DISTRICT OF SOOKE
WASTEWATER TREATMENT
AND COLLECTION SYSTEM

OPERATED BY
EPCOR WATER SERVICES INC.

2011 ANNUAL REPORT
REGISTRATION 17300

EPCOR

District of Sooke

Table of Contents

INTRODUCTION

The Sooke wastewater collection and treatment system is owned by the District of Sooke and operated by EPCOR Water Services Inc. The system services the core area of Sooke.

The system consists of:

- 43 km of collection system piping
- 463 manholes
- 5 pump lift stations (Sooke Road, West Coast Road, Helgesen Road, Sunriver, Prestige)
- A secondary wastewater treatment plant with disinfection
- A marine discharge through a 1.7 km long, 30 m deep outfall

The treatment plant uses a Sequencing Batch Reactor (SBR) treatment process with UV disinfection to provide secondary wastewater treatment. Secondary treatment removes over 95% of the total suspended solids and high levels of other contaminants, providing significant environmental benefits to the District of Sooke.

The treatment plant has a design capacity of 3,000 m3/day (annual average daily flow), and a peak wet weather flow capacity of 6,900 m3/day. The plant is expandable by an additional 3,000 m3/day (average daily flow).

Construction of the Sooke collection system and wastewater treatment plant began in 2004 and the system was commissioned in November 2005. Individual domestic and commercial hook-ups began in January 2006 and continued throughout 2006 and 2007, with the majority completed by December 2006. Additional connections have continued since that time for new construction in the core area.

Table 1: Acronyms

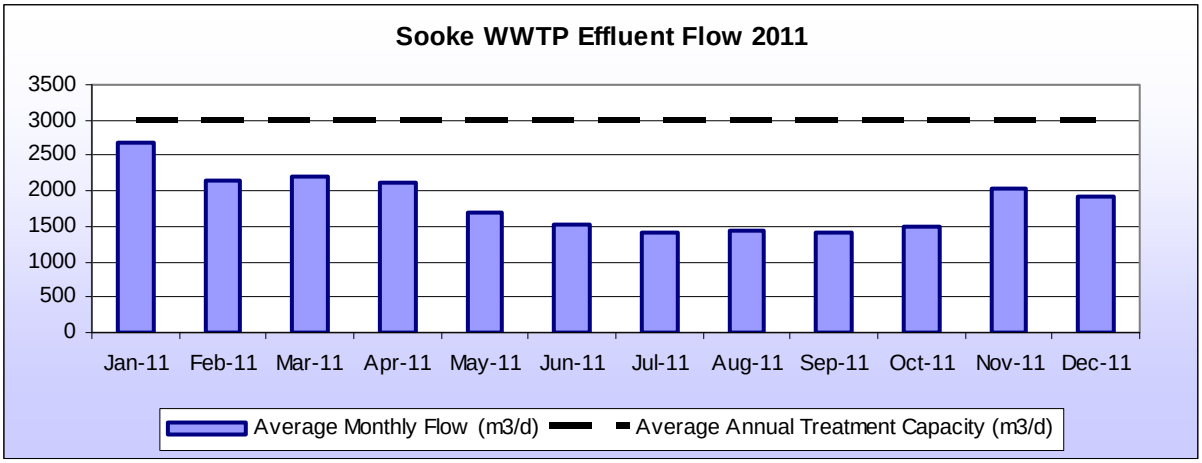
Acronyms /Abbreviations	Description
mg/L	Milligram per litre
BOD	Biochemical Oxygen Demand
FC	Fecal Coliforms
CFU/100ml	Colony Forming Units Per 100 millilitres
COD	Chemical Oxygen Demand
NH_3	Ammonia
TSS	Total Suspended Solids
m^3/day	Cubic meters per day (flow)
MSR	Municipal Sewage Regulations
BCEOCP	British Columbia Environmental Operators Certification Program
I/ I	Inflow and Infiltration
OC	Occupational Certificate
WWTP	Wastewater Treatment Plant
AVE or AVG	Average
IC	Inspection chamber

OVERVIEW

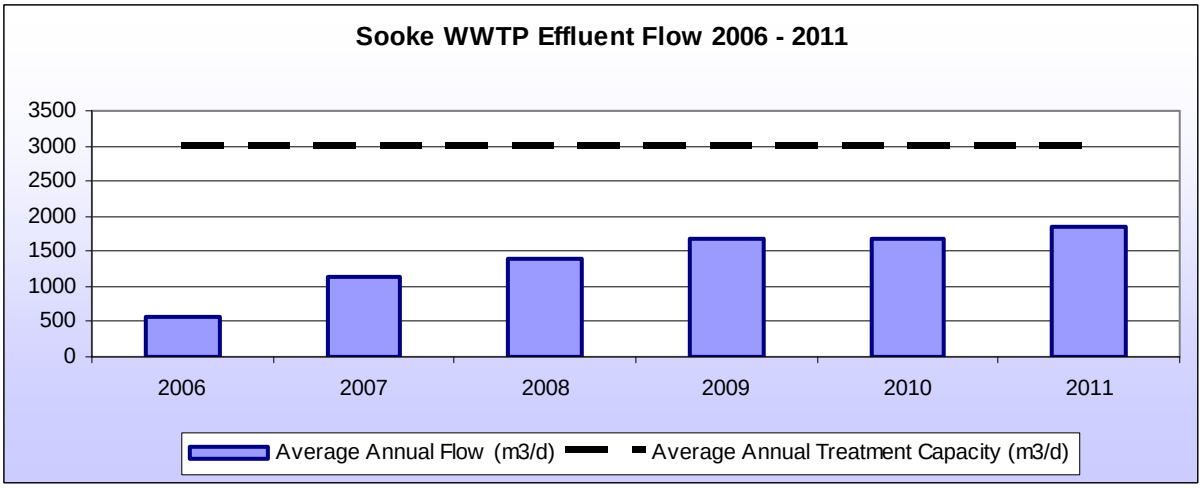
Plant Flow

The annual average effluent flow treated in the plant during 2011 was 1841 m^3/day. Graph 1 summarizes the monthly average flows during the year compared to the plant design capacity (annual average flow). Graph 2 summarizes the average annual flow through the plant each year since 2006. The flow has gradually increased each year as new connections are made to the sewer system.

Graph 1: WWTP Monthly Effluent Flow 2011



Graph 2: WWTP Annual Effluent Flow 2006 - 2011

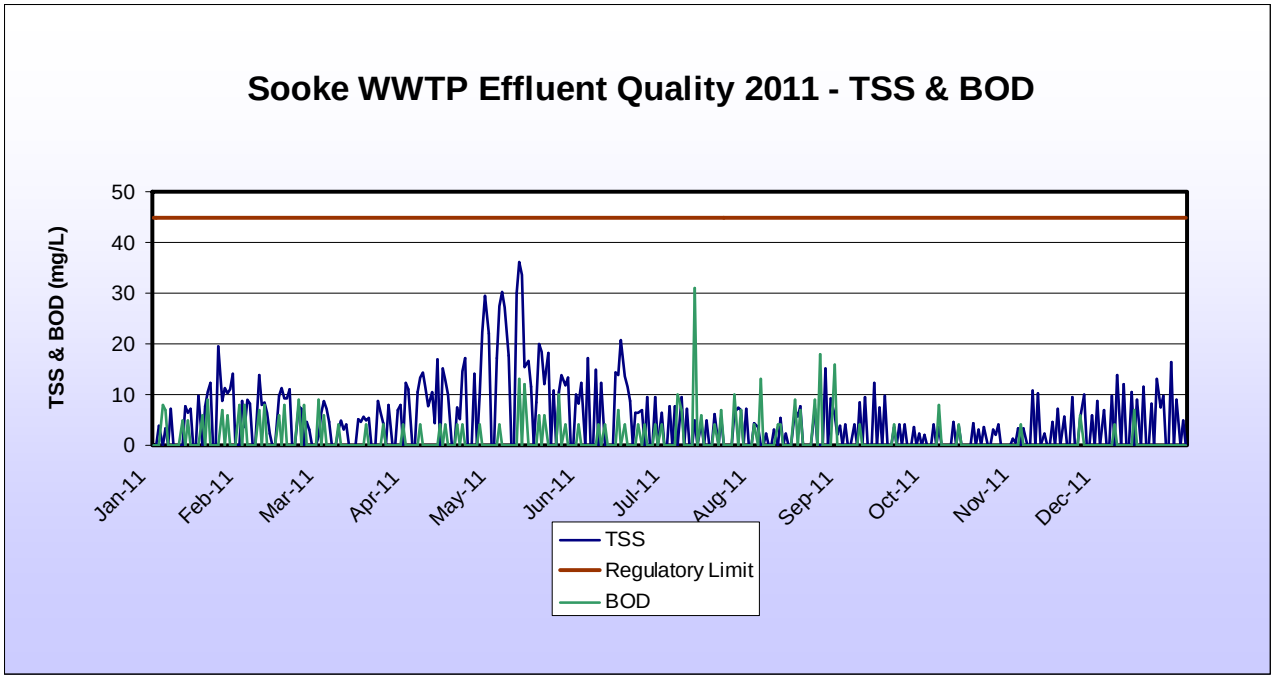


Plant Performance

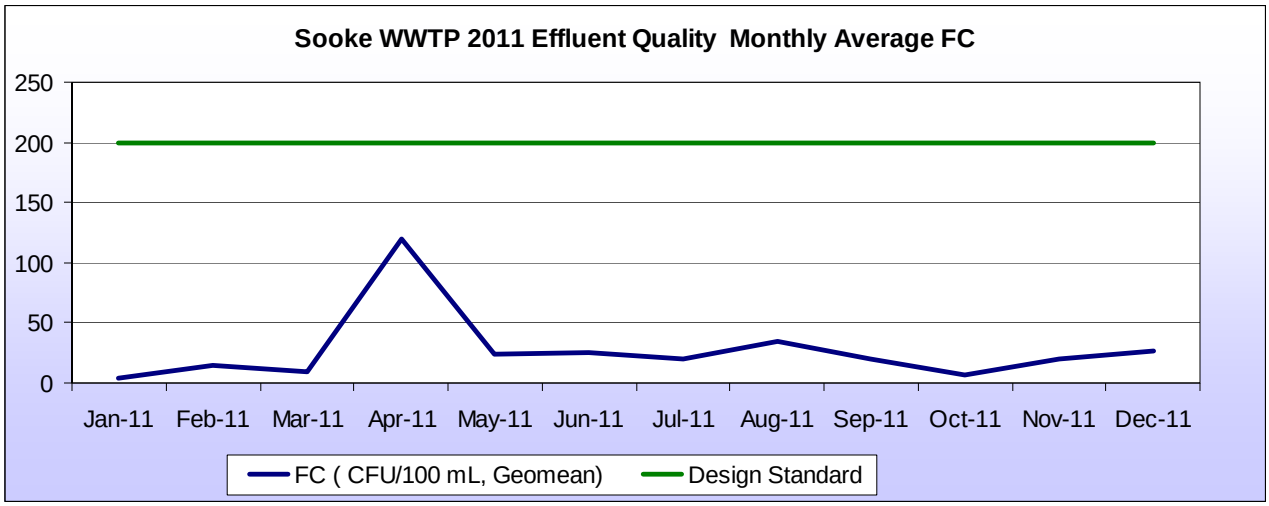
The wastewater treatment plant is performing very well. Three of the important parameters monitored at the plant are total suspended solids (TSS), biochemical oxygen demand (BOD) and fecal coliforms (FC).

Graphs 3 and 4 summarizes the external and internal lab test results for TSS and the external lab results for BOD and FC in the plant effluent compared to the regulatory standards. The TSS, BOD and FC in the plant effluent were consistently better than the regulatory requirements throughout the year. Further information on the performance of the plant throughout the year is contained in the Operations section of this report.

Graph 3: WWTP Effluent Quality -TSS & BOD



Graph 4: WWTP Effluent Quality - FC



OPERATIONS

Certification

The wastewater treatment plant is a Class III Wastewater Treatment Plant, Certification # 1358, in accordance with the Environmental Operators Certification Program.

Table 2 summarizes the operators working at the Sooke WWTP in 2011 and their certifications.

Table 2– Operator Certification

Name	Position	Qualifications
John Reynolds	Lead Operator	BCEOCP Certified: Level IV Municipal Wastewater Treatment & Level II Wastewater Collection Operator
Shawn Pearson	Operator	BCEOCP Certified: Level I Municipal Wastewater Treatment & a MU Wastewater Collection Operator Level I

Water Quality Standards & Results

The detailed water quality standards for the treatment plant operation will be defined in an Operational Certificate (OC) that the Ministry of Environment will be issuing to the District of Sooke. Operational Certificates are not issued until all three stages of a community's Liquid Waste Management Plan are completed and approved. The District of Sooke Liquid Waste Management Plan was approved by the Ministry of Environment in April 2011. Contained in the approved plan is a proposed Operational Certificate, which provides more extensive standards and guidelines for the operation of the wastewater treatment plant than is contained in the plant registration that was submitted by the District to the Ministry in 2002, and in the general guidelines provided in the Municipal Sewage Regulations (MSR). Consultation with the Ministry of Environment regarding the final Operational Certificate occurred throughout 2011, and the OC is expected to be finalized early in 2012.

Table 3 summarizes the regulatory requirements defined in the provincial Municipal Sewage Regulations and the proposed Operational Certificate from the approved Liquid Waste Management Plan.

