Associated Environmental

# REPORT

## British Columbia Ministry of Environment

South Shawnigan Creek
Final Monitoring Study Design

**July 2016**

ISO 9001 and 14001 Certified | An Associated Engineering Company

# Acknowledgements

Cover photo: Aerial photo of Shawnigan Lake, Cowichan Valley, Vancouver Island obtained from http://cowichanvalley.info/shawnigan-lake-aerial-photos

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# 1 Introduction

Residents, First Nations, local politicians and others ("interested parties") in the area surrounding Shawnigan Lake are concerned about water quality in South Shawnigan Creek in relation to development around this key inflow to the lake. Associated Environmental Consultants Inc. (Associated) was retained by the Ministry of Environment (MOE) to provide an *independent assessment* of water quality in the mainstem and key tributaries of South Shawnigan Creek, including the vicinity of Stebbings Road Lot 23 (the Cobble Hill Holdings contaminated soil treatment facility and contaminated soil landfill) and Stebbings Road Lot 21.

This report describes a water quality monitoring study based on our recommendations and feedback from interested parties on a draft monitoring study design. Interested parties also provided input on the purpose and scope of the study outlined in the Terms of Reference (TOR) that was included in the invitation to quote distributed by the Ministry of Environment to select a contractor to undertake the study (included in Appendix A of this report).

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## 1.1 STUDY PURPOSE AND GUIDANCE

This study was designed to address concerns that water quality may be degrading in South Shawnigan Creek and that monitoring studies to date have been insufficient to detect water quality changes. Concerns include the health of the aquatic habitat as well as about water quality in Shawnigan Lake that is used as a drinking water source. As outlined in the TOR (Appendix A), the purpose and scope of the current study is to better understand water quality over a period of one year along South Shawnigan Creek (including areas around Lots 21 and 23 on Stebbings Road and key tributaries), and based on the results, make recommendations for future studies.

The intent of this report is to present a design for a water quality monitoring study including site locations, sampling frequency and chemical parameters, to fulfill the purpose described above and meet the intended uses of the data (outlined in Section 1.2). The current study is not intended to identify all specific sources of contaminants or monitor any environmental media besides surface water; other media might be included in broader, future studies.

While our professional guidance was sought in the design and implementation of this project, engagement of interested parties is also critical. We understand that a goal of the study will be to provide results that will inform decision-making for the South Shawnigan Creek watershed. This report describes our recommended study design as informed by input from interested parties and within the constraints of the TOR.

## 1.2 DATA USAGE AND ANALYSIS

Data collected for this monitoring study will add to existing data collected under the Shawnigan Lake Water Quality Objectives (WQO) attainment monitoring program and other studies. The monitoring study data will be used to:

- Establish current water quality at the monitoring sites;
- Assess water quality along South Shawnigan Creek – in particular, determine if surface water quality degrades along South Shawnigan Creek and compare surface water quality to BC water quality guidelines;
- Determine if existing permitted activities on Stebbings Road at Lot 23 and/or historical activities on Lot 21 are impacting downstream water quality;
- Determine if other activities in the watershed are impacting water quality in South Shawnigan Creek;
- Supplement any other data already being collected by the MOE and the Permittee at Lot 23 (Cobble Hill Holdings) to assess the effectiveness of the *Environmental Management Act* (EMA) Permit; and
- Inform potential updates (if necessary) to the Shawnigan Lake Community Watershed and Tributaries Water Quality Objectives (WQO) report.

In addition to comparisons to water quality guidelines, we will compare water quality results among upstream and downstream sites, and apply other relevant statistics, to better understand the likely source of any contamination that may be found. Should statistical differences be found between sites, we will interpret and discuss the potential reasons for the differences.

# 2 Methodology

## 2.1 FIELD AND LABORATORY MEASUREMENTS

Our Victoria-based water quality technician(s) will collect water samples according to the BC water quality sampling protocols (MOE 2013[1]). Briefly, water samples will be collected in supplied pre-cleaned plastic or amber glass bottles (coordinated through the MOE laboratory[2]), which will be labelled by our technician. Samples will be collected from shore near the surface at one point in the cross section of the flow (refer to Section 4.2 River/Stream sampling protocol in MOE 2013). Wherever it is safe and practical to do so, samples will be collected at mid-stream.

## 2.2 QUALITY CONTROL AND SHIPPING

Quality control will include the submission of trip and field blanks, and the collection of replicate samples at two of the sites per sample trip to evaluate laboratory and field precision. A trip blank is a clean sample of known quality that is taken from the laboratory to the sampling site and transported back to the laboratory without being exposed to sampling procedures; detects any widespread contamination resulting from the container or preservative during transport and storage.

