

Community Clean Water Institute

Volunteer Water Quality Monitoring Program

Sampling and Analysis Methods

Sampling

Samples are collected by direct insert of a probe, collection of surface water by a container on a pole or by a bucket attached to a rope. Field analysis is performed on the samples collected on site. For samples returning to CCWI the sampling containers for nutrient testing are sterilized Whirl Pak bags. Containers for bacteria testing are sterilized wide mouth bottles with attached lid. Samples containers are marked with Site ID, time, and date either with label stickers or by writing with a Sharpie pen. Samples are placed in a cooler with ice or blue ice for transport to CCWI. CCWI staff keep samples refrigerated until analyzed. Operators are instructed to refrigerate samples at home if they are not to be returned to CCWI right away. Chain of Custody is recorded on the field datasheet.

For details on sampling collection and instrument operation, visit http://www.cwi.org/resources/water_tests.html.

Data collection

The Stream Quality Field Data Form documents:

- site location & conditions,
- time and date of sampling,
- names of monitors,
- instrument ID,
- Field results
- Sample Number from Sample Log
- Tracks data entry and secondary review
- And serves as a chain of custody

The Bacteria Testing Data Form documents:

- Test setup and reading date and time
- Site location
- Date and time of sampling
- Sample Prep Dilution Factor
- Observed sample responses
- Test results
- Tracks data entry and secondary review
- And serves as a chain of custody

The Colorimeter Data Form documents:

- Test Parameter (Nitrate-N, Phosphate-P, Ammonia-N)
- Instrument ID
- Reagent ID
- Standard ID with true value
- Sample Number
- Instrument result
- Calculations
- Final result
- Analyst
- Dates of data entry and QC check

The Ion Chromatography Data documentation is the chromatogram print out generated at the time of analysis that includes:

- Date and time of analysis
- Run number
- Retention time of observed peaks
- Area of observed peaks
- Concentration calculation for calibrated peaks
- Hand written sample number
- Hand written dilution Factor
- Reviewer's initials and date
- Notes & calculations

Instrument maintenance is documented in the Equipment Maintenance Log. Reagents, equipment and standards are logged, chronologically and given an incrementing ID number. The accompanying documentation is filed.

Maintenance and narrative about the functioning of the ion chromatograph is described in an instrument log.

Calibration and accuracy checks are recorded in the Calibration Record.

Results and metadata prior to January of 2008 were posted to an Excel spreadsheet (the Ultimate) as a centralized data repository. From January 2008 and forward, data are entered directly into a relational database through interactive data entry screens that match the form layouts. The database is reviewed against original data sheets for validation, and outliers investigated and qualified.

Methods:

	METHODNAME	METHODDESCR	Res	Reporting Limit	Units
Field	EPA170.1B	Temperature by Bulb	0.3	NA	Deg C
Field	EPA170.1T	Temperature by Thermocouple	0.1	NA	Deg C
Field/LAB	EPA150.1	pH	0.1	NA	pH Units
Field/LAB	EPA120.1	Specific Conductance	--	10	µS/cm
Field/LAB	EPA180.1	Hach 2100P Turbidimeter	--	0.01	NTU
Field	ICM-DO	Dissolved Oxygen (polarographic)	0.1	NA	mg/L
Field	Hach10360	Dissolved Oxygen (luminescent)	0.1	NA	mg/L
LAB	LaMotte3642-SC	Ammonia (colorimeter) – non distilled	--	0.1	mg/L
LAB	IDEXX9223	Total Coliforms	--	1	MPN
LAB	IDEXX9223	<i>E. coli</i> Bacteria	--	1	MPN
LAB	HachNI-14	NO ₂ +NO ₃ -N (color wheel)	--	0.02	mg/L
LAB	LaMotte3649-SC	NO ₂ +NO ₃ -N (colorimeter)	--	0.02	mg/L
LAB	EPA300.0M	NO ₃ -N (Ion Chromatography)	--	0.02	mg/L
LAB	HachPO-24	PO ₄ -P (color wheel)	--	0.03	mg/L
LAB	LaMotte3653-SC	PO ₄ -P (colorimeter)	--	0.03	mg/L
LAB	EPA300.0M	PO ₄ -P (Ion Chromatography)	--	0.03	mg/L

Method Names: Is a condensation of source+identification. Example: HachNI-14 refers to the Hach kit number NI-14.