Table 4 summarizes the water quality results and other key operational data from the treatment plant in 2011. More detailed water quality information is contained in Appendices 1 and 2.

Appendices 3 and 4 contain the Receiving Environment Monitoring reports from 2011. The water quality around the discharge point of the outfall continues to be very good.

Table 3 – Summary of Regulatory Requirements

Parameters or Description	MSR		Proposed OC	
	Limits	**Frequency**	**Limits**	**Frequency**
Ammonia	NA	Quarterly (Grab)	NA	NA
BOD_5	<45 mg/L	Monthly (Grab)	45 mg/L	Monthly (Grab)
Fecal Coliforms	<2,550-36,400 CFU/100 ml * Geometric Mean	5 samples GM/ 30 days	<200 CFU/100 ml By Geometric Mean	5 samples GM/ 30 days (Grab)
pH	6.0 - 9.0		6.0 - 9.0	Monthly (Grab)
Receiving Environment Testing	Required	Yearly	Sampled between Aug 1 and Aug 31	1/year. Report submitted with annual report within 120 days of calendar Year
Operator Certification	Required notification to regulator when there is a change in operator with the highest certification level in the plant	NA	Required notification to regulator when there is a change in operator with the highest certification level in the plant	NA
Reports, Annual	As requested by Director	As requested by Director	1/year	Within 120 days of calendar Year
Reports, General	Data submission 2 times per year		Quarterly	Within 31 days of quarter ends
Flow, Average	To be determined	2/week	3000 m^3/day	2/week
Flow, Maximum	To be determined	2/week	14, 400 m^3/day	2/week
Toxicity (LC50, 96hr)	100% (non-acutely acutely toxic)	Every 2 years	Not Required	NA
Effluent TSS	<45 mg/L	Monthly (Grab)	45 mg/L	Monthly (Grab)
Post of Outfall Sign	Required		Erect sign above High water Mark.	NA
Out fall Inspection	Required	Every 5 years	Required	Every 5 years. Next Due 2013
Biosolids Management	NA		Shall be transported to an approved receiving facility	NA

*<200 CFU/100 mL on a geometric mean on the last 5 samples in 30 days at the edge of the dilution zone for recreational water use and <14 CFU/100 mL for shellfish bearing waters. The dilution modeling for the Sooke outfall predicts of minimum dilution zone of 182:1 so the end of pipe limit is 2,550 - 36,400 CFU/100 mL geometric mean.

** All regulated tests are conducted by CALA accredited laboratory.

Table 4 - Sooke WWTP 2011 Monthly Water Quality Summary

	Influent			Effluent															Bio Solids Shipped	
	BOD mg/L	TSS mg/L	NH_3 mg/L	Flow m^3/day			BOD mg/L			TSS mg/L			NH_3 mg/L			FC CFU/100mL			Kg	# of Loads
	Ave	Ave	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Geo Mean		
Regulatory Limit *					14,400	3,000		<45			<45							<200		
January	132	135	19	1670	4864	2680	6	8	7	8	8	8	9	10	9	<2	32	4	73,790	7
February	171	226	26	1723	2711	2142	4	6	5	6	10	8	16	17	17	<2	60	15	54,150	5
March	209	220	31	1725	3079	2205	2	4	3	3	9	6	18	26	22	4	24	10	62,940	6
April	144	122	26	1640	3183	2117	4	9	7	14	14	14	16	24	20	<1	2400	120	52,060	5
May	135	161	21	1506	2365	1707	7	19	13	10	38	24	19	20	20	1	780	24	70,010	7
June	191	222	35	1223	2226	1522	<4	12	7	4	14	9	16	21	19	6	210	25	69,080	7
July	293	164	35	1311	1577	1423	<4	<4	<4	4	<2	9	7	7	7	6	70	20	39,820	4
August	165	186	32	482	1997	1430	<4	5	4	<2	6	4	10	10	10	7	140	34	48,410	5
September	331	325	43	1224	1589	1420	<4	12	7	<2	10	6	1	1	1	2	1000	20	28,860	3
October	231	219	53	1303	1810	1494	2	6	4	3	5	4	<1	2	1	1	65	7	52,170	5
November	na	213	253	1386	4008	2022	<4	<4	<4	4	9	7	na	na	na	6	382	20	56,540	6
December	236	227	31	1371	4016	1925	6	8	7	4	14	10	16	18	17	3	89	25	49,520	5
Total						670443													657,350	65
Annual	203	202	50	482	4864	1841	<4	19	6	<2	38	9	<1	26	13	<1	2400	27	54,779	5

*Proposed Operating Certificate (OC)

Operations, Maintenance & Improvements

Ongoing operations and maintenance activities and improvements occurred throughout the year. Highlights of those activities are included below.

TREATMENT PLANT

Biosolids

Bio-solids extracted from the centrifuge were trucked to the Hartland Landfill for disposal under Control Waste Permits #2011-061 and #2011-062. During 2011, on average, approximately 65 tonnes of bio-solids per month were taken to the landfill.

The biosolids handling system is a critical process that impacts many aspects of the plant operations, including treatment quality, odour control and disposal costs. Extensive optimization of the biosolids handling system occurred in 2011, beginning with a site visit from one of EPCOR's technical experts in January to review and assess the process. Extensive testing and monitoring of the system occurred during that time. Further optimization occurred during the spring and summer of 2011 based on the results of the January testing. The benefits of the optimization included more stable digestor operation with respect to improved thickening, reduced foaming and reduced odour generation. Centrifuge operation was improved to provide more stable solids concentrations and minimize impact of the centrate that is recycled through the treatment plant.

Operations

The treatment plant performed very well throughout the year, even when being challenged by several different conditions through the year. The TSS, BOD and FC design standards were met throughout the year.

In the month of January the District of Sooke experienced several large rain events. There was a total of 308.5 mm of rainfall for the month with 120 mm coming over January 5, 6 and 7. Another rain event from January 12 to 18 reported 139 mm of rainfall. These heavy rainfalls caused higher flows coming into the plant which required 24/7 monitoring of the UV channel flows. The normal high treatment quality was maintained throughout the events.

The plant experienced higher than normal TSS and FC counts in the effluent in the latter half of April and May. After extensive troubleshooting, adjustments were made to the plant to address seasonal changes in flow, temperature, digester optimization and a small filamentous bacteria bloom. The conditions were balanced by the end of May and treatment quality returned to normal parameters.

Reports about odours emanating from the plant were logged in March 2011 from some of the neighbours next to the treatment plant. There have been significant changes to the private property located to the north of the treatment plant since the plant was designed and constructed, resulting in

residential homes being very close to the treatment process with little buffer. This has had an impact on the operation of the plant in our efforts to maintain a long term 'good neighbour' relationship.

During the summer of 2010, these residents had also raised concerns regarding odours they were noticing from the plant. Through extensive consultation with the neighbours in 2010, it was determined that the source of odours was primarily from the headworks building and to a lesser extent from the solids handling room. The odours are intermittent depending on time of day, wind, weather conditions and season, and are more noticeable during warmer summer temperatures. Trials were completed with temporary carbon filtration systems installed on the ventilation exhaust for the two rooms during the summer of 2010, which made a noticeable improvement but wasn't completely successful in addressing the neighbours concerns. More permanent upgrades were identified in 2010 and were submitted to the District for budget approval. Budget approval was received in March 2011, and the carbon filters were ordered immediately. While awaiting the equipment delivery and installation, optimization of the digestor operation was being conducted to improve the solids handling process. A combination of the two initiatives were successful in improving the situation for the neighbours, because the owner of the neighbouring properties called in June to compliment the operation and relayed that odours were non-existent and the usual residents that help monitor odours around the plant had none to report.

Power monitoring in 2010 indicated that the plant power supply fluctuates significantly, and there are frequent shortages and dips in quality. These fluctuations began having an impact on some of the sensitive electronic equipment in the plant. A project was approved in the 2011 budget to install additional power surge protection equipment on the main power supply to the plant. The equipment was installed in May 2011.

In August, the two Sequential Batch Reactors (SBRs) at the plant were cleaned. The process entailed draining the basins (one at a time), manual cleaning of the floors of the basins, and a vacuum truck running steadily to clear out the content. With the basins emptied, the operators completed maintenance on the equipment, ensuring all of the diffusers were cleaned, intact and operating properly. The extensive procedure took approximately 1week per basin, and went very efficiently and safely. However, there were heightened odours and noise from the plant during this maintenance and cleaning, and opportunities for reducing the impact on the neighbouring residents have been identified and will be incorporated into future cleaning activities.

There were higher than normal fecal coliform test results early in September. The suspected source was the ultra violet lamps and effluent channel, which may have been extenuated from the SBR basin cleaning activities in August. After cleaning the channel and the lamp sleeves, the fecal coliform count was substantially lower.

Maintenance

Continuous and ongoing maintenance of the treatment plant equipment was conducted throughout the year. Equipment inspections, preventative maintenance and repairs were completed including the following activities:

- Emptying and cleaning of both SBR basins

- Backup power generator monthly run tests and annual load testing
- Onsite lift station inspections and annual maintenance
- DO probe calibrations and maintenance
- Oil changes for rotating equipment such as digester blowers, SBR blowers, SBR decanter gearboxes
- Monthly rotating equipment maintenance
- Regular greasing schedules for all rotating equipment
- Digester blower belt changes
- Annual maintenance of UV bulbs and channel
- SBR # 2 Decanter motor replacement
- Replaced UPS (Uninterrupted Power Supply) for a Lift Station Communication PLC
- Replaced control screen for the centrifuge PLC
- Replaced PLC components of the centrifuge controls system
- Installed incoming power surge protection device
- SBR aeration blower VFD replacements
- SBR aeration valve, valve motor and actuator replacements

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Plant Optimization – UV Channel Levels

There have been periods of time each winter when the flows into the plant have increased due to inflow & infiltration (I/I) in the collection system. I/I is a common occurrence in all sanitary wastewater collection systems due to rainwater entering the collection system piping through rainwater cross-connections, manholes and piping. The program that is in place to minimize I/I is discussed further in the Collection System section of this report.

The increased flows into the plant have historically resulted in the water levels in the UV Channel rising for short periods of time during the basin decant cycles that require special operations oversight to prevent overflows of the channel. Based on the experience gained in the last few years of operating the plant and collection system, it was possible to take that data and experience and optimize the UV Channel operation in 2011. The data collected from the first few months of 2011 was valuable due to the particular large rain events that occurred during that period.

A technical troubleshooting team consisting of representatives from EPCOR's treatment and controls departments and the manufacturer of the SBR plant (Zylem Sanitaire) was assembled for the plant optimization activities. Over the spring and summer of 2011, testing was done with the SBR basins and UV Channel in order to simulate high flow conditions. Based on the data that was collected and analyzed, several adjustments were made in the fall of 2011 to improve plant performance, including adjustments made to the influent gate valve positions and decanter speed settings. In early December, the final optimization activities were completed, which consisted of controls system programming changes that raise the decanters if the UV Channel reaches a high level.

The results of the optimization activities were monitored in the fall/winter of 2011 and proved to be very effective. Several storm events occurred in the late months of the year that increased the flows into the plant, and the UV Channel levels remained within normal ranges throughout the events. If the UV channel levels had risen above the normal ranges, the decanters would have raised to prevent any overflows of the channel.

LIFT STATIONS

Regular maintenance was conducted at the stations throughout the year including inspections, wet well cleaning, generator run tests, annual generator servicing and load tests and annual pump inspections and servicing.

In 2011 an additional lift station was added to the Sooke collection system. The Prestige Hotel lift station was put in to service on April 5th, in a temporary operation mode with a temporary power supply from the hotel and a wireless based alarm system. Once BC Hydro installed the power lines associated with the new boat launch and dock, the permanent power supply line to the lift station complete with an emergency backup power generator was connected in November. The telecommunications systems complete with permanent alarm and control systems and monitoring at the treatment plant SCADA were commissioned in December.

Power outages are a normal part of operations in Sooke. Outages at the lift stations occurred in January, June and November. All stations operated well on standby generator power during the outages.

Calls were logged regarding odours at the Sooke Road lift station at various times of the year. The carbon was changed in the odour control system regularly to minimize odours.

On January 26 a release of raw wastewater occurred from the valve chamber at the Sooke Road lift Station. On arriving at the site, it was estimated that approximately 0.2 cubic meters had been released to the ground around the lift station. A vacuum truck arrived on site to remove wastewater from the containment area. PEP was notified of the spill and we were issued report number 102853. The cause of the overflow was a bolt that had broken on a check valve cover which allowed wastewater to exit the side of the check valve cover. The bolt was replaced and the lift station was put back into service. A cleanup of the ground in the area of the release was completed.

A release of raw wastewater occurred at the Sooke Road lift station site on February 18, 2011. Operators were notified of the release at 12:30 pm. Vacuum trucks were immediately mobilized and onsite containment began. The release was substantially halted by 1:50 pm when the vacuum trucks arrived at the site. Approximately 3 cubic meters of wastewater were released after it was discovered. Authorities were notified immediately, including PEP, the District of Sooke, and the neighboring oyster processing plant. Environment Canada responded to the PEP report, and due to the chance that wastewater reached the foreshore; a shellfish closure was placed in the area. The release was from the valve chamber at the lift station. A broken bolt was discovered on one of the

check valves located in the valve chamber. Repairs were completed and the lift station was placed back in service by app. 5:30 pm. Extensive water quality monitoring was conducted in the watershed area around the lift station for the following week to assist in demonstrating minimal impact to the receiving environment from the release. The shellfish closure was lifted by March 4, 2011, approximately 1 week earlier than originally anticipated. An extensive evaluation of the incident and the lift station equipment was conducted to determine the impact of the recently implemented, more stringent, shellfish closure regulations and how to minimize the potential for future closures.