Field blanks are samples of analyte-free or de-ionized water poured into the container in the field, preserved and shipped to the laboratory with field samples. They are exposed to the sampling environment at the sample site and handled in the same manner as the real sample (e.g., preserved, filtered); provides information on contamination resulting from the handling technique and from exposure to the atmosphere.

Samples will be stored with ice packets in coolers and shipped as soon as possible after collection to the **ALS Environmental** accredited laboratory, 8081 Lougheed Highway, Burnaby, for analysis.

## 2.3 SAFETY PROTOCOL

Associated Environmental is committed to being a leader in Workplace Safety by providing a safe work environment for staff, sub-consultants and sub-contractors. Our policies include:

- All business be conducted in accordance with our safety procedures and comply with all safety regulations that apply in the jurisdiction in which it is being conducted;
- Workers be prepared for the tasks they are required to perform, be aware of the risks and hazards, and be prepared to respond to a workplace emergency;
- Staff at every level are responsible and accountable for the company's overall safety initiatives;

[1] Ministry of Environment. 2013. Water and wastewater sampling – part E, ambient freshwater and effluent sampling. Province of BC. Victoria, BC. http://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/part_e.pdf

[2] Joyce Austin, Senior Provincial Lab Specialist, Victoria, BC.

- Management is responsible for ensuring that all supervisors and workers participate in the program, and for providing proper equipment, training and procedures;
- All employees are responsible for complying with the health and safety program, contributing to the continuous improvement of the program and refusing to perform work that they feel is unsafe;
- All employees have the right to refuse unsafe work conditions; and
- An injury and accident-free workplace is our goal.

Our safety program is accredited in many jurisdictions, including SAFE Certified by the BC Forest Safety Council / SAFE Companies Program (in partnership with WorkSafeBC). In addition, the field technician that will work on this project has completed:

- Swiftwater Rescue and Safety Training; and
- Working and Staying Safe in Bear Country training.

Health and Safety forms an integral part of ISO certified systems with the inclusion of over 32 safe working practices and procedures for activities that we commonly encounter. All business we carry out is conducted in accordance with our safety procedures and complies with all relevant safety regulations that apply in the jurisdiction in which it is being conducted. In addition, staff are responsible and accountable for the company's overall safety initiatives and complete and active participation by everyone, every day, in every job is a company expectation.

As in all field projects, we prepare a pre-work Job Safety Plan (JSP) that outlines key project contact information, defined check-in / check-out procedures as well as on-site communication protocols, and identified hazards and assigned risks to the various roles. When risks of hazards are identified as significant, mitigative measures are put in place to address those risks. Prior to field work commencing all drivers are verified having had completed Associated's in-house defensive driver and wildlife training programs.

## 2.4 MONITORING SITES

The monitoring sites have been used as sampling sites in the past or are suggested new sampling locations for this study. According to the TOR, sampling should be conducted near sites in the area with the potential to contribute to degraded water quality in South Shawnigan Creek including but not limited to: upstream and downstream of Lot 21 seepage; upstream and downstream of Lot 23 ephemeral creek; and upstream and downstream of key tributaries to South Shawnigan Creek such as Van Horne Creek[3].

Additionally, the TOR states that sampling should include a site to measure undisturbed background levels (e.g., a site upstream of disturbance in South Shawnigan Creek). The final selection of this "far upstream" site was guided by a location map of "Fill Sites" provided by Kate Miller of Cowichan Valley Regional District (CVRD).

[3] Pending resolving access issues at sites distant from public or other roadways.

Since one goal of the monitoring study is to assess any changes in water quality potentially related to Lots 21 and 23 on Stebbings Road, it will be important to provide controls on background (far upstream) and on inputs unrelated to these lots. We recommend sampling at the following sites from upstream to downstream, as suggested in the TOR and depicted on Figure 2-1:

1. South Shawnigan Creek upstream of developments (control, far upstream) – downstream of Elkington Forest E294426;
2. South Shawnigan Creek just upstream of Lots 21 and 23;
3. Ephemeral creek downstream of Lot 23, near water treatment facility discharge[4], upstream of the confluence with South Shawnigan Creek;
4. South Shawnigan Creek downstream of Lot 21 and upstream of the Lot 23 ephemeral creek (Ck 3) inflow;
5. South Shawnigan Creek downstream of the confluence with ephemeral creek and upstream of Van Horne Creek confluence;
6. South Shawnigan Creek downstream of Van Horne Creek;
7. South Shawnigan Creek at Sooke Lake Road (upstream of disturbed area); and
8. South Shawnigan Creek as near as possible to the inflow to Shawnigan Lake (downstream of all).

The selection of sites balances the two main interests in this study:

- ✓ Whether surface water quality degrades or does not degrade along South Shawnigan Creek under dry and/or wet (rainy) conditions, and
- ✓ Determining if existing permitted activities on Stebbings Road Lot 23 and/or historical activities on Lot 21 are impacting downstream water quality in South Shawnigan Creek.

