MYSTIC MONITORING NETWORK
WATER QUALITY MANUAL

Ninth Edition
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Mystic Monitoring Network
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Mystic River Watershed Association
your community • your watershed

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Introduction

The Mystic River Watershed Association

The Mystic River Watershed Association (MyRWA) is a community-based organization established in 1972 to protect and restore the natural resources of the Mystic River watershed. MyRWA is made up of approximately 500 individual and organizational members, a Board of Directors, and a staff of five, including the Executive Director, Water Quality Monitoring Director, Outreach Coordinator, Watershed Scientist and Office Manager.

MyRWA's mission is to protect and restore the Mystic River, its tributaries and watershed lands for the benefit of present and future generations and to celebrate the value, importance and great beauty of these natural resources.

MMN

The Mystic Monitoring Network (MMN) was created under a grant from the Massachusetts Department of Environmental Protection (DEP) to collect water quality data on the Mystic and its tributaries. It is the first watershed-wide volunteer monitoring program in the watershed. Volunteers have been collecting samples since 2000. The goals of the MMN are to:

- Use the information provided from sampling to identify and address water pollution problems,
- Raise public, municipal, and state agency awareness of water quality in the Mystic through timely and widely distributed communication, and
- Create a network of informed and active citizen advocates who will act as watershed stewards.

Purpose of the MMN Water Quality Manual

This manual is designed to provide an explanation of the protocols and procedures for water quality sampling, as well as some background on the parameters being tested. Volunteers are expected to familiarize themselves with these procedures. This is part of the process to ensure that the data collected are as accurate as possible.

Project Description

Currently, the Mystic Monitoring Network has two on-going projects:

1. **Baseline Monitoring:** Upper Mystic Baseline occurs on the **third Wednesday** of every month between 6-8 a.m. Collecting the samples generally does not take the full two hours; **Lower Mystic Baseline Monitoring** is tide dependant (2 hours after low tide), occurring on a weekday between 6-8 a.m. Usually monitors are able to finish all of the steps within 30 minutes.

Parameters Being Tested

In the Field:	**In the Laboratory:**
Color	*E. coli/Enterococcus*
Odor	Total Phosphorus
Water Temperature	Nitrate/Nitrite
Dissolved Oxygen	Total Suspended Solids
Clarity	Specific Conductivity
Suspended Material	Ammonia (Upper Mystic only)

2. **Hot Spot Monitoring:** Depending on the number of samples collected, monitors should expect to be out in the field for 2 – 5 hours, starting at sunrise.

   Many of the Hot Spot studies rely on wet weather conditions. Given the need to react to weather conditions, Hot Spot sampling may be scheduled on short notice and at unpredictable times. A wet weather event is defined as a sample collection that takes place during/after rainfall of 0.25 inches or more in the previous 48 hours. The Water Quality Monitoring Director will determine the appropriate storm events based on weather reports and laboratory availability. If there is a possibility of sampling, MMN volunteers will be contacted prior to the storm and placed "on alert." Approximately 12 hours before the potential sampling, volunteers will be notified if the sampling will take place.

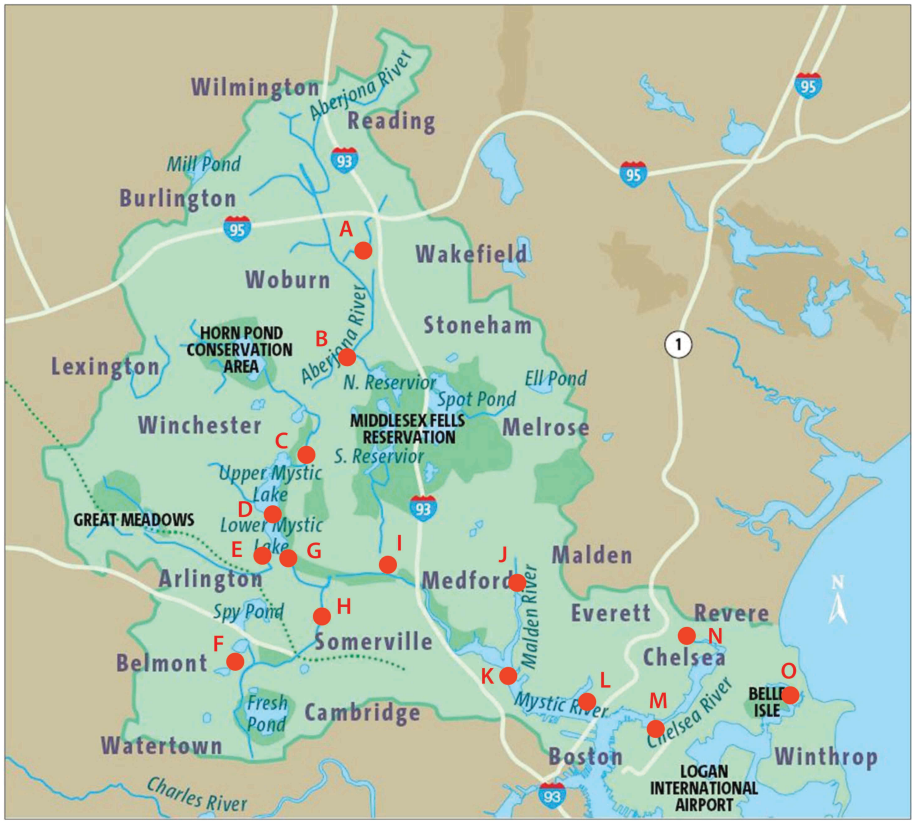
Parameters Being Tested

In the Field:	**In the Laboratory:**
Color	*E. coli/* Enterococcus
Odor	Fecal Coliform
Water Temperature	
Dissolved Oxygen	
Specific Conductivity	
Salinity	
Turbidity	
Ammonia	
Detergent	

Sites

Baseline sampling happens at the same fifteen sites along the Mystic River and its tributaries, as shown in the map below. Hot spot sampling locations vary each month.

Mystic River Monitoring Network
Baseline Sites



A Aberjona River, Woburn (ABR049)
B Aberjona River, Winchester (ABR028)
C Aberjona River, Winchester (ABR006)
D Upper Mystic Lake, Medford (MEB001)
E Mill Brook, Arlington (MIB001)
F Winn's Brook, Belmont (WIB001)
G Mystic River, Medford (MYR071)
H Alewife Brook, Arlington/Cambridge (ALB006)
I Meetinghouse Brook, Medford (MEB001)
J Malden River, Malden (MAR036)
K Mystic River, Somerville (MYR275)
L Mystic River, Chelsea (MYRMMP)
M Chelsea River, East Boston (CHR95S)
N Mill Creek, Chelsea (MIC004)
O Belle Isle Inlet, Revere (BEI093)

Source: Mystic River Watershed Association

Figure 1: MyRWA Baseline Sampling Sites

SITE ID #	DESCRIPTION	TOWN	DROP-OFF
ALB006	Alewife Brook, at Broadway	Somerville/ Arlington	MyRWA
WIB001	Winn Brook, outlet to Little Pond	Belmont	MyRWA
MYR071	Mystic River, outlet from Lower Mystic Lake	Arlington/ Medford	MyRWA
MIB001	Mill Brook, at Mt. Pleasant Cemetery	Arlington	MyRWA
UPL001	Upper Mystic Lake, at Mystic Lakes Dam	Medford	MyRWA
ABR006	Aberjona River, at USGS building	Winchester	MyRWA
ABR028	Aberjona River, at Washington St.	Winchester	MyRWA
ABR049	Aberjona River, at Salem St.	Woburn	MyRWA
MAR036	Malden River, at Medford St. Bridge	Malden	MyRWA
MEB001	Meetinghouse Brook, outlet to Mystic River	Medford	MyRWA
MYRMMP	Mystic River, at Mary O'Malley Park	Chelsea	Mary O'Malley Park
MIC004	Mill Creek, at Broadway Bridge	Chelsea	Mary O'Malley Park
CHR95S	Chelsea River, at Condor Street Urban Wild	East Boston	Mary O'Malley Park
BEI093	Belle Isle Inlet at Crystal Avenue	Revere	Mary O'Malley Park
MYR275	Mystic River at Draw Seven Park	Somerville	Mary O'Malley Park

Quality Assurance/Quality Control
These projects will adhere to MyRWA's EPA- and MA DEP approved Quality Assurance Project Plan (QAPP). The following procedures will be followed to ensure and evaluate the quality of our data:

- Each volunteer will demonstrate the sampling procedures at the training and the Watershed Scientist will fill out a Volunteer Evaluation.
- Sampling equipment will be inspected before each sampling event.
- Field probes will be calibrated prior to each use.
- Monitors will take field duplicate baseline samples on a rotating schedule.

Safety Considerations

Staff and volunteer safety is the most important priority of MyRWA. Please read the following safety precautions carefully.

- Monitoring should always be done with a minimum of two people at each site. Always let someone else know where you are, when you intend to return, and what to do if you don't come back at the appointed time.

- Remember that much of our monitoring occurs in locations that may likely be contaminated by sewage, toxic cyanobacteria, or legacy contaminants in the sediments. Always wear gloves while sampling and avoid contact with the water. Do not forget to thoroughly wash your hands with soap & water after monitoring.

- Do not walk on unstable stream banks. Disturbing these banks may accelerate erosion and potentially cause you harm should the bank collapse.

- If you drive, park in a safe location. Be sure your car does not pose a hazard to other drivers.

- If you are sampling from a bridge, be aware of passing traffic. Never lean over the bridge unless you are firmly anchored to the ground or bridge with good hand/foot holds.

- Wear pants and shirts with long-sleeves. Watch for ticks and be sure to check your body.

- Wear a safety vest or brightly colored clothing so you are highly visible.

- Put your wallet and keys in a safe place. Without proper precautions, they could easily get away from you and end up downstream!

- Know how to identify poison ivy and try to steer clear.

- If at any point you feel uncomfortable about your surroundings, stop monitoring and leave the site. Your safety is more important than the data.

Poison Ivy ID: Upright, climbing or trailing shrub that bears small yellow/white flowers. Leaves are in clusters of three and can look dull or glossy. All parts of the plant contain the oil that causes irritation. If you make contact with poison ivy, wash your body with soap or swab with alcohol, put your clothes in the washing machine and put your shoes in the sun to dry the oil. If the irritation persists, contact your physician.

