Quality Assurance Project Plan

University of Rhode Island Watershed Watch - Ambient and Marine Field Monitoring Program

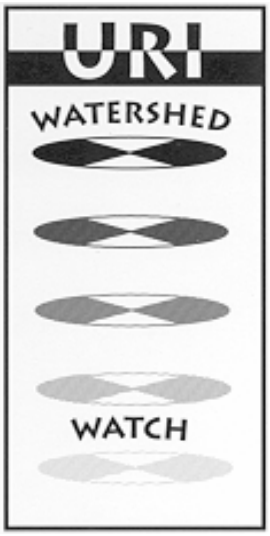
Block Island and Green Hill Pond Watersheds, Rhode Island

Date: December 2005
Prepared for: U.S. Environmental Protection Agency N.E. Region 1
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

Prepared by: University of Rhode Island Watershed Watch
URI Cooperative Extension Water Quality Program
College of the Environment and Life Sciences
Coastal Institute in Kingston
1 Greenhouse Road
Kingston, Rhode Island, 02881

Quality Assurance Project Plan

University of Rhode Island
Watershed Watch
Analytical Laboratory



University of Rhode Island Watershed Watch
URI Cooperative Extension Water Quality Program
College of the Environment and Life Sciences
Coastal Institute in Kingston
1 Greenhouse Road
Kingston, Rhode Island, 02881

Linda T Green, Program Director
Elizabeth M. Herron, Program Coordinator
Arthur J. Gold, Program Advisor

Marie Evans Esten, QAPP Preparer
Loon Environmental, LLC

Kingston, Rhode Island
2005

URI WATERSHED WATCH TECHNICAL REPORT NO. 6

Linda Green, M.S., Elizabeth Herron, M.A. and Arthur Gold, Ph.D. are members of the Dept. of Natural Resources Science, College of the Environment and Life Sciences, University of Rhode Island. **Contribution #5036 of the RI Agricultural Experiment Station**, with support from RI Cooperative Extension, RI Department of Environmental Management, United States Department of Agriculture and local governments.

For additional information or to request a copy:

Linda T Green, Program Director
401-874-2905 - lgreen@uri.edu

Elizabeth M. Herron, Program Coordinator
401-874-4552 - emh@uri.edu

Natural Resources Science Dept.
The Coastal Institute in Kingston
1 Greenhouse Road
Kingston, RI 02881

www.uri.edu/ce/wq/ww/html/ww.html

Approval List

Lead Organization Project Manager:

Robert Adler Date
Environmental Protection Agency, Region 1
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023
Phone: 617-918-1396 Fax: 617-918-2064

Lead Organization Quality Assurance Officer

Steve DiMattei Date
United States Environmental Protection Agency, Region 1
New England Laboratory
11 Technology Drive
North Chelmsford, Massachusetts 01863
Phone: 617-918-8369

Program Leader, University of Rhode Island Cooperative Extension Water Quality Programs and Faculty Advisor to the University of Rhode Island Watershed Watch (URIWW)

Dr. Arthur Gold Date
University of Rhode Island
College of the Environment and Life Sciences
Department of Natural Resources
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2903

Block Island/Green Hill Pond Project Manager

Galen McGovern Date
58 Rockland Drive
Wakefield, Rhode Island 02879
Phone: 401-789-6647

Approval List (continued)

Block Island/Green Hill Pond Project Manager

Lorraine Joubert Date
University of Rhode Island Cooperative Extension
Coastal Institute in Kingston
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2138

University of Rhode Island Watershed Watch Program Director and Laboratory Project Manager – Nutrients

Linda Green Date
University of Rhode Island Watershed Watch Laboratory
University of Rhode Island Cooperative Extension
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2905 Fax: 401-874-4561

University of Rhode Island Watershed Watch Program Coordinator and Laboratory Project Manager – Microbiology

Elizabeth Herron Date
University of Rhode Island Watershed Watch Laboratory
University of Rhode Island Cooperative Extension
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-4552 Fax: 401-874-4561

Quality Assurance Project Plan Preparer

Marie Evans Esten Date
Loon Environmental LLC
41 Rhodes Avenue
Riverside, Rhode Island 02915
Phone: 401-433-2684

Approval List (continued)

Laboratory Quality Assurance Advisor

Jose Amador — Date
University of Rhode Island
Department of Natural Resources Science
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2905 Fax: 401-874-4561

Cooperating Agency – Rhode Island Department of Environmental Management

Susan Kiernan - Deputy Chief — Date
Rhode Island Department of Environmental Management
Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908
Phone: 401-222-3961

Town of New Shoreham

Donald Thimble — Date
Wastewater Management Specialist
Town of New Shoreham
P. O. Drawer 220
New Shoreham, Rhode Island 02807
Phone: 401-466-8924

Salt Ponds Coalition

Victor Dvorak or Bambi Poppick — Date
Executive Director
P.O. Box 375
Charlestown, Rhode Island 02813
Phone: 401-322-3068

Distribution List

Lead Organization Project Manager
Robert Adler
United States Environmental Protection Agency, Region 1
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023
Phone: 617-918-1396 Fax: 617-918-2064

Lead Organization Quality Assurance Officer
Steve DiMattei
United States Environmental Protection Agency, Region 1
New England Laboratory
11 Technology Drive
North Chelmsford, Massachusetts 01863
Phone: 617-918-8369

Program Leader, University of Rhode Island Cooperative Extension Water Quality Programs and Faculty Advisor to the University of Rhode Island Watershed Watch (URIWW)
Dr. Arthur Gold
University of Rhode Island
College of the Environment and Life Sciences
Department of Natural Resources
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2903

Block Island/Green Hill Pond Project Manager
Galen McGovern
58 Rockland Drive
Wakefield, Rhode Island 02879
Phone: 401-789-6647

Block Island/Green Hill Pond Project Manager
Lorraine Joubert
University of Rhode Island Cooperative Extension
Coastal Institute in Kingston
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2138

Distribution List (continued)

Project Manager
Joyce Hudson
Environmental Protection Agency, Headquarters
Municipal Support Division (4204)
1200 Pennsylvania Avenue NW
Washington DC, 20460

University of Rhode Island Watershed Watch Program Director and Laboratory Project Manager – Nutrients
Linda Green
University of Rhode Island Watershed Watch Laboratory
University of Rhode Island Cooperative Extension
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2905 Fax: 401-874-4561

University of Rhode Island Watershed Watch Program Coordinator and Laboratory Project Manager – Microbiology
Elizabeth Herron
University of Rhode Island Watershed Watch Laboratory
University of Rhode Island Cooperative Extension
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-4552 Fax: 401-874-4561

Quality Assurance Project Plan Preparer
Marie Evans Esten
Loon Environmental LLC
41 Rhodes Avenue
Riverside, Rhode Island 02915
Phone: 401-433-2684

Laboratory Quality Assurance Advisor
Jose Amador
University of Rhode Island
Department of Natural Resources Science
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-2905 Fax: 401-874-4561

Cooperating Agency – Rhode Island Department of Environmental Management
Susan Kiernan
Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908
Phone: 401-222-4700

Distribution List (continued)

Block Island Watershed

Town of New Shoreham
Nancy Dodge
Town Manager
P.O. Drawer 220
New Shoreham, Rhode Island 02807

Town of New Shoreham
Donald Thimble
Wastewater Management Specialist
P. O. Drawer 220
New Shoreham, Rhode Island 02807
Phone: 401-466-8924

The Committee for the Great Salt Pond
Carl Kaufman
PO Box 1092
Block Island, Rhode Island 02807

New Shoreham Planning Board
Dorothy McCluskey
P.O. Drawer 220
New Shoreham, Rhode Island 02807

Block Island Steering Committee
Bill Healy
37 River Road
Deep River, Connecticut 06417

Distribution List (continued)

Green Hill Watershed

Salt Ponds Coalition
Victor Dvorak or Bambi Poppick
Executive Director
P.O. Box 375
Charlestown, Rhode Island 02813
Phone: 401-322-3068

Town of South Kingstown
Stephen Alfred
Town Manager
180 High Street
Wakefield, Rhode Island 02879

Town of South Kingstown
Kerry Mahoney
Wastewater Management Specialist
180 High Street
Wakefield, Rhode Island 02879

Charlestown Wastewater Planning Commission
Gus Walker
Charlestown Town Hall
4540 South County Trail
Charlestown, Rhode Island 02813

Town of South Kingstown
Ray Nickerson
180 High Street
Wakefield, Rhode Island 02879

Town of Charlestown
Diane Johnson
Wastewater Management Specialist
Charlestown Town Hall
4540 South County Trail
Charlestown, Rhode Island 02813

Distribution List (continued)

Cooperating Agencies and Organizations:

Rhode Island Department of Environmental Management
Brian Zalewsky
Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908
Phone: 401-222-4700 ext. 7145

University of Rhode Island On-Site Wastewater Training Center
George Loomis
Director
University of Rhode Island Cooperative Extension
Coastal Institute in Kingston
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-4558 Fax: 401-874-4561

University of Rhode Island On-Site Wastewater Training Center
David Kailen
Manager
University of Rhode Island Cooperative Extension
Coastal Institute in Kingston
1 Greenhouse Road
Kingston, Rhode Island 02881
Phone: 401-874-5950 Fax: 401-874-4561

Rhode Island Coastal Resources Management Council
Kevin Cute
Oliver Stedman Government Center
4808 Tower Hill Road
Wakefield, Rhode Island 02879

List of Abbreviations

Abbreviation	Definition
ACE	Army Corps of Engineers
CA	Corrective Action
COC	Chain-of-Custody
CE	Cooperative Extension
%D	Percent Difference
DI	Deionized Water
DQIs	Data Quality Indicators
DO	Dissolved Oxygen
DQO	Data Quality Objectives
g	Gram
L	Liter
LCS	Laboratory Control Standard (standard analyzed as a sample)
MDL	Method Detection Limit
mL	Milli-liter
mg	Milli-gram
MPN	Most Probably Number
MS	Matrix Spike
NA	Not Applicable
NEMO	Non-point Education for Municipal Officials
OWTC	On-site Wastewater Treatment Center
ppb	Parts per billion (µg/L)
ppm	Parts per million (mg/L)

List of Abbreviations (continued)

Abbreviation	Definition
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
R^2	Coefficient of Determination
RIDEM	Rhode Island Department of Environmental Management
RIHealth	Rhode Island Department of Health
%RPD	Replicate Percent Difference
RL	Reporting Limit (Quantitation Limit)
SOP	Standard Operating Procedure
SU	Standard Unit (pH units)
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
µg	Micro-gram
URIWW	University of Rhode Island Watershed Watch
URI	University of Rhode Island
USEPA	United States Environmental Protection Agency

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1.0 PURPOSE AND DESCRIPTION

The towns of South Kingstown, Charlestown and New Shoreham, Rhode Island, in partnership with the University of Rhode Island (URI) through a grant from the United States Environmental Protection Agency (USEPA) are demonstrating a watershed approach to managing on-site wastewater systems using risk-based methods. Two critical areas of southern Rhode Island were chosen for the demonstration: Block Island and Green Hill Pond watersheds (figure 1). The Green Hill Pond watershed is part of the Southwest Coastal Watershed. The purpose of this project is to establish sustainable wastewater management programs in the two project locations using site-specific performance standards and a range of alternative technologies to reduce pollution risk to local water resources while accommodating environmentally sound development. The primary project goals are two-fold, first to accelerate the implementation of wastewater performance standards adopted by the Town of New Shoreham that utilize a risk-based approach to wastewater management and secondly to fully implement wastewater management programs in the Green Hill Pond watershed communities of Charlestown and South Kingstown by adapting similar risk-based methods to suit local needs.

The work plan sets 11 objectives to achieve the project goals. These objectives are common to all three project communities and include:

1. Develop and maintain a process to coordinate and manage the project with community involvement.
2. Identify wastewater treatment needs using Geographic Information System (GIS)-based assessment methods and select management alternatives considering a range of land use planning techniques and wastewater treatment technologies capable of meeting resource-specific water quality goals.
3. Through field investigations, determine site-suitability for on-site wastewater treatment and identify parcel-specific wastewater management options in selected high-risk septic system failure areas.
4. Retrofit, repair or replace septic systems in high-risk “hot spots” using a range of innovative and alternative technologies through demonstration system installation.
5. Establish inspection-based septic system maintenance and repair ordinances, with supporting administrative procedures, technical guidance, inspection tracking database and long-term financing mechanisms.
6. Establish performance-based wastewater treatment standards for new systems and repairs that will minimize pollution risks to local water resources and be consistent with community goals.
7. Encourage participation in and expansion of existing financial assistance programs, to create additional incentives to retrofit, repair or upgrade on-site wastewater systems in accordance with risk-based performance standards.
8. Through training and technology transfer, build capacity of town staff/consultants to effectively administer septic system management programs and of wastewater professionals to design, construct and maintain alternative on-site wastewater technologies.

9. Monitor and evaluate the performance of alternative technologies installed as demonstration systems to determine wastewater renovation efficiency, system operation and maintenance needs and owner satisfaction.
10. Design and implement a monitoring program to track water quality trends in surface and ground waters and provide results of this monitoring and related local research in an accessible format to local decision makers and the general public.
11. Design and carry out an outreach strategy to promote local adoption of wastewater management practices and report project accomplishments to local, state and national audiences.

This Quality Assurance Project Plan (QAPP) only addresses pond and tributary water quality monitoring as part of the watershed monitoring program discussed in action 10.1. A QAPP has already been written and accepted for the tap water assessment aspect of the watershed monitoring program conducted under action 10.1 (URI, 2001). As part of objective 10, action 10.1 is to:

- Design and implement a watershed monitoring program with the purpose of establishing baseline conditions for water quality and ecosystem health,
- Document trends related to natural variability and effects of land use/wastewater management practices and
- Identify potential pollution problem areas in the study area watersheds.

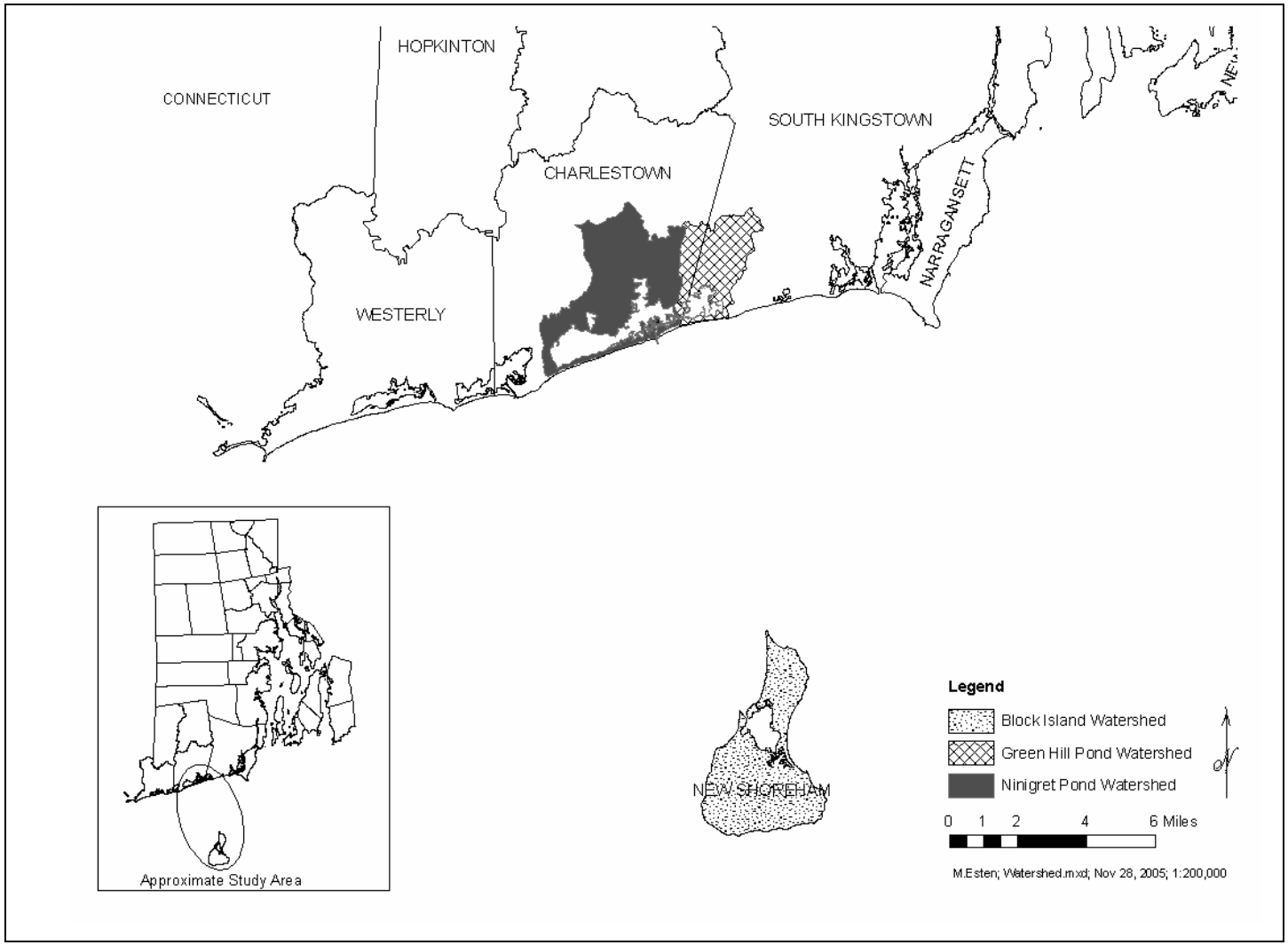
The watershed monitoring program will be designed to enhance public awareness of water resource values by involving, where practical, citizen volunteers working with local watershed groups and by making results available to the public in a user friendly format. The tasks under action 10.1 include:

1. Assembling a monitoring subcommittee composed of town representatives, local monitoring organizations, agency and university representatives and others with interest in local water quality issues and/or expertise in monitoring and database management.
2. Designing a water quality monitoring program focusing on surface waters, groundwater and private well-water testing and building on existing volunteer monitoring efforts. The program needs to continue monitoring following project completion. The focus will be to merge data collection with public outreach goals through volunteer monitoring as a vehicle to promote local awareness of watershed issues. Volunteer monitors will receive training on the science and management of watersheds. Sponsoring local organizations can use monitoring results to promote stewardship of resources at both the individual and community level. This relatively low-cost alternative will also enable the project communities to maintain the capability to continue monitoring long after the demonstration project is completed. The monitoring program may be designed to include adult volunteers and children through school/camp programs. Innovative methods of involving volunteers will be explored such as field monitoring for student groups sponsored through local nonprofit environmental organizations. Types of monitoring may include:
    a. Shoreline and watershed surveys
    b. USGS or other existing test wells for groundwater sampling

c. Stream flow and habitat monitoring
d. Pond water quality sampling
e. Eelgrass mapping and habitat evaluation
f. Private well-water testing.