The preferred list of monitoring sites includes some sites on or near Lot 23 and sites on or near lands owned by the Malahat Nation. Selection of these or other sites requiring access on or through privately-controlled lands assumes permission will be given to access such sampling sites; at this time, we are in the process of obtaining approval from the owners of Lot 21, Lot 23, and Malahat Nation.

Furthermore, sampling all sites is dependent on reasonably efficient and safe access. While every effort will be made to sample the final set of selected sites, safety and reasonable ease of access are important factors during the monitoring program. For example, sites that are not reasonably close to roadways may be deemed logistically inaccessible (e.g., near lower Van Horne Creek). Access to all sites will be evaluated during the first sampling survey, and re-evaluated based on weather conditions for each subsequent survey. Should sites be difficult to access, other more accessible sites may be substituted, if warranted.

[4] Discharge from the containment/settling pond is intermittent based on storm event and other inflows.

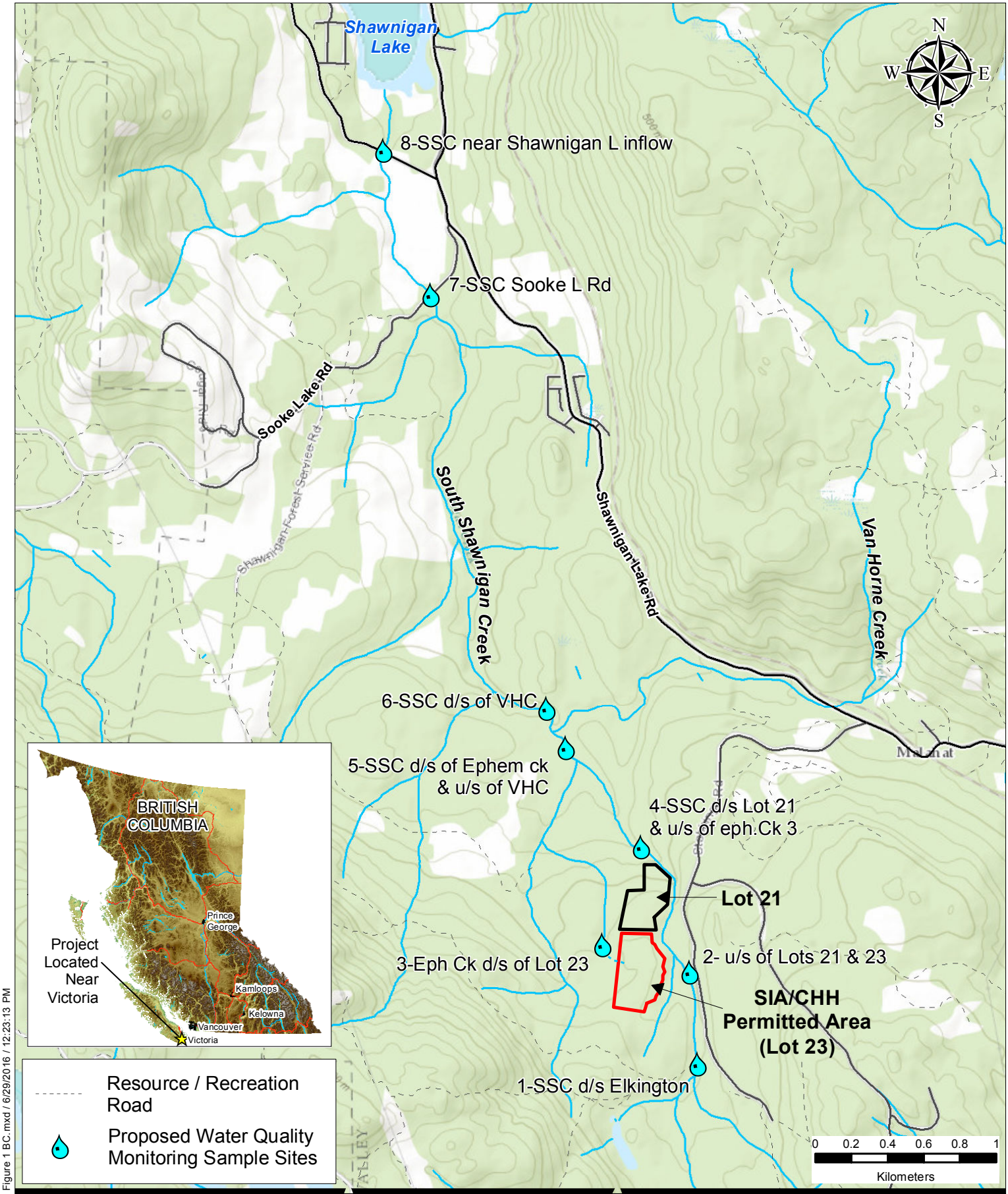



Figure 1 BC.mxd / 6/29/2016 / 12:23:13 PM

Associated Environmental

PROJECT NO.: 2016-8097.000.000
DATE: June 2016
DRAWN BY: DA

**FIGURE 2-1: PROPOSED WATER QUALITY MONITORING STATIONS ON AND NEAR SOUTH SHAWNIGAN CREEK**

South Shawnigan Creek Water Quality Monitoring Study

According to the TOR, the number of sample sites will be eight (8) or fewer. This is an adequate and practical number of sites to provide information on water quality changes from upstream to downstream South Shawnigan Creek over a one-year period under various weather conditions.