Emergency Phone Numbers
In case of emergency while monitoring, call 911 from any location, then call the MyRWA office at 781-316-3438. Report non-emergency problems to the MyRWA office as soon as possible.

Record Keeping

It is important to keep meticulous records of observations and sample information. There are two places where field data will be recorded: the Mystic Monitoring Network Water Quality Data Sheet and the sample labels. Additional documents include Chain of Custody (COC) forms, an Equipment Checklist, a Procedure Checklist, and an Evaluation form. All of these forms can be found in the Appendix of this manual.

MMN Water Quality Data Sheets A datasheet is filled out at each sampling event and is turned in at the drop-off site. Be sure to include the monitors' first and last names. The Baseline and Hot-Spot datasheets vary slightly. Please see the examples in the Appendix.

Sample Labels Information on the bottle label will depend on what parameters will be sampled from that bottle. In general, each bottle should be labeled with the date, the time the sample was taken from the stream, the site name, sampler's initials or name and the sample number. Usually it is easier to do this before the sample bottle gets wet. Dissolved Oxygen sample bottles do not need to have any dates/times/names noted on them.

Chain of Custody Form A Chain of Custody (COC) form will be completed by the samplers at the drop-off site when turning in a set of samples. These forms will track the samples through each change of hands as they travel from sample site to laboratory. A copy of the COC forms will be kept on file at the MyRWA office.

Equipment Checklist The equipment checklist is used to keep track of the materials distributed to Volunteer Monitors during the sampling season. Volunteers will complete equipment checklists upon receipt of the Water Sampling Kit.

Procedure Checklist The procedure checklist is part of the Water Sampling Kit and lists all the steps to be followed in chronological order. It should be reviewed and completed during each sampling event.

Evaluation Form The evaluation form is used to document the proficiency of the samplers. It is completed during the training session, and periodically during the sampling season, if questions arise about performance.

Baseline Monitoring

Baseline Overview

The process starts several days prior to the sampling event. Volunteers will be reminded one week before each event and notify the Watershed Scientist of their availability. The volunteers will also check their equipment and notify the Watershed Scientist of anything they need.

At the site samplers will fill out the Water Quality Data Sheet, noting weather conditions including air temperature and weather conditions. Monitors put on gloves, affix the sample bottle to the swing or bridge sampler, take the cap off the sample bottle, and collect a surface grab sample from the river. Monitors collect a bacteria sample first (smallest plastic bottle) and the dissolved oxygen (glass bottle) last, writing the time of sample collection on the bottle in permanent ink before the sample is collected. Each bottle must be filled, recapped and labeled before the next sample bottle is opened. All bottles should immediately be placed on ice. The dissolved oxygen sample is fixed immediately after collection. After all the bottles are capped and labeled and the dissolved oxygen sample has been fixed, samplers take the temperature of the water in a bottle designated for temperature and enter the value on the data sheet. Lastly, samplers note the color, odor and clarity of the water. Samplers pack up all the equipment, put the thermometer in the cooler, and take the samples (packed on ice) to the designated drop-off point. During the sampling season, monitors will be asked to collect a set of duplicate samples.

At the office, the samplers put the sample bottles in the ice cooler to be delivered to the laboratory, then fill out the Chain of Custody forms and leave their data sheets. The samples are then transported to the appropriate laboratory for analysis. Bottles for the next month's sampling should be picked up when the current month's collected samples are turned in at the drop-off location. Any additional or replacement equipment may also be picked up at this time.

Sampling Procedures

One Week Before

1. Know your site location. Make sure that you have a map or good directions. Know approximately how long it takes to get to the sampling site and to the drop-off site.
2. Contact your sampling partner. Make arrangements to meet, and determine who will bring ice and the cooler, sampling equipment and who will drop off the samples.
3. If you are unable to sample, contact the Watershed Scientist as soon as you know to provide adequate time to find a substitute monitor.

The Day Before

1. Familiarize yourself with the directions and procedures. If necessary, review the sampling procedures in this Water Quality Monitoring manual.

2. Assemble all the equipment that will be needed the next morning (sample bottles, rubber gloves, cooler, sampling forms, sampling pole or bridge sampler, dissolved oxygen kit, thermometer).
3. Fill out information on the Water Quality data sheet and labels as much as possible in order to save time in the morning. Place them with your other equipment.

4. Prepare ice for samples and store it in your freezer.

5. Tell someone else that you will be sampling the next morning. Tell them where you will be and what time you expect to return.

At the Sampling Site

1. Fill out the general information section of the data sheet. Remember to enter your site ID, site description and your name.

2. Complete the weather section of the data sheet. Measure air temperature with the supplied thermometer, hanging it from a nearby object so that it is at least 4 feet off the ground.

3. Collect the water samples to be analyzed for bacteria, nutrients, conductivity, and TSS using the swing sampling pole or bridge sampler. Always begin with the bacteria sample (smallest plastic bottle). Affix the sample bottle to the pole using the plastic snapper rings or two strong rubber bands. Remove the lid from the bottle. Extend the pole as far out to the center of the river as possible and collect a surface grab sample by passing the bottle along the surface of the water, moving from downstream to upstream (see pages 14-15) for detailed instructions). The plastic sample bottles should be filled to the bottle's neck. Put the samples on ice immediately.

4. Dissolved oxygen: Collect a water sample in the small glass bottle following the procedure on page 13 of this manual.

5. Measure the water temperature using the designated sample bottle. Record the reading and time taken in the physical section of the data sheet. Put the thermometer in the cooler.

6. Note the color, odor, clarity and suspended material of the water in the Physical section of the data sheet.

7. Note any observations about the site: any wildlife? Any trash or debris? Any nearby pipes flowing?

8. Make sure that labels and data sheet have been filled out.

9. Pack up all equipment and take samples to the MyRWA office or the designated drop-off point.

Samples and data sheets must be delivered by monitors to the appropriate drop-off site no later than 8:30 a.m. Please be prompt! No late samples can be accepted and the sample delivery time is very tight. Samples must be delivered to the lab within 6 hours of collection.

NOTE: Debris floating on the surface is normal and will not contaminate your sample. If there is excessive debris in the sample bottle, empty it out downstream from where the sample was collected and collect a new sample. A small amount of debris on the sample bottle will not affect the results.

Swing Sampler Procedures

1. Put on gloves.

2. Extend the swing sampler to the appropriate length. In order to lock the pole in place, twist the pole until you hear a click. You will want the sampler to reach as close to the center of the stream as possible.

3. Collect the bacteria sample first (smallest plastic sample bottle). Write down the time of sample and your name on the sample bottle and attach it to the swing sampler using a rubber band. When the bottle is securely attached, take off the cap. Do not touch the inside of the bottle or cap.

4. Reach the pole to the water and gently dip the bottle into the water. Tilt the bottle so the lip is under the surface, and pass the bottle from downstream to upstream until the bottle is full. Do not disturb the bottom sediment while sampling. The water level should reach the shoulder of the bottle. Haul in the bottle and have your partner cap it.

5. Repeat this process for the remaining plastic sample bottles. Use the medium snapper ring for the 500 mL bottle and the large snapper ring for the 1 L bottle. Wrap the snapper around the bottle and back wall of the platform, making sure it rests in the indentation in the back wall of the platform. Push the ends of the snapper towards each other, tightening until the bottle is securely in place.

6. As the 1 L bottle may feel heavy with the pole completely extended, it may be easiest to swing the pole in toward shore and let your partner cap it, to avoid spilling water. Remove the bottle after it has been capped by sliding the ends of the snapper vertically away from each other.

7. For the small glass DO sample bottles, use two strong rubber bands to attach the bottle to the sampler. Reach the pole to the water, and gently dip the bottle in the water. Tilt the bottle so half the opening is under water, and allow the water to

slowly fill the bottle creating as little disturbance as possible. When the bottle is completely full, draw the pole in to the shore and have your partner immediately cap the bottle. The bottle cap will displace a small amount of water. Check to be sure there is no air bubble in the sample by tilting the bottle upside down. If one appears, empty the sample downstream and try again.

8. Proceed to fixing the DO sample.

Bridge Sampler Procedures

The basket sampling device used to collect water samples includes a 2.5 to 5 pound weight attached to the bottom of the basket. When carrying the sampling device please hold it by the basket or weight, not by the rope, to prevent the heavy part of the basket from swinging into anything or anyone.

1. Visually scan the drop location to ensure an unobstructed vertical drop.

2. To prevent loss of the basket sampler, ensure the knot and carabineer are secured and step on the loose end of rope or hand it to your sampling partner to hold. Place the bridge sampling device on a sturdy surface such as a bridge railing or the ground.

3. If you have multiple sampling bottles, sample bacteria bottles first, and repeat lowering of the basket for additional bottles, collecting dissolved oxygen last. If collecting field duplicates, collect samples first and duplicates in a separate basket sampling.

4. Loosen orange cable cuffs and place capped sampling bottle inside so that the top of the bottle's lid is at least 2" above the top of the orange cuff. Do not remove the bottle's lid until it is secured in the basket sampling device. Tighten orange cuff to secure bottle.

5. Carefully unscrew the lid of the sampling bottle. Without touching the inside of the bottle or lid, hand the lid to your partner to hold, face up until bottle is ready to be sealed. (Lids can also be placed in a clean plastic sandwich bag).

6. Lower the bridge sampling device down to the river. Gently plunge the basket into the river so that the top of the sampling bottle(s) is approximately 6" below the surface. Do not let the bridge sampling device hit the river bottom. Keep the loaded sampling device submerged long enough for bottle(s) to fill (approximately 5 to 10 seconds).

7. Carefully raise the bridge sampling device and place the device on a sturdy surface. Check that bottle(s) contains an adequate volume of water. Bottles should be filled at least ¾ full. Without touching the lip or inside of the sampling bottles or the inside of the lids secure lids to the top of the bottles. Loosen the orange cuffs and remove capped sampling bottles.

8. Immediately put samples on ice.

Dissolved Oxygen Sampling Procedures
Chemicals are added to the sample to "fix" or stabilize it. Directions also appear on the inside lid of the DO kit. Follow steps 1 – 7. The remainder of the analysis will be conducted by the MyRWA staff.

