Fonterra Whareroa
Compliance Monitoring Programme
Annual Report
2012-2013

Technical Report 2013–24

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Executive summary

Fonterra Co-operative Group Limited operates a dairy processing complex located on Whareroa Road at Hawera, in the Tangahoe, Tawhiti and Tasman catchments. The company hold resource consents to allow for the abstraction of water from the Tawhiti Stream and Tangahoe River; the discharge of water treatment wastewater back to those two streams; the discharge of stormwater to unnamed tributaries of the Tawhiti Stream, the Tangahoe River and an unnamed coastal stream; the discharge of dairy factory wastewater to the Tasman Sea; the discharge of laboratory waste and unprocessable wastes to waste pits; and the discharge of emissions to air. This report for the period July 2012-June 2013 describes the monitoring programme implemented by the Taranaki Regional Council to assess the Company's environmental performance during the period under review, and the results and environmental effects of the Company's activities.

The Company holds a total of 24 resource consents, which include conditions setting out the requirements that the Company must satisfy. The Company holds four consents to allow it to take and use water and for associated structures, seven consents to discharge stormwater and back flushing from sand filters (and their associated structures) into the unnamed tributaries of the Tangahoe, Tawhiti and an unnamed coastal stream, six consents to discharge wastewater to the Tasman Sea along with associated structures, two consents to discharge waste to land, and five consents to discharge emissions into the air at this site.

The Council's monitoring programme for the year under review included ten site inspections; two composite samples from the outfall discharge for inter-laboratory comparison; 30 samples of stormwater pond discharge collected for physicochemical analysis; 12 grab samples of the outfall discharge for microbiological analysis; one freshwater biomonitoring survey of receiving waters; one freshwater bioinspection downsteam of the stormwater pond discharge points; two intertidal surveys; 34 deposition gauging samples; 12 nitrogen oxides (NO_x) monitoring samples and two periods of fine airborne particles (PM_{10}) monitoring in relation to air emissions, and auditing of monitoring data collected by the Company.

During the 2012-2013 year, the Company demonstrated a variable level of environmental performance overall, that requires improvement for certain consents (in particular those relating to stormwater discharges). Of the 19 consents for which compliance and environmental performance could be categorised, 2 were rated 'poor', 1 was rated 'improvement required', 2 were rated 'good' and 14 'high'. During the year under review there were eight incidents associated with the Whareroa site (five incidents linked with milk spills requiring disposal of product via the marine outfall, two incidents involving stormwater pond non-compliances and one incident requiring the disposal of milk permeate to land). One Infringement Notice was issued during the 2012-2013 period relating to non-compliant stormwater discharge.

Water abstraction from the Tawhiti Stream and from the Tangahoe River were in accordance with consent conditions.

The volume of wastewater discharged from the site complied with conditions of consent 1450. Monitoring of the wastewater by the consent holder showed that water quality of the discharges were mostly compliant with consent conditions. An inter-laboratory comparison between the Council and Fonterra Co-operative Group Limited showed an acceptable level of agreement between the Council laboratory and the company laboratory.

The results of the marine ecological monitoring over the 2012-2013 period indicate that the combined Fonterra Co-operative Group Limited and the South Taranaki District Council Hawera Oxidation Ponds wastewater discharge was not having detectable adverse effects on the intertidal reef communities.

Stormwater monitoring showed that in in the Northern Stormwater Pond (discharging into a tributary of the Tawhiti Stream) the discharge was, on most occasions, in compliance with the consent conditions. A greater number of non-compliant discharges were recorded in the Southern Stormwater Pond (discharging into a tributary of an unnamed coastal stream) and Eastern Stormwater Pond (discharging into a tributary of the Tangahoe River). Since the 2010-2011 monitoring period Fonterra Co-operative Group Limited has implemented additional monitoring, procedural changes, and changes onsite to address issues with high suspended solids and biochemical oxygen demand (BOD) in the stormwater. The results from the period under review indicate that these measures have been successful in relation to the Northern Stormwater Pond. The company are planning future work to improve the quality of discharge to the Southern and Eastern Stormwater Ponds.

Macroinvertebrate surveys undertaken during the monitoring period indicate a recovery in the macroinvertebrate community in the unnamed tributary of the Tawhiti following improvements made to the stormwater system by the company in 2011. There was little evidence of any effects of the stormwater discharge on the macroinvertebrate communities recorded in the unnamed tributary of the Tangahoe. However, there was some evidence to suggest that the nutrient enriched dairy pond discharge may be influencing the macroinvertebrate community further downstream. Continued improvement in the macroinvertebrate community was recorded in the unnamed coastal stream, where there was no evidence of any effects of the stormwater discharge.

Emissions to air were in compliance with consent conditions and relevant air quality guidelines.

This report includes recommendations for the 2013-2014 year.

Table of contents

		Page
1.	Introduction	1
1.1	Compliance monitoring programme reports and the Resource Management Act 1991	1
1.1.1	Introduction	1
1.1.2	Structure of this report	1
1.1.3	The Resource Management Act (1991) and monitoring	2
1.1.4	Evaluation of environmental performance	2
1.2	Process description	3
1.3	Resource consents	4
1.3.1	Water abstraction permits	4
1.3.2	Water discharge permits	6
1.3.3	Other water permits	9
1.3.4	Coastal permits	10
1.3.5	Air discharge permits	11
1.3.6	Discharges of wastes to land	15
1.3.7	Land use consents	17
1.4	Monitoring programme	18
1.4.1	Introduction	18
1.4.2	Programme liaison and management	19
1.4.3	Site inspections	19
1.4.4	Chemical sampling	19
1.4.4.1	Water	19
1.4.4.2	Air	19
1.4.5	Freshwater biomonitoring surveys	20
1.4.6	Marine ecological surveys	20
1.4.7	Review of Fonterra monitoring data	20
2.	Results	21
2.1	Water	21
2.1.1	Inspections	21
2.1.2	Water abstraction	21
2.1.3	Wastewater discharge	23
2.1.3.1	Composite samples	23
2.1.3.2	Grab samples	27
2.1.3.3	Inter-laboratory comparisons	28
2.1.4	Marine ecological surveys	28
2.1.5	Stormwater discharges	31
2.1.5.1	Chemical monitoring	34
2.1.5.2	Freshwater biomonitoring	37
2.2	Air	39
2.2.1	Inspections	39
2.2.2	Results of discharge monitoring on receiving environment	39
2.2.2.1	Deposition gauging	39
2.2.2.2	Emission source analysis	42
2.2.2.3	Nitrogen oxide (NO_x) monitoring	43

2.2.2.4 Inhalable particulate (PM_{10}) monitoring 45
2.3 Investigations, interventions, and incidents 46

3. Discussion 50
3.1 Discussion of plant performance and environmental effects 50
3.1.1 Water 50
3.1.1.1 Inspections 50
3.1.1.2 Abstractions 50
3.1.1.3 Wastewater discharge 50
3.1.1.4 Marine ecological surveys 51
3.1.1.5 Stormwater discharges 51
3.1.2 Air 52
3.1.2.1 Results of discharge monitoring on receiving environment 52
3.1.2.2 Reporting 53
3.2 Evaluation of performance 53
3.3 Recommendations from the 2011-2012 Annual Report 70
3.4 Alterations to monitoring programmes for 2013-2014 70

4. Recommendations 71

Glossary of common terms and abbreviations 72

Bibliography and references 75

Appendix I Resource consents held by Fonterra Whareroa

Appendix II Marine ecological monitoring reports

Appendix III Freshwater biological monitoring reports

Appendix IV PM_{10} monitoring report

Appendix VI Explanation of Box and Whisker Plots

List of tables

Table 1	Product manufactured at Fonterra annually	3
Table 2	Summary of abstraction rate data for 2012-2013	22
Table 3	Summary of wastewater volume data for 2012-2013	23
Table 4	Summary of wastewater composition data for 2012-2013	26
Table 5	Summary of wastewater mass discharge rate data for 2011-2012 and 2012-2013	26
Table 6	Results of analyses of wastewater grab samples for 2012-2013	27
Table 7	Inter-laboratory comparison performed on 24 hour composite wastewater sample 2012-2013	28
Table 8	Limits for stormwater composition for each parameter (consents 3907, 3902, 4133)	34
Table 9	Chemical water quality of stormwater discharge to an unnamed tributary of the Tawhiti Stream (STW 001002), including a summary of previous data (Nov 1998 - May 2012)	35
Table 10	Chemical water quality of stormwater discharge to tributary of the Tangahoe River (Site STW001004), including a summary of previous monitoring data (May 1996 – May 2012)	36
Table 11	Chemical water quality of stormwater discharge to the unnamed coastal stream (Site: STW 002020), including a summary of previous monitoring data (Nov 1994 - May 2012)	37
Table 12	Freshwater biomonitoring sites in unnamed tributaries of the Tawhiti Stream and Tangahoe River, and an unnamed coastal stream	38
Table 13	Description of air deposition monitoring sites	40
Table 14	Total deposited milk powder values for each monitoring site during 2012-2013	41
Table 15	Emission source analysis 2012-2013	43
Table 16	Results of NO_x monitoring during the 2011-2012 and 2012-2013 periods	44
Table 17	Summary of performance for Consent 0047 - to take water from Tawhiti Stream for use in manufacturing, cleaning and cooling	53
Table 18	Summary of performance for Consent 1450 - discharge of dairy factory wastewater into the Tasman Sea	54
Table 19	Summary of performance for Consent 3902-discharge of stormwater into Tangahoe River	55
Table 20	Summary of performance for Consent 3907- discharge of stormwater into Tawhiti Stream	56
Table 21	Summary of performance for Consent 4103 – discharge to air	56
Table 22	Summary of performance for Consent 4133 - discharge of stormwater to unnamed coastal stream	57
Table 23	Summary of performance for Consent 4406 - discharge of laboratory wastes onto land	58

Table 24	Summary of performance for Consent 4508 – abstraction of water from Tangahoe	59
Table 25	Summary of performance for Consent 4927 - discharge of river silt and sand	59
Table 26	Summary of performance for Consent 4953 - erect, place and maintain earth dams	60
Table 27	Summary of performance for Consent 4977 - erect, place and maintain marine outfall	60
Table 28	Summary of performance for Consent 5013 - construction and maintenance of a rock seawall	60
Table 29	Summary of performance for Consent 5015 - damming of unnamed stream	61
Table 30	Summary of performance for Consent 5016 - diversion of unnamed stream	61
Table 31	Summary of performance for Consent 5017 - to drain and excavate an unnamed stream, and erect and use an outfall on the streambed	62
Table 32	Summary of performance for Consent 5036 - discharge of waste material onto land	62
Table 33	Summary of performance for Consent 5044 - discharge of emissions into air	63
Table 34	Summary of performance for Consent 5143 - erect, place and maintain and use a water intake structure	64
Table 35	Summary of performance for Consent 5148 - discharge of river silt and sand	64
Table 36	Summary of performance for Consent 5337 - to dam an unnamed tributary of the Tawhiti Stream	64
Table 37	Summary of performance for Consent 5845 - removal, reconstruction and maintenance of a dam (with fish pass)	65
Table 38	Summary of performance for Consent 6257 – emissions to air from fuel centre	66
Table 39	Summary of performance for Consent 6273 – emissions to air from Cogen I and II	67
Table 40	Summary of performance for Consent 7465 – emissions to air from combustion of wood	68

List of figures

Figure 1	Tawhiti Stream flow at Duffy's Farm from 1 July 2012 to 30 June 2013	23
Figure 2	Volume of wastewater discharged through the Fonterra ocean outfall	24
Figure 3	Concentration of suspended solids in wastewater discharge	24
Figure 4	Concentration of fats in wastewater discharge	25
Figure 5	COD in wastewater discharge	25

Figure 6	Location of the four intertidal survey sites	29
Figure 7	Mean number of species per quadrat: spring surveys 1992-2012	30
Figure 8	Mean Shannon-Weiner index per quadrat: spring surveys 1992-2012	30
Figure 9	Mean number of species per quadrat: summer surveys 1986-2013	31
Figure 10	Mean Shannon-Weiner index per quadrat: summer surveys 1986-2013	31
Figure 11	Approximate stormwater catchments at the Whareroa site	32
Figure 12	Location of freshwater biological sampling sites in the tributaries of the Tangahoe River and Tawhiti Stream and the unnamed coastal stream	38
Figure 13	Location of air deposition sites	40
Figure 14	Milk powder fallout at three air deposition sites surrounding Whareroa	41
Figure 15	Air deposition monitoring results at sites around the Whareroa factory, including a comparison with the previous three years' results	42
Figure 16	NO_x sample site locations around the Whareroa site	44
Figure 17	PM10 concentrations ($\mu g/m^3$) at the Whareroa dairy complex	45

List of photographs

Photograph 1	The Fonterra Whareroa site	4
Photograph 2	Tawhiti water intake	5
Photograph 3	Air discharges from 'Cogen-I" and 'Cogen-II'	14
Photograph 4	Burning waste wood packaging in the burn pit	15
Photograph 5	Tangahoe River intake	21
Photograph 6	Tawhiti stormwater pond following remedial work	33
Photograph 7	Fencing and riparian planting around the southern pond	34
Photograph 8	Sewage fungus and algal mat at the pond outlet into the tributary of the Tangahoe River	46
Photograph 9	Disposal pit containing milk permeate, 24 October 2012	47
Photograph 10	Outfall discharge visible beyond the 200 m mixing zone on 24 October 2012	48

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 2012-June 2013 by the Council on the monitoring programme associated with resource consents held by Fonterra Co-operative Group Limited (from now on referred to as Fonterra). The Company operates a dairy processing complex situated on Whareroa Road at Hawera, including the Tangahoe, Tawhiti and Tasman catchments.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by Fonterra that relate to abstractions and discharges of water within the Tangahoe, Tawhiti and Tasman catchments, and the air discharge permits held by Fonterra 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 Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of Fonterra's use of water, land, and air, and is the twentieth combined annual report by the Council for the Company.

1.1.2 Structure of this report

Section 1 sets out general information about compliance monitoring under the Resource Management Act (1991) and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by Fonterra, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted in the Company's site and catchment.

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 2013-2014 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 1991* (RMA) 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 an activity, and may include cultural and social-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 Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, 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 consent holder(s) 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 inconsequential (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 monitoring period were negligible or minor at most, or, the Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices, or, 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, and any inconsequential non compliances with conditions were resolved positively, co-operatively, and quickly.

- **improvement required (environmental)** or **improvement required (administrative compliance)** (as appropriate) indicates that the Council may have been obliged to record a verified unauthorised incident involving measurable environmental impacts, and/or, there were measurable

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 the end of the period under review, and/or, there were on-going issues around meeting resource consent conditions even in the absence of environmental effects. Abatement notices may have been issued.

- **poor performance (environmental)** or **poor performance (administrative compliance)** indicates generally that the Council was obliged to record a verified unauthorised incident involving significant environmental impacts, or there were material failings to comply with resource consent conditions that required significant intervention by the Council even in the absence of environmental effects. Typically there were grounds for either a prosecution or an infringement notice.

For reference, in the 2012-2013 year, 35% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 59% demonstrated a good level of environmental performance and compliance with their consents.

1.2 Process description

The Whareroa dairy factory was established in 1972 and is currently operated by Fonterra. The site processes up to 14 million litres of milk a day and produces the largest volume of dairy ingredients from a single factory worldwide. Annually, the factory produces about 428,000 tonnes of milk powder, cheese, cream, protein and lactic casein ingredients (Table 1).

Table 1 Product manufactured at Fonterra annually

Generic product	Metric tonnes/season
Whole & skim milk powders	200,000
Cheese products	95,000
Cream products	88,000
Protein products	35,000
Lactic casein	10,000
Total	**428,000**

The Whareroa site covers approximately 25 hectares and is situated on Whareroa Road, east of Hawera (Photograph 1). The site includes five milk powder dryers, two cheese plants, a casein plant, a butter plant, a whey plant, a laboratory, a tanker depot, a cogeneration plant, a water treatment plant, a rail siding and storage for finished product.

