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Christchurch Wastewater Treatment Plant

Annual Monitoring Report

July 2011 - June 2012

Summary

This report summarises the results of parameters monitored by the Christchurch Wastewater Treatment Plant (CWTP) over the period July 2011 – June 2012 in accordance with consent CRC051724. Consent CRC051724 allows the discharge of treated wastewater from the CWTP Oxidation Ponds into the Pegasus Bay Coastal Marine Area via an ocean outfall.

Of the comprehensive sampling programme required by the consents, most samples were collected during the monitoring period and most monitored parameters achieved the required standards. CWTP is still in the process of repairing damage from the 2010/2011 earthquakes, which has caused a number of process interruptions to the oxidation ponds and clarifiers.

Repairs to the oxidation pond banks began January 2012 and is expected to continue to the end of 2012. The repairs used a combination of vibrocompacting the existing banks, strengthening with a plastic mesh, and the addition of large earth to raise it to original levels. This has required CWTP to lower the water levels in all the ponds, and also to isolate and drain ponds 2 and 3 for several months. The project has impacted on the hydraulic residence time and adversely affected disinfection rates. In addition, construction work to repair the structures transferring effluent from one pond to the next required some excavation and caused sediment to be disturbed.

An emergency discharge was approved by ECan for 18th and 19th Aug 2011 due to snow and high network infiltration.

In October 2011 one of the last two operation clarifiers suffered a catastrophic failure of its gearbox. While repairs weren't completed until December, additional polymer was used to compensate for reduced solids capture.

In January 2012, two pipes from CWTP to the oxidation ponds under Cuthberts Road was found to be leaking (pumps were immediately installed to capture any leaks). Divers were sent to inspect the damage, and found gaps where ground movement pulled the pipes apart. A plan has been put in place to decommission the existing pipes and build a new transfer structure by early 2013.

During a high flow event in April, it was found that a recently repair clarifier was not meeting its design flowrate. As a result, some effluent was bypassed into the ponds to avoid flooding equipment.

Christchurch Wastewater Treatment Plant Contents

Annual Monitoring Report

Jul 2010 – Jun 2011

1 Outfall Discharge

1.1 Resource Consent Conditions

Table 1.1.1 Pond Discharge Consent Compliance for Monitoring Period July 2011 – June 2012 CRC051724

Consent Condition	Parameter	Compliance Condition	Compliance												
			Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Overall
2	Discharge Content	Discharge is only wastewater from the CWTP ponds	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺
3	Discharge Volume	Recorded	☺	😐	☺	😐	☺	☺	☺	☺	☺	😐	☺	☺	😐
4	Discharge Rate	Recorded	☺	😐	☺	😐	☺	☺	☺	☺	☺	😐	☺	☺	😐
9	Outfall Maintenance	Routine maintenance completed and recorded	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺
10	Outfall Condition	Visual inspection of outfall	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	😐	☺
12	Pumping Pressure for a given flow	Monitored	☺	😐	☺	😐	☺	☺	☺	☺	☺	😐	☺	☺	😐

Key: ☺ Full Compliance 😐 Minor, Isolated or Risk of Non-Compliance ☹ Major or Consistent Non-Compliance

