

Report No:	REP12-05-06
File No:	W416
Date:	8 May 2012
Information Only - no decision required	

REPORT SUMMARY

Report to: Environment & Planning Committee
Meeting Date: Thursday, 17 May 2012
Report Author: Trevor James, Resource Scientist - Environmental
Subject: **CONTACT RECREATION WATER QUALITY ANNUAL REPORT: 2011-2012**

EXECUTIVE SUMMARY

Of the 22 sites (marine and freshwater) sampled over the past summer bathing season there were a total of 24 exceedences of national guidelines (seven "Alert" and 17 "Alarm") recorded at eight of the sites (out of a total of 359 samples taken). This equates to about 7% of samples exceeding guidelines. Nearly all of the exceedences, other than for Tukurua, were associated with rainfall events. Over half of these exceedences (13, or 4%) were from one site, Tukurua Stream at Playground, which has been subject to ongoing faecal pollution since it was first discovered in January 2010.

Ponding of freshwater within the main recreation areas occurred at Rabbits Island after the December floods. Water samples of the ponds revealed faecal contamination above guidelines and so the island was closed then, when it re-opened the ponds were fenced. Unfortunately the source of contamination was not identified.

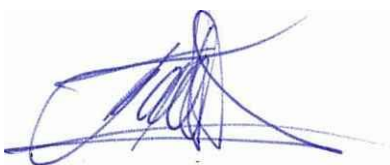
As a result of modelling water quality in the lower Motueka River a real-time warning system can be set up for when *E. coli* concentrations most likely to breach guidelines. The modelling was not successful for the coastal environment associated with the Motueka River plume but may be able to be enhanced if further suitable data is collected.

RECOMMENDATION/S

That the report REP12-05-06 be received.

DRAFT RESOLUTION

THAT the Environment & Planning Committee receives the Contact Recreation Water Quality Annual Report: 2011-2012, Report No. REP12-05-06.



Trevor James
Resource Scientist - Environmental

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1. Introduction

This report outlines results of bathing water quality monitoring at 22 of Tasman's most popular beaches over the 2011/2012 summer.

Bathing water quality monitoring in Tasman District has been ongoing since the mid-1990s. During that time about two thirds of sampling sites in the programme have been sampled consistently with other sites being surveyed for short periods and then discontinued because of consistently good water quality. To ensure we get some water quality information at additional lesser-used sites or sites with lower risk of faecal pollution, additional short-term investigations have been carried out. Where it is found that there are on-going issues, such as Tukurua, those sites may then be brought into the programme.

Council results were posted on the Council website within three days of each sampling event (see <http://www.tasman.govt.nz/environment/water/swimming-water-quality/>). Further information is available on this website about the sampling sites (including maps and photographs) and background to the monitoring programme.

2. Results and Discussion

2.1 Season Summary

A total of 24 exceedences of national guidelines¹ (seven "Alert" and 17 "Alarm") were recorded across the 22 sites (marine and freshwater) sampled in the 2011/2012 season (see Figures 1 and 2). This was out of a total of 359 samples taken. This equates to about 7% of samples exceeding guidelines. Of these exceedences 13 (or 4%) were from one site, Tukurua Stream at Playground, which is subject to ongoing faecal pollution (see section 2.2). Please note that the site "Tukurua Stream at SH60", which is listed on Figure 2, is not included in this data summary (above) as it is not a site that is used for swimming.

¹ Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas, Ministry for the Environment and Ministry of Health, June 2003. ISBN: 0-478-24091-0

All the results from the follow-up samples taken within one-two days of the exceedence were back down to the typical very low levels (near the lower level of detection).