Significant expansion of the factory occurred during the 1996-1997 season. Kiwi Co-operative Dairies greatly increased its milk supply area through the acquisition of small dairy companies in the South Island and the Hawke's Bay and through a merger with the Tui Dairy Company in the Manawatu. Accordingly, the construction of a number of new plants, the upgrade of several existing plants, and improvements in waste treatment systems were undertaken during the 1996-1997 monitoring period.

Currently, the site obtains its water supply from two nearby surface waterways and supplements this with water derived from the milk process (i.e. condensate). Wastewater is discharged through a long marine outfall (1,845m). Energy is mainly sourced from two on-site gas-fired cogeneration plants, operated as a joint venture with Todd Energy Ltd. The 68 MW plants provides all the steam and electricity requirements for the site.

The consolidation of the dairy industry in Taranaki has led to a corresponding centralisation of discharges to both air and water. In 1981 there were 22 dairy processing sites in Taranaki and the resulting discharges to air and water and abstraction of water were dispersed throughout the region. Now the environmental effects are largely confined to the activities at the Whareroa site.

Photograph 1 The Fonterra Whareroa site

1.3 Resource consents

1.3.1 Water abstraction permits

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14.

Fonterra holds water permit **0047** to cover the abstraction of water from the Tawhiti Stream (Photograph 2), a tributary of the Tangahoe River, for the processing and manufacture of dairy products, cleaning of plant, and cooling purposes. This permit was re-issued by the Council on May 1996 under Section 87(d) of the RMA and the fourth consent granted since 1973. It is due to expire on 1 June 2015.

There are five special conditions attached to the consent.

Condition 1 requires that the abstraction shall be managed to ensure a flow of not less than 50 l/s is maintained in the Tawhiti Stream at all times.
Condition 2 requires Fonterra to maintain a measuring device to record daily rates of abstraction, and to supply this information to the Council upon request.

Condition 3 allows the Council the right to suspend or reduce the abstraction temporarily during extreme low flow events in order to protect the biological communities in the stream.

Condition 4 deals with review of the consent.

Condition 5 stipulates that the abstraction rate not exceed 184 l/s when flow is less than 800 l/s and turbidity is less that 150 Nephelometric Turbidity Units (NTU).

Photograph 2 Tawhiti water intake

Fonterra holds water permit **4508** to cover the abstraction of water from the Tangahoe River, for the processing and manufacture of dairy products, cleaning of plant, and cooling purposes. This permit was re-issued by the Council on September 1997 under Section 87(d) of the RMA and the second consent granted since 1994. It is due to expire on 1 June 2015.

There are three special conditions attached to the consent.

Condition 1 allows the Council the right to suspend or reduce the abstraction temporarily during extreme low flow events, in order to protect the biological communities in the river.

Condition 2 requires the Company to maintain a measuring device to record daily rates of abstraction, and to supply this information to the Council upon request.

Condition 3 deals with review provisions.

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

1.3.2 Water discharge permits

Section 15(1)(a) of the RMA 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.

Fonterra holds water discharge permits **3902, 3907** and **4133** to discharge stormwater from the Whareroa sites. These consents were issued by the Council in June 1999 under Section 87(e) of the RMA. The consents were reviewed during the monitoring period and the review dates were changed to 2012 and 2014. An extra condition was inserted into all three consents setting a limit of 2.0 g/m^3 on filtered carbonaceous biochemical oxygen demand (BOD) in samples of stormwater.

All three consents are due to expire on 1 June 2016.

Discharge permit **3902** provides for the discharge of up to 6,825 cubic metres per day (m^3/day) of stormwater into an unnamed tributary of the Tangahoe River.

Discharge permit **3907** covers the discharge of stormwater, back flushing from the sand filters, and intermittent discharges of treated water from a reservoir, from a milk processing industry site into an unnamed tributary of the Tawhiti Stream. The purpose and conditions of this consent were changed in November 2009 to include the discharge of treated (chlorinated) water previously covered in consent 4234. There was no change to the processes at the factory.

Discharge permit **4133** covers the discharge of up to 5,400 m^3/day of stormwater into an unnamed coastal stream.

There are ten special conditions attached to each of these consents. These conditions of these consents are essentially the same as each other and are discussed below.

Condition 1 prohibits the discharge of processing wastes, or industrial or domestic wastewater. In consent 3907 this is condition 2, with condition one being that the discharge not exceed 850 l/s.

Conditions 2 and 3 (3 and 4 in 3907) require effective facilities for diversion of contaminated stormwater from the site to the marine outfall and detention pond(s) to treat and attenuate the volume of stormwater prior to discharge.

Condition 4 (5 in 3907) requires the consent holder to maintain a contingency plan.

Condition 5 (6 in 3907) defines the discharge point as the point of exit from the last detention pond.

Condition 6 (7 in 3907) imposes narrative standards to prevent adverse effects on receiving waters.

Condition 7 (8 in 3907) places numeric standards on the composition of the discharge.

In consents 3902 and 4133, condition 8 requires fencing and planting of riparian margins of the water body to be undertaken for a distance of 500 metres below the discharge point.

Condition 9 sets limits on filtered carbonaceous BOD.

Condition 10 of all three consents deals with review provisions.

Fonterra held consent **4234** to cover the intermittent discharge of up to 50 l/s of chlorinated water through the existing stormwater system to an unnamed tributary of the Tawhiti Stream. This consent was issued by the Council in 1993 under Section 87(e) of the RMA. It expired in June 2010.

The consent was not renewed as it was combined with consent 3907 which covers stormwater discharges to the Tawhiti Stream.

Fonterra holds consent **4927** to cover the discharge of up to 1.05 m^3/day of river silt and sand from mechanical pre-filtering of river water during abstraction of water, by returning it into the Tawhiti Stream. This consent was issued by the Council in May 1996 under Section 87(e) of the RMA. It is due to expire in June 2015.

There are three special conditions attached to this consent.

Condition 1 requires the discharge be operated on a continuous purge basis in order to mitigate adverse effects on the Tawhiti Stream.

Condition 2 allows a 50 metre mixing zone, with limits set for the suspended solids of the receiving water.

Condition 3 outlines a number of potential adverse effects in the Tawhiti Stream which shall not occur outside the 50 metre mixing zone and condition 4 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds consent **5148** to cover the discharge of up to 1.2 m^3/day of river silt and sand from mechanical pre filtering of river water during abstraction of water, by returning it into the Tangahoe River. This consent was issued by the Council in May 1997 under Section 87(e) of the RMA. It is due to expire in June 2015.

There are three special conditions attached to this consent.

Condition 1 requires the discharge to be operated on a continuous purge basis in order to mitigate adverse effects on the Tangahoe River.

Condition 2 states that no adverse effects shall arise in the Tangahoe River outside the 50 metre mixing zone and condition 3 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds coastal permit **1450** to cover the discharge of 40,000 m^3/day of dairy factory wastewater into the Tasman Sea via a marine outfall. This consent was issued by the Council in September 1995 under Section 87(e) of the RMA. It is due to expire in June 2015.

An application for a change of condition on coastal permit 1450, to increase the maximum daily discharge volume limit from 26,000 m^3/day to 40,000 m^3/day, was received on 8 February 2002. The variation to consent conditions was granted on 19 September 2006. A further change to the purpose of the consent was granted on 29 June 2007, to include the temporary discharge of lactose solids from the Fonterra Kapuni site.

There are 16 special conditions attached to the consent.

Condition 1 requires the discharge of lactose solids to be managed in accordance with documentation submitted in support of the application.

Condition 2 states that lactose solids of approximately 400 m^3 be discharged prior to 1 August 2007 only.

Condition 3 requires that all whey and whey permeate to be removed from the wastewater by 31 December 1996.

Condition 4 requires the Company to maintain a loss minimisation programme to reduce product losses to wastewater throughout the term of the consent.

Condition 5 details standards relating to suspended solids, fats and chemical oxygen demand (COD).

Condition 6 required the Company to install an outfall extension which would result in the achievement of no significant visual, chemical or ecological impacts outside a mixing zone.

Condition 7 requires the Company to supply plans and design details for the outfall extension and condition 8 establishes a 200 metre mixing zone which applied after the outfall had been commissioned.

Condition 9 outlines a number of numerical standards that the wastewater shall not exceed up until the time the new outfall had been installed.

Condition 10 requires that there shall be no discharge of raw or treated domestic sewage from the Whareroa site. (Domestic wastes are piped to Hawera sewerage for treatment).

Condition 11 requires the Company to provide a contingency plan outlining procedures to be taken in the event of a spillage of stored chemicals, accidental discharge, accumulation of off-specification effluent or accumulation under emergency conditions of whey or whey permeate.
Condition 12 requires the consent holder to install a system to monitor pipeline structural performance.

Condition 13 requires the consent holder to provide a report reviewing any technological advances in dairy wastewater management and how these might be applicable at the Whareroa site, and detailing any measures taken by the consent holder to improve or minimise the wastewater discharge.

Condition 14 requires the Company and Council staff to meet with submitters to the consent and any other interested party at least once a year to discuss any matters relating to the exercise of the consent and to facilitate ongoing consultation.

Conditions 15 and 16 allow the Council to undertake a review of the special conditions on the consent.

Note: South Taranaki District Council (STDC) also holds a consent to discharge from the marine outfall owned and used by Fonterra. Consent **5079** was granted on 22 March 1998 to provide for the discharge of up to 12,000 m^3/day of municipal wastes from Hawera oxidation ponds. This consent was first exercised in February 2001. Monitoring of this consent is reported separately.

1.3.3 Other water permits

Fonterra holds consent **4953** to erect, place and maintain two earth dams at the headwaters of an unnamed tributary of the Tangahoe River for stormwater collection and treatment purposes. This consent was issued by the Council in May 1999 under Section 87(e) of the RMA. It is due to expire in June 2016.

There are four special conditions attached to this consent.

Condition 1 requires the consent holder to maintain and operate the dams in a safe and appropriate manner.

Condition 2 states the notification period prior to commencement of any construction work or maintenance.

Condition 3 requires the consent holder to prevent the discharge or placement of silt and contaminants, and minimise the disturbance of the bed during construction or maintenance.

Condition 4 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds consent **5016** to allow the permanent diversion of the unnamed stream, which passes through the accessway gully for the purpose of protecting the outfall pipeline and associated structures. This consent was issued by the Council in 1996 under Section 87(e) of the RMA. It is due to expire in June 2015.

There are four special conditions attached to this consent.

Condition 1 states the notification period of three days prior to the construction or maintenance works.

Condition 2 requires the diversion to be constructed in accordance with the documentation submitted with the application.

Condition 3 requires that construction or maintenance shall be undertaken in a way that prevents the discharge or placement of silt, organics or contaminants into the stream and minimise disturbance of the stream bed.

Condition 4 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds consent **5337** to cover the damming of an unnamed tributary of the Tawhiti Stream for stormwater and backwash water collection and treatment purposes. This consent was issued by the Council in May 1997 under Section 87(e) of the RMA. It is due to expire in June 2016.

There are four special conditions attached to this consent.

Condition 1 requires 48 hours' notification to the Council prior to construction, completion and any subsequent maintenance works.

Condition 2 states that during construction or maintenance the consent holder shall prevent the discharge or placement of silt and contaminants, and minimise the disturbance of the bed.

Condition 3 requires the consent holder to operate and maintain a safe dam.

Condition 4 allows the Council to undertake a review of the special conditions on the consent.

Copies of these permits are attached in Appendix I.

1.3.4 Coastal permits

Section 12(1)(b) of the RMA 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.

Fonterra holds consent **4977** to allow Fonterra to erect, place and maintain a marine outfall and diffuser structure of approximately 1845 metres length in the coastal marine area (Photograph 3). Consent **4977** is a restricted coastal activity (RCA) where the consent was issued by the Minister of Conservation in 1996. It is due to expire in June 2015.

There are seven special conditions attached to this consent.

Conditions 1 and 2 require the Company to construct and maintain the structure in accordance with the documentation submitted with the application and that the Council is notified at least three days prior to the commencement of construction or any major maintenance works.

Condition 3 requires that during construction and subsequent maintenance works that every practicable measure be observed to minimise any discharge of contaminants to the environment and any disturbance of the foreshore and seabed. After construction, condition 4 requires that the intertidal construction area be reinstated as far as practicable.

Condition 5 requires that the intertidal section of the pipeline shall not be visible at any stage of the tide.

Condition 6 requires the structure to be removed and the area reinstated if and when it is no longer required.

Condition 7 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds consent **5013** to cover the construction and maintenance of a rock wall 100 m in length in the coastal marine area for the protection of the outfall, stream diversion pipelines and associated structures. This consent was issued by the Council in 1996 under Section 87(e) of the RMA. It is due to expire in June 2015.

There are eight special conditions attached to this consent.

Condition 1 requires a notification period of 3 days prior to the construction or maintenance works.

Condition 2 requires the rock wall to be constructed in accordance with the documentation submitted in support of the application.

Condition 3 states that the construction and maintenance shall be undertaken in a manner that minimises disturbance of seabed, foreshore and the discharge of contaminants.

Following completion, conditions 4 and 5 require the construction site to be reinstated and revegetated, and monitoring for any erosion affects at least 200 m either side of the rock wall.

Condition 6 states that should erosion be occurring the Company will compensate for any losses. If the consent is no longer required condition 7 states the rock wall shall be removed and the area reinstated.

Condition 8 allows the Council to undertake a review of the special conditions on the consent.

1.3.5 Air discharge permits

Section 15(1)(c) of the RMA 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.

Fonterra held air discharge permit **4103** to cover the discharge of emissions into the air arising from the manufacture and processing of milk products and associated

processes at the factory premises on Whareroa Road, Hawera. This permit was issued by the Council on September 1992 under Section 87(e) of the RMA. This consent expired on 1 June 2004 and was renewed on 4 October 2006. It is due to expire on 1 June 2025.

The consent was renewed in such a way as to 'split' the consent in two so that one of the consents would cover emissions from the milk processing plant (4103) while the other consent would cover emissions from the cogeneration and services plant (6273, discussed below). This restructure of the consent is to allow the consents to be considered separately if a change to one of the operations is sought.

There are 15 special conditions attached to consent 4103.

Conditions 1 and 2 deal with best practicable option to prevent or minimise adverse effects on the environment.

Condition 3 deals with alterations to the plant, process or operations.

Condition 4 requires the consent holder to provide the Council, within five years of granting the consent, and every six years thereafter, a report on various aspects of the air discharge.

Conditions 5 to 11 deal with various aspects of the discharge, including limits on various parameters, odour and monitoring requirements.

Condition 12 requires the consent holder to hold an annual meeting with Council and interested submitters to discuss matters pertaining to the discharge.

Condition 13 allows the processing of skim milk powder through Powder-5 only with prior notice and with a monitoring programme in place.

Conditions 14 and 15 deal with review of the consent.

Fonterra holds air discharge permit **5044** to cover the discharge of emissions into air from the disposal of laboratory wastes, unprocessable dairy wastes and stormwater sump cleanings onto and into land. This permit was issued by the Council on September 1992 under Section 87(e) of the RMA. It is due to expire in June 2022.

There are six special conditions attached to the consent.

Condition 1 requires the Company to adopt the best practicable option at all times to prevent or minimise the potential for adverse effects on the environment with respect to the discharge of odours into the air.

Condition 2 requires the exercise of this consent to be undertaken in accordance with the documentation submitted in support of the application.

Condition 3 requires the Company to provide a management plan and outline methods to adopt the best practicable option to prevent or minimise adverse effects on the environment.

Conditions 4 and 5 require that the exercise of the consent shall not result in any offensive or objectionable odour at or beyond the boundary of the property and states the definitions of an odour to be offensive or objectionable.

Condition 6 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds air discharge permit **6257** to cover the discharge of emissions into air from dual fuel boilers (gas or coal) with a maximum energy output of 250 MW together with associated processes. This permit was issued by the Council on 7 December 2005 under Section 87(e) of the RMA. It is due to expire in June 2034.

