December 6, 2005

Long Sought For Pond Protective Association
Mr. Douglas Bell, President
98 Dunstable Road
Westford, MA 01886

Re: 2005 Year-End Report for the Aquatic Management Program at Long Sought For Pond

Dear Association Members:

Please accept this as our Year-End Report for the 2005 Aquatic Management Program at Long Sought For Pond. Following a successful treatment program targeting invasive Eurasian watermilfoil in 2004, this year's program focused on vegetation and water quality monitoring. Vegetation surveys and water quality sampling/measurements were conducted on June 10th and September 1st. Although a few Eurasian milfoil plants were observed by our Biologist in the June survey, we (and members of the Association) were unable to find these plants, or any other milfoil growth, during the remainder of the season.

Vegetation Distribution

The assemblage of aquatic vegetation in Long Sought For Pond was surveyed during both visits. Figure 1 & 2 depict the distribution of plants as observed during these surveys. In the June survey, the aquatic vegetation was dominated by Robbins pondweed (*Potamogeton robbinsii)*. Overall, the bottom was about 60% covered with Robbins pondweed, however much of these plants were still dormant and/or recovering from last year's treatment. The Sonar (fluridone) herbicide, which was used last year to control the Eurasian milfoil, will generally stunt the growth of Robbins pondweed but does not typically cause mortality, especially considering the low dose of Sonar applied to the pond. Several areas of the pondweed were dense and growing actively. A fair amount of filamentous algae was found to be growing on the bottom of the pond, which some floating mats also observed.

Scattered curlyleaf pondweed (*Potamogeton crispus*), another invasive, non-native plant, was observed over less than 10% of the pond bottom. There were no large patches of curlyleaf growth observed in the June survey. Many of the scattered curlyleaf plants were observed to be growing very near the surface of the water. Curlyleaf pondweed has a unique growth cycle, which allows the plants to emerge very early in the spring. For this reason, the peak density of curlyleaf pondweed is usually observed in mid-late June, after which the plants begin to die-back.

During the September survey, there the vegetation assemblage was dominated by a healthy abundance of Robbins pondweed. Most of these plants were actively growing in areas of >4-feet of water depth and most were about 2-6 feet tall. Growth in shallow perimeter areas and within the beach areas was sparse, likely due to sandy substrates. A moderate amount of muskgrass (*Chara sp.*), a beneficial, rooted macro-algae, was observed to be cohabitating the areas of Robbins pondweed. Widely scattered occurrences of bladderwort (*Utricularia sp.*) and tapegrass (*Vallisneria sp.*) were also observed. These are all native plants.

Surprisingly, curlyleaf pondweed was still observed in the pond at this time, including several sizeable areas of continuous, yet sparse, growth. The two largest patches were located in the southwestern and southeastern sections of the pond. Small patches of just several plants were observed periodically along the entire length of the western shore.

As mentioned previously, a small patch of milfoil was noted in the southwestern section of the pond in June, but was not observed in the September survey. No other milfoil plants were observed in the pond this year. Last year's herbicide treatment has provided the milfoil control that was hoped for and has certainly more than met the guarantee of >70% control in the year after treatment.

Water Quality Observations

Water quality samples were collected from the pond on June 10th and September 1st. Three sampling station were collected (See Figure 1). The following section presents the results of the laboratory testing with interpretation:

TABLE 1 - WATER QUALITY RESULTS (2005)

Station	Date	PH (S.U.)	Alkalinity (mg/L)	Turbidity (NTU)	Total Kjeldal Nitrogen (mg/l)	Nitrate Nitrogen (mg/l)	Phosphorus (mg/l)	E.Coli (org/100ml)
# 1 (North End)	June	7.3	19	0.47	<0.3	0.34	<0.010	<10
	Sept	7.0	22	0.28	0.38	0.68	<0.010	<10
# 2 (South End)	June	7.3	20	0.47	<0.3	0.31	0.011	<10
	Sept	7.1	23	0.29	0.46	0.54	<0.010	<10
# 3 (Inlet)	June	5.9	5.5	0.65	<0.3	<0.2	0.039	40
	Sept	6.2	42	5.7	1.3	<0.5	0.072	<10

pH – The pH measurement scale is from 0 to 14, where zero is extremely acidic, 7 is neutral, and 14 is the most basic. pH is related to the concentration of H^+ (hydrogen ions) in solution and can affect many different aspects of water chemistry. The values obtained at LSFP were very nearly neutral, except for the inlet sample station. This may indicate influence from the surficial geology of this stream's watershed or possibly due to decomposition of humic material in the stream bed. A pH range of about 5.5 – 8.5 is desired for maintaining a healthy fishery.