The investigation of the two incidents at the Sooke Road lift station resulted in various actions and recommendations at this lift station and the other stations in the system. Since the cause of the bolt failures during the two incidents is suspected to be due to a manufacturing defect, all of the bolts on the check valve covers at this station and the other two similar stations (West Coast Road and Helgesen Road) were replaced. Modifications were made to the valve chamber drains at the three lift stations. Improvements were made to the site containment and alarm systems at the Sooke Road lift station, and similar improvements are recommended for the other 3 lift stations in the system. Consultations were conducted with Environment Canada in the spring of 2011 to assess the impact of the recently implemented, more stringent, commercial shellfish regulations. In order to further protect the local shellfish industry, a capital project is being proposed for 2012 that will further reduce the risk of overflows from the lift stations and minimize the number of commercial shellfish closures in the future. The proposed modifications include redundancy for components of the alarm and controls systems, additional alarms installed at the lift stations, and more extensive spill containment measures at the critical lift stations.

A small overflow of wastewater occurred at the Helgesen Road Lift Station on March 3. The release was less than 0.2 cubic metres, below the reportable volume to PEP. The wastewater was contained in the soil around the release point. A power bump caused both pumps at the lift station to go into a fault mode and prevented the pumps from starting. The fault was cleared as soon as the operator arrived on site, and the pump station returned to normal operation. Upon investigation of the event, it was discovered that the high level alarm did not call out. A change was made to the PLC programming to ensure that the alarm would be received in the future.

A repair was completed at the Sooke Road Lift Station on March 11 to a weld on the pump discharge piping in the valve chamber. The lift station was offline for 2 hours while the repair was completed, and vacuum trucks were used to handle the wastewater during that period.

The odour control chemical storage system at the Sun River lift station was upgraded in September. The chemical supplier installed a kiosk with a 3000 gallon tank which holds larger quantities of odour control chemical. This minimizes the risks involved in transporting the chemical and provides more secure storage and product containment. The final secondary containment measures were installed in November, which includes secondary storage capacity for the chemical storage tank in the building and a drain from the chemical feed building to the wetwell. The odour control chemical is a nitrate based compound similar to a very mild liquid fertilizer, which is non-

toxic and non-hazardous. The inert characteristics of the compound further minimize any environmental impact associated with the chemical.

COLLECTION SYSTEM

The collection system operations were smooth during the year.

On January 21, EPCOR was notified of wastewater exiting from an Inspection Chamber (IC). The IC had been driven over and the broken lid had dropped down into the main from the house and had caused a blockage. The broken lid was removed and the system returned to operation.

Assistance with the new sewer connection and lift station for the Mariner's Village development occurred throughout 2011. The new lift station and collection system is expected to be in operation in early 2012. The connection of the new line from the Mariner's Village development to the Sooke Road main occurred on March 24, and operations staff were on site to assist with the connection to the collection system. The forcemain from the Sooke Road lift station was offline for 8 hours during the tie-in. Wastewater was handled with vacuum trucks while the forcemain was out of service. An inspection of a portion of the existing Sooke Road forcemain was completed at that time, and the line was found in excellent condition with no buildup of material in the pipe. Design reviews of the new lift station occurred during the summer of 2011 and inspections of the new collection system and lift station occurred in the fall and winter. Throughout the month of November and December, operators worked with contractors at Mariners Village as they installed the new lift station wetwell, pumps and backup power generator, pressure tested the new sewer forcemain, and began installation of communication lines and permanent power to the pump station kiosk.

An E-One pump service technician was in Sooke in March. Approximately 400 E-One residential pump systems are installed at homes in Sooke. The service technician completed upgrades to the pressure switches on one model of the E-One pumps, located at approximately 30 homes. The upgrades were completed at no cost to the homeowners.

In May, a call from a concerned resident notified EPCOR through the On-call pager that there was debris coming from a manhole near their property. A vacuum truck service provider was called and the blockage was cleared with high pressure water. Due to nightfall and rainy conditions, it was difficult to determine the cause of the blockage. Once the blockage was cleared it was found a residential Inspection Chamber (IC) lid was damaged. The damaged IC lid was replaced the following day.

Assistance was provided several times during the year from complaints of odours within private buildings. 11 complaints were received and investigated. No collection system issues were found, and the cause of the odours was related with internal building plumbing issues.

A confined space rescue review was executed between the members of the Sooke Fire Department and EPCOR's plant operators, manager, and safety consultant in October. The procedures for a

collection system confined space entry were reviewed with fire fighters trained for confined space rescues and the confined space entry equipment was assembled for practice.

A report of a manhole overflowing on Grant Road West (MH-GN-01) was received at 07:15 on December 15, 2011. The emergency response plan for wastewater releases was activated immediately. The Fire Department installed an onsite containment dam downstream of the spill to capture as much material as possible. Once the vacuum trucks arrived and began pumping at app. 09:00, the overflow was quickly halted. Authorities were notified immediately, including PEP and the District of Sooke. Environment Canada was satisfied that the actions taken and the location of the release did not have any impact on the commercial shellfish harvesting in the area. The estimated volume of wastewater released was three cubic meters after the release was reported. A piece of broken 6" asbestos cement pipe (6-8" long) commonly used for water lines and a significant amount of grease were removed from the blockage area. Flow through the 10" collection main returned to normal by 4:00 pm. The sources of the blockage are suspected to be from construction activities and a restaurant in the immediate area upstream of the blockage location.

Development continues in Sooke, with new connections being added to the system regularly. EPCOR assisted throughout the year on reviewing development proposals, drawings and construction. The District of Sooke and EPCOR are working closely together to continuously improve the process involved for new connections being made to the sewer system to ensure quality standards are met and adequate system capacity and reliability is maintained.

Inflow and Infiltration (I/I)

During the year, the inflow and infiltration (I/I) investigation program was continued to monitor the system for I/I sources. I/I is the result of rainwater entering the wastewater system through direct sources (inflow) such as flooded manhole covers and rainwater cross connections, or through ground sources (infiltration) that enters the pipes through gaps in pipe joints, manhole walls or pipes. A regular I/I investigation program is important since the rainwater that enters the system provides unnecessary loadings on the pipes, lift stations and treatment plant. A few sources of I/I have been addressed since the system has been operational, including rainwater system cross connections and pipe that had been damaged from construction activities since the system was installed.

The investigation in the winter of 2010/2011 focused on the collection system upstream of the West Coast Road Lift Station since observations of lift station pump cycles and rainwater ponding/flooding during high rain events indicated that this area might have more sources of I/I than other areas. Several potential sources were identified including a few flooded manholes, manhole barrel seals, and potential cross connections to private property rainwater drains.

I/I maintenance work was completed in the summer and fall of 2011. The largest source of I/I that was identified was from flooded manholes, due to the large volume of water that can enter the system through the manhole cover holes. Three manholes were lifted to prevent flooding during

large rain events and another three manholes that might have the potential of being flooded were more securely sealed. Grouting repairs were completed on four manholes. The investigations into the potential cross connections from private properties continue in conjunction with the District of Sooke engineering and building departments.

On November 1, a section of collection piping upstream of the West Coast Road lift station was isolated for inspection and possible repair. The work was conducted to investigate an anomaly that was noticed during camera work in the line earlier in the year. The previous camera work had been done while the line was in service, which didn't allow a full inspection of the pipe. To take the line out of service, an above-ground bypass from a manhole on West Coast road to the West Coast road lift station was established that required three vacuum trucks to manage the flow. A camera was run through the line once it was isolated. The inspection showed that the pipe was in excellent condition. The anomaly noticed on the previous camera work must have been a blockage that has subsequently cleared from the line.

The investigations for further sources of I/I over the winter of 2011/12 began late in 2011. Due to very limited rainfall in November and December, there has been little opportunity for I/I observations.

Audits & Inspections

As part of EPCOR's commitment to quality, there are a variety of audits and inspections that are conducted as a regular part of the operations.

The fire department completed their annual inspection of the treatment plant on March 7 and found the site in good condition.

In August, Western Canada Fire Protection conducted the annual inspection and servicing of fire protection equipment at the treatment plant, including replacement of all fire extinguishers.

EPCOR's Health and Safety Specialists were onsite in March, June and October for training and assessment visits. Review of safety performances, training for lock out/tag out procedures, hot work permits, annual respirator fit testing, and reviews of personal protection equipment were completed. Business Continuity Plans and updates to Emergency Response Procedures were reviewed. A confined space planning exercise, that included the Sooke Fire Department, was also completed.

The laboratory analyses conducted onsite by the operators are part of an extensive Quality Assurance/Quality Control (QA/QC) program. Weekly and monthly tests are completed throughout the year to ensure the accuracy of the lab data reported from the site. In addition, an annual visit by an EPCOR laboratory quality assurance specialist is completed for lab equipment testing, training and a QA/QC audit. The 2011 audit was completed on March 16.

A representative from the Ministry of Environment was onsite on June 28 for the annual inspection of the Wastewater Plant and outfall area. A Compliance Review Record was issued from the Ministry to document the inspection, which identified a few recommended actions. A progress report was submitted to the Ministry of Environment on Dec 12 that summarized the actions taken to address the recommendations. The only remaining actions are associated with finalizing the Operational Certificate (OC). A meeting to review the OC with the Ministry is expected early in 2012.

CUSTOMER SERVICE

Customer Inquiries

EPCOR operates a customer service phone line to address concerns and answer question for the public. In 2011, a total of 112 inquiries were received (summarized in Table 5).

Table 5– 2011 Customer Calls

2011 Customer Calls		
Odour Observations	29	11 – private property building issues 10 - WWTP 5 - Lift station 2 - Collection System 1 - Compliment on WWTP odour improvements
Pump Related Queries	43	43 calls received from 27 properties 16 inquiries about maintenance, operation or types of pumps 13 inquiries that were non- pump repairs i.e. electrical issues, breaker resets or no issues found 9 pump repairs 5 inquiries regarding the manufacturer pressure switch upgrades
Construction Queries	10	Inquiries regarding new sewer/ IC connections
General Queries	30	Report of manhole overflow Broken IC Lids Missing manhole cover Missing catch basin grate Plant tours Community investment inquiries
Total	112	

Community Involvement

EPCOR continues to be committed to investing in communities in numerous ways. These investments include direct contributions and sponsorships, employee volunteerism, and our support as a major contributor to the United Way.

In 2011, EPCOR supported the community of Sooke in many ways. Continued annual support was provided to the Sooke Salmon Enhancement Society, Sooke Branch of Royal Canadian Legion Poppy Campaign and the Rotary Club of Sooke.

A highlight of 2011 was EPCOR's new Community Essentials Council, which provides grants to organizations that are aligned with essential elements that enhance the quality of life in the communities EPCOR serves. One of the successful applicants in 2011 was the Sooke Region Food CHI Society for the program "Engaging in the Essentials: People, Land, Food and Health". The Sooke Region Food CHI is a non-profit society aiming to foster awareness of the importance of local food production, support local food production and encourage food production opportunities to residents who may not have the resources to grow their own food. The program is strongly aligned with EPCOR's goals to contribute to the quality of life in the community it serves and was selected from many applicants due to these principles.

Over the year, EPCOR also supported the Sooke Fine Arts Society, the Charter's River Salmon Interpretive Center, the T'Souke First Nation Spirit Festival, the Sooke Jordan River Chamber of Commerce Spirit Fest, and the Sooke Lioness/Lions.

