The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner

(Distributed via email)

July 22, 2019

Clifton Bell
Technical Leader, Watersheds & TMDLs, Brown and Caldwell
On behalf of the Great Bay Municipal Coalition
1 Tech Drive, Suite 310
Andover, MA 01810-2435

Re: Response to 1/2/2019 letter regarding Feedback on October WQSAC Meeting Materials

Dear Mr. Bell:

Thank you for the above-referenced letter sent on behalf of the Great Bay Municipal Coalition (GBMC), and for your patience and understanding. Our response is provided below.

a. *Consensus:* The letter recommends that we reach a consensus. As an open informational meeting, the WQSAC always strives for consensus, however, ultimately NHDES decisions are bound by our legal authorities.

b. *Mass-Balance Equation Method is not the only approach*: With regards to the mass-balance equation method presented at the October 2018 WQSAC meeting, NHDES never intended to represent that this approach was the only method that could be used for determining reasonable potential and nutrient permit limits (if necessary). We attempted to clarify this point at the January 11, 2018 WQSAC meeting where we initiated discussion of and EPA gave a presentation on the mass-balance equation approach for determining TP permit limits. As indicated in the presentations given that day (see Appendix A, Figure 1), it is possible that site specific studies and models could also be used to establish TP permit limits (where there is reasonable potential).

c. *Flow and Ambient TP Targets for Nutrient Permitting:* As discussed with the WQSAC, New Hampshire does not currently have numeric TP criteria; nor do we have site specific TP criteria or any recent TP TMDLs that impact wastewater treatment facilities (WWTFs) with individual NPDES permits. Consequently, in the absence of this information, discussion to date of appropriate flow and ambient TP targets for nutrient permitting has focused on available information such as what other states use or are considering to use, results of the U.S. Army Corps of Engineers Merrimack River Watershed Study, nutrient related data in New Hampshire and an analysis showing the potential impact of various combinations of flow and ambient TP targets on NH WWTF permit limits.

   For reasons discussed in your letter, we understand that the GBMC believes that the summer median flow should be used to replace the 7Q10 flow. NHDES, however, has presented information which suggests that the August median flow may be an appropriate replacement. Please note that we have not yet made a final decision.

   As discussed with the WQSAC last October, the August median flow is being considered as a potential candidate because 1) it covers the period of the year when systems tend to experience greater stress and exhibit greater nutrient response due to low flows and high temperatures, 2) flows less than or equal to the August median flow

occur on average approximately 17% of the year (62 days)[1] which is likely sufficient time for biological response (see Appendix A, Figure 2 and the discussion below), and 3) as flows fall below the August median, TP concentrations in rivers receiving WWTF effluent tend to steadily increase above 25 ug/L which is approximately two times the median TP found in rivers not receiving WWTF effluent (see Appendix A, Figure 3 and the median TP concentration corresponding to the percent of annual flow no greater than 17%, which is the August median).

GBMC suggests that although the August median occurs 17% of the time (62 days), river response to nutrients is "not controlled by the total number of days per year, but by the number of consecutive days that a stable streamflow persists". In response, we examined flow data from USGS Gage 01072800 on the Cocheco River (near Rochester) for the period 1995-2018. Results indicate that for the months of June through September, flows were at or below the August median 4 to 16 consecutive days in duration (25^{th}-75^{th} percentile of durations) with a median of 9 consecutive days. In our opinion, this is sufficient time for biological growth and other possible ecosystem changes to occur in response to nutrient loadings.

With regard to ambient TP targets, we agree that different river/stream types can respond differently to the same nutrient loading for a variety of factors (see Appendix A, Figure 4). For this reason, development of permit limits based on an EPA / NHDES approved site specific methodology is an option available to permittees. However, to address situations where resources are not available to undertake a site specific study or in cases where it is not necessary to develop the "perfect" TP target, we still foresee the need to establish "default" TP targets that are based on literature and use of the mass balance equation for determining reasonable potential and, if needed, nutrient permit limits. As indicated in our presentation at the October 11, 2018 WQSAC meeting, this approach may be perfunctory and acceptable for a broad range of situations such as small facilities with a great deal of dilution.

