bard water lab

WATER SCIENCE FOR WATER COMMUNITIES

CENTER FOR THE STUDY OF LAND, AIR, AND WATER

Quality Assurance Project Plan

2019

Bard College

Project Manager: M. Elias Dueker, Assistant Professor of Biology and Director of Environmental and Urban Studies Programs
(office phone: 845-752-2338, email: edueker@bard.edu)

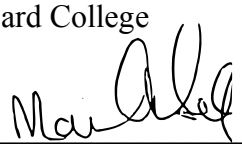
This document has been prepared according to the United States Environmental Protection Agency publication *EPA Requirements for Quality Assurance Project Plans* dated March 2001 (QA/R-5).

A PROJECT MANAGEMENT

A1. Approval Sheet

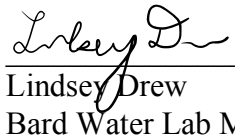
5/20/19

M. Elias Dueker, Ph.D. Project Manager — Date
Bard College



5/20/19

Maureen O'Callaghan-Scholl Bard College — Date
Biology Laboratory Manager



5/20/19

Lindsey Drew — Date
Bard Water Lab Manager

A2. Table of Contents

A3. Distribution List
The following individuals must receive a copy of the approved QAPP in order to complete their role in this project.

Name	Title	Organization	Document Type
M. Elias Dueker	Project Manager/Project Investigator	Bard College	Electronic
Maureen O'Callaghan-Scholl	Biology Lab Manager	Bard College	Electronic
Lindsey Drew	Bard Water Lab Manager	Bard College	Electronic
Lab Interns and Volunteers	Citizen Scientists	Bard College	Electronic

A4. Project/Task Organization

The following people and parties will actively participate in this project and its oversight:

M. Elias Dueker, Assistant Professor, Bard College, Project Manager

Responsibilities:

1. Oversee project administration and coordination of interactions with Dr. Brooke Jude, Maureen O'Callaghan-Scholl, and Lindsey Drew
2. Draft, maintain and modify (when necessary) the official approved copy of the QAPP
3. Determine project strategy and overall design, including site location, parameter selection, sampling frequency.

Maureen O'Callaghan-Scholl, Lab Manager, Bard College Biology Department

Responsibilities:

1. Coordinate with Dr. Jude to maintain lab facilities for violacein-producers.
2. All supplies and consumables are ordered, inspected, catalogued and accepted for use by the Biology Lab Manager

Lindsey Drew, Lab Manager, Bard Water Lab

Responsibilities:

1. Organize sampling teams and lab volunteers for Saw Kill Monitoring Program
2. Oversee Bard Water Lab assays for Saw Kill and Roe Jan
3. Report Saw Kill and Roe Jan Enterolert data to Riverkeeper
4. Coordinate with Dr. Jude to provide samples for violacein-producers research.
5. Communicate findings to community

Lab Interns/Volunteers Bard Water Lab
Responsibilities:

1. Scanning site and data sheets, and entering data into the google drive spreadsheet in the BWL drive
2. Performing turbidity, fluorometry, Enterolert, Colilert, and peristaltic pumping assays on all samples
3. Creating aliquots for future microbial and chemical analyses (total (TN) and filtered (0.22um sterivex) for nutrient analyses; ICP for heavy metal detection; Jude for bacterial analyses

Sampler for Site Collection
Responsibilities:
1. Collecting water samples using aseptic technique
2. Recording physical observations, water temperature, and conductivity at each site
3. Recording time and date of sampling
4. Filling out chain-of-custody sheet at the Bard Water Lab

Partner Organization	Responsibilities
Saw Kill Watershed Community	Approximately 14 sites along the Saw Kill
Roe Jan Watershed Community	Approximately 15 sites along the Roeliff Jansen Kill
Cary Institute of Ecosystems Studies	Nutrient Data Analysis
Riverkeeper	Post Enterococci data on RK website for SKMP and RJMP
FEMC	Post all Water Lab data on Bard Water Lab website

