DISTRICT OF SOOKE
WASTEWATER TREATMENT
AND COLLECTION SYSTEM

OPERATED BY
EPCOR WATER SERVICES INC.

2012 ANNUAL REPORT
REGISTRATION 17300

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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
- 6 pump lift stations (Sooke Road, West Coast Road, Helgesen Road, Sunriver, Prestige Hotel, Mariner's Village)
- 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

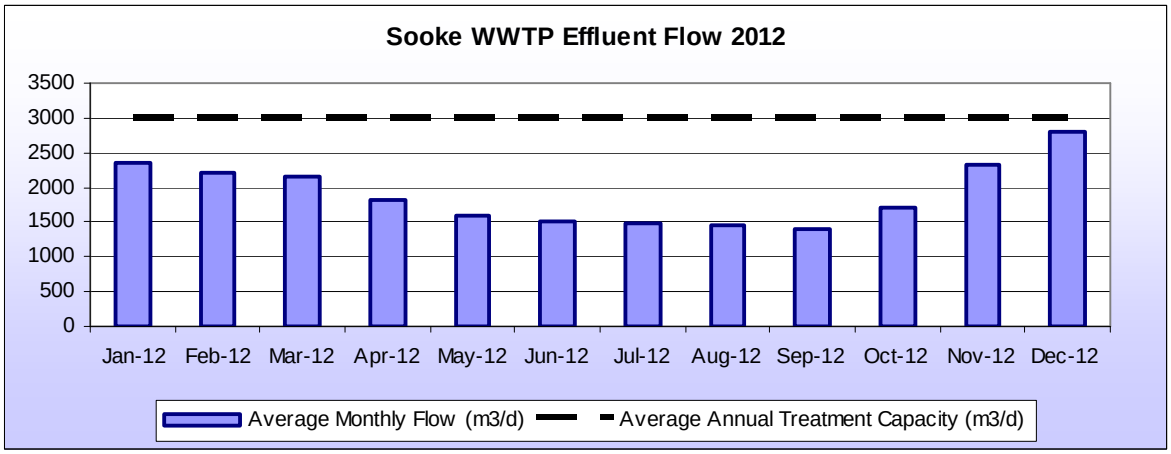
Acronyms /Abbreviations	Description
mg/L	Milligram per liter
BOD	Biochemical Oxygen Demand
FC	Fecal Coliforms
CFU/100mL	Colony Forming Units Per 100 milliliters
COD	Chemical Oxygen Demand
NH_3	Ammonia
TSS	Total Suspended Solids
m^3/day	Cubic meters per day (flow)
MSR	Municipal Sewage Regulation
MWR	Municipal Wastewater Regulation
OC	Operational Certificate
BCEOCP	British Columbia Environmental Operators Certification Program
I/I	Inflow & infiltration
AVE or AVG	Average
IC	Inspection Chamber
WWTP	Wastewater Treatment Plant
SSA	Specified Sewer Area
YTD	Year to Date
HMI	Human Machine Interface
SCADA	Supervisory control and data acquisition (system)
SBR	Sequencing Batch Reactor
PLC	Programmable logic controller
LIT	Level Indicator Transmitter

OVERVIEW

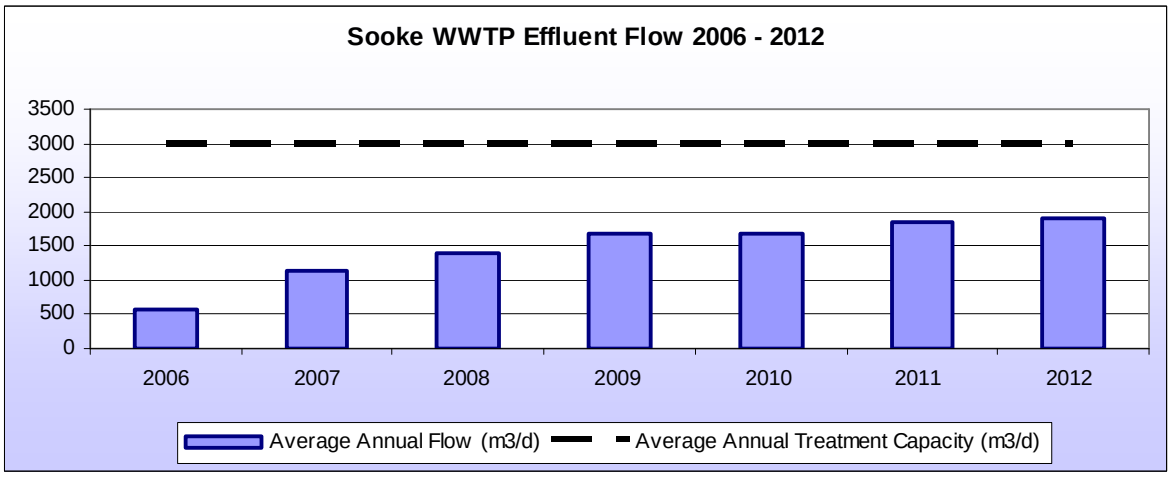
Plant Flow

The annual average effluent flow treated in the plant during 2012 was 1903 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 Effluent Flow 2012



Graph 2: WWTP Effluent Flow 2006 - 2012

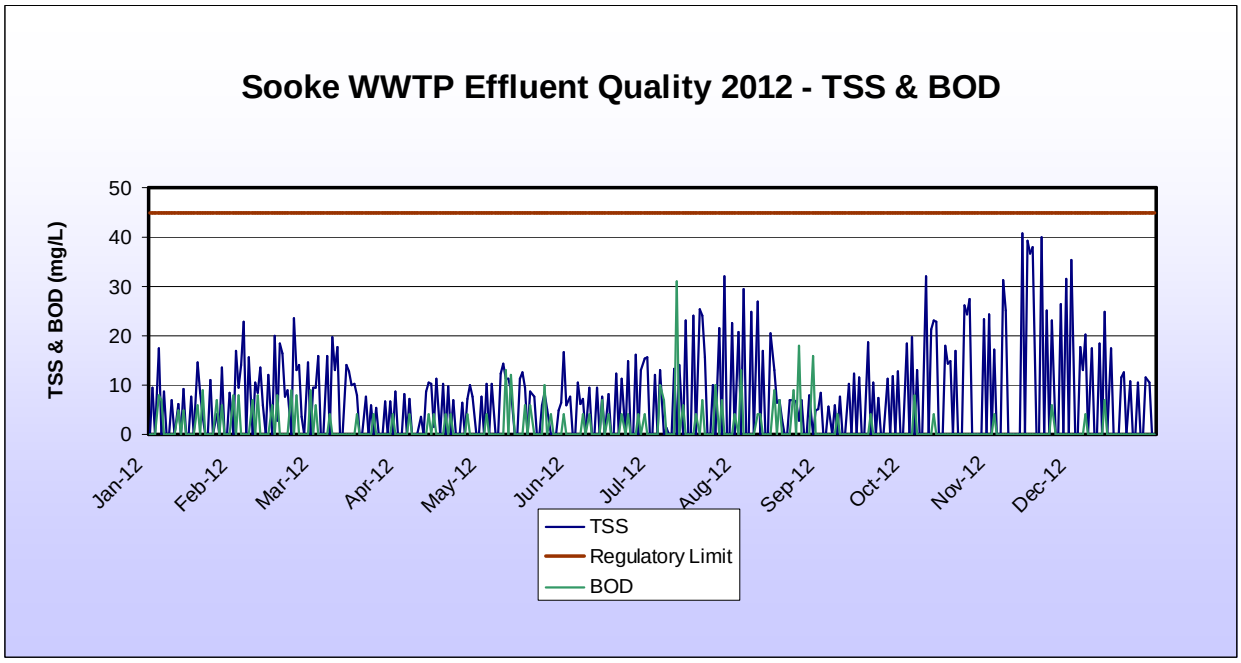


Plant Performance

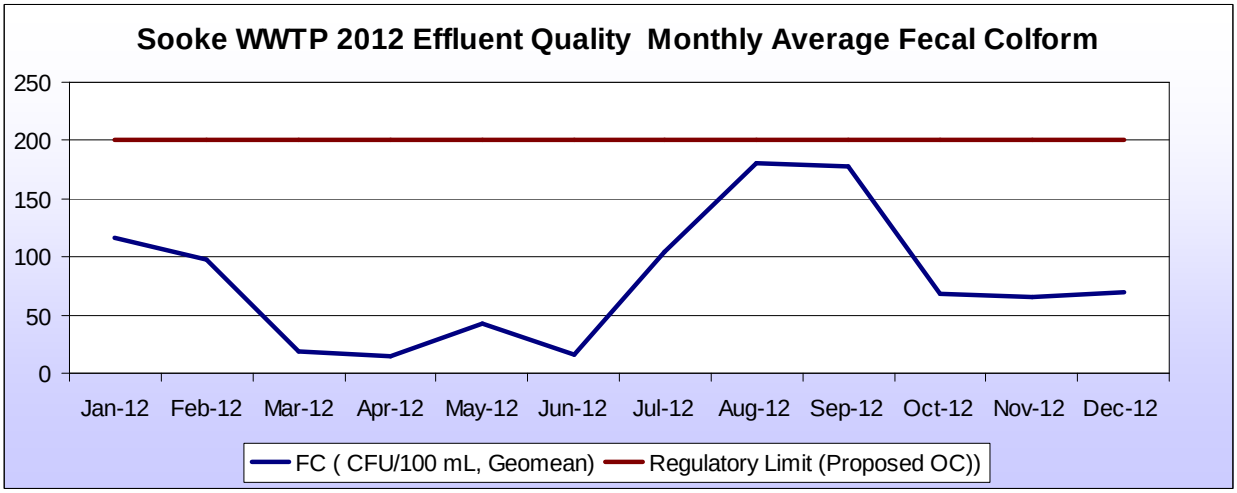
The wastewater treatment plant is performing very well. Three of the important parameters monitored at the plant are total suspended solids (TSS), biochemical oxygen demand (BOD) and fecal coliforms (FC).

