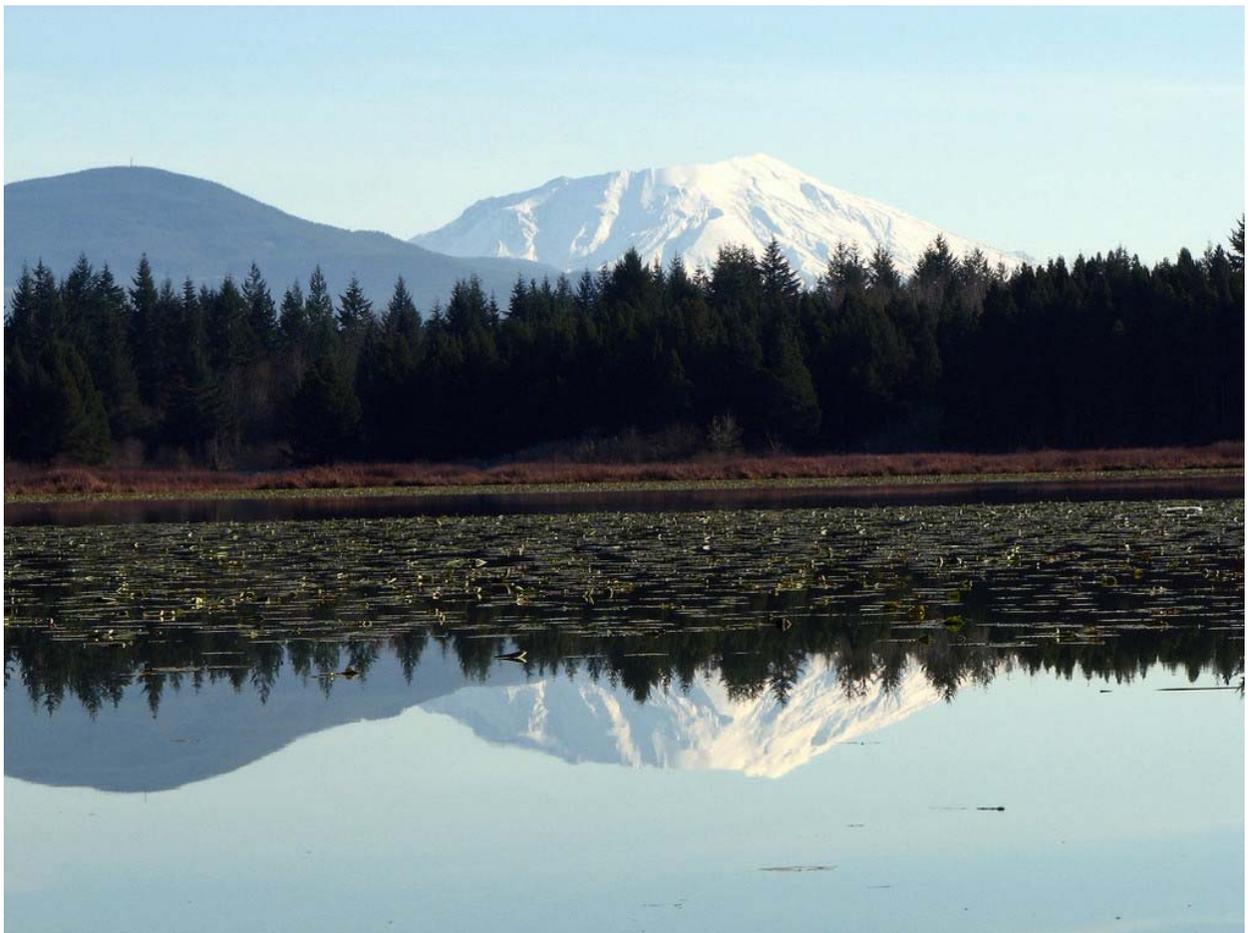


SOPs

SILVER LAKE



By Hilarie Larson, Cowlitz County Environmental Health Unit.
Written in August 2015. Updated in February 2016.