Total Alkalinity – Alkalinity is a measure of the buffering capacity of a waterbody against acid additions such as acid rain and pollution, which can be detrimental to wildlife populations. Total alkalinity measures the presence of carbonates, bicarbonates and hydroxides. Values below 20 mg/l are a signal that the pond may be susceptible to fluctuations in pH. Alkalinity at LSFP is low, like many ponds in the region.

Turbidity - Turbidity is a relative measurement of the amount of suspended material in the water. It is measured through a process involving light diffraction of the pond sample as compared to a series of prepared samples. Turbidity values can range from less than one to thousands of units, however, values in most ponds and lakes rarely rises above 5 NTU. The turbidity values at the pond were desirable and show a low-level of suspended material. This value can vary significantly with stormwater influence. The one elevated result at the inlet station was likely due the relatively low flow condition at the time of sampling.

Nitrogen - Nitrogen is a vital nutrient in the pond environment for plant and algae growth. Nitrogen exists in water as various compounds, with relative amounts governed by such things as atmospheric influence, precipitation, biological activity and water chemistry. Total Kjeldal nitrogen (TKN) is a measure of the nitrogen contained in organic compounds, such as proteins and amino acids, and as ammonia. It is created from biological growth and decomposition. A concentration of 1.0 mg/l or below is considered desirable. TKN values at LSFP were all below this threshold and rose slightly over the course of the summer. This average indicates a desirably low level of productivity in the pond. Again the slightly elevated result in September from the inlet station is likely due to relatively stagnant flow conditions.

Nitrate is another form of nitrogen in the water. Nitrate nitrogen is usually the most prevalent form of inorganic nitrogen in the water and results from such things as natural aerobic bacterial activity and fertilizer use. The 2005 values at LSFP show values "hovering" around the desirable concentration of 0.3 mg/l or less, in June and elevated in September. Higher than desirable levels were observed at both in-pond stations in September and represent a significant deviation from the sample results last year. These elevated levels could be a result of watershed inputs, however the later summer dry period experienced this year makes

this unlikely. Another possible cause is the presence of a moderate algae bloom during the sample collection, which could cause a spike in nitrate values. The results could also be a sampling anomaly, which can only be concluded after future testing shows a lower average nitrate value for the pond.

Total Phosphorus – Phosphorus is generally considered to be the limiting nutrient for plant and algae growth, with concentrations of 0.03 mg/l or more being sufficient to stimulate algae blooms. The phosphorus level in LSFP was desirably below this level. Inlet samples showed somewhat elevated levels of phosphorus, however this is not uncommon from small, intermittent streams. The relatively low water volume supplied from this stream mitigates the effect of the high phosphors. Water column phosphorus does not generally relate to rooted plant growth as they obtain most of their nutrients from the pond sediment.

E. Coli Bacteria – Coliform bacteria are naturally occurring in pond systems as well as resultant from human and animal inputs. E.Coli is an indicator of the presence of human or animal waste inputs. In general, acceptable values in "swimmable waters" for E. Coli is less than 230 organisms per 100 ml. Bacteria tests were well within these acceptable limits.

Dissolved oxygen (DO) is very important in the pond system. Not only do fish and other aquatic fauna require adequate levels of oxygen, but it also controls many aspects of water chemistry. Values below 5.0 mg/l are undesirable for most aquatic life, however lower values are not uncommon near the sediment layer where oxygen demand is great and oxygen influx is at a minimum. Under extreme anoxic conditions (<1.0 mg/l), phosphorus can be released from the sediment and stimulate algae blooms. Under stratified conditions, which occur in many deeper lakes, oxygen depletion can occur in a significant portion of the water column, possibly endangering fish populations, especially coldwater species.