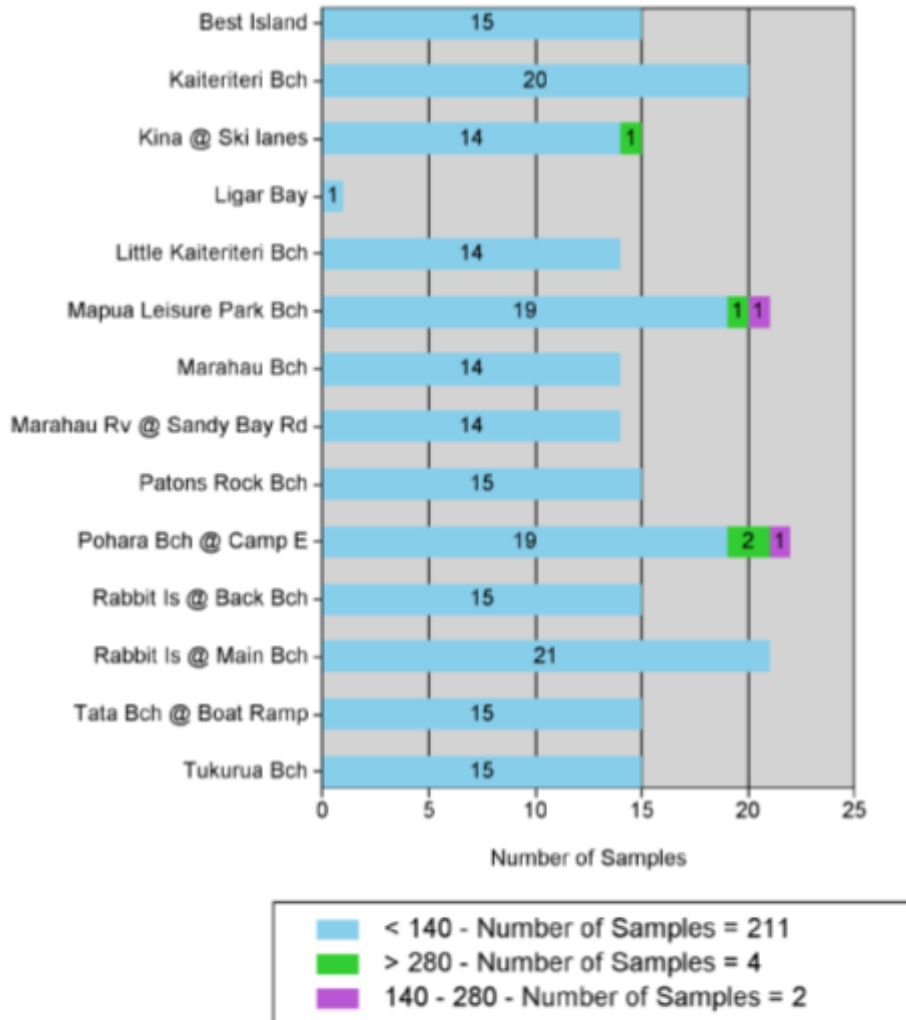


Figure 1: Number of samples exceeding national guidelines for contact recreation water quality at marine beaches for the 2011-2012 season. Green shows results over alarm levels (>280 *Enterococci*/100ml) and purple shows results over alert levels (140-280 *Enterococci*/100ml).