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 2012 and their certifications.

Table 2– Operator Certification

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

Water Quality Standards & Results

The District of Sooke Liquid Waste Management Plan was approved by the Ministry of Environment in May 2011. Contained in the approved plan is a proposed Operational Certificate (OC). The OC 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 Waste Regulations (MWR).

As of April 20, 2012, the Ministry of Environment announced that the Municipal Sewage Regulation (MSR) was repealed and replaced with the Municipal Wastewater Regulation (MWR). Registration date and number (17300) for the plant remains unchanged.

The plant operating plan was updated and submitted to the Ministry of Environment in December as part of the requirement for the implementation of the Operational Certificate (OC).

New Federal Wastewater Systems Effluent Regulations (WSER) were introduced in July 2012 and reviewed, in detail, in preparation for new sampling, testing, and reporting requirements that will begin in January 2013.

The wastewater plant flow was switched to one basin in August due to low inflow to the plant and to test the capability of the plant in preparation for the membrane replacement project which will be done over the next several years. Effluent quality with respect to BOD, TSS, and coliforms was impacted; however, results were still below regulated limits.

Table 3 summarizes the regulatory requirements defined in the provincial Municipal Wastewater 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 2012. More detailed water quality information is contained in Appendices 1 and 2.

Appendices 3 and 4 contain the Receiving Environment Monitoring reports from 2012. 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
Ammonia (un-ionized) as N at 15^0C (Federal WSER)	1.25 mg/L	Monthly	1.25 mg/L	Monthly
BOD_5	<45 mg/L	Monthly (Grab)	45 mg/L	Monthly (Grab)
Fecal Coliforms	<200 CFU/100 ml * Geometric Mean	5 samples GM/ 30 days	NA	NA
pH	6.0 - 9.0		6.0 - 9.0	Monthly (Grab)
Receiving Environment Testing	Required	Yearly	As per Receiving Environment Monitoring Plan	
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 Measurement			NA	Daily Total
Flow, Average	To be determined	2/week	3000 m^3/day	2/week
Flow, Maximum	To be determined	2/week	6,900 m^3/day	To be determined
Total Phosphorus	NA	6 times/year (Grab)	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.
** All regulated tests are conducted by an ISO 17025 accredited laboratory.
Note: As per new Municipal Wastewater Regulation, testing for toxicity not required (deleted from table) and phosphorus testing required (added to table).

Table 5 - Sooke WWTP 2012 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	117	137	17	1688	3459	2355	6	17	16	8	20	13	15	17	16	<2	830	117	49620	5
February	177	202	22	1799	2985	2216	4	10	9	9	24	20	20	21	21	34	370	98	58350	6
March	140	157	na	1782	2811	2161	<4	20	5	6	29	14	na	na	na	6	126	18	42440	4
April	125	209	na	1636	2295	1819	<4	8	5	4	13	9	31	34	33	2	56	14	51150	5
May	260	260	58	1419	1802	1596	<4	11	7	<2	12	7	26	32	29	6	760	42	61820	6
June	242	158	47	1360	2198	1511	5	12	9	4	11	9	25	47	36	<2	2940	16	44460	4
July	142	244	39	1357	1591	1498	<4	19	11	10	21	17	34	34	34	8	3400	104	73490	7
August	225	273	47	1267	1678	1449	4	22	13	6	26	16	33	33	33	<5	5500	180	62150	6
September	205	282	42	1283	1614	1405	5	11	8	6	14	11	24	29	26	38	950	178	41570	5
October	189	222	206	1309	3343	1703	13	18	15	13	21	17	23	26	24	1	6100	69	43330	4
November	165	238	31	1747	3862	2313	9	15	13	20	33	27	15	23	19	<10	660	66	54330	5
December	124	150	20	2015	4159	2811	9	14	11	12	24	17	9	16	12	<2	870	69	29220	3
Total																			611930	60
Annual	176	211	53	1267	4159	1903	<4	22	10	<2	33	15	9	47	26	1	6100	56		

*Proposed Operating Certificate (OC) **na = not available/no test results

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 #2012-012 and #2012-013. During 2012, on average, approximately 50,994 tonnes of bio-solids per month were taken to the landfill. 60 loads and a total of 611,930 kg were hauled for the year.

Operations

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

The Sooke operation was reorganized with a new Operations Manager starting in February. Extensive preparations, including training and orientation meetings, were carried out throughout the month, to ensure a smooth changeover.

On March 6, the decanter motor from basin #1 was replaced as a precautionary measure as it is near its expected lifespan and is a critical process component. The motor that was removed will be kept as a back-up motor. In 2011, the decanter motor from basin #2 was replaced with a newer model and the original is also retained as back up.

In March, detailed Preventative Maintenance Plans, Operations Procedures, Spare Parts Inventory List and a Laboratory Quality Assurance/ Quality Control Program were finalized and submitted to the District of Sooke as per contractual requirements. Emergency Response Procedures were also updated and presented for the plant and collection system.

In April, electronic/computer communication faults caused Digester #2 aeration to be off for an extended period and, when reset, caused odours from the plant. Once the fault was detected and aeration cycles returned to normal, odours dissipated quickly. An alarm was created to call out the operators if the digester aeration interval exceeds four hours to prevent future incidences.

A student operator in training, enrolled in Water Engineering at Okanagan College, joined the operations team from May through August as part of a co-operative/training program.

The Seaparc Arena emptied both swimming pools on June 18 which impacted the plant by putting it into storm cycle twice. The large flows initiated two decanter park modes; a safety

feature built in by Sanitaire and EPCOR technical specialists to prevent UV channel floods. Decants were then managed manually to limit further park modes.

Water sampling was conducted on June 8 and October 12 at the outfall receiving waters in Sooke Bay. Results of the monitoring were satisfactory and consistent with past testing. The official reports are in Appendices 3 and 4.

The SCADA computer hard drive in the Control Room computer failed on July 16. The operators accessed the back-up SCADA clone through EPCOR in Edmonton for process control and the operation ran smoothly until the computer was repaired.

All of the UV channel bulbs were replaced in 2012. The high fecal coliform sample results in October were believed to be from a short duration shock to the plant. Subsequent test results were all significantly lower and the monthly geomean was within MWR requirements.

In November, all of the air diffuser membranes were replaced in Digester #1 as part of an asset renewal project. Air headers and diffusers disperse air into the basins for the treatment process and have manufacturer's life expectancy of five years. This work was done on schedule and on budget. It is proposed that SBR # 1, #2 and Digester #2 have all diffuser membranes replaced in the next four years to ensure treatment quality is maintained.

Process adjustments began in November, which were necessary in order to correct nitrification/de-nitrification problems. Modifications were made to the plant's treatment processes to get the plant fully nitrified and returned to producing high quality effluent. Running the plant fully nitrified will produce a more stable effluent and will be required with the new Federal wastewater regulations coming into effect January 2013 to consistently meet BOD and TSS limits.

The rebuild of the centrifuge began Dec.17 as an asset renewal project. The centrifuge is a high speed rotating piece of equipment that dewaters the biosolids produced at the plant. It is the manufacturer's recommendation that the equipment be serviced after 8000 hours and specialized technicians were brought in to perform the rebuild. All bearings were replaced and the scroll itself will require replacing in 2014.

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.

The new lift station at Mariner's Village was connected to permanent power on February 29. While awaiting the permanent power connection, the developer had the lift station pumped out with a vacuum truck several times a week. A few units within the complex have occupancy, so this interim solution ensured any flow into Mariner's Village pump chamber was managed and the vacuum truck transported the material to the wastewater plant for treatment.

New swing discs were installed in the check valves at the Sooke Road Lift Station on April 30. Operators discovered that the check valves were bypassing while they were installing pressure gauges for the Mariner's Village lift station commissioning tests. Installing the new swing discs has also reduced the Sooke Road lift station pump starts from approximately 8 times per hour to 4 times per hour.

Through routine lift station preventative maintenance checks it was discovered that a battery in the West Coast Road lift station stand-by generator needed replacing. It was replaced on April 18.

Generator diesel drive servicing was scheduled and completed for all lift station generators. A contractor was commissioned to perform these checks.

On May 3, a contractor was onsite at West Coast Road lift station to replace a leaking water pump on the generator. This was detected after the annual servicing of the lift station generators.

The Mariners Village lift station PLC was tied into the plant SCADA system by EPCOR's controls group in May.

Equipment for the boat launch sewage receiving station and a chemical feed system for odour control was supplied and installed by EPCOR as a donation to the District of Sooke. The chemical injection equipment for odour control including the chemical feed pump and spill containment was installed at the Prestige Hotel lift station on May 15, the vacuum pump was installed, and commissioning was completed in June.

On July 20, a main generator breaker lead securing screw was found to be damaged at Sunriver lift station, so scheduled load testing could not be completed. Due to the age of this unit, a new breaker switch was installed.

Annual wet well cleaning occurred at Sunriver and Sooke Road lift stations on July 24. Neighbouring residents to the lift stations were notified about vacuum truck noise prior to the work commencing.

On August 2, Helgesen Road and West Coast Road lift stations were cleaned. Excessive debris, including large chunks of asphalt, hindered the cleaning at West Coast Road. Although it is not currently affecting performance of the lift station, when it is cleaned next year, it will require a confined space entry to remove this material.