There are 29 special conditions attached to the consent.

Conditions 1, 4, 5 and 6 deal with best practicable option to prevent or minimise adverse effects on the environment.

Conditions 2 and 3 require the exercise of the consent is undertaken in accordance with documentation submitted in support of the application.

Condition 7 stipulates that the minimum height of discharges from the boiler stack are at least 60 m above ground.

Condition 8 requires that approval is gained from Council prior to significant plant alterations.

Conditions 9 to 13 deal with emission limits on discharges to the atmosphere.

Conditions 14 to 19 deal with ambient and workplace limits on discharges.

Conditions 20 to 26 deal with recording and reporting requirements.

Condition 27 requires the consent holder to conduct a liaison meeting with Council and interested submitters annually (subsequent to commissioning of the energy centre).

Conditions 28 and 29 deal with lapse and review of the consent.

Fonterra holds air discharge permit **6273** to cover the discharge of emissions into air from 'Cogen-I" and 'Cogen-II' gas fired co-generation energy generating plants (Photograph 3) with an energy output of 70 MW together with associated processes. This permit was issued by the Council on 4 October 2006 under Section 87(e) of the RMA. It is due to expire in June 2025.

There are 15 special conditions attached to the consent.

Conditions 1 and 2 deal with best practicable option to prevent or minimise adverse effects on the environment.

Condition 3 requires the consent holder to consult with the Council prior to undertaking any alterations to the plant, processes or operations.

Condition 4 requires the consent holder to provide a report on various aspects of the emissions.

Conditions 5 to 13 deal with emissions of contaminants to the atmosphere.

Condition 14 requires a suitable water treatment regime for the cooling water system.

Condition 15 deals with review of the consent.

Copies of these permits are attached in Appendix I.

Photograph 3 Air discharges from 'Cogen-I" and 'Cogen-II'

Fonterra holds air discharge permit **7465** to cover the discharge of emissions into air from the combustion of waste wood packaging (photograph 4). This permit was issued by the Council on 31 March 2009 under Section 87(e) of the RMA. It is due to expire in June 2028.

There are nine special conditions attached to the consent.

Conditions 1 and 2 detail the type and volume of waste wood allowed to be burned.

Condition 3 deals with best practicable option.
Condition 4 requires the consent holder to have regard to wind direction so that there are no adverse effects beyond the boundary of the property (Conditions 5 and 6).

Condition 7 requires that a record of each burning event is maintained.

Conditions 8 and 9 deal with lapse and review of the consent.

Photograph 4 Burning waste wood packaging in the burn pit

1.3.6 Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

Fonterra holds discharge permit **4406** to cover the discharge of laboratory wastes onto and into land. This permit was issued by the Council on October 1996 under Section 87(e) of the RMA. It is due to expire in June 2022.

There are 15 special conditions attached to this consent.

Condition 1 requires the Company to adopt the best practicable option at all times to prevent or minimise the potential for adverse effects on the environment.

Condition 2 requires the exercise of this consent to be undertaken in accordance with the documentation submitted in support of the application.

Condition 3 states the daily discharge limit of 1 m^3/day.
Conditions 4 and 5 require the consent holder to provide a management plan for the discharge site and the discharge pit shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

Condition 6 states the discharge shall not occur within 50 m from any bore, well or spring used for water supply purposes, or 25 m near any surface body of water, or within 100 m from the coastal cliff edge.

Conditions 7, 8 and 9 require the disposal does not intercept the water table or lead to contaminants entering the water body from overland surface flows, or no adverse impacts on groundwater due to leaching.

Condition 10 states the types of wastes to be discharged shall only consist of Petri dishes, their contents and the plastic they are wrapped in.

Condition 11 requires 50 mm of earth is to cover the discharged material.

Conditions 12 and 13 requires after each pit is full, it shall be reinstated with a soil cover of 0.5 m, compacted and contoured to maintain its integrity and the vegetation re-established.

Condition 14 requires records to be kept of all uses of the pits, including date, volume discharged and product type.

Condition 15 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds discharge permit **5036** to allow for the discharge of waste material from stormwater sumps and road sump and unprocessable dairy factory wastes onto and into land. This permit was issued by the Council on February 2004 under Section 87(e) of the RMA. It is due to expire in June 2022.

There are 16 special conditions attached to this consent.

Condition 1 of this consent requires that the consent holder shall adopt the best practicable action to prevent or minimise any adverse effects on the environment from the exercise of this consent.

Conditions 2 and 3 require that the resource consent is undertaken in accordance with the documentation submitted with the application for the consent and the discharge shall not exceed 120 cubic metres per week.

Condition 4 requires the Company to provide a management plan for the discharge site and that the management plan is complied with. The management plan is to address means of pit excavation, pit preparation, dimensions of each pit, the placement and covering of wastes, stormwater control, site control, nature of wastes, the location of all present and previous pits, and an outline of the site options for future pit use.

Conditions 5 and 6 require that the discharge shall not occur within 50 metres of any bore, well or spring used for water supply purposes, nor within 25 metres of any surface water body, or within 100 metres from the coastal cliff edge, and the disposal pits shall not intercept the water table.

Conditions 7 and 8 require that the exercise of the consent shall not lead or be liable to lead to contaminants having a significant adverse effect on any surface water body, or result in any adverse impacts on groundwater as a result of leaching, or surface water including aquatic ecosystems.

Conditions 9 and 10 require that the discharged material shall be covered with up to 50 millimetres of earth or suitable cover, within a period of 7 days, and all liquid shall be removed from the disposal pit prior to the application of covering material.

Condition 11 states that only materials authorised by the consent and outlined in the consent application shall be discharged to the disposal pits, all non-biodegradable material shall be removed before the material is discharged.

Conditions 12 and 13 require each disposal pit to be reinstated with a low permeability, clean, compacted soil cover with a minimum thickness of 0.5 m to be placed over the material and the vegetation re-established. The consent holder also shall compact, contour and maintain the cover layer of soil to ensure its integrity at all times.

Condition 14 requires the consent holder to maintain a record of all uses of the pits including date, volume discharged, product type, and the reason for discharge and that these records be available to the Council upon request.

Condition 15 requires the discharge shall only occur after all other reasonable waste disposal options have been exhausted.

Condition 16 allows the Council to undertake a review of the special conditions on the consent.

Copies of the above permits are attached in Appendix I.

During the 2012-2013 year, Fonterra applied for changes to consent 5036-2 to allow disposal of dairy waste to land by irrigation. These changes were accepted by Council in December 2012. A copy of the permit, including the changed conditions, is provided in Appendix I.

1.3.7 Land use consents

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

Fonterra holds consent **5015** to dam an unnamed stream which passes through the access way gully for stream flow control and marine outfall pipeline installation purposes. The unnamed stream is dammed approximately 700 metres from the cliff edge to create a pond. This consent was issued by the Council in 1996 under Section 87(e) of the RMA. It is due to expire in June 2015.

Fonterra holds consent **5017** to cover the drainage and excavation of the bed of the unnamed stream and the use of that bed to erect, place, use and maintain outfall and stream diversion pipeline associated structures. This consent was issued by the Council in 1996 under Section 87(e) of the RMA. It is due to expire in June 2015.

There are six special conditions attached to this consent.

Condition 1 states the notification period of 3 days prior to the construction or maintenance works.

Condition 2 requires the drainage and excavation to be constructed in accordance with the documentation submitted with the application.

Condition 3 requires the outfall and stream diversion pipelines and any associated structures shall keep in with the natural character of the coastal environment. Following construction condition 4 states that the site will be revegetated. If the consent is no longer needed condition 5 requires the outfall and stream diversion pipelines to be removed and the areas reinstated.

Condition 6 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds consent **5143** to provide for the construction and maintenance of the water intake structure in the Tangahoe River. This consent was granted in May 1997 under Section 87(d) of the RMA. The structure must conform to a specified design, with a minimum amount of disturbance to the riverbed. It is due to expire on June 2015.

There are six special conditions attached to this consent.

Fonterra holds consent **5845** to remove, reconstruct, erect, place, and maintain dam and fish pass for the Tawhiti Stream water intake structure. This consent was granted on 31 July 2001 under Section 87(d) of the RMA to provide for replacement of the existing (unlicensed) water intake structure and associated fish pass on the Tawhiti Stream. The structure must conform to a specified design, with a minimum amount of disturbance to the riverbed, and not obstruct the passage of fish. It is due to expire on June 2015.

There are 13 special conditions attached to this consent.

Copies of these land use consents are attached in Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets out an obligation for the Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region.
The 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 Whareroa site consisted of six primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the 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
- new consents
- advice on the Council's environmental management strategies and content of regional plans and
- consultation on associated matters.

1.4.3 Site inspections

The Whareroa site was visited ten times during the monitoring period. With regard to consents for the abstraction of or 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 surrounding area was surveyed for environmental effects.

1.4.4 Chemical sampling

1.4.4.1 Water

The outfall discharge was sampled on 12 occasions and analysed for faecal coliforms and enterococci, total grease, turbidity, pH and conductivity.

Inter-laboratory comparisons of a 24 hour flow-proportional sample were carried out on two occasions and analysed for conductivity, pH, fats, COD, alkalinity, BOD, suspended solids, nitrogen, phosphorus, faecal coliforms and turbidity.

The stormwater discharge was sampled on ten occasions from three points and the samples analysed for alkalinity, chemical oxygen demand (COD), biological oxygen demand (BOD and filtered carbonaceous BOD), conductivity, pH, free and total chlorine, oil and grease, suspended solids and turbidity.

1.4.4.2 Air

The Council undertook sampling of both the emissions from the site and the ambient air quality in the neighbourhood.

Deposition gauges were placed at selected sites in the vicinity of the factory on six occasions at six sites, and the collected samples analysed for total deposited milk powder and pH.

Monitoring of ambient nitrogen oxides (NO_x) levels at the site was conducted on three occasions at four sites. This monitoring involved placing NO_x passive

absorption discs at four sampling sites for two to four weeks. The discs were sent to an external laboratory for analysis.

A 'DustTrak' monitor was deployed on two occasions in the vicinity of the site for approximately 48 hours each time in order to monitor levels of inhalable particulates (PM_{10}).

1.4.5 Freshwater biomonitoring surveys

A biological survey was performed on one occasion in the Tawhiti Stream at two sites, in a tributary of the Tangahoe River at three sites, and at one site at an unnamed coastal stream, to determine whether or not the discharge of stormwater from the site has had a detrimental effect upon the communities of the streams.

1.4.6 Marine ecological surveys

A marine ecological survey was performed on two occasions at sites on the coast surrounding the marine outfall to determine whether the discharge of wastewater through the outfall has had a detrimental effect upon the intertidal marine communities.

1.4.7 Review of Fonterra monitoring data

Fonterra routinely monitors the wastewater discharge for a number of chemical and biochemical parameters. Results are forwarded to the Council along with data relating to abstractions from the Tangahoe catchment.

Fonterra also carried out air testing, supplying results for total particulate concentration from the milk powder.

2. Results

2.1 Water

2.1.1 Inspections

Site inspections were conducted on a monthly basis throughout the 2012-2013 dairy season. A total of ten inspections were undertaken between August 2012 and May 2013, which included a full inspection of the site covering stormwater management, chemical storage, truck wash areas, and general site maintenance and management. Inspection of the three stormwater discharges and the wastewater discharge to the Tasman Sea were also part of the visits.

Overall, site management was found to be good throughout the monitoring period. Minor issues, such as small leaks and bunds that required emptying, were noted during some inspections, however these were generally resolved by Fonterra promptly. Moderate to high milk powder deposition was occasionally observed on site.

2.1.2 Water abstraction

Fonterra holds consents to take water at two points in the Tangahoe catchment up to a total volume of 30,000 m^3/day. The abstraction points are situated on a tributary, in the Tawhiti Stream (consent **0047**), and on the Tangahoe River below their confluence (consent **4508**).

The maximum allowable rate of abstraction from the Tawhiti Stream is reduced from 30,000 to 15,900 m^3/day when the flow of the stream is below 800 l/s, and the turbidity of the water at the Tangahoe intake is less than 150 NTU. A residual flow of 50 l/s must be maintained in the Tawhiti Stream.

The maximum allowable rate of abstraction from the Tangahoe River (Photograph 5) is 16,000 m^3/day.

Photograph 5 Tangahoe River intake

Exercise of the two consents is monitored by both Fonterra and the Council. Fonterra measures abstraction rate continuously for both intakes. Daily abstraction rate data are supplied on a monthly basis to the Council for review. The Council maintains a telemetered hydrologic recorder in the Tawhiti Stream downstream of the abstraction point to monitor compliance with flow restrictions on consent 0047.

A summary of the abstraction data provided by Fonterra is presented in Table 2. The hydrograph for the Tawhiti Stream below Fonterra's intake, at Duffy's Farm, for the 2012-2013 monitoring period is shown in Figure 1. Compliance with conditions on maximum allowable abstraction rate has been determined in terms of number of days that limits were breached.

Table 2 Summary of abstraction rate data for 2012-2013

Month	Tawhiti Stream			Tangahoe River			Total abstraction		
	Mean m^3/day	Max m^3/day	Breach days	Mean m^3/day	Max m^3/day	Breach days	Mean m^3/day	Max m^3/day	Breach days
July	7,325	12,225	0	-	-	0	7,325	12,225	0
August	13,653	18,822	0	1,092	5,666	0	14,744	20,075	0
September	14,389	14,969	0	6,124	8,589	0	20,542	23,196	0
October	14,153	14,763	0	7,115	10,892	0	21,268	25,121	0
November	14,588	15,552	0	7,549	9,360	0	22,137	24,360	0
December	14,692	15,354	0	7,669	10,497	0	22,361	25,163	0
January	14,656	15,617	0	6,579	10,600	0	21,232	23,409	0
February	11,367	15,105	0	7,895	10,000	0	19,262	23,167	0
March	10,755	11,756	0	6,083	8,623	0	16,871	19,749	0
April	10,663	11,621	0	3,528	6,843	0	14,405	18,096	0
May	9,616	11,274	0	2,030	3,787	0	11,647	14,439	0
June	8,856	11,559	0	87	1218	0	8,944	11,559	0

The flow of the Tawhiti Stream regularly dropped below the 800 l/s consent limit over the monitoring period (Figure 1). The limit on maximum abstraction rate of 15,900 m^3/day when the flow in the stream dropped below 800 l/s was complied with throughout the monitoring period.

The results obtained from the Council's telemetered hydrologic recorder in the Tawhiti Stream shows that the minimum residual flow of 50 l/s, required under consent **0047,** was maintained throughout the reporting period. The lowest flow recorded during the 2012-2013 period was 128 l/s, on 9 March 2013.

For the Tangahoe River abstraction, the maximum limit of 16,000 m^3/day was complied with throughout the monitoring period. The maximum daily abstraction rate was 10,892 m^3 on 19 October 2012. An abstraction rate of up to 30,000 m^3/day in the Tangahoe catchment was complied with throughout the monitoring period.

