



THE CRYSTAL MOOSE NEWS

North Vancouver, B.C.

August, 2007



Dr. Tony Sperling, Editor

Greetings and welcome to the 2007 edition of the Crystal Moose News. Life at SHA is very exciting these days with a huge progressive closure design project underway for the City of Vancouver, the EA submission for Highland Valley Landfill

being wrapped up, crews on the ground providing QA/QC services on projects in Fernie, Gibraltar and Nanaimo, innovative technologies being developed to reduce GHG emissions and a few landfill fire projects in exotic destinations (NWT and U.S. Virgin Islands) to add a little spice to the mix. Thank goodness for a super dedicated staff at SHA that is making all of this activity happen in a controlled fashion.

SHA has added staff to keep up with demands from our valued repeat clients. Iqbal Bhuiyan has joined SHA after completing the Ph.D. program in Civil Engineering at UBC, with a focus on waste water and leachate treatment. He is now busy designing leachate collection and treatment systems for Prince Rupert and Gibraltar. Jerome O'Sullivan has joined our team to assist David Kwick in providing environmental monitoring and reporting services as more regional districts and industrial clients retain SHA to provide turn key sample collection, data analysis and annual reporting functions. Also joining SHA's team from BCIT's Civil Technology program is Scott Garthwaite. Scott has been spending the summer in Fernie where he is inspecting a large landfill closure / golf course construction project. SHA's landfill engineering team now includes:

- Dr. Tony Sperling, P.Eng. President & Chief Engineer (Geotech)
- Poul Hansen, General Manager
- Frank Wright, P.Eng., Senior Environmental Engineer (Chem.)
- Scott Ferraro BE. Honnours., Int, Environmental Engineer
- Sharon Tenenbaum, P.Eng., Int. Civil Engineer
- Iqbal Bhuiyan, Ph.D. Candidate, Treatment Specialist
- David Kwick, M.Sc., Senior Environmental Scientist
- Jen Lavoie, Environmental Engineer E.I.T (Geochem)
- Jerome O'Sullivan, M.Sc., Int. Environmental Scientist
- Scott Garthwaite, Engineering Technologist
- Barry Munro, Chief Draftsperson & Surveyor
- Barbara Ramza, CAD / Design Technician
- Aljeh Sperling, Accountant
- Anne Pataky, Administration Assistant

LANDFILLFIRE CONTROL Inc.

2007 has been a very busy year for SHA's associated company, LFCI. At the City of Vancouver our team worked with staff and Porschner Construction to quickly contain a spontaneous combustion fire in Phase 1 and to develop a proactive monitoring program designed to provide an early

warning system for future fires. In February, LFCI was called out to Dawson Creek Landfill to assist the Peace River Regional District with extinguishment of a stubborn subsurface fire at their facility. Fighting a fire with temperatures as low as -40C with wind chill proved to be a new and exhilarating experience. Staff at landfills across Northern British Columbia deserve a lot of credit for operating landfills under such challenging conditions on a day to day basis.

After experiencing several major landfill fires, the City of Yellowknife invited LFCI to prepare a Fire Risk Management Plan and training program for their landfill facility. The training program was attended by both landfill staff and the Yellowknife Fire Department.



Recent Landfill Fire at Yellowknife Landfill

From the coldest landfill projects, to the very hottest, in August Dr. Tony Sperling was invited by the Virgin Islands Waste Management Authority to assist in the planning of a major landfill fire extinguishment on the tropical island of St. Croix. With careful planning, a three day project was extended into a week long holiday.

HIGHLAND VALLEY CENTRE FOR SUSTAINABLE SOLID WASTE MANAGEMENT

By Dr. Tony Sperling:

In July SHA celebrated two major milestones in the Highland Valley Landfill project. Foremost, the project was shortlisted as one of five candidate landfill sites to replace the Cache Creek Landfill which is expected to reach capacity in early 2010. Second, a comprehensive Environmental Assessment (EA) review was completed and submitted to the EA office. We are optimistic that the project will be awarded an EA Certificate in January, 2008. Many thanks to the multi-

disciplinary team that worked on this project under the direction of Mark Freberg, Highland Valley Copper's Superintendent of Environmental Services. Key team members included Don McCallum and Jennifer Turner of Gartner Lee Limited (Project Coordinators), Kathy Preston and Maria Furberg of RWDI (Air Emissions), George Meadows of Hemmera Resources (First Nations), Robert Lo and Thava Thavaraj of Klohn Krippen Berger (Geotechnical), Rod Smith of Water Management Consultants (hydrology), Steve Powers of ND-Lea (Transportation), Dr. Brian Guy of Summit Environmental (Biology), Mike Van Ham and Jason Hutchison of SYLVIS (Biosolids and Reclamation), Peri Mehling of MESH Environmental (Metal Leaching), Todd Baker and Mizanur Rahman of EBA (landfill gas), and Randy Sunderman (Socio-Economics).