Temperature/dissolved oxygen profiling at LSFP was performed in the southern end of the pond over the "deep hole". Measurements taken during the two surveys showed a distinct layering (thermocline) occurring between 2 and 3 meters in June and between 4 and 6 meters in September. The June profile showed good oxygenation (at or near saturation levels) except for directly near the bottom. The September profile showed anoxic condition below ~ 7 meters.

Water clarity measurements were taken with a standard Secchi disk during each of the sampling rounds. Both rounds showed water clarity at around 20-feet. Overall, the water clarity continues to be excellent in LSFP. There was some indication of a blue-green algae bloom of moderate proportions during the September survey, but it did not seem to affect the water clarity much. Most of the algae was seen to be growing in large size clumps, most of which were blown down to the south end of the pond.

Management Recommendations

After observing the continued milfoil control this year from the 2004 treatment, we fully expect to see little re-growth of milfoil in 2006. In the event that some localized milfoil growth is observed in 2006, we may recommend some alternative methods of control including diver handpulling and/or benthic barrier. These methods are much more suitable for small infestation (<1/2 acre) and may help to prolong the duration of control before another treatment is required. More sizable infestations (> 1-acre) should be "spot" treated with the Reward (diquat) herbicide. If the Association decides to manage smaller areas of re-growth with hand-pulling, barriers or treatment, you may want to budget a contingency amount of ~$5,000-$7,500 to do so.

The growth of curly-leaf pondweed, while still generally sparse, is of some concern. Curlyleaf pondweed has been observed at Long Sought for Pond in the past, but may continue to expand now that the milfoil has been controlled. We hope that the presence of the Robbins pondweed will mitigate the rate of spread, but it may be a more prudent course of action to also provide control of the curlyleaf pondweed with spot herbicide treatment. Curlyleaf pondweed propagates and spreads vegatatively through the production of turions (hardened stem tips). Although it is difficult to provide more than seasonal control, the best chance of reducing annual re-growth is by performing early season treatments with the Reward (diquat) or Aquathol-K (endothall) herbicides. Treatments are generally performed as soon as the water warms to

above 60° F. (late April/early May). Based on our survey observations, we expect that most of the pond's western and southern shoreline will need to be treated in order to make sure we control a majority of the curly leaf-pondweed. A pre-treatment survey will be used to confirm the areas of curlyleaf growth and set the actual treatment areas. We estimate the cost of such a treatment to be in the range of $5,000-$6,000.

