New Plymouth District Council
New Plymouth Wastewater Treatment Plant
Marine Outfall and Sludge Lagoon
Monitoring Programme Annual Report
2005-2006

Technical Report 2006-62

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Executive summary

The New Plymouth District Council (NPDC) operates a wastewater treatment plant located on Rifle Range Road at New Plymouth, in the Waiwhakaiho catchment. This report for the period July 2005-June 2006 describes the monitoring programme implemented by the Taranaki Regional Council to assess NPDC's environmental performance during the period under review, and the results and environmental effects of NPDC's activities.

NPDC holds a total of seven resource consents, which include a total of 63 conditions setting out the requirements that NPDC must satisfy. NPDC holds a consent to allow it to discharge treated wastewater to the Tasman Sea, two consents relating to sludge disposal, two consents relating to structures and two consents to discharge emissions into the air at this site.

The Council's monitoring programme for the year under review included four inspections, six water samples collected for physicochemical analysis (including inter-laboratory comparison), two shellfish samples for viral and bacteriological analysis, three shellfish samples for trace metals in tissue, and one marine ecological survey at five sites.

The monitoring showed that the marine ecology survey showed that the discharge of wastewater via the marine outfall into the Tasman Sea has not had any adverse effects on local water quality. No areas of concern regarding air emissions were identified. Review of NPDC monitoring data showed a good quality effluent is produced from the plant. Some elevated ammonia, chemical oxygen demand and faecal coliform levels occurred during the year in relation to the sludge stabilisation lagoon groundwater bores. As in previous years, the monitoring undertaken by both the NPDC and the Council indicated no adverse effect on the receiving environment.

An improvement in the level of environmental performance and compliance with the resource consents held by NPDC is desired. During the year under review consent conditions were compiled with on most occasions. There were nine unauthorised incidents associated with the treatment plant, most were minor and of short duration. One major incident resulted in an infringement notice. NPDC have consulted a process engineer to ensure the problem is eliminated and plant performance is improved.

This report includes recommendations for the 2006-2007 year.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Annual Report for the period July 2005-June 2006 by the Taranaki Regional Council on the monitoring programme associated with resource consents held by the New Plymouth District Council (NPDC). NPDC operates a wastewater treatment plant situated on Rifle Range Road at New Plymouth, in the Waiwhakaiho catchment.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC that relate to the discharge of treated wastewater and sludge, a marine outfall structure, a permit for a culvert and the air discharge permits held by NPDC to cover emissions to air from the site.

One of the intents of the Resource Management Act (1991) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Taranaki Regional Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the NPDC's use of water, land, and air, and is the twelfth combined annual report by the Taranaki Regional Council for NPDC.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the Resource Management Act and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by the NPDC, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted at the New Plymouth Wastewater Treatment Plant.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretation, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2006-2007 monitoring year.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act (1991) and monitoring

The Resource Management Act primarily addresses environmental `effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

(a) the neighbourhood or the wider community around a discharger, and may include cultural and socio-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (eg, recreational, cultural, or aesthetic);
(e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Taranaki Regional Council is recognising the comprehensive meaning of `effects' inasmuch as is appropriate for each discharge source. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the Resource Management Act to assess the effects of the exercise of consents. In accordance with section 35 of the Resource Management Act 1991, the Council undertakes compliance monitoring for consents and rules in regional plans; and maintains an overview of performance of resource users against regional plans and consents. Compliance monitoring, including impact monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the NPDC during the period under review, this report also assigns an overall rating. The categories used by the Council, and their interpretation, are as follows:

- a **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or trivial (such as data supplied after a deadline) non-compliance with conditions.
- a **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the year were negligible or minor at most, items of concern were resolved positively, co-operatively, and quickly, the Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with.
- **improvement desirable** indicates that the Council may have been obliged to record a verified unauthorised incident involving significant environmental

impacts against the company, and/or abatement notices may have been issued; there were adverse environmental effects arising from activities and intervention by Council staff was required, and there were matters that required urgent intervention, took some time to resolve, or remained unresolved at end of the period under review.
- **poor** performance is used when there were grounds for prosecution or infringement notice

1.2 Process description

The New Plymouth District Council Wastewater Treatment Plant (NPWWTP) treats the municipal wastewater from the New Plymouth urban area and Bell Block (a total population of approximately 54 000), by a process of extended aeration activated sludge. There is also a substantial industrial load equivalent to approximately 25 % of the total BOD load treated by the plant. The plant was commissioned in 1984.

The wastewater enters the plant at the milliscreening building (Figure 1) to remove plastics and solids from the wastewater, followed by the removal of grit. The solids are collected and removed regularly for land disposal. Following this preliminary treatment the wastewater enters the aeration basins where micro-organisms, collectively called "activated sludge", feed on the organic matter in the wastewater. Pathogens and heavy metals stick to the activated sludge to be removed at a later stage of the process. The mix of wastewater and activated sludge then overflow into clarifiers, which separate the activated sludge from the water. The clear water overflows into the chlorine contact tank for disinfection prior to discharge through a 450 metre marine outfall offshore of the mouth of the Waiwhakaiho River. The activated sludge remaining in the clarifiers is returned to the aeration basins to maintain biological levels, while the surplus is diverted to the thermal drying facility (TDF).

Thermal drying of the sludge results in a dry granular solid (biosolid) with a moisture content of 5-10% and the temperatures used in the process are such that there is sterilisation of the micro-organisms and pathogens present in the sludge. The biosolid is registered for sale as *Taranaki Bioboost 6-3-0* fertiliser.

Since 2004, eight additional aerators were installed; to provide some 20% additional oxidation capacity to ensure sufficient capacity is available for present and future loads. Increasing population and increased industrial load means the plant presently runs at approximately 84% oxidation capacity. A third clarifier is to be installed in 2006 to provide future hydraulic capacity for when Oakura (2007), and then Waitara (2008) sewerage is delivered to the plant.

1.3 Resource consents

1.3.1 Discharge permits

Section 15(1)(a) of the Resource Management Act stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

The NPDC holds coastal permit **0882** to cover the discharge of up to 86,000 cubic meters/day of treated municipal wastewater from the New Plymouth Waste Water Treatment Plant to the Tasman Sea. This permit was issued by the Minister of Conservation on 23 August 1996 under Section 119 of the Resource Management Act. It is due to expire on 1 June 2014.

There are nine special conditions attached to the permit. Condition 1 details effects not to be found beyond the mixing zone of 100 metres from the outfall diffuser.

Condition 2 requires that the consent holder maintain a diffuser system to ensure a minimum ratio of dilution of 13:1.

Conditions 3, 4 and 6 stipulate the concentration of various components of the discharge which shall not be exceeded in the discharge.

Condition 5 requires that the consent holder undertake disinfection of the effluent prior to discharge.

Condition 7 requires the consent holder to provide a contingency plan, while condition 8 requires an annual plan.

Condition 9 deals with review provisions of the consent.

The NPDC holds discharge permit **2982** to cover the discharge of up to 60 cubic meters/day of leachate from a sludge stabilisation lagoon to groundwater in the vicinity of the Waiwhakaiho River. This permit was issued by the Taranaki Regional Council on 17 October 2002 under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2020.

There are five special conditions attached to the permit. Condition 1 requires that groundwater in the vicinity of the lagoon is monitored, while condition 2 stipulates that the unnamed tributary adjacent to the lagoon be monitored.

Condition 3 stipulates that there be no direct discharge of contaminants to any surface water body. Condition 4 requires that there be no adverse impacts on ground or surface waters.

Condition 5 deals with review provisions.

Copies of the permits are attached to this report in Appendix I.

1.3.2 Discharge to land

Section 15(1)(b) of the Resource Management Act stipulates that no person may discharge any contaminant onto or into land in circumstances which may result in that contaminant(or any other contaminant emanating as a result of natural processes from that contaminant) entering water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

The NPDC holds discharge permit **3989** to cover the discharge of up to 85 cubic meters/day of waste dewatered activated sludge or equivalent dry weight of thermally dried activated sludge from the New Plymouth wastewater treatment plant onto land at the New Plymouth Airport. This permit was issued by the Taranaki Regional Council on 18 October 2002 under Section 87(e) of the Resource Management Act. It is due to expire on 1 June 2014.

There are 20 special conditions attached to the permit. Condition 1 requires the consent holder to comply with their obligations, responsibilities and duties under section 17 of the RMA.

Condition 2 stipulates that the consent only be used in the case of an emergency, and defines such an event.

Condition 3 requires the consent holder to notify the Council of their intention to exercise the consent. Condition 4 requires the consent holder to provide a written report detailing various factors if the consent is exercised.

Condition 5 requires the consent holder to provide an analysis of a representative sample of dewatered sludge prior to the exercise of the consent, and gives parameters to be tested. Condition 6 requires the consent holder to provide an analysis of representative samples of soil from each application.

Conditions 7, 8 and 9 deal with a management plan for the site.

Conditions 10, 11 and 12 deal with sludge and solids application.

Condition 13 requires the consent holder to provide an analysis of any surface or ground waters within the sludge/biosolids application site. Conditions 14, 15 and 16 deal with heavy metals at the site.

Conditions 17, 18 and 19 deal with the restriction of access to the site following disposal.

Condition 20 deals with review provisions.

1.3.3 Air discharge permit

Section 15(1)(c) of the Resource Management Act stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

The NPDC holds air discharge permits **4740** and **5480** to cover the discharge of contaminants into the air from sludge processing activities (relating to different buildings). The permits were issued by the Taranaki Regional Council on 12 July 1995 under Section 87(e) of the Resource Management Act and are due to expire on 1 June 2008.

There are eight special conditions attached to both consents. Condition 1 requires that the consent holder adopt the best practicable option to prevent or minimise adverse effects on the environment.

Condition 2 requires that sludge management processes are maintained and monitored so that discharges are kept to a minimum.

Condition 3 required the consent holder to provide documentation on the biofilter associated with the plant. Condition 4 requires that the biofilter is operated and maintained in compliance with that information.

Condition 5 requires the consent holder to consult with the Council prior to significantly altering the plant, processes or operations.

Condition 6 stipulates that discharges do not give rise to adverse ecological effects on off-site ecosystems.

Condition 7 stipulates that there be no offensive or objectionable odours beyond the property boundary.

Condition 8 deals with provisions for review of the consent.

Copies of the permits are attached to this report in Appendix I.

1.3.4 Coastal permits

Section 12(1)(b) of the Resource Management Act stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

The NPDC holds coastal permit **4593** to erect, place, maintain and use a marine outfall within the coastal marine area as part of the New Plymouth wastewater treatment system. This permit was issued by the Taranaki Regional Council on 24 July 1996 under Section 87(c) of the Resource Management Act. It is due to expire on 1 June 2014.

There are five special conditions attached to the permit. Condition 1 requires that the consent holder maintain the structures authorised by the consent. Condition 2 requires the consent holder to notify Council prior to undertaking maintenance works. Condition 3 requires that all practicable measures are undertaken to prevent undue disturbance to reefs and marine life during maintenance works.

Condition 4 stipulates that the structure is removed when no longer needed.

Condition 5 deals with review provisions.

A copy of the permit is attached to this report in Appendix I.

1.3.5 Land use consent

Section 13(1)(a) of the Resource Management Act stipulates that no person may use, erect, reconstruct, place, alter, extend, remove, or demolish any structure in, on, under, or over the bed of any lake or river, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

The NPDC holds land use consent **1826** to erect, place and maintain a twin box culvert on the Mangaone Stream for road access purposes. This permit was issued by the Taranaki Regional Council on 16 January 2002 under Section 87(a) of the Resource Management Act. It is due to expire on 1 June 2020.

There are eight special conditions attached to the consent. Condition 1 requires that the structure is maintained. Condition 2 stipulates that maintenance be undertaken between November and April inclusive. Condition 3 requires the consent holder to notify the Council prior to maintenance. Condition 4 requires the consent holder to adopt the best practicable option to avoid or minimise effects on the streambed or water quality during maintenance. Condition 5 requires that streambed disturbance is kept to a minimum during maintenance.

Condition 6 stipulates that the structure does not obstruct fish passage.

Condition 7 requires that the structure be removed and the area reinstated if and when no longer required.

A copy of the consent is attached to this report in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the Resource Management Act sets out an obligation for the Taranaki Regional Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region.

The Taranaki Regional Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

The monitoring programme for the NPWWTP consisted of six primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Taranaki Regional Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application, in discussion over monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

1.4.3 Site inspections

Four scheduled inspections were undertaken at the NPWWTP site during the monitoring period. With regard to consents for the discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the consent holder were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Chemical sampling

The final effluent was sampled on four occasions, and the sample analysed for faecal coliforms, enterococci and chlorine (total and free).

Two inter-laboratory comparisons between the Council and NPDC were performed during the 2005-2006 monitoring period. The comparisons were performed to verify the validity of monitoring results reported by the NPDC, and to provide an independent check on compliance with consent conditions. Effluent samples were analysed, by both the Council and the NPDC, for cadmium, chromium, copper, nickel, lead, mercury, zinc, cyanide, phenolic compounds, free available chlorine, total available chlorine, faecal coliform and enterococci bacteria.

1.4.5 Marine ecological survey

A marine ecological survey was carried out at three potential impact sites and two control sites during the 2005-2006 monitoring period. The objective of this survey was to indicate any change in intertidal biological community structure attributable to the presence of the wastewater treatment plant outfall.

1.4.6 Pathogens and metals in mussel tissue

Green-lipped mussels (*Perna canaliculus*), were deployed on one occasion in the vicinity of the discharge plume of the marine outfall. This is performed to assess the effectiveness of the treatment system, and in particular the upgrade of the disinfection system, in terms of pathogen levels in the final effluent. The mussel tissue was analysed for Enterococci, Faecal coliforms, Phage F, *Salmonella*, and Human Enterovirus.

Mussels were also collected on one occasion at three sites (Waiwhakaiho Reef, Bell Block Reef and Arakaitai Reef), with tissue analysed for silver, cadmium, chromium, copper, mercury, nickel, lead and zinc.