APPENDICES

1. Monthly Data Summary
2. Influent Metal Samples
3. Sooke Outfall May 2011 - Environmental Monitoring Report
4. Sooke Outfall November 2011 - Environmental Monitoring Report

JANUARY 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Jan	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfact-ants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC/ CFU**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC/ CFU**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**100mL**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**100mL**
1	1693																									
2	1775																									
3	1919		169																	4						
4	1670																									
5	2507											5								2						
6	4433																									
7	4089																			7						
8	3161																									
9	2728																									
10	2376																									
11	2309																									
12	2784	7.6	147	325	380	174	141	21	434	0.54									7.0	8	37	50	8	8	9	2
13	3234																			6						
14	3215																			7						
15	2868																									
16	4864																									
17	4220																			10						
18	3145																									
19	2779	7.6	90	257	240	89	128	16	450		7.0			50	8	6	10		6.9	8	36					32
20	2449											10						<2								
21	2629											12														
22	2507																									
23	2388																									
24	2367		182									19														
25	2223		144																	9						6
26	2217	7.8	188	375															6.9	11	53					
27	2295																			10						4
28	2035											13								9						
29	1960											14														
30	2323																									
31	1927																									
Min	1670	7.6	90	257	240	89	128	16	434	0.54	7.0	5		50	8	6	10	<2	6.9	2	36	50	8	8	9	2
Max	4864	7.8	188	375	380	174	141	21	450	0.54	7.0	19		50	8	6	10	<2	7.0	11	53	50	8	8	9	32
Avg	2680	7.7	153	319	310	132	135	19	442	0.54	7.0	12		50	8	6	10	<2	6.9	8	42	50	8	8	9	6 *

*Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

FEBRUARY 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Feb	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfact-ants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU 100mL**		**mg/l**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU 100mL**
1	2058											12						54		6						
2	2029	7.8	234	543	520	160	228	29	496	1.15										1	43	60	6		17	10
3	1803																			9						
4	2711											9								8						
5	2469																									
6	2394																									
7	2430											16								12						
8	2280										6.5	3	54	80	10	4		<2		11						
9	2020	7.6	216	473	530	182	224	23	441			11							7.1	5	72	60	10	6	16	60
10	1948																			6						
11	1995																			2						
12	2099																									
13	2520																									
14	2441																			10						
15	2366																			11						
16	2325		235	425																9	50					16
17	2318																			9						
18	1955											16								6						
19	2039																									
20	2076																									
21	2019																			8						
22	1887																			7						10
23	1814																									
24	1815		197	332																5	43					30
25	1984	7.6	260																	3						
26	1723																									
27	1978																									
28	2472																			2						
Min	1723	7.6	197	332	520	160	224	23	441	1.15	6.5	3	54	80	10	4		<2	7.1	1	43	60	6	6	16	10
Max	2711	7.8	260	543	530	182	228	29	496	1.15	6.5	16	54	80	10	4		54	7.1	12	72	60	10	6	17	60
Avg	2142	7.7	228	443	525	171	226	26	469	1.15	6.5	11	54	80	10	4		7	7.1	7	52	60	8	6	17	20

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

MARCH 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Mar.	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfactants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU 100mL**		**mg/l**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU 100mL**
1	2187													70	6	4				7						
2	2273	7.5	269	323	470	215	266	27	514	1									6.8	9	65	60	9	4	18	10
3	2152																			7						
4	2228																			5						
5	2219																									
6	2213																									
7	2196																			3						
8	1964																			5						
9	2172	7.7	210		380	203	174	34	526										6.8	3	46	50	3	<4	26	4
10	2570																			4						
11	2341																									
12	2092																									
13	2164																									
14	2610											6								4						
15	2641																			5						
16	3079	7.4	110	100								6							6.9	6	22		5			
17	2788																			5						
18	2357											6								5						
19	2122																									
20	2071																									
21	2180											7								11						
22	1748																			6						
23	1802	7.4	134																6.8	4						16
24	1773																									
25	1854		174	421								9								7	73					
26	1725																									
27	1823																									
28	2080																			7						24
29	1750																			8	52					
30	2207																									22
31	2974																			12						
Min	1725	7.4	110	100	380	203	174	27	514	1		6		70	6	4			6.8	3	22	50	3	<4	18	4
Max	3079	7.7	269	421	470	215	266	34	526	1		9		70	6	4			6.9	12	73	60	9	4	26	24
Avg	2205	7.5	179	281	425	209	220	31	520	1		7		70	6	4			6.8	6	52	55	6	4	22	10

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

APRIL 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
April	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfact-ants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU 100mL**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU 100mL**
1	2910											12								10						
2	2725																									
3	2454																									
4	2834											14								7						
5	3183											9								18						
6	2906	7.5	101	144	200	84	92	19	375										6.8	15	49	60	14	9	16	<1
7	2464											10								12						
8	2331											10								5						
9	2300																			10						
10	2201																			4						
11	2106											16								18						
12	2019																									
13	1884	7.9	204	425								13							6.9	18	59					310
14	2051																			13						
15	2126																			10						
16	2081																									
17	2082																									
18	1994											8								6						
19	1905																			5						
20	1724	7.6	136	264	380	203	152	33	444			14							7.0	16	84	80	14	4	23.8	148
21	1665																			17						
22	1645																									
23	1640																									
24	1734											12								16						
25	1698																									
26	1720																			10						
27	1808											21								23						2400
28	1873																			30						230
29	1659																			22						
30	1777																									
Min	1640	7.5	101	144	200	84	92	19	375			8							6.8	4	49	60	14	4	16	<1
Max	3183	7.9	204	425	380	203	152	33	444			21							7.0	30	84	80	14	9	24	2400
AVG	2117	7.7	147	278	290	144	122	26	410			13							6.9	14	64	70	14	7	20	120

*Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

MAY 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
May	Effluent flows	pH	TSS	COD	COD	BOD	TSS	NH_3	Conductivity	Surfact-ants	pH	TSS	COD	COD	TSS	BOD	NH_3	FC	pH	TSS	COD	COD	TSS	BOD	NH_3	FC
Regulatory Limits	m3/d		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm at 25 C	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100mL
1	1739																									
2	1733																			17						
3	1821											35								20						
4	1745	7.7	232	427	480	173	204	26	763	1		36							7.0	17	63	100	38	19	20	780
5	1644											35								20						
6	1644																			18						
7	1680																									
8	1728																									
9	1702		258	428																30						
10	1657		217	341								34								38	127					
11	1506																			34	104					
12	1583											9								22						
13	1558											20								13						
14	1698											12								11						
15	2113																									
16	2365		109	258		97	117	16												7	56		10	7	19	1
17	1940																			20						
18	1760																			18						9
19	1699																			12						
20	1669											29								7						
21	1698																									
22	1626											17								4						
23	1642																									
24	1618	7.6	202	378								10							6.9	11	65					120
25	1635											11								17						
26	1676											9								15						10
27	1586											8								19						
28	1527																									
29	1596																									
30	1631											11							7.0	9						
31	1685											11								6						
Min	1506	7.6	109	258	480	97	117	16	763	1		8							6.9	4	56	100	10	7	19	1
Max	2365	7.7	258	428	480	173	204	26	763	1		36							7.0	38	127	100	38	19	20	780
AVG	1707	7.6	203	366	480	135	161	21	763	1		19							7.0	17	83	100	24	13	20	24

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

JUNE 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
June	Effluent flows	pH	TSS	COD	COD	BOD	TSS	NH_3	Conductivity	Surfact-ants	pH	TSS	COD	COD	TSS	BOD	NH_3	FC	pH	TSS	COD	COD	TSS	BOD	NH_3	FC
Regulatory Limits	m3/d		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm at 25 C	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100mL
1	1498	7.2	129	129	370	142	172	26	538			14							7.0	9	80	80	14	12	21	
2	1430																									
3	1518																			17						
4	1511																									
5	1659																									
6	2226											22								7						6
7	1450																									
8	1448																			12						20
9	1427																									
10	1650			604																	70					
11	1357																									
12	1454																									
13	1471											11								18						
14	1453											9								19						
15	1223																			21						
16	1532	7.4	253	465								8							6.8	19	57					210
17	1520																			12						
18	1525											7								10						
19	1487																									
20	1568											8								5						
21	1606																			6						
22	1559	7.5	268	692	590	240	272	45	664			7							6.6	9	79	60	4	<4	16	10
23	1619																									40
24	1515											9								10						
25	1406																									
26	1737																									
27	1559											10								9						
28	1489																									
29	1426																			6						
30	1351																									
Min	1223	7.2	129	129	370	142	172	26	538			7							6.6	5	57	60	4	<4	16	6
Max	2226	7.5	268	692	590	240	272	45	664			22							7.0	21	80	80	14	12	21	210
AVG	1522	7.4	217	472	330	191	222	35	601			11							6.8	12	72	70	9	7	19	25

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

JULY 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
July	Effluent flows	pH	TSS	COD	COD	BOD	TSS	NH_3	Conductivity	Surfactants	pH	TSS	COD	COD	TSS	BOD	NH_3	FC	pH	TSS	COD	COD	TSS	BOD	NH_3	FC
Regulatory Limits	m3/d		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm at 25 C	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100mL
1	1311																									
2	1320																			8						
3	1394																									
4	1505																			8						
5	1357																									
6	1457	7.2	359	841	740	293	244	39	640										6.6	10	57	60	9	<4	7	70
7	1466																									
8	1354											7								8						
9	1350																									
10	1400																									
11	1551											6								4						
12	1577																									12
13	1469	7.3			850	111	83	32		2									6.6	4	60	60	<2	<4	7	40
14	1336																									
15	1373		236									6								4						
16	1376																									
17	1405																									
18	1516											3								9						
19	1477																									
20	1421	7.6	653	1265							6.6	5	55					6	6.6	5	68					58
21	1331																									
22	1410																									
23	1350																									
24	1433																									
25	1434		226									5						18		7						22
26	1543											7						20		7						32
27	1451	7.4	364	673							6.5	6	45					6	6.5	8	69					
28	1414																	10								
29	1473	7.5	294									4							6.5	11						
30	1520																									
31	1332																									
Min	1311	7.2	226	673	740	111	83	32	640	2	6.5	3	45					6	6.5	4	57	60	<2	<4	7	12
Max	1577	7.6	653	1265	850	293	244	39	640	2	6.6	7	55					20	6.6	11	69	60	9	<4	7	70
AVG	1423	7.4	355	926	795	202	164	35	640	2	6.5	6	50					11	6.6	7	64	60	5	<4	7	33

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

AUGUST 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Aug	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfac-tants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**
1	1648	7.3	191								6.8	4														
2	1914											4														
3	1786	7.3			610	186	284	32	578	1				60	< 2	< 4	10	14								
4	1464																									
5	1431	7.4		401							6.6	2														
6	1249																									
7	1251																									
8	1486	7.6	346	146							6.9	3	72													
9	1941																									
10	1622	7.3	218	265	530	165	207				6.8	5	41	40	6	5										
11	1407																									
12	1259											2														
13	482																									
14	1476																									
15	1997			568							6.8	7	63						6.8	7	63					140
16	1850																			6						140
17	1464	7.4	324	578															6.7	8	72					
18	1200																									
19	1247																									
20	1242																									
21	1249																									
22	1770																		6.9	7	94					
23	827																									
24	1585																									
25	1663																									
26	1045																		6.6	15	133					
27	1176																									
28	1348											9														
29	1499		134	547							6.6	8							6.5	4	<3					10
30	1363											3								1						74
31	1376	7.2	307	595								4							6.4	3	158					7
Min	482	7.2	134	146	530	165	207	32	578	1	6.6	2	41	40	< 2	< 4	10	14	6.4	1	<3					7
Max	1997	7.6	346	595	610	186	284	32	578	1	6.9	9	72	60	6	5	10	14	6.9	15	158					140
AVG	1430	7.3	253	443	570	176	246	32	578	1	6.8	5	59	50	4	4	10	14	6.7	6	79					40 *

Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

SEPTEMBER 2010 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Sept	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfact-ants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**
1	1448																									
2	1513		221	227							6.6	5	83						6.5	3	41					
3	1224																									
4	1278																									
5	1436			582							6.7	4	90							4						
6	1582																									
7	1461	7.6	294	237	610	366	320	43				8						70	6.3	7	106	70	10	12	1	20
8	1397																	349								1000
9	1269			176							6.4	9	100						6.3	10	147					
10	1305																									
11	1416																									
12	1547	7.4		1063								17	140						6.3	8	74					
13	1289																									
14	1426			544							6.5	14							5.0	1	86					
15	1295																									
16	1329											16								4						
17	1299																									
18	1405																									
19	1589			477														15	6.4	4						2
20	1401																	38								6
21	1433	7.5	334	354	740	296	330				6.4	5	77	70	5	< 4		78	6.4	2	126	60	< 2	< 4		2
22	1371																									
23	1525			667								6	84							2	7					
24	1460																									
25	1509																									
26	1541			360							6.6	5	99					20	6.4	2	72					8
27	1468																	6								4
28	1460	7.9	203	597							6.4	3	102						6.4	2	86					
29	1531																									
30	1383		394									4	62						6.3	<1	57					
Min	1224	7.4	203	176	610	296	320	43	0	0	6.4	3	62	70	5	<4		6	5.0	1	7	60	<2	<4	1	2
Max	1589	7.9	394	1063	740	366	330	43	0	0	6.7	17	140	70	5	<4		349	6.5	10	147	70	10	12	1	1000
AVG	1420	7.6	289	480	675	331	325	43	0	0	6.5	8	93	70	5	<4		39	6.2	4	80	65	6	8	1	11

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

OCTOBER 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Oct	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfact-ants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**
1	1449																									
2	1520																									
3	1492	7.4		806								6	84							2	47					
4	1381																									
5	1464	7.6	256	513	580	228	179	53	683	1	6.4	5	114	50	4	6	2	44	6.4	2	124	50	3	< 4	<1	2
6	1511																									
7	1474																									
8	1394																									
9	1429																									
10	1471		201	589								2	81							8	56					
11	1659																	37								< 1
12	1571	7.5	273	488	580	234	258					6	123	50	5	5		4	6.4	1	80	40	3	< 4		< 2
13	1541																									
14	1360																									
15	1414																									
16	1479																									
17	1514										6.3	8	117						6.4	1	48					
18	1374																	2								10
19	1445	7.7	310	624							6.5	3	44						6.5	3	30					
20	1303																									
21	1470											3								4						
22	1810																									
23	1645																									
24	1451											4								2						
25	1428			543								2						65		2						3
26	1530											4								4						
27	1490																	7								6
28	1499																									
29	1559																									
30	1602																									
31	1590			733								0								2	32					
Min	1303.0	7.4	201	488	580	228	179	53	683	1	6.3	2	44	50	4	5	2	2	6.4	1	30	40	3	<4	<1	<1
Max	1810	7.7	310	806	580	234	258	53	683	1	6.5	8	123	50	5	6	2	65	6.5	8	124	50	3	<4	<1	10
AVG	1494	7.5	260	594	580	231	219	53	683	1	6.4	4	94	50	5	6	2	13	6.4	3	64	45	3	<4	<1	3

