

The Shawnigan Lake Watershed Contaminated Soil Landfill: A Case Study Illustrating Regulatory Capture & Complete Failure Of The Professional Reliance Model

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The focus of this review is to use the Shawnigan Lake watershed contaminated soil landfill as an exemplar of what is wrong with the Professional Reliance Model; however, on occasion I will look at other examples of problems. The Professional Reliance Model is broken; in fact, it never worked. Worse yet is the capture of the Regulators by Industry that is facilitated by the current Professional Reliance Model. A related problem is that the Ministries often do not have the expertise or enough personnel to determine whether the regulations are being followed. *The Shawnigan Lake Contaminated Soil Landfill is a good example of Regulatory Capture, bankruptcy of the Professional Reliance Model and lack of expertise within the Ministries.*

REGULATORY CAPTURE

Shawnigan Watershed Contaminated Soil Landfill Site: The current Professional Reliance Model by offloading almost all regulatory aspects to industry facilitates Industry's capture of the Regulator. Consider the Shawnigan Lake contaminated soil landfill site: from the very

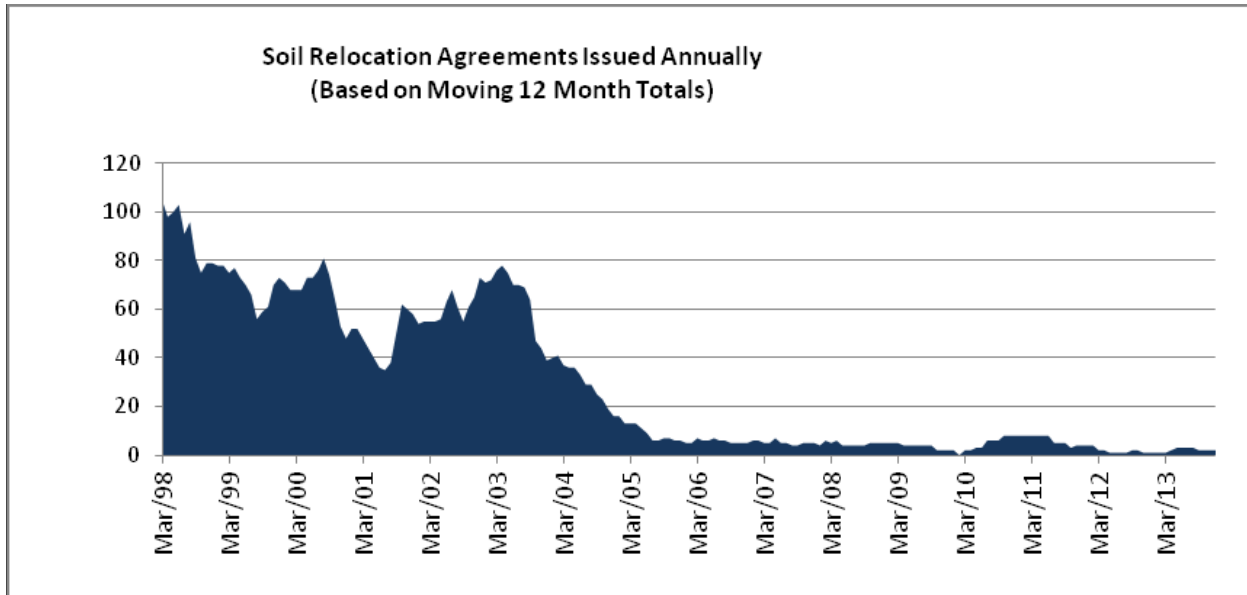
beginning of the Permitting process for establishing a contaminated soil landfill site in the Shawnigan Lake Watershed there was an overly friendly relationship between the Ministry of Environment Staff and the proponents (South Island Aggregates [SIA] and Cobble Hill Holdings [CHH]) of the contaminated soil landfill site. A good example of this is that the Senior Environmental Protection Officer, Coast Region, in his review of August 20, 2013 of the application for a Waste Discharge Permit prepared by Active Earth Engineering [AEE] carefully looked at all the regulations governing landfill sites (Municipal, Waste Wood and Hazardous) and noted that these landfill sites required a detailed environmental risk assessment before their establishment. He also noted that there were no regulations governing a contaminated soil landfill site; therefore, he concluded there was no need for an environmental risk assessment. **To emphasize: despite the fact that a contaminated soil landfill was proposed for a community watershed, it was determined that absence of regulations resulted in no need for an environmental risk assessment – and this comes from a Senior Environmental Protection Officer.** This was ideal for the proponents since this minimized their costs. The Precautionary Principle was nowhere in sight. This is a prime example of Regulatory capture. Clearly, this emphasizes the need for a strong regulatory framework that, currently, is absent in BC.

The Shawnigan Landfill site is located adjacent to a CVRD Parkland that provided a convenient observation site for Community members. Many violations of the Permit were observed by Community members and reported to the Ministry - but the Ministry was non-responsive to these violations. For example, the Permit stated that Soils cannot contain more water than what the Soil Acceptance Plan allowed. When it was pointed out to the Ministry that the Soil Acceptance Plan made no mention of soil moisture content, this violation of the Permit was ignored by the Ministry. It should be noted that the Soil Acceptance Plan, a requirement of the Permit, does not allow the dumping of leachable soils. Landfill sites are not allowed soils that are saturated with water. When it was pointed out to the Ministry that trucks carrying soils to the landfill site were dripping water, from the soils that they were carrying, onto the roadways, this was again ignored. The operators of the Shawnigan landfill site also dumped contaminated water from their contact water pond onto the landfill. This was a cheaper solution than treating the water, but it was a clear violation of the Permit which prohibited “4) Liquid waste or soil and associated ash with a water content exceeding those described in the Soil Acceptance Plan.” - this comes from Section 2.1 of the Waste Discharge Permit. Indeed, often the soil being dumped was so wet that men became stuck and when pulled out left their boots behind. On several occasions compacting machinery became stuck in the gumbo and had to be hauled out with excavators. Community members provided photographic and video evidence of these violations and problems in the construction of the contaminated soil landfill site, yet these evidences were completely ignored by the Ministry.