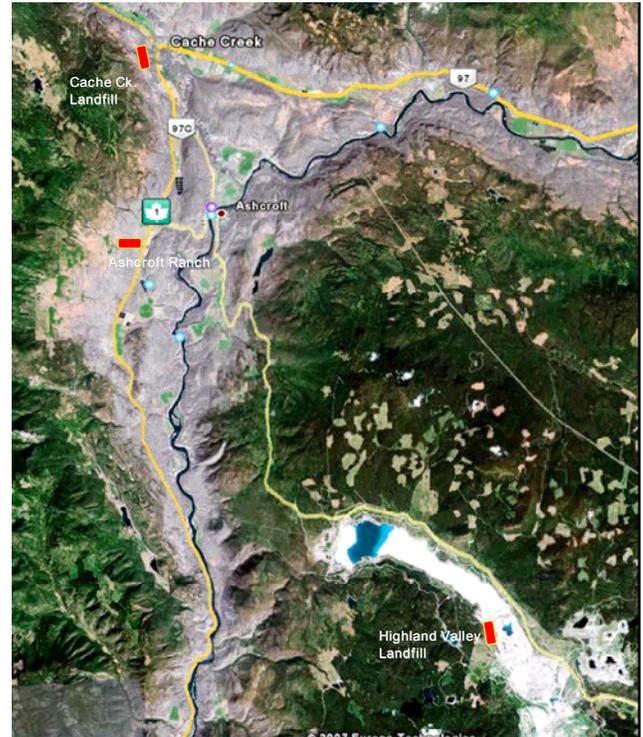
With ever increasing concerns about Global Warming, the amount of green house gas emissions that will be released by the waste management project is perhaps the most important consideration. By embracing new technologies, some pioneered in B.C., the HVL Bioreactor is expected to achieve ultra low GHG emissions ranging between 30,000 and 90,000 tonnes of CO_{2E} per 600,000 tonnes of MSW treated. These emissions, achieved by incorporating an aggressive LFG collection system, continuous Biocover and a haul fleet powered by Westport's engine systems that can run on landfill gas, will be 300 to 700% lower than GHG emissions from a comparable incineration project.

A detailed economic study concluded that MSW disposal at HVL, including transfer station operation, trucking and landfill operations can be achieved for about \$51/tonne from the Lower Mainland.

Although we are much closer to our goal than the last time I reported on this project two years ago, making the landfill a reality will still take a lot of hard work by a lot of dedicated people. Foremost, we are working hard to put in place an agreement with Local First Nations to ensure that their concerns about environmental protection will be fully addressed and that their historic rights and title are fairly accommodated. With a new transportation strategy, truck impacts on Logan Lake will be reduced by 50%. Traffic calming and safety upgrades are being planned to address remaining noise and safety concerns.

The Highland Valley project is all about sustainability and about minimizing waste management costs for all interested regional districts in Southwest British Columbia. By utilizing a 140 ha brownfield site on top of a large waste rock dump, disturbance to large tracts of unspoiled greenfields in B.C.'s ever shrinking Agricultural Land Reserve can be avoided.

I am hopeful that at the end of the day Metro Vancouver's evaluation of the short listed replacement options for the Cache Creek Landfill will conclude that the Highland Valley Landfill project will provide the most responsible way to manage solid waste into the 22nd century while providing a cost effective solution for other municipal facilities that will run out of landfill capacity in years to come.



Proposed Landfill Site at Highland Valley Copper

Any suggestions on how our vision of a regional facility can be structured to best serve British Columbia would be greatly appreciated. You can contact me with your ideas at sperling@sperlinghansen.com.

Tracking Air Space Consumption

By Sharon Tenenbaum



It is becoming increasingly important to track landfill capacity, compaction density and soil cover utilization at landfill sites. With this data, it is possible to accurately predict when your landfill will reach capacity and when major projects such as liner and

progressive closure need to be budgeted. More importantly, an annual analysis allows owners to evaluate compaction and daily soil cover use by the contractor or the landfill operations team relative to industry standards.