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

NOVEMBER 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Nov	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfact-ants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**
1	1551																									
2	1447	7.8	270	342							6.8	4	42						6.7	2	36					
3	1659																									
4	1573		492								6.8	6	35						6.7	1	42					
5	1482																									
6	1537			961																						
7	1697											11	49							11	60					
8	1386																									
9	1450	7.9	256	550							6.8	7	47					12	6.2	14	62					12
10	1520																									
11	1889											2	49							2	42					
12	1929																									
13	1987																									
14	2038	7.7	249	584			214	232			6.8	9	35	60	4			11		2	27	50	4	<4		55
15	1786																									
16	1696	7.7	236	617							6.7	4	33						6.4	10	52					
17	2099																									
18	2172			836							6.7	5	30						6.5	6	12					
19	1920																									
20	1795																									
21	1823						212	273				7	42		10			382		13	31		8	<4		20
22	2370																									
23	4008																									
24	2764										6.6	2						12	6.7	8						17
25	2813	7.6	148	306							6.7	8	5						6.7	12	46					
26	2299																									
27	2844																									
28	2581	7.8	146	332							6.7	7	24					12	6.8	5	35					45
29	2323																	8								20
30	2229			523								11	31					20	6.8	6	22					6
Min	1386	7.6	146	306			212	232			6.6	2	5	60	4			8	6.2	1	12	50	4	<4		6
Max	4008	7.9	492	961			214	273			6.8	11	49	60	10			382	6.8	14	62	50	8	<4		55
AVG	2022	7.7	257	561			213	253			6.7	7	35	60	7			20	6.6	7	39	50	6	<4		20

* Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

DECEMBER 2011 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
Dec	**Effluent flows**	**pH**	**TSS**	**COD**	**COD**	**BOD**	**TSS**	**NH_3**	**Conductivity**	**Surfact-ants**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**	**pH**	**TSS**	**COD**	**COD**	**TSS**	**BOD**	**NH_3**	**FC**
Regulatory Limits	**m3/d**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**µS/cm at 25 C**	**mg/L**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**		**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**CFU/ 100mL**
1	1967																									
2	1932										6.7	10	23						6.8	4	12					
3	1841																									
4	1893																									
5	1796			450							6.8	10	55						6.9	10	75					
6	1808																									
7	1838	7.6	256	639	560	212	262	31			6.8	14	42	80	12	8	16	20	7.1	15	58	100	14	7	18	20
8	1736																									
9	1729											16								8						
10	1731																									
11	1721																									
12	1694		759									9								12						
13	1645																	3								15
14	1515	7.7	416	578		260	192				6.9	10		80	4	6		28	6.9	15	60	90	8	7		6
15	1371																									
16	1614	7.8		732							6.9	11	14						6.9	12	34					
17	1689																									
18	1599																									
19	1566			502							6.9	6	48					55	6.9	11	58					78
20	1408																									
21	1536		204	341								4	55					38		22	72					13
22	1700											6								8						
23	1746		313	646								9	12							11	43					
24	1918																									
25	1801																									
26	1874		123	200								11	36							22	47					
27	2341																									
28	4016	7.5	114	231							6.8	7	48					85	6.9	11	29					89
29	3607																									
30	3127			479							6.8	6							6.8	4	55					
31	2546																									
Min	1371	7.5	114	200	560	212	192	31	0	0	6.7	4	12	80	4	6	16	3	6.8	4	12	90	8	7	18	6
Max	4016	7.8	759	732	560	260	262	31	0	0	6.9	16	55	80	12	8	16	85	7.1	22	75	100	14	7	18	89
AVG	1925	7.6	312	480	560	236	227	31	0	0	6.8	9	37	80	8	7	16	26	6.9	12	49	95	11	7	18	23

*Limits being clarified with Ministry of Environment. Monthly average reported for fecal coliforms is a geometric mean.

Sample Description		Jan.06, 2011 07:45 Influent	Feb. 2,2011 07:45 Influent	Mar.3,2011 08:00 Influent	April 6,2011 07:45 Influent	May 4,2011 07:45 Influent	Aug.10,2011 07:45 Influent	Oct.5,2011 07:45 influent
Metals Total	**Units**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
Aluminum	mg/L	0.362	0.385	0.583	0.357	0.357	0.347	0.27
Antimony	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.01	0.02	0.02	0.02	0.02	0.01	0.01
Beryllium	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Bismuth	mg/L	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	*nn
Boron	mg/L	0.062	0.075	0.064	0.077	0.077	0..16	0.12
Cadmium	mg/L	0.00008	0.00028	0.00016	0.00014	0.00014	0.00016	<0.0004
Calcium	mg/L	14.3	16.0	17.1	18.7	18.7	13.8	17
Chromium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cobalt	mg/L	0.0004	0.0004	0.00053	0.0004	0.0004	0.0002	0.0003
Copper	mg/L	0.05	0.062	0.059	0.15	0.15	0.14	0.40
Iron	mg/L	0.514	0.22	0.530	0.35	0.35	0.26	0.32
Lead	mg/L	0.001	0.002	0.002	0.002	0.002	0.002	0.002
Lithium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium	mg/L	4.4	5.38	6.31	5.46	5.46	4.6	4.1
Manganese	mg/L	0.058	0.04	0.094	0.052	0.052	<0.02	<0.02
Molybdenum	mg/L	<0.0005	<0.0005	0.001	<0.0005	<0.0005	<0.0005	<0.0001
Nickel	mg/L	<0.005	<0.005	<0.005	0.01	0.01	0.007	0.027
Phosphorus	mg/L	5.80	7.47	14.3	7.41	7.41	6.22	7.16
Potassium	mg/L	8.8	13	14	12	12	12	15
Selenium	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	0.003
Silicon	mg/L	3.7	3.8	4.8	4.5	4.5	3.6	2.8
Silver	mg/L	<0.00005	0.00012	<0.00005	<0.00005	<0.00005	0.00022	<0.0002
Sodium	mg/L	24.7	32.6	26.4	82.1	82.1	33.3	38.5
Strontium	mg/L	0.05	0.04	0.04	0.05	0.05	0.04	0.04
Sulfur	mg/L	5.8	8.9	7.5	1500	1500	1580	1450
Tellurium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	*nn
Thallium	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Thorium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tin	mg/L	0.001	0.002	0.001	0.004	0.004	0.002	0.014
Titanium	mg/L	0.006	<0.005	0.088	0.02	0.02	0.03	<0.005
Uranium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L	0.001	0.0007	0.002	0.0008	0.0008	0.0009	<0.0005
Zinc	mg/L	0.092	0.14	0.12	0.12	0.12	0.12	0.16
Zirconium	mg/L	0.002	0.003	0.004	0.003	0.003	0.0060	0.003

WATER SAMPLING FOR THE EPCOR WASTEWATER TREATMENT PLANT OUTFALL IN SOOKE BAY

May 2011

PACIFICUS
Biological Services Ltd

T: 250-949-9450 F: 250-949-7656 PO Box 2760 Port Hardy, BC V0N 2P0
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Water Sampling for the Epcor Wastewater Treatment Plant Outfall in Sooke Bay

Sampling Date: May 12, 2011
Report Submission Date: May 25, 2011

Prepared for:

John Reynolds
EPCOR WATER SERVICES
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Sooke, BC

Prepared by:

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TABLE OF CONTENTS

INTRODUCTION

In 2005, Epcor Water Services was contracted to construct a wastewater treatment facility and outfall to accommodate present and future population growth in the municipality of Sooke. The facility discharges into Sooke Bay, which is located approximately 35 km east of Victoria on the southwest coast of Vancouver Island, British Columbia (Figures 1 & 2). The facility began operations in December 2005. To comply with the regulations outlined by the Ministry of Environment; discharge of effluent must be monitored to ensure that the guidelines outlined in the *Municipal Sewage Regulation* are adhered to.

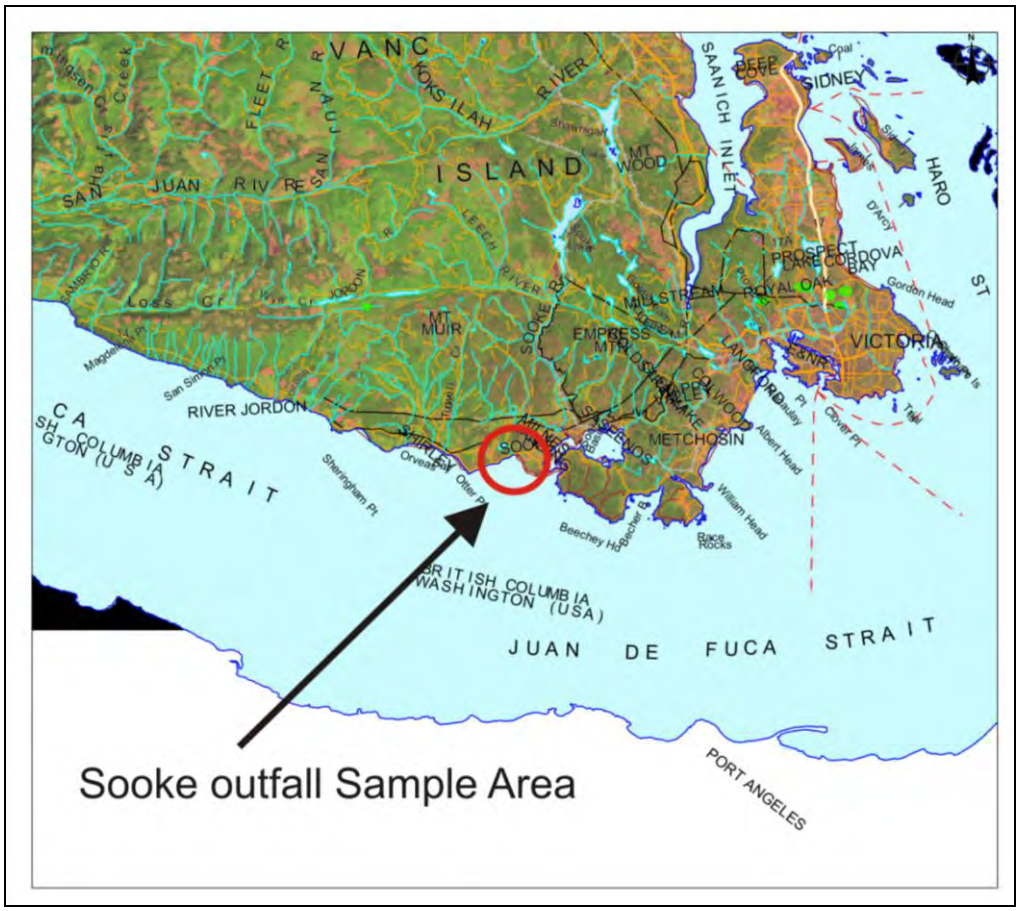

Figure 1: General location of sample sites, Sooke Bay, British Columbia

Figure 2: Aerial view of Sooke Bay outlining location of wastewater outfall with reference to Sooke and the Epcor Office.

Effluent monitoring has consisted of water sampling on a pre-determined schedule of twice per year at 4 index sites. In October 2005, a pre-operational baseline survey was conducted to establish index sites and record water chemistry parameters which future sampling efforts could be compared against. Pacificus Biological Services Ltd. was contracted to perform regular marine water sampling on the receiving waters at the outfall. The latest phase of sampling took place on May 12, 2011. The water sampling involved measuring the following parameters within the receiving waters environment:

Parameter
Biological Oxygen Demand
Total Suspended Solids
pH
Ammonia
Conductivity
Dissolved Oxygen
Salinity
Temperature
Fecal Coliforms

METHODOLOGY

Four index sampling sites were determined by Epcor and provincial ministry staff (Figure 3). The four index sites were sampled before wastewater discharge commenced in 2005, and subsequently at regular intervals. The site locations are as follows:

1. **Location of outfall diffuser** *48° 21' 15"N, 123° 46' 21"W*
2. **100m North of outfall** *48° 21' 17"N, 123° 46' 17"W*
   (Initial dilution zone 100m from outfall diffuser)
3. **100m South of outfall** *48° 21' 13"N, 123° 46' 24"W*
   (Initial dilution zone 100m from outfall diffuser)
4. **300m towards shore** *48° 21' 22"N, 123° 46' 11"W*
   (300m away from the outfall diffuser towards shore)

The sample design calls for the acquisition of samples at each sample location to be at 2m (to avoid any freshwater floating on the surface) and at the pycnocline where a plume would be likely to trap. A pycnocline is a layer of rapid change in water density with depth. In oceans, changes in water density are mainly caused by changes in water temperature and salinity. A study completed by Komex Environmental and Water Resource Engineering Ltd. found that the water profile data displayed homogeneity of the water column in Sooke Bay, indicating that the water is fully-mixed (unstratified) throughout the year. On the date that the latest phase of sampling occurred (May 12, 2011), the weather was clear skies with light wind. The water column was predicted to be unstratified at the time of sampling; therefore, only one set of samples were gathered from each site, at a depth of 2m.

