PUBLIC FORUM TRANSCRIPT

VICTORIA SEWAGE: SEPARATING MYTH FROM FACT

SEPTEMBER 26, 2005

VICTORIA, BRITISH COLUMBIA

The Victoria Sewage Alliance organized this forum to inform and engage the public on the region's lack of sewage treatment. The debate has been going on for over thirty-five years. Victoria's regional government consistently argues that science backs up the raw sewage discharge; this forum and the transcript below shows otherwise.

Any praise for the forum must go to the speakers who volunteered their time and thoughts. Any faults must be attributed to the organizing committee consisting of Christianne Wilhelmson, Georgia Strait Alliance; Jim McIsaac, T. Buck Suzuki Environmental Foundation; and, Colin Graham, Victoria Labour Council.

A special thanks goes out to all the speakers that provided their thoughts, and to the organizations that provided them support, Environment Canada, the British Columbia Ministry of Environment, University of Victoria, Royal Roads University and Sierra Legal Defence Fund.

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SYNPOSIS

On Monday, September 26, 2005, over 200 people came together at Camosun College in Victoria to hear new and innovative perspectives on the issue of sewage treatment for Victoria. Scientists, engineers, regulators and politicians presented their views on everything from the crux of the problem to new opportunities for solutions. They also discussed the laws and regulations that govern sewage treatment in the Capital Regional District. Much of the information presented was new, or had simply not been given the airtime it had deserved. This was a unique, and long overdue forum, which provided new sources of information for the public and allowed a new dialogue to begin.

Though many of the discussions around sewage effluent now focus on toxic contamination, Dr. Edward Ishiguru, a microbiologist from the University of Victoria, turned his attention to the organic matter in sewage, and how that should be of greater concern, and a primary reason for Victoria to treat its sewage. Dr. Ishiguru revealed the limits around the ocean's natural ability to deal with our sewage, the traditional defense for no treatment. Notably that well oxygenated water does not break down organic matter (it's organisms such as bacteria that do that); that we are not necessarily doing a good thing by adding nutrients to the ocean (if there are not enough organisms decomposing our sewage, we could be creating dead zones); and even if there were enough composters, the cold temperatures in the water compromise the rate at which they can work. There is no such thing as clean sewage, and there is no data showing the sewage is being effectively decomposed. It's got to be accumulating somewhere, so let's not take a chance

John Werring of the Sierra Legal Defence Fund has been researching the issue of sewage treatment for many years, and revealed some of the flaws in the CRD's current monitoring system. He also used the CRD's own studies to show the dramatic negative impact on species diversity around the outfalls. In 1970, the area around the outfalls included a wide diversity of species, including scallops, clams, prawns, snails, sole and cod. By 1998, many species had disappeared and the seabed was now dominated by worms that were an indicator of high organic loading and low oxygen seabed environment. Mr. Werring went on to reveal that there are some fundamental flaws in the CRD's monitoring system. Specifically, it currently is not testing for some chemicals at a level sensitive enough to detect them and they are comparing the outfall sites to another site, which is not pristine. In his words, the status quo is not acceptable.

At the federal level, there are many laws and regulations, and new initiatives, which are affecting how the Capital Regional District deals with its sewage and how it is effecting the environment. Phil Wong of Environment Canada revealed that the federal government, through a Canadian Council of Ministers of the Environment (CCME) process, is developing national standards that will create one set of standards to be applied fairly, consistently and predictably across the country. Mr. Wong also spoke about the shellfish closures off Victoria, and how this 60 square kilometer area was increased from 42 square kilometers because of plume dispersion and the CRDs own water quality data indicating that, at times, direct harvesting standards were exceeded. Finally, he addressed the growing concerns of endocrine disrupting compounds and the research being done to investigate the impacts of exposure to these chemicals. Of interest, he noted that secondary sewage treatment removes over 90% of many of the most common endocrine disrupting chemicals.

Gathering independent data on the impacts that Victoria's sewage is having on the environment is difficult, yet very much needed. In 2003, Dusan Markovic completed his Master of Science degree,

studying sediment metal contamination in Victoria Bight, and also discussing the area where science and policy meet. Mr. Markovic revealed in his talk the level of sediment contamination in Victoria Bight, to what extent this contamination can be linked to sewage, and evaluated the policies behind Victoria's Liquid Waste Management Plan. Notably, Mr. Markovic highlighted flaws in the CRDs monitoring plan, including the use of a species of mussel that is able to thrive in toxic environments as a measurement of the environment's health; how the CRD is re-defining the term 'contaminated' in order to present the environment as healthy; and is using Sediment Quality Guidelines initially developed for Puget Sound, a dead end fjord, a very different environment from Victoria Bight.

Mr. Randy Alexander, from BC's Ministry of Environment started his talk with a few take home messages: the more people involved in public policy the better, for everyone; scientists disagree, and the discussion that comes from these disagreements are good; and, that the complex questions around public policy and sewage treatment need to be discussed in public forums so that the CRD can make good decisions. The rest of Mr. Alexander's talk focused on the regulations that the CRD must abide by with regard to its sewage, specifically the Environmental Management Act and the Ministry approved Liquid Waste Management Act. Mr. Alexander revealed the road the CRD took to having its Liquid Waste Management Plan approved, and the conditions that were set down when the Plan was approved in 2003

Mr. Stephen Salter provided the audience with a whole new way to look at sewage; not as waste, but as an opportunity. But first, he reminded us that there are laws on the books that apply to polluters across the country, both municipal and industrial, yet these laws are not applied fairly. Essentially these laws are good laws, but somehow – for reasons that remain unclear – they don't apply to Victoria sewage. Rather, the CRD has the ability to create its own laws to define what is pollution; who lets local governments set policy that effects all our water? The remainder of Mr. Salter's talk focused on what sewage treatment can look like in Victoria – it can be small, clean, relatively inexpensive and can provide resources, such as biogas, that can fuel buses or other vehicles. These ideas are not fantasy, but exist today in countries such as Sweden and Australia. Options don't have to include the traditional large plants, but rather anaerobic facilities that provide resource recovery in addition to effective sewage treatment. Mr. Salter also confirmed that the $400 million dollar price tag for a treatment plant being put forth is over inflated. Rather, based on the costs to build other similar plants, it would be closer to $180 million.

Denise Savoie, Chair of the CRD Roundtable on the Environment ended the night's program by re-emphasizing the need to look forward on the issue of sewage treatment, with resource recovery being a great opportunity to find a solution that fits Victoria. Innovative solutions need to be found, because long delays have limited Victoria's options for building a plant. But this is not a reason not to treat sewage, not with the growing threat of chemicals and pharmaceuticals being dumped into the water. The possibilities of smaller community plants that offer up to tertiary, similar to the innovative Dockside project, are available. Pressure needs to come to bear on the CRD, especially as the independent scientific study unfolds, as now is the time for innovation.

DR. EDWARD E. ISHIGURU

Dr. E. Ishiguro
Professor Microbiology
University of Victoria

INTRODUCTION

Dr. Ishiguro, Professor of the Microbiology Department at the University of Victoria. He obtained his PhD from the University of Illinois, back in 1971 and has been extremely active in the field of microbiology and biochemistry ever since. He has been a faculty member here in Victoria since 1977. A professor since 1987 and was the chair of the department for decades, between 1995 until recently. His main research interest is in molecular microbiology and he has been funded by the National Science and Engineering Research Council of Canada, for about 30 years. He has had over 75 peer reviewed publications. He served on the editorial board of the Journal of Bacteriology and the Canadian Journal of Microbiology. He served on the grant review committees for the National Science and Engineering Research Council of Canada, the National Institutes of Health of the United States, US Department of Energy, and the Michael Smith Foundation of Health Research. He is very dedicated and a well loved teacher. He teaches over 500 students each year. He has been teaching courses on sewage treatment for over 15 years. Tonight we welcome him and thank him for discussing the topic, "Victoria Bight: Mother Nature's Sewage Treatment Plant?"

VICTORIA BIGHT: MOTHER NATURE'S SEWAGE TREATMENT PLANT?

[slide 1] This is a slightly revised version of a talk presented at a public forum entitled "Victoria's Sewage: Separating Fact From Fiction" on September 26, 2005. This forum was organized by The Victoria Sewage Alliance. By way of introduction, I am a microbiologist by training and a teacher by occupation, and this presentation reflects my dual backgrounds as a microbiologist and an educator. I have lived in Victoria for over 28 years and have been involved in the local sewage issue for about that long. This issue has had press coverage of all sorts, and I have maintained a file on the subject dating back to the 1980's.

[slide 2] This is a random sampling of some material from this file. My intention here is to present my perspective on the local sewage treatment issue which I believe is unique and has not appeared in press before.

I have three objectives. [slide3] First, I am going to tell you what conventional sewage treatment is all about: what the objectives of treating sewage are and how these objectives are accomplished. I will discuss this at the very basic level so that you all can understand me, and I apologize in advance to those of you who are professional sewage treatment people for covering this topic in such an oversimplified fashion. Second, I will tell you about what we know for sure about the Victoria sewage disposal system, and, more importantly, what we do not know about the system. The uniqueness of my perspective is the emphasis on the unknown. There is simply too much we do not know about our way of sewage disposal. And finally I will tell you why I think we should treat our sewage. For me, this is not a question. This is not a matter for debate. We should treat our sewage, and I will tell you why I think so.

I believe everyone knows how we dispose of our sewage in Victoria. [slide 4] We rely on, as this excerpt from a Times-Colonist article states it, "a strong body of evidence that says the flushing action of a strong cold current does naturally what a treatment plant would do". Bear in mind the word "cold" because I will return to this point later.

[slide 5] Of course, we don't just pump 100 million liters of raw sewage straight through the outfall on a daily basis. We actually screen it first, and apparently this is thought to be accomplishing quite a lot. I think it is important for everyone to know exactly how much screening actually accomplishes. Let me begin by telling you what sewage is to put this in proper perspective.

[slide 6] Sewage is not just the stuff we flush down the toilet. Sewage is composed of all the material that flows through every drain in your household, like your laundry water, your dish water, your bath water, the water you wash your hands with, etc. Sewage is therefore rich in organic matter, and most this matter is not visible, or is very difficult to see. In other words, sewage is composed of high levels of soluble, organic material, such as soap and detergent, as well as small particles, for example, bits of food and grease from your dishes and cookware, and soil from your dirty laundry. It is of utmost importance for you to understand that there is a lot more in your sewage than you can actually visibly see because there seems to be a misconception about how effective the screening procedure we use is. I am going to be very generous here by saying that the screening procedure removes about 30% of the organic matter in your sewage. [Note that shortly after delivering this talk, I was informed by an engineer that the 6 mm screens employed by the CRD remove far less than the 30% I quoted here. In reality, what is removed is closer to about one truckload of material per week, and synthetic materials such as condoms and tampons account for much of this]. So, one lesson I would like you to take home with you is that there is a vast amount of organic matter in our 100 million litre-daily output of sewage, and most of this material actually passes through the CRD screens and is flushed directly through our sewage outfalls. It is easy to underestimate the amount of organic matter we release through our sewage, considering that most of it is not immediately visible, being in either a soluble or small particulate form. After all, we naturally tend to worry less about things we cannot see.

Finally, a great deal of attention has been paid to "poisonous chemicals" in our sewage, solvents, pesticides, heavy metals, and the like. This concern is illustrated by the excerpt shown at the bottom of this slide that I recently clipped from the Time-Colonist. Many people think that we can solve our sewage problems if we eliminate these poisons from our sewage. Indeed, I am impressed by the progress the CRD has made in the area of source control to prevent such materials from entering our sewage system. I am therefore not going to concern myself here with poisons in our sewage. I will instead focus on the every day bulk organic matter that is characteristically found in anyone's sewage. In this regard, do not get me wrong: I am not downplaying the importance of keeping our sewage poison-free. This is my way of telling you that we should be equally concerned about the huge amount of organic matter that we release through our sewage outfalls every day. This material has so far been largely ignored in the longstanding debate on Victoria sewage, and I believe it is time to expose it. This is material that obviously cannot be source-controlled.