1.4.7 Review of New Plymouth District Council monitoring data

The NPDC routinely monitors the discharge effluent for a number of chemical, biochemical and bacteriological parameters. Once a month, flow-proportional samples are taken over a 24 hour period and are analysed for suspended solids, pH, ammonia, chemical oxygen demand, faecal coliforms, oxidised nitrogen, reactive phosphorus, free available chlorine, total available chlorine, cyanide, phenols, cadmium, chromium, copper, nickel, lead, zinc, iron, manganese and mercury. The

results of monitoring were forwarded to the Council on a monthly basis and are summarised in this report.

Monthly summaries of daily influent composite samples and effluent grab samples are also forwarded to the Council and are summarised in this report.

Monitoring of the sludge lagoon is focused on the potential contamination of groundwater and of the drainage channel located next to the lagoon. Three groundwater bores are located around the lagoon. The location of these bores is shown in Figure 2. Samples from these bores were analysed for pH, ammonia, faecal coliform bacteria, total dissolved phosphorus, oxidised nitrogen and chemical oxygen demand once a month. The drainage channel was also sampled once a month at two sites, one upstream and the other downstream of the sludge lagoon (Figure 2). The drainage channel samples were analysed for pH, ammonia and faecal coliform bacteria. The analysis of groundwater bore and drainage channel samples was performed by the NPDC and results were forwarded to the Council each month. These results are also summarised in this report.

Figure 1 Layout of the New Plymouth Wastewater Treatment Plant

2. Results

2.1 Water

2.1.1 Inspections

Four scheduled site inspections were performed at the plant, on 21 November 2005, 17 January 2006, 7 March 2006 and 2 May 2006. These inspections involved a visual assessment of the plant effluent and plant processes, a check of the final effluent chlorine data, a brief consultation with operations and/or laboratory staff, and an inspection of the foreshore and seawater adjacent to the outfall.

21 November 2006 The effluent was clear in appearance (at the end of the weir in the chlorine contact tank), however some particles of fat and clumps of algal matter were evident. Chlorination records were checked and these were found to be satisfactory. The plant was running smoothly. The effluent plume was not visible around the outfall and the foreshore was clean, while shoreline water was moderately turbid.

17 January 2006 The effluent was relatively clear in appearance, however more particulate matter was evident than is usual, with some larger clumps of sludge observed passing over the weir. The plant was slowly settling down again after a sludge bulking problem in the clarifiers (see section 2.3 below). Copies of the last week's chlorine records were obtained, as well as the routine sludge testing data for the previous month from the duty operator. The surrounds were tidy. There was no effluent plume visible, although a congregation of gulls were observed at the location. The foreshore and shoreline waters were clean.

7 March 2006 The effluent contained the usual fat particles and clumps of algal filaments. The plant had returned to normal after the events in January. No effluent plume was visible and the foreshore and shoreline water was clear.

2 May 2006 The effluent was as per usual, and everything was in order and well maintained. The position of the effluent plume was marked by a clear patch on the surface. The foreshore and shoreline water was clean.

2.1.2 Results of discharge monitoring

2.1.2.1 Grab samples

Grab samples were collected of the final effluent in conjunction with the inspections. The samples were analysed for faecal coliform and enterococci bacteria, total available chlorine and free available chlorine by the Council. The results of these analyses are presented in Table 1 below.

Table 1 Results of effluent grab samples 2005-2006

Parameter	Unit	Date			
		21-Dec-05	17-Jan-06	7-Mar-06	2-May-06
Faecal coliform	nos/100 ml	< 1	< 1	3	29
Enterococci	nos/100ml	< 1	< 1	4	< 1
Total available chlorine	g/m^3	-	-	1.43	1.39
Free available chlorine	g/m^3	-	-	0.06	0.08

The results of these grab samples show that the consent condition which requires the total available chlorine level in the final effluent to be maintained at a level not less than 0.3 g/m^3 was met on all sampling occasions where chlorine was tested.

Relatively low levels of both faecal coliform and enterococci bacteria were recorded in the final effluent on all sampling occasions. Compared with untreated effluent bacterial levels, this is a good level of disinfection.

2.1.2.2 Inter-laboratory comparison

Two grab samples of the final effluent were collected and split in order to perform an inter-laboratory comparison. The samples were analysed for: cadmium, chromium, copper, nickel, lead and zinc (all acid soluble), cyanide and mercury (total), phenols, free chlorine and faecal coliforms. The results of these analyses are shown in Table 2 below.

Table 2 Results of inter-laboratory effluent grab samples 2005-2006

Parameter	Unit	7 March 2006			2 May 2006			Consent limit
		TRC	NPWWTP	√	TRC	NPWWTP	√	
Cadmium	g/m^3	< 0.005	< 0.008	√	< 0.005	< 0.008	√	0.04
Chromium	g/m^3	< 0.03	< 0.05	√	< 0.03	< 0.05	√	0.15
Copper	g/m^3	< 0.01	0.01	√	< 0.01	< 0.01	√	0.1
Cyanide	g/m^3	0.02	0.03	√	0.006	0.06	**	0.1
Mercury	g/m^3	< 0.0002	< 0.001	√	< 0.0002	< 0.001	√	0.002
Nickel	g/m^3	< 0.02	< 0.02	√	< 0.02	< 0.02	√	0.15
Lead	g/m^3	< 0.05	< 0.02	√	< 0.05	< 0.02	√	0.1
Phenol	g/m^3	< 0.02	< 0.05	√	< 0.02	< 0.05	√	1.0
Zinc	g/m^3	0.02	0.03	√	0.02	0.02	√	0.2
Free chlorine	g/m^3	0.06	< 0.2	*	0.08	< 0.2	**	-
Faecal coliforms	nos/100 ml	3	< 2	√	29	< 2	*	-

√ = satisfactory agreement
* = result within 10 -25 % of the mean
** = result > 25 % from mean
NB: Levels of faecal coliform on 7 March are within the same order of magnitude and hence considered to be within agreement.

The results of the inter-laboratory comparison show that the values obtained were mostly in good agreement and all results were within levels prescribed by consent conditions.

2.1.2.3 NPDC self monitoring

A summary of the results of effluent monitoring, performed once a month from July 2005 to June 2006 by the NPDC and forwarded to the TRC, are presented in Table 3, along with a summary of previous results from July 1990. A full table of results for the period under review can be found in Appendix II, while graphs of the full results from 1990 are contained in Appendix III.

Table 3 Summary of results of effluent grab samples collected by NPDC during 2005-2006, with a summary of data from July 1990

Parameter	Unit	2005-2006			1990-2005		
		Median	Range	Number	Median	Range	Number
pH		7.5	7.2 – 7.7	12	7.6	7.1 – 8.0	175
NH_3	g/m^3	0.85	0.15 – 1.4	12	0.8	0.05 – 21.8	175
Suspended solids	g/m^3	7.5	2.5 – 56	12	2.5	2.5 – 34	179
COD	g/m^3	29	19 – 80	12	21	10 – 38	169
Faecal coliforms	No/100ml	1	< 1 – 8	12	1	< 1 – 3000	173
NOx	g/m^3	10	0.5 – 17	12	5.3	0.1 – 18.6	168
Reactive phosphorus	g/m^3	3.90	2.23 – 5.03	12	2.03	0.21 – 6.70	166
Free chlorine	g/m^3	0.1	< 0.2	12	0.1	< 0.2 – 0.4	177
Total chlorine	g/m^3	0.5	0.2 – 0.9	12	0.3	0.1 – 1.3	177
Cyanide	g/m^3	0.05	0.03 – 0.07	12	0.03	0.005 – 0.1	166
Phenols	g/m^3	0.03	< 0.05 – 0.05	12	0.03	< 0.05 – 0.08	163
Zinc	g/m^3	0.02	< 0.02 – 0.04	12	0.04	< 0.02 – 0.11	171
Copper	g/m^3	0.005	< 0.01 – 0.01	12	0.005	< 0.01 – 0.05	171
Chromium	g/m^3	0.025	< 0.05	12	0.025	0.01 – 0.05	171
Nickel	g/m^3	0.01	< 0.02	12	0.01	< 0.02 – 0.07	171
Cadmium	g/m^3	0.004	< 0.008	12	0.004	0.001 – 0.008	171
Lead	g/m^3	0.01	< 0.02	12	0.01	< 0.02 – 0.035	171
Iron	g/m^3	0.07	0.05 – 0.6	12	0.06	0.03 – 0.3	170
Manganese	g/m^3	0.05	0.02 – 0.07	12	0.04	0.01 – 0.11	170
Mercury	g/m^3	0.005	<0.001 – 0.001	12	0.0005	< 0.001 – 0.001	161

Levels of suspended solids exceeded the 20 g/m^3 allowed by consent conditions on one occasion during the period under review – at 56 g/m^3 this is the highest level recorded to date. Total available chlorine in the final effluent was below the 0.3 g/m^3 required by the consent on two occasions (February and April 2006).

NPDC also provided Council with a monthly summary of plant performance (influent and effluent). Data for the period 2005-2005 is presented in Table 4 below.

Table 4 Monthly summary of plant performance – comparison of influent and effluent grabs 2005-2006. Data in black are influent values, while data in blue are effluent values.

Parameter	pH	SS g/m^3	Alk g/m^3	BOD g/m^3	COD g/m^3	NH3 g/m^3	NNN g/m^3	FC g/m^3
July 2005	7.44 7.18	260 < 5	157 76	198 3	586 25	19.9 0.35	1.4 3.5	3.11 x 10^6 2
August 2005	7.45 7.19	270 < 5	165 81	208 2	379 20	20.6 0.65	2.7 9.9	1.75 x 10^6 < 2

September 2005	7.44 7.25	290 < 5	186 89	215 3	454 26	24.2 0.48	2.1 2.8	3.53×10^6 < 2
October 2005	7.43 7.21	353 10	179 74	219 3	428 24	25.2 0.29	1.6 3.0	3.24×10^6 2
November 2005	-	-	-	-	-	-	-	-
December 2005	7.46 7.39	325 < 5	191 96	193 2	463 27	23.6 0.79	1.8 8.6	3.35×10^6 < 2
January 2006	7.43 7.32	287 < 5	188 94	201 3	448 30	24.9 0.27	0.8 < 0.2	6.24×10^6 3
February 2006	7.50 7.22	349 < 5	195 73	203 2	466 24	23.8 0.73	0.5 15.6	7.7×10^6 < 2
March 2006	7.50 7.28	347 6	203 72	225 2	558 26	25.5 0.12	1.8 16.4	5.75×10^6 2
April 2006	7.45 7.18	308 9	181 59	212 3	517 27	24.2 1.17	1.8 14.8	5.55×10^6 2
May 2006	7.47 7.17	293 7	185 67	201 4	487 35	24.8 0.76	1.4 16.9	3.71×10^6 2
June 2006	7.48 7.09	276 6	170 57	176 3	440 39	22.7 1.71	0.4 16.0	2.6×10^6 < 2

The results above show that treatment of influent at the wastewater treatment plant resulted in a reduction in pH, suspended solids, alkalinity, BOD, COD, ammonia, and faecal coliforms. Nitrate increased as the ammonia was converted to nitrate by way of nitrification.

BOD and suspended solids in the final effluent were on all occasions below the 20 g/m^3 prescribed by conditions of consent 0882.

2.1.3 Sludge lagoon monitoring

The results of sludge lagoon monitoring performed once a month by NPDC and forwarded to the Council are summarised in Table 5, along with a summary of previous results from 1990-2005. The full results of the 2005-2006 period are presented in Appendix IV. The location of the sampling sites in relation to the lagoon are shown in Figure 2.

Figure 2 Site diagram of sludge lagoon showing location of NPDC's groundwater bore and drain sampling sites

Table 5 Summary of results of sludge lagoon monitoring performed by New Plymouth District Council 2005-2006 (black), along with a summary of results from July 1990 (blue)

Site	2005 - 2006 1990 - 2005	pH	NH_3 g/m^3	Faecal coliforms No./100ml	TDP g/m^3	NOx g/m^3	COD g/m^3
Bore 1	Number	12	12	12	12	12	12
	Range	5.2 – 6.2	0.05 – 0.8	5 – 60	0.005 – 0.02	0.3 – 10.2	1 – 8
	Median	5.5	0.15	5	0.02	1.85	5.5
	Number	174	174	171	173	174	173
	Range	4.9 – 7.1	0.05 - 100	5 - 2300	0.005 – 3.3	0.01 – 18.3	2 - 44
	Median	6.1	2.3	5	0.01	0.3	10
Bore 2	Number	12	12	12	12	12	12
	Range	5.3 – 6.3	0.05 – 1.7	5 – 10	0.005 – 0.05	0.2 – 9.9	6 – 18
	Median	6.0	0.9	5	0.01	1.6	12.5
	Number	174	174	173	173	174	173
	Range	4.9 – 7.4	0.05 – 20.4	5 - 10000	0.005 -0.36	0.075 - 40	6 - 52
	Median	6.3	3.2	5	0.01	0.1	14
Bore 3	Number	12	12	12	12	12	12
	Range	6.2 – 6.7	0.05 – 2.4	5 – 640	0.02 – 0.31	0.1 – 3.6	10 - 33
	Median	6.4	1.05	40	0.13	0.35	25.5
	Number	174	174	173	173	174	173
	Range	5.7 – 7.3	0.05 – 177	5 – 72000	0.005 - 1	0.07 – 24.8	1 - 740
	Median	6.4	0.705	5	0.02	0.2	10
Open drain point 2	Number	12	12	12			
	Range	6.6 – 6.8	0.6 – 2	5 – 520			
	Median	6.7	1.0	85			
	Number	174	174	173			
	Range	6.4 – 6.9	0.005 – 7.5	5 – 5000			
	Median	6.6	0.4	70			
Open drain point 3	Number	12	12	12			
	Range	6.6 – 6.8	2.1 – 7	5 – 290			
	Median	6.7	3.6	75			
	Number	174	174	173			
	Range	6.4 – 7.1	0.13 – 27	5 – 1970			
	Median	6.8	8.5	100			

Minor changes in pH within all three groundwater bores occurred during the monitoring period, which were probably related to biochemical reactions within the sludge lagoon. Groundwater pH was less than 7 in all bores with Bore 1 and 2 between the range of 5.2 and 6.3 while Bore 3 was slightly higher at 6.2 – 6.7. Surface waters within the drain adjacent to the sludge lagoon remained within the relatively narrow pH range of 6.6 to 6.8. These patterns are typical of previous monitoring results.