A5. Problem Definition/Background

The Bard Water Lab is a community-centered laboratory devoted to bringing water science to water communities. We leverage the interdisciplinary platform of Bard's EUS Program to bring social and political issues together with scientific study to create effective solutions to complex environmental issues relating to water. The monitoring of watersheds is beneficial not only to the organisms living within the ecosystem, but also to the communities who depend on the source for drinking water

Monitoring tributaries like the Saw Kill and Roe Jan allows the Bard Water Lab to identify potential threats to water quality: bacteria, nutrients, heavy metals, salts. Through this research we can establish baseline data on fecal-indicating bacteria (Enterococci, E. coli, and Coliforms), temperature, conductivity, turbidity, chlorophyll a, phycocyanin, optical brighteners (OB), colored dissolved organic material (CDOM), nutrients, and heavy metals, in surface waters.

A6. Project/Task Description

Project overview

Performing consistent water quality tests is a step we can take towards improving the health of our local environment. Scientific analyses of our watersheds can give us a stronger understanding of the connection between public health and environmental health. Moreover, we can gain a stronger sense of community and involvement with the natural world. The monitoring of local water supplies is an activity that benefits the entire community. Water quality analysis provides accurate information on the health of our waterbodies and ensures that we (and other organisms in the ecosystem), can continue to depend on it and safely use it for recreational activities such as swimming and fishing. Furthermore, our analysis can be used to provide insight into the health of endangered species utilizing the river as a resource, and monitor levels of contamination.

The Bard Water Lab monitors nutrients, conductivity, temperature, turbidity, coliforms, the presence of phycocyanin, chlorophyll, optical brighteners, and color dissolved organic materials. Also, we participate in Riverkeeper's ongoing Enterococcus (sewage indicating bacteria) monitoring program on Hudson River tributaries.

A7. Quality Objectives and Criteria

Quality objectives

Parameter	Method Name	Instrument	Detection Limit
Enterrococcus	Enterolert Assay	IDEXX 2000	1 enterococci per 100 mL
Total coliforms and E. coli	Colilert Assay	IDEXX 2000	1 coliform or E. coli per 100 mL
Turbidity	Turbidity	Hach 2100Q Turbidimeter	0.01 NTU
Chlorophyll a, Phycocyanin, OB, CDOM	Fluorometry	Turner Designs Aquaflor	Chlorophyll a 0.3 ug/L Phycocyanin 10 ppb OB 0.5 ppm CDOM 0.1 ppb
Conductivity Temperature	Field Instrument	YSI Pro2030/	Conductivity 0.1 uS Temperature 0.1^{o} C

A8. Special Training/Certification

In order to maintain consistent lab work, staff, faculty, and students must be trained in lab safety and all protocols before participating on sampling days. This training occurs regularly in the Bard Biology Labs, and all are required to engage in training annually. Maureen O'Callaghan-Scholl and Lindsey Drew provide these trainings on a regular basis, and participants are tracked by the Biology Program. The Project Manager will work closely with Maureen O'Callaghan-

Scholl and Lindsey Drew to ensure that all staff and students involved in this project are trained to the extent necessary.

A9. Documents and Records

The Program Manager will ensure that all project participants are kept informed through email, regular project meetings, and phone calls. All participants will receive a copy of the current QAPP, and all changes to this document through the course of the project will be communicated (along with attaching the new QAPP) immediately to project participants. The project will also have a Google Drive folder which houses the QAPP and other important documents, and records, including sampling site information and maps, and data repositories.

The following records and information will be maintained in this shared folder:

raw data (in XL format)
data from other sources such as databases or literature
field logs from sample collection
sample preparation and analysis logs
instrument printouts
results of calibration and QC checks.

Report format/information

Bard Water Lab reports all Enterococcus data to Riverkeeper's monitoring program. In addition, working with the Forest Ecological Monitoring Cooperative (FEMC) all Water Lab data will be accessible to the public from the Bard Water Lab website. Both of these programs give the public access to our datasets and are a resource for educating the public.