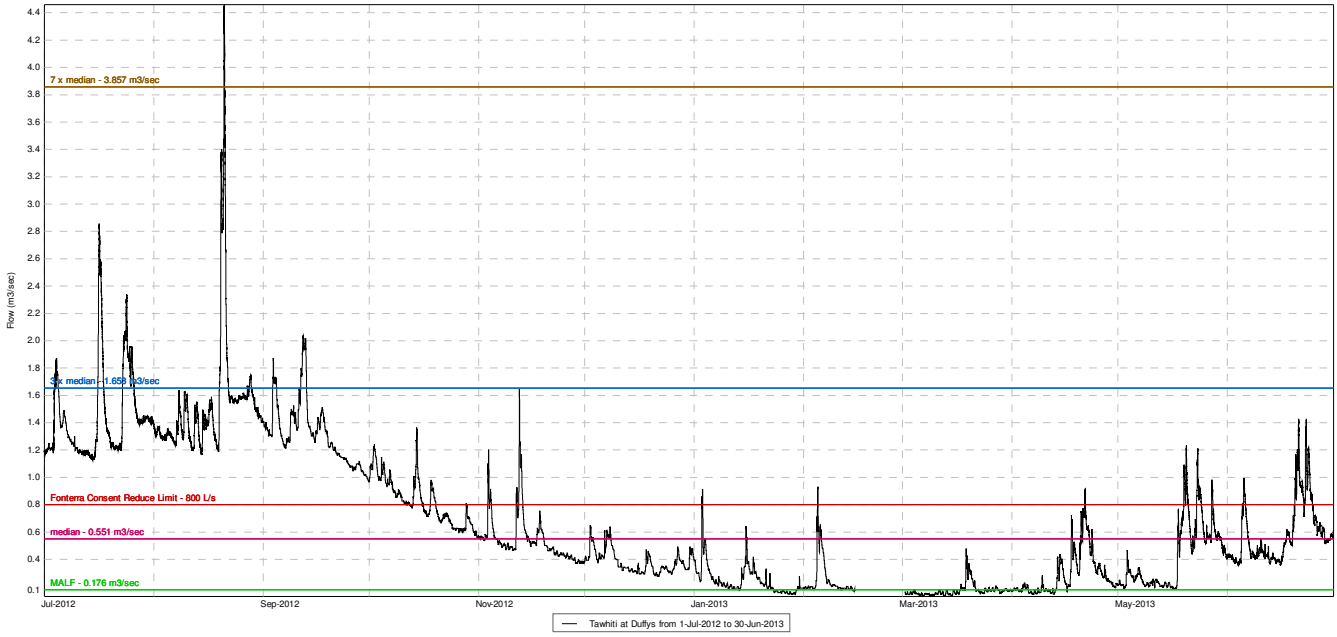


Figure 1 Tawhiti Stream flow at Duffy's Farm from 1 July 2012 to 30 June 2013

2.1.3 Wastewater discharge

2.1.3.1 Composite samples

Fonterra forward monitoring results to the Council monthly. This includes daily discharge volume, fats, COD, pH, suspended solids, and mean daily temperature of the discharge. The chemical measurements are based on 24 hour flow-proportioned composite samples. A summary of wastewater volume data for the period under review is provided in Table 3.

Table 3 Summary of wastewater volume data for 2012-2013

Month	Mean m^3/day	Maximum m^3/day	Non-compliance (days) < 40,000 m^3/day
July	5,724	13,163	0
August	18,260	26,058	0
September	28,084	30,972	0
October	28,940	31,062	0
November	29,301	32,408	0
December	28,800	31,845	0
January	26,466	29,963	0
February	23,319	29,945	0
March	18,882	23,408	0
April	14,533	19,700	0
May	10,974	15,424	0
June	2,924	5,849	0

The highest maximum daily volume discharged was 32,408 m^3 on 17 November 2012. The highest average volume discharged per day also occurred in the month of November (29,301 m^3)

This coincided with the period of highest processing throughput. As in the previous two monitoring periods, the maximum allowable discharge rate of 40,000 m^3/day was not exceeded.

Daily discharge volumes for the 2012-2013 monitoring period are presented in Figure 2. The wastewater composition discharged through the outfall in terms of daily values for suspended solids, COD and fat concentrations, as supplied by Fonterra, is shown in Figures 3, 4, and 5 and summarised in Tables 4 and 5.

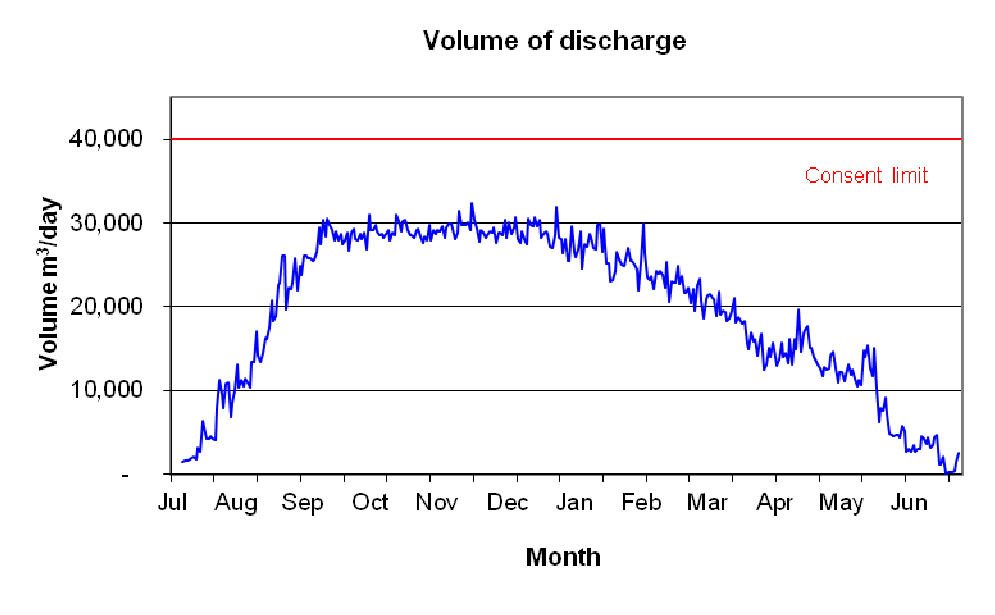


Figure 2 Volume of wastewater discharged through the Fonterra ocean outfall

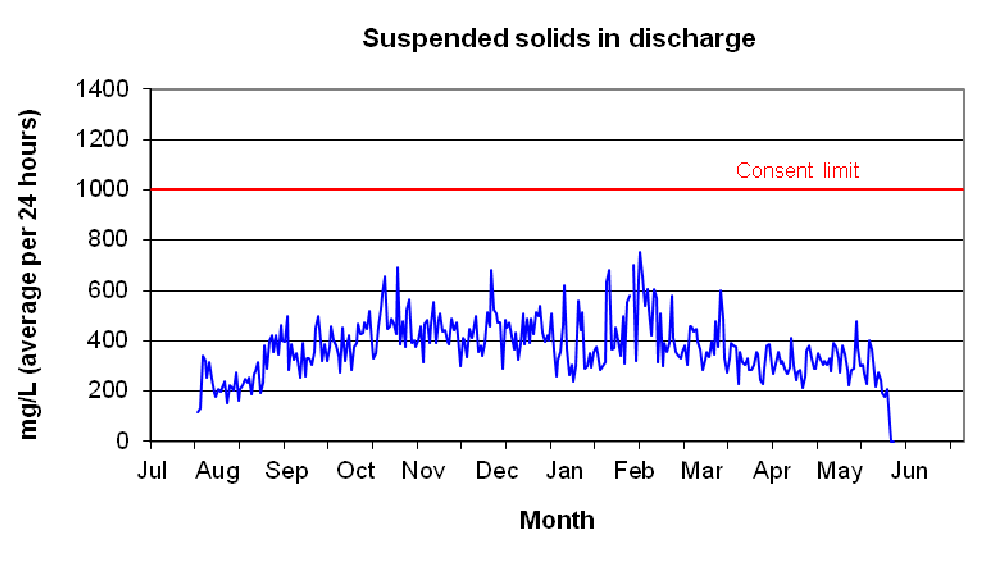


Figure 3 Concentration of suspended solids in wastewater discharge

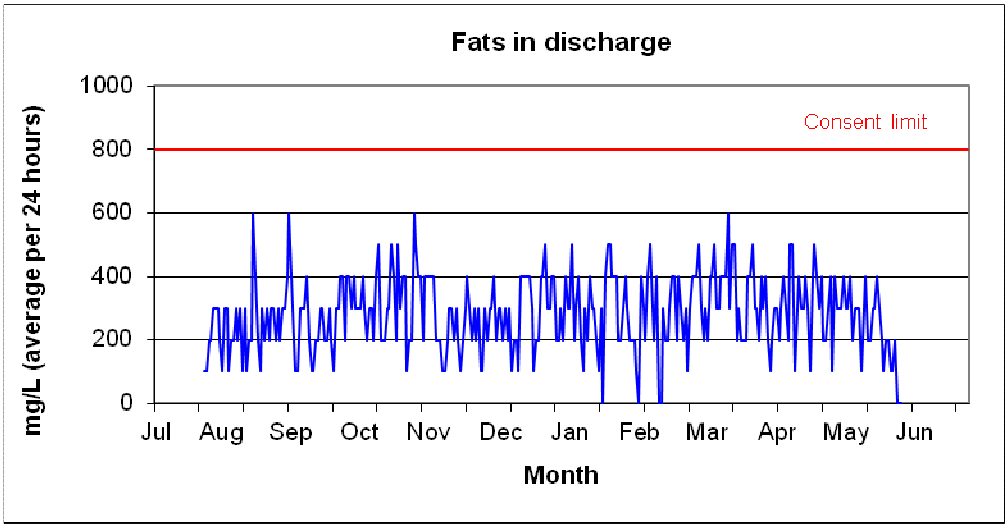


Figure 4 Concentration of fats in wastewater discharge

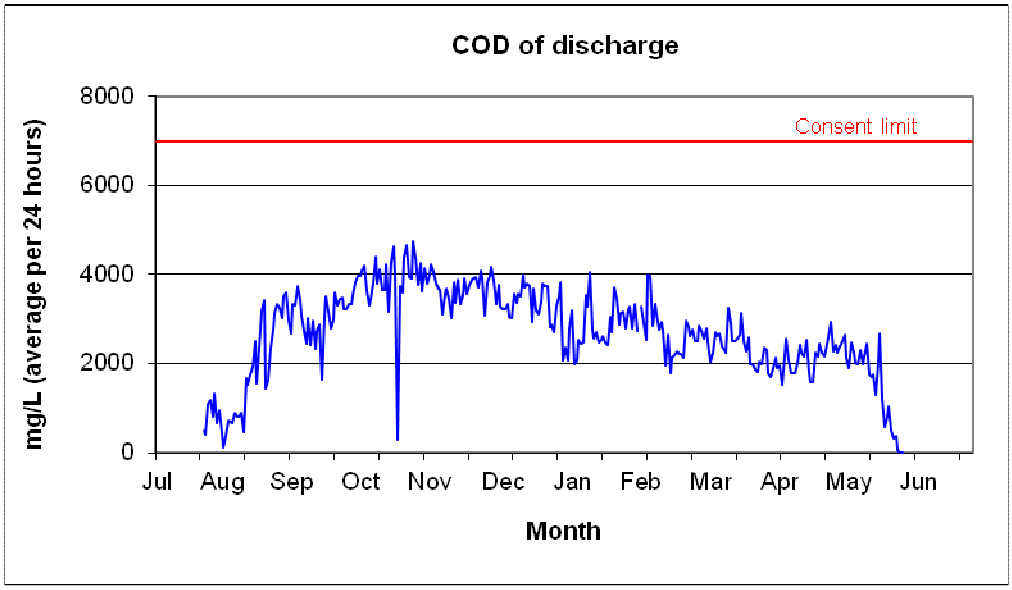


Figure 5 COD in wastewater discharge

It should be noted that these data relate to 24 hour flow proportioned samples, and therefore represent daily average values. The Council analysed a (24 hour flow proportioned) sample taken from the discharge of this wastewater and these results are presented in Section 2.1.3.3 (Table 7).

The discharge volumes, and the concentrations of suspended solids, COD and fats contained within the discharge complied with consent conditions during the monitoring period.

For the 2012-2013 dairy season, 7,149,032 m^3 of wastewater was discharged through the outfall, slightly more than the previous monitoring period when 7,126,618 m^3 was discharged.

Table 4 Summary of wastewater composition data for 2012-2013

Month	Suspended solids		Fat		COD	
	Mean (mg/L)	Max (mg/L)	Mean (mg/L)	Max (mg/L)	Mean (mg/L)	Max (mg/L)
July	231	342	200	300	746	1,313
August	287	500	300	600	2,039	3,593
September	358	498	300	400	3,147	3,979
October	455	692	300	600	3,860	4,751
November	430	552	200	400	3,704	4,231
December	439	682	300	500	3,330	3,984
January	395	684	300	500	2,852	4,050
February	470	752	300	500	2,696	4,009
March	364	600	300	600	2,445	3,246
April	306	410	300	500	2,098	2,939
May	274	478	200	400	1,610	2,682
Consent limit	≤ 1,000		≤ 800		≤ 7,000	

NB: The factory is not operational in June.

Table 5 provides a monthly summary of total volumes discharged of various parameters for both the 2011-2012 and 2012-2013 seasons.

Table 5 Summary of wastewater mass discharge rate data for 2011-2012 and 2012-2013

Month	Volume m^3		Suspended solids (tonnes)		Fat (tonnes)		COD (tonnes)	
	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13
July	152,592	148,828	15	22	17	21	58	70
August	502,875	566,066	166	161	149	153	1,136	1,141
September	695,794	842,509	252	302	187	222	2,248	2,650
October	900,224	897,144	416	409	226	298	3,088	3,454
November	855,992	879,028	324	378	203	214	2,863	3,254
December	877,989	892,792	311	392	237	259	2,675	2,973
January	814,915	820,458	290	324	195	235	2,187	2,339
February	701,404	652,943	209	299	156	177	1,760	1,707
March	637,840	585,344	185	215	154	204	1,519	1,444
April	505,241	435,998	115	133	96	130	1,172	910
May	384,996	340,193	102	100	85	89	800	606
June	96,755	87,729	-	-	-	-	-	-
Total	7,126,617	7,149,150	2,385	2,735	1,705	2,002	19,506	19,633

NB: The factory is not operational in June

The amount of suspended solids discharged through the outfall in 2012-2013 increased 15% (by 350 tonnes) from the 2011-2012 season. Fat discharged increased 17% (297 tonnes) compared with 2011-2012. COD increased <1% (by 127 tonnes) compared with 2011-2012.

2.1.3.2 Grab samples

Grab samples of the wastewater, prior to discharge through the Fonterra outfall, were collected by the Council on 12 occasions during the 2012-2013 dairy season. These samples were analysed for a range of parameters that included conductivity, pH, turbidity, total grease, faecal coliforms, *E. coli* and enterococci bacteria.

The main purpose of collecting the grab samples was to measure the microbiological quality of the discharge, which cannot be undertaken on 24 hour composite samples. These results also allow an assessment of the range of effluent component concentrations, rather than the 'average' results that are produced by composite samples. These results are presented in Table 6.

Concentrations of total grease and COD were below the levels prescribed by consent **1450** on all occasions. Suspended solids exceeded the consent limit on one occasion.

High concentrations of faecal indicator bacteria, in particular enterococci, were recorded in the grab samples (Table 6). The discharge of domestic wastes in the dairy wastewater itself is specifically prohibited, and this condition was complied with. It is not unusual for high numbers of faecal indicator bacteria to be found in dairy factory wastewater in the absence of domestic wastes, as has been found elsewhere in the country e.g. at Clandeboye and Westland Milk Hokitika (Palliser *et al*., 2013 and referenced therein). In order to determine whether elevated numbers of faecal indicator bacteria in the wastewater occur as a result of faecal contamination (e.g. from birds and rodents) or growth of environmental strains, further testing of waste streams is required. This work is currently being undertaken by Fonterra (Palliser *et al*., 2013).

In all grab samples, enterococci counts were notably higher than those for *E. coli*. Enterococci are more tolerant of extreme growth conditions than faecal coliforms (including *E. coli*), with the high temperatures and variable pH occurring in the Whareroa wastewater potentially depressing the growth of the latter (Palliser *et al*., 2013).