## 2.5 TIMING OF SAMPLING

We propose to conduct sampling on a monthly, and sometimes more frequent basis, for one year beginning in mid-July 2016. This schedule will cover better than seasonal change and is a time-frame used for many long-term monitoring programs. In addition to regular monthly samples, approximately weekly samples collected in both late summer (August – September low flows) and during fall rains (mid-October through mid-November) will provide five (5) consecutive samples in 30 days ("5 in 30") representing the long-term average or chronic effects (growth, reproduction) values as required for certain water quality guideline parameters to capture variability during representative time periods.

We will compare results to aquatic life water quality guidelines (both long-term average and short-term maximum, where applicable) as well as human health and agricultural guidelines, as available. BC long-term average aquatic life guidelines are intended to protect the most sensitive species and life-stage, indefinitely. BC short-term maximum guidelines are set to protect against severe effects such as lethality to the most sensitive species and life stage over a defined short-term exposure period (e.g. 96 hours).

While not all parameters have chronic guidelines, to increase the probability of detecting contaminants following a rainstorm event, the measurement of all parameters is recommended for the 5 in 30 sampling during the ***wet*** period (i.e. fall rains).

Based on the above schedule, we anticipate up to 18 sampling trips between July 2016 and the end of June 2017.

Note that setting calendar-based sampling trips should provide results that depict reasonable natural variability over a one-year period. However, it is possible that episodic or upset conditions may be missed. Including the 5 in 30 sets of samples increases the likelihood of capturing such event(s), particularly if sampling occurs during or soon after an intensive rainstorm.

## 2.6 PARAMETERS

Key parameters were selected based on overall watershed disturbances as well as potential discharge from Lot 23, according to the existing types of soil contamination and ancillary discharge from the Water Treatment System. To constrain the list of parameters to relevant conditions at the permitted site, we selected parameters from the results of several laboratory reports for the containment pond (February 2014 to January 2016), as provided by South Island Resource Management, the operator of the contaminated soil treatment facility and contaminated soil landfill on Lot 23. Furthermore, the soil sampling "Fill Site" map (CVRD; end of Appendix A) confirmed that the list included parameters that might come from other soil deposit locations in the area. Additional routine parameters will help to characterize water quality at each

site, and some of these parameters (e.g., pH, hardness, temperature) influence guideline values for contaminants of concern.

The recommended water quality parameters are as follows:

- pH;
- water temperature (°C);
- electrical conductivity;
- turbidity;
- total suspended solids (TSS);
- nutrients (e.g., total phosphorus, dissolved ortho-phosphate, nitrogen species)
- hardness (e.g., calcium, magnesium);
- sodium;
- chloride;
- sulphate;
- total and dissolved organic carbon (TOC, DOC);
- total and dissolved metals (e.g., Al, As, Cd, Cu, Cr, Fe, Hg, Mn, Ni, Zn);
- organic contaminants (based on current site conditions and composition):
    - polycyclic aromatic hydrocarbons (PAHs), full suite, including but not limited to the following and their derivatives:
        - acenaphthene,
        - acridine,
        - anthracene,
        - pyrene,
        - chrysene,
        - fluoranthene,
        - fluorene,
        - naphthalene,
        - phenanthrene,
        - quinolone.
    - light and heavy extractable petroleum hydrocarbons (LEPH/HEPH).

Note that the detection of the listed organic contaminants in water is unlikely in most cases due to their affinity with particulates and organic matter, and because they all have relatively low water solubilities. We recommend water sampling for each of the listed organic substances at all sites for the first several sampling trips, including one or more rainstorm events, then re-evaluating the list of site locations to sample for these contaminants. For example, if none of the organic contaminants are detected in any samples under any conditions, it would be cost-effective and advisable to focus sampling on a reduced number of sites for the PAH and EPH analytes, as follows:

- South Shawnigan Creek just upstream of Lots 21 and 23 (**#2** above);
- The ephemeral creek that drains the water treatment system and containment/settling pond (**#3** above);
- South Shawnigan Creek downstream of the confluence of the ephemeral stream (**#5** above); and

- South Shawnigan Creek at the inflow to Shawnigan Lake (downstream of all, **#8** above).