A Pacificus biologist (David Pratt) navigated to the sample sites using a handheld Garmin GPS (with pre-recorded sample site waypoints) and gathered water samples from a depth of 2m. Dissolved Oxygen, conductivity, salinity, pH and temperature readings were taken and recorded in the field. A YSI Model 85 handheld multi parameter testing system was used to measure oxygen, conductivity, salinity and temperature. The pH measurements were acquired using a pH colorimeter test kit.

Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Ammonia Nitrogen – N, and Fecal Coliform parameters were tested for by Maxxam Laboratory in Victoria within 24 hours. Samples for each of these parameters were gathered and transported in sealed and sterilized sample jars. Sampling completed for the Receiving Waters Monitoring in Sooke Bay is in accordance to methodologies specified by the latest version of the *BC Field Sampling Manual for Continuous Monitoring, plus the collection of Air, Air-Emission, Water, Wastewater, Soil, Sediments and Biological Samples*.

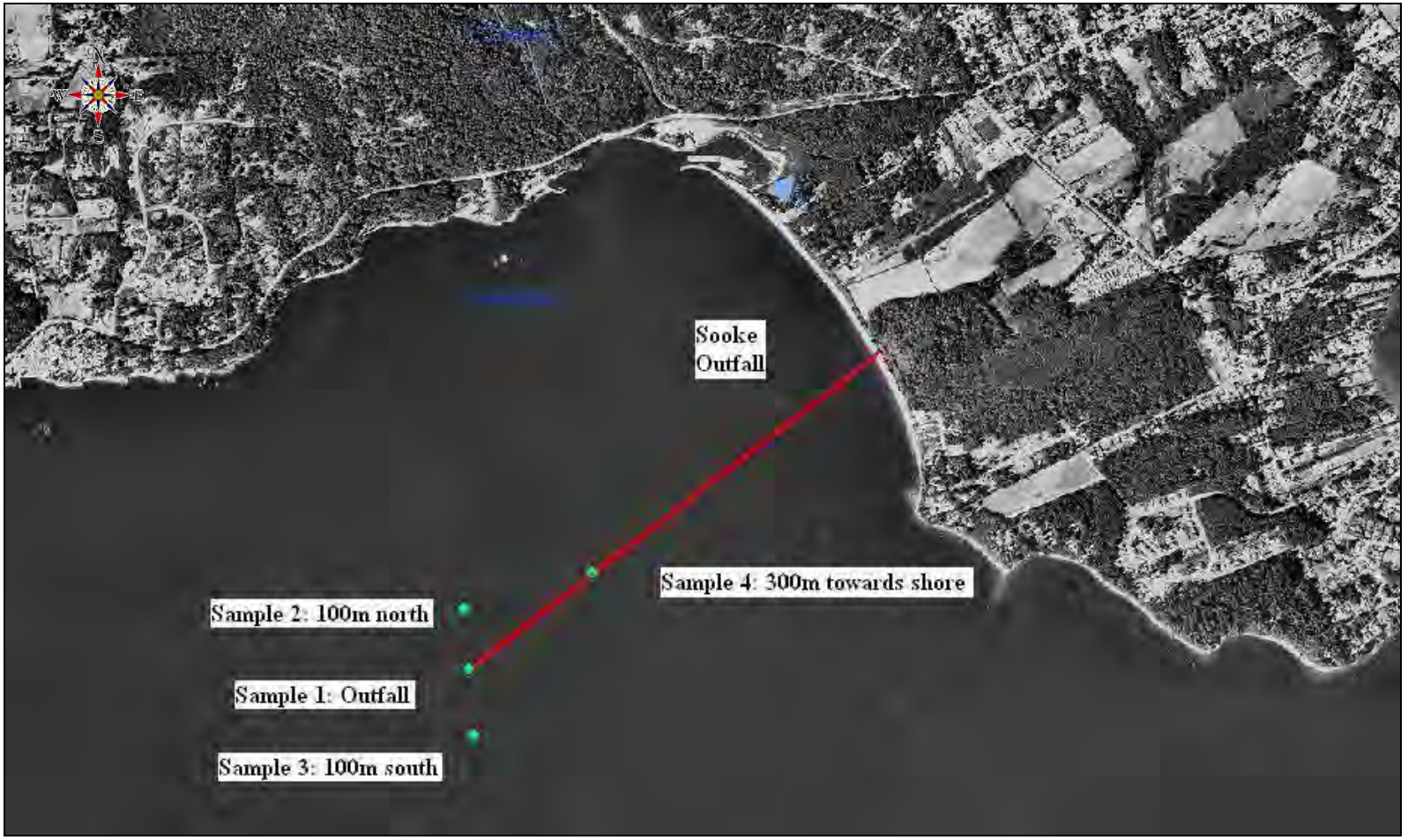

Figure 3: Sooke Bay receiving water-sampling locations (approximate).

TEST METHODS

Ammonia in Water

Analysis was performed using Flow Injection Analysis where the aqueous sample is injected into a carrier stream which merges a sodium hydroxide stream. Gaseous ammonia is formed, which diffuses through a gas permeable membrane into an indicator stream. This indicator stream is comprised of a mixture of acid-base indicators, which will react with the ammonia gas; resulting in a colour shift which is measured photometrically at 590nm.

Conventional Parameters

Analyses performed at Maxxam's Victoria facility, follow procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual" and "Standard Methods for the Examination of Water and Wastewater".

Microbiological Parameters

Analyses were performed using procedures based on those described in "B.C. Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2007 Edition) and "Standard Methods for the Examination of Water and Wastewater", 21st Edition (1998). Analysis was performed at Maxxam Laboratory.

The detection limits for BOD, Fecal Coliforms and TSS are as follows:

BOD	5 mg/L
Ammonia	0.01 mg/L
Fecal Coliforms	1 Col./100mL
Total Suspended Solids	1 mg/L

Please contact CanTest Ltd. (1-800-865-8566) or Pacificus Biological Services Ltd. if more detailed information is required with respect to sampling methodologies and procedures.

All testing completed for the Receiving Waters Monitoring in Sooke Bay were carried out using methodologies specified by the latest version of the *BC Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediments, Biological Materials and Discrete Ambient Air Samples*.

RESULTS

Specific results for the May 12, 2011 sampling at each of the sites are listed in Table 1. A comparison of historic measurements (from the baseline in October 2005 until October 2010) at each of the index sites are listed in Tables 2, 3 and 4. The receiving waters surrounding the Sooke outfall contained acceptable levels of ammonia, BOD, fecal coliform, and total suspended solids in the latest phase of sampling.

CONCLUSION

The May 2011 environmental monitoring of the Sooke outfall receiving waters is complete. All analyzed parameters were within acceptable ranges. Additional monitoring is recommended in 6 months time to ensure the plant is operating properly and the oceanic environment is not being negatively impacted.

REFERENCES:

Eaton, A.D., L.S. Clesceri, E.W. Rice, A.E. Greenberg, & M.A.H. Franson. 1998. *Standard Methods for the Examination of Water and Wastewater*. 21st Edition.

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Komex International Ltd. 2005. *Dilution Modelling Report District of Sooke Treated Wastewater Outfall (9).*

Pacificus Biological Services Ltd. March 2010. *Water Sampling for the Epcor Wastewater Treatment Plant Outfall in Sooke Bay.*

Water, Air and Climate Change Branch Ministry of Water, Land and Air Protection Province of British Columbia. 2003. *British Columbia Field Sampling Manual For Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples.*

Table 1: Water sampling results from the Epcor Sooke outfall May 12, 2011.

Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature ^{o}C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
# 1 Outfall	2	7.9	32.84	% 7.53 mg/L	30.8	8.6	< 1	< 5	162	0.02
# 2 100m north of outfall	2	7.9	32.83	78.9% 7.54 mg/L	30.8	8.7	< 1	< 5	62	0.03
# 3 100m south of outfall	2	7.9	32.82	78.9% 7.54 mg/L	30.8	8.6	< 1	< 5	29	0.02
# 4 300m towards shoreline from outfall	2	7.9	32.76	80.5% 7.74 mg/L	30.7	8.7	< 1	< 5	80	0.02

Table 2: Historic data from Sooke Outfall water samples October 2005 – May 2007.

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
October 2005 BASELINE	#1 Outfall	2	8.1	33.91	66%	30.7	9.9	2	<5.0	22	no data
		12	7.8	34.41	65.70%	31.6	9.6	2	<5.0	16	no data
	#2 100m north of outfall	2	8	33.7	66%	30.5	9.8	<2	<5.0	16	no data
		12	7.7	34.39	65.50%	31.8	9.6	<2	<5.0	15	no data
	#3 100m south of outfall	2	8.1	33.85	68%	30.6	9.9	5	<5.0	18	no data
		12	7.9	34.32	65.80%	31.7	9.5	<2	<5.0	22	no data
	#4 300m south of outfall	2	8	33.8	66%	30.5	9.9	<2	<5.0	17	no data
		12	7.6	34	66%	31.7	9.5	<2	<5.0	17	no data
	#5 Sook Harbour	2	8.1	34.2	67%	30.8	9.8	<2	no data	no data	no data
		12	7.8	34.5	66%	31.8	9.7	<2	<5.0	15	no data
April 2006	# 1 Outfall	2	8	32.98	9.75	30.4	9.4	<1	<5.0	38	<0.002
		9	7.9	33.04	9.22	30.7	9	<1	<5.0	23	0.042
	# 2 100m north of outfall	2	8.1	31.87	9.74	30.1	9.5	<1	<5.0	21	<0.002
		9	8	33.67	9.31	31.1	9.1	1	<5.0	32	0.056
	# 3 100m south of outfall	2	8.1	32.8	9.74	30.2	9.7	<1	<5.0	21	<0.002
		9	8.1	15.3	9.9	30.6	9.9	<1	<5.0	18	<0.002
	# 4 300m south of outfall	2	8.1	32.87	9.77	30.2	9.5	<1	<5.0	12	0.027
		9	8	18.95	9.87	30.9	9.2	<1	<5.0	43	<0.002
September 2006	# 1 Outfall	2	8.3	35.5	65.8	30.7	10.8	<1	<5.0	18	0.023
		12	7.9	35.29	63.5	31.7	10.5	45	<5.0	20	0.023
	# 2 100m north of outfall	2	7.9	35.56	66	30.6	10.8	4	<5.0	23	0.02
		12	7.8	35.34	60.7	31.8	10.5	39	<5.0	21	0.018
	# 3 100m south of outfall	2	7.8	35.48	63.1	30.5	10.7	104	<5.0	18	0.018
		12	7.8	35.39	60.1	31.2	10.5	36	<5.0	18	0.016
	# 4 300m south of outfall	2	7.8	35.59	63.6	31.1	10.9	56	<5.0	17	0.022
		12	7.8	35.38	59.4	31.8	10.5	52	<5.0	29	0.016
January 2007	# 1 Outfall	2	8.3	46.7	75.9	30	7.2	1	<5.0	<1	0.01
		12	7.9	31.4	75.6	30.4	7.3	2	<5.0	4	0.02 <.01
	# 2 100m north of outfall	2	8	31.52	75.8	30.9	7.1	<1	<5.0	4	<.01
		12	8	31.61	75.6	30.7	7.3	1	<5.0	5	<.01
	# 3 100m south of outfall	2	8	31.56	78.1	30.8	7.1	<1	<5.0	3	<.01
		12	8	31.59	79.2	30.7	7.3	1	<5.0	3	<.01
	# 4 300m south of outfall	2	8	31.62	76.9	30.3	7.2	2	<5.0	2	0.01
		12	7.9	31.58	79.3	30.4	7.4	2	<5.0	2	<.01
May 2007	# 1 Outfall	2	8.3	33.84	80.9	31.5	9	<2	<5.0	18	0.01
	# 2 100m north of outfall	2	8	33.63	77.3	31.5	8.9	<2	<5.0	11	0.05
	# 3 100m south of outfall	2	7.9	33.82	80.9	31.5	9	<2	<5.0	13	0.01
	# 4 300m south of outfall	2	8	33.8	83.6	31.6	9	<2	<5.0	24	0.01

Table 3: Historic data from Sooke Outfall water samples September 2007 – October 2009.

