

Memorandum

To: Ms. Colleen Lyons, Lake Hopatcong Commission
From: Patrick Rose, Princeton Hydro
CC: Fred Lubnow, Ph.D., Princeton Hydro
RE: 29 August 2023 – Cyanotoxin Testing – Lake Hopatcong
Pages: Seven

Princeton Hydro conducted the second of two 2023 cyanobacteria / cyanotoxin testing events at Lake Hopatcong on 29 August 2023. The data collected as part of this effort are provided below.

Methodology

Princeton Hydro sampled at eight stations on 29 August 2023. Plankton grab samples were collected at each station, and the cyanobacteria community was identified to genus and densities were quantified as cells/mL. In addition, at each site samples were collected in glass vials and analyzed the same day for the cyanotoxins microcystins and anatoxin-a. The cyanotoxin analyses were performed utilizing Abraxis Algal Toxin Test Strip Kits and read with an Abraxis Field Meter. It should be noted that this analytical methodology is not NJ-State certified; however, the resulting data can be used for informational and management purposes. *In-situ* monitoring was also conducted at each station utilizing an In-Situ AquaTROLL 500 water quality meter which was calibrated prior to use; Princeton Hydro is State certified in its use of field meters (#10006). *In-situ* phycocyanin and chlorophyll-*a* concentrations were also measured at each station with Turner fluoroprobes. The monitoring program was modified in 2023 to concentrate on the assessment of cyanobacteria and cyanotoxins in near-shore areas, directly from the shoreline of the lake. Sampling from the shoreline of the beaches allows for the collection of samples in the immediate vicinity of where people are recreating in the water.

The eight sampling stations are listed below:

- Beach in Northern Jefferson (B1)
- CAPP Beach (B2)
- Witten Park in Byram Bay (B3)
- Northwest shoreline of Crescent Cove (B4)
- Mt. Arlington Municipal Beach (B5)
- Hopatcong State Park Beach – northern end (B6)
- Hopatcong State Park Beach – southern end (B7)
- Shore Hills Country Club (B8)

A figure with the sampling locations is provided at the end of the memo.



Results

The results of the sampling effort are listed in the following tables (Tables 1 through 5).

Table 1: Cyanotoxin Data

Station	Microcystin	Anatoxin-A
B1	Negative	Negative
B2	Negative	Negative
B3	Negative	Negative
B4	Negative	< 0.4 ppb
B5	Negative	Negative
B6	Negative	Negative
B7	Negative	Negative
B8	Negative	Negative

Table 2: In-situ Data

<i>In-Situ Data 8/29/23</i>							
Station	Depth (meters)		Temperature °C	Specific Conductance μS/cm	Dissolved Oxygen		pH S.U.
	Secchi	Total			mg/L	% Sat.	
B1	0.5+	0.5	23.65	0.344	8.14	99.1	7.38
B2	1.1+	1.1	23.94	0.412	8.39	102.9	7.52
B3	1.0+	1.0	24.25	0.433	8.43	103.8	7.50
B4	0.5+	0.5	23.95	0.538	10.10	123.8	7.91
B5	1.5+	1.5	23.51	0.441	8.39	101.8	7.71
B6	1.0+	1.0	25.36	0.444	8.97	113.1	7.58
B7	1.0+	1.0	25.59	0.444	8.48	107.2	7.54
B8	0.7+	0.7	24.49	0.458	7.79	96.3	7.48

Table 3: Observations

Station	Observations
B1	Cloudy yellow/brown water; abundant suspended particulates; no filamentous algae observed
B2	Clear water with a yellow hue; no filamentous algae or cyanobacteria accumulations
B3	Clear water with a yellow hue; no filamentous algae or cyanobacteria accumulations
B4	Filamentous algae and floating plant material observed; light film across the surface of the water
B5	Slight green hue; low amount of suspended particulates; no filamentous algae or cyanobacteria accumulations
B6	Clear water with a yellow hue; no filamentous algae or cyanobacteria accumulations
B7	Clear water with a yellow hue; no filamentous algae or cyanobacteria accumulations
B8	Clear water with a yellow/brown hue; no filamentous algae or cyanobacteria accumulations

Table 4: Phycocyanin and Chlorophyll *a* Concentrations

Station	Phycocyanin	Chlorophyll <i>a</i>
	ppb	ppb
B1	31	25
B2	14	4
B3	15	7
B4	26	17
B5	15	7
B6	13	9
B7	18	10
B8	16	8