3. Oversee the monitoring program and organize volunteers as needed.
4. Provide technical support, including monitor training and equipment, laboratory support and data analysis and interpretation
5. Coordinate design of the monitoring program with USEPA Narragansett Laboratory, the Army Corps of Engineers (ACE) coastal habitat restoration project, Rhode Island Department of Environmental Management (RIDEM) and others with current or proposed field investigation projects in the study area. Consistent methods for data collection, data sharing and display will be identified. Opportunities for obtaining USEPA technical support in "fingerprinting" bacteria types to determine sources will be investigated as well as opportunities to investigate vulnerability and response to nutrient loading in Green Hill Pond as part of the ACE coastal habitat restoration project.
6. Provide monitoring results in a user-friendly format for residents and visitors. This will include data summaries in Salt Pond Coalition newsletters, Watershed Watch annual reports and an annual report of water quality on Block Island. Innovative methods to report results annually to community residents will also be investigated.

Figure 1 - Study Area Watersheds



1.1 Sampling Design and Rational

Two scientific steering committees made up of regulators (RIDEM, Coastal Resources Management Council (CRMC), the United States Environmental Protection Agency (USEPA)), scientists and citizens groups were established in the two watersheds of project interest: Block Island and Green Hill Pond. These steering committees were tasked with determining the sampling design for the watershed of interest.

Three initial meetings were held to discuss the pond and tributary water quality sampling aspect of the watershed monitoring portion of the project. The meetings included the executive board of the Salt Ponds Coalition, representatives from RIDEM, concerned citizens from Block Island and members of the Salt Ponds Coalition. Since both the Block Island monitoring community and the Salt Ponds Coalition had already been sampling water quality in local ponds, meetings focused on how the data will be used in this program.

Sampling objectives, locations, number of sites and parameters monitored for each project location were finalized with advisory review by agency and university members of the Monitoring Subcommittee. Monitoring in Green Hill, Ninigret and Great Salt Ponds is consistent with monitoring that was being completed by local non-profit environmental groups prior to the start of this project. This monitoring includes samples for nutrients, bacteria, chlorophyll, clarity, dissolved oxygen, salinity, pH and other basic indicators.

The Green Hill and Ninigret pond sampling sites were selected from a sub-set of monitoring stations already being monitored by the Salt Ponds Coalition (figures 2 and 3). The Great Salt Pond sites on Block Island were chosen based on areas of concern: the boat basin and tributaries draining into the pond (figure 4). No prior documentation of the magnitude of nutrient loading to Great Salt Pond from tributaries was available making these stations very important. During the course of the project additional stations were added to further assess the role of the tributaries to pond water quality.

Parameters of concern were based on the need to determine the nutrient status of the study areas. The URIWW group had previously determined that the selected factors would provide a basic understanding of a system over time based on other volunteer monitoring efforts they had coordinated. These parameters include: DO, temperature, salinity, chlorophyll-a, Secchi depth, bacteria, pH, ammonia, nitrate + nitrite, total nitrogen and phosphorus and TSS (table 2.6.1).

1.2 Project sampling overview

Biweekly sampling at the Green Hill Watershed pond sites (Green Hill and Ninigret ponds) includes the collection of temperature, DO, wind speed, light conditions, precipitation (rain data), state of tide and chlorophyll samples. Biweekly sampling at the Block Island watershed pond sites (Great Salt Pond) includes the same parameters as the Green Hill Watershed pond sites as well as Secchi disk transparency at each in-pond site and salinity at all sites. In 2001 and 2002 salinity and DO samples collected at the Block Island Watershed pond sites were analyzed by the volunteer monitors using LaMotte test kits. Beginning in 2003 and continuing through 2005 the Block Island monitoring group (Committee for the Great Salt Pond) utilized a YSI multi-parametric probe (YSI 85) for the collection of temperature, DO and salinity. After

2001 salinity samples from the Green Hill Watershed pond sites were sent to the URIWW laboratory instead of having volunteers analyze the salinity samples in the field.

Monthly water collection sampling includes the collection of samples for fecal coliform, Escherichia coli (E. coli), pH, ammonia, nitrate/nitrite, total phosphorus and nitrogen and salinity. Enterococci samples are collected as time permits as part of a method development project. In addition, total suspended solids (TSS) samples are collected at tributary sites on Great Salt Pond. Generally, the monthly water sample collection coincides with the biweekly sampling.

During the winter months (November through April) a modified water collection suite consisting of pH, nitrate/nitrite and total nitrogen and phosphorus is collected monthly from the Green Hill and Ninigret ponds dock sites only. Dock sites are noted in figures 2, 3 and 4.

Bacteria samples were also collected and provided to the URI Microbiology department to allow comparison of data from the membrane method utilized by the URIWW program and the Maximum Probable Number (MPN) method utilized by the Microbiology department. These comparison data were not reported as part of this project, but were used internally to provide method comparison. In 2001 and 2002 the comparison was completed on field duplicates. In 2003 through 2005 one sample was collected and then split in the field to provide the two samples for method comparison (see Section 2.4 – Comparability for further information).

Additional information on this study area is also available in the RIDEM draft Total Maximum Daily Loading (TMDL) study completed in 2004. This TMDL study focuses upon fecal coliform impairments within the study waterbodies and is available for review at the following web-site: http://www.dem.ri.gov/programs/benviron/water/quality/rest/pdfs/ghptmdl.pdf as of December of 2005.

The sampling locations utilized for the study described here were also utilized as sampling locations for the RIDEM TMDL and sampled by the Salt Pond Coalition previous to the start of this study. A cross-reference between the identification numbers utilized by the Salt Pond Coalition and the site names utilized by URI is provided in table 1.2.1.

1.2.1 Cross-Reference between sampling locations utilized by URI and Salt Pond Coalition Table

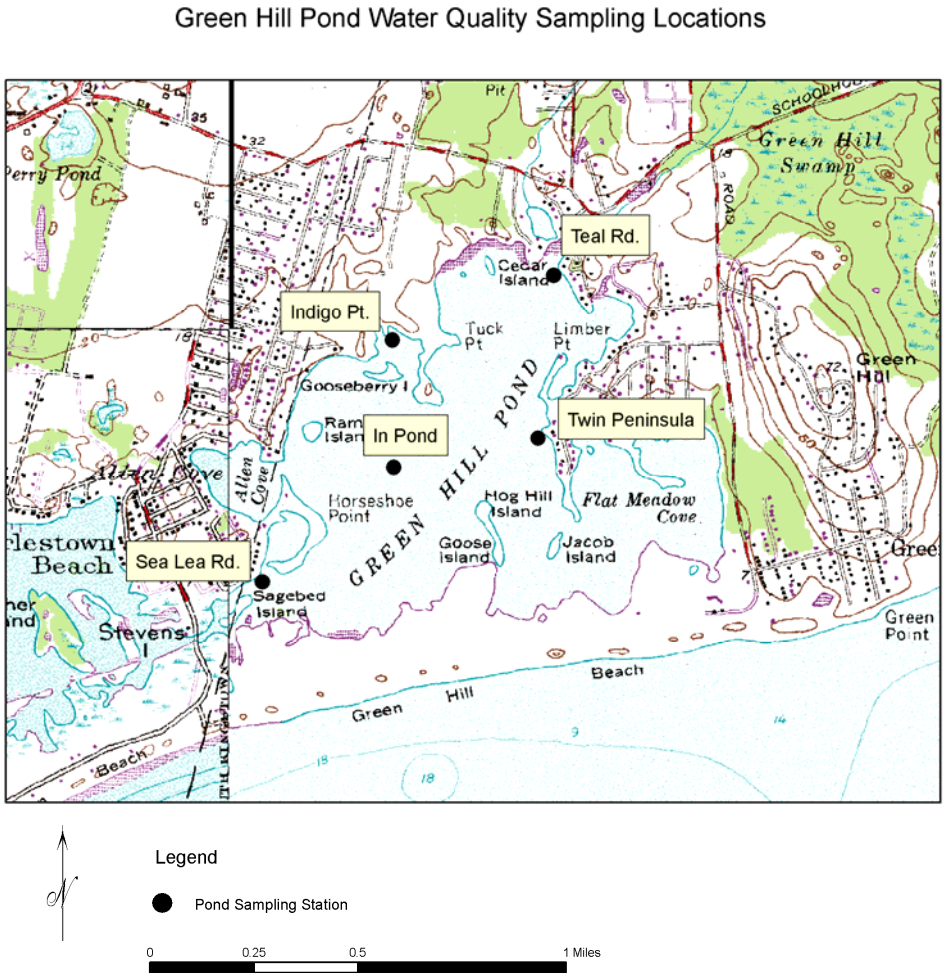
URI Site Name	Salt Pond Coalition Number
Sea Lea Rd.	14
Teal Rd.	16G
Indigo Pt.	16I
Twin Peninsula	16T
Crawford Dock	15
Tockwotten Cove	11A
Pond St.	12B

Note: Several locations sampled by URI as part of this project do not have corresponding Salt Pond Coalition Numbers (In Pond sites, Fort Neck Cove, Tom Cod Cove, Stumpy Pt., Vigna's Dock).

1.3 Schedule/Time-Line

Pond and tributary monitoring will occur from approximately May through October from 2001 through October of 2005 including optional sampling dates for the winter months (November through April) if weather and resources (volunteer time, etc.) permit. Sampling is completed on a biweekly interval during the summer months and a monthly basis during the winter. Schedules are attached (Appendix C).

Figure 2 - Green Hill Pond Water Quality Sampling Locations

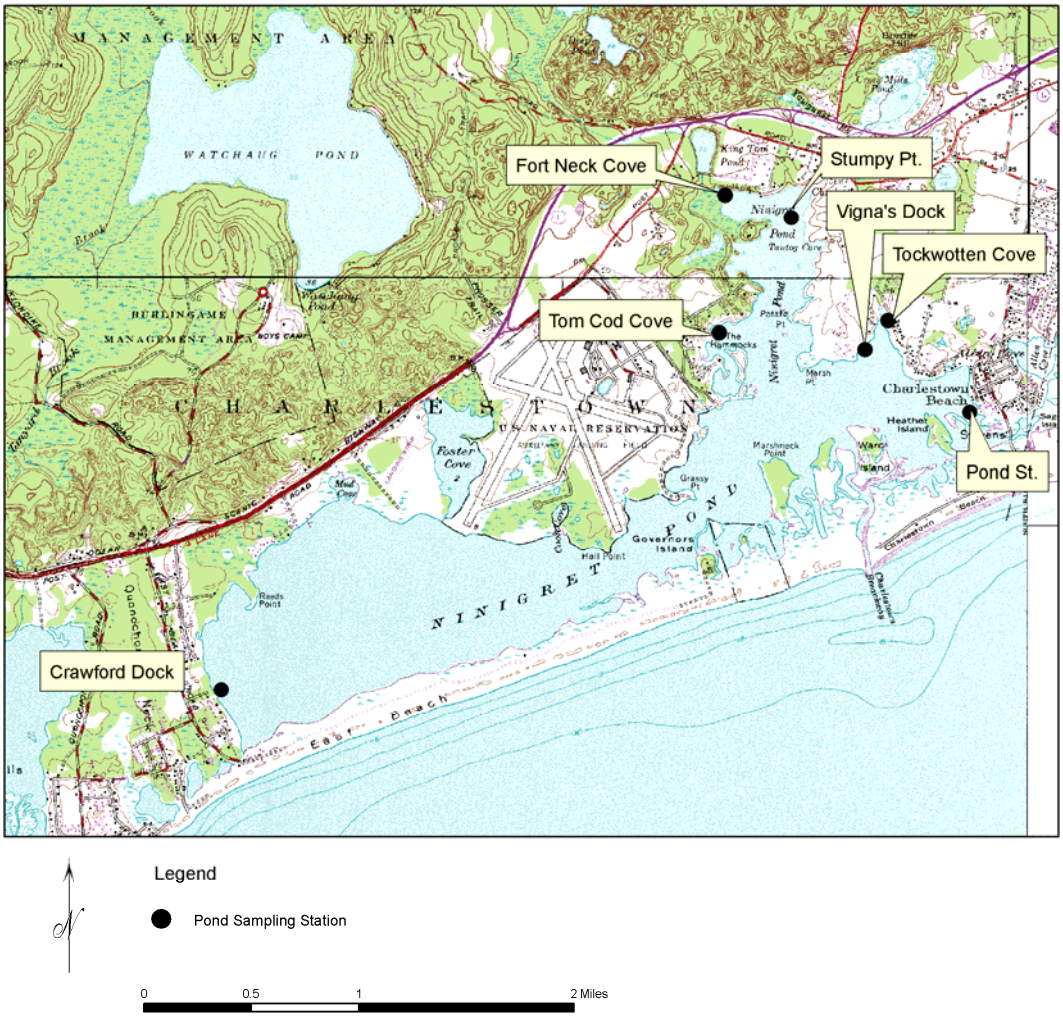


Note: All samples taken from Green Hill Pond are collected from docks except the “In Pond” site, which is collected from a boat. Winter samples, as described in Section 1.2 are collected at dock sites only.

M.Esten
GreenHillSampleLocal
May 11, 2005
1:20,000

Figure 3 - Ninigret Pond Sampling Locations

Ninigret Pond Water Quality Sampling Locations

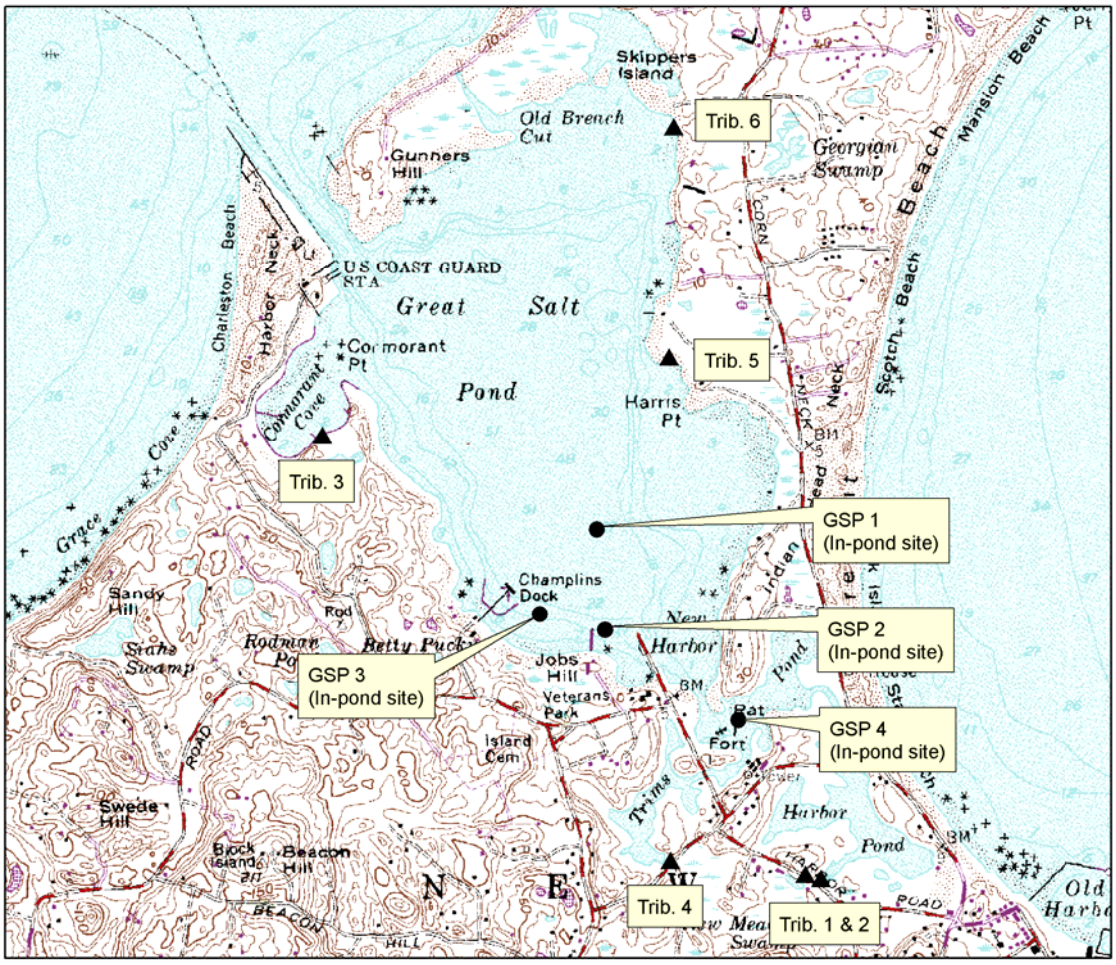


Note: All samples taken from Ninigret Pond are collected from docks. Winter samples as described in Section 1.2 are collected at all sites.