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
September 2007	# 1 Outfall	2	7.9	34.24	52.6	32.1	8.8	<1	<5.0	8	0.04
	# 2 100m north of outfall	2	7.6	35	52.8	31.8	8.7	<1	<5.0	8	0.05
	# 3 100m south of outfall	2	7.8	34.36	52.7	32	8.8	<1	<5.0	9	0.04
	# 4 300m south of outfall	2	7.5	33.69	52.8	31.9	8.7	<1	<5.0	8	0.04
March 2008	# 1 Outfall	2	7.9	47.31	102.9	30.4	7.1	<1	<5.0	13	0.04
	# 2 100m north of outfall	2	7.7	46.14	115.4	30.6	7.4	<1	<5.0	16	0.03
	# 3 100m south of outfall	2	8	49.22	116.5	30.1	7.4	<1	<5.0	14	0.03
	# 4 300m south of outfall	2	7.7	50.11	109.6	30.1	7.5	<1	<5.0	20	0.05
October 2008	# 1 Outfall	2	8.3	34.4	50.4	32.3	8.9	<1	<5	<1	0.02
	# 2 100m north of outfall	2	8.3	34.4	50.1	32.3	8.9	1	<5	6	<.0.01
	# 3 100m south of outfall	2	8.3	34.4	52.8	32.3	8.9	2	<5	2	<0.01
	# 4 300m south of outfall	2	8.3	34.38	56.1	32	9.1	1	<5	<1	0.01
March 2009	Outfall	2 m	7.8	32.20	82.1% 8.12 mg/L	31.6	7.0	1.0	6.0	< 5	0.02
	100m North of Outfall	8 m	7.8	32.15	83.8% 8.44 mg/L	31.6	7.0	1.0	9.0	< 5	0.02
		2 m	7.5	32.18	85.20% 8.39 mg/L	31.6	7.0				
	100m South of Outfall	2 m	8.0	32.22	80.6% 7.95 mg/L	31.6	7.0	1.0	10.0	< 5	0.02
	300m towards shoreline from Outfall	2 m	7.8	32.34	81.2% 7.97 mg/L	31.8	7.0	1.0	9.0	< 5	0.02
October 2009	# 1 Outfall	2	8.0	34.4	69.5	31.9	9.3	<1	<5	<1	0.06
	# 2 100m north of outfall	2	8.0	34.7	63.4	32.2	9.2	2	<5	<1	0.06
	# 3 100m south of outfall	2	8.0	34.7	63.5	32.1	9.3	<1	<5	5	0.05
	# 4 300m towards shoreline from outfall	2	8.0	34.7	63.5	32.2	9.2	<1	<5	<1	0.05

Table 4: Historic data from Sooke Outfall water samples April 2010 – October 2010.

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
April 2010	# 1 Outfall	2	8.5	33.37	99% 8.5 mg/L	31.2	8.9	2	< 5	< 1	0.01
		12	8.5	33.24	105% 9.9 mg/L	30.8	9.1	< 1	< 5	< 1	0.03
	# 2 100m north of outfall	2	8.5	33.15	120% 13.1 mg/L	30.8	9.1	< 1	< 5	< 1	0.08
		12	8.5	33.16	121% 11.3 mg/L	30.8	9.1	< 1	< 5	< 1	0.02
	# 3 100m south of outfall	2	8.5	33.27	96% 9.0 mg/L	30.9	9.0	< 1	< 5	< 1	0.01
		12	8.5	33.26	95% 9.0 mg/L	30.9	9.1	< 1	< 5	< 1	0.02
	# 4 300m south of outfall	2	8.5	33.25	97% 9.1 mg/L	30.8	9.2	< 1	< 5	< 1	0.05
		12	8.5	33.2	94% 9.0 mg/L	30.8	9.1	< 1	< 5	< 1	0.04
October 2010	# 1 Outfall	2	7.5	34.23	90.0% 8.69 mg/L	31.4	9.6	< 1	< 5	3	0.09
	# 2 100m north of outfall	2	7.5	34.28	77.2% 7.18 mg/L	31.4	9.6	< 1	< 5	2	0.09
	# 3 100m south of outfall	2	7.5	34.3	78.2% 7.45 mg/L	31.4	9.7	< 1	< 5	8	0.1
	# 4 300m towards shoreline from outfall	2	7.5	34.24	72.4% 6.73 mg/L	31.4	9.6	< 1	< 5	5	0.1

WATER SAMPLING FOR THE EPCOR WASTEWATER TREATMENT PLANT OUTFALL IN SOOKE BAY

November 2011

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Water Sampling for the Epcor Wastewater Treatment Plant Outfall in Sooke Bay

Sampling Date: September 28, 2011
Report Submission Date: November 2, 2011

Prepared for:

John Reynolds
EPCOR WATER SERVICES
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Prepared by:

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TABLE OF CONTENTS

INTRODUCTION

In 2005, Epcor Water Services was contracted to construct a wastewater treatment facility and outfall to accommodate present and future population growth in the municipality of Sooke. The facility discharges into Sooke Bay, which is located approximately 35 km east of Victoria on the southwest coast of Vancouver Island, British Columbia (Figures 1 & 2). The facility began operations in December 2005. To comply with the regulations outlined by the Ministry of Environment; discharge of effluent must be monitored to ensure that the guidelines outlined in the *Municipal Sewage Regulation* are adhered to.

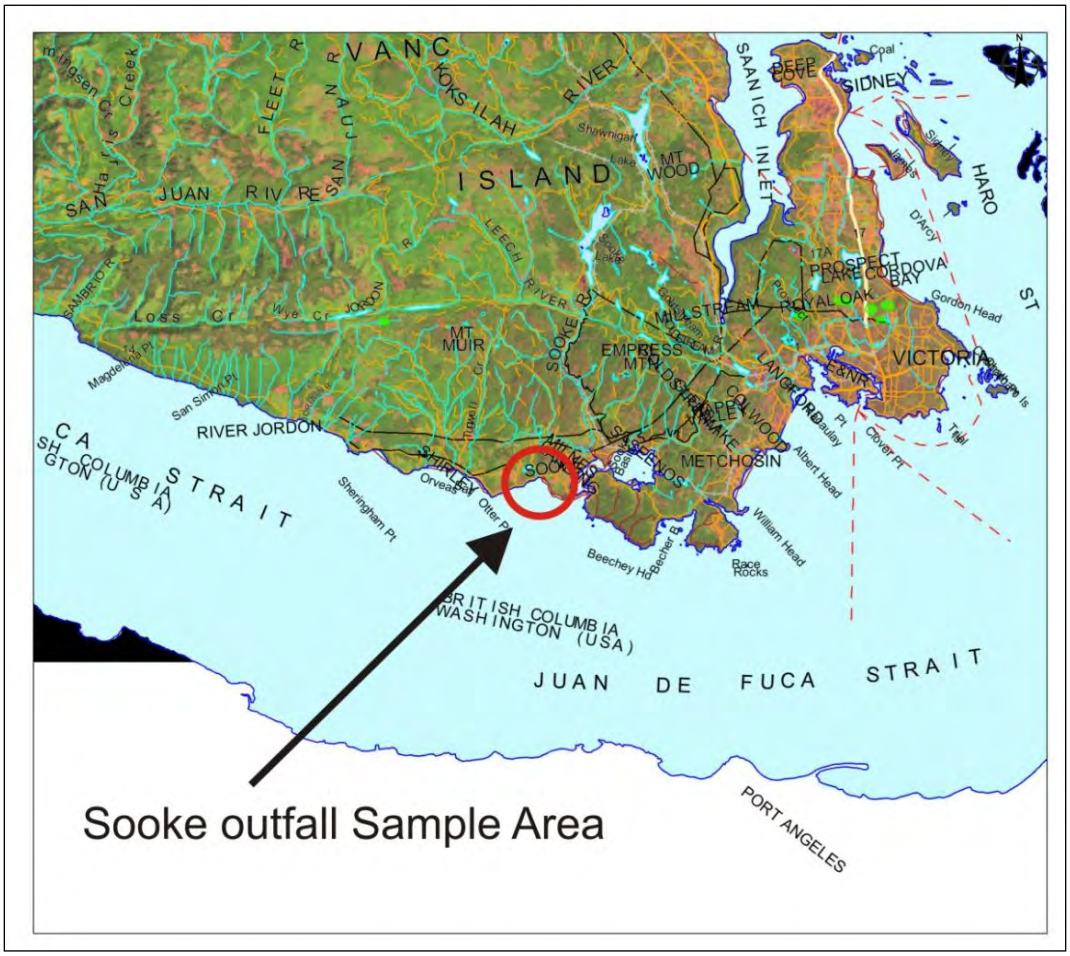

Figure 1: General location of sample sites, Sooke Bay, British Columbia

Figure 2: Aerial view of Sooke Bay outlining location of wastewater outfall with reference to Sooke and the Epcor Office.

Effluent monitoring has consisted of water sampling on a pre-determined schedule of twice per year at 4 index sites. In October 2005, a pre-operational baseline survey was conducted to establish index sites and record water chemistry parameters which future sampling efforts could be compared against. Pacificus Biological Services Ltd. was contracted to perform regular marine water sampling on the receiving waters at the outfall. The latest phase of sampling took place on September 28, 2011. The water sampling involved measuring the following parameters within the receiving waters environment:

Parameter
Biological Oxygen Demand
Total Suspended Solids
pH
Ammonia
Conductivity
Dissolved Oxygen
Salinity
Temperature
Fecal Coliforms

METHODOLOGY

Four index sampling sites were determined by Epcor and provincial ministry staff (Figure 3). The four index sites were sampled before wastewater discharge commenced in 2005, and subsequently at regular intervals. The site locations are as follows:

1. **Location of outfall diffuser** *48° 21' 15"N, 123° 46' 21"W*
2. **100m North of outfall** *48° 21' 17"N, 123° 46' 17"W*
   (Initial dilution zone 100m from outfall diffuser)
3. **100m South of outfall** *48° 21' 13"N, 123° 46' 24"W*
   (Initial dilution zone 100m from outfall diffuser)
4. **300m towards shore** *48° 21' 22"N, 123° 46' 11"W*
   (300m away from the outfall diffuser towards shore)

The sample design calls for the acquisition of samples at each sample location to be at 2m (to avoid any freshwater floating on the surface) and at the pycnocline where a plume would be likely to be trapped. A pycnocline is a layer of rapid change in water density with depth. In oceans, changes in water density are mainly caused by changes in water temperature and salinity. A study completed by Komex Environmental and Water Resource Engineering Ltd. found that the water profile data displayed homogeneity of the water column in Sooke Bay, indicating that the water is fully-mixed (unstratified) throughout the year. On the date that the latest phase of sampling occurred (September 28th, 2011), the weather was clear skies with light wind. The water column was predicted to be unstratified at the time of sampling; therefore, only one set of samples were gathered from each site, at a depth of 2m.

A Pacificus biologist (David Pratt) navigated to the sample sites using a handheld Garmin GPS (with pre-recorded sample site waypoints) and gathered water samples from a depth of 2m. Dissolved Oxygen, conductivity, salinity, pH and temperature readings were taken and recorded in the field. A YSI Model 85 handheld multi parameter testing system was used to measure oxygen, conductivity, salinity and temperature. The pH measurements were acquired using a pH colorimeter test kit.

Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Ammonia Nitrogen – N, and Fecal Coliform parameters were tested for by Maxxam Laboratory in Victoria within 24 hours. Samples for each of these parameters were gathered and transported in sealed and sterilized sample jars. Sampling completed for the Receiving Waters Monitoring in Sooke Bay is in accordance to methodologies specified by the latest version of the *BC Field Sampling Manual for Continuous Monitoring, plus the collection of Air, Air-Emission, Water, Wastewater, Soil, Sediments and Biological Samples*.

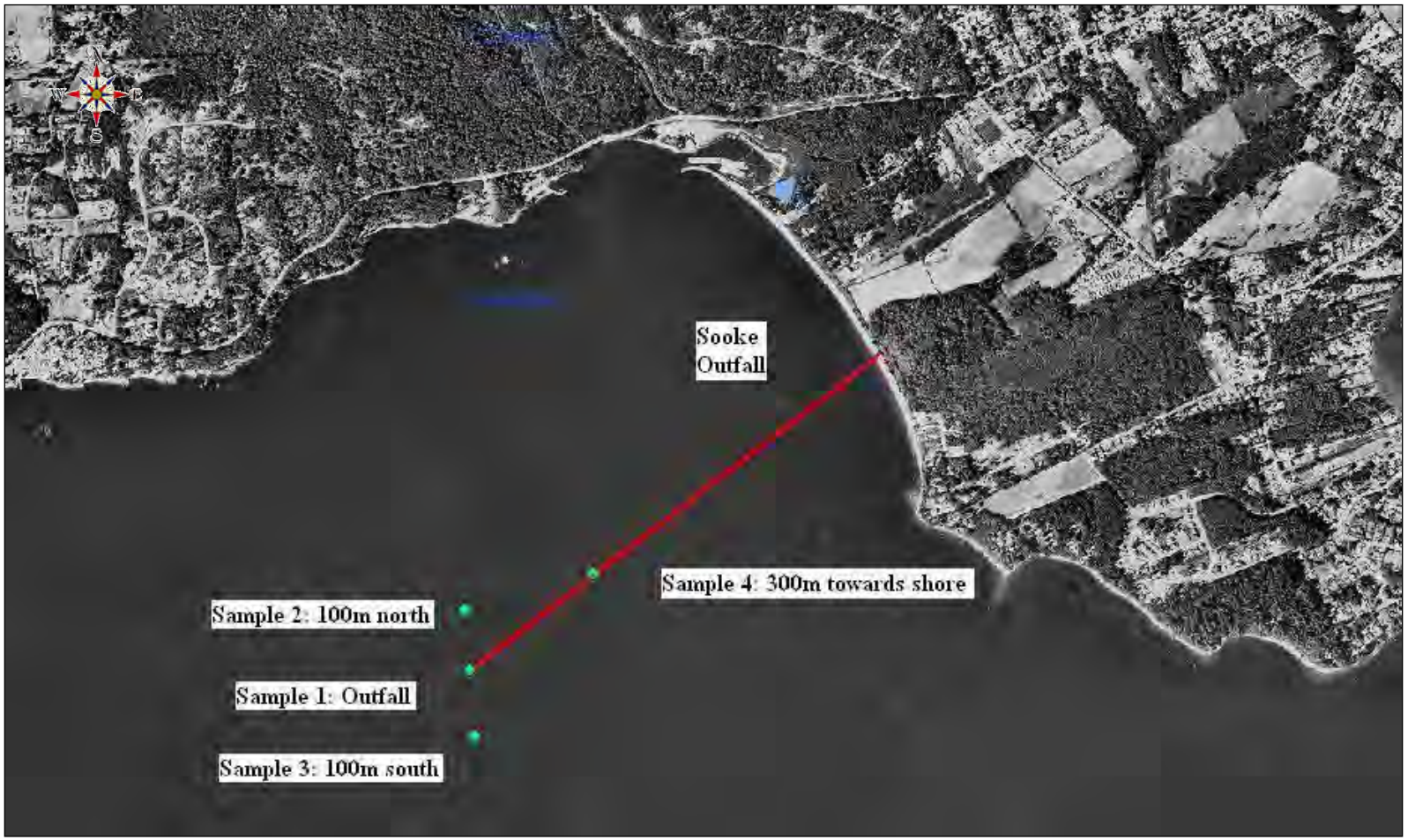

Figure 3: Sooke Bay receiving water-sampling locations (approximate).