Table 6 Results of analyses of wastewater grab samples for 2012-2013

Date	Temp (ºC)	COD g/m³	Conductivity (20ºC mS/m)	pH	SS g/m³	Total grease g/m³	Faecal coliforms cfu/100ml	*E. coli* cfu/100ml	Enterococci cfu/100ml
1-Aug-2012	24.3	50	43.5	10.4	120	67	-	<2	$4.0x10^2$
5-Sep-2012	28.0	2,000	294	11.7	250	52	-	<16	$1.1x10^4$
3-Oct-2012	30.7	3,500	141	8.3	340	104	-	$2.7x10^3$	$6.7x10^5$
24-Oct-2012	30.8	3,400	445	11.9	200	55	<16	<16	$3.0x10^4$
8-Nov-2012	29.1	4,100	310	11.7	520	210	9	<9	$7.3x10^5$
21-Nov-2012	29.1	2,500	144	11.1	280	100	$1.2x10^5$	$9.0x10^4$	$1.0x10^5$
5-Dec-2012	34.8	840	137	11.4	160	84	$5.0x10^1$	$5.0x10^1$	$9.3x10^3$
9-Jan-2013	34.9	2,900	307	4.9	390	38	-	$1.4x10^4$	$2.5x10^5$
7-Feb-2013	29.0	5,000	490	12.3	1,200	380	-	<16	$6.5x10^4$
6-Mar-2013	32.6	2,500	346	11.9	330	92	32	$1.6x10^1$	$4.5x10^4$
3-Apr-2013	34.1	1,800	239	11.9	290	240	-	<33	$3.9x10^5$
1-May-2013	32.2	870	612	12.3	240	59	<16	<16	$2.1x10^3$
Consent limit		**≤7000**			**≤1000**	**< 800**			

2.1.3.3 Inter-laboratory comparisons

An inter-laboratory comparison was performed on two occasions during the 2012-2013 season on the 24 hour flow proportioned samples taken from the wastewater discharge. The results obtained by both laboratories are presented in Table 7.

Table 7 includes an agreements column which summarises the acceptability of the difference in each result for the two laboratories. Differences of less than 10% of the mean of the two values were considered acceptable. Differences of 10-25% are considered to constitute a difference between the two laboratories and a difference of greater than 25% are considered significantly different.

Overall, there was an acceptable level of agreement between the two laboratories with regards to suspended solids and COD.

Table 7 Inter-laboratory comparison performed on 24 hour composite wastewater sample 2012-2013

Parameter	Unit	3-October-2012			14-Feb-2013		
		TRC	Fonterra	Agree	TRC	Fonterra	Agree
Conductivity @ 20°C	mS/m	231			184		
pH	pH	8.2			11.1		
Total alkalinity	g/m^3CaCO_3	150			550		
Suspended solids	g/m^3	460	426	✓	280	314	✓
Total grease/fats	g/m^3	132			160		
COD	g/m^3	4,100	3,630	✓	1,500	1,955	*
BOD	g/m^3	1,900			1,000		
Total nitrogen	g/m^3	176			112		
Total phosphorus	g/m^3	56			12		
Faecal coliforms	cfu/100ml	$1.5x\ 10^5$			$1.6x10^5$		

Note: ✓ = acceptable agreement
* = within 10% - 25% difference from the mean
** = significantly different (i.e. > 25% difference from the mean)

2.1.4 Marine ecological surveys

In order to assess the effects of the Whareroa dairy factory and Hawera Waste Water Treatment Plant combined outfall discharge on the nearby intertidal communities, surveys were conducted in November 2011 (peak season) and March 2012 (post-peak season) at four sites (Figure 6, see Appendix II for photographs). The two survey reports, including statistical analysis of results and further discussion of the findings, are included in Appendix II. Section 2.1.4 summarises the main findings of these survey reports.

It is expected that detectable adverse effects of the outfall discharge on the intertidal communities would have been evident as a significant decline in species richness and diversity at the potential impact sites relative to the control sites. No such adverse effects were evident during the 2012-2013 season. During both the November 2012 and March 2013 surveys, species richness (number of species per quadrat) and diversity (Shannon-Weiner Index per quadrat) were consistently higher at the two potential impact sites closest to the outfall (200 m SE and 350 m NW) relative to the control site at Waihi Road (see Appendix II for details).

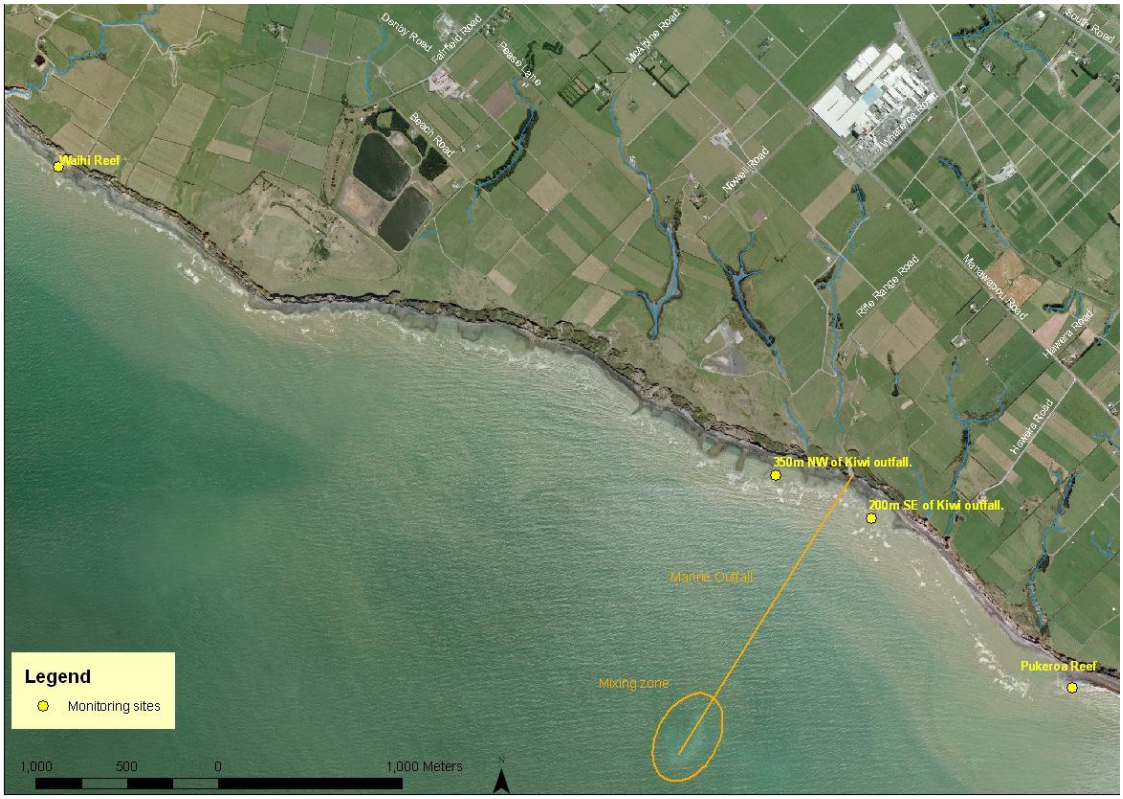


Figure 6 Location of the four intertidal survey sites

From the historical record it can be seen that prior to the installation of the long marine outfall in August 1997, generally there was lower species richness and diversity (number of species and Shannon-Weiner Index per quadrat) at the impact site 200 m SE relative to the control site at Waihi Reef (Figures 7, 8, 9 and 10). Other adverse effects observed at the time included the coating of rocks and tidal pools with fats and significant coverage by filamentous algal and bacterial species (Appendix II). A sharp increase in species diversity occurred at the site 200 m SE following installation of the outfall (Figures 7 and 8). Since then (August 1997), sites have shown interannual variability in both number of species and Shannon-Weiner Index, but there has been no noticeable difference in trends between the impact site and the control sites over this period.

In previous reports, concern had been expressed regarding the general decline in both number of species and Shannon-Weiner Index per quadrat for the site at Pukeroa Reef since 2007, particularly evident during the spring surveys (Figures 7 and 8). The results of the November 2012 survey show a change in this trend, with number of species and Shannon-Weiner Index per quadrat increasing at all three impact sites, including Pukeroa Reef. Natural environmental factors, including coastal erosion, exposure and substrate mobility appeared to be dominant drivers of species richness and diversity at all of the sites surveyed.

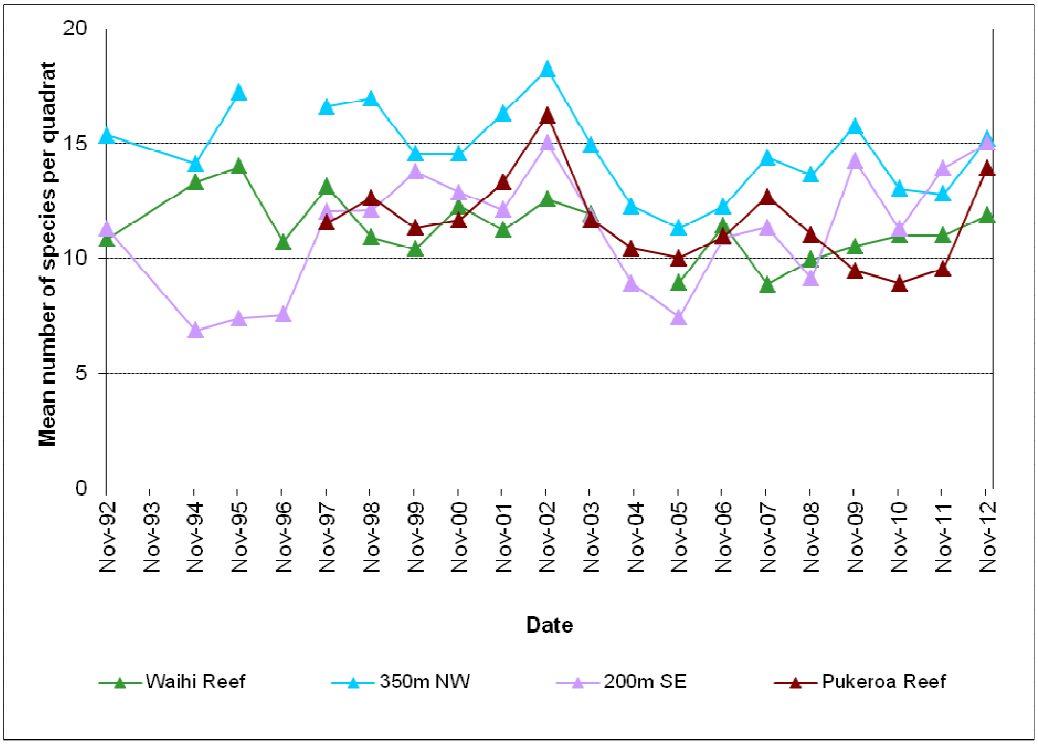


Figure 7 Mean number of species per quadrat: spring surveys 1992-2012

Figure 8 Mean Shannon-Weiner index per quadrat: spring surveys 1992-2012

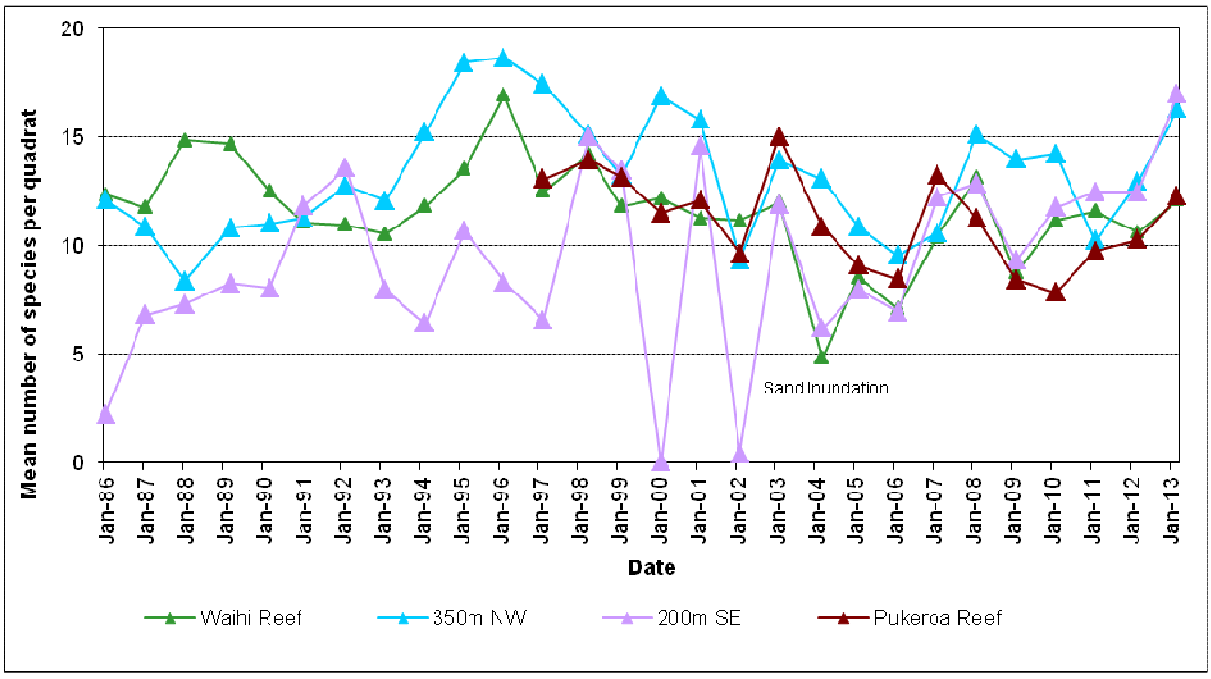


Figure 9 Mean number of species per quadrat: summer surveys 1986-2013

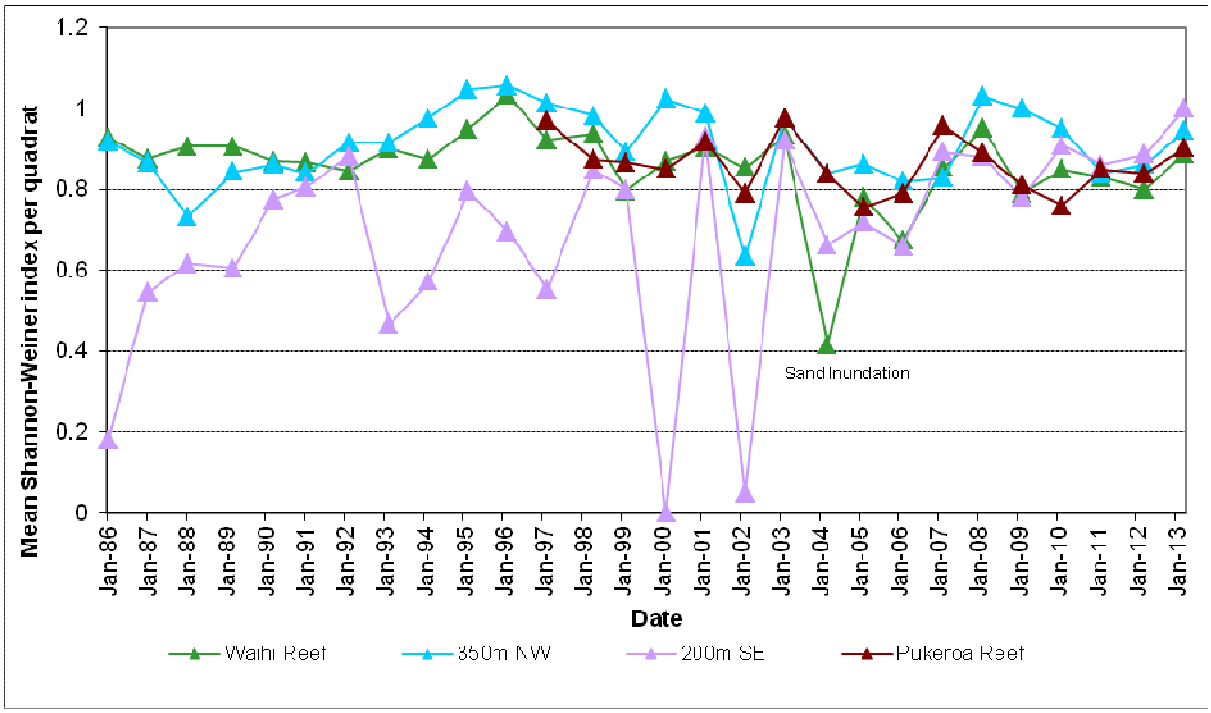


Figure 10 Mean Shannon-Weiner index per quadrat: summer surveys 1986-2013

2.1.5 Stormwater discharges

There are three stormwater catchments covering the Whareroa site. The northern catchment drains to an unnamed tributary of the Tawhiti Stream (consent 3907), the eastern catchment to an unnamed tributary of the Tangahoe River (consent 3902), while the southern catchment drains to an unnamed coastal stream (consent 4133). The discharge to the unnamed tributary of the Tawhiti Stream can also include

intermittent discharges of back flushing from sand filters and chlorinated water from the water reservoir. The approximate stormwater catchment areas at the Whareroa site are shown in Figure 11.