We understand that GBMC opposes a blanket ambient TP permitting target of 30 ug/L for all rivers and streams (except perhaps for highland streams in relatively undeveloped areas) and believes higher TP targets (50-150 ug/L) may be appropriate in productive coastal zone streams that may be able to assimilate much higher TP targets without impairment and that this range roughly corresponds to the TP range used by other states with temperate climates. When comparing targets in other states, we believe that more weight should be given to the work done in states closer to New Hampshire than states like Ohio, Minnesota and Florida as suggested by the GBMC. This is because of regional similarities in waterbody characteristics, existing water quality and expectations of water quality. We don't believe that choosing other state TP targets or response thresholds based on similar climate is appropriate.

At the October, 2018 WQSAC meeting, NHDES provided the rationale that an ambient TP default target of approximately 30 ug/L at an August median flow may, in some cases, be appropriate where a site specific study has not been conducted (see Appendix A, Figure 5). Please note that we have not made a final decision on ambient TP default targets and anticipate there will likely be more than one. For example, ME has three thresholds based on the waterbody classification (18 ug/L, 30 ug/L and 33 ug/L) (see Appendix A, Figure 6) and Vermont has seven

[1] For comparison, the summer median flow proposed by GBMC occurs approximately 30% of the time (110 days).

criteria within the range of 9 to 27 ug/L based on waterbody classification, size, gradient and fishery type (i.e., warm or cold water) (see Appendix A, Figure 7). In addition, based on changes to diatom assemblages and use of the Biological Condition Gradient (BCG), research conducted on Connecticut streams indicated the following: " When considering ecological responses, scientifically defensible and ecologically relevant TP criteria were identified at (1) 0.020 mg/l for designating highest quality streams and restoration targets, above which sensitive taxa steeply declined, tolerant taxa increased, and community structure changed, (2) 0.040 mg/l, at which community level change points began to occur and sensitive diatoms were greatly reduced, (3) 0.065 mg/l, above which most sensitive diatoms were lost and tolerant diatoms steeply increased to their maxima..." [2]. Similarly, work based on the BCG approach using diatoms in New Jersey suggests that TP criteria should range from less than or equal to 0.025 mg/L to no greater than 0.050 mg/L depending on the ecoregion. [3]

d. *Framework:* Although our original charge was to propose a replacement for the 7Q10 flow for nutrient permitting, a more comprehensive TP permitting framework discussion is warranted given that permitters at EPA and NHDES will need additional guidance. Some initial thoughts that we believe are important to keep in mind during the framework discussion are provided below. These thoughts point to a multifaceted approach to TP permitting:

1) NPDES permits must be written to meet state surface water quality standards. NHDES must certify that NPDES permits comply with New Hampshire surface water quality standards (RSA 485-A:12, III).

2) The NPDES program and implementing regulations are preventative so that impairments will not occur. Consequently, a waterbody does not need to be impaired for a NPDES permitted facility to receive a water quality based effluent limitation.

3) Per federal regulation (40 CFR § 122.44 (d), water quality based NPDES permit limits are required when there is reasonable potential that the discharge will cause or contribute to violation of a numeric or narrative water quality criteria.

4) For reasons discussed above in part c. of this letter, the framework should consider use of the mass balance equation method and selection of literature-based ambient TP default targets as one of the permitting approaches that can be used. This approach could recognize differences between watersheds in various parts of the state, i.e. not "one size fits all". Whatever approach is used (mass-balance with targets, site specific studies or models), NHDES must be confident that it will result in a permit that will comply with New Hampshire surface water quality standards.

5) In addition to those proposed by the GBMC, nutrient response indicators for site specific studies should include periphyton and consider research conducted in the Northeast regarding nutrient thresholds for the protection

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[2] Smucker, N.J., Becker, M., Detenbeck, N.E., Morrison, A.C., 2013. Using algal metrics and biomass to evaluate multiple ways of defining concentration-based nutrient criteria in streams and their ecological relevance. Ecol. Indic.32, 51-61.

