General Quality Assurance Project Plan Adoption Form For

Pembroke Ponds Quality Assurance Project Plan

By

Pembroke Watershed Association

December 31, 2007

Revision No. 3

2008 through 2009

1. Signature Page

We, the undersigned, have read and understand the requirements outlined in the General QAPP for Massachusetts Volunteer Coastal Monitoring, and establish that this project meets the overall intent and requirements set forth in the General QAPP.

Project Manager :_____

Name Dr. Debra Tranberg Date

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Program Monitoring Coordinator:_____

Name Charles Banks Date

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Program Quality Assurance Officer:

Name Howard League Date

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Todd Callaghan, CZM Program Contact Date

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Richard Chase, MassDEP QA Officer Date

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2. Table of Contents

3. Distribution List

Project Manager:	Dr. Debra Tranberg
Program Monitoring Coordinator:	Charles Banks
Program Quality Assurance Officer:	Howard League
Project Field Coordinator:	Patricia McCabe
Project Lab Coordinator:	Analytical Balance Labs
Data Management Coordinator:	Charles Banks
Pembroke Watershed Association	Raymond Holman, President William Isenberg, Vice-President Susan Shannon, Executive Secretary Linda Muldoon, Treasurer Mark Ames, Director Arthur Boyle, Director
Webmaster **Pembroke Watershed Association**	www.pembrokeponds.org
Town of Pembroke Selectmen	Paul T. Dwyer III Chairman
Department of Public Works	Michael A. Valenti Director
Recreation Commission	Gregory Haneley Chairman
Herring Brook Commission	Mark DiGiovanni Chairman
Conservation Commission	Marcus Ford Chairman
Board of Health	Lisa Cullity Chair

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4. Project Organization and Responsibilities

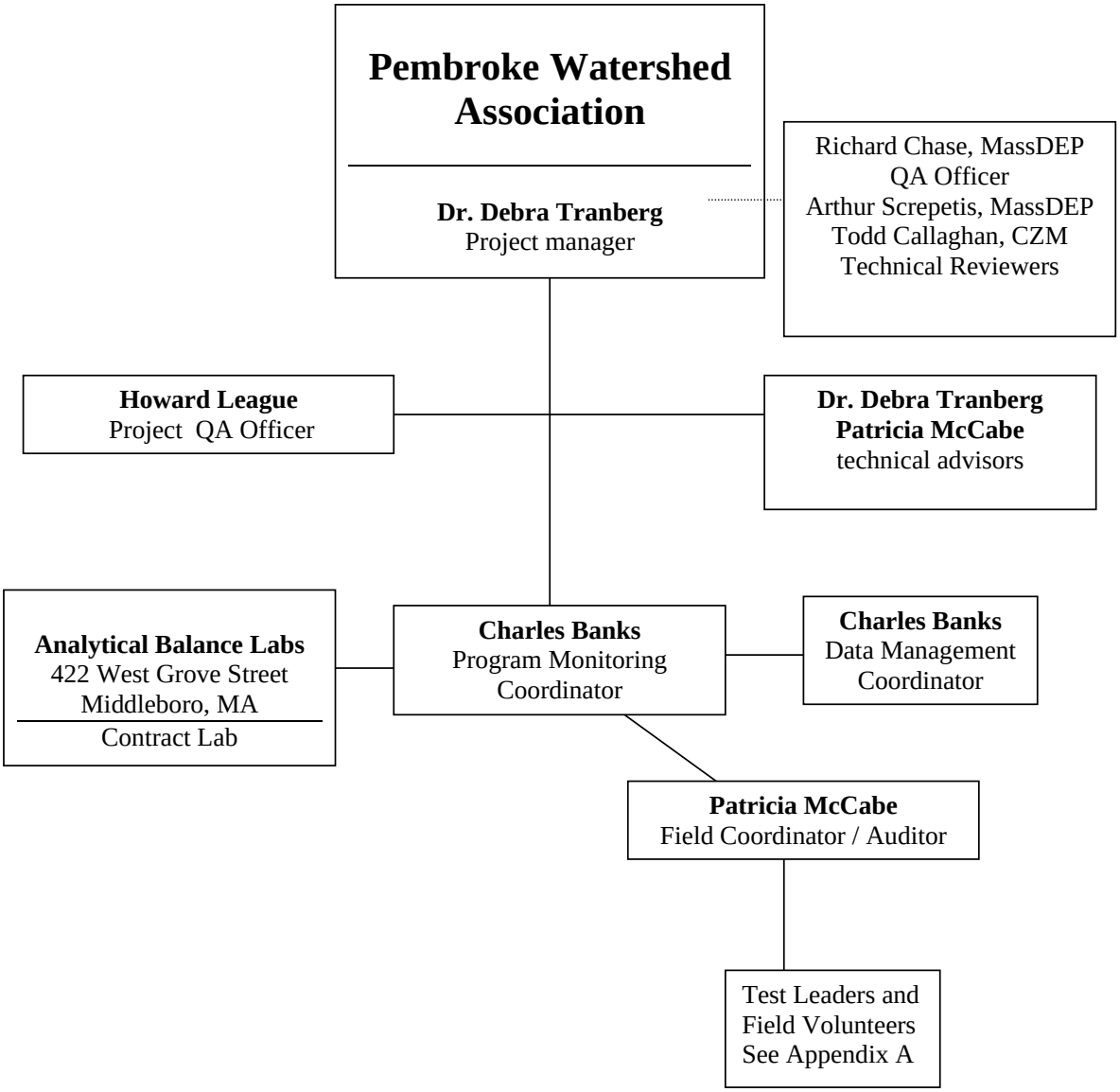
Table 4.1. Project Organization and Responsibilities

Name(s)	Project Title	Description of Responsibilities
Raymond Holman	Pembroke Watershed Association President	Fiscal management of the project, Oversee project objectives, Data uses, program evaluations, program changes.
Dr. Debra Tranberg	Project Manager	Directs all project activities for the responsible agency, oversees development &submission of QAPP; assists with writing the QAPP
Howard League	QA Officer	Assists with writing the QAPP & oversees QA procedures as outlined in the QAPP to ensure all elements are followed and evaluates data against data quality objectives
Charles Banks	Program Monitoring and Data Management Coordinator	Oversees volunteer training & all elements of field monitoring & assesses field performance; compiles field and analytical data into comprehensive format, graphs and/or maps to correspond with format compatible with the state; Develops reports including annual report; Assists with writing the QAPP
Analytical Balance Corp. Labs	Robert E Bentley, Laboratory Director	Directs and conducts analysis of water samples for Total Phosphorous, Nitrate Nitrogen other parameters identified in Section 6
Patricia McCabe	Field Coordinator and Field Auditor	Responsible for training and supervising volunteers. Ensures field forms are properly filled out and water samples and forms are transported to analytical lab as needed. In collaboration with project QA Officer, performs QC check Audit to make sure procedures are followed, maintains QC Logs.

Name(s)	Project Title	Description of Responsibilities
Dr. Debra Tranberg Patricia McCabe	Technical advisors	Provides primary assistance in identifying project objectives, data quality objectives, & appropriate sampling & analytical methods
See Volunteers list: PWA Water Quality Team. Appendix A	Volunteers	Sample, perform field sampling, assist in data entry.
Todd Callaghan	Agency Project Contact	Reviews *General QAPP Adoption Form* and serves as CZM's project contact
Richard Chase	MassDEP QA Officer	Reviews *General QAPP Adoption Form*, reads QA reports, confers with program QA officer on quality control issues that arise during the course of a monitoring program.
Arthur Screpetis	MassDEP Technical Reviewer	Reviews *General QAPP Adoption Form*.
Jason Potrykus	QAPP Coauthor	Assists with writing the QAPP
PWA Test Leader	Test Leader	Reports to the Field Coordinator. Oversees actual tests on a particular pond. Verifies that all required procedures are followed and that paperwork is complete. Delivers all paperwork to the Field Coordinator for review. Test leaders for a particular pond test are designated, there are no official test leaders.

Table 4.2. Organizational Chart:

Lines between boxes indicate who communicates directly with whom



5. Problem Definition/Background

Organizational History and Mission

The Pembroke Watershed Association - www.pembrokeponds.org

The Pembroke Watershed Association (PWA) was created on September 25, 2004 with the following mission statement

> ***To educate the public and restore and protect the Ponds of Pembroke for clean and safe recreational, social and civic activities and to preserve these unique resources for future generations.***

The Description of Pembroke's Ponds Project

Oldham Pond, Furnace Pond, Little Sandy Bottom Pond and Hobomock Pond are bodies of water located within the town of Pembroke, Massachusetts and are part of the South Coastal Watershed. In addition, Stetson Pond, also located within the boundaries of Pembroke, Massachusetts is part of the Taunton River Watershed. These five ponds comprise the focus of our study. A description of each pond in our study is as follows:

Name	WBID#	Size (acres)	Category (2004)	Reasons for study or impairment
Furnace Pond	MA94043	103	5	Impaired due to organic enrichment / Low DO
Little Sandy Bottom Pond	MA904085	56	2	Not Impaired, monitoring to maintain status
Oldham Pond	MA94114	232	4c	Impairment from exotic species
Hobomock Pond	MA94177	13	2	Not Impaired, monitoring to maintain status
Stetson Pond	MA62182	88	5	Impaired due to Nutrients, organic enrichment / low DO and exotic species

Information from- the South Shore Watersheds Water Quality Assessment Report – 2001. Massachusetts Executive Office of Energy and Environmental Affairs, Department of Environmental Protection.

The categories are those identified in the Massachusetts Integrated List (2006). Category 5 are "Waters requiring a TMDL"; Category 4c are waters where "Impairment not caused by a pollutant"; Category 2 is no impairment, NR indicates Not Reported

The Value of Pembroke's Ponds

The Ponds of Pembroke are a natural resource (drinking water, irrigation for cranberry bogs and homes) as well as a water recharge system for the town wells. Furnace pond is a Class A. Public water supply source for Brockton Water Works. The ponds provide and support aquatic and wildlife habitats. Oldham and Furnace ponds provide herring spawning grounds. The ponds provide aesthetic beauty and natural resources that are unique to Pembroke. They provide a recreational resource for the town, including town beaches and fishing access and are a source of additional tax revenue from waterfront properties. The ponds within the town are a valuable part of either the South Coastal Watershed or Taunton Watershed and contribute to the Mass Bay estuary.

Background

In 1993 a diagnostic and feasibility study was performed by BayState Environmental Consultants Inc., on Oldham, Little Sandy Bottom, Furnace and Stetson ponds. This study and another partial study conducted in 2001 by Comprehensive Environmental Inc. had as its purpose to determine the extent and locations of any aquatic invasive species and to assess the quality of the water. These studies form a scientific benchmark to assess future pond monitoring and the effectiveness of future pond management programs.

A Mass DCR Lakes and Ponds Program Grant was awarded in FY2000 to the Town of Pembroke for a study to identify potential sources of phosphorous, and to make recommendations for Best Management Practices and implementation for the removal of other storm water pollutants and sediments at Oldham pond. At that time a recommendation was made to the town of Pembroke to initiate a volunteer watershed group to enhance education and stewardship of the ponds. In 2005 the Pembroke watershed was founded with a mission to preserve and restore the ponds of Pembroke and provide ongoing monitoring and education for safe recreational use.

The Pembroke Watershed Association implemented numerous programs for fundraising (fishing derby, family fun day, raffles, cook-outs), community education and involvement (workshops, lectures, public meetings, pamphlet distribution, pond cleanups, and school presentations) and maintains a visible presence in the community through newspapers, website, and local cable programming. They have partnered with the NSRWA to support education and low impact/green solutions to growth and water management and have joined the Watershed Action Alliance on the south shore to share best practices and continue to utilize experts in the area of water quality and water management.

The PWA has developed an aggressive program of water quality monitoring for the five ponds in our study group. Our initial water quality plan was based on input from other watersheds, COLAP and Rivernet seminars, previous diagnostic surveys mentioned, and information from the Massachusetts Waterwatch website. We selected sites based on previous studies and potential for valuable information regarding non-point source pollution as well as identified sites of pollution, such as bog return effluent or storm drains. We established a contract with Analytical Balance Laboratories in Middleboro, Ma to conduct chemical analysis and garnered financial support from the town of Pembroke for chemical monitoring of the ponds. We developed field testing

forms, a training manual, created or obtained testing equipment (oxygen meters from NSRWA, created a testing stick and secchi discs). We also purchased a Hach Quanta meter to allow us to obtain turbidity and DO readings immediately, but found the equipment difficult to maintain, calibrate, and it needed repair multiple times; hence, we retired the meter. In July 2007 we were granted the use of YSI Model 85 meters and Checkmite pH meters which have been successfully integrated into our testing protocols. We have maintained strict annual training and remediation standards to ensure that our water quality testing processes are accurate and reliable.

Initially we obtained grab samples, Secchi disc readings, and recorded DO readings in shallow water, often 2-3 feet in depth, with one deep hole sample area in each pond. We found our data to be inconsistent and Secchi disc readings were only accurate in deeper areas. The team of volunteer testers, the field monitoring coordinator, and the program monitoring coordinator reviewed the field monitoring sheets and the testing procedures with each testing session, and over time made decisions to improve the quality of the testing. The field monitoring sheets have been revised multiple times, and now include specific directions for completion. We have moved the sampling sites to deeper water and set a standard depth for all samples to be taken, and have found the data collection to be more consistent over the expanse of the pond. We have reduced the number of testing sites given the consistency of the data, and we have now included field blanks and blind samples as part of the routine testing process on each pond. Our water quality testing procedure manual has been revised multiple times to reflect the continuous quality improvement processes and lessons learned along the way.