Figure 1.1.1 - Daily Outfall Flow Totals Jul 2011 – Jun 2012

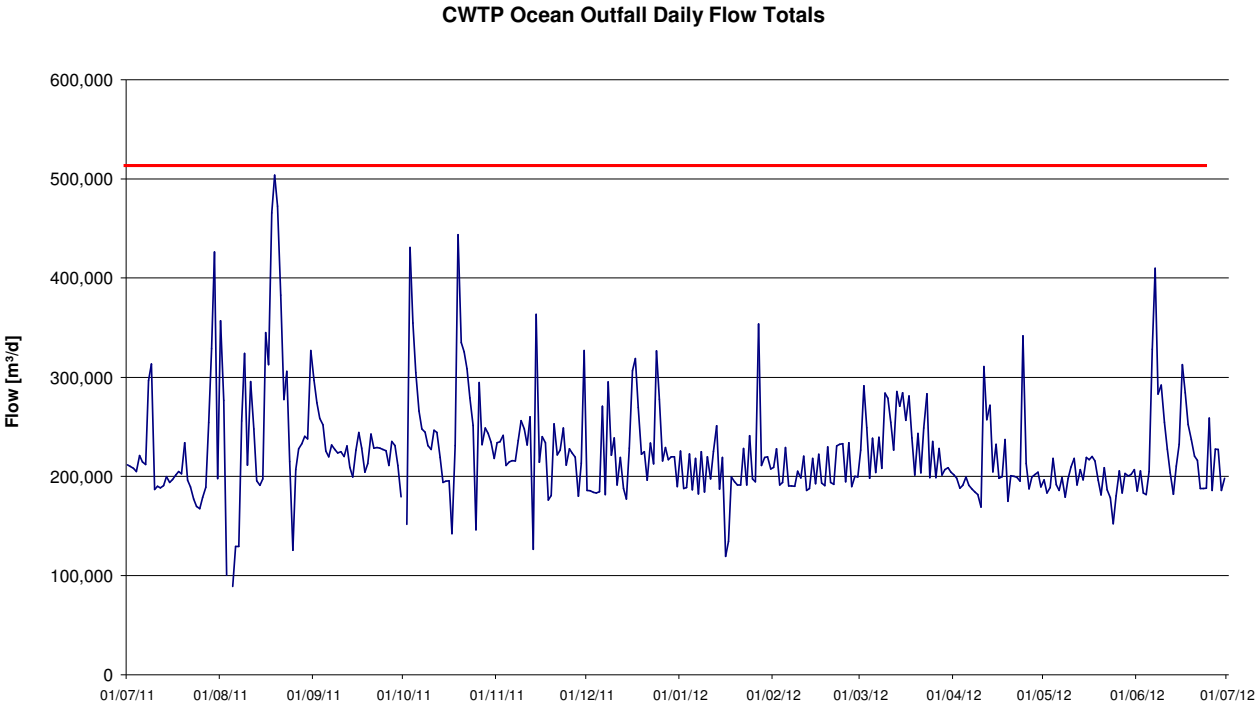
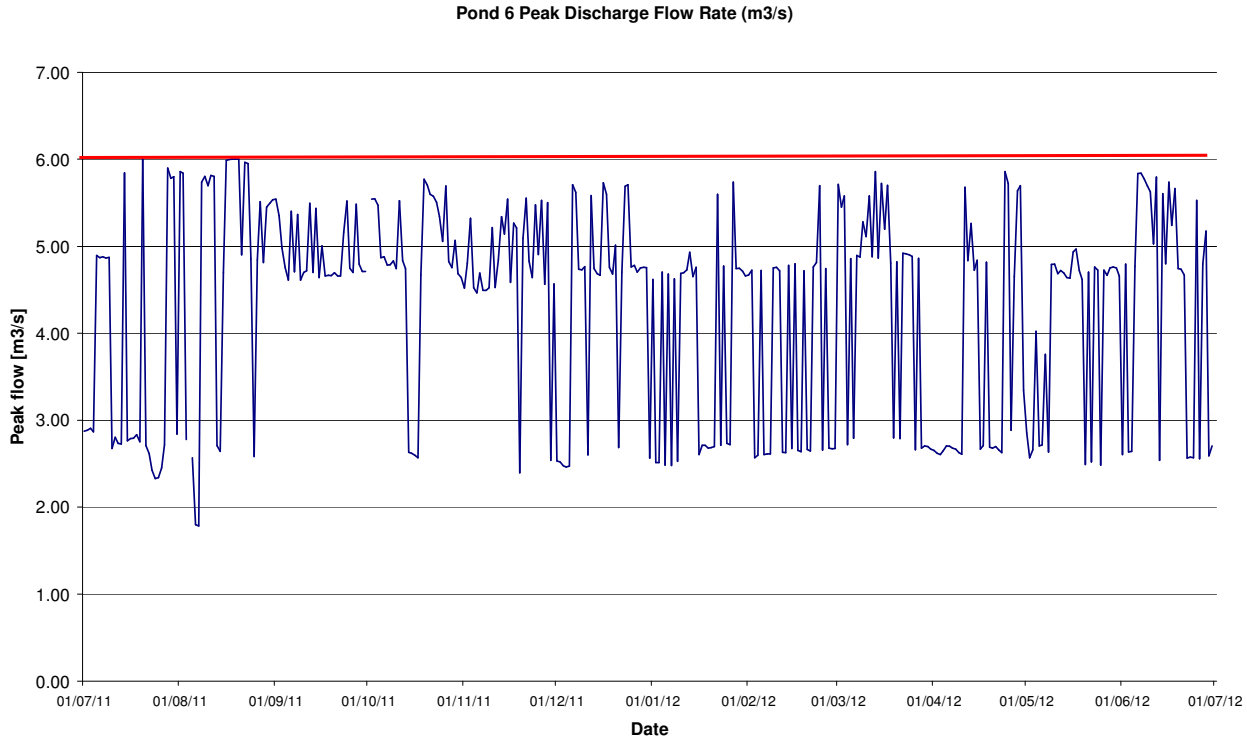


Figure 1.1.2 - Daily Peak Outfall Flows Jul 2011 - Jun 2012



1.2 Comments on Resource Consent Conditions

In general, the Ocean Outfall Pumping Station has operating within expected parameters and is comparable with last year's performance. The discharge flows and pressures were recorded as noted in the quarterly reports, although there a few hours of data lost in August, October and April due to communication issues that have since been resolved.

The ocean outfall's hydraulic performance was tested July 2012 and found to be operating at a slightly higher pressure than the previous tests, but below the September 2010 tests and well below the High Friction values specified by URS.

The snow event late August, combined with the high amounts of infiltration from the sewage network, resulted in extremely high flowrates entering the plant. In order to prevent the ponds from overtopping the banks and subsequently damaging nearby property, a portion of the flow was proposed to be discharged through the old estuary outfall. ECan gave approval for an emergency discharge that took place 18 and 19th August 2011.

1.3 Resource Consent Standard Conditions

Table 1.3.1 Contaminant Limits Consent Compliance Jul 2011 – Jun 2012 CRC051724

Consent Condition	Parameter	Compliance Condition	Compliance												
			Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Overall
15a	Dissolved BOD_5	Concentration does not exceed 20 g/m^3	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺
	Total Suspended Solids	Concentration does not exceed 50 g/m^3	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺
	Ammoniacal Nitrogen	Concentration does not exceed 40 g/m^3	☺	☺	☺	☺	☺	☺	☺	☺	☺	😐	☺	☺	😐
16a	Faecal Coliforms	Concentration does not exceed 1,000(standard)/5,000(higher) MPN/100mL	☺	😐	☺	😐	😐	☺	😐	☺	☺	😐	😐	😐	😐
	Enterococci	Concentration does not exceed 1,500 MPN/100mL	☺	😐	☺	😐	☺	☺	☺	☺	☺	☺	☺	☺	😐

Key: ☺ Compliance Achieved with no Exceedance of Standard 😐 Compliance Achieved with Occasional Exceedance of Standard ☹ Exceedance of Standard resulting in Non-Compliance

1.4 Comments on Resource Consent Standard Conditions

There was a number of issues throughout the year that were attributed to high flows from network infiltration and reduced disinfection capacity due to ongoing repairs to the oxidation pond banks.

