Mount Kemble Lake

2017 Year End Water Quality Summary

Mount Kemble Lake Association, Inc.
Morristown, NJ

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YEAR END SUMMARY
2017 WATER QUALITY PROGRAM
MOUNT KEMBLE LAKE

INTRODUCTION

The following report is the 2017 Year-End Summary of the Water Quality Monitoring and Lake Management Program for Mount Kemble Lake located in Morristown, Morris County, New Jersey. This report includes the details of lake surveys, water quality monitoring program, phytoplankton surveys, and observations logged during site visits in 2017. Recommendations for Mount Kemble Lake management efforts are also included for lake management strategies in the 2018 season. The Appendix of this report includes graphs and tables of the 2017 field data, reference guides, along with supporting documents for this report.

The 2017 Lake Management Program for Mount Kemble Lake focused on control of nuisance and invasive aquatic plant growth, most specifically curly-leaf pondweed (*Potamogeton crispus)*, leafy pondweed (*Potamogeton foliosus*), and southern naiad (*Najas guadalupensis*). Through the season a total of five (5) different aquatic macrophytes were observed during surveys of the lake (Table 1), with invasive species highlighted in red. One (1) of these species duckweed (*Lemna minor*) is a floating aquatic plant.

Scientific Name	Common Name
Potamogeton foliosus	Leafy Pondweed
Potamogeton crispus	Curly-leaf Pondweed
Lemna minor	Small Duckweed
Najas guadalupensis	Southern Naiad
Potamogeton diversifolius	Water-thread Pondweed

Table 1. 2017 Observed Aquatic Macrophytes.

WEATHER DISCUSSION

The year started off with a warmer than average winter. Spring included the warmest April on record, but the majority of the lake management season was close to average with a slight warm spell in September. The closer to average temperatures were helpful when it came to algae growth as there was much less than previous years. (Figure 1 Rutgers Climate Lab). Precipitation was a bit below average for the beginning of the year until May, which was the 9th wettest on record. The majority of the summer saw greater than average precipitation with a relatively dry September, which helped to spark some late season algae blooms. (Figure 2 Rutgers Climate Lab).

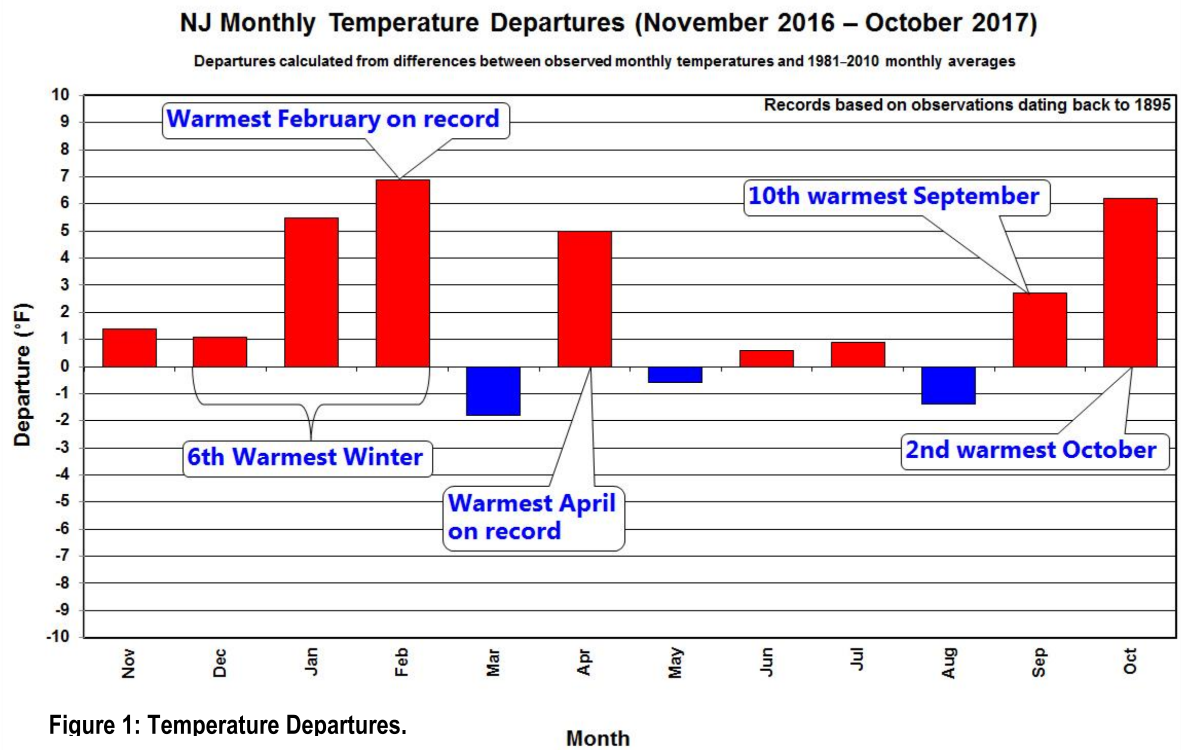


Figure 1: Temperature Departures.

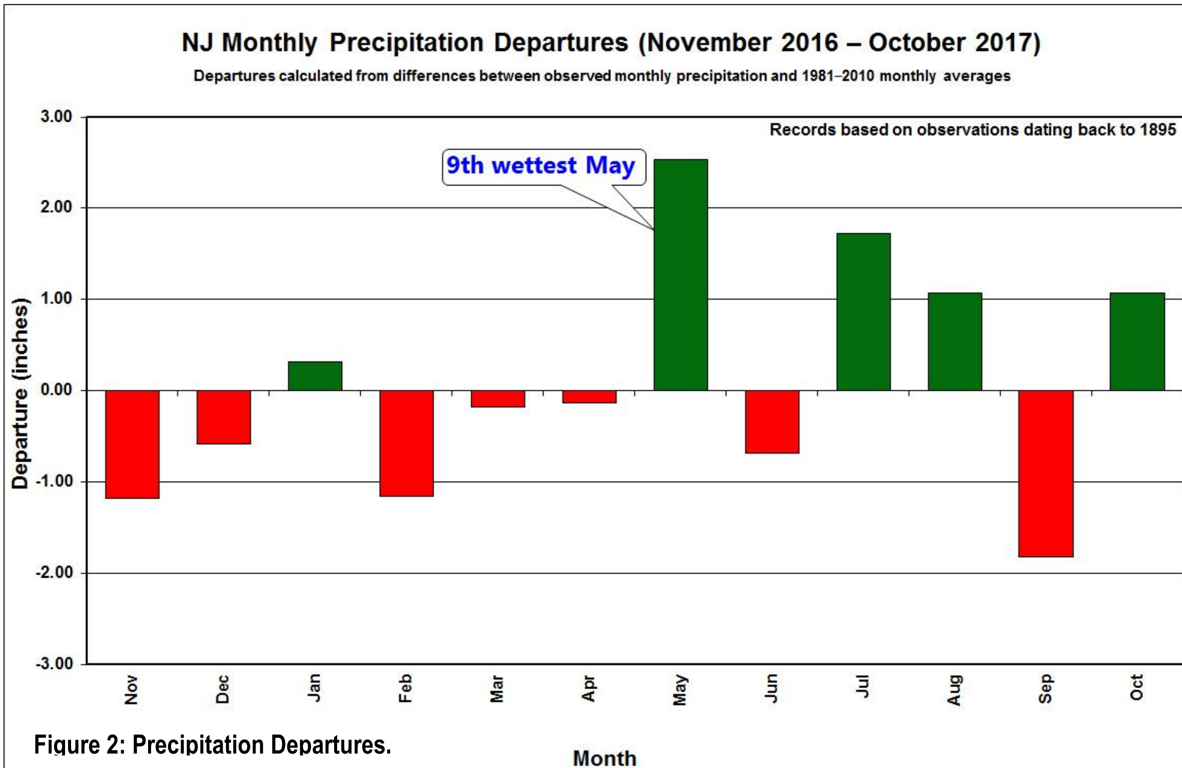


Figure 2: Precipitation Departures.

Lake Management

Aquatic biologists were at Mount Kemble Lake on seven (7) dates from April through September to conduct on-water assessments of aquatic vegetation and algae growth, and to perform *in situ* water quality analysis. On four (4) dates, comprehensive water quality analysis was conducted including, sampling for planktonic algae and zooplankton, lab sample collection and lake profile analysis for temperature and dissolved oxygen. Following each survey, biologists would review lake conditions to determine if management activity was required or requested. In 2017, on only two (2) dates SŌLitude Lake Management field staff conducted herbicide or algaecide applications for control of nuisance and invasive aquatic vegetation growth. The table below provides a reference to indicate dates of applications, what aquatic pesticides were applied, and the target acreage and aquatic plant species for each date (Table 2).

Date	Service Performed	Acres Treated	Target Species
7/14/2017	Copper Sulfate	6.7	Filamentous algae
	Tribune	6.7	*N. guadalupensis*
8/15/17	Copper Sulfate	6.7	Unicellular algae

Table 2: Mount Kemble Lake 2017 Treatment Log

The early season survey conducted at Mount Kemble Lake during April showed that the lake supported small patches of (*N. guadalupensis*) the northwestern shoreline. Overall, the lake looked good and only had minor amounts of filamentous algae that were observed floating on the surface. Curly-leaf pondweed (*P. crispus*) was not observed during this survey. On May 18th, the second survey of the season was conducted and at this time aquatic plant life was observed in similar densities as the first visit of the season. Only trace amounts of filamentous algae were observed floating on the surface, but it was not found in densities that required treatment.

The lake was visited again in early June and the survey indicated the amount of naiad growth remained similar to what was observed in the previous two visits. The amount of filamentous algae increased slightly since that last visit, but still was not at levels that needed treatment. On June 22nd the lake was visited again and the survey reported trace densities of curly-leaf pondweed along the east and west shorelines. Southern naiad was observed in moderate densities, but was far enough away from the surface that treatment was not necessary.

The first survey in July reported that the southern naiad growth had increased to relatively heavy densities and was located along portions of the eastern and western shorelines and primarily in the northern end of the lake. Sparse amounts of algae were also observed at this time and treatment for both the naiad and algae was completed using **Tribune** (diquat) and **Copper Sulfate**.

In mid- august, a lake survey indicated that the previous treatment was successful as plant growth was greatly reduced. The reduction in plants did however, lead to an increase in unicellular algae growth. **Copper Sulfate** was employed in order to control the algae growth as well as improve the water clarity. The last visit to the lake occurred in mid-September and the lake looked good at that time. Only minor amounts of filamentous algae were observed and plant growth was minimal.

Water Quality Monitoring Program

In 2017, the water quality monitoring program included *in-situ* field measured limnological analysis including temperature/dissolved oxygen profiles, pH, transparency, alkalinity, and total hardness. In addition, surface water chemistry samples were collected at the north inlet and lake station, as well as from the lake bottom at the lake station site, and transported to Alpha Laboratories (Mahwah, New Jersey) for analysis of the following parameters: ammonia, conductivity, nitrate, total phosphorus, and total suspended solids. On May 4th, samples for total phosphorous were also collected at the inlet and outlet in accordance with the New Jersey Total Maximum Daily Load (TMDL) threshold. Collection for phytoplankton and zooplankton identification and enumeration was also performed on three dates. Provided in the Appendix is a short description of each water quality parameter, and laboratory data results. Below is the water quality data tabulated to provide a seasonal reference.

Water Quality Data Tables

Mount Kemble Lake Water Quality Results – Inlet Station			
Parameter	**Units**	**5/4/2017**	**Limits**
Total Phosphorus	mg/L	0.005	0.03

Table 3. 2017 Mount Kemble Lake Water Quality Results

Results highlighted in red identify those that are outside the acceptable lake management limit.

Mount Kemble Lake Water Quality Results- North Station						
Parameter	**Units**	**5/4/2017**	**6/22/2017**	**7/20/2017**	**8/17/2017**	**Limits**
Temperature	°C	17.5	25.5	29.1	25.2	NA
Dissolved Oxygen	mg/L	10.06	8.12	8.74	9.41	<4.0
	SU	8.25	8.25	8.5	8.0	9
Alkalinity	mg/L	60	76	68	74	NA
Total Hardness	mg/L	140	120	180	160	NA
Secchi	feet	4.0	4.25	7.0	7.0	<4'
Ammonia	mg/l	0.024	0.061	0.054	0.54	0.3
Nitrate	mg/L	0.386	ND	ND	ND	0.3
Total Phosphorus	mg/L	0.021	0.035	0.027	0.069	0.03
Total Suspended Solids	mg/L	ND	ND	ND	ND	25
Conductivity	Umhos/cm	350	340	317	330	1500

Table 4. 2017 Mount Kemble Lake Water Quality Results

Results highlighted in red identify those that are outside the acceptable lake management limit.

Mount Kemble Lake Water Quality Results- Lake Station Surface						
Parameter	**Units**	**5/4/2017**	**6/22/2017**	**7/20/2017**	**8/17/2017**	**Limits**
Temperature	°C	16.1	26.3	30.1	25.0	NA
Dissolved Oxygen	mg/L	8.93	7.93	8.44	9.18	<4.0
ph	SU	7.25	8.25	8.50	8.0	9
Alkalinity	feet	80	80	76	80	NA
Total Hardness	mg/L	160	120	180	80	NA
Secchi	mg/L	3 est	3.75	5.0	3.5	<4'
Ammonia	mg/l	0.043	0.051	0.056	0.028	0.3
Nitrate	mg/L	0.471	ND	0.039	0.034	0.3
Total Phosphorus	mg/L	0.057	0.045	0.37	0.062	0.03
Total Suspended Solids	mg/L	ND	5.3	ND	ND	25
Conductivity	Umhos/cm	360	340	320	330	1500

Table 5. 2017 Mount Kemble Lake Water Quality Results

Results highlighted in red identify those that are outside the acceptable lake management limit.

Mt. Kemble Lake Water Quality Results–Lake Station-Bottom						
Parameter	**Units**	**5/4/2017**	**6/22/2017**	**7/20/2017**	**8/17/2017**	**Limits**
Dissolved Oxygen	mg/L	6.83	0.07	0.2	0.08	<4.0
Ammonia	mg/L	0.084	1.22	0.921	2.55	0.3
Nitrate	mg/L	0.416	ND	ND	ND	0.3
Total Phosphorus	mg/L	0.008	0.066	0.062	0.207	0.03
Total Suspended Solids	mg/L	ND	12	5.4	12	25
Conductivity	umhos/cm	340	370	340	380	1500

Table 6. 2017 Mount Kemble Lake Water Quality Results

Results highlighted in red identify those that are outside the acceptable lake management limit.

Mount Kemble Lake Water Quality Results – Outlet Station			
Parameter	**Units**	**5/4/2017**	**Limits**
Total Phosphorus	mg/L	0.022	0.03

Table 7. 2017 Mount Kemble Lake Water Quality Results

Results highlighted in red identify those that are outside the acceptable lake management limit.

Water Quality Results Summary

During 2017, the surface water temperature was 16.1° C in April, and by August the temperature had increased a great deal to 30.1 ˚C. The pH values collected from the inlet and lake station sites throughout the year were consistent with a small range of 7.25 to 8.5, which falls within the typical range for freshwater lake systems, and is within historical readings of the past several years for Mt. Kemble Lake. The hardness levels were not as stable as they have been in the past, ranging from 80 mg/L to 180 mg/L. The typical range characteristics to freshwater lakes are those falling between 4 and 200mg/L, which falls in line with typical readings for the lake.

The chemical composition of Mount Kemble Lake's surface water is considered moderately hard water. The alkalinity values remained consistent throughout the year from 60 to 80 mg/L, and within a comparable level compared to similar NJ freshwater lakes' chemical composition. Conductivity was consistent throughout the season with values ranging from 320 to 380 µmhos/cm., with the highest observed value obtained in the August bottom lake station location sample. These conductivity readings would be considered relatively stable as there was not much fluctuation throughout the season. Ammonia and nitrates are nutrients based on the chemical composition of nitrogen. These naturally occurring compounds when influenced by human activity can cause excessive plant and algae growth. Throughout the season, in most locations, ammonia levels were within the acceptable limits, but in 3 samples at the lake station bottom sampling site they were above acceptable limits, which is generally not typical for the lake. Although levels were higher than normal it did not seem to have adverse effects on the lake. Nitrates were found to be elevated in periodically throughout the season as the lake station sampling site reported 3 sampling events that were higher than normal values for nitrates. There were only 2 occasions of this in the other sites and the rest of the samplings all fell within the normal range.

Total phosphorus is usually present in freshwater lakes at low concentrations. Total phosphorus concentrations in a freshwater lake system should be less than 0.03 mg/L to prevent higher productivity. In 2017, the phosphorus levels were observed to be higher than the acceptable values in almost every sample taken throughout the year. The majority of these elevated samples were about double the acceptable limit, but the lake station July sample and the August bottom sample were many times the acceptable limit. When levels were elevated they were marginally above the typical values expected in a eutrophic lake system. Although these levels of phosphorus generally lead to excessive plant and algae growth, growth was relatively limited throughout the season.

Oligotrophic <0.012mg/L Very Good	Mesotrophic 0.012 - 0.024mg/L Good	Eutrophic 0.025 - 0.096mg/L Fair	Hypereutrophic >0.096mg/L Impoundments

Table 8: Trophic Status Based on Phosphorus Values

Transparency (water clarity) displayed moderate variability in 2017, with observed secchi readings between 3 and 7 feet. Mt. Kemble Lake typically supports lake conditions that favor relatively high water clarity readings, however, in 2017 clarity readings were lower than usual as the highest clarity reading was 7 feet and the majority of the season was between 4 and 5 feet. This is likely to do with the turbidity of the water. Often times survey reports stated that the water was tannic, which would lower the water clarity. An alum treatment was not conducted this season and could also have contributed to slightly lower water clarity readings.

Lake Profile Description

	5/4/2017		6/22/2017		7/20/2017		8/17/17	
Depth (m)	Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)	Temp. (°C)	DO (mg/L)
Surface	17.5	10.06	25.5	8.12	29.1	8.74	25.2	9.41
1	17.5	10.85	24.7	7.88	28.3	8.52	25.0	9.31
2	17.4	10.82	21.7	8.83	26.5	6.57	24.6	8.87
3	17.2	10.80	18.2	0.16	23.1	1.20	23.7	3.03
4	15.3	11.07	14.9	0.06	17.2	0.43	21.3	0.81
5	14.3	8.18	12.6	0.06	13.5	0.02	16.2	0.14
6	14.4	8.43	10.4	0.06	11.3	0.19	12.0	0.10
7	14.1	6.92	9.3	0.06	9.9	0.19	10.2	0.09
8	14.1	6.83	8.0	0.06	8.5	0.20	9.2	0.08
9	NA	NA	7.3	0.06	7.9	0.20	8.2	0.08

Table 9. Mount Kemble Lake Dissolved Oxygen Profiles.

The 2017 May profile revealed a well mixed water column, with favorable dissolved oxygen to a depth of twenty-four feet, which was similar to what was observed in the spring of 2016. During June, the lake profile revealed what is called a positive heterograde curve, which simply means that the water quality conditions of the lake depleted dissolved oxygen below a depth of approximately twelve feet, however during this season, the dissolved oxygen levels were extremely low at depths of only 6 feet. This type of water quality condition is observed most frequently in lakes where the surface area is small relative to the maximum depth and protected from intense wind action by surrounding topography and vegetation, which is descriptive of Mt. Kemble Lake. Overall, this pattern remained the same for the rest of the season as dissolved oxygen levels dropped significantly after 6 feet of depth. Complete profile graphs are provided in the Appendix of this report.

