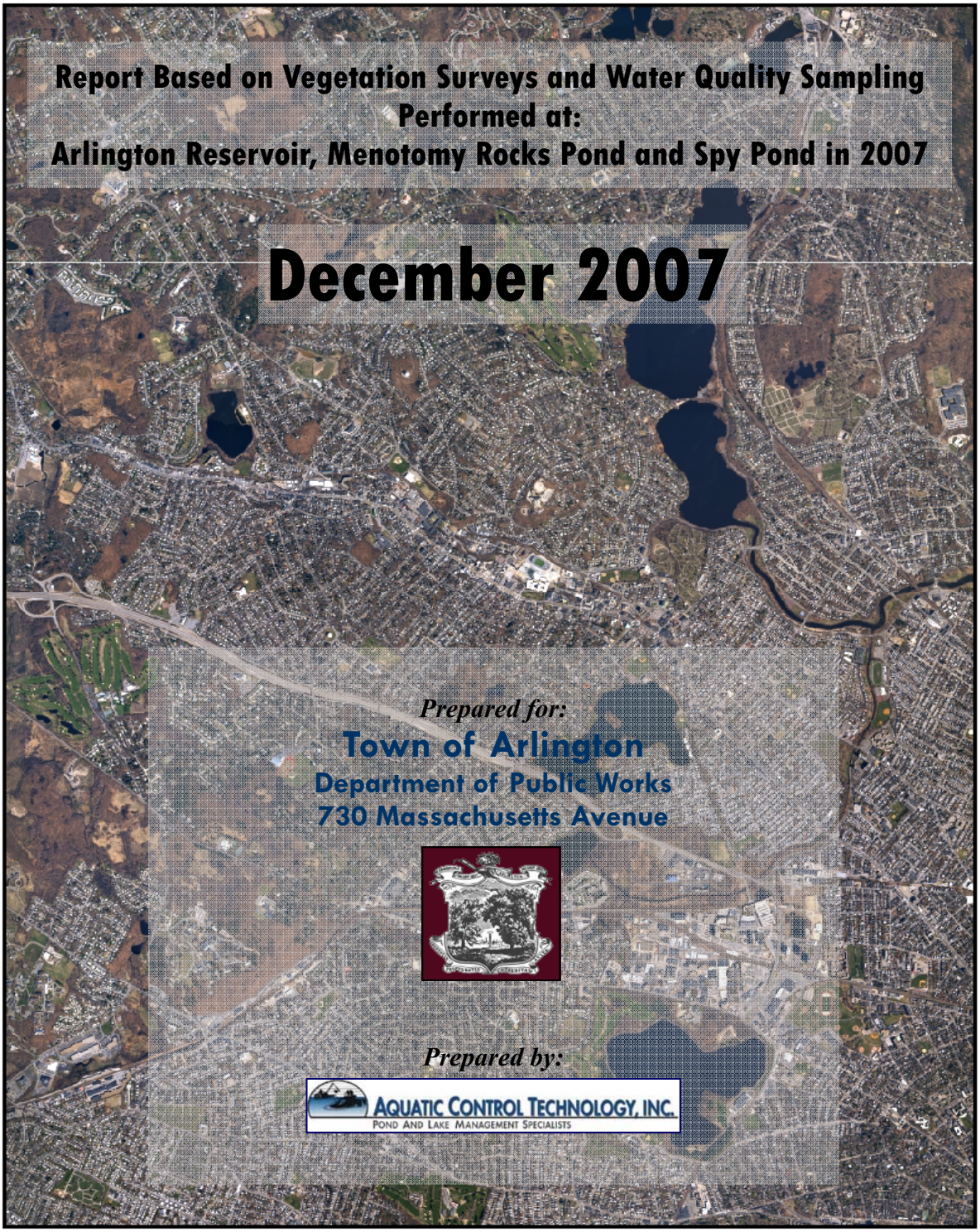
ARLINGTON PONDS
2007 BASELINE SURVEY



Report Based on Vegetation Surveys and Water Quality Sampling Performed at:
Arlington Reservoir, Menotomy Rocks Pond and Spy Pond in 2007

December 2007

Prepared for:

Town of Arlington
Department of Public Works
730 Massachusetts Avenue

Prepared by:

AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

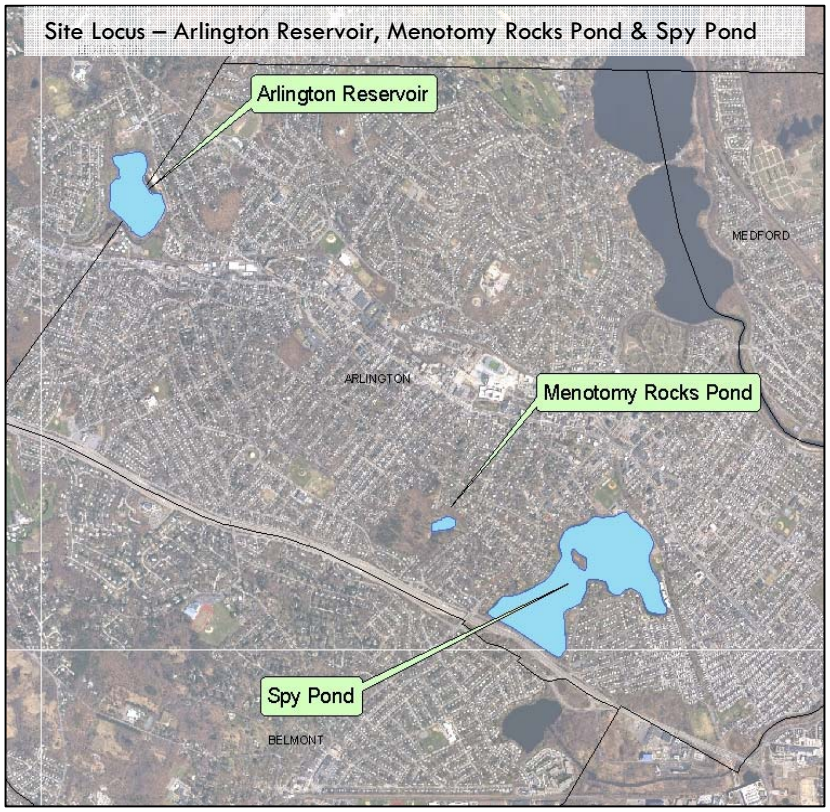
Table of Contents

INTRODUCTION

In the summer of 2007 Aquatic Control Technology, Inc. (ACT) was contracted by the Town of Arlington to conduct comprehensive aquatic plant surveys at three waterbodies: Arlington Reservoir, Menotomy Rocks Pond and Spy Pond. At each waterbody, qualitative Mid-Season Vegetation Surveys and quantitative Late Season Data Point Intercept Surveys were conducted. During each survey Secchi Disk Transparency readings and Temperature/ Dissolved Oxygen Profiles were recorded. A water sample was also collected at each waterbody and tested for a suite of basic water quality parameters by a State Certified Laboratory.

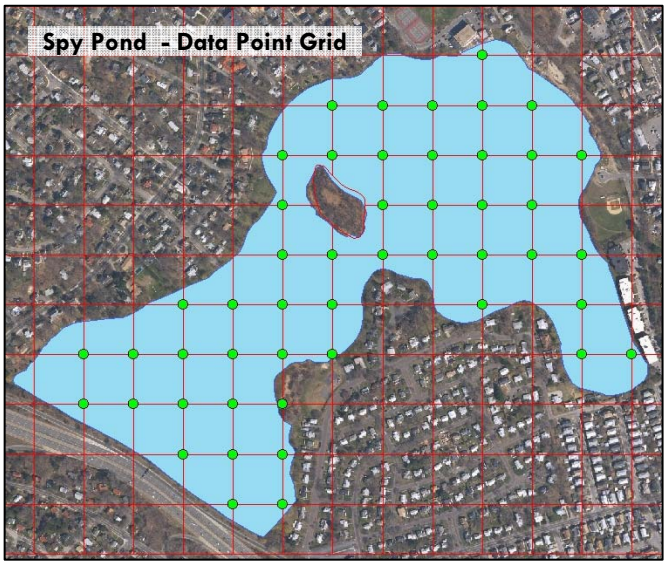
The 2007 survey work was conducted to:

- Establish quantitative baseline information regarding the aquatic macrophyte community at each of the surveyed waterbodies
- Produce detailed maps showing the distribution for each aquatic plant species observed.
- Create and provide a template(s) from which future vegetation surveys can be performed and replicated at each of the waterbodies to allow for long-term vegetation monitoring
- Document and analyze baseline water quality information
- Provide the Town of Arlington with site specific management recommendations for each of the surveyed waterbodies



AQUATIC VEGETATION SURVEYS

Although qualitative vegetation surveys were conducted at Arlington Reservoir, Menotomy Rocks Pond, and Spy Pond at the end of July (7/31/07), the balance of this report will focus primarily on the quantitative vegetation data collected during the Late Season Data Point Surveys. Information gained from the precursory qualitative surveys will however be considered with regards to management recommendations and in discussion of water quality parameters. Marked shifts in vegetative cover between the two survey dates will also be discussed where applicable.



Methodology

On August 31st and September 4th, Aquatic Control Technology, Inc. conducted Data Point Intercept Surveys at Arlington Reservoir, Menotomy Rocks Pond and Spy Pond. The methodology for each of the surveys was derived from the point intercept sampling method developed by the U.S. Army Corps of Engineers (Madsen 1999). The point intercept method is intended to document the spatial distribution, percent cover and biomass of each aquatic macrophyte species at specific re-locatable data point sites.

Using ArcView 9.1 software, point intercept data points were created at the vertices of individually tailored sample grids. Each of the grids was created prior to the field work and was sized according to waterbody area and the anticipated frequency of data points needed to establish a "reasonable" data collection set (see picture above). Frequency of the point intercept data points varied between reservoirs from ~5.5 data points per acre at Menotomy Rocks to ~0.5 data points per acre at Spy Pond.

Data points were navigated to by boat using a Garmin 76Cx GPS unit. At each data point, vegetation was identified and quantified using a combination of a vegetation "throw rake", an underwater AquaVu camera system and visual inspection. For each data point, areal coverage estimates (density) of each species encountered were recorded and an overall biomass estimate was assigned based of the relative volume of each plant community. The biomass index is representative of the overall height of plants in the vicinity of the sample point. The index ranges from 0-4 according to the following breakdown: 0 – No plants, 1 – plants generally low-growing within a foot of the bottom, 2 – plants generally half-way through the water column, 3 – plants within 1-2 feet of the surface, 4 – plants just below or at the surface.

Water depth was recorded using a calibrated sounding rod for depths less than 15 feet and a high-resolution fish finder (Lowrance LC X15mt) for depths in excess of 15 feet (Spy Pond only).

Sediment type was also recorded at each data point where reasonable sediment determinations could be made.

Particular attention was paid to the presence of any non-native plant species, which may have a higher probability of degrading water quality. Dense vegetation, especially consisting of non-native species can negatively impact water quality in a number of ways:

- **reduce open water habitat**
- **impact fish populations and growth trends**
- **reduce predator/prey interaction**
- **create potentially harmful dissolved oxygen fluctuations**
- **increase water temperature**
- **limit access to the pond for recreation**
- **negatively impact shoreline property values**

As aquatic vegetation plays a large role in the waterbody ecosystem, these surveys are an important component in the overall lake and pond management plans.

Results

The following section of the report presents and discusses the data collected during the 2007 survey work. Some relevant tables and figures are found embedded in the text, however, more detailed maps and data point specific survey information can be found in the appendices attached to the end of the report.

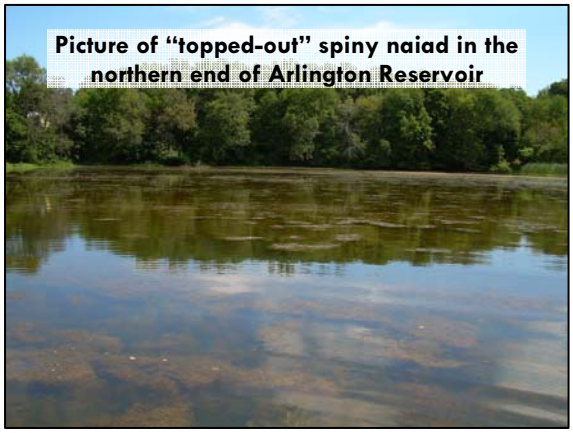
Arlington Reservoir

Arlington Reservoir a 28 acre waterbody located on the Arlington/Lexington line was surveyed on 7/31 & 9/4/07. The Data Point Intercept survey performed in September included 34 data collection sites, creating a data point frequency of approximately 1.2 points/acre.

Table 1

Arlington Reservoir – Summary of Survey Results	
Surface Area	28-acres
Average Depth	5.1-feet
Maximum Recorded Depth	7.5-feet
# of Survey Points	34
# of Survey Points/acre	1.2
Overall Plant Cover	74%
Overall Plant Biomass	~2.8
Dominant Species	Coontail Eurasian milfoil (exotic) Najas minor (exotic)

The average recorded water depth of the reservoir was approximately 5.1 feet with a maximum recorded depth just over 7.5 feet. The substrate composition throughout the majority of the waterbody was generally mucky with patches of sand and gravel. In general the muck appeared to be only a few inches to a foot thick, however, some areas of the Reservoir harbored significantly greater buildup of sediment, most notably the shallower northern cove, where accumulation of sediment is evident along the shoreline to the south of the inlet. In general, however, immediate shoreline areas elsewhere in the waterbody exhibited significantly less accumulation of organic muck and were generally characterized by a sandier, rockier bottom substrate.

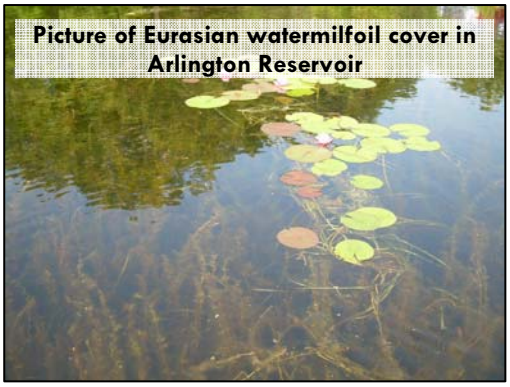


Picture of "topped-out" spiny naiad in the northern end of Arlington Reservoir

The water clarity at the Reservoir was generally poor, averaging 3.7 feet between the two surveys (4.3 ft. – 7/31 & 3.1 ft. – 9/4/07). Dissolved oxygen levels were high throughout season averaging nearly 110% oxygen saturation through the first through the first five feet of water (9.69 mg/L at 26.9°C on 7/31 & 8.52 mg/L at 23.3°C on 9/4/07). The elevated oxygen saturation recorded in Arlington Reservoir is indicative of a waterbody with dense cover of aquatic plant growth. Algae counts were low in Arlington Reservoir but were primarily dominated by *Microcystis* a common blue-green algae which accounted for nearly 1/2 (2,960 of 6,253) of the cells counted.


Picture of variegated water clover in Arlington Reservoir

Although 11 different aquatic plant species were identified during the course of the 2007 Vegetation Survey, the collective vegetation assemblage was dominated by coontail (*Ceratophyllum demersum*), Spiny naiad (*Najas minor*) and Eurasian watermilfoil (*Myriophyllum spicatum*). Of the 34 data points (91% of the data point locations) where vegetation was encountered, coontail was found at 79% of these points; Eurasian watermilfoil at 77%; and spiny naiad at 62%. The average depth of these points was slightly less than 5 feet. The overall biomass at the vegetated sites was high, averaging approximately ~3.25, which was due in large part to the expanse of "topped-out" spiny naiad in the shallow northern third of the Reservoir, and the thick band of "topped-out" coontail growth around much of the reservoir's Southern and southern shoreline. Other smaller areas of "topped-out" thinleaf pondweed and Eurasian water milfoil were also encountered. The average areal density across the 31 vegetated data points was also high with and average of over 80%. (See Appendix A - Figure 3 - Vegetation Assemblage Map)


Picture of Eurasian watermilfoil cover in Arlington Reservoir

Growth of floating leaf plants including: white waterlily (*Nymphaea odorata*), watershield (*Brasenia schreberi*), water chestnut (*Trapa natans*) and variegated water clover (*Marsilea mutica*) was recorded during each of the surveys at Arlington Reservoir. In large part growth of these plants was confined to the northern 1/3 of the Reservoir. Although there were some sizable beds of watershield and water clover along the shoreline of the reservoir, cover of waterlily and water chestnut was widely scattered and patchy.

While Eurasian watermilfoil, a notoriously invasive, non-native plant was found throughout much of Arlington Reservoir, its presence was not as dominating as it often becomes elsewhere, averaging an areal density of less than 5% across the 26 locations where it was found. Milfoil was dense in a few small areas along the southwest shore (see picture above), adjacent the dirt parking lot off Lowe Street, but for the most part was tertiary in overall plant cover. The distribution and density of all encountered milfoil growth can be seen in Figure 9 (Appendix A) found at the end of this report.