1. Add 8 drops of Manganous Sulfate Solution. Add 8 drops of Alkaline Potassium Iodide Azide.

2. Immediately put on the cap so air is not trapped in the bottle and invert several times to mix. This solution is caustic so wear gloves and goggles and rinse if you get any on you. An orange-brown flocculent (mass of particles that form into a clump as a result of a chemical reaction) precipitate will form if oxygen is present.

3. Allow the flocculent a few minutes to settle to the bottom of the bottle. Invert the bottle again and wait until the flocculent settles. This ensures complete reaction of the sample and the reagents.

4. Remove the cap from the sample and add 8 drops of Sulfuric Acid. Immediately put the cap on so air is not trapped in the bottle and invert several times to mix. The flocculent will dissolve and leave a yellow color if oxygen is present. If particles are present, shake, or turn upside-down a few more times until the particles are dissolved.

5. The oxygen in the sample is now fixed. It can be stored in the dark for up to 8 hours.

Equipment List
A Water Sampling Kit is issued to monitors for each sampling site. The Water Sampling Kit includes:

1 swing pole sampler OR 1 basket sampling device with attached weight and rope
Goggles
1 dissolved oxygen kit
1 thermometer
Nitrile gloves
1 black Sharpie marker
1 pencil
3-4 data sheets
1 clipboard
Sampling Bottles (vary between Upper and Lower Mystic Baseline)
1 dissolved oxygen bottle (glass)

Hot Spot Monitoring

Hot Spot Monitoring Overview

The Hot Spot sampling usually occurs once a month. However, additional sampling events may be conducted. Wet weather monitoring occurs during a rain event when 0.25" or more is predicted. In the case of wet weather sampling, you will be notified as soon as we know appropriate weather is predicted.

The location of monitoring will change each month, and will depend for the most part on weather. Some sampling events will involve sampling many times at one location (e.g. a stormdrain during a rain event), or sampling at numerous locations along a stretch of the brook/river (e.g. all of the pipes discharging into the stream). You will be given explicit instructions prior to the sampling event as to the order and frequency of sampling. Be sure each monitor understands the "game plan" before you begin sampling.

For each sample you will collect one vial for bacterial analysis. Additionally, you will use the YSI hand-held meter to evaluate dissolved oxygen, temperature, and conductivity. A CHEMetrics detergents kit is used for field analysis of surfactants and a HACH field kit is used to analyze ammonia on the field.

Sampling Procedures

The night before the sampling event:

1. Make sure you know the time and location of the event. Contact your sampling partner(s) and be sure you agree on when and where to meet.

2. If you are responsible for the equipment, use the checklist at the end of this section to be sure you have all of the necessary items and that they are in good condition and calibrated (if necessary). See the instructions on pages 25 for calibrating the YSI meter.

3. If there are any problems, contact the Water Quality Monitoring Director right away.

4. Tell someone where you are going and how long you expect to be there.

At the Sampling Location:

When you get to the sampling location, assess the safety of the area before you begin monitoring. This is particularly important during wet weather, as water levels can rise quickly and banks can be extremely slippery. *Your safety is more important than getting the samples.* If there is no access to the area you need to sample, skip it and move on.

Turn on the YSI meter approximately 10 minutes before sampling is to begin. Leave the meter on until all samples for the day have been taken. Calibrate the meter at

the first site. If you have ANY doubts about a DO reading, re-calibrate and take another set of readings before continuing.

Keep the meter in open air at ambient temperature, not in a heated or air-conditioned car or in direct sun for extended periods. DO calibration and readings need to occur with the meter near the temperature of samples.

The basic order for sampling will be:

1. Hang the thermometer on a nearby tree to get the air temperature (for first and last site only).
2. Collect the bacterial sample.
3. Collect water for surfactant analysis. Follow the instructions provided in the field kit.
4. Collect the water for the meter analyses.
5. Collect the YSI readings. Record the meter memory cell # in field notebook and on data sheet. This allows for correct transcription.
6. Collect water for ammonia analysis. Follow the instructions provided in the field kit.

Collecting the Bacterial Sample:
Each bacteria vial contains a sodium thiosulfate tablet in it. Do not lose the tablet and do not touch the inside, rim, or inside cap of the vial.

Opening and Closing the Bacteria Vial:
1. To open the vial, lift the tab on the front of the lid and pull the lid up.
2. To close the vial after collecting the sample: close the lid completely and push the tab on the front of the lid completely down; thread the "string" through the hole at the front of the lid until the notch on the string passes through the hole (different bottles have the holes in different places on the lid/bottle, so this will be demonstrated to you when you are trained).

Sampling with a Swing Sampler:
1. Put on Nitrile gloves.
2. Note the time on the vial *before* getting it wet.
3. Affix the vial to the base of the swing sampler using two strong rubberbands.
4. Use the pole to slowly lower the vial into the water so that the mouth is facing *downstream.* Be careful not to lose the sodium thiosulfate tablet.
5. Fill the vial to the fill line, making sure to leave some airspace at the top.
6. Retrieve the vial, and cap and seal it.
7. Remove the vial from the swing sampler and place on ice immediately.

Sampling From a Boat:
- Collect samples by boat only when weather conditions are safe and never at night. Always wear a lifejacket and go out with a partner.
- When sampling in a boat always collect on the upstream side.

1. Put on Nitrile gloves.
2. Wait until the boat comes to a stop and begins to drift with the current before collecting. Do not collect water that has come in contact with the edge of your boat!
3. Remain still for a few seconds to allow any stirred up sediments to be carried away by the current.
4. Note the time on the bottle *before* it gets wet.
5. Dip the collection vial into the stream, making sure not to dump out the sodium thiosulfate tablet.
6. Fill to the fill-line, making sure to leave some airspace at the top.
7. Cap and seal the vial and place on ice immediately.

Sampling from a Pipe Outflow:

Remember that pipes may contain contaminated water, from a questionable source, so always wear gloves and keep your face and body well away from the water. As always, wash your hands immediately after sampling.

1. Put on Nitrile gloves.
2. Approach the pipe and establish firm footing.
3. Place the vial in the stream of water falling from the end of the pipe.
4. Fill to the fill-line, making sure to leave some airspace at the top.
5. Cap and seal the vial and place on ice immediately.

Using the YSI Meter:

Follow the site-dependent instructions from above, substituting the 1 liter bottle for the bacterial vial. Be sure to triple rinse the bottle before collecting the final sample to use with the meter. To collect YSI data, first immerse the probe. A sharp bump on the bottom is necessary to dislodge air bubbles around the dissolved oxygen (DO) sensor. It is protected by an outer plastic cage, so the probe is safe. The probe must be immersed so holes near the top stay under the surface. The probe must be moved to maintain a 1 ft/second velocity so DO is not depleted around the sensor. Wait for the temperature reading to stabilize, then for the DO reading (% sat) to stabilize. It may never cease moving entirely, but movement should be near stable, and no longer moving in only one direction. Then take readings, in triplicate. If you are using a meter that cannot save readings, call out the numbers to your partner, having him/her say them back to you as they write each number down. After collecting the sample, rinse the YSI probe with deionized (DI) water.

After Completing Sampling:

Make sure all of the sampling vials are labeled correctly, and in the cooler on ice. Make sure all memory cell numbers and notes are recorded in the field notebook and on the datasheet. Pack up all of the equipment. Fill out the EPA Chain of Custody. One person will be assigned beforehand to drive the samples to the EPA laboratory in North Chelmsford, MA.

Equipment List:

1 ten-foot swing sampler pole
Sterile bacteria sampling vials
1 L bottle for meter readings
YSI meter
DI water
Detergents Kit
Field Ammonia kit
Thermometer
Gloves
Field notebook
Data sheets
Pencil
Permanent marker
Cooler
Ice
Watch or cell phone

Cyanobacteria Monitoring

Cyanobacteria Overview

Cyanobacteria monitoring will occur at five established sites through the period of May – September. Additional sites may be added to the program if bloom conditions are observed and need to be monitored. The five sites will be monitored at least every other week.

Volunteer monitors participating in the cyanobacteria monitoring program will be responsible for picking up equipment prior to monitoring, collecting all required samples, making detailed site observations, and returning the samples to the lab for processing with a hand-held fluorometer. During some cyanobacteria monitoring events, additional samples may be collected for the analysis of Chlorophyll *a* and nutrients, such as total phosphorus.

Sampling Procedures

The night before the sampling event:

1. Make sure you know the time and location of the event. Contact your sampling partner(s) and be sure you agree on when to meet, etc.

2. If you are responsible for the equipment, use the checklist at the end of this section to be sure you have all of the necessary items and that they are in good condition and calibrated (if necessary). See the instructions on pages 25 for calibrating the YSI meter.

3. If there are any problems, contact the Water Quality Monitoring Director right away.

4. Tell someone where you are going and how long you expect to be there.

At the Sampling Location:
When you get to the sampling location, *assess the safety* of the area before you begin monitoring. *Your safety is more important than getting the samples.* If there is no access to the area you need to sample, skip it and move on.

Turn on the EXO or YSI meter approximately 10 minutes before sampling is to begin. Leave the meter on until all samples for the day have been taken. Calibrate the meter at the first site. See page 26 on how to calibrate the EXO meter.

The basic order for sampling will be:

1. Hang the thermometer on a nearby tree to get the air temperature (for first and last site only) and note the current weather conditions on your data sheet.

2. Collect the cyanobacteria sample. Pack the sample immediately in the cooler on ice.

3. Collect any other samples called for in the sampling plan, in the designated order.

4. Take the EXO or YSI readings.

Collecting the Cyanobacteria Sample:
1. Put on nitrile gloves.

2. Note the time on the WhirlPak bag *before* getting it wet.

3. Affix a clean sample collection vial to the base of a swing sampler pole. Extend the pole to where the water is approximately 3' in the lake or river.

4. Collect a water sample by dipping the mouth of the collection vial vertically underwater. At a depth of 6", scoop the collection vial up towards the surface of the water.

5. Transfer approximately 100 mL of sample water into the pre-labeled WhirlPak bag.

6. Seal the bag and immediately place it in a cooler, on wet ice.

7. If other samples are to be obtained from the site, collect them in the order given in the sampling plans.

Using the EXO Meter:

To collect EXO data, first ensure the total algae probe is installed and calibrated. Immerse the probe in the sample water. A sharp bump on the bottom is necessary to dislodge air bubbles around the dissolved oxygen (DO) sensor. It is protected by an outer plastic cage, so the probe is safe. The probe must be fully immersed so holes near the top stay under the surface. The probe must be moved to maintain a 1 ft/second velocity so DO is not depleted around the sensor. Wait for the temperature reading to stabilize, then for the DO reading (% sat) to stabilize. It may never cease moving entirely, but movement should be near stable, and no longer moving in only one direction. Then capture three readings. After collecting the sample, rinse the EXO probe with deionized (DI) water.