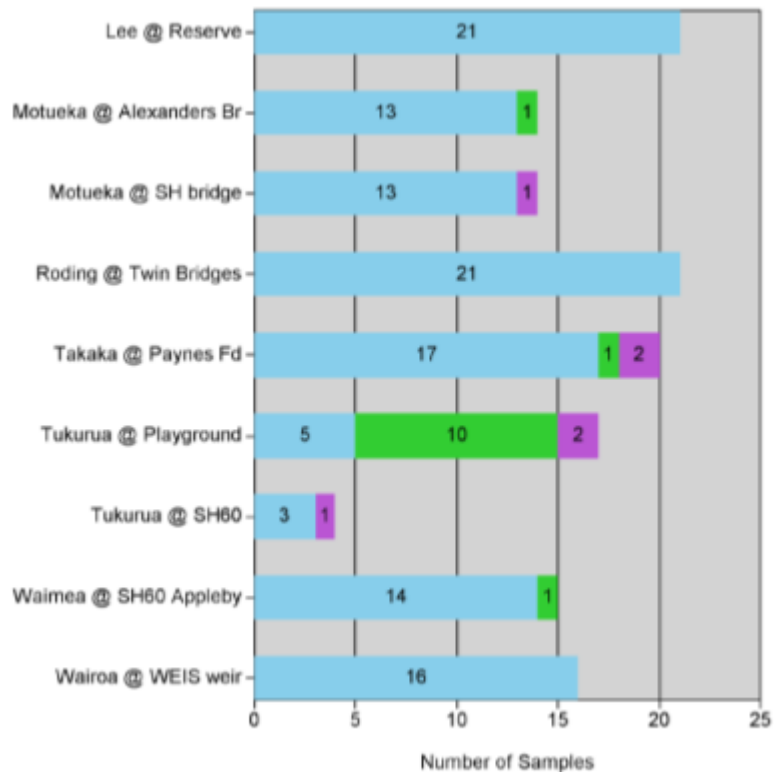


Figure 2: Number of samples exceeding national guidelines for contact recreation water quality at freshwater swimming holes for the 2011-2012 season. Green shows results over alarm levels (>550 *E. coli*/100ml) and purple shows results over alert levels (260 *E. coli*/100ml). Note: Tukurua River at SH60 is not a swimming site and is included as a reference for the Tukurua @ Playground.

As is typical, the vast majority of exceedences were due to rainfall events. The major exceedence at Paynes Ford was associated with the 14 December rainfall event. Similarly Pohara Beach was affected by the rain on 31 December and 22 February. A rainfall event on 6 December 2011 was linked to exceedences on the Waimea at SH60, lower Motueka River, Mapua Beach and Kina Ski lanes.

2. 2 Faecal Contamination at Tukurua Stream

Over the past two years results show that ongoing faecal contamination issues in Tukurua Stream with 50% of (11 of 22) samples being above recreation water quality guidelines (70% for this season). Microbial source tracking results taken in January showed both ruminant and human bacterial markers. All samples taken show there is no source of contamination upstream of farmland so this excludes the possibility of feral animals in the native bush as contributing to the source.



Figure 3: Photo of the lower end of the Tukurua swimming hole showing the warning sign.

The results (39 samples from 15/1/2010 - 29/2/2012) show the following:

- Much more likely to have an exceedence in the peak season (25/12 - 29/2) (~80%, compared to ~50% in the off-peak times).
- Majority (2/3^{rds}) of exceedences in peak season were NOT rainfall related
- When there was an exceedence the site near the mouth of the stream was ~60% more likely to be higher than at SH60 (comparing each sample date where there were samples taken at each site).
- The magnitude of exceedences were much greater at the lower site (mean of 3x the concentration of the upper site)

For streams running through farmland, Tukurua is fairly typical. However, given that the swimming hole is used by many people during the peak summer and the number of results above guidelines, it suggests that we should further investigate the source of this contamination. Compliance staff have walked the creek this time last year and did not find an obvious source (one discharge point found). There are plans to investigate septage systems above the SH60 bridge this summer.

Water quality at Tukurua Beach near full tide was well within guidelines for all except one sample last season. We will be sampling the beach again next season.

Council response:

- Sign warning against swimming has been maintained at the lower site (by the stream adjacent to the camp playground). It seems to have been well headed (talking to child campers).
- Compliance staff isolated one failing septic tank downstream of SH60 - so that should start to improve the situation.
- The on-going contamination issues upstream of SH60 remain unsolved despite thorough searches of the stream upstream of SH60. The environmental performance of Steve Barnett's farming operation in the Tukurua catchment appears to be up to standard. An inspection of septic tanks in this area will be carried out by Jim Trembath in the 2012-2013 peak season.
- We have suspended sampling until next bathing season (20 November 2012).