M. Esten
NinigretSampleLocal
May 20, 2005
1:40,000

Figure 4 - Great Salt Pond Sampling Locations

Great Salt Pond Water Quality Sampling Locations



Note: All samples collected from "GSP" sites are collected from boats. All samples collected from "Trib." sites are collected from shore. No winter samples are collected from Great Salt Pond.

M.Esten
BlockIslandSampleLocal
May 11, 2005
1:20,000

Required Information Checklist

EPA-NE Work-sheet number	Worksheet Title	Location In QAPP
1	Title and approval	In narrative
2	Table of contents & document format	In narrative
3	Distribution list	In narrative
4	Project personnel sign-off sheet	All relevant personnel are included on the approval page
5a	Organizational chart	Figure 5
5b	Communication pathway	Section 1.4 in narrative
6	Personnel responsibilities and qualification	Section 1.4 in narrative
7	Special personnel training requirements	Section 1.4.2 in narrative
8a	Project scoping meeting attendance sheet, agenda	Section 1.1 and 1.2 in narrative
8b	Problem definition/site history & background	Section 1.0 in narrative
9a	Project description	Section 1.0 in narrative
9b	Contaminants of concern	Section 2.6.1
9c	Field & QC sample summary	Section 2.6.2
10	Project schedule timeline	Section 1.2 in narrative
11a	Project quality objectives/decision statements	Section 2.0 in narrative
11b	Measurement performance criteria	Section 2.6.3
12a	Sampling design & rationale	Section 1.1 in narrative and 2.6.4
12b	Sampling locations, methods, SOP requirements	Section 2.6.5

EPA-NE Work-sheet number	Worksheet Title	Location In QAPP
13	Project sampling SOP references	Section 2.6.6
14	Field sampling equipment calibration	Section 2.6.7
15	Field equipment maintenance, testing and inspection	Section 2.6.8
16	Sampling handling, tracking, custody	Section 3.0 in narrative, Section 3.2, figures 6 and 7
17	Field analytical method /SOP references	Section 2.6.9
18	Field calibration	All relevant information summarized in Worksheet 14
19	Field maintenance	All relevant information summarized in Worksheet 15
20	Fixed lab. Analytical method/SOP references	Section 2.6.10
21	Fixed lab. instrument maintenance & calibration	Section 2.6.11
22a	Field sampling QC	Section 2.6.12
22b	Field sampling QC continued	NA
23a	Field analytical QC	Section 2.6.13
23b	More field QC	NA
24a	Fixed lab. analytical QC	Section 2.6.14
24b	More lab analytical QC	No multiple analytes
25	Non-direct measurement criteria	NA
26	Project documentation and records	Section 4.0 in narrative
27a	Assessment and response	Section 4.1 in narrative
27b	Project assessment	Section 4.1 in narrative

EPA-NE Work-sheet number	Worksheet Title	Location In QAPP
27c	Project assessment plan	Section 4.1 in narrative
28	QA management reports	Section 4.2 in narrative
29a	Data evaluation process	Section 4.2 in narrative
29b	Data validation summary	Section 4.2 in narrative
29c	Data validation modifications	Section 4.2 in narrative
30	Data usability assessment	Section 4.2 in narrative

Notes:
NA – Not applicable to this QAPP.

1.4 Quality Assurance Project Plan (QAPP) Objectives

The objective of this QAPP is to present the organization, objectives and specific quality assurance/quality control (QA/QC) procedures associated with the in pond and tributary monitoring for the Block Island and Green Hill Pond Watershed, USEPA National Community Decentralized Wastewater Treatment Demonstration Project. A summary of QA/QC procedures for the collection and analysis of the following contaminants of concern (COC) are provided in this document: chlorophyll-a, salinity, water temperature, dissolved oxygen (DO), pH, Secchi depth transparency, fecal coliform, *E. coli,* Enterococci, total suspended solids, ammonia, nitrate/nitrite and total nitrogen and phosphorus. Specific QA/QC criteria, sampling and analysis procedures and method documentation for laboratory and field analyses are located in individual Standard Operation Procedures (SOPs) in Appendix A of the URIWW Laboratory Program QAPP and the URIWW Field Program – Ambient and Marine Sampling Program QAPP, respectively.

1.5 Organization and Communication

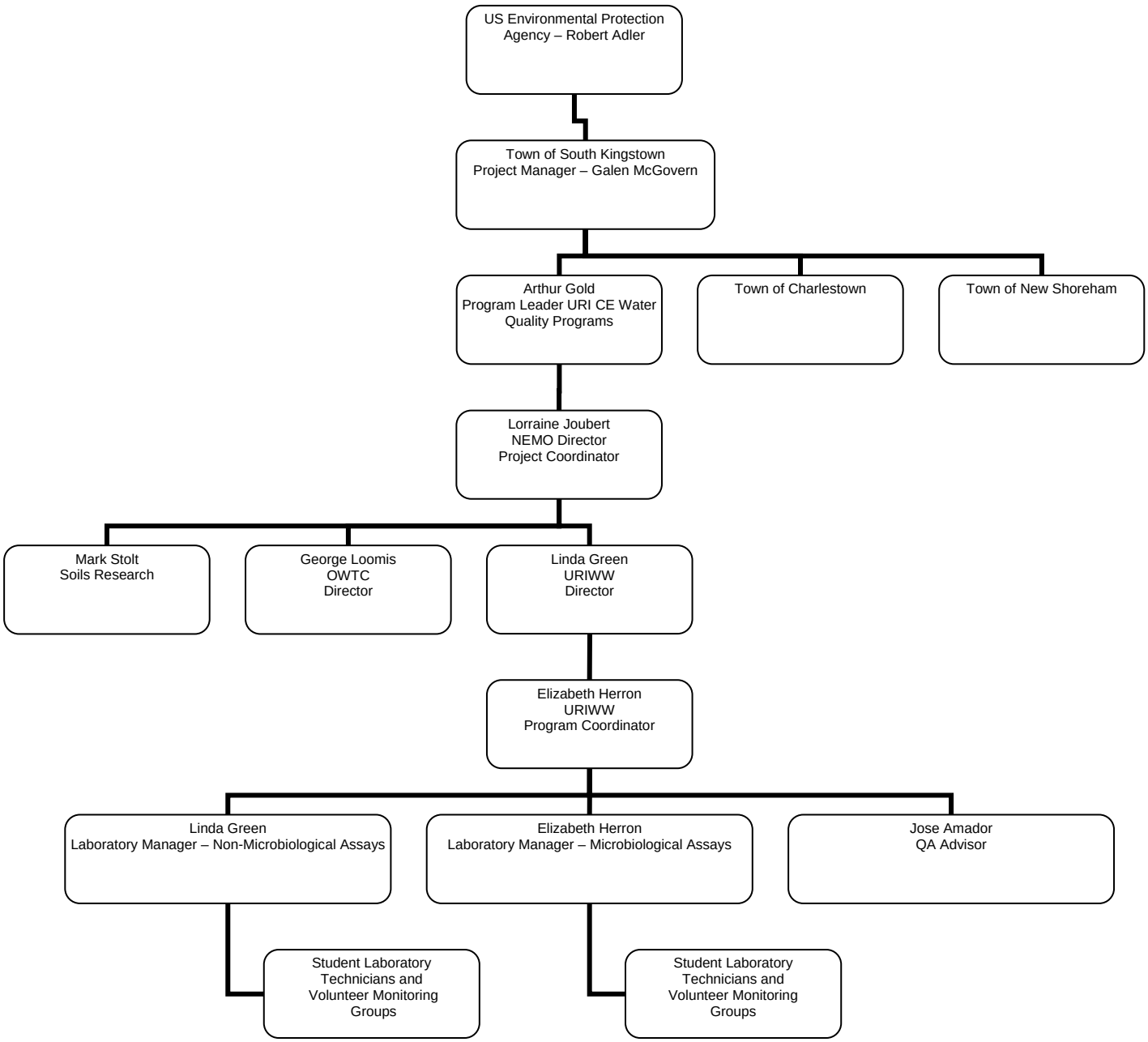
Galen McGovern is the local project manager responsible for coordinating tasks completed by URI, the Town of Charlestown and the Town of New Shoreham; program oversight is provided by the EPA. Dr. Arthur Gold is the Program Leader of the Cooperative Extension (CE) Water Quality Program and faculty advisor to the URIWW program. He provides project guidance for tasks completed by URI programs. Lorraine Joubert is the director of the URI Non-point Education for Municipal Officials (NEMO) group as well as the project coordinator for tasks delegated to URI. Ms. Joubert coordinates tasks completed by Mark Stolt (soils research), George Loomis (On-Site Wastewater Treatment Center (OWTC)) and Linda Green (URIWW). The QAPP presented here deals only with the tasks completed by the URIWW group.

Linda Green is the URIWW Program Director as well as the overall Laboratory Project Manager and Laboratory Manager for nutrient analyses. As such she is responsible for overall operation of the laboratory as well as the QA/QC of all non-microbiological related assays. Elizabeth

Herron is the URIWW Program Coordinator and Laboratory Project Manager for microbiological analysis. She is responsible for the analysis and QA/QC of microbiological assays. Dr. Jose Amador will provide QA/QC guidance. Ms. Herron and Ms. Green are both responsible for the supervision of student laboratory technicians and coordination with volunteer water quality monitoring groups.

All changes to the QAPP or specific SOPs will completed only after review and acceptance by Ms. Green or Ms. Herron.

Figure 5 - Water Quality Monitoring Task Structure



1.5.1 Personnel Qualifications

A brief description of the experience of principal project personnel is described here. Resumes of key personnel are located in Appendix B.

Galen Howard McGovern has over 10 years of experience in the field of water resources management. She has worked in various capacities from Water Allocation Planner to Environmental Scientist. These positions have allowed Ms. McGovern to gain an understanding of not only water resources issues, but also how to practically implement protective measures to protect natural resources by drafting legislation and town plans.

Dr. Arthur Gold is a watershed hydrologist and Professor in the Department of Natural Resources Science at URI. He has over 20 years of experience in the field of water resources; has published over 60 refereed journal articles and has served on numerous national and international committees dealing with water resources. Currently, Dr. Gold is the associate director of the URI Coastal Institute and is the program leader for the URI CE.

Lorraine Joubert is the director of the URI NEMO program. This Cooperative Extension outreach program provides training and technical assistance to local officials in evaluating and managing local water resources. Ms. Joubert has over 20 years of experience in the field of water resources and has been with CE since starting the NEMO program in 1993. She has published numerous reports and technical assessment guides relating to wastewater treatment and community development.

Linda Green is a Research Associate IV in the Department of Natural Resources Science at URI. Ms. Green has over 25 years of analytical laboratory related experience and has been the director of URIWW for over 18 years. She is the recipient of numerous awards and grants related to her work with the URIWW program and has authored numerous articles and technical publications. Ms. Green has hosted workshops on QA/QC in volunteer monitoring programs and is the sole volunteer monitoring representative on the National Water Quality Monitoring Council as well as a co-founding member of the Rhode Island Volunteer Monitoring Steering Committee.

Elizabeth Herron is a Research Associate II in the Department of Natural Resources Science at URI. Ms. Herron has over 15 years of experience in the field and is a former director of the North American Lake Management Society as well as a co-founding member of the Rhode Island Volunteer Monitoring Steering Committee. She has authored numerous articles and technical publications and has presented workshops and technical papers throughout the United States.

Dr. Jose Amador has 20 years of experience in the field of soil science, microbiology and nutrient chemistry. He has published over 40 peer reviewed articles and is currently a Professor of microbial ecology and soil science in the Department on Natural Resources Science at URI.

1.5.2 Training

Training of laboratory personnel is conducted by Linda Green and Elizabeth Herron. Laboratory training is provided on basic laboratory techniques as well as method-specific details. Training requirements for each assay are provided in analyte-specific SOPs. All laboratory assays are conducted by laboratory personnel; no volunteer monitors conduct any laboratory assays.

Training of volunteer monitoring personnel is conducted by Linda Green and Elizabeth Herron. Training is provided on limnologic principals, basic water sample collection and method-specific details for the collection of basic physical and chemical parameters in the field. Training consists of classroom and field workshops held by Ms. Green and Ms. Herron providing verbal and hands-on training with the collection apparatus and the analysis of water samples. Each volunteer is provided with a copy of the Salt Ponds Monitoring Manual, which contains written instructions for the collection and analysis of field samples. Attendance of at least one field training session is mandatory and attendance of a classroom workshop is strongly encouraged. Workshop attendance records are retained by the URIWW group.

The Committee for the Great Salt Pond is responsible for monitoring of the Great Salt Pond, Block Island. This group utilizes a YSI multi-parametric field meter for the collection of temperature, salinity and DO. URIWW does not provide training on this instrument. It is assumed for the purposes of this QAPP that the group follows the instrument instruction manual specifications in regard to calibration and maintenance on this instrument. QA/QC information for this instrument will not be included in this QAPP since it is not controlled by URIWW.

2.0 LABORATORY QUALITY OBJECTIVES AND MEASUREMENT PERFORMANCE CRITERIA

High quality data is the goal of all URIWW Laboratory analyses, field analytical and sample collection procedures. Specific data quality objectives have been set for laboratory and field analytical procedures on a method basis for method detection limits (MDL), precision, accuracy, comparability and completeness. Values specific to each of these objectives are located in analyte-specific SOPs located in Appendix A of the URIWW Laboratory QAPP and Appendix A of the URIWW Field Program – Ambient and Marine Sampling Program QAPP.

Data generated under this QAPP will be utilized to track trends in the water bodies sampled. Since the data generated will be used to track trends over time all accepted data will be reported and utilized to track said trends. If data is not accepted during review it will not be used in the project. Therefore, no specific project action limits or if/then statements are set. Measurement performance criteria are set at method reporting limits.

2.1 Method Detection Limits (MDL) and Reporting Limit (RL)

The MDL is the analyte concentration where there is 99% confidence that the sample concentration is different than zero. Below the MDL it is uncertain if the concentration is not zero. The reporting limit (RL) is the value above which data have definable accuracy and precision. Each analyte of interest has a specific MDL and RL value. These values are located in the analyte-specific SOPs located in Appendix A of the URIWW Laboratory QAPP and

Appendix A of the URIWW Field Program – Ambient and Marine Sampling Program QAPP as well as worksheet 11b (see Section 2.6.3).

The analytical method MDL as reported in Section 2.6.1 for each assay is often different from the achievable laboratory MDL. Generally, the achievable laboratory MDL is higher than the analytical method MDL. This is often the case because the MDL listed for an analytical method is for the best case scenario. In this scenario, there are no other contaminants present in a sample that could cause interferences during sample analysis, the method blank would be extremely low and all equipment would function without error. Unfortunately, this is generally not the case. At the very low contaminant levels that the laboratory is able to analyze samples to it is easy to introduce some contamination from water or reagents. Therefore, the laboratory elevates the method MDL to a level that will account for these concerns.

2.2 Precision

Precision is a measure of the degree to which two or more measurements of the same sample are in agreement as well as a measurement of random error. Precision will be assessed through the measurement of duplicate samples (one sample split into two (2) replicates) and subsequent calculation of the relative percent difference (%RPD) as described below.

$$\%RPD = \frac{\left| \text{Result of Replicate 1} - \text{Result of Replicate 2} \right|}{\text{Average of Result of Replicate 1 and Result of Replicate 2}} \times 100$$

Objectives for precision are located in the analyte-specific SOPs located in Appendix A of the URIWW Laboratory QAPP and Appendix A of the URIWW Field Program – Ambient and Marine Sampling Program QAPP as well as worksheet 11b (section 2.6.3).

2.3 Accuracy

Accuracy is an evaluation of the degree to which a measured value and a known reference value or true value are in agreement. This is a measurement of systematic error and is often referred to as “bias”. Accuracy is determined by the analysis of reference material and comparison of the resulting value to that of the accepted value. The difference between the accepted and reference value is the percent difference (%D). The %D is calculated as follows:

$$\%D = \frac{\left| \text{Known Value of Reference Material} - \text{Calculated Value of Reference Material} \right|}{\text{Known Value of Reference Material}} \times 100$$

Objectives for accuracy are located in the analyte-specific SOPs located in Appendix A of the URIWW Laboratory QAPP and in Appendix A of the URIWW Field Program – Ambient and Marine Sampling Program QAPP as well as worksheet 11b (section 2.6.3).

Accuracy as related to laboratory assays is determined during both routine sample analysis procedures as well as by yearly participation in the EPA Water Pollution Proficiency Test Study for the following assays utilized in this project: ammonia, nitrate/nitrite, total nitrogen and phosphorus and pH.

2.4 Comparability

All methods utilized by the URIWW Laboratory are based on methods found in *Standard Methods for the Examination of Water and Wastewater* published by the American Public Health Association, American Water Works Association and Water Environment Federation. Specific references for each method are found in the analyte-specific SOPs located in Appendix A of the URIWW Laboratory QAPP.