This program has provided a valuable data base for future comparisons and evaluation and has provided the backbone for the volunteer training and water quality analysis SOP's. It is available on our web site www.pembrokeponds.org

A Massachusetts State supplemental budget grant of $30,000.00 specifically for the preservation of Furnace Pond has recently been used to secure the services of Comprehensive Environmental Inc. The feasibility study was completed by mid July 2007. A presentation was made by CEI indicating that dredging of Furnace Pond is recommended to remove the phosphorus loading within the large amount of muck, and indicated that the core sampling of sediment in Furnace was clear of toxins or heavy metals. CEI indicated that water quality testing would be necessary over many years to determine the impact of any restorative processes.

Monitoring and Data Use Objectives

This project will provide information related to the following issues:

- ✓ Water Quality Monitoring
- ✓ Data Assessment and recommendations for Best Management Practices (BMP)
- ✓ As explained in the GENERAL QAPP, the monitoring objectives of this project include:

- ✓ Provide quality-controlled data that support the assessment and restoration of the watershed and critical habitats through the implementation of Commonwealth programs such as:
  - ✓ DEP's 305(b) water body health assessments and TMDL development for impaired waters
  - ✓ EOEEA's watershed action plans for the Taunton and South Coastal Watersheds
  - ✓ National Estuary Programs' Comprehensive Management Plans
  - ✓ Leverage the Commonwealth's funds to increase the collection of quality data
  - ✓ Water body/watershed health assessment
  - ✓ Impact assessment
  - ✓ Public education and outreach

User	Intended Uses
Pembroke Municipal Boards	To guide local control & restoration strategies & secure money to implement projects. Prioritize management efforts as they relate to non-point source pollution storm water management plan
Pond Residents	To help understand the impact of actions within the watershed. Understand aquatic vegetation & restoration efforts.
MA Department of Environmental Protection	To provide information in future assessment & in developing total maximum daily load strategies.
Project Partners Recreation Committee Herring Brook Commission Conservation Commission	To support grant applications for sedimentation projects & other non-point source pollution grants

6. Project /Task Description

Project Description:

The Pembroke Watershed Association will organize and train volunteers to conduct water quality monitoring in the five (5) designated ponds within the town of Pembroke in the South Coastal and Taunton River watersheds. . The monitoring will take place at the specific sites listed below for each pond. Site selection was established with reference to those sites chosen in the 1993 diagnostic and feasibility study performed by Bay State Environmental Consultants Inc. and in-house analysis by the Pembroke Watershed Association to identify addition sites for assessment.

Water quality monitoring teams test:

1. pH
2. Water Temperature
3. Dissolved Oxygen
4. Conductivity
5. Salinity
6. Water clarity (Secchi disk)

The grab sample is sent to Analytical Balance to test for:

1. Nitrite Nitrogen **
2. Nitrate Nitrogen **
3. TK Nitrogen **
4. Total Nitrogen is calculated by the lab based on 1-3 **
5. Total Phosphorous
6. Alkalinity
7. Chloride
8. Ammonia Nitrate **
9. Turbidity

** Tested once per year per pond

Monitoring will be conducted June through September on a monthly basis for Oldham and Furnace ponds or bi-monthly for Little Sandy Bottom, Hobomock, and Stetson ponds as per the schedule submitted by the Program Monitoring Coordinator.

A specified number of sample sites have been designated for each pond.

All Grab samples are taken at a depth of 48 inches. The YSI /pH instrument measurements are conducted at a depth of 48 inches and 84 inches where total depth allows. This will give us at least one 84 inch measurement per pond. All test parameters listed above are evaluated and compared to state standards and when applicable US EPA nutrient criteria. The information collected will be used as base line data against which to assess future changes.

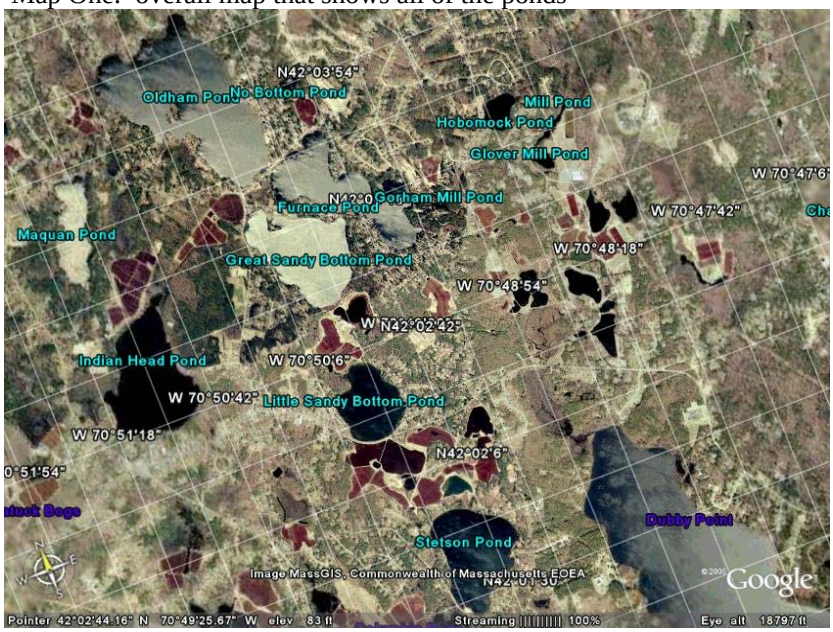
Map(s) of Area, Waterbody and Sampling Sites:

Pembroke Watershed Association: Water based testing

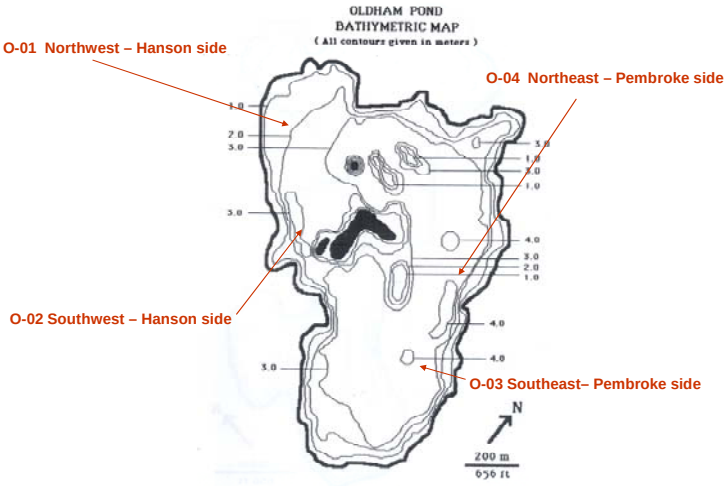
Using Google Earth view of our ponds we have included our testing sites, marked in yellow, on each of the ponds. Site identification includes our identifier and the 1988 survey identifier for the same site. We utilized GPS coordinates to determine and standardize our sites. All Sites

We identified our test sites in red on the following Maps

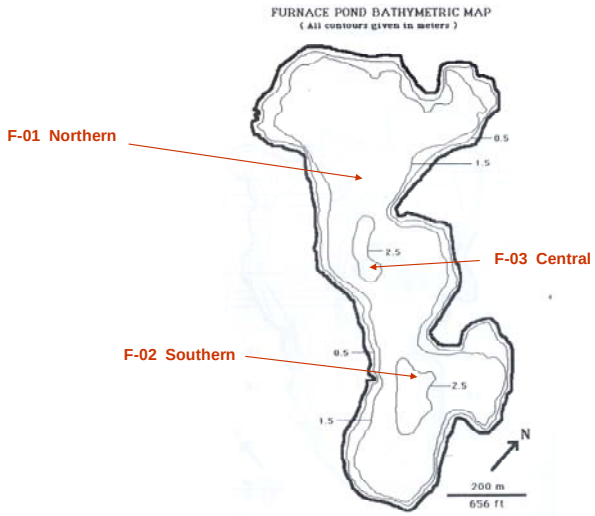
Map One: overall map that shows all of the ponds



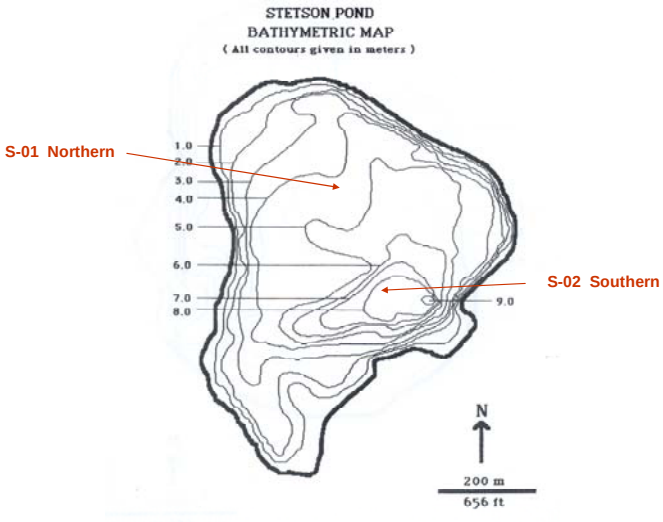
Map Two: Oldham Pond



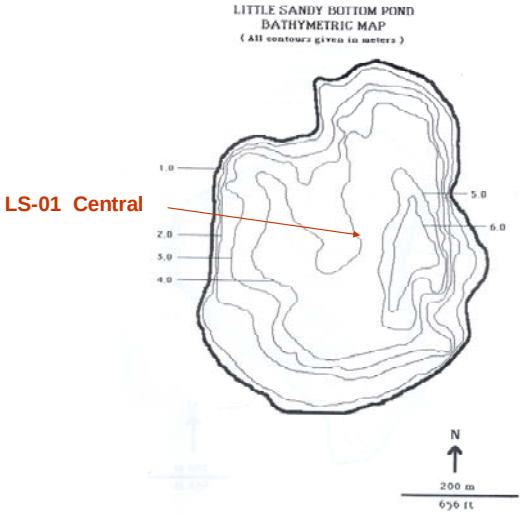
Map Three: Furnace Pond



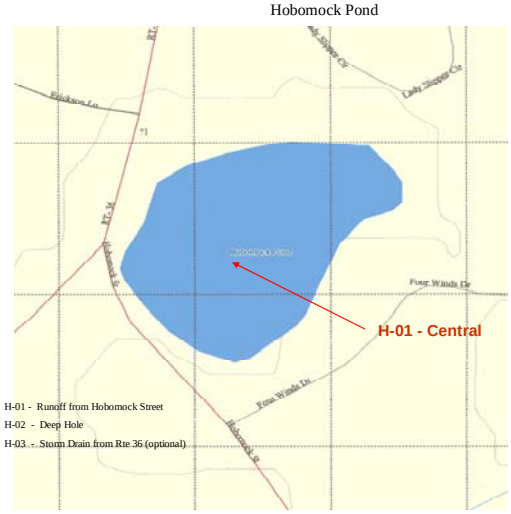
Map Four: Stetson Pond



Map Five: Little Sandy Bottom Pond



Map Six: Hobomock Pond



GPS Coordinates for Test Sites Determined by Field GPS

Oldham Pond				
O-01	**Northwest**	**Hanson Side**	**42^0 04.330 N**	**70^0 50.048 W**
O-02	**Southwest**	**Hanson Side**	**42^0 04.257 N**	**70^0 50.505 W**
O-03	**Northeast**	**Pembroke Side**	**42^0 04.158 N**	**70^0 50.610 W**
O-04	**Southeast**	**Pembroke Side**	**42^0 03.904 N**	**70^0 50.426 W**
Furnace Pond				
F-01	**North**		**42^0 .03.510 N**	**70^0 49.918 W**
F-02	**Central**		**42^0 03.629 N**	**70^0 49.529 W**
F-03	**South**		**42^0 03.219 N**	**70^0 49.199 W**
Stetson Pond				
S-01	**North**		**42^0 01.882 N**	**70^0 49.779 W**
S-02	**South**		**42^0 01.741 N**	**70^0 49.330 W**
Little Sandy Pond				
LS-01	**Central**		**42^0 02.495 N**	**70^0 50.055 W**
Hobomock Pond				
H-01	**Central**		**42^0 03.393 N**	**70^0 48.618 W**

Table 6.1. Anticipated Schedule Please update and assume QAPP will be approved for January 2008 start.

Activity	D	J	F	M	A	M	J	J	A	S	O	N	D
Finalize *General QAPP Adoption Form*	XX												
Meeting with agency representatives			XX										
Meeting with Water Quality Team				XX									
Equipment inventory, purchase, inspection and testing				XX	XX								
Field training and database-related training session(s)					XX	XX	XX – Ongoing -- XX						
Meeting with analytical laboratory				XX									
Sampling surveys							XX	XX	XX	XX			
Data entry							XX	XX	XX	XX			
Data review and validation											XX	XX	
Field audit(s)							XX	XX	XX	XX			
Draft report													XX
Prior year Final report			XX	XX									
Data uploads to website				XX	XX								

7. Data Quality Objectives

The following quality control measures and data quality objectives shall be employed for the Pembroke Ponds Project .

Overall sampling precision will be estimated by the following

- ✓ Taking duplicate field measurements (instruments) for at least 10% of samples.
- ✓ Collecting duplicate field samples for at least 10% of samples.