Water chestnut (*Trapa natans*), another notoriously problematic and invasive, non-native species was also found in the Arlington Reservoir at the time of the survey. Although thorough hand-pulling of water chestnut was performed three weeks prior (Aug. 9 & 10) to the Data Point Survey, small patches of immature water chestnut re-growth were observed along the Southern shoreline, extending into the northern third of the Reservoir. The observed chestnut growth was too immature to produce seeds in 2007, therefore no additional hand-pulling was necessary. Though growth of water chestnut still persist in Arlington Reservoir, low density coverage of this plant has been maintained following the mechanical harvesting effort (2000-2002). Prior to the

start of harvesting in 2000, it was estimated that dense water chestnut covered over 14 acres of the pond.

The one recognizable difference observed at Arlington Reservoir between the two survey dates was the emergence of spiny naiad in the Late Season Survey. Although, spiny naiad was identified on 7/31, it was generally low growing and scattered. By the time of the Data Point Survey, spiny naiad growth had expanded exponentially, coming to dominate many areas that had formerly been dominated by thinleaf pondweed. While this shift in vegetative cover was dramatic it is not unexpected as many naiad species tend to grow later in the season, only reaching full maturity by late summer.

Detailed data point location maps have been created for each of the identified species and can be found in at the end of this report (Appendix A - Figures 1-17). Below is a list of all of the aquatic plant species found in Arlington Reservoir at the time of the 2007 Vegetation Survey. The plants have been listed in order of abundance based on their frequency of occurrence at the 34 survey points sampled. Species encountered during the qualitative Mid Season Survey have also been included in the following list. These species along with other plant species identified during the Late Season Data Point Intercept Survey, but not found at specific sites, have been listed as "observed"

Plants of Arlington Reservoir – Listed by Order of Abundance

COMMON NAME	SCIENTIFIC NAME	FREQUENCY
Coontail (Cd)	*Ceratophyllum demersum*	79.4%
Eurasian Watermilfoil (Ms)	*Myriophyllum spicatum*	76.5%
Spiny Naiad (Nm)	*Najas minor*	61.8%
Thinleaf Pondweed (Pp)	*Potamogeton pusillus*	38.2%
Filamentous algae (Fa)		35.3%
Water Chestnut (Tn)	*Trapa natans*	32.4%
Veriegated water clover (Mm)	*Marsilea mutica*	8.8%
Waterweed (Ec)	*Elodea canadensis*	8.8%
Cattail (T)	*Typha latifolia*	2.9%
Pickerelweed (Pcord)	*Pontederia cordata*	2.9%
Water Willow (Dv)	*Decodon verticillatus*	2.9%
Bushy pondweed (Nf)	*Najas flexilis*	Observed
Watershield (B)	*Brasenia schreberi*	Observed
Cattail (T)	*Typha latifolia*	Observed
White waterlily (Ny)	*Nymphaea odorata*	Observed

Summary of Water Quality in Arlington Reservoir

Water quality samples were collected at each of the Arlington Ponds on 7/31 and 9/4/07. Samples were brought to MicoBac Laboratory in Marlborough, MA and analyzed for a suite of basic water quality parameters. Below you will find a summary of each of the water sample collection results with a brief discussion of the specific parameters and how it relates the waterbody. Similar discussions have been included for Menotomy Rocks Pond and Spy Pond.

Table 2 - Arlington Reservoir Water Quality 2007				
		Dates		
Parameter	**Unit**	**7/30**	**9/4**	**Average**
pH	S.U.	8.88	8.53	**8.71**
Alkalinity	CaCO3/L	48	44	**46**
Turbidity	NTU	0.75	4.2	**2.48**
Total Kjeldal Nitrogen	mg/L	0.62	0.53	**0.58**
Ammonia Nitrogen	mg/L	<0.05	<0.05	**<0.05**
Nitrate	mg/L	0.29	0.63	**0.46**
Total Phosphorus	mg/L	0.028	0.041	**0.035**
Dissolved Phosphorus	mg/L	<0.010	0.014	**0.012***
True Color	Pt-Co	30	30	**30**
Apparent Color	Pt-Co	33	50	**41.5**
E.coli	CFU/100ml	<10	<10	**<10**
*one or more results below laboratory limits				

pH - is a measurement scale used to designate the degree of acid or alkaline condition of a solution. The scale ranges from 0, being the most acidic, to 14, being the most basic or alkaline. The pH value of 7 is considered to be neutral. A pH range of 5.5-8.5 is necessary to maintain a healthy fishery. The pH value obtained at Arlington Reservoir of 8.71 is slightly above the acceptable range but is not elevated enough to detrimentally affect fish populations or other aquatic inhabitants.

Total Alkalinity – Alkalinity is the measure of the buffering capacity of a waterbody against acid additions, such as acid rain and pollutants. Generally a value greater than 20mg/L is a sign that the waterbody is sufficiently protected against pH fluctuations. The result of 46 mg CaCO3/L shows that the pond is well buffered and protected from adverse pH fluctuations that could otherwise be harmful to fish and other wildlife populations.

Turbidity – is a gauge of the amount of suspended solids and light refractory materials that are present in the water column. The measurement scale ranges from less than 10 to into the hundreds of units. Typically in non-polluted lakes the turbidity value rarely rises above five. The turbidity value obtained in this sampling round was 2.48 NTU, indicating low to moderate levels of suspended material, which can be comprised of suspended algae and/or non-living particulates such as suspended silt/clay, indicating that the reservoir has low levels of suspended materials.

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 recorded at Arlington Reservoir were all desirably low, averaging 0.58 mg/L.

Ammonia Nitrogen – is an inorganic, dissolved form of nitrogen that can be found in water and is the preferred form for algae and plant growth. Ammonia is the most reduced form of nitrogen and is found in water where dissolved oxygen is lacking. Depending on temperature and pH (a measurement of "acidity"), high levels of ammonia can be toxic to aquatic life. High ammonia concentrations can stimulate excessive aquatic production and indicate pollution. Important sources of ammonia to waterbodies include: fertilizers, human and animal wastes, and by-products from industrial manufacturing processes. In general, acceptable ammonia concentrations should range between 0 and 0.05 mg/L depending upon temperature and pH. Generally values above 0.05 are considered problematic and potentially toxic to fish. The average Ammonia nitrogen levels in the pond were below laboratory detection limits (0.05 mg/L), indicating that Arlington Reservoir has little to no influence from any of the problematic sources listed above.

Nitrate - is usually the most prevalent form of nitrogen in water because it is the end product of the aerobic decomposition of organic nitrogen. Nitrate from natural sources is attributed to the oxidation of atmospheric nitrogen by bacteria and the decomposition of organic material in the soil. Nitrate concentrations may range from a few tenths to several hundred parts per million (mg/L). Generally, values greater than 0.3 mg/L are considered capable of supporting excessive vegetation and algae growth. The values obtained throughout the sampling regiment were generally close to, or above this threshold for most of the season. However, the values obtained for nitrate are well below drinking water standards (<10.0 mg/L) and are not cause for alarm.

Total and Dissolved Phosphorus – Phosphorus is considered the limiting nutrient essential to plant and algae growth. Typically a value of 0.03mg/L is sufficient to stimulate excessive plant and algae growth. Total phosphorous is a measure of all the various forms of phosphorus (dissolved and particulate) found in water. Dissolved phosphorus is readily available for plants, and consists of inorganic orthophosphate and organic phosphorus-containing compounds. The total phosphorus level obtained from Arlington Reservoir 0.035 is slightly above the aforementioned threshold and could result in problematic algae blooms; however it is important to recognize that this is merely a snap shot of the ever-fluctuating phosphorus levels in the reservoir. In order to establish a more meaningful baseline value, monthly or more frequent testing would be necessary. All reported dissolved phosphorus levels were also desirably low.

True and Apparent Color - Apparent color is the color of the whole water sample, and consists of color due to both dissolved and suspended components. True color is measured by filtering the water sample to remove all suspended material, and measuring the color of the filtered water, which represents color due to dissolved components.

To measure true color, the color of the filtered water sample is matched to one from a spectrum of standard colors. Each of the standard colors has been assigned a number on a scale of platinum-cobalt units (abbreviated as Pt-Co units). On the PCU scale, a higher value of true color represents water that is darker in color. (Lake water generally ranges between 0-500 Pt.-Co.)

Dissolved organic materials such as humic acids from decaying leaves, and dissolved minerals can give water a reddish brown "tea" color. The presence of color can reduce both the quantity and quality of light penetrating into the water column. Changing the quantity and quality of light reaching the bottom of a waterbody can influence the depth of colonization and the types of aquatic plants and algae that can grow there. In some waterbodies, color is the limiting environmental factor. For example, high color concentrations (greater than 50 PCU) may limit both the quantity and types of algae growing in a waterbody. Waterbodies that adjoin poorly drained areas (such as swamps) often have darker water, especially after a rainfall. Consequently, the location of a waterbody has a strong influence on its color. Color indexes in excess of 30 Pt-Co can cause significant reductions in water clarity. The 30 Pt-Co. index recorded here indicates that the water in the reservoir is generally darker in nature, which as mentioned above, is likely the result of water contact with decaying debris. The Apparent Color index of 50 recorded in September indicates an increased amount of suspended material, likely the result of increased runoff.

***E. coli* Bacteria** – *E. coli* is one of many naturally occurring bacteria found within the intestine of healthy humans and animals. The presence of *E. coli* in pond and/or lake water is indicative of recent sewage or animal waste contamination. The Massachusetts Department of Public Health has standards for the presence of *E. coli* in “swimable waters”. The current standard for freshwater is no single sample shall exceed 235 colonies per 100 ml. All values from the sampling effort were below detectable limits (10 per 100 ml), indicating little or no fecal contamination.

Menotomy Rocks Pond

Menotomy Rocks Pond is a roughly 2.3 acre waterbody located in Menotomy Rocks Park in Arlington. The pond was dredged in 1996 and is deep for a waterbody of its size with an average depth of about 6 feet and a maximum recorded depth of over 13 feet. 13 data points were established at the time of the survey yielding a data point frequency of approximately 5.6 points/acre.

The bottom substrate of Menotomy Rocks Pond is primarily composed of sand and gravel with and thin overlying layer of muck and leaf litter. Water clarity was good averaging over 11.5 feet between the two surveys. Dissolved oxygen levels were lower than what was recorded in Arlington Reservoir averaging approximately 90 % oxygen saturation through the first 8 feet of water (7.11 mg/L at 27.1°C on 7/31 & 7.27 mg/L at 24.4°C on 9/4/07). Algae counts were low in Menotomy Rocks Pond but were primarily dominated by *Microcystis* a common blue-green algae which accounted for nearly 1/2 (1,480 of 3,219) of the cells counted.

Table 3

Menotomy Rocks Pond – Summary of Survey Results	
Surface Area	2.3 –acres
Average Depth	5.9 –feet
Maximum Recorded Depth	13.1 –feet
# of Survey Points	13
# of Survey Points/acre	5.6
Overall Plant Cover	67%
Overall Plant Biomass	0.69
Dominant Species	Nitella Filamentous algae

At the time of the Data Point Survey on 9/4/07 Menotomy Rocks Pond was generally devoid of vascular aquatic plant growth with only scattered growth of thin-leaf and curlyleaf pondweed. Although there was little vegetation to speak of, the Pond did support significant cover of stonewort (*Nitella sp.* – a plantlike macro algae) and filamentous algae. In general, nitella formed a desirably thick, low growing layer along the pond's bottom, most notably in the Southern half of the pond. Areas supporting stonewort also harbored moderate to thick cover of filamentous algae which formed a billowy blanket over the underlying stonewort. Some floating mats of filamentous algae were also found along the shore of the pond, but overall cover of floating mats was minimal.

Although devoid of most vascular plant growth during both vegetation surveys in 2007, Menotomy Rocks Pond does have a long-history of vegetation management. Following the dredging effort in 1996, the pond became inundated with growth of Eurasian watermilfoil. A Sonar herbicide treatment for the control of milfoil was conducted successfully in 2001, since which time little if any milfoil has been found in the pond an obvious result and benefit of the on-going management program. Subsequent Reward herbicide treatments have been performed annually to control curlyleaf pondweed, another invasive plant that has come to inhabit the pond. Prior to the most recent application of Reward (diquat) herbicide (6/11/07), it was estimated that curlyleaf pondweed covered approximately 20% of the pond, down from pre-treatment coverage in excess of 75% in 2002. Although consecutive treatments with Reward would undoubtedly affect the vegetative assemblage of the pond, very little native vegetation has been documented in the pond following the dredging project in 1996.

Detailed data point location maps have been created for each of the identified species and can be found in at the end of this report (Appendix B - Figures 18-27). Below is a list of all of the aquatic plant species found in Menotomy Rocks Pond in 2007.

Plants of Menotomy Rocks Pond – Listed by order of abundance

COMMON NAME	SCIENTIFIC NAME	FREQUENCY
Filamentous algae (Fa)		69%
Stonewort (Ni)	*Nitella sp.*	54%
Bushy Pondweed (Nf)	*Najas flexilis*	7.7%
Thinleaf Pondweed (Pp)	*Potamogeton pusillus*	7.7%
Curlyleaf pondweed (Pc)	*Potamogeton crispus*	7.7%
Yellow waterlily (Nu)	*Nuphar variegatum*	Observed
Cattail (T)	*Typha sp.*	Observed
Duckweed (Lm)	*Lemna sp.*	Observed

Summary of Water Quality in Menotomy Rocks Pond

Table 4 - Menotomy Rocks Pond Water Quality 2007

		Dates		
Parameter	**Unit**	**7/30**	**9/4**	**Average**
pH	S.U.	7.64	7.60	**7.62**
Alkalinity	CaCO3/L	56	53	**54.5**
Turbidity	NTU	0.7	0.62	**0.66**
Total Kjeldal Nitrogen	mg/L	0.53	0.65	**0.59**
Ammonia Nitrogen	mg/L	<0.05	<0.05	**<0.05**
Nitrate	mg/L	0.25	0.59	**0.42**
Total Phosphorus	mg/L	0.021	0.023	**0.022**
Dissolved Phosphorus	mg/L	<0.010	0.01	**0.010***
True Color	Pt-Co	13	10	**11.5**
Apparent Color	Pt-Co	20	15	**17.5**
E.coli	CFU/100ml	<10	<10	**<10**
*one or more results below laboratory limits				

pH - The pH value obtained at Menotomy rocks Pond of 7.62 is well within the acceptable range and should be quite favorable to fish populations.

Total Alkalinity – The result of 54.5 mg CaCO3/l shows that the pond is well protected from adverse pH fluctuations that can be harmful to fish and other wildlife populations.

Turbidity – The average turbidity value obtained from Menotomy Rocks pond was 0.66 NTU, indicating low levels of suspended material.

Total Kjeldal Nitrogen (TKN) - TKN values recorded at Menotomy Rocks Pond were all desirably low, averaging 0.59 mg/L.

Ammonia Nitrogen – The average Ammonia Nitrogen levels in the pond were below laboratory detection limits (0.05 mg/L), indicating that Menotomy Rocks Pond has little to no influence from any of the problematic sources listed above.

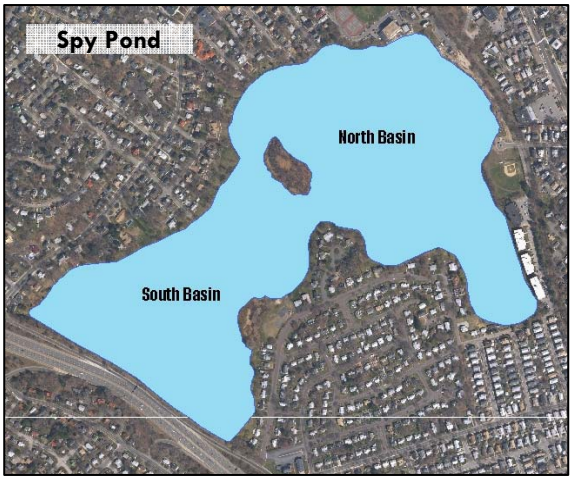
Nitrate - The values obtained throughout the sampling regiment were generally close to, or above the 0.3mg/L threshold for most of the season. However, the values obtained for nitrate are well below drinking water standards (<10.0 mg/L) and are not cause for alarm.

Total and Dissolved Phosphorus – The average phosphorus level recorded in Menotomy Rocks Pond was 0.022 mg/L which is below the 0.03 mg/L threshold needed to stimulate excessive algae growth. The dissolved phosphorus levels were also desirably low in all samples analyzed.