After Completing Sampling:

Make sure all of the containers are labeled correctly, and in the cooler on wet ice. Make sure all memory cell numbers and notes are recorded in the field notebook and on the datasheet. Pack up all of the equipment. Deliver the samples to the MyRWA lab and analyze each cyanobacteria sample with the hand-held fluorometer.

Using the Fluorometer:

1. Warm up the meter for 5 minutes (need to keep it active or will shut off after 3 minutes).

2. Insert calibration standard with tab towards you.

3. Beginning with Channel A, press READ and record value in lab notebook.

4. Repeat for Channel B.

5. Fill cuvette ¾ full with deionized (DI) water and tap to remove bubbles.

6. Dry cuvette if necessary and place into fluorometer with red mark towards you.

7. Take readings on both channels – should be near 0 (if not, discard cuvette) – record value, indicating "Blank" sample.

8. Fill vial with sample and place in fluorometer. Read out values for both channels, recording in notebook with Sample # and Site ID. Record the time that samples were read out in the lab notebook.

9. Reseal bags and place on ice after reading out. They will be discarded after all data are entered and checked (if entry occurs on the same day of data collection).

Appendices

Explanation of Parameters

Biological Properties

Fecal Coliform Bacteria
Fecal coliform bacteria are a group of bacteria that live in the intestinal tract of animals. High fecal coliform levels may indicate contamination from human or animal wastes and the potential presence of other disease-causing types of bacteria. High fecal coliform levels may render rivers and streams unsafe for boating, swimming, drinking, or shellfishing. Under the Federal Clean Water Act, ten percent of samples should have no more than 400 coliform colonies per 100mL of water sample. Fecal coliform might be sampled for the hot spot program.

***E. coli* Bacteria**
For some projects, we will be sampling for both fecal coliform and *E. coli* bacteria. Current Massachusetts surface water quality standards require that no single sample have more than 235 colonies per 100mL.

***Enterococcus* spp. Bacteria**
Like fecal coliform and *E. coli*, *Enterococcus* spp. is an indicator bacteria used to determine water safety. *Enterococcus* spp. is used primarily as an indicator in salt water and is currently used for Massachusetts beach swimming standards. The Department of Public Health's Minimum Standard for marine bathing beaches in the State Sanitary Code, Chapter VII (105 CMR 445.031) is based on *Enterococcus* spp. and states that "No single Enterococci sample shall exceed 104 colonies per 100 mL".

Chemical Properties

Nitrogen Compounds
Nitrate and ammonium are the forms of nitrogen that are available to plants and animals. Most of the nitrogen in the environment is in gaseous form and makes up 80% of our air. Inorganic nitrogen is found in aquatic systems as nitrates (NO_3), nitrites (NO_2), nitrogen gas (N_2), and ammonium (NH_4^+). Although ammonium is the preferred nitrogen source of autotrophs and bacteria, nitrates/nitrites are the most common. Nitrates and nitrites enter rivers and streams from soil, animal wastes, and decomposing plants. The major human sources are sewage, fertilizers, and animal waste. Ammonia (NH_3) may accumulate in bottom sediments where oxygen levels are low. Ammonia is a good indicator of the potential presence of sewage. Ammonia together with amino acids, proteins, urea, and humic acids compose Kjeldhal Nitrogen, the organic part of nitrogen found in water bodies.

Total Phosphorus
Phosphorus can enter rivers and streams from many sources: animal wastes, human wastes, fertilizer, detergents, erosion, and storm runoff. The organic and inorganic, particulate and soluble forms of phosphorus undergo continuous transformations. Phosphorus is frequently the limiting agent to plant and algal growth. Therefore, elevated concentrations of phosphorus may stimulate aquatic plant growth and algal blooms. The decomposition of plants or algae consumes dissolved oxygen, which decreases the amount of dissolved oxygen available to other organisms. Total Phosphorus (TP) is a measure of all forms of phosphorus in the system.

Orthophosphate
Orthophosphate is the form of phosphorus taken up by plants. Sources include detergents (which end up in wastewater), fertilizers, and industrial discharges. Samples may be tested for orthophosphates as an indicator of human sources of nutrient enrichment at sites as needed.

Chlorophyll *a*
Chlorophyll *a* is one of the types of chlorophyll used by aquatic plants, including algae, to conduct photosynthesis. It is the dominant chlorophyll found in true algae and blue-green algae (Cyanobacteria), and is used as an estimate of algal biomass. Although these important organisms form the base of the food chain, high levels of chlorophyll *a* can indicate excess nutrient input to a water body. When massive quantities of algae die off, toxins can be released and decomposition can lead to reduced oxygen levels, causing fish kills.

Surfactants
Surfactants are organic chemicals used in such products as soaps, laundry detergents, and dishwashing soap. Measurement of surfactants can be used in bacterial source tracking efforts to indicate human sources of elevated bacterial levels.

Oil and Grease
An accumulation of oil and grease forms a film over water which spreads and has different effects on organisms, including death, smothering, hypothermia, and inviability of eggs. These samples must not be collected as composite samples (i.e., you cannot combine multiple samples into one bottle), because some grease may be lost on equipment.

Total Petroleum Hydrocarbons
Total petroleum hydrocarbons (TPH) are a group of chemical compounds that are derived from crude oil. The group includes jet fuels, mineral oils, benzene, toluene, naphthalene, and many others. TPHs can affect the lungs, central nervous system, liver, and kidney of humans and other animals. Samples may be collected and have constituents identified as TPH-PHI (TPH-Petroleum Hydrocarbon Identification).

Physical Properties

Depth
This measurement gives an indication of the amount of water in the river. Water quantity is vital to the health of the river ecosystem. Sufficient amounts of water must exist for aquatic flora and fauna to survive. Water quantity is also a component of water quality. The effects of pollutants in a river are buffered by having a sufficient volume of water to dilute them. As water quantity lessens, the concentration of pollutants may increase and adversely affect the water quality.

Dissolved Oxygen
Dissolved oxygen (DO) is the amount of oxygen dissolved in water. This oxygen must be available for fish and other aquatic species. Low DO values indicate excessive vegetative growth often brought on by the input of nutrient pollution (including sewage). Dissolved oxygen is measured as milligrams of oxygen per liter of water (mg/L) or percentage of oxygen saturation. The Mystic River should have more than 5.0 mg/L or between 60% and 100% saturation. This parameter will be measured using a LaMotte Dissolved Oxygen kit for the baseline program and a YSI professional plus meter or EXO sonde for other programs.

Biochemical Oxygen Demand
Biochemical Oxygen Demand (BOD) measures the amount of oxygen used by microorganisms to break down organic matter. When plants die and decompose, aerobic bacteria feed on them. The metabolic processes of the bacteria use available oxygen. When a water body receives excess nutrients (like nitrogen or phosphorus), plant growth is stimulated, which eventually leads to greater bacterial growth and higher BOD. This leaves less oxygen available for other organisms like fish and aquatic invertebrates.

pH
pH is a measure of the acidity of water. pH is important since water that is too acidic or, at the other extreme, too basic, can be toxic to fish and other aquatic life. pH also plays an important role in how other pollutants, such as heavy metals, behave in the environment. High or low pH levels can be the result of acid rain/snow, chemicals getting into the waterways, or certain natural conditions. pH is measured on a scale from 1 to 14, with 1 being very acidic, 7 being neutral, and 14 being very basic. The Mystic River and its tributaries should have pH levels between 6.0 and 8.3.

Temperature
Water temperature may not seem like pollution, but it is critical for rivers and streams to remain relatively cool, in order for fish and other aquatic life to survive. Water temperatures can get too hot from a lack of shade along the riverbanks, from discharges of cooling water, storm water running off hot pavement, or when cool water from underground aquifers is diverted from the stream by nearby wells. Under the Clean Water Act, the Mystic River and its tributaries should have temperatures of

less than 28.3^{0}C. Certain fish species that live in tributaries of the Mystic River need water that is even cooler. This parameter will be measured in the field using a thermometer or a YSI Professional Plus meter.

Total Suspended Solids
Total suspended solids (TSS) is a measure of dust, dirt, sand, and other particles stirred up in the water. Excessive amounts of suspended solids can bury fish and aquatic plants, and can make rivers and streams unpleasant for recreation. In addition, other pollutants, such as oil, heavy metals, and nutrients are frequently attached to suspended solids. Thus, TSS can sometimes provide a very rough indication of where there might be problems with these other pollutants. TSS is measured in mg/L; the Mystic River should have less than 25 mg/L.

Clarity
Water clarity may be measured as turbidity or transparency. Turbidity increases when there are a lot of suspended solids in the water, indicating low water clarity. The causes and effects of high suspended solids concentrations were discussed earlier. Turbidity may be determined by commercial laboratories, while transparency data would be collected using a Secchi disk. The Secchi disk would be lowered until you cannot see it. This depth would be recorded, along with the depth at which the disk is again visible.

Specific Conductance
Specific conductance is a measure of how well water can conduct an electrical current. This depends on the presence of ions and the temperature. The ions, which come from the breakdown of compounds, conduct electricity because they are positively or negatively charged when dissolved in water. It is an indirect measure of dissolved solids; large changes in specific conductance could indicate that a discharge or other source of pollution has entered a river.

Glossary

Accuracy – a measure of how close repeated trials are to the desired target.

Benthic – pertaining to the bottom (bed) of a waterbody.

Dissolved oxygen (DO) – oxygen dissolved in water and available for living organisms to use in respiration.

Distilled water – water that has had most of its impurities removed.

Effluent – wastewater discharge.

Eutrophication – the natural and artificial addition of nutrients to a waterbody, which may lead to depleted oxygen concentrations.

Flocculent (floc) – a mass of particles that form into a clump as a result of a chemical reaction.

Headwaters – the origin of a river or stream.