It was discovered that the level indicating transducer (LIT) was not working at the Helgesen Road lift Station on September 1. After troubleshooting it was found it was a firmware problem and on Sept.6, the PLC was reprogrammed by EPCOR instrument technicians.

As a proactive measure, an electrical contractor was brought in to load test the generator at the Prestige Hotel lift station. The generator overheated and the radiator did not function. A rental standby generator was obtained as a precautionary measure while repairs were performed on the diesel drive. It was determined that the generator could reliably supply 40 amps which is adequate for the lift station requirements, however, the addition of future loads may be limited. To ensure the lift station will be able to function in the event of a loss of power, a second transfer switch connected to the generator was removed.

At Sooke Road lift station adjustments were made to accommodate repairs to a broken discharge pipe. On Nov. 5, an electrical contractor, vacuum truck and operator were onsite in the early hours when flow is minimal. A contractor has been commissioned to fabricate the repair piece and an excavating firm is to complete the repairs in 2013. Analysis of the broken steel pipe will be done to determine the cause of the failure.

Multiple federal and provincial agencies (Environment Canada, Department of Fisheries and Oceans, Canadian Food and Drug Agency, Ministry of Environment) have changed the response to reports of wastewater releases from municipal wastewater systems. More extensive quality control procedures for commercial shellfish harvesting has resulted in more frequent and lengthy harvesting closures if a wastewater release is reported upstream of a harvesting area. This has resulted in an impact on shellfish businesses in the community. The regulated agencies clarified that lift stations were facilities of the highest risk in municipal collection systems. A review of the Sooke lift stations identified areas in need of additional protection to minimize potential releases; containment, alarm system redundancy and valve chamber and PLC alarms. EPCORs controls group with specialized contractors and Sooke staff completed this work, within the year, for the lift station modifications capital project.

COLLECTION SYSTEM

As follow up action to the collection line blockage that occurred in December, a video crew was contracted to camera the area of the pipe affected by the blockage. The obstruction was a piece of broken 6” asbestos cement pipe (approx. 6-8”long), along with a significant amount of grease. The sewer mains were flushed in December so the camera work could commence and the video revealed that there was no damage to the pipe.

On March 25, at 11:10 AM, a call was received through the EPCOR pager that a manhole was overflowing between Driftwood Place and Stonewood Drive. Upon arrival at the site, a representative from CRD Water was present and noted it was a sewer manhole that was overflowing. CRD reported that a call about a water leak in the gravel walkway between Driftwood Place and Stonewood Drive was received by them on March 24 at 20:20 indicating the flow was a small leak into gravel. CRD received another call in the morning and contacted the Sooke Fire Department, who in turn contacted the District of Sooke.
The emergency response plan for wastewater releases was activated, authorities notified and a vacuum truck was called. The vacuum truck removed the blockage (in the form of gravel, blast rock and a piece of rebar) and the overflow was stopped. The gravel walkway was limed and raked. Another vacuum truck arrived onsite at 4PM and began draining the storm pond. Water samples were taken and laboratory tests were performed to determine if there was any chance of a release of contaminants into the Sooke waterways via DeMamiel Creek. Environment Canada determined that there was neither environmental damage nor impact on the watershed. As follow up work to the collection system, lines were flushed and camera work was commissioned to ensure there was neither further blockage nor damage to pipes. Following up from this incident, all calls relating to Sooke that are reported to CRD will now be reported to District of Sooke operations.

As part of EPCOR's Preventative Maintenance plan, servicing began in May on blow-off valves/ pump-out connections of the collection system. Valves are located, exercised and cam locks lubricated as part of maintenance in the low pressure area of the collection system.

In May, EPCOR responded to odour complaints along Grant Road. Neighbouring residents were interviewed and probable sources were defined. Manhole lids were plugged in the area. Ongoing communication continued with residents as follow up until concerns were resolved.

On June 7, a grease trap inspection was conducted at the Prestige Hotel. It was recommended that cleaning frequency records be maintained and further investigation is required to determine if upstairs dishwasher lines feed into the grease trap.

A service request came in on June 26 from the District of Sooke regarding odours near a business on West Coast Road. A paving crew had broken a manhole lid seal. The gasket was replaced and the manhole lid plugged and lid re-installed.

On August 9 and 10, vacuum trucks were on site at pre-determined areas of low slope for flushing as part of the maintenance plan. Substantial amounts of construction debris were found between Church Road and Townsend Road, narrowly avoiding an overflow.

Sewer System Growth monitoring in the Sooke collection system indicated that there was a need for a third pump to be added at the West Coast Road lift station. This is the largest lift station in the collection system and it handles approximately 75% of the wastewater that goes to the treatment plant. The capital project involved electrical and civil contractors as well as EPCOR SCADA and

controls and operations staff. The addition of the pump and integration into operations was completed ahead of schedule and under budget.

A conceptual design of the Sooke Wastewater Collection system was completed in 2008 to identify the capital plan to support growth in the SSA. Since the original plan was developed, the OCP and the zoning bylaw have been updated and the Town Centre Plan has been completed. The System Expansion Conceptual Design Report was updated for 2012 in December. It incorporates changes in the system since 2008 to ensure capital and financial planning for the utility remains as accurate as possible and development requests can be properly evaluated with respect to potential impact on the wastewater system.

Inflow and Infiltration (I/I)

Infiltration and Inflow allowance (I/ I) is a typical allowance which is factored into sanitary sewer systems at design. It represents infiltration of unwanted stormwater into the sanitary sewer system which is an unavoidable occurrence, regardless of the age of the system. Stormwater infiltrates the system via a number of points, such as manholes (manhole lids have lifting holes which allow stormwater in), potential cross connections (homeowners may incorrectly connect their home drainage infrastructure into the sanitary service), lift station hatches and pipe joints, manhole walls, or pipes. New systems typically have low I/ I values, but these values increase as the system ages. EPCOR has a systematic program of identifying new and significant sources of I/I and minimize this flow from the collection and treatment stream.

During the year, the inflow and infiltration investigation program was ongoing to monitor the system for I/I sources. A few sources of I/I have been addressed since the system has been operational, including stormwater system cross connections and pipes that had been damaged from construction activities since the system was installed.

In February, a manhole was found to be positioned in a gutter that was allowing water, sand and gravel in. It had to be sealed by plugging holes in the lid. In April, suspected infiltration was determined to be faulty check valves at the Sooke Road lift station. The valves were not closing and were allowing continuous, heavy flows into the wetwell. After replacing two check valve discs the flow and pump starts were noticeably reduced.

On Aug. 31, a cross connection was dye tested which confirmed that a storm drain is connected to the sewer on West Coast Road. The District of Sooke is following up with the property owner to ensure the sewer line and stormwater line do not have the same connection.

Maintenance

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

- All air headers and diffusers replaced in Digester #1
- 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
- Rebuild of the centrifuge
- Upgrades to communication systems
- Digester blower belt changes
- Annual maintenance of UV bulbs and channel
- Brush clearing around the treatment plant and lift stations
- SBR # 1 Decanter motor replacement
- Retrieval wench recertification
- Replacement of Auma actuator
- Headworks bar screen brush replacement

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.

On March 26, the Sooke Fire Department conducted its annual inspection of the wastewater treatment plant site and it was noted that the plant and its equipment are in excellent shape.

A laboratory Quality Assurance Specialist from EPCOR was onsite on April 26 for the annual internal laboratory audit. This audit is to ensure laboratory tests and procedures are being conducted as per EPCOR's Standard Operating Procedures (SOPs). Also, laboratory equipment is assessed to verify accuracy.

Officers from the Ministry of Environment were onsite for the annual inspection of the wastewater treatment plant and outfall area on Oct.23.

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 three times during 2012 for training and assessment visits. Review of safety performance, hazard analysis, ERP review, annual respirator fit testing, and reviews of personal protection equipment were completed.

CUSTOMER SERVICE

Customer Inquiries

EPCOR operates a customer service phone line to address concerns and answer question for the public. In 2012, a total of 118 new inquiries were received (summarized in Table 5).

Table 6– 2012 Customer Calls

Customer Query Types	Comments	Year-To-Date
Odour	• Report of odour in ditch beside lift station • 8 reports of odour from manholes • 3 reports of odours from plant (1 was trucks hauling biosolid bin) • 1 septic tank odours • 1 compliment from neighboring mobile home park owner about zero odours from WWTP • 7 odours from private properties (4 internal plumbing issue) • Outdoor odours, undetermined sources • Odour from IC needing flapper valve-developer contacted	23
Pump	• 33 inquiries about pump repairs (plumbing service needed) • 8 inquiries about pump types & servicing • Inquiry about obtaining pump	42
Connection	• Inquiries regarding connecting to collection system • Inquiries regarding pipe depth/diameter/connectors into section of collection system • Connection location in relation to water main break • 3 development inquiries • Resident concerned over neighbor's sewer connection	12
General	• Replacement of IC lids (damaged/improperly installed) • Inquiry about location of outfall from plant • Inquiry : purchase of Brooks Box with H2 lid • Noises from Sunriver lift station pump • Plumbing inquiries unrelated to sewer system • Impact from blockage/spill at Sunriver • Decommissioned septic tank • Inquiries about jewelry retrieval from sewer • Line blockages causing overflow on private property • 1 inquiry re: plant operations • 1 request regarding tree replacement at lift station • 1 feral cat inquiry • Boat launch issue for Outfall Monitoring • Sewage blockage, resident's responsibility • 1 inquiry about decals for artwork on lift stations • 1 inquiry about location of sewer line on property • 1 complaint about noise at lift station (cleaning) • 1 concern over hissing generator noise at plant • 1 query :ad error that EPCOR provides fire hydrant servicing • Request/ tour of UV system from Williamshead WWTP	39

	• Reported water running out of neighbor's driveway and pooling. Address not in SSA • 1 adaptor for suction hose at boat launch • Questions about biosolid composition & handling- • Request for high school class tour in November • 1 fallen tree branches-couldn't find any other contact	
Service Area	• Realtor inquiry about property within SSA • Inquiry about plans for Whiffin Spit connection to sewer	2
TOTAL		**118**

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 2012, EPCOR supported the community of Sooke with continued annual support to the:

- Sooke Salmon Enhancement Society,
- Sooke Branch of Royal Canadian Legion Poppy Campaign and the
- Sooke Fine Arts Society.

