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March 11, 2022

Town of Preston
Inland Wetlands and Watercourses Commission
389 Route 2
Preston, Connecticut 06365



**RE: Analysis of Impacts to Avery Pond from
Proposed RV Campground, Preston, Connecticut
(TRC Project Number 483637)**

Dear Mr. Moulson and Commission members:

TRC Companies Inc. (TRC) was hired by Blue Water, Inc. (Blue Water) to evaluate the potential impacts from their proposed RV Campground in Preston, CT on the aquatic habitat and water quality of Avery Pond.

Work was performed by Carl Nielsen, a Certified Lake Manager and qualified limnologist with over 32 years of experience in the assessment and management of lakes and ponds. Mr. Nielsen was supported in his review by TRC engineers and wetland specialists. Mr. Nielsen and TRC staff worked to independently review existing site plans, proposed designs, stormwater designs, and reports from Blue Water's wetland scientists, engineers, and others previously working on the project. Additionally, Mr. Nielsen reviewed concerns expressed by Avery Pond stakeholders and their representatives to ensure that we fully understood the issues being raised before providing our analysis of the potential impacts to the pond.

Based on our review, the issues pertaining to Avery Pond could be grouped into either water quality or biological habitat concerns. After conducting our analysis of the project as proposed, TRC made recommendations to the Blue Water team for improving the project design with regard to these concerns. To their credit, the Blue Water team was able to make significant design changes to the project to eliminate any potentially negative impacts to the aquatic habitat and water quality of Avery Pond. The following analysis has been prepared along with a summary of the suggestions made for improving the project.

Water Quality

With regard to wetland impacts, the most significant concern pertains to the project's potential to impact water quality in Avery Pond due to its proximity to the pond shoreline. As such, the design of the stormwater system and the layout of the property is critical to ensuring that impacts will not occur.

The stormwater design for the property consists of four infiltration basins and five rain gardens to manage the water quality volume and peak discharge and these appear to meet requirements for stormwater design set by the state (DEEP 2004). The soil and drainage appear adequate, and the proposed stormwater design was found by Joseph Theroux, a Certified Forester and Soil Scientist, to have "no significant impacts to the wetlands due to the construction and operation of the project provided that the proposed E&S measures are correctly implemented, inspected and maintained". However, these assessments do not assess potential impacts to the water quality in the pond, particularly with regard to nutrient loading changes. In this regard, phosphorus loading, and to a lesser extent nitrogen loading, are critical to understanding how the project may impact the water of the pond.

As proposed, the design of the stormwater system at the Blue Water site was found to be appropriate and sufficient to meet the state standards for pollutant and nutrient removal with more than 90% of the storm flows being treated and/or infiltrated; however, design improvements were required to ensure that absolutely no impact to the water quality in Avery Pond would occur from the project. As such, we recommended an alternative design to Blue Water for the property layout that eliminated all water quality impacts to Avery Pond from the project and this design has been adopted by the Blue Water team.

The changes to the design include the following:

- Establishment of a 100-foot buffer along the pond shoreline with no development and maintenance of naturally occurring native vegetative cover and tree growth.
- Elimination of parking spaces, roadways, and camp sites within the 100-foot buffer to the pond.
- Stormwater runoff to the pond from developed areas has been essentially eliminated with all drainage being diverted to properly designed stormwater features that discharge to tributaries that flow out of the pond.
- Elimination of the dock at Avery Pond.

Given these significant improvements to the project design, TRC prepared a nutrient loading model to evaluate the impacts to water quality based on the new property design being proposed. The model uses nutrient export coefficients previously established by other researchers and used by the US EPA and state agencies in determining nutrient loading from watersheds and site specific land drainage areas. By quantifying the acreage and nutrient export from each land use type before and after development, a simple comparison can be made to quantify the impacts to water quality that will result from the changes in land use type.

The following analysis of nutrient loading is provided:

Average Annual Nutrient Load by Land Use within Avery Pond Drainage

Existing Condition

Land Use Classification	Acres	P load rate (kg/ha/yr)	P Load rate (kg/acre/yr)	Phosphorus Load (kg/yr)	N load rate (kg/ha/yr)	N Load rate (kg/acre/yr)	Nitrogen Load (kg/yr)
Cropland and Pasture	0.00	0.50	1.24	0.0	5.0	12.35	0.0
Residential/Commercial	0.0	1.00	2.47	0.0	5.0	12.35	0.0
Forest	2.36	0.08	0.19	0.4	3.0	7.41	17.5
Open/Cleared Land	9.86	0.10	0.25	2.4	3.0	7.41	73.1
Transportation	0.0	1.00	2.47	0.0	5.0	12.35	0.0
Water	0.0	0.00	0.00	0.0	0.0	0.00	0.0
Wetland	0.0	0.10	0.25	0.0	3.0	7.41	0.0
Total Area	12.22						
Preliminary Total Annual Nutrient Load				2.9			90.6
Attenuation Coefficient (% of load reaching pond)				33%			67%
Adjusted Total Annual Nutrient Load				0.95			60.7