Utilize QC procedures including field duplicates and duplicate measurements for meters to validate readings

Accuracy of results will be estimated or confirmed by the following

All samples submitted to Analytical Balance Corp. Laboratories. Department of Environmental Protection State Certification No. M-MA022 see certification in appendix E

Review of all data and results to verify accuracy and identify discrepancies or outlier data as outlined in section 23

Data Representativeness will be met by the following:

- ✓ Test sites are selected to be representative of typical conditions for the water body**.** The temperatures and oxygen levels at our four foot testing depth are likely to be affected by nutrient uptake, temperature gradients and other factors
- ✓ Any abnormal or episodic conditions that may affect the representativeness of sample data are noted and maintained as metadata**.**
- ✓ Other sites chosen as possible locations of point source contamination have been identified and noted.
- ✓ Results from all sites will not be extrapolated to other, unmonitored, portions of the water body or watershed.

Comparability of project data among sites and with that of others will be enhanced by the following:

- ✓ Using established protocols
- ✓ Documenting methods, analysis, sampling sites, times and dates, sample storage and transfer, as well as laboratories and identification specialists used so that future surveys can produce comparable data by following similar procedures.

Data Completeness goals shall be:

- ✓ At least 80% of the anticipated number of samples will be collected, analyzed and used
- ✓ Tracked by keeping detailed and complete sample and survey records

- ✓ Summarized via a report detailing number of anticipated samples, number of valid results, and percent completion for each parameter
- ✓ Tracking water quality control requirements by keeping accurate records

Data Completeness - Measurements Completed by PWA

Parameter	Number of valid measurements anticipated	Number of valid measurements needed to reach 80% completeness
pH	Oldham 4 sites x 4 months Furnace 3 sites x 4 months Stetson 2 sites x 2 months Hobomock 1 site x 2 months Little Sandy 1 site x 2 months Total Anticipated measurements for each parameter = 36	29
Water Temperature		29
Dissolved oxygen		29
Secchi Disk		29
Salinity		29
Conductivity		29
		29

Data Completeness - Samples Collected and Delivered to Analytical Balance Labs. .....

Parameter per sample bottle	Number of valid samples anticipated	Number of valid samples needed to reach 80% completeness
Chloride	Oldham 4 sites x 4 months	29
Total Phosphorous	Furnace 3 sites x 4 months	29
Ammonia-nitrogen	Stetson 2 sites x 2 months	5
Alkalinity	Hobomock 1 site x 2 months	29
TK Nitrogen	Little Sandy 1 site x 2 months	5
Nitrite/nitrogen	Total Anticipated samples for each parameter = 36	5
Nitrate/nitrogen	Nitrogen series will be tested once per year per pond	5
Turbidity		29
Total Nitrogen	Calculated by the lab	5

QC Completeness Measurements Completed by PWA

Parameter	Number of valid measurements anticipated	Number of valid measurements QC needed
Additional field duplicates of each measurement	Total Anticipated measurements for each parameter = 36	5 Anticipate one QC per pond

QC Completeness Samples Collected and Delivered to Analytical Balance Lab

Parameter	Number of valid samples anticipated	Number of valid samples QC needed
Duplicate sample (blind to the lab)	Total Anticipated samples for each parameter = 36	5 - Anticipate one blind duplicate sample per pond

A Duplicate sample will be collected and compared to results for an actual sample to verify testing consistency and technique. Duplicate samples are blind to the lab.

Table 7.1. Data Quality Objective **Please note that minimum detection limits were provided by Analytical Balance Lab**

Indicator	Units	Minimum Detection Limit	Accuracy	Overall Precision	Approx. Potential Range
Dissolved Oxygen	mg/l	0.0	+0.5	<0.5 mg/l Difference between duplicates	0.5-15.0
Water Temperature	°F	0.0	±0.5 °	+/- 0.5 °C	0.0-90.0
Conductivity	µS/cm	0.5	± 5% of known QC standard.	10% RPD	10-2000 (fresh water)
pH	pH units	na	±0.2 of QC standard	± 0.2	4.0-10.0
Salinity	psu	0.1	**80-120% recovery of seawater standard of known conductivity**	20% of RPD	
Total Phosphorous (water)	mg/l P	0. 01	**80-120% recovery for QC standard and lab fortified matrix**	20% RPD	0.01-0.50
Nitrite Nitrogen	mg/l N	0.05	**80-120% recovery for QC standard and lab fortified matrix**	+/- 0.02 if <0.1 mg/l or 20% RPD if > 0.1 mg/l	0.05-3.0
Nitrate Nitrogen	mg/l N	0.01	**80-120% recovery for QC standard and lab fortified matrix**	+/- 0.02 if <0.1 mg/l or 20% RPD if > 0.1 mg/l	.01-3.0
Total Kjeldahl Nitrogen	mg/l N	0.5	**80-120% recovery for QC standard and lab fortified matrix**	20% RPD	0.50-3.0
Total Nitrogen			This is a calculation		
Alkalinity	mg/l	4.0	**80-120% recovery for QC standard and lab fortified matrix**	+/- 2.0 mg/l if <20 mg/l or 20% RPD if > 20 mg/l	4.0-25.0
Chloride	mg/l	2.0	**80-120% recovery of seawater standard of known conductivity**	20% RPD	2.0-60.0
Ammonia-Nitrogen	mg/l	0.10	**80-120% recovery for QC standard and lab fortified matrix**	+/- 0.01 if <0.1 mg/l or 20% RPD if > 0.1 mg/l	0.10-0.50
Turbidity	NTU	0.25	90-110% recovery of turbidity standard	± 5 NTU if < 1 NTU or 20%RPD if > 1.0 NTU	0-200
Secchi disk Transparency	Ft	0.5	NA	± 0.5 ft for duplicate readings by the same monitor, as well as different monitors.	0.0-30.0

Note: This table is based on the table in the October 2001 MA Volunteer Monitor's Guidebook to Quality Assurance Project Plans

8. Training Requirements

Training in the following general areas shall be conducted as part of the Pembroke Ponds Project

- ✓ Field Safety
- ✓ Water sample collection
- ✓ Filling out field sheets
- ✓ Recordkeeping and documentation
- ✓ Electronic Meters
- ✓ Instructor Training

Project training shall take place as specified in PWA Volunteer Training Manual see Appendix.

All training activities shall be documented by:

- ✓ Training forms signed by the Instructors
- ✓ Documented in a final report
- ✓ Documented in a Water Quality Qualification Report

Data entry, database management, record keeping, documentation and report writing are under the authority of the Program Monitoring Coordinator and Field Coordinator.

9. Documentation and Records

The following general documentation procedures will be followed to ensure that adequate and acceptable level of records is kept:

- ✓ Document survey and sample information using Field Sheets
- ✓ Document sample custody at all times using Chain-of-Custody Forms, including lab samples on ice/in fridge until lab delivery
- ✓ Track sample identification using sample labels
- ✓ Document lab results using lab reports
- ✓ Document QC requirements using the water quality control checklist

The specific forms to be used for the PWA water project are listed and described in Table 9.1. See sample forms in appendix.

Table 9.1. Project-Specific Datasheets, Labels, Laboratory and Voucher Forms

Documentation Type	Form Name	How Used?	Example in Appendix C
Sample Collection Records	Water Sample Collection Data Sheet	All forms renumbered as to location. Volunteers fill in forms with prompted questions. Signed and witnessed, dated and timed	Yes
	Quality Control checklist		Yes
	Sample Bottle Label		Yes
	Sample Bottle Cap	Monitoring program coordinator labels the cap of the bottle with location code of sample	No
Laboratory Records	Analytical Balance Chain of Custody	Monitoring program coordinator completes location and analysis required sections Volunteers signoff on completion of sample and chain of custody	Yes
	Laboratory report	Returned to Program Monitoring Coordinator with analysis data from samples to be entered into database.	Yes
Training Records	Qualification/Requalification Sampling Competency	Checklist for Field Coordinator	Yes

10. Sampling Process

The following sampling safety and design principles shall be followed for the Pembroke Ponds project**:**

Sampling Safety

- ✓ Personal safety shall be a primary consideration in selection of sampling sites and dates.
- ✓ No sampling shall occur when personal safety is thought to be compromised.
- ✓ The Program Monitoring Coordinator/ Field Coordinator and Pond Captain shall confer before each sampling event to decide whether conditions pose a threat to safety of field volunteers, and will cancel/postpone sampling when necessary.
- ✓ Sampling shall take place in teams of two or more.
- ✓ Samplers shall wear life vests when sampling from boats
- ✓ Samplers shall wear proper clothing to protect against the elements as applicable, especially footwear and raingear.
- ✓ Tests are conducted from boats provided by volunteers, who are responsible for safe operation and their own maintenance. The operator also monitors proper positioning for the testing, utilizing the GPS.

Rational for Selection of Sampling Sites

We had originally determined sampling sites for each pond to match those sites identified by BayState Environmental Consultants Inc. in a diagnostic and feasibility study completed in 1993. Other sites were chosen to monitor specific suspect point sources of pollution. Going forward we have reevaluated our testing processes and selected sites that we now believe are more representative of general pond conditions. Each site has been marked on bathymetric maps with GPS coordinates -- see Section 6. It is believed that subsequent monitoring of each location would give the broadest, most comprehensive profile of water quality for the desired parameters.

Types of Indicators

Chemical and physical indicators will be used in this study . Refer to Section 6 (Project/Task Description) and Section 7 (Measurement Quality Objectives) For the specific data or parameters forms see Appendix C (Water Sample Collection Data Sheet).

Sampling Frequency

The testing season will be during the period June through September. Sampling frequency as determined by the Program Monitoring Coordinator will be monthly for Oldham and Furnace ponds. Stetson, Little Sandy Bottom and Hobomock ponds will be tested not less than twice per testing season, conditions permitting. Actual waypoints will be located with a GPS unit. Other non scheduled tests may be conducted throughout the year if deemed warranted

Site Access

Access to the ponds and sampling waypoints will be from private residences of the team members using their own boats.

11. Sampling Method Requirements

All sample collections for the Pembroke Pond project shall follow detailed methods on how samples will be collected and preserved and/or follow the Standard Operating Procedures (SOPs) as follows

- ✓ Copies of standard operating procedures (SOPs) are in Appendix D –Water Quality Testing and Qualification Procedure Manual.
- ✓ Pre-coordination will occur with project lab(s) to ensure that sample collection procedures meet lab needs

  Analytical Balance Corp. M-MA022 (Appendix E)
  422 West Grove Street
  Middleboro, MA 02346

One sample bottle is delivered to the lab for each site within 24 hours (on ice in the interim). The lab splits the samples and uses acid preservation as necessary

Table 11.1. Sample Collection Methods

Survey type	Sample Type	Parameter(s)	**Container Type(s) and Preparation**	**Minimum Sample Quantity**	**Sample Preservation**
Pond	Meter YSI Model 85	Separate readings are displayed for each of the following DO Conductivity Temperature Salinity	N/A - direct measurement with probe	N/A - direct measurement with probe	N/A
	pH meter Checkmite pH20	Separate readings are displayed for each of the following pH Temperature	N/A - direct measurement with probe	N/A - direct measurement with probe	N/A

Survey type	Sample Type	Parameter(s)	**Container Type(s) and Preparation**	**Minimum Sample Quantity**	**Sample Preservation**
	Secchi Disk	Water Clarity	Secchi disk lowered from boat, extinction depth recorded using view scope. If Secchi disk is equal to or greater than maximum depth - Secchi is noted as ">max depth" If there is significant current or boat drift measurements is not taken	N/A	N/A
	Grab	Nitrogen series Total Phosphorus Ammonia Chloride Turbidity Alkalinity	Lab provided bottle and on site rinsing.	1 Liter Sample bottle for each site	Coolers and Ice packs until delivery to the lab for up to 24 hours. The lab accepts the samples and splits out sub-samples.. These samples are acid preserved as necessary.

12. Sample Handling and Custody Requirements

All sample handling and custody procedures shall be in compliance with project Standard Operating Procedures for each indicator. The following procedures shall be followed for the Pembroke Pond Project.

Sample container labels shall be attached to dry bottles, with the following information:

- ✓ Site ID#
- ✓ Sample type
- ✓ Date and time
- ✓ Name of sampler
- ✓ Name of organization conducting sample.

- ✓ Example of label is found in the Appendix C
- ✓ Chain of custody forms shall be prepared and completed in all cases. (see Appendix C)
- ✓ The whereabouts of all samples shall be known at all times.

The following steps shall be taken to avoid sample mislabeling.

- ✓ Pre-labeled bottles checked by volunteer sampler before sampling session
- ✓ Witness signs off each bottle after collection accomplished.
- ✓ Sample bottle caps are mark with site number using permanent maker

The following steps shall be taken for sample handling

- ✓ Samples are to be placed in a cooler with ice as soon as possible after being taken.
- ✓ Samples are to be kept iced until delivered to lab.

13. Analytical Methods Requirements

All analytical methods used in the PWA ponds project, including methods used by laboratories performing analyses for the project, shall be based on standardized laboratory methods.
All analytical methods used for this project are provided in Appendix E (Certified Parameters list).

Analytical Balance Corp supplies this information with each sample report please see Analytical Balance Manual on file with EPA-NE and MA DEP QA Officer. Analytical Balance State Certification Number M-MA022 (see Appendix E)

14. Quality Control Procedures

The following quality control procedures for the Pembroke Pond Project shall be followed.