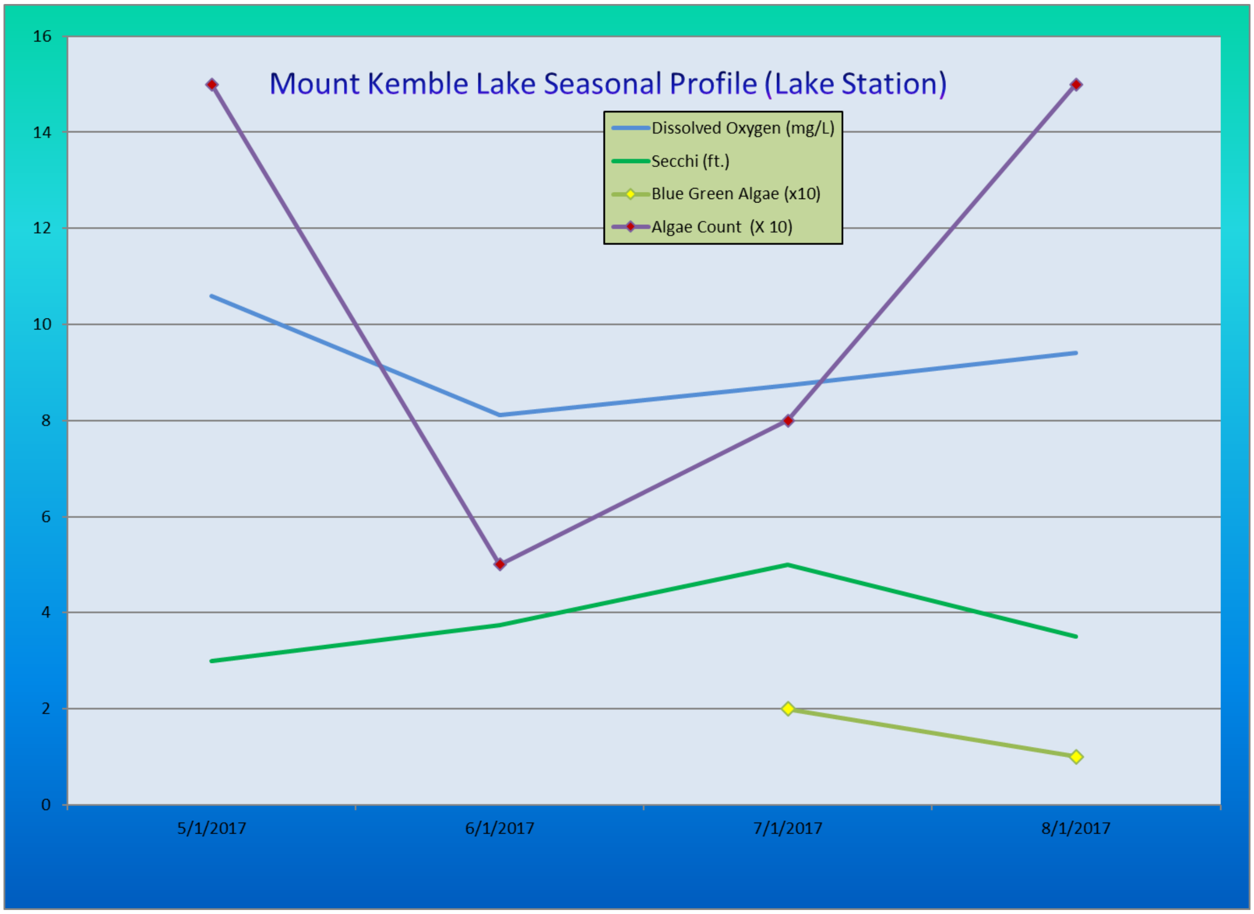


Figure 3. Mount Kemble Lake Seasonal Profile

Plankton Surveys

Phytoplankton and Zooplankton surveys were conducted at Mount Kemble Lake in conjunction with the water quality monitoring program. In 2017, surface phytoplankton samples were collected at two established water quality monitoring sites in May, June, July and August. Samples were collected in dedicated, pre-rinsed one liter plastic bottles and placed in a cooler with ice for transport. The samples were identified and enumerated under a compound microscope immediately upon return to SŌLitude Lake Managements's laboratory. The 2017 microscopic examination data sheets and graphs are provided in the Appendix. In 2017, a single vertical zooplankton tow was conducted at the lake station on each date. The collected sample was preserved in the field, and returned to SŌLitude's lab for analysis.

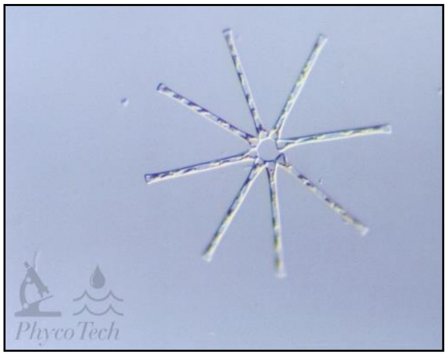
A Phytoplankton Primer

Lakes typically contain three broad categories of phytoplankton (also sometimes referred to as algae). These include filamentous phytoplankton, macroscopic multi-branched phytoplankton (which appear similar to submersed plants), and unicellular phytoplankton. Each category shall be discussed in turn, although the results of the 2017 sampling will focus on the unicellular phytoplankton population.

Filamentous phytoplankton are typically macroscopic (that is, visible with the naked eye), composed of long chains of cells that are attached to a substrate, typically the lake bottom, submersed or emergent vegetation, or rocks. This is called benthic filamentous algae (BFA), and rampant growth can become visible at the surface. As pieces of benthic filamentous algae break apart, it often floats on the surface as dense unsightly mats called floating filamentous algae (FFA). Typically, genera of green algae or blue-green algae develop into nuisance filamentous mats. Abundant nuisance growth of filamentous phytoplankton creates numerous negative impacts to a lake. These can include a decrease in aesthetics, a decrease in recreational uses, increased fishing frustration, and water quality degradation.

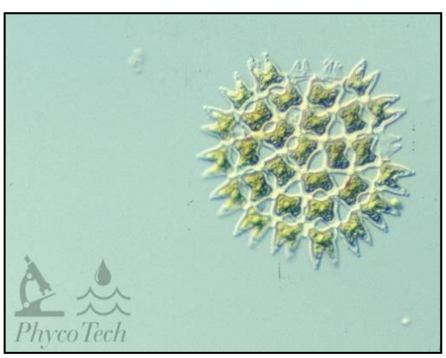
Macroscopic multi-branched phytoplankton appears to be submersed plants, especially when viewed in the water column. Physical examination reveals simple structures, no conductive tissue, and a lack of roots (instead having simplified rhizoids). Although typically only reaching heights of a few inches, under ideal conditions, this type of phytoplankton can reach lengths of several feet, and create a dense carpet on the bottom of a lake. Therefore, it typically does not reach nuisance levels in a lake, save for high use areas such as beaches and other popular swim areas. Since this phytoplankton occupies a similar ecological niche as submersed plants, it’s often included in detailed and visual aquatic plant surveys. It provides numerous benefits to a lake system, including sediment stabilization, acting as a nutrient sink, providing invertebrate and fish shelter and habitat, and is one of the first to re-colonize a disturbed area. In the Northeast, muskgrass (*Chara* sp.) and stonewort (*Nitella* sp.) are two of the most common macroscopic multi-branched phytoplankton.

Unicellular phytoplankton are typically microscopic, and consist of individual cells or colonies of cells suspended in the water column. At high enough densities (often called a bloom), they can impart a green or brown (and sometimes, even red) tint to the water column. Unicellular phytoplankton belongs to several taxonomic groups with density and diversity of these groups often varying due to seasonality. When unicellular phytoplankton density becomes elevated it can reduce water clarity (giving the water a “pea soup” appearance), and impart undesirable odors. Usually blue-green algae are responsible for these odors, but other groups or extremely elevated densities can impart them as well. In addition to decreased aesthetics, unicellular phytoplankton blooms can cause degradation of water quality, increase the water temperature (turbid water warms faster than clear water), and can possibly produce a variety of toxins (in the case of blue-green algae), depending on the type of genera present and environmental conditions. Numerous groups of unicellular phytoplankton are common in the Northeast, including diatoms, golden algae, green algae, blue-green algae, euglenoids and dinoflagellates. Each group shall be discussed in turn.

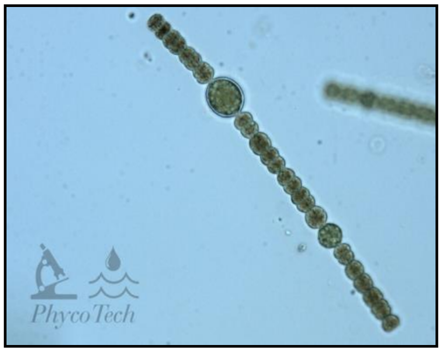


Diatoms are ubiquitous as a group, and often possess a rigid silica shell with ornate cell wall markings or etchings. The silica shells settle to the bottom substrate after they die, and under ideal conditions can become stratified. Limnologists can then study historical (and possibly even ancient) population characteristics of diatoms. Some are round and cylindrical (centric) in shape, while others are long and wing-shaped (pennales). They are usually brown in color, and reach maximum abundance in colder or acidic water. Therefore, they tend to dominate in winter and early spring. Common diatoms in the Northeast include *Fragilaria*, *Cyclotella*, *Navicula*, and *Asterionella* (pictured).

Golden Algae are typically yellow or light brown in color. Cell size is usually small oval shaped with a partially empty area, but several genera create colonies of smaller cells. Most have two flagella, and some type of scales or a rigid coating that grants it a fuzzy appearance. However, a few filamentous forms are possible as well. They typically prefer cooler water, so they dominate in the late fall, winter, or early spring. They also tend to bloom at deeper (cooler) depths. They are common in low nutrient water, and numerous forms produce taste and odor compounds. Common golden algae in the Northeast include *Dinobryon* (pictured), *Mallomonas*, and *Synura*.

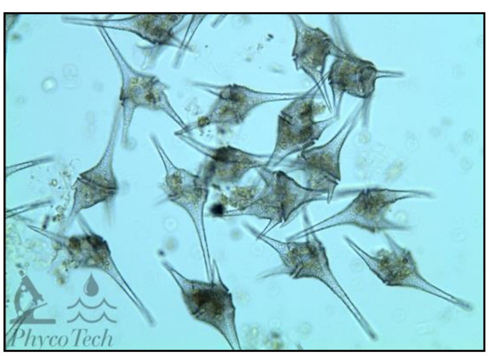


Green Algae are a very diverse group of unicellular phytoplankton. There is tremendous variability in this group which varies from family to family and sometimes even genus to genus. There are flagellated single cells, multi-cell colonies (some motile), filamentous forms and attached forms, typically with distinct cell shapes light green in color. Some prefer acidic waters, and others highly eutrophic (sewage) conditions. A green algae bloom usually occurs in water with high nitrogen levels. Green algae typically dominate in mid to late summer in the Northeast. Common genera include *Chlorella*, *Scenedesmus*, *Spirogyra* and *Pediastrum* (pictured).



Blue-green algae are actually photosynthetic bacteria. Therefore, they tend to be small, simple in structure and lacking interior cell details. Blue-green algae are typically encased in a mucilaginous outer layer. Some genera are adorned with heterocysts, swollen structures capable of fixing nitrogen, a competitive advantage. These types tend to bloom in nitrogen-poor or eutrophic systems. Yet, blue-green algae are tolerant of a wide variety of water chemistries, and boast many oligotrophic forms as well. Blue-green algae often have gas vesicles which provide increased buoyancy another competitive advantage over other groups of phytoplankton, due to their propensity to shade out others by blooming at the surface. Numerous blue-green algae are documented taste and odor (T&O) producers, and under certain environmental conditions and high enough densities, can produce toxins dangerous to fish, livestock, and possibly humans. Blue-green algae typically dominate a lake system in late summer to early fall. Common blue-green algae that occur in the Northeast include *Anabaena* (pictured), *Aphanizomenon, Microcystis* and *Coelosphaerium.*

Euglenoids are typically motile with 0 to 3 (typically 2) flagella, one of which is longer. Euglenoids has plasticity of shape, and usually are grass green in color (although sometime they are clear or even red). Most forms have a distinct red "eyespot. They are often associated with high organic content water, and eutrophic conditions. Common euglenoids that occur in the Northeast include *Euglena* (pictured), *Phacus,* and *Trachelomonas*.



Dinoflagellates are very common in marine environments, in which they often cause toxic blooms. However, toxin production in freshwater genera is very rare. Dinoflagellates are typically single ovoid to spherical cells, but large compared to phytoplankton from other groups. They usually possess two flagella (one wrapped around the middle of the cell) which grant them rotation while they move through the water column. Cellulose plates (armored dinoflagellates) are more common, but genera without cellulose plates (naked dinoflagellates) also occur. They generally prefer organic-rich or acidic waters, and can impart a coffee-like brown tint to the water at high enough densities. Common dinoflagellates in the Northeast include *Ceratium* (pictured) and *Peridinium*.

Phytoplankton Results

In May of 2017, the phytoplankton density was considered low, with a near even split between diatoms and golden algae accounting for the entire sample. Diversity was moderate at the inlet station with six (6) genera, and low at the lake station with three (3) total genera. The most commonly observed genera was *Synedra* as it accounted for more than half of the sample at the north inlet station. The lake station, however, was dominated by the golden algae, *dinobryon*. In the June sampling, both density and diversity remained relatively low as both locations reported low numbers. At the north station, a shift in the dominant algal group occurred as now the most commonly observed was green algae, with *Coelastrum* as the most commonly observed. The lake station sampling site was supporting primarily the euglenoid, *Euglena*.

Algal Group	**Inlet Station**			
% Abundance	**5/4/17**	**6/22/17**	**7/20/17**	**8/17/17**
Diatoms	**63.6%**	5.0%		5.9%
Golden Algae	18.2%			
Protozoa	18.2%			
Green Algae		**75.0%**	**100.0%**	5.9%
Blue-green Algae		20.0%		5.9%
Dinoflagellates				**82.3%**
Euglenoids				
Total Orgs / mL	**110**	**200**	**140**	**170**

Table 10. Inlet Station

For the July sampling event, the phytoplankton density remained relatively similar at both sites as did diversity as only five (5) and four (4) genera were found at each lake station respectively. At the north station, the entire sample consisted of green algae with *Staurastrum* being the most dominant genera. The lake station supported an even number of genera from the green algae, blue-green algae, and dinoflagellate groups. Sampling in August saw similar densities as the rest of the year and at the time of sampling there was also a decrease in diversity. Both locations had supported primarily dinoflagellates, with *Peridinium* accounting for nearly all of both samples.

Algal Group				
% Abundance	**5/4/17**	**6/22/17**	**7/20/17**	**8/17/17**
Diatoms	26.6%	40.0%		
Golden Algae	**73.4%**			
Protozoa				
Green Algae			**50.0%**	6.7%
Blue-green Algae			25.0%	6.7%
Dinoflagellates			25.0%	**86.6%**
Euglenoids		**60.0%**		
Total Orgs. / mL	**150**	**50**	**80**	**150**

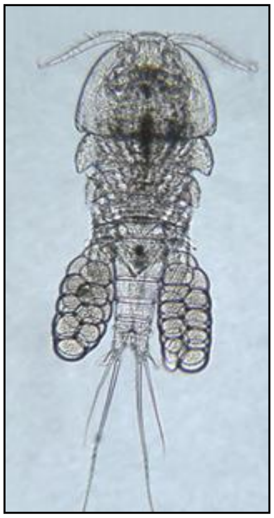
Table 11. Lake Station

A Zooplankton Primer

Zooplankton provides an important link in a typical lake's food web between phytoplankton and developing/juvenile stages of fish. In general, zooplankton feed on phytoplankton, while fish in turn feed on zooplankton. The rate of phytoplankton feeding efficiency is primarily based on body size, but zooplankton group, and to some effect specific genera, also plays an important role. There are three main groups of zooplankton found in freshwater systems: rotifers, cladocera, and copepods.

Rotifers are a diverse group of zooplankton, very common in lakes and marine environments alike. Rotifers are generally the smallest zooplankton of the three groups, and thus typically the least efficient phytoplankton grazers. Feeding preferences are determined primarily by mouth structures, and include generalist feeders (omnivores), which eat any small organic detritus encountered, and predators, which eat other smaller rotifers and small phytoplankton. Generalist feeders include *Filinia, Keratella, Lecane, Euchlanis*, and *Brachionus*. Predator genera include *Polyarthra* (larger species), *Asplanchna*, *Synchaeta*, and *Trichocerca*.

Cladocera are less diverse, but also very common in freshwater lakes. They are sometimes called "water fleas". They spend most of their lifecycle reproducing via parthenogenesis (asexual reproduction with an all female population) only switching to less efficient sexual reproduction when environmental conditions decline. Some genera (such as *Daphnia*) can be quite large (up to 5.0 mm long, visible without magnification), and thus can be classified as highly efficient phytoplankton grazers. Most cladocera are phytoplankton grazers, although their diet includes most organic matter ingested, including bacteria and protozoa. Body size (and thus mouth size) determines feeding efficiency, but ironically the larger-bodied genera are easier to see by predaceous fish, and thus typically have reduced numbers in populations of zooplanktivorous fish. *Daphnia* are the most efficient phytoplankton feeders, while *Ceriodaphnia*, *Bosmina* and *Eubosmina* are less efficient. There are a few predator genera as well, including *Polyphemus* and *Leptodora*.



Copepods are almost excusive to freshwater lake systems (not streams or rivers) and estuarine and marine systems. Of the six suborders native to the United States, three are parasitic, and three are free living. One of the free living, *Harpacticoida* are exclusively benthic and thus often not collected in traditional plankton tows (unless the bottom sediments are disturbed). The remaining two suborders, the Calanoida and the Cyclopoida are of primary concern during lake studies. All copepods have several naupilar stages, followed by several immature stages, before reaching an adult stage. Both suborder adults are considered large bodied zooplankton, but have distinct feeding preferences. Calanoids are almost exclusively phytoplankton feeders and have even demonstrated selective feeding strategies. Cyclopoids have mouth parts suitable for biting and seizing prey. Their diet is primarily other crustacean zooplankton (including cannibalism on younger life stages), as well as phytoplankton and organic detritus ingestion, but less efficiently.

Zooplankton samples were collected with an 80 um Nitex plankton net. At the Lake Station, a single vertical tow was performed to a depth of 18 feet. Using as little site water as possible, the sides of the net were rinsed of any trapped zooplankton, concentrating the organisms into the net bottom. This concentrate was then emptied into a clean 1000 mL HDPE sample bottle. Immediately after collection, the sample was preserved with an equal amount of 10% sucrose formalin, to achieve a 5% solution. Sucrose was added to the preservative to help maintain carapace integrity. The samples were then placed in a cooler stocked with blue ice. On arrival at SŌLitude's laboratory, the samples were stored in a dark refrigerator until the samples were identified and enumerated.

In the laboratory, each sample was manually mixed for about one minute, before a one mL subsample was removed using a calibrated syringe. The subsample was placed on a Sedgewick-Rafter counting cell, and examined under a compound microscope at 100X magnification. By using calibrated guides on the microscope stage, the entire one mL sample was examined, and any zooplankton were identified and enumerated to the lowest practical taxa using regionally appropriate taxonomic keys. This procedure was repeated two more times to generate three replicate counts. The counts were then averaged, and back-calculated to achieve an organism per liter density. The zooplankton count data sheets in the Appendix describe the step by step procedures for all three replicates, and the final averaged densities. Also, included in the Appendix are pie charts depicting the sample date zooplankton group distribution.

2017 Zooplankton Results

Zooplankton Group	5/4/2017	6/22/2017	7/20/17	8/17/2017
Rotifers	**90.1%**	**53.2%**	**97.2%**	**87.1%**
Cladocera	0.0%	40.7%	1.6%	4.1%
Copepoda	9.9%	6.1%	1.2%	8.8%
Total Zooplankton (Orgs. / mL)	1376	1429	1197	1051

Table 12. Mount Kemble Lake 2017 Zooplankton Group Percent Abundance Distribution

In May, overall zooplankton density was 1376 organisms per mililiter, which is considered high, but sample diversity was moderate to high with seven (7) different genera observed. At this time Rotifers accounted for nearly all off the total sample at 90.1 percent of the total zooplankton community with *Polyartha* being the most abundant genera. Additionally, no Cladocerans were observed, however (*Cyclopoid nauplii*) was also represented in the zooplankton community, however this genera only represented 9.9 percent of the total sample.