The combination of infiltration from the earthquake damaged network and a record snow fall in August 2011 resulted in an extremely large effluent flow into a treatment plant operating at a reduced capacity due to earthquake repairs. A portion of the flow had to be diverted to prevent swamping the site and affecting neighbouring property, resulting in an unusually high outfall bacterial count that quickly returned to normal.

The sudden failure of one of the last two operating clarifiers in October 2011 has reduced the disinfection ability of the treatment plant, although this has been mitigated through the use of polymer flocculants and chemical oxidisers. The damaged clarifier was brought back into service in December 2011.

In January, damage to the two main effluent pipes leaving the plant under Cuthberts Road was uncovered, and required an immediate dive inspection. This required stopping the flow out of the plant and bypassing a significant portion of the flow into pond 4, resulting in a high faecal reading for that month.

Due to an error in sample scheduling by CCC's Laboratory Team, an ocean outfall sample taken 06/04/12 was not analysed for nitrites, nitrates, total Kejldahl nitrogen, total nitrogen, or total phosphorus; although ammoniacal nitrogen and dissolved reactive phosphorus was recorded. Other samples were taken on time and within compliance.

A single breech of the standard faecal coliform limit occurred mid-April due to plant bypassing as a recently repaired (due to earthquakes) clarifier channel was not achieving the specified flow. The clarifier repair schedule was modified to work around the flow restriction in the clarifier channel.

From March 2012 to present, the repairs to the pond banks and transfer structures between ponds has disturbed a large amount of sediment. As the activities involve vibro-densification, the addition of large amounts of earth, and heavy construction, sediment disturbance is unavoidable.

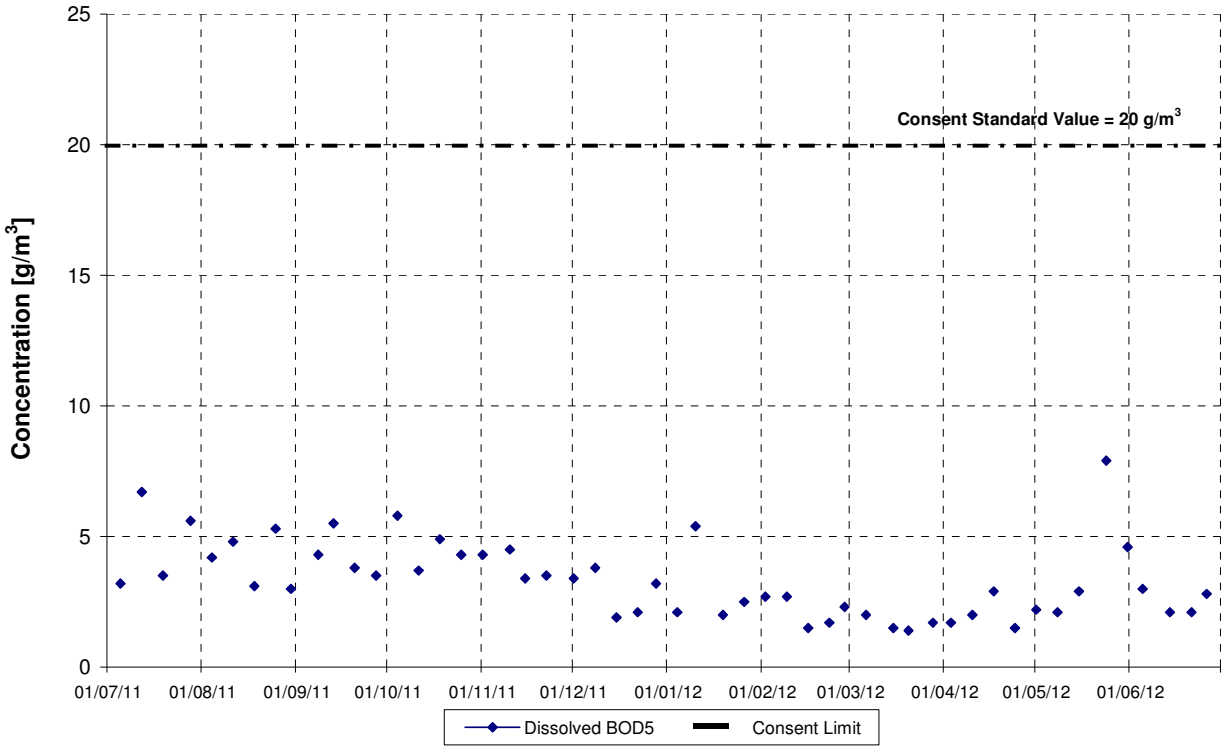
1.5 Dissolved BOD_5 Compliance

Table 1.5.1 Pond Discharge Dissolved BOD_5

Median Value [g/m^3] Current Monitoring Period (July 2011 - June 2012)	9.3	Number of Exceedances Current Monitoring Period (July 2011 - June 2012)	0
Median Value [g/m^3] Previous Monitoring Period (July 2010 - June 2011)	2.6	Number of Exceedances Previous Monitoring Period (July 2010 - June 2011)	0

There were no non-compliances recorded for the 2011-2012 year and no values were above the consent standard value. The mean value for the current reporting period was higher than the previous period, but neither period experienced exceedances of the consent standard value.