[slide 7] There are two objectives in conventional sewage treatment. One is to eliminate any fecal-borne microbial pathogens, i.e., disease causing bacteria, viruses, or fungi, that may just happen to be in sewage. How would such microbes enter sewage? Most of these microorganisms are agents that cause gastro-intestinal tract infections. Such microbes usually grow in the intestinal tract of infected individuals and are thus voided in their feces, often in very high numbers. One of the main objectives of conventional sewage treatment is to kill such organisms before they can be spread to

other people. We don't disinfect our sewage in Victoria. And to my knowledge, there have been no disease outbreaks attributed to this so far. I have heard that pathogens do not survive in our cold water, and we therefore do not have to worry about disinfecting our sewage. Speaking as a professional microbiologist, I'm not sure if this statement is really true, and I am unaware of comprehensive scientifically sound studies that support it. Thus, it is possible that we have simply dodged a bullet so far.

The second objective of conventional sewage treatment is to decompose all of the organic matter in sewage to simpler chemicals, i.e., sewage treatment is intended to be a composting system. It is essential for you to understand that the breakdown of organic matter in any composting system, and this includes secondary sewage treatment, is carried out by the metabolic activities of a complex community of microorganisms. The breakdown of organic matter during composting is certainly not a spontaneous chemical reaction.

[slide 8] This illustration covers the general plan for a conventional sewage treatment process. What I want you to get from this is the difference between primary and secondary treatment. Primary treatment is a mechanical process to remove particulate matter from raw sewage. This is accomplished in two stages. A screening process followed by a sedimentation step removes most of the solids, which we call sludge. It should be apparent that we do not even practice conventional primary treatment in Victoria. Secondary treatment is also a multi-stage process. The organic matter in raw sludge is digested by a unique group of microbes that live in the complete absence of oxygen (that is what "anoxic" means). I believe there are misconceptions about sludge. There is a big difference between raw sludge, i.e., directly from primary treatment, and digested sludge from secondary treatment. Most of the organic matter in sludge is broken down during secondary treatment. While problems such as heavy metal content in sludge are not solved by secondary treatment, it is true that the organic content of treated sludge is substantially reduced in comparison to raw sludge. How sludge, raw or treated, is disposed of has always been a matter of controversy. Nobody seems to want it in their back yard. In this regard, I find it puzzling, and even humorous, that, in Victoria, many who say they do not want the sludge in their backyard, for whatever reason, see nothing wrong about having it poured raw into Victoria Bight every day. I don't know about you, but Victoria Bight is certainly backyard enough for me. Getting back to the secondary sewage treatment process, a second stage involves the digestion of soluble and small particulate organic matter present in the liquid portion of primary-treated sewage. This process, labeled "oxidation" in my illustration, is carried out by numerous types of aerobic microorganisms, i.e., those whose metabolic activities are dependent on the presence of oxygen. At the end of this process, the liquid which is substantially free of organic matter is disinfected before being disposed of. In summary, well over 95% of the organic matter originally present in raw sewage is decomposed in an effective secondary sewage treatment plant.

[slide 9] So, there are two main objectives in treating sewage, eliminating pathogens and composting. At this point, it is essential for you to see that secondary sewage treatment is the minimum requirement for achieving these objectives. I am now ready to address the claim is that the Victoria treatment system is as good as any conventional secondary sewage treatment.

[slide 10] This slide shows an excerpt from a letter published recently in the Victoria Times-Colonist. Incidentally, for my purposes, it doesn't matter who wrote this or said that, and I have consequently blacked out all references to specific individuals in my illustrations. I have highlighted three points in this letter that I would like to comment on. The first point is, "In order to

decompose, all substances require exposure to oxygen". This not entirely true. I have already pointed out to you that, in secondary treatment, the digestion of solid organic matter (sludge) occurs in the absence of oxygen. In point 2, this writer goes on to say that the waters off the sewage outfalls have an inexhaustible supply of oxygen. I will be convinced of this claim when I see the actual measurements of oxygen concentration. But more to the point, as I read further, the writer gives me the impression that oxygen directly causes the decomposition of organic matter. I have already noted that the composting action in secondary sewage treatment is due to the metabolic activities of numerous microbes, and I will not dwell on this issue further. Finally, point 3 is one that I really take exception to where the claim is made that the "effectiveness of this process has been constantly monitored by highly qualified scientists for the past 20 to 30 years."

[slide 11] This slide summarizes what I believe we know about Victoria sewage. More importantly, let me highlight what we do not know. As I have noted several times already, we undeniably release enormous amounts of organic matter into Victoria Bight daily. Contrary to numerous claims, there are no data that directly demonstrate the quick and effective decomposition of this matter. In fact, there are no methods for obtaining such data. We therefore have no means to directly measure the fate of the organic matter that we release through our outfalls because the material is rapidly diluted into a large body of water, making it impossible to track. This situation is consequently very different from a land-based secondary sewage treatment plant where the organic matter is confined in storage tanks, making it possible to directly follow the composting process as a function of time. Therefore, no matter what the claims may be, I maintain that no one knows where our sewage goes and what happens to it. No one, for example, can tell me what happened to the material we released last Thursday. Most of the available so-called scientific data that have been referred to on numerous occasions are indirect indicators at very best. For instance, environmental impact studies, including the recent CRD "trigger" monitoring project, are apparently designed to detect detrimental effects of sewage pollution on marine life. I have two problems with such approaches. First, how do you know where to look for damage in the first place when we do not know where our sewage is going and what is happening to it? Second, such studies look for an aftermath, and history has taught us many times over that ecological disasters are difficult, and, most often, impossible to reverse. Do not misunderstand me. I am not predicting that we are headed for an ecological disaster because I do not know the fate our sewage. No one has such knowledge, and the claim that the ocean treats our sewage is certainly unfounded. In view of the uncertainties I raise here, I ask, should we continue to take our chances on our environment by maintaining our current practice of pumping raw sewage into it?

[slide 12] This is an excerpt from another article published in the Victoria Times-Colonist. The article quotes an individual, an expert in the field, who maintains that Victoria's sewage is relatively clean because we prevent the release of toxic substances into our sewage through enforced source-control measures. Perhaps I should have used this illustration earlier when I discussed source controlling of toxic materials. Nevertheless, this individual says, "We have sewage treatment. It's just not at the end of the pipe - it's at the beginning of the pipe." In my view, these are rather irresponsible statements coming from an expert, and it is no wonder there are many lay people who think there is absolutely nothing wrong with the way we dispose of our sewage. In my way of thinking, sewage is never clean. If it is clean, we should be able to bathe in it. This article goes on to state that not only is our sewage safe because it lacks toxic chemicals but it also contains "nutrients that can be absorbed by the ocean." It is true that the ocean is nutrient-poor, but I am not sure if that means we should fertilize it. We should also consider the fact that we are applying an enormous amount of fertilizer to the ocean on a nonstop basis. This leads to still more questions

we need answered: how much fertilizer do these waters need, and what is the maximum amount it can take? Incidentally, the use of organic matter as fertilizer requires that it be decomposed. This concept should not be new to any gardener who has used manure or other forms of organic matter as a fertilizer. Thus, using sewage to effectively fertilize our ocean will require recruiting the help of a large army of marine microbial composters.

Considering the things we do not know about our current sewage disposal practice, I propose here two very different possible outcomes. [Slide 13] According to the first scenario that I will present, our ocean-based sewage treatment system is not working, i.e., the organic matter in it is not being decomposed. At the top of this slide, I show a portion of a letter published in the Victoria Times-Colonist. It contains misconceptions that I suspect are widespread in the lay public. Starting with the last two statements in this excerpt, it is true that manure can be a nutrient, but as I have stated above, in order to turn it into fertilizer, it must be decomposed. This makes the first statement made by this writer very interesting. It is generally known that the waters off our coast are cold on a year-round basis. Although the existence of bacteria that grow at very cold temperatures in the ocean is well-documented, little is known about their metabolic activities. On the other hand, it is well established that metabolic reactions in all organisms are markedly influenced by temperature – the colder the temperature, the slower the rate of metabolism. Thus, it is likely that the metabolic rates of bacteria are going to be relatively slow at cold temperatures characteristic of our waters, even though such bacteria are adapted to grow at such low temperatures. These types of bacteria have not been studied in our waters, and we have no idea how prevalent they are in the Strait of Juan de Fuca. But even if they do exist here, it is possible that their metabolic activities are going to be too low to effectively decompose our sewage. By way of analogy, if you have a compost pile at home, you may have noticed that rate of composting decreases markedly during the cold days of winter. A more relevant analogy is the accumulation of organic matter from sewage released into the cold water of Halifax Harbor. If my first scenario is correct, we are not fertilizing the ocean with our sewage. The organic matter must instead be accumulating, with a large proportion likely headed into the ocean sediment. If so, identifying the site(s) of deposition will be a major priority.

[slide 14] My second possible scenario is quite different from the first. In this case, let us say the ocean is indeed an excellent sewage treatment system, as many have claimed. If so, it should be borne in mind that too much fertilizer may be a bad thing.

[slide 15] For instance, in some parts of the world, over-fertilizing has resulted in dead zones, areas of the ocean that are oxygen-deficient, and, consequently, lifeless. Dead zones arise when nutrients from sources such as farm fertilizer and sewage cause an explosion of microbial metabolism which results in the consumption of all of the available oxygen in the water. The depletion of oxygen, in turn, makes these areas of the ocean uninhabitable for other forms of marine life, for example, fish, that are dependent on oxygen. The World Health Organization, last year, reported the identification of 150 such dead zones around the world covering 27,000 square miles, and they now list this phenomenon as their top emerging ecological challenge. Of course, it is currently impossible to say whether we will eventually turn the Strait of Juan de Fuca into a dead zone because of the uncertainties that I have already raised: (i) we do not know where our sewage is going; (ii) we do not know what is happening to it; and (iii) we do not know how much fertilizer our waters will take. Maybe we are in danger, or maybe we are not. Still one more uncertainty to deal with.

My final objective is tell you why I think we should begin to treat our sewage immediately. [slide 16] A United Nations study published in 2000 estimated that about 2.4 billion people in the world lacked access to basic sanitation that includes sewage treatment. As a result, one of the priorities of

the UN Millennium Project, released that year, was to cut this number in half by 2015. It is notable that the 2.4 billion people targeted in this Project are all in the third world, and it is assumed that the basic sanitation practices referred to by the UN are hallmarks of industrialized countries like ours. If you are not convinced that we should be treating our sewage simply because it is the civilized thing to do, let me return to the uncertainties that surround our current practice. (i) We do not know where our sewage is going; (ii) we do not know what is happening to it; and (iii) we do not know how much fertilizer our waters will take. Sadly, the recently organized $600,000 CRD Ph.D.-loaded blue ribbon commission will not provide the answers to these questions. If you are among those opposed to sewage treatment after this discussion, consider yourself a gambler. You are a participant in an ecological experiment using the waters of the Juan de Fuca Strait as your laboratory. You may win, and, then again, you may lose. Many oppose sewage treatment primarily, as I understand it, because of the cost of building and maintaining a treatment plant. If you are among this number, here's a thought for you. If you lose the gamble, what will the real cost be? Notice that in order to satisfy the uncertainties I have raised, you still have to run the experiment. I, for one, am not willing to continue the experiment currently in progress, especially when what is at stake is the environment. Anyway, my time is up. Thank you.

JOHN WERRING, RPBIO

INTRODUCTION

John is a Registered Professional Biologist, specializing in land development issues. Currently with Sierra Legal Defence Fund since 1992. He assists their legal staff by providing input on cases. He is well known in British Columbia. He assists many grassroots organizations in their various dealings to government and industry to help them deal with land development. He has had some major successes: gravel mining operation over in the Lower Mainland, river logging that would have endangered …….. Also coauthored many of the legal reports that Sierra Legal is famous for, including Stumpage Sellout: Going Downhill Fast, and of course most important for us is the Sewage Report Card. In the most recent Sewage Report Card, Victoria was expelled from School. That was John's work. He was the school principal I guess. John is currently active in aquaculture issues and in the discharge of raw sewage and is interested in persistent organic pollutants. John's talk, "Victoria's Sewage: The Story You Haven't Heard."

VICTORIA'S SEWAGE: THE STORY YOU HAVEN'T HEARD

For years, the Capital Regional District has vigorously campaigned against the upgrading of its two largest sewage treatment plants at Clover Point and Macaulay Point on the basis that the current method of discharging raw sewage to the marine environment is a benign, environmentally safe practice.