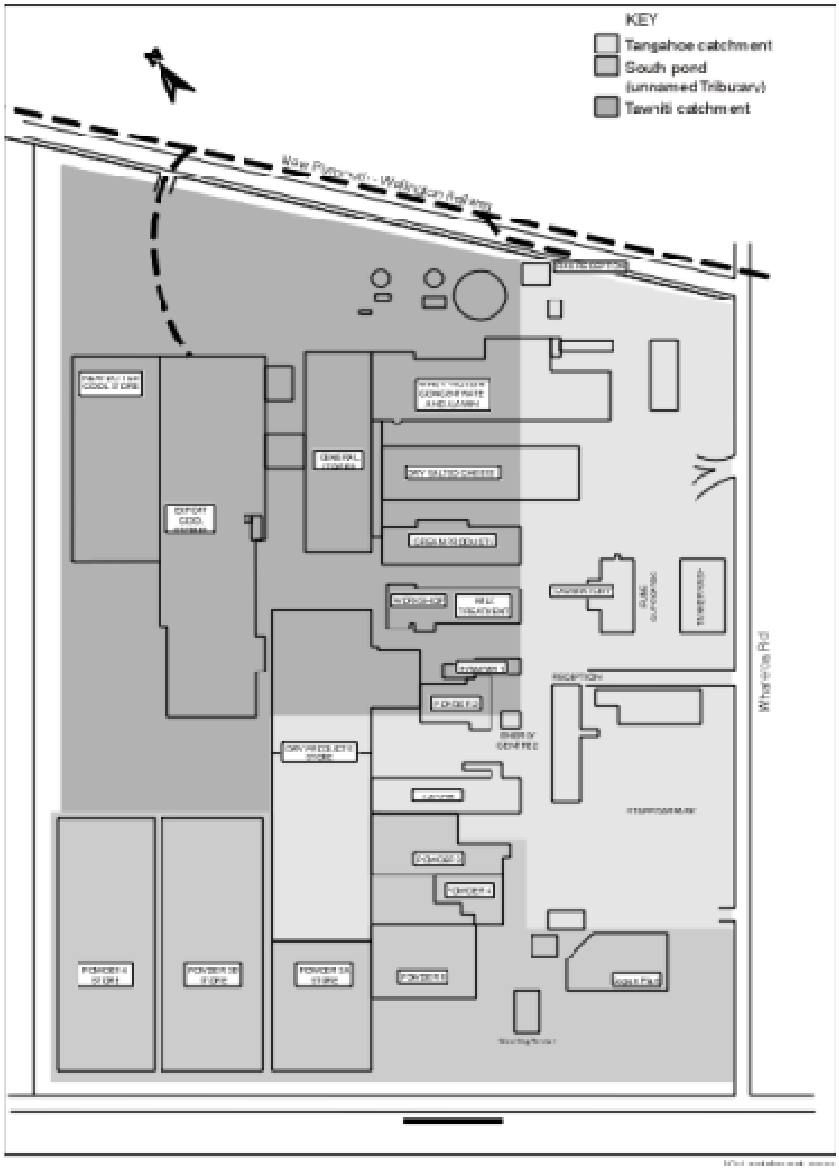


Figure 11 Approximate stormwater catchments at the Whareroa site

Each of the discharges are from a detention pond system designed to contain any spillage that occurs on the site and to attenuate storm flows. The two-pond system in the Tangahoe catchment was completed in May 1996. The benefits of this system were immediately apparent in the results of monitoring in the unnamed tributary.

There is a single pond and wetland in the Tasman catchment (the unnamed coastal stream).

The detention pond system at the headwaters of the unnamed tributary of the Tawhiti Stream (Photograph 6) was upgraded in July 1998. The previous single pond rapidly filled with sediment from sand filter back flushing and was therefore ineffective as a detention pond. This pond was replaced with a three-pond system. In response to Abatement Notice 11657, issued February 2011, Fonterra undertook

extensive works on the Tawhiti stormwater system during 2011 in order to prevent the growth of sewage fungus in the Tawhiti stormwater ponds and the downstream tributaries. These works included cleaning out the third settlement pond, modifying the outlet structures between the three ponds and repairs to the stormwater isolation sump adjacent to the water treatment plant. A marked improvement in pond water quality has occurred following completion of these works (Section 2.1.5.1, Table 9).

Photograph 6 Tawhiti stormwater pond following remedial work

In a voluntary initiative, Fonterra has fenced off and planted areas around the ponds with native vegetation and wetland plants (Photograph 7), to create wetlands that will help maintain the health and habitat of the small streams that receive the discharges. The plantings are progressively being extended down the riparian margins under Riparian Plan 372, and have been found to be well tended during inspections by the Council.

During the 2012-2013 reporting period, the monitoring of stormwater discharges consisted of chemical monitoring of the stormwater discharge to each of the unnamed tributaries, and freshwater biological monitoring of each of the unnamed tributaries.

Photograph 7 Fencing and riparian planting around the southern pond

2.1.5.1 Chemical monitoring

In the Council's 2009-2010 Annual Report, it was recommended to increase stormwater sample collection to every inspection (as opposed to the usual five per year), as sewage fungus had been found downstream of the Tawhiti pond discharge. In addition it was recommended that each sample was additionally tested for filtered carbonaceous biochemical oxygen demand (BODCF). It was also recommended that Fonterra put an internal stormwater monitoring programme in place, which commenced in October 2010.

Discharge samples were tested for a variety of parameters by the Council (Table 8), and the results obtained for each discharge are presented in Tables 9 to 11.

Table 8 Limits for stormwater composition for each parameter (consents 3907, 3902, 4133)

Parameter	Units	Consent limit
Temperature	ºC	25
Oil and grease	g/m^3	5
Total residual chlorine	g/m^3	0.2
pH		6.0 - 9.0
Suspended solids	g/m^3	30
BOD	g/m^3	10
Carbonaceous Filtered BOD	g/m^3	2.0

Tributary of Tawhiti Stream

Samples of the discharge to the Tawhiti tributary are taken at the outlet of the three-pond system. Subsequent to the construction of the three-pond system, there has been a marked reduction in the BOD and suspended solids concentration in the discharge. Temperature, conductivity and pH remained consistent. Oil and grease (O&G) and free chlorine levels have remained low.

A summary of discharge sampling results since the installation of the three-pond system are included in Table 9 for comparison.

Table 9 Chemical water quality of stormwater discharge to an unnamed tributary of the Tawhiti Stream (STW 001002), including a summary of previous data (Nov 1998 - May 2012)

Date	Parameter										
	Temp °C	Cond @ 20°C mS/m	pH	Alkalinity g/m³CaCO₃	SS g/m³	O&G g/m³	COD g/m³	BOD g/m³	BODCF g/m³	Total Cl_2 g/m³	Free Cl_2 g/m³
Number	82	84	84	78	82	81	82	85	20	84	83
Maximum	21.4	31.9	9.9	157	660	7.3	210	21	7.7	0.3	0.3
Minimum	8.0	20.8	7.1	38	1	<0.5	2.5	<0.5	<0.1	<0.1	<0.1
Median	14.9	26.9	7.6	64	8	<0.5	10.5	1.1	0.7	<0.1	<0.1
1-Aug-12	11.4	28.2	7.3	71	**66**	<0.5	33	1.6	0.5	<0.1	<0.1
5-Sep-12	13.0	25.5	7.5	50	10	<0.5	7	0.6	0.5	<0.1	<0.1
3-Oct-12	14.6	26.0	7.6	62	8	<0.5	120	0.6	<0.5	<0.01	<0.01
8-Nov-12	14.3	26.6	7.4	63	7	<0.5	<5	1	<0.5	<0.1	<0.1
5-Dec-12	18.8	27.1	7.7	64	26	<0.5	15	1	0.8	<0.1	<0.1
9-Jan-13	19.9	28	7.7	74	4	<0.5	5	0.8	0.5	<0.1	<0.1
7-Feb-13	16.8	27.8	7.7	58	17	<0.5	18	1	<0.5	<0.1	<0.1
6-Mar-13	16.4	29.2	7.6	85	7	<0.5	9	0.7	<0.5	<0.1	<0.1
3-Apr-13	17.1	28.9	7.7	85	8	<0.5	8	0.8	0.5	<0.2	<0.2
1-May-13	15.6	30.1	7.3	77	7	<0.5	16	0.6	0.5	<0.1	<0.1
Consent limit	**25.0**	**-**	**6.0 - 9.0**	**-**	**30**	**5**	**-**	**10**	**2.0**	**0.2**	**-**

Refer to glossary for an explanation of abbreviations

* Consent limit of 2.0 g/m³ BODCF applies to eight out of ten samples

Temperature, pH, O&G, BOD, carbonaceous filtered BOD and total chlorine were within limits prescribed by consent conditions (**3907**) in all ten samples.

Suspended solids exceeded the consent limit on one occasion and this was probably due to high rainfall prior to sampling.

Tributary of Tangahoe River

Samples of the discharge to the Tangahoe tributary are taken at the outlet of the two-pond system. Since the ponds were constructed, the characteristics of the discharge have changed. In general, the temperature, conductivity, alkalinity, BOD and O&G values recorded have reduced, while the pH and chlorine values have increased.

A summary of the results of discharge sampling carried out since the installation of the two-pond system is included in Table 10 for comparison.

Table 10 Chemical water quality of stormwater discharge to tributary of the Tangahoe River (Site STW001004), including a summary of previous monitoring data (May 1996 – May 2012)

Date	Parameter										
	Temp °C	**Cond @ 20°C mS/m**	**pH**	**Alkalinity g/m³CaCO₃**	**SS g/m³**	**O&G g/m³**	**COD g/m³**	**BOD g/m³**	**BODCF g/m³**	**Total Cl_2 g/m³**	**Free Cl_2 g/m³**
Number	88	90	91	85	89	86	89	90	20	87	87
Minimum	8.1	4.0	7.3	36	1	<0.5	5	<0.5	<0.5	<0.1	<0.1
Maximum	23.5	57.6	9.4	235	110	1.7	220	93	3.5	<0.1	<0.1
Median	16.3	35.6	7.9	113	12	<0.5	23	6	1.1	<0.1	0.1
1-Aug-12	10.1	46.3	**9.1**	119	**31**	<0.5	34	**11.0**	1.5	<0.1	<0.1
5-Sep-12	11.7	44.6	8.2	124	27	<0.5	25	**15.0**	**3.6**	<0.1	<0.1
3-Oct-12	14.6	47.5	7.9	136	11	<0.5	21	5.5	1.4	<0.1	<0.1
8-Nov-12	16.3	42.8	**9.2**	138	22	<0.5	36	**12.0**	1.2	<0.1	<0.1
5-Dec-12	18.9	42.1	8.1	142	7	<0.5	31	4.3	1.3	0.1	<0.1
9-Jan-13	21.3	43.3	8.9	150	14	<0.5	22	5.7	1.9	<0.1	<0.1
7-Feb-13	18.6	35.0	8.8	128	20	<0.5	35	8.8	1.4	0.1	0.1
6-Mar-13	18.9	44.2	8.1	178	21	<0.5	38	8.8	1.2	0.2	0.2
3-Apr-13	18.9	49.4	8.6	199	18	<0.5	31	7.1	0.9	0.2	0.2
1-May-13	16.3	36.5	8.3	145	22	<0.5	34	**17.0**	1.6	0.2	0.2
Consent limit	**25.0**	**-**	**6.0 - 9.0**	**-**	**30**	**5**	**-**	**10**	**2.0**	**0.2***	**-**

* Consent limit of 2.0 g/m³ BODCF applies to eight out of ten samples

Temperature, O&G, and total chlorine were all within limits prescribed by consent conditions at all times.

Out of the ten samples taken during the 2012-2013 monitoring year, the pH maximum limit was exceeded on two occasions, the suspended solids limit was exceeded on one occasion and the BOD limit was exceeded on four occasions. During the monitoring year, the Council recorded two incidents in relation to stormwater discharge non-compliances which are outlined in Section 2.3.

The limit on filtered carbonaceous BOD requires that eight out of ten samples collected during the monitoring period are no greater than 2.0 g/m³. As a consequence, the one off exceedance of the carbonaceous filtered BOD limit on 5 September 2012 does not constitute a consent non-compliance.

Unnamed coastal stream

Chemical water quality of stormwater discharge to the unnamed coastal stream are presented in Table 11, along with a summary of previous results since November 1994 for comparison.

The stormwater discharge to the unnamed coastal stream complied with consent conditions (4133) in terms of temperature, pH, O&G and total chlorine.

Table 11 Chemical water quality of stormwater discharge to the unnamed coastal stream (Site: STW 002020), including a summary of previous monitoring data (Nov 1994 - May 2012)

Date	Parameter										
	Temp °C	Cond @ 20°C mS/m	pH	Alkalinity g/m³CaCO₃	SS g/m³	O&G g/m³	COD g/m³	BOD g/m³	BODCF g/m³	Total Cl_2 g/m³	Free Cl_2 g/m³
Number	92	93	94	89	93	91	92	94	20	92	92
Maximum	21.2	51.2	8.5	130	58	1.5	82	20	5	0.7	0.6
Minimum	7.7	3.6	6.6	23	1	<0.5	5	0.9	0.6	<0.1	<0.1
Median	15.4	29.2	7.4	78	20	<0.5	33	8.4	1.8	<0.1	<0.1
1-Aug-12	9.8	33.3	7.6	82	22	<0.5	29	**14.0**	**4.4**	<0.1	<0.1
5-Sep-12	11.7	33.4	7.4	88	12	0.6	97	8.2	1.2	<0.1	<0.1
3-Oct-12	14.1	37.0	7.4	101	12	<0.5	28	6.6	**3.4**	<0.1	<0.1
8-Nov-12	16	30.1	7.2	89	17	<0.5	31	**14.0**	**2.4**	<0.1	<0.1
5-Dec-12	20.2	32.5	7.6	98	14	<0.5	43	8.6	**3.5**	<0.1	<0.1
9-Jan-13	21.5	26.7	7.4	78	10	<0.5	32	4.5	1.6	<0.1	<0.1
7-Feb-13	18.1	18.8	7.2	53	**78**	<0.5	81	**17.0**	**2.6**	0.1	<0.1
6-Mar-13	18.3	31.2	7.3	104	26	<0.5	50	**11.0**	1.4	<0.1	<0.1
3-Apr-13	18.5	33.6	7.3	111	**42**	<0.5	63	**13.0**	**2**	<0.2	<0.2
1-May-13	15.7	25.4	7.2	78	**40**	0.6	56	**20.0**	**2.3**	<0.1	<0.1
Consent limit	**25.0**	**-**	**6.0 - 9.0**	**-**	**30**	**5**	**-**	**10**	**2.0***	**0.2**	**-**

* Consent limit of 2.0 g/m³ BODCF applies to eight out of ten samples

Out of the ten samples taken during the 2012-2013 monitoring year the suspended solids limit was exceeded on three occasions, the BOD limit was exceeded on six occasions and the carbonaceous filtered BOD limit was exceeded on seven occasions. During the monitoring year, the Council recorded two incidents in relation to stormwater discharge non-compliances which are outlined in Section 2.3.