Document/record control

Hand-recorded data records (for instance, in the field while sampling, or in the laboratory) will be taken with indelible ink, and changes to such data records will be made by drawing a single line through the error and initialed by the responsible person. The Program Manager will have ultimate responsibility for any and all changes to records and documents. Similar controls will be put in place for electronic records.

The Project Manager will retain full responsibility for updating and posting changes to the QAPP.

Other records/documents

Other records and documents used in or produced by the project.

Field sampling reports (as managed by Bard Water Lab Manager)
Amended QAPP (as managed by Project Manager)
Data handling reports (through Bard Water Lab Manager

Storage of project information

All electronic data will be stored on Bard College computers and backed up to Bard's Google Drive on a regular basis by the Bard Water Lab Manager. The Google Drive folders will be monitored and maintained by the Bard Water Lab Manager, who will facilitate the regular back-up of data. Hard-copy notes taken in the field during sampling will be recorded upon sample arrival, and stored in XL spreadsheets (that will then be backed-up onto Google Drive). These hard-copy notes will also be scanned into pdf documents that will also be stored both on Bard computers and in Google Drive. Hard-copy laboratory notes taken during microbiological assays will also be transferred to XL spreadsheets stored as above. The Project Manager shall retain copies of all management reports and memoranda.

B DATA GENERATION AND ACQUISITION

B1. Sample Process Design (Experimental Design)

Refer to the Saw Kill or Roe Jan Sampling QAPP.

B2. Sampling Methods

Refer to the Saw Kill or Roe Jan Sampling QAPP.

B3. Sample Handling and Custody

Refer to the Saw Kill or Roe Jan Sampling QAPP.

B4. Analytical Methods

This project will follow well-recognized statistical analytical methods for determining concentrations. The assays performed in the lab include IDEXX Enterolert Assay, IDEXX Colilert Assay, Turbidity, and Fluorometry.

Bard Water Lab

Aliquoting Protocol

TO BEGIN:
→ WIPE DOWN entire work area with ethanol.
→YOU MUST WEAR GLOVES and use sterile pipettes throughout.
→During the aliquoting process, maintain sterile conditions and use aseptic technique – do not leave caps off for any period of time, work quickly and carefully.
→ Always aliquot sample from site 2.5 and site 6 LAST!

1. Thoroughly shake sample bottle (but not TOO vigorously).
2. Pour 250 ml of sample into 250 ml aliquot bottles for IDEXX assays. Hand to IDEXX processors.
3. Shake/swish sample bottle again to be sure no settling has occurred.
4. Using aseptic technique, pour 40 ml of sample into 50 ml centrifuge tube for turbidity assay. Take to turbidimeter station.
5. Using aseptic technique, pour 40 ml of sample into 50 ml centrifuge tube for AquaFlor assay. Take to aquaflor station.
6. Shake/swish sample bottle again to be sure no settling has occurred.
7. Using aseptic technique, pour 45 ml of sample into another 50 ml centrifuge tube for Total Nutrients assay. Will be stored in freezer.
8. Shake/swish sample bottle again to be sure no settling has occurred.
9. Using aseptic technique, pour 15 ml of sample in 15 ml centrifuge tubes for Jude Lab. Stored in fridge in lab.
10. Pipette 25 ml of sample into 50 ml centrifuge tubes for ICP. Will be acidified in RKC and stored in fridge in RKC.
11. Place remaining 2L sample in refrigerator for peristaltic pumping.

Quality Control Notes:

1. Blank: perform the aliquoting procedure on a DI water container (this will create the blanks for all assays).

1, 2A, 2B, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 2.5, Blank

In the lab, two fecal-indicating bacteria assays are run from the EPA approved IDEXX system. Enterolert to measure Enterococci and Colilert to measure E. coli and Total Coliforms.

Bard Water Lab

IDEXX Enterolert Protocol

Freshwater sample whole, no dilution
EXCEPT, run these sites last
Site 2.5 whole and Site 2.5 1/10 dilution
Site 6 whole and Site 6 1/10 dilution

TO BEGIN:
-TURN ON incubator at 41 degrees Celsius
-TURN ON the IDEXX Quanti-Tray sealer before starting so it will heat up.
-YOU MUST WEAR GLOVES and use sterile pipettes throughout.
-WARNING: DO NOT use the UV light without the viewing cover/box.