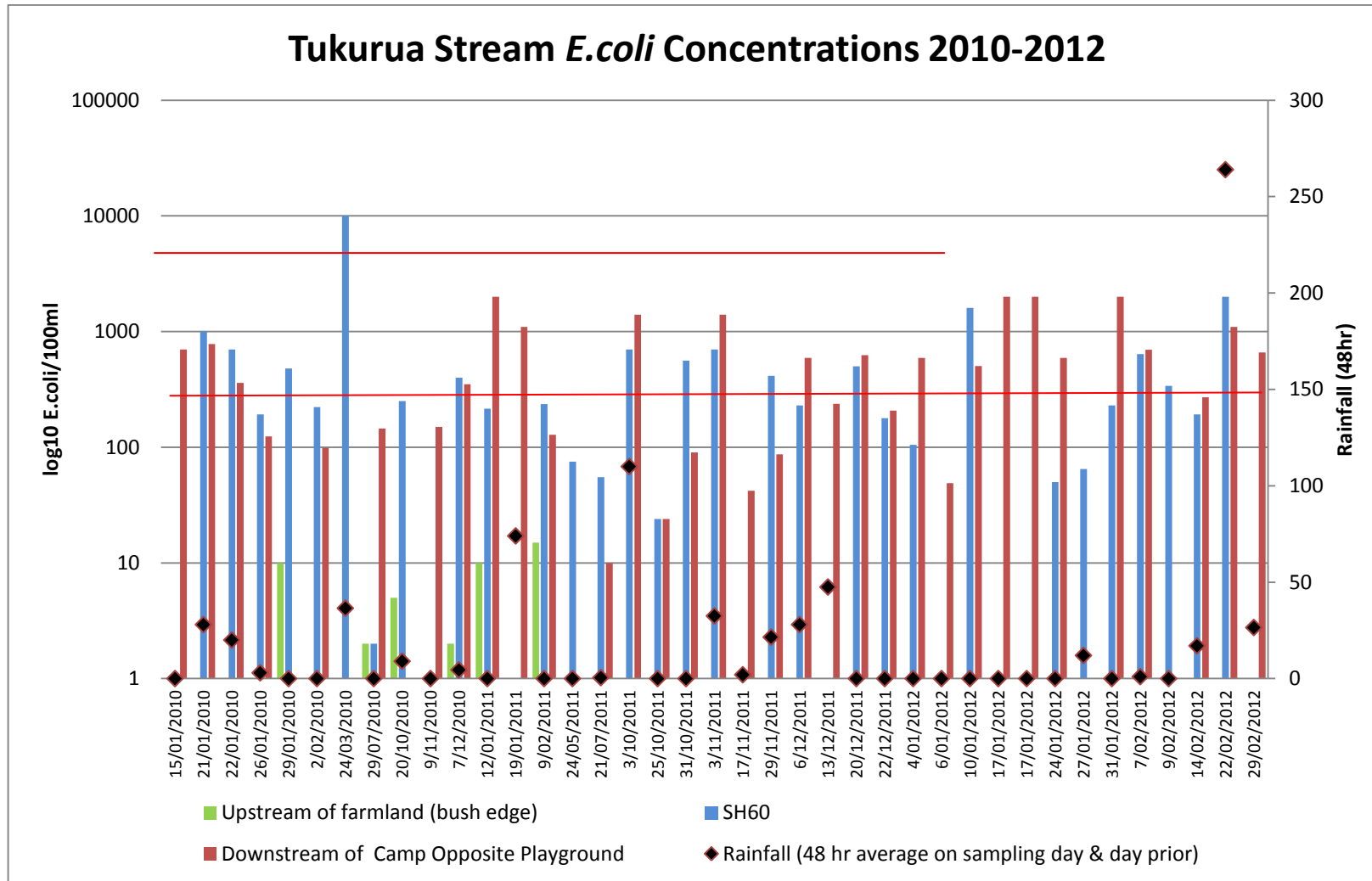


Figure 4: Bathing water quality (*E. coli*) results for Tukurua Stream sampled in 2010-2012 plotted against rainfall. The alert level indicated by the horizontal red line.

2.3 Faecal contamination on Rabbit Island and McKee domain

For the first time in 30+ years² significant areas of overland flooding was present in three of the four main recreation areas just inland from the main beach on Rabbit Island. This ponding was due to the record heavy rainfall on December 14-15 and associated elevated groundwater levels. Ponding was present at many sites over the coastal plains near the Waimea estuary. Groundwater level sampling at several regularly-monitored bores on Rabbit Island showed a rise in level of about 300mm after this rainfall event.