Macroinvertebrate – organisms that lack a backbone and can be seen with the naked eye.

pH – a numerical measure of the hydrogen ion concentration used to indicate the alkalinity or acidity of a substance. Measured on a scale of 1.0 (acidic) to 14.0 (basic); 7.0 is neutral.

Precision – a measure of how close repeated trials are to each other.

Reagent – a substance or chemical used to indicate the presence of a chemical or to induce a chemical reaction to determine the chemical characteristics of a solution.

Riparian zone – the vegetative area on the banks of a body of water.

Sheen – the glimmering effect that oil has on water as light is reflected more sharply off of the surface.

Substrate – refers to a surface. This includes the material comprising the stream bed or the surfaces upon which plants or animals may live.

Titration – the addition of small, precise quantities of a reagent to a sample until the sample reaches a certain endpoint. Reaching the endpoint is usually indicated by a color change.

Tributary – a body of water that drains into another, typically larger, body of water.

Water quality standards – written goals for state waters, established by each state and approved by the Environmental Protection Agency (EPA.)

Watershed – the area of land that water flows across or under on its way to a waterbody.

Using the YSI Meter

Calibration and Post-Calibration (Verification) Check for YSI Meter

1. The YSI meter's dissolved oxygen probe should be calibrated before the sampling event according to the manufacturer's instructions on the following page (page 11 of the manufacturer's instructions). It is preferable to use a local altitude obtained from a barometer (such as the barometric watch supplied with the EPA's YSI meter). However, in the event that one is unavailable, the elevation from a topographic map can be used.

2. The YSI meter's conductivity probe should be checked before every sampling event (after DO calibration). Rinse the probe well with de-ionized water or tap water and shake excess water off the probe. Place at least 3 inches of standard solution in a clean container (enough to cover the oval shaped hole on the side of the probe, with at least ¼ inch of fluid between the bottom of the probe and the bottom of the container). Let the meter equilibrate, and then record the specific conductivity reading (the µs/cm screen with °C symbol flashing). The reading should be within ± 10% of the standard or 20 uS/cm (whichever is greater). If it is not, the meter will need to be calibrated with the standard, according to (Pgs. 12-13 of) the manufacturer's instructions. Rinse the probe well with de-ionized water or tap water before reinserting it into the chamber.

3. For critical dissolved oxygen data (this will be noted in your sampling plan), you will need to do a post-calibration (verification) check. At the end of the sampling event, put the probe in the chamber and let the meter equilibrate. Record the temperature, salinity (ppt), and dissolved oxygen (mg/l) on your datasheet.

4. For critical dissolved oxygen data, you will also need to check the probe with a zero DO solution at the end of the sampling event (after the post-calibration check). Place the probe in a zero DO solution. Verify that the probe reads <0.5mg/l. Record the result on your datasheet. Rinse the probe extremely well at a sink and make sure it is getting a "normal" reading in the stream of water coming from the faucet before putting it back in the chamber.

Using the EXO Sonde

The EXO sonde is a multiparameter instrument that collects water quality data including dissolved oxygen, conductivity, water temperature, turbidity and total algae (chlorophyll *a* and phycocyanin accessory-blue-green algae). Once power is applied to the sonde, users can activate their sondes from *Sleep* state and the Bluetooth connections via a magnetic switch installed in the sonde. The sonde will automatically disable the connection and go to sleep once it has not received a Bluetooth signal for 5 minutes or a signal from the topside connector for 30 seconds. In order to activate their sondes, users should keep a magnet with them when setting up and deploying sondes. The EXO can also be awakened manually via the topside port.

Calibration for EXO Sonde

1. The EXO sonde's dissolved oxygen, conductivity and total algae probes should be calibrated before the sampling event according to the manufacturer's instructions (pages 54-55 of the manufacturer's instructions). It is preferable to use a local altitude obtained from a barometer.

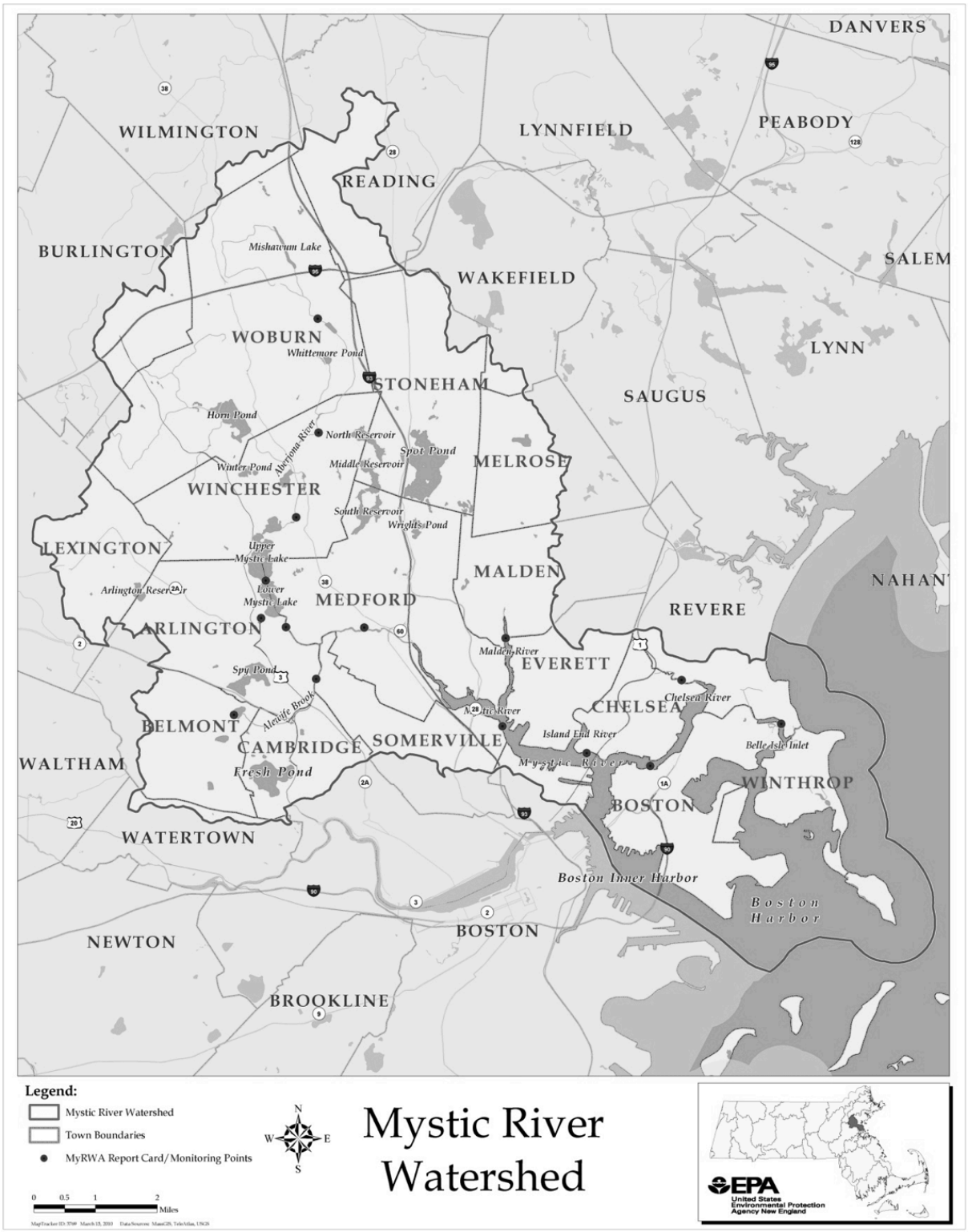
2. Add a small volume of calibration solution in the calibration cup to rinse the probe. Use de-ionzed water for calibrating dissolved oxygen and total algae and a standardized conductivity solution for conductivity.

3. When calibrating dissolved oxygen or total algae, fill the calibration cup to the lowest line. Let the meter stabilize, and then record the pre- and post-calibration values and the ODO gain (for dissolved oxygen).

4. Repeat rinse for conductivity (using a standardized conductivity solution) and fill the calibration cup to the highest line. The reading should be within $\pm$ 10% of the standard. Record the pre- and post-calibration values and the cell constant. Rinse the probe well with de-ionized water or tap water before reinserting it into the calibration cup.

5. To capture data, use the KOR software on the Run tab. Use the dashboard or graph to capture data. The deploy menu may also be used to collect unattended data.

The Mystic River Watershed: Map



Baseline Water Quality Data Sheet

MyRWA
Mystic River Watershed Association
your community • your watershed
781-316-3438

SITE ID# _____ **DATE** _____

WATER BODY _____

TIME BEGIN: _____ AM **END:** _____ AM

MONITOR(S):

Weather

No current precipitation:

0 - Clear
1 - Partly Cloudy
2 - Cloudy

Current Precipitation:

3 - Rain
4 - Sleet
5 - Snow

Clarity

☐ Clear or ☐ Cloudy

Color

0 - Clear
1 - Light Green
2 - Light Tea
3 - Tea
4 - Grey
5 - White
6 - Other _____

Suspended Particles

☐ Yes ☐ No

Odor

0 - None
1 - Organic (Earthy, dirt)
2 - Musty
3 - Sewage
4 - Fishy
5 - Rotten Egg
6 - Oily
7 - Other _____

Lab Bottle ID # _____

Time Bacteria Sample Collected _____ AM

Air Temp. _____ (°C)

Water Temp _____ (°C)

Thermom. # (water temp.) _____

Thermom. # (air temp, if different) _____

Notes:

Were replicates collected?