True and Apparent Color – average values of 11.75 and 17.5 indicate that the "color" of the water is not significantly impacted by either dissolved nutrients or suspended materials.

***E. coli* Bacteria –** All values from the sampling regiment were below detectable limits (10 per 100 ml), indicating little or no fecal contamination.

Spy Pond



Spy Pond is the largest of the waterbodies surveyed in 2007 with a surface area of approximately 103 acres. The pond is comprised of two distinct basins that are separated by a large island directly south of the intersection of Chapman Street and Devereaux Street.

The substrate composition throughout the majority of Spy Pond is mixture of muck sand and gravel and varies greatly depending on location.

Although water clarity has slowly declined following the pond-wide Alum treatment in 2004, Secchi disk readings were good at the time of our inspections, averaging 8.75 feet between the two surveys (6.5 ft. – 7/31 & 11.0 ft. – 9/4/07). Dissolved oxygen levels were high throughout season averaging nearly 120% oxygen saturation through the first six meters of water (9.54 mg/L at 24.7°C on 7/31 & 9.70 mg/L at 23.8°C on 9/4/07). Algae counts were moderate in Spy Pond and were primarily dominated by the golden algae *Synura* which accounted for nearly 90% (11,248 of 12,654) of the cells counted. We expect that the Spy Pond Association monitored water clarity and water chemistry on a more frequent basis hence their data would more fairly represent summer-long conditions at Spy Pond.

Table 5

Spy Pond – Summary of Survey Results	
Surface Area	103 –acres
Average Depth	14.4 –feet
Maximum Recorded Depth	38.9 –feet
# of Survey Points	51
# of Survey Points/acre	0.5
Overall Plant Cover	27.4%
Overall Plant Biomass	1.4
Dominant Species	Eurasian watermilfoil (exotic) Thinleaf pondweed

The South Basin of Spy Pond is approximately 47 acres in size and contained 25 data points (see Figure 30 – Appendix C). The South Basin was generally shallow with an average depth of only 9.3 feet, save for deeper hole in the southernmost cove where depth in excess of 20 feet were recorded. The South Basin of the Reservoir is moderately vegetated harboring growth of vascular plants at 17 of the 25 surveyed data points (68%), with an average areal coverage of 30% and an average overall biomass of 1.8. Excluding data points where no vegetation was found the average areal cover and biomass both increase to 45% and 2.6, respectively. Vegetation in the basin was primarily dominated by Eurasian watermilfoil which was encountered at 64% of the data collection sites. Lesser amounts of thinleaf pondweed and bushy pondweed (*Najas flexilis*) were also encountered during the survey. In general, Eurasian watermilfoil growth was widespread and could be found at water depths to about 10 -12 feet. Thinleaf pondweed was generally scarce throughout the basin but was observed in large patches mixed with Eurasian watermilfoil and claspingleaf pondweed (*Potamogeton perfoliatus*) to the southeast of the island, extending into the small cove near the access point off Spy Pond Parkway. Data points where no vegetation were found averaged over 17 feet in water depth.


Eurasian watermilfoil cover looking south towards Princeton Road

The North Basin of Spy Pond is approximately 56 acres in size, containing 26 data collection points. By comparison to the South Basin the North Basin is sparsely vegetated, supporting vegetation at only 42% (11 of 26) of the surveyed locations. The lower overall vegetation cover is in large part due to the increased depth of the basin, averaging just over 19 feet. The overall biomass of the North Basin was also lower averaging 1.0 across the 26 points surveyed. Although considerably less prevalent, the vegetation composition in the North Basin was similar to that of the South Basin, consisting largely of Eurasian watermilfoil which was encountered at 38% of the data point locations. Thinleaf pondweed, the only other vascular plant identified in the North Basin was only found at 4 of the 26 points. In general, Eurasian watermilfoil was cover was low averaging ~25% cover, save for the shallow cove north of Princeton Road (see picture right) where milfoil cover was between 75%-100% cover to depths of approximately 8 feet (see Figure 29). Most of the milfoil observed during the survey was at or within 1 foot of the Pond's surface. One notable difference at Spy Pond is the absence of coontail which was a prevalent plant in the vegetative community prior to the 2005 Sonar Treatment.

Detailed data point location maps have been created for each of the identified species and can be found in at the end of this report (Appendix C - Figures 28-38). Below is a list of all of the aquatic plant species identified at Spy Pond in 2007 Vegetation Survey. The plants have been listed in order of abundance based on their frequency of occurrence at the 51 survey points sampled. Species encountered during the qualitative Mid Season Survey have also been included in the following list. These species along with other plant species identified during the Late Season Data Point Intercept Survey, but not found at specific sites, have been listed as "observed".

Plants of Spy Pond – Listed by order of abundance

COMMON NAME	SCIENTIFIC NAME	FREQUENCY
Eurasian Watermilfoil (Ms)	*Myriophyllum spicatum*	51%
Thinleaf Pondweed (Pp)	*Potamogeton pusillus*	20%
Filamentous algae (Fa)		16%
Bushy Pondweed (Nf)	*Najas flexilis*	6%
Stonewort (Ni)	*Nitella sp.*	2%
Common Reed (Phrag)	*Phragmites australis*	2%
Sago Pondweed (Sp)	*Stuckenia pectinatus*	Observed
Clasping-leaf Pondweed (Pper)	*Potamogeton perfoliatus*	Observed
Snailseed Pondweed (Pb)	*Potamogeton bicupulatus*	Observed

Summary of Water Quality in Spy Pond

Four water quality samples were collected during each survey conducted at Spy Pond. Samples were collected at two different sites located in the South (Station 1) and North (Station 2) Basins. Two samples were collected at both locations, a surface sample and an "off-bottom" sample collected at 5 meters and 8 meters respectively. These additional samples were collected at Spy Pond because the pond thermally stratifies during the summer months which can cause differences in water quality between the epilimnion (water above the thermocline) and hypolimnion (water below the thermocline).

Table 6 – Summary of Water Quality Results at Spy Pond

		Station 1 - Surface		*Station 1 - 5M*		*Station 2 - Surface*		*Station 2 - 8M*		Average
Parameter	*Unit*	7/30	9/4	7/30	9/4	7/30	9/4	7/30	9/4	
pH	**S.U.**	8.76	8.56	6.71	7.02	8.64	8.52	7.85	8.52	**8.07**
Alkalinity	**CaCO3/L**	39.0	39.0	47.0	38.0	41.0	38.0	43.0	48.0	**41.6**
Turbidity	**NTU**	2.0	0.85	0.98	0.85	1.90	1.00	2.00	0.90	**1.31**
Total Kjeldal Nitrogen	**mg/L**	0.86	0.43	2.10	0.50	0.66	0.54	0.71	0.67	**0.81**
Ammonia Nitrogen	**mg/L**	<0.05	<0.05	1.05	0.11	<0.05	<0.05	0.89	0.05	**0.28***
Nitrate	**mg/L**	1.10	0.25	1.00	0.22	1.10	0.25	1.00	0.11	**0.63**
Total Phosphorus	**mg/L**	0.014	0.018	0.038	0.042	0.020	0.021	0.029	0.055	**0.03**
Dissolved Phosphorus	**mg/L**	<0.01	<0.01	0.01	0.018	<0.010	<0.01	<0.01	0.011	**0.011***
True Color	**Pt-Co**	5	5	5	5	5	5	5	10	**5.63**
Apparent Color	**Pt-Co**	10	15	10	17	8	15	15	15	**13.13**
E.coli	**CFU/100ml**	<10	<10	<10	<10	<10	<10	<10	<10	**<10**

*one or more results below laboratory limits

pH - The pH value obtained at Spy Pond of 8.07 is well within the acceptable range and should be quite favorable to fish populations and other pond inhabitants. Further, it is typical to have higher pH values surface waters when compared to those taken at depth.

Total Alkalinity – The result of 41.6 mg CaCO3/l shows that the pond is sufficiently protected from adverse pH fluctuations that can be harmful to fish and other wildlife populations.

Turbidity – The average turbidity value obtained from Spy Pond was 1.31 NTU, indicating low to moderate levels of suspended and light refractory material.

Total Kjeldal Nitrogen (TKN) - TKN values recorded at Spy Pond were all desirably low, averaging 0.81 mg/L. The average Ammonia nitrogen levels in the pond near or below laboratory detection limits for almost all of the collected samples. The exception to this is the elevated levels (1.05 & 0.89) collected at depth on 7/31/07. Although these readings are higher than desired, they are likely a result of chemical exchange at the sediment-water interface, and are not cause for concern. In deeper stratifying waterbodies such as Spy Pond it is typical to record higher levels of nutrients (both TKN & Nitrate (below)) in the lower reaches of the water column due to the release of nutrients from the substrate and the stagnant nature of a pond's hypolimnion during stratification.

Nitrate - The values obtained throughout the sampling regiment were a little high, averaging 0.63mg/L. However, none of the values obtained for nitrate were above drinking water standards (>10.0 mg/L). Again, higher concentrations were recorded at depth.

Total and Dissolved Phosphorus – The average phosphorus level recorded in Spy Pond was 0.03 mg/L which is equal to the standard 0.03 mg/L threshold needed to stimulate excessive algae growth. Although phosphorus levels were slightly higher from the samples taken at depth, the maximum concentration of 0.055 mg/L is still quite low and encouraging for hypolimnetic (bottom) waters. The dissolved phosphorus levels were also desirably low in all samples analyzed.

True and Apparent Color – average values of 5.63 and 13.13 indicate that the "color" of the water is not significantly impacted by either dissolved nutrients or suspended materials.

***E. coli* Bacteria –** All values from the sampling regiment were below detectable limits (10 per 100 ml), indicating little or no fecal contamination.

SUMMARY & RECOMMENDATIONS

Arlington Reservoir

The most pressing issue at Arlington Reservoir is the overabundance of coontail and non-native spiny naiad; and to a lesser degree Eurasian watermilfoil, water chestnut and thinleaf pondweed. At the time of the Late Season Survey these plants were growing in high density, topped-out beds throughout a majority of the waterbody. Although some open-water habitat was maintained in the center of the Reservoir, a greater part of the waterbody supported vegetation in excess of 75% cover with a high biomass of 3.5-4.

Unfortunately there is no easy solution for the situation facing Arlington Reservoir. Because both spiny naiad and Eurasian watermilfoil have the ability to reproductive through fragmentation many physical or mechanical control measures such as harvesting or hydro-raking are discouraged, because disturbance and "cutting" of these species often results in the further spread and dominance of the targeted plant. Hand-pulling/hand-harvesting would be nearly impossible due to the extent of growth and would cause the same concern for fragmentation.

The only reasonable approach to controlling the species found in Arlington Reservoir would be the use of USEPA/MA DAR registered herbicides. Reward (diquat) a broad-spectrum herbicide, used for control of curly-leaf pondweed in Menotomy Rocks Pond, could be used to gain temporary (seasonal) control of almost all of the problematic species in Arlington Reservoir, including spiny naiad, coontail, Eurasian watermilfoil, and thin-leaf pondweed. Likely one application of Reward would provide season-long control of the nuisance plants. As with all contact herbicides annual treatments would be necessary to maintain desired vegetation cover, though consecutive treatments do often reduce overall density and cove over time.

Reward can be used in a site specific manner (i.e. spot or partial pond treatment) and could be applied in areas of the reservoir to open recreational access, create more open-water habitat, or improve aesthetics, without removing all of the existing vegetation from the waterbody. Costs of a Reward based management program would vary depending on the size and scope of the project but would likely range between $12,500 - $15,000

It is also recommended that the hand-harvesting of water chestnut is also continued. Although it is estimated that greater than 90% of the seed-bearing water chestnut plants were removed by Aquatic Control hand-pullers in August 2007, some re-growth of water chestnut is expected in 2008, albeit at a reduced level. Because water chestnut is a true annual, reproducing solely from seed, it is possible to nearly eradicate this extremely invasive plant though careful monitoring and hand-pulling. The cost for hand-pulling water chestnut at Arlington Reservoir in 2008 would be similar to costs in 2007 ranging between $2000 - $3000.

Menotomy Rocks Pond

Although Menotomy Rocks Pond supported little vegetation at the time of our Data Point Survey, the pond does harbor a well-documented infestation of curly-leaf pondweed. This infestation has been actively managed for a number of years and has recently starting to show a decline in pre-treatment densities. In 2002 it was estimated that pre-treatment coverage of curly-leaf pondweed was upwards of 75%. Prior to treatment in 2007, densities of this noxious weed were estimated at only 20%. Although, curly-leaf is still easily found in the waterbody, consecutive years of treatment have started to deplete the pond's bank of reproductive wintering buds (turions), slowly reducing the cover of the plant in the waterbody. It is recommended that annual Reward treatments continue at Menotomy Rocks Pond to help continue the further depletion of the curlyleaf pondweed population in the pond.

Continued maintenance of algae is also recommended at Menotomy Rocks Pond. Use of both Alum and copper-based algaecide treatments have improved and maintained water clarity, reducing overall cover of filamentous algae and controlling nuisance algae blooms. The cost for the continued maintenance of Menotomy Rocks Pond, including herbicide/algaecide treatments and alum applications will cost approximately $5,000 - $7,000, depending on the level of vegetation control needed or the number of algaecide treatments required.

Spy Pond

The extent of the Eurasian milfoil infestation in Spy Pond precludes the use of physical removal techniques such as hand-harvesting or suction harvesting as the primary management strategies. Benthic weed barriers would also be impractical due to the cost and potential impacts of covering such a large areas. As mentioned above, mechanical methods are generally discouraged for plants like milfoil that spread by fragmentations.

Treatment with US EPA / MA DAR registered herbicides, has been in the past, and continues to be the most effective option for managing Eurasian watermilfoil at Spy Pond. Several aquatic herbicides will provide control of Eurasian milfoil. Treatment with Reward (diquat) would typically provide seasonal control of he milfoil, however systemic products like Sonar (fluridone), Renovate (triclopyr) and Navigate (2,4-D) would typically provide multiple years of control. Sonar has been applied at Spy Pond in the past, most recently in 2005, and has provided excellent control of Eurasian watermilfoil for 2-3 years. The cost for another whole-lake Sonar treatment program at Spy pond in 2008 would cost in the order of $35,000.

Sonar (fluridone) works by inhibiting the synthesis of carotenoids, pigments within the plants that protect chlorophyll from degradation by sunlight. Sonar works slowly and required a 45-60 day contact time with targets plants for most effective control. Since Sonar is highly soluble and has a half-life of ~ 24-days, multiple applications are usually necessary to ensure this contact time, especially in high-flow systems. Additionally, because of it high solubility, conducting partial lake treatments are more difficult and require the use of the pellet formulations which release the active ingredient over a period of time. Although it may not be of interest to treat the Eurasian watermilfoil in 2008, it is likely that without treatment nuisance densities of this plant will return quickly requiring some form of management in the near future. If the Town's budget allows, we would suggest pursuing a whole-pond Sonar treatment in 2008. Although, nuisance densities of milfoil may not be wide-spread for a few years, successful, lasting control becomes increasingly more difficult the more established and mature individual plants and their "root crowns" become.

In our experience, loner-lasting control of milfoil is more easily achieved on newly established plants; while those that have survived for a number of years are more likely to rebound due to the stored energy in their root-crowns. Although Sonar is systemic in nature and does "kill" the root of the plant, the milfoil root-crowns grown larger and stronger with each growing season, making complete control more difficult to attain.

Plan for Future Vegetation Monitoring

The level of detail and methodology used in the 2007 surveys can be replicated to monitor future changes in the vegetation assemblage of these waterbodies. Costs could be somewhat reduced from this year, as some of the preparation and mapping tasks would not need to be repeated.