[3] Charles, D.F., Tuccillo, A.P., Belton, T.J., 2019. Use of diatoms for developing nutrient criteria for rivers and streams: A Biological Condition Gradient approach. Ecological Indicators, 96, 258-269.

of aquatic life based on diatom assemblages and the Biological Condition Gradient or BCG (see NHDES Response "c" above).

6) We concur that the framework should address antidegradation (Env-Wq 1708). Water quality monitoring and modeling conducted to determine if there is any remaining assimilative capacity in a waterbody should consider the requirements in Env-Wq 1708.08 (Assessing Waterbodies) in PART Env-Wq 1708 Antidegradation of the state surface water quality standards. This includes assessing existing water quality based on point sources discharging at their allowed loadings and the highest loadings anticipated from nonpoint sources [Env-Wq 1708.08(b)].

7) If predictive models are proposed, which models would be used? Would they be steady state or continuous? What would be the "critical" conditions? Can the model predict all of the potential response variables and what would the ambient thresholds be for each response variable?

8) For monitoring and modeling, what should the spatial extent be to capture the cumulative effects of nutrient loads on water quality?

We look forward to continuing our discussions on this issue with the GBMC and WQSAC and are particularly interested in your thoughts on developing the framework for modeling and site specific studies. Should you have any questions, please do not hesitate to contact me, Ted Diers (Ted.Diers@des.nh.gov , 603-271-3289) or Ken Edwardson (Kenneth.Edwardson @des.nh.gov, 603-271-8864).

Regards,

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Ted Diers, NHDES Watershed Management Bureau Administrator

Appendix A

Figure 1: Slide 12, 1/11/18 WQSAC Meeting

Focus of Today's Discussion

- Nutrients include Total Phosphorus (TP) and Total Nitrogen (TN)
- Focus of today's discussion is on the methodology for setting total phosphorus (TP) limits in NPDES WWTF permits
  - in free-flowing Class B freshwater (FW) rivers and streams that do not discharge directly to a lake, pond or impoundment (with lake-like characteristics),
  - which do not have a site specific TP criteria established (none currently exist in NH), and
  - which do not have a TP TMDL established.
    - If a nutrient TMDL has been completed, the wasteload allocation (WLA) for the WWTF in the TMDL would be used to establish the nutrient permit limit.