The process of decomposition of nitrogenous fractions within the sludge biomass generates ammonia. Ammonia levels were low in Bore 1, with a median of 0.15 g/m^3. Levels in Bore 2 were slightly higher and ranged between 0.005 and 1.7 g/m^3, while levels in Bore 3 were slightly higher than both Bore 1 and 2. Ammonia levels in open drain site 2 were similar to Bore 3. Open drain site 3 recorded higher ammonia

levels throughout the monitoring period and historically, which may indicate seepage from the sludge lagoon.

With the exception of May 2006, faecal coliform counts recorded at Bore sites 1 and 2 were very low. Occasional high counts were recorded at Bore 3 and the two open drain sites, which can be attributed to the lagoon. However, as noted during previous annual reports, variation in faecal coliform numbers in the surface waters of the drain is to a greater extent affected by fluctuations in drain flow and access by stock and wildlife.

Soluble phosphate is released from the sludge biomass under anaerobic conditions and therefore is the major contributor to total dissolved phosphorus levels. Levels at Bores 1, 2 and 3 remained low throughout the year. The generally low levels of total dissolved phosphorus at the bore sites indicate that soluble phosphorus is possibly being absorbed into the ash and clay substrate.

Oxidised nitrogen levels in the groundwater bores generally remained low throughout the monitoring period, with slight increases in bores 1 and 2 on a few occasions, resulting in a median somewhat higher than the historic median.

Levels of COD were relatively low in Bore 1, increasing in Bore 2 and further in Bore 3. Levels of COD in Bores 1 and 2 were generally lower than in previous monitoring periods, while at Bore 3 the results were generally higher, suggesting higher levels of organic compounds in the groundwater at this site.

Overall, elevated ammonia, faecal coliform and COD levels throughout the monitoring period indicate that seepage from the lagoon was occurring. The construction of the lagoon was so that the sludge would be forced by hydraulic pressure into the fine river silts and ash which underline the lagoon thus blinding and sealing the bottom of the lagoon. This has in the most part been achieved although minimal leakage still occurs as indicated by the monitoring results of groundwater and surface waters in the vicinity of the lagoon.

2.1.4 Marine ecological surveys

A marine ecological survey was conducted at five sites between 4 January and 6 January 2006 as part of the 2005-2006 monitoring programme. In this report the effect of the New Plymouth Wastewater Treatment Plant outfall on the intertidal marine ecological community is assessed according to spatial differences in ecological diversity between impact and control sites, and temporal changes in ecological diversity between surveys at each site.

The site 300 metres to the north east is the most likely to be affected by any discharge, and to be affected to the greatest extent.

The marine ecological survey conducted during January 2006 as part of the 2005-2006 monitoring programme indicated that the ecological diversity was significantly lower at the 500 metre SW site and Mangati Reef compared to Turangi Reef, Greenwood Road and 300 metre NE sites. Compared to the January 2005 survey, four of the five sites showed a decrease in both species richness and species diversity. This decrease across the sites is most likely linked to environmental factors

experienced during 2005 and 2006 as the control sites also decreased in both species richness and species diversity. Sand levels were significant in the decrease in species richness and diversity at the Mangati Reef site.

The difference in substrate type between the control sites and the two Waiwhakaiho Reef sites is considered to have a major influence on the ecological diversity, and consequently more emphasis during interpretation is given to the temporal data to indicate adverse effects.

The results of this survey show that both the potential impact and the two control sites decreased in terms of species richness, and all sites decreased apart from one control site in terms of species diversity. The 500m SW site once again recorded the lowest species diversity due to the location of the site close to a freshwater source. It is indicated from the results that the discharge from the New Plymouth Wastewater Treatment Plant has not resulted in any changes in ecological diversity in the local intertidal marine community.

A full copy of the report on this marine ecological survey is contained in Appendix V.

2.1.5 Pathogens and metals in mussel tissue

2.1.5.1 Pathogens

Mussels were placed in mesh bags secured on a mooring below a marker buoy 50m east and west of the NPWWTP outfall. The mussels were deployed on 7 July 2005 and were left until 30 August 2005, when seawater temperatures were cooler as the viruses live longer in cooler water, providing a better indication of the viral contamination present in the seawater from the discharge.

Live green-lipped mussels (*Perna canaliculus*) were collected from Port Taranaki so that they were already acclimatised to the local environment. These mussels were deployed in two bags suspended on a rope underneath buoys approximately 50 metres west and east of the outfall diffuser and left for eight weeks. In recent years commercially grown green-lipped mussels from the Coromandel were used which were bought live from the supermarket. Due to stresses most likely associated with temperature differences and travel these mussels did not survive during the winter months off the Taranaki coast, which did not allow any results to be obtained.

Mussels are an excellent way of assessing the quality of the water due to their feeding mechanisms. Mussels filter feed fine particles such as phytoplankton and microscopic algae and nutrients out of the water. In doing this the mussels will accumulate toxins, bacteria or hydrocarbons from the water column within their body tissue which can be easily tested for.

The mussels were collected and sent to Watercare Services Ltd in Auckland for analysis. A control sample was also taken from the live mussels collected from the harbour. Tests were undertaken for faecal coliform and enterococci bacteria, *Salmonella*, human enterovirus and F-specific bacteriophage. The results of the analyses are shown in Table 6 below. Human enterovirus is expressed as plaque forming units (pfu) per 100 grams of wet mussel tissue.

Table 6 Results of virological analysis of mussels deployed August 2005

Sample site	Enterococci	Faecal coliform	F-specific bacteriophage	*Salmonella*	Human enterovirus
	MPN/100g ww	MPN/100g ww	Pfu/100g wet	/100g wetwt	Pfu/100g wwt
50m west of outfall diffuser	< 20	< 20	4	< 2	< 4.0
50m east of outfall diffuser	20	< 20	20	< 2	< 4.0
Control	800	20	422	< 2	< 4.0

The results have shown that the samples east and west of the outfall recorded low values for all the tested pathogens. This supports the fact that NPDC are ensuring a high level of disinfection of the effluent is achieved before being discharged.

2.1.5.2 Metals

This survey of mussels from intertidal reefs surrounding the outfall is scheduled for every 2 years and will be next completed as part of the 2007-2008 monitoring period.

Mussel samples from three naturally occurring intertidal mussel populations were collected from three sites, located on Waiwhakaiho Reef, Arakaitai Reef and Bell Block Reef. The Arakaitai and Bell Block sites represent control sites, while Waiwhakaiho Reef is the reef potentially impacted by the marine outfall effluent discharge. All sites consisted of scattered mussel populations. Each sample was depurated (mussels were placed in freshwater for a period of time to allow the elimination of waste products from the gut). Analysis for a number of heavy metals was carried out and the results of these analyses are presented in Table 7.

Table 7 Results of heavy metal analysis of naturally occurring mussel populations

Parameter	Units	Site		
		Bell Block Reef (control)	Arakaitai Reef (control)	Waiwhakaiho Reef (impact)
Silver	mg/kg	< 0.01	< 0.01	< 0.01
Cadmium	mg/kg	0.038	0.030	0.045
Chromium	mg/kg	0.12	0.07	0.05
Copper	mg/kg	0.79	0.77	0.60
Mercury	mg/kg	0.015	0.014	0.014
Nickel	mg/kg	0.62	2.1	0.48
Lead	mg/kg	< 0.05	< 0.05	< 0.05
Zinc	mg/kg	8.7	8.0	11.3

Levels of silver, cadmium, chromium, mercury and lead were found at low concentrations, and were similar at the two control sites and the impact site at Waiwhakaiho. Metals results collected since 1993 (refer to Appendix V) indicate that the Waiwhakaiho Reef mussels have contained similar concentrations of these three metals compared to the control sites.

Levels of copper and nickel at the Waiwhakaiho Reef were similar to historical means, and lower than the other two sites.

As in the previous results, levels of zinc at the Waiwhakaiho site were higher than at the impact sites. Zinc reached a new maximum value of 11.3 mg/kg, well above the mean of 8.47 mg/kg (Appendix V). This follows a trend of increasing zinc concentration found at the site from 1999 onwards (refer to graphs in Appendix V). Zinc is a trace metal required as part of a healthy diet and the Ministry of Health guidelines recommend a minimum of 12 mg of zinc is consumed per day. As such, the value of 11.3 mg/kg in the mussel tissue is not considered to be dangerous.

2.2 Air

2.2.1 Inspections

Air inspections were undertaken in conjunction with scheduled site inspections on 21 November 2005, 17 January 2006, 7 March 2006 and 2 May 2006.

An assessment of the odour performance of the milliscreen and sludge filter buildings was made during each visit. On all occasions there was a slight to moderate odour evident around the milliscreen building and in vicinity of the sludge thickening/drying buildings.

2.3 Register of incidents

The Taranaki Regional Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The register ('unauthorised incident register') includes events where the company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Incidents may be alleged to be associated with a particular site. If there is an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident. (or that the allegation cannot be proven).

In the 2005-2006 year, there were nine incidents recorded by the Council that were associated with the NPWWTP. Three of these incidents occurred at the NPWWTP, while six others involved pump stations. These are summarised in Table 8 below.

Table 8 Pump station overflows associated with the NPWWTP during 2005-2006

Location	Date	Duration (min)	Cause
Richmond Street	7 July 2005	87	Pump fault while standby pump unavailable due to renewal work on discharge pipe
Herekawe SPS	31 July 2005	78	Electrical fault in one pump and a blockage in another
Te Henui SPS	31 July 2005	18	Unplanned power outage by Powerco
Lee Breakwater SPS	18 September 2005	180	Stormy seas & exceptionally high tides resulted in flooding of power station overflow line & flooding of pump station
NPWWTP outfall	30 September 2005	15	Failure of level detector on flow splitter at plant caused sewage to bypass aeration basins

Connett Road SPS	26 October 2005	50	Localised power faliure
NPWWTP outfall	26 October 2005	150	Overwash from clarifiers, series of breakdowns in the Thermal Drying Facility preventing adequate wasting.
Connett Road SPS	20 December 2005	78	Power lines down due to severe storm
NPWWTP outfall	10 January 2006	Discussed below	

SPS = Sewage pumping station

For 24 hours beginning 10 January 2006, an over-wash from the clarifiers occurred resulting in a direct discharge of sludge to the Tasman Sea outfall. The clarifier over-wash was due to a series of Thermal Drying Facility and Dewatering breakdowns preventing adequate wasting and processing of poor settling sludge. The chlorine dose was manually increased to 0.6 ppm to ensure a sufficient residual was maintained and clarifier scrapers were slowed to increase retention within the system. Signage was erected by the District Health Board to prevent swimming either side of the Waiwhakaiho River mouth. Discolouration was noted in the sea in the vicinity of the outfall, however monitoring by Council staff found no evidence of unacceptable shoreline contamination.

Council requested a report on what measures were being adopted and put in place to prevent future over-washes. The NPDC were engaging a consultant process engineer to assist staff to identify the cause of poor settling floc information, and develop appropriate operating philosophy and procedures to ensure this problem is eliminated. A third clarifier is to be built during 2006. NPDC were issued with an infringement notice of $750 for breaching section 15(1)(a) of the RMA.

Photograph 1 Plume around outfall (brown area in centre of photo) associated with the incident on 10 January 2006

3. Discussion

3.1 Discussion of plant performance

Inspections and various monitoring undertaken by the Council, together with data supplied by NPDC, indicate that the New Plymouth Wastewater Treatment Plant was generally well managed and operated during the monitoring period. Special conditions of the various consents were generally complied with during the monitoring period.

Consent 0882 requires that NPDC provide an annual report to the Council by 31 August each year on the waste treatment system, including the performance of the outfall and compliance with the consent. This report was received in August 2006.

The report noted that during the year normal inspections and remedial maintenance were undertaken on all pump stations. A programme of pump replacement is due to begin during the 2006-2007 period. Work was begun to replace ageing DC pumps in the Te Henui Pump Station with high efficiency AC pumps. This was scheduled to be completed in the 2006-2007 period. There were seven pump station overflows during the 2005-2006 period (these are outlined in section 2.3 above).

Only planned maintenance was undertaken on the milliscreens at the NPWWTP. An aeration refurbishment and upgrade is in the final stage of commissioning. Eight additional aerators have been fitted in preparation for the extra plant flows and loading from Oakura, Waitara and Urenui. This enhances the ability of existing aerators to manage increased BOD loadings.

Only planned maintenance was required on the clarifiers. Planning has begun for building of a third clarifier to handle increased hydraulic load once planned expansion of the plant catchments to outlying townships is actioned. Disinfection equipment was run to a high standard, with only remedial maintenance of a minor nature required during the year. Pumps and pipe work were replaced and upgraded as dictated by the maintenance regime.

No problems were experienced in relation to the chlorine contact tank.

The diffuser at the end of the outfall was found to be missing during a routine dive inspection, and this was replaced. Cathodic protection monitoring of the pipeline demonstrated that the system was working well.

The dewatering plant ran successfully throughout the year with only planned maintenance undertaken. Work to refurbish a third belt press for the plant was begun during the year and is scheduled to be installed and commissioned during 2006-2007.

The annual maintenance shutdown of the Thermal Drying Facility (TDF) was carried out in April 2006. The manufacturing process for "Bioboost" received continuation of registration for Q-Base Code 2001 quality system accreditation from Telarc in January 2006. The majority of Bioboost was sold through the distributor, while some product was been used by the New Plymouth District Council for use on sports turf and ornamental gardens around the city. A major process failure at the TDF in June

2006 resulted in ten tonnes of out-of-specification product, this was disposed of at the Colson Road landfill.