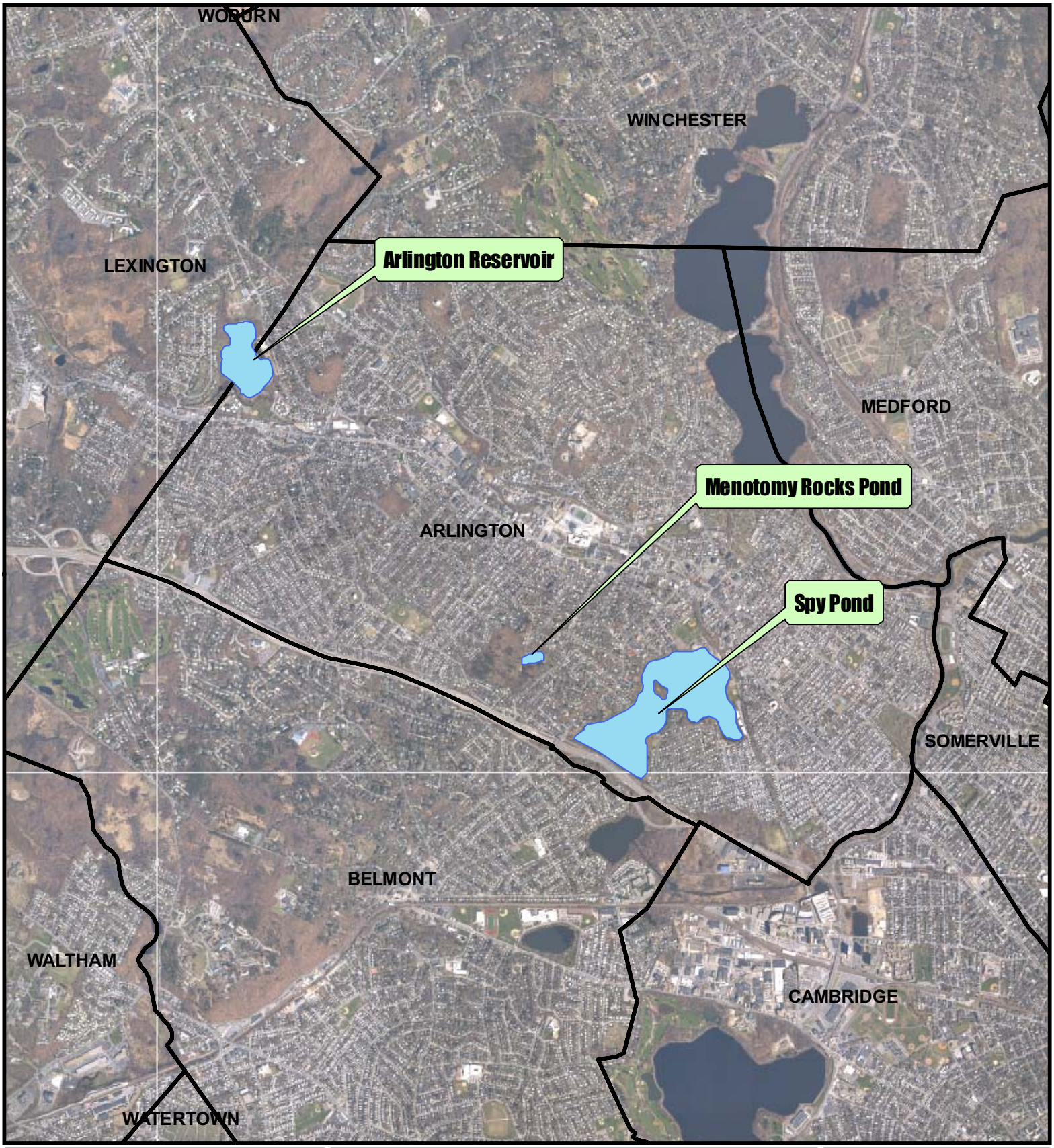
Based on what we now know about these waterbodies, it does not appear necessary to repeat the complete comprehensive surveys on each waterbody annually. We'd recommend repeating these Data Point Surveys every other year initially and then possibly even moving to every third year. It would not be recommended to go longer than three years, in the event a new invasive species become introduced that may require a rapid response. We'd therefore recommend that all of the surveys be completed on a two-year schedule beginning in 2009. Following that year, a decision can be made to move on whether to go to a three-year schedule. Of course, if the need arises, whether from the introduction of a new invasive species or because some management work is planned, individual waterbodies can be surveyed more frequently.

Although we do not see the need to replicate the plant surveys in 2008, we would recommend that the Town continue with a "scaled-back" monitoring plan that includes the collection of at least one round of water quality samples (preferably later in the summer) and at least one qualitative vegetation inspection at each of the waterbodies. A monitoring plan of this scope will cost approximately $5,000 for all three waterbodies.

APPENDIX A

Arlington Reservoir Data Point Locations & Vegetation Coverage
(Figures 1 – 17)

Data Tables form Arlington Reservoir Data Point Vegetation Survey – 9/4/07



Arlington Ponds

Site Locus Map
<Figure 1 click to edit>

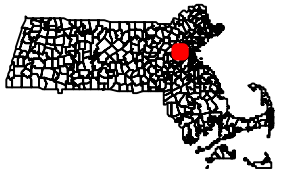
FIGURE:	SURVEY DATE:	MAP DATE:
1	–	12/14/07

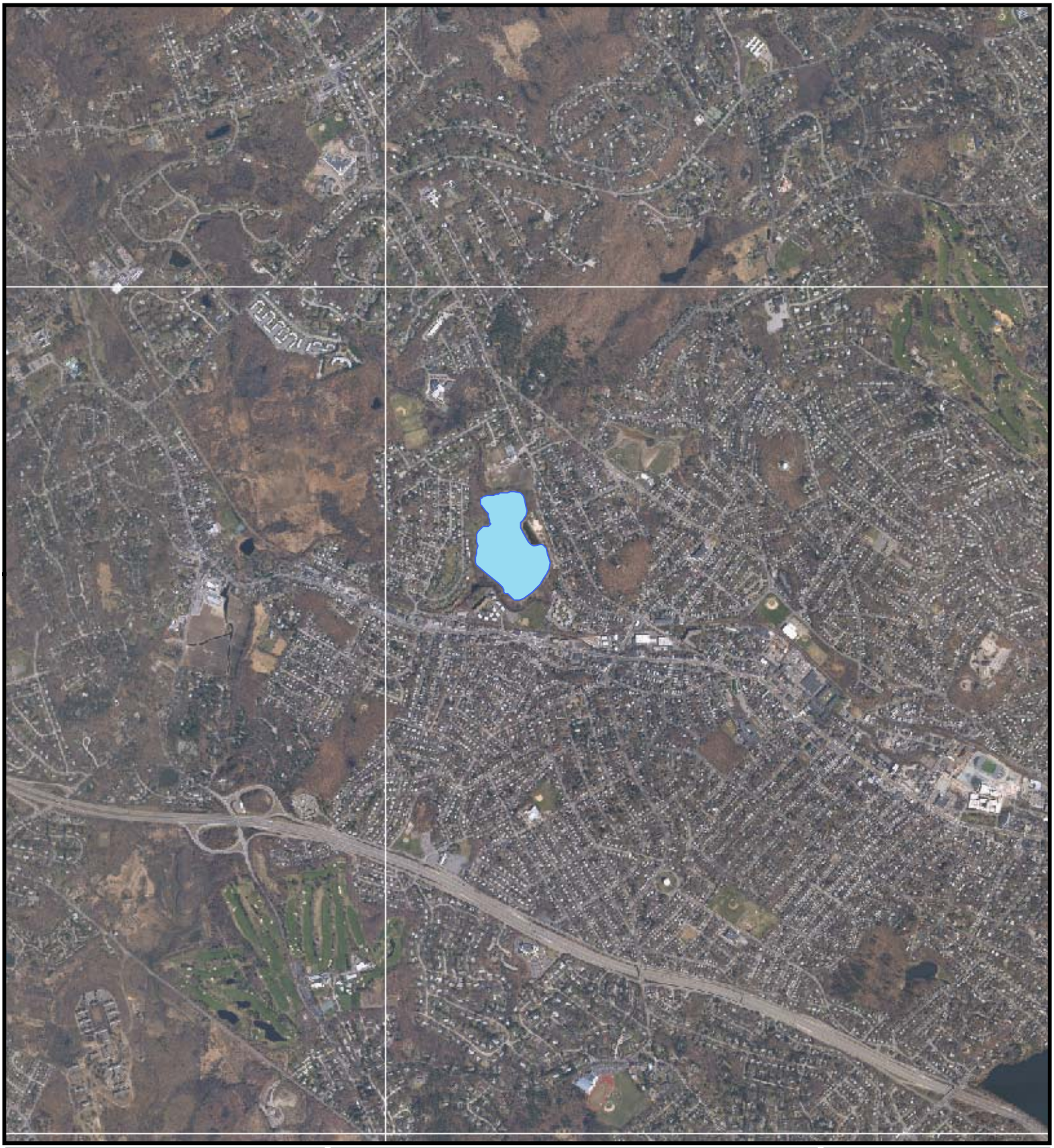
Legend:

N

0 0.25 0.5 1 1.5 Miles

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM





Arlington Reservoir

Arlington & Lexington, MA

Site Locus

FIGURE:	SURVEY DATE:	MAP DATE:
2	9/4/07	12/12/07

Legend:

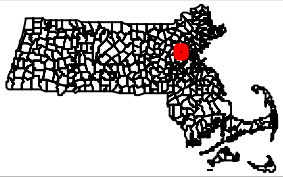
Arlington Reservoir (~28 acres)

N

0 0.125 0.25 0.5 0.75 1 Miles

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Arlington Reservoir

Arlington & Lexington, MA

Data Point Map

FIGURE:	SURVEY DATE:	MAP DATE:
4	9/4/07	12/12/07

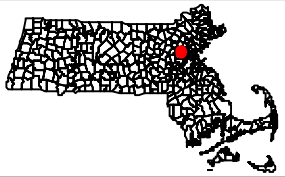
Legend:

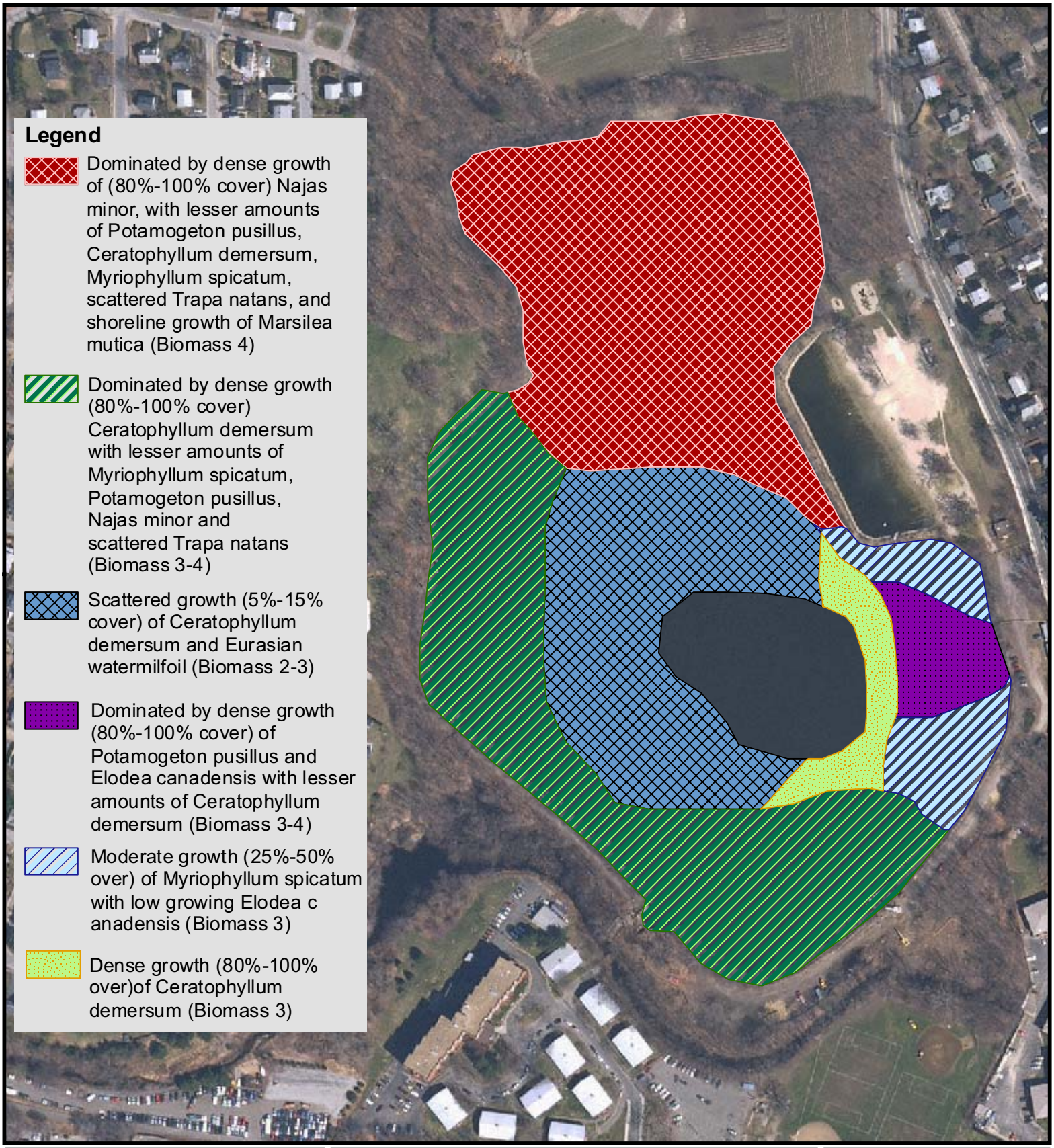
- Survey point locations (34 points) - Actual locations of survey points captured by GPS during the 2007 Vegetation Survey. Survey based on 60 meter Survey Grid.
- Arlington Reservoir (~28 acres)

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM





Arlington Reservoir

Arlington & Lexington, MA

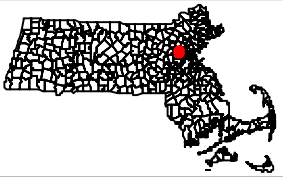
Vegetation Assembly Map

FIGURE:	SURVEY DATE:	MAP DATE:
3	9/4/07	12/12/07

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Arlington Reservoir

Arlington & Lexington, MA

Data Point Map

FIGURE:	SURVEY DATE:	MAP DATE:
4	9/4/07	12/12/07

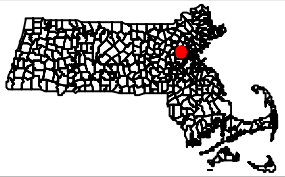
Legend:

- Survey point locations (34 points) - Actual locations of survey points captured by GPS during the 2007 Vegetation Survey. Survey based on 60 meter Survey Grid.
- Arlington Reservoir (~28 acres)

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Arlington Reservoir

Arlington & Lexington, MA

Vegetation Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
5	9/4/07	12/12/07

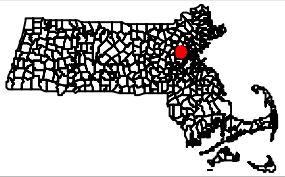
Legend:

- 1%-25% vegetation cover
- 26%-50% vegetation cover
- 51%-75% vegetation cover
- 76%-100% vegetation cover

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Arlington Reservoir

Arlington & Lexington, MA

Vegetation Biomass Map

FIGURE:	SURVEY DATE:	MAP DATE:
6	9/4/07	12/12/07

Legend:

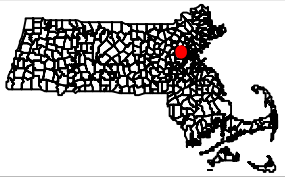
- Biomass 1
- Biomass 2
- Biomass 3
- Biomass 4

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Arlington Reservoir

Arlington & Lexington, MA

Ceratophyllum demersum Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
7	9/4/07	12/12/07

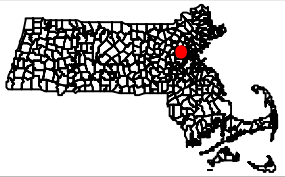
Legend:

- 1%-25% cover Ceratophyllum demersum
- 26%-50% cover Ceratophyllum demersum
- 51%-75% cover Ceratophyllum demersum
- 76%-100% cover Ceratophyllum demersum

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Arlington Reservoir

Arlington & Lexington, MA

Najas minor Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
8	9/4/07	12/12/07

Legend:

- 1%-25% cover Najas minor
- 26%-50% cover Najas minor
- 51%-75% cover Najas minor
- 76%-100% cover Najas minor

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM

Arlington Reservoir

Arlington & Lexington, MA

Myriophyllum spicatum Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
9	9/4/07	12/12/07

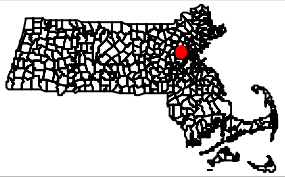
Legend:

- 1%-25% cover Myriophyllum spicatum
- 26%-50% cover Myriophyllum spicatum
- 51%-75% cover Myriophyllum spicatum
- 76%-100% cover Myriophyllum spicatum

N

0 75 150 300 450 600 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Locations of *Potamogeton pusillus*