Preparing Sample:

1. Carefully crack open the Enterolert media and empty into a sterile 120 mL vessel (with sodium thiosulfate powder).
2. Gently shake the water sample you've collected and using a sterile pipette, place 100 ml of sample into the vessel
3. Close the vessel and invert gently until media is fully dissolved.
4. Carefully open a Quanti-Tray by pulling the tab gently outwards and gripping around the plastic side of the tray with one hand, pressing slightly to open it wider.
5. Pour the entire contents of the vessel into the tray. **Pour slowly to avoid creating bubbles.**
6. Taking care not to spill contents, place the tray in the sealer mold (face down) and gently push into sealer (open end is up, last to go in). The sealer will "grab" the tray and roll it through at the proper speed. Push only enough to engage the tray.
7. Once all trays are poured place them into the incubator set at **41 degrees Celsius**. Record the time incubation began. Remove and read after 24 hours.
8. Keep trays as horizontal as possible and face down as they are light sensitive

Evaluating MPN:

1. After the incubation period (24 hours), remove the tray from the incubator.
2. To measure enterococcus, place the tray under the UV light box and count the number of large and small wells with a bright, blue fluorescence. Mark fluorescing wells with sharpie; this is a good idea in case you need to recount or get interrupted.
3. Use the MPN (most probable number) chart provided to determine the amount of enterococcus per 100mL sample. If the sample is diluted, you must multiple by the dilution factor (multiple by 10 for a 1/10 dilution).
4. Record data (number of positive wells is important information to gather) on the lab computer in the Water Lab Data spreadsheet under the 'Enterolert' tab.

Quality Control Notes:

1. There is a BLANK and a DIPC
2. Positive control: run a duplicate sample for Site #2 (2A, 2B) during each sampling run.

Bard Water Lab

IDEXX Colilert Protocol

Freshwater sample = 1/10 dilution
EXCEPT, run these sites last
Site 2.5 1/10 dilution and Site 2.5 1/100 dilution
Site 6 1/10 dilution and Site 6 1/100 dilution

TO BEGIN:
-TURN ON incubator at 35 degrees Celsius
-TURN ON the IDEXX Quanti-Tray sealer before starting so it will heat up.
-YOU MUST WEAR GLOVES and use sterile pipettes throughout.
-WARNING: DO NOT use the UV light without the viewing cover/box.

Preparing Sample:

1. Carefully crack open the Colilert media and empty into a sterile 120mL vessel (with sodium thiosulfate powder).
2. Gently shake the water sample you've collected and using a sterile pipette, place **10 ml of sample** in the vessel, followed by **90 mL of autoclaved DI water** (for a 1/10 dilution).
3. Close the vessel and invert gently until media is fully dissolved.
4. Carefully open a Quanti-Tray by pulling the tab gently outwards and gripping around the plastic side of the tray with one hand, pressing slightly to open it wider.
5. Pour the entire contents of the vessel into the tray. **Pour slowly to avoid creating bubbles**.
6. Taking care not to spill contents, place the tray in the sealer mold (face down) and gently push into sealer (open end is up, last to go in). The sealer will "grab" the tray and roll it through at the proper speed. Push only enough to engage the tray.
7. Once all trays are poured place them into the incubator set at **35 degrees Celsius**. Record the time incubation began. Remove and read after 24 hours.
8. Keep trays as horizontal as possible and face down as they are light sensitive.

Evaluating MPN:

1. After the incubation period (24 hours), remove the tray from the incubator.
2. To measure total coliforms, count the number of yellow wells (as yellow or more yellow than the comparator), record number big and number small wells.
3. To measure E. coli, place the tray under the UV light box and count the number of large and small wells with a bright, blue fluorescence that are also yellow. Mark fluorescing wells with sharpie; this is a good idea in case you need to recount or get interrupted.
4. Use the MPN (most probable number) chart provided to determine the amount of enterococcus per 100mL sample. If the sample is diluted, you must multiple by the dilution factor (multiple by 10 for a 1/10 dilution).
5. Record data (number of positive wells is important information to gather) on the lab computer in the Water Lab Data spreadsheet under the 'Colilert' tab.

