPONSE* to 2- 1**

This section contains opening remarks by Leslie Bergum, including references to portions of the Ammonoosuc River being added to the Draft, 2018 303(d) List and their groups familiarity with the stations monitored. Responses to comments on individual assessment units are discussed below.

***NHDES RESPONSE* to 2- 2**

This section begins with the groups agreement that the new aluminum impairment for the Ammonoosuc River (NHRIV801030506-10) is warranted. The comments continue on to indicates the groups willingness to participate in sampling efforts and further requests that aluminum data be added the NHDES' Volunteer River Assessment Program (VRAP) reports. Although the offer to sample comments are not specific to the

2018 draft CALM or 303(d) List, and therefore do not require a response, NHDES would like the commenter to know that it has passed along these comments to the VRAP Coordinator.

NHDES RESPONSE **to 2- 3**
This comment concerns the impairment (4B-T) of the Ammonoosuc River (NHRIV801030403-03) for biochemical oxygen demand (BOD), due to NPDES violations at the Bethlehem Wastewater Treatment Facility (WWTF). These comments are not specific to the 2018 draft CALM or 303(d) List, and therefore do not require a response. However, NHDES would like the commenter to know that per section 3.1.21 of the CALM (NHDES, 2019a), WWTFs in "significant non-compliance" of their NPDES permit or on the "exceptions list" for one or more of its permitted effluent limits, are assessed as threatened and assigned to impairment category 4B-T because the allowable pollutant loading needed to meet water quality standards has already been established in the NPDES permit (an enforceable document). BOD data reviewed from January 2011 thru February 2019 had a single documentation of SNC for one quarter which was part of this evaluation. This was a result of Bethlehem WWTF having monthly average BOD concentrations of 31 mg/L, 31 mg/L, 32 mg/L, and 32 mg/L for the months of October 2017, January 2018, February 2018, and March 2018, respectively. Since March 2018, the permittee has been in compliance with the 30 mg/L monthly average BOD limitation in their permit. As BOD has the greatest impact on river health during warm summer conditions and the permit limit is based on a summer low-flow condition, it should be solace to the commenter that the periods when the permittee was in non-compliance likely had limited impact of the rivers health. NHDES and EPA continue to monitor Bethlehem's compliance.

NHDES RESPONSE **to 2- 4**
Closing remarks by Leslie Bergum, Ammonoosuc River - Volunteer River Assessment Program. NHDES appreciates the time taken to review the documents and no further response is needed.

RESPONSE TO COMMENT #3: Michele L. Tremblay, Upper Merrimack River Local Advisory Committee

NHDES RESPONSE **to 3- 1**
The commenter was in agreement with the assessment decision made by NHDES in the Upper Merrimack River area, from Franklin to Bow, in addition to informing NHDES that additional water quality and organism passage data will be submitted at a future date. NHDES appreciates the time taken to review the documents and encourages the commenter to utilize the Guidance for Submittal of Surface Water Data/Information. No further response is needed.

RESPONSE TO COMMENT #4: Fred Quimby, New Durham, NH resident

NHDES RESPONSE **to 4- 1**
This section contains opening remarks by Fred Quimby, including a request to have Mill Pond in Alton, NH (NHLAK700020102-04) added to the 303(d) for Cyanobacteria hepatotoxic microcystins. NHDES' response to this request is discussed below.

NHDES RESPONSE **to 4- 2**
This section contains justification as to why the commenter believes that Mill Pond (NHLAK700020102-04) should be impaired for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use. Included in the justification were a historical perspective on potential contributors to the cyanobacteria bloom documented by NHDES in 2018, anecdotal evidence supporting the possibility of additional blooms that were not documented in recent years, observations supporting the frequent use of

the pond by anglers who come into direct contact with the water, and additional preliminary data analyzed by the University of New Hampshire showing elevated nutrient (total phosphorus) concentrations within the pond that are likely contributing to the growth of cyanobacteria.

Upon review of the additional information provided by the commenter, NHDES felt that it had gained a better understanding of the frequency and duration of blooms, the likelihood of citizens to report a bloom, and some historical context on potential causes. It was for these reasons and the fact that the 2018 cyanobacteria bloom occurred in amounts and for a duration that significantly interfered with the primary contact recreational use of the lake, that NHDES decided to add Mill Pond (NHLAK700020102-04) to the draft, 2018 303(d) List. It has been placed in category 5-M for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use. The complete parameter level assessment made to Mill Pond by NHDES is provided below in **Table 2**.

Table 2: Parameter Level Assessment Made to Mill Pond (NHLAK700020102-04) Originally Categorized as 3-PNS

Assessment Unit Name	Assessment Unit ID	Use Description	Parameter Name	Draft 2018 NHDES Assessment Category (January 24, 2019)	Updated Draft 2018 303(d) NHDES Assessment Category (March 26, 2019)
Mill Pond	NHLAK700020102-04	Primary Contact Recreation	Cyanobacteria hepatotoxic microcystins	3-PNS	5-M
Parameter comments	A cyanobacteria bloom was documented in 2018 lasting approximately 14 days. The maximum total cell concentration reported was 300,000 cells/mL on 9/17/2018. Cyanobacteria taxa identified included *Microcystis, Aphanocapsa* and *Gloeocapsa*. Subsequent analysis indicates that the Microcystin toxin (the one toxin for which NHDES can test) was present in the sample. It should be noted that the waterbody is relatively shallow and not used significantly for swimming. However, it is a popular fishing location that is frequently accessed through wading by many anglers. It has also been noted that the Alton Fire Department occasionally withdrew water from the pond to use during training exercises. This practice has the potential to aerosolize any toxic algae present, which prompted NHDES to suggest this practice be curtailed. During conversation with the Alton Fire Department comments were made that the pond has been "green for years," indicating that although 2018 was the first year in which NHDES documented a cyanobacteria bloom it has most likely been occurring for many years. Additionally, a failing septic system at a commercial laundromat was discovered in the early 1980s, which was found to be discharging high concentrations of phosphorus and bacteria into the pond. It's possible that these compounds could have build-up in the sediment, helping contribute to the growth of cyanobacteria. Preliminary data from recent samples analyzed by UNH reportedly indicate elevated phosphorus concentrations within the pond. Much of the aforementioned information was conveyed to NHDES through public comments received on the January 24, 2018 draft, 2018 303(d) List. This new information gave NHDES a better understanding of the frequency and duration of blooms, the likelihood of citizens to report a bloom, and some historical context on potential causes. It is for these reasons and the fact that the 2018 cyanobacteria bloom occurred in amounts and for a duration that significantly interfered with the primary contact recreational use of the lake, that Mill Pond (NHLAK700020102-04) has been placed in category 5-M for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use.					

Following this decision, and in accordance with Section 3003(d) of the federal Clean Water Act, NHDES released the proposed change to the 303(d) List on March 26, 2019, for a 30-day public comment period. A downloadable copy of the proposed change with supporting justification were made available on the NHDES website for review (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm). Public comments were accepted through the close of business on April 26, 2019. In addition to posting at multiple locations on the NHDES website, direct notification by email was sent to nearly 1,500 stakeholders including but not limited to:

Federal agencies
State agencies in New Hampshire and abutting states
Municipal officials

DPW Directors of the MS4 Communities
County Conservation Districts
Regional Planning Commissions
Nonprofit interest groups
Volunteer monitoring groups
New England Interstate Water Pollution Control Commission
University of New Hampshire

NHDES received no formal public comments on the addition of Mill Pond (NHLAK700020102-04) to the 2018 303(d) List for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use by the close of business on April 26, 2019. No further response is needed.

RESPONSE TO COMMENT #5: Sarita S. Croce, Town of Merrimack

***NHDES RESPONSE* to 5- 1**
This section contains opening remarks by Sarita S. Croce. References to portions of the draft 2018 303(d) and draft CALM are discussed in the responses below.

***NHDES RESPONSE* to 5- 2**
This comment begins with a summary of a predictive model conducted by CDM-Smith, in coordination with the US Army Corps of Engineers (USACOE). The commenter points out that the summary indicates that "the river exhibits no aquatic health risks due to low oxygen levels, and available data suggests nutrients do not prevent the river from meeting aquatic life or recreational uses." This section does not appear to be a CALM comment or a specific 303(d) comment, and therefore does not require a response. However, NHDES would like to direct the commenter to section 3.1.4 Study Limitations, of the CDM-Smith Lower Merrimack Assessment Report where it states "…the model development and application in this study are comprehensive, but any model is a simplification and parameterizations of the real world. The large geographic scope of the model development necessarily limits the spatial resolution of the model's representation of the river" (CDM-Smith, 2018).

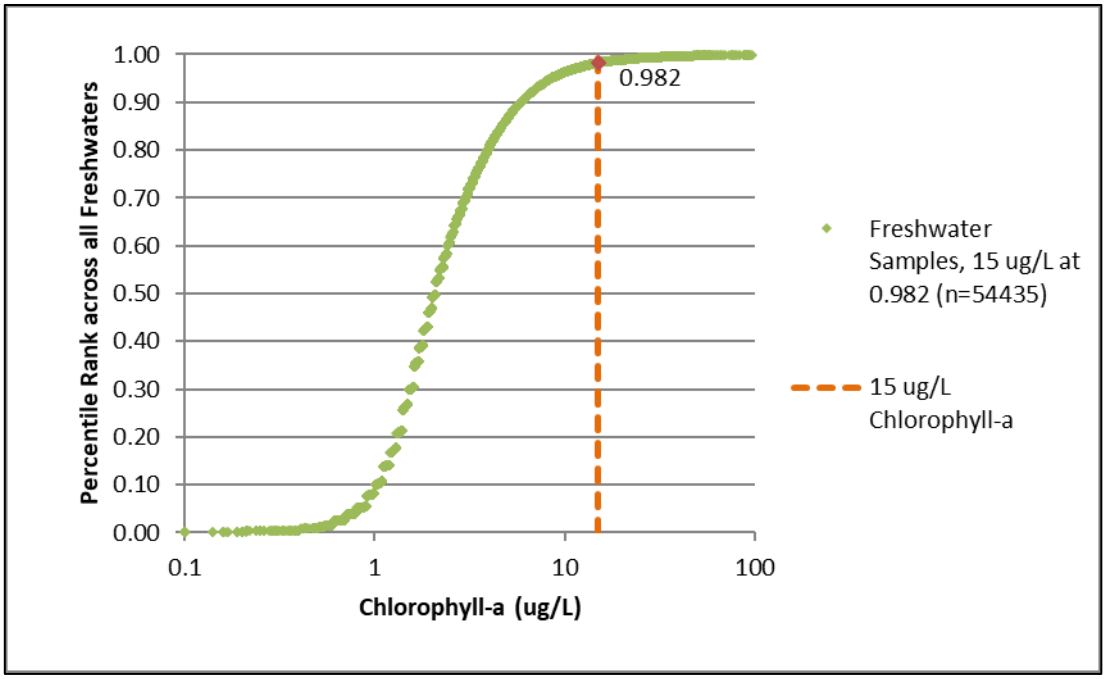
***NHDES RESPONSE* to 5- 3**
The commenter points out that pheophytin concentration can interfere with chlorophyll-a concentration and can give an artificially high chlorophyll-a concentration. The commenter summarizes a comparison conducted as part of the study conducted by CDM-Smith, in coordination with the USACOE, that states that pheophytin accounts for on average 35% of the total pigments in the river. The commenter further implies that by applying the chlorophyll-a to total pigment ratio at the Merrimack sampling station (80%) would lower a 17 µg/L chlorophyll-a measurement to 13.6 µg/L, which would be in compliance with NHDES' 15 µg/L chlorophyll-a threshold for the primary contact recreation designated use. As the commenter references chlorophyll-a at the state-line, NHDES has assumed that they are commenting on chlorophyll-a in the Merrimack River assessment unit NHRIV700061206-24 as that is the only segment of the Merrimack River listed as impaired due to high chlorophyll-a.

NHDES agrees with the commenter that the pheophytin concentration in a sample can have an impact on the chlorophyll-a concentration because it absorbs light and fluoresces in the same region of the spectrum as chlorophyll-a. However, because pheophytin absorbs light in nearly the exact same region of the light spectrum as chlorophyll-a, it also makes the water appear green, and difficult to see through just like healthy chlorophyll-a.

NHDES' 15 µg/L chlorophyll-a threshold for the primary contact recreation designated use (NHDES, 2019a) was not developed with regard to a particular method. Therefore, it is applicable to compared both

chlorophyll-a corrected for pheophytin and chlorophyll-a uncorrected for pheophytin to this threshold. The rationale for the development of the chlorophyll-a threshold, exclusive of method, was due to the fact that both chlorophyll-a and pheophytin absorb light in nearly the exact same region of the light spectrum making the water appear green to the casual observer. It is a common misconception that a waterbody that is impaired for chlorophyll-a for the primary contact recreation designated use is always green in color and/or algal blooms are constantly present. However, these types of visual cues are intermittent and not always spotted by the public. An evaluation of the existing chlorophyll-a data (both corrected and uncorrected for pheophytin) available for New Hampshire's freshwaters indicates that a 15 µg/L chlorophyll-a concentration is a very rare event (**Figure 1**), landing at the 98th percentile.

Figure 1: Percentile distribution of all valid freshwater samples collected for chlorophyll-a between 1/1/1990-4/18/2018



It is also important for the commenter to understand that NHDES does not make assessment determinations based on one discrete data point. Since 1990 there have been 53 chlorophyll-a samples collected within the Merrimack River (NHRIV700061206-24), eight of those were corrected for pheophytin. As evident in **Figure 2**, two of the samples that exceed the 15 µg/L threshold were corrected for pheophytin, and one was very close to the threshold. Based on the ACOE dataset, without the correction for pheophytin, we would expect the two values around 20 µg/L to visually act as 26 µg/L and the borderline sample to visually act as 19 µg/L. Furthermore, if the logic presented by the commenter is followed and all samples that are uncorrected for pheophytin are reduced by 35% (river average), that would mean that any uncorrected sample over 23 µg/L would still be an exceedance of the water quality threshold. In this instance that would mean there would be a total of four samples over the threshold even if the concentrations were corrected as suggested by the commenter. Although NHDES does not agree with the commenters approach, this confirms the fact that the impairment is warranted. Finally, although samples collected during the "current" period (2013-2018) did not measure chlorophyll-a above the 15 µg/L threshold, the CDM-Smith model data (**Figure 3**) predicts that chlorophyll-a exceedances are very common under the summer and August median flow conditions (NHDES, 2018). Examination of the chlorophyll-a data collected from the Merrimack River (NHRIV700061206-24) as a function of flow conditions at the USGS gage in the Merrimack River near Goffs Falls (**Figure 4**Figure 1) shows that the limited low-flow data collected in the current period (2012-2018) appears to be an improvement over the older data. NHDES looks forward to additional data being collected in the future in order to explore this further.

Figure 2: Chlorophyll-a Samples Collected in the Merrimack River (NHRIV700061206-24)

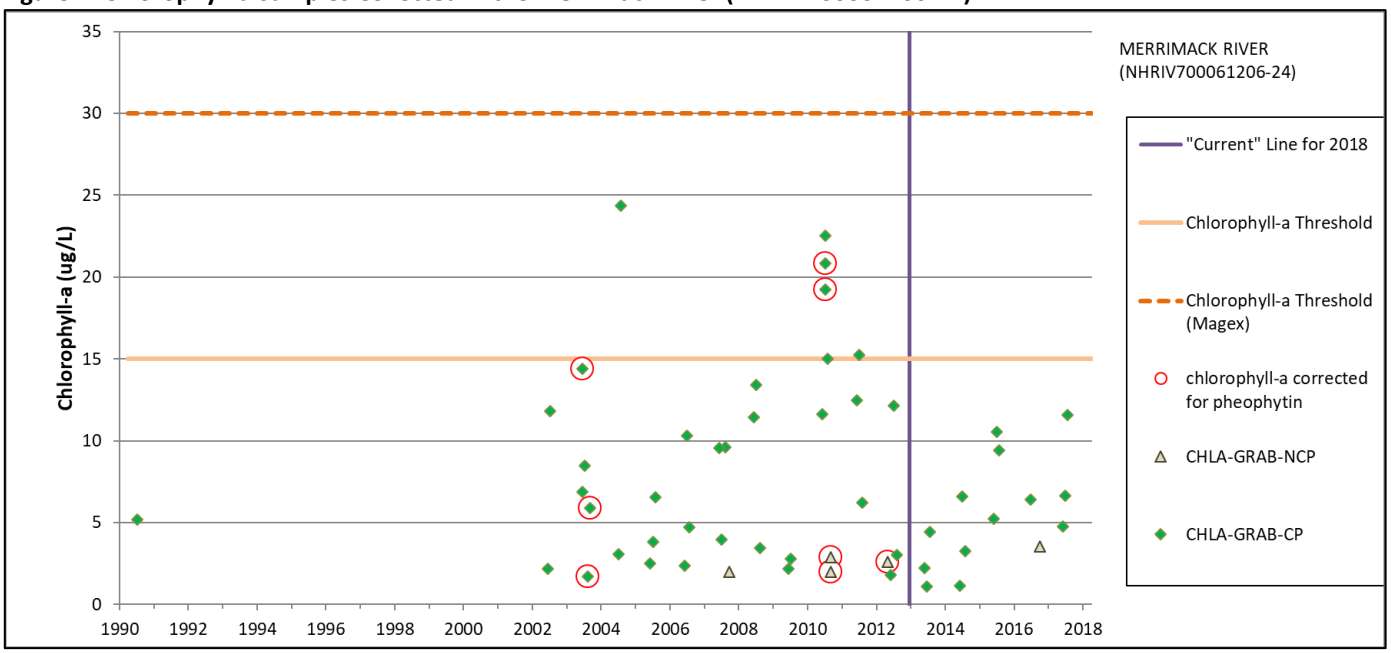


Figure 3: Modeled Events Under a Given Flow Condition

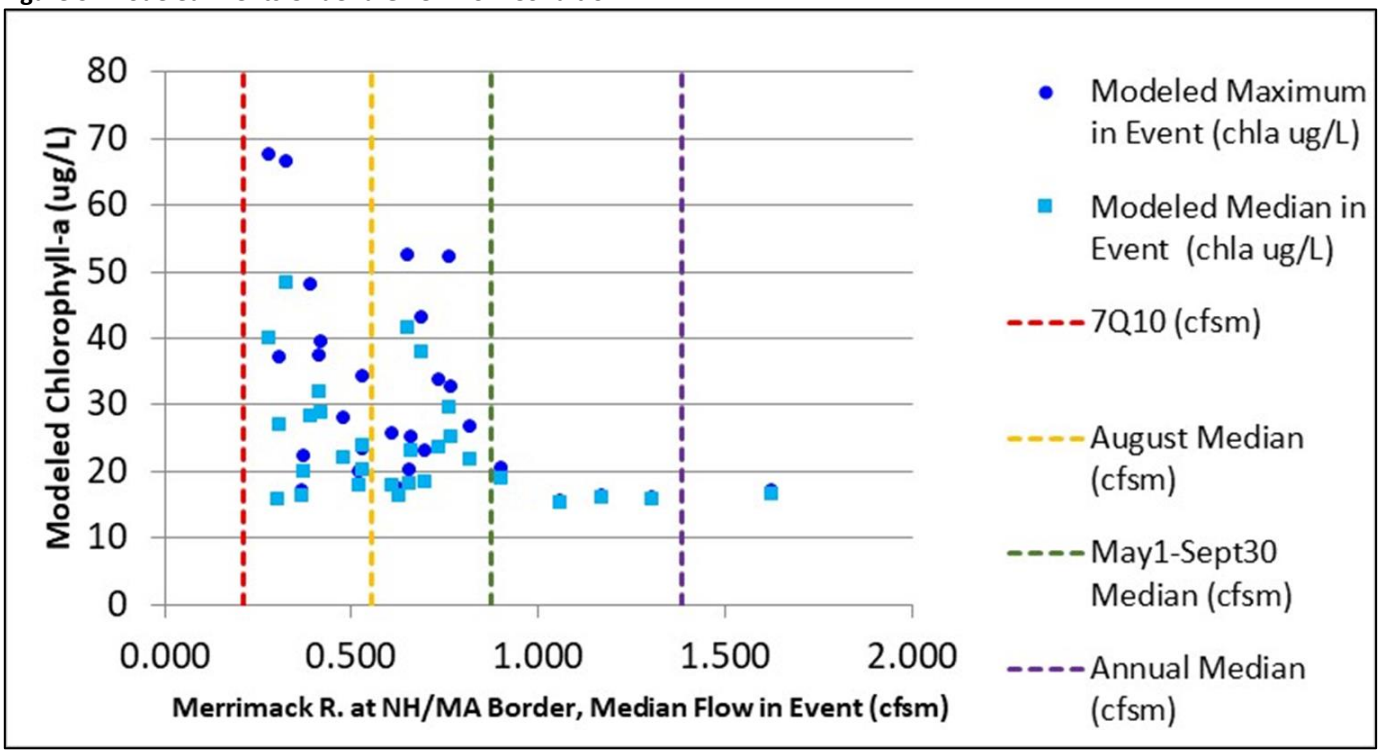
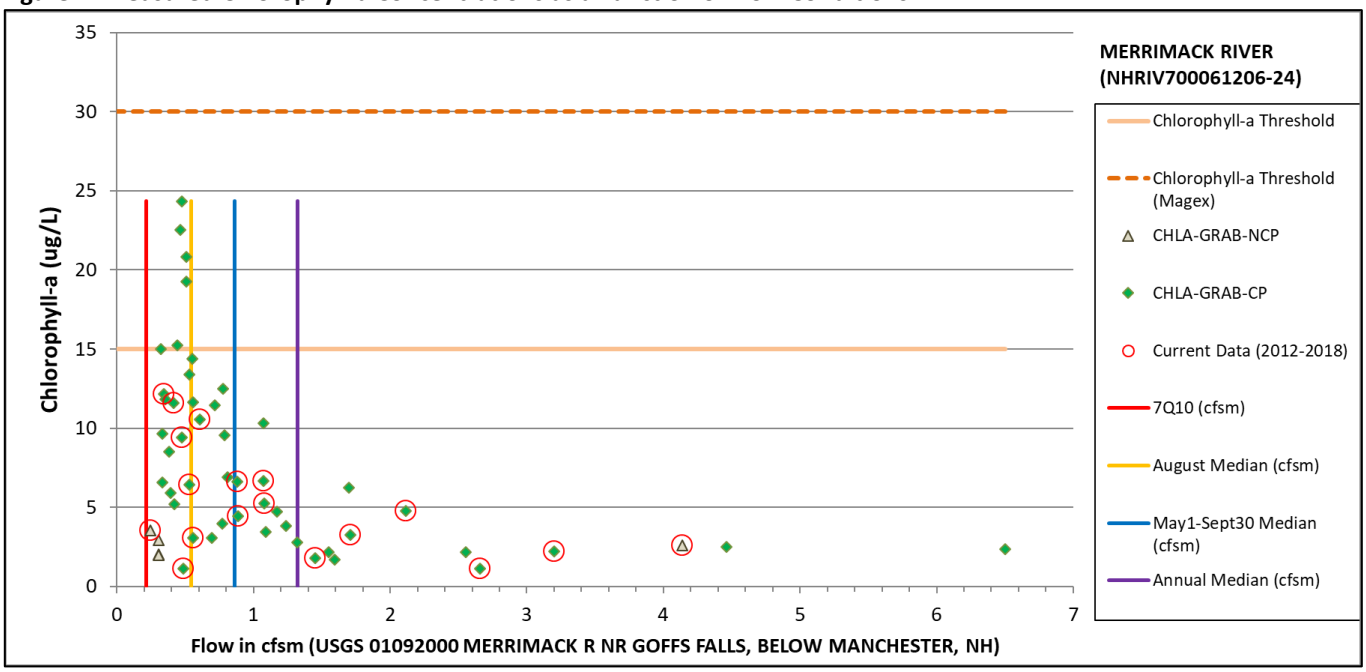


Figure 4: Measured Chlorophyll-a Concentrations as a Function of Flow Conditions



Notes:

CHLA-GRAB-CP = Grab samples of chlorophyll-a collected during the peak contact recreation season (aka critical period).
CHLA-GRAB-NCP = Grab samples of chlorophyll-a not collected during the peak contact recreation season (aka non-critical period).

NHDES RESPONSE **to 5- 4**

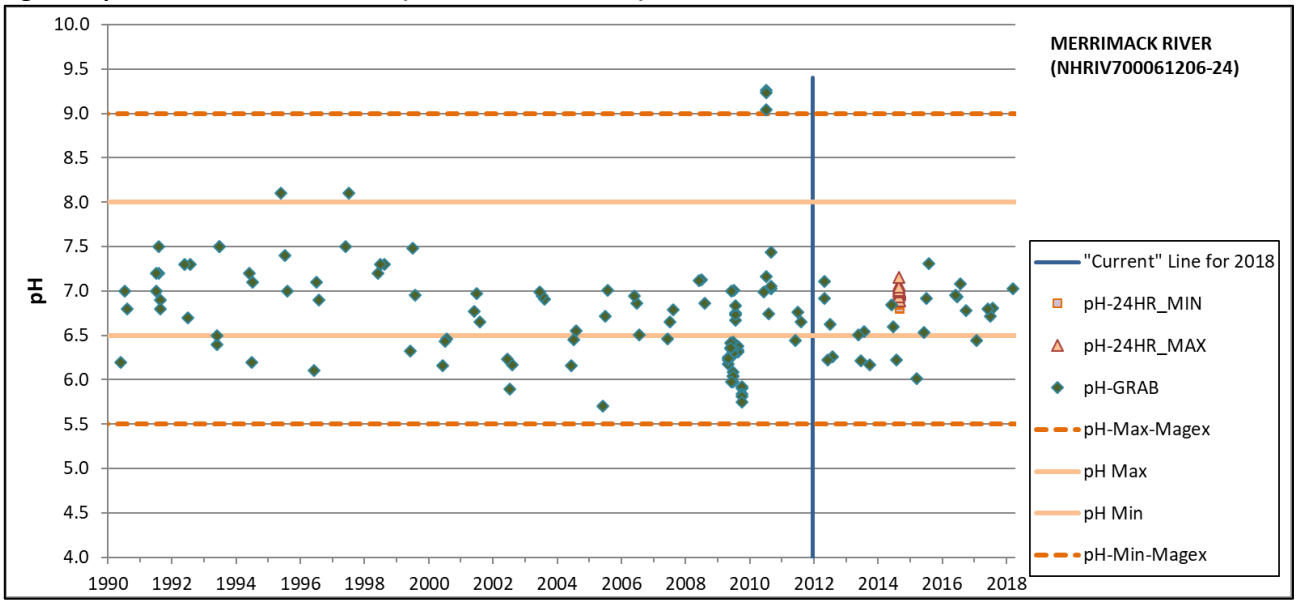
This comment summarizes a conversation that was had between Rick Cantu of OspreyOwl Environmental, LLC and Gregg Comstock of NHDES, in which the commenter indicates that the chlorophyll-a threshold for the primary contact recreation designated use was developed as an interpretation of water clarity. It is important to note that this interpretation of the chlorophyll-a threshold is only part of the rationale. As outlined in the Draft 2018 CALM, "For assessment purposes, chlorophyll-a concentration in excess of 15 µg/L in fresh water and 20 µg/L in salt water are indicators of excessive algal growth that interferes with recreational activities" (NHDES, 2019a). Although the commenter correctly correlated Mr. Comstock's comments about water clarity as a direct relationship to visual clarity (e.g. secchi depth), they did not consider the algal growth component. As evident from the aforementioned language from the draft 2018 CALM, the threshold was intended to represent an indicator of algal growth. Although algal growth can affect visual water clarity, thus posing a danger when diving into the water, it can also affect the aesthetic enjoyment of a waterbody. It is for these reasons that it is used as an assessment indicator of the General Water Quality Criteria (Env-Wq 1703.03), which requires that surface waters be free of substances which: produce color or turbidity making the water unsuitable for the designated use, or interfere with recreational activities (Env-Wq 1703.03 (c)(1) c & e).

NHDES RESPONSE **to 5- 5 & 5- 6**

This comment takes issue that there is not alignment between NHDES' assessments and a modeling study of the Merrimack River by CDM-Smith, in coordination with the USACOE. The commenter briefly references that the model indicates that there are no violations of the prime drivers of pH. It is not clear from the comments if this was a typo or intentional, as the commenter provides no context to the comment, no specific assessment unit, and no justification for their belief. Of the two assessment units for which the commuter has raised other concerns, only NHRIV700061206-24 has a pH impairment. However it is clear from **Figure 5** that this assessment unit experiences both low pH due to acid precipitation on poorly

buffered soils and high pH due to swings associated with high productivity like that seem on 7/27/2010 and 9/21/2010, when the Chlorophyll-a level reached 20 µg/L (Figure 10).

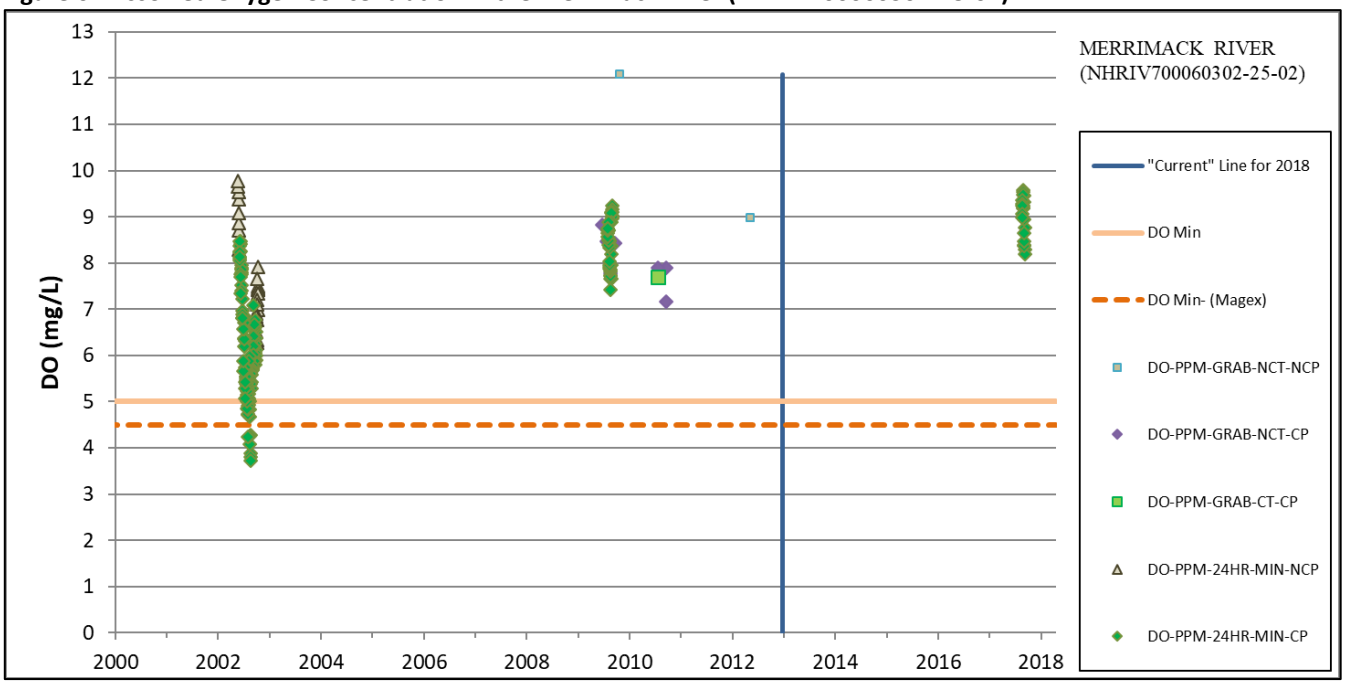
Figure 5: pH in the Merrimack River (NHRIV700061206-24)



The commenter further disagrees with NHDES' impairment of the mainstem Merrimack River (NHRIV700060302-25-02) for dissolved oxygen concentration for the aquatic life integrity designated use, and the Merrimack River (NHRIV700061206-24) for chlorophyll-a for the primary contact recreation designated use. As addressed in comments **5- 2** and **5- 3**, above; the model referenced by the commenter is a simplification of real world conditions, and has limitations based on its spatial resolution (CDM-Smith, 2018). The data used by NHDES to make assessment decisions must be of high quality and defensible. Although modeled conditions can be used in assessment determinations, they do not supersede physical data when the physical data demonstrates water quality thresholds are not being met.