The June sampling revealed a high density of zooplankton as there were 1429 organisms per mililiter. Once again Rotifers were the most commonly found, but only accounted for at little more than half of the total sample at 53.2 percent of the total with the genera *Polyarthra* being the most commonly found within the group. At this time zooplankton diversity is considered high as only a total of thirteen (13) different genera were found in the sample. *Bosmina* was the most commonly observed Cladoceran as they accounted for 40.7% of the total sample. The *Copepoda*, (*Cyclopoid nauplii*) was found in this sample and was the most dominant copepod, but the copepods only accounted for a total of 6.1 percent of the zooplankton observed.

A sampling date on July 20th showed that the zooplankton composition was still considered high as ten (10) different genera were found at that time, however, the decreased to be 1197 organisms per milliliter were found. Rotifers made of 97.2 percent of the zooplankton composition with *Keratella* being the most abundant in the sample. *Cyclopoid nauplii* made up 1.2 percent of the sample and the Cladoceran, *Bosmina* was found in very low numbers in this sample and made up less than 1% of the total sample.

The final sampling revealed a still high density of zooplankton as there were 1051 organisms per mililiter. Once again Rotifers were the most commonly found, accounting for a large portion of the total sample as it the sample was comprised of 87.1 percent of the total with the genera *Polyarthra* being the most commonly found within the group. At this time zooplankton diversity is considered high as only a total of twelve (12) different genera were found in the sample. *Bosmina* was the most commonly observed Cladoceran as it was the only genera observed and accounted for 4.1% of the total sample. The *Copepoda*, (*Cyclopoid nauplii*) was found in this sample and was the most dominant copepod. Copepoda only accounted for 8.8% of the total observed sample.

Discussion

The 2018 management program of Mount Kemble Lake will continue to focus on the control of nuisance densities of plant and algae growth. The target aquatic macrophyte species observed at Mount Kemble Lake in 2017, southern naiad (*N. guadalupensis*). It is recommended that localized applications of the contact aquatic herbicide **Reward/Tribune** continue to be utilized through the season for its ability to selectively control nuisance submerged vegetation by rapid absorption into the target plant. Throughout the 2017 lake management season, the appearance of curly-leaf pondweed was minimal, as only throughout the seasons surveys trace amounts were observed in very few locations. In addition, it is beneficial to allow certain amounts of plants to persist in the lake to provide dissolved oxygen, fish habitat, and compete for nutrients required for nuisance plant and algae development. The growth of leafy pondweed and southern naiad should be encouraged in areas of the lake, such as the northern inlet, where they are not interrupting recreational activities or reducing the aesthetic appeal of the lake.

Copper sulfate will continue to provide the most cost effective and cost efficient management method for controlling nuisance density filamentous and planktonic algae growth. It should be reminded that **Copper Sulfate** has acknowledged negative impacts on zooplankton populations, with localized targeted applications recommended for only nuisance growth of filamentous algae, and limited use on planktonic algae blooms only at times when water clarity is significantly impaired. Numerous other copper and non-copper based algaecides are available and at the request of the Association, SŌLitude Lake Management would be happy to discuss these alternatives.

The management program for 2018 is anticipated to be similar to the 2017 monitoring program, which included at least once per month lake surveys, including lake-wide assessment of the submersed aquatic plant community. Throughout the season the increase monitoring led to more properly timed herbicide applications and the end result was a reduction in the amount of treatment work that needed to be done on the lake overall. In 2017, an alum treatment was not performed and water clarity readings were lower than they have been in the past making it something to consider once again in the 2018 season.

A more intensive management effort for the inlet pond will also be evaluated for 2018, including a possible nutrient mitigation application to reduce phosphorous introduction into Mt. Kemble Lake. During the season two herbicide/algicide applications were made in an effort to reduce that amount of plant and algae growth that was being introduced into the lake. A more elaborate program can be discussed at the request of MKLA.

The current Mount Kemble Lake Water Quality Monitoring Program is well-designed, and provides suitable water quality data allowing for proactive management of the lakes' environment and reduces the opportunity for the development of problematic situations. It is important to continue water quality monitoring on a regular yearly basis over the long-term to build a baseline data record which will assist biologists in developing more quantitative analysis for greatest possible management procedures. In 2017 an additional water quality sampling date was added, which has been able to provide more data of how the lake changes throughout the season, which in turn is beneficial for managing the lake.

SŌLitude Lake Management appreciates the opportunity to be of service to the Mount Kemble Lake Association and looks forward to assisting the Association on the stewardship of Mount Kemble Lake in the 2018 lake management season.

Sincerely,

Carl Cummins

Carl Cummins
Environmental Scientist

SŌLITUDE
LAKE MANAGEMENT

APPENDIX

Appendix A: Water Quality Parameter Descriptions

Temperature

Temperature is measured in degrees Celsius, and is very important to aquatic biota. Several factors affect temperature in a lake system, including air temperature, season, wind, water flow through the system, and shade trees. Turbidity can also increase water temperature as suspended particles absorb sun rays more efficiently. Water depth also affects temperature. In general, deeper water remains cooler during the summer months.

Temperature preferences vary among aquatic biota. Since water temperature typically varies between 5 ºC and 30 ºC during the season, most aquatic biota can flourish under this wide range of temperatures. Of more concern is thermal shock, which occurs when temperature rapidly changes in a short amount of time. Some aquatic biota can become stressed when temperature changes as little as 1-2 ºC in a 24 hour period.

Dissolved Oxygen

Dissolved Oxygen is the measurement of the amount of oxygen freely available to aquatic biota in water. Several factors play a role in affecting the amount of dissolved oxygen in the water. These factors include temperature (warmer water holds less dissolved oxygen), low atmospheric pressure (such as higher altitude) decreases the solubility of oxygen, mineral content of the water can reduce the water's dissolved oxygen capacity, and water mixing (via wind, flow over rocks, or thermal upwelling) increases dissolved oxygen in the water. In addition, an over abundance of organic matter, such as dead algae or plants causes rapid aerobic bacteria growth. During this growth, bacteria consume oxygen during respiration, which can cause the water's dissolved oxygen to decrease.

Dissolved oxygen has a wide range, from 0 mg/L to 20 mg/L. To support diverse aquatic biota, 5-6 mg/L is minimally required, but 9-10 mg/L is an indicator of better overall water quality. Dissolved oxygen reading of below 4 mg/L is stressful to most aquatic organisms, especially fish.

Water Clarity

Transparency (or visibility) is measured with a Secchi disc, and can provide an experienced biologist with a quick determination of a lake's water quality. In short, higher visibility indicates a cleaner (and healthier) aquatic system. Cloudy conditions could indicate nutrient rich sediments entering the lake or excessive algal blooms due to nutrient availability, leading to a degradation of water quality.
Clear conditions allow greater light penetration and the establishment of a deeper photic zone. The photic zone is the depth of active photosynthesis carried out by plants and algae. A byproduct of photosynthesis is dissolved oxygen, required for use by higher aquatic organisms, such as zooplankton and fish.

Total Hardness

Hardness is a measure of dissolved salts in the water, usually calcium, but also magnesium and iron. Hardness is usually influenced by the rock and soil types of the watershed, and the amount of runoff over these surfaces. Hardness can be measured for only calcium content (Hardness (Ca)), or for all three salts, called Total Hardness. Water with Hardness (Ca) less than 10 mg/L can only support sparse aquatic biota. Freshwater typically has a Hardness (Ca) level from 4 to 100 mg/L. In general, the degree of total hardness can be classified according to the table to the right.

Alkalinity

Alkalinity is the measure of the water's capacity to neutralize acids. A higher alkalinity can buffer the water against rapid pH changes, which in turn prevents undue stress on aquatic biota due to fluctuating pH levels. The alkalinity of a lake is primarily a function of the watersheds soil and rock composition. Limestone, dolomite and calcite are all a source of alkalinity. High levels of precipitation in a short amount of time can decrease the waters alkalinity. A typical freshwater lake has an alkalinity of 20-200 mg/L. A lake with a low alkalinity typically also has a low pH, which can limit the diversity of aquatic biota.

pH

The measurement of acidity or alkalinity of the water is called pH (the "potential for hydrogen"). Several factors can impact the pH of a lake, including precipitation in a short amount of time, rock and soil composition of the watershed, algal blooms (increase the pH), and aquatic plant decomposition (decreases the pH). A pH level of 6.5 to 7.5 is considered excellent, but most lake systems fall in the range of 6.0 to 8.5. Aquatic biota can become stressed if the pH drops below 6.0, or increases above 8.5 for an extended amount of time.

Most aquatic biota are adapted to specific pH ranges. When the pH fluctuates rapidly, it can cause changes in aquatic biota diversity. Immature stages of aquatic insects and juvenile fish are more sensitive to low pH values than their adult counterparts. Therefore, a low pH can actually inhibit the hatch rate and early development of these organisms.

Conductivity

Conductivity is the measure of water's ability to conduct an electrical current, and is measured in umhos/cm, the higher the number of charged particles(ions) in the water, the easier for electricity to pass through it. Conductivity is useful in lake management by estimating the dissolved ionic matter in the water, the lower the conductivity, the higher the quality of water (oligotrophic). A higher conductivity usually indicates an abundance of plant nutrients (total phosphorous and nitrate), or eutrophic conditions. Industrial discharge, road salt runoff, and septic tank leaching can increase conductivity. Distilled water has a conductivity of 0.5 to 2.0 umhos/cm, while drinking water conductivity typically ranges from 50to 1,500 umhos/cm. Conductivity below 500 umhos/cm is considered ideal in a lake system.

Nitrate

Nitrates are chemical compounds derived from nitrogen and oxygen. Nitrogen is needed by all plants and animals to make proteins needed for growth and reproduction. Nitrates are generated during plant and animal decomposition, from man-made sources, and from livestock and waterfowl sources. Man-made sources of nitrates include septic system leaching, fertilizer runoff, and improperly treated wastewater. Freshwater lake systems can potentially receive large nitrate inputs from waterfowl, specifically large flocks of Canada geese. An increase in nitrate levels can in turn cause an increase in total phosphorous levels. A nitrate level greater than 0.3 mg/L can promote excessive growth of aquatic plants and algae.

Total Phosphorous

Total phosphorous is a chemical compound derived from phosphorous and oxygen. Total phosphorous is usually present in freshwater in low concentrations, and is often the limiting nutrient to aquatic plant growth. However, man-made sources of phosphorous include septic system leaching, fertilizer runoff, and improperly treated wastewater. These phosphorous inputs usually enter a freshwater lake system during rain events, and bank erosion.

A total phosphorous level greater than 0.03 mg/L can promote excessive aquatic plant growth and decomposition, either in the form of algal blooms, or nuisance quantities of aquatic plants. This process is called eutrophication, and when induced or sped up by man-made nutrient inputs, it is called cultural eutrophication. As a result of this excessive growth, recreational activities, such as swimming, boating, and fishing in the lake can be negatively impacted. In addition, aerobic bacteria will thrive under these conditions, causing a decrease in dissolved oxygen levels which can negatively impact aquatic biota such as fish.

Total Suspended Solids

Total suspended solids refer to all of the particulate matter suspended in the water column. When these solids settle to the bottom of a water body (a process called siltation), they become sediments. There are two components that make up total suspended solids: inorganic and organic. The inorganic portion is usually considerably higher than the organic portion and includes silts, clays, and soils. Organic solids include algae, zooplankton, bacteria and organic debris. All these solids create turbid (or "muddy") conditions. The geology and vegetation of a watershed affect the amount of suspended solids that enter a lake system. Most suspended solids originate from accelerated soil erosion from agricultural operations, logging activities, and construction activities. Another source is the disturbance of bottom sediments from dredging activities, grazing of bottom feeding fish, and recreational activities such as boating.

Ammonia

Ammonia is a type of nitrogen compound used by plants and algae to support growth. Ammonia content in a body of water is influenced by decaying plants and animals, animal waste, industrial waste effluent, agricultural runoff, and atmospheric nitrogen gas transfer. A concentration exceeding 0.30 mg/L can promote excessive plant and algae growth. Elevated ammonia levels can increase nitrification, which in turn depletes the oxygen content of water. Extremely high ammonia levels can be toxic to aquatic biota (such as fish).

APPENDIX B: AQUATIC MACROPHYTE GUIDE

Small Duckweed (*Lemna minor*. Common Names: Small duckweed, water lentil, lesser duckweed. **Native.**). Small duckweed is a free floating plant, with round to oval-shaped leaf bodies typically referred to as fronds. The fronds are small (typically less than 0.5 cm in diameter), and it can occur in large densities that can create a dense mat on the water's surface. Each frond contains three faint nerves, a single root (a characteristic used to distinguish it from other duckweeds), and no stem. Although it can produce flowers, it usually reproduces via budding at at a tremendous rate. Its population can double in three to five days. Since it is free floating, it drifts with the wind or water current, and is often found intermixed with other duckweeds. Since it's not attached to the sediment, it derives nutrients directly from the water, and is often associated with eutrophic conditions. It over winters by producing turions late in the season. Small duckweed is extremely nutritious and can provide up to 90% of the dietary needs for waterfowl. It's also consumed by muskrat, beaver and fish, and dense mats of duckweed can actually inhibit mosquito breeding.

Curly-leaf Pondweed (*Potamogeton crispus*. Common Name: curly-leaf pondweed. **Invasive.**): Curly-leaf pondweed has spaghetti-like stems that often reach the surface by mid-June. Its submersed leaves are oblong, and attached directly to the stem in an alternate pattern. The margins of the leaves are wavy and finely serrated, hence its name. No floating leaves are produced. Curly-leaf pondweed can tolerate turbid water conditions better than most other macrophytes. In late summer, Curly-leaf pondweed enters its summer dormancy stage. It naturally dies off (often creating a sudden loss of habitat and releasing nutrients into the water to fuel algae growth) and produces vegetative buds called turions. These turions germinate when the water gets cooler in the autumn and give way to a winter growth form that allows it to thrive under ice and snow cover, providing habitat for fish and invertebrates.

Leafy Pondweed (*Potamogeton foliosus*: Common Name: leafy pondweed. **Native**.): Leafy pondweed has freely branched stems that hold slender submersed leaves that become slightly more narrow as they approach the stem. The leaf contains 3-5 veins and often tapers to a point. No floating leaves are produced. It produces early season fruits in tight clusters on short stalks in the leaf axils. These early season fruits are often the first grazed upon by waterfowl during the season. Muskrat, beaver, deer and even moose also graze on the fruit. It inhabits a wide range of habitats, but usually prefers shallow water. It has a high tolerance for eutrophic conditions, allowing it to even colonize secondary water treatment ponds.

Southern Naiad (*Najas guadalupensis*. Common Names: Southern water nymph, bushy pondweed. **Native**.): Southern naiad is an annual aquatic plant that can form dense stands of rooted vegetation. Its ribbon-like leaves are dark-green to greenish-purple, and are wider and less pointed than slender naiad. Flowers occur at the base of the leaves, but are so small, they usually require magnification to detect. Southern naiad is widely distributed, but is less common than slender naiad in northern zones. Southern naiad reproduces by seeds and fragmentation.

Water-thread Pondweed (*Potamogeton diversifolius*. Common Names: Water-thread pondweed, variable-leaf pondweed, snailseed pondweed. **Native**.): Variable-leaf pondweed have freely-branched stems emerging from slender rhizomes. The submersed leaves are narrow and linear with one obvious midvein bordered by a row of hollow cells. The floating leaves are shaped like an ellipse, but are usually less than 4 cm long, Variable-leaf pondweed fruit spikes are produced in two distinct forms. It occurs in lakes, ponds, rivers and streams and prefers soft sediment and water less than 2 meters deep. Waterfowl graze on the fruit, and local fauna often graze on the stems and leaves.

APPENDIX D: PHYTOPLANKTON ENUMERATION CHARTS

MICROSCOPIC EXAMINATION OF WATER

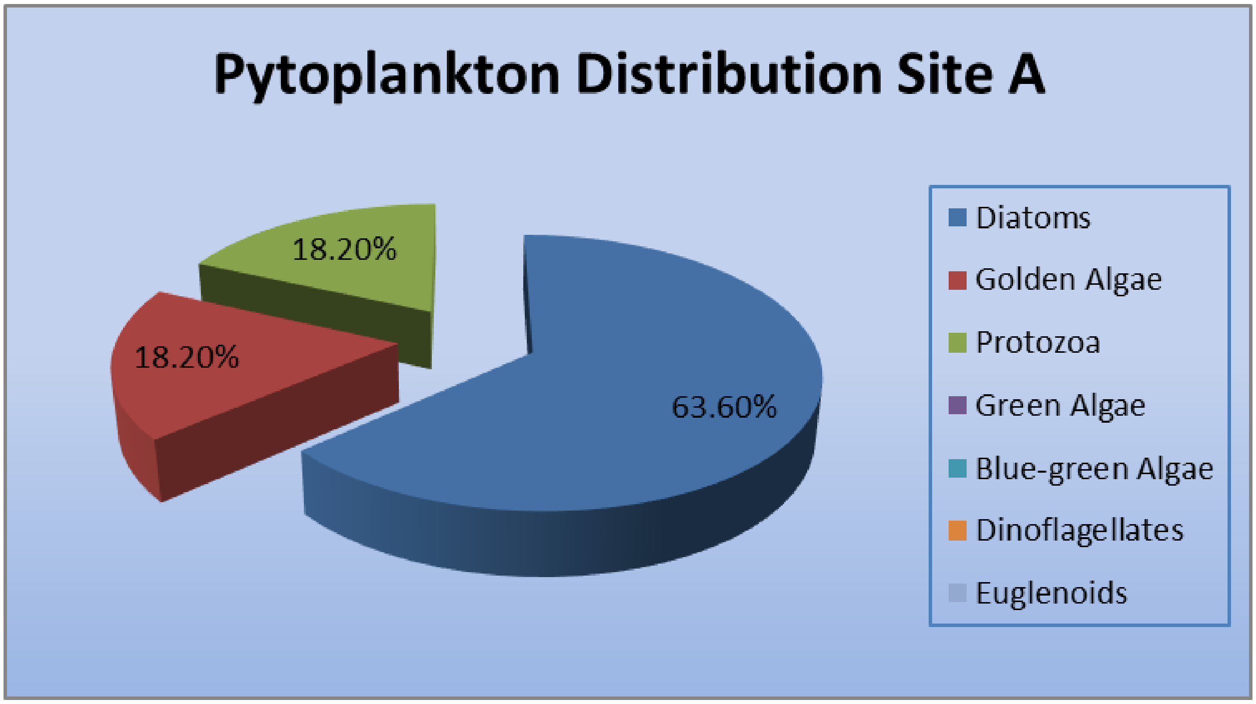
Sample from: Mt. Kemble Lake

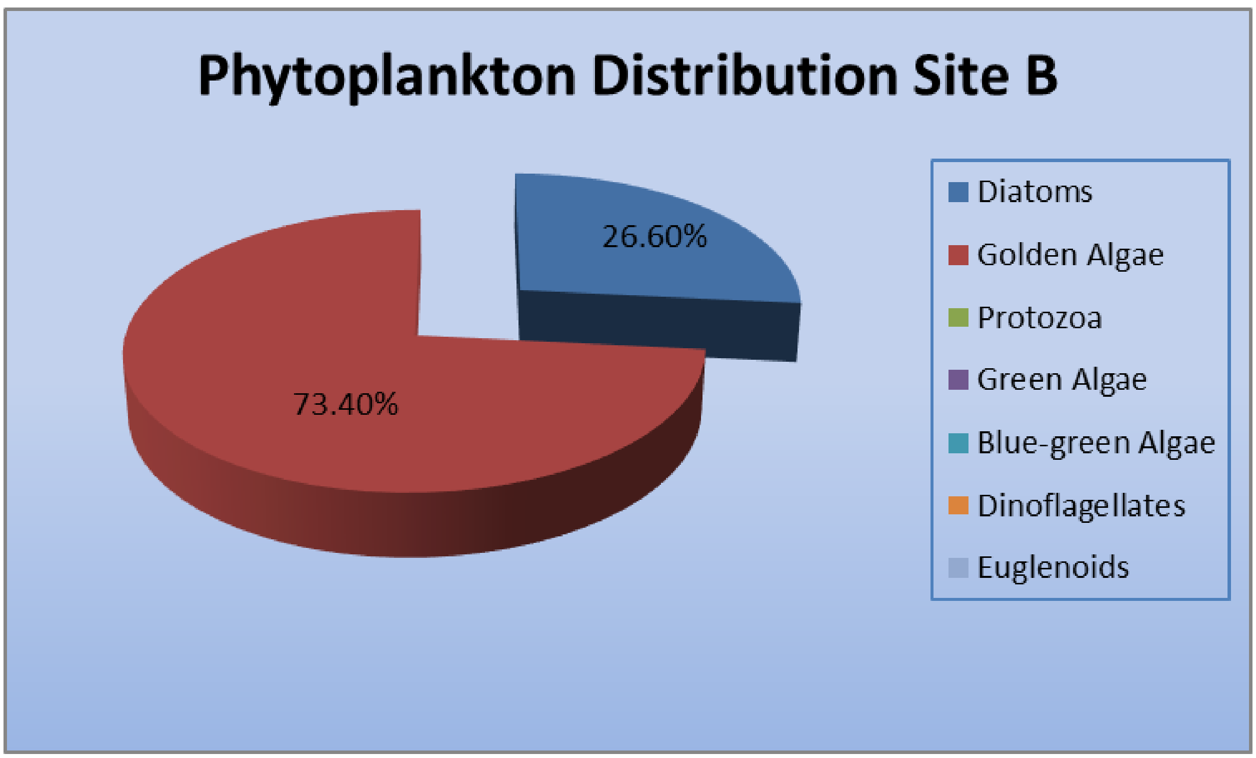
Collection Date: 5/4/17	Examination Date: 5/5/17	Amount Examined: 200 ml.
Site A: North Station (inlet)	Site B: Lake Station	Site C:

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella				*Ankistrodesmus*				*Anabaena*			
Cyclotella				*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*				*Aphanizomenon*			
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria		10		*Closterium*				*Gomphosphseria*			
Melosira				*Coelastrum*				*Lyngbya*			
Navicula	10			*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia	10			*Oedogonium*				*Pseudoanabaena*			
Urosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus				*Pandorina*				*Agmenellum*			
Stauroneis				*Pediastrum*							
Synedra	50	30		*Phytoconis*				**PROTOZOA**			
Tabellaria				*Rhizoclonium*				*Actinophyrs*	20		
Cocconeis				*Scenedesmus*							
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum							
Dinobryon	10	110		*Sphaerocystis*				*Euglena*			
Mallomonas	10			*Ulothrix*				*Phacus*			
Synura				*Volvox*				*Trachelomonas*			
Tribonema				*Zygnema*							
Uroglenopsis				*Aulacoseira*							
				Microtinium				**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Cosmerium							
								Ceratium			
								Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	6	3	
TRANSPARENCY:	3'est	4'	
ORGANISMS PER MILLILITER:	**110**	**150**	

NOTES: This is the first sampling event of 2017. Algal density is considered to be low at all sites. Algal diversity is considered to be moderate at site A, while site B is considered to be low. Site A is dominated by diatoms while site B is dominated by the golden algae *Dinobryon*. Trace amounts of protozoa were observed at site A only. Water clarity is considered to be fair at both sites.


Pytoplankton Distribution Site A
18.20%
18.20%
63.60%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids


Phytoplankton Distribution Site B
26.60%
73.40%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids

MICROSCOPIC EXAMINATION OF WATER

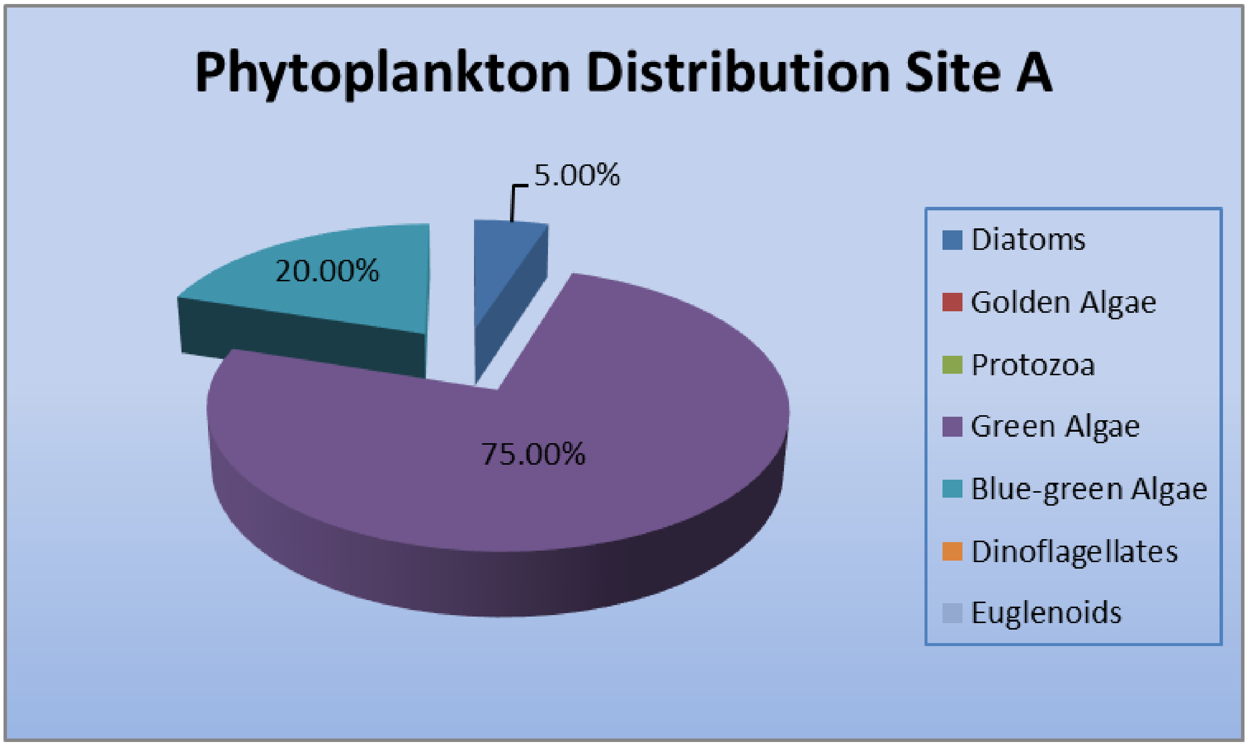
Sample from: Mt. Kemble Lake

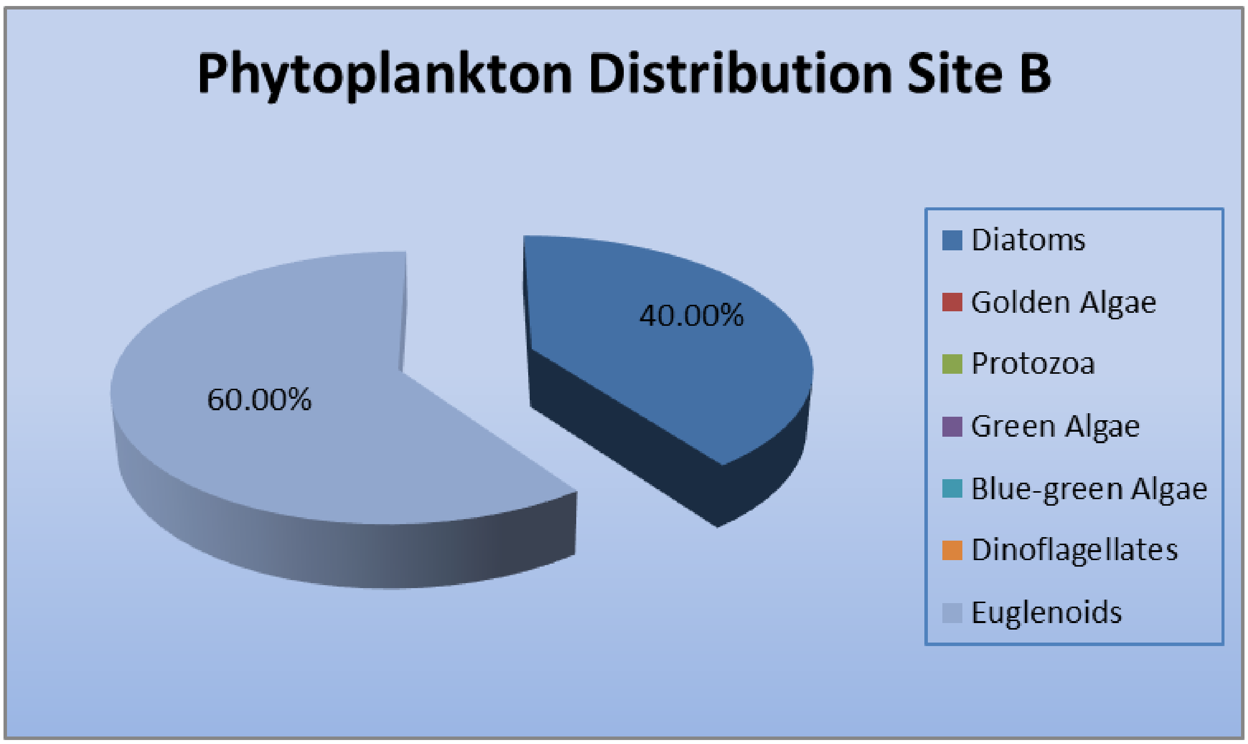
Collection Date: 6/22/17	Examination Date: 6/23/17	Amount Examined: 200 ml.
Site A: North Station (inlet)	Site B: Lake Station	Site C:

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella				*Ankistrodesmus*				*Anabaena*	40		
Cyclotella				*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*				*Aphanizomenon*			
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria	10	10		*Closterium*				*Gomphosphseria*			
Melosira				*Coelastrum*	80			*Lyngbya*			
Navicula				*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia				*Oedogonium*				*Pseudoanabaena*			
Urosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus				*Pandorina*				*Agmenellum*			
Stauroneis				*Pediastrum*							
Synedra		10		*Phytoconis*				**PROTOZOA**			
Tabellaria				*Rhizoclonium*				*Actinophyrs*			
Cocconeis				*Scenedesmus*	20						
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum	50						
Dinobryon				*Sphaerocystis*				*Euglena*		20	
Mallomonas				*Ulothrix*				*Phacus*		10	
Synura				*Volvox*				*Trachelomonas*			
Tribonema				*Zygnema*							
Uroglenopsis				*Aulacoseira*							
				Microtinium				**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Cosmerium							
								Ceratium			
								Peridinium			

SITE	**A**	**B**	**C**
TOTAL GENERA:	5	4	
TRANSPARENCY:	3.75'	4.25'	
ORGANISMS PER MILLILITER:	**200**	**50**	

NOTES: Algal diversity decreased at site A and increased at site B since the last sampling event. Diversity is now considered to be low at both sites. Algal density increased at site A and decreased at site B. Density is still considered to be low at each site. Green algae dominates the assemblage this week. Euglenoids were also observed. Trace amounts of diatoms were observed. Water clarity increased at each site and continues to be fair.


Phytoplankton Distribution Site A
5.00%
20.00%
75.00%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids


Phytoplankton Distribution Site B
40.00%
60.00%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids

MICROSCOPIC EXAMINATION OF WATER

Sample from: Mt. Kemble Lake

Collection Date: 7/20/17	Examination Date: 7/21/17	Amount Examined: 200 ml.
Site A: North Station (inlet)	Site B: Lake Station	Site C:

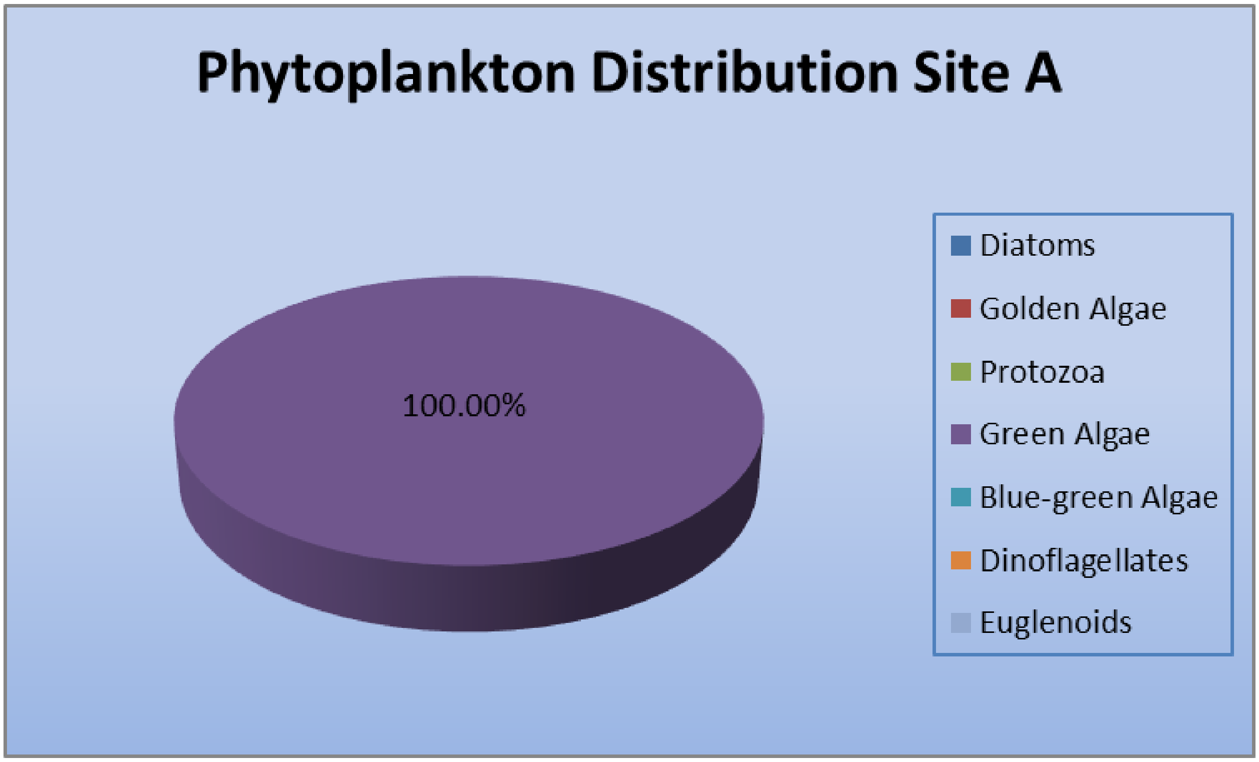
BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**
Asterionella			
Cyclotella			
Cymbella			
Diatoma			
Fragilaria			
Melosira			
Navicula			
Nitzschia			
Pinnularia			
Urosolenia			
Stephanodiscus			
Stauroneis			
Synedra			
Tabellaria			
Cocconeis			
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**
Dinobryon			
Mallomonas			
Synura			
Tribonema			
Uroglenopsis			

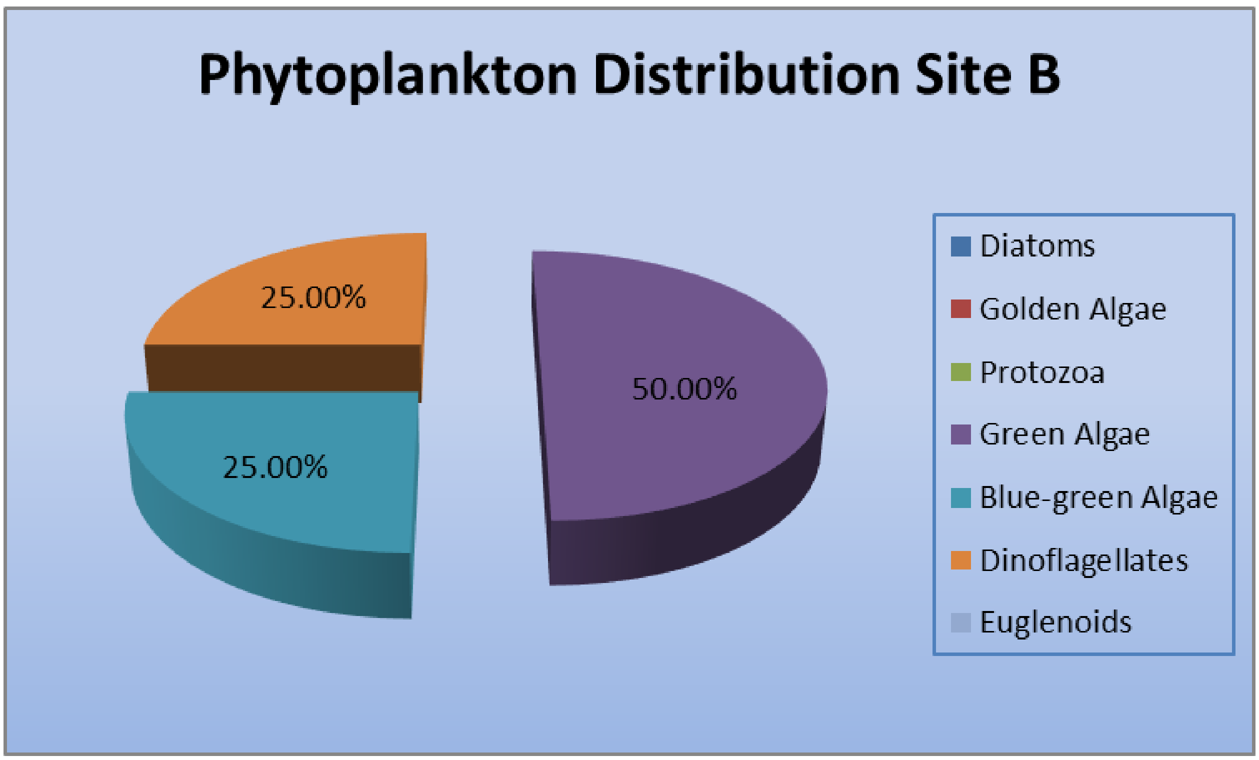
CHLOROPHYTA (Green Algae)	**A**	**B**	**C**
Ankistrodesmus			
Chlamydomonas			
Chlorella			
Chlorococcum			
Closterium	40	20	
Coelastrum	10		
Eudorina			
Mougeotia			
Oedogonium	20		
Oocystis			
Pandorina			
Pediastrum			
Phytoconis			
Rhizoclonium			
Scenedesmus			
Spirogyra			
Staurastrum	60	20	
Sphaerocystis			
Ulothrix			
Volvox			
Zygnema			
Aulacoseira			
Microtinium			
Cosmerium			
Gloeocystis	10		

CYANOPHYTA (Blue-green Algae)	**A**	**B**	**C**
Anabaena		20	
Anacystis			
Aphanizomenon			
Coelosphaerium			
Gomphosphseria			
Lyngbya			
Microcystis			
Oscillatoria			
Pseudoanabaena			
Synechocystis			
Agmenellum			
PROTOZOA			
Actinophyrs			
EUGLENOPHYTA (Euglenoids)	**A**	**B**	**C**
Euglena			
Phacus			
Trachelomonas			
PYRRHOPHYTA (Dinoflagellates)	**A**	**B**	**C**
Ceratium			
Peridinium		20	

SITE	**A**	**B**	**C**
TOTAL GENERA:	5	4	
TRANSPARENCY:	4’	5.5’	
ORGANISMS PER MILLILITER:	**140**	**80**	

NOTES: Since the last sampling event, the algal diversity has not changed and continues to be low at each site. Algal density decreased at site A while site B increased. Density at both sites continues to be low. Site A is dominated by green algae. Site B is dominated by a mix of blue-green algae, dinoflagellates and green algae. Water clarity increased at both sites but continues to be fair.