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1. General Information

This Standard Operating Procedure (SOP) is applicable to the collection of representative liquid samples from Silver Lake. The intent of SOPs is to ensure safety of personnel and validity of results.

Activities for each sample event are divided into four segments: land preparation, water preparation, sampling and measuring, and shipping.

In general, sampling should occur between 10 am and 3 pm. However, there is flexibility in both the time and the day of the sampling event, especially in consideration of weather conditions. Common sense and good judgment dictate timing. Under no circumstances should volunteers be on the water during rain or electrical storms, high winds, or other unsafe conditions.

To assist in obtaining the highest quality of data possible, please keep in mind that there are two common sources of interference; cross contamination of samples and improper sample collection. Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems.

2. Land Preparation

Land Preparation includes four distinct tasks:

TASK 1 - Confirm sample schedule and plan, and weather conditions.

- Check Samples and Test Schedule, and Silver Lake # of Test Bottles / Event (both shown below) to determine what tests to perform and what samples to take.
- Check the current and forecasted weather and decide if the conditions allow for safe sampling. Confirm this decision after personally inspecting lake conditions prior to launching the boat and beginning the sampling trip.

Sample and Test Schedule September 2015 – September 2016

Sampling Event Target Date	Month / Week	BG Algae toxin	Total Phosphorus	Chlorophyll <i>a</i>	<i>E. coli</i> (+ fecal coliform indicated by ^)	In-Situ	Secchi Depth
Sept 21, 2015	Sep wk 3		(5) a, b, c, d, e	(5) a, b, c, d, e	(4) f, g, h, i ^	(3) a, b, c	(3) a, b, c
Oct 5, 2015	Oct wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e	(2) d, e	(3) a, b, c	(3) a, b, c
Nov 9, 2015	Nov wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e	(2) d, e	(3) a, b, c	(3) a, b, c
Dec 7, 2015	Dec wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e	(2) d, e ^	(3) a, b, c	(3) a, b, c
Jan 4, 2016	Jan wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e	(2) d, e	(3) a, b, c	(3) a, b, c
Feb 1, 2016	Feb wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e	(2) d, e	(3) a, b, c	(3) a, b, c
Mar 7, 2016	Mar wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e	(2) d, e	(3) a, b, c	(3) a, b, c
Apr 4, 2016	Apr wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e	(2) d, e	(3) a, b, c	(3) a, b, c
May 2, 2016	Maywk 1		(5) a, b, c, d, e + B	(5) a, b, c, d, e	(2) d, e	(3) a, b, c	(3) a, b, c
Jun 6, 2016	Jun wk 1		(5) a, b, c, d, e	(5) a, b, c, d, e + B	(6) d, e, f, g, h, i ^	(3) a, b, c	(3) a, b, c
Jun 13, 2016	Jun wk 2						
Jun 20, 2016	Jun wk 3	(1) f	(5) a, b, c, d, e	(5) a, b, c, d, e	(4) f, g, h, i + B	(3) a, b, c	(3) a, b, c
Jul 27, 2016	Jun wk 4	(1) f					
Jul 5, 2016 (Tues)	Jul wk 1	(1) f	(5) a, b, c, d, e	(5) a, b, c, d, e	(6) d, e, f, g, h, i	(3) a, b, c	(3) a, b, c
Jul 11, 2016	Jul wk 2	(1) f					
Jul 18	Jul wk 3	(1) f	(5) a, b, c, d, e	(5) a, b, c, d, e	(4) f, g, h, i ^	(3) a, b, c	(3) a, b, c
Jul 25	Jul wk 4	(1) f					
Aug 1	Aug wk 1	(1) f	(5) a, b, c, d, e	(5) a, b, c, d, e	(6) d, e, f, g, h, i	(3) a, b, c	(3) a, b, c
Au 8	Aug wk 2	(1) f					
Aug 15	Aug wk 3	(1) f	(5) a, b, c, d, e	(5) a, b, c, d, e	(4) f, g, h, i	(3) a, b, c	(3) a, b, c
Aug 22	Aug wk 4	(1) f					
Aug 29	Sep wk 1	(1) f	(5) a, b, c, d, e	(5) a, b, c, d, e	(6) d, e, f, g, h, i	(3) a, b, c	(3) a, b, c
Sept 6*	Sep wk 2	(1) f					