Water Quality samples

- ✓ Program Monitoring Coordinator randomly designates that a blind duplicate sample will be collected at the same site

Procedures for each QC step checked above are

- ✓ The volunteer collects a grab sample , and a second volunteer collects another grab sample at the same location and time
- ✓ Lab QC protocols shall be discussed with the lab prior to sampling to ensure acceptability

Water Quality measurements

- ✓ Program Monitoring Coordinator randomly designates that duplicate measurements will be taken
  - ✓ Program Monitoring Coordinator will designate sample sites where both meters are to be used and results cross checked for QC.
  - ✓ In the event only one meter is available, QC will be accomplished by having two separate testers perform the meter samples at the same site and compare results.
  - ✓ Meters are calibrated to manufacturer's standards prior to each test cycle.
  - ✓ Secchi disk QC will be accomplished by taking a reading and immediately having a different person taking another reading at the same site
  - ✓ A Quality Control checklist will be completed and turned in to the Field Monitoring Coordinator (See appendix C)

15. Instrument/Equipment Inspection and Testing

The following instrument/equipment inspection and testing methods shall be followed for the PWA Pembroke Ponds project.

- ✓ Prior to the testing season the Field Coordinator and Program Monitoring Coordinator will calibrate and test all instruments and perform maintenance as required.
- ✓ Maintenance shall occur as needed. Maintenance will be performed by the Project Field Coordinator and the Quality Assurance Officer.
- ✓ Detailed inspection, maintenance and calibration procedures are described in manufacture's SOPs contained in Appendix F.

Table 15.1. Instrument/Equipment Inspection, Testing Procedures – Summary

Equipment Type	Inspection Frequency	Type Inspection	Maintenance, Corrective Action
Sample bottles	Before each use	Visual for integrity, cleanliness	Lab Prepped Rinsed at each site prior to use
Meters	Before each use	Visual and Calibration	Proper Storage and Fresh Batteries as per User Manuals Recalibrate prior to each use. Calibration stand solutions must be replaced prior to expiration
GPS	Before each use	Visual for proper sequencing.	Cleaned and stored as per users manual instructions Fresh batteries as needed
Secchi Disk	Before each use	Visual for defects (as in rope)	Cleaning and storage
View scope	Before each use	Visual for integrity	Rinse after use and storage to prevent damage
Grab Sticks	Before each use	Visual for integrity, and cleanliness	Rinse before and after use

16. Instrumentation Calibration and Frequency

The following instrument calibration procedures will be followed for the Pembroke Pond Project:

- ✓ Instruments shall be calibrated before each use by the Field Monitoring Coordinator or Test Leader
- ✓ Detailed inspection, maintenance and calibration procedures are described in manufacture's SOPs contained in appendix F.
- ✓ If meter readings appear inconsistent, recalibration or retesting with a second meter is required
- ✓ A Calibration Log will be kept by the Field Coordinator noting calibrations completed, when, by whom, and dates done; all problems with calibration will be noted

Table 16.1. Instrumentation Calibration Procedures

Instrument	Inspection and Calibration Frequency	Standard of Calibration Instrument Used	Corrective Action
YSI and pH Meters	Before each sampling run	All solutions including buffers, turbidity, probe solutions and external standards as per user's manual and training SOPs-- see appendix	Adjust instrument, clean electrodes, replace electrodes , replace membranes, following manufacturer's SOPs

17. Inspection & Acceptance Requirements for Supplies

The following procedures for procurement, inspection and acceptance of sampling, analytical and ancillary project supplies shall be followed for the Pembroke Pond Project:

A check is made to see that we have all the materials required to do the sampling that day.
Test items include:

- ✓ Correct number of labeled bottles (including spare bottles)
- ✓ Field data sheets (see Appendix C)
- ✓ Quality Control checklist if required (see Appendix C)
- ✓ Cooler with ice or ice packs
- ✓ Sharpie for recording data.
- ✓ Copy of testing procedures (see Appendix D)
- ✓ Maps of sample sites (GPS locations)
- ✓ Necessary Data Sheets (see Appendix C)
- ✓ Meters, GPS, Secchi Disk and tape measure

Table 17.1. Supplies Inspection, Acceptance Procedures

Supplies	Inspection Frequency	Type of Inspection	Available Parts	Maintenance
Calibration Solutions	During each use	Visual inspection of quantity and expiration date	Fresh bottles of calibration solutions	Replace as needed referencing expiration dates
Bottles and labels	Before each use	Visual for integrity and damage	Spare bottles and labels	Proper storage and handling
Field and data sheets	Inspection before using	Visual	Spare copies	n/a
Life Jackets	Before each use	Visual for integrity and damage	spares	As needed
cooler	Before each use	Visual for cleanliness and ice or ice packs	n/a	As needed

18. Data Acquisition Requirements

The following information will be provided for the Pembroke Watershed Association water project:

- ✓ External data validity shall be documented as described in Table 18.1

Table 18.1. Non-Project Data Validity

The following data will be used. Data validity is described here:

Title or descriptive name of data document	Source of data	QAPP written? Y/N	Notes on known or unknown quality of data	Planned restrictions in use of the data due to questions about data quality
2005, 2006 and 2007 Water Quality Data	Collected under the SOPs of the Pembroke Watershed Association	No	Same procedures as now in use Good Confidence as to validity	Background Data for future comparison and analysis
2001 Survey by Comprehensive Environmental Inc	Independent Consultants	No	Undetermined	Findings were used to determine need for further monitoring
1993 BayState Environmental Consultants Inc.	Independent Consultants	No	Undetermined	Findings were used to determine need for further monitoring Establishment of monitoring waypoints

19. Data Management

The following data management activities shall be followed for the Pembroke Watershed Association water project:

- ✓ Field samplers shall record data on field sheets, review them, sign and turn over to field coordinator.
- ✓ Field Coordinator shall review sheets and discuss with sampling team discrepancies in data acquisition, incompleteness of sheets, and provide needed corrective action.
- ✓ Pond Captain or Designated test leader shall fill out the chain-of-custody form for forwarding the processed samples to the laboratory.
- ✓ Test Leader and each person who transports samples shall also sign the custody form upon receipt of the samples.
- ✓ Chain of custody forms will follow samples to the lab and back to Program Monitoring Coordinator.
- ✓ Once laboratory analyses are complete, the laboratory personnel shall mail lab results to the Program Monitoring Coordinator or arrange for pickup.
- ✓ The Program Monitoring Coordinator and/or Data Management Coordinator will enter raw field and lab data into the project computer system.
- ✓ Computer-entered data shall then be compared with field sheets for accuracy.
- ✓ Original data sheets will be stored at central location for Pembroke Watershed Association with copies to field coordinator
- ✓ Disk back-ups and copies of the data sheets will be made and stored in a separate location designated by the Program Monitoring Coordinator. Copies provided to Field Coordinator.
- ✓ Documentation of data recording and handling, including all problems and corrective actions, shall be included in all preliminary and final reports.
- ✓ Examples of data forms and checklists are provided in Appendix.

Data management systems - spreadsheets, databases, statistical or graphical software packages, location of data records (paper and electronic), are described here:

Data is collected on a scheduled basis by teams of trained volunteers who follow specific instructions on the collection and submission of the water quality information. Each team collects samples from the same location in each pond, labels them with indelible marker and places in an iced cooler for delivery to Analytical Balance Laboratory Corp. Samples must be delivered to the lab within 24 hours.

Program Monitoring Coordinator reviews the data to determine if major changes have occurred since the last sampling and if any errors have resulted from the testing. If there are errors or discrepancies the Program Monitoring Coordinator will call the team who took the samples and discuss the results with them. If the discrepancies are pronounced, a new sample may be obtained. In any case, suitable inquiries determine the next step to be pursued.
Data is maintained on excel spreadsheet and is used to create Word documents, reports, and PowerPoint presentations. Final Reports contain all the raw data, analytical graphs and recommendations. The reports are distributed to parties on our distribution list and to the general public through our Web Site and copies maintained at the Pembroke Public Library.

Paper and electronic records are stored at the Pembroke Watershed Association central location. Backup copies are stored with the Field Coordinator and the Program Monitoring Coordinator.

20. Assessment and Response Actions

The Program Monitoring Coordinator, QA Officer and TAC will use the following process to identify and effectively address any issues that affect data quality, personal safety, and other important project components.

The Program Monitoring Coordinator will periodically check to see the following:

- ✓ Monitoring is occurring as planned;
- ✓ Sufficient written commentary and/or supporting photographs exist;
- ✓ Sufficient volunteers are available;
- ✓ Volunteers have been observed as they sample their sites;
- ✓ Samplers are collecting in accordance with project schedules;
- ✓ Data sheets and custody control sheets are being properly completed and signed off;
- ✓ Data are properly interpreted;
- ✓ Plans for dealing with adverse weather are in place;
- ✓ Retraining or other corrective action is implemented at the first hint of non compliance with the QAPP or SOPs;
- ✓ Labs are adhering to the requirements of the QAPP- use of State Certified Lab.
- ✓ Data management is being handled properly, i.e. data are entered on a timely basis, are properly backed up, are easily accessed, and raw data are properly stored in a safe place;
- ✓ Procedure for developing and reporting the results exists.

The Program Monitoring Coordinator shall confer with the Field Coordinator and the QA Officer as necessary to discuss any problems that occur and what corrective actions are needed to maintain project integrity. The Program Monitoring Coordinator, Field Coordinator and QA Officer shall meet at the end of the sampling season to review the draft report and discuss all aspects of the program including identifying necessary program modifications for future sampling activities. The Technical Advisory Committee (TAC) shall be included in these discussions. Corrections may include retraining volunteers, rewriting sampling instructions, replacement of volunteers, altering of schedules, sites, or methods or any other actions deemed necessary. If modifications require changes in the Quality Assurance Project Plan, these changes shall be submitted in writing to the MassDEP for review

21. Reports

The following reporting mechanisms will be used. The final report will describe the program's goals, methods, quality control, results, data interpretation, and recommendations and will include:

- ✓ Raw data
- ✓ QC data
- ✓ Associated metadata
- ✓ Flagged Questionable data

The final report will be sent to the QAPP and *General QAPP Adoption Form* distribution lists and submitted to CZM and/or MassDEP following MassDEP guidelines CN 0.74 *Recommended Content of 3rd Party Data* and CN 0.78 *Data Deliverable Guidelines for Grant Projects*.

Table 21.1 describes the reporting mechanism for this project's data, who is responsible for completion and distribution, and to whom each report will be distributed.

Table 21.1. Report Mechanisms, Responsibilities, and Distribution

Reporting Mechanism	By Whom	Distribution
Annual Water Quality Report	Program Monitoring Coordinator Field Coordinator Program QA Officer	Distribution list. Public by being posted on the PWA web site, being shared with the local media, by donating to town library.
Web Site	Webmaster	General Public
Press Release	PWA Executive Secretary	General Public

22. Data Review, Validation and Verification Requirements

All project data, metadata and quality control data shall be critically reviewed by the Program Monitoring Coordinator and QA Officer to determine if there are any problems that compromise data usability.

The Program Monitoring Coordinator and the Field Coordinator will review field and laboratory data after each sampling run and take corrective actions if necessary. If there appears to be inconsistent data the Program Monitoring Coordinator will discuss with the sampling team the circumstances surrounding the sampling and what might have caused the problem. If they can resolve the problem, this will end the concern. If the problem can't be resolved then the Program Monitoring Coordinator will discuss the issue with the Field Coordinator and the QA Officer and together they will decide what remedial steps to take. At the end of the season the Program Monitoring Coordinating will share all data with the Field Coordinator and QC Officer to determine if the data appears to meet the objectives of the QAPP.

The following logs will be maintained by the Program Monitoring Coordinator and Field Coordinator to track performance and documentation

- ✓ Field sheets with results from Analytical, by pond and date
- ✓ QC sheets completed during sampling
- ✓ Chain of Custody forms with all signatures, times, dates
- ✓ QC logs by date including all QC activities, such as flagged data issues, remediation, corrective action plan, etc
- ✓ Calibration and Maintenance log

23. Validation and Verification Methods

All project data and metadata are reviewed and approved as usable data or as un-usable when the data are questionable for any reason.

Data validation and verification will occur as described in Table 23.1, and will include checks on:

- ✓ Completion of all fields on data sheets
- ✓ Missing data sheets
- ✓ Completeness of sampling runs (e.g. number of sites visited/samples taken vs. number proposed, were all parameters sampled/analyzed?)
- ✓ Completeness of QC checks (e.g. number and type of QC checks performed vs. number/type proposed)
- ✓ Number of samples exceeding QC limits for accuracy and precision and how far limits were exceeded.