TEST METHODS

Ammonia in Water

Analysis was performed using Flow Injection Analysis where the aqueous sample is injected into a carrier stream which merges a sodium hydroxide stream. Gaseous ammonia is formed, which diffuses through a gas permeable membrane into an indicator stream. This indicator stream is comprised of a mixture of acid-base indicators, which will react with the ammonia gas; resulting in a colour shift which is measured photometrically at 590nm.

Conventional Parameters

Analyses performed at Maxxam's Victoria facility, follow procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual" and "Standard Methods for the Examination of Water and Wastewater".

Microbiological Parameters

Analyses were performed using procedures based on those described in "B.C. Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2007 Edition) and "Standard Methods for the Examination of Water and Wastewater", 21st Edition (1998). Analysis was performed at Maxxam Laboratory.

The detection limits for BOD, Fecal Coliforms and TSS are as follows:

BOD	5 mg/L
Ammonia	0.005 mg/L
Fecal Coliforms	1 Col./100mL
Total Suspended Solids	2 mg/L

Please contact CanTest Ltd. (1-800-865-8566) or Pacificus Biological Services Ltd. if more detailed information is required with respect to sampling methodologies and procedures.

All testing completed for the Receiving Waters Monitoring in Sooke Bay was carried out using methodologies specified by the latest version of the *BC Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediments, Biological Materials and Discrete Ambient Air Samples*.

RESULTS

Specific results for the September 28th, 2011 sampling at each of the sites are listed in Table 1. A comparison of historic measurements (from the baseline in October 2005 until May 2011) at each of the index sites are listed in Tables 2, 3 and 4. The receiving waters surrounding the Sooke outfall contained acceptable levels of ammonia, BOD and fecal coliforms in the latest phase of sampling. Total Suspended Solid levels were found to be moderately elevated when compared to historical data. An algal bloom is a probable cause of the higher reading as the Total Suspended Solids measurement includes all particulate matter larger than 1.6 microns. Furthermore, the TSS measurement taken from directly above the outfall was only 74mg/L (the lowest of the four samples taken) indicating that this is likely not the source of the elevated TSS levels.

CONCLUSION

The May 2011 environmental monitoring of the Sooke outfall receiving waters is complete. Ammonia, BOD and fecal coliform levels were within acceptable ranges. Total Suspended Solids measurements were slightly elevated; however, the outfall is not likely the source. Additional monitoring is recommended in 6 months time to ensure the plant is operating properly and the oceanic environment is not being negatively impacted.

REFERENCES:

Eaton, A.D., L.S. Clesceri, E.W. Rice, A.E. Greenberg, & M.A.H. Franson. 1998. *Standard Methods for the Examination of Water and Wastewater*. 21st Edition.

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Table 1: Water sampling results from the Epcor Sooke outfall September 28th, 2011.

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
September 2011	**# 1 Outfall**	2	8.07	34.29	54.9% 5.12mg/L	31.6	9.5	10	< 5	74	0.04
	# 2 100m north of outfall	2	8.05	34.32	55.2% 5.15 mg/L	31.6	9.5	11	< 5	112	0.04
	# 3 100m south of outfall	2	8.03	34.00	55.0% 5.14 mg/L	31.3	9.5	9	< 5	101	0.07
	# 4 300m towards shoreline from outfall	2	8.08	34.33	54.7% 5.10 mg/L	31.6	9.5	9	< 5	160	0.06

Table 2: Historic data from Sooke Outfall water samples October 2005 – May 2007.

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
October 2005 BASELINE	#1 Outfall	2	8.1	33.91	66%	30.7	9.9	2	<5.0	22	no data
		12	7.8	34.41	65.70%	31.6	9.6	2	<5.0	16	no data
	#2 100m north of outfall	2	8	33.7	66%	30.5	9.8	<2	<5.0	16	no data
		12	7.7	34.39	65.50%	31.8	9.6	<2	<5.0	15	no data
	#3 100m south of outfall	2	8.1	33.85	68%	30.6	9.9	5	<5.0	18	no data
		12	7.9	34.32	65.80%	31.7	9.5	<2	<5.0	22	no data
	#4 300m south of outfall	2	8	33.8	66%	30.5	9.9	<2	<5.0	17	no data
		12	7.6	34	66%	31.7	9.5	<2	<5.0	17	no data
	#5 Sook Harbour	2	8.1	34.2	67%	30.8	9.8	<2	no data	no data	no data
		12	7.8	34.5	66%	31.8	9.7	<2	<5.0	15	no data
April 2006	# 1 Outfall	2	8	32.98	9.75	30.4	9.4	<1	<5.0	38	<0.002
		9	7.9	33.04	9.22	30.7	9	<1	<5.0	23	0.042
	# 2 100m north of outfall	2	8.1	31.87	9.74	30.1	9.5	<1	<5.0	21	<0.002
		9	8	33.67	9.31	31.1	9.1	1	<5.0	32	0.056
	# 3 100m south of outfall	2	8.1	32.8	9.74	30.2	9.7	<1	<5.0	21	<0.002
		9	8.1	15.3	9.9	30.6	9.9	<1	<5.0	18	<0.002
	# 4 300m south of outfall	2	8.1	32.87	9.77	30.2	9.5	<1	<5.0	12	0.027
		9	8	18.95	9.87	30.9	9.2	<1	<5.0	43	<0.002
September 2006	# 1 Outfall	2	8.3	35.5	65.8	30.7	10.8	<1	<5.0	18	0.023
		12	7.9	35.29	63.5	31.7	10.5	45	<5.0	20	0.023
	# 2 100m north of outfall	2	7.9	35.56	66	30.6	10.8	4	<5.0	23	0.02
		12	7.8	35.34	60.7	31.8	10.5	39	<5.0	21	0.018
	# 3 100m south of outfall	2	7.8	35.48	63.1	30.5	10.7	104	<5.0	18	0.018
		12	7.8	35.39	60.1	31.2	10.5	36	<5.0	18	0.016
	# 4 300m south of outfall	2	7.8	35.59	63.6	31.1	10.9	56	<5.0	17	0.022
		12	7.8	35.38	59.4	31.8	10.5	52	<5.0	29	0.016
January 2007	# 1 Outfall	2	8.3	46.7	75.9	30	7.2	1	<5.0	<1	0.01
		12	7.9	31.4	75.6	30.4	7.3	2	<5.0	4	0.02 <.01
	# 2 100m north of outfall	2	8	31.52	75.8	30.9	7.1	<1	<5.0	4	<.01
		12	8	31.61	75.6	30.7	7.3	1	<5.0	5	<.01
	# 3 100m south of outfall	2	8	31.56	78.1	30.8	7.1	<1	<5.0	3	<.01
		12	8	31.59	79.2	30.7	7.3	1	<5.0	3	<.01
	# 4 300m south of outfall	2	8	31.62	76.9	30.3	7.2	2	<5.0	2	0.01
		12	7.9	31.58	79.3	30.4	7.4	2	<5.0	2	<.01
May 2007	# 1 Outfall	2	8.3	33.84	80.9	31.5	9	<2	<5.0	18	0.01
	# 2 100m north of outfall	2	8	33.63	77.3	31.5	8.9	<2	<5.0	11	0.05
	# 3 100m south of outfall	2	7.9	33.82	80.9	31.5	9	<2	<5.0	13	0.01
	# 4 300m south of outfall	2	8	33.8	83.6	31.6	9	<2	<5.0	24	0.01

Table 3: Historic data from Sooke Outfall water samples September 2007 – October 2009.

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
September 2007	**# 1 Outfall**	2	7.9	34.24	52.6	32.1	8.8	<1	<5.0	8	0.04
	# 2 100m north of outfall	2	7.6	35	52.8	31.8	8.7	<1	<5.0	8	0.05
	# 3 100m south of outfall	2	7.8	34.36	52.7	32	8.8	<1	<5.0	9	0.04
	# 4 300m south of outfall	2	7.5	33.69	52.8	31.9	8.7	<1	<5.0	8	0.04
March 2008	**# 1 Outfall**	2	7.9	47.31	102.9	30.4	7.1	<1	<5.0	13	0.04
	# 2 100m north of outfall	2	7.7	46.14	115.4	30.6	7.4	<1	<5.0	16	0.03
	# 3 100m south of outfall	2	8	49.22	116.5	30.1	7.4	<1	<5.0	14	0.03
	# 4 300m south of outfall	2	7.7	50.11	109.6	30.1	7.5	<1	<5.0	20	0.05
October 2008	**# 1 Outfall**	2	8.3	34.4	50.4	32.3	8.9	<1	<5	<1	0.02
	# 2 100m north of outfall	2	8.3	34.4	50.1	32.3	8.9	1	<5	6	<.0.01
	# 3 100m south of outfall	2	8.3	34.4	52.8	32.3	8.9	2	<5	2	<0.01
	# 4 300m south of outfall	2	8.3	34.38	56.1	32	9.1	1	<5	<1	0.01
March 2009	**Outfall**	2 m	7.8	32.20	82.1% 8.12 mg/L	31.6	7.0	1.0	6.0	< 5	0.02
	100m North of Outfall	8 m	7.8	32.15	83.8% 8.44 mg/L	31.6	7.0	1.0	9.0	< 5	0.02
		2 m	7.5	32.18	85.20% 8.39 mg/L	31.6	7.0				
	100m South of Outfall	2 m	8.0	32.22	80.6% 7.95 mg/L	31.6	7.0	1.0	10.0	< 5	0.02
	300m towards shoreline from Outfall	2 m	7.8	32.34	81.2% 7.97 mg/L	31.8	7.0	1.0	9.0	< 5	0.02
October 2009	**# 1 Outfall**	2	8.0	34.4	69.5	31.9	9.3	<1	<5	<1	0.06
	# 2 100m north of outfall	2	8.0	34.7	63.4	32.2	9.2	2	<5	<1	0.06
	# 3 100m south of outfall	2	8.0	34.7	63.5	32.1	9.3	<1	<5	5	0.05
	# 4 300m towards shoreline from outfall	2	8.0	34.7	63.5	32.2	9.2	<1	<5	<1	0.05

Table 4: Historic data from Sooke Outfall water samples April 2010 – May 2011

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature °C	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
April 2010	# 1 Outfall	2	8.5	33.37	99% 8.5 mg/L	31.2	8.9	2	< 5	< 1	0.01
		12	8.5	33.24	105% 9.9 mg/L	30.8	9.1	< 1	< 5	< 1	0.03
	# 2 100m north of outfall	2	8.5	33.15	120% 13.1 mg/L	30.8	9.1	< 1	< 5	< 1	0.08
		12	8.5	33.16	121% 11.3 mg/L	30.8	9.1	< 1	< 5	< 1	0.02
	# 3 100m south of outfall	2	8.5	33.27	96% 9.0 mg/L	30.9	9.0	< 1	< 5	< 1	0.01
		12	8.5	33.26	95% 9.0 mg/L	30.9	9.1	< 1	< 5	< 1	0.02
	# 4 300m south of outfall	2	8.5	33.25	97% 9.1 mg/L	30.8	9.2	< 1	< 5	< 1	0.05
		12	8.5	33.2	94% 9.0 mg/L	30.8	9.1	< 1	< 5	< 1	0.04
October 2010	# 1 Outfall	2	7.5	34.23	90.0% 8.69 mg/L	31.4	9.6	< 1	< 5	3	0.09
	# 2 100m north of outfall	2	7.5	34.28	77.2% 7.18 mg/L	31.4	9.6	< 1	< 5	2	0.09
	# 3 100m south of outfall	2	7.5	34.3	78.2% 7.45 mg/L	31.4	9.7	< 1	< 5	8	0.1
	# 4 300m towards shoreline from outfall	2	7.5	34.24	72.4% 6.73 mg/L	31.4	9.6	< 1	< 5	5	0.1
May 2011	# 1 Outfall	2	7.9	32.84	% 7.53 mg/L	30.8	8.6	< 1	< 5	162	0.02
	# 2 100m north of outfall	2	7.9	32.83	78.9% 7.54 mg/L	30.8	8.7	< 1	< 5	62	0.03
	# 3 100m south of outfall	2	7.9	32.82	78.9% 7.54 mg/L	30.8	8.6	< 1	< 5	29	0.02
	# 4 300m towards shoreline from outfall	2	7.9	32.76	80.5% 7.74 mg/L	30.7	8.7	< 1	< 5	80	0.02