X = take duplicate sample here
B = take "blank" sample at this location with distilled water

Silver Lake # of Test Bottles / Event Sept 2015 – Sept 2016							
Event #	Sampling Event Target Date	Month / Week	Total Phosphorus	Chlorophyll <i>a</i>	<i>E. coli</i>	Fecal coliform For 10% of <i>E. coli</i>	Turbidity
1	Sept 21, 2015	Sep wk 3	(5)	(5)	(4)		3
2	Oct 5, 2015	Oct wk 1	(5)	(5)	(2)		
3	Nov 9, 2015	Nov wk 1	(5) + Q = 6	(5)	(2) + Q = 3		
4	Dec 7, 2105	Dec wk 1	(5)	(5) + Q = 6	(2)		
5	Jan 11 2016	Jan wk 1/2	(5)	(5)	(2)		
6	Feb 1, 2016	Feb wk 1	(5)	(5) pending lab accredit.	(2) + Q = 3		3
7	Mar 7, 2016	Mar wk 1	(5) + Q	(5) + Q	(2)		
8	Apr 4, 2016	Apr wk 1	(5)	(5)	(2)		
9	May 2, 2016	May wk 1	(5) + Q + B = 7	(5) + Q = 6	(2) + Q = 3		3
10	Jun 6, 2016	Jun wk 1	(5)	(5) + B = 6	(6)	(6)	
	Jun 13, 2016	Jun wk 2					
11	Jun 20, 2016	Jun wk 3	(5)	(5)	(4) + B = (5)		
	Jul 27, 2016	Jun wk 4					
12	*Jul 5 - Tue	Jul wk 1	(5)	(5)	(6)		
	Jul 11, 2016	Jul wk 2					
13	Jul 18, 2016	Jul wk 3	(5)	(5)	(4)	(4)	
	Jul 25, 2016	Jul wk 4					
14	Aug 1, 2016	Aug wk 1	(5) + Q = 6	(5) + Q = 6	(6) + Q = 7		3
	Au 8, 2016	Aug wk 2					
15	Aug 15, 2016	Aug wk 3	(5)	(5)	(4)		
	Aug 22, 2016	Aug wk 4					
16	Aug 29, 2016	Sep wk 1	(5)	(5)	(6)	(6)	
	*Sept 6 - Tue	Sep wk 2					
	Totals/year		85	85	61	16 or 10% of <i>E. coli</i>	12
	Q = Quarterly Field Replicate						
	B = Annual Field Blank						

TASK 2 – Ensure that Probe is calibrated and recording.

- Use the YSI ProDSS User Manual, with Quick Start Guide and Probe Tutorial Notes from 8/27/15 to calibrate probes. Instead of one rinse as described, use three rinses. Ensure calibration by checking “last calibrated date” for each analyte. Ensure that the sonde is properly storing information by taking an “in office” sample and entering the File menu, view data.

TASK 3 – Prep labels and reports.

Fill out general info on bottle labels and Chain of Custody Report. Always leave “time” blank until all samples are collected, then fill it in. Write sample site with an upper case letter followed by a period on top of the bottle with permanent marker pen.

TASK 4 – Check for boating safety equipment.

- Ensure that a personal flotation device is available for each person. Devices must be Coast Guard-approved, readily available, and the proper size.
- Ensure that a first aid kit is onboard.
- Check for other equipment that may be required by State and local boating laws. For example, boats may be required to carry fire extinguishers and sound-producing devices. (Also, the boat must be registered according to State and local laws.)