Phytoplankton Distribution Site A
100.00%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids


Phytoplankton Distribution Site B
25.00%
25.00%
50.00%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids

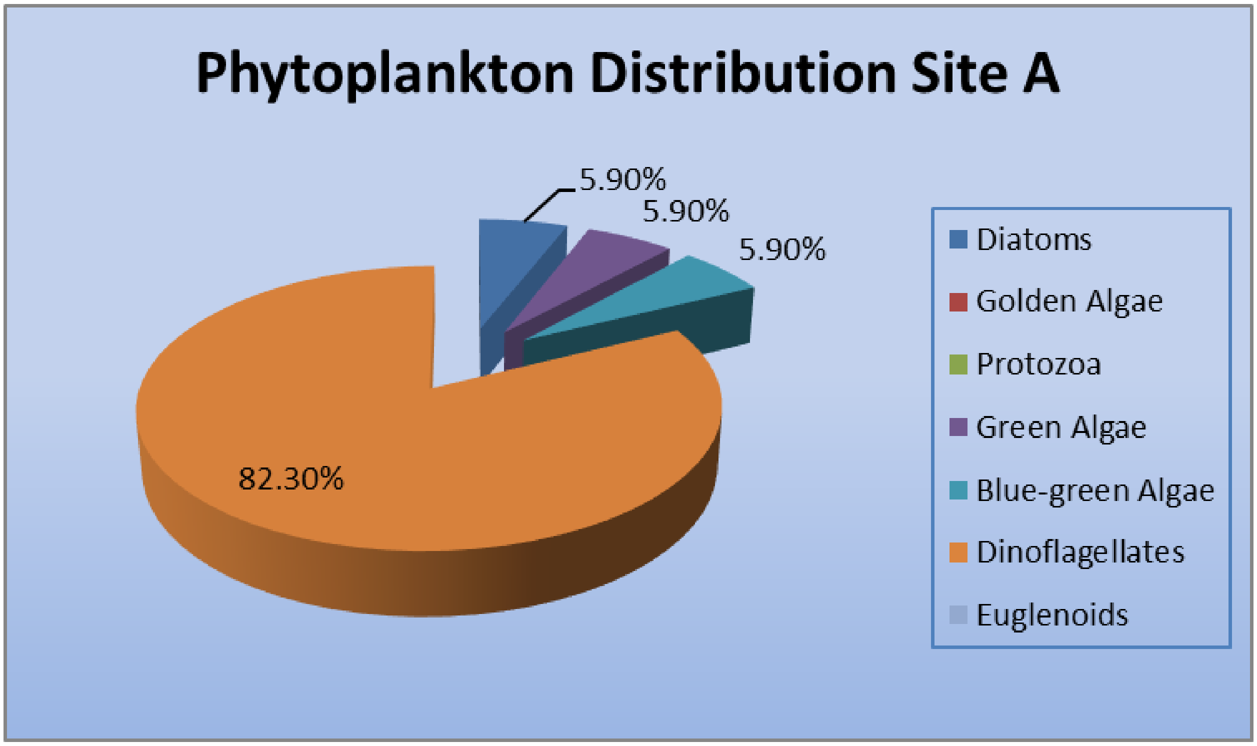
MICROSCOPIC EXAMINATION OF WATER

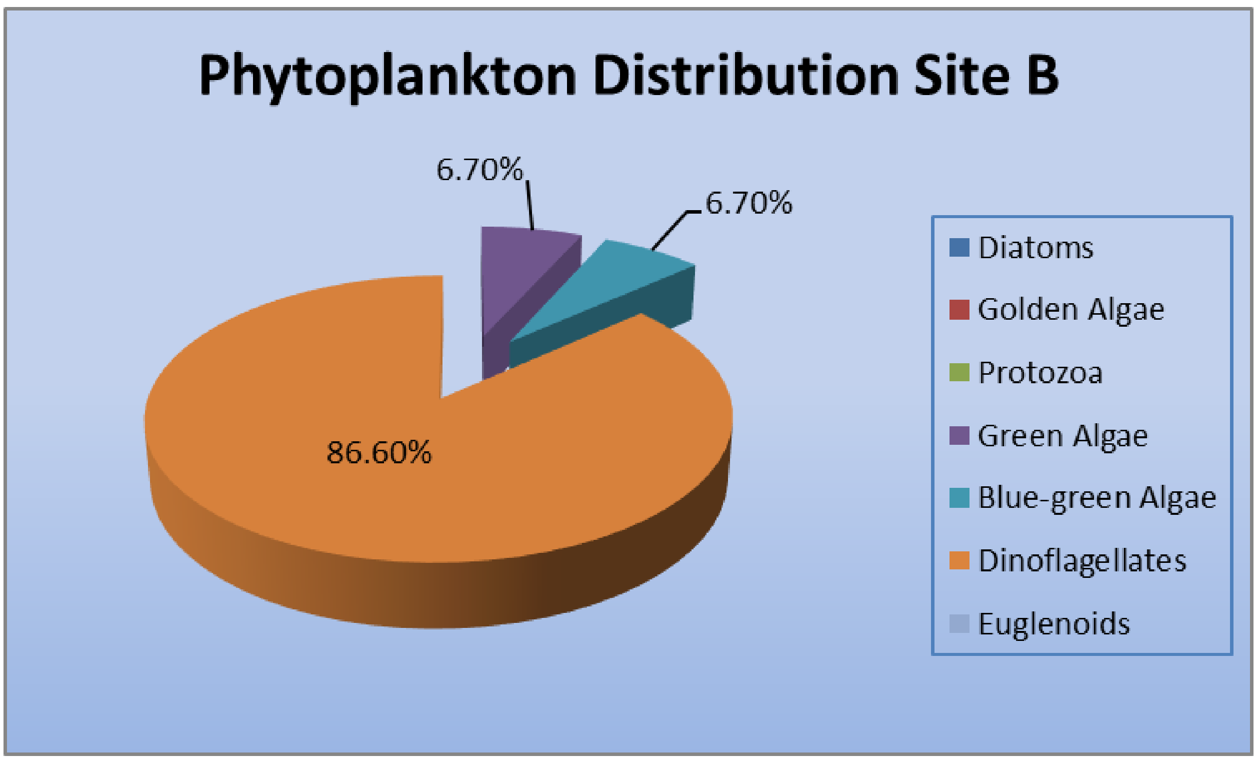
Sample from: Mt. Kemble Lake		
Collection Date: 8/17/17	Examination Date: 8/18/17	Amount Examined: 200 ml.
Site A: North Station (inlet)	Site B: Lake Station	Site C:

BACILLARIOPHYTA (Diatoms)	**A**	**B**	**C**	**CHLOROPHYTA (Green Algae)**	**A**	**B**	**C**	**CYANOPHYTA (Blue-green Algae)**	**A**	**B**	**C**
Asterionella				*Ankistrodesmus*				*Anabaena*			
Cyclotella				*Chlamydomonas*				*Anacystis*			
Cymbella				*Chlorella*				*Aphanizomenon*	10	10	
Diatoma				*Chlorococcum*				*Coelosphaerium*			
Fragilaria	10			*Closterium*				*Gomphosphseria*			
Melosira				*Coelastrum*				*Lyngbya*			
Navicula				*Eudorina*				*Microcystis*			
Nitzschia				*Mougeotia*				*Oscillatoria*			
Pinnularia				*Oedogonium*				*Pseudoanabaena*			
Urosolenia				*Oocystis*				*Synechocystis*			
Stephanodiscus				*Pandorina*	10			*Agmenellum*			
Stauroneis				*Pediastrum*							
Synedra				*Phytoconis*				**PROTOZOA**			
Tabellaria				*Rhizoclonium*				*Actinophyrs*			
Cocconeis				*Scenedesmus*							
CHRYSOPHYTA (Golden Algae)	**A**	**B**	**C**	*Spirogyra*				**EUGLENOPHYTA (Euglenoids)**	**A**	**B**	**C**
				Staurastrum							
Dinobryon				*Sphaerocystis*				*Euglena*			
Mallomonas				*Ulothrix*				*Phacus*			
Synura				*Volvox*				*Trachelomonas*			
Tribonema				*Zygnema*							
Uroglenopsis				*Aulacoseira*							
				Microtinium				**PYRRHOPHYTA (Dinoflagellates)**	**A**	**B**	**C**
				Cosmerium							
				Gloeocystis		20		*Ceratium*			
								Peridinium	140	120	

SITE	**A**	**B**	**C**
TOTAL GENERA:	4	3	
TRANSPARENCY:	3.5’	7’	
ORGANISMS PER MILLILITER:	**170**	**150**	

NOTES: Algal diversity decreased at both sites since the last sampling event but continues to be low. Algal density decreased at each site as well but continues to be low. The assemblage is now dominated by dinoflagellates, specifically *Peridinium*. A mix of diatoms (site A only), green algae and blue-green algae were also observed. Water clarity decreased at site A while site B increased. Clarity at site A continues to be fair while site B is now good.


Phytoplankton Distribution Site A
5.90%
5.90%
5.90%
82.30%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids


Phytoplankton Distribution Site B
6.70%
6.70%
86.60%
Diatoms
Golden Algae
Protozoa
Green Algae
Blue-green Algae
Dinoflagellates
Euglenoids

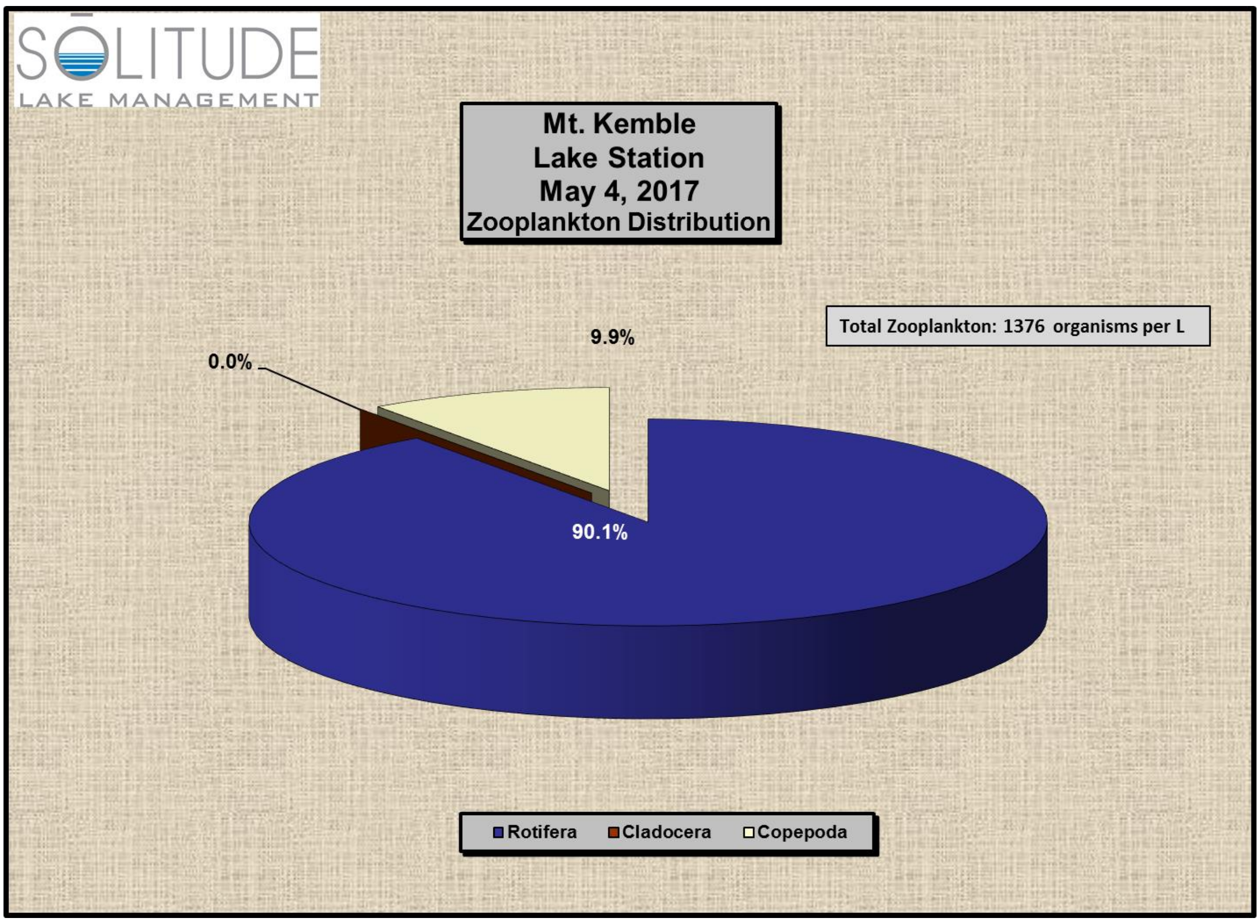
APPENDIX E: ZOOPLANKTON ENUMERATION CHARTS

Zooplankton Count Results

Site: Mt. Kemble **Date: 5/4/17**

Group	Order	Family	Genus	Replicate A	Replicate B	Replicate C	Total/3 (# per mL)	x1000 mL (= 1 L)	Water sampled (L)	# organisms per L
Rotifera	**Ploima**	Synchaetidae	*Polyarthra*	37	32	39	36.00	36000	68.8	523
			Synchaeta	10	9	3	7.33	7333	68.8	107
		Asplanchnidae	*Asplanchna*	16	14	18	16.00	16000	68.8	233
		Brachionidae	*Brachionus*	18	23	26	22.33	22333	68.8	325
			Keratella	3	2	4	3.00	3000	68.8	44
		Trichocercidae	*Trichocerca*	1			0.33	333	68.8	5
	Flosculariacea	Conochiliidae	*Conochilus*			1	0.33	333	68.8	5
									Total:	**1240**
Cladocera	**Cladocera**								68.8	
									Total:	**0**
Copepoda	**Cyclopoida**		*Cyclopoid* nauplius	6	6	16	9.33	9333	68.8	136
									Total:	**136**

Total Organisms per L	Rotifera	%	Cladocera	%	Copepoda	%
1376	1240	90.1%	0	0.0%	136	9.9%



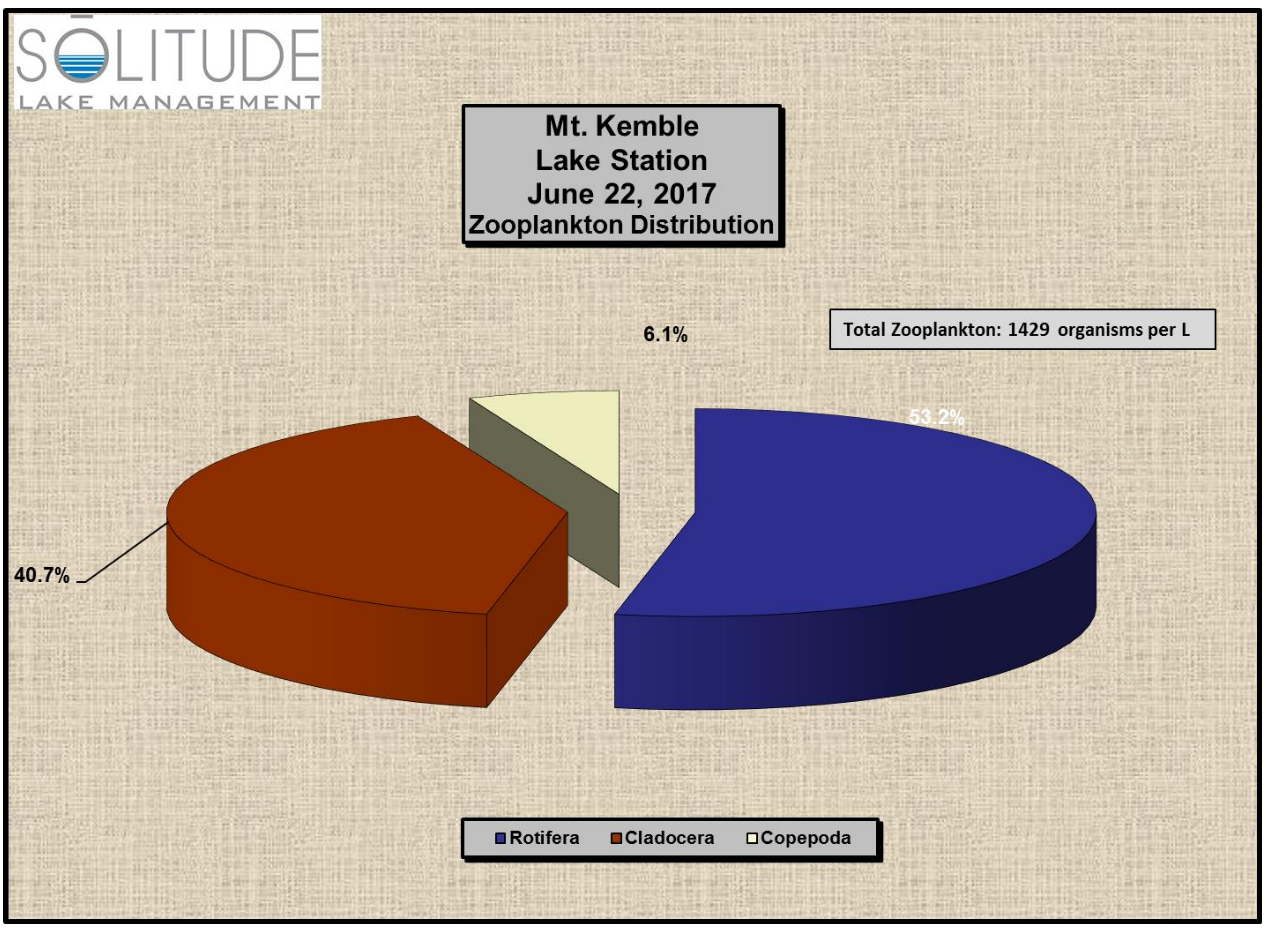
Zooplankton Count Results

SOLITUDE LAKE MANAGEMENT

Site: Mt. Kemble **Date: 6/22/17**

Group	Order	Family	Genus	Replicate A	Replicate B	Replicate C	Total/3 (# per mL)	x1000 mL (= 1 L)	Water sampled (L)	# organisms per L
Rotifera	**Ploima**	Synchaetidae	*Polyarthra*	9	15	14	12.67	12667	68.8	184
			Ploesoma	1			0.33	333	68.8	5
			Synchaeta	4	1	6	3.67	3667	68.8	53
		Asplanchnidae	*Asplanchna*	1	4	2	2.33	2333	68.8	34
		Brachionidae	*Brachionus*	8	15	14	12.33	12333	68.8	179
			Kellicottia	2	11	7	6.67	6667	68.8	97
			Keratella	5	5	12	7.33	7333	68.8	107
		Trichocercidae	*Trichocerca*	4	2		2.00	2000	68.8	29
	Floscularиacea	Conochiliidae	*Conochilus*	7	3	1	3.67	3667	68.8	53
		Testudinellidae	*Filinia*	3	1		1.33	1333	68.8	19
									Total:	**761**
Cladocera	**Cladocera**	Bosminidae	*Bosmina*	33	25	48	35.33	35333	68.8	514
			Bosminopsis		13		4.33	4333	68.8	63
		Daphniidae	*Daphnia*			1	0.33	333	68.8	5
									Total:	**581**
Copepoda	**Cyclopoida**		*Calanoid* nauplius	6	1	1	2.67	2667	68.8	39
			Cyclopoid adult	3	5	2	3.33	3333	68.8	48
									Total:	**87**

Total Organisms per L	Rotifera	%	Cladocera	%	Copepoda	%
1429	761	53.2%	581	40.7%	87	6.1%