The Permit required the development of an Environmental Procedures Manual. This manual stated that the Rule of 20 would be followed to determine whether a TCLP (Toxicity Characteristic Leaching Procedure) test would be done to determine if the contaminant of interest was at the hazardous level. In many cases the Rule of 20 was not followed. For example, in a soil sample benzo(a)pyrene was noted to be at 2.82 mg/kg dry soil (Work Order #6052075-06; Soil # AJ-SPS-0526-1, test results reported on June 3, 2016). The Rule of 20 indicates that this contaminant had a potential to have a TCLP value of 0.141 mg/L (the hazardous level of benzo(a)pyrene is 0.001 mg/L); thus, potentially 141 times higher than the hazardous level, yet no TCLP analysis was done. When such violations of the Permit were pointed out in a meeting

with Ministry staff recently, there was no response. This illustrates not only a problem of Regulatory Capture but despite having a new government and a new Minister, the staff still have the same perspectives as before. Nothing will change as long as no new individuals, unaffected by the previous administration's outlook, are appointed in senior leadership positions within the Ministry.

Ministry's Response To Decrease Of Soil Relocation Permit Applications & Issuances: The Ministry of Environment noted that in recent years there was a huge decrease in Soil Relocation Permits issued in BC – see graph below.



Graph: Decrease in Soil Relocation Permits as documented by the Ministry of the Environment

This decrease in the number of Permit applications and Permits issued was associated with a huge increase in soil dumping at multiple sites in the Shawnigan Lake Watershed. This decrease in Soil Relocation Permits should have been a red flag to the Ministry since in November 2012 the Ministry performed contaminant analyses in multiple soil dumpsites in the Shawnigan Lake area. The Ministry concluded that at least 8 of these dumpsites had deposits with certain metals and/or hydrocarbons that exceeded the industrial standard. The removal and relocation of such soils should have required a Soil Relocation Permit. Shockingly, these soils had been dumped without a Permit. See Appendix 1 for the Ministry document indicating the locations of these illegal dumps and associated exceedances. Nothing was done regarding this illegal dumping.

One would have thought that the data indicating a massive decrease in Soil Relocation Permits concomitant with evidence of illegal dumping would have caused the Ministry to increase their enforcement of the regulations. This did not happen, rather the Ministry concluded that the Regulations were too onerous and, rather than enforcing the standards, the Ministry increased the allowable limits for contaminants. A few examples of increases in allowable limits for contaminants are listed below. Note that the units are in mg/kg dry soil.

- 1) Dichlorobenzenes (many of which are carcinogenic) have increased from 0.1 to 1,000 and up to 4,500 (depending upon specific compound) for agricultural land and from 1 to 2,500 and up to 9,000 for urban parks.
- 2) Phthalic esters (which are endocrine disrupters) have increased from 30 to 1,000 for agricultural land and from 0 to 2,500 for urban parks.
- 3) Benzo(a)anthracene (a known carcinogen) has increased from 0.1 to 50 for agricultural land and from 1 to 95 in urban parks.

This was a rather strange solution to a problem of industry deliberately flouting the regulations. And why are the limits higher for Urban Parks? The Ministry seemed to have forgotten that children make close contact with soil in urban parks.

LACK OF EXPERTISE IN THE MINISTRIES

Community members were in continual observation of the building of Section 1C of the contaminated soil landfill site Permanent Encapsulation Area (PEA) in the Shawnigan Lake watershed. We documented many violations and problems with the construction of the landfill, but I will focus on one. This was the construction of the Leak Collection System. It was designed in such a manner that it could not collect any leaks that occurred through the linear low-density polyethylene liner. A document (see Appendix 2) was prepared by the Shawnigan Research Group outlining the deficiencies in this system and sent to the Ministry. This document was ignored. In the Spring of 2017 the Ministry hired Hemmera as a consultant to review of the final closure plan prepared for the contaminated soil landfill dumpsite by Sperling Hansen Associates. The Hemmera consultants pointed out that the leak collection system of the contaminated landfill site could not detect leaks. From the Hemmera Review, May 2017, Section 5.3.3, page 25, second paragraph: "The leakage detection system collector pipe does not appear to be properly located to intercept leakage liquids. Since approximately November 2016 when the cover liner was installed and welded to the basal geomembrane, any precipitation that collects along the upper portions of Cell 1 is expected to infiltrate between the clay berm and the geomembrane, and accumulate within the leak detection sand layer. However, the leak detection system has not identified any flow from the sand layer to date." The Hemmera Review can be found on the Ministry of Environment's website. Why did the Ministry of Environment ignore the report on the Leak Collection system prepared by the Shawnigan Research Group? Indeed, for that matter, why was a rectification of the Leak Collection System not mandated by the Ministry since even today the contaminated soil landfill site in the Shawnigan Watershed has an improperly installed Leak Collection System.