12

Figure 2: Slide 64, 10/11/18 WQSAC Meeting

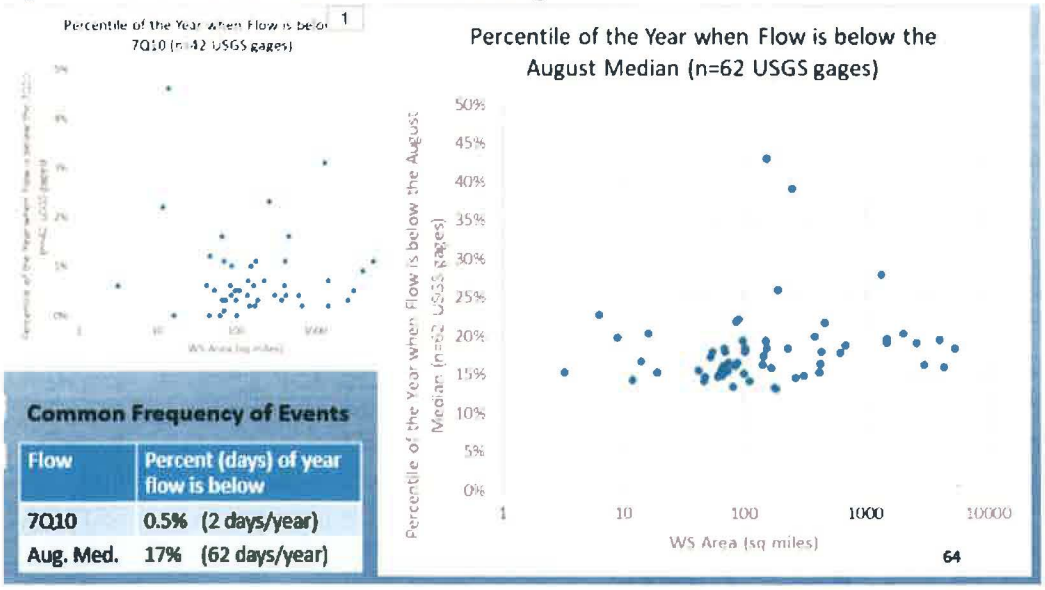


Figure 3: Slide 44, 10/11/18 WQSAC Meeting

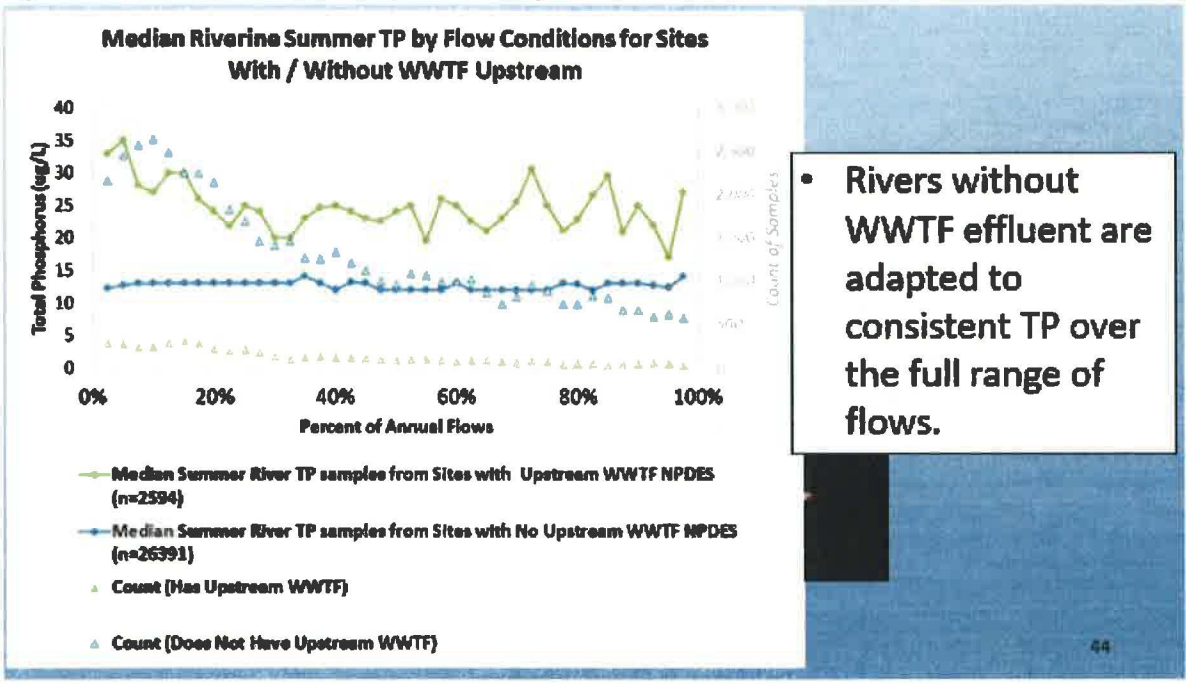


Figure 4: Slide 14, 1/11/18 WQSAC Meeting

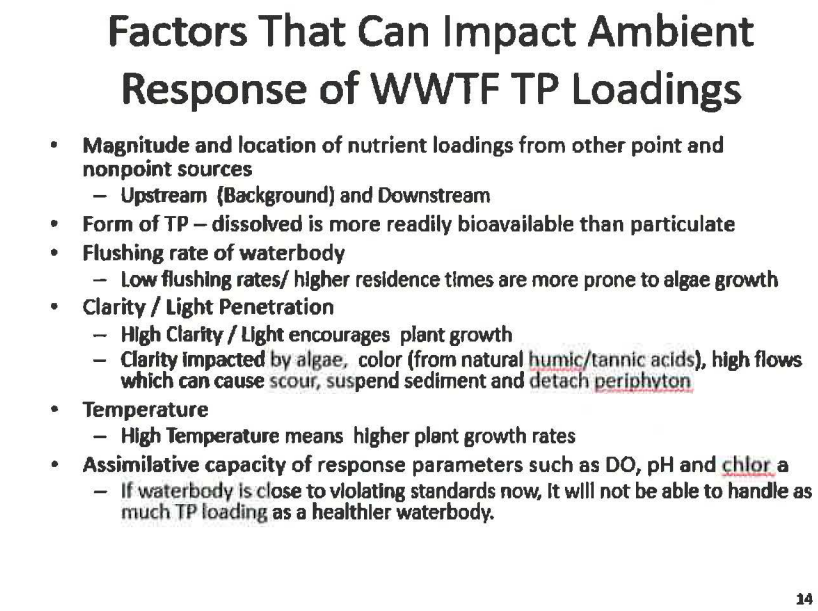


Figure 5: Slide 75, 10/11/18 WQSAC Meeting

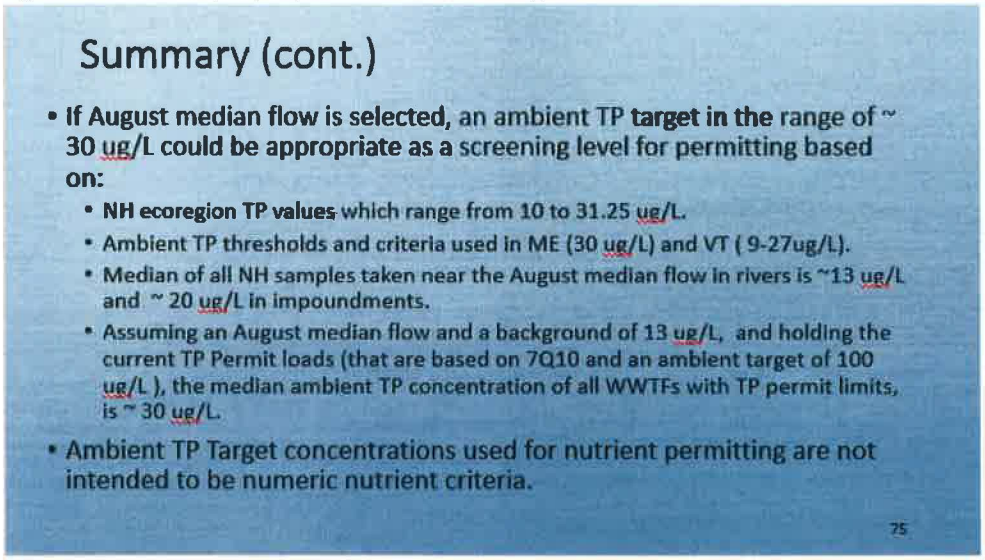


Figure 6: Slide 22, 10/11/18 WQSAC Meeting

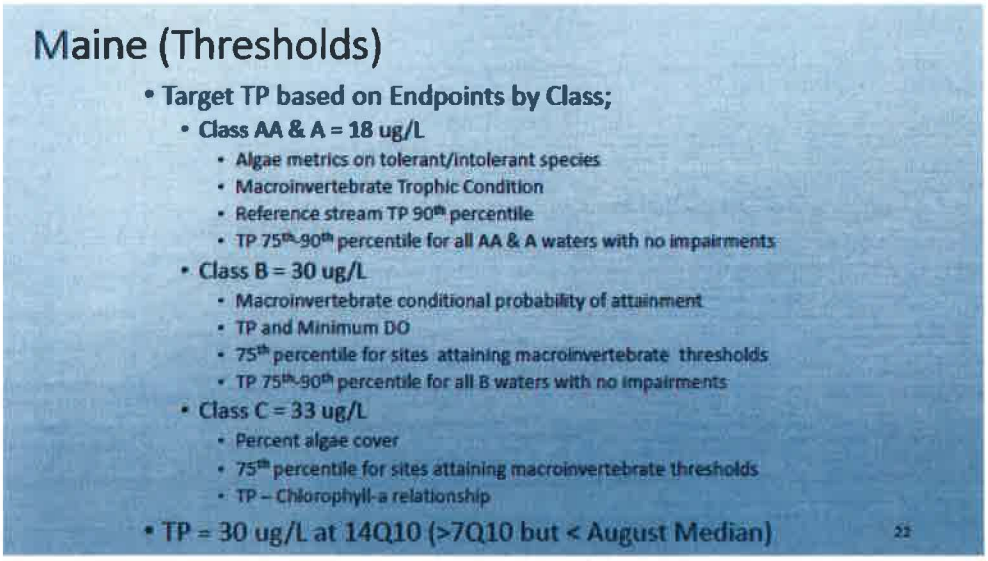