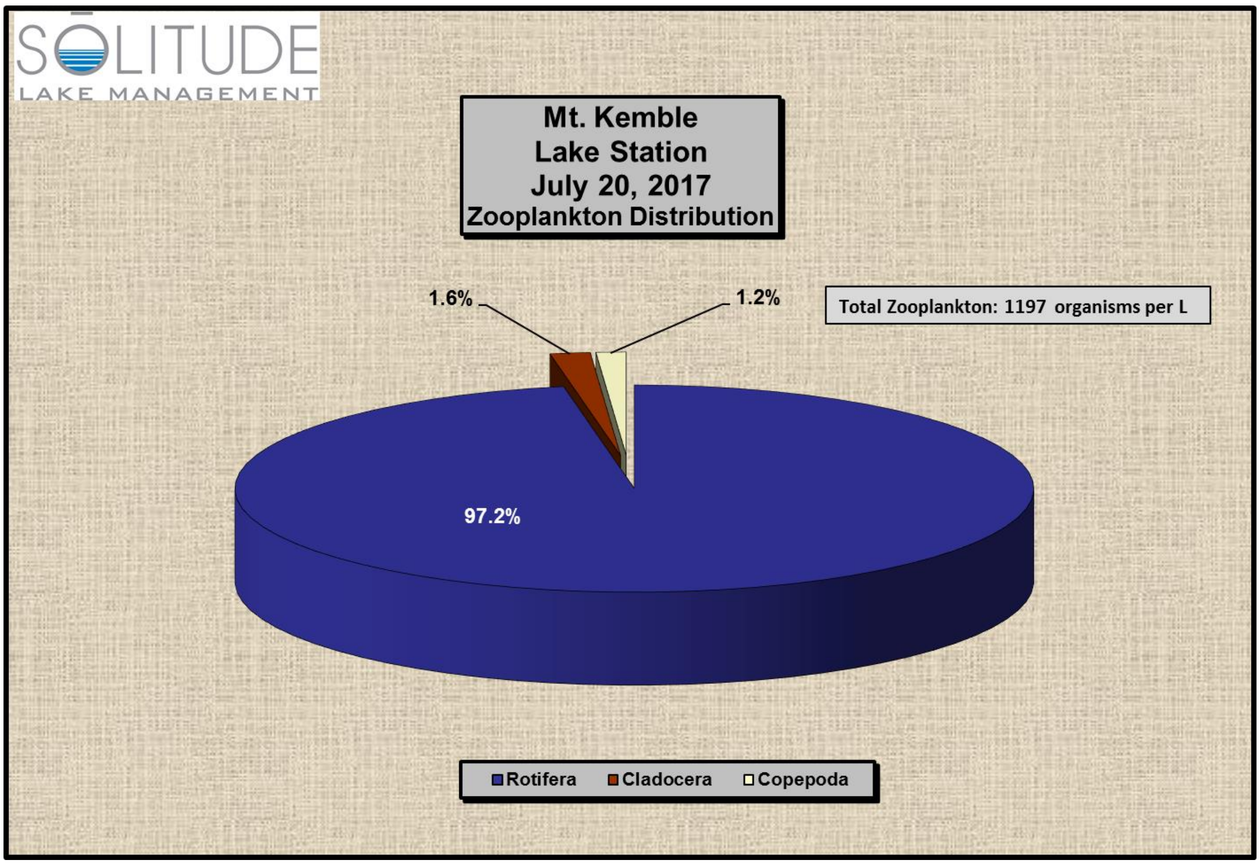


Zooplankton Count Results

Site: Mt. Kemble **Date: 7/20/17**

Group	Order	Family	Genus	Replicate A	Replicate B	Replicate C	Total/3 (# per mL)	x1000 mL (= 1 L)	Water sampled (L)	# organisms per L
Rotifera	**Ploima**	Synchaetidae	*Polyarthra*	4	4	5	4.33	4333	68.8	63
			Synchaeta		1	1	0.67	667	68.8	10
		Brachionidae	*Brachionus*	7	8	4	6.33	6333	68.8	92
			Kellicottia	22	12	16	16.67	16667	68.8	242
			Keratella	46	36	53	45.00	45000	68.8	654
		Trichocercidae	*Trichocerca*	1	3	2	2.00	2000	68.8	29
	Flosculariacea	Conochiliidae	*Conochilus*		2	2	1.33	1333	68.8	19
		Testudinellidae	*Filinia*	4	3	4	3.67	3667	68.8	53
									Total:	**1163**
Cladocera	**Cladocera**	Bosminidae	*Bosmina*	2	1	1	1.33	1333	68.8	19
									Total:	**19**
Copepoda	**Cyclopoida**		*Cyclopoid* nauplius	1	1		0.67	667	68.8	10
		Cyclopidae	*Acanthocyclops*			1	0.33	333	68.8	5
									Total:	**15**

Total Organisms per L	Rotifera	%	Cladocera	%	Copepoda	%
1197	1163	97.2%	19	1.6%	15	1.2%

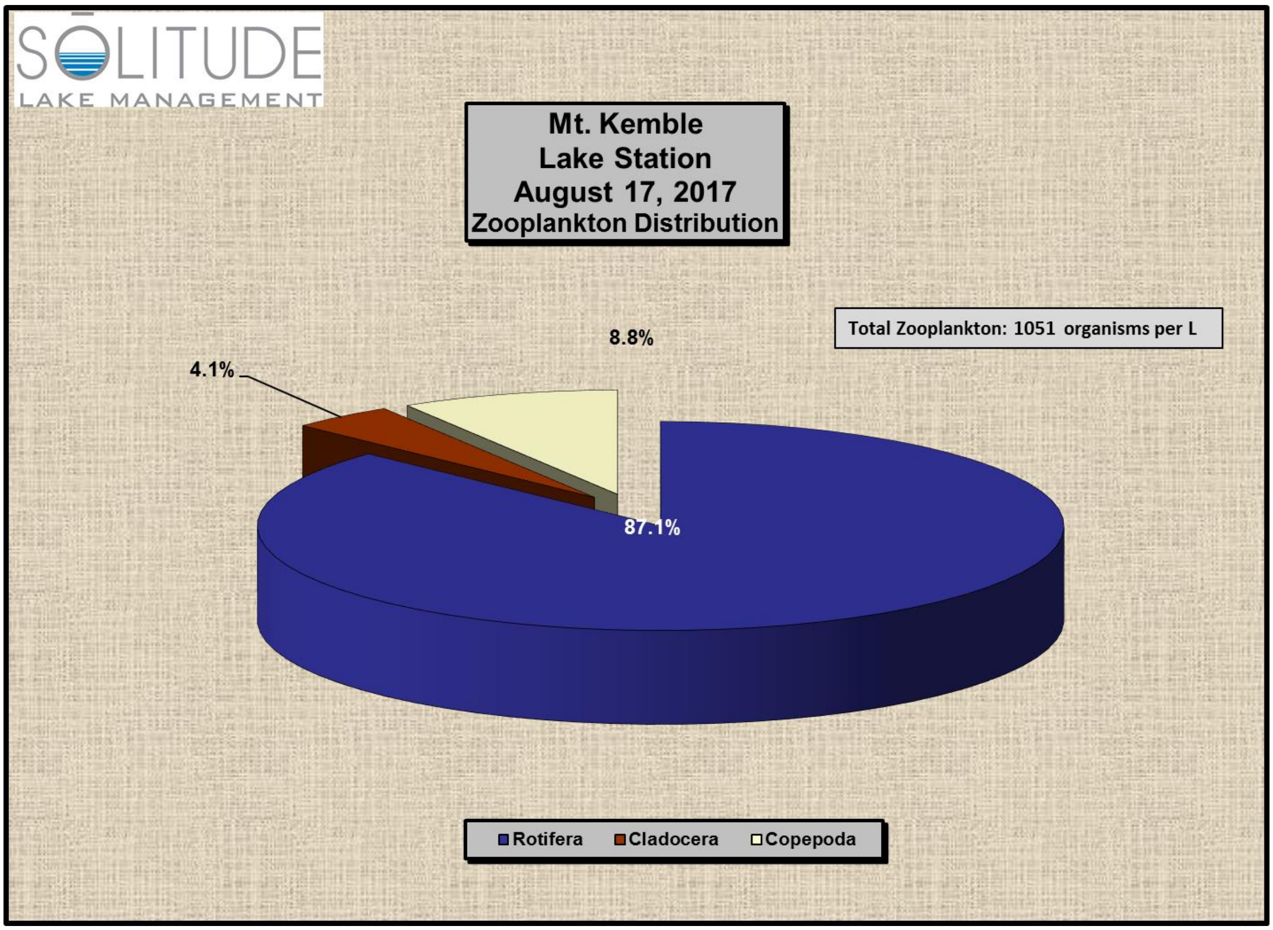


Zooplankton Count Results

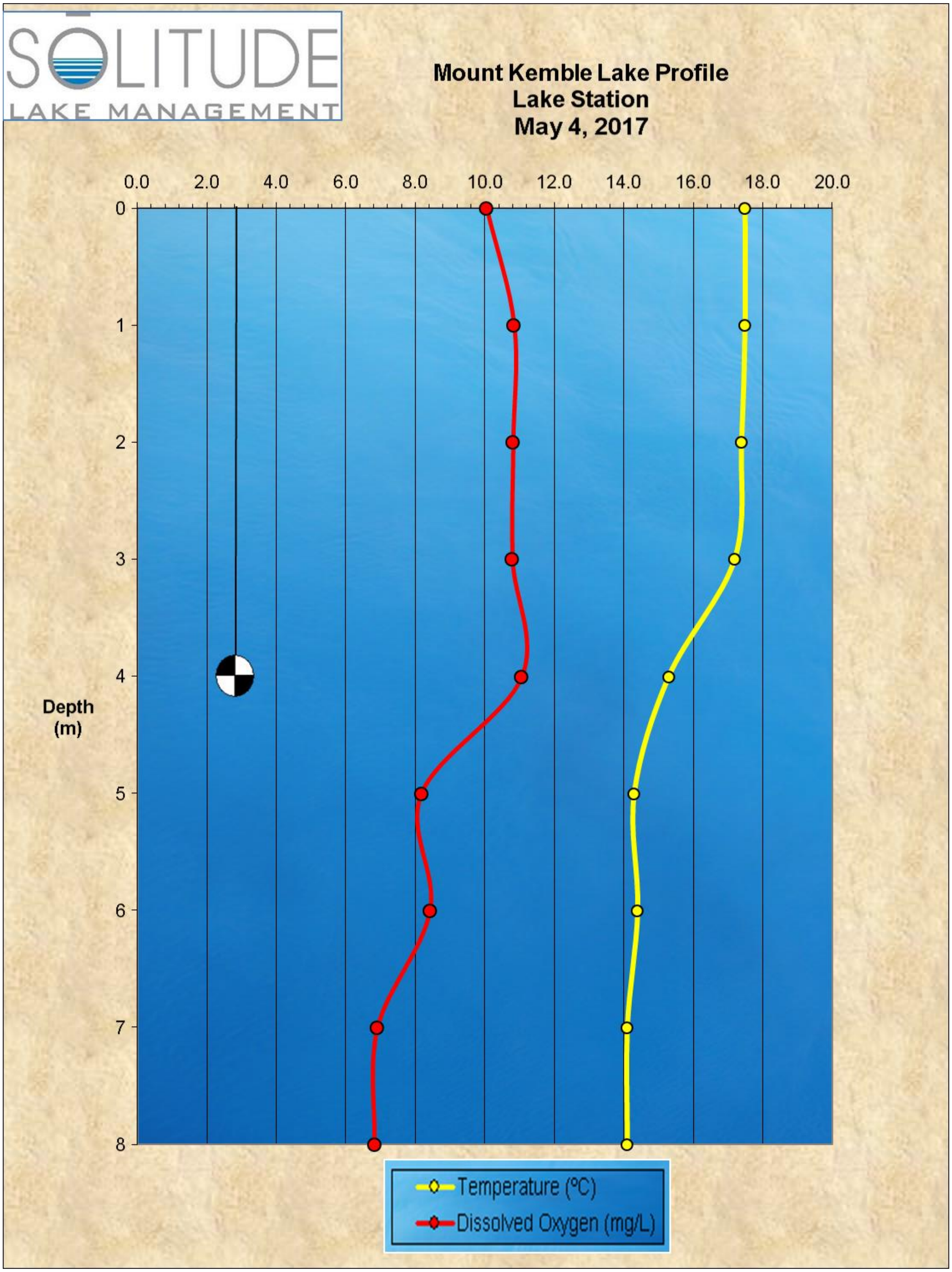
Site: Mt. Kemble **Date: 8/17/17**

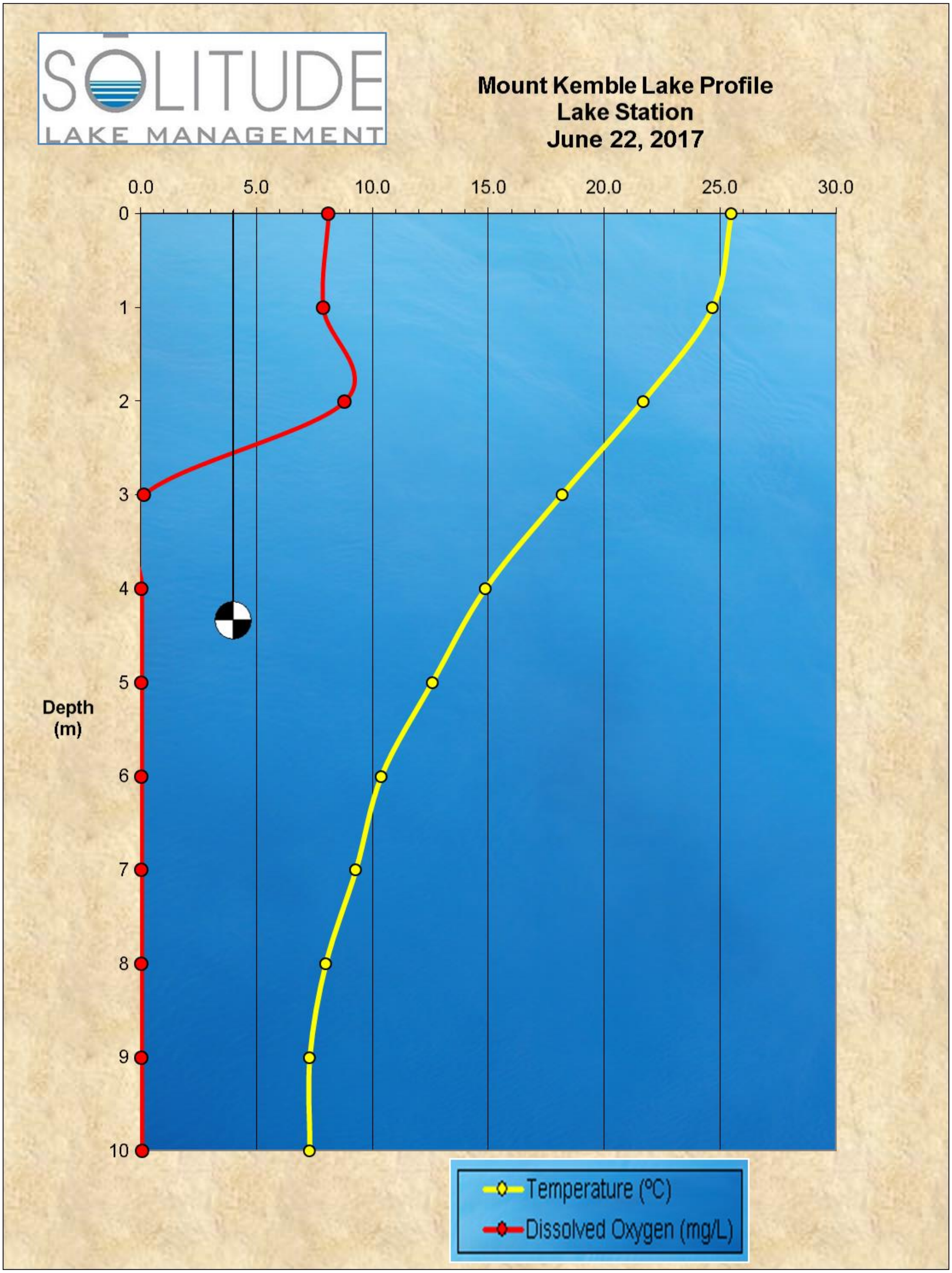
Group	Order	Family	Genus	Replicate A	Replicate B	Replicate C	Total/3 (# per mL)	x1000 mL (= 1 L)	Water sampled (L)	# organisms per L
Rotifera	**Ploima**	Synchaetidae	*Polyarthra*	43	37	33	37.67	37667	68.8	547
		Asplanchnidae	*Asplanchna*	3	1	3	2.33	2333	68.8	34
		Brachionidae	*Brachionus*	1			0.33	333	68.8	5
			Kellicottia	1		1	0.67	667	68.8	10
			Keratella	5	6	5	5.33	5333	68.8	78
		Trichocercidae	*Trichocerca*	1		1	0.67	667	68.8	10
	Floscularíacea	Conochiliidae	*Conochilus*	18	15	14	15.67	15667	68.8	228
		Testudinellidae	*Filinia*	1			0.33	333	68.8	5
									Total:	**916**
Cladocera	**Cladocera**	Bosminidae	*Bosmina*	7		2	3.00	3000	68.8	44
									Total:	**44**
Copepoda	**Cyclopoida**		*Cyclopoid* nauplius	2	5	2	3.00	3000	68.8	44
			Cyclopoid adult	1	1		0.67	667	68.8	10
		Cyclopidae	Acanthocyclops		3	5	2.67	2667	68.8	39
									Total:	**92**

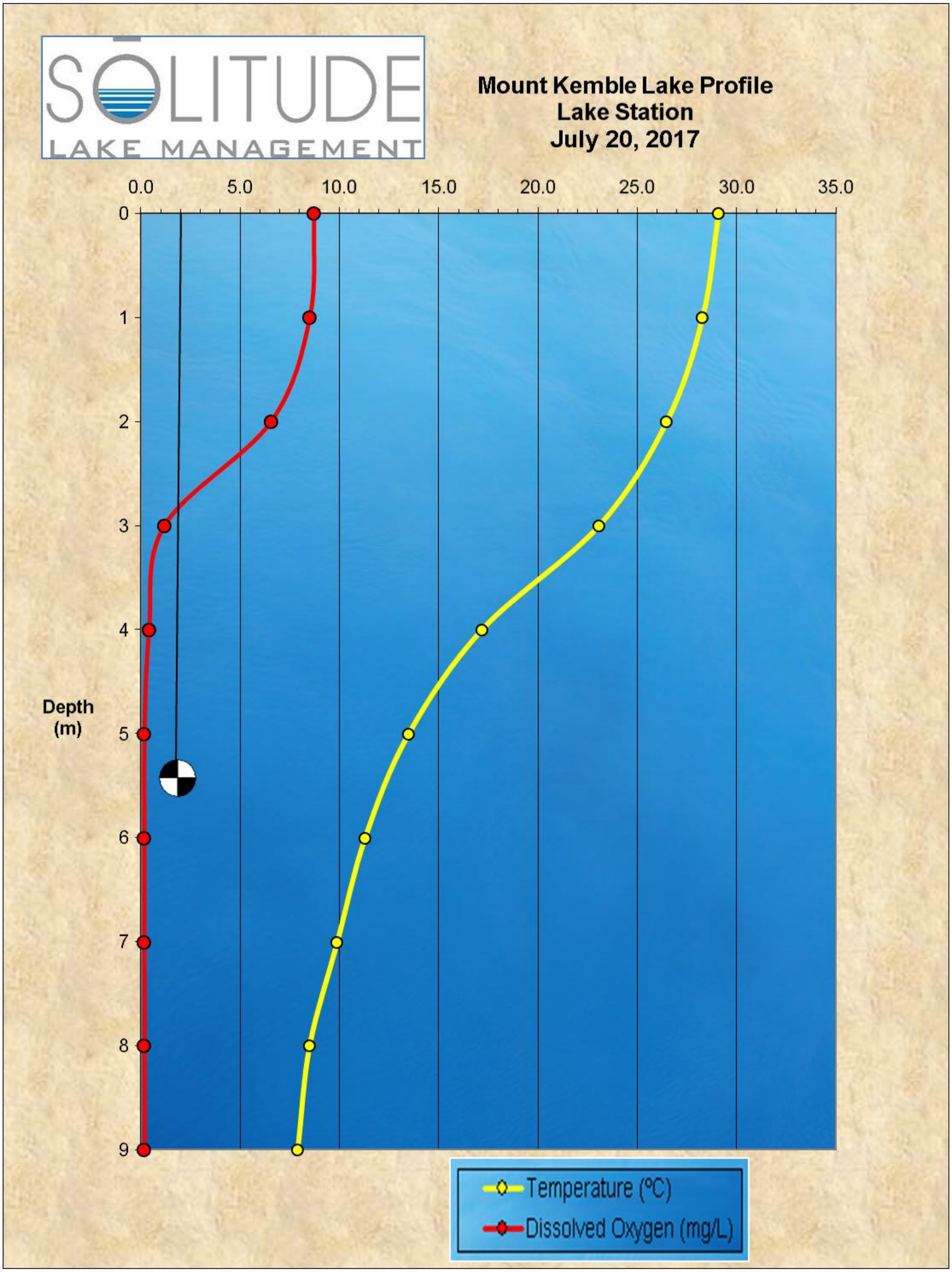
Total Organisms per L	Rotifera	%	Cladocera	%	Copepoda	%
1051	916	87.1%	44	4.1%	92	8.8%

