T. Buck Suzuki Environmental Foundation
SETAC Submission Summary

Introduction

The T. Buck Suzuki Environmental Foundation (TBSEF) has worked to protect and enhance fish habitat, prevent pollution from entering fish bearing waters and work toward sustainable fisheries for the last 25 years. One of the goals for TBSEF's pollution prevention program is to attain advanced sewage treatment in all of British Columbia. This is a long-term goal that will reduce harm to fish stocks by reducing the volume of harmful substances entering our freshwater and marine waterways.

Sewage pollution is the largest input of harmful substances into the Georgia Basin marine ecosystem. Both Greater Victoria and Greater Vancouver remain the two largest sources of raw or minimally treated sewage on the BC coast; Victoria is the worst raw sewage polluter in Canada[1]. Every day, Victoria dumps 129 million litres of raw sewage containing pathogens, persistent organic pollutants including PCB[2]s and PBDEs, heavy metals, and pharmaceuticals into the Strait of Juan de Fuca.

We believe that the following information will be useful in answering many of the questions that have been posed regarding Victoria's raw sewage discharge.

Hartland Leachate Impacts

It is well known that the Hartland landfill leachate contaminated Heal lake, Heal, Durrance and Tod creeks, and Tod inlet before it was contained in 1990 and plumbed into the Capital Regional District's (CRD) sanitary sewage system[3]. The leachate killed most of the aquatic organisms in these systems before being contained; the systems have not fully recovery, 16 years later.

A 1991 report[4] shows that consultants were directed by the CRD staff to look at an administrative solution, the creation of a sewer use bylaw, rather than a treatment solution to dealing with the Hartland leachate. Of note, this report identifies the problems if the leachate were to be discharged directly to the

[1] The National Sewage Report Card, Sierra Legal Defence Fund, September 2004, p.2.
[2] Priority Substances of Interest in Georgia Basin – Profiles and Background Information on Current Toxic Issues, C. Garrett, Environment Canada, August 2004, p. 135
[3] CRD Tod Creek/ Prospect Lake Rehabilitation Study, UMA Engineers, November 1992, p. 1.
[4] Hartland Landfill Leachate Treatability Study, Gartner Lee, February 1991 p. 1.

marine environment - the difficulty in getting a permit for such a discharge, and the preferred treatment option - a municipal secondary treatment plant[5].

The Hartland leachate that is contained and pumped through a pipe into the CRD sewer system is probably the largest point source pollution in the region. The CRD sewer use bylaw allows this discharge and the regional source control bylaw was built on the sewer use bylaw. As a result it should be no surprise that the Hartland leachate meets the requirements of the CRD's source control program.

This chart compares removal rates at the CRD's core area discharge plants against the discharge from a secondary sewage treatment plant in the GVRD's:

COMPOUND	Annacis (Secondary) % Removal[6]	Clover & Macaulay % Removal
Phthalates: Bis-(2ethylexyl)	**84**	**0**
nonylphenols	**86**	**0**
PCBs	**99**	**0**
PAHs : (LPAHS)	**99.9**	**0**
(HPAHS)	**99**	**0**
Copper	**93.5**	**0**
Chlorobenzenes	**87**	**0**
Average percent removal	**92.6**	**0**

[5] Ibit p. 43.

[6] Bertold, S. and Stock, P., 1999. GVRD Municipal Wastewater Treatment Plant 1997 Monitoring Program: Wastewater Chemistry – Data evaluation. Final Report. Greater Vancouver Regional District, 4330 Kingsway, Burnaby BC.

Endocrine Disrupting Compounds

All modern municipal wastewater contains endocrine disrupting compounds (EDCs). It is widely believed that EDCs are irreversibly impacting life on this planet, including humans[7], and that sewage treatment technologies exist to remove a substantial portion of EDCs from the waste stream before the wastewater is freely discharged into the environment[8]. Source control is not a viable alternative to sewage treatment in the removal of EDCs[9].

A Royal Society report[10] identifies the importance of the precautionary approach when dealing with endocrine disruptors and the need for strong regulations to encompass this approach. The Canadian Fisheries Act attempts to emcompass the precautionary approach for fish protection by prohibiting "the deposit of a deleterious substance of any type in water frequented by fish[11]". However, it is more than just fish that are protected by this section of the Act. Although the Terms of Reference (TOR)of your review do not include legal issues, we believe it is important not to overlook the precautionary approach built into these regulations. It is our opinion the CRD's raw sewage discharge is in contravention of the Fisheries Act.