All field analytical procedures and sample collection methods utilized by the Block Island and Green Hill Pond Watershed USEPA National Community Decentralized Wastewater Treatment Demonstration Project (BI/GHP WW project) are based on procedures found in the following sources:

APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 19th ed. Washington D.C.: APHA, 1995.

U.S. Environmental Protection Agency. Volunteer Stream Monitoring: A Methods Manual, EPA 841-B-97-003. Washington D.C.: Office of Water, Nov. 1997.

U.S. Environmental Protection Agency. Volunteer Lake Monitoring: A Methods Manual, EPA 440/4-91-002. Washington D.C.: Office of Water, Dec. 1991.

Carlson, R. and J. Simpson. A Coordinator's Guide to Volunteer Lake Monitoring Methods. North American Lake Management Society (NALMS), Feb. 1996.

U.S. Environmental Protection Agency. Volunteer Estuary Monitoring: A Methods Manual. 2nd ed. U.S. Environmental Protection Agency and Center for Marine Conservation, No Date Listed.

Field Test Kit Instructions from the manufacturer (LaMotte) at www.lamotte.com

Additionally, in 2001 and 2002 at the Green Hill Pond and Ninigret Pond sites sample splits were taken for fecal coliforms analysis. The splits were sent to the URIWW laboratory and the URI Microbiology department. Volunteer monitors had been collecting fecal coliforms samples from these ponds prior to the BI/GHP WW project and sending them to the URI Microbiology department for analysis. The URI Microbiology department utilizes the most probably number multiple tube fermentation method (MPN method) to determine fecal coliforms as this method was specified by the Rhode Island Department of Health (RIHealth) to determine shell fish closures. The URIWW laboratory utilizes the Membrane Filtration Technique (APHA et al., 1995), so in order to be sure the URIWW values are comparable to historic values the samples were split. There was no specific acceptance level for the different methods, values from both laboratories were simply compared internally.

2.5 Completeness

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected to be obtained under normal conditions. Greater than 90% completeness of samples accepted into the laboratory is expected. Greater than 80% completeness of field analytical procedures and collection of valid samples is expected. Completeness is calculated as follows:

$$\text{Completeness} = \frac{\text{Number of Valid Laboratory Measurements}}{\text{Number of Laboratory Measurements Planned}} \times 100$$

2.6 QA/QC Tables

Tables summarizing the QA/QC objectives for the analysis and collection of samples for the BI/BHP WW project are provided on the following pages. These tables specifically address the Data Quality Indicators (DQIs) or the procedures to be followed to provide assurance that an analytical procedure is returning valid results. Each DQI has a specific result that must be met before the data are considered acceptable. Maintenance and calibration procedures for equipment and instrumentation are also provided along with sample collection methods. Analyte-specific tables provide information on the number of QA/QC samples to be prepared (blanks, replicates, etc.) and the expected result as well as the person(s) responsible for assessing any problems and determining the proper course of action, if necessary.

2.6.1 Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table) - Worksheet #9b

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Reporting Units	Project Action Limit (Units) (wet or dry weight)	Project Quantitation Limit (Units) (wet or dry weight)	Analytical Method		Achievable Laboratory/Field Limits	
					MDLs	Method RLs	MDLs	RLs
Laboratory Assays								
fecal coliforms – SOP 007 & 008		Colonies/100 mL	NA[1]	Variable: Dependent upon volume filtered	0		Variable: Dependent upon volume filtered	
Escherichia coli – SOP 007		Colonies/100 mL	NA[1]	Variable: Dependent upon volume filtered	0		Variable: Dependent upon volume filtered	
Salinity – SOP 017		ppt	NA[1]	0.4	0.4		0.4	0.4
Enterococci – SOP 018		Colonies/100 mL	NA[1]		0		Variable: Dependent upon volume filtered	
pH – SOP 010		Standard Unit (SU)	NA[1]	1.0	1.00		1.00	1.0
Total Suspended Solids – SOP 009		mg/L TSS			Not Provided		1	1
Chlorophyll-a – SOP 012		µg/L chlorophyll-a	NA[1]	0.2	0.1		0.1	0.2
Ammonia – SOP 014	7664-41-7	µg/L NH_3-N	NA[1]	40	5		20	40
Nitrite + Nitrate – SOP 015		µg/L NO_3/NO_2-N	NA[1]	30	10		20	30
Total Phosphorus – SOP 016		µg/L P	NA[1]	4	2[3]		3	4
Total Nitrogen – SOP 016		µg/L N	NA[1]	50	10[3]		20	50

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	CAS Number	Reporting Units	Project Action Limit (Units) (wet or dry weight)	Project Quantitation Limit (Units) (wet or dry weight)	Analytical Method		Achievable Laboratory/Field Limits	
					MDLs	Method RLs	MDLs	RLs
Field Analytical Procedures								
Secchi Depth Transparency – Field SOP 005		m	NA[1]	0.1	0.1	0.1	0.1	0.1
Temperature – Field SOP 006		°C	NA[1]	0.0	0.0	0.0	0.0	0.0
Dissolved Oxygen – Field SOP 010		mg/L O_2	NA[1]	0.2	0.0	0.2	0.0	0.2
Wind Speed – Field SOP 003		Code – See Field SOP 003	NA[1]	NA	NA	NA	NA	NA
Light – Field SOP 003			NA[1]	NA	NA	NA	NA	NA
Rain – Field SOP 003			NA[1]	NA	NA	NA	NA	NA
State of Tide – Field SOP 003			NA[1]	NA	NA	NA	NA	NA
Salinity (via YSI probe)[2]		ppt	NA[1]	0.1	0.0	0.1	0.0	0.1
Dissolved Oxygen (via YSI probe)[2]		mg/L O_2	NA[1]	0.5	0.00	0.5	0.00	0.5
Temperature (via YSI probe)[2]		°C	NA[1]	-5.0	-5.0	-5.0	-5.0	-5.0

Notes:

[1] Not Applicable as project is designed to document trends.

[2] Parameter collected using a YSI probe from 2003- 2005 for Great Salt Pond sites only.

[3] The MDLs for Total Phosphorus and Total Nitrogen were not provided by the method reference. Therefore, the method MDLs for orthophosphate and nitrate + nitrite were reported since the total phosphorus and nitrogen assays are based on the orthophosphate and nitrate + nitrite assays, respectively. After a sample is digested for total nitrogen and phosphorus the sample is analyzed as a nitrate + nitrite and orthophosphate sample (please refer to the analyte-specific SOP located in the URIWW Laboratory QAPP for more information).

2.6.2 Field and Quality Control Sample Summary Table - Worksheet 9c

EPA-NE QAPP Worksheet #9c - Rev. 10/99

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks	Total No. of Samples to Lab per sampling event[2]
Field Analytical Procedures									
In-situ measurement	Secchi Disk Transparency	Ambient and Marine Waters	Field SOP 005	5	10 (2 duplicate pair of measurements per site)	NA	NA	NA	20 values reported to laboratory (4 per site)
In-situ measurement	Temperature	Ambient and Marine waters	Field SOP 006	27	0	NA	NA	NA	27 values report to laboratory
Unfiltered Water Sample	Dissolved Oxygen[1]	Ambient and Marine waters	Field SOP 010	5 - Deep Samples (Hypolimnion)	10 (2 duplicate titrations per site)	NA	NA	NA	20 values reported (4 per site)
				22 – Shallow or Mid water column	22 (1 duplicate titration per site)	NA	NA	NA	44 values reported (2 per site)
NA	Wind Speed	NA	Field SOP 003	22	NA	NA	NA	NA	22 values reported (1 per site)
NA	Light	NA	Field SOP 003	22	NA	NA	NA	NA	22 values reported (1 per site)
NA	Rain	NA	Field SOP 003	22	NA	NA	NA	NA	22 values reported (1 per site)
NA	State of Tide	NA	Field SOP 003	22	NA	NA	NA	NA	22 values reported (1 per site)

EPA-NE QAPP Worksheet #9c - Rev. 10/99

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks	Total No. of Samples to Lab per sampling event[2]
Field Samples Collected									
Filter	Chlorophyll-a	Ambient and Marine waters	Field SOP 007	22	44 (2 duplicate pair per site)	0	0	0	88 filters (4 per site)
Filtered Water Sample	Nitrate + Nitrite	Ambient and Marine waters	Field SOP 007	27	0	0	0	0	27
Filtered Water Sample	Ammonia	Ambient and Marine waters	Field SOP 007	27	0	0	0	0	27
Unfiltered Water Sample	Total Suspended Solids	Ambient and Marine waters	Field SOP 009	6	0	0	0	0	6
Unfiltered Water Sample	pH	Ambient and Marine waters	Field SOP 009	27	0	0	0	0	27
Unfiltered Water Sample	Total Nitrogen and Phosphorus	Ambient and Marine waters	Field SOP 009	27	0	0	0	0	27
Unfiltered Water Sample	Salinity[1]	Ambient and Marine waters	Field SOP 009	27	0	0	0	0	27
Unfiltered Water Sample	fecal coliforms *Escherichia coli*	Ambient and Marine waters	Field SOP 008	22	0	0	0	0	22
Unfiltered Water Sample	enterococci	Ambient and Marine waters	Field SOP 008	Variable	Variable	0	0	0	Variable

Note: Due to the nature of the analyses performed by the laboratory there is no need to collect additional sample volume for MS and duplicate analyses, they come from the same bottle. Therefore, this column has been eliminated from this table.

[1] The number of samples reported here assumes that all dissolved oxygen and salinity values were obtained using test kits and not the YSI probe. If the YSI probe was utilized then there is no duplication of measurements.

2 "Total number of samples to the laboratory" provided is for both a monthly water sample collection and a biweekly sampling event.

2.6.3 Measurement Performance Criteria Table – Worksheet 11b

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table (field collection, field analysis and lab analysis)

Sampling Procedure	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	QA Samples Address Sample (S) or Analytical (A) Error	Analytical Method/SOP
fecal coliforms, *Escherichia coli* and enterococci	Method Blank	< 1 colony/100 mL	Bias	A	007/008/018
	Sample Replication	Not greater than 20%RPD	Precision	A	
	Inoculate a plate with a known positive plate or positive sample	Positive growth	Bias/false negatives	A	
pH	EPA Water Pollution Proficiency Test Study (Analysis of Unknowns)	2 standard deviation	Accuracy/ Comparability	A	010
	Calibration	Electrode efficiency greater than 96%	Accuracy	A	
	Standards as Samples (Calibration check)	Change in standard not greater than 0.1 SU	Accuracy/ Precision	A	

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table (field collection, field analysis and lab analysis)

Sampling Procedure	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	QA Samples Address Sample (S) or Analytical (A) Error	Analytical Method/SOP
Chlorophyll-a	Method Blank	Not greater than 0.03 µg/L chlorophyll-a as read on the fluorometer	Bias	A	012
	Filter Blank	Not greater than 0.03 µg/L chlorophyll-a as read on the fluorometer	Bias	A	
	Sample Replication of Fluorometer reading	Not greater than 20%RPD	Precision	A	
	Calibration Check Using Liquid and Solid Standards	Not greater than 15%D	Accuracy	A	
	LCS (Calibration check using Solid Standard)	Not greater than 15%D	Accuracy/ Precision	A	
	Field Duplicate Pair	Not greater than 100% RPD	Precision	S	Field SOP 007
	Filter each field sample twice (field duplicate)	Not greater than 50% RPD	Precision	S	

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table (field collection, field analysis and lab analysis)

Sampling Procedure	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	QA Samples Address Sample (S) or Analytical (A) Error	Analytical Method/SOP
Ammonia	Method Blank	Not greater than 30 µg/L NH_3-N	Bias	A	014
	Sample Replication	Not greater than 15%RPD (Replicate from same sample cup) Not greater than 20%RPD (Replicate from different sample cups)	Precision	A	
	Calibration	R^2 of calibration linear regression not less than 0.990	Accuracy	A	
	EPA Water Pollution Proficiency Test Study (Analysis of Unknowns)	2 standard deviation	Accuracy/ Comparability	A	
	Laboratory Control Samples (Purchased External Standards)	Not greater than 20%D	Accuracy/ Comparability	A	
	Standards as Samples (Calibration check)	Not greater than 20%D	Accuracy	A	

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table (field collection, field analysis and lab analysis)

Sampling Procedure	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	QA Samples Address Sample (S) or Analytical (A) Error	Analytical Method/SOP
Nitrate + Nitrite	Method Blanks	Not greater than 20 µg/L NO_3/NO_2-N	Bias	A	015
	Sample Replication	Not greater than 15%RPD (Replicate from same sample cup) Not greater than 20%RPD (Replicate from different sample cups)	Precision	A	
	Calibration	R^2 of calibration linear regression not less than 0.990	Accuracy	A	
	EPA Water Pollution Proficiency Test Study (Analysis of Unknowns)	2 standard deviation	Accuracy/ Comparability	A	
	Laboratory Control Samples (Purchased External Standards)	Not greater than 20%D	Accuracy/ Comparability	A	
	Standards as Samples (Calibration check)	Not greater than 20%D	Accuracy	A	

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Measurement Performance Criteria Table (field collection, field analysis and lab analysis)

Sampling Procedure	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	QA Samples Address Sample (S) or Analytical (A) Error	Analytical Method/SOP
Total Phosphorus and Nitrogen Analysis	Method Blank	Not greater than 3 µg P/L and 5 µg N/L	Bias	A	016
	Digestion Blank	Not greater than 3 µg/L P and 10 µg/L N	Bias	A	
	Sample Replication	Not greater than 15%RPD (Replicate from same sample cup) Not greater than 20%RPD (Replicate from different sample cups) Not greater than 25%RPD (Replicate digestions)	Precision	A	
	Calibration	R^2 of calibration linear regression not less than 0.990	Accuracy	A	
	EPA Water Pollution Proficiency Test Study (Analysis of Unknowns)	2 standard deviation	Accuracy/ Comparability	A	
	Laboratory Control Samples (Purchased External Standards)	Not greater than 20%D	Accuracy/ Comparability	A	

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Measurement Performance Criteria Table (field collection, field analysis and lab analysis)

Sampling Procedure	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	QA Samples Address Sample (S) or Analytical (A) Error	Analytical Method/SOP
Total Phosphorus and Nitrogen Analysis (Continued)	Standards as Samples (Calibration check)	Not greater than 20%D	Accuracy	A	
Salinity	Sample Replication	Not greater than +/- 2 ppt	Precision	A	017
	Sample Comparison (compare result of sample analyzed by refractometer)	Not greater than +/- 2 ppt	Comparability	A	
TSS	Method Blank	Not greater than 1 mg/L TSS	Bias	A	009
	Sample Replication	Not greater than 30%RPD	Precision	A	
	Check of balance calibration	Not greater than 10%D	Accuracy	A	
	EPA Water Pollution Proficiency Test Study (Analysis of Unknowns)	2 standard deviation	Accuracy/Comparability	A	
Secchi Depth Transparency	Field Duplication	Not greater than 0.25 m difference between all readings	Precision	A	Field SOP 005
	Calibrate yearly	Less than 10%D in gradation of measurement line	Accuracy	A	

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Measurement Performance Criteria Table (field collection, field analysis and lab analysis)

Sampling Procedure	QC Sample and/or Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	QA Samples Address Sample (S) or Analytical (A) Error	Analytical Method/SOP
Temperature	Calibrate yearly	Difference less than +/- 1 °C from reference	Accuracy	A	Field SOP 006
Dissolved Oxygen	Duplicate Titration	Difference between measurements not greater than 1 mg/L DO	Precision	A	Field SOP 010
	Collection and analysis of duplicate field samples for deep water samples	Difference between measurements not greater than 1 mg/L DO	Precision	A & S	
Wind Speed, light, rain, state of tide	NA	NA	NA	NA	Field SOP 003

Note:
All QC Measurement Performance Criteria in this table are for assessment of analytical error only.