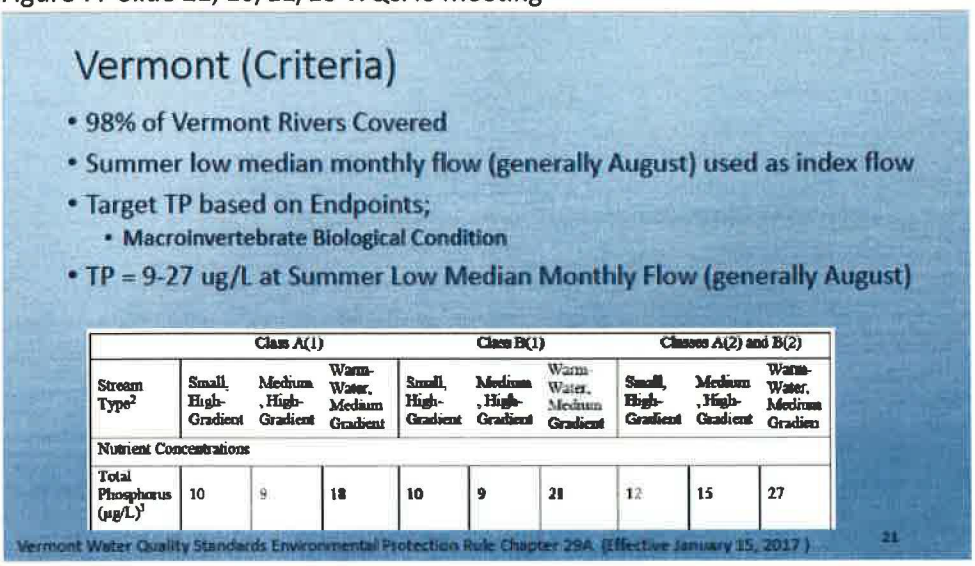


Figure 7: Slide 21, 10/11/18 WQSAC Meeting



Vermont (Criteria)

- 98% of Vermont Rivers Covered
- Summer low median monthly flow (generally August) used as index flow
- Target TP based on Endpoints;
  - Macroinvertebrate Biological Condition
- TP = 9-27 ug/L at Summer Low Median Monthly Flow (generally August)

	Class A(1)			Class B(1)			Classes A(2) and B(2)		
Stream Type[2]	Small, High-Gradient	Medium, High-Gradient	Warm-Water, Medium Gradient	Small, High-Gradient	Medium, High-Gradient	Warm-Water, Medium Gradient	Small, High-Gradient	Medium, High-Gradient	Warm-Water, Medium Gradien
Nutrient Concentrations									
Total Phosphorus (µg/L)[3]	10	9	18	10	9	21	12	15	27

Vermont Water Quality Standards Environmental Protection Rule Chapter 29A (Effective January 15, 2017)

21