TASK 5 – Confirm sampling equipment and supplies

Before leaving shore, volunteers must make sure that all sampling equipment and supplies are on board the boat:

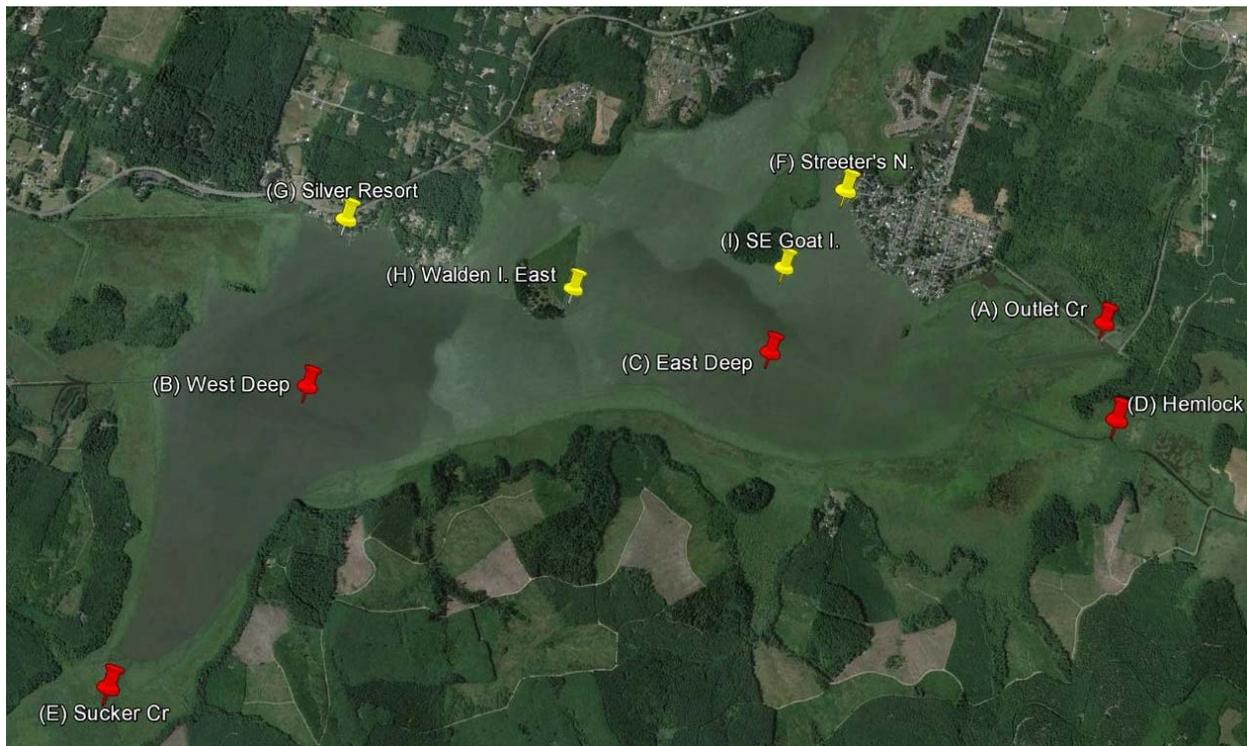
- Anchor
- Secchi disk with a measured line
- Water sampler instrument / pole
- Water sample collection containers
- Clipboard, waterproof pens, and sampling forms including:
 - Check Off Sheet for Silver Lake Lab Samples
 - Silver Lake In-Situ Testing
- SOP manual with map of lake
- Laboratory issued shipping coolers with frozen ice packs and Chain of Custody Reports
- Phosphorus sample shipping bottles (with a small amount of acid to preserve the sample), chlorophyll a shipping bottles, and E. coli sample shipping bottles arranged in cooler in order of boat arrival, as found on forms.
- Box of gloves
- ProDSS water quality sonde with sensor guard in place
- 3' grabbers (for E. coli direct sample)

3. Water Preparation

TASK 1 - Position boat at the designated sample site.

Locate the sample site on the water. The position should be verified using the shoreline landmark method. Also use the GPS function on the probe or the GPS on the boat.