Well, I'll skip the introduction because you've already heard it. What I'll talk about today are what the CRD's environmental studies, new independent studies, and the passing of time, can tell us. Why we should be concerned, and what do we want the CRD to do.

These outfalls have been monitored since 1970, before the outfalls were even there, and at the time when the government did the outfall, they checked the bottom where the discharge was going to occur, and they found the sea bottom around Macaulay was primarily sandy and mud, and around Clover was really rocky.

The animals that they found there were scallops, clams, prawns, snails, crabs, hermit crabs, sole, cod...what you'd expect to see in a pristine environment.

By 1972, just two years after the discharge occurred, they began to notice that mollusks and hermit crabs were showing up in fewer numbers in the area around the end of Macaulay pipe. In their place were worms - worms that had never been there previously. One species *capitella capitata* is an indicator of high organic loading and a low oxygen seabed environment.

By 1976, the seabed community closest to the outfall was completely dominated by worms and all the other mollusks and bottom living organisms were found only in very poor numbers. Hermit crabs weren't found at all. By early 1998, the species had disappeared completely; the benthic environment was dominated by worms.

By 1991, new studies showed that high numbers of worms were beginning to appear up to 100 meters away from the outfall, and the mussels, crabs and clams at those sites began declining. Undersea photography showed that the seabed as far as five hundred meters from the Macaulay outfall was covered with decomposing sewage. So this is where a lot of this material is going; it's not being broken down. And the idea that this is really deep, fast-flowing water that's going to wash all this stuff away seems rather absurd because if the water was that good at agitating the bottom and removing this stuff then you wouldn't have an ocean bottom at all. Things stuck to the bottom.

The researchers note that "Excess organic matter, from the outfall, is accumulating and decomposing as would be expected. If the organic load continues to increase then larger benthic invertebrates (e.g. sea anemones) will be lost and replaced with smaller organisms (e.g. worms)" And that is exactly what has happened.

Now a couple of other studies - ah, I just want to get out the idea that what's happening - This 500 meter of basically a round pile of crap sitting on the bottom of the ocean crawling with worms - if you want to put that into perspective, just consider Beacon Hill Park, it's about the same size, and probably just about as high as BC Place.

In 1998, Crone, a US researcher conducted a drift card study - he put little plywood cards off the Macaulay and Clover outfall pipes and let the tide carry them away and then try to recover them. What he showed was that 60 percent of the material of the cards that he captured stayed within the Victoria Bight. That's an awful strong number. Now, it doesn't say it is necessarily happening down at the bottom as these tidal currents are different, but this constant - this stuff is washed away and carried out to sea - is wrong.

And Dusan Markovic recently did a study that showed that the contamination from the CRD sewage extends over a much larger area, and the ocean bottom, basically virtually the entire Victoria Bight, shows signs of pollution if you look at some of the numbers. Forty square kilometers of water off the foreshore of Victoria is closed to all shellfish harvesting, and more often than not, surface fecal coliform counts are so high that you can't swim in it or recreate. The wind surfers or those who fish may take note

So, all this tells us that the seabed in the vicinity of the outflow has become polluted with sewage and that that pollution is growing and it's spreading. This is directly as a result of organic material. It does not wash away: it settles out and the finer the particle, the longer it takes to settle out. So,

even though you have tide carrying it away, it's eventually going to drop out. That's why we are seeing pollution as far away as Royal Roads.

Toxicity studies on the effluent that is being discharged from the Victoria sewage pipes shows a wealth of materials that kills all test organisms exposed to it within minutes. Now, the argument that the CRD is that within a hundred meters of the outfall pipes, the toxic elements in that water are diluted to a point where they are no longer toxic. That may be so if you were to examine direct toxicity. These tests are 96 hour intervals over 50 per cent deaths. Fish are exposed to sewage effluent for a period of 96 hours and if more than 50 per cent of them die then it's deemed "toxic. But what this test does not do is that it does not look at the long term effects on fish at lower concentrations - like whether it's affecting their reproductive capabilities or whether it's affecting their ability to feed and all those other things - what they call chronic effects.

We also know that this specific effluent contains very high levels of heavy metals, persistent organic chemicals: esters, pesticides, herbicides. It also contains some PCB's. One of the things that the CRD is saying is that the way to take a look at this effluent that's coming out, that they can't find a lot of these chemicals. That is a simple artifact of science. If you are looking for chemicals at a certain level, measured in micrograms per liter or milligrams per liter, and you set the level that you are looking at to a high enough level, when you sample the sewage you aren't going to find it. Many of these extremely toxic chemicals - pesticides, herbicides, the PAHs, and the PCBs - are found in very low concentrations on the order of nanograms per liters in some cases and micrograms per liter in other cases. The CRD most often is looking as the milligram per liter and so they are not finding these chemicals. They are just saying they are not there and that is not true

The other thing is that the CRD doesn't monitor the water column, so they have no idea just how contaminated the water column is around those outfalls. They are relying on speculation that this stuff is washed away dilute.

Now the independent tests that I've talked about - these are the tests that the CRD has been relying on to inform the people of Victoria - say that there is an impact related to these outfalls. They don't deny that, but they say that it is highly localized and it's in a very small area confined to the areas around the outfall pipes - a few hundred meters. There is a critical flaw in their science. When you undertake a test to determine whether a zone is impacted, what you want to do is find an area that has had no impact whatsoever, that represents a relatively pristine environment. That is called your control site. In the case of the studies that the CRD rely on and that show up on the peer- reviewed papers. Back in1991, 1992, and 1993 when they did this study, a company called Sea Consult actually did some studies with little floats with beacons that you throw in the water and you watch to see where they go and it gives you an idea of the water current patterns are.

What it shows is that the Victoria Bight is kind of like a big gyro that keeps going around in circles, and Parry Bay is the most likely site for settling the sewage for Macaulay Point. Parry Bay is the control site that the CRD uses to monitor their zones of impact. So they are comparing apples and oranges, as there is no way that you can actually look at the data that you gather at Parry Bay and say - well, you can say that Macaulay Point is more impacted than Parry Bay - but you can't take that as a reference and say that they aren't having a larger impact.

What this tells me is that the impact from these outfalls is not localized, is not just an area one hundred meters around the outfall, one two hundred, or three hundred. It's up to 12 or 13 kilometers away. Markovic's thesis throws some light on that.

So, the scientific evidence shows that the discharge of raw sewage from Clover and Macaulay is having an impact. The impact is actually growing, but we don't know any more on how great that impact is because the very basic elements of science have been compromised in this particular situation.

What do we want the CRD to do? We want them to begin to upgrade Clover and Macaulay to secondary sewage treatment as a minimum immediately. Not ten or thirteen years from now. They are beginning what I think is a somewhat absurd trigger to decide whether they will actually need sewage treatment. I've talked to some of the CRD officials about this. They are going to look at the sea bottom around the Macaulay Point outfall. It's a regularly watched environment (unintelligible), but there is a species of sea worm called the Pacific sea worm that has colonized that area. It's been determined to be one of the most pollution resistant organisms in the Pacific Ocean. So, what the CRD proposes to do is to monitor the health of the population of those worms for the next five, six, seven, eight years. If they see a decline in population, and if they can prove that the decline in the population is related to sewage treatment, then that will hit the trigger to say that they will have to treat the sewage. I think that is absolutely absurd.

So, how can you all help? By exposing the news that the status quo is not acceptable. Write your M.P., your M.L.A., the CRD and demand action. That's it.

PHIL WONG

Environment Canada

INTRODUCTION

Phil has been the Senior Program Engineer for the Environmental Protection Branch of Environment Canada since 1994. He provides expert technical advice to management, other federal departments and agencies, provincial and local governments, industry, and the public on municipal discharges including sewage, combined sewer overflows and solid waste management. Tonight he will discuss: Federal Municipal Wastewater Effluent Strategy, Shellfish Closure and Science of Endocrine Disrupting Compounds

FEDERAL STRATEGY, SHELLFISH CLOSURE AND NEW EDC SCIENCE

Good evening. The title of my presentation today is Municipal Wastewater Effluent: Issues and Approaches. The topics to be presented are the Federal municipal wastewater effluent strategy, the shellfish harvesting closure adjacent to the CRD, and endocrine disrupting compounds. While I am familiar with the information that I will be presenting tonight, the shellfish program and the EDC laboratory study that I will be outlining shortly is delivered by other program areas within Environment Canada. So given that I am not fully immersed, so to speak, in these issues I may not be able to answer all the questions you might have in this area.

For municipal wastewater effluents, there are a number of existing federal activities and instruments. With regard to legislation, there is an ammonia guideline, a notice for pollution prevention planning for chlorine and a national pollutant release inventory under the Canadian Environmental Protection Act. Under the Fisheries Act, subsection 36(3) prohibits the deposit of deleterious substance to waters frequented by fish.

With regard to infrastructure funding, the federal government has implemented over $4 billion in infrastructure programs and with this amount it has leveraged an addition $8 billion from other levels of government and private partners. This has resulted in a total investment of about $12 billion. As well the federal government is involved in science, research and technology. Environment Canada is directly delivering in this area at our Wastewater Technology Centre and National Water Research Institute as well as several labs across the country.

The two instruments under the Canadian Environmental Protection Act were published in December 2004. The Ammonia Guideline which applies to any sewage discharge greater than 5,000 cubic meters per day. There are roughly 280 facilities across Canada including about 30 in BC to which this guideline applies. There is an acute standard whereby the effluent should not cause ammonia-induced acute lethality, meaning killing fish, as well as a chronic standard which means that the effluent should not result in sub-lethal affects to aquatic life in the receiving environment.

The Notice for Pollution Prevention for Chlorine applies to facilities that are discharging greater than 5,000 cubic meters per day as well as having total residual chlorine levels greater than 0.02 milligrams per liter. And there are roughly 95 of these across Canada, possibly including 1 or 2 in BC.

It is not expected that the CRD would need to take any substantive action for either of these instruments, in that the risk management objectives for chlorine and ammonia are being met by the CRD. I'm sorry, I just heard somebody say, "acutely toxic": It is ammonia-induced acute lethality, so given that the guideline is for ammonia, there isn't enough ammonia in raw sewage (at the pH of the effluent discharge) to kill fish, that is what it comes down to.

The Canadian Council of Ministers of Environment, which is made up of 13 provincial and territorial ministers of environment as well as Environment Canada's minister, agreed in November 2003 to develop a Canada-wide Strategy for the management of municipal wastewater effluents. This Canada-wide Strategy is to be completed by the end of December, 2006 and is to include a formal agreement between the federal/provincial/territorial governments for performance and governance.

With regard to performance, there is to be collectively agreed-to regulatory baseline, including national standards which will be developed. And collectively agreed-to means Environment Canada and all provinces and territories will be in concurrence on this.

In the development of national standards, the intent is to consider risk characterization of effluents and receiving environment. As well, the risk reduction approach will include prioritizing action such that high risk situations will be addressed sooner than facilities that have a lower environmental risk.

With regard to governance, the goal is a harmonized regulatory framework and this is to be achieved by referencing the standards developed by the CCME in a Fisheries Act regulation and reflecting the CCME standards in provincial, and territorial permits, licenses and other authorizations. As well, there are to be formal federal/provincial/ territorial agreements such that a one window approach is ensured.

The key outcomes to be achieved by this process will be that the sector is managed in a collectively agreed-to management framework and there will be one set of standards to be applied fairly, consistently and predictably.

Onto shellfish. Environment Canada is a partner with the Canadian Shellfish Sanitation Program with the Canadian Food Inspection Agency and the Department of Fisheries and Oceans. CFIA is responsible for safe handling, processing, import, export and marine biotoxin program. DFO's role is stock assessments and harvesting restrictions, opening and closing areas, posting notices, patrolling and enforcing, as well as harvesting permits. Environment Canada conducts sanitary surveys in growing areas, identifying pollution sources, and recommending area classifications. This slide shows a number of potential shoreline contamination sources. Environment Canada conducts field surveys to collect marine and freshwater samples for fecal coliform analysis in conjunction with shoreline pollution source investigations. This slide shows the current sanitary closure in red lines and the two black lines indicate the Macaulay and Clover Point outfalls. The current closure area is actually 60 square kilometers. There has been a shellfish harvesting closure off Victoria since the 1970s because of sewage discharges, land based activities linked to sources of contamination, as well as paralytic shellfish poisoning. The closure was extended in 1983 to include offshore scallop trawling grounds, following reports that fecal coliform levels exceeded guidelines and extended 2.5 kilometers from the Macaulay outfall. This closure was further extended in 1992 on a precautionary basis to reflect increased sewage discharges from the outfalls. Again in 2002, it was extended on a precautionary basis because of new information from computer modeling of the plume dispersion as well as some of CRD's water quality data which indicated that, at certain times of the year, the direct harvesting standards were exceeded. The 2002 expansion resulted in increased closure areas from 42 square kilometres, which it has previously been, to 60 square kilometers now.