From November 2005 onwards a focus on plant optimisation has been made and an optimisation project instigated. Subsequent to the January unauthorised incident (refer to section 2.4 above), performance of the process has improved markedly. The project will continue through 2006-2007.

3.2 Environmental effects of exercise of consents

3.2.1 Effluent discharge to Tasman Sea

Two consents cover the discharge of treated wastewater from the plant to the Tasman Sea via the marine outfall. Consent 0882 allows the discharge of the wastewater through the marine outfall and consent 4593 licences the presence of the outfall structure in the coastal marine area. Both of these consents were renewed in July 1996.

Monitoring of the wastewater discharge to the Tasman Sea during the 2005-2006 monitoring period consisted of both monitoring of the final wastewater composition prior to discharge, and monitoring of the effects of the discharge on the receiving environment.

Monitoring of the final wastewater prior to discharge was primarily undertaken by NPDC in the form of daily grab samples and monthly 24-hour composite samples. Inter-laboratory comparisons and checks of compliance with consent conditions were also undertaken by the Council. Monitoring by both NPDC and the Council indicated that the treatment plant consistently achieved a high level of treatment throughout the monitoring period, although there was one occasion where suspended solids were above levels prescribed in consent conditions and two occasions when the value for total available chlorine was below the required limit.

Monitoring of effects on the receiving environment was primarily carried out by the Council during the 2005-2006 monitoring period. This monitoring consisted of an intertidal marine ecological survey of potentially affected cobble reefs, metals analysis of mussel tissue from the impact reef and two adjacent reefs, and a survey of pathogens in mussels placed in mesh bags moored either side of the outfall discharge. No evidence of adverse effects on the receiving environment due to the wastewater discharge was identified in relation to the marine ecological monitoring or mussel tissue analysis results. Additional monitoring undertaken in conjunction with the overwash in January 2006 (refer to section 2.3) noted discolouration around the outfall pipe, however bacteriological monitoring of the adjacent shoreline did not indicate contamination.

As part of the consent renewal process for these two consents carried out in 1996 an agreement was reached between the NPDC, the Council and submitters to the consents regarding a suitable monitoring programme outline for the next ten years in relation to these consents. It was agreed that the final details of the monitoring programme would be more appropriately determined on a yearly basis but that the monitoring programme should include effluent monitoring, site inspections, compliance monitoring, pathogen monitoring, marine ecological monitoring, surveys

of trace metals in mussels, and shoreline bacteriological water quality surveys. It was agreed that these components would be included each year except for the trace metals in mussels and the shoreline water quality surveys that would be conducted in alternate years. The shoreline bacteriological monitoring would be reviewed after three sets of data had been collected. There have now been four sets of shoreline bacteriological data collected, with some unexplained high counts of bacteria found. In the near future the NPWWTP is going to receive effluent from Waitara and Oakura, so a continuation of this programme will show if there are any adverse effects arising from the increased loading.

3.2.2 Sludge lagoon and sludge disposal monitoring

NPDC also hold two consents in relation to the management of activated sludge and biosolids. Consent 2982 allows the discharge of leachate from the sludge stabilisation lagoon to groundwater and consent 3989 allows the discharge of waste activated sludge and/or biosolids from the treatment plant onto land.

Monitoring of the sludge lagoon facility during the 2005-2006 monitoring year consisted of monthly testing of groundwater bores and nearby surface water in an open drain by NPDC and inspections by the Council. Overall, during the monitoring period the groundwater in bore 3 and the surface water in the two drains generally recorded the highest levels for most parameters, indicating seepage from the lagoon to groundwater and the drainage channel was occurring. The distance travelled before the surface water reaches the Waiwhakaiho River and the dilution that occurs at the river meant the level of contamination in the drainage channel adjacent to the lagoon was not at a level to cause concern. There were no other problems identified in relation to the sludge lagoon.

Due to consent 3989 now being used as a contingency no disposal to land occurs unless the Council is notified. In March 2005 NPDC were released from their management responsibilities as defined under Consent 3989 for Airport sites Block B and C. A heavy metal analysis of the sludge applied to Block B met the new soil concentration limits specified in "Guidelines for the safe application of biosolids to land in New Zealand: August 2003".

3.2.3 Air discharge

NPDC holds consent 4740 that allows the discharge of contaminants into the air from sludge processing activities. NPDC have provided documentation on the design specifications, operation and maintenance of the biofilter intended for abatement of discharges to air from the sludge management processing facilities.

3.3 Evaluation of performance

A tabular summary of NPDC's compliance record for the year under review is set out in Tables 9-15.

Table 9 Summary of performance for Consent 0882-3 to discharge wastewater to the Tasman Sea

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Effects not to arise beyond mixing zone	Inspections and ecological surveys	No. One incident of visual effects in January 2006
2. Maintenance of multiport diffuser system	Site inspections	Yes
3. Concentration limits upon potential contaminants in discharge	Samples collected by both Council and consent holder	Yes
4. Concentration limits upon suspended solids and BOD	Samples collected by consent holder	One suspended solids grab sample result exceeding consent limits
5. Disinfection of effluent prior to discharge	Presence of chlorine in samples collected by both Council and consent holder	Yes
6. Levels of chlorine in the final effluent	Samples collected by both Council and consent holder	Level below consent requirements on two occasions
7. Contingency plan	Received and accepted	Yes
8. Annual Report	Received 25 August 2006	Yes
9. Review of consent conditions	Not scheduled for period under review	N/A

N/A = not applicable

Table 10 Summary of performance for Consent 1826-2 to erect, place and maintain a culvert

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Structure maintained to meet consent conditions	Inspections	Yes
2. Instream maintenance work between November and April	No maintenance required	N/A
3. Notification prior to maintenance work	No maintenance required	N/A
4. Best practicable option during maintenance to avoid adverse effects on environments	No maintenance required	N/A
5. Area and volume of streambed disturbance minimised during maintenance	No maintenance required	N/A
6. No obstruction of fish passage	Inspections	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
7. Removal and reinstatement		N/A
8. Review of consent conditions	Not scheduled for period under review	N/A

N/A = not applicable

Table 11 Summary of performance for Consent 2982-4 discharge of leachate from sludge stabilisation lagoon

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Monitoring of groundwater adjacent to lagoon	Monitoring undertaken by consent holder- results received	Yes
2. Monitoring of unnamed tributary of the Waiwhakaiho	Monitoring undertaken by consent holder- results received	Yes
3. No direct discharge of contaminants to surface water	Inspections	Yes
4. No adverse effects upon ground or surface waters	Inspections and results of monitoring	Yes
5. Review of consent	Not scheduled during period under review	N/A

Table 12 Summary of performance for Consent 3989-2 to discharge waste to land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. General duty under S 17 of RMA to avoid, remedy, or mitigate effects	Inspections	Yes
2. Consent exercised only in event of emergency	Consent not exercised during period under review	N/A
3. Written notification prior to disposal	Consent not exercised during period under review	N/A
4. Report detailing disposal	Consent not exercised during period under review	N/A
5. Analysis of sludge/biosolid sample	Consent not exercised during period under review	N/A
6. Analysis of soil sample	Consent not exercised during period under review	N/A
7. preparation of management plan	Consent not exercised during period under review	N/A
8. Management plan to form part of conditions		N/A
9. Consent exercised for site which management plan addresses	Consent not exercised during period under review	N/A
10. No disposal within 150 m of property boundary	Consent not exercised during period under review	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. No dried solids to be discharged within 10 m of property boundary	Consent not exercised during period under review	N/A
12. No ponding of surface water on contact with sludge	Consent not exercised during period under review	N/A
13. Analyses of surface and ground waters within disposal area	Consent not exercised during period under review	N/A
14. Compliance with heavy metal guidelines	Consent not exercised during period under review	N/A
15. Further analyses of soils contaminated with heavy metals	Consent not exercised during period under review	N/A
16. Consent holder responsible for site if contaminated by heavy metals	Consent not exercised during period under review	N/A
17. Access restrictions to disposal site	Consent not exercised during period under review	N/A
18. Access restrictions to disposal site	Consent not exercised during period under review	N/A
19. Access restrictions to disposal site	Consent not exercised during period under review	N/A
20. Review of consent conditions	Not scheduled for period under review	N/A

Table 13 Summary of performance for Consent 4593-2 to erect, place, maintain and use a marine outfall

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Structures maintained	Inspections	Yes
2. Notification prior to maintenance	No maintenance undertaken	N/A
3. Measures to prevent disturbance	No maintenance undertaken	N/A
4. Removal of structures when no longer required		N/A
5. Review of consent conditions	Not scheduled for period under review	N/A

N/A = not applicable

Table 14 Summary of performance for Consent 4740-1 to discharge contaminants to the air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option to prevent or minimise adverse effects	Inspections	Yes
2. Operation and maintenance of sludge management processes	Inspections	Yes
3. Design specifications of biofilter	Inspections	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Biofilter operated and maintained in accordance with information supplied	Inspections	Yes
5. Notification prior to alterations	No alterations undertaken	N/A
6. No significant adverse ecological effects	Inspections	Yes
7. No offensive or objectionable odours beyond the property boundary	Inspections	Yes
8. Review of consent conditions	Not scheduled for period under review	N/A

N/A = not applicable

Table 15 Summary of performance for Consent 5480-1 to discharge contaminants to the air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option to prevent or minimise adverse effects	Inspections	Yes
2. Operation and maintenance of sludge management processes	Inspections	Yes
3. Design specifications of biofilter	Inspections	Yes
4. Biofilter operated and maintained in accordance with information supplied	Inspections	Yes
5. Notification prior to alterations	No alterations undertaken	N/A
6. No significant adverse ecological effects	Inspections	Yes
7. No offensive or objectionable odours beyond the property boundary	Inspections	Yes
8. Review of consent conditions	Not scheduled for period under review	N/A

N/A = not applicable

An improvement in the level of environmental performance and compliance with the resource consents held by NPDC is desired. During the year under review consent conditions were compiled with on most occasions. There were nine unauthorised incidents associated with the treatment plant, most were minor and of short duration. One major incident resulted in an infringement notice. NPDC have consulted a process engineer to ensure the problem is eliminated and plant performance is improved.

3.4 Recommendations from the 2004-2005 Annual Report

In the 2004-2005 Annual Report, it was recommended:

1. That the monitoring programme for the New Plymouth Wastewater Treatment Plant in the 2005-2006 year continues at the same level as in 2004-2005 year with the inclusion of trace metals in mussels survey in 2005-2006.

2. That a shoreline bacteriological survey be included in the monitoring programme for the New Plymouth Wastewater Treatment Plant in 2006-2007.

Both these recommendations were implemented.

3.5 Alterations to monitoring programmes for 2006-2007

In designing and implementing the monitoring programmes for air and water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring emissions and discharges and effects, and subsequently reporting to the regional community, the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki emitting to the atmosphere and discharging to the environment.

In the case of the NPWWTP, the programme for 2005-2006 unchanged from that for 2004-2005. It is now proposed that for 2006-2007, the programme remains unchanged. Bacteriological shoreline water quality monitoring at five sites is included in the 2006-2007 programme, while metals in mussel tissue will be included again in 2007-2008. A recommendation to this effect is attached to this report.

4. Recommendations

1. THAT the monitoring programme for the New Plymouth Wastewater Treatment Plant in the 2006-2007 year includes shoreline bacteriological water quality monitoring at five sites.

2. THAT metals analysis of mussel tissue at three sites is included in the 2007-2008 monitoring programme.

Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report:

Al*	aluminium.
As*	arsenic
Biomonitoring	assessing the health of the environment using aquatic organisms
BOD	biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate
BODF	biochemical oxygen demand of a filtered sample
bund	a wall around a tank to contain its contents in the case of a leak
CBOD	carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate
cfu	colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample
COD	chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m
Cu*	copper
DO	dissolved oxygen
DRP	dissolved reactive phosphorus
E.coli	*Escherichia coli,* an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample
F	Fluoride
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample
fresh	elevated flow in a stream, such as after heavy rainfall
g/m^3	grammes per cubic metre, and equivalent to milligrammes per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures
l/s	litres per second
MCI	macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats
mS/m	millisiemens per metre
mixing zone	the zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	ammonium, normally expressed in terms of the mass of nitrogen (N)

NH_3	unionised ammonia, normally expressed in terms of the mass of nitrogen (N)
NO_3	nitrate, normally expressed in terms of the mass of nitrogen (N)
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water
O&G	oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons)
Pb*	lead
pH	a numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	measurement of both physical properties(e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment
PM_{10}	relatively fine airborne particles (less than 10 micrometre diameter
resource consent	refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and subsequent amendments
SS	suspended solids,
Temp	temperature, measured in °C (degrees Celsius)
Turb	turbidity, expressed in NTU
UIR	Unauthorised Incident Register entry- an event recorded by the Council on the basis that it had potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan
Zn*	zinc

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact the Council's laboratory

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Taranaki Regional Council 2004: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2003-2004. TRC Technical Report 04-57.