Once the site is located, anchor the boat if necessary. Repositioning the anchor once it is dropped should be discouraged, especially in shallow lakes, because it can stir up sediments from the lake bottom. Increasing sediment turbidity may alter data results. After anchoring, volunteers should allow the boat to stabilize.



TASK 2 - Complete the observations portion of the sampling form.

Record your observations about the lake and weather conditions on the sampling form. In addition, write down any unusual conditions that may affect the sampling results. Reporting visual conditions such as water color and appearance will aid in interpreting data results. For example, if the sampling trip was conducted after a storm, the water may temporarily be more brownish and turbid than usual. This turbidity probably will lower the Secchi disk reading and elevate the total phosphorus concentration. Without the information concerning the rainstorm, an analyst might conclude that other factors could have caused a decrease in water quality.

- If not done previously, record the name of the lake and site, the date, the time of sampling, and the names of volunteers doing the sampling.

- Record water condition observations at the site including water color, suspended sediment and algae, aquatic plants, waterfowl activity, and odor.
- Record weather conditions on the form including the amount of cloud cover (when taking the Secchi disk reading), and water surface conditions. Indicate any unusual weather conditions that may have occurred in the past week including storms, high winds, and temperature extremes.
- Record any other factors or conditions that make the sampling trip unusual or that may potentially influence sample results. For example, report any chemical, mechanical, or biological control of algae or aquatic weeds that may have been done recently on the lake.

4. Take Samples and Measurements

TASK 1 - Probe Measurements.

- Perform depth calibration on site and just above water surface before every sample event.
- Take an ambient air temperature with probe before submerging in the water and record on Silver Lake In-Situ Testing form. Continue to take ambient air temperature at each site unless affected by boat heat.

The CCHD staff will then follow all manufacturer's instructions to obtain surface water temperature at 1', and at 3': water temperature, pH, conductivity, dissolved oxygen, and turbidity. Measurements at 3' will be taken twice and averaged in results. Be attentive to the fact that **pH readings** need a few minutes to equilibrate at each depth. Also, vertical position readings are much faster than depth readings.

TASK 2 - Secchi disk depth.

It is preferable to have the same individual take the reading at a site throughout the entire sampling season. Sunglasses should not be worn. The line attached to the Secchi disk must be marked according to ¼ feet increments.

- Check to make sure that the Secchi disk is securely attached to the measured line.
- Lean over the side of the boat and lower the Secchi disk into the water, keeping your back toward the sun to block glare.
- Continue to lower the disk until it just disappears from view. Lower the disk another one foot, and then slowly raise the disc until it just reappears. Continue to move the disk up and down until the exact vanishing/reappearing point is found.
- Call out a reading if one is possible with certainty, or attach a clothespin to the line at the point where the line enters the water and slowly pull the disk out of the water and record the measurement based on the location of the clothespin on the line.

This procedure will be repeated as a quality control check; an average of the two readings will be recorded on the Silver Lake In-Situ Testing form, shown below:

Silver Lake **In-Situ** Testing

Date:

Names:

Comments:

Sites – in boat route order	Time:	Secchi Depth	Air Temp	Surface Probe √	3' Probe √	3' Probe √	Notes
Streeters (F)							
Tree H (I)							
Deep E (C)							
Outlet (A)							
Hemlock (D)							
Deep W (B)							
Sucker (E)							
Resort (G)							
Walden (H)							

TASK 3 – Take E. coli sample directly into lab bottle – *Do not use intermediate jar!*

- Note: E. coli sterile sample bottles contain sodium thiosulfate, a chlorine neutralizing agent. This is the way that the lab purchases the bottles. The sodium thiosulfate is not necessary for this study.
- Remove the cap from a sterile collection bottle without touching the inside of the cap or the inside of the bottle. Gently place the cap, facing up, onto a stable flat surface.
- Secure the lab bottle with the tongs of the gripper pole to, and plunge it in a downward and motion into the water to a depth of 12-18”.
- Using a forward sweeping motion, invert the bottle and bring it to the surface.