To obtain the necessary data it is important to continuously track incoming MSW tonnage and the quantity of soil consumed. This can be challenging if cover is being extracted from a trench within the landfill footprint, but it can still be achieved by tracking load counts or survey. The landfill surface should be surveyed once each year. Many regional landfills now use aerial photogrammetry to produce ortho photos with 1 m contours and a digital terrain model (DTM) that is accurate to 0.1 m or better.

Often, there is a need to properly account for waste settlement in order to obtain meaningful results. Rigorous volumetric analysis requires an intimate knowledge of landfill operations and performance. With annual monitoring projects for the

City of Vancouver, Regional District of Nanaimo five landfills in the Thompson Nicola Regional District, Gibraltar Landfill, Port Clements Landfill, Mission Flats, Seven Mile, Norampac, amongst others, SHA has the tools and experience to complete this analysis for your facility.

REGIONAL PROJECTS



By Scott Ferraro The following paragraphs provide highlights of a number of exciting projects that our staff have been involved in over the past year and other news from landfills around the province.

Vancouver Landfill. The City of Vancouver is preparing to construct a closure system on the recently completed Phase 1 area, the first of nine planned progressive closures for the facility over the next 40 years. SHA is currently developing the conceptual design for the 20 ha final cover system, a project that is expected to cost \$10 million. A linear low density polyethylene (LLDPE) geomembrane will provide the primary barrier layer that will shed clean runoff and contain landfill gas. Unique design elements that are currently being evaluated are the use of Biocover to minimize fugitive LFG emissions, recycled crushed glass as a primary drainage layer, a thick subsoil horizon incorporating stabilized biosolids from Iona's WWTP and a large engineered wetland to retain and treat storm water run-off.

Concurrently with the landfill closure project, the City is upgrading the landfill gas collection system and system controls to provide more LFG to Maxim's waste to energy facility at Can Agro. Plans for the gas system upgrade are being prepared by CH2M-Hill.

The landfill continues to experience unprecedented growth in the tonnage of wastes being managed at the facility. Barry Munro is working with City staff and state-of-the-art GPS technology to track cell development and plan future filling activities so the accelerated pace of landfilling can be properly planned and efficiently executed.



Barry and GPS Unit at the Vancouver Landfill

SHA is also working with CH2M Hill and Earthfx on the Hydrogeological Study at the site. The field work for this

project is well underway, with a detailed report expected in mid 2008.

Gibraltar Landfill: The Gibraltar Landfill, the first landfill in British Columbia to be developed on top of a waste rock dump at an active mine site, continues to be expanded by the Cariboo Regional District. In 2006 a large settling pond was added to the primary leachate treatment lagoon. This past summer, SHA teamed up with Sylvis to construct an engineered wetland for final leachate polishing. An aeration system with two 7.5 HP aerators is being added late this summer to complete the treatment system. On the drawing board for 2008 or 2009 is a progressive closure of Phase 1 and a liner expansion for Phase 2B & Phase 3.



Recently Planted Wetland System at Gibraltar

Prince Rupert: Anticipating an increase in waste volumes as a result of the major container port upgrade at the City's docks, an upgrade to the leachate collection system is underway at Rupert's Wainright Basin landfill site. A new pump station and leachate collection works are being added this year. Progressive closure of portions of the completed landfill are being planned for 2008.

Fernie: SHA recently updated the design for the Fernie Landfill Closure, and is currently supervising the 13 ha closure. The closure system utilizes LLDPE Geomembrane in one area, and a Compacted Clay Liner in another. An active gas collection system is being installed, which will vent through a biofilter to reduce odours and methane emissions. The work is progressing in tandem with a major golf course development at the site.

Creston: SHA recently completed a design update for Creston Landfill on behalf of the Regional District of Central Kootenay. By converting the natural control landfill to a fully compliant engineered site, SHA demonstrated that the landfill lifespan of the facility could be extended dramatically from 2016 to 2057. Completion of a comprehensive Design and Operations Plan update is under way.

Kamloops: The City of Kamloops has recently retained SHA to update the Design and Operations plan for the facility that we originally prepared in 1995. Major upgrades to the facility will likely include Biocover to limit methane emissions, as

well a progressive closure strategy for the 6.25 ha of landfill that has been brought up to final grades to date.