Taranaki Regional Council 2005: New Plymouth District Council New Plymouth Wastewater Treatment Plant marine outfall and sludge lagoon annual report 2004-2005. TRC Technical Report 05-30

Appendix I

Resource consents held by New Plymouth District Council

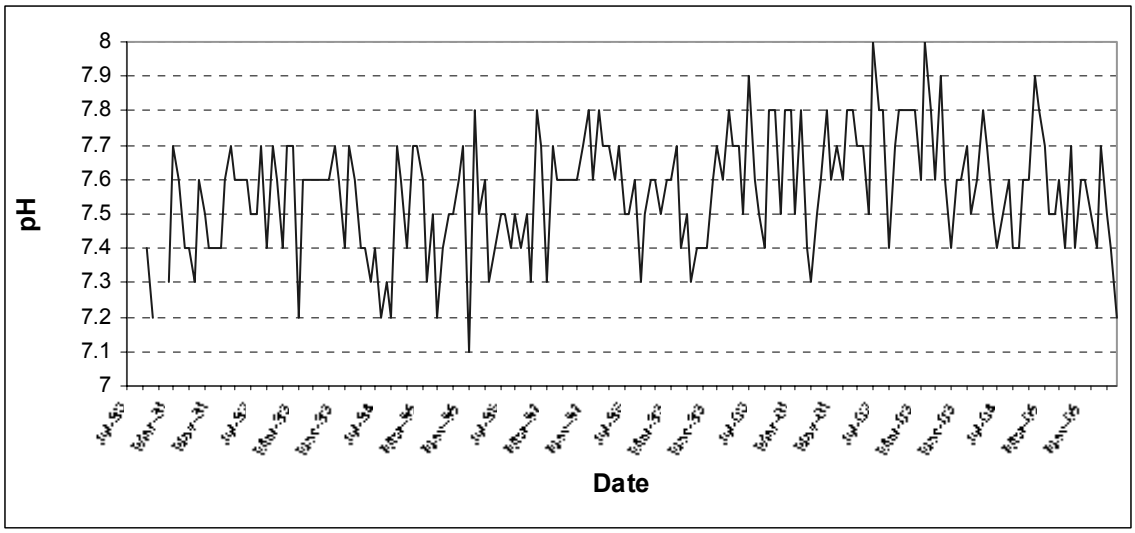
Appendix II

Results of monthly grab sample effluent monitoring 2005-2006

Parameter	Month (2005-2006)											
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	April	May	June
pH	7.6	7.4	7.7	7.4	7.6	7.6	7.5	7.4	7.7	7.5	7.4	7.2
NH_3	0.15	0.3	1.4	0.2	1	0.9	1	0.7	0.8	0.9	1.3	0.6
SS	2.5	2.5	2.5	2.5	8	2.5	56	7	9	10	12	13
COD	26	19	24	19	30	27	80	27	31	32	39	35
Faecal coli.	1	1	1	1	1	1	8	1	1	1	1	4
NOx	6.5	7.1	4.5	6.2	7.7	11.3	0.5	15.4	16.9	17	16.9	14
Reactive phosphorus	3.04	2.23	4.1	2.32	3.89	4.16	4.38	3.22	5.03	3.36	4.2	3.9
Free chlorine	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total chlorine	0.4	0.3	0.6	0.9	0.6	0.8	0.5	0.2	0.5	0.2	0.4	0.4
Cyanide	0.05	0.03	0.03	0.03	0.05	0.07	0.04	0.03	0.03	0.06	0.06	0.06
Phenols	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.05	0.025	0.025	0.025	0.025
Zinc	0.01	0.01	0.01	0.01	0.01	0.02	0.04	0.02	0.03	0.02	0.02	0.02
Copper	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.01	0.005	0.005	0.005
Chromium	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Nickel	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cadmium	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Lead	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Iron	0.05	0.06	0.06	0.05	0.09	0.05	0.6	0.08	0.06	0.07	0.08	0.14
Manganese	0.07	0.05	0.04	0.05	0.03	0.04	0.06	0.02	0.05	0.05	0.02	0.04
Mercury	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.0005	0.0005

Appendix III

Graphical results of monthly composite effluent monitoring 1990-2006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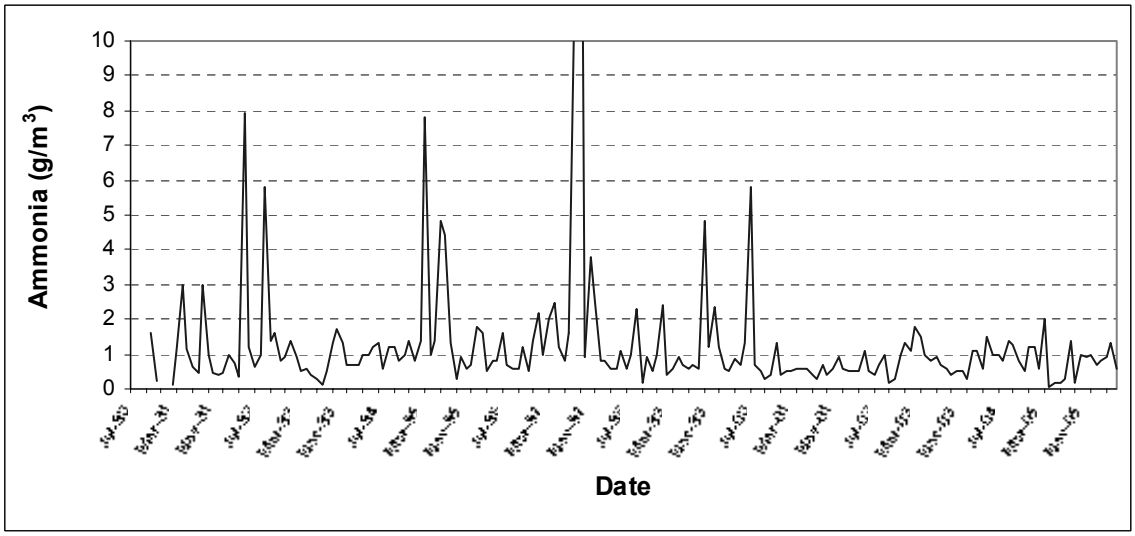
7.9
7.8
7.7
7.6
7.5
7.4
7.3
7.2
7.1
7
Date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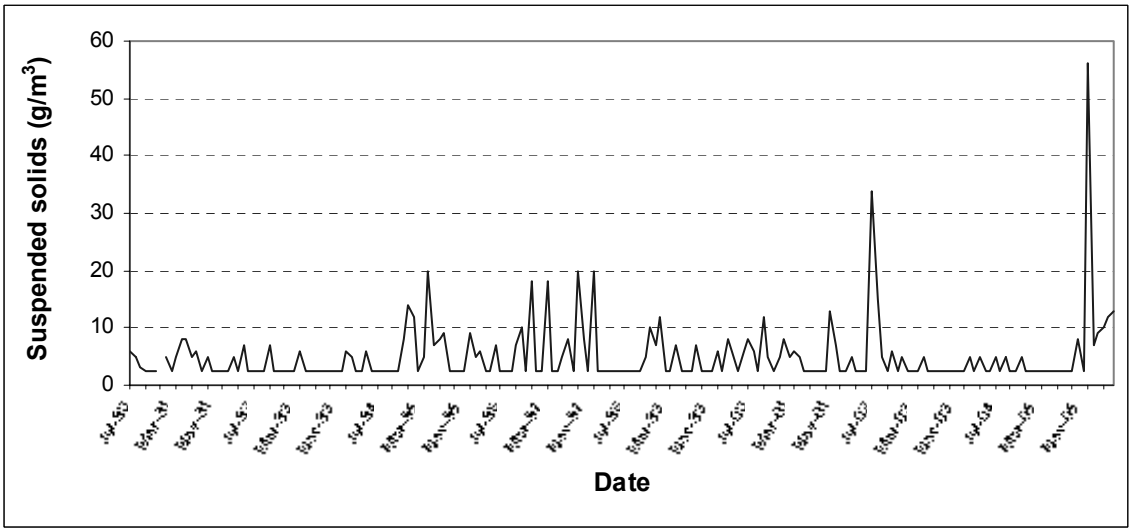
9
8
7
6
5
4
3
2
1
0
Date


Suspended solids (g/m3)
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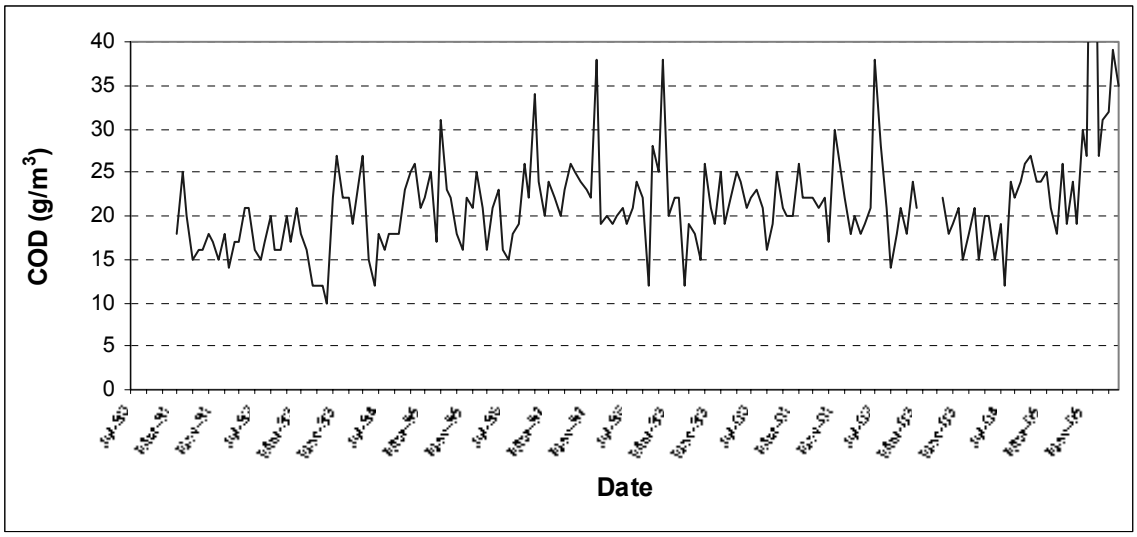
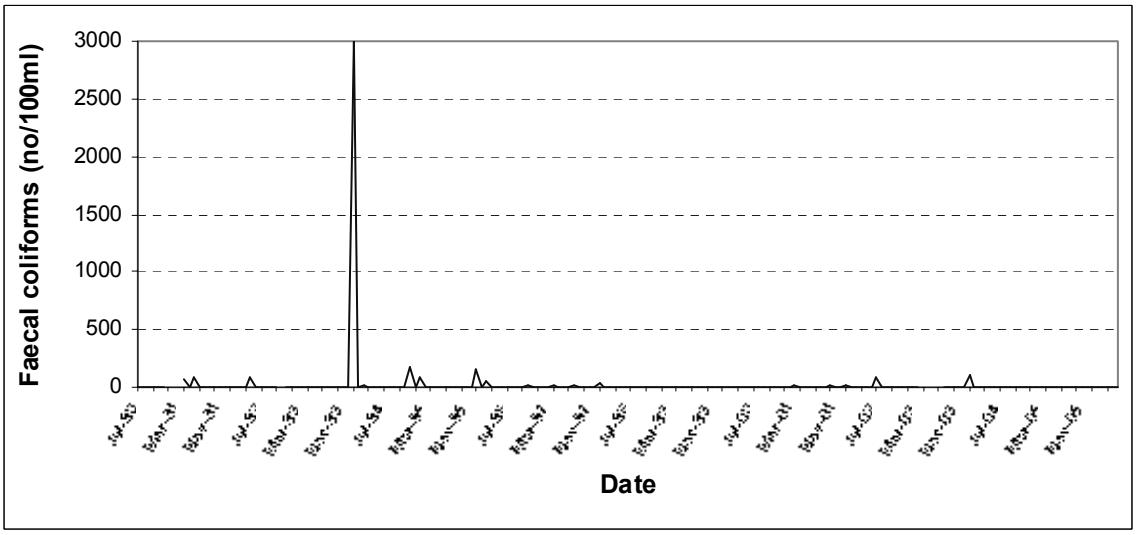
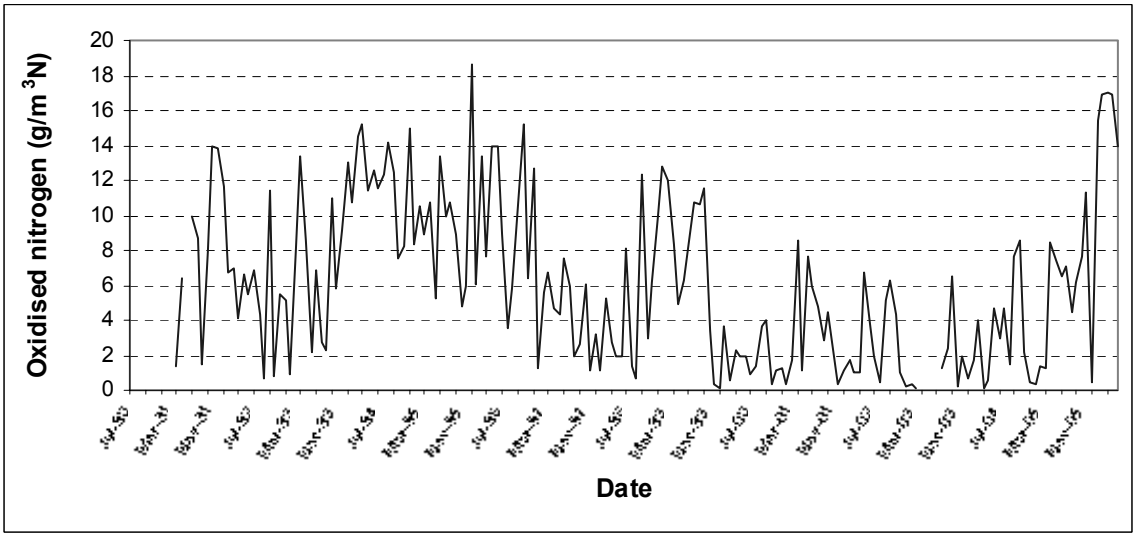
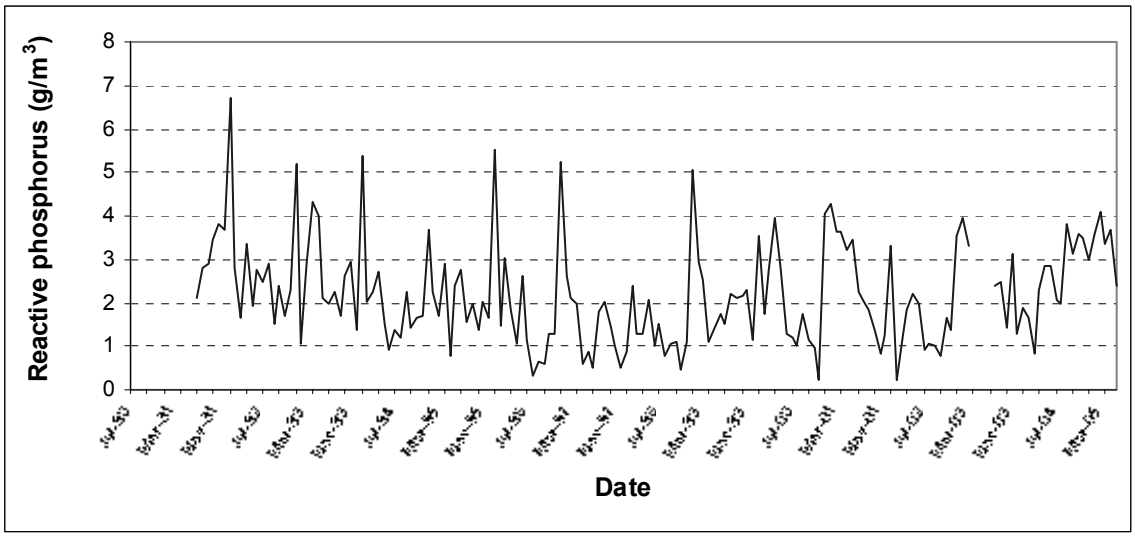
50
40
30
20
10
0
Date