The list of parameters to measure at the four key sites above should not be reduced because these are the permitted discharge substances known to occur in the settling pond (containment reservoir) on Lot 23. Should any results indicate the presence of organic contaminants (PAH, EPH), the need to include additional sites will be re-evaluated (analytical budget permitting). All of the other parameters should be monitored at all sites during every field trip.

# 3 Schedule

The proposed schedule for the monitoring study is provided in Table 3-1.

**Table 3-1**
**Planned schedule of the South Shawnigan Creek monitoring study**

| Activity | Scheduled Date(s) |
|---|---|
| Study design workshop | June 28 |
| Final date for comments on study design | June 30 |
| Finalized study design submitted to group | July 8 |
| Regular sampling dates (proposed):<br>5-in-30 day sampling dates: | Mid months: July 2016 through June 2017<br>5 dates from August 16 - September 15 (dry)<br>5 dates from October 18 – November 15 (rainy) |
| Quarterly summary reports | Within 2 weeks of receipt of lab results<br>Approximately mid-October, mid-January, mid-April |
| Meeting to present results (6 month) – discussion of results to date | Late January 2017 |
| Final report (following receipt of June sampling trip lab results) | July 2017 |
| Final workshop on results of study and next steps | Late July 2017 |

# 4 Discussion

This program is designed to evaluate changes in water quality along South Shawnigan Creek over a period of one year. We understand there are many disturbances in the South Shawnigan Creek watershed besides Lots 21 and 23 on Stebbings Road (such as the Fill Sites identified by CVRD; Appendix A).

The study will monitor a number of sites including near the inflow of South Shawnigan Creek to the lake. Factors that will influence findings are large flows in the Creek relative to small tributary or seepage discharge volumes (i.e., dilution), weather patterns that might influence runoff quality, types of contaminants (i.e., soluble vs non-soluble contaminants), and other unrelated and diverse disturbances in the watershed.

Note that sampling moving water at specific sites in creeks provides information for only a transient snapshot in time.

Partly because Shawnigan Lake is relatively fast-flushing (reportedly less than 1 year), overall *lake* water quality degradation is not likely to be detected in the shorter term. The depositional areas of the streams and lake are more likely to reveal changes than the water column. For example, it may be informative to sample settled sediments near the lake inflow or in a deep site in future monitoring for an integrated accumulation of metals and organic contaminants. Also, monitoring water discharge (hydrology) in the creek would be an informative metric for future monitoring that would allow modelling of contaminant loading to the Lake.

Recommendations for future study will be included in the final report based on the outcome of the current study and the input of interested parties.

# 5 Study Design Feedback

We have incorporated feedback on the study design received from interested parties at the workshop with assistance from the contracted facilitator (Ms. Sally Rudd[5]). Feedback was invited from others that could not participate in the workshop.

The intent of requesting input is to assist with the development and implementation of a water quality monitoring study that will address water quality monitoring concerns for all interested parties with a reasonable degree of certainty.

The MOE has final approval of the monitoring study design.

[5] Ms. Sally Rudd <srudd@compassrm.com>

# Appendix A – Terms of Reference and “Fill Site” locations

# South Shawnigan Creek
# Water Quality Monitoring Study
# Terms of Reference

The Ministry of Environment (also referred to as the "ministry") is proposing that an intensive water quality monitoring study (referred to hereafter as the "monitoring study") on South Shawnigan Creek be conducted with input/engagement from Cowichan Valley Regional District (CVRD), First Nations, other agencies, and local stakeholder representatives (also referred to as "interested parties"). This Terms of Reference (TOR) outlines the overall purpose and process for the development and implementation of the monitoring study and will be used to solicit quotes (in a competitive bid process) from independent[1] qualified professionals to design and implement the monitoring study. The monitoring study will be completely separate from the on-site monitoring activities taking place on Stebbings Road Lot 21 and Lot 23 under the Cobble Hill Holdings Ltd. *Environmental Management Act* permit.

## Summary


- It is proposed that an independent qualified professional with pertinent knowledge, experience and credentials, be hired in early 2016 to develop, implement and report out on a monitoring study on South Shawnigan Creek near Stebbings Road.
- The qualified professional will be contracted by the ministry and will operate in an independent manner, meaning that data and analysis will be reported simultaneously to the ministry and all interested parties.
- The purpose of the study is to get an assessment of water quality on South Shawnigan Creek including the vicinity of South Island Aggregates/Cobble Hill Holdings Ltd. properties on Stebbings Road and associated key tributaries. The assessment will provide data and analysis on how surface water quality does or does not degrade along South Shawnigan Creek, particularly at points where water quality degradation is suspected of occurring.
- The program will focus on sampling the mainstem of South Shawnigan Creek and the major flows coming off of Lot 23 (ephemeral stream), 21 (seepage) and other key tributaries such as Van Horne Creek.
- The ministry will use an independent facilitator to engage all interested parties in the development of the monitoring study. Interested parties will be invited to contribute ideas, identify key concerns, and comment on the draft study design.
- The qualified professional will provide summary reports and a year-end report with recommendations for future monitoring to the ministry and all interested parties.