2.6.4 Sampling rational and design

Location	Depth	Biweekly					Monthly Water collection days (includes data collected for biweekly sampling)					Winter collection (Monthly Nov. Thru Apr.)
		Wind speed, light, rain, state of tide	DO & Temperature	Salinity	Chlorophyll-a	Secchi Depth	fecal coliform, E. coli, enterococci	pH	Ammonia, nitrate/nitrite, total phosphorus and nitrogen	Salinity	TSS	pH, nitrate/nitrite and total nitrogen and phosphorus.
Green Hill Pond – All samples taken from docks except "In-Pond" site.												
Teal Rd.	0.5 m - surface	X	X		X		X	X	X	X		X
Twin Peninsula	0.5 m - surface	X	X		X		X	X	X	X		X
Indigo Pt.	0.5 m - surface	X	X		X		X	X	X	X		X
Sea Lea Rd.	0.5 m - surface	X	X		X		X	X	X	X		X
In Pond	1 m – surface	X	X		X	X	X	X	X	X		
In Pond	1 m from bottom - bottom		X					X	X	X		
Ninigret Pond – All samples taken from docks.												
Fort Neck Cove (added in 2004)	0.5 m - surface	X	X		X		X	X	X	X		X
Pond St.	0.5 m - surface	X	X		X		X	X	X	X		X
Vigna's Dock (2004 only)	0.5 m - surface	X	X		X		X	X	X	X		X
Tockwotten Cove	0.5 m - surface	X	X		X		X	X	X	X		X

Location	Depth	Biweekly					Monthly Water collection days (includes data collected for biweekly sampling)					Winter collection (Monthly Nov. Thru Apr.)
		Wind speed, light, rain, state of tide	DO & Temperature	Salinity	Chlorophyll-a	Secchi Depth	fecal coliform, E. coli, enterococci	pH	Ammonia, nitrate/nitrite, total phosphorus and nitrogen	Salinity	TSS	pH, nitrate/nitrite and total nitrogen and phosphorus.
Ninigret Pond (Continued) – All samples taken from docks.												
Stumpy Pt. (added in 2004)	0.5 m - surface	X	X		X		X	X	X	X		X
Tom Cod Cove (added in 2004)	0.5 m - surface	X	X		X		X	X	X	X		X
Crawford Dock	0.5 m - surface	X	X		X		X	X	X	X		X
Block Island (Great Salt Pond) – Sites identified as "GSP" are collected by boat; sites identified as "Trib." are collected from shore.												
GSP1	1 m – surface	X	X	X	X	X	X	X	X	X		
GSP1	1 m from bottom – bottom		X	X				X	X	X		
GSP2	1 m – surface	X	X	X	X	X	X	X	X	X		
GSP2	1 m from bottom – bottom		X	X				X	X	X		
GSP3	1 m – surface	X	X	X	X	X	X	X	X	X		
GSP3	1 m from bottom – bottom		X	X				X	X	X		
GSP4	1 m – surface	X	X	X	X	X	X	X	X	X		
GSP4	1 m from bottom – bottom		X	X				X	X	X		
Trib.1	Mid water column	X	X	X	X		X	X	X	X	X	
Trib.2	Mid water column	X	X	X	X		X	X	X	X	X	

Location	Depth	Biweekly					Monthly Water collection days (includes data collected for biweekly sampling)					Winter collection (Monthly Nov. Thru Apr.)
		Wind speed, light, rain, state of tide	DO & Temperature	Salinity	Chlorophyll-a	Secchi Depth	fecal coliform, E. coli, enterococci	pH	Ammonia, nitrate/nitrite, total phosphorus and nitrogen	Salinity	TSS	pH, nitrate/nitrite and total nitrogen and phosphorus.
Block Island (Great Salt Pond) (Continued) – Sites identified as "GSP" are collected by boat; sites identified as "Trib." are collected from shore.												
Trib.3	Mid water column	X	X	X	X		X	X	X	X	X	
Trib.4 (added in 2003)	Mid water column	X	X	X	X		X	X	X	X	X	
Trib.5 (added in 2003)	Mid water column	X	X	X	X		X	X	X	X	X	
Trib.6 (added in 2004)	Mid water column	X	X	X	X		X	X	X	X	X	
TOTAL		22	27	14	22	5	22	27	27	27	6	

Notes:
Not all sampling locations will be monitored in 2005. It is unknown at this time which stations will be eliminated. Therefore, it is assumed that all locations will be sampled for the purposes of this QAPP.
[1] Salinity on Great Salt Pond sites was completed with a YSI probe.
[2] Salinity analyzed in the URIWW Laboratory

2.6.5 Sampling Locations, Sampling and Analysis Method/SOP Requirements Table – Worksheet #12b

EPA-NE QAPP Worksheet #12b - Rev. 10/99

Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
All Dock Sites on Green Hill and Ninigret Ponds/0.5 m (Teal Rd., Twin Peninsula, Indigo Pt., Sea Lea Rd., Fort Neck Cove., Crawford Dock, Tom Cod Cove, Stumpy Pt., Tockwotten Cove, Vigna's Dock and Pond St.	Temperature	NA	1	006	NA	NA	NA	NA	NA
	DO	Unfiltered water sample	2 (each sample is titrated twice)	010	NA	60 mL	2 – 60 mL glass DO bottle	Ice/4 °C	1 hour
	Wind Speed	NA	1	003	NA	NA	NA	NA	NA
	Light	NA	1	003	NA	NA	NA	NA	NA
	Rain	NA	1	003	NA	NA	NA	NA	NA
	State of Tide	NA	1	003	NA	NA	NA	NA	NA
	Chlorophyll-a	Filter	2 (2 aliquots from each bottle are filtered = 4 filters)	007	012	100 mL from each of 2 250 mL bottles	Aluminum foil packet containing filters	Place filters in zip-lock plastic bag with desiccant chips and freeze	6 months
	Fecal coliform, E. coli and Enterococci	Unfiltered water sample	1	008	007 & 018	250 mL	1, 250-500 mL sterile white plastic bottle[2]	Ice/4 °C	6 hours
	pH	Unfiltered water sample	1	007	010	Measured directly in sample bottle	1, 125 – 250 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	6 hours
	Ammonia and Nitrate/Nitrite	Filtered water sample	1	007	014 & 015	60-125 mL	1, 60-125 mL brown glass bottle	Ice/4 °C	30 days

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
All Dock Sites on Green Hill and Ninigret Ponds/0.5 m (continued)	Total Phosphorus and Nitrogen	Unfiltered water sample	1	009	016	100 mL	1, 125-250 mL brown glass bottle	Ice/4 °C	30 days
	Salinity	Unfiltered water sample	1	009	017	2 mL	1, 125-250 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	1 year
In Pond sample site Green Hill Pond / 1 m from surface and 1m from bottom	Temperature – surface & bottom	NA	1 – surface 1 - deep	006	NA	NA	NA	NA	Analyze sample as soon as collected
	DO – surface	Unfiltered Water Sample	1 sample (titrated 2 times)	010	NA	60 mL	1-60 mL glass DO bottles	Ice/4 °C	1 hour
	DO - bottom	Unfiltered Water Sample	2 (Each sample titrated 2 times)	010	NA	60 mL	2-60 mL glass DO bottles	Ice/4 °C	1 hour
	Wind Speed	NA	1	003	NA	NA	NA	NA	NA
	Light	NA	1	003	NA	NA	NA	NA	NA
	Rain	NA	1	003	NA	NA	NA	NA	NA
	State of Tide	NA	1	003	NA	NA	NA	NA	NA

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
In Pond sample site Green Hill Pond / 1 m from surface and 1m from bottom (continued)	Chlorophyll-a – surface	filter	2 (2 aliquots from each bottle are filtered = 4 filters)	007	012	100 mL from each of 2 250 mL bottles	Aluminum foil packet containing filters	Place filters in zip-lock plastic bag with desiccant chips and freeze	6 months
	Fecal coliform, E. coli and Enterococci – surface	Unfiltered water sample	1	008	007 & 018	250 mL	1, 250-500 mL sterile white plastic bottle[2]	Ice/4 °C	6 hours
	pH - surface	Unfiltered water sample	1	007	010	Measured directly in sample bottle	1, 60-125 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	6 hours
	pH - bottom	Unfiltered water sample	1	007	010	Measured directly in sample bottle	1, 60-125 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	6 hours
	Ammonia and Nitrate/Nitrite - Surface	Filtered water sample	1	007	014 & 015	60-125 mL	1, 60-125 mL brown glass bottle	Ice/4 °C	30 days
	Ammonia and Nitrate/Nitrite - Bottom	Filtered water sample	1	007	014 & 015	60-125 mL	1, 60-125 mL brown glass bottle	Ice/4 °C	30 days

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
In Pond sample site Green Hill Pond / 1 m from surface and 1m from bottom (continued)	Total Phosphorus and Nitrogen - Surface	Unfiltered water sample	1	009	016	100 mL	1, 125-250 mL brown glass bottle	Ice/4 °C	30 days
	Total Phosphorus and Nitrogen - Bottom	Unfiltered water sample	1	009	016	100 mL	1, 125-250 mL brown glass bottle	Ice/4 °C	30 days
	Salinity - Surface	Unfiltered water sample	1	009	017	2 mL	1, 125-250 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	1 year
	Salinity - bottom	Unfiltered water sample	1	009	017	2 mL	1, 125-250 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	1 year
	Secchi Depth	NA	2 (2 field duplicates = 4 values)	005	NA	NA	NA	NA	NA
In Pond sample sites Block Island (GSP1, GSP2, GSP3, GSP4)[3]	Temperature – surface & bottom	NA	1 – surface 1 - deep	006	NA	NA	NA	NA	Analyze sample as soon as collected
	DO – surface	Unfiltered Water Sample	1 (sample titrated 2 times)	010	NA	60 mL	1-60 mL glass DO bottles	Ice/4 °C	1 hour

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
In Pond sample sites Block Island (GSP1, GSP2, GSP3, GSP4)[3] (continued)	DO – bottom	Unfiltered Water Sample	2 (each sample titrated 2 times)	010	NA	60 mL	2-60 mL glass DO bottles	Ice/4 °C	1 hour
	Wind Speed	NA	1	003	NA	NA	NA	NA	NA
	Light	NA	1	003	NA	NA	NA	NA	NA
	Rain	NA	1	003	NA	NA	NA	NA	NA
	State of Tide	NA	1	003	NA	NA	NA	NA	NA
	Chlorophyll-a – surface	filter	2 (2 aliquots from each bottle are filtered = 4 filters)	007	012	100 mL from each of 2 250 mL bottles	Aluminum foil packet containing filters	Place filters in zip-lock plastic bag with desiccant chips and freeze	6 months
	Secchi Depth	NA	2 (2 field duplicates = 4 values)	005	NA	NA	NA	NA	NA
	Fecal coliform, E. coli and Enterococci – surface	Unfiltered water sample	1	008	007 & 018	250 mL	1, 250-500 mL sterile white plastic bottle[2]	Ice/4 °C	6 hours
	pH - surface	Unfiltered water sample	1	007	010	Measured directly in sample bottle	1, 60-125 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	6 hours

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
In Pond sample sites Block Island (GSP1, GSP2, GSP3, GSP4) [3] (continued)	pH - bottom	Unfiltered water sample	1	007	010	Measured directly in sample bottle	1, 60-125 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	6 hours
	Ammonia and Nitrate/Nitrite - Surface	Filtered water sample	1	007	014 & 015	60-125 mL	1, 60-125 mL brown glass bottle	Ice/4 °C	30 days
	Ammonia and Nitrate/Nitrite - Bottom	Filtered water sample	1	007	014 & 015	60-125 mL	1, 60-125 mL brown glass bottle	Ice/4 °C	30 days
	Total Phosphorus and Nitrogen - Surface	Unfiltered water sample	1	009	016	100 mL	1, 125-250 mL brown glass bottle	Ice/4 °C	30 days
	Total Phosphorus and Nitrogen - Bottom	Unfiltered water sample	1	009	016	100 mL	1, 125-250 mL brown glass bottle	Ice/4 °C	30 days
	Salinity - Surface	Unfiltered water sample	1	009	017	2 mL	1, 125-250 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	1 year
	Salinity - bottom	Unfiltered water sample	1	009	017	2 mL	1, 125-250 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	1 year

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
Tributary sample sites Block Island (Trib.1, Trib.2, Trib3, Trib.4, Trib.5, Trib.6)[3]	Temperature – mid-watercolumn	NA	1	005	NA	NA	NA	NA	Analyze sample as soon as collected
	DO – mid water column	Unfiltered Water Sample	1 (sample titrated 2 times)	010	NA	60 mL	1-60 mL glass DO bottles	Ice/4 °C	1 hour
	Wind Speed	NA	1	003	NA	NA	NA	NA	NA
	Light	NA	1	003	NA	NA	NA	NA	NA
	Rain	NA	1	003	NA	NA	NA	NA	NA
	State of Tide	NA	1	003	NA	NA	NA	NA	NA
	Fecal coliform, E. coli and Enterococci – surface	Unfiltered water sample	1	008	007 & 018	250 mL	1, 250-500 mL sterile white plastic bottle[2]	Ice/4 °C	6 hours
	pH - Mid watercolumn	Unfiltered water sample	1	007	010	Measured directly in sample bottle	1, 60-125 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	6 hours
	Ammonia and Nitrate/Nitrite - Mid watercolumn	Filtered water sample	1	007	014 & 015	60-125 mL	1, 60-125 mL brown glass bottle	Ice/4 °C	30 days

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Sampling Locations, Sampling and Analysis Method/SOP Requirements Table[4]

Sampling Location & Depth	Parameter	Matrix	# Samples per site[1]	Field Sampling SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
Tributary sample sites Block Island (Trib.1, Trib.2, Trib3, Trib.4, Trib.5, Trib.6) [3] (continued)	Total Phosphorus and Nitrogen - Mid watercolumn	Unfiltered water sample	1	009	016	100 mL	1, 125-250 mL brown glass bottle	Ice/4 °C	30 days
	Salinity - Mid watercolumn	Unfiltered water sample	1	009	017	2 mL	1, 125-250 mL brown glass bottle (same sample bottle as TP/TN sample)	Ice/4 °C	1 year
	TSS - Mid watercolumn	Unfiltered water sample	1	009	011 & 009	500 mL	1, 500 mL HDPE bottle	Ice/4 °C	1 week

Notes:
[1] Not all analytes are collected during each sampling round, see table 2.6.4 Sampling rational and design.
[2] During part of project bacteria samples will be split, therefore there will be two sample bottles during that time for bacteria. One will go to the URI Microbiology department for analysis of fecal coliforms by the MPN method and the other will go to the URIWW laboratory for analysis of fecal coliforms and Escherichia coli. Samples for the split will be collected in a sterile bottle, mixed and then half poured into another sterile bottle. Prior to 2003 "sample splits" consisted of two separate samples collected in separate bottles. One bottle was then sent to the URIWW laboratory while the other was sent to URI Microbiology. It was determined that this method did not guarantee that the samples being sent to the laboratories were the same, therefore the new method was utilized.
[3] Block Island temperature, salinity and DO samples were collected using YSI multi-parametric meters from 2003 through 2005. URIWW does not maintain these YSI meters or associated QA/QC data for these meters, so this information is not included in this QAPP. The Committee for the Great Salt Pond is responsible for the maintenance and correct use of these YSI meters.
[4] Winter samplings have a modified analytical parameter schedule, see Table 2.6.4 for sampling parameters collected during winter period.

2.6.6 Project Sampling SOP Reference Table – Worksheet 13

EPA-NE QAPP Worksheet #14 - Rev. 10/99

Project Sampling SOP Reference Table

SOP	Title, Revision Date and/or Number	Originating Organization	Equipment Identification	Modified for Project Work Y or N
Field SOP 005	Secchi Depth Transparency, 3/05	URIWW	Secchi Disk	N
Field SOP 006	Water Temperature, 3/05	URIWW	Thermometer	N
Field SOP 007	Chlorophyll (Algae) and Nutrients, 3/05	URIWW	Filter housing, syringe, aluminum foil, magnesium bicarbonate, filters	N
Field SOP 008	Bacterial Monitoring, 3/05	URIWW	None	N
Field SOP 009	Unfiltered Water Samples, 3/05	URIWW	None	N
Field SOP 010	Dissolved Oxygen Monitoring, 3/05	URIWW	DO Test Kit and DO sampler	N
Field SOP 011	Shallow Water Sampler Operation, 3/05	URIWW	Shallow water sampler	N
Field SOP 012	Deep Water Sampler Operation, 3/05	URIWW	Deep water sampler	N
Block Island/Green Hill Pond SOP 001	Salt Ponds Monitoring Manual Supplement to URI Watershed Watch Lake and Pond Monitoring Manual	URIWW	Explains basis behind sampling scheme and when to utilize each of the field SOPs (ie: in what order to sample field parameters and collect water samples)	N

2.6.7 Field Sampling Equipment Calibration Table - Worksheet #14

EPA-NE QAPP Worksheet #14 - Rev. 10/99

Field Sampling Equipment Calibration Table

Equipment	Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Thermometer	Check thermometer against standard thermometer	Yearly	Less than +/- 1 °C difference between thermometer and reference	Replace or repair thermometer	URIWW Laboratory Staff	006
Deep Sampler	Check calibrated line	Yearly	Less than 10% difference between line and reference	Replace calibrated line	URIWW Laboratory Staff	012
Secchi Disk	Check gradations on calibrated line attached to Secchi Disk	Yearly	Less than 10% difference between line and reference	Replace calibrated line	URIWW Laboratory Staff	005

2.6.8 Field Equipment Maintenance, Testing and Inspection Table – Worksheet #15

EPA-NE QAPP Worksheet #15 - Rev. 10/99

Field Equipment Maintenance, Testing and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Secchi Disk	Rinse with tap water after use	NA	Make sure line is attached securely to Secchi Disk	Person(s) collecting sample	Before each use	Securely attached	Attach line securely	005
Thermometer	Rinse with tap water after use	Electronic thermometers only: Make sure that thermometer turns on	Electronic thermometers: make sure probe is not damaged. Spirit thermometers: Make sure spirit is continuous in the thermometer (no breaks in internal fluid) and that the probe is not damaged.	Person(s) collecting sample	Before each use	Electronic thermometers: thermometer turns on and probe is not damaged. Spirit thermometer: Spirit is continuous and probe is not damaged.	Electronic thermometers: replace battery if probe does not turn on. If still not operational call URIWW Laboratory for a replacement thermometer. Spirit thermometer: Call URIWW Laboratory for a replacement thermometer.	006
Filter housings, syringe	Rinse with tap water after use	NA	Check that filter housing and syringe are not cracked or damaged.	Person(s) collecting sample	Before each use	Filter housing and syringe are not damaged.	Call URIWW Laboratory for a replacement filter housing or syringe.	007