Health Impacts

Direct human health impacts from the CRD's raw sewage discharge are thought to be minimal in part because modeling shows local ocean stratification to hold the raw sewage plume 20 to 30 metres below the surface. However, as noted by Wilson in 2002[12], the sewage plume reaches the surface in the eight winter months of the year, grease and oil reach the surface most days, seabirds feed on the globules, wind and kite surfers frequent these waters and a vast area of Victoria Bight is subjected to fecal coliform contamination. The murrelet, a species listed endangered in the region, has been listed among the seabirds found feeding over the outfall[13].

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[7] The Prague Declaration on Endocrine Disruption, 2005, Eden Endocrine Disruption Research, http://www.edenresearch.info/declaration.html

[8] Technical Brief: Endocrine Disrupting Compounds and Implications for Wastewater Treatment 2005, Water Environment Research Foundation

[9] Brief to the Canadian Minister of Environment, 2002 Environment Canada

[10] Endocrine disrupting chemicals (EDCs), 2000, The Royal Society

[11] Fisheries Act, Section 36 (3)

[12] A Comparative Review of the CRD's Environmental Monitoring Programs for the Clover Point and Macaulay Point Wastewater Outfalls, Prepared by 2WE Associates Consulting Ltd. For Environment Canada, Pacific and Yukon Region, January 2002 (revised),

[13] Brief to the Canadian Minister of Environment, 2002, Environment Canada

Of further concern, recent CRD reports[14] reveal that fecal coliform counts greater than 200 CFU/100 ml, sometimes used as the criteria for the plume reaching the surface[15], occur during summer months. For instance, the CRD fecal coliform data for ***one day*** in June 2002 at Macaulay Point reach 1500 CFU/100ml, 13 sample points in ***one day*** exceed 200 CFU/100ml, clearly indicating that a vast area of Victoria Bight can be contaminated during a summer day[16]. The Clover Point and Macaulay Point outfalls flank east and west sides of the entrance to Victoria harbour; mariners, many in open top vessels, entering or leaving the harbour are unable to avoid transiting a marine area that has fecal coliform contamination both summer and winter.

Harmful Algae Blooms

The T. Buck Suzuki Environmental Foundation recognizes that we have much to learn about harmful algae blooms (HABs) and the transportation of pollutants that cause them. A 2003 United Nation's report listed the nearly 150 ocean dead zones as a top emerging ecological challenge, one that will shortly replace overfishing as the largest threat to world fish stocks. Some dead zones cover over 70,000 square kilometers of ocean; oxygen depleting harmful algae blooms (HABs) are believed to be the causes[17].

As HABs are become more common around our planet, the area covered by ocean dead zones doubles every decade; nitrogen loading from agriculture runoff and human sewage provide the key sources of nutrients feeding HABs[18]. HABs can render shellfish toxic to humans, deplete dissolved oxygen content in marine waters, and can lead to lethal and sub-lethal impacts on fish. Strong currents and high oxygen content are thought to prevent HABs in Juan de Fuca Strait directly off Victoria's raw sewage outfalls.

In 1991 a HAB closed the harvest of shellfish along the outer coast of Washington state. Research into this HAB has pointed to the Juan de Fuca eddy, located at the entrance to Juan de Fuca Strait, as the HAB starting point[19]. Since the Juan de Fuca HAB's discovery its strength and frequency has increased; in

[14] Macaulay & Clover Point Wastewater & Marine Environment Program Annual Report, 2002, 2003, 2004, Capital Regional District, Victoria BC
[15] Qualitative Risk Assessment of Marine-Based Public Activities in the Vicinity of Macaulay Point and Clover Point Wastewater Outfalls CRD BC, 2002, Golder Associates, pg 21
[16] Macaulay & Clover Point Wastewater & Marine Environment Program Annual Report 2002, CRD, Appendix E, page 1
[17] Sea 'dead zones' threaten fish, March 29, 2004, Alex Kirby BBC News
[18] Swimming in Sewage, 2004, Natural Resource Defence Council, page vii
[19] Transport of surface waters from the Juan de Fuca eddy region to the Washington coast, B. Hickey, 2005

late summer 2004 the HAB stretched top to bottom across the entrance of Juan de Fuca Strait[20]. There is no record of this HAB prior to 1991[21].

The cause of the Juan de Fuca HAB is still under investigation; one of two suggested causes is nutrient loading exiting from Juan de Fuca Strait[22]. Loading from Victoria's sewage is into Juan de Fuca Strait and exceeds the combined loading from all 13 BC Kraft pulp mills[23]. Reports discussing Canadian loadings to the Georgia–Fuca Basin and the North Pacific, identifying Victoria's raw sewage discharge as an important source[24].