Proposed Condition

Land Use Classification	Acres	P load rate (kg/ha/yr)	P Load rate (kg/acre/yr)	Phosphorus Load (kg/yr)	N load rate (kg/ha/yr)	N Load rate (kg/acre/yr)	Nitrogen Load (kg/yr)
Cropland and Pasture	0.0	0.50	1.24	0.0	5.0	12.35	0.0
Residential/Commercial	0.0	1.00	2.47	0.0	5.0	12.35	0.0
Forest	2.27	0.08	0.19	0.4	3.0	7.41	16.8
Open/Cleared Land	0.0	0.10	0.25	0.0	3.0	7.41	0.0
Transportation (trail)	0.09	1.00	2.47	0.2	5.0	12.35	1.1
Water	0.0	0.00	0.00	0.0	0.0	0.00	0.0
Wetland	0.0	0.10	0.25	0.0	3.0	7.41	0.0
Total Area	2.36						
Preliminary Total Annual Nutrient Load				0.6			17.9
Attenuation Coefficient (% of load reaching pond)				33%			67%
Adjusted Total Annual Nutrient Load				0.21			12.0

Notes: Phosphorus export coefficients based on median value predicted by Reckhow et al. (1980), Lin (2004), and Rast and Lee (1978)

Based on the nutrient loading analysis provided above, it can be seen that phosphorus and nitrogen loading to the pond are lower under the proposed development scenario. This is a result of the removal of development from within the 100-foot buffer which allows this area to provide natural stormwater buffering from these areas while runoff from developed areas is captured and treated by the stormwater system. Nearly ten acres of cleared land that previously drained to the pond is now being directed through the stormwater treatment systems and essentially no drainage (only 0.09 acres for a trail) from developed areas will drain to the pond.

In addition to this water quality benefit, the 100-foot natural buffer along the shoreline of the pond significantly reduces or eliminates potential nighttime light impacts to the pond from the property which was an issue raised by others regarding zooplankton living in the pond that feed on algae and provide forage for some fish species. The light attenuation will minimize the potential for any impacts to the zooplankton community and thus to other biota that may have been impacted by potential changes to the zooplankton community.

Biological Habitat

The establishment of the 100-foot buffer along the shoreline and the elimination of development from within these areas along with the removal of the dock from the proposed design have essentially eliminated any negative impacts of the proposed development to the physical habitat essential to the biota that would be associated with Avery Pond. Given this, there will not be any impacts to birds that may use the pond margins for foraging, nesting, etc. and there will not be any impacts to shoreline habitats where turtles, frogs, or other species may occur, overwinter, or forage.

The water quality changes discussed above have shown that the project will reduce phosphorus and nitrogen inputs to the pond, slightly, and this will therefore not result in any degradation to water quality, water clarity or increased occurrence of algal blooms. Given this, there will not be any negative impacts to fish living in the pond or migrating to the pond to use it for spawning.

Proposed Avery Pond Monitoring Program

Despite the above assurances that the project design has been improved to avoid any impacts to the pond, it would still be prudent, in our opinion, to establish a long-term water quality and aquatic habitat monitoring program at Avery Pond. This program should be started in 2022 to establish baseline conditions within the pond and then continued for a period of at least 5 years during the operation of the proposed Blue Water facility.

The annual data collection effort should include assessment of field measured water quality parameters including dissolved oxygen, pH, turbidity, salinity, and temperature as well as laboratory analysis for phosphorus, nitrogen and algal and zooplankton community composition and abundance. In addition, mapping of the rooted aquatic plant growth within the pond would be beneficial towards understanding its current condition and to establish whether non-native species already exist within the pond and to quickly identify any occurrences of these species in the future so that the Town can be alerted.

Work should be performed by a limnologist that can provide interpretation of the results in an annual report to the Town. Implementation of the recommended monitoring program will be beneficial to understanding the Avery Pond system.

Based on our analysis, along with the significant changes to the proposed project that have been made by the Blue Water team, the project as currently proposed will not have any negative impacts to Avery Pond.

If you have any questions, please contact me at cnielsen@trccompanies.com or 401-524-5108.

Thank you,
TRC



Carl Nielsen, CLM