[1] For these purposes, "independent" is defined as a qualified professional who has not previously been contracted to work on issues related to the South Island Aggregates/Cobble Hill Holdings Ltd. properties on Stebbings Road or any other properties held by these companies. As well, "independent" means that the qualified professional who undertakes this work will report data and analysis simultaneously to the ministry and all interested parties.

## Background

In 2013, the Ministry of Environment issued a permit to Cobble Hill Holdings Ltd. (formerly South Island Aggregates) for a contaminated soil treatment facility and landfill on Stebbings Road in the Shawnigan Lake Watershed. The permit decision was appealed and the permit was upheld by the Environmental Appeal Board; however, local stakeholders including the Shawnigan Residents Association (SRA), CVRD, and First Nations including Malahat First Nations and Cowichan Tribes are concerned about the safety of the ongoing operation. Community and politicians are questioning the data provided by the company and are highly suspect of limited monitoring undertaken by the ministry. Primary concerns relate to EMA-permitted activities on Lot 23, but other concerns exist around the adjacent Lot 21.

As part of the ministry's mandate to manage water bodies, the ministry has Water Quality Objectives (WQO) and a WQO Attainment Monitoring Program for a number of water bodies, including Shawnigan Lake. The purpose of the WQO Attainment Monitoring Program is to accumulate the baseline data necessary to assess and report on both the current state of water quality and long-term trends, on a waterbody specific basis. The reports provide a list of objectives to protect water quality that are tailored to the specific waterbody for which they have been created, taking into account natural water quality, water uses, water movement, and waste discharges. While the WQOs currently have no legal standing, they can direct resource managers aiming to protect the waterbody in question and are used as a standard against which to measure the water quality of that waterbody. Once objectives have been developed, periodic monitoring (every three to five years) is undertaken to determine whether objectives are being met. In Shawnigan Lake, WQOs attainment monitoring was conducted between 2006 and 2014. The updated WQOs attainment report for Shawnigan Lake is expected to be completed in May.

As part of their permit, Cobble Hill Holdings Ltd. is also required to carry out sampling and monitoring on contaminated soils and ash; water treatment system and settling pond discharge; ground water quality; surface water quality; and air quality.

While the existing monitoring programs implemented by the Ministry of Environment and Cobble Hill Holdings Ltd. provide data that is relevant to the concerns raised by local stakeholders and First Nations, concerns have continued to be expressed regarding the safety of drinking water.

## Purpose

The purpose of the proposed South Shawnigan Creek Monitoring Study is to get an assessment of water quality along South Shawnigan Creek including the vicinity of South Island Aggregates/Cobble Hill Holdings Ltd. properties on Stebbings Road and associated key tributaries. This data will augment the water quality data being collected in Shawnigan Lake as part of the existing WQO attainment monitoring program. Data will be used to:

- Establish current water quality at the monitoring sites.

- Assess water quality along South Shawnigan Creek including key tributaries – in particular, assess how surface water quality does or does not degrade along South Shawnigan Creek and how surface water quality compares to BC water quality guidelines.
- Determine if existing permitted activities on Stebbings Road Lot 23 or historical activities on Lot 21 are impacting downstream water quality.
- Determine if other activities in the watershed are impacting water quality in South Shawnigan Creek.
- Augment data already being collected by the ministry and the Permittee to assess effectiveness of the EMA Permit.
- Inform potential updates (if necessary) to Shawnigan Lake Community Watershed and Tributaries WQO.

Note that while the study will provide data and analysis on where degradation may be occurring along South Shawnigan Creek and what sectors may be contributing to the degradation (e.g. mining, agriculture, residential development etc.), providing data and analysis on specific sources is beyond the scope of the current study, except for the specific focus on whether permitted activities on Stebbings Road are contributing to degradation. The ministry is focusing the study on Stebbings Road activities because the activities are regulated by a provincial permit and because there are outstanding community concerns regarding these activities.

## Program Delivery

The consultant should be a Qualified Professional registered with a professional association in BC. They should have extensive knowledge and experience in designing and implementing water quality monitoring and impact assessment studies, and must have the abilities and capacity to fully implement the monitoring program, including data analysis and reporting.