EPA-NE QAPP Worksheet #15 - Rev. 10/99

Field Equipment Maintenance, Testing and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
DO test kit	Rinse all syringes and glassware with tap water after use, allow to dry	NA	• Check that enough reagent is available for the next round of sampling and that it is the correct color (color change indicates reagent needs replacement). • Make sure there is no precipitate in the reagent bottles. Precipitate indicates that reagent must be replaced. • Check that syringes and glassware are not damaged.	Person(s) collecting sample	Before each use	No equipment is damaged and enough good reagent is available for next sampling round.	Call URIWW Laboratory for replacement equipment or more reagent.	010
DO test kit	Replace all reagents and clean test kit components	NA	NA	URIWW Laboratory Staff	Yearly	NA	NA	010
Shallow water sampler	Rinse with tap water after use and allow to dry	NA	Check to be sure that the primer bulb is not cracked and the tubing is securely attached to the sampler.	Person(s) collecting sample	Before each use	Equipment is not damaged.	Call URIWW Laboratory for replacement sampler.	011

EPA-NE QAPP Worksheet #15 - Rev. 10/99

Field Equipment Maintenance, Testing and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Deep water sampler	Rinse with tap water after use and allow to dry	NA	Check to be sure that sampler is operational, that all lines are securely attached to sampler and the weight is attached to the sampler. Also check that the tube that goes into the DO bottle is present. If it is not there replace it using the barrel of a round Bic® pen cut to the appropriate length.	Person(s) collecting sample	Before each use	Equipment is not damaged, line is securely attached and tube leading into the DO bottle is present.	Call URIWW Laboratory for a replacement sampler and/or re-attach sampler line.	012

2.6.9 Field Analytical Method/SOP Reference Table (Test Kits and Instruments) –Worksheet #17

EPA- NE QAPP Worksheet #17 – Rev. 10/99

Field Analytical Method/SOP Reference Table

Reference Number (Field SOP Number)	Title, Revision Date and/or Number	Analytical Parameter	Instrument
005	Secchi Depth Transparency, 3/05	Secchi Depth	Secchi Disk
006	Water Temperature, 3/05	Temperature	Thermometer
010	Dissolved Oxygen Monitoring, 3/05	Dissolved Oxygen	None
003	Monitoring Postcard Instructions	Wind Speed, Light, Rain, State of Tide	None

Notes:
No SOPs were modified for project work

2.6.10 Fixed Laboratory Analytical Method/SOP Reference Table – Worksheet 20

EPA-NE QAPP Worksheet #20 - Rev. 10/99

Fixed Laboratory Analytical Method/SOP Reference Table

Reference Number (SOP Number)	Title, Revision Date and/or Number	Analytical Parameter	Instrument
007	Ambient Waters Microbiological Procedure, Rev. 1: 11/04	fecal coliforms and *Escherichia coli*	Incubator – 35 °C Precision incubator Incubator – 44.5 °C Precision fecal coliform water bath Autoclave
018	Enterococci Analysis, Rev. 1: 11/04	enterococci	Incubator – 41 °C Thermolyne incubator Incubator – 44.5 °C Precision fecal coliform water bath Autoclave
009	Total Suspended Solids Analysis, Rev. 1: 11/04	Total suspended solids	Analytical Balance – Mettler Toledo AB 104 Drying Oven – Blue M Stabiltherm Mechanical Convection Oven
010	Alkalinity and pH Procedures, Rev. 1: 11/04	pH	pH Meter – Fisher Scientific Model AR20
012	Chlorophyll-a Analysis, Welschmeyer Method, Rev. 1: 11/04	Chlorophyll-a	Fluorometer – Turner Designs Model TD-700

EPA-NE QAPP Worksheet #20 - Rev. 10/99

Fixed Laboratory Analytical Method/SOP Reference Table

Reference Number (SOP Number)	Title, Revision Date and/or Number	Analytical Parameter	Instrument
014	Ammonia Analysis, Rev. 1: 11/04	Ammonia (NH_3-N)	Astoria®-Analyzer Model 303A Segmented Continuous Flow Autoanalyzer
015	Orthophosphate and Nitrate + Nitrite Analysis, Rev. 1: 11/04	Nitrate + Nitrite (NO_3/NO_2-N)	Astoria®-Analyzer Model 303A Segmented Continuous Flow Autoanalyzer
016	Total Phosphorus and Nitrogen Analysis, Rev. 1: 11/04	Total phosphorus (P) and total nitrogen (N)	Astoria®-Analyzer Model 303A Segmented Continuous Flow Autoanalyzer
017	Salinity Analysis, Rev. 1: 04/05	Salinity	LaMotte Test Kit and A336ATC Hand Held Salinity Refractometer

Notes:
No SOP was modified for project work
All Fixed laboratory analytical methods are for definitive data
All fixed laboratory analytical methods are performed by URIWW laboratory
No analytical methods have Region 1 NESTS Method Codes.

2.6.11 Fixed Laboratory Instrument Maintenance and Calibration Table - Worksheet 21

EPA-NE QAPP Worksheet #21 - Rev. 10/99

Fixed Laboratory Instrument Maintenance and Calibration Table

Maintenance, Testing and Inspection Activities

Activity	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
fecal coliforms and *Escherichia coli*	Incubator – 35 °C precision incubator	Check temperature	Each time used	35 +/- 1 °C	Adjust temperature control	E. Herron	007,008, 004
	Autoclave	Check temperature and pressure	Each time used	Must reach 121 °C and maintain for at least 15 minutes	Contact professional to provide maintenance service	E. Herron	
	Incubator – 44.5 °C precision fecal coliform bath	Check temperature	Each time used	44.5 +/- 1 °C	Adjust temperature control	E. Herron	

EPA-NE QAPP Worksheet #21 - Rev. 10/99

Fixed Laboratory Instrument Maintenance and Calibration Table

Maintenance, Testing and Inspection Activities

Activity	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
enterococci	Incubator – 41 °C Thermolyne incubator	Check temperature	Each time used	415 +/- 1 °C	Adjust temperature control	E. Herron	018 & 004
	Autoclave	Check temperature and pressure	Each time used	Must reach 121 °C and maintain for at least 15 minutes	Contact professional to provide maintenance service	E. Herron	
	Incubator – 44.5 °C precision fecal coliform bath	Check temperature	Each time used	44.5 +/- 1 °C	Adjust temperature control	E. Herron	

EPA-NE QAPP Worksheet #21 - Rev. 10/99

Fixed Laboratory Instrument Maintenance and Calibration Table

Maintenance, Testing and Inspection Activities

Activity	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
pH	pH Meter – Fisher Scientific Model AR20 pH Probe – Fisher Scientific Model AR20	Calibrate Refill electrode with saturated KCl solution	Each time used Check before each use	Electrode Efficiency >96% KCl solution is within ¼ inch of top of electrode and filling hole is open	Replace standards then if calibration still a problem replace the electrode Re-fill electrode as needed	URIWW Staff URIWW Staff	010
Chlorophyll-a	Fluorometer – Turner Designs Model TD-700	Calibrate	Calibrate yearly, Check calibration daily	Daily – Not greater than 15%D	Re-calibrate and then replace light source if calibration continues to drift	URIWW Staff/ L. Green	012

EPA-NE QAPP Worksheet #21 - Rev. 10/99

Fixed Laboratory Instrument Maintenance and Calibration Table

Maintenance, Testing and Inspection Activities

Activity	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Ammonia, Nitrate + Nitrite, Total Phosphorus and Nitrogen	Astoria®-Analyzer Model 303A Segmented Continuous Flow Autoanalyzer	Calibrate	Each time used	R^2 of calibration linear regression not less than 0.990	Re-calibrate	L. Green	013, 014, 015, 016
		Check analytical tubing	Each time used	No cracks or clogs	Replace affected tubing	L. Green	
		Check reagents flows	Each time used	No clogs in tubing causing pulsating flow	Replace affected tubing	L. Green	
		Check light source voltage	Each time used	< 90V	Replace light source	L. Green	
		Check baseline	Each time used	Should be smooth	Replace tubing/trouble shoot instrument using instruction manual	L. Green	
		Check intersample bubble shape	Each time used	Bubble shape is uniform	Adjust tubing, flow or reagents	L. Green	
		Check peak height and shape	Each time used	Check that peaks are not off scale	Dilute samples	L. Green	

EPA-NE QAPP Worksheet #21 - Rev. 10/99

Fixed Laboratory Instrument Maintenance and Calibration Table

Maintenance, Testing and Inspection Activities

Activity	Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Salinity	Test Kit	Rinse all syringes and glassware with tap water, allow to dry	After each use	Clean syringes	Replace syringes	URIWW Staff	017
		Replace all reagents and clean test kit components	Yearly	Clean materials	Replace old/worn/dirty components	URIWW Staff	
	Refractometer	Calibrate with DI water	Before each use	Reads 0 ppt	Adjust calibration	URIWW Staff	

2.6.12 Field Sampling QC Table – Worksheet 22a

EPA-NE QAPP Worksheet #22a - Rev. 10/99 - Field Sampling QC Table

Chlorophyll-a (algae)[1]

Sampling SOP	Field SOP 007 and BI/BHP SOP 001	Analytical Method/SOP Reference	SOP 012
Medium/Matrix	Filter / Ambient or Marine Waters	Sampler's Name	Various
Analytical Parameter	Chlorophyll-a	Field Sampling Organization	Salt Ponds Coalition and Committee for the Great Salt Pond
Concentration Level (without dilution)	Ambient and Marine samples: <0.2 – 100 µg/L chlorophyll-a	No. of Sample Locations	22

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Field Duplicate Pair (raw water)	100%	Not greater than 100 %RPD	Re-analyze on fluorometer., if still greater than QC objective then note deviation in final data	L. Green or E. Herron	Precision
Field Filtration Duplicate	100%	Not greater than 50 %RPD	Re-analyze on fluorometer., if still greater than QC objective then note deviation in final data	L. Green or E. Herron	Precision

Note:
[1]Measurement performance criteria = method reporting limit.

2.6.13 Field Analytical QC Table – Worksheet 23a

EPA-NE QAPP Worksheet #23a - Rev. 10/99 - Field Analytical QC Table

Secchi Depth[1]

Sampling SOP	Field SOP 005 and BI/BHP SOP 001	Analytical Method/SOP Reference	NA – Field Measurement
Medium/Matrix	Ambient or Marine Waters	Sampler's Name	Various
Analytical Parameter	Secchi Depth	Field Sampling Organization	Committee for the Great Salt Pond
Concentration Level	NA	No. of Sample Locations	5

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Field Duplicate Measurements	100%	Not greater than 0.25 meter difference between all readings	Flag data as inconsistent	L. Green, E. Herron	Precision
Calibrate measurement line	Yearly	Less than 10%D in gradation of measurement line	Replace calibrated line	URIWW Staff	Accuracy

Notes:
[1] Measurement performance criteria = method Reporting Limit

EPA-NE QAPP Worksheet #23a - Rev. 10/99 - Field Analytical QC Table

Temperature[1]

Sampling SOP	Field SOP 006 and BI/BHP SOP 001	Analytical Method/SOP Reference	NA – Field Measurement
Medium/Matrix	Ambient or Marine Waters	Sampler's Name	Various
Analytical Parameter	Temperature	Field Sampling Organization	Salt Ponds Coalition and Committee for the Great Salt Pond
Concentration Level	0 -100 °C	No. of Sample Locations	27

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Calibrate	Yearly	Difference less than +/- 1 °C from reference	Replace or repair thermometer	URIWW Staff	Accuracy

Notes:
[1] Measurement performance criteria = method Reporting Limit

EPA-NE QAPP Worksheet #23a - Rev. 10/99 - Field Analytical QC Table

Dissolved Oxygen[1]

Sampling SOP	Field SOP 010 and BI/BHP SOP 001	Analytical Method/SOP Reference	NA – Field Test Kit
Medium/Matrix	Ambient or Marine Waters	Sampler's Name	Various
Analytical Parameter	Dissolved Oxygen	Field Sampling Organization	Salt Ponds Coalition and Committee for the Great Salt Pond
Concentration Level	0 – 14 mg/L O_2	No. of Sample Locations	27

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Duplicate Titration	100%	Results not more than 1 mg/L O_2 different	Re-analyze sample. If still greater than QC objective then note deviation in final data.	Sampler	Precision
Collect field duplicate pair and analyze each sample twice (deep water samples only)	100%	Results not more than 1 mg/L O_2 different	Re-analyze sample. If still greater than QC objective then note deviation in final data.	Sampler	Precision

Notes:
[1] Measurement performance criteria = method Reporting Limit

2.6.14 Fixed Laboratory Analytical QC Sample Table –Worksheet #24 a

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99

FECAL COLIFORMS, ESCHERICHIA COLI and ENTEROCOCCI[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 007, 008 and 018
Sampling SOP	Field SOP 008 and Block Island/Green Hill Pond SOP 001	Laboratory Name	URIWW
Concentration Range (without dilution)	Ambient and marine samples: <1 – 80 colonies/100 mL	No. of Sample Locations	22

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Method Blank	2/run or 2/100 plates, whichever is greater	Less than 1 colony/100 mL	Samples re-analyzed, data qualified as outside holding time	E. Herron	Bias
Laboratory Duplicate	25% of non-diluted samples	20%RPD	Data qualified	E. Herron	Precision
	100% of diluted samples. Diluted samples replicated by comparing samples at different dilutions	20%RPD	Data qualified	E. Herron	Precision
Positive Plates	2/run	Positive growth	Samples re-analyzed, data qualified as outside holding time	E. Herron	False Negatives

Notes:
[1] Measurement performance criteria = method Reporting Limit

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99

TOTAL SUSPENDED SOLIDS[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 009
Sampling SOP	Field SOP 009 and Block Island/Green Hill Pond SOP 001	Laboratory Name	URIWW
Concentration Range (without dilution)	Ambient samples: <1 – 500 mg/L TSS	No. of Sample Locations	6

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Method Blank	1/24 samples	Not greater than 1 mg/L TSS	Re-weigh, if still outside QC limits then data qualified	URIWW Staff	Bias
Laboratory Duplicate	100%	Not greater than 30%RPD	Re-weigh samples then if still outside QC limits data is qualified	URIWW Staff	Precision
EPA Water Pollution Proficiency Test Study – Analysis of unknown	yearly	2 standard deviation	Data reported to laboratory	NA	Accuracy/Comparability
Check Calibration of Balance	Daily, when in use	Not greater than 10%D	Service and re-calibrate	URIWW Staff	Accuracy

Notes:
[1] Measurement performance criteria = method Reporting Limit

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99

pH[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 010
Sampling SOP	Field SOP 007 and Block Island/Green Hill Pond SOP 001	Laboratory Name	URIWW
Concentration Range (without dilution)	pH ambient and marine samples: 1 – 14 SU	No. of Sample Locations	27

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Calibrate pH meter	Each time used	Electrode Efficiency >96%	Replace standards then if calibration still a problem replace the electrode	URIWW Staff	Accuracy
pH: Standards as Samples (check of calibration using standards)	1/15 samples	Change in standard not greater than 0.1 SU	Re-check values of calibrants (4 and 7 pH buffers), then recalibrate and re-analyze affected samples if necessary	URIWW Staff	Accuracy/Precision
EPA Water Pollution Proficiency Test Study – Analysis of unknown for pH	yearly	2 standard deviation	Data reported to laboratory	NA	Accuracy/Comparability

Notes:
[1] Measurement performance criteria = method Reporting Limit

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99
Salinity[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 017
Sampling SOP	Field SOP 009 and Block Island/Green Hill Pond SOP 001	Laboratory Name	URIWW
Concentration Level (undiluted samples)	Marine samples: <0.4 – 40 ppt	No. of Sample Locations	27

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Laboratory Replication	50%	+/- 2 ppt	Re-titrate sample, if still greater than acceptance limit note on project data sheet	URIWW Staff	Precision
Sample Comparison (Check with refractometer)	100%	+/- 2 ppt	Re-titrate sample with test kit and re-analyze with refractometer. If still greater than acceptance limit replace test kit titrant and re-analyze sample. If still greater than acceptance limit assume that refractometer is in error and send it out for repair.	URIWW Staff	Comparability

Notes:
[1] Measurement performance criteria = method Reporting Limit

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99
CHLOROPHYLL-a[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 011
Sampling SOP	Field SOP 007 and BI/GHP SOP 001	Laboratory Name	URIWW
Concentration Level (undiluted samples)	Ambient and marine samples: <0.2 – 100 µg/L chlorophyll-a	No. of Sample Locations	22

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Calibrate fluorometer	Calibrate yearly, Check calibration daily	Daily – Not greater than 15%D	Re-calibrate and then replace light source if calibration continues to drift	URIWW Staff/ L. Green	Accuracy
Method Blank	1/rack (38 samples)	Not greater than 0.03 µg/L chlorophyll-a as read on the fluorometer	Re-analyze on fluorometer, then qualify samples associated with blank if necessary	URIWW Staff	Bias
Filter Blank	1/rack (38 samples)	Not greater than 0.03 µg/L chlorophyll-a as read on the fluorometer	Re-analyze on fluorometer, then qualify samples associated with blank if necessary	URIWW Staff	Bias
Laboratory Duplicate (Replication of fluorometer reading)	100%	Not greater than 20%RPD	Re-analyze on fluorometer, then qualify samples associated if still greater than QA objective	URIWW Staff	Precision
LCS (Check standard using solid standard)	1/rack (38 samples)	Not greater than 15%D	Re-analyze on fluorometer, check value of primary standard, recalibrate if necessary, re-analyze associated samples	URIWW Staff	Accuracy

Notes:
[1] Measurement performance criteria = method Reporting Limit

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99
AMMONIA[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 014
Sampling SOP	Field SOP 007 and BI/GHP SOP 001	Laboratory Name	URIWW
Concentration range (without dilution)	Ambient and marine samples: <40 – 1000 µg/L NH_3-N	No. of Sample Locations	27