Figure 5: Photo of Rabbit Island pond C taken on 21 December 2011.

Because the ponds were deep enough for contact recreation (500-600mm deep), relatively warm and inviting and located in a very popular area it was decided to take water samples for faecal indicator bacteria (FIB). Samples taken revealed elevated *E.coli* concentrations, with several samples exceeding guidelines for contact recreation (see Table 1). Concentrations generally decreased over time.

Site	22/12/2012	29/12/2012	4/01/2012	17/01/2012
Western Pond (Pond W)	659		306	64
Central Pond (Pond C)	659	560	192	10
Eastern Pond (Pond E)	831	87	560	207

Table 1: Results of sampling ponded water on Rabbit Island in December-January (2011-12).

² Roger Hart and Ralph Lonsdale (pers.comm.2012). Sicon staff who have been associated with the island for over 30 years.

Heavy metal concentrations in the three ponds were above ANZECC guidelines (90% level of protection) for most sites for Chromium, Copper, Nickel, and Zinc but below detection for Boron (<0.05g/m³).

Ponding was also evident at McKee Domain but this was only brought to Council attention in January when the pond depth had lowered to less than 200mm. The result was over alert levels (373 *E.coli* /100ml; recorded on 10/01/2012).

The risk of sickness to recreationists visiting the Rabbit Island reserve was managed by closing the reserve from 14th December due to the overland flooding. Temporary fencing was erected around these areas which allowed the front beach picnic areas to be opened again on December 23rd. Ponding in these areas dried out in early-mid February but remained closed until 19/3/2012. The exclusion fence remained for so long due to staff concern about soil compaction or turf damage from vehicles on these soft areas until they were fully recovered.

The cause of this contamination is not clear. Potential causes include past or present toilet blocks at the reserve, wildfowl, feral animals and the biosolids discharge.

- The Rabbit Island reserve toilet blocks are a very unlikely source for the following reasons:
 - as all of the sites sampled had elevated faecal indicator bacteria levels and only Pond E was close to a toilet block (the main block) in the reserve. Pond W to the west was well away from any past or present toilet block.
 - The toilet block is a very new system with alarms to alert any system failures, and has been subject to inspection by wastewater system engineers so appears to be working well.
- Wildfowl are an unlikely source as very few wildfowl or droppings were seen on or near the ponds by Council staff (in over 15 visits by staff involved in water sampling and parks and reserves staff). While it is possible that birds could have visited the ponds around dusk through to dawn (or other time when staff were not there, but whenever there are aggregations of birds there is usually a reasonable amount of excrement that is obvious.
- Feral animals such as rats, mice and rabbits are also an unlikely source as they have been kept to very low levels in these council reserves.

- While biosolids were applied in an area about 500m to the SW of the ponded areas during the month of November prior to the December rainfall event, the biosolids discharge cannot be confirmed as a source of the contamination. Samples from the ponds were analysed for heavy metals for the purpose of comparing to that of the groundwater from bores in the general vicinity of the picnic area. In comparison to the pond samples, lead was present in much greater concentrations on average in the Rabbit Island groundwater samples, with Arsenic and Copper concentrations being much less. Chromium and Nickel concentrations in the groundwater varied above and below that of the ponded water. Zinc concentrations were relatively similar.

	Arsenic	Chromium	Copper	Nickel	Lead	Zinc
% median GW to median pond samples	5-30%	50-200%	7-20%	8-200%	400-700%	45-90%

Table 2: Proportion of median concentration for groundwater samples compared to ponded water.

The concentration of heavy metals in the water of the ponds was surprisingly high in the three ponds were above ANZECC guidelines (90% level of protection) for most sites for Chromium, Copper, Nickel, and Zinc but below detection for Boron.

Even if it were the biosolids discharge, the very rare nature of this ponding event means that the adverse effects could be considered very minor and entirely manageable i.e. by re-erecting fencing and warning signs to exclude people.