1.5.2 Pond Discharge Dissolved BOD_5



1.6 Total Suspended Solids Compliance

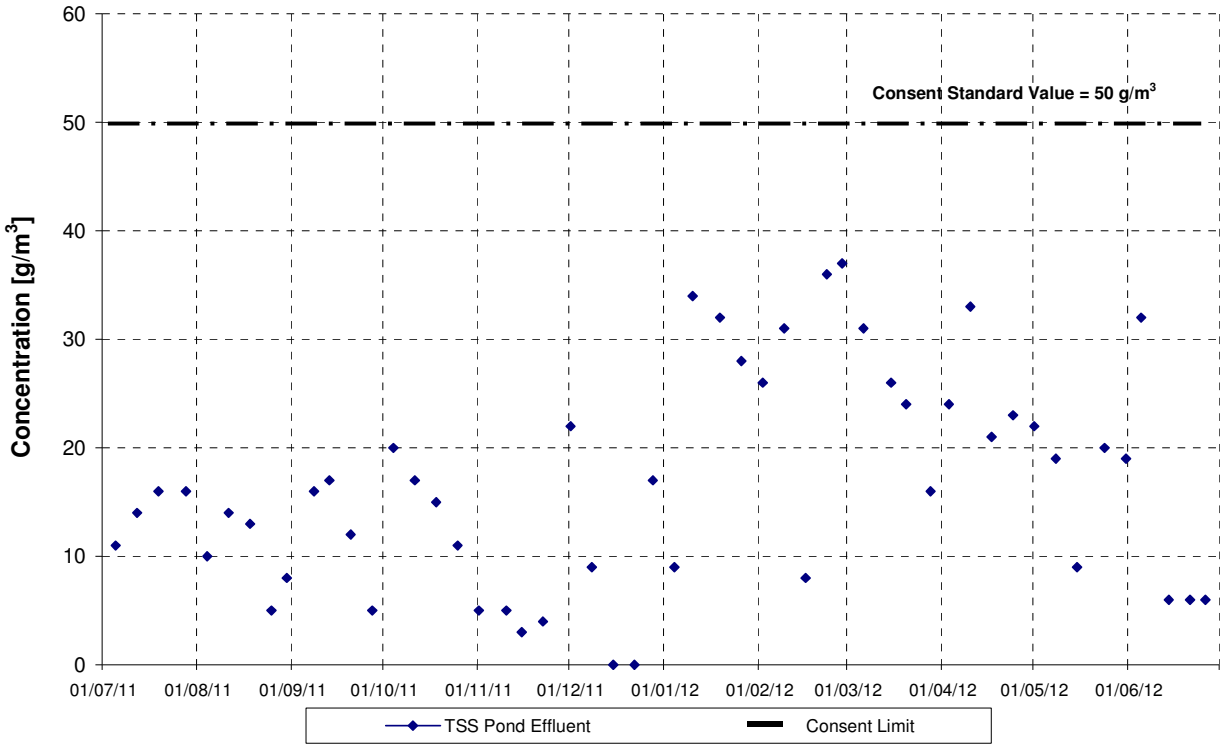
Table 1.6.1 Pond Discharge Total Suspended Solids

Median Value [g/m^3] Current Monitoring Period (July 2011 - June 2012)	16.0	Number of Exceedances in Current Monitoring Period (July 2011 - June 2012)	0
Median Value [g/m^3] Previous Monitoring Period (July 2010 - June 2011)	21.5	Number of Exceedances in Previous Monitoring Period (July 2010 - June 2011)	6

There were no non-compliances recorded for the 2011-2012 year and all values were within the consent standard value. The mean value for the 2011-2012 period was slightly lower then the 2010-2011 reporting period.

Slightly elevated total suspended solids figures in Jan – Jun were due to repair work around the pond transfer structures.