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Calibrate	Each time used	R^2 of calibration linear regression not less than 0.990	Re-calibrate	L. Green	Accuracy
Method Blank	1/10 samples	Not greater than 30 µg/L NH_3-N	Re-analyze, then re-calibrate and re-analyze associated samples if necessary	L. Green	Bias
Laboratory Duplicate	Sample aliquot taken from same cup – 100% Ambient & marine samples poured into two separate cups – 10% of samples	Not greater than 15%RPD Not greater than 20%RPD	Re-analyze samples, if still greater than QC objective then note deviation on project data sheet	L. Green	Precision
LCS (Purchased External Standards)	3/90 samples	Not greater than 20%D	Re-analyze standard, if still outside QC objective recalibrate instrument and re-analyze associated samples	L. Green	Accuracy/ Comparability
LCS (Calibrant)	1/15 samples	Not greater than 20%D	Re-analyze standard, if still outside QC objective recalibrate instrument and re-analyze associated samples	L. Green	Accuracy
EPA Water Pollution Proficiency Test Study – Analysis of unknown	Yearly	2 standard deviation	Data reported to laboratory	NA	Accuracy/ Comparability

Notes:
[1] Measurement performance criteria = method Reporting Limit

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99
NITRATE + NITRITE[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 015
Sampling SOP	Field SOP 007 and BI/GHP SOP 001	Laboratory Name	URIWW
Concentration range (without dilution)	Nitrate/Nitrite: Ambient and marine samples: <30 – 2000 µg/L NO_3/NO_2-N	No. of Sample Locations	27

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Calibrate	Each time used	R^2 of calibration linear regression not less than 0.990	Re-calibrate	L. Green	Accuracy
Method Blank	1/10 samples	Not greater than 20 µg/L NO_3/NO_2-N	Re-analyze, then re-calibrate and re-analyze associated samples if necessary	L. Green	Bias
Laboratory Duplicate	Sample aliquot taken from same cup – 100% Ambient & marine samples poured into two separate cups – 10% of samples	Not greater than 15%RPD Not greater than 20%RPD	Re-analyze samples, if still greater than QC objective then note deviation on project data sheet	L. Green	Precision
LCS (Purchased External Standards)	3/90 samples	Not greater than 20%D	Re-analyze standard, if still outside QC objective recalibrate instrument and re-analyze associated samples	L. Green	Accuracy/ Comparability
LCS (Calibrant)	1/15 samples	Not greater than 20%D	Re-analyze standard, if still outside QC objective recalibrate instrument and re-analyze associated samples	L. Green	Accuracy
EPA Water Pollution Proficiency Test Study – Analysis of unknown	yearly	2 standard deviation	Data reported to laboratory	NA	Accuracy/ Comparability

Notes:
[1] Measurement performance criteria = method Reporting Limit

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24 a – Rev. 10/99

TOTAL PHOSPHORUS AND NITROGEN[1]

Medium/Matrix	Water	Analytical Method/ SOP Reference	SOP 016
Sampling SOP	Field SOP 009 and BI/GHP SOP 001	Laboratory Name	URIWW
Concentration range (without dilution)	Total N Ambient and marine samples: <30 – 2000 µg/L N Total P Ambient and marine samples: <4 – 200 µg/L P	No. of Sample Locations	27

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**
Calibrate	Each time used	R^2 of calibration linear regression not less than 0.990	Re-calibrate	L. Green	Accuracy
Instrument Blank	1/10 samples	Not greater than 3 µg/L P and 5 µg/L N	Re-analyze, then re-calibrate and re-analyze associated samples if necessary	L. Green	Bias
Method Blank	3/90 samples	Not greater than 10 µg/L N and 3 µg/L P	Re-analyze, if still outside QC criteria flag data	L. Green	Bias
LCS (Purchased External Standards)	2/run (150 vials)	Not greater than 20%D	Re-analyze standard, then if still outside QC criteria recalibrate instrument and re-analyze associated samples	L. Green	Accuracy/ Comparability

Fixed Laboratory Analytical QC Sample Table – EPA NE QAPP Worksheet #24a – Rev 10/99

TOTAL PHOSPHROUS AND NITROGEN (continued)

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Laboratory Duplicate	Sample aliquot taken from same cup – 100% Sample poured into two separate cups – 10% of samples Replicate digestions of sample 20% of marine and ambient samples	Not greater than 15%RPD Not greater than 20%RPD Not greater than 25%RPD	Re-analyze sample, if still outside QC criteria note deviation on project data sheet	L. Green	Precision
LCS (Calibrant)	1/10 samples	Not greater than 20%D	Re-analyze standard, if still outside QC criteria recalibrate instrument and re-analyze associated samples	L. Green	Accuracy
EPA Water Pollution Proficiency Test Study – Analysis of unknown	yearly	2 standard deviation	Data reported to laboratory	NA	Accuracy/ Comparability

Notes:
[1] Measurement performance criteria = method Reporting Limit

3.0 SAMPLE HANDLING, TRACKING AND CUSTODY REQUIREMENTS

A sample log sheet will be completed for each set of samples by the person(s) responsible for collection and/or delivery of the samples to the laboratory (figures 6 and 7). Sample collected on Block Island are placed into a cooler and shipped to Point Judith, Rhode Island via the Block Island ferry. The samples are then picked up the URIWW technicians and transported to the laboratory at URI. The COC form will be provided by the URIWW laboratory and will include the following information:

1. Project Name
2. Project Location
3. Person(s) responsible for transporting samples
4. Date and time of sample collection
5. Sample identification name/number
6. Number and type of sample bottles

A technician will be responsible for checking that the samples listed on the sample log sheet correspond correctly with the samples received. A copy of the sample log sheet will be maintained in the project file. Project files are maintained in the main URIWW laboratory and Linda Green's office, in the URI Coastal Institute. Both locations are locked when staff are not present.

3.1 Acceptance of Expendable Laboratory supplies

All expendable laboratory supplies such as test tubes, Petri dishes, chemicals and sample bottles will be inspected upon arrival by either Linda Green or Elizabeth Herron. Packages containing damaged material or packages that were open upon arrival will not be accepted. Chemicals will be marked with the date of acceptance as well as the date they are opened.

Figure 6 - Log sheet for Green Hill and Ninigret Pond Samples

Receipt Log Green Hill & Ninigret Pond Samples: January, 2005

Received by: _____
Date/Time: _____

Monitoring Location	Delivered By	Date of Collection	Time of Collection	(Filtered) Brown	(Unfiltered) Br. Glass	(Bacteria) Sterile Plastic	(TSS) Large plastic	(Chl-a) Baggies
GH-In Pond								
GH-Indigo Point								
GH-Sea Lea								
GH-Teal Road								
GH-Twin Peninsula								
NP-Crawford Dock								
NP-Ft Neck Cove								
NP-Pond Street								
NP-Stumpy Point								
NP-Tockwotten Dock								
NP-Tom Cod Cove								
NP-Vigna's Dock								

Date/Time Samples Filtered: _____
Technician Initials: _____

Date/Time Bact. Setup: _____
Technician Initials: _____

Date/Time TP Setup: _____
Technician Initials: _____

Date/Time TSS Setup: _____
Technician Initials: _____

Figure 7 - Log Sheet for Block Island (Great Salt Pond) Samples

2004 Log Sheet: Block Island (Great Salt Pond)
October 6, 2004 Collection

You should have all of the bottles/bags listed with each monitoring location. Please check each off, write in the date and time collected, as well as the name of the person who delivered the samples to the ferry.

Monitoring Location	(CGSP) Delivered by	(URI) Received by	Date Collected	Time Collected	Brown Unfiltered	Brown Filtered	Plastic Sterile	Large plastic	Chl-a bag
Great Salt Pond #1					2	1	1		1
Great Salt Pond #2					2	1	1		1
Great Salt Pond #3					2	1	1		1
Great Salt Pond #4					2	1	1		1
Great Salt Pond Trib #1					1		1	1	
Great Salt Pond Trib #2					1		1	1	
Great Salt Pond Trib #3					1		1	1	
Great Salt Pond Trib #4					1		1	1	
Great Salt Pond Trib #5					1		1	1	
Great Salt Pond Trib #6					1		1	1	
Great Salt Pond Trib #7									
Great Salt Pond Trib #8									
Great Salt Pond Trib #9									
Great Salt Pond Trib #10									
Great Salt Pond Trib #11									

3.2 Sample Handling System – Worksheet 16

EPA-NE QAPP Worksheet #16 - Rev. 10/99 **Sample Handling System**
SAMPLE COLLECTION, PACKAGING AND SHIPMENT
Sample Collection: Various persons Sample Packing: Person(s) responsible for sample collection Coordination of Shipment: Person(s) responsible for sample collection Type of Shipment: Generally the person responsible for sample collection or their designee delivers samples to the URIWW laboratory. Block Island samples are placed on the Block Island ferry and picked up by URIWW personnel upon arrival.
SAMPLE RECEIPT AND ANALYSIS
Responsible Organization: University of Rhode Island Watershed Watch Laboratory (URIWW) Sample Receipt: URIWW Staff Sample Custody and Storage: URIWW Staff Sample Preparation: URIWW Staff Sample Determinative Analysis: URIWW Staff
SAMPLE ARCHIVAL
Field Sample Storage (No. of days from sample collection): Dependent upon analysis – Refer to analyte-specific SOPs in the URIWW Laboratory QAPP Sample Extract/Digestate Storage (No. of days from extraction/digestion): Dependent upon analysis – Refer to analyte-specific SOPs in the URIWW Laboratory QAPP.
SAMPLE DISPOSAL
Responsible Organization and personnel: URIWW / URIWW Staff

4.0 PROJECT DOCUMENTATION, RECORDS AND VALIDATION

4.1 Project Records

All Sample log sheets will be retained by the laboratory in the project files. All hard copy sample data sheets and sample preparation worksheets as discussed in each analyte-specific SOP under Section 7.0 Documentation of the URIWW Laboratory Program QAPP will also be retained in the project files. For assays that produce electronic files, the electronic file will be stored and a hard copy of the file contents will be produced. The hard copy will include a peak height tracing of each sample, a standard curve and a final data worksheet.

Project files are maintained in the main URIWW laboratory and Linda Green's office, in the URI Coastal Institute by Linda Green and Elizabeth Herron. Both locations are locked when staff are not present. Electronic data are stored on a password protected laboratory computer that is networked to several other password protected computers throughout the laboratory and URIWW offices. All laboratory data (electronic and hard copy) are retained for at least 10 years.

4.2 Assessment and Response Actions

No formal project assessments are planned for this task. The data will be informally reviewed during the data validation process for basic trends at each sample location as well as pond wide. If questions regarding possible causes of an observed trend are raised then various responses may be completed including:

- Increasing the frequency of monitoring to observe trends over reduced time scales or
- Increasing the number of sampling stations to determine if a specific inlet, outlet, tributary or area of land is contributing to nutrient loading more or less than expected;

During the 2003 and 2004 sampling years tributary sampling stations were added to the sampling scheme in Great Salt Pond in response to questions regarding the role of tributaries to overall pond nutrient load.

The project sampling and analysis scheme may also be modified in response to the ability of the volunteer monitoring groups (Committee for the Great Salt Pond and Salt Pond Coalition) to collect and analyze samples correctly. In the event this becomes a concern the URIWW laboratory may complete assays in the laboratory that were originally planned to be completed in the field by the volunteers. This scenario occurred early in the project (2001) when the Salt Pond Coalition volunteers had difficulty with the salinity field analysis. In response the URIWW program began to analyze the salinity samples in the laboratory instead of having volunteers analyze the samples in the field.

Additionally, trip blanks were initially included in the sampling scheme at 1 trip blank per sampling event. After the first sampling year it was determined that most of the volunteer monitors were unclear of the purpose of the trip blank and often compromised the field blank prior to returning it to the laboratory. Therefore, trip blanks were removed from the program.

4.3 Data Validation and Usability Assessment

No general quality management reports are prepared. During the analysis of samples the technician completing sample analysis is responsible for recording any problems with meeting measurement performance criteria (Section 2.6.3) and/or instrument operational issues. Any failure of a sample to meet defined measurement performance criteria should be recorded and the data flagged for further review upon data entry and final data validation.

Data generated by each analysis is internally validated by either Ms. Green or Ms. Herron. The data validation process starts once the data has been produced and it is entered into Microsoft Excel files. After data has been entered into the appropriate file, URIWW staff complete an initial check to be sure all data was entered correctly. Then, Ms. Green or Ms. Herron check the data entered for errors and correct any. Outliers and inconsistencies are flagged for further review. If data collected by volunteer monitor is flagged, then the monitor is contacted to check that the data sent to the laboratory was correct. Data are compared to values obtained for similar samples analyzed in the past. The decision to discard data will be made by either Ms. Green or Ms. Herron.

Once a monitoring year is completed and the data validated it is transmitted electronically and as a hard copy to Lorraine Joubert – Project Coordinator. A final synopsis of all data collected during the project will be written by Ms. Green and/or Ms. Herron and included in the final project report.

The main purpose of the collection of data described in this QAPP is for the initial evaluation of trends within the study areas. Once data has been validated by the URIWW program it will be considered useable. No further evaluation of usability is undertaken.

5.0 REFERENCES

URI. Quality Assurance Project Plan for Private Well Tap Water Testing, A Component of the Block Island and Green Hill Pond Watershed National Community Decentralized Wastewater Treatment Demonstration Project. August 2001. URI Cooperative Extension, Kingston, RI.

URI. Quality Assurance Project Plan, University of Rhode Island Watershed Watch Field Program – Ambient and Marine Sampling Program – DRAFT. April 2005. URI Cooperative Extension, Kingston, RI.

URI. Quality Assurance Project Plan, University of Rhode Island Watershed Watch Laboratory – Program. February 2005. URI Cooperative Extension, Kingston, RI.

APHA, AWWA & WEF. Standard Methods for the Examination of Water and Wastewater. 19th ed. Washington D.C: AHPA, 1995.

Appendix A

Standard Operation Procedures
List of SOPs

Description	SOP Number
Project SOPs	
Salt Ponds Monitoring Manual Supplement to URI Watershed Watch Lake and Pond Monitoring Manual (provided upon request)	Block Island/Green Hill Pond SOP 001
Laboratory SOPs Applicable to the Block Island and Green Hill Watershed QAPP **(These SOPs have been approved as part of the URIWW Laboratory Program QAPP and are not attached)**	
General Laboratory Safety	001
University Safety and Waste Handling Document	001a
Laboratory Water	002
General Labware Cleaning Procedure	003
General Autoclave Operation	004
Bottle Autoclaving Procedure	005
Waste Autoclaving Procedure	006
Ambient Waters Microbiological Procedure	007
Total Suspended Solids Analysis	009
Alkalinity and pH Procedures	010
Chlorophyll-a Analysis, Welschmeyer Method	012
Ammonia Analysis	014
Orthophosphate and Nitrate + Nitrite Analysis	015
Total Phosphorus and Nitrogen Analysis	016
Salinity Analysis	017
Enterococci Analysis	018

Description	SOP Number
Field SOPs Applicable to the Block Island and Green Hill Watershed QAPP	
(These SOPs have been approved as part of the URIWW Field Program – Ambient and Marine Sampling Program and are not attached)	
Secchi Depth Transparency	Field SOP 005
Water Temperature	Field SOP 006
Chlorophyll (Algae) and Nutrients	Field SOP 007
Bacterial Monitoring	Field SOP 008
Collecting Unfiltered Water Samples	Field SOP 009
Dissolved Oxygen Monitoring	Field SOP 010
Shallow Water Sampler Operation	Field SOP 011
Deep Water Sampler Operation	Field SOP 012

Appendix B

Resumes for Key Laboratory Personnel
List of Resumes

Gailen McGovern

Arthur Gold, PhD

Lorraine Joubert

Linda Green

Elizabeth Herron,

Jose Amador, PhD

Appendix C

Project Sampling Schedules

Block Island (Great Salt Pond) Monitoring Schedules

URI WATERSHED WATCH

2001 WATER QUALITY MONITORING SCHEDULE

Great Salt Pond & Tributaries

Week Ending	BIWEEKLY MONITORING: Secchi depth, temperature, chlorophyll, dissolved oxygen, salinity	WATER COLLECTION DATES: Fill water bottles & bring with frozen chlorophyll filters to BI ferry for Watershed Watch lab analysis of Nutrients, bacteria, suspended solids
14	X	TRAIN VOLUNTEERS
21		
July 28	**X**	**FIRST COLLECTION: THURSDAY July 26**
AUGUST 4		
11	X	
18		AUGUST 13 IS VICTORY DAY
25	**X**	**SECOND COLLECTION: THURSDAY Aug. 23**
SEPT. 1		
8	X	SEPTEMBER 3 IS LABOR DAY
15		
22	**X**	**THIRD COLLECTION: THURSDAY Sept. 20**
29		
OCT. 6	X	
13		OCTOBER 8 IS COLUMBUS DAY
Oct. 20	**X End of biweekly monitoring**	**FOURTH COLLECTION: THURSDAY Oct. 18**
Collection of water samples only (Weather permitting)		**Fill water sample bottles**
		Nov 15, '01
		Dec 13, '01
		Jan 17, '02
		Feb 14, '02
		Mar 14, '02
		Apr 18, '02

Monitoring is scheduled for every other week, but you may monitor weekly if you choose to! **Monitor between 6 AM and 9 AM** ***It is better to collect the water samples earlier rather than later.*** After collection immediately bring the water samples on ice in a cooler to the central collection area for transport to the BI ferry. The water samples will be shipped on a midday ferry to Pt. Judith. They will be picked up and transported to the URI Watershed Watch laboratory for analysis. URI Watershed Watch phone #874-2905, email URIWW@etal.uri.edu.