Figure 6 illustrates the dissolved oxygen data within the Merrimack River (NHRIV700060302-25-02) that was used in the 2018 assessments. At first glance it appears to demonstrate that conditions within this stretch of the river have been improving since first sampled in 2002. However, understanding the data that was used in the original listing is critical when evaluating the newer data for possible consideration of a delisting. The newer data must be comparable to the original data in as many ways as possible. Specifically, the data must be collected at the same station and under the same (or more limiting) conditions as the original data that showed problems (NHDES, 2019b).

Figure 6: Dissolved Oxygen Concentration in the Merrimack River (NHRIV700060302-25-02)



Notes:

DO-PPM-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PPM-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PPM-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PPM-GRAB-NCT-NCP = Grab samples of dissolved oxygen not in the early morning hours and outside the summer critical period.
DO-PPM-24HR-MIN-CP = 24-hour minimum dissolved oxygen concentration from a datalogger deployed during the summer critical period.
DO-PPM-24HR-MIN-NCP = 24-hour minimum dissolved oxygen concentration from a datalogger not deployed during the summer critical period.

Examination of **Figure 7** shows that the data that was originally used to make the impairment determination in 2008 was collected at station P1893-03 (it should be noted that the 2002 data was collected by Gomez and Sullivan, and not submitted to NHDES until 2007, therefore the first assessment cycle in which it was available was 2008). One of the first factors to consider when comparing the different datasets is whether the data was collected at the same station. It can be seen in **Figure 7** that only the data collected in 2017 was collected at station P1893-03. One of the next considerations is to determine if the 2017 data from station P1893-03 was collected during the same relative time frame as the 2002 data.

When we look at **Figure 8** we can see that the 2017 data was only collected in September, in contrast the 2002 data was collected in May through October. We can also see that the only time when dissolved oxygen fell below the 5 mg/L threshold was in August, which unfortunately is absent from the 2017 dataset. Furthermore, pairing the dissolved oxygen data with the flow data from the Merrimack River gage near Goffs Falls, it is apparent that the August 2002 data were collected under lower flow conditions than much of the 2017 data (**Figure 9**). Water temperatures at the time of sample collection were also examined, but because there were no appreciable defenses, the data has not been presented. Until additional data can be collected that demonstrates an improvement in water quality under similar conditions (August with flows <0.40 CFSM), the Merrimack River (NHRIV700060302-25-02) must remain impaired.

Figure 7: Dissolved Oxygen Concentration by Station ID in the Merrimack River (NHRIV700060302-25-02)

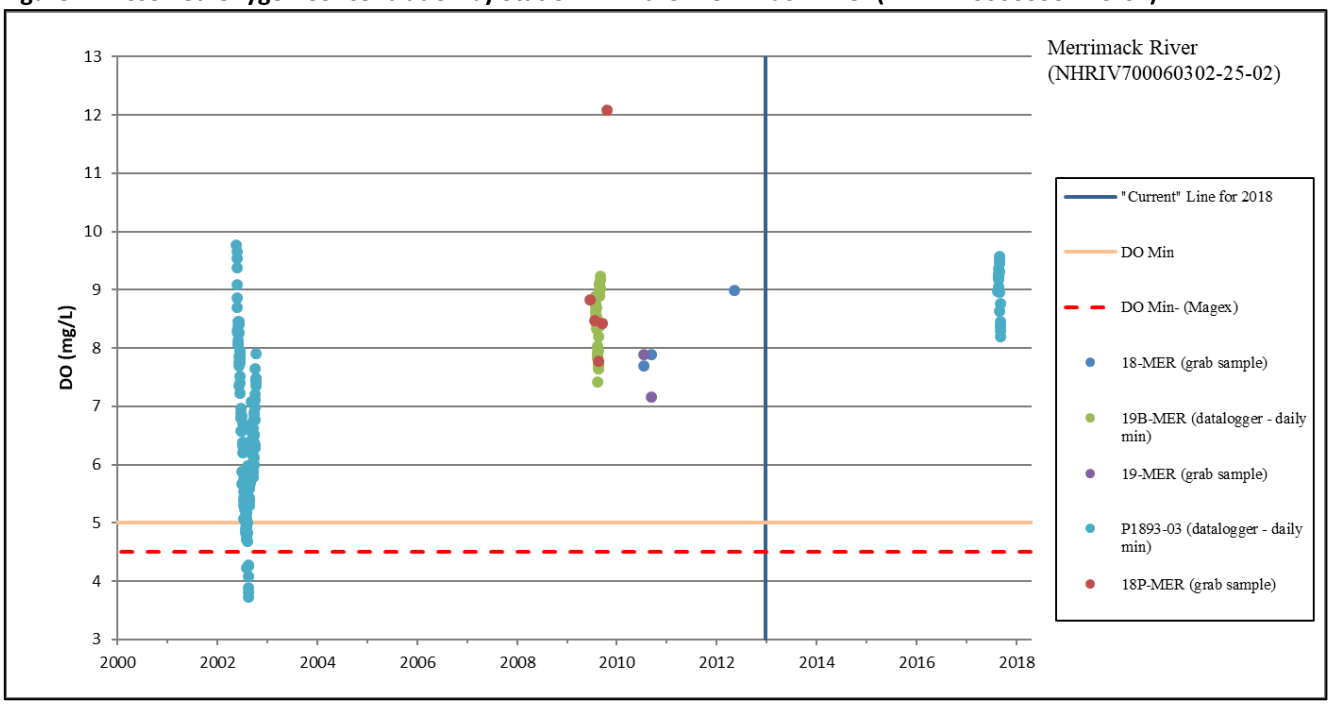


Figure 8: Daily Minimum Dissolved Oxygen Concentration from Dataloggers at P1893-03 in the Merrimack River (NHRIV700060302-25-02)

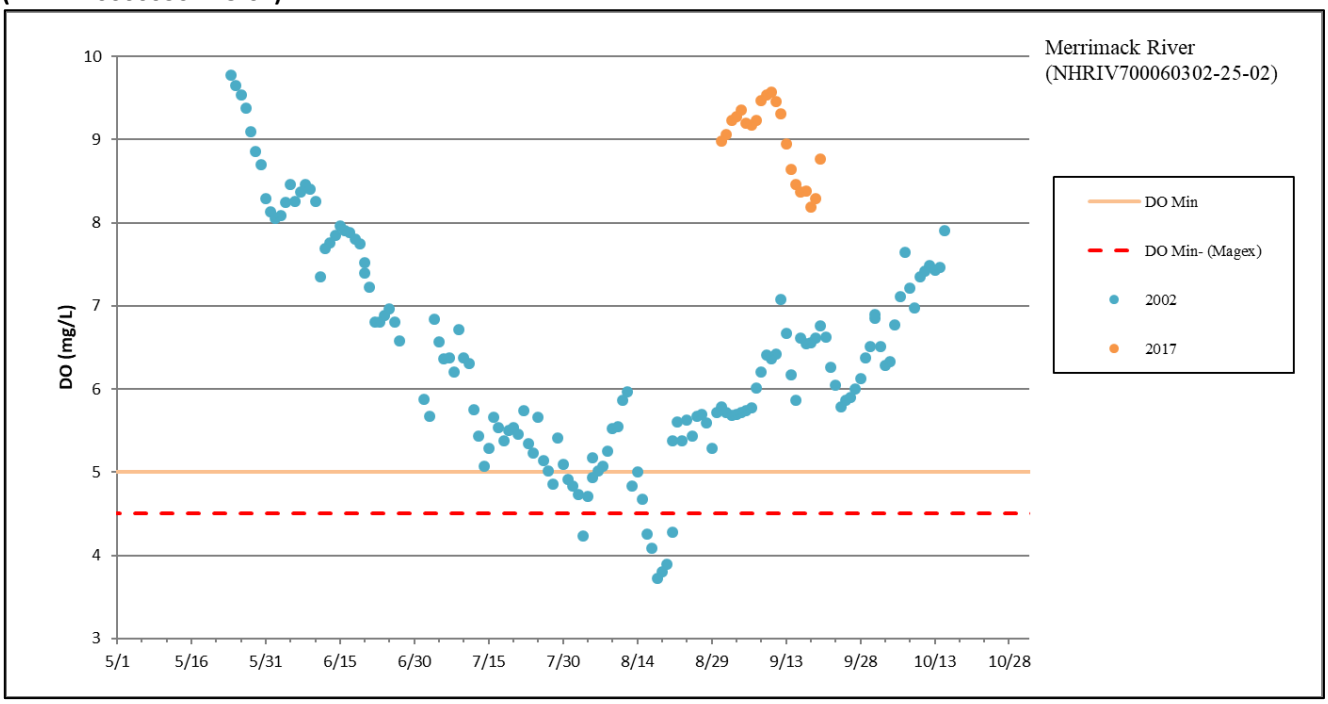
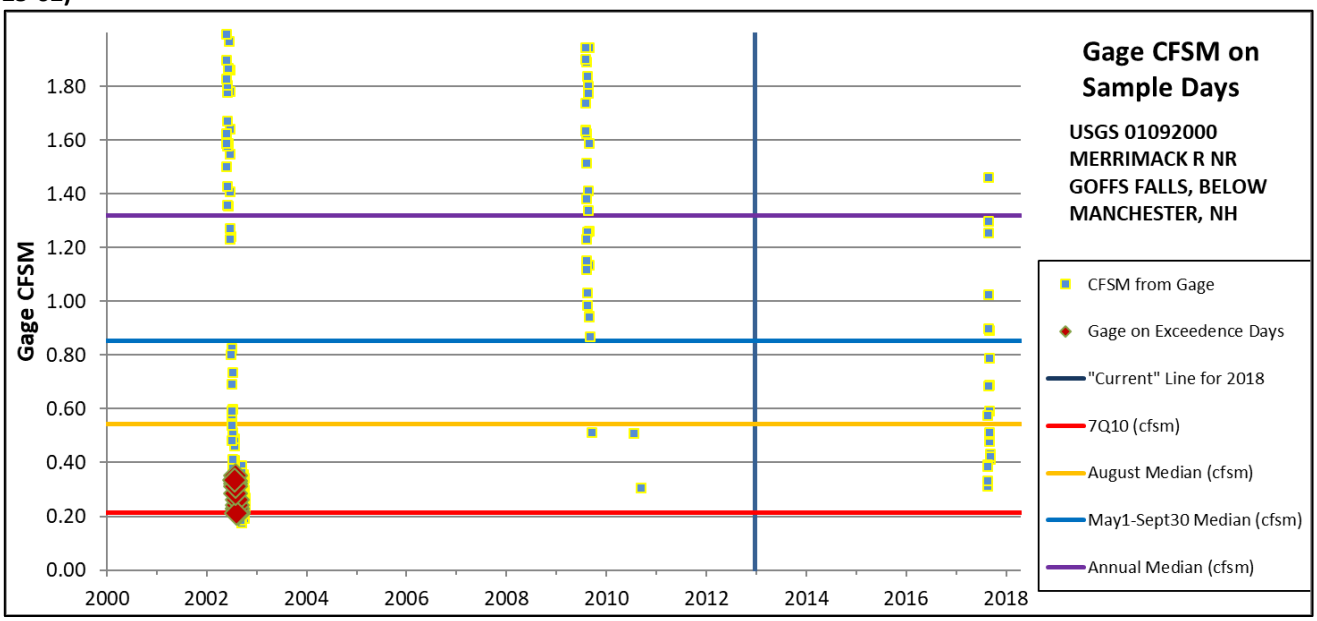
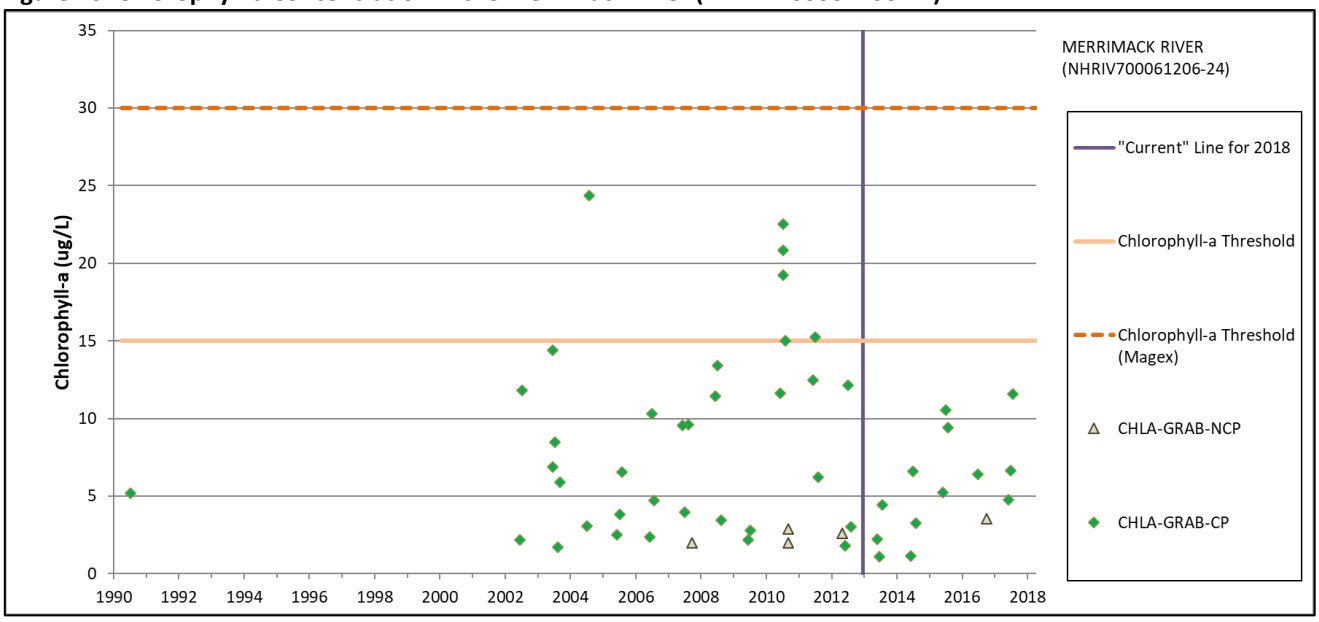


Figure 9: Gage Data Paired to the Dissolved Oxygen Concentration data in the Merrimack River (NHRIV700060302-25-02)



When we take a similar look at the chlorophyll-a data collected in the Merrimack River (NHRIV700061206-24; **Figure 10**), we again can see that the current data appears to show improving water quality. However, similar to the dissolved oxygen data, when we start to dig a little deeper we can see that there are differences between the current data and the historic data that was originally used to make the impairment determination.

Figure 10: Chlorophyll-a Concentration in the Merrimack River (NHRIV700061206-24)



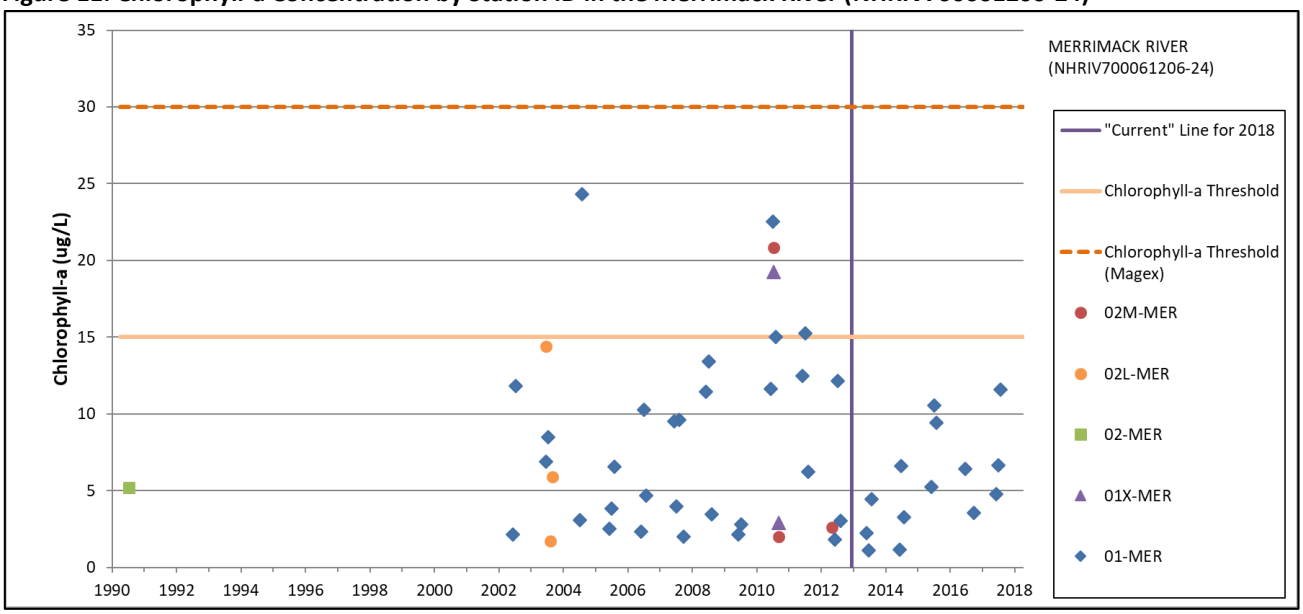
Notes:

CHLA-GRAB-CP = Grab samples of chlorophyll-a collected during the peak contact recreation season (aka critical period).
CHLA-GRAB-NCP = Grab samples of chlorophyll-a not collected during the peak contact recreation season (aka non-critical period).

Figure 11 reveals that the data used to make the original impairment determination was collected at three different stations (02-MER, 01X-MER and 01-MER). In contrast, all of the data in the current period was

collected at station 01-MER. Although there were some additional samples collected at stations 01X-MER and 02M-MER that were below the 15 µg/L threshold, comparing these data points to those in **Figure 10** one can see that they were collected in the non-critical period. Samples collected during the non-critical period do not hold as much weight during the assessment process as this is a time when the waterbody is less likely to be used for the designated use (i.e. swimming) and when chlorophyll-a levels are expected to be lower due to environmental conditions such as lower temperatures and reduced ambient light.

Figure 11: Chlorophyll-a Concentration by Station ID in the Merrimack River (NHRIV700061206-24)



Further examination of the data reveals that exceedances of the 15 µg/L threshold do not typically occur when flows at the Merrimack River gage near Goffs Falls is above the August median (0.54 CFSM; **Figure 12**). When just the data that has been collected during the current period (2013-2018; **Figure 13**) is examined, it becomes clear that limited data (35%; 5 of 14) have been collected under these conditions. As Illustrated in **Figure 3**, if NHDES were to use the CDM-Smith model under existing conditions as the basis for assessments one could expect chlorophyll-a concentrations to frequently exceed the 15 µg/L threshold. Therefore, until additional data can be collected that demonstrates an improvement in water quality at all the stations that were used to make the original impairment determination and under similar conditions (stations 01-MER, 01X-MER, and 02M-MER; flow < the August median), the Merrimack River (NHRIV700061206-24) must remain impaired.

Figure 12: Gage Data vs. Chlorophyll-a Concentration Data in the Merrimack River (NHRIV700061206-24)

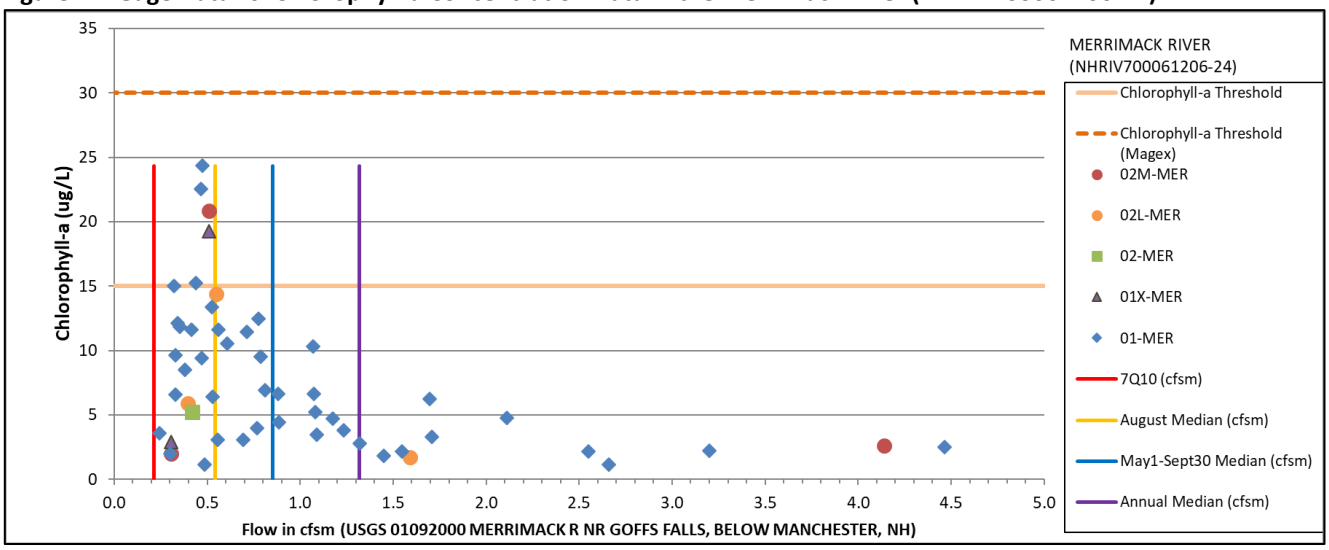
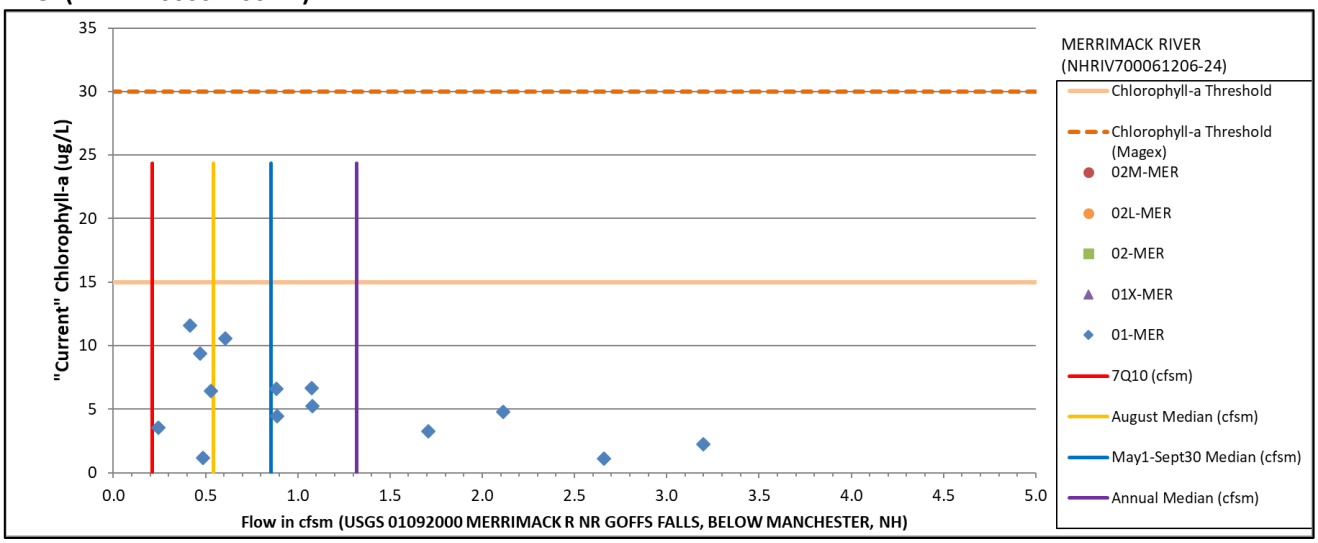


Figure 13: Gage Data vs. Chlorophyll-a Concentration Data from the Current Period (2012-2017) in the Merrimack River (NHRIV700061206-24)



***NHDES RESPONSE* to 5- 7 & 5- 8**

Attachments referenced in the comments. NHDES suggests that the commenter submits their SOPs and data to the EMD to ease use in future assessments. No additional response necessary.

***NHDES RESPONSE* to 5- 9**

This comment begins by inquiring as to how samples were collected, and ultimately makes comments on how they feel they should be conducted in the future. This section does not appear to be a CALM comment or a specific 303(d) comment, and therefore does not require a response. However, NHDES would like to direct the commenter to Section 3.1.12 Data Quality of the Draft 2018 CALM, which provides an overview of how NHDES classifies data used to make assessment decisions (NHDES, 2019a, p. 20).

NHDES RESPONSE* to 5- *8

This section informs NHDES of sampling that the commenter plans to conduct in the summer of 2019. This section does not appear to be a CALM comment or a specific 303(d) comment. No response is provided.

***NHDES RESPONSE* to 5- 11**
This comment inquires whether NHDES compared the data used to make the aluminum impairment determination for Souhegan River (NHRIV700060906-18) against EPA's aluminum calculator. NHDES's assessments compare the data collected against the states' current water quality standards. The chronic and acute criteria for toxic substances are identified in Env-Wq 1703.21 and Table Env-Wq 1703.1. NH's aluminum water quality standards were developed in accordance with EPA's 1988 ambient water quality criteria document for aluminum. On December 14, 2018 EPA released its 2018 Final Aquatic Life Criteria for Aluminum in Freshwater (USEPA, FINAL AQUATIC LIFE AMBIENT WATER QUALITY CRITERIA FOR ALUMINUM 2018 (EPA-822-R-18-001), 2018), which replaces the 1988 guidance (USEPA, 1988). This updated guidance for aquatic life criteria for aluminum in freshwater is reflective of the latest science and allows stakeholders to develop criteria that are reflective of local water chemistry on aluminum toxicity to aquatic life, and includes that aluminum calculator identified by the commenter. As of NHDES' commencement of the 2018 assessment process EPA's 2018 guidance had not yet been released, therefore as EPA's new guidance was not yet, an is not yet, the water quality standard, the NHDES's assessment process did not use the new aluminum calculator. NHDES is currently reviewing the 2018 Final Aquatic Life Criteria for Aluminum in Freshwater and will be engaging the Water Quality Standards Advisory Committee in those deliberations. Once the review has been completed and if the NHDES feel modifications to the state's water quality standards are appropriate, NHDES will make the appropriate changes to Env-Wq 1700.

RESPONSE TO COMMENT #6: Melissa Paly, Conservation Law Foundation (CLF)

***NHDES RESPONSE* to 6- 1**
This section contains opening remarks by the Conservation Law Foundation. References to portions of the Draft 2018 303(d) are discussed in the responses below.

***NHDES RESPONSE* to 6- 2**
The commenter supports the NHDES listing of Marsh Pond for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use. NHDES appreciates the support. While NHDES agrees that the Powder Mill Fish hatchery is one of the nutrient sources to Marsh Pond, the assessment process does not require source identification. NHDES further notes that there are ongoing permitting discussions occurring with EPA.

***NHDES RESPONSE* to 6- 3**
The commenter supports the NHDES listing of Upper Sagamore Creek for dissolved oxygen concentration for the aquatic life integrity designated use. NHDES appreciates the support. No further response necessary.

***NHDES RESPONSE* to 6- 4**
The commenter supports the NHDES listing of the Bellamy River for light attenuation coefficient for the aquatic life integrity designated use. NHDES notes that the proposed impairment does not represent an "apparent decline in water clarity" but rather this is a case where some data has been collected after a extended period without current data (**Figure 14**). Further discussion of this proposed impairment is provided in the response to comment **8- 4.**

***NHDES RESPONSE* to 6- 5**
The commenter supports the NHDES listing of the Squamscott River North for light attenuation coefficient for the aquatic life integrity designated use. Note that this is not a new impairment. NHDES appreciates the support. No further response necessary.

***NHDES RESPONSE* to 6- 6**
The commenter objects to the NHDES decision to delist 181 assessment units for dissolved oxygen saturation based on changes to state statute. The commenter objects to these proposed changes because they are not based on EPA approved state water quality standards. These comments are addressed in the responses to **9- 3** below.

RESPONSE TO COMMENT #7: Meredith A. Hatfield, Conservation Law Foundation (CLF)

***NHDES RESPONSE* to 7- 1**
This comment re-asserts and incorporates by reference the comments submitted by CLF to the Draft 2014 and Draft 2016 303(d) Lists. NHDES would like to note that these comments were received after the deadline for submitting comments on the Draft 2018 303(d) List, which were due by the close of business on Friday March 15, 2019. However, NHDES concluded that because the comments were received on Tuesday March 19, 2019, work had not yet begun on addressing comments, and the fact that the comments did not raise any new issues that had not already been addressed that they would be accepted. As such, NHDES refers the commenter to the Response to Public Comments on the Draft 2014 Section 303(d) List of Impaired Waters (NHDES, 2017a). Additionally, NHDES refers the commenter to the Response to Public Comments on the Draft 2016 Section 303(d) List of Impaired Waters (NHDES, 2017b).

RESPONSE TO COMMENT #8: John B. Storer, City of Dover

***NHDES RESPONSE* to 8- 1**
This section contains opening remarks by the City of Dover and incorporates by reference the comments submitted by the Great Bay Municipal Coalition, concerning the draft 2018 303(d) material and draft CALM. These comments are addressed in the responses to comments **10- 1** through **10- 20** below.

***NHDES RESPONSE* to 8- 2**
The commenter disagrees with NHDES' decision to list the Cocheco River (NHEST600030608-01) as impaired for Total Nitrogen. The commenter asserts that the department is basing their decision on speculation rather than a science based approach. The commenter's justification for their assertion is based on the observation that spikes in chlorophyll-a occur in both daytime and nighttime. According to the commenter, because chlorophyll-a requires sunlight for growth, spikes at nighttime suggest that the evaluated chlorophyll-a is more likely attributed to plant growth which sloughs off the marsh at low tide.

It appears that the commenter continues to misunderstand the data presented by NHDES in regards to chlorophyll-a concentration, which were addressed in NHDES' Response to Public Comments on the Draft 2016 Section 303(d) List of Impaired Waters and Draft Consolidated and Listing Methodology (NHDES, 2017b). The 2016 NHDES Response to comment 2-9 on page 19 states that "[t]he changes recorded by the datalogger at 15 minute intervals do not represent instantaneous growth of phytoplankton, but rather records the concentration in the water, which has had upwards of 12 hours of time to grow, as it flows past the probe at a given moment" (NHDES, 2017b). NHDES' response continues by explaining that there had been a sufficient number of hours of daylight for phytoplankton growth to account for the elevated levels seen during the nighttime low tide.
For the full write-up, please refer to the Response to Public Comments on the Draft 2016 Section 303(d) List of Impaired Waters and Draft Consolidated and Listing Methodology.

The commenter also disagrees with NHDES' decision to impair the Cocheco River (NHEST600030608-01) for dissolved oxygen. The commenter attributes the low dissolved oxygen concentrations to anaerobic

groundwater discharge during low flows, and provides as justification the short duration and instantaneous recovery as the tide comes in. NHDES has given tremendous consideration as to what might be happening in the system to produce these low dissolved oxygen concentrations. A detailed evaluation was provided in the 2016 Technical Support Document for the Great bay Estuary (NHDES, 2017c, pp. 53-64). Additionally, NHDES provided a detailed response regarding the validity of the Cocheco River datalogger data in Response to 5-18 of the Response to Public Comment on the Draft 2016 303(d) and CALM (NHDES, 2017b, pp. 60-68).

***NHDES RESPONSE* to 8- 3**

The commenter indicates that the Cocheco River (NHEST600030608-01) is impaired for PAH's based on water quality samples collected in 2005, which may have been released as a result of dredging activities in 2005, and further requests NHDES to resample the river to determine current PAH levels.

As shown in **Table 3**, the samples used to make the impairment decision were collected in 2003, 2004, as well as 2005 and in fact were sediment samples, not water samples as indicated by the commenter. Two of the samples pre-date the dredging activities that occurred in the spring of 2005 and therefore are not a result of the dredging activities, but legacy contaminants. As outlined in the draft 2018 CALM, NHDES bases impairment determinations that use sediment samples on the sediment quality triad approach (NHDES, 2005). Specifically, assessment determinations are based on the weight of evidence provided by the sediment chemistry, sediment toxicity, and benthic community data. In this instance, the sediment chemistry exceeded the marine Threshold Event Concentration (TEC) of 763 µg/kg and the benthic IBI for macroinvertebrates indicated an impact to the benthic community. It is for these reasons that NHDES listed the Cocheco river as impaired for PAH for the aquatic life integrity designated use in the 2006 assessment. NHDES affirms that additional sediment samples collected outside the area dredged to remove coal tar impacted sediments would help to understand the current conditions of the river, and those samples would be needed to determine if a deimpairment is warranted. At this time NHDES does not have the funds or resources to re-sampling these stations for PAH.