EPCOR also sponsored and participated in the:

- Rotary Spring Fair
- 7th Annual Consultants' Invitational Fishing Derby and
- Sooke Jordan River Chamber of Commerce Santa Parade.

Equipment for the boat launch sewage receiving station and a chemical feed system for odour control was supplied and installed by EPCOR as a donation to the District of Sooke. The chemical injection equipment for odour control including the chemical feed pump and spill containment was installed at the Prestige Hotel lift station in May and the vacuum pump was installed and the system was available for use by the community in June.

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APPENDICES

1. Monthly Data Summary
2. Influent Metal Samples
3. Sooke Outfall June 2012 - Environmental Monitoring Report
4. Sooke Outfall October 2012 - Environmental Monitoring Report

JANUARY 2012 MONTHLY DATA

Jan-12		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
	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
Jan	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/100 mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL
1	2187																									
2	2174			195								9	41							10	57					
3	2120																									
4	2477	7.6	133	331	320	85	120	17			6.8	14	7	70	20	7	17	192	6.9	23	43	80	13	6	15	22
5	2767																									
6	2831	7.4	107	167							6.8	6	38						6.9	12	42					
7	2455																									
8	2275																									
9	2032										6.9	5	21						6.9	8	41					
10	2007																									
11	1860	7.8	283	602							7.0	6	62					50	7.0	6	73					24
12	1688																									
13	1774			507								13	54						6.9	6	33					
14	1981																									
15	2072																									
16	2132			366							7.0	13	56						6.9	3	50					
17	2003																									
18	1751	7.7	182	414		149	153				6.9	22	65	80	12	10		<2	6.9	16	73	70	8	9		186
19	1768											9								8						
20	1975	7.8		541							7.0	6	61						6.9	1	45					
21	3459																									
22	2912																									
23	2475			338								9	50							13	25					
24	2606																	340								39
25	3047	7.8	176	343								5	52						6.9	4	90					
26	3028																	137								99
27	2475			535								8	37							19	34					
28	2251																									
29	2954																									
30	3001			526								8	42					830								
31	2454																	74								7
Min	1688	7.4	107	167	320	85	120	17			6.8	5	7	70	12	7	17	<2	6.9	1	25	70	8	6	15	7
Max	3459	7.8	283	602	320	149	153	17			7.0	22	65	80	20	10	17	830	7.0	23	90	80	13	9	15	186
Avg	2355	7.7	176	405	320	117	137	17			6.9	10	45	75	16	9	17	83	6.9	10	51	75	11	8	15	37

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

FEBRUARY 2012 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	Conduct-ivity	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/100 mL		mg/l	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL
1	2529	7.7	202	218							7.0	10	22						6.9	17	34					
2	2423																									
3	2134			343								4	41							14	31					
4	2135																									
5	1991																									
6	1826			468								20	43							20	30					
7	1860																	56								83
8	1830	7.9	220	290	320	128	172	22			7.1	11	30	70	10	4	21	42	6.9	12	50	80	9	6	20	34
9	1922																									
10	2021			441								10	32							14	31					
11	2038																									
12	1959																									
13	1978			459								15	60							18	47					
14	1922																	166								84
15	1898	7.7	197	401	620	225	232				7.0	34	51	80	24	14		232	6.9	15	56	80	21	10		72
16	1799																									
17	1979	7.5		492							6.9	13	79							18	52					
18	2621																									
19	2527																									
20	2283			338								19	80							17	51					
21	2360																									
22	2832	7.6	103	220							6.9	20	33					77	6.9	24	28					78
23	2447																									
24	2752			559							6.9	25	66						7.1	14	30					
25	2985																									
26	2566																									
27	2339			433								18	58							10	54					
28	2097																	370								230
29	2104	7.8	179	517							6.9	25	64						6.9	10	31					
Min	1799	7.5	103	218	320	128	172	22	0	0	6.9	4	22	70	10	4	21	42	6.9	10	28	80	9	6	20	34
Max	2985	7.9	220	559	620	225	232	22	0	0	7.1	34	80	80	24	14	21	370	7.1	24	56	80	21	10	20	230
Avg	2216	7.7	180	398	470	177	202	22	0	0	6.9	17	50	75	17	9	21	117	7.0	16	41	80	15	8	20	82

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

MARCH 2012 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	Conduct-ivity	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/100 mL		mg/l	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL
1	2026																		6.9	10	31					
2	1922			421								22	77							10	36					
3	1937																									
4	2165																									
5	2737			343								22	65							10	73					
6	2346																	34								12
7	2272	8.0	160	418	480.0	160	153	25.0	500	0.5	7.0	36	34	90	29	14	20	30	7.1	8	8	60	6	5	20	8
8	2025											23								3						
9	1969	7.7		435							7.0	29	71						6.9	6	34					
10	2243																									
11	2202																									
12	2205			444								22								7						
13	2417											16								10						
14	2359	7.9	153	483	360	119	160				7.1	14	80	80	14	7		25	6.9	4	80	50	8	<4		7
15	2730											13						10		7						6
16	2811			363							6.8	10	55						6.9	6	48					
17	2515																									
18	2275																									
19	2096			505							7.1	10	44						7.0	5	39					
20	1985																									
21	1951	7.8	138	400							7.1	8	87					27	6.9	4	24					21
22	1915																									
23	1892	7.8		337							7.1	7	53						6.9	4						
24	1782																									
25	1974																									
26	1881			535							7.0	9	66						6.9	4	56					
27	1840																	42								126
28	1798	7.8	297	532							7.1	8	59						7.0	5	55					
29	2086																									
30	2325			367								11	78					8		6	76					
31	2296																									
Min	1782	7.7	138	337	360	119	153		500			7		80	14	7		8	6.9	3	8	50	6	<4		6
Max	2811	8.0	297	535	480	160	160		500			36		90	29	14		42	7.1	10	80	60	8	<4		126
Avg	2161	7.8	187	429	420	140	157		500			16		85	21.5	11		18	6.9	6	47	55	7	<4		27

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

APRIL 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
	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
April	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	2295																									
2	2136			516								11	107							6	67					
3	2215																									
4	2215	7.8	391	517	410	124	132				7.0	10	60	80	9	8		30	6.9	5	63	60	4	4		2
5	1893																									
6	1862																									
7	1798																									
8	1816	7.7	146								6.9	1								6						
9	1813																									
10	1654											7						8		10						40
11	1636	7.7	328	564							7.1	9	77						6.9	12	72					
12	1648											9						25		12						5
13	1653			454								2	76													
14	1704																			11	59					
15	1843																									
16	1874			553								8	76							12	89					
17	1760																									
18	1753	7.7	286	589	690	125	286	43			7.0	5	58	70	11	5	34	56	6.9	10	99	60	13	4	31	21
19	1741																									
20	1883			456								7	68							7	58					
21	1782																									
22	1675																									
23	1825			708								8								5						
24	1729																	12								10
25	1896	7.8		496							7.0								7.1	7	98					
26	1731											10	26													
27	1645			635								12	79							3	60					
28	1655																									
29	1689																									
30	1756	7.7		695								14	79						7.3	2	60					
Min	1636	7.7	146	454	410	124	132				6.9	1	26	70	9	5	34	8	6.9	2	58	60	4	<4	31	2
Max	2295	7.8	391	708	690	125	286				7.1	14	107	80	11	8	34	56	7.3	12	99	60	13	<4	31	40
AVG	1819	7.7	288	562	550	125	209				7.0	8	71	75	10	7	34	21	7.0	8	73	60	9	<4	31	10

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

MAY 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
	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
May	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	1748																									
2	1718	7.7	322	627							7.2	16	99					760	7.0	5	66					6
3	1650																									
4	1637			484								14	56							6						
5	1676																									
6	1760																									
7	1757			627								14								11	92					
8	1802											18								11						
9	1631	7.8	238	666	590	133	230				7.2	16	61	90	12	11	32	98	7.3	9	68	90	8	6	26	17
10	1536											14								8						
11	1549			613								11								7						
12	1531																									
13	1571																									
14	1603											16								7						
15	1575											18								8						
16	1621	7.9	384	748							7.0	13	82					430	6.8	6	41					12
17	1606																									
18	1646											11								7						
19	1638											9								6						
20	1479																									
21	1619																									
22	1578																			6						
23	1616	7.7	291	642							7.0	12	74					210	6.5	5	36					32
24	1492		408	647	630	258	290	58				6	76	100	8	8		16		5	56	100	<2	<4		84
25	1422																									
26	1508																									
27	1577																									
28	1618			830								5								5						
29	1419											6														
30	1432	7.8	310	670							7.1	28						16	6.6	5	21					6
31	1467											8								4						
Min	1419	7.7	238	484	590	133	230	58	0	0	7.0	5	56	90	8	8	32	16	6.5	4	21	90	<2	<4	26	6
Max	1802	7.9	408	830	630	258	290	58	0	0	7.2	28	99	100	12	11	32	760	7.3	11	92	100	8	6	26	84
AVG	1596	7.8	326	655	610	196	260	58	0	0	7.1	13	75	95	10	10	32	109	6.8	7	54	95	5	4	26	16

