

## APPENDIX B. QUALITY ASSURANCE

The China Lake study followed a quality assurance plan developed by CEAT to standardize the procedures used. The following document was modified from CEAT (2004).

### Bottle Preparation:

Using 1:1 HCl : E-pure water, triple-acid rinse all phosphorus-sample bottles before use to avoid contamination of the sample.

1. To make the acid rinse, use 1 L of E-pure and 1 L concentrated hydrochloric acid. The result is a 1:1 ratio HCl:E-pure water.
2. If an epicore sample is taken, triple-acid rinse the mixing bottle before sampling and E-pure rinsed after sampling was completed.

### Approaching Site:

1. When approaching the test site, accelerate, then turn off the engine and coast to the sampling site to limit stirring the surface water.
2. Always sample into the wind and from the bow of the boat.

### Surface Sampling:

1. Remove the cap from the sample bottle without touching the lip or the edge of the cap.
2. Invert and immerse the bottle to approximately 0.5 m. Turn the bottle on its side and move it horizontally through the water away from the boat.
3. Tilt the bottle upright, remove from water, and replace the cap. Place the bottle in the cooler on ice.

### Secchi Disk:

1. Use the Aqua-scope to view the disk.
2. Lower the disk until it disappears from view, then record the depth.
3. Bring the disk back to the surface and repeat the process two more times.

### Measuring Depth:

1. Use LCD Digital Sounder (Depth Finder) or boat sonar.
2. Put the lanyard of the depth finder around your wrist.
3. Put the depth finder in the water and push the switch towards the bottom of the lake (in the direction of the arrow). Hold for three seconds.
4. Point the depth finder straight down. Record this depth.
5. Repeat the process once.

### Conductivity:

1. Use YSI Sonde or take water sample.
2. Follow surface sampling procedure.
3. Place the water sample in the cooler on ice.
4. Bring sample to 25° C before test.
5. Use a YSI Model 31S Conductance Bridge to measure conductivity.

### Turbidity:

1. Measure turbidity using the HACH 2100 Portable Turbidimeter (HACH 1999).
2. Used cleaned sample cells included with the portable turbidimeter.
3. Conduct analysis in the field using the calibrated instrument (calibrated with three standards). Follow surface sampling procedure.
4. Place the water sample in the cooler on ice.

### Acidification of Hardness Samples:

1. Rinse the bottle lids with distilled water and add a small amount of the sample to the lid.
2. Test the pH of the water in the sample bottle lid. If it is lower than 2, discard, rinse the lid, and cap the bottle. If the pH is greater than 2, add concentrated nitric acid (HNO<sub>3</sub>) to the sample drop by drop until below pH 2.
3. Add the same amount of acid to all other bottles of the same size and same test.

### Using the pH Meter:

- A. Calibration: Before any test is performed, the pH meter must be calibrated using a 2-point calibration method at pH 4 and pH 7. This should be done once during the testing day, provided the calibration entered into the meter is not accidentally deleted.
1. Press the POWER button. The pH meter automatically enters the measurement.
  2. Apply the pH 7 solution by opening the sensor guard and wetting the entire probe.
  3. Press the CAL button once. The sensor guard will display 7.0 and a CAL symbol will appear at the bottom right hand corner followed by a smiley face (☺) indicating that it is finished calibrating.
  4. After calibration, rinse the sensor thoroughly with E-pure water.
  5. Repeat calibration for pH 4.
  6. Check that the probe is working properly by measuring aerated deionized water. The meter should give a value of 5.56.
  7. Be sure to rinse the probe with distilled water prior to and following each measurement.
- B. Measurement.
1. Lift the lid of the probe fully, and immerse the pH meter 0.5 m to 1.0 m below the surface.
  2. Close the lid. Bring the meter to the surface and record the reading after the smiley face has appeared in the bottom right hand corner.
- C. Quality Assurance.

1. Take the pH reading twice at each site to assure accuracy.

#### Dissolved Oxygen:

1. Calibrate the meter in the saturated air chamber after the proper warm-up time.
2. Lower the Dissolved Oxygen/Temperature meter into the water, shaking it gently to make sure there are not bubbles around the probe.
3. Immerse the probe until covered. Record DO and Temperature readings every meter as the probe is lowered.

#### Mid-depth and Bottom Sample:

1. Pull the rubber stoppers out of the ends of the bottom sampler.
2. Hook metal cables to the two small pegs located at the top of the sampler.
3. After taking the depth reading, lower the sampler to mid-depth to sample.
4. Release the sliding weight to close water sampler.
5. Pull out the water sampler. Open the air valve and the black tap by pushing the outside ring of the tap in. Drain the tap for a few seconds.
6. Fill the sample bottle and place it in the cooler on ice.
7. Empty the water sampler. Repeat the sampling procedure for the bottom sample.
8. Take the bottom sample one meter above the bottom to avoid sediment contamination.