Table 3: Cocheco River (NHEST600030608-01) PAH samples

Station ID	Start Date	Start Time	Parameter Name	Result	Medium
NH02-0067A	8/22/2003	13:28:00	Polycyclic Aromatic Hydrocarbons	2,076 µg/kg	Sediment
NH02-0067A	7/22/2004	10:03:00	Polycyclic Aromatic Hydrocarbons	6,778 µg/kg	Sediment
NH05-0260B	7/15/2005	10:25:00	Polycyclic Aromatic Hydrocarbons	4,411 µg/kg	Sediment

***NHDES RESPONSE* to 8- 4**

The commenter objects to NHDES' decision to impair the Bellamy River for light attenuation for the aquatic life integrity designated use. NHDES' draft 2018 assessment of light attenuation for the Bellamy River assessment zone (NHEST600030903-01-01, NHEST600030903-01-03, and NHEST600030903-01-04) placed it in category 5-M. This decision was based in part on the light attenuation data collected in the Bellay River itself, as well as that of the boundary waters (Little Bay assessment zone). As can be seen in **Figure 14** all of the light attenuation measurements within the current period far exceeded the restoration depth based threshold of 0.75 m^{-1}, as have 9 of the 11 sampled ever collected in this assessment zone (NHDES, 2019c). NHDES recognizes that there were only three samples collected within the current period, which is far less than the 15 required per the CALM, however NHDES also took into account the light attenuation values in Little Bay that flows into the Bellamy River on an incoming tide. As one can see in **Figure 15**, the waters of Little Bay are routinely well above restoration depth based threshold of 0.75 m^{-1}. NHDES surmised that during an incoming tide the waters from Little Bay would flow into and mix with the waters of the Bellamy River. This mixing of waters would create light attenuation values that were very similar between the two waterbodies during an incoming tide.

Figure 14: Light Attenuation in the Bellamy River

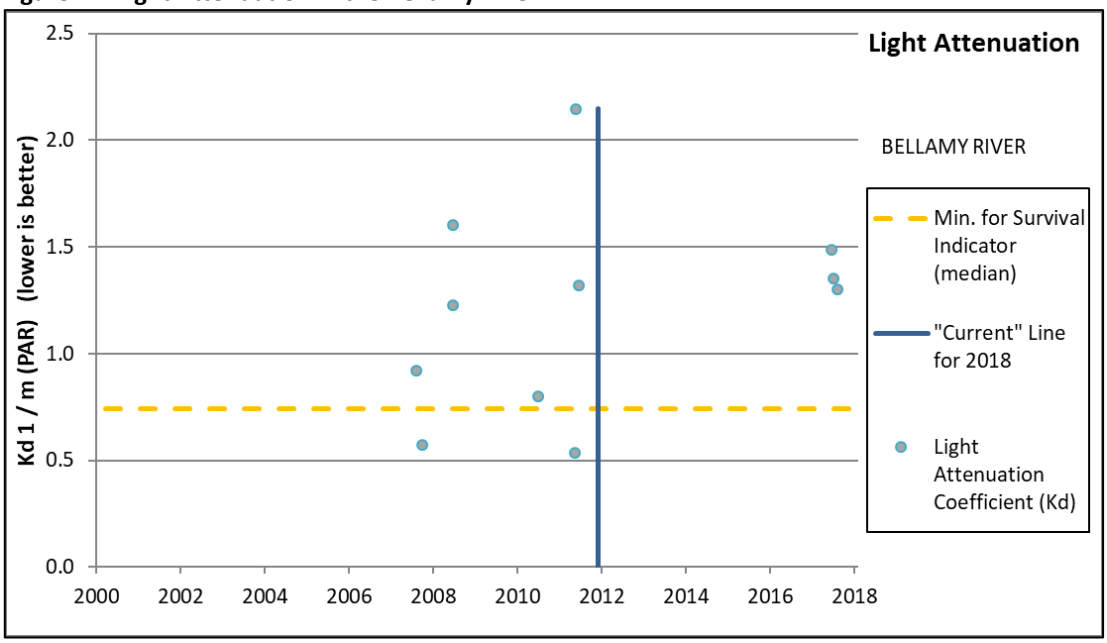
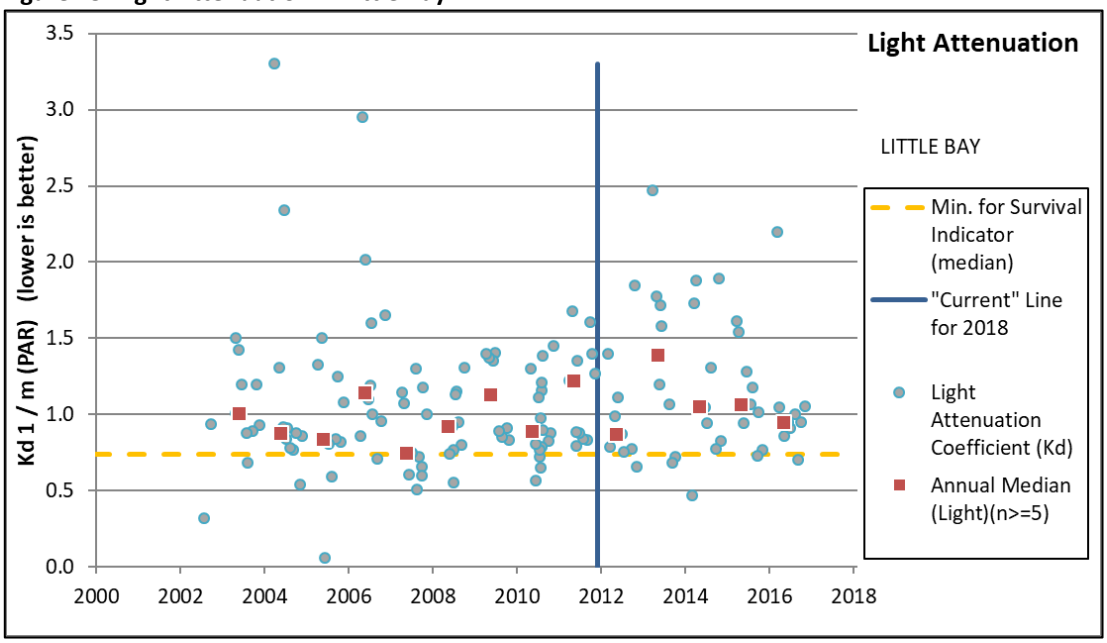
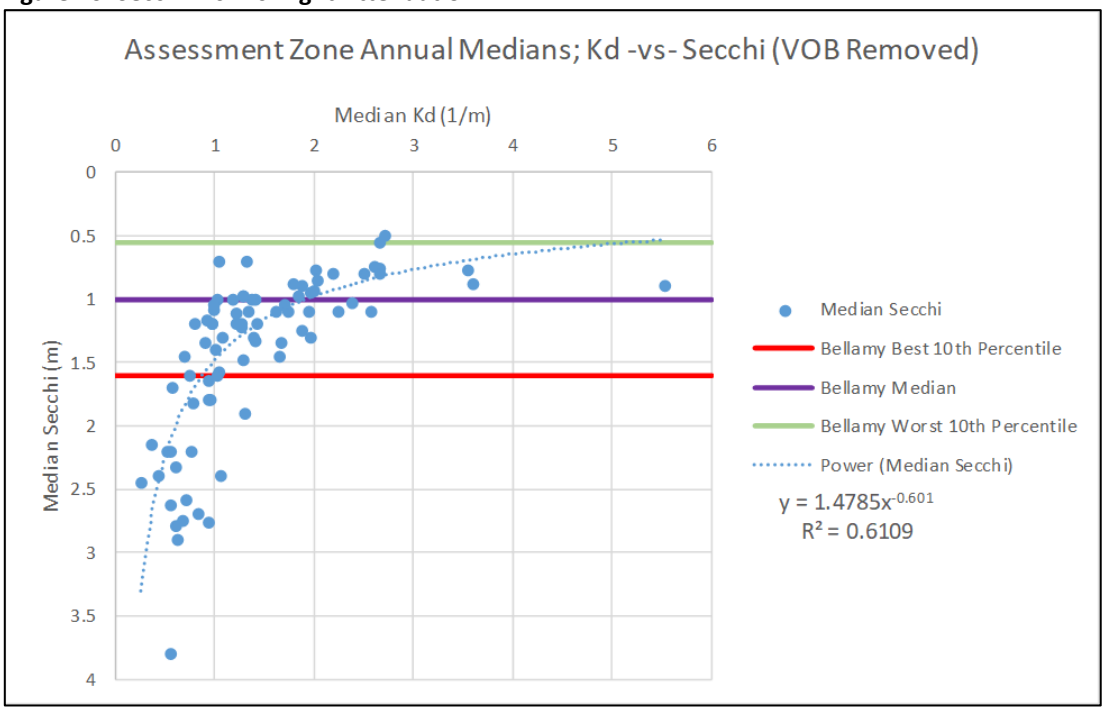


Figure 15: Light Attenuation in Little Bay



As a secondary measure of light attenuation, NHDES queried for all of the Kd and Secchi disk data then aggregated by assessment zone and calendar year. The blue dots in **Figure 16** depict the annual medians for each assessment zone. The Bellamy River had Secchi depth readings (n=24) from 2004-2011, which were used to create the horizontal lines that represent the 10th, 50th, and 90th percentiles. The intersection of the percentile lines with that of the power trend line predicts Kd's of 0.88, 1.92 and 5.18 m^{-1}, respectively. This helps illustrate that under typical conditions (Bellamy Median; purple line) the Bellamy River would exceed the restoration depth based threshold of 0.75 m^{-1}, having a predicted Kd of 1.92 m^{-1}.

Figure 16: Secchi Disk vs. Light Attenuation



Although the CALM does give NHDES latitude to stray from the documented approach outlined in the CALM, and use best professional judgement, it is the feeling of NHDES that the initial assessment was a significant enough departure from the CALM that the final assessment category should be revised. As a result, the Bellamy River assessment zone (NHEST600030903-01-01, NHEST600030903-01-03, and NHEST600030903-01-04) has been moved from category 5-M to 3-PNS for light attenuation for the aquatic life integrity designated use based on data collected in the current assessment period, resulting in its removal from the final 2018 303(d) List. It is anticipated that ongoing sampling in this assessment unit will resolve whether it should be or should not be listed as impaired due to low water clarity.

RESPONSE TO COMMENT #9: Ken Moraff, United States Environmental Protection Agency (EPA)

***NHDES RESPONSE* to 9- 1**
This section contains opening remarks by the United States Environmental Protection Agency. References to portions of the Draft 2018 303(d) are discussed in the responses below.

***NHDES RESPONSE* to 9- 2**
The commenter notes their concerns with the NHDES rationale to not list certain waterbodies and states that those concerns are the same as they had on the draft 2014 and draft 2016 303(d). NHDES references our response to comments on the draft 2014 303(d) (NHDES, 2017a) and response to comments on the draft 2016 303(d) (NHDES, 2017b).

The commenter notes that they will conduct their review of the final 2014, 2016, and 2018 303(d) Lists based on the material already provided and any additional information provided with the final 2018 303(d). No response necessary.

***NHDES RESPONSE* to 9- 3**
The commenter notes that they will not be able to approve the delisting of 181 assessment units for dissolved oxygen saturation based on changes to state statute. The commenter objects to these proposed

changes because they are not based on EPA approved state water quality standards. As outlined in the Response to Public Comment on the Draft 2016 Section 303(d) List of Impaired Waters (NHDES, 2017b), 2017 SB127 amended three sections of RSA 485.

> *RSA 485-A:6,* ***Rulemaking. –*** *The commissioner shall adopt rules, under RSA 541-A, after public hearing, relative to:*
>
> > *XIV. Dissolved oxygen concentration water quality standards under RSA 485-A:8, II and II-a.*
>
> and
>
> *RSA 485-A:8,* ***Standards for Classification of Surface Waters of the State.***
>
> In RSA 485-A:8 II adding the following text;
>
> > *II. …"The commissioner shall adopt rules, under RSA 541-A, relative to dissolved oxygen water quality standards in a manner consistent with Environmental Protection Agency guidance on dissolved oxygen water criteria published pursuant to section 304(a) of the Clean Water Act, and other relevant scientific information."…*
>
> and adding RSA 485-A:8 IIa.
>
> > *IIa. The commissioner shall adopt rules, under RSA 541-A, relative to dissolved oxygen water quality standards for tidal and saline waters in a manner consistent with Environmental Protection Agency guidance on dissolved oxygen water criteria published pursuant to section 304(a) of the Clean Water Act, and other relevant scientific information.*

The specificity of RSA 485-A:6, XIV to concentration appears to denote exclusivity from saturation. As such, NHDES has been advised to not use dissolved oxygen saturation to make impairment determinations in the 2018 303(d) assessment process. As noted by the commenter, NHDES submitted a request for approval of amendment to the states' water quality standards to EPA on January 30, 2018 and is awaiting a response. The department appreciates the comments by EPA and looks forward to discussing these concerns.

NHDES RESPONSE **to 9- 4**

The commenter requests that additional information be provided in the CALM to outline how NHDES makes assessment determinations based on its weight of evidence approach when there are conflicting results from multiple parameters when making decision regarding cultural eutrophication. NHDES will take the commenter's concerns under advisement as it works to finalize the CALM, but it is important to understand that the CALM is not a formula that is applied automatically to data, it is simply a guidance document and cannot account for every possible data matrix permutation. The assessment program utilizes the CALM to the extent it can but often, additional datasets or professional judgment may yield assessment decisions outside of the CALM descriptions. In the end, the state water quality standards are the ultimate basis for assessment decisions, not the CALM (NHDES, 2019a).

NHDES RESPONSE **to 9- 5**

The commenter requests that additional information be provided in the CALM to specify a concentration relative to the term "elevated" when discussing the 90th percentile chlorophyll-a concentrations. NHDES will take the commenter's concerns under advisement as it works to finalize the CALM. For additional information please refer to the response to **9- 4**, above.

NHDES RESPONSE **to 9- 6**

The commenter disagrees with NHDES' decision to use dissolved oxygen saturation as a screening level indicator as EPA has not yet approved its removal from the states' water quality standards. NHDES will take the commenter's concerns under advisement as it works to finalize the CALM. For additional information please refer to the response to **9- 3** above.

RESPONSE TO COMMENT #10 Dean Peschel, Great Bay Municipal Coalition (GBMC)

***NHDES RESPONSE* to 10- 1**

This section contains opening remarks by the Great Bay Municipal Coalition (GBMC) in addition to a request to meet with NHDES to review their concerns and/or have an independent review of the assessments performed by the department. NHDES is willing to meet with the commenter as time allows, however this document serves at the department's official response to the comments submitted by the GBMC.

NHDES released the draft 2018, 303(d) List and draft CALM for a public comment period on January 24, 2019. Comments were originally due on March 1, 2019, and later extended to March 15, 2019, giving all interested parties a total of 50 days in which to submit comments. The department would like to remind the commenter that all interested parties are given the same opportunity to submit comments, regardless of their affiliation to New Hampshire.

***NHDES RESPONSE* to 10- 2**

This section contains opening remarks by the GBMC and incorporates by reference their previously submitted comments on the draft 2016 303(d) material and draft CALM. NHDES refers the commenter to the Response to Public Comments on the Draft 2016 Section 303(d) List of Impaired Waters (NHDES, 2017b).

***NHDES RESPONSE* to 10- 3**

This comment argues that the restoration depth based threshold of 0.75 m^{-1} is not applicable due to the fact that eelgrass loses have not occurred primarily in deeper waters. The commenter contends that they have raised this issue in their previous comments on the 2014 and 2016 draft assessment material, but they feel the argument is still applicable. NHDES' position has not changed on this subject since the issuance of the 2014 Response and 2016 Response to comments (NHDES, 2017a) (NHDES, 2017b).

NHDES continues to disagree with the commenter's claim that "most losses of eelgrass in Great Bay occurred in shallower waters." The Great Bay Eelgrass Depth Analysis (Wood, 2016), which was presented as part of the 2014 Response to Comments clearly demonstrates that eelgrass is being lost throughout Great Bay, and the rate of loss is greatest in the sub-tidal zone with unacceptable light anticipated (> 1.3m below MTL). NHDES has updated the underlying data used in that analysis to include all the data that was used in the 2018 draft assessments. As evident from **Figure 17** and **Table 4**, eelgrass is being lost throughout Great Bay. The rate of loss is approximately -8.5 acres/yr within the intertidal zone (<1m below MTL) and the sub-tidal zone with acceptable light anticipated (1 to 1.3m below MTL). In contrast, the rate of loss within the deeper sub-tidal zone with unacceptable light anticipated (> 1.3m below MTL) is nearly three times that of the other two depth regimes, at a rate of -26.8 acres/yr. This is a direct contradiction to the commenters claim that the shallower waters have the most loss of eelgrass.

Figure 17: Great Bay Eelgrass Acreage at Various Depth Regimes

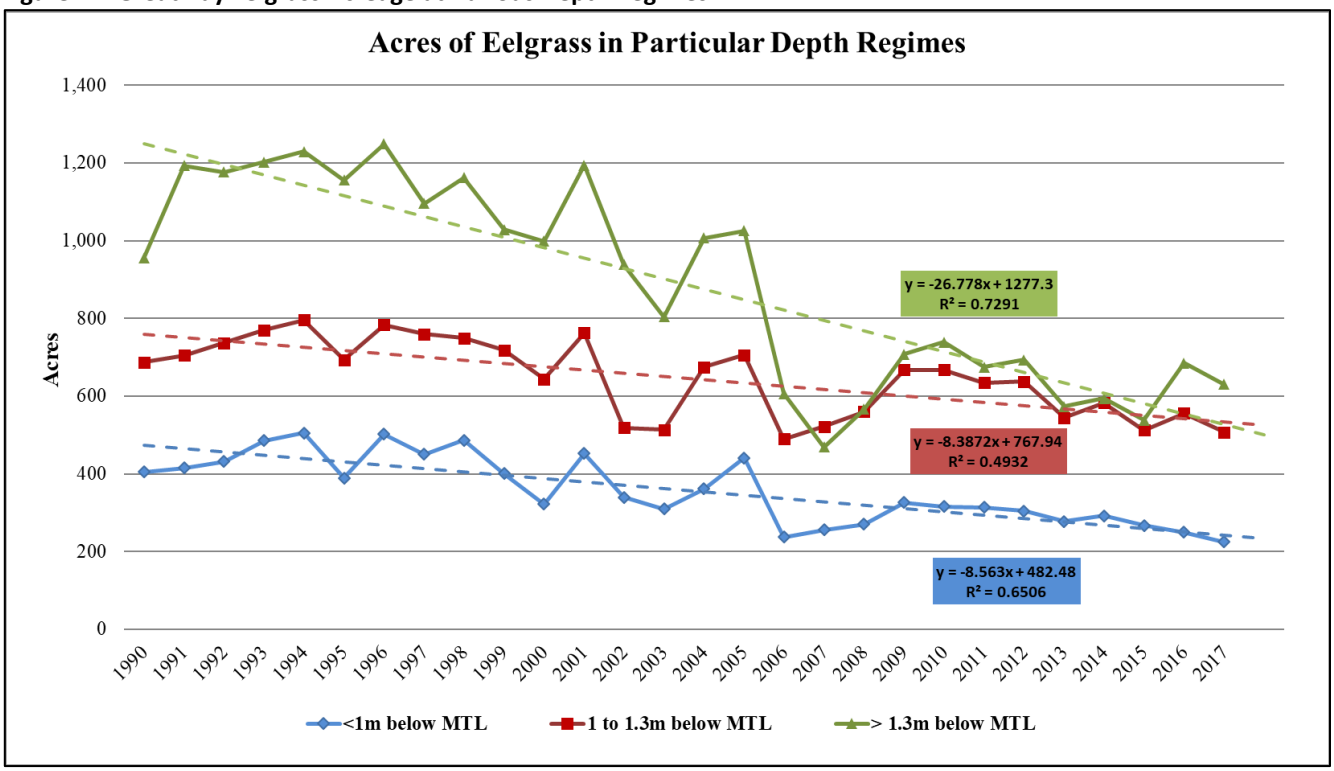


Table 4: Great Bay Eelgrass Depth Regime Trend Statistics, 1990 to 2017

Depth Regime	<1m below MTL, Intertidal zone	1 to 1.3m below MTL, Sub-tidal zone with acceptable light anticipated	> 1.3m below MTL, Sub-tidal zone with unacceptable light anticipated
Regression Significance (p)	2.18E-07	3.11E-05	7.60E-09
Regression Coefficient R^2	0.65	0.49	0.73
Trend Significance (p)	2.18E-07	3.11E-05	7.60E-09
Trend Slope (acres/yr)	-8.6	-8.4	-26.8
Trend Slope (Percent change 1990-2017)	-30.5%	-14.6%	-35.2%

NHDES RESPONSE **to 10- 4**

The commenter feels that NHDES should not use historical eelgrass extents derived from past reports because the data was not collected with an approved QA/QC plan. NHDES would like the commenter to understand that the data in question was collected between 1948 and 1980, long before anyone envisioned it being used for the purposes of making assessment determinations. Therefore, it is unrealistic to think they would have used the same documentation methods currently employed to ensure the data is defensible. That's not to say that the data is of poor quality, only to recognize the fact that it was captured for different purposes and therefore not documented in a manner consistent with modern approaches. NHDES has reviewed the reports and/or metadata associated with the eelgrass cover from 1948, 1962 and 1980 and found them to be credible sources of data and appropriate for use in assessment determinations. Furthermore, as discussed below in the NHDES response to comment **10- 5**, NHDES uses two different methods when evaluating eelgrass cover for assessment purposes. NHDES considers a region to be impaired if either of the two methods indicates significant eelgrass loss. It is important to note that for every instance where a region is identified as being impaired for eelgrass loss based on the comparison of the historical data in question by the commenter to the most recent 3-year median, it is also identified as

being impaired based on the linear regression of eelgrass cover in a region versus year. Additionally, all of the data used in the linear regression comparisons were collected with approved QA/QC plans and/or EPA approved QAPPs.

***NHDES RESPONSE* to 10- 5**

The commenter believes that NHDES' use of eelgrass cover data to make inter-annual comparisons is inappropriate because they do not always represent the maximum eelgrass cover within a particular year. As previously reported by NHDES, system wide aerial eelgrass surveys are aligned with the late summer index period in order to attempt to capture maximum eelgrass biomass (NHDES, 2017b, p. 45). However, the aerial surveys that acquire the data needed to make these comparisons have a variety of constraints placed on them including sun angle, tidal height, cloud cover, wind velocity, and water clarity. Alignment of acceptable flight/mapping conditions with the exact timeframe of peak biomass, which for Great Bay can range from July to October (http://seagrassnet.org/percentcover/NH9.2) and is variable from year to year, is virtually impossible. It is for these reasons that NHDES utilizes two different methods when evaluating eelgrass cover.

The first method examines the percent decline from historic levels to determine impairments. A region is considered impaired if there is a greater than 20% loss from historic levels. This threshold value was selected as it three-times the natural variability observed in eelgrass cover in Great Bay from 1990-1999 when eelgrass was relatively healthy and stable (NHDES, August 11, 2008). To avoid spurious impairments from one year of data, the median eelgrass cover from the last three years of data is compared to the historic eelgrass cover (NHDES, 2019a). The second method evaluates recent trends in the eelgrass cover through the use of a linear regression of eelgrass cover in a region versus year. The region is considered impaired if there is a statistically significant ($p<0.05$), decreasing trend that shows a loss of 20% of eelgrass with 95% confidence (NHDES, 2019a).

To account for natural variability in peak biomass and timing of imagery acquisition, neither of these methods compares distinct years against one another. Because the methods used by NHDES to make assessment determinations accounts for inter-annual variability it is not critical to capture the exact peak biomass in a given year. Provided the yearly aerial imagery is acquired in the late summer index period it is appropriate for NHDES to use this data to make inter-annual comparisons.

***NHDES RESPONSE* to 10- 6**

The commenter feels that NHDES should not present chlorophyll data in its analysis that has been collected with a probe if it shows poor correlation with extracted chlorophyll-a samples. NHDES fully addressed this same comment in its response to comments on the 2016 303(d) List (NHDES, 2017b, pp. 17-19).

In addition to NHDES' previous response, NHDES would like to commenter to understand the following. According to YSI, the manufacturer of the EXO Total Algae PE Smart Sensor probes, the probes are designed to measure chlorophyll through florescence. This process shines a beam of light of the proper wavelength (470 nm) into the water, and then measures the higher wavelength light which is emitted as a result of the fluorescence process, utilizing an optical filter. Without this optical filter, turbid water would appear to contain fluorescent phytoplankton, even though none were present. The results of this in-situ analysis will never be as accurate as results from an extractive analysis procedure. Therefore, all data from the total algae sensors are considered preliminary unless comparisons between the in-situ probe data and analytical data demonstrate a statistically significant trend and the data are corrected.

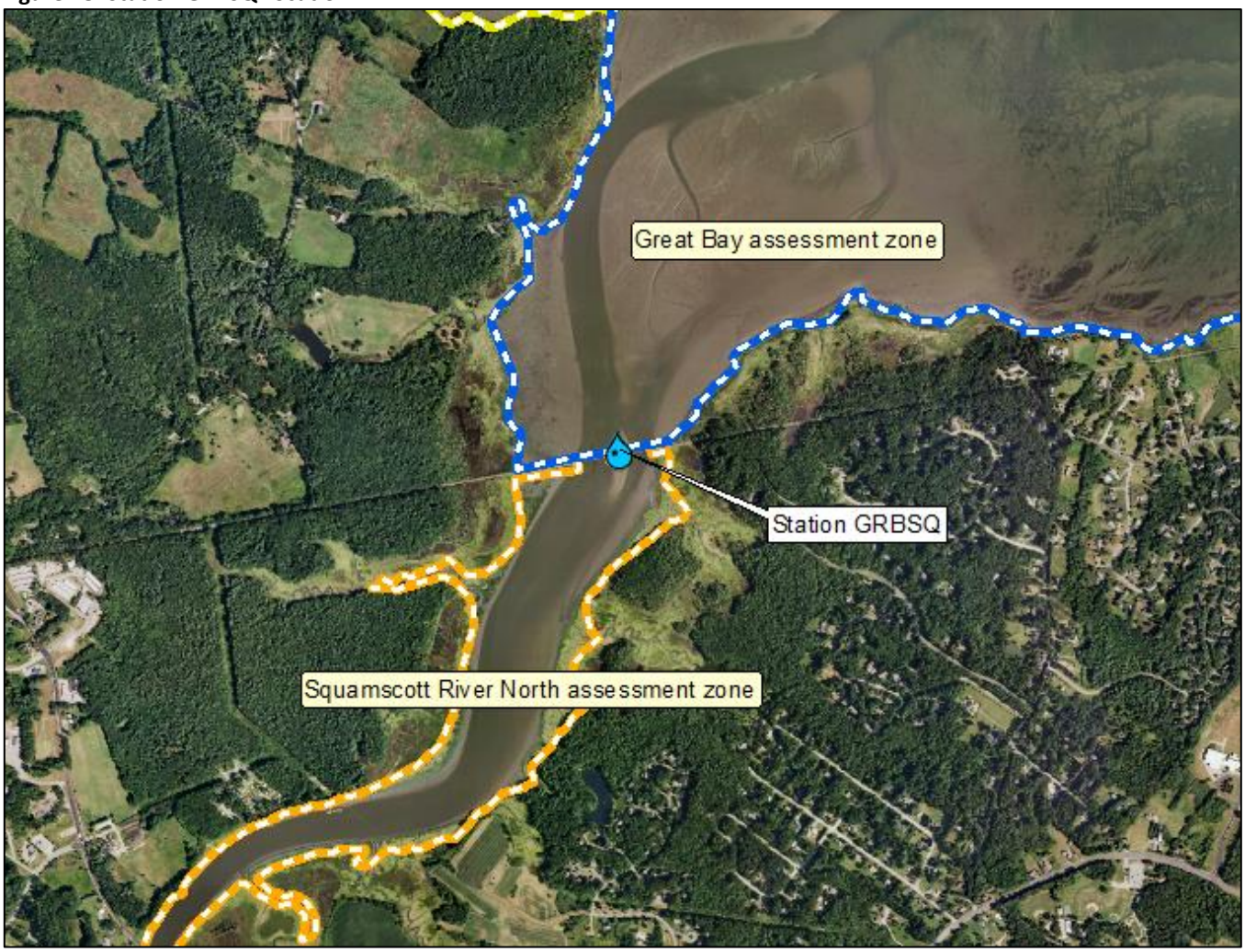
Although chlorophyll-a grab samples are collected and analyzed at the lab, to date there have been too few samples to demonstrate a statistically significant trend between the in-situ and extractive samples. The poor correlation is a function of the number of samples, not the relationship between the two methods. As

a result of this poor correlation, the in-situ sensor data can only be utilized to compliment the more accurate results from the extractive samples. This is exactly how NHDES has utilized the data, as reflected in the 2018 Technical Support Document (NHDES, 2019c). None of the in-situ sensor data was utilized in the chlorophyll-a median calculation, which are the only values that are compared to the CALM water quality threshold. The in-situ sensor data is utilized in conjunction with the extractive samples to visually demonstrate that chlorophyll concentrations fluctuate in these highly dynamic systems. The probe results demonstrate that the extractive samples, even when above the water quality thresholds, do not always capture the peak levels of chlorophyll-a in the system.
Also see the response to comment **10- 14**

NHDES RESPONSE **to 10- 7 through 10- 9**
The commenter contends that their comments on the 2016 draft assessment material relative to chlorophyll-a, dissolved oxygen, eelgrass and water clarity thresholds as they relate to total nitrogen continue to be unrelated and therefore are unnecessary. NHDES fully addressed these comments in its response to comments on the 2016 303(d) List (NHDES, 2017b, pp. 15-45). No further response necessary.

NHDES RESPONSE **to 10- 10**
This section of the comments revisits past concerns that sampling locations on the boundary of a waterbody can only be used for assessment on one waterbody. The commenter further requests that graphics in the Technical Support Document (NHDES, 2019c) depicting total nitrogen in Great Bay that include the Squamscott River station. Great Bay is not currently impaired for total nitrogen, therefore these comments are not specific to the 2018 draft 303(d) List, and therefore do not require a response. NHDES would like the commenter to understand that water flowing from one waterbody into another waterbody can have a profound effect on the receiving waterbody's water quality. Therefore, it is not only appropriate, but imperative, to consider these types of monitoring stations when evaluating a waterbody. We cannot ignore the influence that a waterbody with different water quality might be having on the receiving water, especially in a system that is tidally influenced, where flows change direction. As shown in **Figure 18**, station GRBSQ is directly on the boundary between the Great Bay and Squamscott River North assessment zones. Depending on the tidal conditions at the time of sample collection, this station has the potential to more closely represent the water quality in Great Bay (flooding tide), the Squamscott River (ebbing tide) or a mixture of the two waterbodies (slack tide). But perhaps most importantly, station GRBSQ always represents the water quality at that exact location. Because the environmental conditions do not adhere to the man-made boundaries defined by NHDES it is appropriate to utilizes the data collected at this station when evaluating both assessment zones.

Figure 18: Station GRBSQ Location



NHDES RESPONSE **to 10- 11**

The commenter contends that their comments concerning voids in eelgrass within Great Bay were not addressed as part of the response to comments on the 2016 303(d) material. NHDES disagrees this with statement and directs the commenter to the extensive response given by NHDES on this topic in the response to comments on the 2016 303(d) List (NHDES, 2017b, pp. 32-45). No further response necessary.

NHDES RESPONSE **to 10- 12**

This section of the comments quotes NHDES' 2016 response to comments (NHDES, 2017b) and provides further explanation as to why the commenter does not agree with NHDES' original response. The commenter feels that the peer review (Bierman, Diaz, Kenworthy, & Reckhow, 2014) did not find evidence that nitrogen was a factor in the decline of eelgrass, therefore NHDES should not be allowed to make such statements. NHDES disagrees with this assessment, and directs the commenter to the joint statement regarding eelgrass stressors in the great bay estuary provided by Dr. Jud Kenworthy (served on the 2014 Peer Review Panel), Dr. Ken Moore and Dr. Chris Gobler to the PREP Technical Advisory Committee (Kenworthy, Gobler, & and Moore, 2017). That memorandum clearly indicates that nitrogen does have an impact on eelgrass, and it if for this reason that NHDES uses eelgrass cover as part of its collection of indicators when evaluation total nitrogen concentrations and associated eutrophication impacts in the Great Bay estuary. The memorandum states that "[d]espite encouraging reductions in nitrogen from wastewater treatment plants, loading levels are still well above levels found to be related to environmental

degradation and reduced estuarine ecosystem resiliency in many other systems (Latimer and Rego 2010). The most recent physiological measurements of Ulva (a green seaweed) that is abundant in the estuary indicate complete nitrogen saturation (Nettleton et al. 2011). Episodic phytoplankton blooms reach levels that both NOAA and EPA consider high and potentially damaging to eelgrass (Bricker et al. 2003; US EPA 2012; NHDES 2017). Low nitrogen levels will reduce the number and impact of phytoplankton and seaweed blooms. In fact, if nitrogen isn't low enough, reducing sediment loadings will allow more light to phytoplankton and seaweed which could cause a further decrease in eelgrass abundance." (Kenworthy, Gobler, & and Moore, 2017).