1.6.2 Pond Discharge Total Suspended Solids



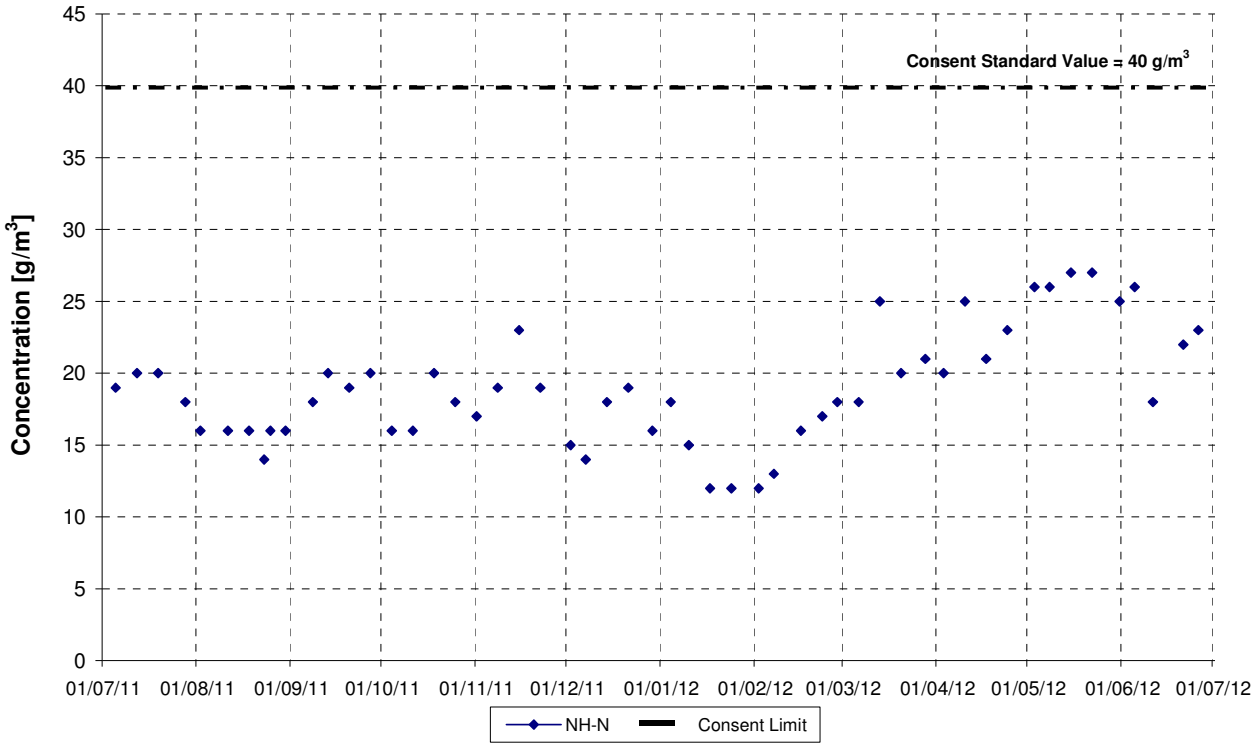
1.7 Ammonia Nitrogen Compliance

Table 1.7.1 Pond Discharge Ammoniacal Nitrogen

Median Value [g/m^3] Current Monitoring Quarter (July 2011 - June 2012)	18	Number of Exceedances Current Monitoring Quarter (July 2011 - June 2012)	0
Median Value [g/m^3] Previous Monitoring Quarter (July 2010 - June 2011)	24	Number of Exceedances Previous Monitoring Quarter (July 2010 - June 2011)	0

There were no exceedances recorded for 2011-2012. The mean value for the 2011-2012 period was lower than the 2010-2011 reporting period.

1.7.1 Pond Discharge Ammoniacal Nitrogen



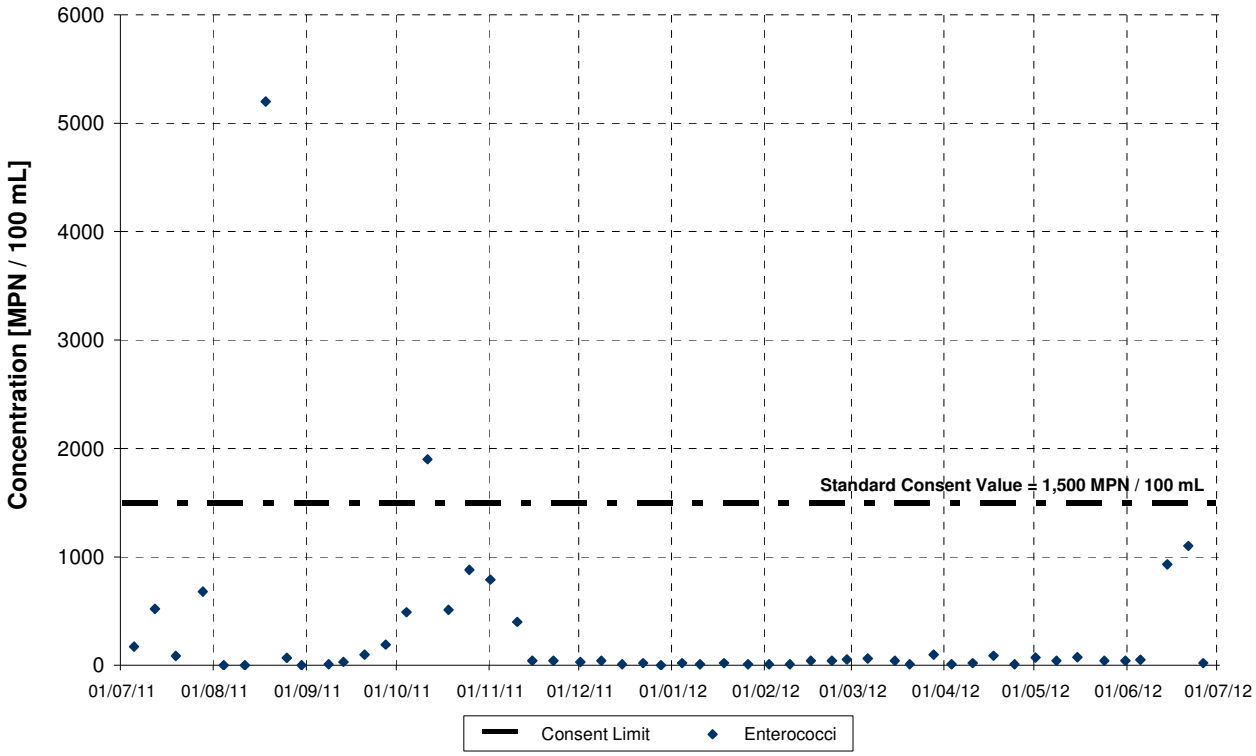
1.8 *Enterococci Monitoring*

Table 1.8.1 Pond Discharge Enterococci

Median Value [MPN/100ml] Current Monitoring Quarter (July 2011 - June 2012)	41	Number of Exceedances Current Monitoring Quarter ((July 2011 - June 2012)	2
Median Value [MPN/100ml] Previous Monitoring Quarter (July 2010 - June 2011)	160	Number of Exceedances Previous Monitoring Quarter ((July 2010 - June 2011)	5

There were two exceedances of the consented value in August and October 2011, although CWTP still meets the consent requirements under 16b. The mean value was significantly lower than the 2010-2011 period.