YES ☐ NO ☐

If yes, Bottle Replicate ID # _____

Time Replicate Bacteria Sample Collected

_____ AM

Staff Gage Height _____ ft

Mystic River Watershed Association
your community • your watershed

Hot Spot Water Quality Data Sheet

rec'd
ent'd
chk'd

WEATHER

Location/Study: _____

Monitors: _____

Date: _____ **Time:** _____ _____
BEGIN END

WEATHER: CLEAR PARTLY CLOUDY CLOUDY OVERCAST DRIZZLE
(*circle one*) RAIN SNOW SLEET OTHER _____

WEATHER LAST 48 HRS (note precipitation) _____
AIR TEMPERATURE (^{0}C) Begin: End: **THERMOMETER #** _____

LABORATORY/METER

Sample ID:	Site ID/Description:	Comments:	GPS Waypt:	YSI Cell(s):	Time:

Meter Information

pH Meter #: _____ **Calibration:** _____ _____ _____ _____
Yellow Red Blue Yellow in field

Notes _____

YSI Meter #: _____ **Notes:** _____

Post Calibration Checks: _____ _____ _____ _____
Temp (oC) Salinity (ppt) DO (mg/L) Zero DO Check

Mystic Monitoring Network Chain of Custody Form

Lab Manager accepting samples (print):

Date of Sampling:

Site ID	Bottle ID	Sampling Time	Sample Type	Analysis Requested							Total # of Bottles	Preserved on ice / cooler	Cooler Temp	DO Bottle ID	Time Relinguished	Relinquished by:
				E.Coli	Total S.S.	Sp. Conduc.	Total Phosp.	Nitra.&Nitri.	Dis. Oxygen							
								Time Accepted:					Accepted by:			
								Time Accepted:					Accepted by:			
								Time Accepted:					Accepted by:			
								Time Accepted:					Accepted by:			
								Time Accepted:					Accepted by:			

Lab (samples sent to):								**Laboratory Address:**	
Lab (samples sent to):								**Laboratory Address:**	
Relinquished by:				**Date:**				**Time:**	Received by:
Relinquished by:				**Date:**				**Time:**	Received by:

Comment:

Mystic River Watershed Association
your community • your watershed

Mystic Monitoring Network

Sampler Evaluation

SITE ID # _____ LOCATION _____

EVALUATOR _____

MONITOR _____

DATE _____ TIME _____

EQUIPMENT CONDITION _____

Parameter	Good	Poor	Lab Result	RPD	Comments

NOTES _____

Mystic River Watershed Association
your community • your watershed

Date: _____

MYSTIC MONITORING NETWORK

Name: _____

Phone: (H) _____ (C) _____

Address: _____

City, ST, ZIP _____

Email: _____

In case of emergency, please contact:

Name: _____

Phone: (H) _____ (C) _____

Address: _____

_____

Doctor: _____

Phone: _____

Address: _____

_____

Insurance Co: _____

Please note any pertinent health information (e.g. allergies, diabetes, epilepsy, etc).

_____

_____

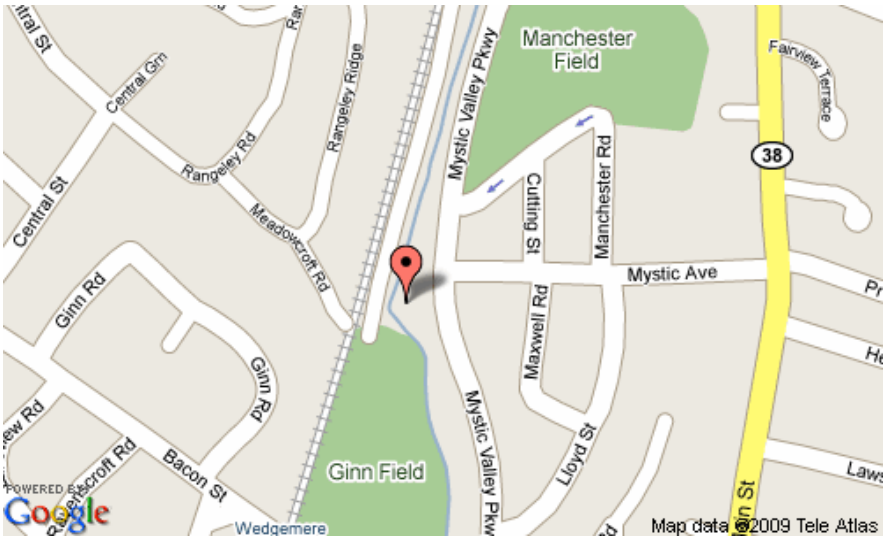
Site:_____ SUB:_____

Site Descriptions

Baseline Sampling Station #: ABR006
Description: Aberjona River at USGS stream gauging station
Town: Winchester Drop-off site: MyRWA offices, Arlington

Directions: Follow the Mystic Valley Parkway to approximately one-half mile south of Winchester center. Turn onto Mystic Avenue and park. Cross the Mystic Valley Parkway and walk to the USGS building. Park on Mystic Ave.

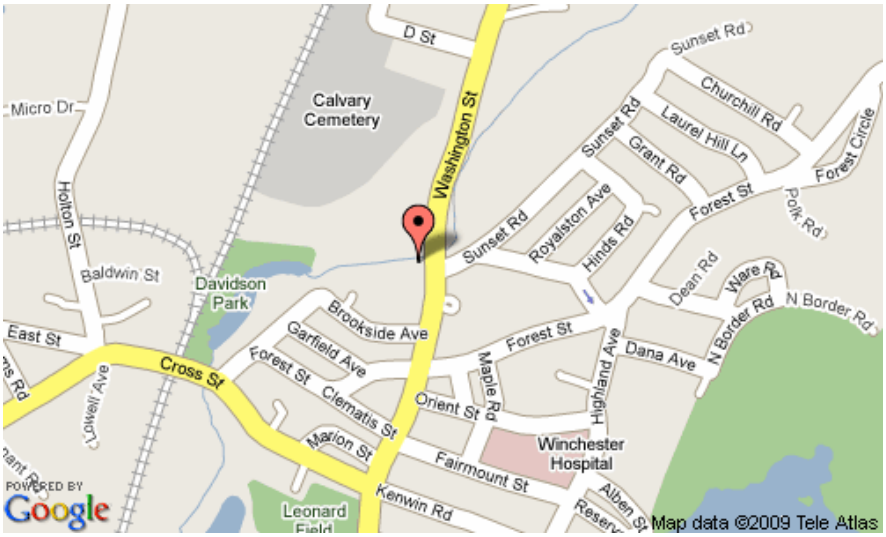
Sampling location: From the right bank (if you are facing upstream) behind the small concrete USGS building.



Baseline Sampling Station #: ABR028
Description: Aberjona River, at Washington St, north of Forest St.
Town: Winchester Drop-off site: MyRWA office, Arlington MA

Directions: From 38 North, bear right onto Washington St. Approximately 1.5 miles down the road, pass Forest St. on the right and make a left into the Agape Christian Academy parking lot. Cross Washington St. to the upstream side of the bridge. Park at the Agape Christian Academy parking lot or Sunset Road.

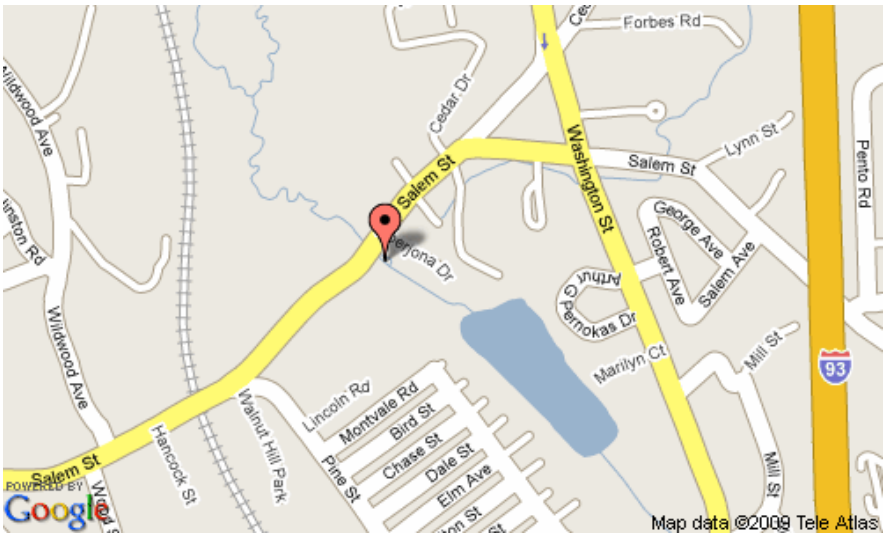
Sampling location: facing upstream, sample from right-hand bank.



Sampling Station #: ABR049
Description: Aberjona River, at Salem St.
Town: Woburn Drop-off site: MyRWA office, Arlington MA

Directions: Follow route 38 to Salem St. Travel approximately 1.5 miles until you cross over a small bridge. Make a right into the Boston Welding parking lot and park. Park in the Boston Welding parking lot (285 Salem St.)

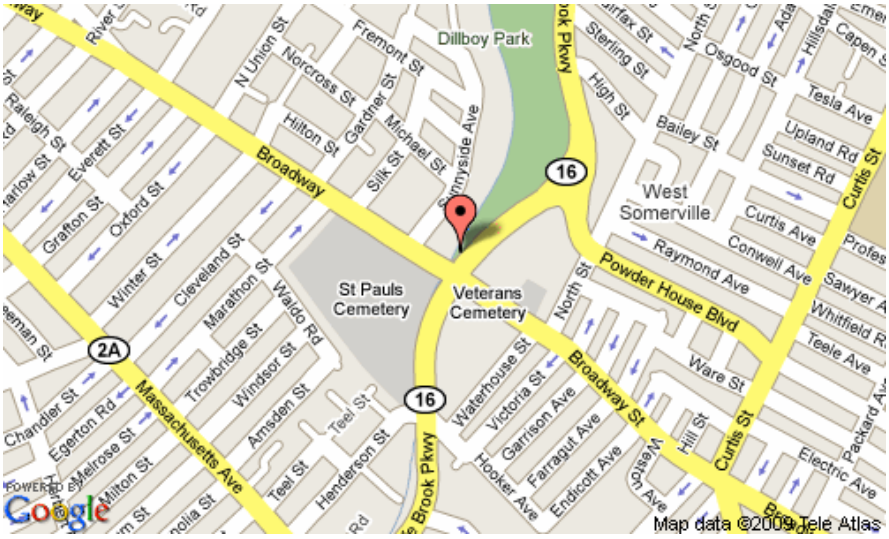
Sampling location: facing downstream, sample from left hand side.



Sampling Station #: ALB006
Description: Alewife Brook at Broadway
Town: Arlington/Somerville border Drop-off site: MyRWA office, Arlington

Directions: Follow route 16 to the intersection with Broadway. Turn onto Broadway and park. Park on Broadway, past the bridge on the right or in Together in Motion parking lot (1 Broadway, Arlington).