While there has been a significant increase in the size of the closure, Victoria fisheries officers as well as the Trial Island lighthouse keeper have communicated that it probably results in little impact in terms of shellfish harvesting because there are few, if any, shellfish growing areas identified in and around the Trial Islands area.

The last topic I will be speaking to is endocrine disrupting compounds (EDCs). The potential for chemicals to cause endocrine disrupting effects came to light in the 1960s when effects were observed in wildlife exposed to pesticides such as DDT. In more recent years, there has been a more widespread concern with the potential of numerous naturally occurring and man-made chemicals, causing endocrine effects on aquatic life as well as human health. EDCs are substances or mixtures that alter functions of the endocrine system and consequently can cause adverse affects to the organism or its offspring. Sources of input into the aquatic environment include municipal wastewater and industrial discharges.

An endocrine system is like a courier system for most living things and delivers key signals to fire up or shut down molecular systems. Any disruption in this process by EDCs can lead to affects to fish as noted on this slide. Estrogen in birth control pills is a good example of an EDC. In the early life stages, some of the effects can include low fertilization, delayed hatch or low hatch rate, mortality, cellular level impacts. For underyearlings its affects are intersex gonads, sex reversal, deformities, poor survival. The effects on adult fish could be impaired reproduction, hormonal or biochemical changes, behaviour or courtship changes, and poor survival.

Our Pacific Environmental Science Centre in North Vancouver is using a state of the art science approach to determine presence and impact of EDCs on salmonids by some of the sewage discharges within the Georgia basin. The study of up and down regulation of key genes has potential to determine whether the effluent is capable of causing endocrine disruption effects to fish. This is a five year lab based study and our partners include Capital Regional District and the

Greater Vancouver Regional District. The study is to be completed and published by March 2008. How the study is being done: Juvenile salmon are exposed to effluents from Clover and Macaulay Point outfalls which are CRD outfalls, and the Annacis Island discharge, which is GVRD's, at concentrations that are expected in receiving environment. Sampling is conducted in the summer and winter. Testing is done using state of the science gene chip technology, or toxicogenomics, to determine effects on organisms at the molecular level. Genomics is the study of genes of a cell or tissues at the DNA level. Toxicogenomics combines genomics and toxicology to identify and characterize gene profiles. As well as biological testing, chemical analyses to measure levels of estrogenic pharmaceuticals in samples are done to compare with reported values in the scientific literature. This slide shows some pictures of the laboratory setup for the study. The indicator species used are Rainbow Trout, Coho and Chinook. The test was done on sexually immature fish, either at early stages or underyearlings and the organ of interest on this one is liver. That is the primary focus of the genomic work.

Continuing on with EDCs: the Water Environment Research Foundation (WERF) which is a non-profit organization which funds and manages water quality research projects released a report several months ago entitled "Technical Brief: Endocrine Disrupting Compounds and Implications for Wastewater Treatment." This document summarizes the available science on EDCs and was prepared in response to concerns over the potential for EDCs to enter the environment from wastewater discharges and biosolids generated from wastewater treatment.

This slide is a table from the report and shows sources of EDCs. As well, they have classed EDCs into 6 classes of chemicals and provides examples of compounds within each of those classes and indicates potential sources. The classes are steroids and sterols including naturally occurring hormones and synthetic hormones; organohalides such as DDT, dioxins, PCBs; metals or organometals such as cadmium, tribute tin, mercury, lead; alkyl phenols, which is in detergents; polynuclear aromatic hydrocarbons or oils; and plasticizers. If you look at the last column, you will see some of the potential sources to surface water include human excretion, storm water runoff, areas treated with certain pesticides, personal care products, household fungicides, personal care products, storm water runoff, storm water runoff, home use, personal care products, storm water runoff. From this table, it is apparent that every class of EDC is present in municipal wastewater effluents.

This is another table from the WERF report, indicating EDC removal efficiencies by various treatment processes. It is a busy slide and I won't go through the individual removal rates shown on this table, however, there is a take home message. I have only one take home message, Dr. Ishiguro had quite a few. The take home message from this table is that secondary treatment with disinfection can remove over 90% of many of the most common compounds known or suspected to be EDCs that enter a treatment plant.

The report also provides information on evidence of effects for aquatic life. Some fish species near wastewater treatment plants in Europe have shown affects attributed to compounds acting like hormones and estrogen. The specific compounds or conditions causing the effects, however, is not clear. For example, temperature may cause some of the changes, or it could be natural variations of populations. To date, there have been no US studies that have effectively linked changes to the fish population to wastewater treatment discharges.

Evidence with regard to adverse human health affects, there have been no studies to date that effectively link low concentrations of EDCs in wastewater to adverse human health affects.

You might wonder what about biosolids. Detailed studies on potential affects of EDCs following land application of biosolids are generally not available and it is a topic of ongoing research.

We are also interested in implications with regard to possible use of recycled waters such as for irrigation. What they say is that the common forms of treatment required for recycled water uses removes most of the EDCs. Environmental consequences of low concentrations in recycled water requires more research.

Finally, the report states that work continues in dozens of labs around the world to determine whether chemicals are EDCs, understand how to remove EDCs from wastewater, and to determine the effects of exposure to EDCs. Effects on aquatic life remains the area of greatest interest, in part because existing data demonstrates that this is the area of greatest potential for adverse affects.

Last slide. In closing, there are a number of municipal wastewater activities under way and the timelines vary. Work is proceeding on municipal wastewater effluent strategy based on the science available. As more scientific knowledge becomes available, such as from the ongoing EDC research work, this knowledge will inform future decisions and the overall approach. Stay tuned.

DUSAN MARKOVIC, MSC.

INTRODUCTION

Dusan received a Bachelor in Arts from McMaster University in 1995 and a Master of Science in Environment and Management from Royal Roads University in 2003. As part of his Masters study, Dusan researched Victoria's Sewage Discharge and Sediment Metal Contamination in Victoria Bight. Dusan's conclusions are of interest tonight - Heavy Metals in Victoria's Untreated Sewage.

HEAVY METALS IN VICTORIA'S UNTREATED SEWAGE

Thanks everyone for coming out to this forum tonight, and thank you very much for having me here to talk about some of the research I did. I will try to keep this as brief as possible. I apologize ahead of time, there is a bit of redundancy in some of the topics that I will cover. I would like to tell you a little bit about my research. What is currently happening, the link between science and policy and implications and conclusions from my research: what I have found. I had three specific goals when I was writing my paper. The first of which was to determine the spatial distribution and level of metal contamination in sediments in Victoria Bight. The next was to determine if the outfalls are the likely source of that metal contamination. And finally I was going to evaluate the current liquid waste management plan from a sustainable development perspective and I will apologize, there are a lot of "TLA"s, or three letter acronyms that are about to come at you.

As you well know by now the CRD discharges approximately 120,000 cubic meters of untreated municipal sewage per day into the Juan de Fuca Strait. The effluent is the combined liquid waste from households, industries, businesses, institutions, commercial establishments and to my horror - landfill leachate: It is convenient to pump from Hartland out the outfalls. This is a little background map to show you where you are. The two outfalls are identified by these red asterisks. The study area I worked in was Victoria Bight and covered essentially by drawing a line through the Trial Islands down to William Head, so this area there. So just a little map to show where we are.

Heavy metals. The untreated sewage contains a wide variety of chemicals and contaminants that are potentially harmful to the receiving environment. The reason I studied heavy metals as opposed to organics is because they are a good indicator of anthropogenic sources of contamination as opposed to natural background levels. Also the chemical analyses of the metals is far less finicky than organics. I analyzed three metals, chromium, copper and zinc. All of which have been identified by CRD and USEPA as primary pollutants. Of those three, copper is of prime importance and it is potentially one of the most significant marine pollutants. Past research indicates that copper levels may be toxic to biota, at levels only marginally above background levels. This is a very serious contaminant. I'll come back to this later talking about beginning of pipe treatment as opposed to end of pipe treatment.

Monitoring at the receiving environment. All the previous investigations have been largely confined within a 2 km radius of the outfalls. Previous to this research, my study, the most comprehensive study was based on a 25 sample sites. The limited aerial extent of the current monitoring does not satisfactorily address one of the principles of contaminated sediment transport deposition and this was touched on briefly earlier. And this is, you know the catch phrase by now, a "take home" point. In coastal zones, regardless of the point of introduction, fine particles seek preferred zones of deposition. In cases of continuous contaminant input, such as the outfalls here in Victoria, the source of input is likely to be responsible for consistent contamination at the input site as well as secondary contamination at depositional areas. Again, this is a very important point.

The situation here in Victoria. This is a map, that was created at the time I did my study back in 2000/01 and this shows the CRD's monitoring program for sediments. As you can see then, you have got a transect going east/west and one going southwest from the Macaulay point outfall. This is a 2 km radius. They have got one more site just off Albert Head and then these were the control sites that Mr. Werring spoke of earlier in Perry Bay. At Clover Point they had one east/west transect monitoring sites. Since I have done my study the CRD has added a few more monitoring sites, however, they all fall within the 2 km radius and I believe they are just a few more sites essentially in the shape of a compass rose around the outfall. The curious thing here is that one of the big arguments for the status quo is that the effluent is mainly fresh water and when it comes out, the diffusers it rapidly rises and is dispersed by the currents and tides, which leads one to ask "then why have they concentrated their assembly of monitoring at the outfalls?" Peculiar.

Having said that, this is a map showing the survey I undertook as part of my research and each black dot represents a sediment sample I collected and each cross represents where no sediment was retrieved from the bottom, or ground. Again you can see around Clover Point there were many samples that were irretrievable, either because of a rocky bottom or all the sediment grab would bring up were mussels. So this is the aerial extent of my study. Of these samples, there are 582 sample sites and I conducted chemical analysis on 360 of those based on particle size. And I won't bore you with the physics, but contaminants tend to associate with fine particles. And so this is one way that one can help determine where things are going based on the currents and particle size. Conditions around the outfall, this has already been touched on. Biomass is greater than biodiversity indicating a stressed environment. And it means that specialized species have been replaced with a few tolerant opportunistic species. The CRD likes to point out that there are thriving mussel communities, particularly around Clover Point outfall and claiming this indicates low toxicity. But what they fail to acknowledge is that mussels in particular can produce a metal binding protein that allows them to survive in highly toxic environments. There is current research, where researchers used, or measured the production of MT to determine how stressed the environment is. These are little bits that aren't really made public.

Sediment quality guidelines or SQGs. This is perhaps the most important aspect of the whole talk, in terms of my whole presentation. There are two types of sediment quality guidelines, and bear with me because this is where all the TLAs come in and it is a bit confusing. The two types are effect level and threshold level. Effect level sediment quality guidelines are levels at which negative effects in test organisms are expected to occur. So if you have these guidelines and if a certain chemical is at this level then you would expect your test organisms to get sick, and more likely die. The other types of SQGs are threshold levels. These are levels below which negative effects in test organisms are unlikely. So you can see here how one set of sediment quality guidelines are far more protective than the other if you are looking at levels at which things are expected to die, or levels at which below there should be no adverse affects.

The CRD uses effect level, in particularly AET's or Apparent Effects Thresholds. These are some of the first sediment quality guidelines that were developed by the Washington Department of Environment, or, it escapes me now, for Puget Sound, which is a dead end fjord. And sediment quality guidelines are often highly specific to the environment that they are meant to be used in and Puget Sound is probably an exact opposite of Victoria harbour. Under AETs, 100% of test organisms are expected to have severe or lethal effects. SQGs are the mechanism that link scientific findings to policies and regulations. So CRD, SQG, AETs what does it all mean? SQGs define the term contamination from a regulatory point of view. So we are not looking at the term contamination here from a scientist's point of view, but rather from a policy point of view.