URI WATERSHED WATCH

2002 WATER QUALITY MONITORING SCHEDULE

Great Salt Pond and its Tributaries

Week Ending	Biweekly monitoring: Secchi depth, temperature, chlorophyll, dissolved oxygen, salinity	WATER COLLECTION DATES: Fill water bottles & bring with frozen chlorophyll filters to BI ferry for shipment to URI Watershed Watch lab for analysis of pH, nutrients, bacteria, suspended solids
June 15	**X**	**Train new volunteers, replenish supplies, start up of 2002 season, Wednesday June 12**
June 22		
June 29	**X**	
July 6		Participate in '02 Great American Secchi Dip-In
July 13	X	
July 20		
July 27	**X**	**FIRST COLLECTION: THURSDAY July 25**
August 3		
August 10	X	
August 17		AUGUST 12 IS VICTORY DAY
August 24	**X**	**SECOND COLLECTION: THURSDAY Aug. 22**
August 31		SEPTEMBER 2 IS LABOR DAY
September 7	X	
September 14		
September 21	X	**THIRD COLLECTION: Sept. 19**
September 28		
October 5	X	
October 12		OCTOBER 14 IS COLUMBUS DAY
October 19	**X**	**Scheduled sampling postponed due to weather** ***Participate in National Water Monitoring Day***
October 26		
November 2		
November 9		
November 16	Return all supplies	**FOURTH COLLECTION: Nov.12**

Monitoring is scheduled for every other week, but you may monitor weekly if you choose to! **Monitor between 6 AM and 9 AM** ***It is better to collect the water samples earlier rather than later.*** After collection immediately bring the water samples on ice in a cooler to the central collection area for transport to the BI ferry. The water samples will be shipped on a midday ferry

URI WATERSHED WATCH
2003 WATER QUALITY MONITORING SCHEDULE
Great Salt Pond and its Tributaries

2003 Wednesday Dates	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen	WATER COLLECTION DATES: Fill water bottles & bring with frozen chlorophyll filters to BI ferry for shipment to URI Watershed Watch lab for analysis of pH, nutrients, bacteria, suspended solids
June 11		**Train new volunteers, replenish supplies, start up of 2003 season, Wed. June 11**
18	**X**	
June 25	**X**	**FIRST COLLECTION: June 25** All water sample bottles, chl-a filters
2	**Enjoy the July 4th Holiday!**	
July 9	**X**	
16		
July 23	**X**	**SECOND COLLECTION: July 23** All water sample bottles, chl-a filters
30		
August 6	**X**	
13		
August 20	**X**	**THIRD COLLECTION: Aug. 20** All water sample bottles, chl-a filters
27		
Sept. 3	**X**	
10		
Sept. 17	**X**	**FOURTH COLLECTION: Sept. 17** **All water sample bottles, chl-a filters**
24	X	
Oct. 1	**X** **Return all monitoring supplies**	**FIFTH COLLECTION: Oct. 1** **All water sample bottles, chl-a filters**

Monitoring is scheduled for every other week, but you may monitor weekly if you choose to! **Monitor between 6 AM and 9 AM** ***It is better to collect the water samples earlier rather than later.*** After collection immediately bring the water samples on ice in a cooler to the central collection area for transport to the BI ferry. The water samples will be shipped on the 12:30 ferry to Pt. Judith. They will be picked up and transported to the URI Watershed Watch laboratory for analysis. URI Watershed Watch phone #874-2905, email URIWW@etal.uri.edu.

URI WATERSHED WATCH
2004 WATER QUALITY MONITORING SCHEDULE
Great Salt Pond and its Tributaries

2004 Wednesday Dates	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen	WATER COLLECTION DATES: Fill water bottles & bring with frozen chlorophyll filters to BI ferry for shipment to URI Watershed Watch lab for analysis of pH, nutrients, bacteria, suspended solids
June 16		**Train new volunteers, replenish supplies, start up of 2004 season, Wed. June 16**
June 23	**X**	**FIRST COLLECTION: June 23** All water sample bottles, chl-a filters
30	**!**	
July 7	**X**	
14		
July 21	**X**	**SECOND COLLECTION: July 21** All water sample bottles, chl-a filters
28		
August 4	**X**	
11		
August 18	**X**	**THIRD COLLECTION: Aug. 18** All water sample bottles, chl-a filters
25		
Sept. 1	**X**	
8		
Sept. 15	**X**	**FOURTH COLLECTION: Sept. 15** **All water sample bottles, chl-a filters**
22		
29	**X**	
Oct. 6	**X** **Return all monitoring supplies**	**FIFTH COLLECTION: Oct. 13** **All water sample bottles, chl-a filters**

Monitoring is scheduled for every other week, but you may monitor weekly if you choose to! **Monitor between 6 AM and 9 AM** ***It is better to collect the water samples earlier rather than later.*** After collection immediately bring the water samples on ice in a cooler to the central collection area for transport to the BI ferry. The water samples will be shipped on the 12:30 ferry to Pt. Judith. They will be picked up and transported to the URI Watershed Watch laboratory for analysis. URI Watershed Watch phone #874-2905, email URIWW@etal.uri.edu.

URI WATERSHED WATCH
2005 WATER QUALITY MONITORING SCHEDULE
Great Salt Pond and its Tributaries

2005 Dates (based on mid-week low tides)	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen	WATER COLLECTION DATES: Fill water bottles & bring with frozen chlorophyll filters to BI ferry for shipment to URI Watershed Watch lab for analysis of pH, nutrients, bacteria, suspended solids
June 8		Train new volunteers, replenish supplies, start up of 2005 season, Wed. June 8
June 15		**FIRST COLLECTION: Wednesday, June 15 (Low tide – 8:12 am)** All water sample bottles, chl-a filters
June 22		
June 29	**X**	
July 6		**Extra July Fourth Bacteria Samples??**
July 14		**SECOND COLLECTION: Thursday, July 14 (Low tide – 7:08 am) All water sample bottles, chl-a filters**
July 21		
July 27	**X**	
August 3		
August 10	**X**	
August 15		**THIRD COLLECTION: Monday Aug. 15 (Low tide – 9:29 am) All water sample bottles, chl-a filters**
August 24		
August 31	**X**	
Sept. 7		
Sept. 13		**FOURTH COLLECTION: Tuesday Sept. 13 (Low tide – 9:17 am) All water sample bottles, chl-a filters**
Sept 21		
Sept 28	**X**	
Oct. 5		
Oct. 12	**Return all monitoring supplies**	**FIFTH COLLECTION: Wednesday Oct. 12 (Low tide – 9:16 am) All water sample bottles, chl-a filters**

Monitoring is scheduled for every other week, but you may monitor weekly if you choose to! **Tributaries should be monitored between 6 AM and 9 AM. *It is better to collect the water samples earlier rather than later*. Water clarity (Secchi depth) at the Great Salt Pond sites should be monitored between 10 AM and 2 PM if possible.** After collection immediately bring the water samples on ice in a cooler to the central collection area for transport to the BI ferry. The water samples will be shipped on the midday ferry to Pt. Judith. They will be picked up and transported to the URI Watershed Watch laboratory for analysis. URI Watershed Watch phone #874-2905, email URIWW@etal.uri.edu. Please call to let URIWW know that the samples have made the ferry.

Green Hill and Ninigret Pond Monitoring Schedules

URI WATERSHED WATCH
2001 WATER QUALITY MONITORING SCHEDULE
GREEN HILL & NINIGRET PONDS

All monitoring will take place on Wednesday mornings to accommodate bacterial analytical requirements. All monitoring and water sample collections will take place between 7 and 8:30 am. Please contact Ralph Minopoli, phone 364-7771, Salt Pond Watchers (SPW) Monitoring Coordinator for volunteer coordination and sample pick-up and delivery information, questions or concerns. Please contact Linda Green or Elizabeth Herron, URI Watershed Watch, 874-2905 for sampling and testing methods questions or concerns.

2001 Wednesday Dates	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, salinity	SAMPLES COLLECTED AND DELIVERED TO THE USFW OFFICES BIWEEKLY
May 23		
30		
June 6	X	FIRST COLLECTION: June 6 All water sample bottles, chl-a filters
13		
June 20	X	SPW bacteria bottle only, chl-a filters
27		
JULY 4th	Enjoy the Holiday!	
11	X	SECOND COLLECTION: July 11 All water sample bottles, chl-a filters
July 18	X	SPW bacteria bottle only, chl-a filters
25		
August 1	X	THIRD COLLECTION: Aug. 1 All water sample bottles, chl-a filters
8		
August 15	X	SPW bacteria bottle only, chl-a filters
22		
August 29	X	FOURTH COLLECTION: Aug. 29 All water sample bottles, chl-a filters
5		
Sept. 12	X	chl-a filters
19		
Sept. 26	X	FIFTH COLLECTION: Sept. 26 All water sample bottles, chl-a filters
3		
Oct. 10	X End of biweekly monitoring	SIXTH COLLECTION: Oct. 10 All water sample bottles, chl-a filters

	Collection of water samples only (Weather permitting)	Fill all bottles All water sample bottles
Nov 14, '01		
Dec 12, '01		
Jan 16, '02		
Feb 13, '02		
Mar 13, '02		
Apr 17, '02		

URI WATERSHED WATCH
2002 WATER QUALITY MONITORING SCHEDULE
GREEN HILL & NINIGRET PONDS

All monitoring will take place on Wednesday mornings to accommodate bacterial analytical requirements. All monitoring and water sample collections will take place between 6 and 8:30 am. Please contact Ralph Minopoli, phone 364-7771, Salt Pond Watchers (SPW) Monitoring Coordinator for volunteer coordination and sample pick-up and delivery information, questions or concerns. Please contact Linda Green or Elizabeth Herron, URI Watershed Watch, 874-2905 for sampling and testing methods questions or concerns.

2002 Wednesday Dates	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen	SAMPLES COLLECTED AND DELIVERED TO THE USFW OFFICES BIWEEKLY
May 15	X	Chlorophyll filters only – keep in freezer
22		
May 29	X	FIRST COLLECTION: May 29 All water sample bottles, chl-a filters
5		
June 12	X	SPW bacteria bottle only, chl-a filters
19		
June 26	X	SECOND COLLECTION: June 26 All water sample bottles, chl-a filters
3	Enjoy the July 4th Holiday!	
July 10	X	SPW bacteria bottle only, chl-a filters
17		
July 24	X	THIRD COLLECTION: July 24 All water sample bottles, chl-a filters
31		
August 7	X	SPW bacteria bottle only, chl-a filters
14		
August 21	X	FOURTH COLLECTION: Aug. 21 All water sample bottles, chl-a filters
28		
Sept. 4	X	FIFTH COLLECTION: Sept. 4 All water sample bottles, chl-a filters
11		
Sept. 18	X End of biweekly monitoring	SIXTH COLLECTION: Sept 18 All water sample bottles, chl-a filters
25		
	Collection of water samples only (Weather permitting)	Fill all water sample bottles Nutrients & TSS
Oct. 16		
Nov 6, '02	X	
Dec 4, '02	X	
Jan 8, '03	X	
Feb 5, '03	X	
Mar 5, '03	X	
Apr 9, '03	X	

URI WATERSHED WATCH
2003 WATER QUALITY MONITORING SCHEDULE
DOCKSIDE at GREEN HILL & NINIGRET PONDS

All monitoring will take place on Wednesday mornings to accommodate bacterial analytical requirements. All monitoring and water sample collections will take place between 6 and 8:30 am. Please contact Ralph Minopoli, phone 364-7771, Salt Pond Watchers (SPW) Monitoring Coordinator for volunteer coordination and sample pick-up and delivery information, questions or concerns. Please contact Linda Green or Elizabeth Herron, URI Watershed Watch, 874-2905 for sampling and testing methods questions or concerns.

2003 Wednesday Dates	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen	SAMPLES COLLECTED AND DELIVERED TO THE USFW OFFICES BIWEEKLY
Thurs May 8, 5pm	Training and equipment handout At the home of George & Cathy Hill, 221 Indigo Point Rd, Wakefield	
May 14	Start biweekly monitoring X	Chlorophyll filters only – keep in your freezer
21		
May 28	X	FIRST COLLECTION: May 28 All water sample bottles, chl-a filters
4		
June 11	X	SPW bacteria bottle only, chl-a filters
18		
June 25	X	SECOND COLLECTION: June 25 All water sample bottles, chl-a filters
2	Enjoy the July 4th Holiday!	
July 9	X	SPW bacteria bottle only, chl-a filters
16		
July 23	X	THIRD COLLECTION: July 23 All water sample bottles, chl-a filters
30		
August 6	X	SPW bacteria bottle only, chl-a filters
13		
August 20	X	FOURTH COLLECTION: Aug. 20 All water sample bottles, chl-a filters
27		
Sept. 3	X	FIFTH COLLECTION: Sept. 3 All water sample bottles, chl-a filters
10		
Sept. 17	X	Chlorophyll filters only – keep in your freezer
24		
Oct 1	X End of biweekly monitoring	SIXTH COLLECTION Oct 1 All water sample bottles, chl-a filters
	Collection of water samples only (Weather permitting)	Fill all water sample bottles Nutrients & TSS
Nov 12, '03	X	
Dec 3, '03	X	
Jan 7, '04	X	
Feb 4, '04	X	
Mar 4, '04	X	
Apr 8, '04	X	

Note: The in-pond samples taken on Green Hill Pond for 2003, 2004 and 2005 also follow this schedule except SPW bacteria bottles are not collected and no sampling occurs in the winter.

URI WATERSHED WATCH
2004 WATER QUALITY BIWEEKLY MONITORING SCHEDULE
DOCKSIDE at GREEN HILL & NINIGRET PONDS

All monitoring will take place on Wednesday mornings to accommodate SPW bacterial analytical requirements. All monitoring and water sample collections will take place between 6 and 8:30 am. Please contact Ralph Minopoli, phone 364-7771, Salt Pond Watchers (SPW) Monitoring Coordinator for volunteer coordination and sample pick-up and delivery information, questions or concerns. Please contact Linda Green or Elizabeth Herron, URI Watershed Watch, 874-2905 for sampling and testing methods questions or concerns.

2004 Wednesday Dates	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen, (salinity optiona)l	SAMPLES COLLECTED AND DELIVERED TO THE USFW OFFICES BIWEEKLY
Wed May 12, 4pm	Training and equipment handout At the home of George & Cathy Hill, 221 Indigo Point Rd, Wakefield	
21		
May 26	X	FIRST COLLECTION: May 26 All water sample bottles, chl-a filters
2		
June 9	X	SPW bacteria bottle only
16		
June 23	X	SECOND COLLECTION: June 23 All water sample bottles, chl-a filters
June 30	!	
July 7	X	SPW bacteria bottle only
14		
July 21	X	THIRD COLLECTION: July 21 All water sample bottles, chl-a filters
28		
August 4	X	SPW bacteria bottle only
11		
August 18	X	FOURTH COLLECTION: Aug. 18 All water sample bottles, chl-a filters
25		
Sept. 1	X	FIFTH COLLECTION: Sept. 1 All water sample bottles, chl-a filters
8		
Sept. 15	X	Chlorophyll filters only – keep in your freezer (no SPW bacteria collection)
22		
Sept. 29	X End of biweekly monitoring	SIXTH COLLECTION Sept. 29 All water sample bottles, chl-a filters
Weather permitting	Collection of water samples only	Fill all water sample bottles Nutrients & TSS
Oct 13, '04	X	
Nov 10, '04	X	
Dec 8, '04	X	
Jan 5, '05	X	
Feb 2, '05	X	
Mar 2, '05	X	
Mar 30, '05	X	
Apr 27, '05	X	

URI WATERSHED WATCH
2005 WATER QUALITY BIWEEKLY MONITORING SCHEDULE
DOCKSIDE at GREEN HILL & NINIGRET PONDS

All monitoring will take place on Wednesday mornings to accommodate SPW bacterial analytical requirements. All monitoring and water sample collections will take place between 6 and 8:30 am. Please contact Ralph Minopoli, phone 364-7771, Salt Pond Watchers (SPW) Monitoring Coordinator for volunteer coordination and sample pick-up and delivery information, questions or concerns. Please contact Linda Green or Elizabeth Herron, URI Watershed Watch, 874-2905 for sampling and testing methods questions or concerns.

2005 Wednesday Dates	Biweekly monitoring: Collect and run samples in "WORK HORSE" BOTTLES for temperature, chlorophyll, dissolved oxygen, (salinity optional)	SAMPLES COLLECTED AND DELIVERED TO THE USFW OFFICES BIWEEKLY
May 4		
May 11	X	FIRST COLLECTION: May 11 All water sample bottles, chl-a filters
18		
May 25	X	SPW bacteria bottle only
June 1		
June 8	X	SECOND COLLECTION: June 8 All water sample bottles, chl-a filters
15		
June 22	X	SPW bacteria bottle only
29		
July 6	X	THIRD COLLECTION: July 6 All water sample bottles, chl-a filters
13		
July 20	X	SPW bacteria bottle only
27		
August 3	X	FOURTH COLLECTION: Aug. 3 All water sample bottles, chl-a filters
10		
August 17	X	SPW bacteria bottle only
24		
August 31	X	FIFTH COLLECTION: Aug 31 All water sample bottles, chl-a filters
7		
Sept. 14	X	Chlorophyll filters only – keep in your freezer (no SPW bacteria collection)
21		
Sept. 28	X End of monitoring	SIXTH COLLECTION Sept. 21 All water sample bottles, chl-a filters

Appendix D

URIWW Program Information