COD (g/m3)
40
35
30
25
20
15
10
5
0
Date


Faecal coliforms (no/100ml)
3000
2500
2000
1500
1000
500
0
Date


Oxidised nitrogen (g/m3N)
20
18
16
14
12
10
8
6
4
2
0
Date


Reactive phosphorus (g/m3)
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7
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4
3
2
1
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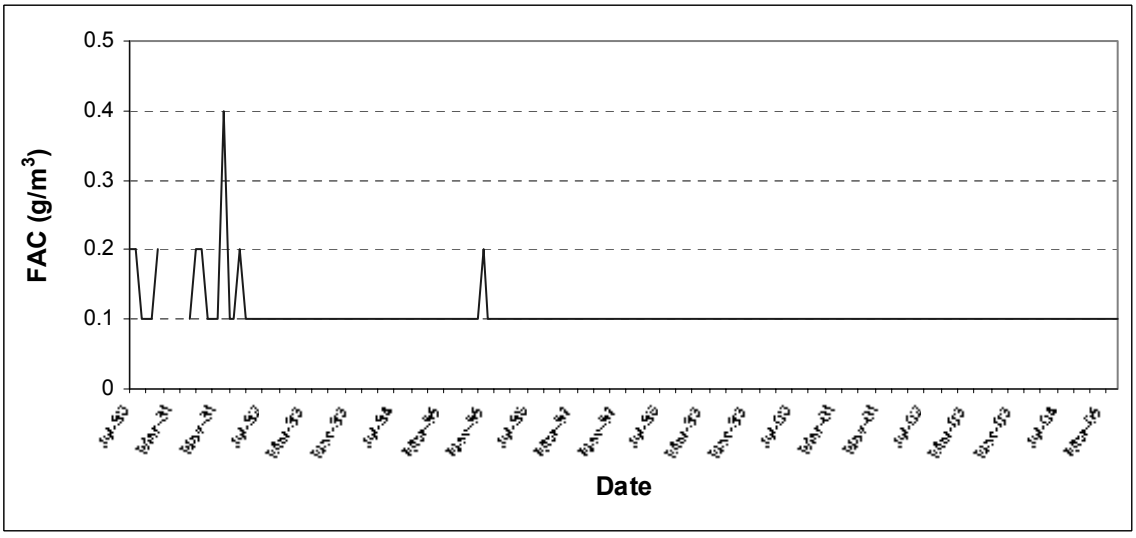
Date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0.2
0.1
0
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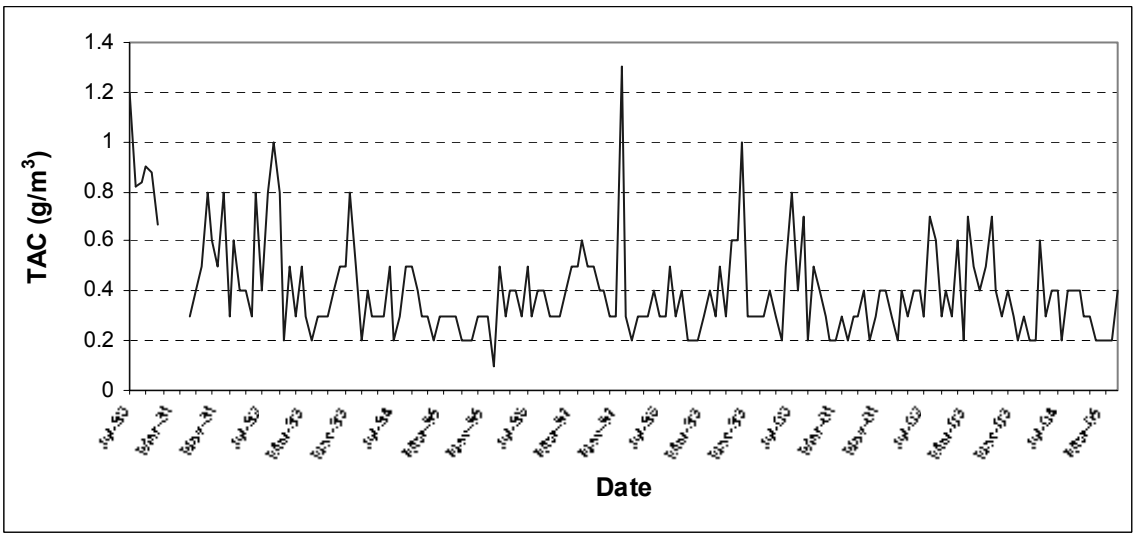
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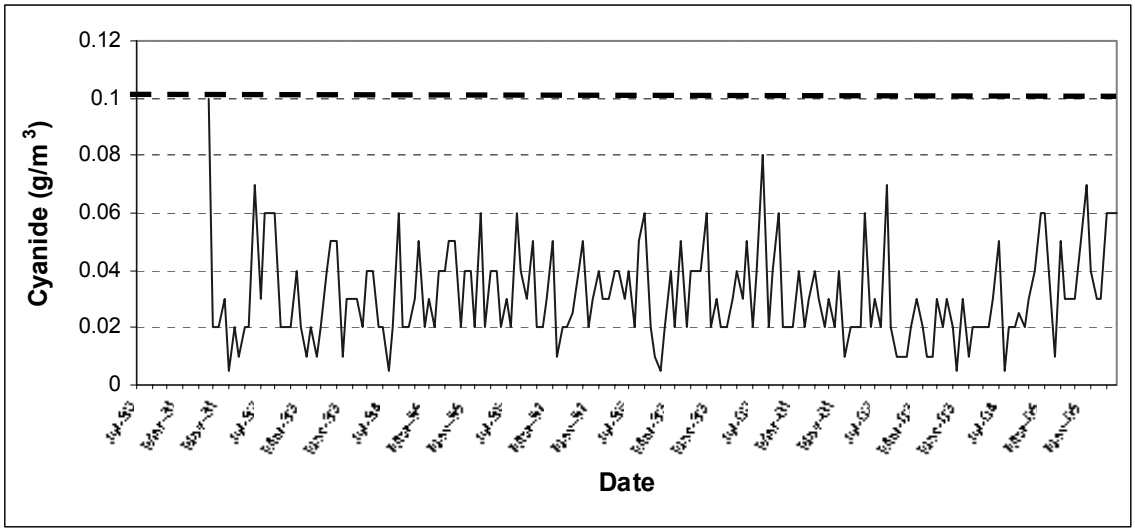
1
0.8
0.6
0.4
0.2
0
Date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0.06
0.04
0.02
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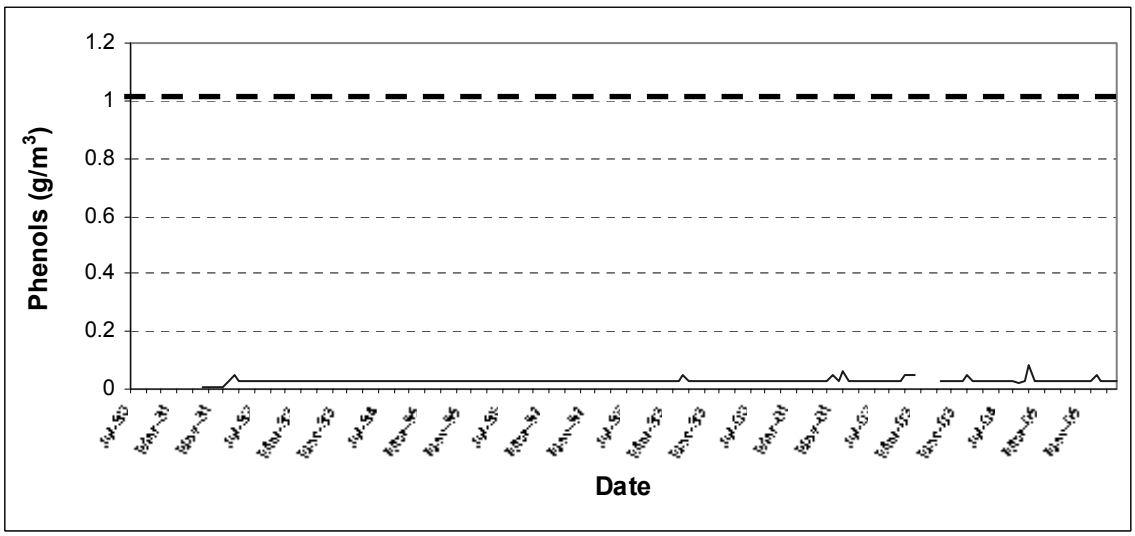
Cyanide (g/m 3)
Date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0.6
0.4
0.2
0
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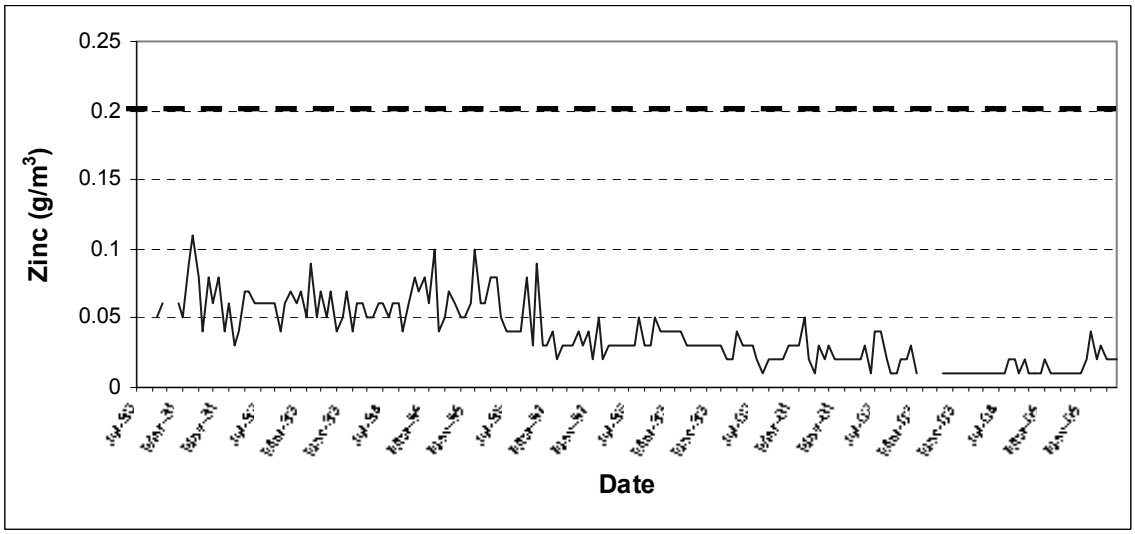
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0.1
0.05
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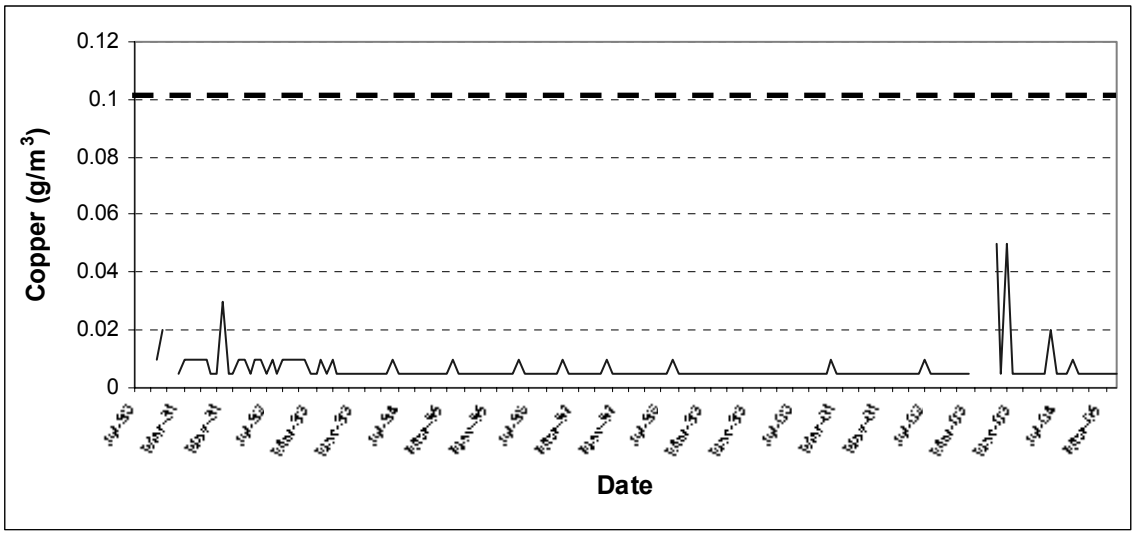
Zinc (g/m3)
Date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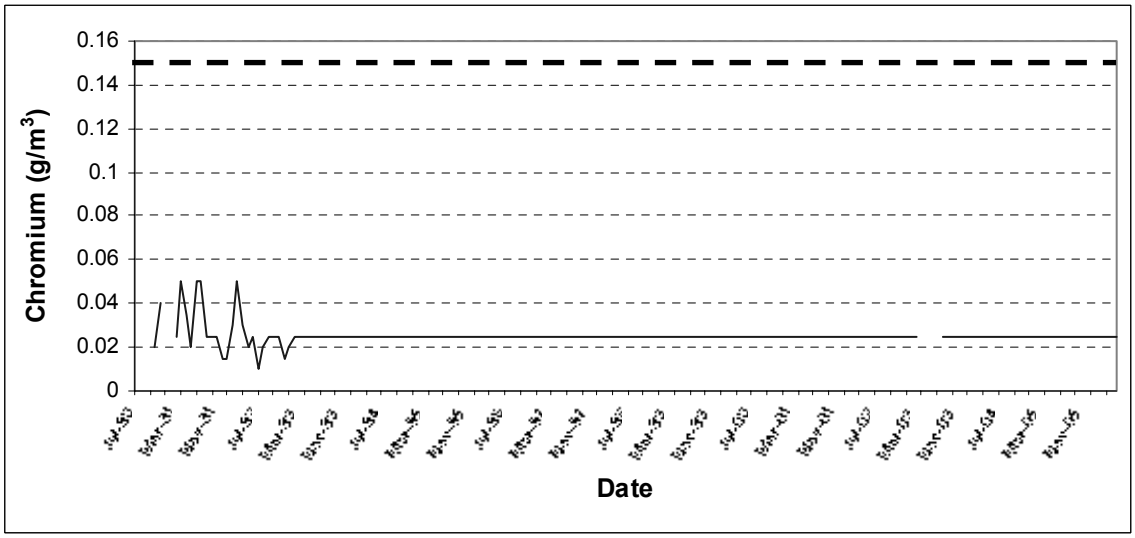
Date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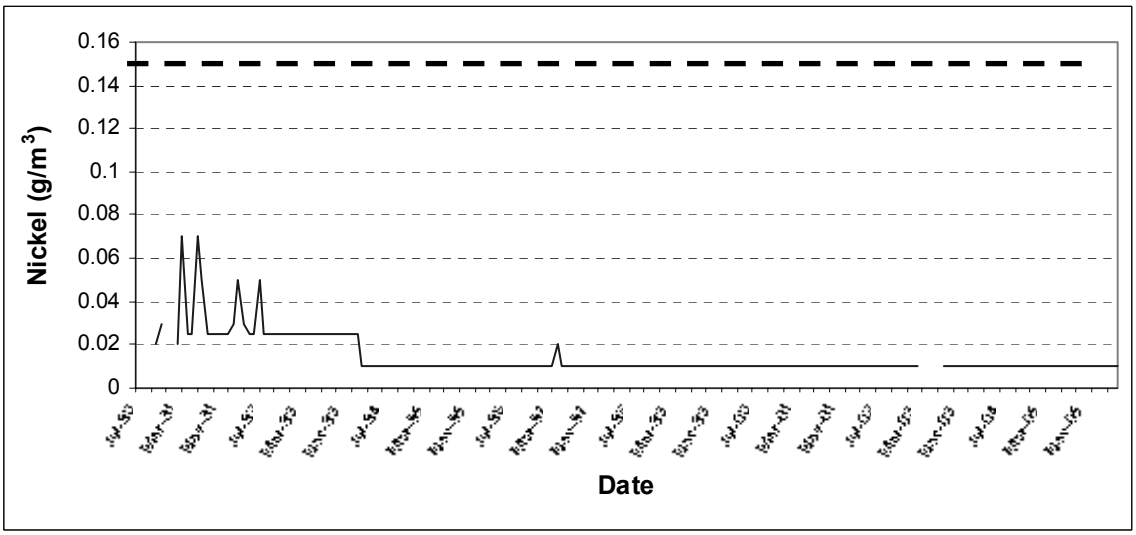
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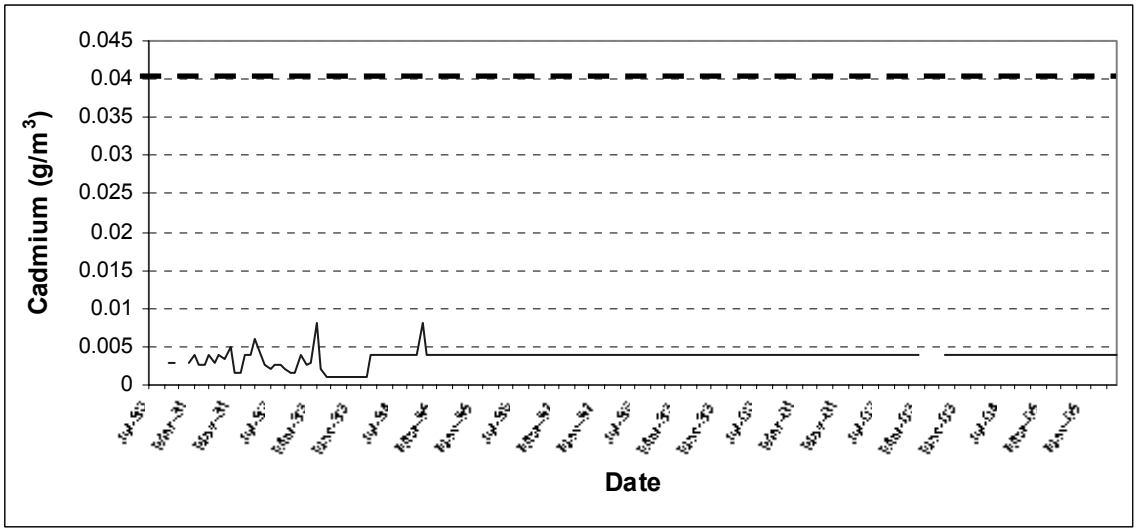
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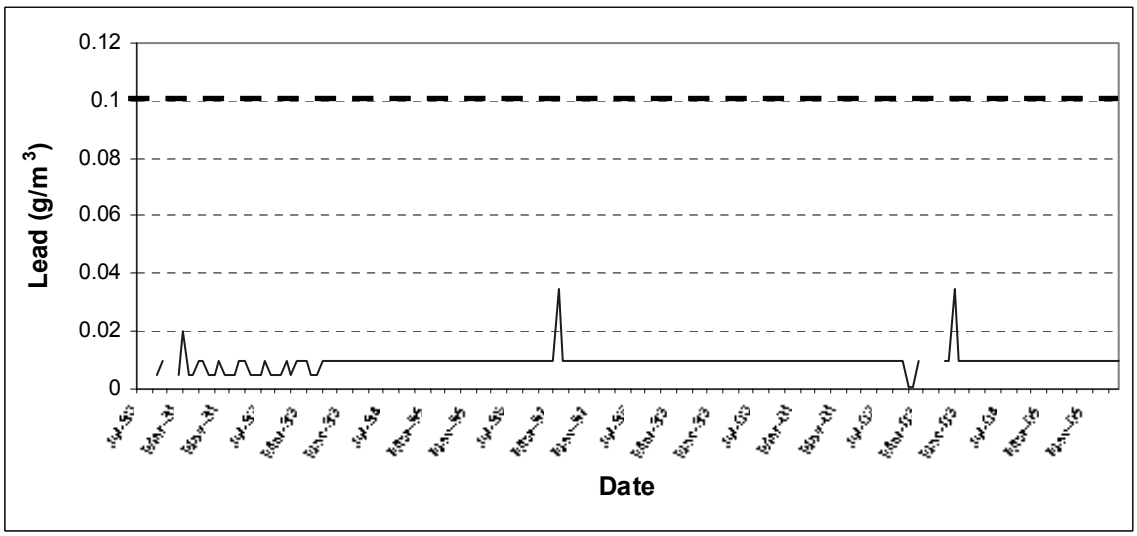
0.025
0.02
0.015
0.01
0.005
0
Cadmium (g/m3)
Date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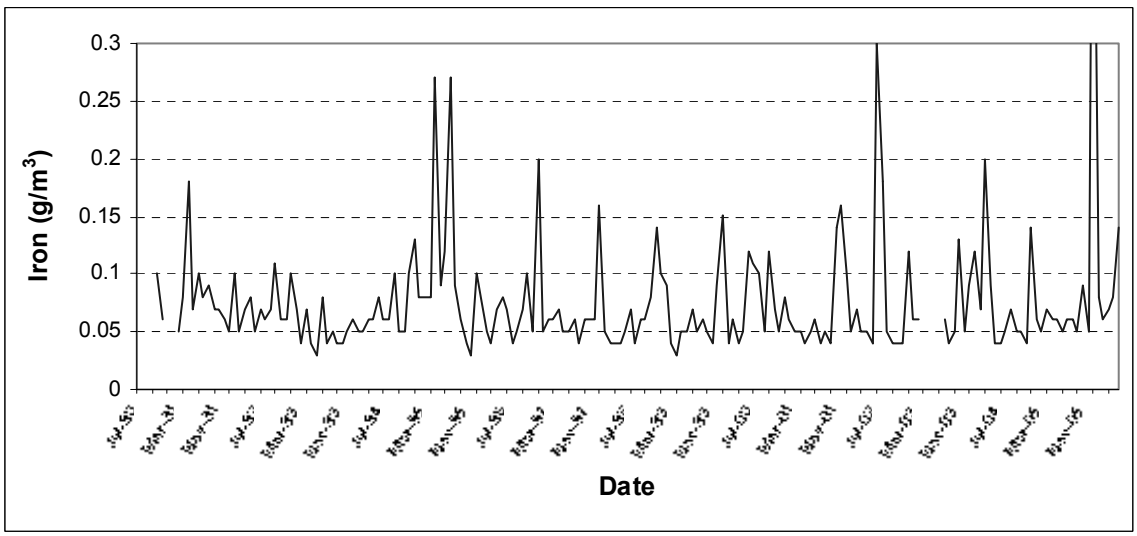
Lead (g/m3)
Date