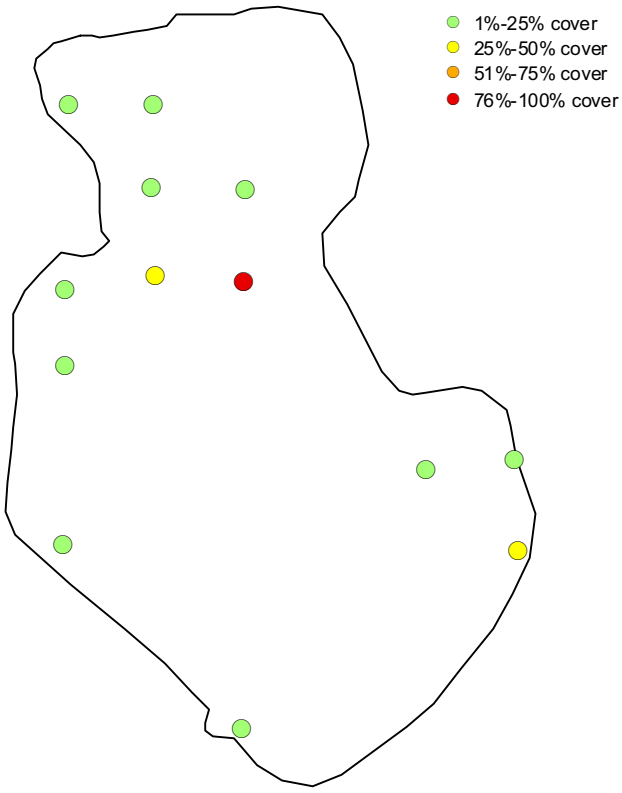


Figure 10

Locations of Filamnetous algae

Figure 11

Locations of *Trapa natans*

Figure 12

Locations of *Marsilea mutica*

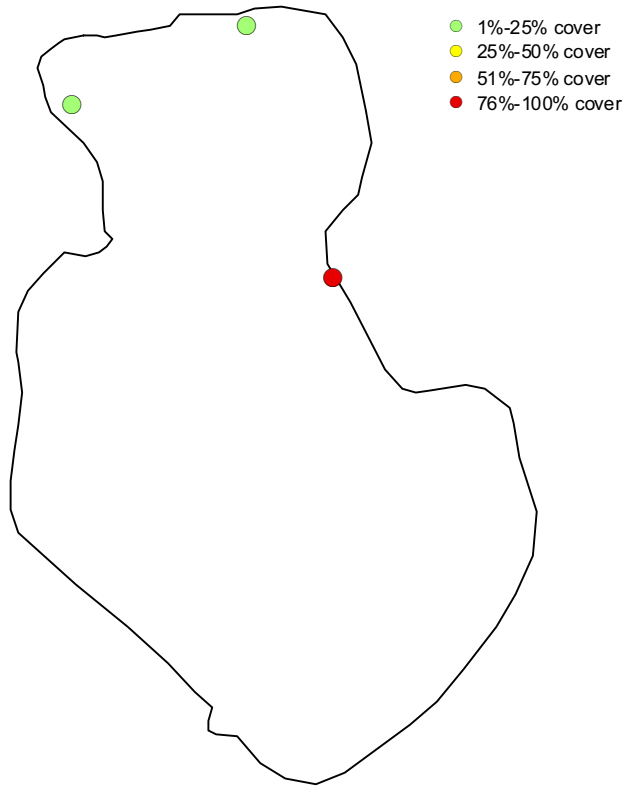


Figure 13

Locations of *Elodea canadensis*

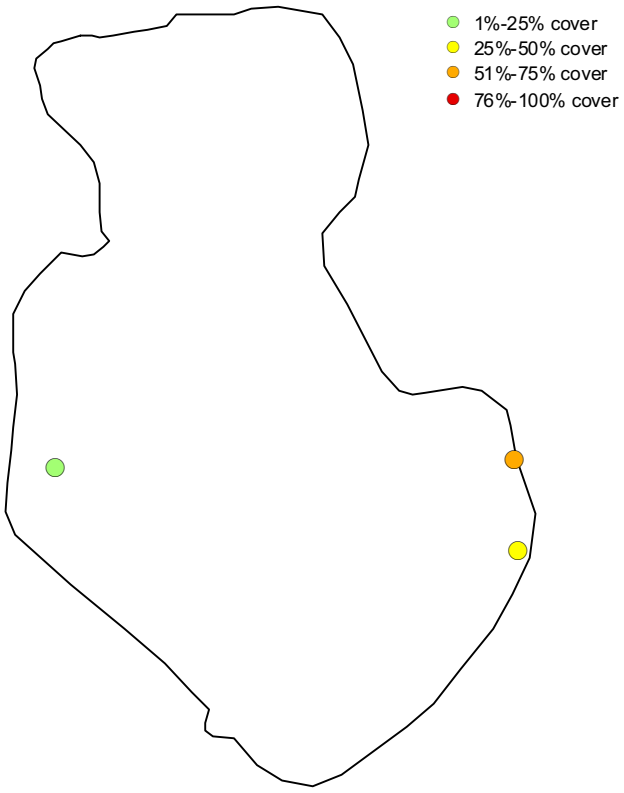


Figure 14

Locations of Typha sp.

Figure 15

Locations of *Decodon verticllatus*

Figure 16

Locations of *Polygonum sp.*

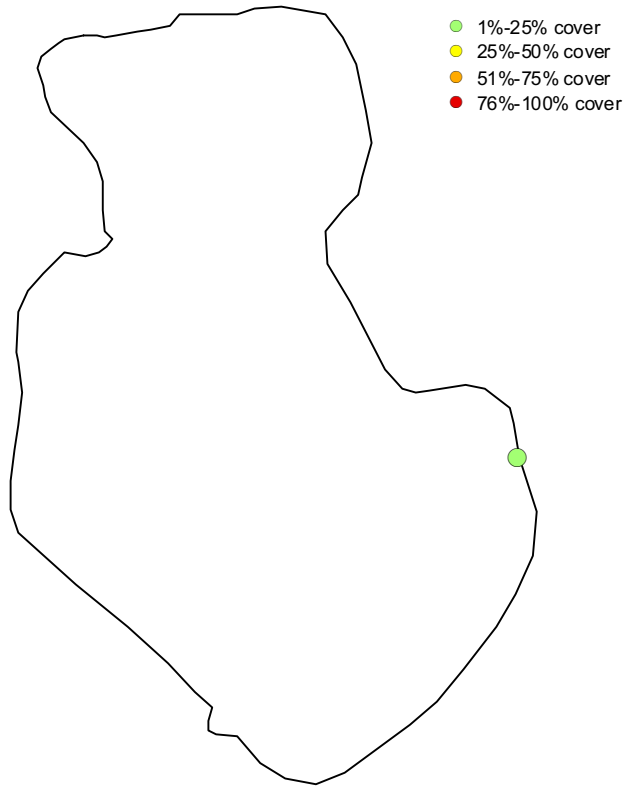


Figure 17

Arlington Reservoir

Data Point #	LAT	LONG	WaterDepth	Sediment Type	Biomass	Total Cover	Cd	Ms	Nm	Pp	Fa	Tn	Mm	Ec	T	D	Polg
1	42.43127751	-71.18910265	2.9	S/G	4	145	T	T	95		10	T	20		25		
2	42.43094835	-71.18841198	3.8	M/G	4	170	10		90		70						
3	42.43082757	-71.18907038	4.7	M	4	150	T	T	95		50	T					
4	42.43082078	-71.18981889	3.5	M/G	4	70		T	65	T		T					
5	42.43082045	-71.19049983	1.2	M	4	100	T	T	80	20		T	T				
6	42.43032868	-71.18983934	5.1	M	4	100	5	T	85	10	20	T					
7	42.43031393	-71.18908287	4.9	M	4	150	5	T	75	20	50	T					
8	42.43029482	-71.18841098	2.0	R/G	3	120	5	T	95		20						
9	42.42977715	-71.1884031	2.5	S/G	4	110	5	T	5				100			T	
10	42.42975955	-71.18909821	5.2	S/M	4	100	5	T	15	80		T					
11	42.42980121	-71.18980799	5.4	M	3.5	100	10	5	50	30	5						
12	42.42972108	-71.19053453	4.0	R/S/M	4	160	50	5	25	20	60	T					
13	42.42926292	-71.1905342	5.1	M	4	170	10	T	70	20	70	T					
14	42.42922579	-71.18987362	5.8	M	2.5	100	85	5	10								
15	42.42923887	-71.18914272	6.6	M	2.5	30	20	10									
16	42.42921799	-71.18839463	7.6	M	1	5		5									
17	42.42869823	-71.18693065	3.3	R/S	2	100	20	5	10	5				60			T
18	42.42864249	-71.18764085	6.2	M	2.5	100	85			15							
19	42.42862757	-71.18842548	7.5	M		0											
20	42.42866328	-71.1890584	6.6	M		0											
21	42.42864509	-71.18987664	6.1	M	2	20	20										
22	42.42865582	-71.19061584	5.7	M	4	95	80	T	T		10	T		T			
23	42.42820135	-71.19056052	3.4	M	4	100	95	T	T	T							
24	42.4281809	-71.1898447	7.0	M	1	5		T									
25	42.42819096	-71.18912159	6.7	M	1	5		5									
26	42.42816565	-71.18839304	6.9	M		0											
27	42.42815726	-71.18766055	5.7	M	3.5	100	90	5	5								
28	42.42816213	-71.18690575	3.4	S	3.5	100	10	10	20	30				30			
29	42.42761395	-71.18760103	6.5	M	3.5	100	90	10									
30	42.42755092	-71.1883725	6.1	M	3	5	5										
31	42.42760431	-71.1891029	6.6	M	3	75	75										
32	42.42761923	-71.18981034	5.7	M	4	100	95	T	T			T					
33	42.42709897	-71.18912553	3.8	R	4	130	95	T	5	T	30						
34	42.42709922	-71.18834116	6.5	M	3.5	95	75	T			20						
Average			5.1		3.5	74*											
						Frequency	79.4%	76.5%	61.8%	38.2%	35.3%	32.4%	8.8%	8.8%	2.9%	2.9%	2.9%
						Count	27	26	21	13	12	11	3	3	1	1	1

Temperature Dissolved Oxygen Profiles		
7/30/2007		
Depth (ft)	Temp	DO
S	27.9	9.57
1	27.4	9.83
2	27.0	9.65
3	26.8	9.89
4	26.7	10.14
5	25.7	9.07
6	24.7	>1.25

9/4/2007		
Depth (ft)	Temp	DO
S	23.5	8.78
1	23.4	8.54
2	23.2	8.52
3	23.3	8.51
4	23.2	8.49
5	23.2	8.25
6	23.1	5.04

Table 3 - Arlington Reservoir Water Quality 2007				
		Dates		
Parameter	**Unit**	**7/30**	**9/4**	**Average**
pH	S.U.	8.88	8.53	**8.71**
Alkalinity	CaCO3/L	48	44	**46**
Turbidity	NTU	0.75	4.2	**2.48**
Total Kjeldal Nitrogen	mg/L	0.62	0.53	**0.58**
Ammonia Nitrogen	mg/L	<0.05	<0.05	**<0.05**
Nitrate	mg/L	0.29	0.63	**0.46**
Total Phosphorus	mg/L	0.028	0.041	**0.035**
Dissolved Phosphorus	mg/L	<0.010	0.014	**0.012***
True Color	Pt-Co	30	30	**30**
Apparent Color	Pt-Co	33	50	**41.5**
E.coli	CFU/100ml	<10	<10	**<10**
Secchi Disk Clarity	Ft.	4.3	3.1	**3.7**
*one or more laboratory results below detection limit				

APPENDIX B

Menotomy Rocks Pond Data Point Locations & Vegetation Coverage (Figures 18 – 28)

Data Tables form Menotomy Rocks Pond Data Point Vegetation Survey – 9/4/07

Menotomy Rocks Pond

Arlington, MA

Site Locus Map

FIGURE:	SURVEY DATE:	MAP DATE:
18	9/4/07	12/14/07

Legend:

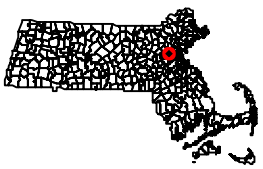
Menotomy Rocks Pond (2.3 acres)

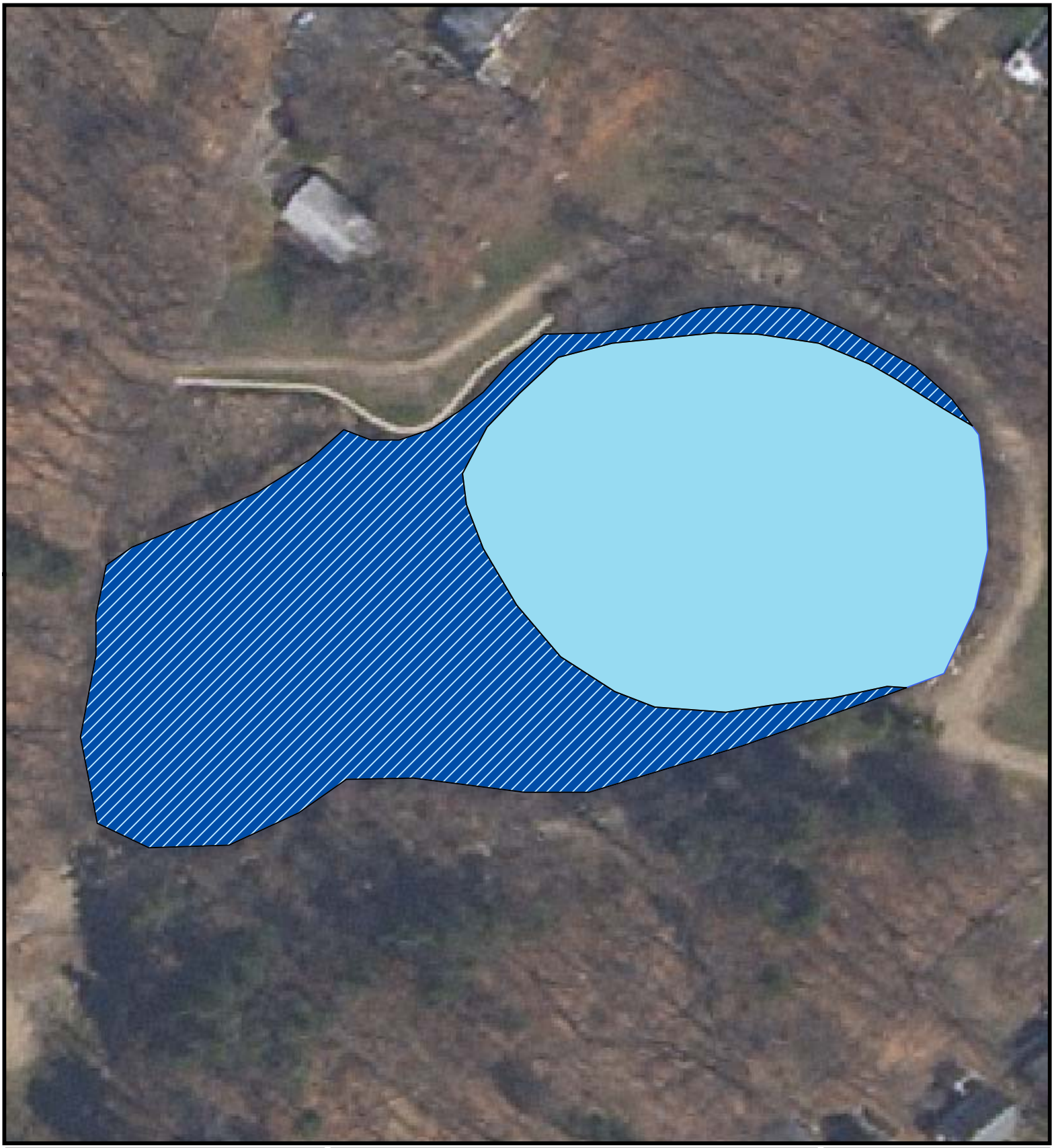
N

0 150 300 600 900 1,200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM





Menotomy Rocks Pond

Arlington, MA

Vegetation Assembly Map

FIGURE:	SURVEY DATE:	MAP DATE:
19	9/4/07	12/14/07

Legend:

Moderate to dense (50%-100% cover) Nitella sp. and filamentous algae with very scattered growth of Potamogeton pusillus, Potamogeton crispus and Najas flexilis