The CRD sediment quality guideline for copper is 390 grams per kilogram. None of the samples I have tested surpassed this level and as such none would be considered contaminated under the current CRD sediment quality guidelines and this sort of thing was touched on earlier by Mr. Werring. However contamination is in the eye of the policy holder. I will give you a second to take this map in because it is quite important. What this map shows are sediment copper levels out of my analysis in milligrams per kilogram by various sediment quality guidelines. You have here at this end of the spectrum, the CRD at 390. Environment Canada has their threshold effect level which is the protective type of sediment quality guideline at 18.7. Now if you were to use, for example, the sediment quality objectives of the Netherlands, which is 36 milligrams per kilogram, well then all of this area would be considered contaminated. Again, what is interesting is that this area down here at the edge of the study area consistently showed higher elevated levels of contaminants. I am not sure, maybe Sooke Basin is the final destination. Maybe Port Angeles. I don't know. I had to limit my study because sampling that much could drive one crazy. Anyway, so it is just an interesting map to drive home a point that it really is an objective term. Contamination. When the CRD tells you sediments aren't contaminated, well that is based on their definition of contamination. It is something to bear in mind.

Some implications. Threshold levels, sediment quality guidelines are far more protective and do a far better job of accounting for chronic sub lethal affects. So again things like an organism's inability to eat, or reproduce properly, or even to populate an area, that sort of thing, as opposed to AET's which are used by the CRD that are based on an acute effect meaning death. So proponents of the CRD's liquid waste management plan argue that the discharge of sewage is not a problem because of the dilution itself and cleansing properties of the receiving environment. Ironically, this type of environment simply leads to a much larger area subject to moderate levels of contamination – a situation where monitoring of chronic sub lethal affects is far more appropriate to evaluate harm. So they have got it wrong how they are measuring what is going on, given the environment that they are testing.

So the two conclusions that I would leave you with are that the CRD needs to expand their monitoring program to account for areas of the secondary deposition. And also that the CRD needs to re-evaluate their current sediment quality guidelines to properly assess and protect the receiving environment.

Thank you.

RANDY ALEXANDER

Ministry of Environment

INTRODUCTION

Randy is a chemical engineer from Queens and has a Masters of Business Administration from Simon Fraser University. Randy is Environmental Protection Manager for Vancouver Island, with the BC Ministry of Environment. The Environmental Protection Division is responsible for the management of municipal, commercial, industrial and institutional wastes in conformance with the Environmental Management Act. The division also monitors and studies the impacts of human activities on ambient air and water quality. Randy has been with the Ministry since 2003. He has over 20 years experience in environmental management in the private and public sector.

PROVINCIAL REGULATIONS AND THE CRD

I have been contemplating Dr. Ishiguro's "take home lesson" concept like everyone else and I have got some take home lessons I want to share with you before I start my presentation. My job is to tell you about the regulatory framework that the CRD works within: The provincial regulatory framework that shapes their decisions on what they do with respect to sewage. That can be a really dry subject, so before I lose you on that, I want to share what I think my "take home lessons" are from that.

The first one is Public policy. My job is to administer regulations that are set up to put forward, to achieve public policy. Public policy starts in a room like this. Everybody in this room who cares enough about this issue to come out, to listen to talks, and to get involved – this is where public policy starts. I want to thank you all for coming. It is really important and makes my job a lot easier and a lot more rewarding to know that people are involved in making public policy better. So that is one take home message.

John Werring's last slide was all about who to get in touch with to make your views known. That is really important. Politicians listen to their constituents. I have learned that because I work with politicians on a regular basis. They care about what they do, they care what their constituents think. So by all means, take John's advice and contact the politicians, your representatives.

Phil Wong touched on the need to harmonize our regulations. The federal government has regulations, the provincial government has regulations, we have different requirements. We are trying to work very hard to bringing those together so that we have got a one window approach, one common regulatory approach, common sense. It is a tricky thing to do.

Dusan had a lot of "take home lessons" that I can take home from his presentation, but the one thing that came to mind with me is that scientists disagree. They bring forward data, they postulate what is going on and why, they argue about it like heck, and good decisions come out of that . Good science comes out of that. So science is evolving, this leads to better decisions, it leads to improved standards that I administer and it makes better public policy and regulation, so the scientific debate is really important. The science is very complex, but it is important for people who disagree to find out what the truth is.

Environmental protection goals, health protection goals… these are the complex questions that inform public policy. How much are all of you in this room willing to pay for sewage treatment? Where do we put the sewage treatment? Where do you put the sludge? All of those things are difficult issues, which have to be discussed in public forums so that the CRD can make good decisions. Those are my take home lessons. Now I'll probably bore you with the regulatory end of things.

Sewage in British Columbia is regulated under the Environmental Management Act. There are two main mechanisms under that Act that authorize sewage discharges. One is the Municipal Sewage Regulation and it describes the technical standards that sewage treatment has to meet. The second is the Liquid Waste Management Planning Process. It sets out your commitment to safeguard the water quality, human health and the environment. It is the process that the CRD and all regions within British Columbia go through to decide how they are going to manage their waste.

So a couple of definitions. From the regulatory perspective, primary treatment is defined as the standard of biochemical oxygen demand and total suspended solids in the effluent. That is how we define primary treatment. So it is any form of treatment that meets the standards set out in the provincial regulations, except for dilution. Secondary treatment, again, is any form of treatment excluding dilution that produces a certain effluent quality – a much higher effluent quality. Initial Dilution Zone is a concept that we use in the province that is the three dimensional zone around the outfall, around the point of discharge where the mixing of effluent and receiving sea waters occur. That comes up in regulations quite a bit too…the initial dilution zone.

The Liquid Waste Management Plan is a process that provides a long range mechanism for communities to achieve provincial standards. This is in a manner that takes into account the assimilative capacity of the receiving environments (environmental impact studies, that sort of thing), and the ability of communities to finance upgrades in sewage facilities. How are you going to achieve the goals in a manner that you can afford? And also, it is very important, public input into the waste management planning process. All through the process, public input is very important. The purpose of the Liquid Waste Management Plan is to involve the public, then define sewage issues and problems, identify and evaluate the options, prepare an action plan for implementation. This is all led primarily by regional districts with support from the province.

Goals of the Liquid Waste Management Plan from my perspective, from the province's perspective, are pollution prevention, so we want to reduce toxic contaminants. Reuse municipal sludge possibly beneficially if possible. Recycle effluent economically. Reduce treatment waters. Basically the 3 R's. The principle of polluter pay, you know we have to pay for our waste that we generate. It also allows us a staged upgrade of facilities over time to achieve this in an affordable manner. The province believes that secondary sewage treatment best meets these goals. It satisfies the toxicity requirements of the federal Fisheries Act as well. It also enables nutrients and water to be economically recovered. It is easily managed. Secondary sludge and effluent also provides a

good monitor of the effectiveness of the source control programs. How do you keep contaminants out of the sewage in the first place?

Wastes addressed in the liquid waste management plan include: municipal sewage; storm water runoff ; combined sewer overflows ; septic tank pumpage; pump station overflows, sewage treatment plant sludge; all the waste that ends up in our sewer system.

The process is a three stage process. Stage one is developing realistic options with public input. Stage two is to examine those options and associated costs. Public input, results in a draft plan. Stage three is selecting the final option. Standards Implementation Schedules – all the things to implement a solution. It is presented to the province and the province approves it or not.

The other component that I mentioned was the municipal sewage regulation. It really sets the standards, the provincial standards for sewage discharge. It spells out the rules for treating municipal sewage. It is intended to strengthen environmental standards to ensure added protection for the environment. It discusses discharges to water, what you are allowed to discharge to water, under conditions you are allowed to discharge. It sets out standards for that. It discusses effluent quality. It sets effluent quality standards. It discusses the initial dilution zone, what that is, and how to determine what it is for receiving environmental monitoring purposes.

Now to the CRD's liquid waste management plan. The CRD completed a plan in July of 2000 for the core area which is Colwood, Esquimalt, Langford, Oak Bay, Saanich, Victoria and View Royal. It sets out a strategy for the next 25 years that the CRD, through its consultation processes, has determined is appropriate. It has been approved by the provincial Minister of Environment. It complements the Saanich municipal plan and Saanich has a secondary treatment system in place as well.

In the plan, the CRD makes commitments for source control, managing the flow and infiltration, waste water and marine assessment, storm water quality management, harbours and environmental action, management of liquid waste, sewage system overflows. It deals a lot with source control. Very focused on source control. The waste treatment and disposal plan proposes a trigger process rather than a fixed schedule for implementing treatment. And that trigger process is basically monitoring certain contaminants in the sediment and water quality to determine when levels of those contaminants exceed a level that will trigger a need to build a sewage treatment plant. I will talk a little bit more about that in a minute. It also lays out plans for: effluent monitoring and analysis ; surface water monitoring and analysis for human health risk; water column investigations; reviewing and reporting. This liquid waste management plan is on the web, it is on the CRD's website. It is very long document. It is important to understand the commitments the CRD has made.

In 2003 the Minister of Water Land and Air Protection approved the Liquid Waste Management Plan, with some conditions. She was satisfied that the trigger process could protect the environment if it resulted in the provision of primary treatment within 3 years of the triggers being exceeded. And that trigger is under development right now for the sea water. It needs to be acceptable to Ministry staff, reflect the requirements of the municipal sewage regulation, discharges must not cause water quality parameters outside of the initial dilution zone to exceed water quality guidelines. That is the trigger issue.

Last slide. There are also other conditions set in the Ministers approval. To maintain a marine monitoring advisory group. This is made up of scientists from Environment Canada, Ministry of the Environment, DFO, UVIC, Royal Roads, Camosun College and they are the scientists who inform the CRD of the scientific validity of the decisions that they are making. The Minister instructed them to undertake a number of studies including: endocrine disruptors; pharmaceuticals; persistent organic pollutants; sediment transport mechanisms (Dusan, you might be interested in that one). The minister also required them to: pilot test primary treatment technologies so that if the trigger was pulled, they would be prepared to have the treatment in place within 3 years; develop a sludge management plan and siting process; undertake more public input into the plan; and plan to eliminate Saanich's sewer overflows and eliminate the combining sewers in Oak Bay. Thank you, that's my talk

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STEPHEN SALTER, P.ENG.

INTRODUCTION

From the private sector, we have Stephen Salter, who is a professional engineer, and environmental consultant. He has worked with more than eighty companies across North and South America over the last 15 years helping clients find ways to pollute less through conservation or by recovering wasted resources. He's working as a volunteer on the issue of pollution from Victoria's outfalls because he can't stand to see waste... going to waste!

RESOURCES FROM SEWAGE: POWER FROM THE PEOPLE!

I would like to start off with a story from a very well known environmental scientist by the name of Dr. Seuss. Do you remember the *Cat in the Hat*? His problem also began in the bathroom, with a persistent stain, which the Cat chose to handle with dilution. So he blew that stain all over creation... much to the distress of the next generation... until he produced "Voooom", the magical agent of decontamination. I guess my question is, "Where's a good cat when you need him?"

People who don't agree that we should treat sewage make three points, and they are worth listening to. The first is that it's not really pollution - it doesn't count. Second, if you treat it you create a bigger problem by having to dispose of the sludge on land. And third, it costs too much, it's not a good use of public money. So why should we treat sewage, what's the point?

[Slide 1] Treatment has three goals. The first is to protect the health of the environment. The second is to protect the health of humans. And the third is to comply with *existing*, not future, environment laws and regulations. These are the laws that apply to every other source in Canada, apply to pulp mills, oil refineries, and to the 95% of other municipalities who treat their sewage in Canada. Why would we say these are good laws for those sources of pollution, but not for us? Why would we take a corporation to court for spilling a 1,000 liters of something toxic into the environment, and not the CRD? We spill that amount every second! It's almost too big to grasp, and I think that's one of the reasons we're stuck.

There's a second reason for bringing the law into this. Think about the thousands of scientist-years, which have gone into writing our existing environment laws. To simply throw that out, and say, "those scientists weren't as scientific as ours" - I don't think we can do that.