Also worrisome is that the Mines Permit, as amended July 17, 2015 has a diagram on page 19 of the amended permit stamped by Active Earth Engineering (AEE) entitled "Cell Toe Detail". This diagram (see Appendix 3) shows an incorrectly positioned Leak Collection system exactly as documented by the Community observers. This diagram was sent by the responsible engineering firm to both the Mines and Environment Ministries on June 30, 2015 as part of the As-Built diagrams for the Contaminated Soil Landfill Permanent Encapsulation Area (PEA), that is, the contaminated soil dumpsite. There are several problems associated with this diagram. One of

which is that a QP, presumably an arms-length professional, has signed off on an incorrectly designed Leak Collection System. The second problem is that no one in the Mines nor in the Environment Ministries noted the incorrect design, even when the Community pointed this out to the Environment Ministry. Why was the Community ignored? Where was the Mines and Environmental oversight? Is the problem, as mentioned above, that many staff are appointed to positions where it is not obvious they have the necessary expertise or is the problem one of Regulatory Capture? Either possibility indicates a major problem.

NON-RESPONSIVENESS OF THE MINISTRIES TO COMMUNITY CONCERNS

The Community observers pointed out the following issues associated with the contaminated soil landfill dumpsite: saturated soils, errors in placement and attachment of the linear low-density polyethylene base liner, non-functioning leak collection system, major deviations from the As-Built as presented in the Technical Assessment Report (TAR), non-compliances with both the Waste Discharge and the Mining Permits. Very rarely did the Community get a response from either Ministry, and if we did get a response it usually was that a QP signed off from the deviation from the Permits and therefore everything was fine. Currently, the requirements of Permits are meaningless since neither the Ministry of Mines nor Environment enforce such requirements. This is yet another example of Regulatory Capture.

PROBLEMS WITH THE PROFESSIONAL ASSOCIATIONS

The five principals of the Engineering firm who were presumably the arms-length QPs determining whether the watershed site was suitable for a contaminated soil landfill site and were also involved in the design of the landfill site turned out to have a joint venture agreement with the proponents of the Permit, Cobble Hill Holdings (CHH) and South Island Aggregates (SIA). This joint venture agreement with unsigned versions starting in November of 2010 and with signed versions on September 10, 2012 and on February 14, 2013 was an agreement to share 50:50 with the Principals of CHH/SIA the profits arising from the operation of the contaminated soil landfill. This joint venture agreement was unknown to the Ministry, the Environmental Appeal Board and the Shawnigan Residents Association. The Shawnigan Residents Association has argued that this secret joint venture agreement has coloured the work done by the firm in evaluating the suitability of the Watershed site for a contaminated soil landfill and influenced the design for the contaminated soil landfill (e.g., why design a Leak Collection System in a manner such that it does not collect leaks?).

The participants in the secret Joint Venture Agreement argue that there was no joint venture agreement. Thus, in the BC Supreme Court of BC the lawyers for CHH/SIA argued to Justice Sewell that there was no meeting of minds; hence, there was no joint venture agreement. An affidavit by one of the engineers stated that the joint venture agreement only came about because CHH/SIA had difficulty meeting their payments; however, this is not congruent with the November 2010 joint venture agreement that, although unsigned, indicated there was an intent to form a joint venture agreement from the very beginning of the project.

There was a secret joint venture agreement as shown by the following statements that are taken directly from the ‘Reasons For Judgement’ by Justice Sewell of the BC Supreme Court on January 24, 2017 in the case of the Shawnigan Residents Association versus the Director of the Environmental Management Act, Cobble Hill Holdings and the Environmental Appeal Board (known as the Board in the Judgement).

“[164] I am satisfied that the Board ought to have been made aware that the design of the Facility and the TAR presented to the Delegate was prepared by engineers who were not independent and who stood to profit from the continued operation of the Facility. That is a circumstance that goes to the heart of the integrity of the approval process under the *EMA*. The Delegate and the Board proceeded throughout on the basis that Active Earth were professionals acting on a fee for service basis.”

[167] In fact, Active Earth was not acting on a fee for service basis; rather, its principals were active participants in the business venture in respect of which the Permit was being sought. I am satisfied that the Board was misled on this point. Paragraph 273 of the Board’s reasons shows the extent to which they were misled:

[169] I have reviewed Mr. Block’s evidence before the Board. I am forced to conclude that Mr. Block was not being truthful in the evidence he gave with respect to the nature of the relationship between Active Earth and CHH. For the purposes of this proceeding it is not necessary to determine whether Mr. Block committed perjury before the Board. As pointed out in *Granitile Inc.*, perjury requires an actual intention to deceive. I would be reluctant to make a finding that all of the elements necessary to establish perjury have been established against Mr. Block on a judicial review application.

[174] Accordingly, I have no difficulty in concluding that the Board was misled into believing that there was no conflict of interest on the part of Active Earth, except for that inherent in the fact that they were acting for CHH and were advocating for an approval of the Permit in that capacity.

[175] I am satisfied that the Board was misled about the true nature of the relationship between Active Earth and CHH and the fact that Active Earth’s principals were partners in the proposed Facility. That is information that ought to have been disclosed to the Board. I am also satisfied that Mr. Block deliberately concealed that information from the Board in his testimony on behalf of CHH.

[179] I also find that CHH filed misleading evidence in this Court.

[181] In response, counsel for CHH obtained an affidavit from Mr. Pye, sworn July 10, 2015. In that affidavit, Mr. Pye deposed that the February 2013 Agreement had “not been followed through with”. He also deposed that at all times Active Earth had been providing engineering services at an hourly rate and that by May 2014, Active Earth and CHH had abandoned the concept of using OPCO. The contents of this affidavit are somewhat startling given the fact that only two months previously, on

May 1, 2015, Active Earth's counsel had delivered a notice of default of the February 2013 Agreement to CHH.