- ✓ Field Coordinator and Program Monitoring Coordinator will examine all data sheets for completeness and reasonableness of results. If any inconsistent results are discovered, an action plan decision is generated which could include retesting, remedial training, recalibration of equipment and retesting or a flag not to include specific data in the results.
- ✓ The chain of custody is reviewed to determine that appropriate standards are met

Table 23.1 Validation and Verification Methods

Verifier	When	Activity	Possible Corrective measures and notification
Field Coordinator and QA Officer	Prior to testing	Calibration of meters	Maintain calibration log If calibration fails - recalibrate - use an alternate meter - return for repair or replacement
Pond Captain or Team Leader	Monitoring day – when volunteers turn over data sheets	Collect, review volunteers field sheets for - Outliers - Illegible entries - Missing data - Unusual conditions	Discuss with volunteers. Correct simple problems. Retrain as needed Locate missing sample sheets or data Data is flagged to indicate that it should not be entered in a database or used for decision making.
Program Monitoring Coordinator	At end of Monitoring Day	Review chain of custody sheet for errors or omissions. Check samples for proper condition.	Discuss with volunteers Resample if possible Data is flagged to indicate that it should not be entered in a database or used for decision making
Data Management Coordinator and QA Officer	When QC data is reported	Compare number of QC tests performed vs. number planned Compare QC test results with targets or expected values.	Discuss with volunteers. Correct simple problems. Retrain as needed Report in QC log
Program Monitoring Coordinator and Field Coordinator	When results are received	Review results with field sheets Identify outlier data Identify action required Trend Results	Check field sheets for conditions Check holding times Develop an action plan if necessary Questionable data is flagged to indicate that it should not be entered in a database or used for decision making

24. Reconciliation with Data Quality Objectives (DQO's)

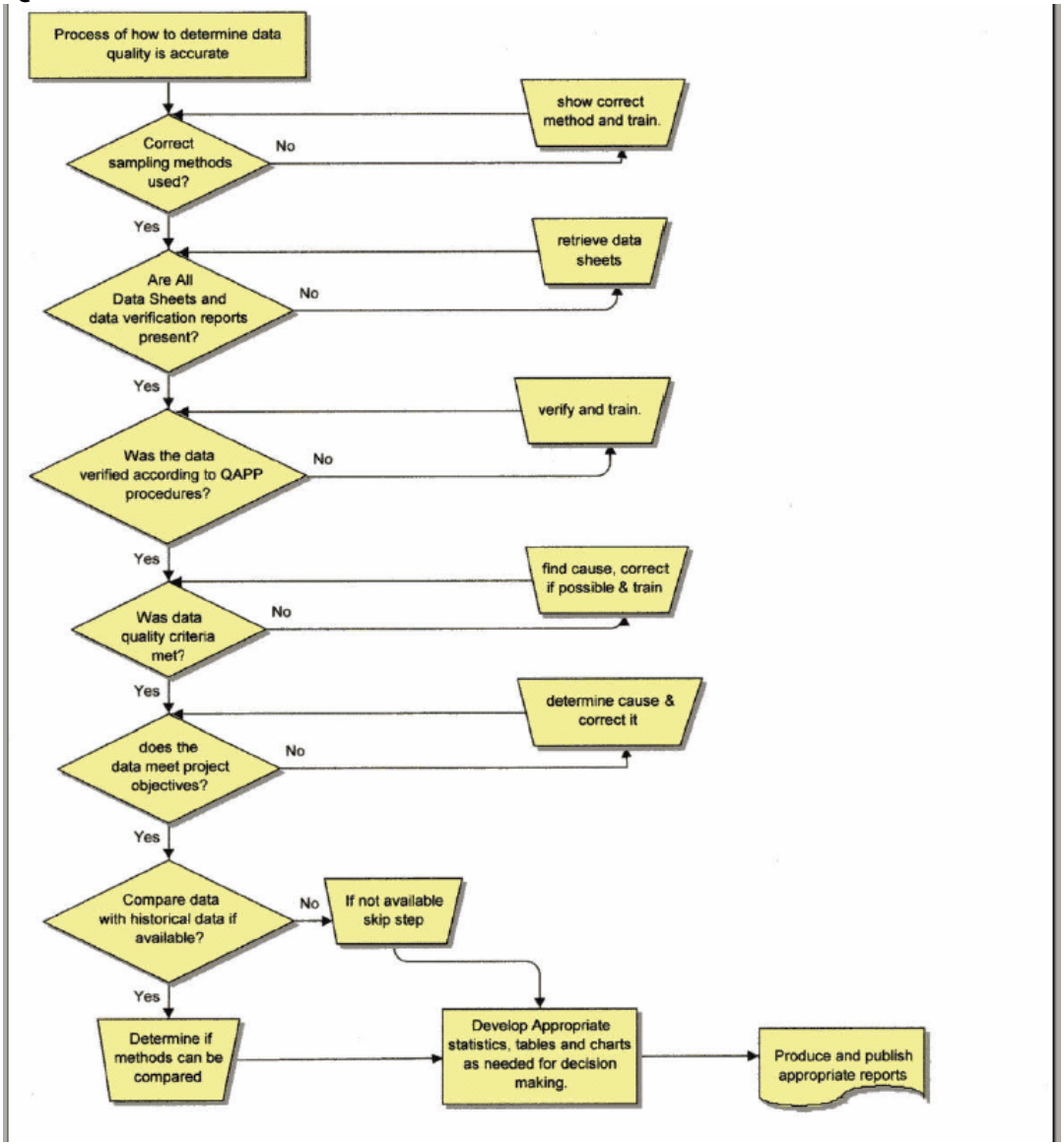
At the conclusion of the sampling season (i.e., after all in-season quality control checks, assessment actions, validation and verification checks and corrective actions have been taken), the resulting data set will be compared with the program's data quality objectives (DQO's).

This review will include, for each parameter, calculation of the following:

- ✓ Completeness goals: overall % of samples completed compared to number planned
- ✓ Percent of samples exceeding accuracy and precision limits
- ✓ Average departure from accuracy and precision targets.
- ✓ After reviewing these calculations, and taking into consideration such factors as clusters of unacceptable data (e.g. whether certain parameters, sites, dates, volunteer teams etc. produced poor results), the Program Monitoring Coordinator, QA Officer and TAC members will evaluate overall program attainment of the program's data quality objectives and determine what limitations to place on the use of the data, or if a revision of the DQO is allowable.

The following process describes how project data are compared to the program's data quality objectives and the mechanisms used to accomplish it. The Project Management Coordinator, Project Field Coordinator and Project QC Officer shall utilize the following decision tree as needed.

QAPP Data Review Decision Tree for PWA ***



*** As Adapted from Massachusetts Guidebook to Quality Assurance Project Plans

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The following is a scanned copy of the signed signature page

General Quality Assurance Project Plan Adoption Form For
Pembroke Ponds Quality Assurance Project Plan
By
Pembroke Watershed Association
December 31, 2007
Revision No. 3
2008 through 2009

1. Signature Page

We, the undersigned, have read and understand the requirements outlined in the General QAPP for Massachusetts Volunteer Coastal Monitoring, and establish that this project meets the overall intent and requirements set forth in the General QAPP.

Project Manager : Dr Debra Tranberg 1/12/08
Name Dr. Debra Tranberg Date
Address 82 Philips Road Pembroke, MA 02359
Phone: 781- 545-7388 Fax: 781-545-6552 Email: drt@drtranberg.com

Program Monitoring Coordinator: Charles Banks 1/10/08
Name Charles Banks Date
Address 20 Lake Avenue Pembroke, MA 02359
Phone: 781-293-1072 Fax: Email: Charliebanks@comcast.net

Program Quality Assurance Officer: Howard League 1/10/08
Name Howard League Date
Address 51 Lake Street Pembroke, MA 02359
Phone: 781-294-0819 Fax: Email: kmleague@comcast.net

TP Callaghan 1/29/08
Todd Callaghan, CZM Program Contact Date
251 Causeway St. Suite 900, Boston, MA 02114-2119
617- 626-1233 Fax: 617-626-1240 email: todd.callaghan@state.ma.us

R. C 1/16/08
Richard Chase, MassDEP QA Officer Date
627 Main St., 2nd floor, Worcester, MA 01608
(508) 767-2859 Fax: 508-791-4131 email: richard.f.chase@state.ma.us

AS Screpetis 1/17/08
Arthur Screpetis, MassDEP Technical Reviewer Date
627 Main Street, 2nd floor, Worcester, MA 01608
508-767-2875, Fax: 508-791-4131 email: arthur.screpetis@state.ma.us,

Pembroke Watershed Association – Quality Assurance Project Plan 1

Table of Contents -- QAPP Appendices

A PWA Water Quality Team

Pembroke Watershed Association Water Quality Team, 2007

Co-Chairs of Water Quality Committee: Charlie Banks and Patti McCabe

Pond Captains:
Furnace: Patti McCabe
Oldham: Charlie Banks
Little Sandy Bottom: Steve Downing
Stetson: Jim McClarnon and Fred Baker.
Hobomock: Andy Key

Qualified instructors for volunteer water quality training:
Jerry Fusco, Charlie Banks, Patti McCabe. Jim McClarnon, Deb Tranberg

Qualified volunteer water samplers:
5 Instructors and 24 Volunteers

- Oldham Pond
  - Charlie Banks - Instructor
  - Hal Johnson
  - Dudley Sepeck
  - Robert Buckley
  - Jack Daniels
  - Peter Metcalf
  - Norm Shepherd
  - Ray Palumbo
  - Terry Banks
- Furnace Pond
  - Jerry Fusco - Instructor
  - Patti McCabe - Instructor
  - Chuck McCabe
  - Ray Holman
  - Scott MacInnes
  - Brian Shea
  - Deb Tranberg - Instructor
  - Erin Sullivan
  - Bill Doherty
- Stetson Pond
  - Robert Shannon
  - Mitchell Cahill
  - Fred Baker
  - David Spaulding
  - Jim McLarnon - Instructor

- Little Sandy Bottom Pond
  - Arthur Boyle
  - Steven Downing
  - Becky Paul

- Hobomock Pond
  - Howard League
  - Andy Key
  - Jason Potrykus

Storm Drain Stencil Project:

- Patti McCabe, Scotty MacInnes, Cindy Champagne: Furnace
- Mitch Cahill: Stetson
- Andy Key and Miles Prescott: Hobomock
- Kathy Hanson: Oldham

B Water Quality Testing Qualifications

Pembroke Watershed Association

Water Quality Committee

Members Qualified to conduct Water Quality testing

4 Instructors qualified in 2005
1 Instructor qualified in 2006
18 Members Qualified in 2005
5 Members Qualified in 2006
1 Member Qualified in 2007

Name	Pond	Certified as an instructor	Date Certified
Jerry Fusco	Furnace	5/1/2005	5/1/2005
PattiMcCabe	Furnace	8/23/2005	7/23/2005
Chuck McCabe	Furnace		5/5/2005
Scotty MacInnes	Furnace		5/5/2005
Ray Holman	Furnace		5/5/2005
Deb Tranberg	Furnace	5/1/2005	5/1/2005
Brian Shea	Furnace		7/23/2005
Erin Sullivan	Furnace		6/25/2006
Bill Doherty	Furnace		6/25/2006
Andy Key	Hobomock		6/25/2006
Howard League	Hobomock		6/25/2006
Jason Potrykus	Hobomock		6/25/2006
Arthur Boyle	Little Sandy		7/23/2005
Steve Downing	Little Sandy		7/23/2005
Becky Paul	Little Sandy		7/23/2005
Charlie Banks	Oldham	8/23/2005	7/23/2005
Hal Johnson	Oldham		7/23/2005
Norm Shepherd	Oldham		7/23/2005
Jack Danirls	Oldham		5/17/2005
Peter Metcalf	Oldham		5/17/2005
Robert Buckley	Oldham		5/17/2005
Ray Palumbo	Oldham		8/23/2005
DudleySepeck	Oldham		6/25/2006
Terry Banks	Oldham		8/19/2007
Jim McLarnon	Stetson	6/25/2006	8/23/2005
Mitch Cahill	Stetson		8/23/2005
Bob Shannon	Stetson		9/18/2005
Skip Baker	Stetson		9/18/2005
Dave Spaulding	Stetson		6/25/2006

C-1 Water Sample Collection Data Sheet

Pembroke Watershed Association

P. O. Box 368, Pembroke, MA 02359-0368

Water Sample Collection Data Sheet Date: _____

Sampling Station # _____ Watershed: _____

Pond or River: _____ GPS Location: _____

Town: _____ Water level: _____ Ft.

Today's weather: _____ Rainfall: _____ in.

Yesterday's weather: _____ Rainfall: _____ in.

Day before's weather: _____ Rainfall: _____ in.

Site location: _____

Sample taken from: Boat, Bank, Wade, Dock, Other _____

Water use: None, Fishing, Boating, Skiing, Swimming

Water color: Clear, Cloudy, Milky, Foam, Brown (muddy), Gray (silty), Tea, Green

Water odor: None, Sewage, Oil, Chlorine, Rotten egg, Other(describe)

Algal growth: None, 5%, 10%, 15%, 20%, 25%, 50%, 75%, >75% Algae Color Green, Blue Green

Bottom appearance: Not Visible, Sludge, Sand, Rock, Weeds, Mud, Other (describe) _____

Weed Growth in Sample area Not Visible, Submerged, Surface - % of weed growth _____

Water Characteristics: Large Wave, Small waves, Smooth, Still

Current at sample area: Fast, Slow, Still, None

Secchi Disk Transparency: (Yes) No Time: _____ am / pm Depth _____ ft.