Quality Control Notes:

1. There is a BLANK and a DIPC
2. Positive control: run a duplicate sample for Site #2 (2A, 2B) during each sampling run.

To measure the turbidity of our samples we use a Hach Turbidimeter 2100Q.

Bard Water Lab

Turbidimeter Protocol

1. Invert your sample three times to be sure no settling has occurred.
2. Fill a clean sample cell halfway with sample cap it, shake and dump out. Repeat 3x.
3. Fill a clean sample cell to the line (~15mL) with sample and cap it.
4. Use a lint-free cloth to wipe down the cell and remove any water spots and fingerprints.
5. Apply one drop silicone oil. Wipe with a soft cloth until there's an even film over the entire cell's surface.
6. Insert the cell into the turbidimeter compartment so that the triangular orientation mark aligns with the raised mark in front of the compartment.
7. Close the compartment, press **READ** and record the turbidity in NTU.
8. Empty the cell of sample, carefully rinse the cell with tap water and return to step 1 for the next sample.

Quality Control Notes:

1. Blank: run one blank sample (using autoclaved DI water as "sample") during each sampling run. Record the turbidity reading.
2. Positive control: run a duplicate sample for Site #2 (2A, 2B) during each sampling run. Record the turbidity reading.
3. If sample is highly turbid, you may need to perform a dilution and re-read the turbidity. First try a 1/10 dilution (2 ml sample + 18 ml DI water).

To measure chlorophyll a, phycocyanin, color dissolved organic materials, and optical brighteners we use fluorometry. We specifically use Turner Designs AquaFluor, handheld fluorometer and turbidimeter.

Bard Water Lab

Fluorometry Protocol

1. Select the correct Aquafluor fluorometer to measure your parameter; each fluorometer is only set up to measure 2 of 4 parameters. One Aquafluor measures Phycocyanin (channel A) and CDOM (channel B), while the other measures optical brighteners (channel A) and Chlorophyll (channel B). Check this by turning on the device and pressing the **<A/B>** button, which will show you the parameters it measures.
2. Turn on the fluorometers by pressing the **<ON/OFF>** button, and wait at least 5 seconds for the instruments to boot up.
3. Using gloves, obtain a plastic cuvette **(NO GLASS CUVETTES)**, making sure that the outer surfaces are clean and free of noticeable scratches or marks. **Check for the sharpie mark on the rim of the cuvette; make sure to insert the cuvette with this side facing you for every reading.**
4. Run one blank sample **FIRST** (using autoclaved DI water) for all 4 channels before measuring the other samples. Follow the instructions below and repeat steps 5 -14 for each sample.
5. Rinse the cuvette with DI water **3 times**.
6. Gently agitate your water sample to re-suspend any particles that have settled to the bottom.
7. Rinse the cuvette with your sample **3 times**, then fill the cuvette until it is ¾ full (do not fill the cuvette to its maximum volume).
8. Gently clean off any smudges or liquid droplets from the outside of the cuvette with a KIMTECH wipe.
9. After opening the small hatch to the sample bay, place your sample into the fluorometer, **making sure not to spill any of the contents of the sample into the interior of the device. If a spill occurs, quickly invert the device and immediately let a member of the BWL know.**
10. Select your desired parameter to measure using the **<A/B>** button.
11. Press either of the two **<READ>** buttons, and record the measured parameter in RFU. Make sure measure all 4 parameters (Chla, PC, OB, and CDOM) for each sample.
12. Empty the cuvette and start at step 5 to measure the next sample.
13. **Finally, read one more blank sample after all of the other samples have been measured.**

IMPORTANT NOTES:

- Positive control: Measure the Site 2 sample twice (2A, 2B) for each parameter to provide an indication of instrument variation.
- If your cuvette becomes too dirty or scratched, you may discard it and take a new one. However, you **MUST run another blank for all 4 parameters before proceeding to the next sample**. This allows us to account for variability between cuvettes.