NHDES RESPONSE **to 10- 13**

In this section the commenter wrongly infers that because NHDES does not currently have an assessment zone impaired for total nitrogen that NHDES can therefore not make statements that the waterbody shows signs of eutrophication. Although these comments are not specific to the 2018 draft CALM or 303(d) List, and therefore do not require a response, NHDES would like the commenter to understand that their interpretation of the assessment categories are incorrect and that NHDES has clearly demonstrated in the 2018 Technical Support Document (NHDES, 2019c) that signs of eutrophication are in fact present throughout the Great Bay Estuary.

As defined in the CALM (NHDES, 2019a), assessments to determine compliance with Env-Wq 1703.14 consider both indicators of nutrients and nutrient-related impairments (i.e. eutrophication). In the Great Bay Estuary, the measure for nutrient levels is total nitrogen concentrations because nitrogen is the limiting nutrient in estuaries. The indicators of nutrients and nutrient-related impacts are evaluated as a collection of indicators, and summarized as the category assigned to total nitrogen. As shown in **Table 5**, 5 of 12 of the assessment zones that are not currently impaired for total nitrogen have been designated as category 3-PNS. This category indicates that "there is some but insufficient data to assess the parameter per the CALM, however, the data that is available suggests that the parameter is Potentially Not Supporting (PNS) water quality standards" (NHDES, 2019a). Furthermore, there are an additional four assessment zones that are designated as category 3-ND, which means there is not enough current data available to make an evaluation. For all of the assessment zones in which some data is available for consideration, 12 of 15 show signs of eutrophication, therefore it is reasonable for NHDES to make statements indicating the estuary is showing signs of eutrophication.

Table 5: Great Bay Estuary Total Nitrogen Assessment Summary

Assessment Zone	2018 Total Nitrogen Assessment Category	CALM Assessment Category Definition	Assessment Summary
Portsmouth Harbor	2-M	Meets water quality standards but only marginally	Marginal
Lower Piscataqua River - North	3-PAS	There is some but insufficient data to assess the parameter per the CALM, however, the data that is available suggests that the parameter is Potentially Attaining Standards (PAS)	Likely Good
Lower Piscataqua River - South	3-PAS		
Winnicut River	3-ND	There is no current data available	No Data
North Mill Pond	3-ND		
South Mill Pond	3-ND		
Little Harbor/Back Channel	3-ND		
Great Bay	3-PNS	There is some but insufficient data to assess the parameter per the CALM, however, the data that is	Likely Bad
Little Bay	3-PNS		

Assessment Zone	2018 Total Nitrogen Assessment Category	CALM Assessment Category Definition	Assessment Summary
Bellamy River	3-PNS	available suggests that the parameter is Potentially Not Supporting (PNS) water quality standards	
Upper Piscataqua River	3-PNS		
Sagamore Creek	3-PNS		
Lamprey River North	5-M	The impairment is marginal	Poor
Lamprey River South	5-M		
Oyster River	5-M		
Cocheco River	5-M		
Salmon Falls River	5-M		
Squamscott River South	5-P	The impairment is more severe	Severe
Squamscott River North	5-P		

NHDES RESPONSE **to 10- 14**

The commenter disagrees with NHDES' decision to impair the Cocheco River for chlorophyll-a, dissolved oxygen concentration, and total nitrogen. The commenter asserts that comparisons of the parameters on a strict yearly basis "do not demonstrate that algal growth is causing dissolved oxygen to fall below the state standard or that eutrophication effects are occurring or can be attributed to total nitrogen."

A large body of scientific knowledge indicates a causal linkage between nitrogen and dissolved oxygen, due to growth and decomposition of algae. As decomposition is a major component in decreased dissolved oxygen, it is not surprising that in some cases, low dissolved oxygen did not temporally "coincide" with elevated algal growth. In fact, dissolved oxygen super-saturation events have been observed in the estuary at times of elevated algal growth (NHDES, 2017a). Additionally, the acceptable levels of nutrients in surface waters are governed by Administrative Rule Env-Wq 1703.14 which requires that there be no nutrients in such quantities as to impair any designated uses in Class B waters. Therefore, assessments to determine compliance with Env-Wq 1703.14 consider both indicators of nutrients and nutrient-related impairments (i.e. eutrophication). Env-Wq 1703.14 does not require that a direct linkage be made for every data point that is collected.

NHDES cautions the commenter in its comparison of very limited data for evaluating eutrophication effects within the estuary, as this approach is too simplified to capture the dynamic nature of this system. NHDES also cautions the commenter in interpolation of data from figures, as unintentional error could be introduced. NHDES' evaluation, as presented in (NHDES, 2019c), not only compares the current data for a particular assessment zone, but also looks at internal nuances of the historical data that contributed to its original impairment listing. Interactions between the various parameters are also considered to help determine if an impairment is warranted. As in the case of chlorophyll-a, NHDES also considers supplementary information such as the datalogger data, which are not utilized in the 90th percentile calculation. Additionally, there are many environmental co-variables that can influence the parameters being measures (i.e. precipitation, temperature, flow, tidal/lunar cycle, etc.), which could explain why low dissolved oxygen did not temporally coincide with elevated algal growth.

The commenter offers as an example the fact that the highest total nitrogen concertation observed within the last 4 years (2014) was associated to the lowest annual chlorophyll-a 90th percentile. As evident when looking at **Figure 19**, the lowest annual chlorophyll-a 90th percentile within the current period was recorded

in 2014 (7.8 µg/L). However, one should understand that the 7.8 µg/L was calculated from 20 discrete chlorophyll-a samples collected over the course of the growing season. When those data points are overlaid by the uncorrected chlorophyll datalogger data that were collected at the same time (**Figure 20**), it becomes apparent that the chlorophyll grab samples were collected when the concentrations were relatively low, as evident by the continuous datalogger track.

Figure 19: Chlorophyll-a Concentrations from Grab Samples Collected in the Cocheco River

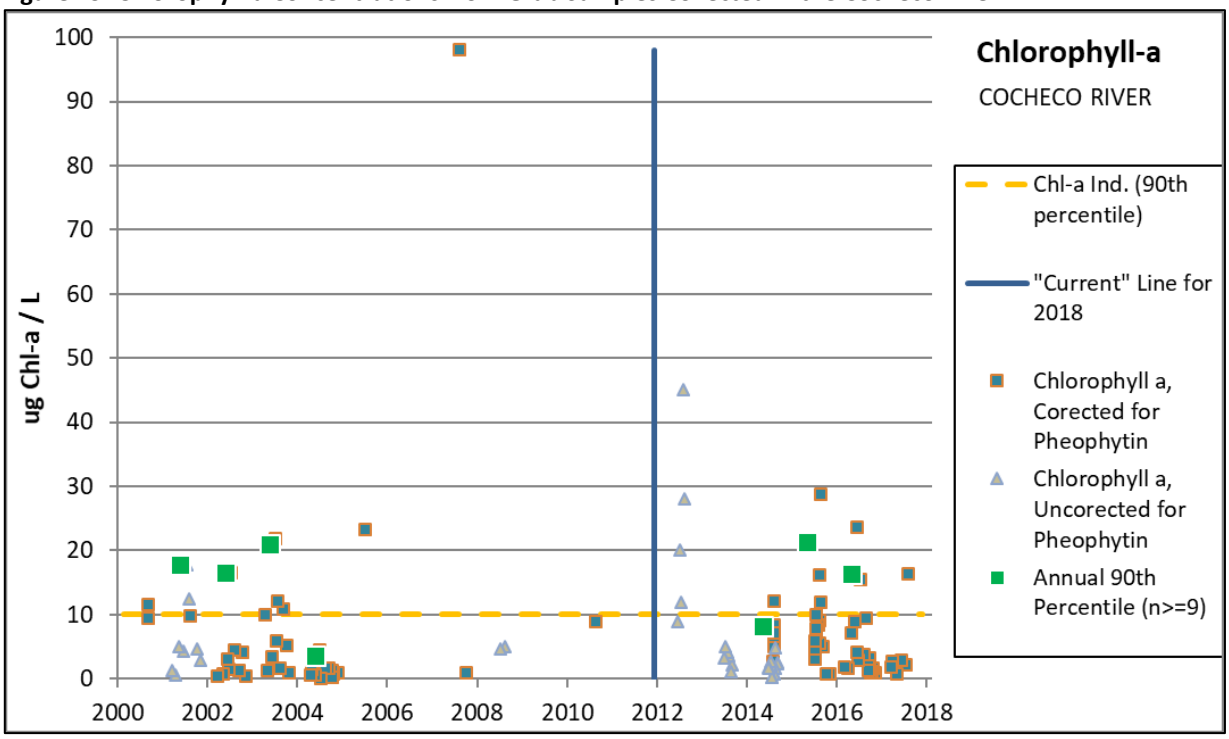
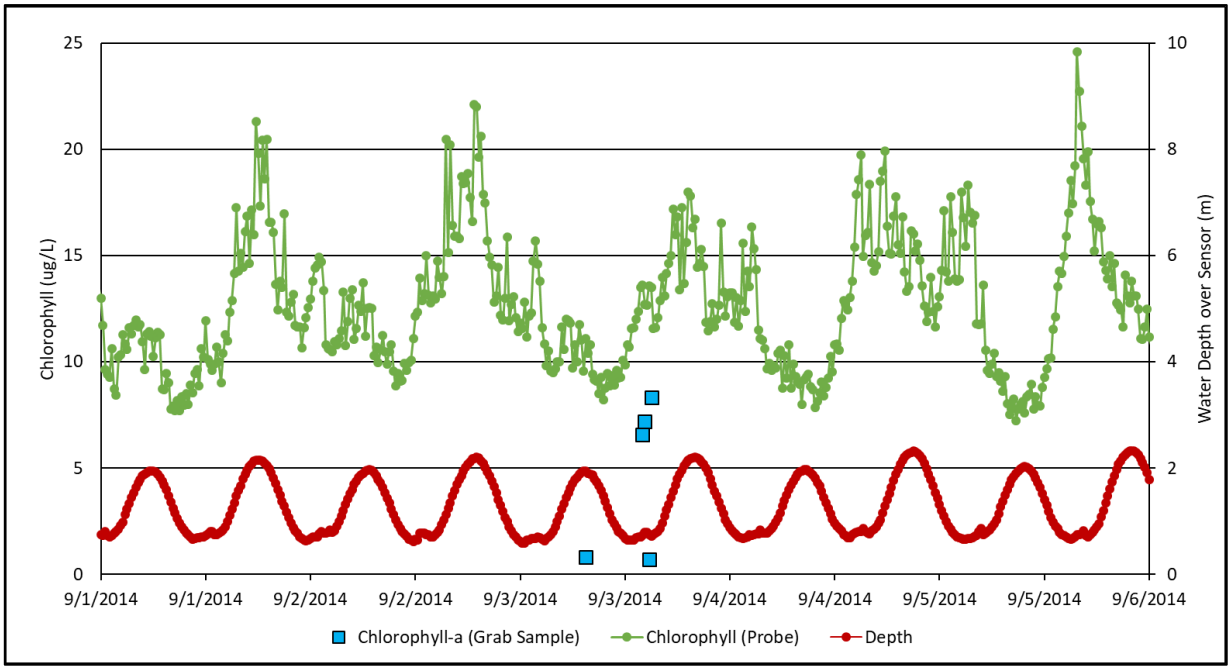


Figure 20: Chlorophyll-a Concentrations from Grab Samples Collected in the Cocheco River and associated Chlorophyll Datalogger Data



Weather can also play a large role in understanding the observations made when comparing data from one year to another. **Figure 21** and **Figure 22** reveal that in 2014 there were fewer rain events with a 3-day total over one inch, which is also illustrated in the reduced peak in stream flow. Reduced stream flow and rainfall tend to indicate that there is less stormwater runoff contributing to the nitrogen observed in 2014 (**Figure 23**). Reduced flow could also help explain why dissolved oxygen was low in 2014 (**Figure 24** & **Figure 25**), as there was less opportunity for agitation and re-aeration. In contrast, 2016 and 2017 show much higher flows and increased 3-day rainfall totals over one inch, leading to greater agitation, flushing, and subsequently higher dissolved oxygen.

In conclusion, NHDES reaffirms that the data and analyses presented in the 2018 Technical Support Document (NHDES, 2019c) adequately demonstrate the eutrophication effects on the Cocheco River and that the impairments for chlorophyll-a, dissolved oxygen concentration, and total nitrogen are warranted.

Figure 21: Flow Data Associated with Cocheco River Grab Sample and Datalogger Collections

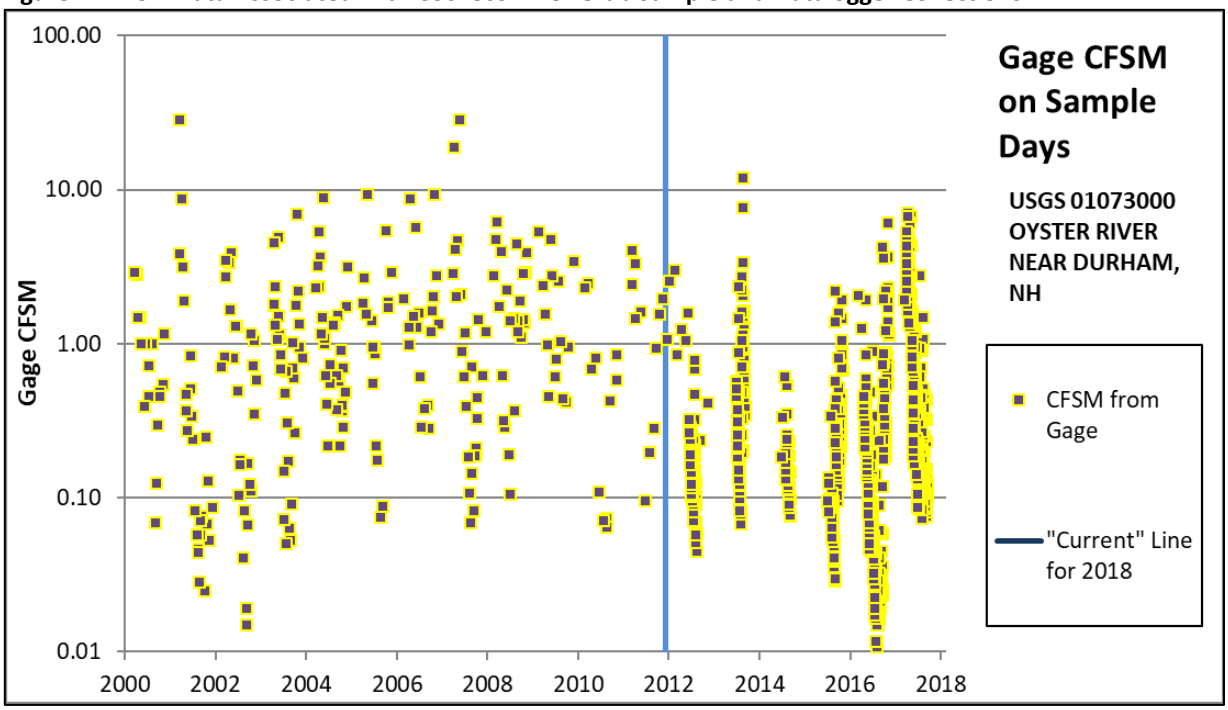


Figure 22: Rainfall Data Associated with Cocheco River Grab Sample and Datalogger Collections

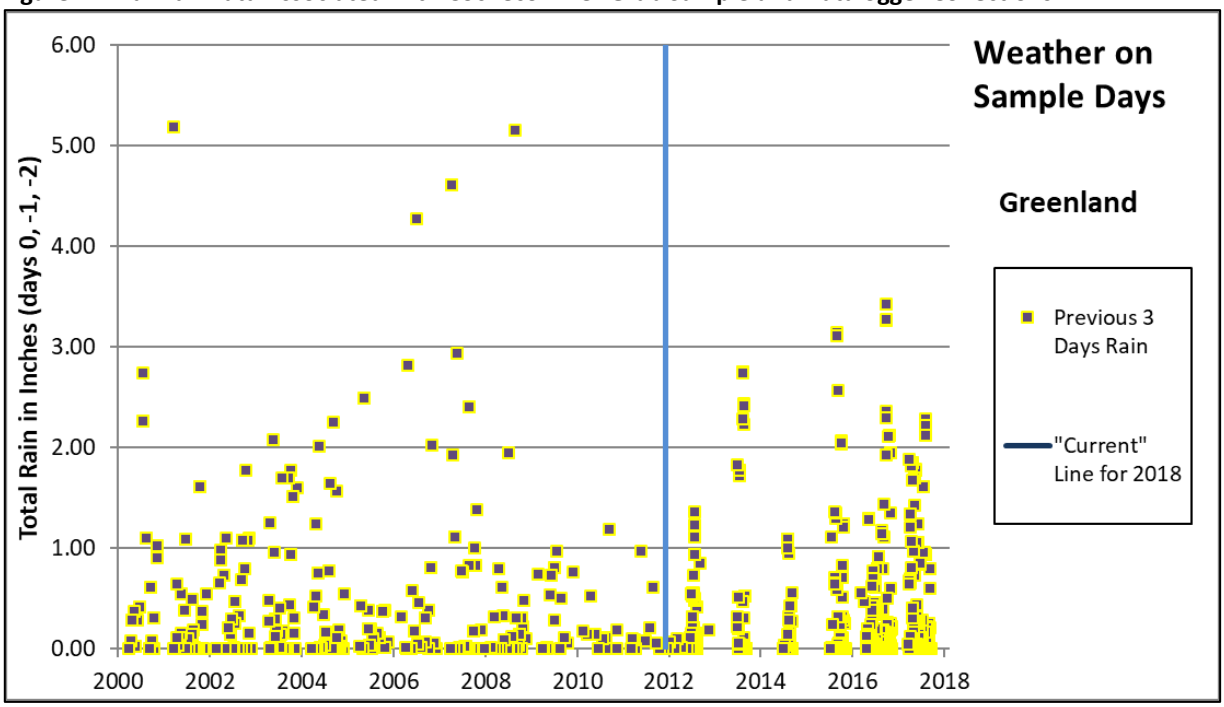


Figure 23: Total Nitrogen Concentrations from Grab Samples Collected in the Cocheco River

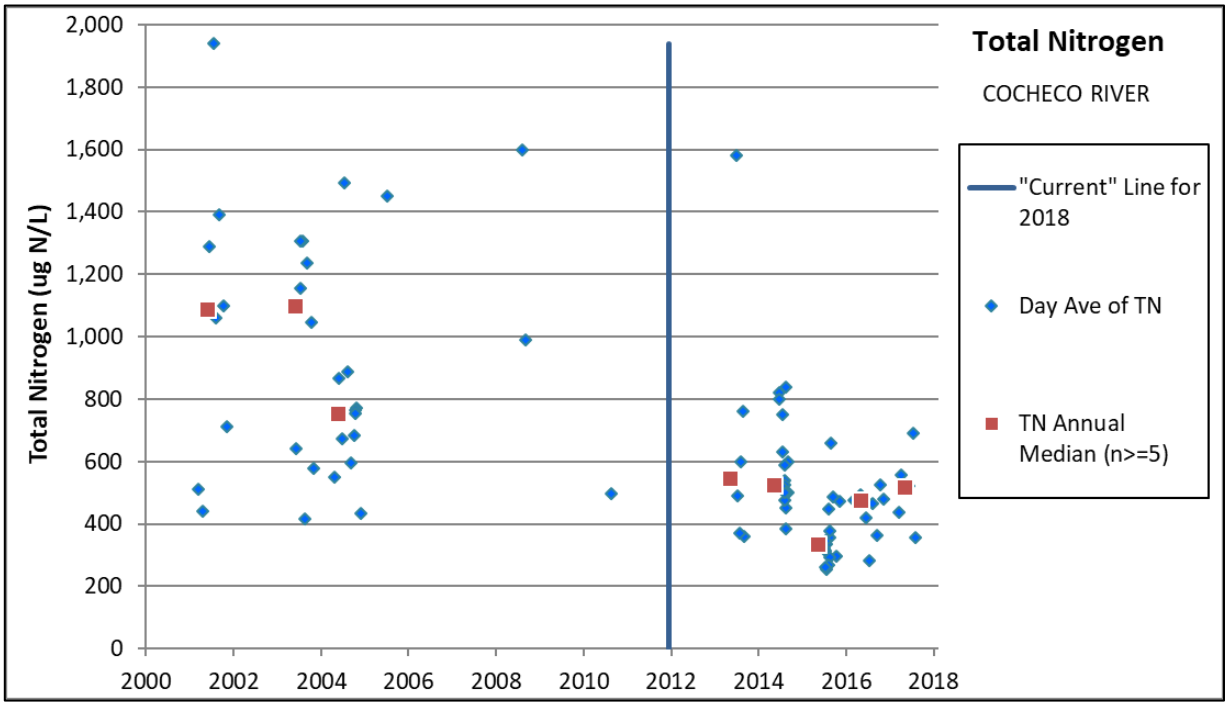


Figure 24: Dissolved Oxygen Concentrations in the Cocheco River

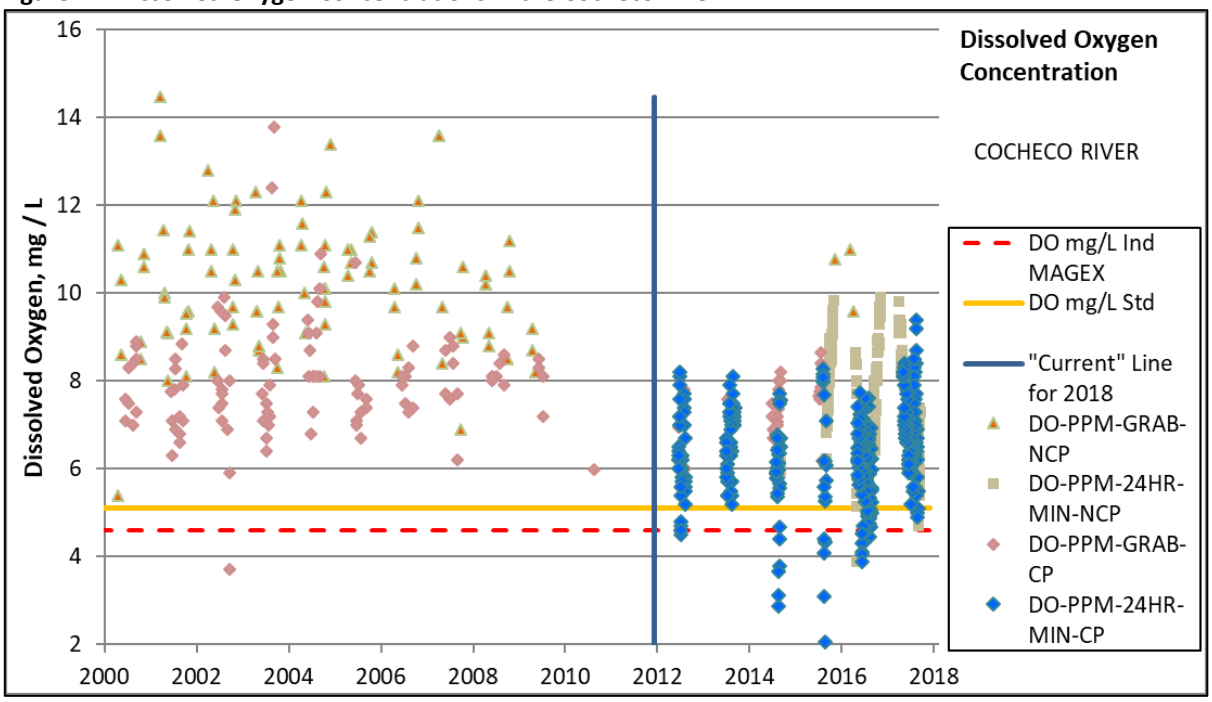
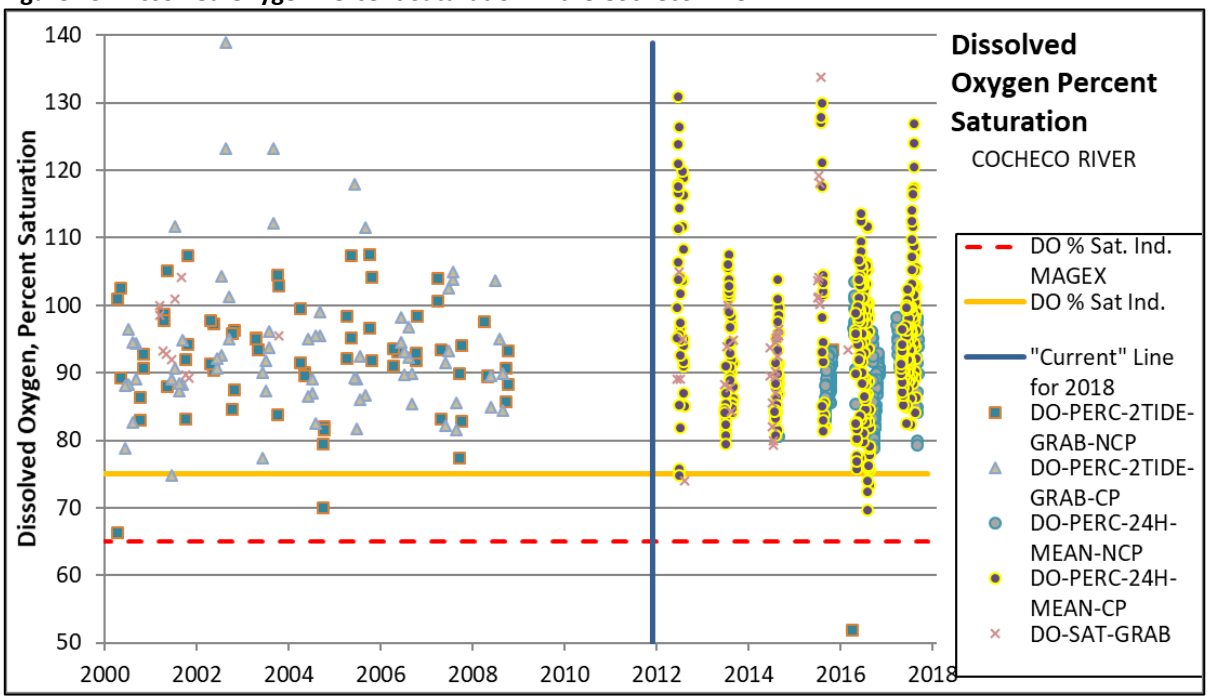


Figure 25: Dissolved Oxygen Percent Saturation in the Cocheco River



NHDES RESPONSE **to 10- 15**

The commenter objects to NHDES' decision to impair the Bellamy River for light attenuation for the aquatic life integrity designated use. NHDES agrees with the commenter, as a result, the Bellamy River assessment zone (NHEST600030903-01-01, NHEST600030903-01-03, and NHEST600030903-01-04) has been moved from category 5-M to 3-PNS for light attenuation for the aquatic life integrity designated use based on data collected in the current assessment period, resulting in its removal from the final 2018 303(d) List. See NHDES' response to **8- 4** for additional information.

***NHDES RESPONSE* to 10- 16**
The commenter found a copy and paste error under the Dissolved Oxygen Saturation sub-section of the Total Nitrogen indicator in the CALM (NHDES, 2019a). NHDES appreciates the commenters identification of this error, which NHDES will correct in the final CALM. Indicator Part 9g: Dissolved Oxygen Percent Saturation will be updated as follows:

Indicator Part 9g: Dissolved Oxygen Percent Saturation

Suggests II-PAS:

Dissolved Oxygen criteria are met per the methodology in Aquatic Life Use: Indicator 22.

Suggests II-PNS:

Dissolved Oxygen criteria are not met per the methodology in Aquatic Life Use: Indicator 22.

***NHDES RESPONSE* to 10- 17**
The commenter feels that NHDES revised the Aquatic Life designated use definition, thus placing additional requirements on evaluations to show that water quality is sufficient to support a species composition comparable to that of similar natural habitats of the region. NHDES would like the commenter to understand that there while there are slight differences between Table 3-4 in the 2016 CALM (NHDES, 2017d) and the 2018 CALM (NHDES, 2019a), NHDES made these changes to better reflect the designated use definitions as presented in the NH Code of Administrative Rules, chapter Env-Wq 1700 Surface Water Quality Standards, at Env-Wq 1702.17. NHDES' understanding of these designated uses has not changed, as reflected by the consistency of the designated use indicators between the 2016 and 2018 CALMs. This change reflects the fact that the state water quality standards (Env-WQ 1700) are the ultimate basis for assessments.

***NHDES RESPONSE* to 10- 18**
Attachments referenced in the comments. No additional response necessary.

***NHDES RESPONSE* to 10- 19**
Attachments referenced in the comments. No additional response necessary.

***NHDES RESPONSE* to 10- 20**
Attachments referenced in the comments. No additional response necessary.

RESPONSE TO COMMENT #11 Terry Desmarais, City of Portsmouth

***NHDES RESPONSE* to 11- 1**
This section contains remarks by the City of Portsmouth and incorporates by reference the comments submitted by the Great Bay Municipal Coalition, concerning the draft 2018 303(d) List for the assessment units within the Great Bay Estuary. These comments are addressed in the responses to comments **10- 1** through **10- 20**, above.

***NHDES RESPONSE* to 11- 2**
This section contains remarks by the City of Portsmouth and incorporates by reference the comments submitted by the Great Bay Municipal Coalition, concerning the draft 2018 Consolidated Assessment and

Listing Methodology. These comments are addressed in the responses to comments **10- 1** through **10- 20**, above.

RESPONSE TO COMMENT #12 Peter C. Nourse, City of Rochester

NHDES RESPONSE **to 12- 1**
This section contains opening remarks the City of Rochester. References to portions of the draft 2018 303(d) and draft CALM are discussed in the responses below.

NHDES RESPONSE **to 12- 2**
The commenter feels that NHDES has not addressed their concerns, first raised with comments made on the 2016 CALM (NHDES, 2017d), that NHDES failed to incorporate recommendations of the 2014 peer review (Bierman, Diaz, Kenworthy, & Reckhow, 2014) into the CALM. NHDES' position on this matter has not changed since first addressed in the 2016 response to comments (NHDES, 2017b, p. 53). Changes were made to the 2014 CALM in response to the peer review, those changes were carried into the 2016 CALM, and later the draft 2018 CALM. In response to the peer review NHDES discontinued use of the numeric nutrient criteria (NHDES, 2009) and transitioned to the use of a multi-indicator evaluation to assess compliance with the narrative criteria (Env-Wq 1703.14) for the Great Bay Estuary.

Furthermore, in the joint statement regarding eelgrass stressors in the great bay estuary the authors state that "[d]espite encouraging reductions in nitrogen from wastewater treatment plants, loading levels are still well above levels found to be related to environmental degradation and reduced estuarine ecosystem resiliency in many other systems (Latimer and Rego 2010)." (Kenworthy, Gobler, & and Moore, 2017). NHDES made changes to is assessment process to account for the confounding factors identified in the 2014 peer review (Bierman, Diaz, Kenworthy, & Reckhow, 2014) and the identification of total nitrogen as an important variable. As demonstrated in **Table 6**, NHDES delisted 54% of the assessment zones that were impaired for total nitrogen under the numeric nutrient criteria, following the changes made to the CALM as recommended by the peer review.