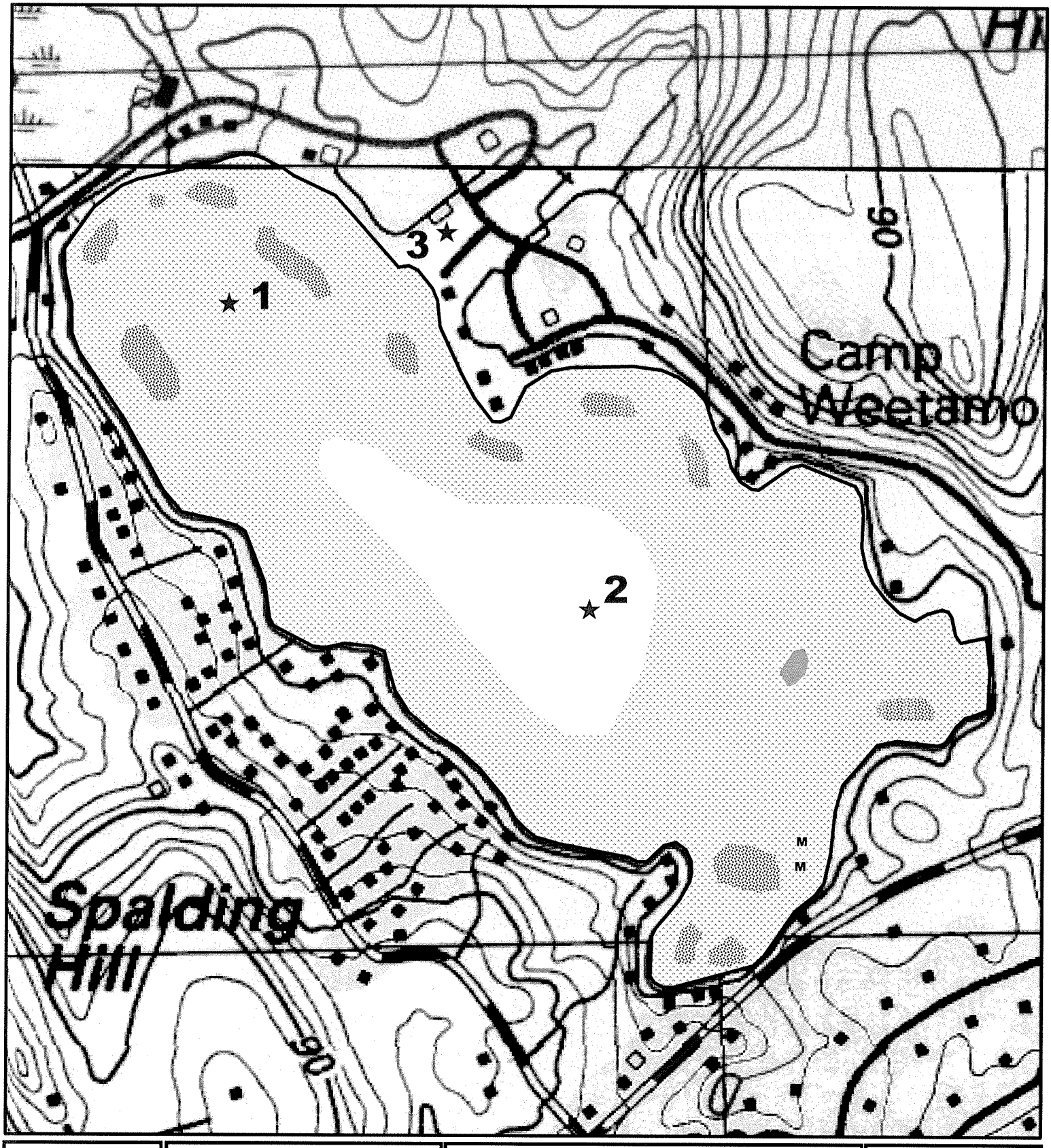
For 2006, we also strongly recommend continuing with an early & late summer vegetation/water quality survey. The vegetation surveys will be important to monitor for re-growth of milfoil and document the presence and extent of other species in the pond. We recommend that you budget $2,750 for the two vegetation surveys and water quality monitoring sampling rounds. Continued monitoring of the pond is not only prudent but was also alluded to, if not required, by the Order of Conditions permit issued by the Town for this project. In the event that the Association moves forward with treatment of the curly-leaf pondweed, the cost of monitoring will be somewhat reduced as we can perform some of the monitoring tasks during our visits to the pond as part of the treatment program.

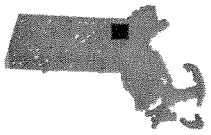
We appreciate your cooperation with this past year's program and look forward to working with you again next year. If you have any questions, please feel free to give me a call.

Sincerely,
AQUATIC CONTROL TECHNOLOGY, INC.