0.3
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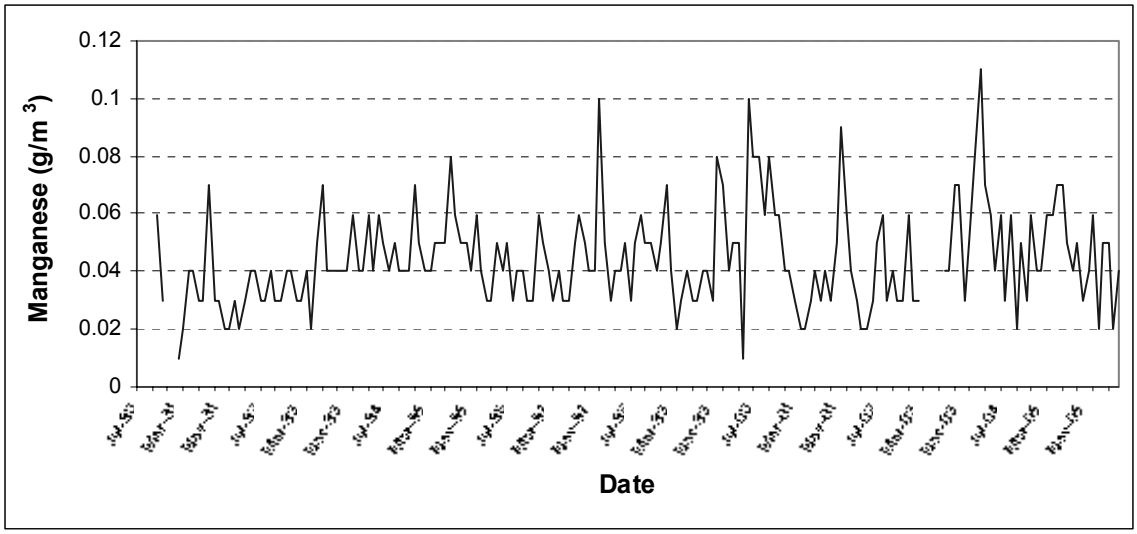
0.2
0.15
0.1
0.05
0
Iron (g/m3)
Date


Manganese (g/m 3)
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0.04
0.02
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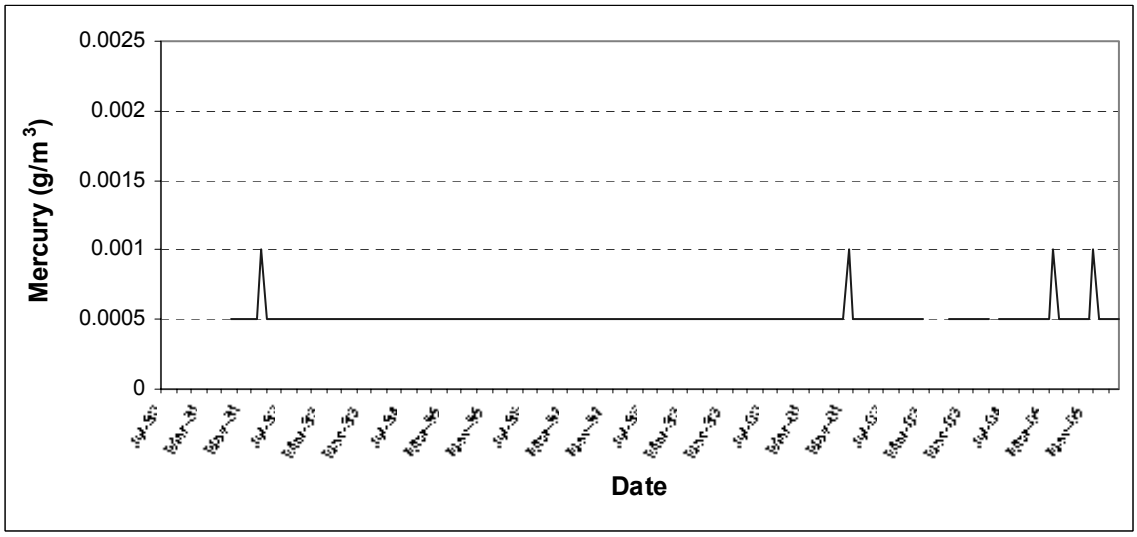
Date