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- If necessary, empty it slightly to leave approximately one inch of air at the top.
- Carefully re-cap the container, then label and store it at a temperature between 39 – 45 degrees F.
- Transport the bottle to the laboratory as soon as possible after sampling.

Task 4 – If Blue – Green Algae sample is to be collected, follow separate instruction sheet that you will find attached to this SOP during the summer months.

TASK 5 – Use water sampler instrument and collection jar to prepare for phosphorus and chlorophyll a samples:

- When you arrive at each sampling location, rinse sample collection jar with surface water and shake dry.
- Attach sample collection jar to the Telescopic Jar Sampler.
- Lower the sampler gently into the water to the desired depth as marked on the pole.
- Pull the pull-ring extending from the handle to open the plunger on the telescoping pole. When bubbles stop rising from the sampler, release the pull ring to close the plunger and gently bring the sampler to the surface.
- Remove the sampling bottle from the pole and fill the pre-labeled lab containers.
- Shake collection jar to remove water drops.
- Follow directions for shipping per below:

5. Shipping

TASK 1 - Transfer sample water into lab bottles, but use caution!

Phosphorus bottles have acid present in powder form.

Lids are susceptible to contamination – do not remove until ready to pour.

Prepare to transfer sample water into laboratory bottles. If weather conditions could interfere with a safe transfer of sample water into lab bottles, then bring the boat back to shore and unload the sampling equipment and supplies, and move indoors or find an outdoor location that is dry and shielded from the wind.

The phosphorus lab bottle contains an acid that preserves the sample water during transport, which can burn skin or stain clothing and even the boat surfaces if spilled or mishandled. The bottle vapors should also be avoided. Please be familiar with the Acid Warning Info Sheet kept in the Field Manual.

Use the Check Off Sheet for Silver Lake Lab Samples, shown below, to help avoid missed QC samples, etc. Perform the applicable test, as described in the sampling plan, in the order listed below and on check off sheet.

A. For *phosphorus* sample bottle – Glasses/Goggles needed!

Warning: cap is extremely susceptible to contamination. Remove cap only when ready to pour sample.

- Make sure the phosphorus sample bottle is (yellow) labeled with:
 - the parameter to be analyzed (total phosphorus).
 - the date and the sample lake, location, and depth.

- any additional information such as an accession number for laboratory identification and the acid content.
- Confirm that there is **acid present** in the bottom of the bottle by visual inspection.
- Move the total phosphorus sample bottle into position and remove the cap, being careful not to spill the acid contents or breathe in the vapors.
- Gently shake the collection container with the sample water to re-suspend any settled material.
- Gently pour the sample water into the phosphorus bottle until the liquid reaches the fill line.
- Carefully cap the sample bottle and place it into the shipment container with the frozen ice packs and close the lid so sunlight cannot reach it.

C. For chlorophyll a sample bottle:

- Make sure the chlorophyll a sample bottle is labeled with:
 - the parameter to be analyzed (chlorophyll a).
 - the date and the sample lake, location, and depth.
 - any additional information such as an accession number for laboratory identification
- Move the chlorophyll a sample bottle into position and remove cap.
- Gently shake the container with the sample water to re-suspend any settled material.
- Gently pour the sample water into the chlorophyll a bottle until the liquid reaches the fill line. **Filling to neck is best.** A fill that is less than shoulder height will be inadequate. Some air space is also necessary.
- Cap the chlorophyll a sample bottle and place it into the shipment container with the frozen ice packs and close the lid so sunlight cannot reach it.

TASK 2 – Clean Equipment and Transport Samples with Forms

Clean the sampling and laboratory equipment for the next sampling trip. The Secchi disk and water sampler should be rinsed off with fresh tap water, and the sampling containers rinsed with distilled water.

Pack and forward the shipping containers with the samples to the laboratories as soon as possible.

Wrap the bottle containing the sample with bubble wrap.

- Place the bubble-wrapped bottle, along with a frozen ice package into a Styrofoam or well-padded shipping container. The sample must remain cool or the lab will have to discard it.