Nanaimo: Phase 1 of the Geogrid Berm expansion at Nanaimo's Cedar Landfill has proven an unqualified success. A Phase 2 expansion of the Geogrid berm will now be examined.

As well, SHA and our project partners Sylvis and Dr. Hettiaratchi from the University of Calgary, are providing the design and QA/QC services during construction of the first Biocover capping system in British Columbia. To achieve the functional Biocover design, the original intermediate closure system has been optimized to minimize fugitive methane emissions.



Biocover Construction at Nanaimo Landfill

All of us at SHA are sorry to learn that Petra Wildauer, the Landfill Superintendent at Nanaimo Landfill is moving to take on the position of Manager of Solid Waste at the Regional District of Fraser Fort George. We wish Petra the very best in her new position.

Hartland Landfill: Expansion of the Hartland Landfill continues at a fast clip. SHA recently completed a comprehensive filling plan for the landfill facility that was closely integrated with a rock quarry design. Quarrying of rock for operational cover continues to be successful at Hartland, with the extra air space created within the landfill easily covering the cost of rock processing.

Hope: The final expansion of the Hope liner system was completed in the fall of 2006. An upgrade to the on-site transfer station was also undertaken. On the drawing board is an upgrade to the leachate treatment system.

Squamish: A feasibility study of a major landfill expansion at Squamish landfill was recently completed by SHA. The fully compliant facility would provide a service life of 47 years for all residents of the Sea-to-Sky Corridor, including Whistler and Pemberton. Costs are expected to be much lower than out of region transfer or incineration.

This year, SHA is working with Carney's Waste Systems and the District of Squamish to construct the next progressive closure system.

THE SEVENTH ANNUAL INDIAN ARM BURNER

By David Kvick Due to massive storm damage and washouts in the Indian River Valley this year the format will change from a 30 km Thigh Burner Bike ride to a leisurely two to three hour paddle up Indian Arm. As in past years, Champion Barge will be in attendance to transport paddlers back to Deep Cove after our evening salmon bar-b-que.

The seventh annual Indian Arm Burner will occur on Saturday, September 22nd, 2007, starting at 11:00 am from the paddling centre at Deep Cove. For those that do not have access to a kayak or canoe, please make arrangements with the Deep Cove Kayak centre to rent a boat .



Champion Barge Drift Buster on Indian Arm

Those not keen on paddling can still participate. Champion Barge's "Drift Buster" will be departing from the Deep Cove Dock at 1:00 pm and returning from Coldwell Beach at about 8:00 pm. For more details and how to register see last page of this newsletter. Regardless of whether you want to do the full kayak paddle or just come up on the Drift Buster for the barbeque afterwards, please give David Kvick or Anne Pataky a call or drop them an email to book your spot. The cost of the event is by donation (\$35 to \$50, kayak rentals extra).

For those hard core mountain bikers needing a bike ride fix (me and Tony included) we will carry on the tradition with an informal Thigh Burner ride to Diamond Head on Sunday, Sept. 23rd. For those coming from out of town, you will be welcome to crash at the Sperling's on Saturday night after the party (just bring a foamy and sleeping bag).



Riding by Elfin Lakes near Diamond Head

ACCOMPLISHMENTS BY STAFF

After 5 years of hard work Iqbal Bhuiyan will be defending his Ph.D. Thesis titled “Investigation into the solubility growth and dissolution kinetics of struvite in the context of phosphorus recovery from wastewater” at UBC, Dept. of Civil Engineering. Sharon Tenenbaum recently earned her Professional Engineer designation from APEGBC. Congratulations Sharon. Anne Pataky is an extremely proud mother as her son Mark recently qualified to participate on Canada’s National Sailing Team. David Kvik continues to excel in mountain biking and cross country skiing, but more importantly David and Annie are the proud parents of Oliver Kvik. Oliver recently celebrated his first Birthday at SHA’s office. Jennifer Lavoie turned a new page in life, marrying Rory Quigley from New Zealand.

STAFF TRAVELS

SHA staff continued our long standing tradition of travel to exotic places during the past year.

Sharon Tenenbaum completed an epic three month journey of discovery to far of places in the orient that included jostling through the streets of India, trekking through the Nepali Himalayas and a two week bicycle trip through Myanmar (Burma). Sharon thrilled all of us with hundreds of photographs of the diverse cultures and friendly people she experienced along the way.