Bard Water Lab

Filtering Protocol

TO BEGIN:
-WIPE DOWN entire work area with isopropyl
-YOU MUST WEAR GLOVES AND SAFETY GOGGLES and use sterile pipettes throughout.
-Use aseptic technique – do not allow ends of tubing to touch anything but sample
- Make sure to have 50mL centrifuge tubes and 0.22 sterivex filters labelled for each site
-Run Site 2.5 and Site 6 LAST

Materials:
-autoclaved glass pipettes
-autoclaved luer-lock plastic ends
-autoclaved tubing
-autoclaved tin foil
-10% HCl, 250 mL bottle, and 10 mL plastic pipette
-autoclaved DI water (2, 2L bottles)
-0.22 um sterivex filters

1. Connect peristaltic pump to battery/power source (away from sink and water).
2. Have at least two bottles of autoclaved, sterile deionized water near the sink ready to use.
3. Set up autoclaved tubing in pump latches and attach luer-lock to the exiting end.
4. Take one the autoclaved, sterile deionized (BLANK) water bottles and cover the top with a piece of autoclaved foil.
5. Open an autoclaved glass pipette and carefully pierce it through the foil covering the BLANK bottle, making sure the narrower end is facing up.
6. Attach the sipping end of the tubing to the glass pipette letting the luer-lock end run the exiting water into the sink.
7. Once this is all set up, turn the pump on and set to speed 2-3. Allow BLANK water to run through for **one minute.**
8. After one minute, detach the sipping end from the glass pipette and allow the remaining BLANK water to run through the tubing.
9. When this is done turn off the pump and move the BLANK bottle out of the way.
10. Take the 250 mL bottle of 10% HCl acid and cover the top with autoclaved foil.
11. Open an autoclaved glass pipette and carefully pierce it through the foil covering the 10% HCl acid, making sure the narrower end is facing up.
12. Attach the sipping end of the tubing to the glass pipette and place the luer-lock end so that the acid will empty back into the 10% HCl acid bottle.
13. Then turn on the pump starting at speed 1 to make sure that everything is working properly.
14. While acid is running through make sure you are holding the tubing onto the glass pipette to make sure they do not detach.
15. Turn speed up 2-3 and let acid run through tubing for **30 seconds.**
16. After 30 seconds carefully remove tubing from glass pipette. Keeping the luer-lock end in the 10% HCl acid bottle to allow the last of the acid to exit the tubing.
17. When this is done turn off pump. Carefully move the 10% HCl acid bottle out of the way.
18. Next remove a 2L sample bottle from the fridge. Invert bottle three times and then remove cap and cover it with a piece of autoclaved foil.

19. Open an autoclaved glass pipette and carefully pierce it through the foil covering the sample, making sure the narrower end is facing up.
20. Attach the sipping end of the tubing to the glass pipette letting the luer-lock end run the exiting water into the sink.
21. Let the sample rinse through the tubing for **30 seconds** on speed 2-3.
22. After 30 seconds turn pump off.
23. CAREFULLY open a sterivex package (we need to reuse the package, so only open the very end). Put the packaging aside and attach new sterivex filter to luer-lock end of tubing.
24. Place a 2L graduated cylinder into the sink, place the filter end so that the exiting water will go into the graduated cylinder.
25. After this is set up turn the pump back on to speed 2-3.
26. Take the .22 filtered 50 mL centrifuge tube labelled with the site and fill it with 45 mL of the water exiting the filter. Then continue to fill the graduated cylinder with the sample.
27. Ideally filtering through 500-900 mL of sample. If the water is turbid then you may need to stop sooner, listen to how the pump sounds also the color of the filter will indicate how clogged it may be.
28. Once you have collected enough sample, again detach the tubing from the glass pipette and let the water run through. Use the pump to remove remaining liquid from the filter as we want it to be as dry as possible.
29. When that is done then the pump can be shut off and the filter should be labelled with the Volume, Site, Date. Making sure that you add the 45 mL to the total volume that were collected in the centrifuge tube.
30. Place the sterivex filter and label into its original package. Using staple-less stapler, re-close the packaging.
31. Repeat this process for each site.
32. When the process is over, place sterivex filters in -80 deg C freezer in RKC for storage.