Samples for microbial source tracking (MST) were taken on 17 January but there was insufficient DNA in the sample to complete this analysis (samples for MST analysis should have been taken earlier on when the concentration of faecal bacteria was higher). Whitening agent was analysed in samples from 4 January, but were not detected. Whitening agent is associated with municipal sewage receiving wastewater from clothes-washing and could be used to distinguish from wastewater from the toilet block. This result is inconclusive as this chemical breaks down quickly in an aerated environment (i.e. when spray-irrigated onto the forestry blocks).

It is recommended that if these ponds form again in any of the Rabbit Island reserves or at McKee Domain, in the future, the water be tested as soon as possible, not only for FIB, but also for MST if the *E. coli* concentrations were over 240/100ml (samples for MST analysis can be stored frozen for months pending a decision on whether to analyse).

2.4 Predicting Water Quality Exceedences in the Lower Motueka River and Coastal Plume

A recent modelling exercise by Cawthron (funded by Envirolink) has been successful in producing a workable system for real-time prediction of exceedences of national guidelines in the lower Motueka River, but not in the coastal plume³. The performance of the model for predicting water quality in the lower Motueka River was better than for other models used for live warnings overseas (e.g. Philly RiverCast in the USA) with >80% of predictions being a true positive and <10% false positive.

While it is disappointing that the model was not able to effectively predict water quality at Kaiteriteri or other beaches along this coast, it is still possible that, with more data, this will be possible. There were only 13 exceedences in 198 samples from Kaiteriteri Beach across our 15 year record (this is positive in showing good water quality, but not for model development). Collecting data during/immediately after wet weather events will be required for to get a greater number of exceedences for the models to have a better chance of successful prediction. This targeted sampling will not be used for analysis of the performance of our beach sites as the data is biased to periods of poor water quality.

This project was initiated because of the lag time between sampling and obtaining a result from the laboratory, resulting in public warnings that are often out of date. With extensive data collected as part of the Motueka Integrated

Catchment Management (ICM) programme, a modelling approach was feasible. It is hoped that the model can run alongside our telemetry system and automatically send a txt message to the duty officer who will initiate a response (i.e. announce a warning to the public if appropriate). The Kaiteriteri Domain Board is happy to erect and remove the temporary signs at Kaiteriteri and possibly neighbouring beaches.

This is only useful for bathing sites on the lower Motueka River and within the river's coastal plume. This plume in a moderate (3-6 month return-period) flood can extend from the Motueka River mouth to Marahau Beach in the north and Kina Beach in the south-east. Rather than an evenly spread plume the wind and tide push the plume in one or other direction.

The model uses real data, such as river flow (Motueka at Woodmans Bend), as well as turbidity, solar radiation and current speed, from the Tasman Bay monitoring buoy in combination with existing coastal circulation models.

³ Knight, B and Jiang, W; April 2012. Indicator bacteria modelling decision support tool for recreation beaches affected by the Motueka River plume.

3. Conclusions

Results for the 2011-2012 season showed a relatively low number of exceedences of the national recreational water quality guidelines compared to previous years. Rainfall events accounted for almost all of these.

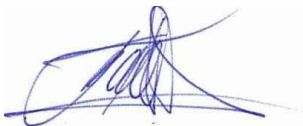
Tukurua Stream continues to be affected by faecal contamination. One major source has been found and addressed but more work is required to find the cause of high *E. coli* concentrations upstream of SH60. In the meantime signs will remain at the campground warning people of the potential health risk.

Ponding of water occurred at Rabbit Island and McKee domain in December-January and was associated with high faecal contamination. The source of the problem remains unknown.

Modelling of water quality in the lower Motueka River and coastal plume, allows us to predict water quality in the river, but not for beaches along the coast. Targeted flood monitoring will be necessary in order to effectively model water quality along the coast. We will review the setting up of a system for warning the public using the lower Motueka River during the bathing season.

6. Draft Resolution

THAT the Environment & Planning Committee receives the Contact Recreation Water Quality Annual Report: 2011-2012 Report No. REP12-05-06.

A handwritten signature in blue ink, appearing to read "Trevor James", is written over a light blue grid background.

Trevor James
Resource Scientist - Environmental