Table 5: Plankton Data

Cyanobacteria Community Composition Analysis								
Sampling Location: Lake Hopatcong	Sampling Date: 8/29/23				Examination Date: 8/30/22			
Cyanophyta (Blue-Green Algae)	B1	B2	B3	B4	B5	B6	B7	B8
<i>Aphanizomenon</i>	14,181	9,936	4,494	4,272	5,660	5,823	7,153	6,093
<i>Chroococcus</i>							789	
<i>Coelosphaerium</i>		2,770					9,866	
<i>Cylindrospermopsis</i>	30,260	8,482	9,037	42,720	3,962	14,908	15,785	10,220
<i>Dolichospermum</i>	1,899	2,873	3,566	1,335	8,038	3,727	7,991	393
<i>Merismopedia</i>				7,690	2,717			1,258
<i>Microcystis</i>	7,120						1,973	983
<i>Planktothrix</i>			1,221	10,947				
<i>Pseudanabaena</i>		692				2,795	12,085	7,469
<i>Woronichinia</i>								
Total Cyanobacteria Cells/mL	53,459	24,753	18,318	66,963	20,377	27,254	55,642	26,416

Discussion

A total of ten cyanobacteria genera were identified in the near-shore samples (Table 5). Cyanobacteria densities were low to moderate throughout the lake, with no stations exceeding the 80,000 cells/mL threshold which would fall under the “Advisory” HAB Alert Level. Note, since these data were not developed by NJDEP, they can not be used for regulatory purposes. However, the data can be used for both educational and management purposes. Seven stations had cell counts that exceeded the 20,000 cells/mL threshold that represents a “Watch” HAB Alert Level.

Cyanobacteria cell counts decreased at seven stations relative to the July cyanotoxin sampling event; B1 was the only station with an increase, with a cell count of 53,359 cells/mL. Cyanobacteria cell counts ranged from a minimum of 18,318 cells/mL at B3 to a maximum of 66,963 cells/mL at B4. The dominant genus varied by station

and included *Cylindrospermopsis*, *Dolichospermum*, *Microcystis*, and *Aphanizomenon*. *Cylindrospermopsis* was not identified in any of the samples in July, but it was the most dominant genus identified on 29 August. This genus became prevalent in the lake during the intense bloom in Crescent Cove / River Styx in 2022 and appears to be present throughout the lake for a second consecutive year.

Phycocyanin concentrations also decreased significantly at seven stations on 29 August relative to the July cyanotoxin monitoring (Table 4). Similar to the cyanobacteria cell count at B1, the phycocyanin concentration increased 15% over the past month, with a current concentration of 31 ppb. Phycocyanin concentrations at all other stations varied from 13 ppb at B6 to 26 ppb at B4. Based on these results, cyanobacteria densities were low to moderate around the lake, with no significant blooms observed on 29 August.

Microcystins were negative at all stations, indicating that concentrations were absent or below the detection limit for these tests (Table 1). B4 was the only station that had a measurable concentration of anatoxin-a at <0.4 ppb. This anatoxin-a concentration is below the New Jersey Health Advisory Guidance levels. For reference, the threshold for anatoxin-a is 15.0 ppb. Please note that while microcystins and anatoxin-a are typically the two most common groups of cyanotoxins found in freshwater systems, they are only two groups. Other cyanotoxins that NJDEP has recommended thresholds for include cylindrospermopsin and saxitoxin. However, these other cyanotoxins tend to be rare in New Jersey lakes and reservoirs.

Photos of all the stations can be found at the end of this document. Water clarity was to the bottom of the lake at all shoreline stations (Table 2). Visual conditions were positive overall, with no accumulations of cyanobacteria observed at any of the stations (Table 3).

Please feel free to contact myself or Dr. Fred Lubnow with any questions or concerns.