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

JUNE 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
	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
June	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	1418											12								4						
2	1484																									
3	1491																									
4	1489			557								7								14						
5	1541											10								3						
6	1418	7.8	310	638	510	234	50	47			7.2	13	111	100	10	11	47	16	6.9	2	49	70	4	<4	25	22
7	1480																									
8	1360			510								13								6						
9	1436																									
10	1509																									
11	1573			476								17								2						
12	1538																	4								2
13	1561	7.9	356	603							7.2	11	69						6.7	4	56					
14	1489																	4								<2
15	1385			369								11								6						
16	1401																									
17	1448																									
18	2198			381								18								6						
19	1492																									
20	1477	7.8	307	469	740	250	266			2	7.0	13	108	130	11	12		12	6.5	12	51	90	9	5		2940
21	1558																									
22	1463		527	679								17	98							13	99					
23	1445																									
24	1515																									
25	1508			722								17								16						
26	1473																	104								58
27	1586	7.7		778							7.0	15	135						6.6	11	86					
28	1486											20						6		11						24
29	1574		282	531								19								12						
30	1528																									
Min	1360	7.7	282	369	510	234	50	47		2	7.0	7	69	100	10	11	47	4	6.5	2	49	70	4	<4	25	<2
Max	2198	7.9	527	778	740	250	266	47		2	7.2	20	135	130	11	12	47	104	6.9	16	99	90	9	5	25	2940
AVG	1511	7.8	356	559	330	242	158	47		2	7.1	14	104	115	11	12	47	11	6.7	8	68	80	7	3	25	24

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

JULY 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
	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
July	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	1460																									
2	1591			565								16								8						
3	1582																	40								8
4	1574	7.4	284	638							7.0	20	108						6.5	7	101					
5	1531																	32								16
6	1586			658																1						
7	1430																									
8	1460																									
9	1422			660								22								5						
10	1503																									
11	1460	7.4	204	291	560	196	202	39			7.1	18	70	130	21	13	34	18	6.0	8	40	60	10	<4	n/a	8
12	1437																									
13	1478			716								20								26						
14	1574																									
15	1581																									
16	1560			722								22								26						
17	1403																									
18	1559	7.3	49	707							6.9	20	60					50	6.7	31	69					
19	1390											24														890
20	1541			456								14								18						
21	1457																									
22	1490																									
23	1508			628								13						2500		7						1700
24	1521																									
25	1402	7.4	99	393	400	88	285				6.9	24	122	120	19	19		3400								
26	1357																									
27	1496			481								32														
28	1456																									
29	1561																									
30	1498		513									20								25						
31	1564																									
Min	1357	7.3	49	291	400	88	202	39			6.9	13	60	120	19	13	34	18	6.0	1	40	60	10	<4	n/a	8
Max	1591	7.4	513	722	560	196	285	39			7.1	32	122	130	21	19	34	3400	6.7	31	101	60	10	<4	n/a	1700
AVG	1498	7.4	230	576	480	142	244	39			7.0	20	90	125	20	16	34	146	6.4	15	70	60	10	<4	n/a	69

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

AUGUST 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT								SBR 2 EFFLUENT							
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					IN HOUSE			EXTERNAL				
	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
Aug.	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	1476	7.3	131	116							6.8	21	110													
2	1381																									
3	1515			579								30														
4	1357																									
5	1344																									
6	1409		267	522								25														
7	1342																	5500								
8	1360	7.5	373	846	900	318	338	47			7.2	28	139	170	26	22	33	2010								
9	1476																									
10	1678			908								17														
11	1528																									
12	1533																									
13	1514			705																20						
14	1519																			13						1400
15	1440	7.6	264	670															7.0	6	63					340
16	1502																			7						
17	1502			1065																3						
18	1267																									
19	1423																									
20	1611			702																7						340
21	1501																			7						560
22	1489		182	717		131	208													7	15		6	4		<5
23	1453																			3						
24	1534			680																7						
25	1421																									
26	1357																									
27	1411			516																8						130
28	1287																									<10
29	1510	7.6	222	328															7.1	5	47					49
30	1439																			5						74
31	1326											13								4	71					
Min	1267	7.3	131	116	900	131	208	47			6.8	13	110	170	26	22	33	2010	7.0	3	15		6	4		<5
Max	1678	7.6	373	1065	900	318	338	47			7.2	30	139	170	26	22	33	5500	7.1	20	71		6	4		1400
AVG	1449	7.5	240	643	900	225	273	47			7.0	22	125	170	26	22	33	3325	7.1	7	79		6	4		93

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

SEPTEMBER 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT									SBR 2 EFFLUENT								
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL					
	Effluent flows	pH	TSS	COD	COD	BOD	TSS	NH_3	Conductivity	Surfactants	pH	TSS	COD	COD	TSS	BOD	NH_3	PO_4	FC	pH	TSS	COD	COD	TSS	BOD	NH_3	PO_4	FC
Sept	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	mg/L	CFU/ 100mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100mL
1	1309																											
2	1318																											
3	1614			612								6									5							
4	1504																											
5	1432	7.7	212	603							6.9	7	70							7.0	5	62						
6	1289																											
7	1341			715								8									7							
8	1410																											
9	1493																											
10	1463			715								10					26		38		10					25		950
11	1446																											
12	1536	7.7	250	544	490	115	258	42			7.0	12	98	95	14	11	26		760	7.0	12	73	83	11	7	24		120
13	1361																											
14	1283			880								13									10							
15	1304																											
16	1352																											
17	1470			702								13									24							
18	1473																											
19	1397	7.7		1102							6.9	11	62				28		100	7.3	10	84				29		96
20	1318																	1.19	96									400
21	1374		472	810								6									9							
22	1343																											
23	1446																											
24	1451		330	693								11	67								12	71						
25	1376																		66									352
26	1385	7.5	494	529	738	295	306					8	50	81	6	7			92	7.5	20	67	94	13	5			390
27	1506																											
28	1334			674								10									16							
29	1379																											
30	1454																											
Min	1283	7.5	212	529	490	115	258	42			6.9	6	50	81	6	7	26	1.19	38	7.0	5	62	83	11	5	24		96
Max	1614	7.7	494	1102	738	295	306	42			7.0	13	98	95	14	11	28	1.19	760	7.5	24	84	94	13	7	29		950
AVG	1405	7.6	352	715	614	205	282	42			6.9	10	69	88	10	9	26	1.19	109	7.2	12	71	89	12	6	26		290

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

OCTOBER 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT										SBR 2 EFFLUENT									
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL							IN HOUSE			EXTERNAL						
	Effluent flows	pH	TSS	COD	COD	BOD	TSS	NH_3	Conductivity	Surfact-ants	pH	TSS	COD	COD	TSS	BOD	NH3	NH3 (unionized)*	PO_4	FC	pH	TSS	COD	COD	TSS	BOD	NH_3	NH3 (unionized)*	PO_4	FC
Oct	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		mg/L	CFU/ 100mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	CFU/ 100mL
1	1588			893								18										19								
2	1397																													
3	1326	7.7	354	870	843	189	346		683	3	7.0	20	84	108	20	18				630	7.1	19	87	104	21	15				6100
4	1522																													
5	1309			690								10										16								
6	1379																													
7	1437																													
8	1550			617								32																		
9	1705																													
10	1497	7.6	329	862							7.3	27	74								7.1	16	102							
11	1373											31										16								
12	1350		232	429								31	159									15	102							
13	1579																													
14	2187																													
15	1885		182	357								16										20								
16	1741											14																		
17	1549	7.7	230	632	424	222	226	36			6.9	14	108	122	13	13	23				7.1	18	96	113	14	13	26	0.088		
18	1697																			6										1
19	1867		200	465								12										22								
20	1778																													
21	1787																													
22	1750		179	428								24								6		28								750
23	1726		194	714																		24								
24	1615		282	639								24	121									31	126							
25	1375		243	633																										
26	1536		261	572																										
27	1813																													
28	2153																													
29	1885		91	305								23										24								
30	2087																													
31	3343	7.7	148	291							7.0	17	75								7.1	32	87							
Min	1309	7.6	91	291	424	189	226	36	683	3	6.9	10	74	108	13	13	23			6	7.1	15	87	104	14	13	26	0.088		1
Max	3343	7.7	354	893	843	222	346	36	683	3	7.3	32	159	122	20	18	23			630	7.1	31	126	113	21	15	26	0.088		6100
AVG	1703	7.7	231	607	634	206	286	36	683	3	7.0	21	109	115	17	16	23			28	7.1	20	103	109	18	14	26	0.088		166