Note:

1. Make sure to filter a DIPC/ Blank sample as your negative control.

In the lab samples are also collected for further analysis including nutrient, metagenomics, and ICP.

B5. Quality Control

This project will undertake the following specific steps to measure/estimate the effect of data errors:

Water blanks: in each sample delivery from the Bard Water Lab, there is always a processing control sample which consists of autoclaved DI water to be used to assess any contamination issues arising from the aliquoting process.
Positive Control: There is always a duplicate of site 2 run during each assay to test the accuracy of the procedural process.

Data anomalies

The project will handle the following anomalies in these ways:

Missing data: if data are missing due to sites being dry or iced-over, this will be noted in data spreadsheets and those data will be treated as "NA". When data is missing due to data entry error or omission, the Project Manager will work with Project Investigators to use handwritten notes (in the field and the lab) to find the missing data.
Outliers: Because of the unique nature of these data, outliers will be maintained in all analyses. We do not yet have a good sense of baseline for this waterway, so cannot assess outliers beyond this.

B6. Instrument/Equipment Testing, Inspection, and Maintenance

Field Instruments and Equipment:

- long-handled dippers
- Calibrated YSI 2030 Environmental Probe
- sterile (autoclaved and acid-washed) 2L sample bottles
- insulated cooler backpacks
- ice packs
- Nitrile gloves

These will be maintained, cleaned, and tracked by the Bard Water Lab Manager
We have three extra dippers, at least 20 back-up sample bottles, several extra backpacks and at least 20 extra ice packs for use in the field.

B7. Instrument/Equipment Calibration and Frequency

Bard Water Lab-

- IDEXX 100-mL sealed sterile disposable plastic bottles with sodium thiosulfate
- IDEXX Enterolert reagent powder snap packs
- IDEXX Quanti-Tray 2000 incubation trays
- Incubator for Enterolert and Colilert assays
- Quanti-tray sealer
- Quanti-tray holder
- UV viewing cabinet
- IDEXX MPN table
- Calibration of YSI probes: the week prior to sampling
- Turbidimeter: calibration check the week prior to sampling Hach 2100Q
- Turner Designs AquaFluors: periodic calibration check with a secondary standard; does not need to be calibrated regularly and instrument does not use primary calibration
- Duplication (2A, 2B) for all assays
- Blank (negative control) for all assays
- DIPC (de-ionized water process control) for all assays done with aliquots from the original 2L sample- ensures no microbiological contamination during the aliquoting process

B8. Inspection/Acceptance for Supplies and Consumables

All supplies and consumables are ordered, inspected, catalogued and accepted for use by the Biology Lab Manager, Maureen O'Callaghan-Scholl.

B9. Data Management

As part of this project, Bard College will develop a data management strategy, and amend the QAPP based upon any changes in the strategy. The Project Manager is responsible for ensuring that that strategy is developed and that the QAPP is amended to reflect that strategy.

We will be implementing the following:

Data management scheme:

- Sampling dates, times, and sites recorded when 2L sample bottle arrives at Bard Water Lab– scanning of handwritten data and entry of those data into XL spreadsheets kept on Bard College computers and backed up to shared Google Drive folder.
- Water quality data will be recorded and entered into XL spreadsheets kept on Bard College computers and backed up to shared Google Drive folder.
- Regular visual maintenance and upkeep of files in shared Google Drive folder by Bard Water Lab Manager and Project Manager.

Standard recordkeeping and tracking practices, and document control system

- o Project Manager maintains, documents, and distributes all changes to project QAPP.
- o All handwritten notes (in the field and lab) will regularly be scanned into pdf versions and stored in shared Google Drive folder.
- o Handwritten notes will be taken in field and the lab and will be monitored for detail and completeness by Bard Water Lab Manager and Project Investigator.