2.1.5.2 Freshwater biomonitoring

A six site biomonitoring survey was undertaken using either the Council's standard '400 ml sweep-net', 'kick-sampling' methods or a combination of both methods, in tributaries of the Tawhiti Stream (two sites), Tangahoe River (three sites) and an unnamed coastal stream (one site) (Figure 12, Table 12) to assess whether stormwater discharges had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_s$ scores for each site. A biomonitoring report, including data analysis and further discussion of the findings, is included in Appendix III. Section 2.1.5.2 summarises the main findings of this survey.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the

presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_s$ takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or the $SQMCI_s$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

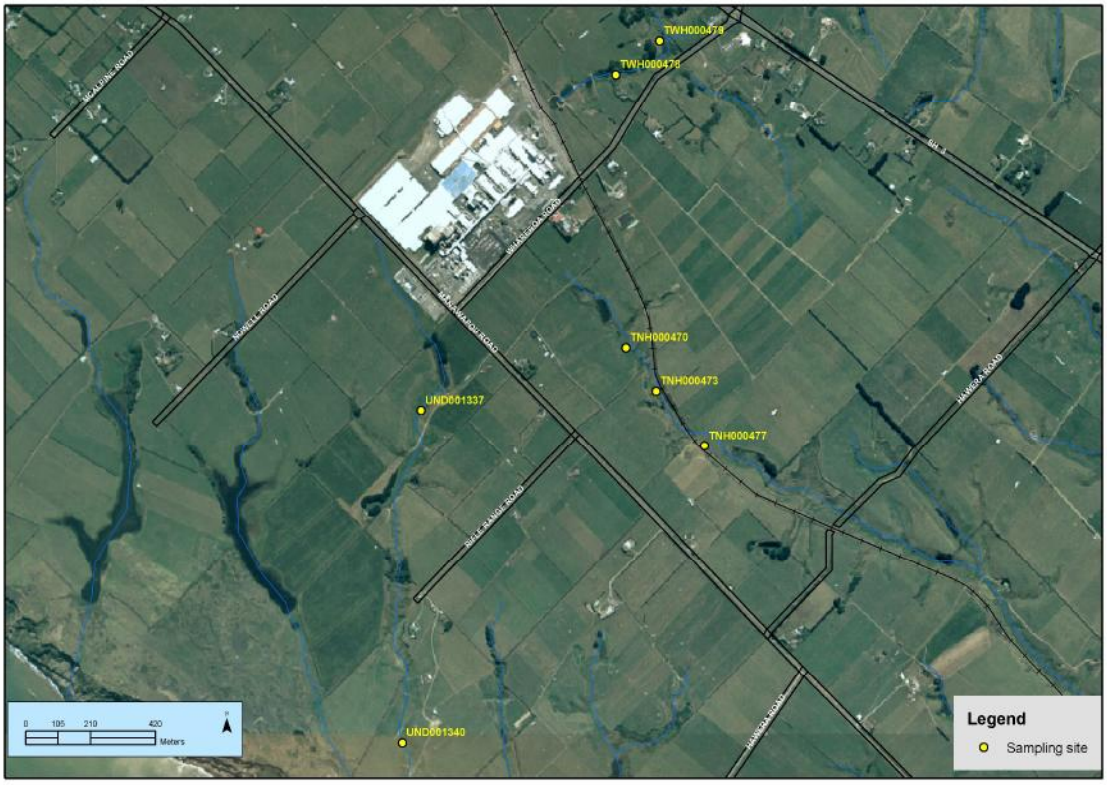


Figure 12 Location of freshwater biological sampling sites in the tributaries of the Tangahoe River and Tawhiti Stream and the unnamed coastal stream

Table 12 Freshwater biomonitoring sites in unnamed tributaries of the Tawhiti Stream and Tangahoe River, and an unnamed coastal stream

Site No.	Site code	Map reference	Location
B1	TWH 000478	Q21: 219770	Tawhiti S. tributary – 60 m below northern discharge
B2	TWH 000479	Q21: 223772	Tawhiti S. tributary – 200 m below northern discharge
1	TNH 000470	Q21: 221762	Tangahoe R. tributary - 10 m u/s of culvert (40 m d/s northern discharge)
2	TNH 000473	Q21: 222762	Tangahoe R. tributary - 400 m below eastern discharge
3	TNH 000477	Q21: 223759	Tangahoe R. tributary - d/s of railway culvert
S1	UND 001337	Q21: 214761	Unnamed coastal stream 300 m below Manawapou Road
S2	UND 001340	Q21: 213749	Unnamed coastal stream 200 m upstream from coast

An unauthorised discharge recorded in the unnamed tributary of the Tawhiti stream in 2011 resulted in the proliferation of undesirable heterotrophic growths 'sewage fungus' at site B1 and to a lesser extent at site B2 downstream of the stormwater discharge. In response to this incident, Fonterra carried out a number of improvements to the stormwater management system at the Whareroa site between February and April 2011. Results from the 2012 survey and the current survey suggest an improvement in water quality at these sites since the stormwater upgrade

was completed in April 2011. The $SQMCI_s$ score, although similar to the previous survey results, was significantly higher than the historical median at site B1. No significant changes, from historical median scores were recorded at site B2.The macroinvertebrate community was dominated by species that would be expected in this slower flowing and weedy stream (amphipods *Paracalliope*) and snails *Potamopyrgus*).

In the unnamed tributary of the Tangahoe Stream, MCI and $SQMCI_s$ scores recorded at site 1 were generally similar to the historical medians recorded at this site and were reflective of the nature of the stream. At site 2 a significant decrease in $SQMCI_s$ score was recorded, suggestive of possible adverse effects from the dairy discharge. The abundance of *Chironomus* blood worms at site 2 was most likely indicative of the effects of the effluent given the absence of this taxon at site 1 which is located above the discharge point. However, a marked decrease in the abundance of these taxa at site 3 indicated an improvement in preceding water quality between sites 2 and 3, suggesting that the dairy discharge may be mostly assimilated at site 3.

The results of this survey continued to reflect improvements in the macroinvertebrate community that have been recorded over the past 5 years at site S2 in the unnamed coastal stream. This improvement has been attributed to the fencing and planting of the stream in the vicinity of this site. There was no evidence of any effects of the stormwater discharge on the macroinvertebrate community in the unnamed coastal tributary.

In summary, the results of this survey indicated a continued recovery in the macroinvertebrate community in the unnamed tributary of the Tawhiti following the improvements made to the stormwater management system by the Company in the early part of 2011. There was some evidence to suggest that the nutrient enriched dairy pond discharge may be influencing the macroinvertebrate community of the unnamed tributary of the Tangahoe at site 2 and to a lesser extent at site 3. Above average macroinvertebrate health continued to be recorded at site S2 in the unnamed coastal stream.

2.2 Air

2.2.1 Inspections

During each monthly site visit a good standard of housekeeping was observed and no unusual emissions to air were noticed. Occasional product odour was noted around the site during the surveys, but these were never obnoxious and did not occur beyond the boundaries of the site.

2.2.2 Results of discharge monitoring on receiving environment

2.2.2.1 Deposition gauging

Many industries emit dust from various sources during operational periods. In order to assess the effects of the emitted dust, industries have been monitored using deposition gauges.

Deposition gauges are basically buckets elevated on a stand to about 1.6m. The buckets contain filters to collect deposition, along with distilled water to ensure that any dust that settles out of the air is not re-suspended by wind. A copper sulphate

solution at a concentration of 5 g/L acts as a preservative to prevent growth of algae and bacteria.

Deposition gauges were deployed at six sampling sites on six occasions around the Whareroa site for periods of approximately two to four weeks, between August and December 2012. The contents of the gauges were analysed for COD and pH. The COD results are compared with the theoretical COD value for dry milk powder and a "total deposited milk powder" (TDMP) value is calculated.

The location of the monitoring sites are provided in Table 13 and Figure 13.

Table 13 Description of air deposition monitoring sites

Site Number	Description
AIR002409	Entrance to staff carpark – outside boundary fence
AIR002416	Corner of Manawapou Road and Whareroa Road, near road sign
AIR002422	WNW of Powder 5 – on Manawapou Road, adjacent to Powder 3B store
AIR002424	Whareroa Road, 200 m from State Highway 3
AIR002426	Duffy's property - extra site due to recommendations from previous annual report
AIR002427	Little's property 515 Manawapou Rd

Figure 13 Location of air deposition sites

TDMP values for each monitoring site are presented in Table 14. The 2012-2013 results for the sites nearest the powder plants are given in Figure 14.
TDMP values for 2012-2013 are compared with results from the previous three years in Figure 15.

The Council's guideline value for total particulate deposited to cause a nuisance is 130 milligrams per square metre per day, but the Council does not have a specific guideline value for milk powder deposited. The Fonterra deposition survey determines deposition due to milk powder only, not total deposition.

The results for TMPD indicate that fallout occurred in the immediate vicinity of the powder plants and did not extend far beyond the site boundaries. Deposition of milk powder on the site is not of great environmental significance, providing the stormwater management systems perform satisfactorily.

Table 14 Total deposited milk powder values for each monitoring site during 2012-2013

Site Number	Total deposited milk powder mg/m²/day					
	1 August to 24 August	24 August to 14 September	14 September to 9 October	9 October to 31 October	31 October to 21 November	21 November to 11 December
AIR002409	66	174	98	330	305	-
AIR002416	31	57	36	112	82	128
AIR002422	51	23	25	38	124	100
AIR002424	32	69	30	30	56	62
AIR002426	30	26	8	8	72	29
AIR002427	29	23	-	25	74	73

As expected, the highest values of total deposited milk powder (TDMP) at or outside the boundaries were recorded for sites downwind (in relation to the prevailing winds from the north-west quadrant) of the powder plants. The staff car park entrance (AIR002409) recorded significantly higher levels of milk powder compared with the other sites. Levels recorded were similar to those for previous years, and peaked over the period October to December, around the peak time of maximum milk powder production.

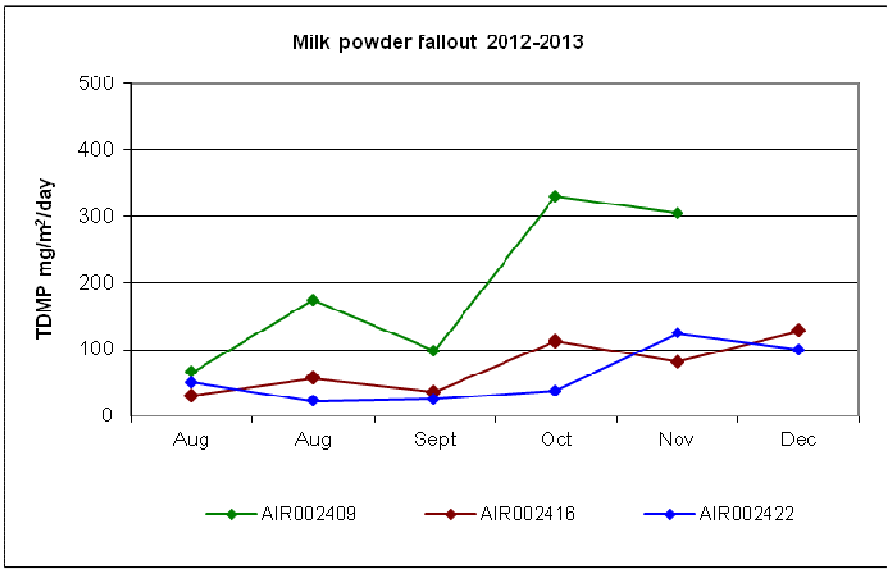


Figure 14 Milk powder fallout at three air deposition sites surrounding Whareroa

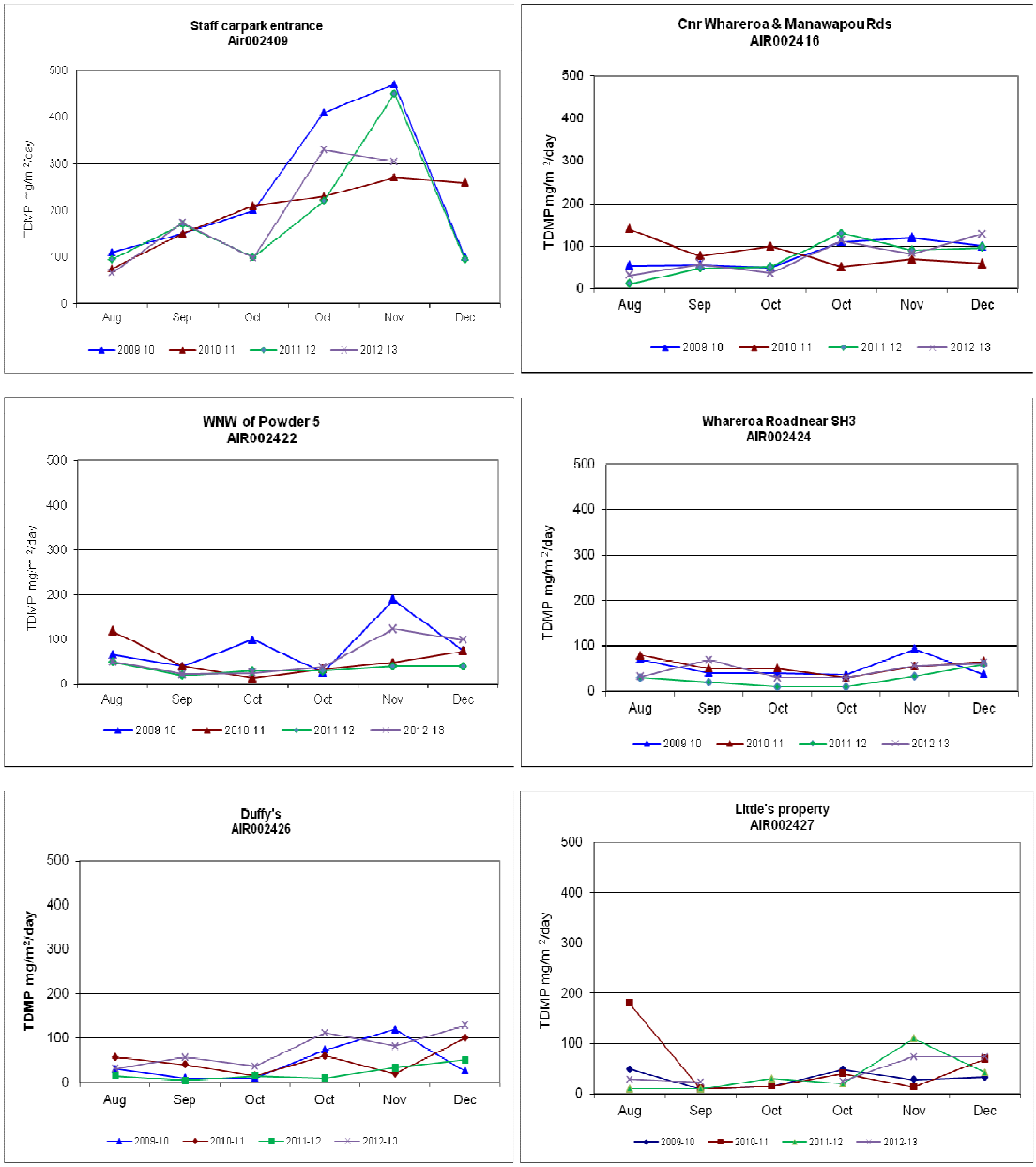


Figure 15 Air deposition monitoring results at sites around the Whareroa factory, including a comparison with the previous three years' results

2.2.2.2 Emission source analysis

Consent **4103** places a limit of 125 mg/m³ of gas flow on powder emissions to the atmosphere from the spray drying process cyclone exhaust.

The Company's independent consultants, CRL Energy Limited, carried out powder emission measurements on drier exhaust stacks (Powders 2, 3, 4, 5, and whey products) during December 2012 and January 2013. These results are presented in Table 15.