1.8.1 Pond Discharge Enterococci



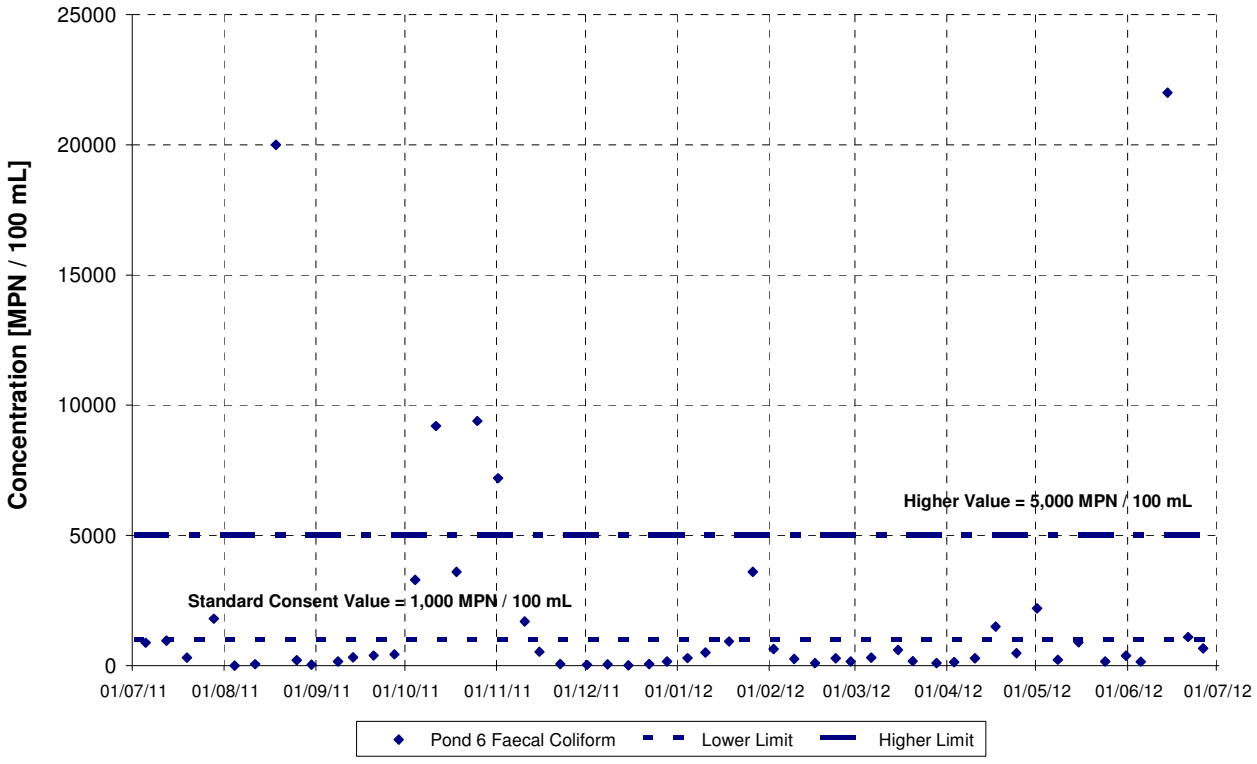
1.9 *Faecal Coliform Compliance*

Table 1.9.1 Pond Discharge Faecal Coliforms

Median Value [MPN/100ml] Current Monitoring Quarter (July 2011 - June 2012)	380	Number of Exceedances of Lower Limit for Current Monitoring Period (July 2011 - June 2012)	13
Median Value [MPN/100ml] Previous Monitoring Quarter (July 2010 - June 2011)	1100	Number of Exceedances of Lower Limit for Previous Monitoring Period (July 2010 - June 2011)	35

Thirteen samples exceeded the standard limit, although all samples complied to both the standard and higher limits under 16a. All the exceedances can be attributed to earthquake related damage either by direct damage to plant or via reduced pond capacity. The median for this year is much lower than the previous period.

1.9.1 Pond Discharge Faecal Coliforms



1.10 Other Pathogenic, and Other Contaminants

Condition 13e

Giardia cysts, cryptosporidium, salmonella, enterovirus, adenovirus and campylobacter levels have been measured in March; and were found to be either of insignificant concentration, or have negligible affect due to poor survivability in sea water.

Condition 13f

Heavy metals (copper, chromium, nickel, zinc, cadmium, lead, arsenic, and mercury) were measured and reported for each quarter.

Condition 13g

Organochlorine pesticides, organophosphate pesticides, PCBs, and polycyclic aromatic hydrocarbons were measured in August 2011, and found to be near or below lower detectable limits.

Condition 17

No scums, foams or other floatable material was observed at the edge of the diffuser mixing zone. Naturally occurring seaweed was inadvertently reported in March by a sampler unfamiliar with the site.

2 Receiving Environment Monitoring in Pegasus Bay

2.1 *Water Quality Resource Consent Conditions*

Table 2.1.1 Receiving Environment Water Quality Consent Compliance Aug 2010 – Jul 2011

Consent Condition	Parameter	Compliance Condition	Compliance				
			Jul - Oct 11	Nov –Jan 12	Feb – Apr 12	May - Jun 12	Overall
18	Faecal Coliforms	Sampled and Analysed	☹	☹	☹	☺	☹
	Enterococci	Sampled and Analysed	☺	☺	☺	☺	☺
22a[1]	Temperature	Two yearly	n/a	n/a	n/a	n/a	n/a
	DO	Two yearly	n/a	n/a	n/a	n/a	n/a
	Salinity	Two yearly	n/a	n/a	n/a	n/a	n/a
	Total Suspended Solids	Two yearly	n/a	n/a	n/a	n/a	n/a
	Nitrogen Oxides	Two yearly	n/a	n/a	n/a	n/a	n/a
	Ammoniacal Nitrogen	Two yearly	n/a	n/a	n/a	n/a	n/a
	Dissolved Reactive Phosphorus	Two yearly	n/a	n/a	n/a	n/a	n/a
	Chlorophyll-a	Two yearly	n/a	n/a	n/a	n/a	n/a
	Trace Metals (arsenic, cadmium, copper, chromium, lead, nickel and zinc)	Two yearly	n/a	n/a	n/a	n/a	n/a
	Faecal Coliforms	Two yearly	n/a	n/a	n/a	n/a	n/a
	Enterococci	Two yearly	n/a	n/a	n/a	n/a	n/a
	Phytoplankton Species	Two yearly	n/a	n/a	n/a	n/a	n/a