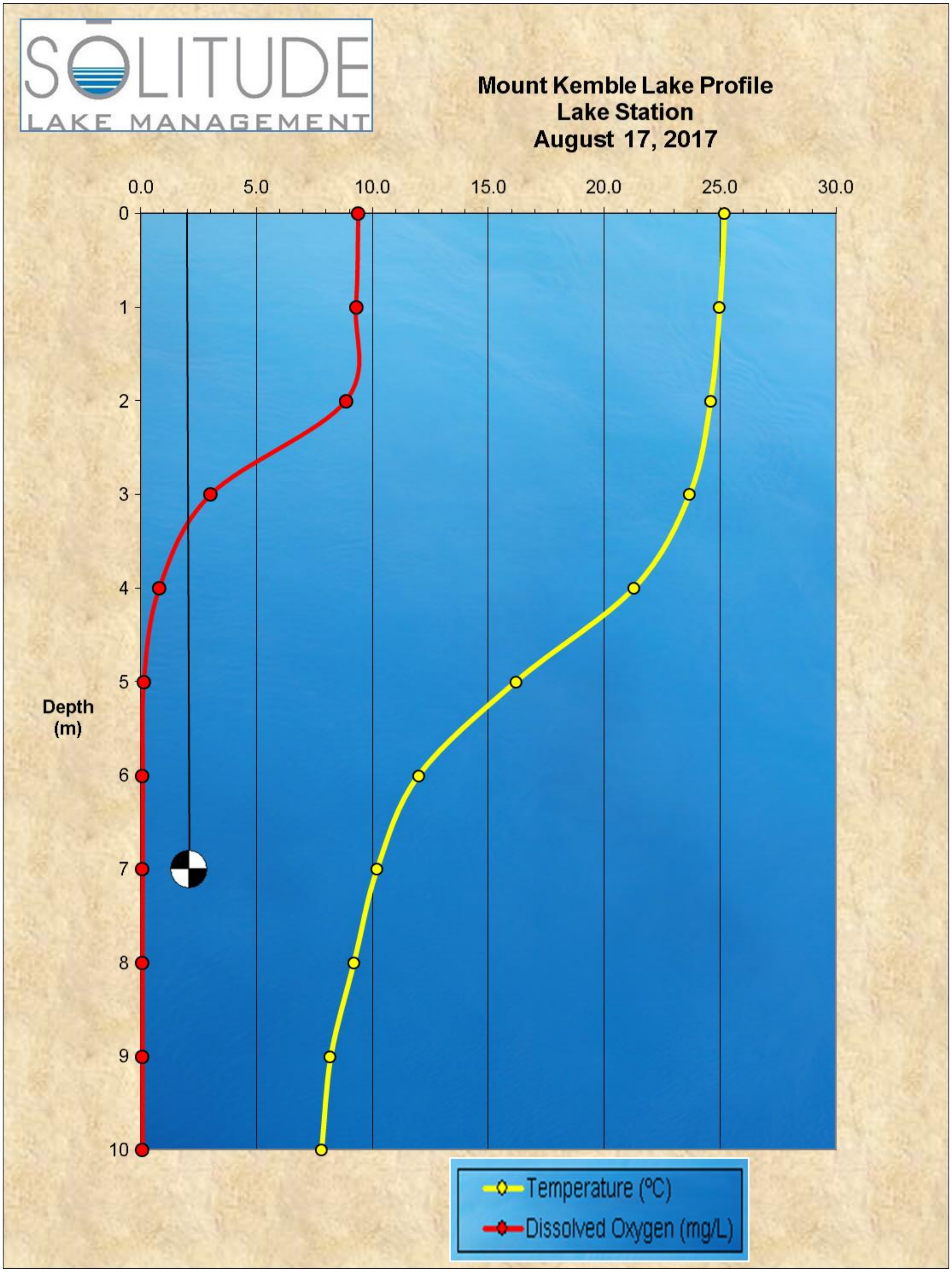


APPENDIX F: DISSOLVED OXYGEN – TEMP. PROFILES




Mount Kemble Lake Profile
Lake Station
June 22, 2017
0.0
5.0
10.0
15.0
20.0
25.0
30.0
0
1
2
3
4
5
6
7
8
9
10
Depth
(m)
Temperature (ºC)
Dissolved Oxygen (mg/L)


SOLITUDE
LAKE MANAGEMENT
Mount Kemble Lake Profile
Lake Station
July 20, 2017
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
0
1
2
3
4
5
6
7
8
9
Depth
(m)
Temperature (ºC)
Dissolved Oxygen (mg/L)


SOLITUDE
LAKE MANAGEMENT
Mount Kemble Lake Profile
Lake Station
August 17, 2017
0.0
5.0
10.0
15.0
20.0
25.0
30.0
0
1
2
3
4
5
6
7
8
9
10
Depth
(m)
Temperature (ºC)
Dissolved Oxygen (mg/L)

ANALYTICAL REPORT

Lab Number:	L1729028
Client:	Solitude Lake Management LLC 580 Rockport Rd Hackettstown, NJ 07840
ATTN:	Emily Mayer
Phone:	(908) 850-0303
Project Name:	MT. KEMBLE
Project Number:	MT. KEMBLE
Report Date:	08/24/17

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: MT. KEMBLE

Project Number: MT. KEMBLE

Lab Number: L1729028

Report Date: 08/24/17

SAMPLE RESULTS

Lab ID: L1729028-01
Client ID: NORTH STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 08/17/17 12:03
Date Received: 08/18/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	330		umhos/cm	10	10.	1	-	08/19/17 02:13	121,2510B	VB
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	08/21/17 14:05	121,2540D	DW
Nitrogen, Ammonia	0.028	J	mg/l	0.075	0.024	1	08/19/17 13:18	08/20/17 19:04	121,4500NH3-BH	AT
Nitrogen, Nitrate	0.034	J	mg/l	0.100	0.032	1	-	08/19/17 00:59	121,4500NO3-F	MR
Phosphorus, Total	0.062		mg/l	0.025	0.007	2.5	08/22/17 11:45	08/22/17 15:30	121,4500P-E	SD

Project Name: MT. KEMBLE
Project Number: MT. KEMBLE

Lab Number: L1729028
Report Date: 08/24/17

SAMPLE RESULTS

Lab ID: L1729028-02
Client ID: LAKE STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 08/17/17 12:15
Date Received: 08/18/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	330		umhos/cm	10	10.	1	-	08/19/17 02:13	121,2510B	VB
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	08/21/17 14:05	121,2540D	DW
Nitrogen, Ammonia	0.054	J	mg/l	0.075	0.024	1	08/19/17 13:18	08/20/17 19:05	121,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/l	0.100	0.032	1	-	08/19/17 01:00	121,4500NO3-F	MR
Phosphorus, Total	0.069		mg/l	0.025	0.007	2.5	08/22/17 11:45	08/22/17 15:30	121,4500P-E	SD

Project Name: MT. KEMBLE

Project Number: MT. KEMBLE

Lab Number: L1729028

Report Date: 08/24/17

SAMPLE RESULTS

Lab ID: L1729028-03
Client ID: BOTTOM SAMPLE STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 08/17/17 12:30
Date Received: 08/18/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	380		umhos/cm	10	10.	1	-	08/19/17 02:13	121,2510B	VB
Solids, Total Suspended	12.		mg/l	10	NA	2	-	08/21/17 14:05	121,2540D	DW
Nitrogen, Ammonia	2.55		mg/l	0.075	0.024	1	08/19/17 13:18	08/20/17 19:06	121,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/l	0.100	0.032	1	-	08/19/17 01:02	121,4500NO3-F	MR
Phosphorus, Total	0.207		mg/l	0.025	0.007	2.5	08/22/17 11:45	08/22/17 15:30	121,4500P-E	SD

Project Name: MT. KEMBLE **Lab Number:** L1729028

Project Number: MT. KEMBLE **Report Date:** 08/24/17

Method Blank Analysis

Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1033439-1										
Nitrogen, Nitrate	0.046	J	mg/l	0.100	0.032	1	-	08/18/17 21:42	121,4500NO3-F	MR
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1033552-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.024	1	08/19/17 13:18	08/20/17 18:36	121,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1033755-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	08/21/17 14:05	121,2540D	DW
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1034129-1										
Phosphorus, Total	ND		mg/l	0.010	0.003	1	08/22/17 11:45	08/22/17 15:30	121,4500P-E	SD

Lab Control Sample Analysis
Batch Quality Control

Project Name: MT. KEMBLE
Project Number: MT. KEMBLE

Lab Number: L1729028
Report Date: 08/24/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1033439-2								
Nitrogen, Nitrate	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1033530-1								
Specific Conductance	100		-		99-101	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1033552-2								
Nitrogen, Ammonia	92		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1034129-2								
Phosphorus, Total	98		-		80-120	-		

Project Name: MT. KEMBLE
Project Number: MT. KEMBLE

Lab Duplicate Analysis
Batch Quality Control

Lab Number: L1729028
Report Date: 08/24/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG1033530-2 QC Sample: L1729028-01 Client ID: NORTH STATION						
Specific Conductance @ 25 C	330	330	umhos/cm	0		20

Project Name: MT. KEMBLE
Project Number: MT. KEMBLE

Lab Number: L1729028
Report Date: 08/24/17

Sample Receipt and Container Information

Were project specific reporting limits specified? NO

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1729028-01A	Plastic 120ml unpreserved	A	7	7	5.1	Y	Absent		NO3-4500(2),COND-2510(1)
L1729028-01B	Plastic 500ml H2SO4 preserved	A	<2	<2	5.1	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1729028-01C	Plastic 950ml unpreserved	A	7	7	5.1	Y	Absent		TSS-2540(7)
L1729028-02A	Plastic 120ml unpreserved	A	7	7	5.1	Y	Absent		NO3-4500(2),COND-2510(1)
L1729028-02B	Plastic 500ml H2SO4 preserved	A	<2	<2	5.1	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1729028-02C	Plastic 950ml unpreserved	A	7	7	5.1	Y	Absent		TSS-2540(7)
L1729028-03A	Plastic 120ml unpreserved	A	7	7	5.1	Y	Absent		NO3-4500(2),COND-2510(1)
L1729028-03B	Plastic 500ml H2SO4 preserved	A	<2	<2	5.1	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1729028-03C	Plastic 950ml unpreserved	A	7	7	5.1	Y	Absent		TSS-2540(7)

*Values in parentheses indicate holding time in days

Serial_No:08241713:36

ALPHA ANALYTICAL

NEW JERSEY CHAIN OF CUSTODY

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page 1 of 1

Date Rec'd in Lab: 8/18/17

ALPHA Job #: L1729028

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Project Information
Project Name: Mt. Kemble
Project Location: Morristown, NJ
Project #
(Use Project name as Project #) ☒
Project Manager: Emily Mayer
ALPHAQuote #:

Client Information
Client: SLM
Address: 310 East Washington Ave Suite C Washington NJ
Phone: 908-850-0303
Fax:
Email: EMayer@solutiondelivery.com

Deliverables
☐ NJ Full / Reduced
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Billing Information
☒ Same as Client Info
PO #

Regulatory Requirement
☐ SRS Residential/Non Residential
☐ SRS Impact to Groundwater
☐ NJ Ground Water Quality Standards
☐ NJ IGW SPLP Leachate Criteria
☐ Other

Site Information
Is this site impacted by Petroleum? Yes ☐
Petroleum Product:

Turn-Around Time
Standard ☒
Rush (only if pre approved) ☐
Due Date:
# of Days:

These samples have been previously analyzed by Alpha ☐

For EPH, selection is REQUIRED:
☐ Category 1
☐ Category 2

For VOC, selection is REQUIRED:
☐ 1,4-Dioxane
☐ 8011

Other project specific requirements/comments:
Billing - 'MID' - Report results in mg/L.
Please specify Metals or TAL.

Sample Filtration
☐ Done
☐ Lab to do
Preservation
☐ Lab to do
(Please Specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Total Phosphorus	Total Suspended Solids	Nitrate	Conductivity	Ammonia Nitrogen	Sample Specific Comments	Total Bottle
29028-01	North Station	8/17/17	12:03	L	TS	X	X	X	X	X		
02	Lake Station	8/17/17	12:15	L	TS	X	X	X	X	X		
03	Bottom Sample Station	8/17/17	12:30	L	TS	X	X	X	X	X		

Container Type	P	P	P	P	P
Preservative	D	A	A	A	D

Preservative Code:
A = None
B = HCl
C = HNO_3
D = H_2SO_4
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Relinquished By:	Date/Time	Received By:	Date/Time
Emily Mayer	8/18/17 10:41	[signature] AAL	8/18/17 10:41
[signature] AAL	8/18/17 14:00	[signature]	8/18 19:30
Angel [illegible]	8/18 2200	[signature]	8/18/17 2200

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

ANALYTICAL REPORT

Lab Number:	L1725207
Client:	Solitude Lake Management LLC 580 Rockport Rd Hackettstown, NJ 07840
ATTN:	Emily Mayer
Phone:	(908) 850-0303
Project Name:	MOUNT KEMBLE
Project Number:	MOUNT KEMBLE
Report Date:	07/27/17

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: MOUNT KEMBLE
Project Number: MOUNT KEMBLE

Lab Number: L1725207
Report Date: 07/27/17

SAMPLE RESULTS

Lab ID: L1725207-01
Client ID: NORTH STATION
Sample Location: Not Specified
Matrix: Water

Date Collected: 07/20/17 12:59
Date Received: 07/21/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	320		umhos/cm	10	10.	1	-	07/21/17 23:20	1,9050A	AS
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	07/22/17 05:18	121,2540D	VB
Nitrogen, Ammonia	0.056	J	mg/l	0.075	0.022	1	07/24/17 12:17	07/24/17 22:35	121,4500NH3-BH	AT
Nitrogen, Nitrate	0.039	J	mg/l	0.100	0.032	1	-	07/25/17 23:13	121,4500NO3-F	MR
Phosphorus, Total	0.037		mg/l	0.010	0.003	1	07/27/17 05:45	07/27/17 10:38	121,4500P-E	SD

Project Name: MOUNT KEMBLE
Project Number: MOUNT KEMBLE

Lab Number: L1725207
Report Date: 07/27/17

SAMPLE RESULTS

Lab ID: L1725207-02
Client ID: LAKE STATION
Sample Location: Not Specified
Matrix: Water

Date Collected: 07/20/17 13:27
Date Received: 07/21/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	310		umhos/cm	10	10.	1	-	07/21/17 23:20	1,9050A	AS
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	07/22/17 05:18	121,2540D	VB
Nitrogen, Ammonia	ND		mg/l	0.075	0.022	1	07/24/17 12:17	07/24/17 22:37	121,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/l	0.100	0.032	1	-	07/25/17 23:14	121,4500NO3-F	MR
Phosphorus, Total	0.027		mg/l	0.010	0.003	1	07/27/17 05:45	07/27/17 10:40	121,4500P-E	SD

Project Name: MOUNT KEMBLE
Project Number: MOUNT KEMBLE

Lab Number: L1725207
Report Date: 07/27/17

SAMPLE RESULTS

Lab ID: L1725207-03
Client ID: BOTTOM SAMPLE STATION
Sample Location: Not Specified
Matrix: Water

Date Collected: 07/20/17 13:36
Date Received: 07/21/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	340		umhos/cm	10	10.	1	-	07/21/17 23:20	1,9050A	AS
Solids, Total Suspended	5.4		mg/l	5.0	NA	1	-	07/22/17 05:18	121,2540D	VB
Nitrogen, Ammonia	0.921		mg/l	0.075	0.022	1	07/24/17 12:17	07/24/17 22:38	121,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/l	0.100	0.032	1	-	07/25/17 23:20	121,4500NO3-F	MR
Phosphorus, Total	0.062		mg/l	0.010	0.003	1	07/27/17 05:45	07/27/17 10:41	121,4500P-E	SD

Project Name: MOUNT KEMBLE **Lab Number:** L1725207
Project Number: MOUNT KEMBLE **Report Date:** 07/27/17

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1024867-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	07/22/17 05:18	121,2540D	VB
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1025242-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.022	1	07/24/17 12:17	07/24/17 22:22	121,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1025650-1										
Nitrogen, Nitrate	ND		mg/l	0.100	0.032	1	-	07/25/17 22:37	121,4500NO3-F	MR
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1025993-1										
Phosphorus, Total	ND		mg/l	0.010	0.003	1	07/27/17 05:45	07/27/17 10:11	121,4500P-E	SD

Lab Control Sample Analysis
Batch Quality Control

Project Name: MOUNT KEMBLE
Project Number: MOUNT KEMBLE

Lab Number: L1725207
Report Date: 07/27/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1024847-1								
Specific Conductance	99		-		99-101	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1025242-2								
Nitrogen, Ammonia	99		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1025650-2								
Nitrogen, Nitrate	99		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1025993-2								
Phosphorus, Total	100		-		80-120	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: MOUNT KEMBLE
Project Number: MOUNT KEMBLE
Lab Number: L1725207
Report Date: 07/27/17

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG1025242-4 QC Sample: L1725207-01 Client ID: NORTH STATION												
Nitrogen, Ammonia	0.056J	4	3.88	97		-	-		80-120	-		20

Project Name: MOUNT KEMBLE
Project Number: MOUNT KEMBLE

Lab Duplicate Analysis
Batch Quality Control

Lab Number: L1725207
Report Date: 07/27/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG1025242-3 QC Sample: L1725207-01 Client ID: NORTH STATION						
Nitrogen, Ammonia	0.056J	0.049J	mg/l	NC		20

Project Name: MOUNT KEMBLE
Project Number: MOUNT KEMBLE

Lab Number: L1725207
Report Date: 07/27/17

Sample Receipt and Container Information

Were project specific reporting limits specified? NO

Cooler Information

Cooler	*Custody Seal*
A	Absent

Container Information

Container ID	*Container Type*	*Cooler*	*Initial pH*	*Final pH*	*Temp deg C*	*Pres*	*Seal*	*Frozen Date/Time*	*Analysis(*)*
L1725207-01A	Plastic 120ml unpreserved	A	7	7	3.8	Y	Absent		NO3-4500(2),COND-9050(28)
L1725207-01B	Plastic 500ml H2SO4 preserved	A	<2	<2	3.8	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1725207-01C	Plastic 950ml unpreserved	A	7	7	3.8	Y	Absent		TSS-2540(7)
L1725207-02A	Plastic 120ml unpreserved	A	7	7	3.8	Y	Absent		NO3-4500(2),COND-9050(28)
L1725207-02B	Plastic 500ml H2SO4 preserved	A	<2	<2	3.8	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1725207-02C	Plastic 950ml unpreserved	A	7	7	3.8	Y	Absent		TSS-2540(7)
L1725207-03A	Plastic 120ml unpreserved	A	7	7	3.8	Y	Absent		NO3-4500(2),COND-9050(28)
L1725207-03B	Plastic 500ml H2SO4 preserved	A	<2	<2	3.8	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1725207-03C	Plastic 950ml unpreserved	A	7	7	3.8	Y	Absent		TSS-2540(7)

*Values in parentheses indicate holding time in days

NEW JERSEY CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page ___ of ___

Date Rec'd in Lab: 7/21/17

ALPHA Job #: L1725207

Project Information
Project Name: Mount Kemble
Project Location:
Project #
(Use Project name as Project #) ☒
Project Manager: Emily Mayer
ALPHAQuote #:

Turn-Around Time
Standard ☒
Rush (only if pre approved) ☐
Due Date:
# of Days:

Client Information
Client: Solitude Lake Management
Address: 580 Rockport Rd
Hackettstown, NJ 07840
Phone: 908-850-0303
Fax:
Email: EMayer@Solitudelake.com

Deliverables
☐ NJ Full / Reduced
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Regulatory Requirement
☐ SRS Residential/Non Residential
☐ SRS Impact to Groundwater
☐ NJ Ground Water Quality Standards
☐ NJ IGW SPLP Leachate Criteria
☐ Other

Billing Information
☒ Same as Client Info
PO #

Site Information
Is this site impacted by Petroleum? Yes ☐
Petroleum Product:

These samples have been previously analyzed by Alpha ☐

For EPH, selection is REQUIRED:
☐ Category 1
☐ Category 2

For VOC, selection is REQUIRED:
☐ 1,4-Dioxane
☐ 8011

Other project specific requirements/comments:
Billing - "MID" Report Results in mg/L
Please specify Metals or TAL.