RS = resolution (size of the smallest observed interval)

µS/cm = micro Siemens per centimeter

NA = Not Applicable

MPN = Most Probable Number

NTU = Nephelometric Turbidity Unit

Field Testing

Temperature

Alcohol filled bulb thermometer and or a thermocouple in the Dissolved Oxygen Meter. The range of the Bulb Thermometer is from -5 to 50 deg C in 0.5 divisions. The thermocouple is a digital output to the tenths of a degree Celsius.

pH

Instrument is a pHTester model 10 from Eutech instruments. The method is electrometric with temperature compensation, with three point calibration (4, 7 & 10). Results are recorded as displayed to the tenths place.

Specific Conductance

Instruments are the ECTester from Eutech. One instrument the ECTester Low operates in the 0 to 2000 micro Siemens range with a resolution of 10 micro Siemens. The ECTester High operates in the 0 to 19900 micro Siemens Range with a resolution of 100 micro Siemens. The method is direct conductivity measurement with temperature compensation, with a single point calibration. Results are recorded as displayed.

Turbidity

Instrument is a Hach Model 2100P Portable Turbidimeter Catalog number 46500-88. Instrument calibration is performed with Hach StablCal Calibration set Catalog number 26594-05 as per manufacturer's instructions on a quarterly or as needed basis. Secondary Gelex Standards are used between calibration to check accuracy and accompany the meter to the field for use should meter malfunction be suspected. Meter set to autorange and signal average. Data recorded as displayed in digital format. No rounding rules applied

Dissolved Oxygen

1. Polarographic Electrode method using an ICM Model 31050 Oxygen Meter. Instrument calibrated to moist air at the lab or in the field prior to use per day. Reported values are as observed on the meter with out compensations for altitude, barometric pressure or salinity.
2. Hach Luminescent Dissolved Oxygen (LDO) Model HQ10, method 10360. Calibrations are not normally required for this probe. The calibration is verified by sampling an air saturated water. Reported values are as observed on the meter with out compensation for salinity. This instrument compensates for barometric pressure based on an internal pressure sensor. EPA approved the validation study for this method in July of 2006.

Lab Testing

Ammonia - Colorimetric

By LaMotte's Smart 2 Colorimeter with the reagent kit code: 3642-SC. This is a kit form of Nessler's reagent with Rochelle salt. Samples are analyzed directly with out distillation.. The colorimeter measures the amount of color in the sample. This sample absorbance is compared to a calibration curve stored within the meter to return a concentration of ammonia – nitrogen (NH₃-N) in mg/L. The calibration curve is set by LaMotte. The reporting limit for this method is 0.1 mg/L NH₃-N.

Bacteria:

Total Coliform Bacteria by multiple well Quanti-Tray Method: 9223 (IDEXX Corp.)

The lowest Most Probable Number is 1 when a single small well is positive out of the 48 small and 49 large wells.

E. coli Bacteria by multiple well Quanti-Tray Method: 9223 (IDEXX Corp.)

The lowest Most Probable Number is 1 when a single small well is positive out of the 48 small and 49 large wells.

Individually wrapped sterile pipettes are used for dilutions.

pH

Instrument is a pHTester model 10 from Eutech instruments. The method is electrometric with temperature compensation, and three point calibration (4, 7 & 10). Results are recorded as displayed to the tenths place.

Specific Conductance

Instruments are the ECTester from Eutech. One instrument the ECTester Low operates in the 0 to 2000 micro Siemens range with a resolution of 10 micro Siemens. The ECTester High operates in the 0 to 19900 micro Siemens Range with a resolution of 100 micro Siemens. The method is direct conductivity measurement with temperature compensation, with a single point calibration. Results are recorded as displayed.

Turbidity

Instrument is a Hach Model 2100P Portable Turbidimeter Catalog number 46500-88. Instrument calibration is performed with Hach StabCal Calibration set Catalog number 26594-05 as per manufacturer's instructions on a quarterly or as needed basis. Secondary Gelex Standards are used between calibration to check accuracy and accompany the meter to the field for use should meter malfunction be suspected. Meter set to autorange and signal average. Data recorded as displayed in digital format. No rounding rules applied.