Key: ☺ Full Compliance ☹ Minor, Isolated or Risk of Non-Compliance ☹ Major or Consistent Non-Compliance

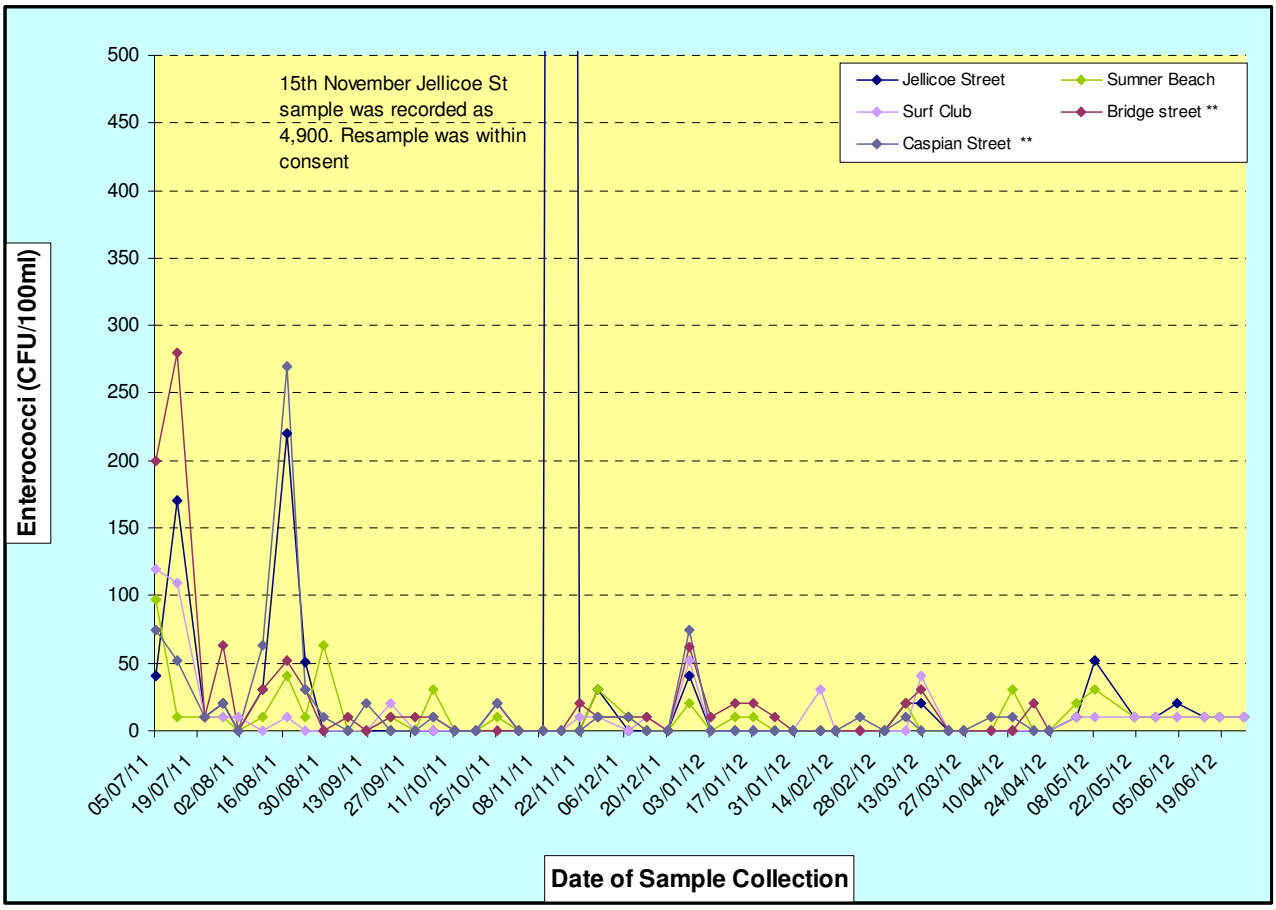
[1] Sampling is scheduled for 2013.