Sample Filtration
☐ Done
☐ Lab to do
Preservation
☐ Lab to do
(Please Specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Total Suspended Solids	Conductivity	Nitrate	Ammonia	Total Phosphorus			Sample Specific Comments	Total Bottles
25207 -01	North Station	7/20/17	12:59	L		X	X	X	X	X				
-02	Lake Station	7/20/17	13:27	L		X	X	X	X	X				
-03	Bottom Sample Station	7/20/17	13:36	L		X	X	X	X	X				

Container Type:
Preservative:

Preservative Code:
A = None
B = HCl
C = HNO_3
D = H_2SO_4
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Relinquished By:	Date/Time	Received By:	Date/Time
Emily Mayer	7/20/17 / 1:25pm	Bob Johnson AAL	7/20/17 13:25
Bob Johnson	7/20/17 15:15	Angel D AAL	7/21 1710
Angel D AAL	7/21 2200	[illegible signature]	7/21 2200

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

ANALYTICAL REPORT

Lab Number:	L1714470
Client:	Solitude Lake Management LLC 580 Rockport Rd Hackettstown, NJ 07840
ATTN:	Emily Mayer
Phone:	(908) 850-0303
Project Name:	MOUNT KEMBLE LAKE
Project Number:	MOUNT KEMBLE LAKE
Report Date:	05/11/17

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1714470
Report Date: 05/11/17

SAMPLE RESULTS

Lab ID: L1714470-01
Client ID: NORTH STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 05/04/17 10:15
Date Received: 05/04/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	360		umhos/cm	10	10.	1	-	05/05/17 01:10	1,9050A	VB
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	05/06/17 18:44	121,2540D	RP
Nitrogen, Ammonia	0.043	J	mg/l	0.075	0.022	1	05/05/17 15:01	05/08/17 21:29	121,4500NH3-BH	AT
Nitrogen, Nitrate	0.471		mg/l	0.100	0.022	1	-	05/05/17 00:48	121,4500NO3-F	MR
Phosphorus, Total	0.057		mg/l	0.010	0.003	1	05/09/17 12:15	05/10/17 09:51	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1714470
Report Date: 05/11/17

SAMPLE RESULTS

Lab ID: L1714470-02
Client ID: LAKE STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 05/04/17 11:10
Date Received: 05/04/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	350		umhos/cm	10	10.	1	-	05/05/17 01:10	1,9050A	VB
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	05/06/17 18:44	121,2540D	RP
Nitrogen, Ammonia	0.024	J	mg/l	0.075	0.022	1	05/05/17 15:01	05/08/17 21:30	121,4500NH3-BH	AT
Nitrogen, Nitrate	0.386		mg/l	0.100	0.022	1	-	05/05/17 00:53	121,4500NO3-F	MR
Phosphorus, Total	0.021		mg/l	0.010	0.003	1	05/09/17 12:15	05/10/17 09:53	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1714470
Report Date: 05/11/17

SAMPLE RESULTS

Lab ID: L1714470-03
Client ID: BOTTOM SAMPLE STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 05/04/17 11:20
Date Received: 05/04/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	340		umhos/cm	10	10.	1	-	05/05/17 01:10	1,9050A	VB
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	05/06/17 18:44	121,2540D	RP
Nitrogen, Ammonia	0.084		mg/l	0.075	0.022	1	05/05/17 15:01	05/08/17 21:33	121,4500NH3-BH	AT
Nitrogen, Nitrate	0.416		mg/l	0.100	0.022	1	-	05/05/17 00:54	121,4500NO3-F	MR
Phosphorus, Total	0.008	J	mg/l	0.010	0.003	1	05/09/17 12:15	05/10/17 09:54	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1714470
Report Date: 05/11/17

SAMPLE RESULTS

Lab ID: L1714470-04
Client ID: INLET STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 05/04/17 12:05
Date Received: 05/04/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Phosphorus, Total	0.005	J	mg/l	0.010	0.003	1	05/09/17 12:15	05/10/17 09:55	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1714470
Report Date: 05/11/17

SAMPLE RESULTS

Lab ID: L1714470-05
Client ID: OUTLET STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 05/04/17 12:15
Date Received: 05/04/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Phosphorus, Total	0.022		mg/l	0.010	0.003	1	05/09/17 12:15	05/10/17 09:58	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE | **Lab Number:** L1714470
Project Number: MOUNT KEMBLE LAKE | **Report Date:** 05/11/17

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1000496-1										
Nitrogen, Nitrate	ND		mg/l	0.100	0.022	1	-	05/05/17 00:36	121,4500NO3-F	MR
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1000607-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.022	1	05/05/17 15:01	05/08/17 21:11	121,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1001054-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	05/06/17 18:44	121,2540D	RP
General Chemistry - Westborough Lab for sample(s): 01-05 Batch: WG1001570-1										
Phosphorus, Total	ND		mg/l	0.010	0.003	1	05/09/17 12:15	05/10/17 09:32	121,4500P-E	SD

Lab Control Sample Analysis
Batch Quality Control

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE
Lab Number: L1714470
Report Date: 05/11/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1000496-2								
Nitrogen, Nitrate	100		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1000511-1								
Specific Conductance	100		-		99-101	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1000607-2								
Nitrogen, Ammonia	95		-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-05 Batch: WG1001570-2								
Phosphorus, Total	96		-		80-120	-		

Project Name: MOUNT KEMBLE LAKE **Lab Number:** L1714470
Project Number: MOUNT KEMBLE LAKE **Report Date:** 05/11/17

Sample Receipt and Container Information

Were project specific reporting limits specified? NO

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1714470-01A	Plastic 250ml unpreserved	A	7	4.9	Y	Absent	NO3-4500(2),COND-9050(28)
L1714470-01B	Plastic 500ml H2SO4 preserved	A	<2	4.9	Y	Absent	TPHOS-4500(28),NH3-4500(28)
L1714470-01C	Plastic 950ml unpreserved	A	7	4.9	Y	Absent	TSS-2540(7)
L1714470-02A	Plastic 250ml unpreserved	A	7	4.9	Y	Absent	NO3-4500(2),COND-9050(28)
L1714470-02B	Plastic 500ml H2SO4 preserved	A	<2	4.9	Y	Absent	TPHOS-4500(28),NH3-4500(28)
L1714470-02C	Plastic 950ml unpreserved	A	7	4.9	Y	Absent	TSS-2540(7)
L1714470-03A	Plastic 250ml unpreserved	A	7	4.9	Y	Absent	NO3-4500(2),COND-9050(28)
L1714470-03B	Plastic 500ml H2SO4 preserved	A	<2	4.9	Y	Absent	TPHOS-4500(28),NH3-4500(28)
L1714470-03C	Plastic 950ml unpreserved	A	7	4.9	Y	Absent	TSS-2540(7)
L1714470-04A	Plastic 250ml H2SO4 preserved	A	<2	4.9	Y	Absent	TPHOS-4500(28)
L1714470-05A	Plastic 250ml H2SO4 preserved	A	<2	4.9	Y	Absent	TPHOS-4500(28)

*Values in parentheses indicate holding time in days

NEW JERSEY CHAIN OF CUSTODY

ALPHA

Westborough, MA 01581, 8 Walkup Dr., TEL: 508-898-9220, FAX: 508-898-9193

Mansfield, MA 02048, 320 Forbes Blvd, TEL: 508-822-9300, FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page 1 of 1

Date Rec'd in Lab: 5/9/17

ALPHA Job #: L1714170

Project Information
Project Name: Mount Kemble Lake
Project Location: Morristown, NJ
Project #: Mount Kemble Lake
(Use Project name as Project #) ☐
Project Manager: Emily Mayer
ALPHAQuote #:

Turn-Around Time
Standard ☒ Due Date:
Rush (only if pre approved) ☐ # of Days:

Client Information
Client: Solitude Lake Man.
Address: 580 Rockport Rd. Hackettstown, NJ 07840
Phone: 908-850-0303
Fax:
Email: EMayer@solitudelake.com

Deliverables
☐ NJ Full / Reduced
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Regulatory Requirement
☐ SRS Residential/Non Residential
☐ SRS Impact to Groundwater
☐ NJ Ground Water Quality Standards
☐ NJ IGW SPLP Leachate Criteria
☐ Other

Billing Information
☒ Same as Client Info
PO #

Site Information
Is this site impacted by Petroleum? Yes ☐
Petroleum Product:

These samples have been previously analyzed by Alpha ☐

For EPH, selection is REQUIRED: ☐ Category 1 ☐ Category 2

For VOC, selection is REQUIRED: ☐ 1,4-Dioxane ☐ 8011

Other project specific requirements/comments:
- Billing 'Mid'
- Report results in mg/L.
Please specify Metals or TAL.

Sample Filtration: ☐ Done ☐ Lab to do
Preservation: ☐ Lab to do
(Please Specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Total Phosphorus	Total Suspended Solids	Nitrate (SM4500NO3-F)	Ammonia Nitrogen (SM4500NH3-BH)	Conductivity	Sample Specific Comments	Total Bottle
14170-01	North Station	5/4/17	10:15AM	L	EM	X	X	X	X	X		
02	Lake Station	5/4/17	11:10AM	L	EM	X	X	X	X	X		
03	Bottom Sample Station	5/4/17	11:20AM	L	EM	X	X	X	X	X		
04	Inlet Station	5/4/17	12:05pm	L	EM	X						
05	Outlet Station	5/4/17	12:15pm	L	EM	X						

	Total Phosphorus	Total Suspended Solids	Nitrate	Ammonia Nitrogen	Conductivity
Container Type	P	P	P	P	P
Preservative	D	A	A	D	A

Preservative Code: A = None, B = HCl, C = HNO_3, D = H_2SO_4, E = NaOH, F = MeOH, G = $NaHSO_4$, H = $Na_2S_2O_3$, K/E = Zn Ac/NaOH, O = Other

Container Code: P = Plastic, A = Amber Glass, V = Vial, G = Glass, B = Bacteria Cup, C = Cube, O = Other, E = Encore, D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Relinquished By:	Date/Time	Received By:	Date/Time
Emily Mayer	5/4/17 13:55	Roger Lopez	5/4/17 13:55
Roger Lopez	5/4/17 18:35	Angel B	5/4/17 17:55
Angel B	5/4/17 2238	[illegible]	5/4/17 2238

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

ANALYTICAL REPORT

Lab Number:	L1721520
Client:	Solitude Lake Management LLC 580 Rockport Rd Hackettstown, NJ 07840
ATTN:	Emily Mayer
Phone:	(908) 850-0303
Project Name:	MOUNT KEMBLE LAKE
Project Number:	MOUNT KEMBLE LAKE
Report Date:	06/29/17

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1721520
Report Date: 06/29/17

SAMPLE RESULTS

Lab ID: L1721520-01
Client ID: NORTH STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 06/22/17 12:46
Date Received: 06/23/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	340		umhos/cm	10	10.	1	-	06/24/17 00:15	1,9050A	AS
Solids, Total Suspended	5.3		mg/l	5.0	NA	1	-	06/25/17 20:35	121,2540D	RP
Nitrogen, Ammonia	0.051	J	mg/l	0.075	0.022	1	06/28/17 15:53	06/28/17 22:32	121,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/l	0.100	0.022	1	-	06/24/17 00:30	121,4500NO3-F	MR
Phosphorus, Total	0.045		mg/l	0.010	0.003	1	06/28/17 10:00	06/29/17 09:44	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1721520
Report Date: 06/29/17

SAMPLE RESULTS

Lab ID: L1721520-02
Client ID: SOUTH STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 06/22/17 13:10
Date Received: 06/23/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	340		umhos/cm	10	10.	1	-	06/24/17 00:15	1,9050A	AS
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	06/25/17 20:35	121,2540D	RP
Nitrogen, Ammonia	0.061	J	mg/l	0.075	0.022	1	06/28/17 15:53	06/28/17 22:35	121,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/l	0.100	0.022	1	-	06/24/17 00:35	121,4500NO3-F	MR
Phosphorus, Total	0.035		mg/l	0.010	0.003	1	06/28/17 10:00	06/29/17 09:48	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1721520
Report Date: 06/29/17

SAMPLE RESULTS

Lab ID: L1721520-03
Client ID: BOTTOM SAMPLE STATION
Sample Location: MORRISTOWN, NJ
Matrix: Water

Date Collected: 06/22/17 13:17
Date Received: 06/23/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Specific Conductance @ 25 C	370		umhos/cm	10	10.	1	-	06/24/17 00:15	1,9050A	AS
Solids, Total Suspended	12.		mg/l	10	NA	2	-	06/25/17 20:35	121,2540D	RP
Nitrogen, Ammonia	1.22		mg/l	0.075	0.022	1	06/28/17 15:53	06/28/17 22:36	121,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/l	0.100	0.022	1	-	06/24/17 00:37	121,4500NO3-F	MR
Phosphorus, Total	0.066		mg/l	0.010	0.003	1	06/28/17 10:00	06/29/17 09:50	121,4500P-E	SD

Project Name: MOUNT KEMBLE LAKE **Lab Number:** L1721520
Project Number: MOUNT KEMBLE LAKE **Report Date:** 06/29/17

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1016557-1										
Nitrogen, Nitrate	ND		mg/l	0.100	0.022	1	-	06/24/17 00:02	121,4500NO3-F	MR
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1016851-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	06/25/17 20:35	121,2540D	RP
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1017821-1										
Phosphorus, Total	ND		mg/l	0.010	0.003	1	06/28/17 10:00	06/29/17 09:21	121,4500P-E	SD
General Chemistry - Westborough Lab for sample(s): 01-03 Batch: WG1017952-1										
Nitrogen, Ammonia	ND		mg/l	0.075	0.022	1	06/28/17 15:53	06/28/17 22:17	121,4500NH3-BH	AT

Lab Control Sample Analysis
Batch Quality Control

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1721520
Report Date: 06/29/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1016557-2								
Nitrogen, Nitrate	98		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1016561-1								
Specific Conductance	100		-		99-101	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1017821-2								
Phosphorus, Total	101		-		80-120	-		
General Chemistry - Westborough Lab Associated sample(s): 01-03 Batch: WG1017952-2								
Nitrogen, Ammonia	103		-		80-120	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE L/

Lab Number: L1721520
Report Date: 06/29/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-03 QC Batch ID: WG1016851-2 QC Sample: L1721520-03 Client ID: BOTTOM SAMPLE STATION						
Solids, Total Suspended	12.	12	mg/l	0		29

Project Name: MOUNT KEMBLE LAKE
Project Number: MOUNT KEMBLE LAKE

Lab Number: L1721520
Report Date: 06/29/17

Sample Receipt and Container Information

Were project specific reporting limits specified? NO

Cooler Information

Cooler	*Custody Seal*
A	Absent

Container Information

Container ID	*Container Type*	*Cooler*	*Initial pH*	*Final pH*	*Temp deg C*	*Pres*	*Seal*	*Frozen Date/Time*	*Analysis(*)*
L1721520-01A	Plastic 120ml unpreserved	A	7	7	5.3	Y	Absent		NO3-4500(2),COND-9050(28)
L1721520-01B	Plastic 500ml H2SO4 preserved	A	<2	<2	5.3	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1721520-01C	Plastic 950ml unpreserved	A	7	7	5.3	Y	Absent		TSS-2540(7)
L1721520-02A	Plastic 120ml unpreserved	A	7	7	5.3	Y	Absent		NO3-4500(2),COND-9050(28)
L1721520-02B	Plastic 500ml H2SO4 preserved	A	<2	<2	5.3	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1721520-02C	Plastic 950ml unpreserved	A	7	7	5.3	Y	Absent		TSS-2540(7)
L1721520-03A	Plastic 120ml unpreserved	A	7	7	5.3	Y	Absent		NO3-4500(2),COND-9050(28)
L1721520-03B	Plastic 500ml H2SO4 preserved	A	<2	<2	5.3	Y	Absent		TPHOS-4500(28),NH3-4500(28)
L1721520-03C	Plastic 950ml unpreserved	A	7	7	5.3	Y	Absent		TSS-2540(7)

*Values in parentheses indicate holding time in days

NEW YORK CHAIN OF CUSTODY

ALPHA ANALYTICAL
Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page 1 of 1

Date Rec'd in Lab: 6/23/17

ALPHA Job #: L1721520

Project Information
Project Name: Mount Kemble Lake
Project Location: Morristown NJ
Project #
(Use Project name as Project #) ☒
Project Manager: Emily Mayer
ALPHAQuote #:

Turn-Around Time
Standard ☒
Rush (only if pre approved) ☐
Due Date:
# of Days:

Client Information
Client: Solitude Lake Mgmt
Address: 580 Rockport Rd
Hackettstown NJ 07840
Phone: (908) 850-0303
Fax:
Email: emayer@solitudelake.com

Deliverables
☐ ASP-A ☐ ASP-B
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Regulatory Requirement
☐ NY TOGS ☐ NY Part 375
☐ AWQ Standards ☐ NY CP-51
☐ NY Restricted Use ☐ Other
☐ NY Unrestricted Use
☐ NYC Sewer Discharge

Billing Information
☒ Same as Client Info
PO #

Disposal Site Information
Please identify below location of applicable disposal facilities.
Disposal Facility:
☐ NJ ☐ NY
☐ Other:

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:
Billing 'Mid' Please report results in mg/L

Please specify Metals or TAL.

Sample Filtration
☐ Done
☐ Lab to do
Preservation
☐ Lab to do
(Please Specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Total Phosphorus	Total Suspended Sol.	Nitrate (SM4500NO3-F)	Ammonia Nitrogen	Conductivity				Sample Specific Comments	Total Bottles
21520-01	North Station	6/22/17	12:46	L	TS	X	X	X	X	X					3
02	~~Lake~~ South Station	6/22/17	13:10	L	TS	X	X	X	X	X					3
03	Bottom Sample Station	6/22/17	13:17	L	TS	X	X	X	X	X					3

Container Type
Preservative

Preservative Code	Container Code
A = None	P = Plastic
B = HCl	A = Amber Glass
C = HNO_3	V = Vial
D = H_2SO_4	G = Glass
E = NaOH	B = Bacteria Cup
F = MeOH	C = Cube
G = $NaHSO_4$	O = Other
H = $Na_2S_2O_3$	E = Encore
K/E = Zn Ac/NaOH	D = BOD Bottle
O = Other	

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Relinquished By:	Date/Time	Received By:	Date/Time
Emily Mayer	6/23/17/ 15:14	[signature] AAL	6/23/17 15:14
[signature]	6/23/17 17:20	[signature]	6/23 2221
[signature]	6/23 2245	[signature]	6/23/17 2245

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-25 HC (rev. 30-Sept-2013)