Dominic M. Meringolo
Environmental Engineer

Gerald N. Smith
President/Aquatic Biologist





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Long Sought For Pond

Vegetation Distribution June 2005

FIGURE	SURVEY DATE	MAP DATE
1	6/10/05	12/2005

LEGEND

Dense Robbins Pondweed

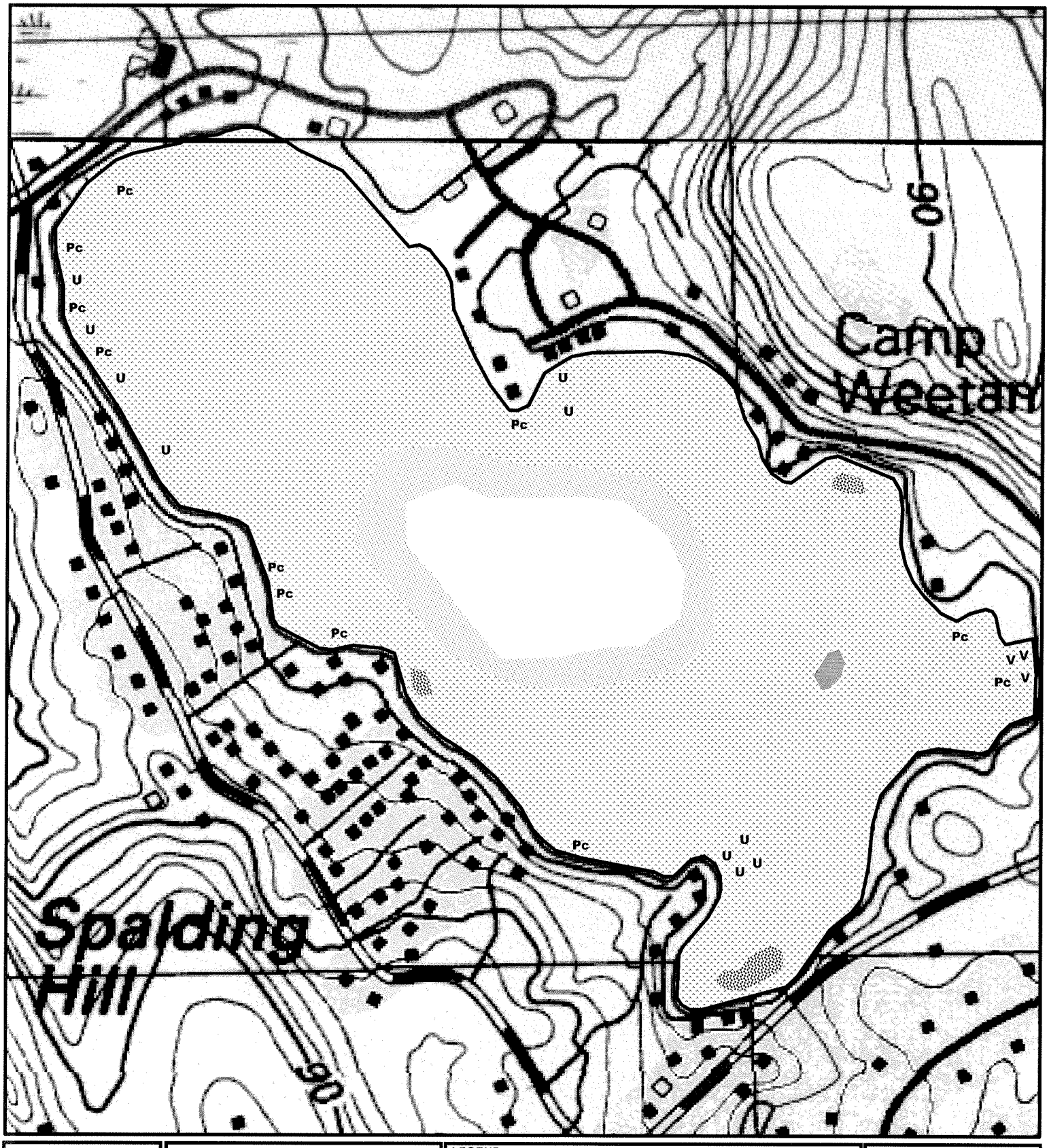
60% cover with Robbins pondweed - some dormant Scattered curlyleaf pondweed

M - Eurasian milfoil

400 0 400 800 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

11 John Road
Sutton, Massachusetts 01590
PHONE: (508) 865-1000
FAX : (508) 865-1220
EMAIL: info @aquaticcontroltech.com
WEB: www.aquaticcontroltech.com



N
W E
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Long Sought For Pond

Vegetation Distribution September 2005

FIGURE	SURVEY DATE	MAP DATE
2	9/1/05	12/2005

LEGEND

- Areas of curlyleaf pondweed
- 60% cover of Robbins pondweed with some muskgrass on the bottom
- Deeper water with mostly muskgrass

U - bladderwort (Utricularia sp.)
Pc - curlyleaf pondweed (Potamogeton crispus)
V - tapegrass (Vallinsernia sp.)