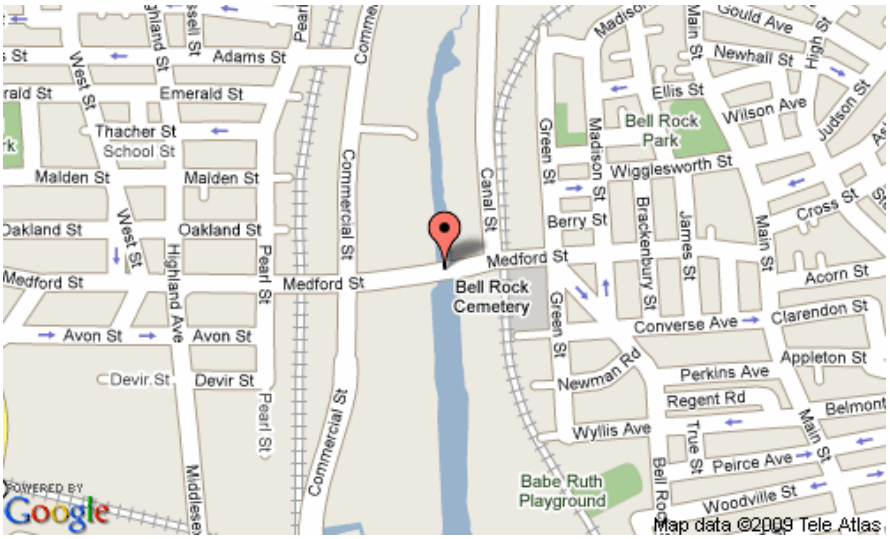
Sampling location: on the Somerville side of the brook (across from Stop and Shop) on the downstream side of the bridge. Follow the path next to the bridge down to the bank.



Sampling Station #: MAR036
Description: Malden River, at Medford St.
Town: Malden Drop-off site: MyRWA Office, Arlington

Directions: Follow route 28 (Fellsway West) to Medford St. in Malden. Stay straight on Medford St. for approximately 0.6 miles until you cross over the Malden River. Park in the lot on east side of river, north side of Medford St.

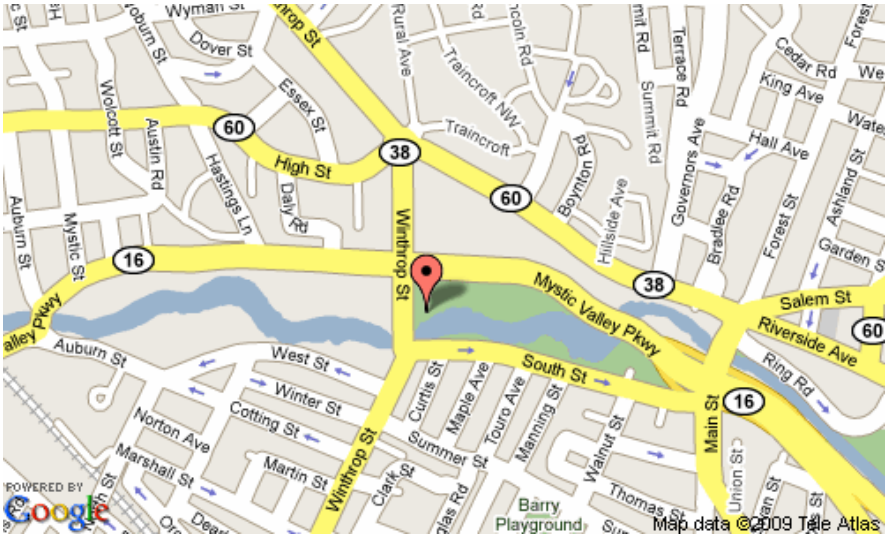
Sampling location: Upstream side of bridge.



Sampling Station #: MEB001
Description: Meetinghouse Brook, outlet into the Mystic River
Town: Medford Drop-off site: MyRWA Office, Arlington

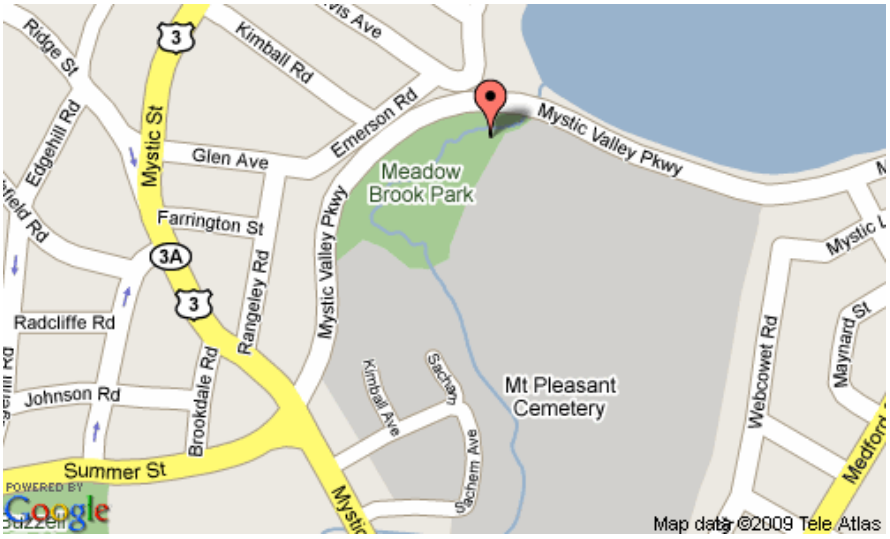
Directions: Follow route 16 (Mystic Valley Parkway) to the Metropolitan District Commission (MDC) parking lot approximately 0.25 miles downstream of the Winthrop St. bridge. Park in the MDC parking lot, near the Condon Hatch Shell

Sampling location: Follow the footpath upstream from the parking lot for about 100 yards to just downstream of the Winthrop St. Bridge. Meetinghouse Brook is on your right (facing upstream). Sample just before the brook goes into the culvert under the footpath.



Sampling Station #: MIB001
Description: Mill Brook at Mt. Pleasant Cemetery
Town: Arlington Drop-off site: MyRWA office, Arlington

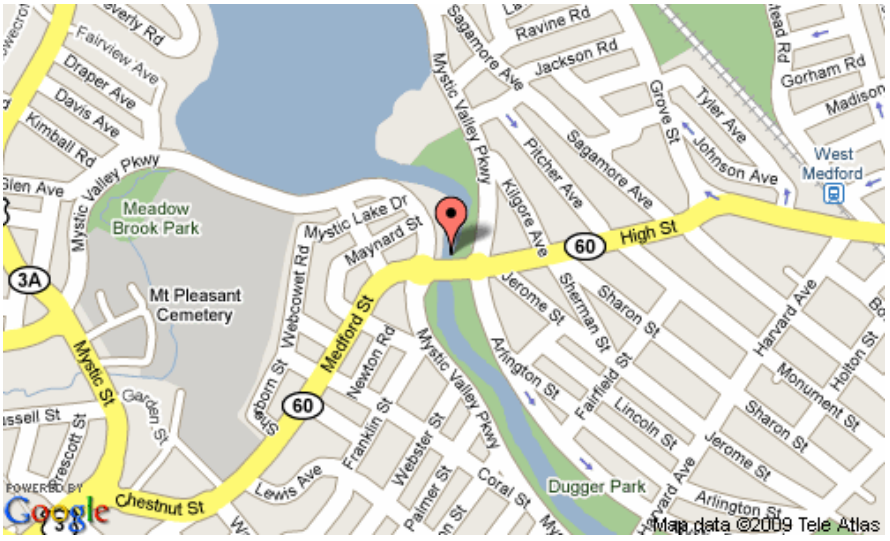
Directions: Enter the Mt. Pleasant Cemetery in Arlington from Sachem Avenue (off of Rt. 3 – Mystic Street). Drive towards the left until Sachem ends, then turn right. Drive over the small bridge and take the first left. Park on the side of the road in Mt. Pleasant cemetery, across from the small dam in the Brook.



Sampling location: Walk through the separation in the fence, down the bank. Sample from the upstream side of the dam on the right hand bank (looking downstream).

Sampling Station #: MYR071
Description: Mystic River, outlet from Lower Mystic Lake
Town: Medford Drop-off site: MyRWA office, Arlington

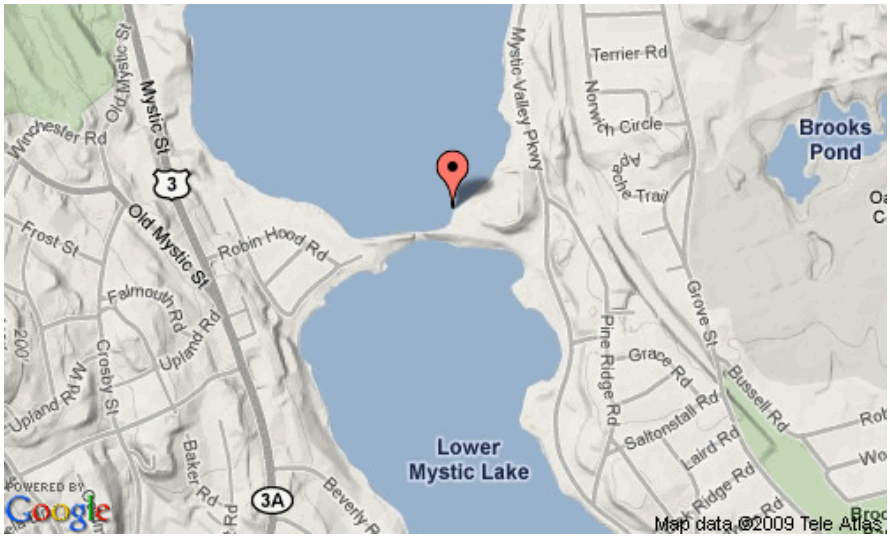
Directions: From Arlington Center, take Route 60 East towards Medford. Go straight through traffic circle before bridge. This is the High Street Bridge (Medford St. becomes High Street in Medford.) Park on the Mystic Valley Parkway near traffic circle.



Sampling location: Arlington bank just upstream of the bridge.