Individuals responsible for elements of the data management scheme

- o Project Manager (compiling data for reports)
- o Project Investigator (lab notes and data entry of concentrations; archival and notations for genomes)
- o Lab Managers (field and equipment-level notes and data entry for field data)

Process for data archival and retrieval

- o Data will be stored both on Bard computers and the Google Drive shared folder.
- o Data will be uploaded monthly to FEMC storing it and making it accessible to the public

Data Entry Protocol

To Scan:

1. Place document to be scanned face down in the scanner.
    a. The top of the document should be closest to you and the document should be aligned with the arrow on the lower left of the scanner.
2. Make sure scanner is turned on and connected.
    a. If not, unplug scanner USB from computer and re-plug it in.
    b. In the computer's search bar (very top right), search "canoscan."
    c. Select canoscan scanner.
3. Place document to be scanned face down in the scanner.
    a. The top of the document should be closest to you and the document should be aligned with the arrow on the lower left of the scanner.
4. In bottom left of the scanner menu, select "scanned sheets." This is where the scanned documents should scan to.
    a. Select drop down menu
    b. Scroll and select "other"
    c. Select "desktop"
    d. Select "scanned sheets."
5. In scanner window, click "scan."
6. Repeat for each document.

To Organize:

1. After scanned in all documents, open the "scanned sheets" folder where all documents should be saved.
2. Label each with the content and the date. For example:
    a. Site forms [Site X Date]: Site 1 6/1/16
    b. Chain of Custody [COC Site(s) Date]: COC 6-8 6/1/16
    c. Any notes [Content Date]: Protocol Edits 6/1/16
3. Put each document in its folder in the SKMP folder.

To Enter Data:

1. Open google drive document.
2. Enter YSI data, turbidity data, and physical observations.
3. Enter data completely- all cells should be filled unless it is not applicable.
4. When data has been entered, download the spreadsheet as "SKMP_Data_date" as an xlsx document and drop it in the SKMP folder.

Things to note:

1. Data should be as complete as possible. If you don't know how to enter something, ask.
2. All documents should be well labeled and easy to find.

C ASSESSMENT/OVERSIGHT

C1. Assessment and Response Actions

The Project Manager will thoroughly brief project implementation staff before and after beginning their respective implementation tasks, to identify emerging/unanticipated problems and take corrective action, if necessary.

D DATA REVIEW AND EVALUATION

D1. Data Review, Verification, and Validation

This QAPP shall govern the operation of the project at all times. Each responsible party listed in Section A4 shall adhere to the procedural requirements of the QAPP and ensure that subordinate personnel do likewise.

This QAPP shall be reviewed at least annually to ensure that the project will achieve all intended purposes. All the responsible persons listed in Section A4 shall participate in the review of the QAPP. The Project Manager and the Quality Assurance Officer are responsible for determining that data are of adequate quality to support this project. The project will be modified as directed by the Project Manager. The Project Manager shall be responsible for the implementation of changes to the project and shall document the effective date of all changes made.

It is expected that from time to time ongoing and perhaps unexpected changes will need to be made to the project. The Project Manager shall authorize all changes or deviations in the operation of the project. Any significant changes will be noted in the next progress report and shall be considered an amendment to the QAPP. All verification and validation methods will be noted in the analysis provided in the final project report.

D2. Verification and Validation Methods

Data will be regularly inspected to ensure that they are gathered appropriately and as described in the Project QAPP. We will be relying on methods outlined in B5, B6 and B7 to perform QA/QC of our data stream.

Once we are confident that our data are complete and valid, we will use them to report back to the Saw Kill Watershed Community, and publish them as important pieces of peer-reviewed research manuscripts

D3. Evaluating Data in Terms of User Needs

Field and lab data management will involve review blank and duplicate sample results, checking rating errors, retrieving or documenting missing data, and compiling a master data spreadsheet.