Chemistry sample: (Yes) No Time: _____ am / pm Depth _____ ft. Bottle ID#. _____

DO Meter Sample: Time: _____ am / pm

Depth 4 ft. DO _____ mg/l _____ % Water temp _____ °F / C

Conductivity _____ pH _____ Salinity _____

Depth 7 ft. DO _____ mg/l _____ % Water temp _____ °F / C

Depth _____ ft. DO _____ mg/l _____ % Water temp _____ °F / C

Depth at sample area: _____ Ft. Air temp: _____ °F / C Surface water temp: _____ °F/ C

Comments: _____

Sample taker name: _____ Date _____ Time _____
PRINT & SIGN

Witness: _____ Date _____ Time _____
PRINT & SIGN

Water Sample Form revised 10/07

C-2 Sample Bottle Label

Analytical Balance
CORPORATION
422 West Grove Street, Middleboro, MA 02346 • (508) 946-2225

PROJECT NO		PROJECT NAME			
LOCATION					
DATE	TIME	GRAB		COMPOSITE	
PRESERVATIVE		DEPTH/VOLUME			
LAB NO		FIELD ID NO			
ANALYSES REQUESTED/COMMENTS					
SAMPLER NAME					

Sample Completed form – DEMO

Analytical Balance
CORPORATION
422 West Grove Street, Middleboro, MA 02346 • (508) 946-2225

PROJECT NO	C-01	PROJECT NAME	PWA		
LOCATION	OLDHAM				
DATE	6/23/07	TIME	1600	GRAB	✓ COMPOSITE
PRESERVATIVE		DEPTH/VOLUME			
LAB NO		FIELD ID NO			
ANALYSES REQUESTED/COMMENTS					
SAMPLER NAME	Charles E Banks				

C-3 Analytical Balance Chain of Custody Form

Analytical Balance CORPORATION

CHAIN OF CUSTODY

422 West Grove Street
Middleboro, MA 02346
Ph. (508) 946-2225
Fax (508) 946-3335
Lab I.D. #M-MA022

Client Name: | **Project Name:**

Address: | **Collected by:**

C-o-C#

Analytical LAB I.D.	COLLECTION Date	Time	I.D. Matrix	Pres.	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	ANALYSIS REQUIRED	TURNAROUND TIME

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT.

RELINQUISHED BY: (Signature)	*RECEIVED BY: (Signature)*	*DATE*	*TIME*	***LAB COMMENTS***
RELINQUISHED BY: (Signature)	*RECEIVED FOR LABORATORY BY: (Signature)*	*DATE*	*TIME*	*SHIPPING CONDITIONS: (Check One)* ☐ *Iced* ☐ *Ambient*
				TEMPERATURE: _____ °C Lowest _____ °C Highest _____ °C Receipt

MATRIX CODES:

RW	— *REAGENT WATER*	**SE**	— *SEDIMENT*
DW	— *DRINKING WATER*	**SL**	— *SLUDGE*
GW	— *GROUND WATER*	**HW**	— *HAZARDOUS WASTE*
SW	— *SURFACE WATER*	**WW**	— *WASTE WATER*
SO	— *SOIL*	**PW**	— *POOL WATER*

CONTAMINATION LEVEL

L	— *LOW (NO ODOR)*	**H**	— *HIGH*
M	— *MEDIUM*	**U**	— *UNKNOWN*

TURN-AROUND TIME (TAT)

NORMAL (7–10 Working Days)

- *TAT begins when sample is received at test facility.*
- *TAT for samples received after 4 p.m. will begin on the next business day.*
- *All TAT's are subject to laboratory approval and customer consent.*

Sample Completed form – DEMO

Analytical Balance CORPORATION

CHAIN OF CUSTODY

422 West Grove Street
Middleboro, MA 02346
Ph. (508) 946-2225
Fax (508) 946-3335
Lab I.D. #M-MA022

Client Name: Pembroke Watershed Assoc.
Address: P.O. Box 368, Pembroke MA 02359
C-o-C#

Project Name: Oldham Pond
Collected by: Test Leader
PO 05-123

Analytical LAB I.D.	COLLECTION Date	COLLECTION Time	I.D. Matrix	I.D. Pres.	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	ANALYSIS REQUIRED: Nitrite	Nitrate	TKN	Total Nitrogen	Total Phosphorus	Ammonia	Alkalinity	Chloride	Turbidity	TURNAROUND TIME
0-01	10/1/07	1015	SW			✓	0-01 SW	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
0-02		1020				✓	0-02 NW	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
0-03		1025				✓	0-03 NE	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
0-04	↓	1030	↓			✓	0-04 SE	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT.

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
Test Leader	Sample Courier		
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE	TIME

LAB COMMENTS

SHIPPING CONDITIONS: (Check One) ☐ Iced ☐ Ambient
TEMPERATURE: ____ °C Lowest ____ °C Highest ____ °C Receipt

TURN-AROUND TIME (TAT)
NORMAL (7–10 Working Days)
- TAT begins when sample is received at test facility.
- TAT for samples received after 4 p.m. will begin on the next business day.
- All TAT's are subject to laboratory approval and customer consent.

MATRIX CODES:
RW — REAGENT WATER
DW — DRINKING WATER
GW — GROUND WATER
SW — SURFACE WATER
SO — SOIL
SE — SEDIMENT
SL — SLUDGE
HW — HAZARDOUS WASTE
WW — WASTE WATER
PW — POOL WATER

CONTAMINATION LEVEL
L — LOW (NO ODOR)
M — MEDIUM
H — HIGH
U — UNKNOWN

C-4 Analytical Balance Certificate of Analysis

Betty Minichills
Pembroke Watershed Association
PO Box 368
Pembroke, MA 02359
COLLECTED BY: S.MacInnes
TIME: 10:30
LOCATION: Oldham Pond
Camp Pembroke

CERTIFICATE OF ANALYSIS

REPORTED: 07/27/2005
ORDER #: G0573582
SAMPLE DATE: 7/16/2005
DATE RECEIVED: 7/18/2005
SAMPLE ID: Grab
DESCRIPTION: WATER

RESULTS OF ANALYSIS

Parameter	Analytical Method	Date Analyzed	Units	Det. Limit	Results
Test Parameters				**LAB-ID#: 0573582-01**	
Alkalinity 310.2	EPA 310.2	07/18/2005	mg/L	4	**21.4**
Ammonia, Nitrogen 350.1	EPA 350.1	07/20/2005	mg/L	0.1	**<0.10**
Chloride 4110B	SM 4110 B	07/18/2005	mg/L	4.0	**49.4**
Kjeldahl, Nitrogen	EPA 351.2	07/21/2005	mg/L	0.50	**1.71**
Nitrate, Nitrogen 4110B	SM 4110 B	07/18/2005	mg/L	0.20	**<0.20**
Nitrite, Nitrogen 4110B	SM 4110 B	07/18/2005	mg/L	0.10	**<0.10**
Nitrogen, Total	Calculation	07/21/2005	mg/L	1.0	**1.71**
pH	SM 4500 H+B	07/18/2005	S.U.	0-14	**8.2**
Phosphorus, Ortho	SM 4500P-B/E	07/18/2005	mg/L	1.0	**<1.0**
Phosphorus, Total	SM 4500-P B/E	07/20/2005	mg/L	0.01	**0.04**
Specific Conductance	SM 2510 B	07/18/2005	umhos/cm	1.5	**242**
Turbidity	SM 2130B	07/18/2005	NTU	0.25	**22**

Analytical Balance Corp., **422 West Grove Street, Middleboro, MA 02346 Ph: 508-946-2225**

Page 1 of 6

Pembroke Watershed Association

Qualification / Requalification Sampling Competency:

1. Completed water sample collection according to procedure: _____
2. Performed Secchi disc measurement according to procedure: _____
3. Completed DO measurement according to procedure: _____
4. Completed Sampling form and DO form per procedure: _____
5. Completed role of witness correctly: _____
6. Demonstrated safety and careful handling of equipment: _____
7. Verbalized correct safety and team behavior expected on boat: _____
8. Identified situations in which testing would not be possible or would require alternative plan: _____
9. Described chain of custody, storage, and transport of samples: _____

Certified by:

Print Name and Signature Water Quality Committee

Pembroke Watershed Association

Quality Control Checklist

An additional 10% of our test samples have to be taken as quality control.

36 Samples for 2008 require 4 QC samples

Water Sample QC;

- **½ of the field samples will be Blind samples, the remainder will be blanks**
- **Sample Bottle is to be labeled "B" for Blind .**
- **Time on the bottle is to be the time when the tests were finished.**
- **Actual location and time are to be noted on our form.**

Quality Control Sample # ____ Test date _____

Pond _____

Actual Test Site (O-01, F-03 etc) _____

An additional Water Quality test sheet is to be completed for the QC sample showing actual location, time and conditions

At the same site where we take a water sample for QC, an instrument QC will be completed. This will be accomplished by having two different testers do the Secchi disk reading and the instrument readings on the DO and pH meter.

Water Quality QC sample taken by _____

Type of QC sample: ____ Blind sample ____ Blank Sample (distilled water)

Instrument QC readings completed by _____

Test Leader _____

This form is to be completed and turned in to the Field Monitoring Coordinator

Modified 10/28/07

Pembroke Watershed Association

Water Quality Testing And Qualification

Procedure Manual

Revised October, 2007

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Pembroke Watershed Association

Protocols for Water Quality testing

General procedures

1. Water quality testing will be carried out by volunteers trained by the water quality committee. Volunteers will attend a training session or sessions as required by the following procedures. Testing will be carried out by a minimum of two people. Personnel and responsibilities are as follows:

   Program Monitoring Coordinator - Overall responsibility for the water quality testing program

   Field Monitoring Coordinator – Responsible for actual testing procedures and Quality Control procedures.

   Test Leader - The Field Monitoring Coordinator will appoint a Test Leader to coordinate testing on a specific pond. Under the direction of the Field Monitoring Coordinator the Test Leader is responsible for verification of testing procedures and proper completion of all paperwork. The Test leader will sign all forms as witness and sign the Chain of Custody forms. The Test Leader will also deliver all forms to the Field Monitoring Coordinator for collection and review

   Water Quality Team Member -
   Tester - follows procedures to take the actual samples.
   Assistant – Assists with Secchi Disk measurement or other testing as needed. Completes paperwork and verifies accuracy

   Data Management Coordinator – Maintains and verifies data integrity and accuracy. Creates spreadsheets, presentations and reports.

   Quality Assurance Officer - works with the Field Monitoring Coordinator to verify that samples are taken properly and that Quality Control procedures are followed.

   Boat Driver – Provides use of a privately owned boat to be used for testing. Responsible for all maintenance and safety.

2. Safety must be a major concern. All participants are required to wear life jackets whenever they are on board a boat and to follow the safety guidelines.

3. In the event of inclement weather the Program Monitoring Coordinator, Field Monitoring Coordinator or a properly appointed substitute will make the determination on whether or not to conduct the tests. If any test sites are omitted because of changes in conditions, the reasons must be documented.

4. Prior to the testing date, the Field Monitoring Coordinator will obtain purchase orders for the testing and make arrangements for the samples to be carried to

Analytical Labs. Analytical Labs bottle labels and chain of custody forms are to be used for all tests.

Test Sampling General Information:

The number of Water Quality tests has been determined at the beginning of the testing year, depending on the condition and size of the ponds. In all cases we will conduct testing at the specified number of sites.
Testing will be as follows:

1. DO, conductivity, temperature and salinity using the YSI model 85 meter
2. Secchi disk using the Secchi disk and the view scope
3. pH using the Checkmite pH-20 sensor
4. Chemical Grab sample – using the sample stick

Maximum Depth at each sample site shall be determined using a depth finder if available or dropping the Secchi disk to the bottom and measuring. Note: if depth is measured using the Secchi disk it must be done after all other sampling to avoid roiling the bottom and contaminating the sample.

ALL water samples are to be placed in a cooler with ice or ice packs immediately after being taken and kept iced until delivered to the lab.

The test schedule will be as determined by the Program Monitoring Coordinator in cooperation with the Field Monitoring Coordinator.
See appendix # 1 for the current year testing schedule.

Test Sampling Procedure:

1. Obtain preliminary information and document on forms: This information is available on the following URL:
   http://www.weather.com/outlook/homeandgarden/home/pastweather/02359?locid=02359&when=-1
   - Weather conditions for the day of the test, including rainfall, if any
   - Weather conditions for the previous 2 days, including rainfall, if any
   - Actual water level of the pond (note location)

2. The testing equipment used for water quality testing is to be calibrated properly utilizing the manufacturer's calibration procedures. The test leader will work with the Field Monitoring Coordinator to ensure that this is done.

3. Utilize GPS to obtain correct location of test site. Sites are determined by the water quality committee and all tests are to be completed unless there is a safety issue. The test leader will make this determination. If a specific site or sites are not tested, the full reasons why will be written on the forms.

4. At test site: Obtain and document physical characteristics of the water, water conditions, presence of weeds and algae, and document on the appropriate form, using consensus and camera picture if necessary or significant.

5. Surface water temperature, air temperature, and total water depth at sampling area are to be collected and documented on the form.

6. Test bottle identifier should be written on cap with marker.
   a. Labeling of sampling bottle is to be completed and the bottle signed by the tester.
   b. To start the actual test the bottle is to be rinsed three times with surface water on the opposite side of boat from sampling area.
   c. The test stick must be rinsed clean before testing starts, with special emphasis on removing any algae or weeds fragments.

7. The following illustrates proper test procedures

First remove the cap and rinse the bottle three times on the opposite side of the boat. place the bottle in the bottom of the test grab stick, secure it and place a cork in the mouth.

Note: sampler should be cleaned of all plant fragments, algal strands, etc. and rinsed prior to use

Special care must be taken that the inside of the cap and bottle are never touched.

The Bottle is lowered to a depth of 4 feet - all tests are to be done at this depth.

The string is pulled, filling the bottle at depth.

The bottle is moved back and forth to release any air and brought to the surface.

Bottle is to be inspected for any foreign material. If there is any foreign matter, the bottle is to be discarded and the test retaken with a new bottle.