N

0 25 50 100 150 200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM

Menotomy Rocks Pond

Arlington, MA

Data Point Map

FIGURE:	SURVEY DATE:	MAP DATE:
20	9/4/07	12/14/07

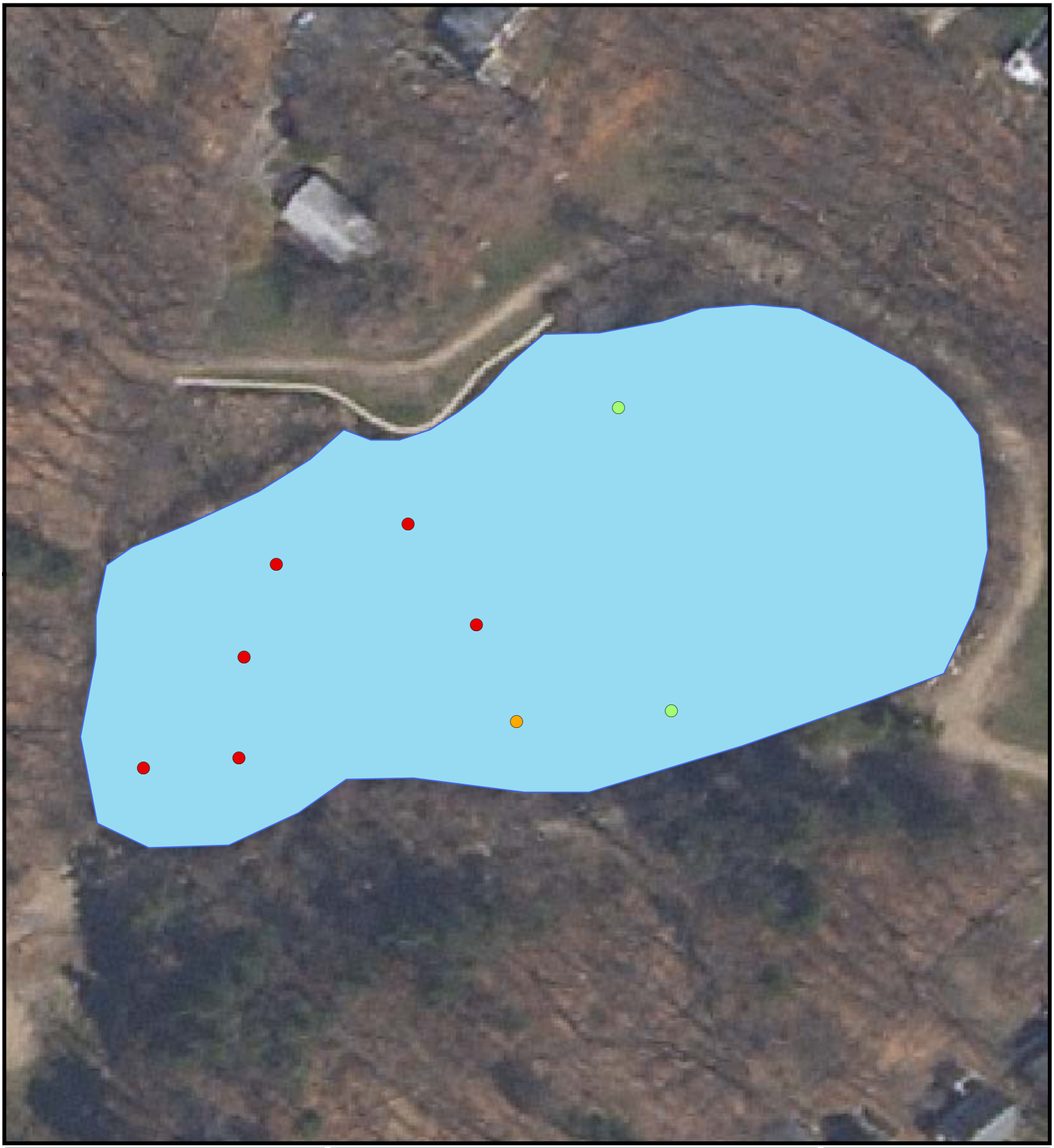
Legend:

- Survey point locations (13 points) - Actual locations of survey points captured by GPS during the 2007 Vegetation Survey.
- Menotomy Rocks Pond (2.3 acres)

N

0 25 50 100 150 200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Menotomy Rocks Pond

Arlington, MA

Vegetation Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
21	9/4/07	12/14/07

Legend:

- 1%-25% vegetation cover
- 26%-50% vegetation cover
- 51%-75% vegetation cover
- 76%-100% vegetation cover

N

0 25 50 100 150 200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM

Menotomy Rocks Pond

Arlington, MA

Biomass Map

FIGURE:	SURVEY DATE:	MAP DATE:
22	9/4/07	12/14/07

Legend:

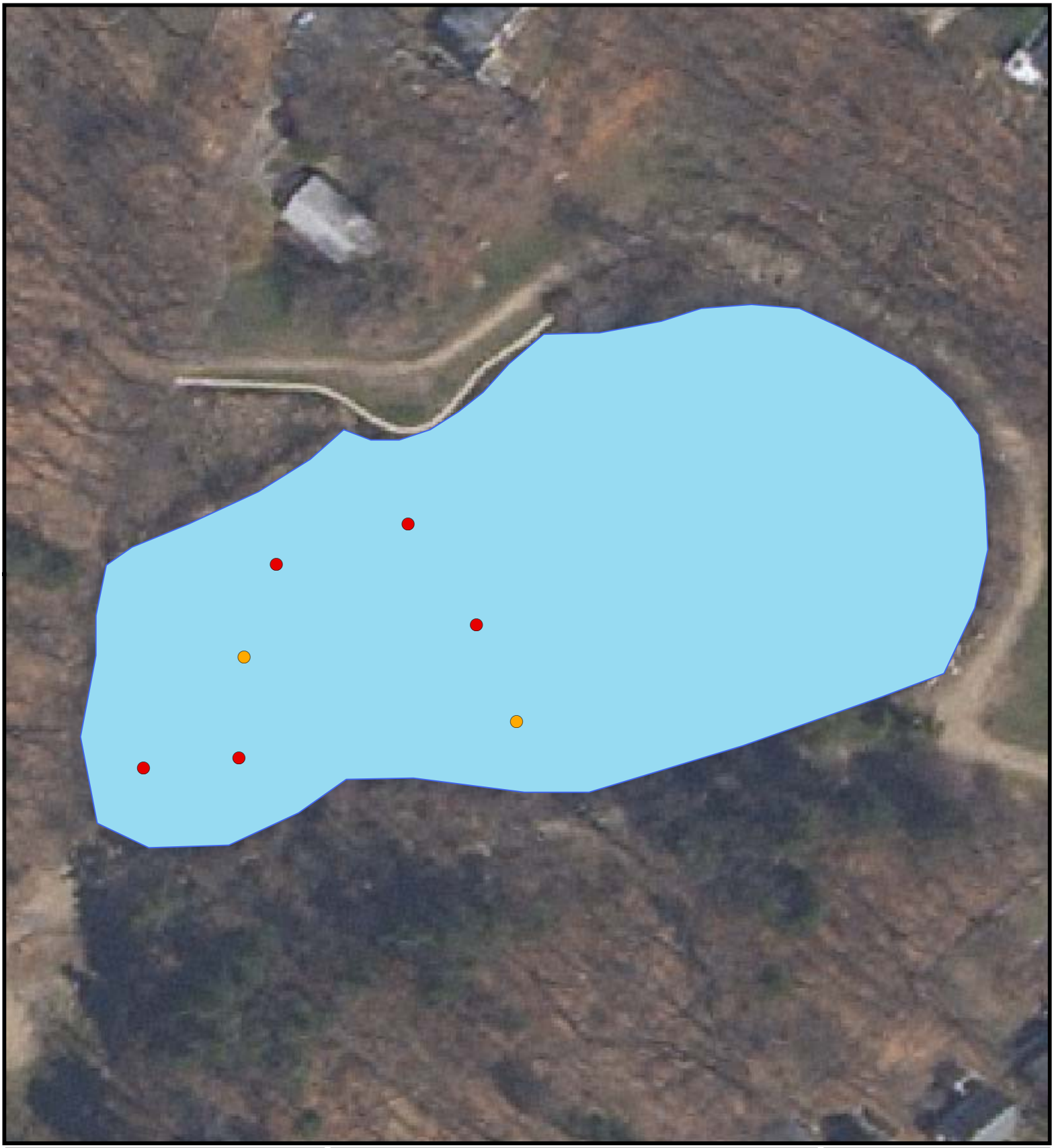
- Biomass 1
- Biomass 2
- Biomass 3
- Biomass 4

N

0 25 50 100 150 200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Menotomy Rocks Pond

Arlington, MA

Nitella sp. Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
23	9/4/07	12/14/07

Legend:

- 1%-25% cover of Nitella sp.
- 26%-50% cover of Nitella sp.
- 51%-75% cover of Nitella sp.
- 76%-100% cover of Nitella sp.

N

0 25 50 100 150 200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM

Locations of Filamentous algae

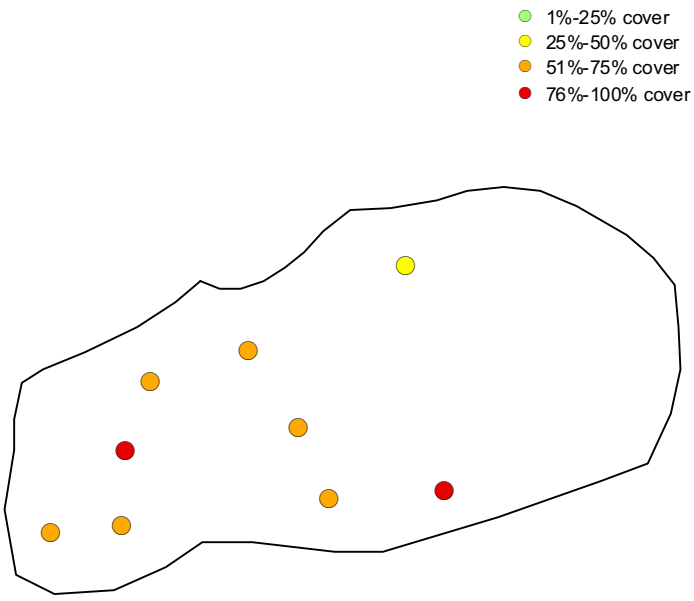


Figure 24

Locations of Najas flexilis

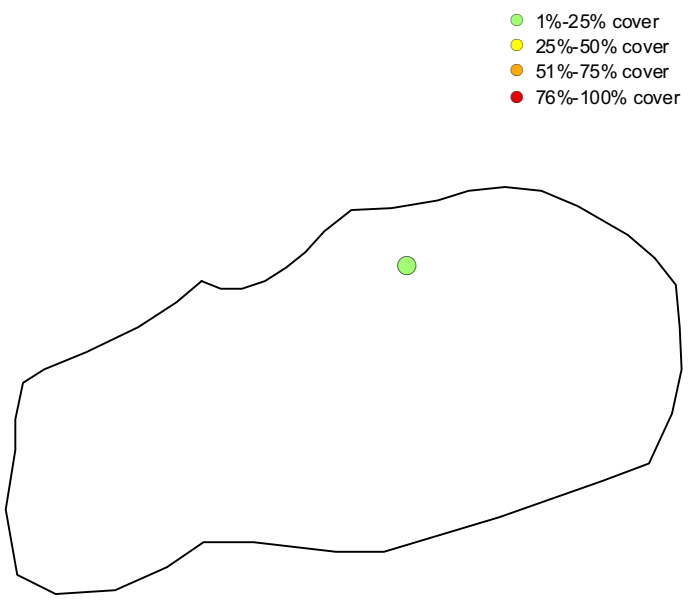


Figure 25

Locations of *Potamogeton crispus*

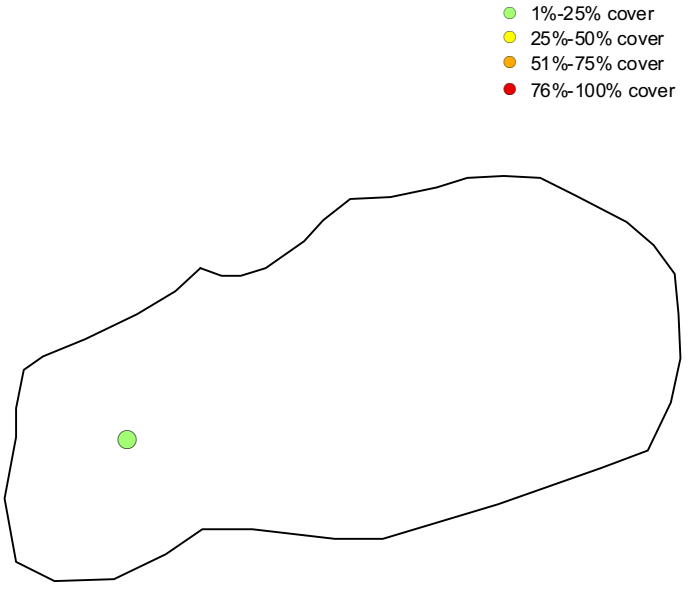


Figure 26

Locations of *Potamogeton pusillus*

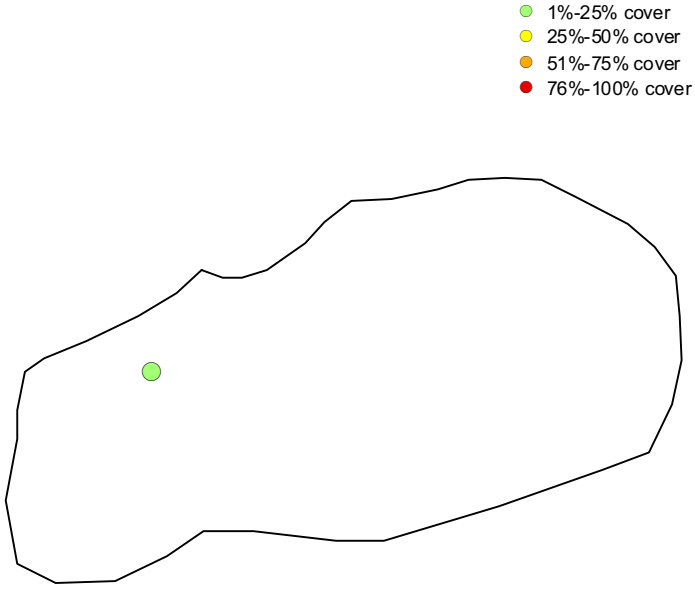


Figure 27

Menotomy Rocks Pond

Data Pont #	LAT	LONG	Water Depth	Sediment Type	Biomass	Total Cover	Fa	Ni	Nf	Pc	Pp
1	42.41116832	-71.16507023	4.5	M	0	0					
2	42.410969	-71.16508171	10.5	S	0	0					
3	42.41079281	-71.16507316	6.6	R	0	0					
4	42.41073238	-71.16530165	3.5	M	1	100	100				
5	42.41095341	-71.16547373	13.1	M	0	0					
6	42.41119095	-71.1654071	6.5	M	1	75	50		25		
7	42.4110177	-71.16583575	3.5	R/S	1	175	75	100			
8	42.41086531	-71.16569887	7.6	M	1	175	75	100			
9	42.41071913	-71.16561689	4.2	M	1	150	75	75			
10	42.41066608	-71.16618334	4.5	R/S/M	1	175	75	100			
11	42.41081762	-71.16617102	4.6	M	1	175	100	75		T	
12	42.41095777	-71.16610598	4.6	R/S/M	1	180	75	85			20
13	42.4106504	-71.16637805	3.1	R/S/M	1	175	75	100			
			5.907692308		0.69	67.3*					
						Frequency	69.2%	53.8%	7.7%	7.7%	7.7%
						Count	9	7	1	1	1

Temperature Dissolved Oxygen Profiles		
7/31/2007		
Depth (ft.)	Temp (c)	DO
S	28.1	8.28
1	28.0	7.34
2	27.5	7.24
3	27.3	7.06
4	27.2	6.99
5	27.1	6.87
6	26.7	7.06
7	26.2	6.90
8	25.6	6.27
9	24.8	2.79