[182] Not surprisingly, after consulting with his own counsel, Mr. Pye swore a second affidavit, giving a different version of the relationship between Active Earth and CHH and SIA. In this affidavit, Mr. Pye still did not disclose the notice of default, but deposed that it was CHH that had apparently tried to abandon the February 2013 Agreement.

[183] I need not review the extensive cross-examination of Mr. Pye, Mr. Block and Mr. Kelly. I think it sufficient to say that all three acknowledged that the underlying arrangement called for Active Earth or some entity representing its principals to perform the engineering work required for the Facility in exchange for a 50% interest in the business operating the Facility.

Having sat through the first 10 days of the Court proceedings, I composed a letter of complaint and sent this to the Association of Professional Engineers and Geoscientists of BC (APEGBC). In this letter I outlined how the Engineering firm kept hidden from the Environmental Appeal Board and the Ministry of Environment their joint venture agreement with Cobble Hill Holdings (CHH) and South Island Aggregates (SIA). I outlined, in great detail, the evidence for this, including a November 2010 unsigned joint venture agreement, the 2012 and 2013 signed joint venture agreements and so on. I indicated that this violated their Code of Ethics' *Principle 5: uphold the principle of appropriate and adequate compensation for the performance of engineering and geoscience work*, and *Principle 7: Conduct themselves with fairness, courtesy and good faith towards clients, colleagues and others, give credit where it is due and accept, as well as give, honest and fair professional comment*.

Eighteen months later, on August 2, 2017, I received a reply that was labelled confidential. APEGBC has a duty to ensure their members adhere to their Code of Ethics so in my opinion there is nothing confidential about this letter. In essence, this letter stated the following:

- 1) A joint venture agreement was never executed and thoughts of a joint venture agreement only came about late in the process because CHH had difficulties paying AEE.
- 2) The Delegate was aware of this joint venture agreement; hence, nothing was hidden.

This resulted in the following conclusion by APEGBC: **"Based on all of the foregoing, the APEGBC Investigation Committee found that there were no reasonable or probable grounds to believe that any of the Engineering firm's Professionals demonstrated unprofessional conduct or contravened the APEGBC Code of Ethics."** – emphasis added.

In subsequent communications with APEGBC I pointed out:

- 1) there is a November 2010 joint venture draft; hence, the idea that a joint venture agreement came up late in the process is untrue.
- 2) There were two signed detailed agreements: 1) One between AE Newco (completely owned by the AEE principles), SI Newco (owned by CHH/SIA principles), CHH and an operating company called OPCO dated September 10,

2012, pp. 51-66 of the affidavit. 2) One signed February 14, 2013 amongst AE Newco and CHH, SIA and OPCO.

- 3) Furthermore, there is an email from one Engineer to an interested Party dated May 12, 2015 pointing out that the fEngineering firm has an equity position in OPCO (the joint venture company) and is willing that 1/3 of OPCO be sold to South Island Resource Management (SIRM) for \$3,000,000.

Thus, to claim there was no signed joint venture agreement as stated by APEGBC is ludicrous.

Further, if AEE principals and CHH principals were aware that the Delegate knew of the secret joint venture then the question arises as to why did their lawyers fight so hard to hide this fact from Judge Sewell. If CHH had brought this fact out in the Court, then the Shawnigan Residents Association would have lost their case. The incongruence between what transpired in the Supreme Court and the recent memories of certain parties was not considered by APEGBC.

To dissuade several members of the Shawnigan Research Group from continuing an application to the BC Supreme Court for a judicial review of the APEGBC decision, representatives from APEGBC met with several of us on December 15, 2017. We brought up the issue of the incongruence between the behaviour of CHH in the Supreme Court before Judge Sewell and the conclusion by APEGBC that the Ministry and apparently the Environmental Appeal Board were aware of the joint venture company initiative. Their comments were that Justice Sewell unfortunately did not have all the facts before him, whereas they did.

We also pointed out that there was a violation of Principal 5 of their Code of Ethics that was not commented upon by the APEGBC's Complaints Tribunal.

Principle 5: uphold the principle of appropriate and adequate compensation for the performance of engineering and geoscience work.

We pointed out that APEGBC's Guidelines go on to elaborate Principal 5. The Guidelines specifically state:

(b) Members should not undertake an engineering or geoscience engagement on a contingent fee basis.

(g) Members should not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with their clients or employers in connection with work for which they are responsible.

We argued that the joint venture agreement in effect is a contingent fee basis (or it is a commission) and this violated Principal 5 of their Code of Ethics. Their initial response was that the Guidelines were not the Code of Ethics and essentially could be ignored. This was followed by their comments that the Code of Ethics was last revised in 1991 and needs revision because it no longer reflects the current practices. Our response was that the Code of Ethics should determine current practice and current practice certainly should not determine the Code of Ethics.

We also pointed out that they did not address any of the other concerns about violations of their Code of Ethics that were brought forth in the letters of complaint.

Keep in mind that the Ministries currently rely upon the Professional Bodies to ensure that Qualified Professionals behave ethically. One can only conclude that APEGBC does not always enforce their Code of Ethics.