Pharmaceuticals

In the last 10 years scientists have awakened to the threat that pharmaceuticals in our waste stream pose on our ecosystems. Most pharmaceuticals are metabolized incompletely by patients and enter the municipal sewage with the patients' excretions. Source control can be effective in preventing unused pharmaceuticals from entering wastewater, however source control cannot remove excreted pharmaceuticals from wastewater. As a result, the CRD's open sewage system sends pharmaceuticals freely into the marine ecosystem.

Pharmaceuticals found in municipal sewers including painkillers, cholesterol control medication, antibacterial agents, musks, X-ray contrast media, cancer treatment drugs, anti-seizure medication, nonsteroidal anti-inflammatory drugs and anti-depressant drugs[25]. Some pharmaceuticals such as anti-tumour agents are carcinogenic, mutagenic, teratogenic and fetotoxic.

The ability of sewage treatment systems to remove pharmaceuticals is low, but not insignificant. Studies to date have looked at pharmaceutical impacts from discharge after a sewage treatment system,[26] not from an open system. Impacts from an open system likely will be greater. The consequences of CRD's

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[20] Algae bloom is 10 times larger than normal, Rachel Goldworthy, Peninsula News, A. Pena, Institute of Ocean Sciences, Oct 6, 2004.

[21] The Big Eddy- Proceedings of the Western Juan de Fuca Ecosystem Symposium, Canadian Parks and Wilderness Society, Vera Trainer, NOAA, May 2004, p. 24.

[22] Ibit, page 85

[23] Frequently Asked Questions, 2005, Victoria Sewage Alliance

[24] Macdonald et al, "A review of marine environmental contaminant issues in the North Pacific: The dangers and how to identify them", 2003, Environ. Rev. Vol 11, 2003 pp. 103-138. Paul West et al, "Canada Loadings and Discharges to the Strait of Georgia and Juan de Fuca: Current Loading and Sediment Record", 1994, Air & Waste Management Association Pacific International Section, Victoria BC.

[25] Rakesh Kanda et al, Pharmaceuticals and Personal Care Products in Sewage treatment Works, *Journal of Environmental Monitoring*, 2003, 5(5), 823 - 830

[26] Pharmaceutical Abstracts Risk to Ecosystem, Removal with Water & Sewage Treatment

pharmaceutical discharge are unknown, in the face of the mounting concern, we cannot assume that this discharge is harmless.

Sediment Contamination

The average depth of our oceans is 4,000 meters, the average depth at the thermocline, the surface skin of the oceans inside which most marine life resides, is 300 meters. The CRD's discharges are at approximately 65 meters, certainly inside the top third of the ocean's surface skin. When ocean sediment in this range becomes contaminated, the contamination is easily transported up the marine food web. Liver lesions in over 70% of English sole and rock fish samples from around the Macaulay Point outfall[27] indicate that pollutants are rising up the benthic food web.

The 2005 Salter analysis[28] and 2003 Markovic study[29] both raise concerns regarding sediment contamination around the CRD outfalls. The Salter analysis shows that 19 out of 30 compounds tested exceed the British Columbia contaminated site guidelines. The Markovic study shows that heavy metals from the CRD's raw sewage discharge do collect at levels of concern in areas around Victoria bight, not just in the areas sampled by the CRD.

Sediment contamination should not be surprising; the CRD's own data shows the discharge of millions of kilograms of minerals and heavy metals per year in to Victoria Bight, a discharge that has been going on for decades.

Conclusion

We recognize that it is water that makes this planet special, that the global water cycle is closed, and that polluted water when discharged freely into the environment returns to us, polluted. As stewards of this planet, we must protect water for future generations and for other species; dilution is not an acceptable management solution. The only acceptable solution is to treat sewage as best as possible using best available resource recovery technologies.

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250-360-1398

[27] Capital Regional District Environmental Impacts Around Macaulay and Clover Point sewage Outfalls, Alan Colodey and Alain David, Environment Canada, Feb 1992, p. 2.

[28] Clover and Macaulay Point outfalls – contaminated sites?, Stephen Salter, Victoria Sewage Alliance, November, 2005.

[29] Dusan Markovic, Untreated Municipal Sewage Discharge in Victoria Bight, British Columbia: An Investigation of Sediment Metal Contamination and Implications for Sustainable Development, Masters Thesis, Royal Roads University, April, 2003