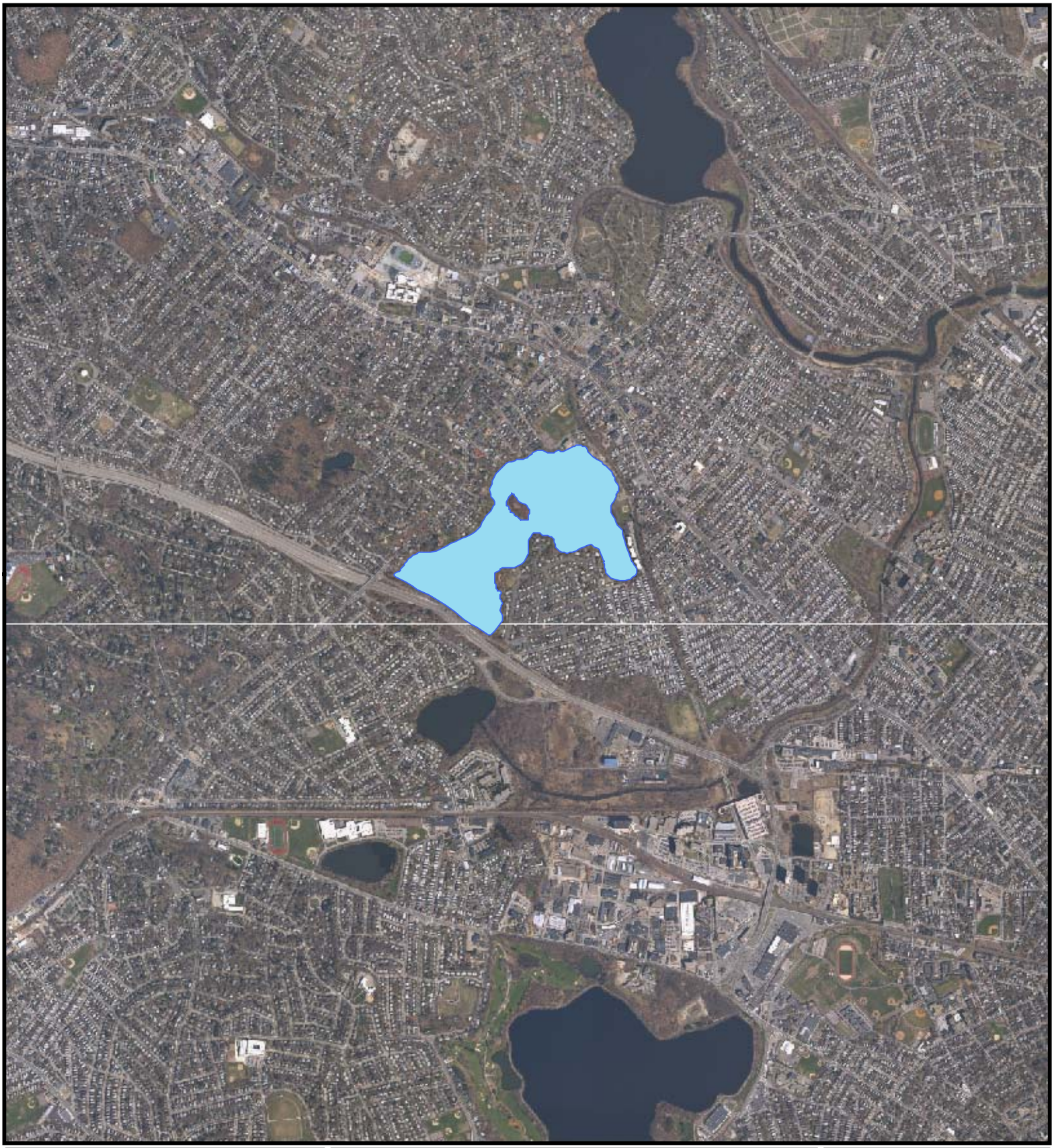
9/4/2007		
Depth (ft.)	Temp (c)	DO
S	24.6	7.59
1	24.6	7.62
2	24.5	7.46
3	24.4	7.33
4	24.4	7.29
5	24.4	7.26
6	24.3	7.15
7	24.3	6.99
8	24.3	6.74
9	24.1	6.64

Table 4 - Menotomy Rocks Pond Water Quality 2007				
		Dates		
Parameter	**Unit**	**7/30**	**9/4**	**Average**
pH	S.U.	7.64	7.60	**7.62**
Alkalinity	CaCO3/L	56	53	**54.5**
Turbidity	NTU	0.7	0.62	**0.66**
Total Kjeldal Nitroge	mg/L	0.53	0.65	**0.59**
Ammonia Nitrogen	mg/L	<0.05	<0.05	**<0.05**
Nitrate	mg/L	0.25	0.59	**0.42**
Total Phosphorus	mg/L	0.021	0.023	**0.022**
Dissolved Phosphor	mg/L	<0.010	0.01	**0.010***
True Color	Pt-Co	13	10	**11.5**
Apparent Color	Pt-Co	20	15	**17.5**
E.coli	CFU/100ml	<10	<10	**<10**
Secchi disk	ft.	9.3	13.1	**11.2**
*one or more laboratory results below detection limit				

APPENDIX C

Spy Pond Data Point Locations & Vegetation Coverage
(Figures 29 – 38)

Data Tables form Spy Pond Data Point Vegetation Survey – 8/31/07



Spy Pond

Arlington, Ma

Site Locus Map

FIGURE:	SURVEY DATE:	MAP DATE:
28	8/31/07	12/14/07

Legend:

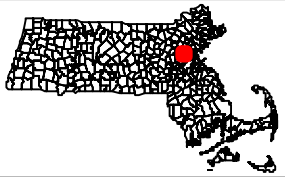
Spy Pond (103 acres)

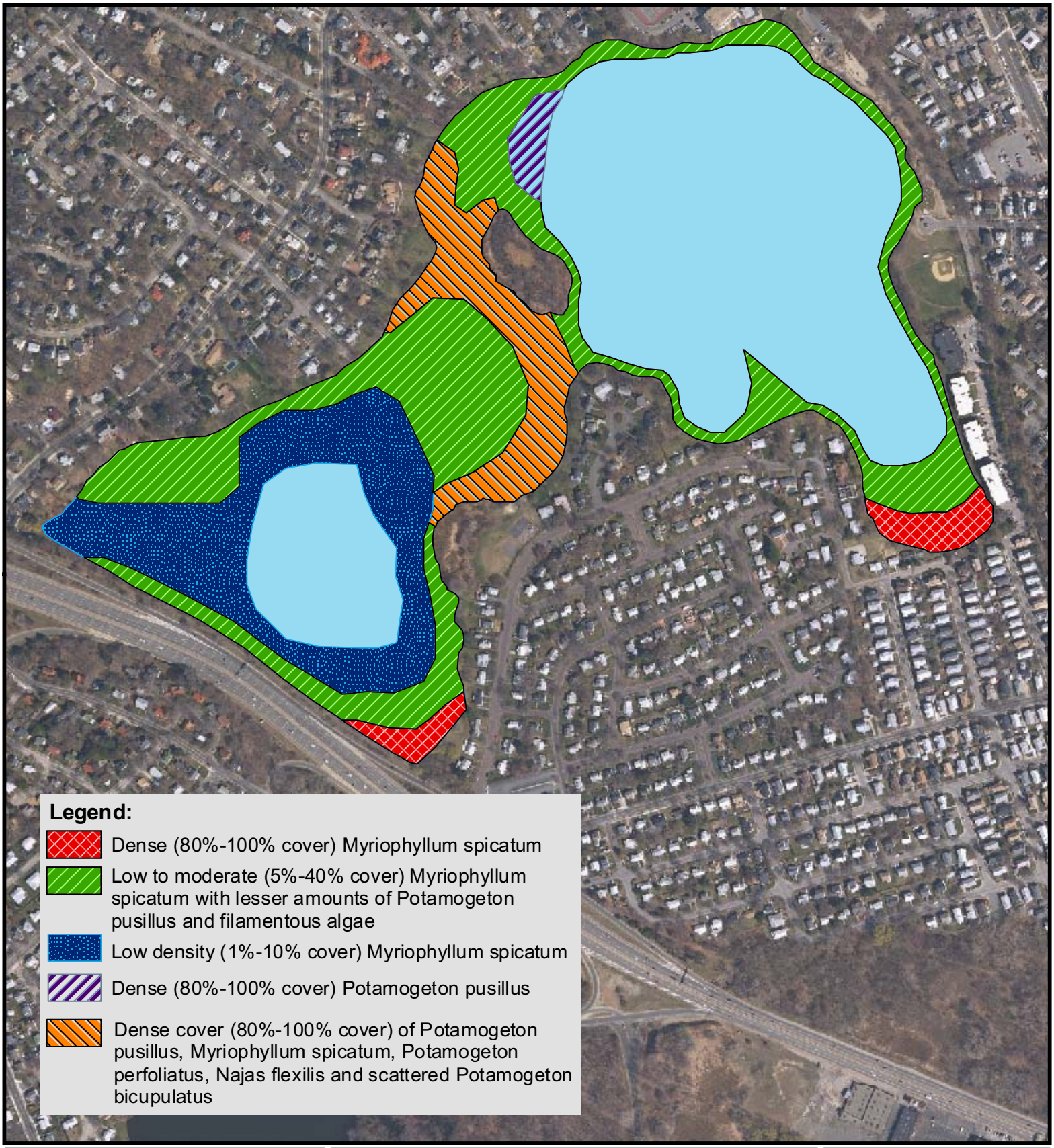
N

0 0.125 0.25 0.5 0.75 1 Miles

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM





Spy Pond

Arlington, Ma

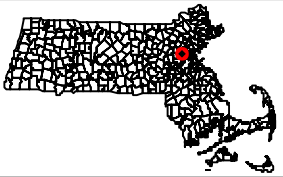
Vegetation Assemblage Map

FIGURE:	SURVEY DATE:	MAP DATE:
29	8/31/07	12/14/07

N

0 150 300 600 900 1,200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Spy Pond

Arlington, Ma

Data Point Map

FIGURE:	SURVEY DATE:	MAP DATE:
30	8/31/07	12/14/07

Legend:

N

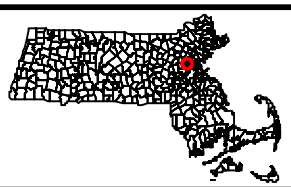
Survey point locations (51 points) - Actual locations of survey points captured by GPS during the 2007 Vegetation Survey. Survey based on 90 meter Survey Grid

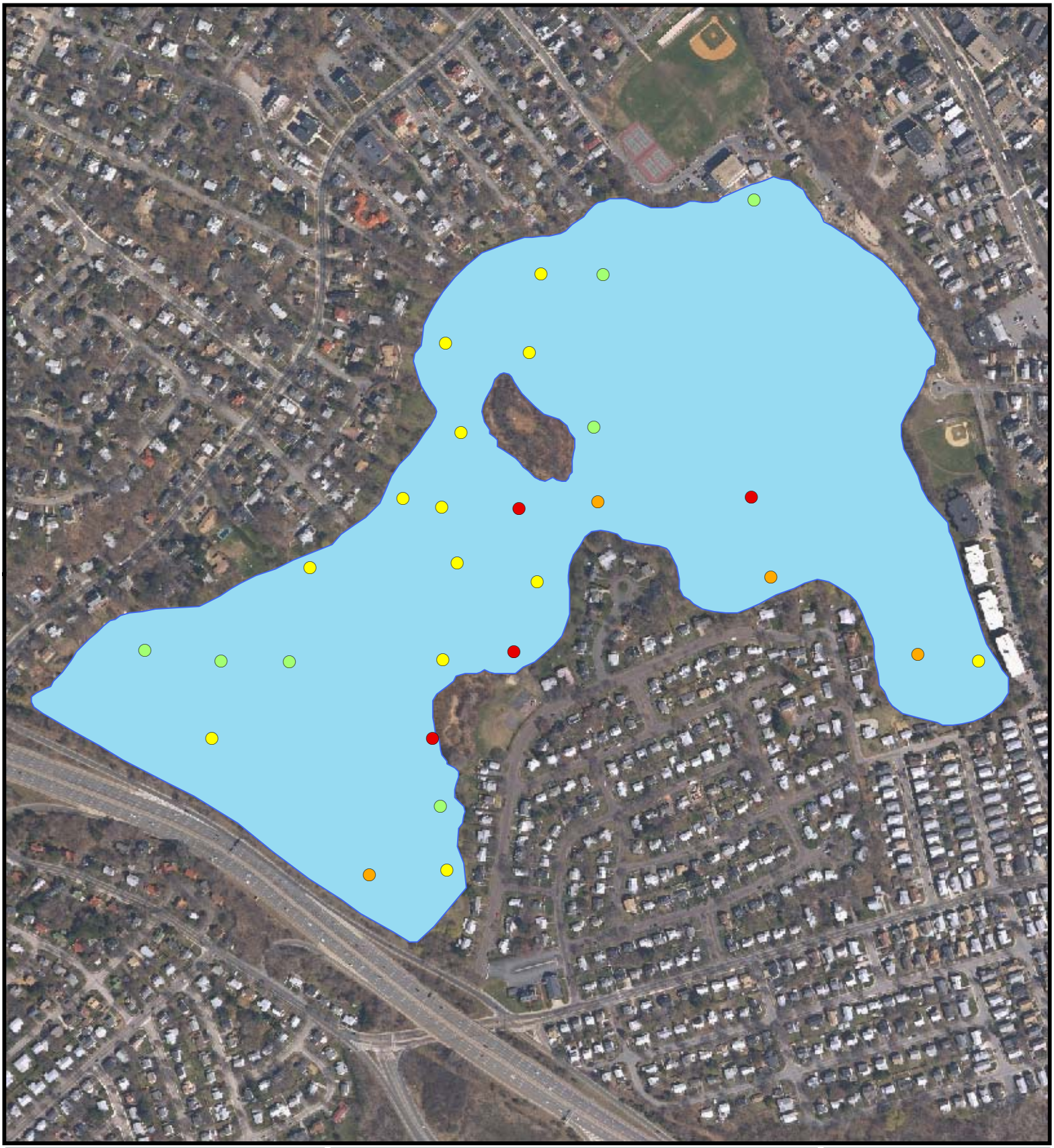
Spy Pond (103 acres)

0 150 300 600 900 1,200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM





Spy Pond

Arlington, Ma

Vegetation Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
31	8/31/07	12/14/07

Legend:

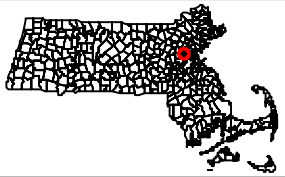
- 1%-25% vegetation cover
- 26%-50% vegetation cover
- 51%-75% vegetation cover
- 76%-100% vegetation cover

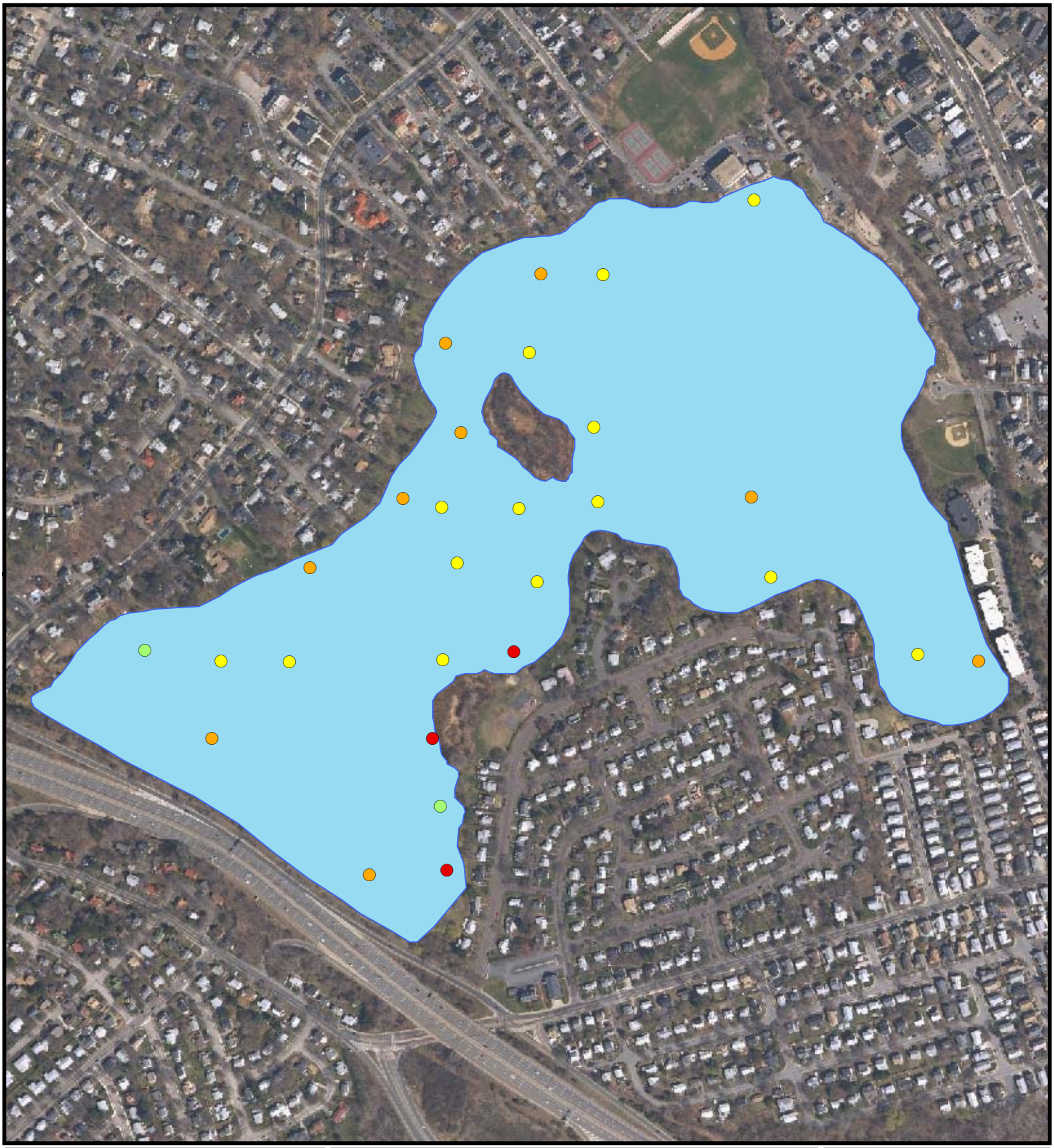
N

0 150 300 600 900 1,200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM





Spy Pond

Arlington, Ma

Biomass Map

FIGURE:	SURVEY DATE:	MAP DATE:
32	8/31/07	12/14/07

Legend:

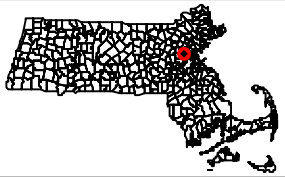
- Biomass 1
- Biomass 2
- Biomass 3
- Biomass 4

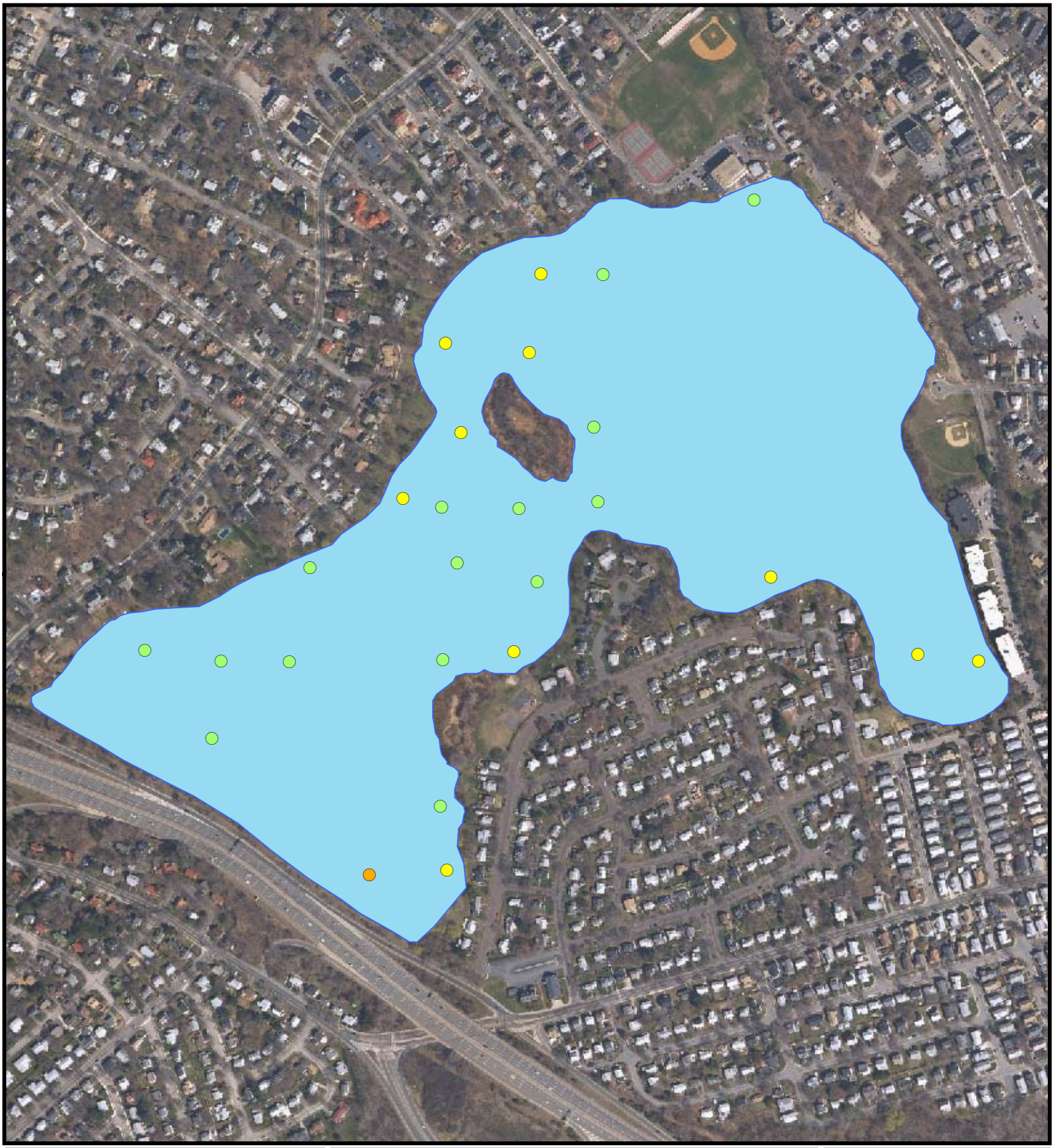
N

0 150 300 600 900 1,200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.

11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM





Spy Pond

Arlington, Ma

Myriophyllum spicatum Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
33	8/31/07	12/14/07

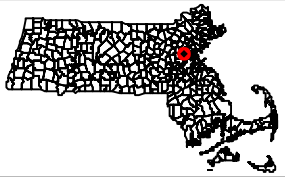
Legend:

- 1%-25% cover Myriophyllum spicatum
- 26%-50% cover Myriophyllum spicatum
- 51%-75% cover Myriophyllum spicatum
- 76%-100% cover Myriophyllum spicatum

N

0 150 300 600 900 1,200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Spy Pond

Arlington, Ma

Potamogeton pusillus Coverage Map

FIGURE:	SURVEY DATE:	MAP DATE:
34	8/31/07	12/14/07

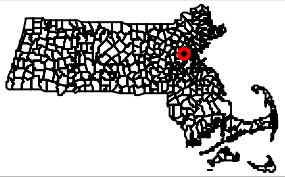
Legend:

- 1%-25% cover Potamogeton pusillus
- 26%-50% cover Potamogeton pusillus
- 51%-75% cover Potamogeton pusillus
- 76%-100% cover Potamogeton pusillus

N

0 150 300 600 900 1,200 Feet

AQUATIC CONTROL TECHNOLOGY, INC.
11 JOHN ROAD
SUTTON, MASSACHUSETTS 01590
PHONE: (508) 865-1000
FAX: (508) 865-1220
WEB: WWW.AQUATICCONTROLTECH.COM



Locations of Filamentous algae

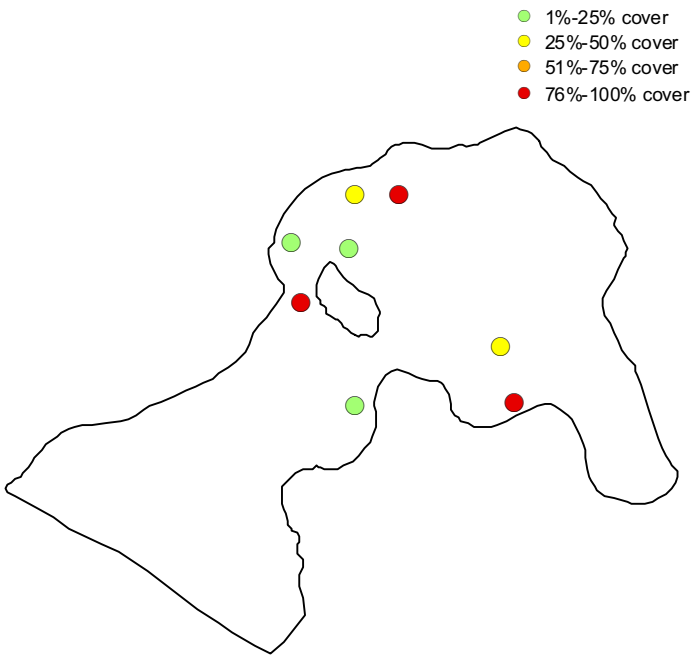


Figure 35

Locations of Najas flexilis

Figure 36

Locations of *Nitella sp.*

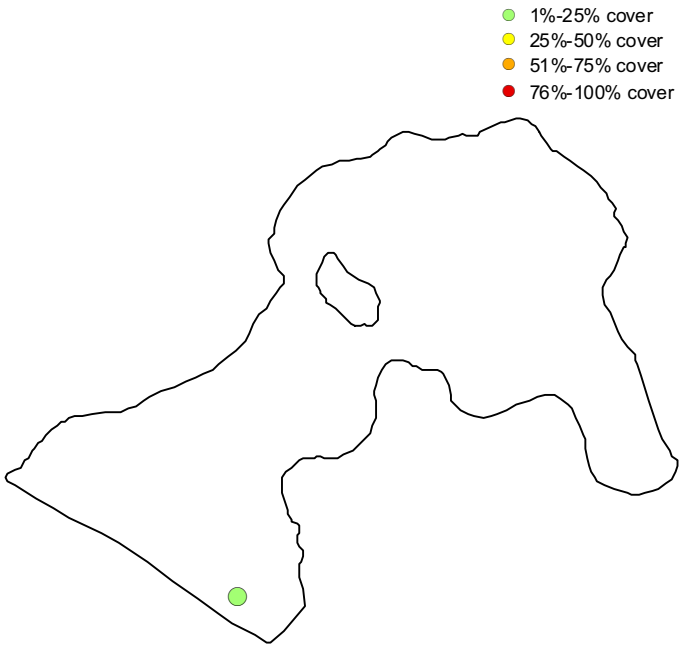


Figure 37

Locations of *Phragmites australis*

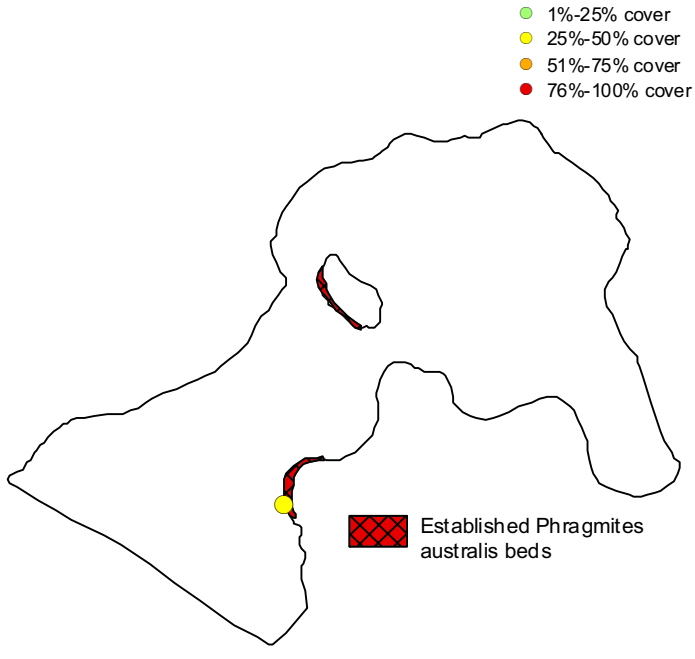


Figure 38

Arlington Ponds
2007 Aquatic Vegetation Survey

Spy Pond

Survey Date: 8/31/07

Data Point #	LAT	LONG	Water Depth	Sediment Type	Biomass	Total Cover	Ms	Pp	Fa	Nf	Ni	Phrag
1	42.41136488	-71.15204081	13.4	M/S	2	5	5					
2	42.41050053	-71.15091118	27.3	M	0	0						
3	42.41052878	-71.15207023	27.3	M	0	0						
4	42.41057681	-71.15317421	24.3	M	0	0						
5	42.41057304	-71.15418901	8.3	M	2	110	10		100			
6	42.4105955	-71.15508788	6.5	M	3	90	40		50			
7	42.40985865	-71.15644399	7.2	M	3	40	30		10			
8	42.40976058	-71.1552515	7.6	M	2	50	40		10			
9	42.40978606	-71.15414953	21.4	M	0	0						
10	42.40973535	-71.15313909	29.4	M	0	0						
11	42.40972504	-71.15198784	38.9	M	0	0						
12	42.4098423	-71.15075829	33	M	0	0						
13	42.40971842	-71.14974719	18.3	M	0	0						
14	42.40907829	-71.15093716	29.8	M	0	0						
15	42.40900151	-71.15213016	29.9	M	0	0						
16	42.4091171	-71.15323967	32.3	M	0	0						
17	42.40897218	-71.15433477	16.5	M	2	5	T	T				
18	42.40891753	-71.15623034	4.6	M	3	120	40		80			
19	42.40822434	-71.15705788	4.1	M	3.5	60	50	10				
20	42.40813516	-71.15650862	5.5	M	2.5	40	20	10		10		
21	42.40810934	-71.15540707	5.2	M	2.5	75	25	50				
22	42.40818109	-71.15428867	7.5	M	2	60	10	50				
23	42.40823457	-71.15319072	27.6	M	0	0						
24	42.40822996	-71.15208942	4.5	M	3	150		100	50			
25	42.40821001	-71.15095535	28.6	M	0	0						
26	42.40811639	-71.14986579	22	M	0	0						
27	42.40734567	-71.14974769	24.2	M	0	0						
28	42.40738079	-71.15183109	5.5	M	2	170	30	40	100			
29	42.40733854	-71.15514454	5.6	M	2.5	45	25		20			
30	42.40754189	-71.15630032	6.2	M	2	30	20	10				
31	42.40735598	-71.15740523	14.4	M	0	0						
32	42.40748707	-71.15839664	6.5	M	3	30	25			T		
33	42.40663296	-71.1607403	9.8	M	1	10	10					
34	42.40651913	-71.15966482	5.2	M	2	15	15					
35	42.40649499	-71.15869009	7.3	M	2	10	10					
36	42.40663748	-71.15761955	16.3	M	0	0						
37	42.40651703	-71.15649076	4.5	M	2	40	20	10		10		
38	42.4066058	-71.15548627	3.4	M	4	100	50	50				
39	42.4065592	-71.14974006	4.6	M	2.5	50	50					
40	42.40648577	-71.14886642	5.1	M	3.5	45	45					
41	42.40568882	-71.15665765	6	M	4	50						50
42	42.40565152	-71.15753414	20.1	M	0	0						
43	42.4056853	-71.15859982	18.6	M	0	0						

Spy Pond

Data Point #	LAT	LONG	Water Depth	Sediment Type	Biomass	Total Cover	Ms	Pp	Fa	Nf	Ni	Phrag
44	42.40569653	-71.15979273	8.2	M	3	25	25					
45	42.40572637	-71.16071943	12.2	M	0	0						
46	42.40602753	-71.16181687	17.2	M	0	0						
47	42.40487527	-71.15871448	19	M	0	0						
48	42.40495406	-71.15770035	20	M	0	0						
49	42.40496663	-71.15653787	4.5	S	1	15	15					
50	42.40430404	-71.15646453	3.5	M	4	40	40					
51	42.40424847	-71.15756666	6.2	M	3.5	65	60				T	
			14.4		1.4	27.4*						
						Frequency	51.0%	19.6%	15.7%	5.9%	2.0%	2.0%
						Count	26	10	8	3	1	1

Temperature Dissolved Oxygen Profiles		
7/31/2007		
Depth (m)	Temp (c)	DO
S	28.3	9.66
1	27.6	9.62
2	27.1	9.32
3	25.4	9.56
4	24.5	9.12
5	22.3	11.48
6	17.9	8.02
7	13.7	9.35
8	14.0	6.43
9	12.5	1.08

9/4/2007		
Depth (m)	Temp (c)	DO
S	26.4	9.55
1	26.4	9.76
2	25.5	10.03
3	24.9	11.46
4	23.2	10.66
5	22.0	10.19
6	18.2	6.26
7	15.1	0.36
8	12.2	0.23
9	9.8	0.21

		Station 1 - Surface		*Station 1 - 5M*		*Station 2 - Surface*		*Station 2 - 8M*		Average
Parameter	*Unit*	7/30	9/4	7/30	9/4	7/30	9/4	7/30	9/4	
pH	S.U.	8.76	8.56	6.71	7.02	8.64	8.52	7.85	8.52	8.07
Alkalinity	CaCO3/L	39.0	39.0	47.0	38.0	41.0	38.0	43.0	48.0	41.63
Turbidity	NTU	2.0	0.85	0.98	0.85	1.90	1.00	2.00	0.90	1.31
Total Kjeldal Nitrog	mg/L	0.86	0.43	2.10	0.50	0.66	0.54	0.71	0.67	0.81
Ammonia Nitrogen	mg/L	<0.05	<0.05	1.05	0.11	<0.05	<0.05	0.89	0.05	0.28*
Nitrate	mg/L	1.10	0.25	1.00	0.22	1.10	0.25	1.00	0.11	0.63
Total Phosphorus	mg/L	0.014	0.018	0.038	0.042	0.020	0.021	0.029	0.055	0.03
Dissolved Phosph	mg/L	<0.010	<0.010	0.010	0.018	<0.010	<0.010	<0.010	0.011	0.011*
True Color	Pt-Co	5	5	5	5	5	5	5	10.00	5.63
Apparent Color	Pt-Co	10	15	10	17	8	15	15	15.00	13.13
E.coli	CFU/100ml	<10	<10	<10	<10	<10	<10	<10	<10	<10