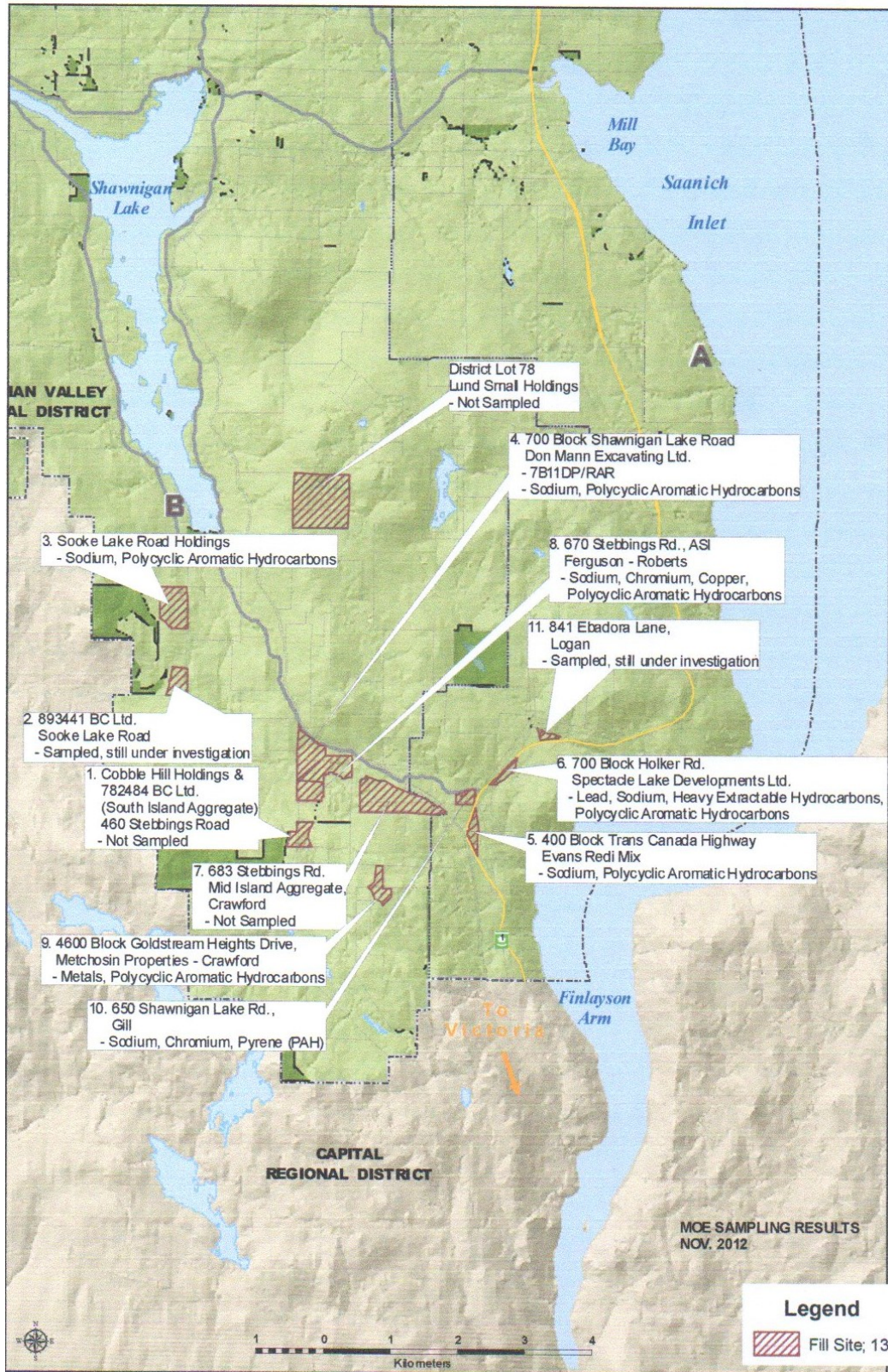
THE SOLUTIONS

- 1) **All Professional Association must review and revise their Codes of Ethics.** Each Code must be clear, concise and give examples of how to apply each Principle of the Code. Included in this Code must be a requirement that with each new contract the Qualified Professional (QP) must declare all potential conflicts of interest, whether that conflict is with Employers, Government interests or Public interests. There also must be a requirement that all Association Board members or Board Tribunal members declare potential conflicts of interest. When such new Codes are being developed the Public must be given an opportunity to give comment. Finally, each Code of Ethics must be approved by a Public Body appointed by the Government and comprised of Qualified Professionals as well as members of the Public.
- 2) There must severe but fair penalties for unethical behaviour, unprofessional behaviour and illegal conduct. This must be clearly written in association with the Code of Ethics so that everyone knows the consequences. Penalties can range from warning letters to fines, loss of license for a period of time or loss of license from a lifetime.
- 3) **It is vital that there be clear Rules and Regulations in place for all of the activities for which the Ministries are responsible.** For example, if the Ministry of Environment authorizes that a contaminated soil landfill be established then it is important that specific rules and regulations governing a contaminated soil landfill are in place. There are clear guidelines for municipal waste, wood waste and hazardous waste landfills. It is the absence of such guidelines for contaminated soil landfill sites that allowed the Ministry's Senior Environmental Protection Officer to conclude no environmental risk assessment was necessary for placing a contaminated soil landfill in the Shawnigan Watershed.
- 4) **There must be a Governmental Oversight Body that ensures the Professional Reliance Model is working.** If it is not working satisfactorily then the Government must be prepared to step in with more Governmental regulations and oversight. This Oversight Body should have the authority to establish Tribunals that act as Courts of Appeal for complaints from the citizenry when citizens loses trust in the Professional Bodies' Complaints Tribunals. At the moment, the only recourse a citizen has is to apply to to the Supreme Court of BC for a judicial review.
- 5) **The Ministries need to be adequately staffed with individuals of the appropriate qualifications.** Many of these new staff members should come from newly-qualified professionals whose perspectives are not coloured by the old ways of doing thinking. In addition, one would want some very experienced QPs. Currently the Ministries that deal with the environment are severely understaffed. is important that staff have expertise in the areas of responsibility, i.e., they should know in great detail the regulations and reasons for such regulations and be able to assess whether industry is following all the regulations. Further, the Ministries need QPs that do the environmental risk assessments and not depend upon industry QPs for such assessments. It is important that the Ministries stop their almost complete reliance upon the QPs hired by industry. Such Industry QPs often have a conflict between what is right, what their employers want and their future employment prospects. One must