* Ammonia (unionized) as N at 15°C

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

NOVEMBER 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT										SBR 2 EFFLUENT									
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL							IN HOUSE			EXTERNAL						
	Effluent flows	pH	TSS	COD	COD	BOD	TSS	NH_3	Conductivity	Surfactants	pH	TSS	COD	COD	TSS	BOD	NH_3	NH3 (unionized)*	PO_4	FC	pH	TSS	COD	COD	TSS	BOD	NH_3	NH3 (unionized)*	PO_4	FC
Nov	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		mg/L	CFU/ 100mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	CFU/ 100mL
1	2599																													
2	2225			305								17																		
3	2098																													
4	2105																													
5	2166			578								21										42								
6	2286	7.8	243	333	439	166	297	38			7.1	22	108	119	20	9	23			20	6.9	38		130	21	15	20			<10
7	2024																													
8	1843																			38										660
9	1747																													
10	1770																													
11	1775																													
12	2061		139	254								40										41								
13	1938																													
14	2391	7.7	249	478							6.9	42	143								6.9	36	158							
15	2174											30										43								
16	1813	7.6		575							7.2	38																		
17	1882																													
18	2250																													
19	3334			428																		40								
20	3574																													
21	3862	7.6	137	435							7.0	28	84							100	6.9	22	66							80
22	2991	7.5									6.8										6.8									
23	3001	7.5		195							6.7	25									6.8	21								
24	2415																													
25	2274																													
26	2303	7.7		400							6.9	35									6.9	18								
27	2034																													
28	1892	7.7	182	398	382	163	178	23			6.8	33	104	109	33	14	15		1	210	6.9	28	104	106	32	15	16		1	90
29	2005																													
30	2572	7.7		460							6.9	38									7.0	33								
Min	1747	7.5	137	195	382	163	178	23			6.7	17	84	109	20	9	15		1	20	6.8	18	66	106	21	15	16		1	<10
Max	3862	7.8	249	578	439	166	297	38			7.2	42	143	119	33	14	23		1	210	7.0	43	158	130	32	15	20		1	660
AVG	2313	7.6	190	403	411	165	238	31			6.9	31	110	114	27	12	19		1	63	6.9	33	109	118	27	15	18		1	168

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

DECEMBER 2012 MONTHLY DATA

		INFLUENT									SBR 1 EFFLUENT											SBR 2 EFFLUENT										
		IN HOUSE			EXTERNAL						IN HOUSE			EXTERNAL								IN HOUSE			EXTERNAL							
	Effluent flows	pH	TSS	COD	COD	BOD	TSS	NH_3	Conductivity	Surfact-ants	pH	TSS	COD	COD	TSS	BOD	CBOD	NH_3	NH3 (unionized)*	PO_4	FC	pH	TSS	COD	COD	TSS	BOD	CBOD	NH_3	NH3 (unionized)*	PO_4	FC
Dec.	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	mg/L		mg/L	CFU/ 100mL		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	CFU/ 100mL
1	3373																															
2	3716																															
3	3662	7.5		251							6.7	17										6.7	18									
4	3325																						13									
5	3180	7.6	143	251	306	111	156	20			6.7	20	73	84	24	14		16			260	6.9	18	86	77	19	10		13			270
6	3570																															
7	3691	7.7		325							6.7	18										6.7	17									
8	3110																															
9	2665																															
10	2351	7.6		387							6.7	20										6.9	17									
11	2299																															
12	2305	7.8	179	426							6.9	24	103								470	6.9	26	82								870
13	2249																															
14	2174	7.8		303							6.8	19										6.9	16									
15	2559																															
16	2795																															
17	3543																															
18	3343	7.6		353							6.7	9									20	6.6	14									10
19	3343	7.7	157	310		137	144	19			6.7	11	62		12	9		10				7.0	16	65		12	9	9	9			
20	4159																															
21	3023	7.6	140								6.7	9										6.8	12									
22	2681																															
23	2374																															
24	2327	7.4		341							6.7	9										6.7	12									
25	2420																															
26	2402																															
27	2174	7.4	159	283							6.7	8	52								<2	6.8	15	64								<2
28	2205	6.8	142	373							6.2	7										6.2	14									
29	2061																															
30	2059																															
31	2015	7.6	93	185							6.8	13								0.60		6.9	17								0.71	
Min	2015	6.8	93	185	306	111	144	19			6.2	7	52	84	12	9		10		0.60	<2	6.2	12	64	77	12	9	9	9		0.71	<2
Max	4159	7.8	179	426	306	137	156	20			6.9	24	103	84	24	14		16		0.60	470	7.0	26	86	77	19	10	9	13		0.71	870
AVG	2811	7.5	145	316	306	124	150	20			6.7	14	73	84	18	12		13		0.60	40	6.8	16	74	77	16	10	9	11		0.71	39

Note: Monthly average reported for fecal coliforms is a geometric mean. Proposed OC limits <45 mg/L for TSS/BOD. External testing done by an ISO 17025 accredited Lab, EXOVA , Surrey, BC

Sample Description	Influent			
Matrix	Water			
Analyte **Metals Total**	**Units**	**March Results**	**October Results**	**Nominal Detection Limits**
Aluminum	mg/L	0.17	0.076	0.001
Antimony	mg/L	<0.001	0.0002	0.0001
Arsenic	mg/L	<0.001	0.00033	0.00005
Barium	mg/L	0.007	0.00628	0.00005
Beryllium	mg/L	<0.0002	<0.00005	0.00005
Bismuth	mg/L	na	0.0022	0.0001
Boron	mg/L	0.007	0.099	.002
Cadmium	mg/L	<0.0004	0.00010	0.00001
Chromium	mg/L	<0.002	0.0005	0.0005
Cobalt	mg/L	0.0003	0.0003	0.0001
Copper	mg/L	0.10	0.0614	0.0001
Iron	mg/L	0.13	0.195	0.002
Lead	mg/L	0.001	0.0013	0.0001
Lithium	mg/L	<0.005	0.0018	0.0005
Manganese	mg/L	<0.02	0.0327	0.0002
Molybdenum	mg/L	0.0002	0.00071	0.00005
Nickel	mg/L	<0.005	0.0026	0.0002
Selenium	mg/L	<0.003	0.0004	0.0001
Silver	mg/L	<0.0002	0.00005	0.00001
Strontium	mg/L	0.04	0.0298	0.0001
Thallium	mg/L	<0.00005	<0.00001	0.00001
Thorium	mg/L	<0.002	0.00002	0.00001
Tin	mg/L	0.003	0.0019	0.0001
Titanium	mg/L	<0.005	0.0160	0.0005
Uranium	mg/L	<0.002	<0.00001	0.00001
Vanadium	mg/L	<0.0005	0.0002	0.0001
Zinc	mg/L	0.081	0.0712	0.0005
Zirconium	mg/L	0.001	0.0014	0.0005
Calcium	mg/L	15.9	11.4	0.05
Magnesium	mg/L	5.03	4.53	0.04
Potassium	mg/L	8.7	16.7	0.1
Silicon	mg/L	3.6	2.93	0.02
Sodium	mg/L	24.8	40.7	0.1
Routine Water				
Electrical Conductivity	µS/cm at 25 C	500	683	1

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

June 2012

PACIFICUS
Biological Services Ltd

T: 250-949-9450 F: 250-949-7656 PO Box 2760 Port Hardy, BC V0N 2P0
info@pacificus.ca www.pacificus.ca

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

Sampling Date: June 8, 2012
Report Submission Date: June 25, 2012

Prepared for:

EPCOR WATER SERVICES
7113 West Coast Rd
Sooke, BC

Prepared by:

PACIFICUS BIOLOGICAL SERVICES LTD.
P.O. Box 2760
Port Hardy, B.C.
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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.

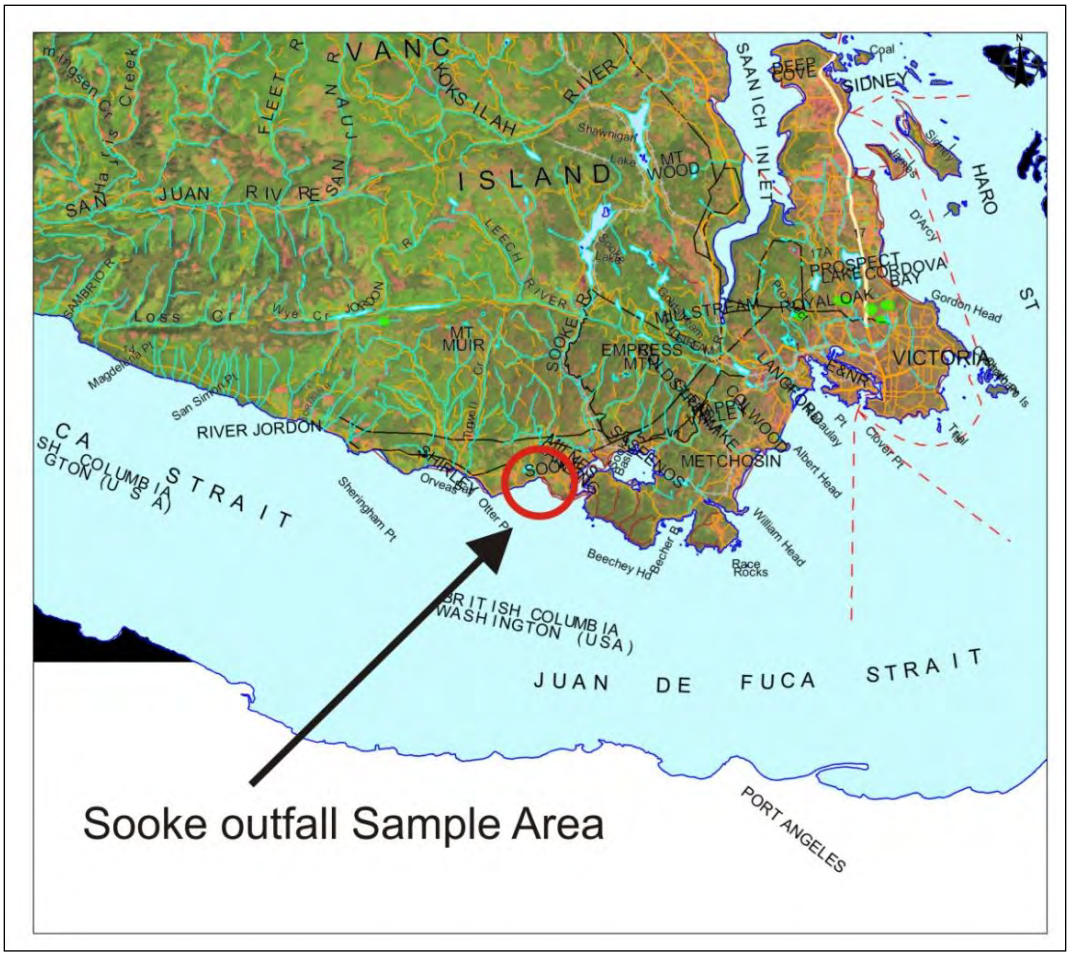

Figure 1: General location of sample sites, Sooke Bay, British Columbia

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 June 8, 2012. 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, if a pycnocline is present. 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 (June 8th, 2012) the weather was partially cloudy with light wind. The water column was measured to be unstratified at the time of sampling; therefore, only one set of samples were gathered from each site at a depth of 2m.