Yangon, Myanmar (Burma) – Getting ‘Caught Up’

DON’T MISS:

- 7th Annual Indian Arm Burner, Sept. 22nd, 2007.
- SWANA’s Landfill Fire E-Course, Nov. 8&15, 2007
- Southern Interior Waste Managers Conference, Harrison Hot Springs, Sept. 25 to 27, 2007.
- SWANA 2008 Landfill Symposium, June 9-14, 2008, Palm Springs, CA.

Scott Ferraro traveled to the beaches of Peru (mid winter) to meet up with his mates and hit the surf rolling across the Pacific from his homeland in Australia. A lull in the ocean swell gave him a good reason to see some of the other highlights in Peru, including the fabled Inca City of Machu Picchu.



Lobitos – Northern Peru

The Sperling Family traveled to the Middle East, visiting Israel, Egypt and Jordan en-route. Visiting many ancient temples along the Nile, the tombs in the Valley of the Kings, the Pyramids at Giza and the canyon City of Petra and 50 degree temperatures in Aswan was truly an experience of a life time. Being in Israel during the war with Hezbolah, experiencing helicopter gun ships and fighter jets flying by the hotel, and seeing Katusha rocket craters and burned out areas in Northern Israel after the war ended was also an experience that made us realize how truly lucky we are in Canada not to have hostilities right on our door step.



The Sperling Family in Egypt

You are Invited to
The 7th Annual Indian
Arm Burner



September 22nd 2007

Details:

- 10 km kayak ride from Deep Cove.
- Kayaks can be rented from Deep Cove Kayak Centre (604) 929-2268.
- Pick up Kayaks before 10:30 am.
- BYO Lunch on Racoon Island.
- Salmon Barbeque will commence around 4:00 pm at Eagles Nest.
- Barge will ferry participants to Deep Cove around 8:00pm.
- Kayak Rentals are \$60 single \$86 double not including tax for the day.

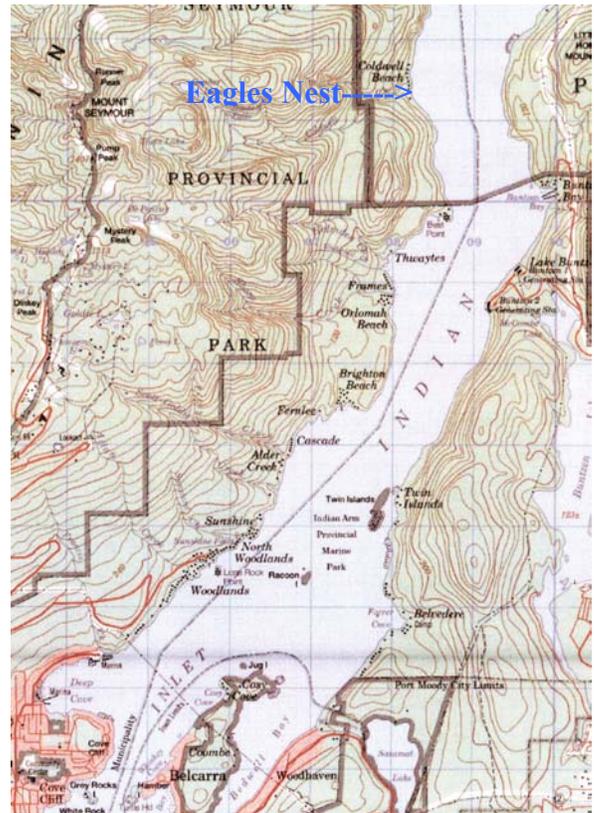
Donations:

One half of funds raised will be shared with Sea-to-Sky Environmental Camp at Keats Island. The balance will be used to sponsor a child in a less fortunate part of the world through World Vision. The Sperling family already sponsors Diego in Chile and Isra in Palestine. At SHA we believe in these causes and to celebrate another successful year we will match all donations made. I hope that all of you can join us!!!

Minimum Donation
\$35-\$50/participant

For the Saner Half:

- If you, your spouse or friend are not into paddling, come for the barbeque.
- Champion Barge will depart from Deep Cove Govt. Dock at 1:00.



Registration Form:

Name: _____
 Phone # _____
 Fax # _____
 E-mail _____

Number Paddling: _____
 Number Coming Later _____
 Number for the Sunday bike ride _____

Fax to: (604) 986-7734

Email: apataky@sperlinghansen.com