Table 6: Changes in Eutrophication Assessment Category Following Peer Review

Assessment Zone	2012 Total Nitrogen Assessment Category	2014 Total Nitrogen Assessment Category	Change Following Peer Review
Sagamore Creek	3-PAS	3-ND	
Winnicut River	3-ND	3-ND	
North Mill Pond	3-ND	3-ND	
South Mill Pond	3-ND	3-ND	
Lower Piscataqua River - North	3-PNS	3-PNS	
Lower Piscataqua River - South	3-PNS	3-PNS	
Portsmouth Harbor	5-M	3-PNS	Delist
Little Harbor/Back Channel	5-M	3-PNS	Delist
Great Bay	5-M	3-PNS	Delist
Little Bay	5-M	3-PNS	Delist
Lamprey River North	5-M	5-M	
Salmon Falls River	5-M	5-M	
Bellamy River	5-P	3-PNS	Delist
Upper Piscataqua River	5-P	3-PNS	Delist

Assessment Zone	2012 Total Nitrogen Assessment Category	2014 Total Nitrogen Assessment Category	Change Following Peer Review
Cocheco River	5-P	3-PNS	Delist
Lamprey River South	5-P	5-P	
Oyster River	5-P	5-P	
Squamscott River South	5-P	5-P	
Squamscott River North	5-P	5-P	

NHDES would also like the commenter to understand that their summation of the peer review is misleading as presented in their comments on the draft 2018 assessment material. The commenter chooses to quote only portions of the peer review that support their own arguments and/or assumptions. When the peer reviewers were asked "Given the available data/studies, is nitrogen an important factor in the presence/absence of eelgrass in various segments of the estuary […]?" Dr. Bierman responded "Yes, it is an important factor," and Dr. Diaz responded in part, "Yes, overall nitrogen is an important factor for eelgrass growth, but in the context of numeric nitrogen criteria it is the concentration of nitrogen that disrupts the balance of primary producer species that are known to negatively interact with eelgrass (Neckles et al. 1993)." Dr. Diaz continues, "Within the various estuarine segments, the importance of nitrogen as a controlling factors needs to be balanced by other co-varying factors, such as transparency and sediment quality (Kenworthy et al. 2013), and those listed in Kenworthy's response." (Bierman, Diaz, Kenworthy, & Reckhow, 2014, p. 18). As discussed above, NHDES was responsive to these comments by the discontinued use of the numeric nutrient criteria (NHDES, 2009) and transition to the use of a multi-indicator evaluation.

NHDES does not agree with the commenters statement indicating that NHDES "continues to contradict the peer review scientist by assuming nitrogen is the cause of impairments and eelgrass loss in Great Bay." As documented in the CALM, eelgrass is assessed based on either historical loss greater that 20% or by no decreasing trend that shows a loss of 20% of the resource. Nowhere is nitrogen mentioned as a consideration under Indicator 8: Eelgrass (Zostera marina) Cover in the Great Bay Estuary (NHDES, 2019a). Similarly, for Indicator 9: Total Nitrogen Concentrations (TN) and Associated Eutrophication Impacts in the Great Bay Estuary, NHDES utilizes a collection of indicators to evaluate nutrients and nutrient-related impacts.

***NHDES RESPONSE* to 12- 3**

The commenter feels that NHDES should delay finalization of the 2018 303(d) list until new dissolved oxygen regulations are enacted. NHDES is currently in the process of reevaluating its current dissolved oxygen standards and presenting information to its Water Quality Standards Advisory Committee (WQSAC). Until such time that new standards are developed, adopted by NHDES, and approved by EPA, NHDES is required make assessment determinations based of the current NH Code of Administrative Rules, Chapter Env-Wq 1700 Surface Water Quality Standards. The WQSAC is an open public forum designed to interact with stakeholders on issues related to state water quality regulations. The purpose of the committee is to facilitate the discussion around focused issues. WQSAC meetings are open to anyone. For more information, visit the WQSAC webpage.

Also see response to comment **9- 3** regarding dissolved oxygen, and response to comment **1- 1** and **1- 2** regarding regulatory authority.

NHDES RESPONSE **to 12- 4**
The commenter feels that NHDES is in violation of its rulemaking obligations under RSA 541-A, and that until NHDES completes the rulemaking process it should suspend the 2016 303(d) list. NHDES is unaware if the commenters reference to the 2016 303(d) list is a typographical error or an intention statement. Regardless of the commenters objection to the 2016 or the draft 2018 303(d) list, it appears that the foundation of objection lies with NHDES' rulemaking obligations. As previously addressed in the 2016 response to comments (NHDES, 2017b, p. 53), the CALM is not a rule. RSA 541-A:1, XV, defines "rule" as "each regulation, standard, form as defined in paragraph VII-a, or other statement of general applicability adopted by an agency to (a) implement, interpret, or make specific a statute enforced or administered by such agency or (b) prescribe or interpret an agency policy, procedure or practice requirement binding on persons outside the agency, whether members of the general public or personnel in other agencies." The CALM is used to fulfill a federal obligation, not to "implement, interpret, or make specific" a state statute. The CALM creates no "policy, procedure or practice requirement [that is] binding on persons outside the agency." The CALM is used in preparing the 305(b) Report and 303(d) list, and that list may be used by the federal or state government to make decisions in regulatory programs, but each such decision is made under its own administrative process that includes opportunities for public input and appeal. Regarding the antidegradation policy, antidegradation is implemented on a case by case basis for projects based on how much of a waterbodies remaining assimilative capacity will be used by that specific project. To date, NHDES has not applied antidegradation to make support/non-support determinations in the assessment process.

NHDES RESPONSE **to 12- 5**
This section incorporates by reference the comments submitted by the Great Bay Municipal Coalition and Brown & Caldwell, concerning the draft 2018 303(d) material and draft CALM. There is also a summary of recommendations, which are addressed in the responses to comments **10- 1** through **10- 20**, above, and **12- 10** through **12- 19**, below.

NHDES RESPONSE **to 12- 6**
The commenter requests that the Cocheco River be changed from category 5-M to category 3-PAS until more high quality data is collected, but does not specify for what indicator. The only two indicators for which the Cocheco River is impaired, under category 5-M, are dissolved oxygen and total nitrogen. With respect to dissolved oxygen, as presented in **Figure 24,** there have been six years of high resolution datalogger data collected since 2012, representing 388 days. Similarly, there have been 53 total nitrogen samples collected since 2012 (**Figure 23**), in addition to the dissolved oxygen (n = 388) and chlorophyll-a (n = 70, **Figure 19** and **Figure 20**) data that are used in the multi-indicator evaluation process. As presented in the technical support document (NHDES, 2019c, pp. 71-76), there are sufficient data in which to make an assessment determination for both dissolved oxygen and total nitrogen. NHDES agrees that more data is always beneficial when evaluating water quality, however, at this time there is sufficient data with which to make an assessment determination, and the data does not support a delisting at this time.

See NHDES' response to **10- 14** for additional information.

NHDES RESPONSE **to 12- 7**
The commenter feels that NHDES does not have the technical data necessary to warrant an impairment determination for total nitrogen in the Cocheco River. The commenter notes the recent facility upgrades to WWTFs as justification. While NHDES acknowledges the tremendous work that the city has done in reducing the effluent nitrogen concentrations, the data as presented in the technical support document (NHDES, 2019c, pp. 71-76) does not yet indicate that a delisting is warranted. While the recent data appears to show a reduction in total nitrogen in the Cocheco River, it is not yet a statistically robust trend. Furthermore, NHDES ceased using total nitrogen numeric thresholds in 2014 per the recommendations of the peer review (Bierman, Diaz, Kenworthy, & Reckhow, 2014). Nitrogen levels alone cannot be used as

justification for delisting an impairment. The total nitrogen concentrations in conjunction with the dissolved oxygen and chlorophyll-a data suggest that nitrogen is contributing to cultural eutrophication. The acceptable levels of nutrients in surface waters are governed by Administrative Rule Env-Wq 1703.14 which requires that there be no nutrients in such quantities as to impair any designated uses in Class B waters. Therefore, assessments to determine compliance with Env-Wq 1703.14 consider both indicators of nutrients and nutrient-related impairments (i.e. eutrophication). As such, NHDES' total nitrogen impairment determination is still warranted at this time.

***NHDES RESPONSE* to 12- 8**
The commenter feels that NHDES should develop a water quality management strategy, with a focus on collaboration between regulatory agencies and affected stakeholders. Although these comments are not specific to the 2018 draft CALM or 303(d) List, and therefore do not require a response, NHDES would like the commenter to know that NHDES is currently engaged with the Piscataqua Region Estuaries Partnership (PREP) through their regional monitoring collaborative, to ensure that what limited resources are available through NHDES, PREP, EPA and local municipalities are utilized to gather the most useful data possible to try understand this complex system. The strategy recommended by the commenter is currently underway, but being managed by PREP as opposed to NHDES. Through this monitoring collaborative and the data provided by the GB Municipal Coalition, NHDES has adequate information to make assessment determinations in some assessment zones. NHDES welcomes a Great Bay-specific study but at this time resources are not available. Attempts have been made over the last several years by UNH staff to secure grant funding for this type of study but have been unsuccessful in receiving funding. NHDES has sent letters of support of each of these endeavors.

***NHDES RESPONSE* to 12- 9**
This section contains closing remarks by the City of Rochester and a summation of their concerns. NHDES appreciates the time taken to review the documents and no further response is required.

***NHDES RESPONSE* to 12- 10**
This section contains opening remarks by Brown and Caldwell and states that their comment were prepared on behalf of the City of Rochester. References to portions of the draft 2018 303(d) and draft CALM are discussed in the responses below.

***NHDES RESPONSE* to 12- 11**
The commenter agrees with NHDES' decision to remove dissolved oxygen percent saturation as a full assessment indicator, but feels it should not be used as screening level indicator. They feel this approach would be more consistent with the legislative intent of Senate Bill 127 (2017). As acknowledged by the commenter, 2017 SB127 amended three sections of RSA 485. The specificity of RSA 485-A:6, XIV to concentration appears to denote exclusivity from saturation. As such, NHDES has been advised to not use dissolved oxygen saturation to make impairment determinations in the 2018 303(d) assessment process. However, NHDES feels that dissolved oxygen saturation can be a strong indicator of water quality and provide insight into trends seen in other parameters. It is for these reason that NHDES has retained dissolved oxygen saturation as a screening indicator. NHDES will take the commenter's concerns under advisement as it works to finalize the CALM.

See NHDES' response to **9- 3** for additional information.

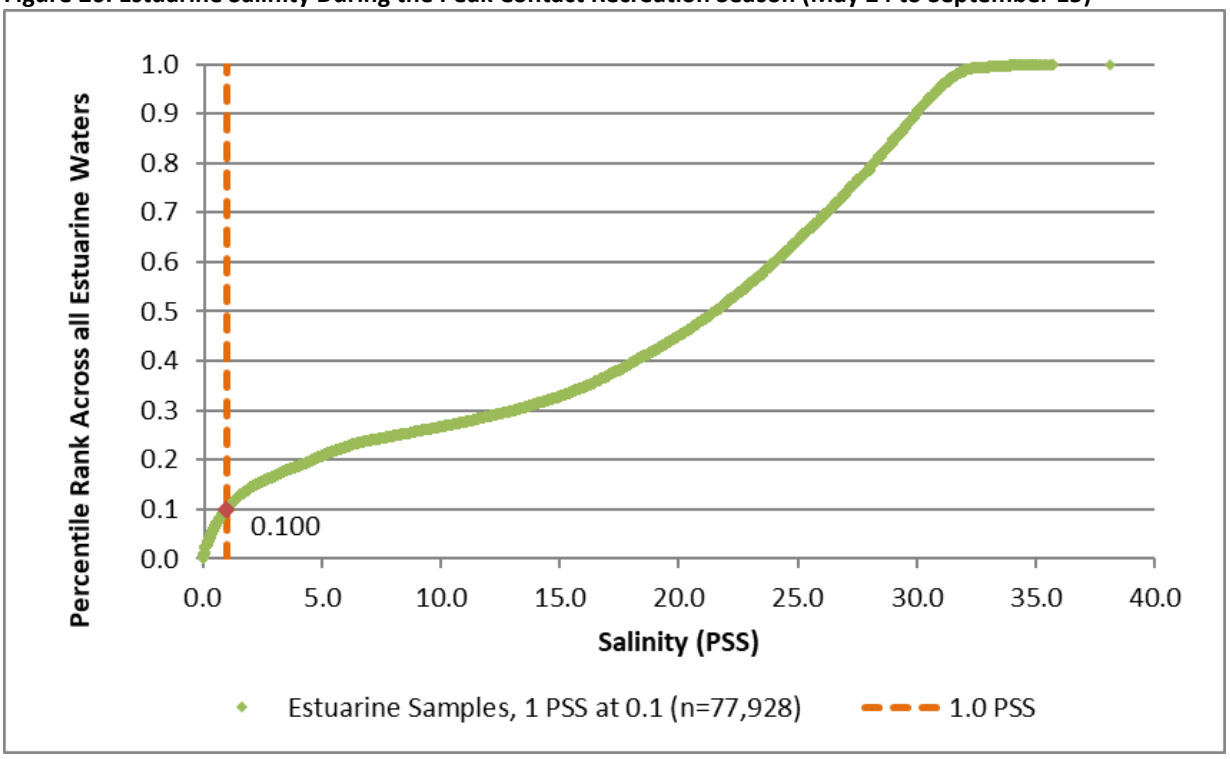
***NHDES RESPONSE* to 12- 12**
The commenter feels that the dissolved oxygen daily minimum concentration criterion is not appropriate for use for tidal waters and acknowledges and supports NHDES in its ongoing efforts to research and revise the current dissolved oxygen criteria. No response necessary.

***NHDES RESPONSE* to 12- 13**
It should be noted that this comment on the Draft 2018 303(d) List is nearly identical to the comments made by the City on the 2014 and 2016 303(d) List. NHDES' position on this matter has not changed. The commenter asserts that the chlorophyll-a indicator to protect the swimming designated use is inappropriate. The indicator used for 305(b)/303(d) assessments has been in place since 2004. The chlorophyll-a threshold of 20 µg/L is an aesthetic indicator, not a health indicator to identify a threshold at which toxic blooms become likely. For the full response see NHDES Response to 5- 16 on NHDES' response to comments on the 2016 303(d) List (NHDES, 2017b, pp. 56-59).

***NHDES RESPONSE* to 12- 14**
The commenter feels that the nitrogen in estuarine waters indicator, for the primary contact recreation designated use, should be discontinued. The commenter feels that it is repetitive of the chlorophyll-a indicator. As discussed in NHDES' response to **12- 13**, the chlorophyll-a indicator for the primary contact recreation designated use is an aesthetic indicator, not an indicator used to identify a threshold at which toxic blooms become likely. While similar, the nitrogen in estuarine waters indicator differs from the chlorophyll-a indicator in that chlorophyll-a is used to identify primary and secondary symptoms of eutrophication caused by external nutrient inputs.

The commenter notes that light and hydraulic residence time in the estuary can control algal growth. While true, no amount of light or residence time will produce algal biomass in the absence of nitrogen to feed that biomass. Along those lines, the commenter also claims, without supporting evidence, that the upper estuary can at times be phosphorus limiting. It's true that the portions of the estuary can at times demonstrate low salinity levels (**Figure 26**), and appear to be freshwater dominated (< 1.0 PSS) (USGS, n.d.). However, these conditions are variable and can change from one day to the next depending on the tides, weather, or other factors, but for the most part these conditions are short in duration. As presented in the 2018 CALM (NHDES, 2019a), the estuarine eutrophication model used by the National Oceanic and Atmospheric Administration relates external nutrient inputs to primary and secondary symptoms of eutrophication (Bricker, et al., 2007). Until such time that sufficient data has been collected that demonstrates that nitrogen is not the limiting nutrient in the system, the impairments will be specifically for nitrogen because the preponderance of scientific evidence supports that nitrogen is the limiting nutrient in marine waters.

Figure 26: Estuarine Salinity During the Peak Contact Recreation Season (May 24 to September 15)



NHDES RESPONSE **to 12- 15**

The commenter feels that it is inappropriate for NHDES to conclude that there are nitrogen impairments within the Great Bay estuary due to that fact that the precise cause-effect relationship between nitrogen and other indicators has not been established. They feel it would be more appropriate to rename Indicator 9 form "Total Nitrogen Concentrations (TN) and Associated Eutrophication Impacts in the Great Bay Estuary," to "Aquatic Life Integrity in the Great Bay Estuary," so as to place more emphasis on the influence that other environmental factors may have on the response indicators. NHDES will consider this request, however the acceptable levels of nutrients in surface waters are governed by Administrative Rule Env-Wq 1703.14 which requires that there be no nutrients in such quantities as to impair any designated uses in Class B waters. Therefore, assessments to determine compliance with Env-Wq 1703.14 consider both indicators of nutrients and nutrient-related impairments. In the Great Bay Estuary, the measure for nutrient levels is total nitrogen concentrations because nitrogen is the limiting nutrient in estuaries (NHDES, 2019a). NHDES agrees that there can be many other factors that influence a particular parameter at any given time, in addition to nitrogen. Those types of interactions are taken under consideration when evaluating each of the response indicators that make up the total nitrogen multi-indicator evaluation.

For additional information see NHDES Responses **10- 13**, **10- 14** and **12- 2**.

NHDES RESPONSE **to 12- 16**

The commenter feels that it is inappropriate to list the Cocheco River as impaired for chlorophyll-a. Their primary arguments being that chlorophyll-a should not be used as an indicator of dissolved oxygen, and that the sonde-based chlorophyll data has been invalidated. As stated previously, nitrogen is the limiting nutrient in estuaries and is therefore used to evaluate compliance with water quality standards. The acceptable levels of nutrients in surface waters are governed by Administrative Rule Env-Wq 1703.14 which requires that there be no nutrients in such quantities as to impair any designated uses in Class B waters. Therefore, assessments to determine compliance with Env-Wq 1703.14 consider both indicators of nutrients and nutrient-related impairments (i.e. eutrophication). As discussed in the CALM (NHDES, 2019a),

chlorophyll-a growth is stimulated by eutrophication processes and represents a potential draw on available dissolved oxygen in two principle ways. Initially, live phytoplankton must consume oxygen during the night to maintain biological functions. Once phytoplankton dies, the remaining organic matter is available to bacteria and additional oxygen consumption from the water column. This interaction between chlorophyll-a and dissolved oxygen "contributes to" cultural eutrophication, and is therefore an appropriate indicator in which to evaluate total nitrogen as part of the multi-indicator evaluation process.

Also discussed earlier, the in-situ chlorophyll data collected from the datalogger are not utilized in the 90th percentile calculation, which are the only data compared against the water quality threshold. The in-situ sensor data is utilized in conjunction with the extractive samples to visually demonstrate that chlorophyll concentrations fluctuate in these highly dynamic systems. The extractive samples, even when above the water quality thresholds, do not always capture the peak levels of chlorophyll-a in the system. For additional information see the NHDES response to comment **10- 6** and **10- 14.** In summation, NHDES' justifications presented in the 2018 technical support document (NHDES, 2019c) for chlorophyll-a are justified.

NHDES RESPONSE **to 12- 17**

The commenter asserts that NHDES continues to use dissolved oxygen data collected in 2015 for assessment purposes, despite the City of Rochester's objection, as they feel it is unreliable. NHDES directs the commenter to the extensive comments provided by NHDES in their response to comments on the 2016 assessment material (NHDES, 2017b, pp. 60-68). In summation, NHDES demonstrated through their analysis of the data that the trends for which the commenters objects were also observed within the Upper Piscataqua River and the Oyster River. NHDES explained in their response that the amplitude of these trends were different at each station due in part to differences in freshwater inputs, nutrient loading, and tidal flushing. However, the fact that the same patters were observed at three separate locations, at relatively the same times, directly contradicts the commenters assertion that the data was due in part to interference and should be deemed unreliable. NHDES agreed with the commenter that organic rich matter on nearby mudflats was contributing to the low dissolved oxygen values being observed. However, NHDES does not believe them to be an entirely natural process as decades of anthropogenic loading likely contributed to the buildup.

As stated above, NHDES does not agree with the commenters opinion of the data and it is appropriate for use in assessment decisions. **Figure 27** and **Figure 28** present the paired results from the datasondes deployed in the Cocheco River and Oyster River in 2016. The data has been constrained to a few days in each of the figures in order to more clearly see the patterns (data from the Upper Piscataqua River could not be compared as in the previous analysis because the river was not monitoring in 2016). Similar to the analysis conducted with the 2015 data, it is evident that the two rivers, despite being geographically separated, display very similar data patterns. When two different tidal river datasondes (three in the 2015 dataset) present such similar readings, it is irresponsible to simply assume that the site experiencing lower DO has experienced meter errors without performing a detailed data review as NHDES conducted for the 2015 dataset.

Figure 27: Dissolved Oxygen Concentration in the Cocheco and Oyster Rivers (6/29/2016 through 7/6/2016)

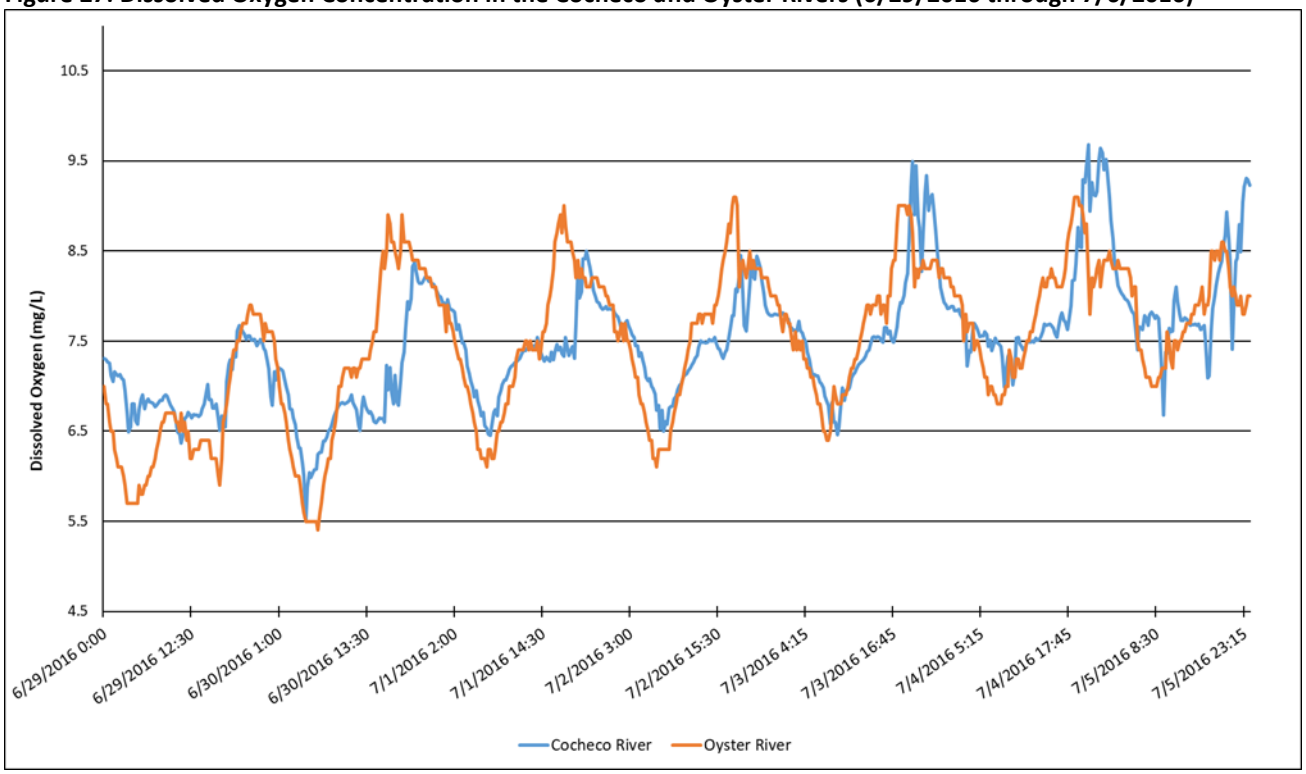
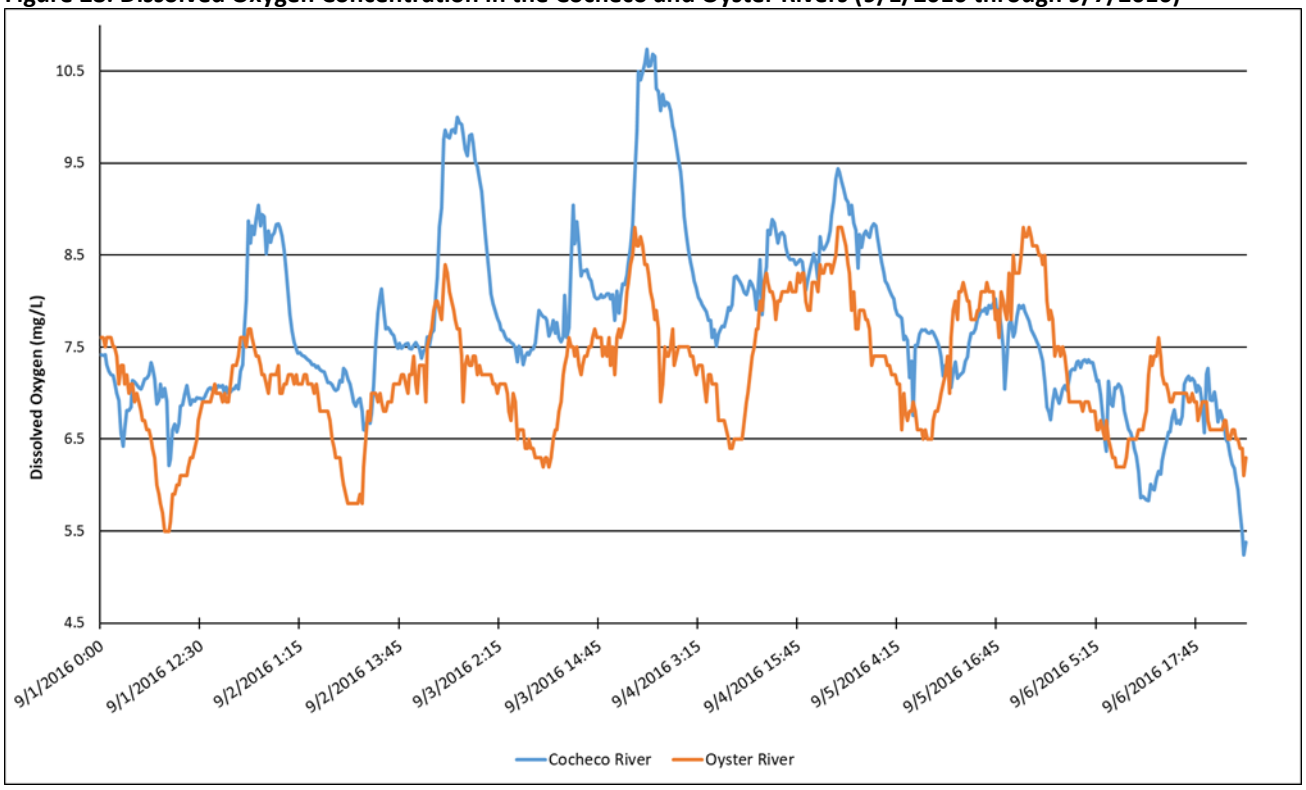
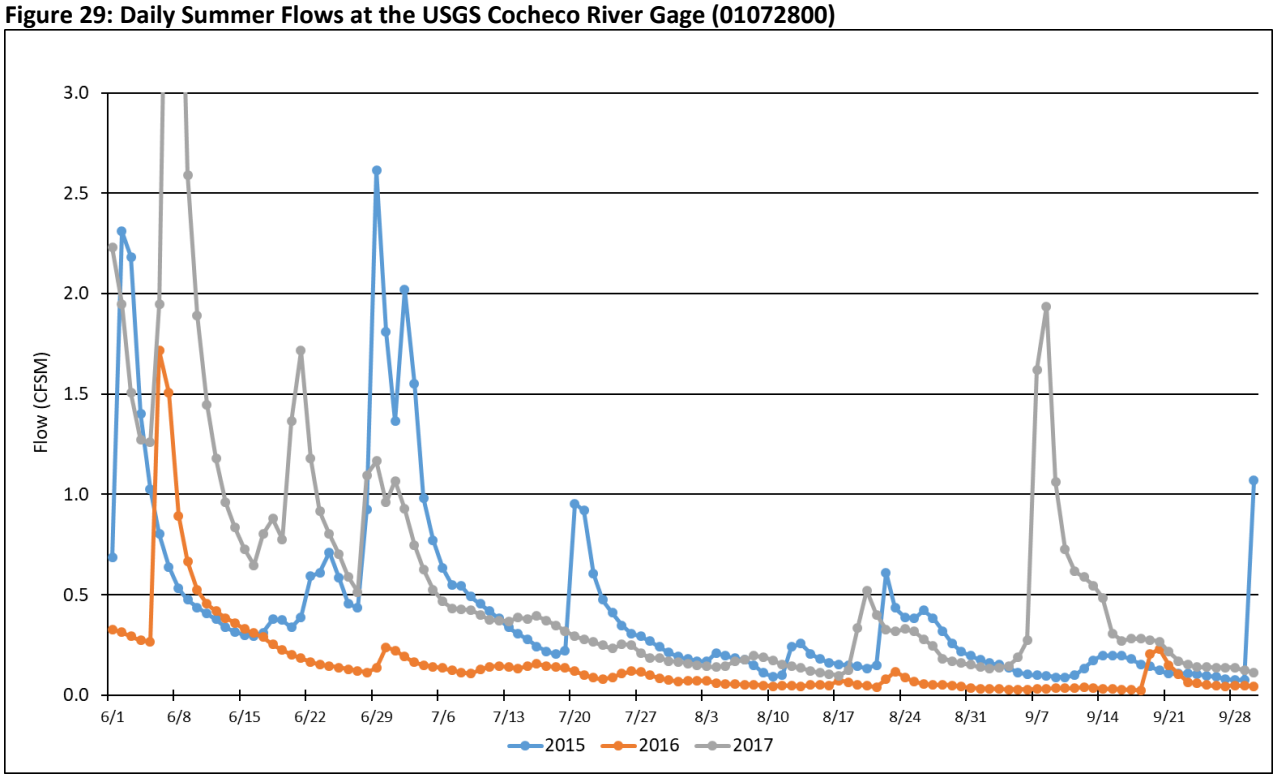


Figure 28: Dissolved Oxygen Concentration in the Cocheco and Oyster Rivers (9/1/2016 through 9/7/2016)



It is also important to point out that in 2016 the datasonde used in the Cocheco River was a Eureka Manta 2 (same as in previous years), in contrast to the much newer YSI EXO2 used in the Oyster River. This is an important distinction as the commenter also contends that many of the aberrant dissolved oxygen readings were not observed in the Cocheco River in 2017 because the datasonde was upgraded to the newer YSI EXO2. The difference observed between the 2015, 2016 and 2017 data in the Cocheco River were most likely a consequence of hydrological and meteorological differences between the years (**Figure 29**), which resulted in better flushing, as noted in the 2016 response to comments (NHDES, 2017b).

Figure 29: Daily Summer Flows at the USGS Cocheco River Gage (01072800)



The commenter also contends that the 2016 data should not be used in assessment decisions because more than 10% of the data was invalidated because of aberrant values and/or biofouling. While it is true that 10.5% (2,055 of 19,499) of the data was invalidated, 9.6% (1,864 of 19,499) was a result of biofouling alone. Biofouling is a common occurrence with datasondes that are placed in marine environments for extended periods of time. The rate at which biofouling occurs is dictated by many factors but typically intensifies with increasing salinity, water temperatures, nutrient levels, and the age of the sensor. Contractors typically combat this fouling through the use of copper, either in the form of a guard or screen around the sensors or as tape that is installed on individual components, which was the method employed by UNH in 2016. According to YSI, the use of anti-fouling practices can help a probe withstand warm, marine environment deployments and extend the need for manual cleanings. **Table 7** lists the typical deployment lengths a sonde can go without receiving a physical cleaning (YSI, 2013).