[Slide 2] So the good news here is that we have a lot to work with when it comes to recovery or doing something useful with the material in sewage. First of all, the grease and oil that reaches the surface most days of the year adds up to 5 million kilograms per year. That's good news from my point of view. We can do something with that. Second, the 16 million kilograms per year of organic material that goes into the water; Dusan talked about the metals, but before we get to that, the organics are equal to the loading of 13 pulp mills, but concentrated in the Victoria Bight. So we're asking that small environment to tackle the output of 13 pulp mills, which by the way is more pulp mills than we have on the coast of BC.

And finally, the metals. And just a footnote to your point Dusan: I read your paper, and was very interested in it. I wondered where the CRD "limit" of 360 (ppm) for copper in sediments came from. It turns out it did come from Washington Department of Ecology, but the WDOE has since abandoned maintaining it. It is also three times higher than the Canadian standard for contaminated sites! So why have we let local government set policy for our water? I think what's going to happen is that sooner or later Canadians will take this back, either through the regulators or others. I think sooner or later it is going to become Canadian water and Canadian sediment once again. The risk otherwise is that the rest of Canada will become a sewer.

[Slide 3] So the good news: we could use that bio-diesel to run buses in Victoria. It turns out that we would have more than enough bio-diesel from the oil and grease in our sewage to run 200 buses in Victoria. We only have 195 in the whole transit system. For me that's excellent news. If we took the organics and ran them through the right kind of sewage treatment plant (and I'll talk about that in a moment), we would have enough fuel to run another 200 buses or a further 4,000 cars. You may be thinking, well, why aren't they doing this? It turns out they are, and I'll come to that in another moment.

The last thing here is that no one in the CRD can say they comply with current legislation, current regulations. They won't do that on record because they can't. So we have two compelling reasons for going ahead with the right kind of treatment. First, we are off-side with respect to the law; we're expecting everyone else in Canada to follow those laws but us. Second, we have a great opportunity here. By the way, University of Toronto scientists and engineers have just recently published a paper saying sewage contains 5 to 10 times the energy required for its treatment. So we have a lot we can do with it.

[Slide 4] There are three options I'll quickly go through. One is constructed wetlands, which work for small applications. Prince George is using two for example, for new subdivisions where it's impractical to pump the sewage to the city's other three treatment plants. The downside is that they take a lot of space, and you need an environment that can actually take the loading. And for us, we're talking about 2.5 million kilograms of minerals and metals a year; the environment cannot sustain it. So it works for small sites, as in the Prince George subdivisions. The traditional treatment plants that have been discussed so far use the aerobic process. That's the one on the right. And in that kind of plant you have open tanks, open systems, and they do tend to smell. Their biggest sin is that they fail to recover anything from the sewage, they let it all go. Their goal is to denature the sewage and recover the contaminants. They do that, but the cost is huge in electricity; it takes a huge amount of power to run these things and they don't give much back in return. So the people who are saying "no" to treatment actually have a point when they are talking about this particular kind of plant. The last is the one that has been used in Japan, Australia and

Europe, and is an anaerobic plant. It's contained in vessels and is intended to help us recover resources.

[Slide 5] Here's how treatment works. Dr. Ishiguro will recognize the bug on the left (rotifer). In the traditional plants we feed oxygen to the bugs, they eat through the sewage and give off huge quantities of CO2 and a little bit of energy in terms of heat, but we can't use that; it's gone. The organic waste in an anaerobic type, the slide on the right, goes to anaerobic bacteria. We put the sewage in a vessel with no air and the anaerobic bacteria belch out carbon dioxide and methane; the product is about 3/4 methane and 1/4 carbon dioxide. There are some advantages of the anaerobic process. The first is that it doesn't require the electricity that traditional plants require, and second, the big one obviously, is that it gives resources back. Another advantage that is just emerging is interesting. It's also been found that anaerobic bacteria of a certain type can actually begin to denature some organic pollutants. They can denature dioxins, chlorobenzenes, chlorophenols, and other persistent organic compounds that we are concerned about.

[Slide 6] So the way it works is pretty simple. By the way, this is not leading edge technology; this is what made the natural gas in the earth to begin with, from decomposing matter. It was reinvented by an English chemist about 150 years ago, so it's not new. The way it works is you get the sewage into a tank without air and you let the bacteria go to work. You strip the carbon dioxide and a few other smelly chemicals out of that gas, and you put it into a distribution system; that's your fuel. What do you do with the sludge? In Europe they find that if you cook it at a high enough temperature, you will actually break the cell walls in sludge to make it more available for the next digestion stage. So it can be broken down further to yield more biogas. The final stage is to take the remaining sludge through pyrolysis, a high temperature process which gives bio-diesel and more bio-gas. The final product of pyrolysis is ingots of metals, minerals and so on. This has already been done; in Japan, Australia, and all over Europe these bio-gas plants are common. Australia is pioneering the pyrolysis idea, putting the ingots aside and saying that at some point we're going after those metals.

[Slide 7] So this is not an ugly picture. This slide is from a municipality in Sweden called Kristianstad, and this is just one of 3,000 biogas plants across Europe. But the interesting thing about this place is that municipal leaders have a vision.

[Slide 8] The population of the area is around 50,000 and here's what they do. They decided in 1999 to become a fossil-free zone within Europe, in order to support 15 environmental objectives from the Swedish parliament. They built a biogas plant, then subsidized the use of bio-gas for citizens. So first, they put 22 buses in their transit system on bio-gas. Second, they helped citizens buy bio-gas cars by subsidizing the cost of the conversion kits required for cars to run on bio-gas (which by the way is just natural gas - it's what you see taxis filing up with at the local gas station). They gave bio-gas car owners free parking, and they sell this fuel for the equivalent of CDN$0.32 per liter. So it's a process that not only gets rid of a sewage problem, but is also helping reduce global warming/greenhouse gases. The other thing is that natural gas burns cleaner than diesel, giving off 95% less particulates, resulting in less pollution at the lung level on the street as well. That's leadership, isn't? Why couldn't we do that?

[Slide 9] A couple of other examples. The Dockside Development planned for Victoria's inner harbour will treat its own sewage in the basement! You are looking at the final outfall here. It is the water that will run past the greenway in front of the buildings. Fuel cells are already running on bio-gas, and a new kind of fuel cell has been developed at Pennsylvania State University that uses microbes to generate electricity from sewage directly. It's kind of interesting that the biology we're

trying to protect in our receiving environment is actually going to save us when it comes to treatment as well.

[Slide 10] So here are the numbers, based on the huge volumes we're putting out our pipes. I mentioned 200 buses, 4,000 cars. If we decided not to go that way, we could power 2,000 homes with electricity or we could provide natural gas for 5,000 homes. So this is not a trivial amount of resources we're looking at. There's no limit to our options! If you enter two words in Google: "sewage" and "bio-gas", you'll get 138,000 pages back, most from Europe where this is already being done.

[Slide 11] In terms of cost, is it too expensive? I called sewage treatment plant operators around BC over this last summer and asked what they paid for their plants. They were very willing to help, and based on their numbers it looks like our cost would be closer to $150-180 million, one third of the number we're hearing. That's before grants. The CRD by the way, is expecting cost-sharing with the feds and the province that would bring it down to $90 per home per year. And that is before resource recovery. So why are we stuck here? Why don't we do it?

[Slide 12] I also think it's worth saying something to the people who hold the trigger on the regulations. Why would we allow the CRD to be a corporate polluter and not industry? Why would we allow that? Why would we give up on resources which we could put to better uses? So if you feel that way too, and if you don't want to be apologizing to your grandchildren as I don't want to apologize to mine, then consider writing to Stéphane Dion, who has indicated that he is willing to show leadership on this issue.

We can recover the resources, and let the ocean recover at the same time. Thank you.

DENISE SAVOIE

Chair CRD Roundtable on the Environment

INTRODUCTION

Denise is city councilor and member of the CRD board for the past 6 years. She is the chair of the CRD Environmental Roundtable. She was the founder of the Greater Victoria cycling coalition and worked to establish the regional housing trust. She is developing the greenways and trails that network Victoria and spearheading the cleanup of the Victoria harbour. Denise has been actively promoting sewage treatment in Victoria for over 15 years and tonight she offers us her insight into the road to treatment.

Good evening. Perhaps the worst thing, worse than thinking about sewage is being the last person to speak about sewage. But I promise that I am not going to talk about STG, and ATT's, so I am coming from the perspective of a community advocate. I have been involved in this issue, for the last 20 years and more recently as an elected official. So I guess the question that I ask myself, is, "where do we go from here." And Stephen said something which I think is really important to remember, and it is about the right kind of treatment. Over the past 6 years, I have sat on the CRD board and have seen many good initiatives come forward. I am not certainly going to be the apologist of the CRD, but there have been excellent initiatives around our models of storm water runoff. As many of you know that it is a part of what is contaminating our marine environment. So

there are excellent initiatives. But there are also problems with what we have in Victoria related to sewage treatment.

As an elected official sitting at the board, I receive a lot of information and read material that has come to us from Environment Canada, from the minister, provincial ministers and one of the comments, for example, there was a reference earlier this evening to our trigger process and its ineffectiveness. This came from, I think Mr. Werring. And certainly an environmentalist might expect that. But here are comments that we received from the Environment Canada: "The limitations of the trigger process, as the main mechanism for making decisions on source control and level of sewage treatment, are inherent in the receiving system under study." So in other words, we are saying that this material, we are dumping it in swift, flushing waters and so we might assume that it may be very difficult to establish what the contamination there is, because it is being transported. So they continue, "the dynamic nature of Juan de Fuca Strait, including significant tidal flushing and strong ocean currents, makes detection of water borne contaminants very difficult." There are many information gaps concerning the safe and effect of contaminants known to enter the system." So this is the perspective of Environment Canada that comes to us.

Tonight you have heard many arguments and most of them center around the scientific evidence of damage to the marine environment. You have heard Stephen's excellent proposal of resource recovery and there also the arguments around economic, presumably the fish have good sense to avoid the outfall, and such that tourists may want to avoid Victoria. So those are the three main arguments that over the years we have heard. It seems to me a much more productive direction to consider the possibility of resource recovery. Let me tell you where we are at right now. In terms of the current situation, it seems to me as the debate progresses the outside influences on the CRD are increasing. The federal government now appears to be indicating that it does not accept the validity of the region's approach because its science is out of date.

It appears, and we have heard more about that this evening as well, that national standards will be established for secondary treatment. And again, another comment from the Environment Canada, recently in our correspondence:" there are many scientific uncertainties and unknowns regarding potential impacts of sewage effluents upon receiving environments". Although current CRD monitoring data indicate only a few compounds are of concern around Clover and Macaulay outfalls, this is likely due to the favourable oceanographic conditions that transport the discharged contaminants from the outfall area. Again, we have heard about that. So the material may be transported, we just simply don't know. However, notwithstanding the fact that monitoring has shown only limited impacts at the outfalls, there is considerable uncertainty associated with a longer term fate and effects of persistent and biocumulative contaminants in the virtually raw sewage discharge which the trigger process will not address.

So here we are at the CRD as the debates heightens. The CRD came to the conclusion that it would commission a new $500,000 scientific study to re-examine, yes, again, the need for treatment and the treatment options available. I do place some hope in that independent scientific study as imperfect as it is. And some of you have been part of the discussions or have been aware of some of those imperfections. But it seems to me that it gives us the possibility of gracefully looking at the issue from a broader perspective than we have been at the CRD. It is not perfect, but some of us who sit at the board have insisted that some questions be included in the study to ensure that we at least consider the issue more broadly. For example, we asked them that cost/benefits, environmental, social and economic to disperse treatment plants across the region, or include them in larger developments as we have done in Victoria's Dockside, be considered. In the early 90s, a study was

done to consider smaller treatment plants and the only consideration at that time was the economic cost. But from everything you have heard this evening you can see that there are various kinds of costs and I think we would miss the mark if we only consider the financial ones.

So with the scientific study, there is the possibility of considering that. We also asked the scientists to look at resource recovery possibilities, which Stephen talked about. The need for example to look at the total picture of water in the region and deal with that in an integrated way seems like a rationale thing to do. For example, the size of the plant we need, might be dependent on how much water we consume. And water efficiency and the potential for irrigation, especially for local treatment plants makes sense. And here I am going to get to the point of small treatment plants that seem to make sense. And going back to the question of the right kind of treatment plant because, at the moment, we are a built-up environment. We have become a built-up environment. We have lost many opportunities in the last 20 years, that I am aware of, of possible sites for treatment plants.