Nitrate+Nitrite-Nitrogen

1. Color wheel

By Hach Low Range Nitrate Test Kit Model NI-14 Catalog number 14161-00 using the Nitrate Nitrogen (0-1 mg/L) procedure. A separate procedure to assess the Nitrite Nitrogen is not performed. The mg/L Nitrate+Nitrite Nitrogen is read directly from the color wheel. Color Wheel Part number 14171 is from zero to 1.0 mg/L Nitrate Nitrogen with divisions at 0.02 mg/L. The lowest non zero division for this wheel is 0.02 mg/L Nitrate+Nitrite Nitrogen. The reporting limit for this method is 0.02 mg/L Nitrate+Nitrite Nitrogen.

2. Colorimetric

By LaMotte's Smart 2 Colorimeter with the reagent kit code: 3649-SC. This is a low range cadmium reduction method. The colorimeter measures the amount of color in the sample. This sample absorbance is compared to a calibration curve stored within the meter to return a concentration of Nitrate-Nitrogen (NO₃-N) in mg/L. The calibration curve is set by LaMotte. Nitrite present in the sample is included in the result. Results are mg/L Nitrate+Nitrite-Nitrogen with a reporting limit of 0.02 mg/L.

Nitrate-Nitrogen

Ion Chromatography

Dionex Model 4000i with Anion Separator 14S column running a Carbonate / bicarbonate eluant (0.008 Molar Sodium Carbonate / 0.001 Molar Sodium bicarbonate). A calibration curve is prepared following each eluant prep. The calibration is verified by performance on an externally prepared reference solution which also serves as the continuing calibration verification. This method measures Nitrite separately from Nitrate. The results are Nitrate-Nitrogen (NO₃-N) with a reporting limit of 0.02 mg/L.

Phosphate-Phosphorus

1. Color wheel

By Hach Total Phosphate Test Kit Model PO-24 Catalog 2250-01 using the Low Range procedure. The observed value from the disk is divided by 50 to obtain the mg/L phosphate then divided again by 3 to represent the mg/L PO₄-P.

The color wheel part number 24898-00 is from 0 to 50 mg/L in unit divisions. For the Low Range method this represents a 0.02 to 1 mg/L phosphate range or 0.007 to 0.33 mg/L PO₄-P. The reporting limit for this method is the first non zero division at 0.007 mg/L PO₄-P. For the medium range method the reporting limit is five time the Low Range method at 0.03 mg/L PO₄-P.

2. Colorimetric

By LaMotte's Smart 2 Colorimeter with the reagent kit code: 3653-SC. This is an Ascorbic Acid reduction method. The colorimeter measures the amount of color in the sample. This sample absorbance is compared to a calibration curve stored within the meter to return a concentration of phosphate in mg/L. The calibration curve is set by LaMotte. The phosphate result provided by the instrument is divided by 3.07 to present the phosphate-phosphorus value (PO₄-P). The reporting limit for this method will be the same as the color wheel at 0.03 mg/L PO₄-P.

3. Ion chromatography

Dionex Model 4000i with Anion Separator 14S column running a Carbonate / bicarbonate eluant (0.008 Molar Sodium Carbonate / 0.001 Molar Sodium bicarbonate). A calibration curve is prepared following each eluant prep. The calibration is verified by performance on an externally prepared reference solution which also serves as the continuing calibration verification. A blank begins each run, and reference solution is run at the beginning and end of each run. The results are Phosphate-Phosphorus (PO₄-P) with a reporting limit of 0.03 mg/L.

-end of section



STREAM QUALITY FIELD DATA FORM *BR*

Community Clean Water Institute Citizen Monitoring Program
500 N. Main St. Ste 110 Sebastopol, CA 95472 707 824-4370 www.ccwi.org

Stream name: _____
Watershed name: _____
Citizen Monitors: _____
Date _____ **T** _____ **crew** **Storm Sampling?**

Weather in past 48 hours: _____ Storm, Rain, Showers, Overcast/Fog,
 Current weather: _____ Partially Cloudy, Sunny

Stage/Flow: Low, Intermediate, High, Flood. (Circle one)