Table 7: Typical Deployment Results in Marine Environments Reported by YSI

YSI EXO sonde with anti-fouling	YSI 6-Series sonde with anti-fouling (comparable to the Eureka Manta 2)	Sondes without anti-fouling
45-90 days possible, site dependent	14-30 days possible, site dependent	<5 days

Despite the contractor's efforts to clean and swap out the datasondes, approximately monthly, the mere fact that they receive biofouling is why NHDES encourages entities collecting data to preform robust QA/QC evaluations of the data prior to submitting it to NHDES. The data in 2016 was collected by UNH who

performed a robust QA/QC evaluations of the data in accordance with the procedures outlined in NOAA's National Estuarine Research Reserve (NERRS) System-wide Monitoring Program Data Management Manual (NERRS, 2015). UNH's explanation of the invalidated dissolved oxygen data is as follows; "It is our assumption that these anomalous low dissolved oxygen events were caused by two interacting factors. Shortly following the peak of flood tide, opposing tidal and river currents reached an equilibrium, such that the water became somewhat stationary around the sonde. This stagnant water, in combination with biofouling of the probes and sonde guard, may have created a unique environment in which microfaunal respiration rapidly consumed much of the oxygen surrounding the probes. Once the river and tidal flows began to move in the same direction, the low dissolved oxygen water was flushed away from the sonde. This same pattern did not present itself during low tide, presumably because the freshwater current was moving past the sonde at a sufficient rate and did not allow the water to stagnate. […] Although we believe that a portion of the depressed dissolved oxygen is real, and a natural part of the system, it is difficult to attribute the proportion that is being influenced by this biofouling/stagnant water effect. Because of this uncertainty, a decision was made to invalidate 60 minutes of data on either side of the lowest dissolved oxygen reading for each of these events." (Martin, 2017). Because the data underwent a robust QA/QC evaluation, and no other restriction were placed on the data, NHDES feels that the validated dissolved oxygen data it is of high quality and appropriate for use in assessments.

NHDES RESPONSE **to 12- 18**
See response to comment **12- 15** regarding total nitrogen as an indicator of eutrophication Impacts in the Great Bay Estuary.
See response to comment **12- 16** regarding chlorophyll-a in the Cocheco River.
See response to comment **12- 17** regarding dissolved oxygen in the Cocheco River.

NHDES RESPONSE **to 12- 19**
The commenter requests the removal of the total nitrogen impairment from the Cocheco River (NHEST600030608-01) as outlined in their previous comments. The commenter provides as anecdotal evidence the lack or reported fish kills or complaints from the public. NHDES would like the commenter to understand that the sudden mass mortality of fish and complaints from residents are not meaningful endpoints. NHDES' goal is to protect aquatic life so that a waterbody does not get degraded to a point that would result in mass casualties of aquatic life.

See response to comment **12- 15** regarding total nitrogen as an indicator of eutrophication Impacts in the Great Bay Estuary.
See response to comment **12- 16** regarding chlorophyll-a in the Cocheco River.
See response to comment **12- 17** regarding dissolved oxygen in the Cocheco River.

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D. PUBLIC COMMENT ON THE DRAFT, 2018 SECTION 303(D) LIST

COMMENT #1: Andrew Kohlhofer, Fremont, NH resident

Thu 1/24/2019 5:21 PM ANDREW P KOHLHOFER <a.kohlhofer@comcast.net> **draft 201 8 , 303(d) List of Impaired Surface Waters for New Hampshire** To DES: 303d Comment First of all, EPA only has authority over interstate navigable waters, and none of the the impaired waters on the map meet that description, so we are under no obligation to report anything to the EPA. So I see this as a waste of time and money.	**1- 1**
Also, the Trump administration is in the process of redefining the CWA, so this effort is probably moot. Our own legislature needs to act to define what an impaired water is and what actions need to be taken. It appears at this time that you have no authority to do anything. Andrew Kohlhofer 848 Main Street Fremont, NH (603) 895-4675 Where the spirit of the Lord is there is liberty 2 Cor. 3:19	**1- 2**

COMMENT #2: Leslie Bergum, Ammonoosuc River - Volunteer River Assessment Program

February 21, 2019 Dear Mr. Wood, Thank you for your email announcing the ability for stakeholders to review and comment on the Draft 2018, 303 (d) List of impaired surface waters and related documents. My name is Leslie Bergum; I am the coordinator for the Ammonoosuc (Ammo) River Volunteer River Assessment Program (VRAP). We are a small group of dedicated volunteers who continue to conduct water quality monitoring at seven Ammo station locations. After review of the Draft document, we see two Ammo River locations have been identified for addition to the Impairment List. Both are NHDES Trend Stations. We do not sample or conduct water quality monitoring at either location, however, we are familiar with them because we conducted water quality monitoring at both in the past.	**2- 1**
1. Assessment Unit ID # NHRIV801030506-10, Bath NH (NHDES Trend Station 03 AMM), moved from 3-PNS to 5-M for aluminum: Data clearly indicates pH levels coupled with high flow periods show this location to be consistently above the chronic criteria. It is our recommendation that additional aluminum samples be collected both upstream and downstream, of this impairment. We are willing to collect these additional samples and (with your approval and funding) could add this to our annual Sampling Plan. The Ammo River VRAP group also recommends adding your aluminum data to the annual Ammo River VRAP report. Including this data in the NHDES annual Ammo River VRAP report would be of value to all of us, the Ammo River Local Advisory Committee, natural resource agencies such as NHF&G, local conservation groups like Ammonoosuc Conservation Trust, municipalities through which the river flows, and the general public. This report serves as a valuable resource when entities such as these for example are reviewing proposed permits, seeking grant funding for protection and restoration projects, and assessing priorities for river related stewardship work.	**2- 2**

2. Assessment Unit ID # NHRIV801030403-03, Bethlehem, NH (NHDES Trend Station 22 AMM), moved from 3-ND to 4B-T for Biochemical Oxygen Demand (BOD), Bethlehem Waste Water Treatment Facility in violation of NPDES Permit: This facility has been in significant non-compliance for exceeding effluent BOD monthly average concentration limit for at least four months during two consecutive quarter review periods. Our Ammo River VRAP feels strongly that NHDES must hold the Bethlehem WWTP accountable. We do not understand why it says "this appears to have been an isolated incident with only one quarter in SNC" if it says what I have noted above. We also want to know what NHDES is doing to make certain violations like these will not happen again.	**2- 3**
The Ammo River is protected under the NHDES Designated River Program so any addition to the 303(d) List or additions to the categories 4A, 4B or 4C of the 305 (b) Report is a serious matter. We hope and trust that the obligation to compile this report and the long term shared "Vision" of the state and EPA's co-led process will stay on track to meet the Six Key Goal Statement. Thank you for engaging us as stakeholders to submit comments; we hope you find our recommendations helpful. We look forward to hearing from you with insight on our questions as well as our offer to be of assistance with regard to the additional sampling. Sincerely, Leslie Bergum, Ammo VRAP Coordinator on behalf of the Ammo River VRAP Group lebergum@aol.com cell 603-738-5766 CC: Ted Walsh, Director NH VRAP	**2- 4**

COMMENT #3: Michele L. Tremblay, Upper Merrimack River Local Advisory Committee

Tue 3/12/2019 9:00 AM Michele L. Tremblay, naturesource communications <MLT@naturesource.net> **Re: NH Draft 2018 303(d) List, CALM, and 303(d) Vision – Comment Opportunity Extended** To Wood, Matt Cc umrlac listserve; Sales, Tracie; Drociak, Jen; Mitchell, Mariah Dear Mr. Wood, The Upper Merrimack River Local Advisory Committee reviewed the list of impairments in its area of concern from Franklin to Bow. At this time, the UMRLAC does not have any concerns about the accuracy and the integrity of the data presented. The UMRLAC's sister organization, the Upper Merrimack Watershed Association, is working with partners including the Central New Hampshire Regional Planning Commission, on a Turkey River Watershed Restoration and Management Plan. One of the steps to produce the plan is to provide additional water quality and organism passage data. The UMWA looks forward to providing these data and other information to the Department for its future listings. Thank you. Sincerely, Michele L. Tremblay, Chair Upper Merrimack River Local Advisory Committee -- Michele L. Tremblay naturesource communications PO Box 3019 | Penacook NH 03303 603.796.2615 | 796.2600 fax | 902.218.2291 Canada www.naturesource.net | https://www.linkedin.com/in/MicheleLTremblay naturesource is a 1% for the Planet business	**3- 1**

COMMENT #4: Fred Quimby, New Durham, NH resident

Wed 3/13/2019 3:13 PM

Fred William Quimby <fwq1@cornell.edu>

Adding Mill Pond, Alton, NH to the 303(d) list

To DES: 303d Comment; Fred William Quimby

You replied to this message on 3/13/2019 3:51 PM.

4- 1

I am requesting the addition of Mill pond in Alton, NH to the current 303(d) list for cyanobacteria and hepatotoxic microcystins. The pond is identified as AUID NHLAK700020102-04 and I would like to see it listed in the 2018 303(d) list of impaired waterbodies, for the primary contact recreation designated use.

The reasons I believe this should be listed is that I have frequently seen fisherman fishing in this pond and taking the captured fish with them (presumably to eat).Not only have I seen this personally while gathering samples but I have been told this by Alton residents , including one Alton selectman. I sampled the pond several times during 2018 after I heard residents complain about the water turning green. I samples on 9/6,9/7,9/17,9/26 and 10/18. I was taught by Amanda MacQuaid how to quantitate cyanobacteria colonies and cell counts using a Palmer chamber and my results show the following counts for Microcystis cells: 9/6 two samples 500,000-750,000 cells/mL, 9/7 taken to Amanda's Lab and she confirmed high levels of Microcystis and some of the largest colonies she has ever seen, 9/17 300,000 cells/mL, 9/26 200,000 cells/mL, and 10/1 150,000 cells/mL. The last sample was taken to Amanda and she confirmed large numbers of Microcystis as well as the presence of Aphanocapsa, Gleocapsa, and Lyngbya limnetica. All these samples were surface samples collected off Rt.140 across from the Alton Fire Department. I was told to post an advisory at this site by Amanda on 9/7/18 which I did.

Amanda MacQuaid ran microcystin concentrations on samples collected on 9/7 and 9/17 with the following results: 9/7 Mill Pond Mc=1.1ppb;9/17 Mill Pond Mc=0.142ppb and Merrymeeting River at culvert crossing from Mill Pond Mc=0.28ppb. Drinking water standards for Mc are 0.3ppb. I fear the Mc in Mill Pond may be concentrating in the fish(especially yellow perch) and may present a hazard for humans consuming these fish. A study documenting Mc levels in fish flesh is scheduled for spring 2019.

On 9/26/18 I also sampled Mill Pond and Merrymeeting River and submitted the samples to Bob Craycraft at the Freshwater Biology Lab at UNH for phosphorus concentrations.I collected surface samples from Mill Pond across from the Alton Fire Department on Rt.140 TP=33.0 ug/L; on Mill Pond at the culvert crossing under Letter S Road TP=33.7 ug/L; on Wentworth Pond(Merrymeeting River) at the same place the culvert from Mill Pond empties into the River TP=26.9ug/L. As controls for the Merrymeeting River I also sampled the river above the culvert off Rt.140 Bridge TP=15.8 ug/L; and at the Alton Power Dam a quarter mile below the culvert TP=18.4 ug/L. I was clear that the water from Mill Pond flowed into the river and that the lower concentration of TP in the river diluted the high concentrations of phosphorus before it reached the Alton Power Dam.

I also submitted samples from tributaries into Mill Pond with the following results: Liberty Tree Park Culvert TP=73.2ug/L and specific conductivity =1485 uS/cm; School Street culvert TP=19.1ug/L ,conductivity 35.8 uS/cm. There were also 5-7 culverts on the east bank of Mill pond which direct stormwater drainage from Rt.11 into the pond; these will be sampled this spring.

4- 2

I also met with the firemen attending the Alton Fire Station across the street where they were pumping the Mill Pond water into trucks for training. I advised them not to continue using Mill Pond water and was told it has been green for years....so I doubt this is a new event.

I heard from an Alton resident there was a previous matter concerning a commercial laundromat in the early 1980s which may have contributed large amounts of phosphorus to Mill Pond. Upon investigation in the Alton Map and Lot files, I discovered that residents reported a bad odor from a laundromat in 1979. The Town referred the situation to the NH DES. The DES performed an analysis on what was described as raw sewerage and found hundreds of milligrams of phosphorus in the sewerage which was running from a failed septic system into Mill Pond, NH DES issued a cease and desist order in late 1979 until a new septic system was built and tested.Engineering Plans were presented to the laundromat owners for the construction of a new system. This was done in 1980. The laundromat no longer in in operation.

This Fall when discussing the situation with Alton residents I was informed that an abandoned town dump which contained refuse up to the banks of Mill Pond was capped decades ago and whenever it rains, a stream of liquid can be seen emerging from under the cap into Mill Pond. This is being investigated by our watershed planners this Spring.

Recently I read in: "History of Alton (NH) published in 1965 that in the mid 1800s this area was the heart of Alton's manufacturing zone. Along Letter S Road (called Mill Street then) were Wentworth Mill, a blacksmith shop, a grist mill and saw mill, a box shop and the Glidden slaughter house. All this burned in a fire in 1906. The grist mill, saw mill and Wentworth Mills were all dependent on power from the Alton Power Dam,which still exist next to Mill Pond. Above the pond at the intersection of Rt 140 and Main Street stood the Alton Shoe Factory which turned out thousands of pairs of shoes per year until 1930 when it burned down.

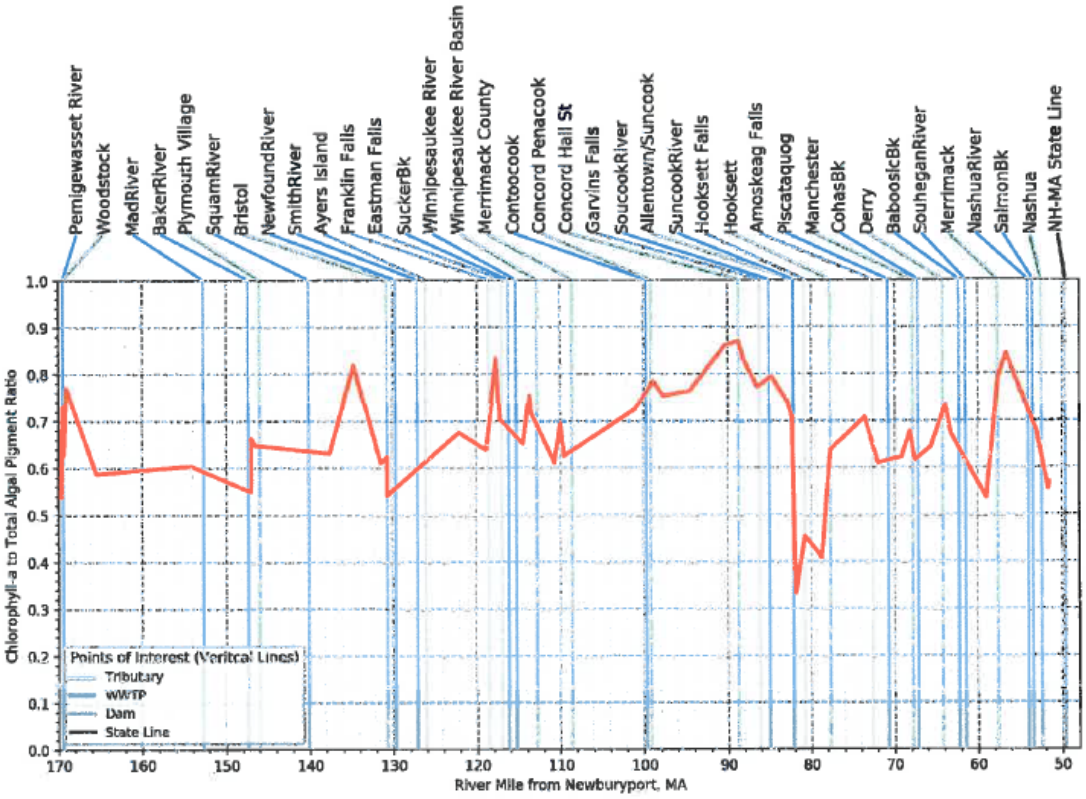
Mill Pond has a long history tied to heavy manufacturing and a more recent history of sewerage failures, dump sites, storm water drainage and contaminated tributaries. It is a popular fishing site with people taking fish home. It appear to have had repeated cyanobacteria blooms in the past and certainly does now. I thing this is unsafe for human recreation and possibly fish consumption and should definitely be listed as impaired on the 2018 303(d) list. Fred Quimby

COMMENT #5: Sarita S. Croce, Town of Merrimack

Town of Merrimack, New Hampshire Public Works Department 6 Baboosic Lake Road Merrimack, New Hampshire 03054 TEL: (603) 424-5137 FAX: (603) 424-1408 March 12, 2019 Mr. Matthew Wood New Hampshire Department of Environmental Services Watershed Management Bureau 29 Hazen Drive, PO Box 95 Concord NH, 03302-0095 Re: 2018, 303(d) Comments Dear Mr. Wood The Town of Merrimack has prepared comments for your review on the 2018 Comprehensive Assessment and Listing Methodology (CALM) and 303(d) list. In addition to the comments, the Town has also attached for your inclusion in the 303(d) list, Merrimack River analytical results for sampling conducted from June 2018 thru October 2018. Attachment 1 contains a summary of the sampling program. Attachment 2 contains the raw data.	**5- 1**
Chlorophyll-a Comment CDM-Smith, in coordination with the USACE and the stakeholder communities (Manchester, Nashua, Lawrence, Lowell, and Haverhill) completed a 15-year Merrimack River Study. This Study documented: "The river exhibits no aquatic health risks due to low oxygen levels, and available data suggest nutrients do not prevent the river from meeting aquatic life or recreational uses. The ability of the Merrimack to support both ecological and human health is remarkable for a post-industrial river in a highly urbanized basin. Indicators of water quality risks, such as levels of phosphorus and chlorophyll-a could suggest, when taken out of context, that the river is at risk of use impairment because these values sometimes exceed guidance levels that are used to assess river health state-wide. However, the monitoring and modeling in this study over the past 15 years have shown that the unique hydrology and hydraulics of this river flush it rapidly, re-oxygenate it frequently, and absorb the byproducts of civilization that might render other smaller rivers in this region impaired."1	**5- 2**
The study was extensive and did note that chlorophyll-a was higher in the furthest reaches of the Merrimack River and at the Massachusetts boundary. The study included an extensive in-vitro sampling event in three phases. The sampling indicated at the state line with Massachusetts, the chlorophyll-a measurement was 16 ug/l and 17 ug/l downstream of the MWWTP. As part of the QA/QC review, it was discovered that pheophytin interfered with	**5- 3**

chlorophyll-a concentrations and gave an artificially high count/results. The CDM-Smith study listed the magnitude of the interference in the Phase III Report.

"The chlorophyll-a to pheophytin ratio suggests that pheophytin accounts for on average 35% of the total pigments in the river during this sample event, with a range between 13% and 77% throughout the Upper Merrimack and Pemigewasset Rivers. A longitudinal profile of the chlorophyll-a to pheophytin ratio throughout the Pemigewasset and Merrimack Rivers is shown below.



As indicated in the chart above, chlorophyll-a to total pigment ratio at the Merrimack sample station is 80%. When this ratio is applied to the 17 ug/l measurement, the concentration of true chlorophyll-a is 13.6 ug/l. This level is in compliance with the NHDES 15 ug/l chlorophyll-a concentration for contact recreation (swimming).

Discussions with NHDES provided a snapshot of why the 15 ug/l concentration was chosen for swimming as related to water clarity. After a meeting at the Southern New Hampshire Regional Planning Commission in Manchester during a CDM Phase III presentation, Rick Cantu approached Greg Comstock and asked how the 15 ug/l was chosen as a criterion. Mr. Comstock indicated that this was to provide enough in-water visibility to determine if there were rocks or other obstructions in the water before a person jumped/dove into the water for recreation purposes.

Town of Merrimack *March 12, 2019*
2018 CALM & 303(d) Comments *Page 3 of 232*

"Water clarity has two main aspects. First, there is visual clarity, i.e., the maximum distance at which aquatic animals and people can see submerged objects. Visual clarity is determined by the attenuation of image-forming light, which is identical to the attenuation of a collimated light beam comprising parallel rays."2

During days when there are overcast clouds, the image-forming sunlight is greatly reduced and the water surface appears almost black when looking below the depth of the surface. Whether the water column had 10 ug/l, 15 ug/l, 20 ug/l or 30 ug/l of chlorophyll-a, it would be difficult to nearly impossible to determine clear water column depth under the surface. The weather at the Merrimack River at any point during any day can change between sunny and overcast in a very short period of time. Time of day, position of sun overhead, and cloud cover all play an important role in affecting the attenuation of image-forming light.

5- 4

Measurements and Findings from the Merrimack River Watershed Studies indicate the Merrimack River is in good health. Per the report, there are NO violations of the prime drivers of dissolved oxygen and pH. Therefore, any impairments associated with either chlorophyll-a or dissolved oxygen measurements should be removed. In addition, based on concerns associated with pheophytin interference any chlorophyll-a analysis conducted which has not been reviewed for potential pheophytin should be either dropped or noted that resampling must be conducted to determine if an impairment of the waterbody exists.

5- 5

Alignment between NH 303(d) list and 15-year Merrimack River Study

There are alignment issues between the NH 303(d) list and the monitoring and modeling results from the 15-year Merrimack River Study. The main stem Merrimack is listed for DO noncompliance, and chlorophyll-a in the Nashua area. The 15-year Study report also concludes, both through field measurements and simulation modeling, that the river is fully compliant with dissolved oxygen concentration and saturation requirements – the one isolated measurement of exceedance between the Manchester WWTP and the Derry WWTP is attributed to measurement error, as it could not be reproduced synthetically even with unreasonably high oxygen demand parameters in experimental simulations.

Cycle	Assessment Unit ID (AUID)	Assessment Unit Name	Town(s) Primary Town is Listed First	Water Size	Size Unit	Designated Use Description	Parameter Name	NHDES Category	Threatened	TMDL Priority
2018	NHRIV700060302-25-02	MERRIMACK RIVER	BOW, CONCORD, PEMBROKE	3.476	MILES	Aquatic Life Integrity	Oxygen, Dissolved	5-P	N	LOW
2018	NHRIV700061206-24	MERRIMACK RIVER	NASHUA, HUDSON	5.151	MILES	Primary Contact Recreation	Chlorophyll-a	5-M	N	LOW

5- 6

General Health of the Merrimack River

The Merrimack is generally a swift flowing river, with many areas of reaeration over rapids or spillways, and with impoundments that flush rapidly and do not impose long residence times on its waters. Its flow dynamics have a profound impact on the assimilative capacity of this river. Despite the fact that total phosphorus is sometimes measured at higher concentrations than a uniformly applied guidance level (not a water quality criteria), and that chlorophyll-a levels can exceed guidance levels on a frequency basis near the state line (again, not a requirement, but a

guidance value), the river does NOT exhibit actual nutrient related limitations in its support of beneficial uses:

- Dissolved oxygen meets state standards for aquatic health.
- Algae blooms are not documented as causing impairments to recreational opportunities (fishing, boating, and swimming).
- The river does not have a history of taste and odor complaints, to the knowledge of this reviewer.
- The river does not have a history of aesthetic (nuisance) issues.

Phrased differently, the guidance values for phosphorus and chlorophyll-a historically applied to the Merrimack River are not necessarily appropriate indicators of this river's health and ability to serve its designated functions. Travel time, residence time, reaeration opportunities and rates, temperature, and hydraulic behavior of any river will affect its ability to assimilate nutrients in ways that render universal standards as inappropriate, and often overly restrictive. Both phosphorus and chlorophyll-a are indicators of potential risks in similar types of water bodies, but over the span of Phase I and Phase II study, the risks have not translated into actual problems in this river. Fifteen years of scientific study conclude that the Upper Merrimack River does not experience unhealthy nutrient enrichment that could cause ecological stress, aesthetic stress, taste and odor issues, or recreational prohibitions. It is a post-industrial river in remarkably good health, supporting all uses that could otherwise be impaired by nutrients. Therefore, any impairment associated with nutrients should be removed from the listing.

Specific Comments

Specific Comments can be found in Attachment 3.

Please do not hesitate to contact me if you have any questions on the attached comments. I can be reached directly at (603) 420-1624 or via email at scroce@merrimacknh.gov.

Sincerely,

Sarita S. Croce
Assistant DPW Director/Wastewater

Cc:
Kyle Fox, Department of Public Works Director
Phillip Appert, Town of Merrimack Industrial Pretreatment Manager
Dawn B. Tuomala, Deputy DPW Director/Town Engineer

Attachment 1 – **Summary of the Merrimack River Sampling Program from June 2018 through October 2018** The full original attachment received by NHDES is available on the department's FTP site; 1. Go to this address using a web browser: ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/Draft_CALM_303d_Comments 2. At the login window, click on the box in the lower left hand corner labeled "Login Anonymously." 3. The user name will then be automatically filled in with the word "Anonymous." 4. Type in your email address in the "Email Address" block. 5. Then click on the "Log On" button.	**5- 7**
Attachment 2 – **Raw Data of the Merrimack River Sampling Program from June 2018 through October 2018** The full original attachment received by NHDES is available on the department's FTP site; 1. Go to this address using a web browser: ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/Draft_CALM_303d_Comments 2. At the login window, click on the box in the lower left hand corner labeled "Login Anonymously." 3. The user name will then be automatically filled in with the word "Anonymous." 4. Type in your email address in the "Email Address" block. 5. Then click on the "Log On" button.	**5- 8**

Attachment 3 –
Specific Comments (2018-draft-status-of-each-assess-unit Rev 1.pdf)

Assessment Unit ID (AUID)	Assessment Unit Name	Town(s) Primary Town is Listed First	Designated Use Description	Parameter Name	Parameter Level - NHDES Category	Last Sample	Last Exceedence	Comment	Town of Merrimack Sampling Program
NHLAK700061001-04-02	BOWERS POND	MERRIMACK, NASHUA	Aquatic Life Integrity	Iron	5-M	2005	2005		
NHLAK700061001-06	HOLT POND	MERRIMACK, NASHUA	Aquatic Life Integrity	Oxygen, Dissolved	5-P	2006	2006	Did the sampling protocol include calibration before and after measurements? After the meter is is pulled out of the water body, the field technician should immediately check the calibration by inserting the probe in a standard solution. Another option would be to collect a sample and check the pH using a newly calibrated meter in the field. Recommend to re-sample with a meter that can take continuous measurements.	The Town currently plans to collect DO and pH data from this water body during the summer of 2019. A rugged DO and pH probe will be used. The Town will submit for NHDES approval the sampling location and sampling protocol. .
NHLAK700061001-06	HOLT POND	MERRIMACK, NASHUA	Aquatic Life Integrity	pH	5-M	2006	2006	Please refer to DO comment above.	Please refer to DO comment above.
NHRIV700060905-19	BABOOSIC BROOK - RIDDLE BROOK	MERRIMACK, BEDFORD	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments (Streams)	5-P	2003	2003		
NHRIV700060905-19	BABOOSIC BROOK - RIDDLE BROOK	MERRIMACK, BEDFORD	Aquatic Life Integrity	Oxygen, Dissolved	5-P	2000	N/A	Please refer to DO comment above.	Please refer to DO comment above.
NHRIV700060906-18	SOUHEGAN RIVER	MERRIMACK, AMHERST	Aquatic Life Integrity	Aluminum	5-M	2017	2014	Aluminum exceedances should be evaluated per the Aluminum Calculator which was developed by USEPA. The EPA has resolved that aluminum toxicity is not just a matter of aluminum concentration. Aluminum toxicity is contingent upon the receiving water pH, dissolved organic carbon and hardness. Placing the total aluminum values into the aluminum calculator along with the dissolved organic carbon, hardness and pH, demonstrates that the aluminum concentration is lower than the calculated chronic and continuous concentrations. Was this impairment compared to criterion developed inthe aluminum calculator.	
NHRIV700060906-18	SOUHEGAN RIVER	MERRIMACK, AMHERST	Aquatic Life Integrity	Oxygen, Dissolved	5-P	2018	2017	Please refer to DO comment above.	Please refer to DO comment above.
NHRIV700060906-18	SOUHEGAN RIVER	MERRIMACK, AMHERST	Aquatic Life Integrity	pH	5-M	2018	2017	Please refer to DO comment above.	Please refer to DO comment above.
NHRIV700060906-20	MUSKRELL BROOK - TO SOUHEGAN RIVER	MERRIMACK, AMHERST	Aquatic Life Integrity	pH	5-M	2003	2003	Please refer to DO comment above.	Please refer to DO comment above.
NHRIV700061001-07	PENNICHUCK BROOK - WITCHES BROOK	MERRIMACK, AMHERST, HOLLIS, NASHUA	Aquatic Life Integrity	Oxygen, Dissolved	5-P	2006	2006	Please refer to DO comment above.	Please refer to DO comment above.
NHRIV700061001-07	PENNICHUCK BROOK - WITCHES BROOK	MERRIMACK, AMHERST, HOLLIS, NASHUA	Aquatic Life Integrity	pH	5-P	2006	2006	Please refer to DO comment above.	Please refer to DO comment above.
NHRIV700061001-10	PENNICHUCK BROOK	MERRIMACK, LITCHFIELD, NASHUA	Aquatic Life Integrity	Benthic-Macroinvertebrate Bioassessments (Streams)	5-P				

5- 9
5- 10
5- 11

COMMENT #6: Melissa Paly, Conservation Law Foundation (CLF)

clf
conservation law foundation

For a thriving New England

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Concord, NH 03301
P: 603.225.3060
F: 603.225.3059
www.clf.org

March 15, 2019

Matt Wood
NH Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Submitted via E-Mail to: 303dcomment@des.state.nh.us

Re: CLF's Comments on NHDES DRAFT 2018 Section 303(d) Surface Water Quality Report List of Threatened or Impaired Waters

Conservation Law Foundation (CLF) appreciates the opportunity to comment on the NH Department of Environmental Services Draft 2018 Section 303(d) and 303(d) Surface Water Quality Report List of Threatened or Impaired Waters, published by DES on January 24, 2019. CLF is a member-supported environmental advocacy group that works to solve environmental problems facing communities and our natural resources in New Hampshire and throughout New England. CLF and its members have a strong interest in protecting waterbodies around the state, with a particular emphasis on restoring and maintaining the health of the Great Bay Estuary and the rivers that feed it. For more than 10 years, CLF has engaged in concerted, ongoing efforts to address and reduce threats to the health of the Great Bay Estuary, which is recognized as an estuary of national significance under Section 320 of the Clean Water Act.

Section 303(d) of the Clean Water Act requires the State of New Hampshire to identify surface waters that are impaired or threatened by a pollutant or pollutant(s) such that they cannot support their designated use. CLF provides the following assessment-unit-specific comments below.

Impairments Added

6- 1

1. Marsh Pond for cyanobacteria hepatotoxic microcystins.

   As DES notes in the description for adding Marsh Pond, a lake warning was issued in 2018 that lasted 70 days and "the cyanobacteria bloom occurred in amounts and for a duration that significantly interfered with the primary contact recreational use of the lake." CLF has several members who have been directly affected by cyanobacteria blooms in Marsh Pond and adjoining segments of the Merrymeeting River, and we strongly support this listing. We also urge DES, in its listing, to identify the Powder Mill Fish Hatchery, which discharges pollutants directly into Marsh Pond, as the source of pollutants causing this impairment.

6- 2

2. Upper Sagamore Creek for Dissolved Oxygen. As DES notes in the description for adding Upper Sagamore Creek, low levels of DO were seen in an extended area, including through the upstream mile of the 2-mile-long estuary. DES also noted the timing of the low DO values, the percent of low DO samples, and that grab samples under-estimate the frequency and magnitude of degraded water quality. CLF supports this listing.	**6- 3**
3. Bellamy River North for aquatic life integrity (light attenuation coefficient) As DES noted, the Bellamy River North does not support aquatic life due to light attenuation, based upon the eelgrass condition and the available light data. CLF is concerned by the apparent decline in water clarity and supports reclassifying the Bellamy river from 3-ND to 5-M for Light Attenuation Coefficient for the aquatic life integrity.	**6- 4**
4. Squamscott River North for aquatic life integrity (light attenuation coefficient). CLF supports the corrected listing for Squamscott River North.	**6- 5**
<u>Impairments Removed</u> On page ten of the proposed Delisting document, DES identifies 181 assessment units that it believes should be delisted for Dissolved Oxygen, five of which are in the Great Bay-Piscataqua Estuary. DES proposes changing the categorization for these waterbodies from 5-M to 3-PAS (Potentially Attaining Standards)) or 3-PNS (Potentially Not Supporting). DES notes that it will continue to utilize existing DO saturation thresholds as an indicator of water quality, and refers to these proposed changes as "administrative" in nature and not reflecting changes in water quality. CLF objects to these changes in impairment designations (which we do not believe can be accurately characterized as "administrative"), as they are not premised on a state water quality standard that has been approved by the U.S. Environmental Protection Agency pursuant to Section 303(c) of the Clean Water Act. We also object to these proposed changes as unlawful to the extent they would adversely affect threatened or endangered species such as, but not limited to, the Atlantic and short-nose sturgeon. Thank you for your consideration of our comments. Respectfully submitted, Meredith A. Hatfield Senior Attorney for Melissa Paly Great Bay – Piscataqua Waterkeeper	**6- 6**

COMMENT #7: Meredith A. Hatfield, Conservation Law Foundation (CLF)

Tue 3/19/2019 4:26 PM

Meredith Hatfield <mhatfield@clf.org>

RE: CLF's Comments on NHDES Draft 2018 Section 303(d) Surface Water Quality Report, List of Threatened or Impaired Waters

To DES: 303d Comment

Cc Melissa Paly

Please note that in addition to the comments submitted on Friday, CLF re-asserts and incorporates by reference our comments on the prior two 303(d) lists regarding our opposition to proposed nitrogen de-listings in the Great Bay – Piscataqua Estuary.