Mercury (g/m 3)
0.0025
0.002
0.0015
0.001
0.0005
0
Date

Appendix IV

Results of sludge lagoon monitoring 2005-2006

Site	Parameter					
Bore 1	**pH**	**NH_3 g/m³**	**Faecal coliforms No./100ml**	**TDP g/m³**	**NOx g/m³**	**COD g/m³**
July 2005	5.2	0.05	5	0.02	10.2	6
August 2005	5.2	0.05	5	0.01	8.6	4
September 2005	5.3	0.05	5	0.02	2.3	1
October 2005	5.2	0.1	5	0.02	7.3	7
November 2005	5.4	0.5	5	0.02	2.5	5
December 2005	5.6	0.3	5	0.02	0.3	8
January 2006	5.5	0.2	5	0.01	0.5	5
February 2006	5.7	0.4	5	0.005	0.4	5
March 2006	5.9	0.8	5	0.005	0.6	5
April 2006	6.2	0.8	5	0.02	1.3	6
May 2006	5.8	0.1	60	0.02	3.9	6
June 2006	5.4	0.05	5	0.02	1.4	8
Bore 2	**pH**	**NH_3 g/m³**	**Faecal coliforms No./100ml**	**TDP g/m³**	**NOx g/m³**	**COD g/m³**
July 2005	5.4	0.05	5	0.01	9.9	13
August 2005	5.3	0.05	5	0.03	9.3	14
September 2005	5.4	0.05	5	0.02	2.5	6
October 2005	5.6	0.4	5	0.01	4.8	18
November 2005	5.9	0.6	5	0.01	2.6	15
December 2005	6.1	1.7	5	0.01	0.2	10
January 2006	6	1.2	5	0.05	0.2	14
February 2006	6	1.4	5	0.005	0.2	10
March 2006	6.2	1.6	5	0.005	0.2	10
April 2006	6.2	1.4	5	0.005	0.2	12
May 2006	6.3	1.5	10	0.01	0.7	13
June 2006	6	0.05	5	0.01	6.9	11
Bore 3	**pH**	**NH_3 g/m³**	**Faecal coliforms No./100ml**	**TDP g/m³**	**NOx g/m³**	**COD g/m³**
July 2005	6.2	0.3	10	0.14	3.6	10
August 2005	6.3	0.05	590	0.22	1.8	16
September 2005	6.4	0.6	50	0.31	0.3	33
October 2005	6.3	0.7	50	0.13	0.5	27
November 2005	6.4	1.1	40	0.07	0.3	31
December 2005	6.5	2	5	0.18	0.4	24
January 2006	6.4	1.8	40	0.05	0.1	27
February 2006	6.4	2.3	5	0.02	0.1	23
March 2006	6.7	2	5	0.03	0.2	29
April 2006	6.7	2.4	5	0.13	0.1	30
May 2006	6.4	1	640	0.11	0.8	13
June 2006	6.3	0.2	40	0.13	1.6	15
Open Drain	**pH**		**NH_3**		**Faecal coliforms**	
	Pt 2	**Pt 3**	**Pt 2**	**Pt 3**	**Pt 2**	**Pt 3**
July 2005	6.7	6.6	1.9	2.9	520	220
August 2005	6.7	6.7	2	3.7	90	40
September 2005	6.6	6.7	1.6	4	30	50
October 2005	6.7	6.8	1.7	7	20	30

November 2005	6.6	6.7	1.2	3.7	500	290
December 2005	6.7	6.8	1	6	100	70
January 2006	6.6	6.6	0.8	3.7	80	40
February 2006	6.6	6.6	0.8	3.3	60	80
March 2006	6.7	6.8	1	3.5	80	130
April 2006	6.7	6.8	0.7	2.9	330	150
May 2006	6.6	6.7	0.8	2.9	420	170
June 2006	6.8	6.8	0.6	2.1	5	5

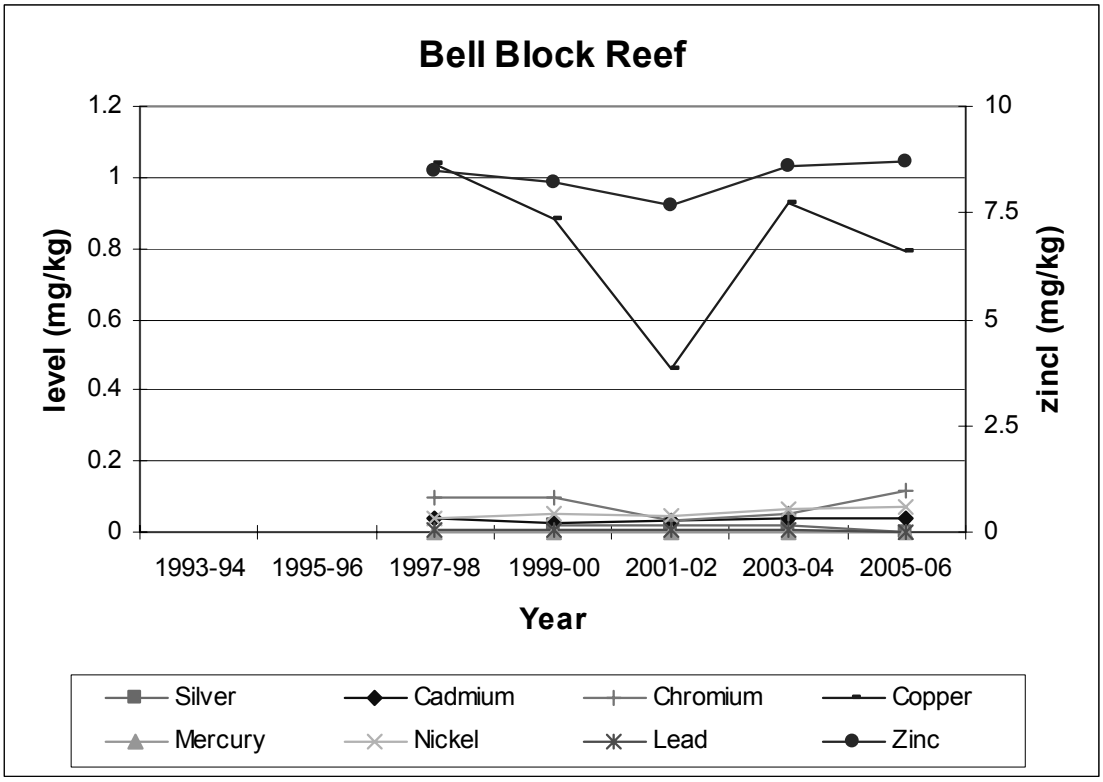
Appendix IV

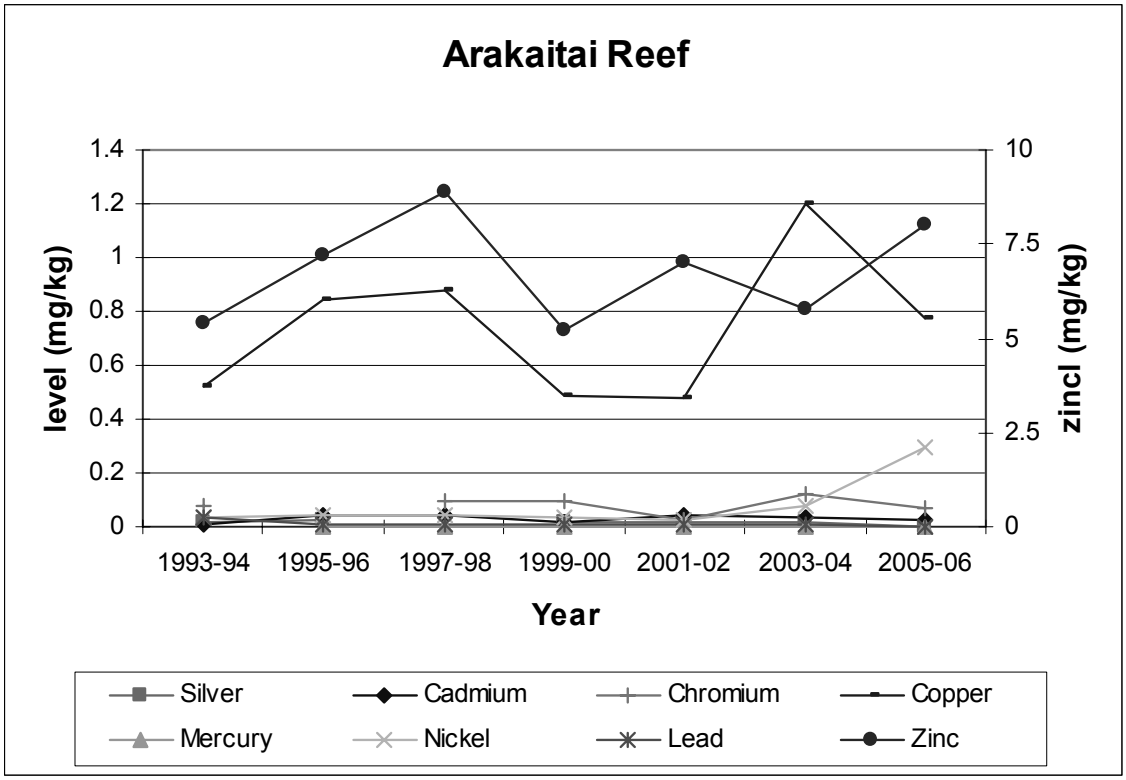
Marine ecological survey report

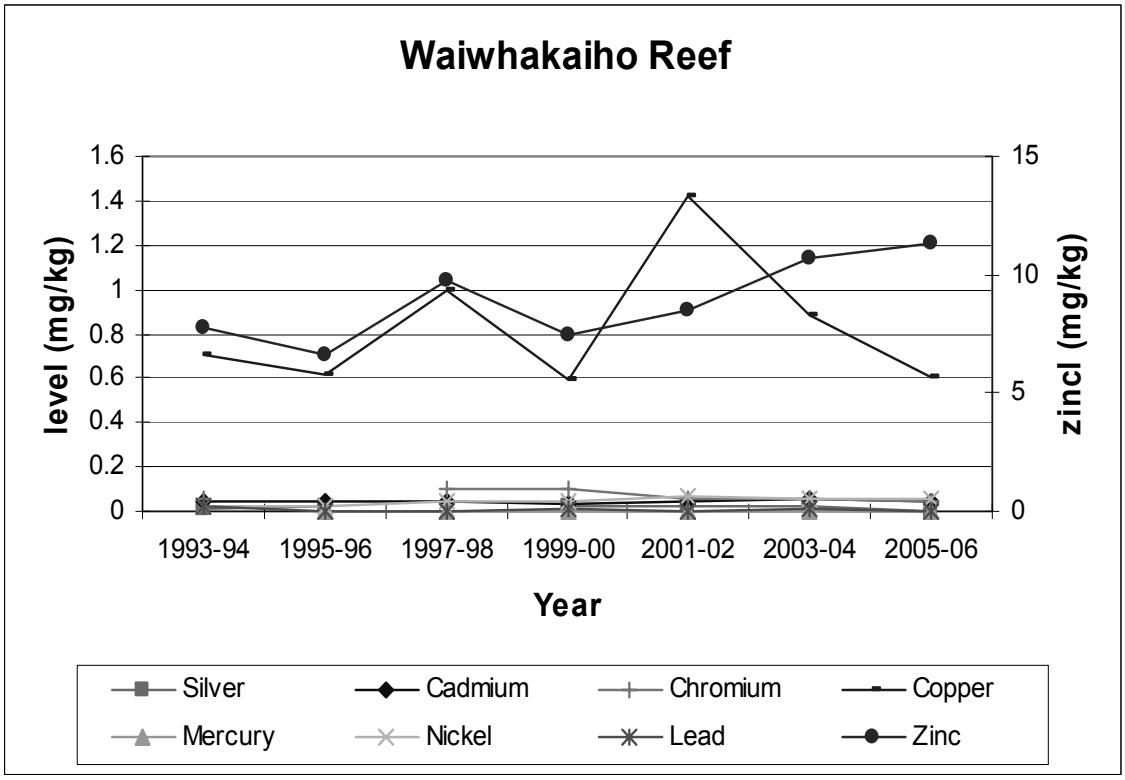
Appendix V

Metals in shellfish tissue
Summary and graphs of previous results
1994 – 2004

Parameter (mg/kg)	Site								
	Mangati Reef (control)			Te Henui Reef (control)			Waiwhakaiho Reef (impact)		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Silver	< 0.02	0.02	0.02	0.015	0.025	0.02	0.011	0.025	0.02
Cadmium	0.025	0.041	0.03	0.01	0.042	0.03	0.03	0.052	0.04
Chromium	< 0.03	0.1	0.07	0.03	0.12	0.09	< 0.06	0.1	0.08
Copper	0.46	1.04	0.83	0.48	1.2	0.74	0.59	1.42	0.87
Mercury	0.01	0.014	0.01	0.01	0.02	0.01	0.011	0.02	0.01
Nickel	0.34	0.53	0.42	0.18	0.56	0.31	0.19	0.6	0.42
Lead	< 0.05	0.08	0.07	< 0.05	0.22	0.10	< 0.05	0.22	0.09
Zinc	7.7	8.6	8.25	5.2	8.9	6.58	6.6	10.7	8.47




Arakaitai Reef
level (mg/kg)
zincl (mg/kg)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
10
7.5
5
2.5
0
1993-94
1995-96
1997-98
1999-00
2001-02
2003-04
2005-06
Year
Silver
Cadmium
Chromium
Copper
Mercury
Nickel
Lead
Zinc


Waiwhakaiho Reef
level (mg/kg)
zincl (mg/kg)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
15
10
5
0
1993-94
1995-96
1997-98
1999-00
2001-02
2003-04
2005-06
Year
Silver
Cadmium
Chromium
Copper
Mercury
Nickel
Lead
Zinc