The cap is secured.

8. Dry bottle off, complete labeling of sampling bottle, tester signs bottle and sampling form, and bottle is placed in cooler with ice.

9. Complete Secchi disc measurement: one person lowers Secchi disc straight down in water while second person uses view scope and notes when Secchi disc is no longer visible. First person places clip on Secchi disc rope at that point and measures length from clip to disc - record measurement and time on form. Secchi disc is used on shady side of boat to minimize effects of glare.

10. Utilize the YSI model 85 to test for DO, conductance, and salinity. Document each reading on forms with sample time, temperature, and depth. A separate pH reading is required utilizing the Checkmite pH-20 sensor.

11. Total Depth at site is to be taken last so as not to stir up the bottom. Drop the Secchi disk down until it reaches the bottom, mark and measure the depth using the tape measure. If the boat has a depth finder, that may be used to measure total Depth

12. The test leader will witness all data forms.

13. The following tests should be requested from Analytical labs. They are to be entered on the Chain of custody form.

    - Turbidity
    - Nitrate Nitrogen
    - TK Nitrogen
    - Nitrite Nitrogen
    - Total Nitrogen - calculated by the lab
    - Total Phosphorous
    - Ammonia
    - Chloride

- Alkalinity

Data Handling and Transporting Samples to the lab.

1. The test leader will verify completeness of all forms. All data forms are to be filled in completely. Bottle labels are also to be filled in completely and the test site number should be written on the top.

2. Sample bottles are to be placed in a cooler with ice or ice packs as soon as they are collected. The samples are to be kept iced or refrigerated until delivered to the lab.

3. All test sample forms are to be collected at the end of the tests for that pond. The original forms are to be turned in to the Field Monitoring Coordinator, who will then make copies and forward the original forms to central storage.

4. Chain of Custody forms are to be completed by the test leader. The purchase order number will be provided and is entered on the form. The Chain of Custody form MUST be signed by the test leader and whoever is transporting the samples. If custody of the samples changes, the persons involved must both sign off on the form. Once the samples reach the lab, they will return the pink copy of the form to the transporter along with new bottles. These are to be returned to the Field Monitoring Coordinator. The pink copy of the chain of custody will be turned over to central storage. Addendum # 3 A completed example of the bottle label and chain of custody forms is included in this document.

5. The test results will be mailed back to the PWA by the lab. Originals are to be turned over to the Field Monitoring Coordinator, who will then make copies and forward the original forms to central storage.

6. Copies of all test forms and results from Analytical will be given to the Data Management Coordinator, who will input the data into the spreadsheet and periodically provide copies for central storage.

Quality Control procedures:

We are required to take additional samples for quality control. An additional 10% of our total samples must be taken for quality control.

Chemical sample quality control will be accomplished by a blind sample. The Water Quality Co-Chairs will inform the test leader if and how many blind samples are needed. Half of the quality control samples are to be blanks using distilled water

The test leader will have 1 additional sample taken and marked as B (for Blind).

The sample will be included on the Chain of Custody form and will be noted as to its actual location on the test forms that we retain.

Quality control for use of our testing equipment will be accomplished by having two different people doing the same test, again filling in the results on an additional form.

Equipment and supplies needed for water quality testing:

The test leader should make visual inspection prior to testing to ensure that all required equipment is present:

1. Cooler for sampling storage include ice or frozen ice packs
2. GPS
3. DO meter (YSI model 85)
4. Sampling bottles (2 extra)
5. Marker for noting sampling area on cap
6. pens for documentation
7. testing stick - must be clean of all algae and weed fragments
8. yard stick or tape measure for depth measurement
9. thermometer for air and surface water temperature measurements
10. Secchi disc
11. view scope
12. pH meter
13. clothes pin or clip
14. paper towels or towels for drying bottles
15. documentation forms for sampling and DO for all sites
16. chain of custody forms - include correct PO Number
17. clip boards for forms
18. camera: take pictures of unusual or significant physical findings (prefer digital)
19. A copy of these testing procedures, sunscreen and beverages

Pembroke Watershed Association

P. O. Box 368, Pembroke, MA 02359-0368

Water Sample Collection Data Sheet

Date: (1)

Sampling Station # (2) Watershed: (3)

Pond or River: (4) GPS Location: (5)

Town: (5) Water level: (7) Ft.

Today's weather: (8) Rainfall: ____ in.

Yesterday's weather: (9) Rainfall: ____ in.

Day before's weather: (10) Rainfall: ____ in.

Site location: (11)

Sample taken from: Boat, Bank, Wade, Dock, Other (12)

Water use: (13) None, Fishing, Boating, Skiing, Swimming

Water color: (14) Clear, Cloudy, Milky, Foam, Brown (muddy), Gray (silty), Tea, Green

Water odor: (15) None, Sewage, Oil, Chlorine, Rotten egg, Other(describe)

Algal growth: (16) None, 5%, 10%, 15%, 20%, 25%, 50%, 75%, >75% (16a) Algae Color Green, Blue Green

Bottom appearance: (17) Not Visible, Sludge, Sand, Rock, Weeds, Mud, Other (describe) ____

Weed Growth in Sample area (18) Not Visible, Submerged, Surface - % of weed growth (18a)

Water Characteristics: (19) Large Wave, Small waves, Smooth, Still

Current at sample area: (20) Fast, Slow, Still, None

Secchi Disk Transparency: (Yes) No Time: ____ am / pm Depth (21) ____ ft.

Chemistry sample: (22) Time: ____ am / pm Depth ____ ft. Bottle ID#. ____

DO Meter Sample: (23) Time: ____ am / pm

Depth 4 ft. (24) DO ____ mg/l ____ % Water temp ____ °F / C

(25) Conductivity ____ pH ____ Salinity ____

Depth 7 ft. (26) DO ____ mg/l ____ % Water temp ____ °F / C

Depth ____ ft. (27) DO ____ mg/l ____ % Water temp ____ °F / C

Depth at sample area: (28) Ft. Air temp: ____ °F / C Surface water temp: ____ °F/ C

Comments: (29)

Sample taker name: (30) Date ____ Time ____
PRINT & SIGN

Witness: (31) Date ____ Time ____
PRINT & SIGN

Water Sample Form revised 10/07

1 Todays Date
2 Sampling Station - our site designation i.e. O-01
3 Watershed - South Coastal or Taunton
4 Name of Pond
5 GPS Readings for that site
6 Town Pembroke or Hanson
7 Water level - available on each pond
8 Todays weather and rainfall amount
9 Yesterdays weather and rainfall amount - available on internet
10 Two days prior weather and rainfall amount - available on internet
11 Site location - use our location code and description
12 Sample from - circle appropriate (will normally be from a boat)
13 Water use - Circle appropriate
14 Water Color - Circle appropriate
15 Water odor - Circle appropriate
16 Algal growth - Circle appropriate
16a If Algae exists, circle type
17 Bottom Appearance - circle appropriate
18 Weed Growth in sample area - Circle appropriate
18a If Weeds exist fill in %
19 Water Characteristics- Circle appropriate
20 Current at sample area - Circle appropriate
21 Secchi Disk - Time and Depth
22 Chemistry sample is yes - fill in date, time & Bottle ID
23 DO sample time
24 DO sampling from Meter - DO in mg/l and % time of sample and water temp at sample depth for 4 foot
25 Fill in all readings for Conductivity, pH and Salinity or mark n/a
26 DO sampling from Meter - DO in mg/l and % time of sample and water temp at sample depth for 7 foot
27 Fill in as above if a deeper sample is taken
28 Total Depth at sample area , air temp and surface water temp. Note - This should be done last
29 Comments
30 Sample taker must sign and date
31 Witness must sign and date

** http://www.weather.com/outlook/driving/interstate/pastweather/02359?from=36hr_topnav_driving

This is an example of a completed form showing several possible comments

Pembroke Watershed Association

P. O. Box 368, Pembroke, MA 02359-0368

Water Sample Collection Data Sheet

Date: 10/14/2007

Sampling Station # O-01 Watershed: South Coastal

Pond or River: Oldham GPS Location: 42° 04.330 N 70° 50.048 W

Town: Hanson Water level: 55.6 Ft.

Today's weather: Sunny Rainfall: 0 in.

Yesterday's weather: Sunny Rainfall: 0 in.

Day before's weather: Rain Rainfall: 1.5 in.

Site location: O-01 Northwest side of pond

Sample taken from: (Boat), Bank, Wade, Dock, Other _____

Water use: (None), Fishing, Boating, Skiing, Swimming

Water color: Clear, Cloudy, Milky, Foam, Brown (muddy), Gray (silty), Tea, (Green)

Water odor: (None), Sewage, Oil, Chlorine, Rotten egg, Other(describe)

Algal growth: None, 5%, 10%, 15%, 20%, (25%), 50%, 75%, >75% Algae Color (Green), Blue Green

Bottom appearance: (Not Visible), Sludge, Sand, Rock, Weeds, Mud, Other (describe) _____

Weed Growth in Sample area (Not Visible), Submerged, Surface - % of weed growth _____

Water Characteristics: (Large Wave), Small waves, Smooth, Still

Current at sample area: (Fast), Slow, Still, None

Secchi Disk Transparency: (Yes) No Time: 11 20 am / pm Depth 1.3 ft.

Chemistry sample: (Yes) No Time: 11 25 am / pm Depth 4 ft. Bottle ID#. O-01

DO Meter Sample: Time: 11 30 am / pm

Depth 4 ft. DO 8.93 mg/l 115.4 % Water temp 24.8 °F (C)

Conductivity 218 pH 6.9 Salinity .1

Depth 7 ft. DO NA mg/l _____ % Water temp _____ °F / C

Depth _____ ft. DO NA mg/l _____ % Water temp _____ °F / C

Depth at sample area: 6 Ft. Air temp: 87 (°F) / C Surface water temp: 79 (°F) C

Comments: Heavy Weeds with 50' invasive weeds on shore
Heavy wind & waves

Sample taker name: John Tester PRINT & SIGN John Tester Date 10/14/07 Time 1145

Witness: John Witness PRINT & SIGN John Witness Date 10/14/07 Time 1145

Water Sample Form revised 10/07

These are completed examples of the Bottle label

Analytical Balance
CORPORATION
422 West Grove Street, Middleboro, MA 02346 • (508) 946-2225

PROJECT NO G-01		PROJECT NAME PWA			
LOCATION OLDHAM					
DATE 6/23/07	TIME 1600	GRAB		✓ COMPOSITE	
PRESERVATIVE		DEPTH/VOLUME			
LAB NO		FIELD ID NO			
ANALYSES REQUESTED/COMMENTS					
SAMPLER NAME Charles E Banks					

And the Chain of Custody form. Note that the purchase order number is required on the form.

The chain of custody form must be signed by the responsible test leader and the transporter. Each separate person who becomes responsible for the test samples MUST sign the form.

We will always request tests from Analytical Labs for:
Turbidity
Nitrate Nitrogen
Nitrite Nitrogen
TK Nitrogen
Total Nitrogen
Total Phosphorous
Chloride
Ammonia
Alkalinity.

Conductance should only be included if necessary. Note that Analytical labs requires us to include the time of the sample

Analytical Balance CORPORATION

CHAIN OF CUSTODY

422 West Grove Street
Middleboro, MA 02346
Ph. (508) 946-2225
Fax (508) 946-3335
Lab I.D. #M-MA022

Client Name: PEMBROKE WATERSHED ASSOC.
Address: PO Box 368, Pembroke MA 02359
C-o-C#

Project Name: OLDHAM POND
Collected by: Test Leader
PO 05-123

Analytical LAB I.D.	COLLECTION Date	COLLECTION Time	I.D. Matrix	I.D. Pres.	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	Nitrite	Nitrate	TKN	Total Nitrogen	Total Phosphorus	Ammonia	Alkalinity	Chloride	Turbidity	TURNAROUND TIME
0-01	10/1/07	1015	SW			✓	0-01 SW	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
0-02	↓	1020	↓			✓	0-02 NW	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
0-03		1025				✓	0-03 NE	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
0-04		1030				✓	0-04 SE	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	

LAB RESERVES THE RIGHT TO RETURN UNUSED PORTIONS OF NON-AQUEOUS SAMPLES TO CLIENT.

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE	TIME
Test leader	Sample Courier		
RELINQUISHED BY: (Signature)	RECEIVED FOR LABORATORY BY: (Signature)	DATE	TIME

LAB COMMENTS

SHIPPING CONDITIONS: (Check One) ☐ Iced ☐ Ambient
TEMPERATURE: _____ °C Lowest _____ °C Highest _____ °C Receipt

MATRIX CODES:
RW — REAGENT WATER; DW — DRINKING WATER; GW — GROUND WATER; SW — SURFACE WATER; SO — SOIL; SE — SEDIMENT; SL — SLUDGE; HW — HAZARDOUS WASTE; WW — WASTE WATER; PW — POOL WATER

CONTAMINATION LEVEL
L — LOW (NO ODOR); M — MEDIUM; H — HIGH; U — UNKNOWN

TURN-AROUND TIME (TAT)
NORMAL (7–10 Working Days)
- TAT begins when sample is received at test facility.
- TAT for samples received after 4 p.m. will begin on the next business day.
- All TAT's are subject to laboratory approval and customer consent.

What are we testing for?