The Pacificus technician, Tristan Gale, 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 (DO), conductivity, salinity, pH and temperature readings were taken and recorded in the field using a YSI Model 85 handheld multi parameter testing instrument.

Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Ammonia (N) and Fecal Coliform parameters were submitted to Maxxam Laboratory in Victoria on

the same date as collection. 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*.

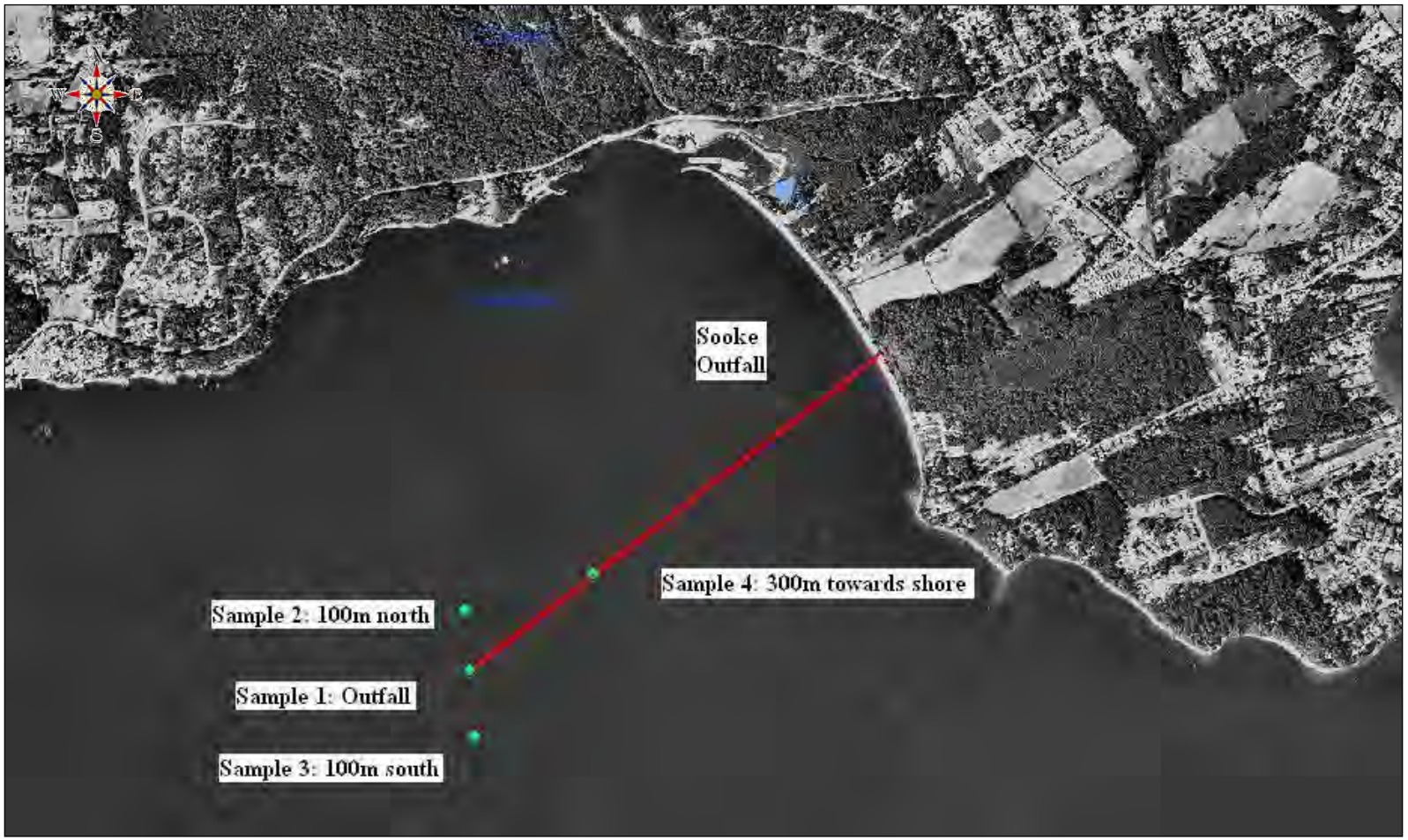

Figure 3: Sooke Bay receiving water-sampling locations (approximate).

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 were 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	5 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 June 8, 2012 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 levels of ammonia, BOD and fecal coliforms within guideline limits during the latest phase of sampling.

CONCLUSION

The June 2012 environmental monitoring of the Sooke outfall receiving waters is complete. Ammonia, BOD, TSS and fecal coliform levels were within acceptable ranges. This sampling event represents Year 7 of the outfall monitoring program in Sooke which started in April of 2006 and has continued biannually since the outfall has been active. In this 7 year period, very few non-conformities have been noted with this routine monitoring. TSS levels were measured to be elevated during the May and September, 2011 sampling events but this was considered to be a result of algal blooms present in the surrounding environment rather than directly attributable to the outfall activities (Pacificus, 2011). The September 2006 sampling event observed higher than usual Fecal coliform presence in all areas of the sampling site but this was the only documented spike for this parameter in 7 years of monitoring (Pacificus, 2006). All other parameters and sampling events have been observed to be within acceptable range for the entirety of this monitoring program. Therefore, it is recommended that the Sooke outfall monitoring program be changed from twice yearly to an annual event with the next sampling to be conducted in the summer of 2013. Government approval may be required prior to changing the sampling schedule based on requirements contained within the Sooke Outfall Operational Certificate.

REFERENCES:

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Pacificus Biological Services Ltd. November 2006. *Water Sampling for the Epcor Wastewater Treatment Plant Outfall in Sooke Bay.*

Pacificus Biological Services Ltd. November 2011. *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 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
June 2012	**# 1 Outfall**	2	7.91	33.46	68.9% 6.55mg/L	31.3	8.9	<1	< 5	<5	0.024
	# 2 100m north of outfall	2	7.87	33.57	140.5% 13.73 mg/L	31.6	8.6	1	< 5	10	0.034
	# 3 100m south of outfall	2	8.02	33.64	81.3% 7.76mg/L	31.7	8.7	<1	< 5	6	0.058
	# 4 300m towards shoreline from outfall	2	8.05	33.64	73.6% 7.00mg/L	31.6	8.7	<1	< 5	5	0.077

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 – September 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	0.10
	# 4 300m towards shoreline from outfall	2	7.5	34.24	72.4% 6.73 mg/L	31.4	9.6	< 1	< 5	5	0.10
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
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

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

December 2012

PACIFICUS
Biological Services Ltd

T: 250-949-9450 F: 250-949-7656 PO Box 2760 Port Hardy, BC V0N 2P0
info@pacificus.ca www.pacificus.ca

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

Sampling Date: October 22, 2012
Report Submission Date: December 20, 2012

Prepared for:

EPCOR WATER SERVICES
7113 West Coast Rd
Sooke, BC

Prepared by:

PACIFICUS BIOLOGICAL SERVICES LTD.
P.O. Box 2760
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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.