Sincerely,

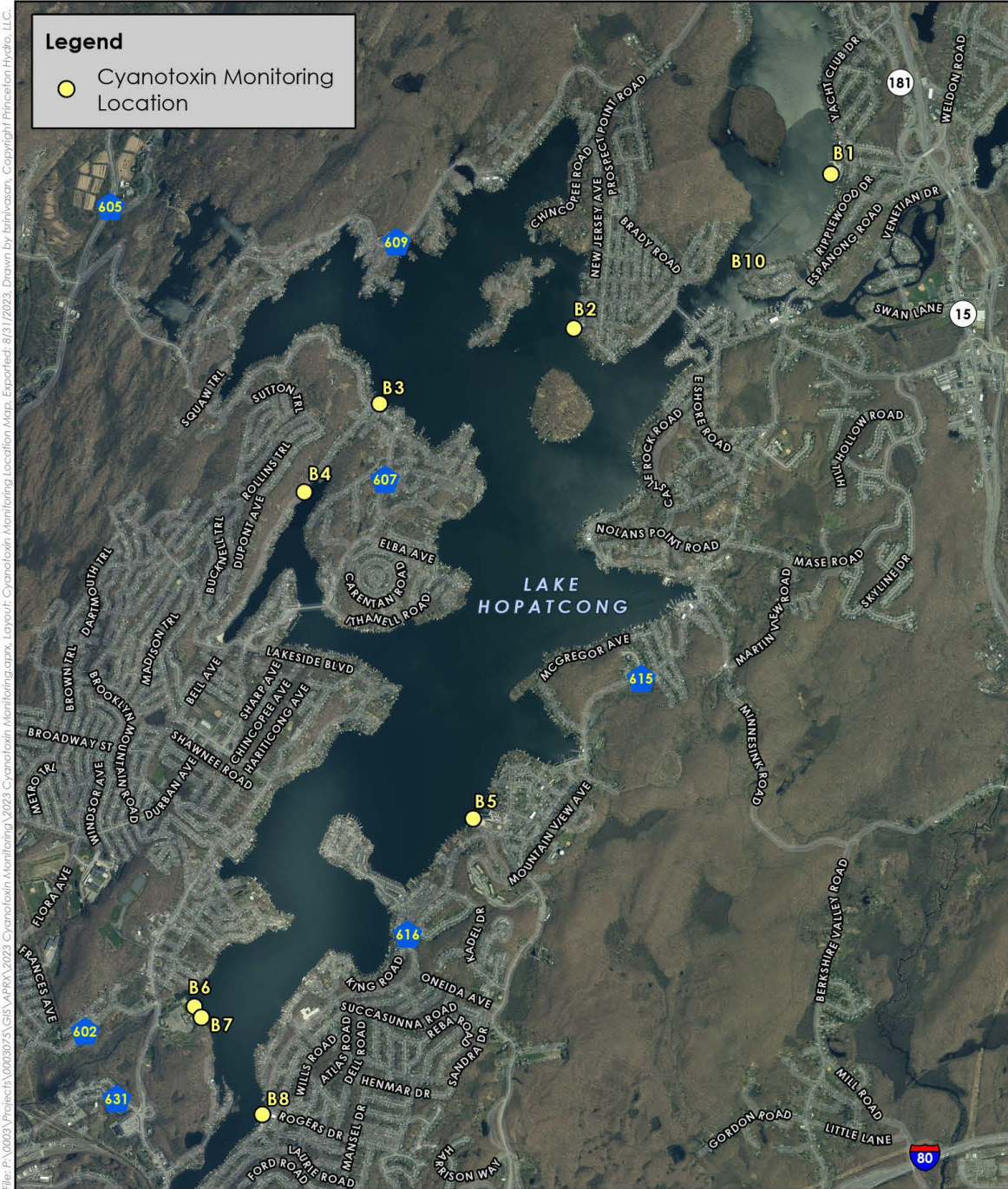
Patrick Rose



Project Manager

Princeton Hydro, LLC

Site Location Map



File: P:\0003\Projects\0003075\GIS\APRA\2023\Cyanotoxin Monitoring.aprx, Layout: Cyanotoxin Monitoring Location Map, Exported: 8/31/2023, Drawn by: Istinivasan, Copyright Princeton Hydro, LLC.

NOTES:
 1. Cyanotoxin monitoring locations are approximate.
 2. 2020 orthorectified imagery and roads obtained from the New Jersey Geographic Information Network.

0 1,500 3,000 Feet
 Spatial Reference: NAD 1983 2011 StatePlane New Jersey FIPS 2900 Ft US

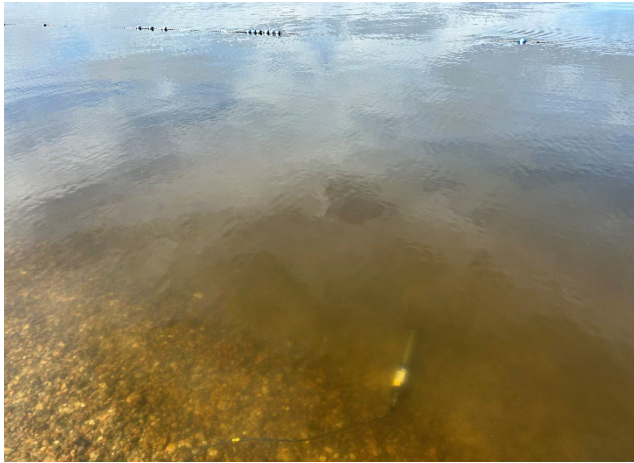
CYANOTOXIN MONITORING LOCATION MAP

LAKE HOPATCONG
 MORRIS AND SUSSEX COUNTIES
 NEW JERSEY



Photographs of Near-Shore Sampling Sites

B1



B2



B3



B4



B5



B6



B7



B8