- **Nitrogen -** is a fundamental nutrient and is required by all living plants and animals for building proteins
  Measured in mg/liter
  - Natural range is between 0.1 and 2 mg/l
  - For concentrations >5 mg/l negative impact is certain

- **Phosphorus -** is normally scarce in a normal aquatic environment, is necessary for plant growth, and is abundant on land.
  Measured in mg/liter
  - Concentration should be between .01 and .1 mg/l
  - For concentrations >.05 mg/l impact is light
  - For concentrations >.10 mg/l negative impact is certain

- Note: marked increase in Nitrogen or Phosphorous loads in a pond will encourage the proliferation of algae, fueling an overpopulation of bacteria that eat the decomposing algae. Less light diffuses through the water, impacting aquatic plant life. Aquatic life and algae compete for dissolved oxygen, and oxygen levels will plummet, resulting in eutrophic conditions and loss of habitat.

- **Turbidity:** The amount of suspended solids in the water.
  - Measured in NTU (Nephelometric Turbidity units)
  - Level should be between 1.0 and 10.0 NTU
  - Turbidity directly effects transparency (clarity) of the water

- **Dissolved Oxygen (DO):** The amount of oxygen in the water
  - Measured in mg/liter
  - Fish need a DO level >6.0 for warm water species, >7.0 for cold water species
  - DO levels will be higher near the surface due to wind effects, therefore should be measured at a minimum depth of 4 feet

- **pH and Alkalinity:** ability of water to handle acid and basic solutions
  - A pH of 7.0 is neutral, a higher pH means alkaline, a lower pH means acidic.
  - Pond water pH should range between 6.5 and 8.5
  - Alkalinity refers to the ability of the body of water to neutralize incoming acids from precipitation or discharges. Low alkalinity indicates low buffering ability.

- **Secchi Disk Transparency:** directly relates to turbidity, measures clarity.
  - Measured in feet
  - Water clarity: how far down can a Secchi disc be seen.
  - Expected depth should be > 10 feet, with high water quality exceeding 16 feet

- **Other:** Chloride, Salinity and Ammonia are also included

GPS Coordinates for Test sites

Oldham Pond

Current

O-01	**Northwest**	**Hanson Side**	**42^0 04.330 N**	**70^0 50.048 W**
O-02	**Southwest**	**Hanson Side**	**42^0 04.257 N**	**70^0 50.505 W**
O-03	**Northeast**	**Pembroke Side**	**42^0 04.158 N**	**70^0 50.610 W**
O-04	**Southeast**	**Pembroke Side**	**42^0 03.904 N**	**70^0 50.426 W**

Furnace Pond

Current

F-01	**South**	**42^0 03.450 N**	**70^0 49.728 W**
F-02	**Central**	**42^0 03.288 N**	**70^0 49.455 W**
F-03	**North**	**42^0 03.177 N**	**70^0 49.377 W**

Stetson Pond

Current

S-01	**North**	**42^0 01.882 N**	**70^0 49.779W**
S-02	**South**	**42^0 01.741 N**	**70^0 49.330 W**

Little Sandy Pond

Current

LS-01	**Central**	**42^0 02.495 N**	**70^0 50.055 W**

Hobomock Pond

Current

H-01	**Central**	**42^0 03.393 N**	**70^0 48.618 W**

Pembroke Watershed Association
Water Quality Testing Qualification/Requalification Program

Part I: Land Based training

1. Review of dissolved oxygen Meter calibration, set-up, and measurements
2. Review of Secchi disc measurements and use
3. Review of the sample forms for lab samples, DO, and Chain of Custody
4. Gather equipment and supplies for testing
5. Obtain and document preliminary information on sample forms

Part II: Obtain Samples and tests during actual tests, according to written procedures

1. Complete sample collection procedural requirements for a minimum of 3 sites
2. Complete DO tests for a minimum of 3 sites
3. Complete both sample and DO forms completely and properly for a minimum of 3 sites
4. Complete Secchi disc measurement and use of view scope for a minimum of 3 sites
5. Demonstrate proper use and storage of equipment and sampling bottles
6. Identify conditions in which sampling cannot be done
7. Act as tester, witness, and assistant in testing collection and documentation

Part III: Documentation of Training

1. A member will be considered trained once they have successfully completed the above training requirements.
2. A Qualification/Requalification Sampling Competency sheet (see addendum # 2) will be competed and signed by the instructor. It will then be turned in to the Field Monitoring Coordinator.
3. The Field Monitoring Coordinator will send the original signed Qualification/Requalification Sampling Competency sheet to PWA central storage and keep a copy for reference.

Addendum # 1

Testing schedule for the 2008 testing year (June 2008 – September 2008).

We will conduct a total of 36 tests

Furnace Pond (94085) – 103 Acres

3 test sites. This pond will be tested monthly from June through September. 12 tests

Oldham Pond (94114) - 232 Acres

4 test sites. This pond will be tested monthly from June through September. 16 tests

Stetson Pond (62182) – 88.2 Acres

2 test sites This pond will be tested in June and August . 4 tests

Hobomock Pond (94177) – Category 2 – 12.7 Acres

1 test site. This pond will be tested in June and September. 2 tests

Little Sandy Pond (94085)– Category 2 - 56.1 Acres

1 test site. This pond will be tested in August and September. 2 tests

The following categories are those identified in the Massachusetts year 2006 Integrated List of waters

Category 5 are "Waters requiring a TMDL"

Category 4c are waters where "Impairment not caused by a pollutant"

Category 2 "attaining some uses – others not assessed"

Furnace Pond (94085) – Category 5 - Organic enrichment/low DO

Oldham Pond (94114) – Category 4c - Exotic species

Stetson Pond (62182) – Category 5 – Nutrients, Organic enrichment/low DO, Exotic species

Hobomock Pond (94177) – Category 2

Little Sandy Pond (94085)– Category 2

Pembroke Watershed Association

Qualification / Requalification Sampling Competency:

1. Completed water sample collection according to procedure: _____
10. Performed Secchi disc measurement according to procedure: _____
11. Completed DO measurement according to procedure: _____
12. Completed Sampling form and DO form per procedure: _____
13. Completed role of witness correctly: _____
14. Demonstrated safety and careful handling of equipment: _____
15. Verbalized correct safety and team behavior expected on boat: _____
16. Identified situations in which testing would not be possible or would require alternative plan: _____
17. Described chain of custody, storage, and transport of samples: _____

Name: _____ Date _____

Instructor _____
(print & sign)

E-1 Analytical Balance State Certification

The Commonwealth of Massachusetts

Department of Environmental Protection

Division of Environmental Analysis
Senator William X. Wall Experiment Station

certifies

M-MA022 **ANALYTICAL BALANCE CORP**
422 WEST GROVE ST
MIDDLEBOROUGH, MA 02346-0000

Laboratory Director: **Robert E. Bentley**

for the analysis of **NON POTABLE WATER (CHEMISTRY)**
POTABLE WATER (CHEMISTRY)
POTABLE WATER (MICROBIOLOGY)
pursuant to 310 CMR 42.00

This certificate supersedes all previous Massachusetts certificates issued to this laboratory. The laboratory is regulated by and shall be responsible for being in compliance with Massachusetts regulations at 310 CMR 42.00.

This certificate is valid only when accompanied by the latest dated Certified Parameter List as issued by the Massachusetts D.E.P. Contact the Division of Environmental Analysis to verify the current certification status of the laboratory.

Certification is no guarantee of the validity of the data. This certification is subject to unannounced laboratory inspections.

Oscar C. Jacobs

Director, Division of Environmental Analysis

Issued: **01 JUL 2006**
Expires: **30 JUN 2007**

E-2 Mass DEP Certified Parameter List

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 01 JUL 2006

M-MA022 **ANALYTICAL BALANCE CORP**
MIDDLEBOROUGH MA

NON POTABLE WATER (CHEMISTRY) **Effective Date** **01 JUL 2006** **Expiration Date** **30 JUN 2007**

Analytes	Methods	Analytes	Methods
ALUMINUM	SM 3113B	ALKALINITY, TOTAL	EPA 310.2
ALUMINUM	EPA 200.8	CHLORIDE	SM 4500-CL-B
ANTIMONY	SM 3113B	CHLORIDE	SM 4110B
ANTIMONY	EPA 200.8	SULFATE	SM 4110B
ARSENIC	SM 3113B	AMMONIA-N	EPA 350.1
ARSENIC	EPA 200.8	NITRATE-N	SM 4110B
BERYLLIUM	EPA 3113B	KJELDAHL-N	EPA 351.2
BERYLLIUM	EPA 200.8	ORTHOPHOSPHATE	SM 4500-P-E
CADMIUM	SM 3113B	ORTHOPHOSPHATE	SM 4110B
CADMIUM	EPA 200.8	PHOSPHORUS, TOTAL	SM 4500-P-B,E
CHROMIUM	SM 3113B	CHEMICAL OXYGEN DEMAND	* HACH METHOD 8000
CHROMIUM	EPA 200.8	BIOCHEMICAL OXYGEN DEMAND	SM 5210B
COBALT	EPA 200.8	CYANIDE, TOTAL	SM 4500-CN-C,E
COPPER	SM 3111B	NON-FILTERABLE RESIDUE	SM 2540D
COPPER	EPA 200.8	CHLORINE, TOTAL RESIDUAL	SM 4500-CL-G
IRON	SM 3111B	OIL AND GREASE	EPA 413.1
LEAD	SM 3113B	* OIL AND GREASE	EPA 1664
LEAD	EPA 200.8	VOLATILE HALOCARBONS	EPA 624
MANGANESE	SM 3111B	VOLATILE AROMATICS	EPA 624
MANGANESE	EPA 200.8		
MOLYBDENUM	EPA 200.8		
NICKEL	SM 3113B		
NICKEL	EPA 200.8		
SELENIUM	SM 3113B		
SELENIUM	EPA 200.8		
SILVER	SM 3111B		
SILVER	EPA 200.8		
THALLIUM	EPA 200.8		
VANADIUM	EPA 200.8		
ZINC	SM 3111B		
ZINC	EPA 200.8		
PH	SM 4500-H-B		
SPECIFIC CONDUCTIVITY	SM 2510B		
TOTAL DISSOLVED SOLIDS	SM 2540C		
HARDNESS (CACO3), TOTAL	SM 2340B		
HARDNESS (CACO3), TOTAL	SM 2340C		
CALCIUM	SM 3111B		
CALCIUM	SM 3500-CA-D		
MAGNESIUM	SM 3111B		
SODIUM	SM 3111B		
POTASSIUM	SM 3111B		
ALKALINITY, TOTAL	SM 2320B		

June 22, 2006 *** Provisional Certification** **Page 1 of 2**

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 01 JUL 2006

M-MA022 ANALYTICAL BALANCE CORP
MIDDLEBOROUGH MA

POTABLE WATER (CHEMISTRY) **Effective Date** **01 JUL 2006** **Expiration Date** **30 JUN 2007**

Analytes	Methods
ANTIMONY	EPA 200.8
ANTIMONY	SM 3113B
ARSENIC	EPA 200.8
ARSENIC	SM 3113B
BARIUM	EPA 200.8
BARIUM	SM 3113B
BERYLLIUM	EPA 200.8
BERYLLIUM	SM 3113B
CADMIUM	EPA 200.8
CADMIUM	SM 3113B
CHROMIUM	EPA 200.8
CHROMIUM	SM 3113B
COPPER	EPA 200.8
COPPER	SM 3111B
LEAD	EPA 200.8
LEAD	SM 3113B
MERCURY	EPA 200.8
NICKEL	EPA 200.8
NICKEL	SM 3113B
SELENIUM	EPA 200.8
SELENIUM	SM 3113B
THALLIUM	EPA 200.8
THALLIUM	EPA 200.9
NITRATE-N	SM 4110B
NITRATE-N	SM 4500-NO3-D
NITRITE-N	SM 4110B
NITRITE-N	SM 4500-NO2-B
FLUORIDE	SM 4110B
FLUORIDE	SM 4500-F-C
SODIUM	SM 3111B
SULFATE	SM 4110B
CYANIDE, TOTAL	SM 4500-CN-C,E
CYANIDE, TOTAL	SM 4500-CN-F
TURBIDITY	SM 2130B
CHLORINE, RESIDUAL FREE	SM 4500-CL-G
CALCIUM	SM 3500-CA-D
CALCIUM	SM 3111B
ALKALINITY, TOTAL	SM 2320B
TOTAL DISSOLVED SOLIDS	SM 2540C
PH	SM 4500-H-B
TRIHALOMETHANES	EPA 524.2
VOLATILE ORGANIC COMPOUNDS	EPA 524.2

June 22, 2006 *** Provisional Certification** **Page 2 of 2**

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 01 JUL 2006

M-MA022 **ANALYTICAL BALANCE CORP**
MIDDLEBOROUGH MA

POTABLE WATER (MICROBIOLOGY) **Effective Date** **01 JUL 2006** **Expiration Date** **30 JUN 2007**

Analytes and Methods

HETEROTROPHIC PLATE COUNT	SM9215B
TOTAL COLIFORM	MF-SM9222B
TOTAL COLIFORM	ENZ. SUB. SM9223
FECAL COLIFORM	MF-SM9222D
E. COLI	EC-MUG-SM9221F
E. COLI	ENZ. SUB. SM9223

June 22, 2006 *** Provisional Certification** **Page 1 of 1**

YSI Model 85

Handheld Oxygen, Conductivity, Salinity, mg/LC and Temperature System

Operations Manual

CONTENTS

For Complete manual see PDF Attached : YSI Mdl 85 Manual.pdf