Responsibilities for the consultant will include:

- Prepare a draft study design that will fulfill the purpose of the monitoring study as described above.
- Ensure that sampling frequency will be appropriate to compare to BC water quality guidelines and Shawnigan Lake WQOs.
- Present draft study design to the ministry and interested parties during a facilitated meeting (either a face-to-face meeting in Shawnigan Lake area or teleconference).
- Incorporate input from the ministry and interested parties into draft study design.
- Finalize study design and submit it to the ministry and interested parties.
- Plan and execute fieldwork – use accredited lab for lab analysis.
- Receive, analyze and summarize data on a quarterly basis and report results to the ministry and all interested parties. In addition, the consultant will be asked to present results and interpretation to two meetings with representatives from interested parties (e.g. presentation

after 6 months and 12 months of data collection) and may need to update their results report with additional analyses based on discussion at these meetings.

- Prepare draft and final summary report at the end of the year that:
    - compares water quality monitoring locations to BC water quality guidelines (aquatic life and human health guidelines);
    - compares water quality between the monitoring locations to show whether and where water quality degradation is occurring; and,
    - recommends additional monitoring to further investigate any outstanding questions around water quality degradation (including questions that are both related or not related to the permitted activities on Stebbings Road).

## Proposed Study Design

### Sites:

At the conceptual level, sampling should be conducted near the permitted activities and any other site in the area with the potential to contribute to degraded water quality on South Shawnigan Creek including: near the seepage area of Lot 21; the ephemeral creek on Lot 23; and additional sites upstream and downstream of the main flows (e.g. upstream and downstream of Lot 21 seepage; upstream and downstream of Lot 23 ephemeral creek; and upstream and downstream of key tributaries to South Shawnigan Creek such as Van Horne Creek). Additionally, sampling should include (if possible) a site to measure natural background levels (e.g. a site as far upstream as possible in South Shawnigan Creek). It is anticipated that there will be a total of 6-8 sampling sites.

### Sampling Schedule and Parameters:

The independent qualified professional will propose a sampling schedule as well as what parameters should be sampled at each site. Parameters will be compared to existing BC water quality guidelines. It is anticipated that sampling will occur on a monthly basis for 12 months, with an additional 4 weekly samples in both late summer low flows and fall rains (i.e. 5 consecutive weekly samples in 30 days, "5/30"), to capture variability during the critical time periods.

## Facilitated Engagement on Monitoring Study

The ministry is using an independent facilitator to engage all interested parties in the development of the monitoring study.

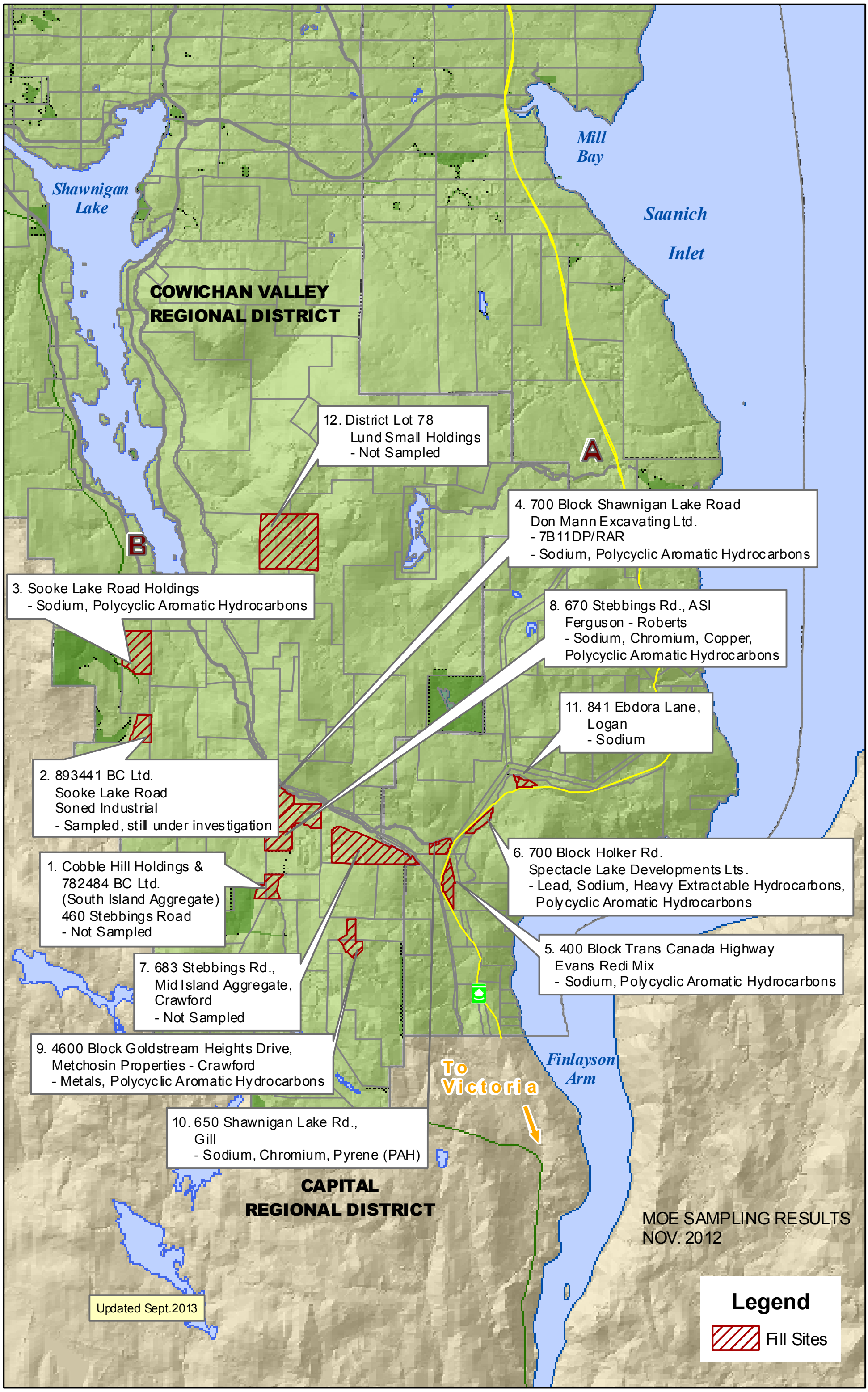
Engagement on this TOR was done through 1-on-1 interviews between the independent facilitator and the interested party. The facilitator worked with the ministry to make additions and changes to the draft TOR in response to the input received and a revised draft TOR was distributed back to interviewees by the facilitator for any further written comments. The final TOR is issued by the ministry within an Invitation to Quote for an independent qualified professional to design and implement the monitoring study.