One of the options that we have now, with the advances in technology is the possibility of smaller community plants that offer up to tertiary, even levels of treatment as the Dockside project does. I believe that this is likely a better way to go. I am hoping that through the independent scientific study that it is going to begin very shortly, that we will have the option to do this. Of course, we do need to have the political will and that is where you come into the picture. I think that you have to let people know, your elected officials know that this is an issue that is important to you. That you want it considered in the broader context. You want to have a wise decision, not necessarily treatment just to treat, I think that you know that some types of treatment, traditional treatment plants might not be as effective as we would like. But the technology has progressed incredibly and we do have these opportunity now. I hope that we consider it.

There is also the issue of chemicals and pharmaceuticals that was raised along the way. I think we have also included that in the terms of reference of the scientific study that will be done. And they, more than anything, for me, illustrate the need for innovative treatment technologies. The kind that might allow us to neutralize some of these chemicals that are finding their way, bio-chemical or as endocrine disruptor or whatever. I think that is the issue that, in the short term, because they are there, we need to look at this kind of new treatment technology. In the longer term obviously, we need to find a way to take them out of the environment. But at the moment, within our jurisdiction dealing with the removal of toxic materials is something that depends on higher levels of government. For me that might be the subject of my next career, but for here, for the CRD, it is important to look at innovative treatment plants and that is possible. It will be possible to bring pressure to bear on the CRD to consider that especially as the independent scientific study unfolds. So I urge you to do that and stay involved.

QUESTIONS

INTRODUCTION

Thank you everyone for staying. This is going to be a question and answer period. Just questions, don't make speeches if you can possibly restrain yourself and we will get as many questions as possible and as many responses as possible from this very distinguished panel. But I will allow one

gentleman to make a statement and Dr. Sean Peck, our former medical health officer, who is in the audience. You have a few comments on this Dr. Peck.

DR. PECK

I did ask permission ahead of time. I worked as the medical officer for the Capital Region between 1989 and 1995. And in 1991, as many of you will remember we went through this big debate about "was sewage treatment needed or not?". And we held a referendum to the public and they voted against it at that time. But now, since retired, I wanted to say a few words. When I look at this issue, I try to look at it from a public health point of view, which is, is there any evidence that human health is being affected by this? So that is part of my question to the panel. Do you know of any studies that I don't know of that there is evidence of human health or human exposure consequences in which we should look at more closely, because we think there are human health issues. The other thing that I just want to mention is that I worry about the cost of this and I felt we had to be very responsible in terms of treatment, at the both federal provincial and local level. So I looked up what the estimated costs were. For primary treatment it was $237 million, cost $5.8 million a year in operating costs. But it would have add to each of the people who live in the region (it would add to those on their own systems), it would add to our household taxes $270 and if the secondary was brought in it would add $573 per household.

I was rather pleased to hear Stephen talk about costs because I think that is rather interesting. I haven't heard about that from the CRD's point of view. And I would like to thank the panel very much. I learned a great deal this evening. I find it a very intriguing issue, but from public health point of view, what is the evidence towards human health. What is the evidence of human exposure that can cause harm? So that adds to the arguments to doing sewage treatment to improve our environment.

COMMENTS

(DM) I'll just make some general comments and then pass it to people who have better knowledge of some specifics to address that question. In terms of direct human health impacts, human beings throughout history tend to be reactionary and focus their efforts on remediation as opposed to prevention. And so in this situation, I would argue that while the impacts may not be acute or immediate, is it something that we want to gamble with down the road. Not so long ago, particulate matter in the air was not a concern to people, yet now, given new advances in technology, it is able to identify that particulate matters is a huge concern and it has caused thousands of premature deaths each year, because of smog and that type of thing. I would argue that perhaps we should look at this from a more precautionary point of view as opposed to a typical remediation point of view. In terms of costs, again, you are dealing with trying to assign a monetary value to the receiving environment, for example. It is difficult to do, yet it is something that has to be attempted, because it seems we have been trained to speak in dollars only. Inherent value of something is not taking into account yet. We'll pay for a new arena but not for sewage treatment.

(DS) I have just one comment because a few years ago, no one knew that there were any PBDE, that is a type of flame retardant that is used in the chairs you are sitting on, and our computers, and office furniture. Nobody knew that we were putting in the marine environment. Nobody knew that we were going to find it in breasts milk, in mother's breast milk. Nobody knew that we were going to find it in our homes, in the marine environment. A few years ago, Dr. Peter Ross did a study and analysis of global seals, and found that substance (PBDEs) in fairly high levels. Recently the EPA has just come out with a study showing that there is extremely high levels in women's breast's milk

living in the northwest, both in BC and Washington, Oregon, etc. So it is one example, it is hard to look for something that you don't know is there. They couldn't ask the questions because they didn't know that substance was there. So I would say that would apply to some of the human health issues generally, we are finding those types of substances in the water.

(Q) I'm from Surrey, and you've probably heard this many times before, but I'm new to the area, but currently does the City of Victoria fail any Department of Fisheries and Oceans tests for effluent standards, toxicity requirements at the end of pipe. It's kind of a yes or no.

(PW) Environment Canada and/or the Department of Fisheries and Oceans have not conducted sampling at that site. I understand that the CRD has taken some samples from the past as well as Sierra Legal Defense Fund and I understand that those tests failed the 96 hour rainbow trout toxicity test.

(Q) So the question that I for you the Department of Fisheries and Oceans they should test because they uphold the Fisheries Act and if we do eventually test, if they know that the City is not in compliance, why have they not charged the municipality given that the Feds have shown appetite for doing in other instances.

(DS) I just want to pick at the word "City". Late 80's or late 90's there was the huge pipe called the east coast interceptor that would funnel all the sewage from Saanich, Oak Bay, Victoria to Clover point and on the other side from Langford, Colwood, to Macaulay Point. So the sewage, we should be talking about the region. This isn't just a City of Victoria problem.

(JW) I just want to comment on the request for studies. We have taken samples from both Clover and Macaulay and exposed fish to this 96 hour test. All of the fished died within 20 minutes, both sides.

(Q) So DFO doesn't believe in laying charges?

(JW) Apparently not.

(PW) We did. We (Sierra Legal) actually laid charges against the CRD using a method called private prosecution, but the government stepped in and stayed it, the provincial government.

(Q) Can you elaborate on whether or not the water at the edge of the IPZ was able to meet the fisheries requirements?

(??) IPZ. Initial pollution zone?

(Q) Perhaps Mr. Wong can tell me what the bactcat relation of it would be? He's already identified that the ammonia would beat it. What about the other things, Phil

(PW) Maybe I can go back and answer the other question first, in terms of why DFO has not gone and laid charges. It is Environment Canada that actually administers 36(3) of the Fisheries Act, or co-administers it with DFO at the Prime Ministerial Direction quite a number of years ago. What we are doing right now is focusing on a Canada-wide strategy under CCA and developing a Fisheries Act regulations. The prosecution process is quite a lengthy one, where you are required going out and collecting various evidence and running it through our enforcement investigation people, up to the Department of Justice and if they decide to lay charges, then the prosecution goes to the courts and the courts would make the determination as to whether or not the discharge was in violation of the Fisheries Act. And even if the case was that they were found guilty, there was no certainty that

they would achieve treatment in a reasonable timeframe. So that is why we are focusing on the CCME process as well as the federal National Waste Water strategy.

(Q) Sorry you were going to answer the 2nd question again?

(PW) Under the present legislation there is the general pollution intervention provisions of the Fisheries Act which is 36(3) and one of the primary measures is the 96-hour trout test. However there is no, to my knowledge, there is no water quality, there is no initial pollution zone recognized.

(Q) Under provincial legislation?

(PW) Perhaps the provincial rep can speak to that. I don't know.

Unfortunately he lives in Nanaimo and he had to go over the Malahat so he is not here.

(SS) First on the question of health. CRD is very good at publishing data, for example, the fecal coliform on the surface is in some case up to 17x's Health Canada's guidelines and these are the areas that we are sending tourism boats through and wind surfer use. So there is pretty direct contact with it. Birds are feeding on it at least eight months of the year. They are not going to stay put. They are going to land – where is the stuff attached to their feet go? That's more obvious. What's not so obvious is that if we can burn this stuff in buses, get rid of the diesel, we would get rid of 95% of the particulates at lung level on the street. That has to be a great health benefit for us. So it isn't just a question of sewage. It's what we are not doing with it that can have a health impact. It's not just the pollution, it's the law. I liken it to "administrative think". It is a convenience. It is a concept that has nothing to do with actually sound practices. Look at the area of air pollution: We first went after the lead in the exhaust, then we went after the fuel additives, but behind our backs, we have global warming and climate change. What is the difference here? I can see none. Building taller smoke stacks is the same as a longer outfall.

We have a lots of people with questions so we have to move along.

(Q) I think we have to deal with a series of negligent acts. I think the CRD, certainly the engineers of the CRD and I am going to ask you, how we are going to address years of negligence at all levels of government, and certainly the engineer, I won't mention his whole name, from CRD issued a lovely little brochure, a blue brochure "to the sea" and he was the one that advocated dilution is the solution to pollution. My question is there has been a whole series of negligence and I want the panel to address the negligence that has taken place throughout the years. In 1988, there was a big movement here in Victoria to have some form of treatment. And the CRD, the engineer from the CRD foiled it. University professors foiled it. We had a conference in Rio where every country made a commitment to implement the Precautionary principle. That is a principle of international law that relates to health and environment. We don't have to wait until there is scientific certainty that harm is being done. The government has been negligent. Fisheries has been negligent.

Okay, I am going to have to cut you off. What is your question?

(Q) My question is. Going back to mentioning the Justice Department, I think possibly it is the federal Justice Department that is above all negligent because as you say, they did not enforce the fisheries act and that could have been enforced and it could have addressed the problems years ago. So I would like you to address the issue of negligence?

(JW) I'm tempted but I won't. (Jack is a lawyer)

(SS) None of us are lawyers…

(Q) I have three questions.

You are allowed 1 question so pick your best one.

(Q) My question is there are many, many environments. There is our own internal environment, there is the financial environment, social environment, community…and my question would be best coordinated by Denise Savoie is how do you balance one with others. Because cost does matter cost affects what happens to my children down the road.

(SS) The costs, let's talk about that. I saw the poll from the CRD staff that said it is going to cost for treatment $447 million based on some very tight constraints. Let's contrast that with how we built the arena for example. We need to go to open bidding. We are going to have a design competition and invite the best ideas from all over the place. If we did that with sewage treatment the ideas would flow. We can solve it at reasonable cost. I have numbers from plant operator from around BC and the numbers I showed tonight were from $150 to $180 million which is far more like than the $450 million. I'm absolutely confident of that. …….

(Q) This is related to those costs. How is the capacity of that proposal to cost $150, $180 in terms of dealing with population increases and how much more would it cost to deal with one that could handle maybe 50,000 or 100,000 more people in the greater Victoria region.

(SS) My estimates were based on a population of 400,000, which is what we have in currently in the CRD plus tourists, cruise ships and so on. So, if we say that is what it is today and worked it out on a household per capital tax base, it amounts to $90 per home per year.

(JW) Virtually every major city in Canada east of the Rockies has treatment and the only place that doesn't have it is here.

(Q) This is a question for Phil Wong. You were saying that rather than use the force of the Fisheries Act, you are focusing on national standards. Does that mean that the national standards will force Victoria to put in a sewer system?

(PW) I can't say ahead what these national standards will be because that is something that is going through the CCMA process. We will have to wait until the dust settles on that one.

(DS) In terms of how do you balance these difference costs, I think we too often consider the financial costs and they have been emphasized at the expense of social costs and environmental costs and all the other factors that just don't even enter into the equation. I think that is what we have tried to do with Dockside. We have performance measures. We know what we are expecting, what we are going to get out of it. So I think there is a measure to identify, there is a way to identify and to balance those costs, so there is no one sector that is disadvantaged and that you get benefits on all three levels.

(Q) Yeah, I'm surprised that this region is still held in such high regard, because my European friends just can't believe that we are still dumping raw sewage into the ocean. Maybe this $500,000 grant that was talked about, yet again doing yet another study would be better spent in looking into smaller biogas plants or maybe the smaller treatment plants.