Data input

QC database check

From Sample Login @ CCWI			TB-CCWI-29	PHL-CCWI-9	TB-CCWI-28	DOL-CCWI-04	DOL-CCWI-04	TUN-CCWI-02	EC-CCWI-6	Indicate which parameters the device is used for	<input type="checkbox"/> Orange Peel <input type="checkbox"/> Flow Meter	<input type="checkbox"/> Stage <input type="checkbox"/> Depth	
Sample #	Site ID	Time	Air Temperature (°C)	pH	Water Temperature Thermometer (°C)	Water Temperature Dissolved Oxygen Meter (°C)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Electrical Conductivity uS or mS	Sampling Device: 1.) pole 2.) bucket 3.) grab	Flow - From attached field form units : cfs (cubic feet per second)	If depth measure it where DO is taken using folding ruler	Stream Reach Type 1.) Pool 2.) Flat Water 3.) Riffle
										pH temp EC DO turb bag			
										pH temp EC DO turb bag			
										pH temp EC DO turb bag			
										pH temp EC DO turb bag			
										pH temp EC DO turb bag			
										pH temp EC DO turb bag			

Chain of Custody

Relinquished By	Received By	Date	Time

Comments



Bacteria Testing Data Form

Community Clean Water Institute Citizen Monitoring Program

500 N. Main St. Ste 110 Sebastopol, CA 95472 707 824-4370 www.ccwi.org

Procedure Checklist:

1. Turn on IDEXX Quanti-Tray Sealer to preheat at least 30 minutes before use
2. Obtain Sample numbers by logging samples into sample log - NOTE SAMPLES HAVE 8 HOUR HOLD TIME
3. Include "Lab Blank" to gathered sample set
4. Wipe down prep bench with antiseptic and wash hands before handling samples
5. Prepare 10 X dilution bottles for field samples - fill to mark with sterile water (90 mLs) ADD IDEXX media to sterile container - MIX
6. With fresh 10 mL sterile pipet Add 10 mL field sample to 10 X dilution bottle - MIX - label with sample number
7. With one hand compress toward the center the edges near the top of the IDEXX 2000 to pop open the region above the large center well then Pour the prepared sample into IDEXX 2000 tray.
8. Place tray into support on sealer - PRESS- SEAL BUTTON
9. Sample tray is SEALED. Quickly remove sample tray from support to minimize heat transfer to sample.
10. Label completed sealed tray with sample number and current time.
11. Place completed sample tray into incubator set at 35 deg C
12. save sample for nutrient testing - just in case- then clean up - Arrange to have samples read in 24 hours

SETUP DATE AND TIME: _____ BY _____ READING DATE AND TIME: _____ BY _____

Notes:

CHAIN OF CUSTODY:

Relinquished by: _____ Received for CCWI by: _____ Date _____ Time _____

Sample #	Sampled		Site ID	Wells that are Yellow		MPN from Table	Dilution Factor	MPN Coliforms Per 100 mL	Wells that are Fluorescent		MPN from Table	Dilution Factor	MPN e.Coli per 100 mL
	DATE	TIME		# Large	# Small				# Large	# Small			
			Lab Blank				* =					* =	
							* =					* =	
							* =					* =	
							* =					* =	
							* =					* =	
							* =					* =	



CCWI Colorimeter Data Form

Instrument : COL-CCWI-1 LaMotte Smart2 SN 3975

Parameter: * Nitrate – N * Phosphate –P * Ammonia-N *
(circle one) NO3-N PO4-P NH3-N

Reagent ID: Standard ID: True Value:

Run Date Start Time

Run	Sample # <small>(from login)</small>	Result <small>(NO3-N or NH3-N)</small>	Result <small>(PO4)</small>	/ 3.07 =	Result <small>(PO4-P) report</small>	X	DF	=	Result mg/L	% Rec
1	Blank			/ 3.07 =		X		=		
2	CCV			/ 3.07 =		X		=		
3				/ 3.07 =		X		=		
4				/ 3.07 =		X		=		
5				/ 3.07 =		X		=		
6				/ 3.07 =		X		=		
7				/ 3.07 =		X		=		
8				/ 3.07 =		X		=		
9				/ 3.07 =		X		=		
10				/ 3.07 =		X		=		
11				/ 3.07 =		X		=		
12				/ 3.07 =		X		=		
13				/ 3.07 =		X		=		
14				/ 3.07 =		X		=		
15				/ 3.07 =		X		=		
16				/ 3.07 =		X		=		

Close run with an ending standard and blank End Time:

Samples analyzed by: _____

Data Entered by: _____ Date

QC Check by: _____ Date: _____

Dilution Factor DF = (total volume/sample volume)
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