400 0 400 800 Feet

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FAX : (508) 865-1220
EMAIL: info @aquaticcontroltech.com
WEB: www.aquaticcontroltech.com

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MASSACHUSETTS DIVISION
148 Bartlett Street
Marlborough, MA 01752
(508) 460-7600 Fax (508) 460-7777
Daniel J. Ste.Marie, Lab Director
www.microbac.com E-Mail: massachusetts@microbac.com

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CERTIFICATE OF ANALYSIS

AQUATIC CONTROL TECHNOLOGY
11 JOHN ROAD
SUTTON,MA 01590-2509

Date Reported	6/27/2005
Date Received	6/9/2005
Sample ID	0506-00400
Invoice No.	96198
Cust #	A031
Cust P.O. #	

Subject **LONG SOUGHT FOR POND SAMPLES REC'D 6/9/05**

Sampled By: CLIENT Date 6/9/2005 Time

Test	Result	Date	Time	Tech	Method
001 Sample Collected: 6/9/2005 12:00:00AM					
LONG SOUGHT FOR POND SITE 1					
pH	7.3 S.U.	6/10/2005	11:00	KJR	SM-4500-H-B
Alkalinity as CaCO3	<20 mg CaCO3/L	6/14/2005		KJR	SM 2320B
Turbidity	0.47 NTU	6/10/2005	12:00	KJR	SM 2130B
Total Kjeldal Nitrogen	<0.30 mg/l	6/21/2005	8:09	ACU	EPA 351.2
Nitrate Nitrogen as N	0.34 mg/L	6/11/2005	9:30	KJR	4500-NO3-D
Phosphorous as P	<0.010 mg/L	6/14/2005		DLK	EPA 200.7
E. coli	<10 per 100ml	6/10/2005	15:30	LBL	SM9213D
Temperature at Lab	18.0 Degrees C	6/9/2005		HCL	
LOW LEVEL ALKALINITY ESTIMATE = 19 MG/L					
002 Sample Collected: 6/9/2005 12:00:00AM					
LONG SOUGHT FOR POND SITE 2					
pH	7.3 S.U.	6/10/2005	11:00	KJR	SM-4500-H-B
Alkalinity as CaCO3	20 mg CaCO3/L	6/14/2005		KJR	SM 2320B
Turbidity	0.47 NTU	6/10/2005	12:00	KJR	SM 2130B
Total Kjeldal Nitrogen	<0.30 mg/l	6/21/2005	8:09	ACU	EPA 351.2
Nitrate Nitrogen as N	0.31 mg/L	6/11/2005	9:30	KJR	4500-NO3-D
Phosphorous as P	0.011 mg/L	6/14/2005		DLK	EPA 200.7
E. coli	<10 per 100ml	6/10/2005	15:30	LBL	SM9213D
003 Sample Collected: 6/9/2005 12:00:00AM					
LONG SOUGHT FOR POND SITE 3					

Current State Certification IDs:
IN, C-MA-02; KY, #90138; ME, MA003; MA, M-MA003; RI, #00280; VT, listed

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SUTTON,MA 01590-2509

Date Reported	6/27/2005
Date Received	6/9/2005
Sample ID	0506-00400
Invoice No.	96198
Cust #	A031
Cust P.O. #	