keep in mind that one of the primary goals of an industry is profit. Skirting regulations can increase the profit margin. To fund this increase in staff the Ministries can increase licensing and permit fees to afford in-house expertise. As an example, for a soil relocation permit, the Ministry of environment could tack on a fee of one to two dollars per tonne relocated. Industry may cry foul but industry should keep in mind this increase in fees is associated with the Ministries now performing more of the groundwork necessary for a permit.

- 6) **In any Tribunal, whether governmental or professional body, that deals with complaints, the complainant should be allowed an active role in pursuing the facts.** In our complaints to APEGBC, the attitude was that as soon as a citizen filed a complaint the citizen no longer had standing in that complaint. Thus, when we disagree with the details provided to Tribunals of the Professional Associations we have no recourse to appeal other than go before the Supreme Court of BC where the Professional Body will likely argue we have no standing. Indeed, this is what APEGBC representatives did argue that if we went ahead with the application for a Judicial Review then APEGBC will argue that we have no standing.
- 7) **The Office of the Ombudsperson should have in place an Ombudspersons in charge of environmental issues.** Such ombudspersons should have the technical background to deal with technical issues regarding problems brought forth by citizens. This, ultimately, is the only way to ensure that Ministry staff do not ignore legitimate concerns of residents.

Appendix 1



Appendix 2

■■■■'s Non-Functional Leak Detection System

A leak detection system in a landfill should be designed to detect movement of water and contaminants through the polyethylene liner. In the case of 460 Stebbings Road, Shawnigan Lake, the liner is a 40 mil linear low density polyethylene (LLDPE) liner. The proper design for a leak detection system is illustrated in Figure 1. Here we see that the perforated pipe of the **leak detection system** is well below the LLDPE liner. Above the liner we have the **leachate detection system**.

Figure 1. Diagram illustrating how the leak detection system should be located in a landfill.

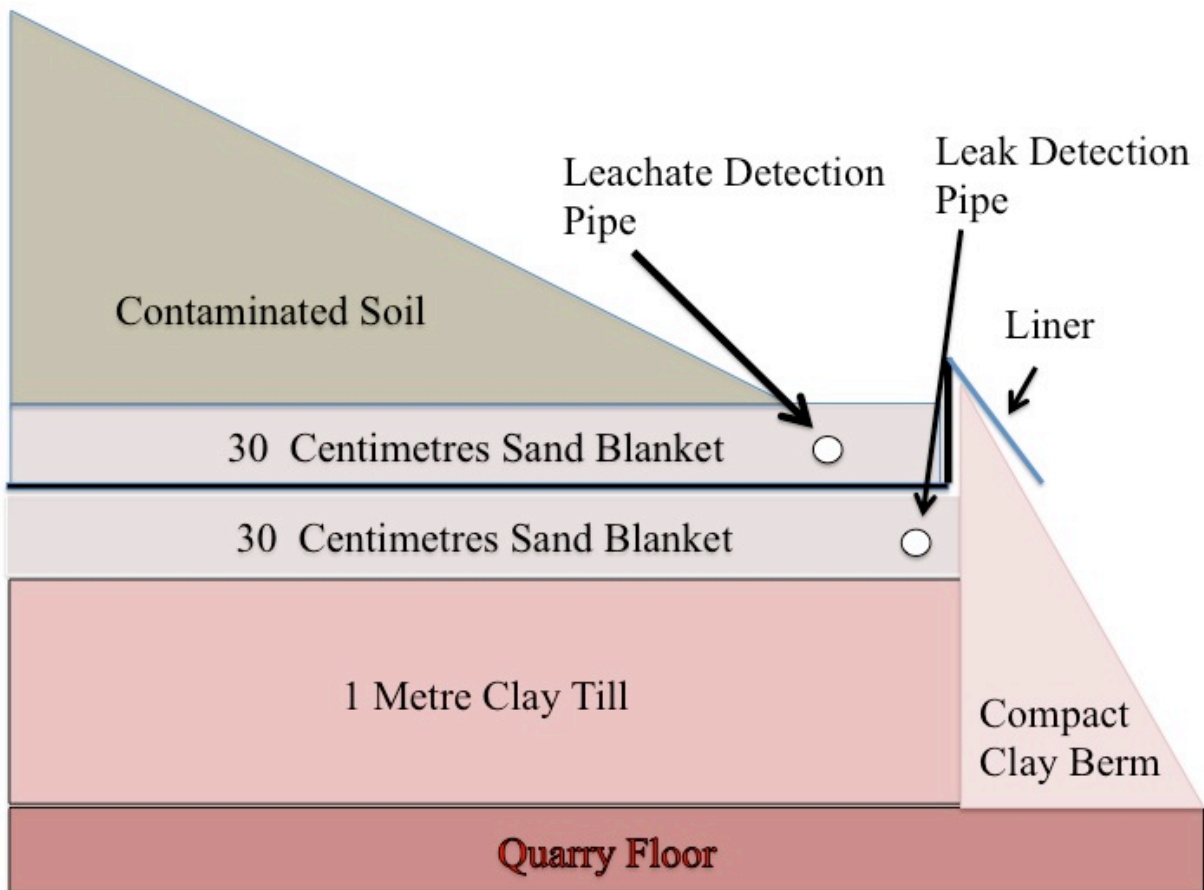


Figure 2 illustrates an early stage of the construction of ■■■■'s Leak Detection System. It starts by folding back the LLDPE liner from its sand blanket at the edge of the Soil Containment Area

#2. A very shallow groove is then produced in this sand blanket. The groove appears to be 3-5 cm deep. A loose clay till berm is then placed alongside this groove. A geotextile blanket is then placed over the berm and the sand-blanket groove.