Deliver in person to: ALS Global Laboratory, 1317 S. 13th Ave, Kelso, WA 98626 between 8am and 5pm Monday-Friday and between 8am and 12pm on Saturday. They prefer to receive by 4pm on weekdays and by 11am on Saturdays.

For bluegreen algae: Ship to King County Environmental Laboratories using an overnight delivery service. Ship samples at the beginning of the week. Never ship on Fridays. Personal delivery can be made at 322 West Ewing Street, Seattle WA from 8:30am to 5:30pm, excluding holidays. If there is any delay in shipping, refrigerate the sample (no more than a day or two).

Check Off Sheet for Silver Lake Lab Samples

Date and Staff:

General Comments (weather, QA samples, QAPP deviations, etc):

Site Letter (route order)	Location Name	Time	E. coli Use Direct Grab!	Phos.	Chlor a (fill to neck)	Variable Tests include: Lab Turbidity or Fecal Coliform (use direct grab), Field Duplicate / Blanks: Indicate/highlight boxes as applicable.			
F	Streeters								
I	Tree H								
C	Deep E								
A	Outlet Crk								
D	Hemlock								
B	Deep W								
E	Sucker Crk								
G	Silver Resort								
H	Walden								

Submit (3) Lab Turbidity Samples quarterly. Submit Duplicates quarterly. Submit Blanks annually. Submit 10% Fecal Coliform Samples. Describe today's variable tests, if any, below:

6. Chain of Custody Sample



ALS Environmental

1317 South 13th Ave. Kelso, WA 98626 Phone (360) 577-7222 / 800-695-7222 / FAX (360) 636-1068
www.alsglobal.com

CHAIN OF CUSTODY

52406

001

SR# _____

COC Set ___ of ___

COC# _____

Page 1 of 1

Project Name: Silver Lake		Project Number: _____		NUMBER OF CONTAINERS SM 9223 B / Outlay E/C C 305.2 / HDZ NO3 T 305.3 / Phos T		BH		ZBD		Remarks				
Project Manager: Del Gilkerson		Company: SLWAC				SM		ZBD						
Address: P.O. Box 88 - Toutle, WA, 98649		Phone #: _____				SM		ZBD						
Sampler Signature: Del Ceef		Sampler Printed Name: Del Gilkerson				SM		ZBD						
Email: delgil@chni.net		Matrix: _____				SM		ZBD						
CLIENT SAMPLE ID	LABID	SAMPLING Date Time	Matrix	SM	ZBD	SM	ZBD	SM	ZBD	SM	ZBD			
# 2 Hwy 504		10-10	H ₂ O	2	✓	✓	✓							
# 3 Streeter														
# 7 Hemlock														
# 10 Sucker														
# 12 Sequest														
# 13 Silver R.														
# 15 Easy St.														
# 17 Walden I.														
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Relinquished By:		Received By:		Relinquished By:		Received By:		Relinquished By:		Received By:				
Signature: Del Ceef		Signature: _____		Signature: _____		Signature: _____		Signature: _____		Signature: _____				
Printed Name: Del Gilkerson		Printed Name: _____		Printed Name: _____		Printed Name: _____		Printed Name: _____		Printed Name: _____				
Firm: SLWAC		Firm: _____		Firm: _____		Firm: _____		Firm: _____		Firm: _____				
Date/Time: _____		Date/Time: _____		Date/Time: _____		Date/Time: _____		Date/Time: _____		Date/Time: _____				

e-mail Results to:
delgil@chni.net
Longs@co.cowlitz.wa.us.
skoglands@live.com

7. References

- Simpson JT. 1991. Volunteer lake monitoring: a methods manual. EPA 440491002
- Joy J. 2006. Standard operating procedure for manually obtained surface water samples. Ecology. EAP015
- Ward W, Mathieu N. 2011. Standard operating procedures for the collection of fecal coliform bacteria samples in surface water. Version 2.1. Ecology. EAP030.