Engagement on the draft monitoring study design will be done through an independently facilitated meeting (either face-to-face or teleconference). The facilitator will provide draft and final meeting notes to all interested parties on feedback heard at the meeting. The monitoring study design will then be updated by the independent qualified professional based on the feedback given at the meeting and the available budget for the study (budget is provided by the ministry). For those that cannot participate in a workshop or teleconference, written comments can be provided to the qualified professional on the draft monitoring study design. Depending on interest, the ministry will also organize 2 meetings for the independent qualified professional to present results and interpretation to representatives of interested parties.

The intent of this engagement is to inform the development and implementation of a monitoring study that will answer the key water quality monitoring questions of concern of all interested parties with a reasonable degree of certainty. In the event that interested parties do not agree on an aspect of the monitoring study design, the independent qualified professional will be asked to make a recommendation that in his/her professional opinion, best addresses the interests of all parties within the available budget for the study. The ministry will have final approval of the monitoring study design.

Organizations invited to participate in engagement interviews on the draft TOR and meetings on the monitoring study included, but are not necessarily limited to the following:

- Ministry of Environment
- Ministry of Energy and Mines
- Cowichan Valley Regional District
- Shawnigan Residents Association
- Department of Fisheries and Oceans and/or Environment Canada
- Malahat First Nation
- Cowichan Tribes
- Cobble Hill Holdings Ltd.
- South Island Resource Management Ltd.
- Vancouver Island Health Authority


Shawnigan Lake
Mill Bay
Saanich Inlet
COWICHAN VALLEY REGIONAL DISTRICT
A
B
12. District Lot 78
Lund Small Holdings
- Not Sampled
4. 700 Block Shawnigan Lake Road
Don Mann Excavating Ltd.
- 7B11DP/RAR
- Sodium, Polycyclic Aromatic Hydrocarbons
3. Sooke Lake Road Holdings
- Sodium, Polycyclic Aromatic Hydrocarbons
8. 670 Stebbings Rd., ASI
Ferguson - Roberts
- Sodium, Chromium, Copper,
Polycyclic Aromatic Hydrocarbons
11. 841 Ebdora Lane,
Logan
- Sodium
2. 893441 BC Ltd.
Sooke Lake Road
Soned Industrial
- Sampled, still under investigation
1. Cobble Hill Holdings &
782484 BC Ltd.
(South Island Aggregate)
460 Stebbings Road
- Not Sampled
6. 700 Block Holker Rd.
Spectacle Lake Developments Lts.
- Lead, Sodium, Heavy Extractable Hydrocarbons,
Polycyclic Aromatic Hydrocarbons
5. 400 Block Trans Canada Highway
Evans Redi Mix
- Sodium, Polycyclic Aromatic Hydrocarbons
7. 683 Stebbings Rd.,
Mid Island Aggregate,
Crawford
- Not Sampled
9. 4600 Block Goldstream Heights Drive,
Metchosin Properties - Crawford
- Metals, Polycyclic Aromatic Hydrocarbons
To Victoria
Finlayson Arm
10. 650 Shawnigan Lake Rd.,
Gill
- Sodium, Chromium, Pyrene (PAH)
CAPITAL REGIONAL DISTRICT
MOE SAMPLING RESULTS
NOV. 2012
Updated Sept.2013
Legend
Fill Sites