Thank you,
Meredith

Meredith A. Hatfield
Senior Attorney
CLF New Hampshire

27 North Main Street
Concord, NH 03301-4930

P: 603-369-4787
E:mhatfield@clf.org

For a thriving New England

clf

7- 1

COMMENT #8: John B. Storer, City of Dover

JOHN B. STORER, P.E.
Director Community Services
j.storer@dover.nh.gov

288 Central Avenue
Dover, New Hampshire 03820-4169
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www.dover.nh.gov

City of Dover, New Hampshire

COMMUNITY SERVICES DEPARTMENT

March 15, 2019

City of Dover comments to the 2018 draft 303(d) List

The City of Dover incorporates the "Great Bay Municipal Coalition comments submitted on the Draft 2018 NH 303(d) Listings, Technical Support Document for the Great Bay Estuary Aquatic Life Integrity Assessments, CALM, and 2016 CALM Response to Comments" into its comments by reference. In addition it offers the additional comments:

8- 1

Cocheco River TN Impairment The tidal Cocheco River impairment for TN is based on speculation that spikes in chlorophyll a and low DO measured with data sondes which occur in late summer around low tide are signs of nutrient related eutrophication. The fact that the high chlorophyll a spikes can occur whether it is day or night suggest the readings are not from algal growth in the river which requires sunlight. It is more plausible that the high chlorophyll a reading are a result of plant growth which slough off marshes during low tide. Groundwater discharging from wetlands are typically anaerobic. During periods of low river flow, groundwater discharging could induce low DO sonde readings around low tide. These anomalous DO and Chorophyll readings are usually short in duration, 15 minutes to more than an hour, and recover to acceptable levels instantaneously as the tide rolls in. Before NHDES concludes that the Cocheco River is impaired for nitrogen it is imperative that a clear understanding of the observed data needs to occur. A speculative conclusion is not a reasonable standard to declare that a waterbody is impaired. For more detailed comments review the Great Bay Municipal Coalition comments and the City of Rochester comments.	**8- 2**
The Cocheco River is also listed as impaired for PAH's based on sample data from 2005. No subsequent sampling has been reported. The City of Dover suggests that the sampling being used was collected the year following dredging in the river that included an environmental dredge to remove coal tar impacted sediments from the river adjacent to the former coal gasification plant. It is highly likely that as the dredging was removing the contaminated sediments PAH's were released into the river during the spring of 2005 resulting in high PAH sample results in 2005. NHDES should resample the Cocheco River for PAH's to determine if levels in the water column remain elevated.	**8- 3**
Bellamy River Impairment for Light Attenuation The Bellamy River is proposed to be listed as impaired for Light Attenuation. The data supporting the impairment does not meet the standards set forth in the CALM to be sufficient to make a determination. There is an insufficient number of samples from all seasons to meet the CALM requirements. The river should not be listed as impaired. Sincerely, Stacey A. Hager on behalf of John B. Storer Director of Community Services	**8- 4**

COMMENT #9: Ken Moraff, United States Environmental Protection Agency (EPA)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY **Region I – New England** **5 Post Office Square, Suite 100** **Boston, MA 02109-3912** March 13, 2019 Matthew Wood New Hampshire Department of Environmental Services Water Division 29 Hazen Drive, Box 95 Concord, NH 03302-0095 Re: Comments on New Hampshire's 2018 Draft 303(d) List and Draft 2018 CALM document Dear Mr. Wood: Thank you for the opportunity to review the State's draft 2018 Clean Water Act section 303(d) list and draft 2018 Consolidated Assessment and Listing Methodology (CALM) document. We address several issues below.	**9- 1**
303(d) List - Great Bay Listings By this letter, we intend to alert you to questions and concerns we have about whether the administrative record would support the State's decision not to list certain water body segment/impairment combinations in the Great Bay Estuary. These concerns are the same concerns EPA had when we commented on the State's proposed decisions to delist or not list certain water body segment/impairment combinations in the Great Bay Estuary on the State's 2014 and 2016 303(d) lists. We are evaluating the scientific rationale included by New Hampshire Department of Environmental Services (NHDES) for these decisions and look forward to receiving any additional information submitted along with the State's final list (including public comments and NHDES's responses) to support the final listing decisions for the Great Bay assessment zones. Any such additional information, together with that provided thus far by NHDES, will enable EPA to carry out its obligation to review and to approve or disapprove the State's final listing decisions. See 40 C.F.R. §130.7.	**9- 2**

303(d) List - Dissolved Oxygen Saturation Water Quality Standard State listing decisions under Section 303(d) of the Clean Water Act are required to be based on EPA-approved state water quality standards. NHDES has proposed to delist 181 waterbodies for dissolved oxygen saturation due to a recent amendment to state law that eliminated the dissolved oxygen saturation criterion from the statutory water quality standards. While NHDES has submitted the state law amendment to EPA for review and approval or disapproval as a change to state water quality standards, pursuant to Section 303(c) of the Clean Water Act, EPA has not yet taken action on this revised standard. Therefore, EPA will not be able to approve the proposed delistings mentioned above. We also note that the State's revised water quality standard submittal did not contain a scientific analysis supporting the change. EPA has concerns about whether an adequate scientific basis exists to support the removal of dissolved oxygen saturation from the state water quality standards. Specifically, EPA is concerned that the removal of the dissolved oxygen saturation standard, without the addition of more stringent dissolved oxygen concentration criteria, would not adequately protect the State's aquatic life designated use. EPA looks forward to discussing these concerns further with NHDES.	**9- 3**
CALM Document- Weight of Evidence Approach for Aquatic Life Use Support Decisions, Section 3.1.23 The CALM document describes how NHDES uses a Weight of Evidence Approach for making listing and delisting decisions when data for multiple indicators exist and there may be conflicting results for some, or all, of these indicators. Table 3-14: Factors Considered in the Weight of Evidence Approach, outlines how different factors are assessed for this approach. The table describes the acceptability of samples and sampling techniques (Data Quality, Sample Time, Sample Location, Quantity of Samples) and in general terms how Sample Type is used to make a decision. NHDES should provide additional detail on how these factors are used and how these factors are scored. It would be very helpful to provide the details on how the weight of evidence approach is used to make decisions regarding cultural eutrophication listings and delistings in lakes/pond, rivers/streams and estuaries/coastal water body types. Please provide detail on how scores are assigned and how determinations are made when data exist for multiple parameters and the results for these parameters conflict with each other.	**9- 4**
CALM Document- Section 3.2.4.1 Indicator Part 9d: Chlorophyll-a Concentration (Chl-a) Indicator as a Component of Water Clarity This indicator describes the relationship between chlorophyll-a concentration and attenuation of light in the water column as related to eutrophication in estuaries. The measure for this indicator is whether chlorophyll-a is "elevated" or "not elevated." It is unclear as to what level of chlorophyll-a is considered to be "elevated." Please provide more detail on how this indicator is measured.	**9- 5**
CALM Document- Section 3.2.4.2 Screening Assessment Indicators, Indicator 22: Dissolved Oxygen Saturation EPA does not agree that this indicator should be used only as a screening level indicator at this time due to the fact that the change to dissolved oxygen saturation in New Hampshire's water quality standards, resulting from an amendment to RSA 485, has not been approved by EPA.	**9- 6**

Dissolved oxygen saturation is still a component of New Hampshire's EPA-approved water quality standards for all Clean Water Act purposes, including 303(d) listing and delisting. If you have any questions, please contact me at 617-918-1502, or have someone from your staff contact Toby Stover at 617-918-1604. Sincerely, /s/ Ken Moraff Director, Office of Ecosystem Protection	

COMMENT #10: Dean Peschel, Great Bay Municipal Coalition (GBMC)

GREAT BAY MUNICIPAL COALITION
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VIA EMAIL to 303dcomment@des.state.nh.us

March 15, 2018

Mr. Matt Wood
New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

10- 1

RE: 2018, 303(d) Comments

Dear Mr. Wood:

In accordance with the Guidance for Submitting Comments on the draft 2018, 303(d) List of Impaired Surface Waters for New Hampshire (https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/index.htm), the Great Bay Municipal Coalition (GBMC) respectfully submits the attached comments on the draft 2018 303(d) List for assessment units within the Great Bay Estuary.

We look forward to meeting with you to review these concerns with your technical experts. Alternatively, we request that the data and analyses be reviewed by an independent expert panel to evaluate our concerns.

Sincerely

GBMC

Great Bay Municipal Coalition Comments on the Draft 2018 NH 303(d) Listings, Technical Support Document for the Great Bay Estuary Aquatic Life Integrity Assessments, CALM, and 2016 CALM Response to Comments The draft 2018 NH 303(d) List, CALM, and Technical Support Document for the Great Bay Estuary base recommended impairment listings on assessment methodologies that are nearly identical to the methodologies used in the 2016 303(d) List. The GBMC submitted extensive comments on the NH 2016 CALM and 303(d) List (Attachment 1 – June 23, 2017 comment letter and Attachment 2 – June 2018 Supplemental Comments on NH 2016 CALM and 303(d) List letter). These concerns are still valid for this draft. The GBMC refers DES to these previously-submitted comments, which are incorporated herein by reference, on the following issues, insufficiently addressed by DES in the 2016 Response to Comments or the 2018 CALM, TSD, or 303(d) list:	**10- 2**
• Water Clarity Target Not Necessary DES continues to defend the 0.75 m^{-1} K_d target and states that "Further, evidence that eelgrass is failing in the deeper waters, a clear sign of poor light conditions, was presented in the NHDES response to comments on the draft 2014 303(d) (NHDES, 2017)." (2016 RTC at 30). The GBMC refers DES to the Coalition's June 23, 2017 comment letter (Attachment 1, e.g., at 16, 20, 26-28) and June 2018 Supplemental Comments on NH 2016 CALM and 303(d) List Letter (Attachment 2). The data presented in the TSD show that Great Bay supports extensive eelgrass beds and reports the least loss of eelgrass beds with a $K_d = 1.46$ m^{-1}, which shows that the threshold of 0.75 m^{-1} is not necessary. Moreover, most losses of eelgrass in Great Bay occurred in shallower waters as discussed above and in prior GBMC comments (Attachments 1 and 2). Since the eelgrass losses have not occurred primarily in the deeper waters, the need for this impairment threshold is not demonstrated. Additional data presented in the TSD show large eelgrass losses occurred in the Lower Piscataqua River (South) even though the water clarity exceeded the threshold target ($K_d = 0.565$ m^{-1}). Taken together, these observations show that the selected impairment threshold for water clarity ($K_d = 0.75$ m^{-1}) is not warranted.	**10- 3**
• Historic Eelgrass Cover Concerns Eelgrass cover is assessed for attainment of aquatic life uses in the Great Bay Estuary based on a comparison of current eelgrass cover to historic levels (CALM at 64). The aerial photographs on which Great Bay Estuary historic eelgrass cover data are based are not publicly available for review, and these data were collected without an approved QA/QC plan or reliable ground truthing prior to 2002, including the 1981 NHF&G survey which is used for historical comparisons. Even if no aerial photography was used for the 1948 and 1962 eelgrass measurements, these were similarly collected without an approved QA/QC plan as required by the CALM and therefore should not be used in historical vs. current comparisons.	**10- 4**

• Eelgrass Monitoring Insufficient for Intended Use In addition to comparison against historic eelgrass cover, DES also considers recent trends in eelgrass to assess attainment of aquatic life uses. These trends are evaluated using eelgrass cover determined from aerial photography, as explained in the QAPP for these surveys. The objective of the aerial surveys has been to document the maximum extent of eelgrass cover, and these measurements serve as the basis for the trend evaluations. However, as shown in the SeagrassNet surveys conducted by Dr. Short, the occurrence of maximum eelgrass cover is variable from year to year and the aerial photograph data are expected to show a high amount of variability. As DES agrees, a single fly-over cannot be used to determine the "maximum" cover for a given year ("Timing system-wide aerial eelgrass surveys to ideal clear and calm weather conditions is difficult enough. Making that timing align with peak biomass is not within human control." (2016 RTC at 45)). Consequently, the utility of these data to evaluate use attainment or make inter-annual trend comparisons is suspect and should not be used in CALM or 303(d) procedures.	**10- 5**
• Claim Concerning Chlorophyll Sonde Data Not Supported The TSD continues to present sonde chlorophyll data, noting that "Although the multiple probe based chlorophyll-a data (not used in the median above) collected in the assessment zone was qualified as "estimated," due to poor correlation between probe and extracted chlorophyll-a grab sample data, the relative biomass is valid and shows large spikes in chlorophyll-a." Given the acknowledged poor correlation, DES cannot claim that the relative biomass is valid or accurate. The GBMC refers DES to its previous comments and continues to disagree 1) that these "de-validated" data have any utility or reliability, and 2) that these "de-validated" data should be presented at all. As previously requested, the GBMC requests that DES "Please provide the scientific rationale and evaluation that supports this statement, as a cursory review of the data logger results suggests that these data are completely unreliable."	**10- 6**

• Impairment Indicator Thresholds Not Justified The relationships between impairment indicator threshold targets and attainment of response criteria are unrelated. Therefore, as discussed in our prior comments, these indicator threshold targets are not necessary and must be revised (Attachment 1). The updated data in the 2018 draft 303(d) documents continue to support the GBMC's prior comments. Table 1 indicates a range of chlorophyll-a, dissolved oxygen, eelgrass, and water clarity conditions occur in Great Bay Estuary assessment zones regardless of TN concentration, as the GBMC has noted prior. As noted throughout the TSD, the chlorophyll-a indicator threshold is intended to prevent low dissolved oxygen. A cursory inspection of the information presented in Table 1, which DES relied upon to make its impairment determinations, shows that the 10 µg/L chlorophyll-a threshold is unrelated to whether the dissolved oxygen standard is attained or exceeded. As illustrated in Table 1, Great Bay and Little Bay exceed the chlorophyll-a indicator threshold but meet the dissolved oxygen water quality standard. The Upper Piscataqua River shows chlorophyll-a levels well below the indicator threshold but does not meet the dissolved oxygen water quality standard. The Cocheco River exceeds the chlorophyll-a indicator threshold but shows dissolved oxygen water quality nearly identical to that seen in the Upper Piscataqua River. Consequently, this threshold should be eliminated from consideration in the CALM.	**10- 7**
Moreover, the conceptual model upon which estuarine eutrophication is based does not support use of the 90th percentile chlorophyll-a concentration as a reasonable threshold for evaluating attainment of the dissolved oxygen standard. Dissolved oxygen is linked to chlorophyll-a concentration based on death/oxidation of algal biomass expressed as sediment oxygen demand (SOD). SOD builds up in response to long term average chlorophyll-a concentration and has nothing to do with the 90th percentile concentration absent an increase in the overall average chlorophyll-a concentration. This is the approach used in the Chesapeake Bay TMDL development to establish a chlorophyll-a target as illustrated in the figure below from Harding et al. (2013).[1]	**10- 8**
The summary data in Table 1 also show that eelgrass loss is unrelated to light extinction and TN is this system. The least reported eelgrass loss in the assessment zone for Great Bay coincides with the highest light extinction coefficient. In the Lower Piscataqua River South assessment zone, excessive loss in the eelgrass cover coincides with water clarity that meets the light extinction target and has the lowest TN concentration. Obviously, eelgrass loss is due to some other factor that has not been considered.	**10- 9**

• Squamscott River Data Concern The Squamscott River data are still grouped with Great Bay data in some graphs. As commented previously, the GBMC's position remains: > Graphs including the Squamscott River station should be removed as it is representative of the conditions in the Squamscott River more so than Great Bay. This is evident when comparing the Great Bay TN graphs including and excluding Stations GRBAP and GRBSQ (TSD at 39) with the Squamscott River TN graph (TSD at 18) (note the changes in scales). The data demonstrate that the Squamscott River conveys high TN levels to Great Bay causing elevated TN concentrations for which more northern Great Bay communities cannot be held responsible. > (Attachment 1 at 24)	**10- 10**
• Comments Regarding Eelgrass Voids in Great Bay Not Addressed In the GBMC comments submitted on the Draft 2016 CALM, the Coalition noted that six areas of Great Bay completely lost eelgrass in 2006 and these areas have not since recovered. NHDES responded that "the general pattern is that the areas missing since 2006 have been on a downward spiral of cycles of growth and death since the stable period in the early 1990s that led up to the decreases in 2006 []" (2016 CALM RTC at 34) and "[t]he fact that eelgrass has been gone since 2006 is a continuation of the downward trend." (2016 CALM RTC at 35). DES seems to speculate that these areas would have lost all eelgrass in 2006 regardless of the 2006 Mother's Day storm and ignores the Coalition's observation that *since 2006*, these areas have not recovered. NHDES instead argues that *before 2006*, eelgrass cover fluctuated in these areas (see, e.g., 2016 CALM RTC at 35).This is irrelevant to the Coalition's point. It remains unclear why DES appears reluctant to investigate the possibility that, while nutrient concentrations are near all-time lows in the estuary, non-nutrient factors may be precluding eelgrass recovery in these areas. We further note that these voids are surrounded by areas with eelgrass cover which should be able to provide a nearby source of seeds to re-establish eelgrass beds. In 1990, reseeding was apparently able to re-populate approximately 1,600 acres of eelgrass in Great Bay (from only 315 acres of eelgrass beds measured in 1989) following an outbreak of wasting disease. In contrast, the referenced voids have not reported measurable eelgrass cover over 12 consecutive growing seasons, even though these void areas experience the same water quality as the adjacent 1,600 acres of eelgrass beds. This pattern suggests that factors other than water quality are preventing eelgrass recovery in these areas.	**10- 11**

• Peer Review Conclusion on TN-Eelgrass Relationship Mischaracterized During the public comment period, CLF submitted the following (2016 RTC at 179): Certain interests have characterized the resulting Peer Review as establishing that nitrogen is not causally related to the loss of eelgrass in the estuary, a major sign of eutrophication. That is simply not the case. Quite to the contrary, the Peer Review established only that there are multiple factors at work in the estuary that may be contributing to eutrophication and that in light of those multiple factors the Department's methodology had not definitively established that excess nitrogen is the *primary* factor causing the decline of eelgrass and the inability for eelgrass to repopulate specific areas. NHDES replied (2016 RTC at 71): NHDES appreciates the recognition by the commenter that the text of the peer review (Bierman, Diaz, Kenworthy, & Reckhow, 2014) has at times been misconstrued by certain parties. The peer reviewers agreed that nitrogen plays an important role in estuarine eutrophication and that the 2009 nitrogen document (NHDES, 2009) did not conclusively demonstrate that nitrogen was the primary factor. However, the 2014 delistings, many of which have been maintained through the 2016 draft assessment, are not based on the "primary factor" question but rather on a fresh view of the pre-existing data and the more recent data in the absence of numeric total nitrogen thresholds.	**10- 12**

While DES appears to agree that some peer review statements and conclusions have been "misconstrued," to the degree this refers to the GBMC, the Coalition directs DES to Dr. Bierman's March 16, 2017 clarification email (Attachment 3):

> I am writing to clarify my statement on the role of nitrogen in the presence/ absence of eelgrass in Great Bay Estuary in our Joint Report of the Peer Review Panel (Bierman et al. 2014). On Page 18, I stated that nitrogen is an important factor, and went on to state that it is one of the primary factors, not the sole primary factor. I formed these statements in response to the two specific elements of Charge Question 1b.
>
> By these responses, I was simply observing that nitrogen is an important factor that must be considered, not that the available data and studies confirmed a scientifically defensible relationship between nitrogen and adverse impacts on eelgrass.
>
> Specifically, I concur with the following statements by my colleague, Dr. Kenworthy:
>
> "There is no basis for a scientifically defensible linkage between nitrogen impairment and eelgrass impairment presented in the report." This statement is on Page 19 of our Joint Report and the linkage to which he refers is implied in the DES reports of 2008 and 2009.
>
> "As suggested above, the preliminary analysis using the more current eelgrass cover data affirms scientifically defensible DES concerns for eelgrass declines in the Great Bay Estuary; however, by no means does this infer a direct relationship with nitrogen impairment as suggested by the original assessment …" This statement is on Page 20 and the original assessment to which he refers is the DES report of 2008.

Thus, the Peer Review did not find evidence that nitrogen is a factor, primary or otherwise, in the eelgrass impairment in this specific estuary. Such misleading statements should be struck and revised by DES.

<u>Draft 2018 Section 303(d) Surface Water Quality List and Draft 2018 Technical Support Document for the Great Bay Estuary Aquatic Life Integrity Use Support Assessments, 2018 305(b) Report/303(d) List</u> • Mischaracterization of Eutrophication Status of Estuary Although DES continues to support the delisting of the system as nutrient impaired (other than the Cocheco River), they continue to make the opposite statement in the bodies of their reports. For example, the 2018 303(d) GBE TSD (at 4-5) includes the statement (emphasis supplied): > The 2013 State of the Estuaries Report (SOOE) for the estuary (PREP, 2013) showed that the Great Bay *estuary has all the classic signs of eutrophication*: increasing nitrogen concentrations, low dissolved oxygen and disappearing eelgrass habitat. The 2018 report (PREP, 2018) that followed found that the estuaries are declining due to stress from human activities as well as natural processes influenced by human activities. *These symptoms of eutrophication have the potential to impair the Aquatic Life Integrity designated use*, which would be a violation of the state water quality standards for nutrients (Env-Wq 1703.14) and biological and aquatic community integrity (Env-Wq 1703.19). Statements for Great Bay, Little Bay, Cocheco River, Upper Piscataqua River, Bellamy River, and Portsmouth Harbor are similar. For example, under the Great Bay section, DES states (emphasis supplied): > *Some of the classic indicators of nutrient eutrophication are present in this assessment zone and total nitrogen remains elevated* in portions of the assessment zone. As the discussion above illustrates, *there is a clear nutrient "signature" in the data*. It is less clear, at this time, whether the response datasets demonstrate sufficient power to determine that *the eutrophication effects* on designated uses can be attributed *to total nitrogen alone*. These "eutrophication," "nutrient signature," and "total nitrogen alone" statements give the impression that TN is a demonstrated cause – though not the only cause – for aquatic life and eelgrass impairments. These characterizations need to be revised to reflect the actual determinations delisting the assessment zones as nutrient impaired.	**10- 13**

• Cocheco River Impairment Listing Inappropriate The Cocheco River remains listed as impaired for chlorophyll-a, dissolved oxygen, and total nitrogen. The apparent basis for this declaration is that the concentrations of total nitrogen are high enough, especially at low tide and lower river flow conditions, to result in these algal blooms (see the detailed Cocheco River 2015 Datalogger Evaluation section in the 2016 TSD (NHDES, May 8, 2017)): The 2016 TSD (NHDES, May 8, 2017) provided graphics and accompanying narrative below demonstrate that the growth of algae is causing dissolved oxygen to fall below state standards. The concentrations of total nitrogen are high enough, especially at low tide and lower river flow conditions, to result in these algal blooms (NHDES, May 8, 2017). It is not clear at this time whether the measured high chlorophyll and low DO is solely the result of current loads of nitrogen or if the historically higher loads are still flushing through the ecosystem. Some of the classic indicators of nutrient eutrophication are present in this assessment zone and total nitrogen remains elevated. The newer datasets provide a more robust set of indicators of eutrophication than were available for the 2014 assessment and those response datasets demonstrate sufficient power to determine that the eutrophication effects on designated uses can be attributed to total nitrogen. While there has been a rapid decrease in nutrient loading and improved conditions expected in the coming years, the response datasets warrant impairment under New Hampshire's narrative standard. As such, this assessment zone has been assessed as marginally non-supporting (5-M) for total nitrogen.	**10- 14**

(Emphasis added)

The data presented in the subsequent figures for chlorophyll-a (TSD at 72), dissolved oxygen (TSD at 74), and TN (TSD at 75) do not support this assessment. These data are summarized in Table 2 based on interpolation of the data presented in each of the figures. In the last four years of the assessment period, the highest annual median TN concentration (reported in 2014) was associated with the lowest chlorophyll-a concentration, which complies with the target threshold deemed necessary to meet the requirements for dissolved oxygen. However, the dissolved oxygen condition did not achieve the standard. In contrast to this, the year with the lowest TN concentration (2015) experienced the highest chlorophyll-a concentration and the lowest dissolved oxygen. The subsequent years (2016, 2017) showed much higher TN concentrations with chlorophyll-a concentrations exceeding the 90th percentile targets, but with improving dissolved oxygen.

Table 2: Summary of 2018 TSD Assessments for the Cocheco River

Parameter	2014	2015	2016	2017
Chlorophyll-a (µg/L) (Annual 90th Percentile)	9	22	17	16*
Dissolved Oxygen (mg/L) (Minimum 24-hour)	2.8	2.0	3.7	4.6
Total Nitrogen (µg N/L) (Annual Median)	520	340	480	500

* 90th percentile not reported because n<9; estimated value set equal to maximum reported concentration

These data do not demonstrate that algal growth is causing dissolved oxygen to fall below the state standard or that eutrophication effects are occurring or can be attributed to TN. Given this uncertainty and the trend in point source TN loading, an assessment of 3-PNS should be specified for these parameters.

- Bellamy River Impairment Listing Inappropriate

The Bellamy River was inappropriately listed as impaired for light attenuation based on three current (since 2012) data (Figure 1):

> Median=1.360 m^-1 (n=3). For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. All of the light attenuation coefficient measurements far exceeded the restoration depth based threshold as have 9 of the 11 sampled [sic] ever collected in this assessment zone. Given the eelgrass condition and the available light data, this assessment zone has been assessed as not supporting aquatic life due to light attenuation.

However, the CALM states for water clarity data requirements (emphasis supplied):

> Data Requirements:
>
> a) *Assessments shall be based on Kd data that is five years or less in age* and the median Kd value shall be used to make the threshold comparison.
>
> b) The *median Kd value shall be calculated from representative data that cover all four seasons of the year*.
>
> c) *The minimum sample size of independent results to be considered complete for Kd shall be 15 for a given waterbody*.

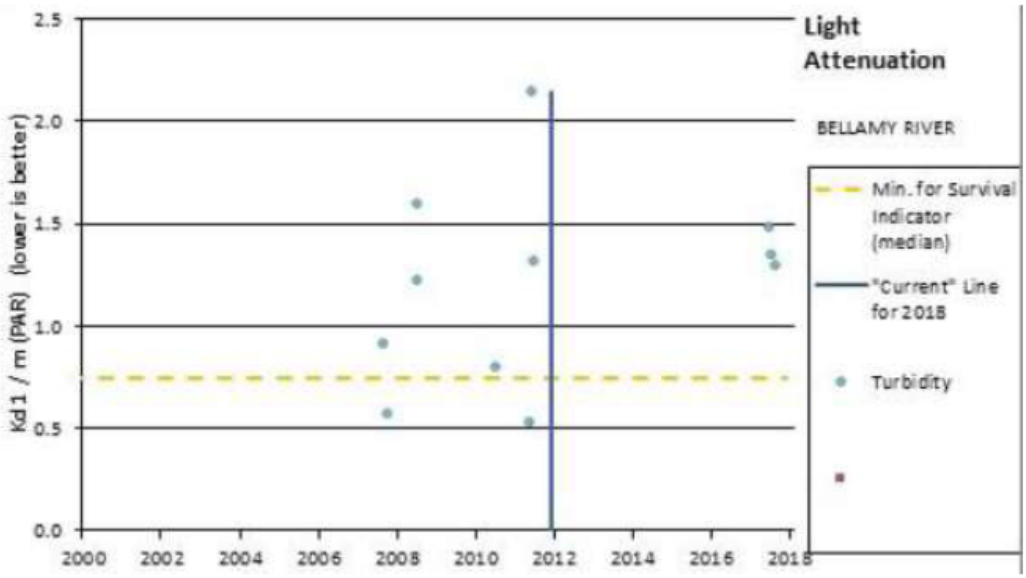

Figure 1: Bellamy River – Light Attenuation Data (2018 GBE TSD at 69)

The K_d data used to assess the Bellamy River as impaired for water clarity neither meet the data requirement for minimum sample size of current K_d data nor the requirement for representative data covering all four seasons. As such, the Bellamy River 303(d) listing should be revised to 3-PNS until sufficient data have been collected and evaluated.

10- 15

Draft 2018 Section 305(b) and 303(d) Consolidated Assessment and Listing Methodology • DO Saturation Indicator The section for Indicator Part 9g: Dissolved Oxygen Percent Saturation includes the text: "Suggests II-PAS: Documented little to no epiphytic growth. Suggests II-PNS: Documented moderate to heavy epiphytic growth." This appears to be erroneously copied and pasted from the previous epiphyte section and should be revised.	**10- 16**
• Use: Aquatic Life vs. Use: Aquatic Life Integrity The Aquatic Life Use was revised to "Use: Aquatic Life Integrity." The 2016 definition of Aquatic Life Use was "Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms." The 2018 definition of Aquatic Life Integrity reads: "Waters that can support aquatic life, including a balanced, integrated and adaptive community of organisms having a species composition, diversity and functional organization comparable to that of similar natural habitats of the region." This revision significantly alters the "Aquatic Life" use definition to require that the water body's water quality be sufficient to support a species composition comparable to that of "similar natural habitats of the region," potentially even if those species are precluded from living in the assessed water body for non-water quality reasons. A presumption is made, without any specific assessment, that differences in aquatic life, as compared with similar natural habitats of the region, are caused by some aspect of water quality. This is not a scientifically defensible approach. At a minimum, DES needs to explain how it will determine that differences in aquatic life support between one assessment zone and a similar natural habitat are sufficient to designate an area as impaired and to conclude that the impairment is caused by a pollutant. In addition, "species composition, diversity and functional organization," "similar natural habitats," and "the region" remain undefined. The GBMC requests that DES strike these revisions or alternatively, provide definitions for these terms and describe the intent of these revisions, subject to additional public comment submissions.	**10- 17**
Attachment 1 – **June 23, 2017 GBMC Comment Letter** The full original attachment received by NHDES is available on the department's FTP site; 1. Go to this address using a web browser: ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/Draft_CALM_303d_Comments 2. At the login window, click on the box in the lower left hand corner labeled "Login Anonymously." 3. The user name will then be automatically filled in with the word "Anonymous." 4. Type in your email address in the "Email Address" block. 5. Then click on the "Log On" button.	**10- 18**
Attachment 2 – **June 2018 GBMC Supplemental Comments on NH 2016 CALM and 303(d) List** The full original attachment received by NHDES is available on the department's FTP site;	**10- 19**

1. Go to this address using a web browser: ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/Draft_CALM_303d_Comments 2. At the login window, click on the box in the lower left hand corner labeled "Login Anonymously." 3. The user name will then be automatically filled in with the word "Anonymous." 4. Type in your email address in the "Email Address" block. 5. Then click on the "Log On" button.	
Attachment 3 – **Dr. Bierman March 16, 2017 Clarification Email** The full original attachment received by NHDES is available on the department's FTP site; 1. Go to this address using a web browser: ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2018/Draft_CALM_303d_Comments 2. At the login window, click on the box in the lower left hand corner labeled "Login Anonymously." 3. The user name will then be automatically filled in with the word "Anonymous." 4. Type in your email address in the "Email Address" block. 5. Then click on the "Log On" button.	**10- 20**

COMMENT #11: Terry Desmarais, City of Portsmouth

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March 15, 2019

Mr. Matt Wood
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Watershed Management Bureau
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Concord, New Hampshire 03302-0095

11- 1

RE: 2018, 303(d) Comments

Dear Mr. Wood:

In accordance with the Guidance for Submitting Comments on the draft 2018, 303(d) List of Impaired Surface Waters for New Hampshire (https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/index.htm), the City of Portsmouth incorporates by reference the comments submitted by the Great Bay Municipal Coalition (GBMC) on March 15, 2019, concerning the draft 2018 303(d) List for assessment units within the Great Bay Estuary.

For informational purposes, the City will be submitting at a later date sampling results for Sagamore Creek.