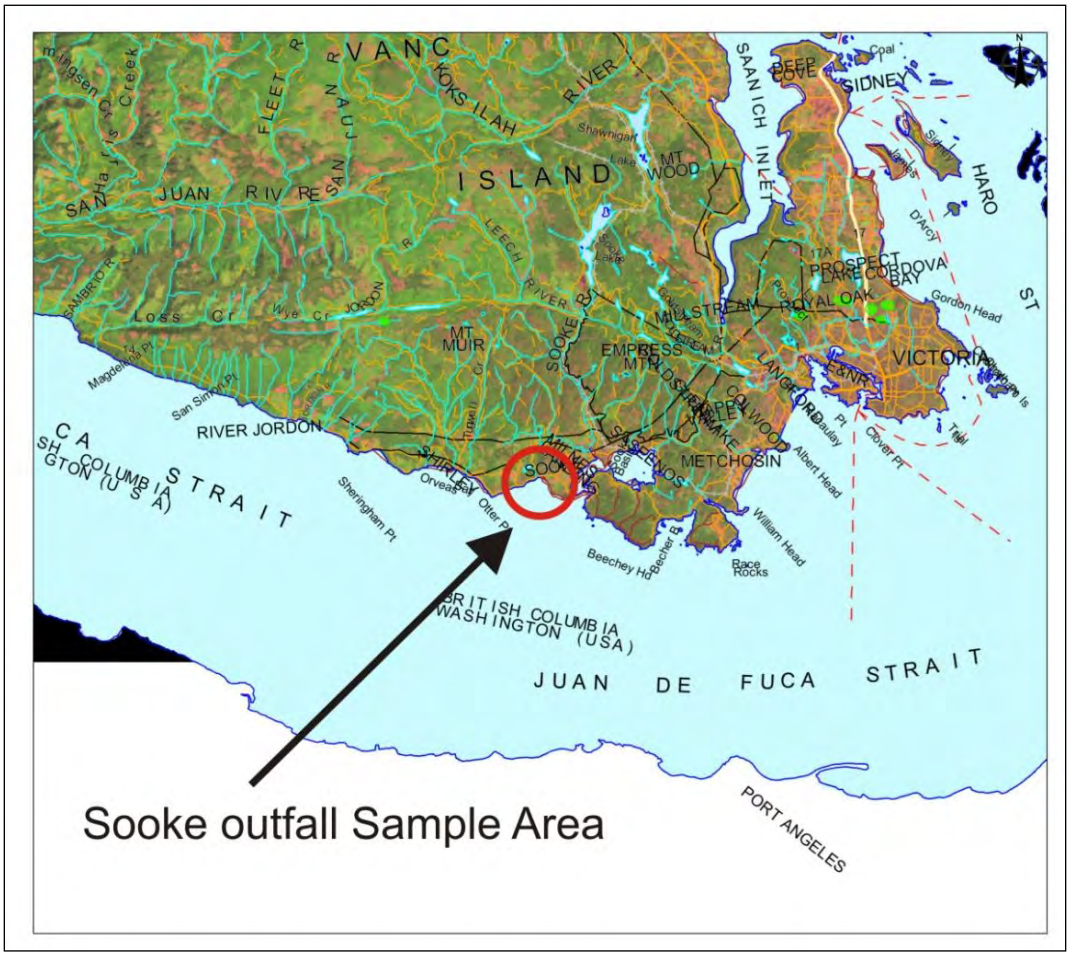

Figure 1: General location of sample sites, Sooke Bay, British Columbia

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 October 22, 2012. 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, if a pycnocline is present. 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 (October 22, 2012) the weather was partially cloudy with light wind. The water column was measured to be unstratified at the time of sampling; therefore, only one set of samples were gathered from each site at a depth of 2m.

The Pacificus technician, Tristan Gale, 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 (DO), conductivity, salinity, pH and temperature readings were taken and recorded in the field using a YSI Model 85 handheld multi parameter testing instrument.

Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Ammonia (N) and Fecal Coliform parameters were submitted to Maxxam Laboratory in Victoria on

the same date as collection. 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*.

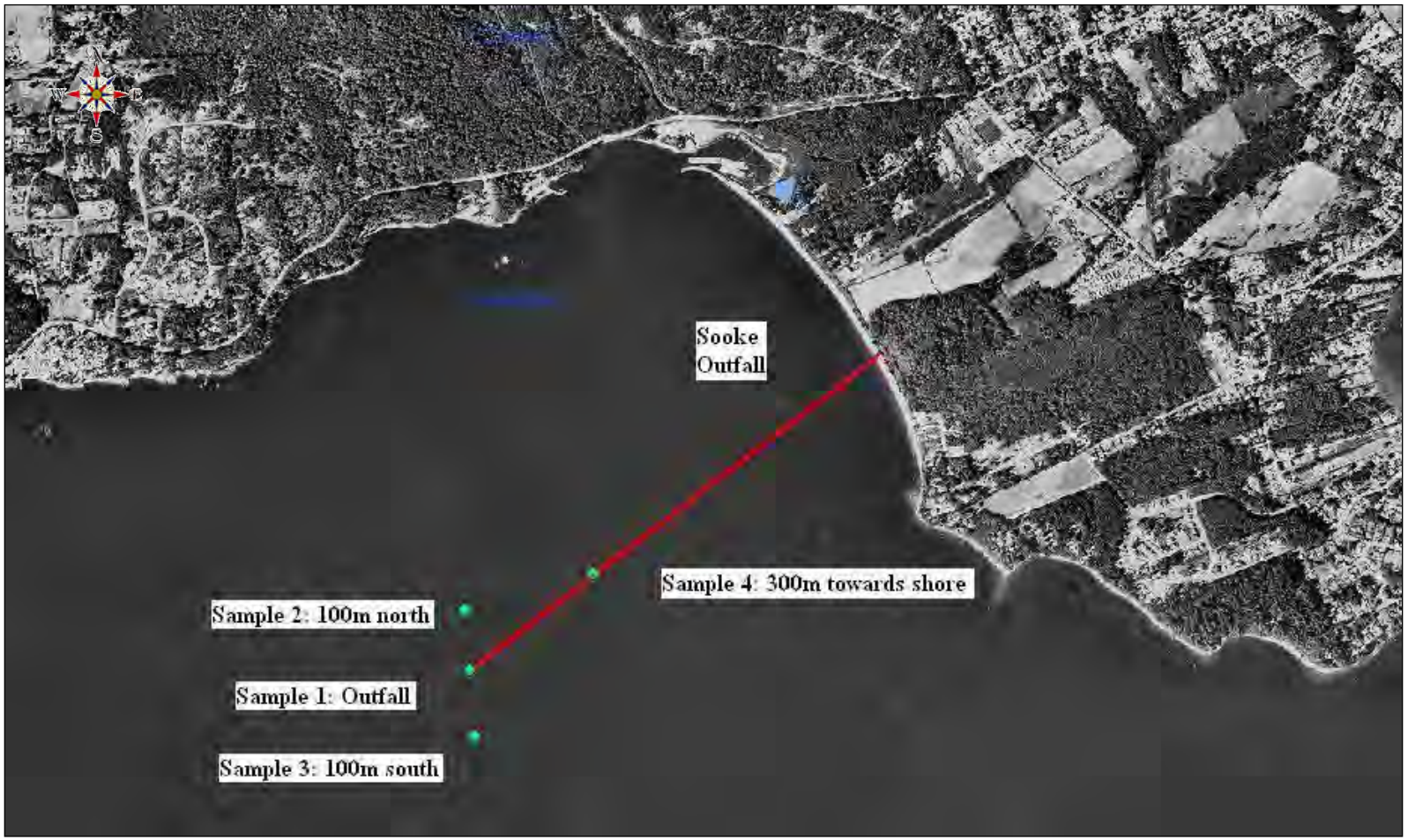

Figure 3: Sooke Bay receiving water-sampling locations (approximate).

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 were 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	5 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 October 22, 2012 sampling at each of the sites are listed in Table 1. A comparison of historic measurements (from the baseline in October 2005 until June 2012) at each of the index sites are listed in Tables 2, 3 and 4. The receiving waters surrounding the Sooke outfall contained levels of ammonia, BOD and fecal coliforms within guideline limits during the latest phase of sampling.

CONCLUSION

The October 2012 environmental monitoring of the Sooke outfall receiving waters is complete. Ammonia, BOD, and fecal coliform levels were within acceptable ranges. However, TSS levels were found to be elevated above acceptable levels at some sites.

The maximum acceptable level for TSS within the Initial Dilution Zone (IDZ) of the outfall is 45mg/L. Three of the measurements taken during this round of sampling exceed this limit with the highest reading being 270mg/L. These elevated TSS levels represent the highest recorded measurements of the past 7 years of sampling. The spatial distribution of the high measurements does not specifically indicate the outfall being the source as the control sample site, located 300m towards shore from the outfall returned a reading of 270mg/L while the sample site located directly above the outfall returned a TSS reading of only 29 mg/L which is well within acceptable limits.

RECOMMENDATIONS

Total Suspended Solids levels documented in previous sampling events have also been elevated above acceptable levels. In some cases the previous elevated readings may represent algal blooms or sediment laden discharge from nearby streams during heavy precipitation. This round of sampling, however, does not have a clear cause for high TSS readings. Due to the measurements being the highest on record, with no easily discernible cause, it may be precedent to conduct a supplementary sample event in the months of January or February.

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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 October 22nd, 2012.

Date	Sample #	Depth (m)	pH	Cond ($_m$S/cm)	D.Oxygen %	Salinity (ppt)	Temperature ^oC	Fecal Col. CFU/100mL	BOD mg/L	TSS mg/L	Ammonia mg/L
October 2012	**# 1 Outfall**	2	7.55	34.34	68.8% 6.49mg/L	32.35	8.7	1	< 5	29	0.054
	# 2 100m north of outfall	2	7.58	34.33	68.4% 6.46 mg/L	32.28	8.8	<1	< 5	121	0.024
	# 3 100m south of outfall	2	7.54	34.33	72.5% 6.84 mg/L	32.24	8.7	<1	< 5	14	0.032
	# 4 300m towards shoreline from outfall	2	7.67	34.31	69.6% 6.56 mg/L	32.24	8.8	1	< 5	270	0.026

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 – June 2012

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	0.10
	# 4 300m towards shoreline from outfall	2	7.5	34.24	72.4% 6.73 mg/L	31.4	9.6	< 1	< 5	5	0.10
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
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
June 2012	# 1 Outfall	2	7.91	33.46	68.9% 6.55mg/L	31.3	8.9	<1	< 5	<5	0.024
	# 2 100m north of outfall	2	7.87	33.57	140.5% 13.73 mg/L	31.6	8.6	1	< 5	10	0.034
	# 3 100m south of outfall	2	8.02	33.64	81.3% 7.76mg/L	31.7	8.7	<1	< 5	6	0.058
	# 4 300m towards shoreline from outfall	2	8.05	33.64	73.6% 7.00mg/L	31.6	8.7	<1	< 5	5	0.077