#### Epicore Samples:

1. Rinse the tube three times by lowering it down into the lake water and pulling it back out.
2. For sites with sufficient depth for a thermocline, lower the tube one meter below the thermocline (determined from the DO/temperature profile).
3. For shallow depths, lower the tube to one meter from the bottom.
4. The tape marks on the tube indicate one meter.
5. Crimp the tubing just above the water (best done by bending it tightly, twisting, and then holding it in one hand).
6. Pull the tubing up, making sure that the excess tubing goes into the water and not the boat. Be careful not to touch the end through which the water comes out.
7. Allow the water to drain into the labeled epicore mixing bottle, being careful not to touch the inside of the tube, the cap, or the end of the tube.
8. Be sure to keep the non-pouring end of the tube up, so the water does not drain out of it, and so that it does not take up surface water.
9. Hold up the crimped area and undo the crimp. Continue to raise the tubing and move towards the draining end.
10. Repeat the process three times, draining all of the water into the epicore mixing bottle.
11. Pour about 125 mL each of this water into two PPM flasks (fill to just below the neck). Be careful not to contaminate the samples by touching the inside of the bottles or the inside of the caps.
12. Discard the remaining water from the mixing bottle and rinse it with E-pure water. Place all samples into the cooler on ice.

### Flo-Mate:

1. Turn the meter on. Place the black sensor entirely underwater with the bulb facing upstream.
2. The meter will read the flow in either ft/s or m/s. Press the ON/C and OFF keys simultaneously to switch between the two.
3. Fixed Point Average (FPA) will take the most accurate readings (hold the up and down arrows at the same time). A time bar will move across the screen. When it reaches the far side, a new average velocity will be displayed.
4. Divide the topography of the stream into equal sections by width, and measure the flow and depth in each segment.

### Quality Control Sampling:

1. Spike E-pure samples with a known amount of concentrated standard and run against a standard curve to confirm the accuracy of technician before water samples were analyzed. This accuracy test is repeated until the values of the test samples are within 10% of each other.
2. Duplicate samples every tenth sample to test the accuracy of sampling procedures.
3. Split samples every tenth sample in the laboratory to test the lab procedure.
4. Run one control with each set of samples analyzed.

### Total Phosphorus:

1. Collect and make splits and duplicates for every ten samples.
2. Make standard solutions of known concentrations with each testing to ensure lab precision.
3. Use reagent blanks to make a standard curve to determine the concentration of phosphorus studied. The standard curve should have a minimum of six points.
4. The accuracy of the Absorbic Acid method used for total phosphorus analysis has a detection point less than 1 ppb.
5. Preserve water samples for analysis by digesting with sulfuric acid and ammonium peroxydisulfate, and then autoclaved at 15 psi for 30 minutes.
6. Conduct analysis within 28 days of sampling date.

### Tributary Stormwater Sampling:

1. Use Global Water Stormwater Sampler SS201.
2. Set to start collecting after 0.5 inches of rain.
3. Place sampler in tributary in an upright position.
4. Left hose collects continuous sample, right hose collects staggered sample.

### Alkalinity:

1. Take one duplicate sample for every ten samples.

2. Use the Potentiometric Method to analyze the samples.
3. Conduct analysis within 14 days of sampling date.

Color:

1. Take one duplicate sample for every ten samples.
2. Color should not vary more than  $\pm 5$  SPU per duplicate.
3. Keep color standards in the dark and protected from evaporation.
4. Use the HACH Platinum-Cobalt Standard Method and HACH DR/4000U Spectrophotometer for the color test (HACH 1997).
5. The limit of detection for the test is 2 units Pt-Co. The range of the test is 0 units to 500 units.
6. Conduct analysis within 48 hours of sampling date.

Nitrates:

1. Collect and make splits and duplicates for every ten samples.
2. Analyze nitrates by using the HACH UV Direct Reading and the HACH DR/4000U Spectrophotometer (HACH 1997).
3. The limit of detection for the test is 0.2 ppm  $\text{NO}_3^-$ N. The range for the tests is 0.0 ppm to 10.2 ppm  $\text{NO}_3^-$ N.
4. Conduct analysis within 48 hours of the sampling date.

YSI 560 MDS (Multiparameter Display System) Sonde

The YSI MDS Sonde was calibrated and used as directed in the YSI 6-Series operating manual (YSI 2002). The sonde was used to measure the following parameters in the field: Chlorophyll-*a*, Nitrates, Ammonium, pH profile, Temperature, Dissolved Oxygen, and Depth.