Figure 2. Early stage of [REDACTED]'s leak detection system construction.

Figure 3 illustrates a new segment of the leak detection pipe glued to the previous segment. Note the perforations are on the sides of the pipe. The pipe extends over the geotextile blanket laid over the shallow groove in the sand blanket and over the clay berm. Rip rap or coarse crushed

rock is then added supporting the pipe from below, the sides and finally on top. Note that the pipe lies on crushed rock that has an apparent greater depth than the groove in the sand blanket and that the perforations are half way up the sides of the 4 inch pipe. The geotextile blanket is then folded over as seen in Figure 4. Note that the pipe appears to be above the level of the sand blanket upon which the LLDPE liner rests. One of the workers was asked if the pipe was below the liner level. He answered “it was supposed to be”. He did not say that it *was* below the liner level. It looks like the perforations are possibly 4-6 inches above the level of the LLDPE liner.



Figure 3 illustrating how rip rap is placed around the leak detection pipe.

Figure 4 more clearly illustrates how rip rap is placed around the leak detection pipe followed by wrapping with the geotextile blanket.



Figure 4. Demonstrates the 'leak detection' system extending further in the westerly direction.

Figure 5 illustrates that once the 'leak detection' pipe is surrounded by rip rap and the geotextile blanket is wrapped, it becomes covered with sand. The berm is then built up with more loose clay till. Finally, the LLDPE liner is folded over everything as seen in Figure 6.



Figure 5. Covering the ‘leak detection’ system with sand.

Figure 6 illustrates the LLDPE liner being pulled back over the ‘leak detection’ pipe assembly and the enlarged loose clay till berm.



Figure 6. Once the 'leak detection' system is completed work will start on the leachate detection system.

So in fact the 'leak detection' system that has been built by [REDACTED] is illustrated in Figure 7. The blue arrows represent water movement. The leak detection system seems to be designed not to detect leaks. One can only detect leaks because of water passing through the loose clay till berm and onto the floor of the quarry, which of course [REDACTED] says is non-contact rainwater. Figure 8

illustrates such wet areas of the berm on the westerly side of the original contaminated Soil Containment Area at 460 Stebbings Road, Shawnigan Lake.

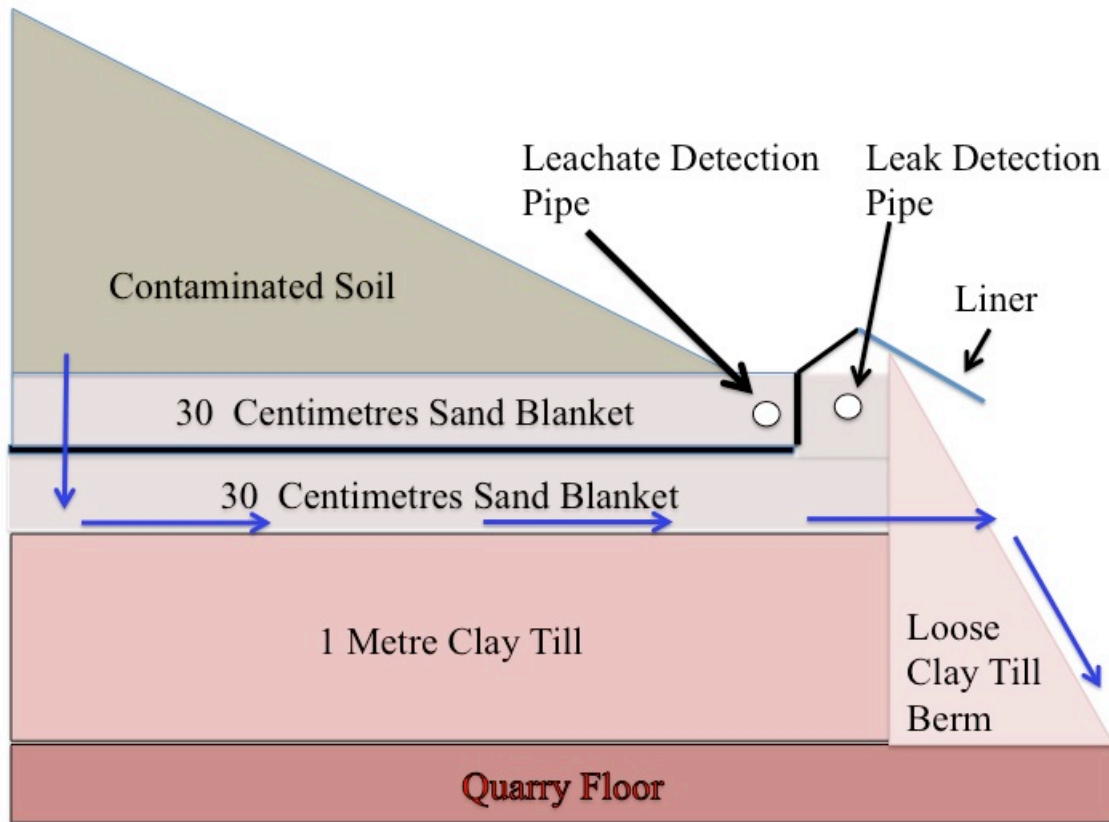


Figure 7. The so-called “leak detection system” designed by SIRM. The leaks would have to go **uphill** through sand and coarse crushed rock to enter the leak detection pipe.