Subject **LONG SOUGHT FOR POND SAMPLES REC'D 6/9/05**

Sampled By: CLIENT Date 6/9/2005 Time

Test	Result	Date	Time	Tech	Method
003 Sample Collected: 6/9/2005 12:00:00AM					
LONG SOUGHT FOR POND SITE 3					
pH	5.9 S.U.	6/10/2005	11:00	KJR	SM-4500-H-B
Alkalinity as CaCO3	<20 mg CaCO3/L	6/14/2005		KJR	SM 2320B
Turbidity	0.65 NTU	6/10/2005	12:00	KJR	SM 2130B
Total Kjeldal Nitrogen	<0.30 mg/l	6/21/2005	8:09	ACU	EPA 351.2
Nitrate Nitrogen as N	<0.2 mg/L	6/11/2005	9:30	KJR	4500-NO3-D
Phosphorous as P	0.039 mg/L	6/14/2005		DLK	EPA 200.7
E. coli	40 per 100ml	6/10/2005	15:30	LBL	SM9213D

LOW LEVEL ALKALINITY ESTIMATE = 5.5 MG/L

This report has been reviewed and is electronically signed by:

Daniel J. Ste.Marie
Laboratory Director

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11 JOHN ROAD
SUTTON,MA 01590-2509

Date Reported	9/15/2005
Date Received	9/1/2005
Sample ID	0509-00463
Invoice No.	354
Cust #	A031
Cust P.O. #	

Subject LONG SOUGHT FOR POND SAMPLES 9/1/05

Sampled By: CLIENT Date 9/1/2005 Time

Test	Result	Date	Time	Tech	Method
001 Sample Collected: 9/1/2005 12:00:00AM					
SAMPLE #1					
pH	7.0 S.U.	9/1/2005	17:00	EVD	SM-4500-H-B
Alkalinity as CaCO3	22 mg CaCO3/L	9/6/2005		EVD	SM 2320B
Turbidity	0.28 NTU	9/1/2005	17:25	EVD	SM 2130B
Total Kjeldal Nitrogen	0.38 mg/l	9/12/2005	9:02	ACU	EPA 351.2
Nitrate Nitrogen as N	0.68 mg/L	9/2/2005		EVD	4500-NO3-D
Phosphorous as P	<0.010 mg/L	9/7/2005		DLK	EPA 200.7
E. coli	<10 per 100ml	9/2/2005	16:05	LBL	SM9213D
Temperature at Lab	10.0 Degrees C	9/1/2005		MAB	
002 Sample Collected: 9/1/2005 12:00:00AM					
SAMPLE #2					
pH	7.1 S.U.	9/1/2005	17:00	EVD	SM-4500-H-B
Alkalinity as CaCO3	23 mg CaCO3/L	9/6/2005		EVD	SM 2320B
Turbidity	0.29 NTU	9/1/2005	17:25	EVD	SM 2130B
Total Kjeldal Nitrogen	0.46 mg/l	9/12/2005	9:02	ACU	EPA 351.2
Nitrate Nitrogen as N	0.54 mg/L	9/2/2005		EVD	4500-NO3-D
Phosphorous as P	<0.010 mg/L	9/7/2005		DLK	EPA 200.7
E. coli	<10 per 100ml	9/2/2005	16:05	LBL	SM9213D
003 Sample Collected: 9/1/2005 12:00:00AM					
SAMPLE #3					

Current State Certification IDs:
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Invoice No.	354
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Subject LONG SOUGHT FOR POND SAMPLES 9/1/05

Sampled By: CLIENT Date 9/1/2005 Time

Test	Result	Date	Time	Tech	Method
003 Sample Collected: 9/1/2005 12:00:00AM					
SAMPLE #3					
pH	6.2 S.U.	9/1/2005	17:00	EVD	SM-4500-H-B
Alkalinity as CaCO3	42 mg CaCO3/L	9/6/2005		EVD	SM 2320B
Turbidity	5.7 NTU	9/1/2005	17:25	EVD	SM 2130B
Total Kjeldal Nitrogen	1.3 mg/l	9/12/2005	9:02	ACU	EPA 351.2
Nitrate Nitrogen as N	<0.5 mg/L	9/2/2005		EVD	4500-NO3-D
Phosphorous as P	0.072 mg/L	9/7/2005		DLK	EPA 200.7
E. coli	<10 per 100ml	9/2/2005	16:05	LBL	SM9213D

This report has been reviewed and is electronically signed by:

Daniel J. Ste.Marie
Laboratory Director

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