Sincerely,

Terry Desmarais
City Engineer

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March 15, 2019

2018, CALM Comments
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Concord, New Hampshire 03302-0095

11- 2

RE: 2018, 305(b) / 303(d) Comprehensive Assessment and Listing Methodology Comments

To Whom It May Concern:

In accordance with the Guidance for Submitting Comments on the draft 2018, 305(b) / 303(d) Comprehensive Assessment and Listing Methodology (CALM) (https://www.des.nh.gov/organization/divisions/water/wmb/swqa/2018/index.htm), the City of Portsmouth incorporates by reference the comments submitted by the Great Bay Municipal Coalition (GBMC) on March 15, 2019, concerning the draft 2018 CALM.

Sincerely,

Terry Desmarais
City Engineer

COMMENT #12: Peter C. Nourse, City of Rochester

City of Rochester, New Hampshire
PUBLIC WORKS DEPARTMENT
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March 15, 2019

VIA EMAIL (303dcomment@des.state.nh.us
and wqdata@des.state.nh.us) ONLY

2016, 303(d) Comments
New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095
Attn: Ken Edwardson

RE: Comments on draft 2018 CALM and 303(d) List

Dear Mr. Edwardson:

12- 1

Thank you for providing us with the opportunity to comment on the draft 2018 Consolidated Assessment and Listing Methodology ("CALM") and 303(d) List. The City of Rochester (the "City") has significant concerns about the Department of Environmental Services' ("DES") lack of scientific evidence to place the Cocheco River (Assessment Unit NHEST600030608-01) into Category 5 for chlorophyll-a, dissolved oxygen ("DO") and total nitrogen ("TN"). The City also has concerns about the legal authority to implement the CALM as a guideline rather than through rulemaking. Even if the CALM is legally authorized as a guideline instead of through rulemaking, DES has no legal authority to determine that a waterway is impaired, in whole or in part, based upon chlorophyll-a which has no regulatory limits under the Env-Wq 1700 rules. At a minimum, the CALM as it relates to chlorophyll-a is an invalid promulgation of a water quality standard.

The 2018 303(d) List is unchanged from the 2016 List as it relates to the Cocheco River. As such, the City's comments and the comments of Brown & Caldwell are relevant to the 2018 List. With the letter, the City has attached and incorporates in full the following:

- Brown & Caldwell's March 15 2019 "Comments on New Hampshire Draft 2018 CALM and 303(d) Listings:;
- Brown & Caldwell's June 22, 2017 "Comments on NHDES Draft 2016 CALM and Tidal Cocheco River 303(d) Listing"; and
- The City's June 23, 2017 letter comments on DES's 2016 CALM and 303(d) List.

Because these comments from the 2016 CALM and 303(d) List are equally relevant to the draft 2018 CALM and 303(d) List, the City respectfully requests that DES consider them and along with the comments to the draft 2018 CALM and List.

The 2018 CALM Fails to Incorporate the 2014 Peer Review Findings In 2018, the City commented on DES's draft 2016 CALM. In that comment, the City raised its concern regarding "the lack of *any* reference to the 2014 Joint Report of Peer Review Panel or application of the recommendations contained in the peer review panel's report" as one of the most glaring deficiencies of the draft 2016 CALM. In its response to comments on the 2016 CALM, DES stated simply that "[c]hanges were made to the 2014 CALM in response to the comments by the peer review, those changes carried into the 2016 Draft CALM." DES's November 30, 2018 response to comments at p. 53. DES's comment simply missed the point of the City's comment. Thus, in these comments to the 2018 draft CALM, the City will be more specific. The draft CALM describes the relationship between DO and TN in part as follows: > Low dissolved oxygen is a well-established indicator of elevated nutrients in estuaries.... Fish and other species require sufficient concentrations of dissolved oxygen in the water to survive. In nitrogen-limited systems, such as estuaries ..., increasing nitrogen inputs will increase primary productivity in the form of both pelagic phytoplankton and rooted or free-floating macroalgae. Respiration of the organic matter created by the primary productivity consumes oxygen from the water column and sediments. The resulting low oxygen conditions affect fish and benthic communities.... Effects on species include death, compressed habitats, and shifts in species composition to opportunistic benthic species with short life spans and smaller body sizes.... 2018 draft CALM at 66 (citations omitted).[1] In the 2014 Joint Report, the scientists concluded that "[t]o assess if nitrogen reductions will improve DO conditions, data on the origin, quantity, and quality of organic matter in the various assessment regions of Great Bay are needed. […] In particular, relating DO to nitrogen concentration as in figures 28 and 29 of the DES 2009 Report without accounting for the co-varying influence of these factors is too simple." 2014 Joint Report at 33. The peer review scientists were asked "[d]o you have any recommendations for the long-term (10-year) monitoring and evaluation of the estuary to assess changes in conditions over time?" Dr. Bierman responded: "Long-term monitoring and evaluation of the estuary should be conducted within the larger context of an overall decision support system. An adaptive management framework should be used for this decision support system, and should be a framework for integrating continued monitoring, data analysis and process-based mass balance model to improve scientific understanding and reduce uncertainties. A relevant example would be the recommendations in the Massachusetts Estuary Project (MEP) Linked Watershed Embayment Model Peer Review (Scientific Peer Review Panel 2011)." 2014 Peer Review	**12- 2**

Report at 67. Dr. Diaz responded, in part: "Basically, there are no simple cause-effect relationships, it is all interactions. Therefore to focus limited resources on what is essential for setting nitrogen criteria within Great Bay, a detailed conceptual model of all sources of nitrogen entering Great Bay and interactions of ecosystem components with nitrogen would be needed. Evaluation of data gaps within this overall model framework combined with best professional judgment will guide both which linkages are most important, and which short-term and long-term datasets are needed." *Id.* DES has failed to perform any of the studies and modeling recommended by the peer review scientists, yet continues to contradict the peer review scientists by assuming nitrogen is the cause of impairments and eelgrass loss in Great Bay. To this point, the peer review scientists were asked "Given the available data/studies, is nitrogen an important factor in the presence/absence of eelgrass in various segments of the estuary?" Dr. Bierman responded, in part, "The DES 2009 Report did not adequately demonstrate that nitrogen is the primary factor in the Great Bay Estuary because it did not explicitly consider any of the other important, confounding factors in developing relationships between nitrogen and the presence/health of eelgrass. These answers apply to the Estuary as a whole and to its various individual segments." 2014 Peer Review Report at 18. Dr. Kenworthy concluded that "DES also included their assessments of chlorophyll-a in each of the zones and determined that there were four zones with nitrogen impairment and seven zones without nitrogen impairment; implicitly linking eelgrass impairment to nitrogen impairment. Four of the seven zones with eelgrass impairment were not declared nitrogen impaired. This is not very compelling evidence linking nitrogen impairment to eelgrass impairment if only 36% of the zones in the Great Bay Estuary are considered impaired for both, and more than half of the zones with eelgrass impairment were not declared nitrogen impaired. . . .There is no basis for a scientifically defensible linkage between nitrogen impairment and eelgrass impairment presented in the report." *Id.* Thus, the City reiterates its comment made in 2016 that the lack of *any* reference to the 2014 Joint Report of Peer Review Panel or application of the recommendations contained in the peer review panel's report is one of the most glaring deficiencies of the draft 2018 CALM. This is reflected in DES's continued failure to adopt the report's findings, perform the recommended studies, and reach conclusions consistent with the approach recommended by the peer review scientists. DES continues to imply potential nitrogen impairments using ambiguous, inappropriate, or unsubstantiated statements while ignoring the 2014 Peer Review Report and other evidence of the lack of nitrogen-related impairments. The CALM should be revised to incorporate the findings of the 2014 Peer Review Report and report uncertainties as they currently exist. Where there is this level of uncertainty over the data, DES should not recommend impairment.	
<u>DES Should Delay Finalizing the 2018 303(d) Until New DO Regulations Are Enacted</u> In 2017, the New Hampshire legislature instructed DES to "adopt rules, under RSA 541-A, relative to dissolved oxygen water quality standards for tidal and saline waters in a manner consistent with Environmental Protection Agency guidance on dissolved oxygen water criteria published pursuant to section 304(a) of the Clean Water Act, and other relevant scientific information." Senate Bill 127 (2017). Nevertheless, DES has determined the Cocheco River is DO impaired, but is using rules the legislature has specifically instructed DES to abandon. Until such time as DES promulgates rules in accordance with its legislative mandate, it should suspend its 2018 303(d) listings.	**12- 3**

DES Has Not Properly Engaged In Rulemaking to Promulgate the CALM Under New Hampshire law, a "rule" is defined in relevant part to mean: > each regulation, standard ... or other statement of general applicability adopted by an agency to (a) implement, interpret, or make specific a statute enforced or administered by such agency or (b) prescribe or interpret an agency policy, procedure or practice requirement binding on persons outside the agency, whether members of the general public or personnel in other agencies. New Hampshire Administrative Procedures Act ("APA"), RSA 541-A:1. "Where an agency's efforts 'effect substantive changes binding on persons outside the agency, the agency's policy constitutes a 'rule' that must be promulgated pursuant to the APA.'" *Bel Air Assocs. v. DHHS*, 154 N.H. 228, 233, (2006). The City raised this issue regarding the 2016 CALM. In its response, DES stated "[t]he CALM is used to fulfill a federal obligation, not to "implement, interpret, or make specific" a state statute;" and (2) "[t]he CALM creates no 'policy, procedure or practice requirement [that is] binding on persons outside the agency.'" Neither of those explanations were responsive to the City's complaint. First, a federal act cannot be the sole basis for a state agency to undertake an action. In *Printz v. United States*, 117 S. Ct. 2365, 2380 (1997), the Court wrote that "we adhere to that principle today, and conclude categorically, as we concluded categorically in *New York:* 'The Federal Government may not compel the States to enact or administer a federal regulatory program.'" *Printz*, 117 S. Ct at 2383. "The Federal Government may neither issue directives requiring the States to address particular problems, nor command the States' officers, or those of their political subdivisions, to administer or enforce a federal regulatory program. It matters not whether policymaking is involved, and no case-by-case weighing of the burdens or benefits is necessary; such commands are fundamentally incompatible with our constitutional system of dual sovereignty." *Printz*, 117 S.Ct. at 2384. In order for DES to act, it must have specific state legislative authority and can only implement those policies as directed by the Legislature. DES has failed to do so and instead is relying on federal statute and rules to promulgate guidelines through the CALM. DES's failure to act in accordance with State law puts it in violation of its rulemaking obligation under RSA 541-A.	**12- 4**

Second, the CALM does create a policy, procedure or practice requirement that is binding on the City. DES defines "antidegradation" to mean "a provision of the water quality standards that maintains and protects existing water quality and uses." Env-Wq 1702.03. DES's determination of impairment directly implicates DES's antidegradation requirements. In addition, on January 18, 2017, EPA issued its General Permits For Stormwater Discharges From Small Municipal Separate Storm Sewer Systems ("MS4 Permit"). For example, Section 2.1.2 of the MS4 Permit states: > There shall be no new or increased discharges from the MS4 to *impaired waters* listed in categories 5 or 4b on the most recent EPA-approved New Hampshire Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b) unless the permittee demonstrates that there is no net increase in loading from the MS4 to the impaired water of the pollutant(s) for which the waterbody is impaired. Section 2.2.2 provides: > For purposes of this permit, a 'water quality limited water body' is any water body that does not meet applicable water quality standards, including but not limited to waters listed in categories 5 or 4b on the most recent EPA-approved New Hampshire Clean Water Act section 303(d) list or New Hampshire Integrated Report under Clean Water Act section 305(b). As is described on DES's website, "The Surface Water Quality Assessment Program produces two surface water quality documents every two years, the "305(b) Report" and the "303(d) List". As the two documents use the same data, the 305(b) Report and 303(d) List were combined into one Integrated Report starting in 2002. Thus, DES's conclusion that "[t]he CALM creates no policy, procedure or practice requirement that is binding on persons outside the agency" does not accurately reflect the true impact DES's designations have on communities like Rochester. Until such time as DES completes the rulemaking process and properly promulgates the CALM, DES should suspend the 2016 303(d) list process.	
Brown & Caldwell's and Great Bay Municipal Coalition's Technical Analysis The City incorporates in full Brown & Caldwell's technical analysis of the 2018 draft CALM and draft 303(d) List, a copy of which is attached hereto, and the Great Bay Municipal Coalition's comments filed separately. **Requests and Recommendations** The City respectfully requests the following actions relative to the draft CALM: 1. Suspend its use of the CALM until such time as it has been fully evaluated and considered in a rulemaking process as required by the APA.	**12- 5**

2. For the reasons described by Brown & Caldwell, all references to standards based upon chlorophyll-a should be removed from the CALM. 3. For the reasons described by Brown & Caldwell, DES should not use chlorophyll-a thresholds to conclude TN is causing DO impairment. 4. Although the CALM has discontinued the use of DO percent saturation to make full-support or non-support decisions, the City requests that DO percent saturation not be used for PAS or PNS decisions for the reasons described by Brown & Caldwell. 5. For the reasons described by Brown & Caldwell, the City recommends that DES remove indicator 4 for primary contact recreation. This indicator is based on chlorophyll-a concentrations which is technically unsupported and results in the imposition of a rule that has not gone through the rulemaking process. DES should incorporate the specific recommendations described in the 2014 Joint Report of Peer Review Panel. 6. Indicator 9 should be revised to acknowledge that the response variables may be affected by a variety of environmental conditions other than nitrogen. Also, chlorophyll-a should not be used as an indicator of DO impairments. Rather, DO should be assessed using DO data.	
The City respectfully requests that DES take the following actions relative to the 2018 draft 303(d) listing for the tidal Cocheco: 1. Revise the draft 2018 303(d) listing for the Cocheco River from category 5-M to category 3-PAS as an interim listing until such time as more high quality data can be collected and assessed.	**12- 6**
2. DES has not provided evidence or analysis to suggest the tidal Cocheco River is not achieving any designated use or that total nitrogen has been demonstrated to be a causative pollutant for any impairment. DES states nitrogen remains elevated while acknowledging a rapid decrease in loading. Before designating any impairment, the City requests that DES conduct a thorough statistical evaluation using verifiable, high quality data to identify if changes in nitrogen loading as a result of recent facility improvements have any measurable impact water quality in the Cocheco River. Without identification of such linkages, DES lacks the technical basis for listing the tidal Cocheco River as impaired	**12- 7**
3. Develop water quality management strategies for the Cocheco River and the Great Bay Estuary that focus on collaboration between regulatory agencies and affected stakeholders in the watershed. In recent years, the Great Bay Coalition communities have significantly decreased TN loading into the Great Bay Estuary. Given the TN management strategies already implemented by Rochester and the significant reductions already observed, we strongly recommend that DES oversee a Great Bay-specific study and analysis to establish what factors have prevented eelgrass from fully rebounding and study the effect the existing nutrient loading reductions have had on the Great Bay Estuary over time. This, in turn, will give DES with actionable data upon which it can properly determine the impairment status of waterbodies within the Great Bay Estuary.	**12- 8**

Conclusion

The City appreciates the substantial effort undertaken by DES to develop the 2018 draft CALM and 303(d) listings. The draft 2018 CALM and 303(d) list, however, have significant deficiencies that call into question the legal and technical conclusions reached by DES. For the reasons stated in this letter, as well as the attached report from Brown & Caldwell, the comments submitted on behalf of the Great Bay Coalition, and the comments submitted in response to the draft 2016 CALM and 303(d) list, all of which are incorporated into this letter in full, the City respectfully requests that DES amend its CALM process and its impairment conclusions in accordance with the requests outlined in this letter and in the referenced documents.

12- 9

Sincerely,

Peter C. Nourse
Director of City Services
City of Rochester NH

Brown AND Caldwell

Technical Memorandum

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T: 978.794.0336

Prepared for: City of Rochester, New Hampshire

Technical Memorandum

Subject:	Comments on New Hampshire Draft 2018 CALM and 303(d) Listings
Date:	March 15, 2019
To:	Peter Nourse, PE, Director of Public Works
From:	Clifton Bell, PE, PG and Daniel Hammond
Copy to:	Mr. Richard W. Head; Rath, Young and Pignatelli, P.C.

This technical memorandum presents comments to the New Hampshire Department of Environmental Services (NHDES) regarding the 2018 Draft Consolidated Assessment and Listing Methodology (CALM) document (NHDES, 2019a) and the draft 2018 303(d) List (NHDES, 2019b), with a focus on the tidal Cocheco River. These comments were prepared on behalf of the City of Rochester, New Hampshire.

Comments on the Draft 2018 CALM

Our technical review of the draft 2018 CALM focused on the appropriateness of various indicators (dissolved oxygen, chlorophyll-a, and total nitrogen) to make impairment determinations. Several of these comments are very similar to those submitted in previous comment cycles. In general, we still conclude that NHDES lacks a viable methodology for determining nitrogen or algal-related impairments in tidal waters, which can lead to inappropriate 303(d) listings. Specific comments are outlined below.

12- 10

1. *Dissolved oxygen saturation should not be used to indicate potential non-support*. The CALM indicates that, because DO percent saturation is no longer part of the NH's water quality standards, it will be not be used to make full-support or non-support decisions. However, the CALM states that DO percent saturation will still be used to indicate potential attainment (PAS) or potential non-support (PNS). The stated justification is that "low daytime [DO percent saturation] can indicate low nighttime DO [concentration]". We concur with the discontinuation of DO percent saturation to make impairment determinations. However, we recommend that DO percent saturation not be used for PAS or PNS decisions either. Large diel swings in DO concentrations would be primarily driven by algal or plant photosynthesis and respiration. In this circumstance, low nighttime DO would be accompanied by high DO percent saturation during the day, not by low DO percent saturation. Low DO percent saturation during the day would be more likely caused by biological oxygen demand, either from natural or anthropogenic sources. But in this circumstance, DO concentrations would tend to be higher (not lower) at night due to lower nighttime temperature. It is recommended to remove reference to DO percent saturation in the CALM, and to assess DO using DO concentrations only. This approach is also more consistent with the legislative intent of Senate Bill 127 (2017).	**12- 11**
2. *NH's existing DO daily minimum concentration criterion lacks a scientifically defensible link to attainment of designated uses for tidal waters and should be revised*. As stated in previous comment cycles, the NHDES daily minimum criterion of 5.0 mg/L is likely highly overprotective when applied to tidal waters as an instantaneous minimum value outside of a spawning/nursery period. We acknowledge and support the NHDES ongoing efforts to research and revise the current DO criteria in NH. We make this comment to emphasize that listings of tidal waters based on this criterion do not necessarily represent actual ecological impairments, and to encourage NHDES to move forward with the criterion revision as soon as practical.	**12- 12**
3. *The recreational chlorophyll-a thresholds in the draft 2018 CALM represent unpromulgated criteria and should not be used directly for impairment determinations*. As in previous iterations, the draft 2018 CALM cites chlorophyll-a thresholds for indicating non-support of primary contact recreation (e.g., 20 ug/L in salt water). We continue to affirm that the NHDES is using these values as unpromulgated numeric criteria, and that they have no solid technical basis. The NHDES's previous responses on this issue (DES, 2017) focused on the low frequency of chlorophyll-a values above 20 ug/L, rather than any linkage between that value and recreational use. Chlorophyll-a concentrations tend to be log-normally distributed (USEPA, 2007), so it is to be expected that high values will occasionally occur, even in benign algal populations. But chlorophyll-a values in the 20-30 ug/L range are not necessarily associated with highly noticeable or harmful bloom conditions—particularly for upper estuary segments that have naturally high concentrations of dissolved organic matter, such that the water appearance is not highly sensitive to variability in chlorophyll-a. Given that the NHDES has not explicitly linked chlorophyll-a to recreational uses in any rigorous manner, we believe that a reasonable approach would be to use the chlorophyll-a thresholds to indicate PNS but not non-support of recreational uses. A finding of non-support should require additional evidence such as documentation of nuisance bloom conditions or algal toxins that exceed recreational thresholds.	**12- 13**
4. *Remove indicator 4 for primary contact recreation (N in estuarine waters)*. This indicator appears to be based on chlorophyll-a concentrations, and thus is both redundant of chlorophyll-a and to suffer from the same shortcomings of that indicator as described above. Moreover, the addition of a nitrogen indicator assumes that elevated chlorophyll is caused or controlled by anthropogenic nitrogen sources, which might or might not be the case. Phosphorus-limiting conditions can sometimes occur in upper estuarine segments (for example see Harrison and others, 1990; Murray and others, 1992; Doering and others, 1995). In some segments, algal levels may be controlled by light and hydraulic residence time rather than nitrogen, or imposing a nitrogen limitation on algae would be impractical. Rather than including a redundant indicator that presumes a causal link, the CALM should focus on response indicators. The investigation of causal variables such as nitrogen should be relegated to the appropriate scientific programs and processes outside the CALM.	**12- 14**

5. *Comments on indicator 9 for aquatic life integrity (total nitrogen in the Great Bay estuary)*. As the NHDES is aware, the potential role of nitrogen and other stressors in the Great Bay system is a complex topic that does not lend itself to the use of simple indicators. Cause-effect relations between nitrogen and other indicators have not been established (Bierman and others, 2014). As such, it is inappropriate for DES to use the indicators in this section to conclude a nitrogen impairment. We recommend that indicator 9 be renamed as "aquatic life integrity in the Great Bay estuary" without a sole focus on nitrogen. The role of nitrogen or other factors in affecting response variables should be relegated to the appropriate scientific programs and processes outside of the CALM. The text on indicator 9 should be revised to acknowledge that the response variables may be affected by a variety of environmental conditions other than nitrogen. Also, chlorophyll-a should not be used as an indicator of DO impairments. The relation between chlorophyll-a and DO is too complex and variable to support this approach. Rather, DO should be assessed using DO data.	**12- 15**
Comments on the Draft 303(d) List 1. *Remove the non-support (5-P) listing of the tidal Cocheco River (segment NHEST600030608-01) for chlorophyll-a*. Consistent with our comments on the CALM, it is inappropriate to list this segment as non-supporting aquatic life or recreational uses based on chlorophyll-a. Chlorophyll-a should not be used as an indicator of DO; rather, DO should be assessed directly from DO data. (See comments below on the DO-based listing of this segment). The sonde-based chlorophyll-a data for 2017 were all marked as non-valid, do not provide accurate information on the magnitude of chlorophyll-a, and should not be referenced in the technical support document. The grab sample data used in the 2018 listing cycle show a relatively low chlorophyll median of ~3 ug/L and a 90th percentile of ~16 ug/L. These values are not indicative of a segment that cannot support aquatic life uses. Rather, they show the expected asymmetric (e.g., lognormal) distribution of a productive upper estuary segment.	**12- 16**

2. *Tidal Cocheco River (segment NHEST600030608-01) dissolved oxygen data supports a listing of 3-PAS rather than 5-M.* During the 2016 303(d) assessment cycle, The City of Rochester submitted comments regarding data quality issues that impacted the assessment for this waterbody. The 2018 assessment continues to use the suspect data identified in the earlier assessment, and the 2016 deployment data also exhibits similar data quality issues that hinder an accurate assessment of DO in the tidal Cocheco River. The 2016 deployment dataset exhibited several periods of questionable data, leading to a sizable amount of data that was qualified and removed from the assessment. Over 10 percent of the total deployment dataset was qualified for numerous reasons: erroneous "0 mg/L" measurements; time periods removed for biofouling; and other small but frequent periods of time (two-hour time segments) that appear to represent unexplained large magnitude changes in DO over a short time period (Figure 1). A data quality error rate of more than 10 percent is typically too high to consider the dataset valid, especially for regulatory purposes. The 2016 dataset has similar quality issues that were observed in the 2014 and 2015 datasets, and were used in the 2016 assessment as well as the 2018 assessment. The 2014-2016 datasets exhibit large magnitude drops in DO followed by immediate rebounds in concentration that are uncharacteristic of typical DO diel or tidal cycle fluctuations and do not reflect ecological causes (e.g. algal biomass or nutrient dynamics). In the 2016 dataset, some of these uncharacteristic fluctuations appear to have been flagged and removed during Quality Control (QC) of the data, however several of these anomalous sag/rebound cycles were not removed from the assessment. This resulted in suspect data being used in the assessment leading to the listing of the tidal Cocheco River segment for the same reasons as the 2016 listing. It is not clear from the data how the QC was performed and why only certain sag/rebound cycles were removed from the data and not all these erroneous data time periods. Further evidence of the data quality issues in the tidal Cocheco River dataset can be found in a comparison of the 2016 and 2017 deployment data. While numerous time periods of questionable data are evident in the 2016 dataset, none are found in the 2017 dataset (Figure 1). No data records were removed by NHDES from the 2017 dataset for erroneous measurements, biofouling, or large magnitude DO sag/rebound cycles. The 2017 dataset exhibits characteristic DO diel, tidal cycle, and seasonal fluctuations, without the anomalous or erroneous data that are exhibited in the 2016 dataset. The reasons for this are not entirely understood at this time, but may reflect several differences including a different data sonde, a new or different DO probe, a new sonde deployment location, or any combination of these. Whatever the reason, an obvious improvement in data quality is observed in the 2017 dataset allowing for a more reliable assessment of the tidal Cocheco River. The NHDES suggests that the improvement in the 2017 data records may be the result of better flushing caused by higher summer flows compared to 2015 and 2016 (NHDES, 2019). Regardless of the flow effects, there is evidence to suggest an improvement in data quality as the reason for the improvement in the 2017 data records. The 2016 dataset (and for the same reasons, the 2014 and 2015 datasets) exhibit data quality issues that prevent a robust and ecologically meaningful assessment of water quality conditions in the tidal Cocheco River. Instead of assuming 2017 water quality data are different from prior years because of increased flushing, DES needs to evaluate the equipment and logistical effects of the sampling program on the 2014-2016 data set that led to large amounts of questionable data being qualified and removed from the assessment. Based on the discussion above, NHDES should revise the 2018 listing for the tidal Cocheco River to category 3-PAS as an interim listing until such time as more high quality data can be collected and assessed. Given the data quality issues in continuous recorder data prior to 2017, these data cannot be relied upon to make accurate regulatory decisions regarding water quality conditions in the tidal Cocheco River.	**12- 17**

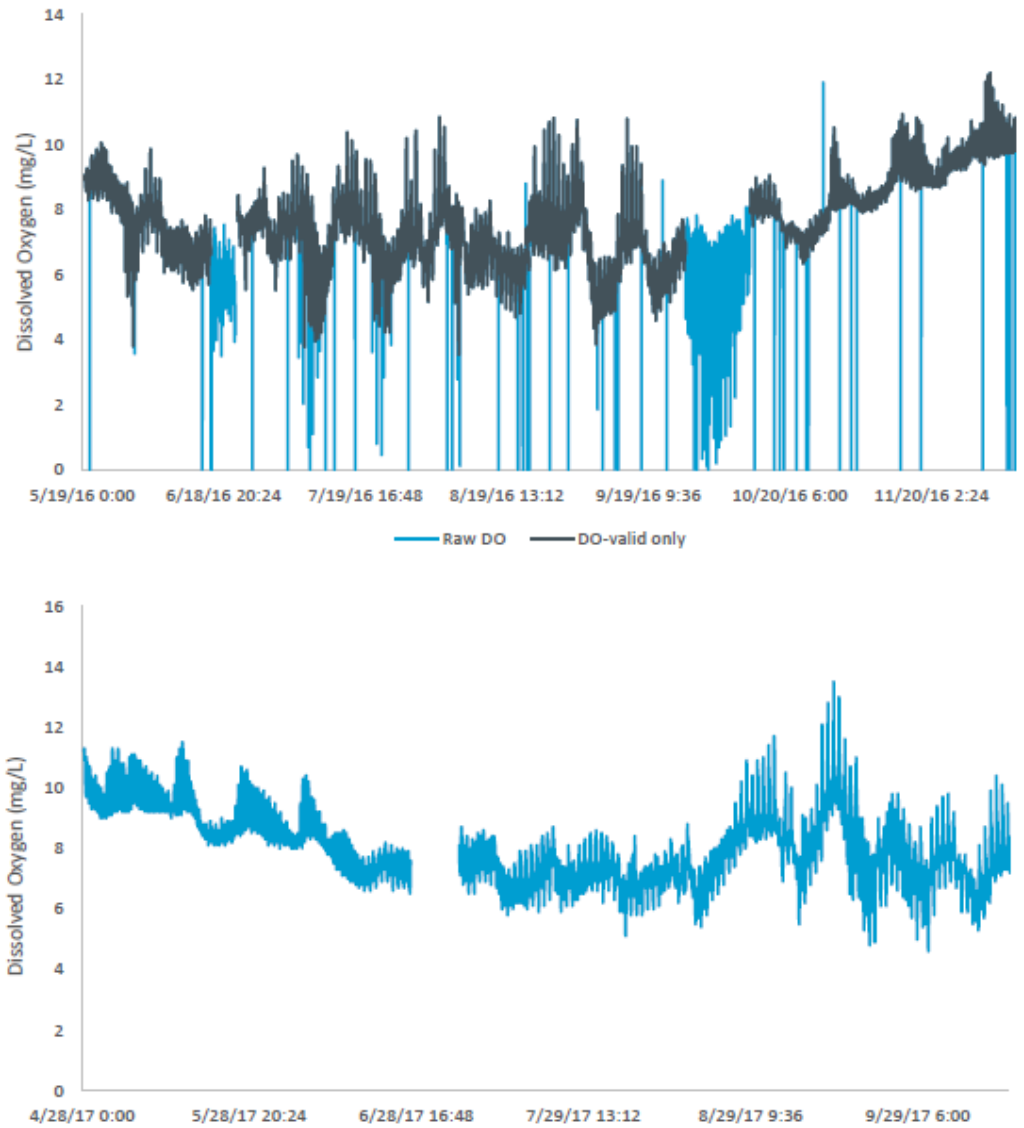

Figure 1. Continuous recorder dissolved oxygen data (station GRBCR) from 2016 (top) and 2017 (bottom) used in the 2018 303(d) assessment of the tidal Cocheco River (segment NHEST600030608-01).

3. *DES has provided no technical basis for its conclusions regarding algal biomass or a link to total nitrogen.* DES states "the growth of algae is causing dissolved oxygen to fall below state standards" (NHDES 2019, pg. 72). However, DES provides no evaluation or analysis to support this claim. Instead, DES refers to graphics from the 2016 303(d) TSD and narrative to draw an assumption of a relationship between sonde probe chlorophyll-a readings and DO concentrations. DES admits the probe-based chlorophyll-a readings are "estimated" based on a poor correlation with extracted chlorophyll-a grab sample data (NHDES 2019, pg. 72), which was also the case in the 2016 assessment (NHDES 2017). Additionally, there is sufficient evidence to conclude the DO data used in the 2016 and 2018 assessments have data quality issues that prevent meaningful analysis of cause and effect relationships. Given that the chlorophyll-a and DO data lack statistical rigor to develop cause and effect relationships, DES has no justification for concluding algal growth is in any way related to DO concentrations in the tidal Cocheco River. DES uses the above statement purporting to link chlorophyll-a to DO as the method of listing total nitrogen as the causative pollutant. Again, no technical analysis has been provided to justify this link and statements from the 2016 listing are provided as evidence (NHDES 2019, pg. 72). No evidence or analysis has been provided to suggest the tidal Cocheco River is not achieving any designated use, or that nitrogen has been proven to be a causative pollutant for any impairment. DES states nitrogen remains elevated while acknowledging a rapid decrease in loading (NHDES 2019, pg. 72). DES needs to conduct a thorough statistical evaluation using verifiable, high quality data to identify if changes in nitrogen loading as a result of recent facility improvements have any measurable impact on water quality in the Cocheco River. Without identification of such linkages, DES lacks the technical basis for listing the tidal Cocheco River as impaired.	**12- 18**
4. *Remove the non-support (5-M) listing of the tidal Cocheco River (segment NHEST600030608-01) for total nitrogen.* As outlined in comments 1 and 2 above, the tidal Cocheco River should not be listed as non-supporting uses based on chlorophyll-a or DO. We are unaware of reports of fish kills, user complaints regarding blooms, or any other information that would suggest non-attainment of uses. Moreover, it is unclear that the chlorophyll-a or DO dynamics are controlled or controllable by nitrogen as opposed to other factors such as flushing rates and the natural exchange of water between tidal flats and the main channel. It appears to be a productive upper estuary segment that would benefit from additional DO monitoring data given data quality issues as discussed in comment 2. Accordingly, the 5-M listing for total nitrogen should be removed from the 2018 303(d) list, pending the collection of additional DO and its interpretation.	**12- 19**