

13 May 2010

Hill and Dale Property Owners, Inc.  
c/o Mr. David K. Gordon, Attorney at Law  
P.O. Box 411  
Carmel, New York 10512

Dear Mr. Gordon:

Princeton Hydro, LLC is pleased to submit this formal review of the New York State Department of Environmental Conservation's (NYS DEC's) Quality Assurance Protection Plan (QAPP) for collecting samples at Palmer Lake, Town of Kent, Putnam County, New York. As mentioned in the original Letter of Authorization dated 26 October 2009, the goal of this review is *"to determine if the proposed monitoring program is sufficient to identify the causes and symptoms of excessive nutrient loading in Palmer Lake"*. In addition, this review also provides recommendations on how to enhance the proposed monitoring program to better assess the causes / symptoms of excessive nutrient loading. It is also recognized that this assessment will be conducted through the use of the Total Maximum Daily Load (TMDL) approach, where the primary pollutant of concern is total phosphorus (TP).

Based on Princeton Hydro's review of the Palmer Lake QAPP, the following points and suggestions are being made:

1. While the sampling stations have been identified on a USGS map and included in the QAPP, it is recommended that the location of each sampling station is recorded with GPS. The stations can then be found during each sampling event with a hand held GPS unit and would ensure sampling location consistency. The coordinates of the sampling stations should be included in the final report.

**Princeton Hydro, LLC**

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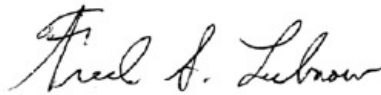
2. The sampling frequency (every two weeks from June 1 to October 1, 2010) and identified discrete parameters that will be monitored are satisfactory for the Palmer Lake monitoring program. However, it is recommended that a bottom water sample be collected at least for TP during each sampling event at the centroid and/or Palmer Lake Outlet station. On 3 September 2008 Princeton Hydro conducted a sampling event of Palmer Lake and at that time the bottom water TP concentration was 0.104 mg/L, which was over three times the surface water TP concentration of 0.028 mg/L. Thus, internal phosphorus loading could account for a substantial portion of the lake's annual TP load, particularly during a dry growing season. Bottom water samples should be collected for TP and the lake's internal phosphorus load should be accounted for in the TMDL-based analysis.
3. Typically, when Princeton Hydro submits a QAPP to US EPA or the States, we are required to collect a blank sample and at least one duplicate sample during each monitoring event. For clarification, at least one, possibly more, parameter will receive quality control sampling during each sampling event, correct? In other words, some type of water quality control samples will be collected during each of the nine monitoring events, correct? Also, since the pollutant of concern for the TMDL model is TP, it is recommended that quality control sampling be skewed to favor more samples being analyzed for TP.
4. The QAPP states that all samples for soluble reactive phosphorus (SRP) and chlorophyll *a* will be filtered in the laboratory. It is recommended that samples requiring filtering be filtered immediately, in the field, and then preserved prior to their transport / shipment to the laboratory.
5. The only biological indicator being sampled for in Palmer Lake is chlorophyll *a* (phytoplankton biomass). Since the type of algae in a lake can be as important as the total amount of biomass in assessing existing impairments, it is recommended that samples be collected for the identification of the dominant phytoplankton, down to the most practical taxon (typically genus). This would require the collection of additional water samples, preserved with Lugol's solution and taken to the laboratory for microbiological identification.
6. In addition, it is recommended that a visual assessment be conducted on the relative densities of aquatic macrophytes (plants and filamentous mat algae) in Palmer Lake during each sampling event. Dominant and nuisance species should be identified; the presence of any invasives species should also be documented. All macrophyte information can be recorded along with the rest of the field measurements.

7. While it is not known at this point the specific model that will be used to quantify the existing and targeted pollutant (TP) loads under the TMDL analysis, it is recommended that some discharge measurements be collected along Michael Brook during each monitoring event. Specifically, one upstream and one downstream monitoring station should be established along Michael Brook to collect discharge data of water entering and leaving Palmer Lake. Such data can be used to develop a ratings curve of discharge vs. staff gage height. In turn, such data can be calibrated to regional USGS discharge data to account for local conditions. The resulting information can be used to calculate hydrologic flows such as million gallons per day (MGD). The hydrologic flow data can then be combined with pollutant concentration data to calculate pollutant loads. Such empirically-based data would be extremely valuable in calibrating the water quality models that will be used to develop the TMDL.

In conclusion, the NYS DEC QAPP for Palmer Lake is satisfactory in collecting the required data to identify the potential causes and symptoms of excessive nutrient loading and hence possible water quality impairment. However, Princeton Hydro has provided a series of recommendations listed above to maximize the information gathered to conduct a thorough water quality assessment of the lake.

Thank you for your time and if you have questions on this review, please feel free to contact me at our Exton, PA office (610-524-4220).

Sincerely,

A handwritten signature in cursive script, reading "Fred S. Lubnow".

Fred S. Lubnow, Ph.D.  
Director of Aquatics Program