Sampling Station #: UPL001
Description: Upper Mystic Lake at the Mystic Lakes Dam
Town: Medford Drop-off site: MyRWA office, Arlington

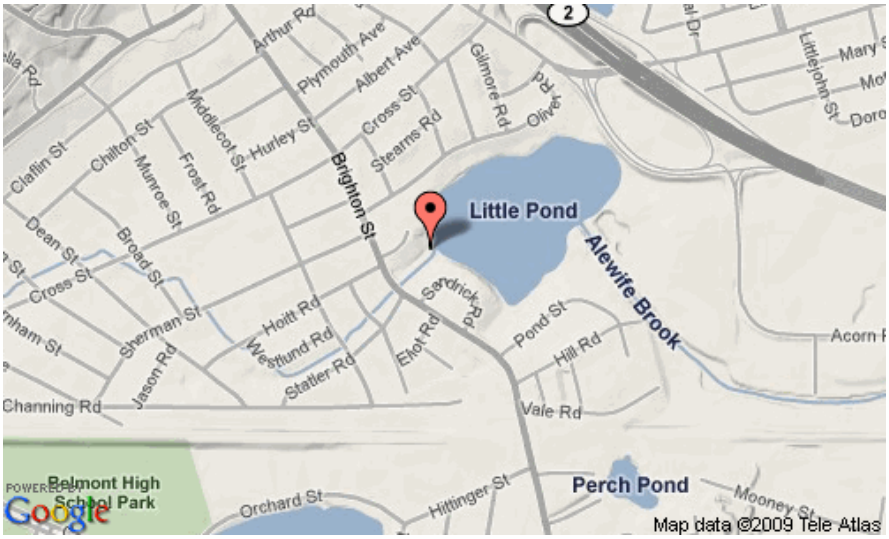
Directions: Follow the Mystic Valley Parkway (MVP) toward the Medford/Arlington. If traveling east, make a left onto High St. to cross over the Mystic River, and then make your first left back on to MVP. If traveling west, make a left onto Boston Ave. Make a right onto the MVP. Pass the Lower Mystic Lake on the left. At the sign for the Medford Boat Club, make a left into the parking lot (on the Medford side).



Sampling location: Sample from the boat ramp next to the Tufts boat house and the MWRA pump station, upstream of the dam.

Sampling Station #: WIB001
Description: Winn Brook, outlet into Little Pond
Town: Belmont Drop-off site: MyRWA office, Arlington

Directions: From Rt 60, turn east onto Brighton St. Travel approximately 0.5 miles, make a right onto Sandrick Road and park.



Sampling location: There is a small path located on Brighton St, between Larch Circle and Sandrick Rd that leads to Little Pond. The brook is underground so you will not see it until you reach the end of the path, where it enters into the Pond. Sample from the bridge at the end of the path.

Sampling Station #: MYRMMP

Description: Mystic River at the Mary O'Malley Park
Town: Chelsea Drop-off site: Mary O'Malley Park parking lot

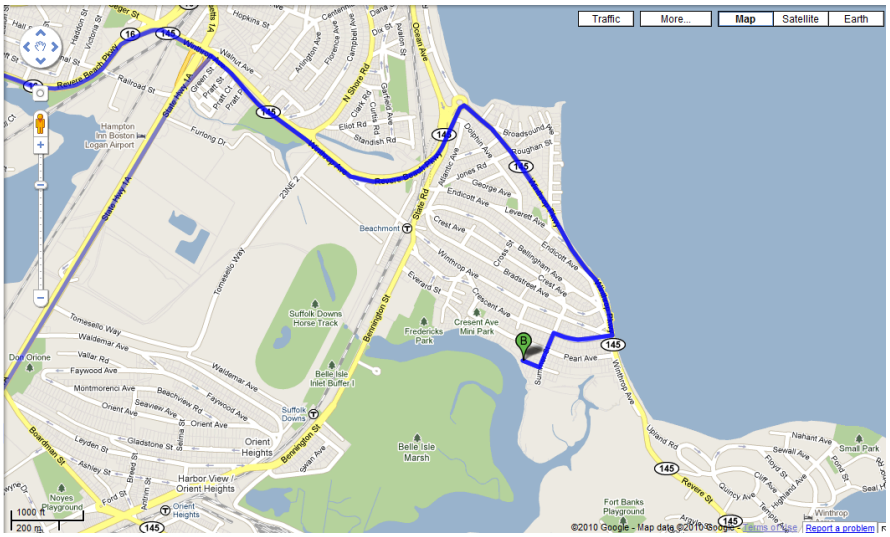
Directions: From Route 16, bear right onto 2nd St, Everett. Turn right on Spruce St. pass Williams where Spruce becomes Commandant's Way. Continue on Commandant's Way until you reach the park. From Route 99, head east on Beacham St. Follow it to the right as it becomes Williams. Turn right onto Commandant's Way and follow directions as above. Park in the 2nd parking area in Mary O'Malley waterfront park.

Sampling location: Follow the sidewalk that leads to the dock. Sample from the smaller wood dock.

Sampling Station #: BEI093

Description: Belle Isle Inlet at Crystal Avenue
Town: Winthrop Drop-off site: Mary O'Malley Park (see directions for MYRMMP)

Directions: Drive along Route 16 East and take right at Revere Beach Parkway/Winthrop Ave. At the traffic circle take first exit onto Winthrop Parkway. Take right onto Crescent Avenue, take second left onto Summer St, and finally second right onto Crystal Ave. Park at end of Crystal Ave. Recommended address for GPS: 100 Crystal Ave. Winthrop, MA.



Sampling location: Site is accessed usually at end of dock of private property owner.

Sampling Station #: CHR95S

Description: Chelsea River at Condor St. Urban Wild
Town: East Boston Drop-off site: Mary O'Malley Park (see directions for MYRMMP)

Directions: From Route 16, head toward Chelsea. exit at Route 107/Broadway. Bear left on Eastern Avenue. Turn left on Central to take the Chelsea St. Bridge. Take the first right on to East Eagle St, and turn right on Putnam St. Turn right on Condor St. Park at the Urban Wild. From Route 1, take the Chelsea exit to 4th St. Follow 4th and turn left on Division and right on Bellingham. Turn right on Eastern and follow the directions as written above.

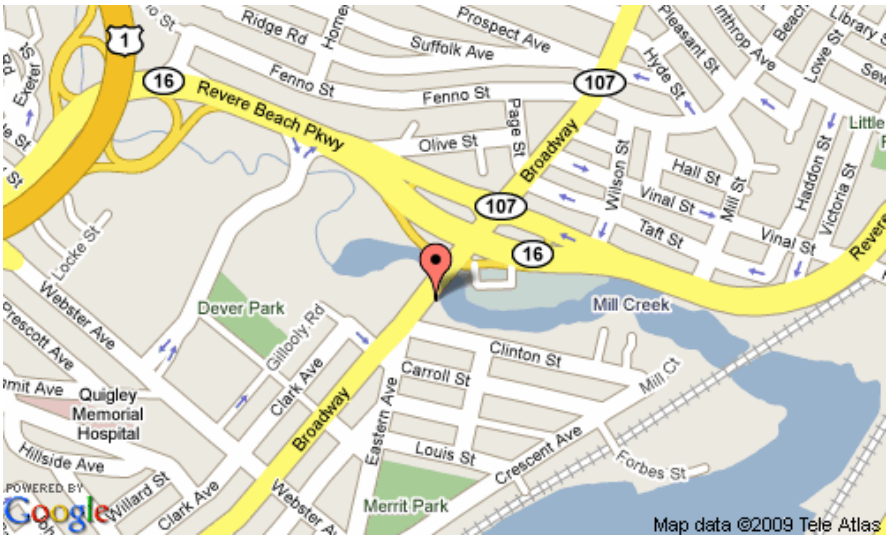
Sampling location: Walk to the eastern edge of the Urban Wild, along the path toward the river edge. Sample from the fishing pier.

Sampling Station #: MIC004

Description: Mill Creek at the Route 107 bridge (Broadway at Route 16)
Town: Chelsea Drop-off site: Mary O'Malley Park (see directions for MYRMMP)

Directions: Follow Route 16 to Chelsea, exiting at Route 107/Broadway. The site is just south of the Route 16 – Route 107 interchange. Park in the ice rink parking lot, on the north bank of Mill Creek.

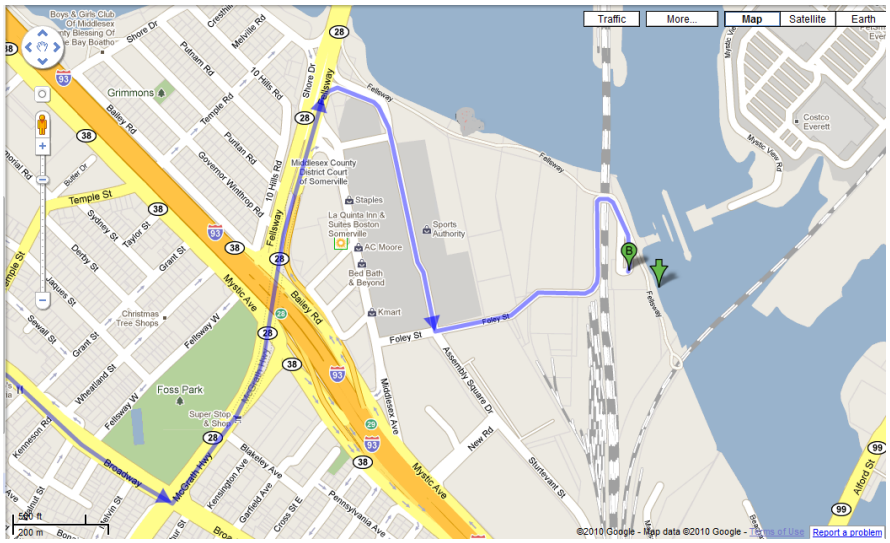
Sampling location: The sampling site is on the south bank of Mill Creek, on the downstream side of the Broadway Bridge. Access the site by walking from the parking lot over the Broadway Bridge and climbing down the rocks to the shoreline.



Sampling Station #: MYR275

Description: Mystic River at Draw Seven Park
Town: Somerville Drop-off site: Mary O'Malley Park (see directions for MYRMMP)

Directions: Access Foley St. from Route 28 or Mystic Ave in Somerville MA. Foley Street will wind toward the Amelia Earhart Dam. For GPS directions, it is easiest to input the address 300 Foley St. Somerville, MA. Park near the water at the far end of parking lot.



Sampling location: The sampling site is located just downstream (southeast) of the parking lot. There is a chain link fence that runs along the water and the sample is taken just downstream of the chain link fence.