2.2 *Beach Water Quality Analysis Results*

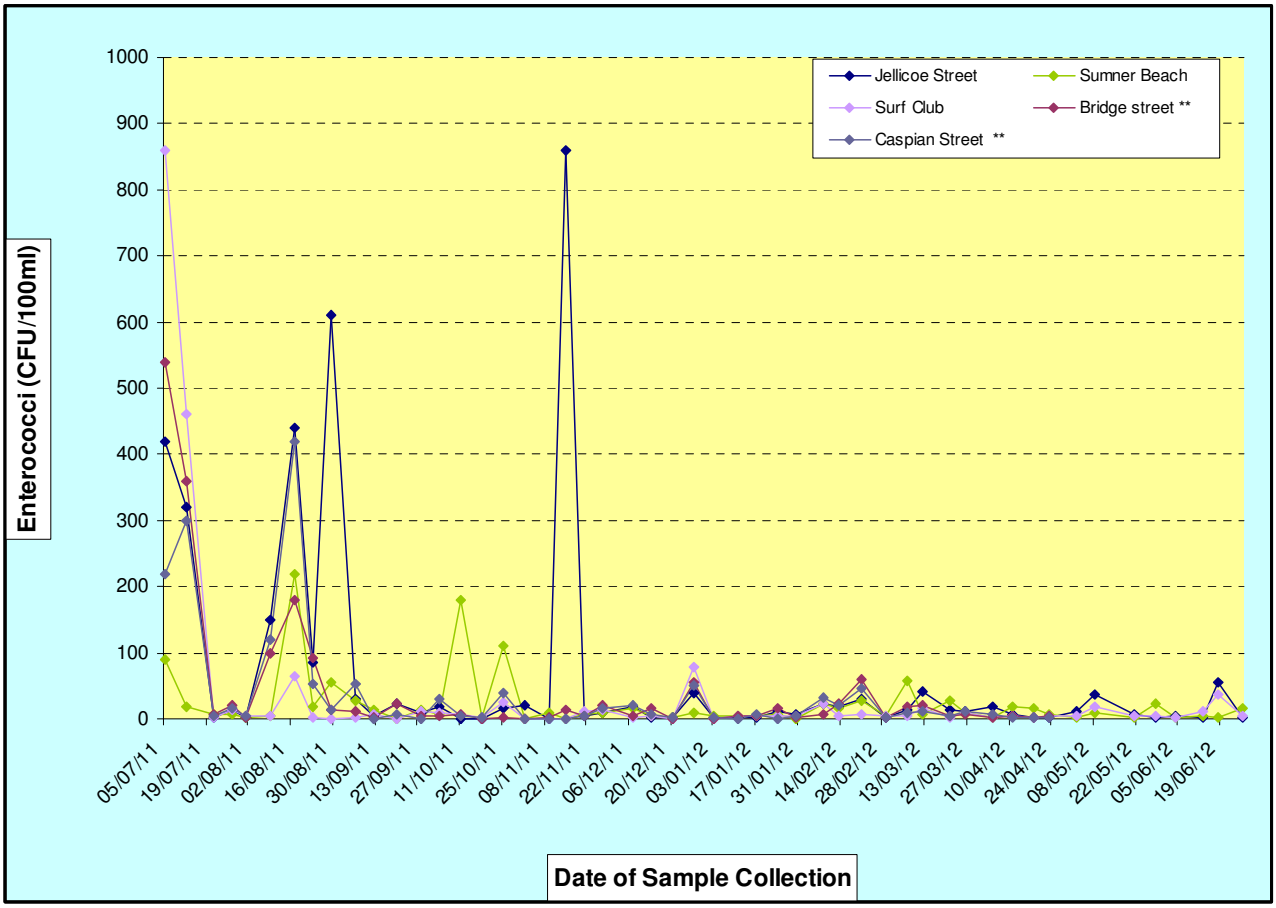
Samples for condition 18 are taken at weekly intervals from locations around the vicinity of the outfall. Enterococci was identified in the AEE as a pathogenic organism, while faecal colliforms are an indicator organism used to monitor the likelihood of other pathogenic organisms. The results are presented in Figures 2.2.1and 2.2.2. Retest results are contained in the Quarterly Reports.

High beach water faecal numbers were primarily due to overflowing sewer and stormwater stations, although there was a large spike in August due to the emergency estuary discharged authorised by ECan.

2.2.1 Enterococci Levels at beaches adjacent to the Outfall



2.2.2 Faecal Coliform Levels at beaches adjacent to the Outfall



2.3 Other Receiving Environment Analysis

Consent conditions 23, 25, 26 and 27 call for monitoring of the marine environment around the outfall at various frequencies and were identified in the AEE. These requirements are summarised in Table 2.3.1. The results are attached to the quarterly reports covering the same period.

Table 2.3.1 Receiving Environment Monitoring Consent Compliance Aug 2010 - July 2011

Consent Condition	Parameter	Frequency	Compliance Condition	Compliance				
				Jul –Oct 11	Nov – Jan12	Feb – Apr 12	May – Jul 12	Overall
23	Marine Sediments	5-yearly	Reported	n/a	☺	n/a	n/a	☺
25	Benthic Invertebrates	5-yearly	Reported	n/a	☺	n/a	n/a	☺
26	Epibenthic Fauna	5-yearly	Reported	n/a	☺	n/a	n/a	☺
27	Shellfish/Tuatua	Quarterly	Sampled and Analysed	☺	☺	☺	☺	☺
29	Complaints	As required	Recorded and Reported	☺	☺	☺	☺	☺
31	Report	Annually	Report and information lodged with ECan	☺	n/a	n/a	n/a	☺
32	Report	Quarterly	Report and information lodged with ECan	☺	☺	☺	☺	☺
35	Management Plan	6 Months of commissioning	Report and information lodged with ECan	☺	n/a	n/a	n/a	☺
36	Community Liaison	Annually	Reported	n/a	☺	n/a	n/a	☺

Key: ☺ Full Compliance ☹ Minor, Isolated or Risk of Non-Compliance ☹ Major or Consistent Non-Compliance

2.4 Comments on Other Receiving Environment

Conditions 23 - 26

The first sediment, benthic and epibenthic post-commissioning survey was completed March 2012 (delayed due to the 2011 earthquakes). The report was submitted to ECan August 2012 and found little difference in the samples within and beyond 200m of the diffusers, other then some changes in mud percentage near the diffuser. All chemical parameters measured were within ANZECC limits. The benthic ecosystem showed little difference outside of the mixing zone, and the levels of diversity was in line with previous surveys.

Condition 27

The shellfish samples following the June earthquakes are above the consent limits for E.coli and enterovirus. While it is mentioned in the AEE that the ocean outfall could have an effect on surf clams, there are a number of additional sources of contamination caused by the earthquakes. The probable reasons for the consent breech are the same as the reasons for the high bacterial beach samples mentioned in Section 2.2. ECan and CCC entered into an agreement in April 2011 that repeat testing of shellfish was not required, due to the continued discharging of untreated sewage into the marine environment directly from sewers, and this has been in effect until the end of the reporting period.

Condition 29

There were no complaints from the public regarding the ocean outfall during the reporting period.

Condition 31 and 32

Annual and quarterly reports have been submitted to ECan.

Condition 33

A report on the diffuser field testing was completed and supplied to ECan.

Condition 35

The AEE management plan was submitted to ECan August 2011.

Condition 36

The CLG meeting was held December 2011. The next meeting is planned for November 2012.