Figure 8. Photo taken in May 2016 of the original Contaminated Soil Containment Area #1 after more than a month without rain. This is a view of the westerly face of the landfill. Clearly seen are wet areas in several locations in the clay berm that lies **below** the LLDPE liner. Similar wet areas persist to the present day, although now hidden by the newly established unfinished Contaminated Soil Containment Area #2.

It is clear that [REDACTED]'s Leak Detection System will not detect leaks.

How To Detect Leaks From the Contaminated Soil Containment Areas:

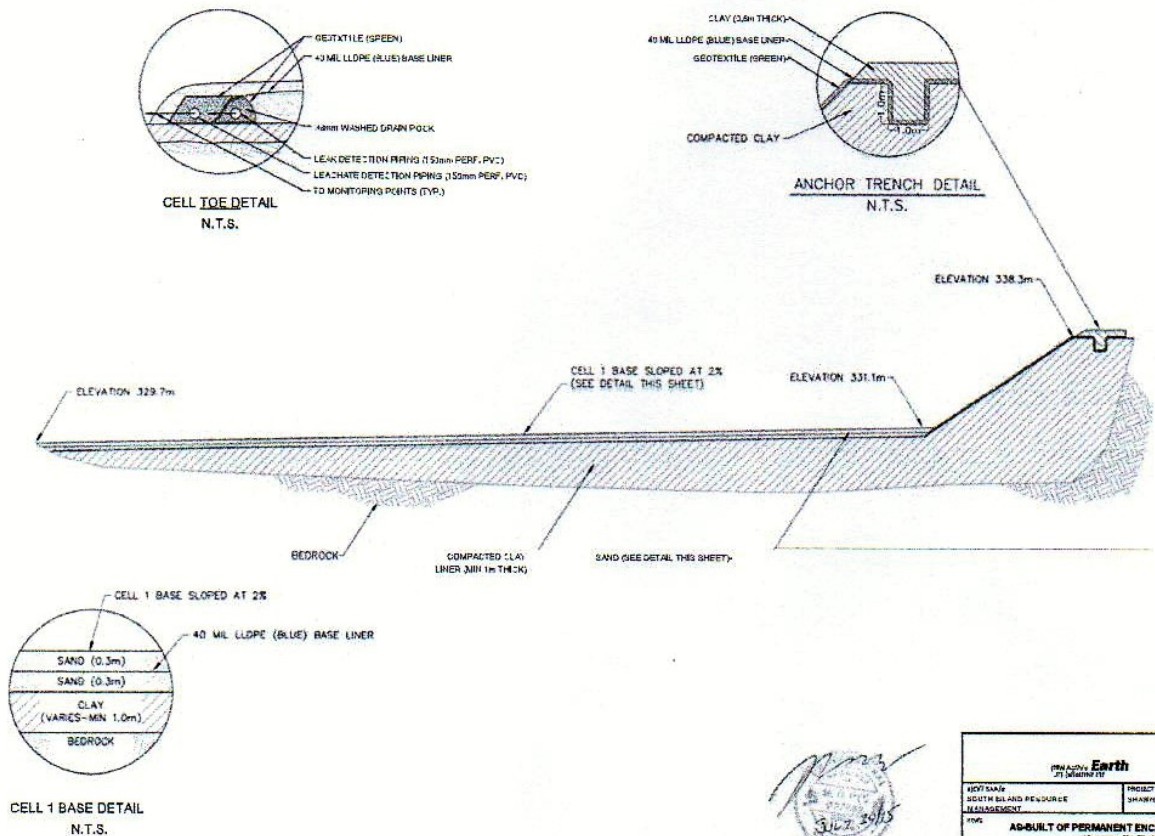
The north-west corner of the new Contaminated Soil Containment Area #2 is the lowest part of the Containment Area. The northerly berm that contains the 'leak detection' system abuts a large berm of very coarse rip rap. In the past we have observed water leaving this area of the quarry to flow through this large rip rap berm but do not know where this water ends up. It clearly is not captured by SIRM's water treatment system. The leaks that will occur in this contaminated soil landfill will flow through this large western boundary berm undetected by the 'leak detection' system. If the Ministries are seriously interested in detecting leaks they should have a well constructed in the north-west corner just beside the leak detection berm. This well should extend

only to the quarry floor. This well will then allow the sampling of the leaks through the liner system.

A more accurate method to test for leaks in the liner system under the contaminated Soil Containment Area #1 would be to take sand and clay till samples from the areas under the liner indicated in Figure 8.

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The upper left corner diagram illustrates the as-built for the leachate and leak collection systems. This leak collection system designed by AEE and built by SIRM completely failed to detect leaks for the reasons indicated in Appendix 2. This system was also signed off by staff in Mines and Environment. Parenthetically, the anchor trench illustrated in the upper right corner diagram was never built even though the as-built diagram would indicate it was – this, too, was pointed out to the Ministry of Environment.



3022 30/15

PRINCE OF WALES Earth 21 (MAY 1975)			
SOUTH BAY AND RECLUSE MANAGEMENT		PROJECT LOCATION: SHANNESAN LAKE, BC	
AS-BUILT OF PERMANENT ENCLOSURE CELL 1 CROSS SECTION A-A			
BY: BM	DATE: DEC	REV: 015-024	FIGURE 2
BY: MP	DATE:	REV: 015-011	