(DS) Hopefully that is what the study that has been approved will do. That was integrated into the terms of reference to come back with some of those issues.

(Q) I assumed that the purpose this evening was to public education. I would like to know why there is not a greater focus on source control as opposed to controlling the end product.

(DM) Source control is a great idea and I think it needs to be implemented but, copper for example, which is one of the worst pollutants out there, a lot of the pipes are made of copper, and so having some sort of control at the front of the pipe will make no difference on what is coming out at the end. And it is very difficult to police source control and very expensive. People talk about costs. How are you going to make sure that "Joe" car shop doesn't dispose any oil down the drain in his shop, which gets pumped, or accidental spills aren't controlled by source control? While it is a good part of the solution, there is no way it can be effective.

(DS) And I think Environment Canada in a letter to us confirms that. Again, they state exactly, treatment is significantly more effective than source control and they indicate why. They do say, and I feel very strongly about it, it is an important component, it is an important piece of the puzzle. We need to continue to reduce it at source, but it will never, because of all of the chemicals, pharmaceuticals it will never replace treatment.

(JW) On the issue of source control, almost all the rules and regulations that I have seen in government source control, they basically set limits about what can go into the sewage system. And with few exceptions, almost anything can. So, when they legislate, they say if you are going to pollute, then you will have to pay us to do it. It doesn't stop stuff from getting into the system. It imposes fines on polluters, and the polluters are likely to try to not pay the fine, so it comes down to issues of increased policing and monitoring. So, if you look as source control regulations, it does not stop you from putting things into the system.

(PW) Just because Denise had referred to Environment Canada's views on this, I would like to elaborate a bit. Source control is generally targeted to the industrial and commercial sectors and it doesn't target the residential sector. If you look at typical removal rates from source control, it's generally about 50% tops, although I believe the CRD has found for some contaminants as high as 70% for mercury, I believe. A number of contaminants are in the sewage ,which will not be capped, so what treatment does is take out a wide range of contaminants that aren't necessarily targeted by source control.

(Q) Until I heard Stephen and Denise talk about alternative options to the traditional sewage treatment I was discouraged. Now I'm quite excited about the possibilities of small scale and anaerobic treatment facilities. I am a resident of Esquimalt, and Macaulay Point is a great source of concern to the residents and should be to all residents of Greater Victoria. My question is I would like to find out why it is that the CRD bothered conducting another study yet again looking into expanded treatment at Macaulay Point. How could you justify this to anybody in this region that this would be a suitable place for expanded treatment?

(DS) First of all I won't justify anything the CRD Board has made - the decision of the CRD a couple of weeks ago for the reason that we have a study, we are spending $500,000 of your tax dollars on a study is to address some of these questions, what are the possibilities of small community treatment plants. We don't have those answers yet, and so I was not ready to make any decision about what happens at Macaulay Point until we have this sort of information, because it is valuable, technical information that will help us make an enlightened decision, not about whether to treat, but how, where, and the right kind of treatment.

(EI) I wanted to answer Dr. Peck's question concerning human health. I think you know that the second leading killer in the world are diarrheal diseases. Diseases of the gastro intestinal tract. Most of this obviously occurs in the 3rd world where they don't treat sewage. I think we have dodged the bullet and I don't know why, but let me try to offer an explanation. I think generally because we have a healthy population. There is no source of these contaminants. I think we have dodged the bullet. Now wait just a minute until some of us start getting sick, and then we will see that we get some action. Dr. Peck, you might then decide it's time to come back to work. Anywhere here is my take home message and it concerns source control. Too much emphasis has been placed on source control. In my mind the source must be controlled in the substance we flush down the toilet. That is the major source of pollution out there. We can control to a certain extent, we can control how much grease the restaurants pour into the sewer. We can do things like that. What we can't do is see what the average household pours down the kitchen sink. My take home message is that there is no such thing as clean sewage. Source control, everything you want, but you are still going to let something there, otherwise you wouldn't need a sewage system. We haven't paid enough attention to that. There is absolutely no way to measure what happens to that stuff once it leaves the outfall. That's my take home message.

(JW) To all the presenters, thank you very much. You made this happen. And, to everyone that participated, thank you for coming.

APPENDICES

PRESENTATION AGENDA

Victoria's Sewage: Separating Myth from Fact

CAMOSUN LANSDOWNE CAMPUS - GIBSON AUDITORIUM

Sept 26, 2005, 7 pm - 9 pm

MC – Jack Woodward

7:00 – 7:20	Dr. E. Ishiguro - Victoria Bight: Mother Nature's Sewage Treatment Plant?
7:20 – 7:35	John Werring, RPBio - Victoria's Sewage: The Story You Haven't Heard
7:35 – 7:50	Phil Wong, Environment Canada - Federal Strategy, Shellfish Closure & New EDC Science
7:50 – 8:05	Dusan Markovic, MSc - Heavy Metals in Victoria's Untreated Sewage
8:05 – 8:20	Randy Alexander, Ministry of Environment - Provincial Regulations and the CRD
8:20 – 8:35	Stephen Salter, PEng - Resources From Sewage: Power from the People!

8:35 – 8:50 Denise Savoie, Chair CRD Roundtable on the Environment - The Road to Treatment

8:50 – 9:00 Questions

9:00 – 9:15 Break

9:15 – 9:45 Discussion hosted by Jack Woodward

VICTORIA SEWAGE BACKGROUND

- **Mid 1960** Victoria's beaches are covered with feces as multiple outfalls discharge sewage directly at shoreline. Decision made to combine outfalls and pump raw sewage 300 meters offshore;
- **Late 1960's** Victoria makes the decision to install long outfall pipes (1000 meters) instead of building a treatment plant;
- **Early 1970's** Victoria builds long outfall pipes;
- **Mid 1970's** Victoria installs screens after sewage white fish are found on the shores of San Juan Island, USA;
- **Late 1980's** Hartland landfill leachate is diverted to Victoria's sewer lines after the leachate killed 1 lake, 2 creeks and 1 inlet;
- **1990** Dr Tony Boydell finishes 14 month study into CRD's Liquid Waste Management concluding that CRD has 2 options for sewage treatment – both involve secondary treatment – several small plants or one big plant.
- **1991** Sewage Circus is published by Dew-Jones, ex CRD engineer, to defend long outfall dilution solution. This was written, in part, to discredit the Boydell study
- **Early 1990's** study concludes that CRD can create a sewer use bylaw that allows landfill leachate into sewers. Same study says the leachate must be treated if it was pumped directly into the ocean and cheapest way to treat it is secondary treatment plant;
- **Late 1992** CRD referendum on sewage treatment. Three options/taxpayer cost per year: source control/$4, primary/$231 or secondary/$336. Treatment cost estimates were questionably high and effectiveness of source control was the promoted beyond ability to deliver. Still treatment captured 43% of votes;
- **Early 1993** Boycott launched against Victoria's tourism sector in response to the no treatment vote. Conferences cancelled at Victoria Conference Center and hotel bookings lost;
- **1993** BC Premier Harcourt & Washington Governor Lowry sign agreement with Victoria installing primary treatment by 2002 and secondary by 2008;
- **1993** CRD writes BC minister committing to install secondary treatment within 25 years;
- **2000** CRD submits a 25 year Liquid Waste Management Plan (LWMP), removing the commitment to treatment just prior to submitting;

- **2002** Environment Canada report shows health risks and environmental risk from Victoria's raw sewage discharge;
- **2003** BC Government approves the CRD's LWMP with no plan for treatment. This essentially kills the 1993 agreement with Washington State;
- **2004** Markovic study shows heavy metal contamination caused by Victoria's outfalls.

Today

- 129 million litres of raw sewage a day pumped into ocean at entrance to Victoria harbour;
- A 60 sq. km. area around the outfalls is closed to all shellfish harvest;
- One main reason the local orcas have been listed as endangered is because of chemical contaminants bioaccumulating in their bodies, many found in Victoria's raw sewage;
- Sewage plume reaches surface at least 8 months of year;
- Oil and grease reaches the surface most days, multiple sea bird species feed on this;
- Surface Fecal Coliform levels at times exceed recreational standards by 17 times (3400CFU/100ml);
- Fecal Coliform contamination (an indicator of sewage pollution) extends 2.5 km from the outfall;
- There is a potential health risk to recreational users such as windsurfers, kayakers and sports fishers who use the waters near the outfalls;
- Sediment quality environmental protection guidelines are exceeded daily on the seabed around the outfalls;
- The tide carries the surface sewage plume towards the Esquimalt Lagoon shoreline;
- The CRD's source control program continues with limited capacity to remove pathogens, heavy metals and many toxic chemicals from the waste stream;
- The CRD's 45 year plan to twin existing outfalls.

VICTORIA SEWAGE ALLIANCE FAQS

Don't currents in the Strait of Juan de Fuca dilute the sewage rapidly?
Contrary to what we've been told, the currents near the outfalls do not carry the sewage out into the Pacific. Rather, because currents change direction with the ebb and flow of the tide, a lot of the sewage either stays nearby or flows back into Georgia Strait. Also, dilution does not get rid of what's in sewage (organics, pathogens like hepatitis, heavy metals or chemicals) and therefore it doesn't prevent the long-term damage to the environment, or the waste of the energy and mineral resources carried by sewage.

Victoria has concentrated on source control - isn't this enough?
Source control is an important part of keeping our environment healthy, and responsible municipalities both manage source control and treat their sewage. However, according to a Decision Note prepared by the Ministry of Water, Land and Air Protection (MWLAP) staff for the

Minister on February 20, 2002 concerning Victoria's raw sewage situation, *"* **source control has limited capacity to reduce contaminants … Treatment is not only more effective in reducing contaminants, it is effective immediately upon implementation and will remove a wide array of contaminants not targeted under source control**."

Isn't Victoria's sewage non-industrial, unlike most other cities, so we don't need treatment?
Most industrialized cities have a sewer use bylaw similar to Victoria's sewer use bylaw, which ensures all industrial waste is pre-treated before entering the sewers. These bylaws will put industrial city wastewater on a level similar to Victoria's, however all of these more industrialized cities will then have sewage treatment before discharging sewer effluent into surface water.

Science has not proven that Victoria's raw sewage harms the environment, has it?
Yes it has. In fish toxicity tests on Victoria's sewage, the fish died within 20 minutes[1]. In identical tests on pulp mill effluent, fish routinely survive for more than 96 hours[2]. These are just a few examples of the growing amount of independent scientific data (i.e. not conducted by a government agency biased against sewage treatment) that supports the need for treatment.

Victoria has discharged raw sewage since 1894; why change now?
In 1894, those responsible for Victoria's sewage did what they were first asked to do - get rid of it. In that era industry also discharged it's effluent untreated, but as our understanding of industrial effluent changed, so did society's tolerance for pollution. We now understand that raw sewage includes many harmful and toxic chemicals, therefore, environmental laws no longer tolerate raw sewage discharges from municipalities.

Shouldn't we wait for better technology?
Treatment technology will always be improving, and doing nothing is no longer an option. We have the technology to treat our sewage. We know that secondary sewage treatment removes a large amount of organic matter, as well as many chemicals such as heavy metals and PCBs and keeps them out of the marine environment.

Isn't sewage treatment too expensive in Victoria?
The new sewage treatment plant in North Saanich was designed to serve 50,000 and cost $20 million to build. Even if we scale by a factor of ten to estimate the cost of a treatment plant for Victoria, part of the $200 million should be paid for by the Province, and part by Federal Infrastructure funding, as is the case in Halifax and other BC municipalities. Surplus Federal land is also available in Victoria for building sites. After operating costs and depreciation, we estimate that the cost per household would be well under $100/year, and currently residents of Central and North Saanich, Sidney, and Ganges pay about $100/year for their sewage treatment - far less than a penny a flush. Strangely enough, if Victoria residents check their utility bills and property tax notices, they'll see they're already paying about $100/year for "sewage". Finally, can we really afford not to protect our marine environment? Is it really an option to go on ignoring Federal and Provincial environmental laws?

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[1] The results of industry standard fish toxicity (LC96) tests on samples of sewage taken by the Sierra Legal Defence Fund on September 23, 1993; February 10, 1994; and March 23, 1998.

[2] Other BC municipal sewage treatment plants and industry must conduct fish toxicity (LC96) tests monthly; results are available to the public through the Ministry of Environment.

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