Results from the driers tested were all below the limit of 125 mg/m³ prescribed by consent 4103.

Table 15 Emission source analysis 2012-2013

Plant		Date	Emission concentration (mg/m³ 0ºC, 1 atm, dry gas)
Powder 1	North stack	21 Dec 2012	3.4
	South Stack		2.7
Powder 2	Drier stack	22 Jan 2013	17
Powder 3	East stack	20 Dec 2012	53
	West stack		52
	Fluid Bed exhaust		10
Powder 4	Wt scrubber exhaust	19 Dec 2012	15
Powder 5	East stack	24 Jan 2013	18
	West stack		29
	North stack	23 Jan 2013	74
	South stack		42
Whey products	WPC Drier	19 Dec 2012	7.8
Casein	Drier stack 1	18 Dec 2012	18
	Drier stack 2		27
Consent limit			**125**

2.2.2.3 Nitrogen oxide (NO_x) monitoring

Ambient NO_x monitoring was incorporated into the programme in 1996-1997 to monitor the effects of the co-generation plant at the site. In October 1997 the Company commissioned a second co-generation plant (Cogen 2) in response to increased milk coming to the site. NO_x is the main emission of concern associated with Fonterra's cogen plants, from the perspective of potential environmental effects. Special condition 7 of consent 6273 limits NO_x to less than 200 µg/m³ (one hour average) or less than 100 µg/m³ (24-hour average).

The Council uses passive absorption discs to monitor ambient nitrogen dioxide (NO_2). The gases diffuse into the discs and any target gases (nitrogen dioxide) are captured. These discs are deployed for periods of approximately two to four weeks and then sent to an external laboratory for analysis.

Passive NO_x discs were placed in four locations surrounding Whareroa site (Figure 16) on three occasions during 2012-2013. The results of the NO_x sampling are presented in Table 16, together with the 2011-2012 monitoring results for comparison.

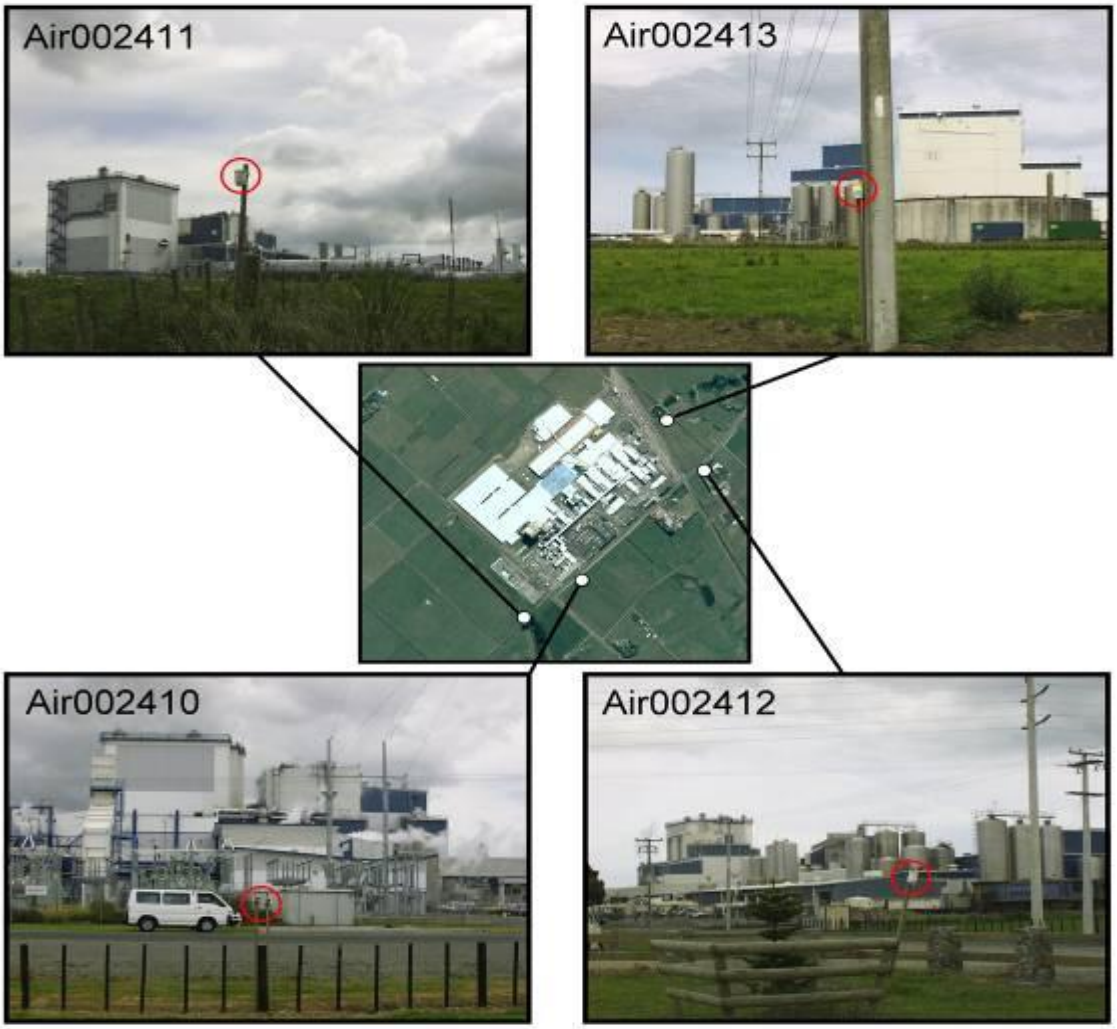


Figure 16 NO_x sample site locations around the Whareroa site

Table 16 Results of NO_x monitoring during the 2011-2012 and 2012-2013 periods

Monitoring period	NO_x concentration µg/m³											
	AIR002410			AIR002411			AIR002412			AIR002413		
	NO_x	24 h	1 h	NO_x	24 h	1 h	NO_x	24 h	1 h	NO_x	24 h	1 h
11-Jan-12 to 2-Feb-12	8.8	16.3	30.8	9.0	16.7	31.5	5.7	10.6	20.0	5.8	10.8	20.3
2-Feb-12 to 22-Feb-12	3.8	6.9	13.1	6.4	11.7	22.0	3.9	7.1	13.4	3.8	6.9	13.1
22-Feb-12 to 15-Feb-12	4.0	7.4	14.0	9.5	17.6	33.3	4.7	8.7	16.5	4.0	7.4	14.0
20-Nov-12 to 14-Dec-12	8.8	16.6	31.4	20.5	38.7	73.1	5.4	10.2	19.3	5.2	9.8	18.6
14-Dec-12 to 11-Jan-13	5.5	10.7	20.2	22.1	43.0	81.3	4.2	8.2	15.4	4.2	8.2	15.4
11-Jan-13 to 23-Jan-13	3.4	5.6	10.5	19.0	31.2	59.0	5.6	9.2	17.4	4.9	8.0	15.2
Consent Limit		**100**	**200**		**100**	**200**		**100**	**200**		**100**	**200**

24 h = 24 Hour average
1 h = 1 Hour average

Throughout both the 2011-2012 and 2012-2013 seasons NO_x concentrations remained well below consent condition limits (consent 6273, special condition 7, 200 mg/m³ one hour average, 100 mg/m³ 24 hour average).

The variation in NO_x concentration values can be explained in terms of distance from possible NO_x sources, namely the plant and road traffic, and the wind speed and direction.

2.2.2.4 Inhalable particulate (PM_{10}) monitoring

The report for PM_{10} monitoring at the Whareroa site over the 2012-2013 season is provided in Appendix IV. Special condition 9 of consent **4103** sets a limit on the emissions of fine particulates (PM_{10}) to the atmosphere from the site to a maximum of 50 µg/m³ (24 hour average).

During the reporting period, a "DustTrak" PM_{10} monitor was deployed on two occasions in the vicinity of the dairy complex. The deployments lasted from 55 to 68 hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of PM_{10} concentrations. The results from the sampling runs are shown in Figure 17.

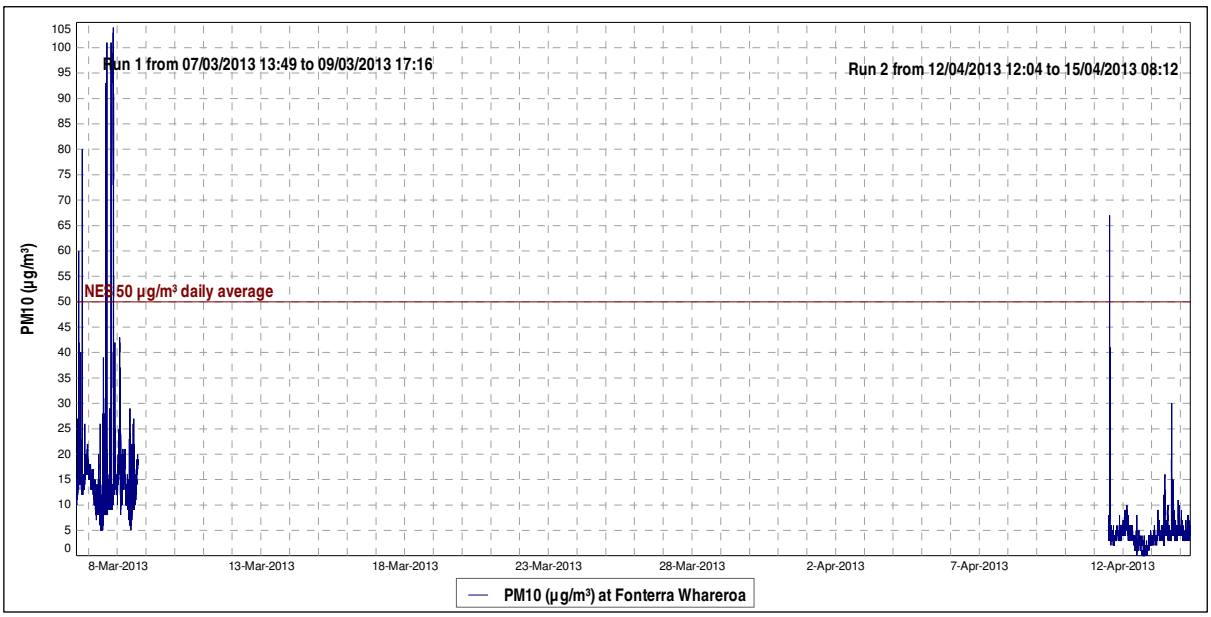


Figure 17 PM10 concentrations (µg/m³) at the Whareroa dairy complex

During the first 52-hour run, from 7 March to 5 March 2013, the average recorded PM_{10} concentration for the first twenty-four hour period was 13.4 µg/m³ and 15.5 µg/m³ for the second twenty-four hour period. These daily means equate to 26.8% and 30.1%, respectively, of the 50 µg/m³ value that is set by both the National Environmental Standard and the resource consent.

During the second 68-hour run, from 12 April to 15 April 2013, the average recorded PM_{10} concentration for the first twenty-four hour period was 4.55 µg/m³, 3.11 µg/m³ for the second twenty-four hour period and 5.05 µg/m³ for the third twenty-four hour period . These daily means equate to 9.1%, 6.2% and 10.1%, respectively, of the 50 µg/m³ value that is set by both the National Environmental Standard and the resource consent 4103.

Background levels of PM_{10} in the region have been found to be around 11 •g/m³.

2.3 Investigations, interventions, and incidents

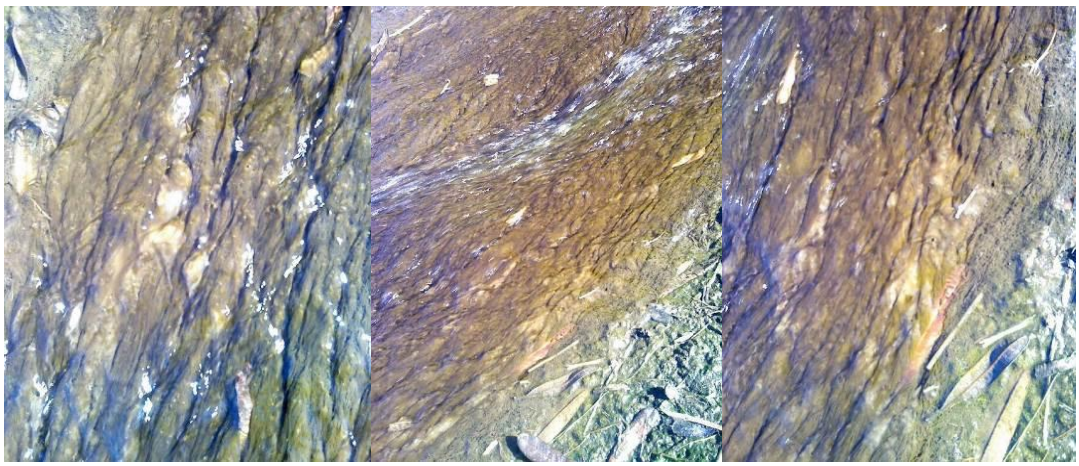
The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the consent holder. During the year matters may arise which require additional activity by the Council e.g. provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The 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 Unauthorised Incident Register (UIR) includes events where the company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Complaints may be alleged to be associated with a particular site. If there is potentially 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 2012-2013 period, there were eight recorded incidents associated with the Whareroa site, including five incidents linked with milk spills requiring disposal of product via the marine outfall, two incidents involving stormwater pond non-compliances and one incident requiring the disposal of milk permeate to land. One Infringement Notice was issued during the 2012-2013 period relating to non-compliant stormwater samples. Details of the incidents are provided below:

1) Several consent non-compliances (BOD, pH and suspended solids) were identified in pond discharge samples taken for routine stormwater analysis on 1st August 2012. Samples collected from the discharge point of the Eastern Stormwater Pond on 5 September continued to have high BOD (15 g/m^3) and during a biomonitoring inspection on 25 September 2012 sewage fungus was present at the pond outlet which discharges into the tributary of the Tangahoe River (Photograph 8). In response an Infringement Notice was issued on 19 November 2012.



Photograph 8 Sewage fungus and algal mat at the pond outlet into the tributary of the Tangahoe River

2) On 15 October 2012 self-notification was received from Fonterra about the requirement to dump milk permeate product into storage pits and then spread

onto land as a result of manufacturing problems. The pit where the milk permeate was stored (Photograph 9) and the areas sprayed were inspected. There were no odour issues at the time of inspection. The areas sprayed showed no signs of run off or ponding. The disposal was carried as per the contingency plan held for the site. In order to check for any environmental effects on nearby water bodies, three sites along the unnamed coastal stream were sampled on 24 October 2012. Concentrations of BOD and filtered carbonaceous BOD were found to be low in all three samples (<2.5 g/m^3 and <1 g/m^3 respectively). Fonterra later applied for a change to consent 5036-2 in order to permit the disposal of milk permeate to land by irrigation.

Photograph 9 Disposal pit containing milk permeate, 24 October 2012

3) On 24 October 2012 self notification was received concerning a milk spill on the Whareroa site (~60,000 L). The resulting discharge via the marine outfall contravened special condition 8 of resource consent 1450-2 (Photograph 10). A letter of explanation established that the discharge was due to an unforeseeable mechanical failure and that the Company had a defence for the non-compliance. Appropriate measures had been taken by Fonterra in order to minimise the impact of the milk spill and the Council had been informed of the spill in a timely manner.

Photograph 10 Outfall discharge visible beyond the 200 m mixing zone on 24 October 2012

4) On 9 January 2013 self-notification was received concerning a raw whey spill at the Whareroa site. The spill of cheese whey (~190 m^3) was discharged though the marine outfall. Investigations found that the spill had occurred as a result of an unforseeable mechanical failure. An inspection of the marine outfall found no significant effects. A report was received from Fonterra demonstrating that there had been no breach of consent associated with the spill and that the contingency plan had been followed.

5) On 9 February 2013 self-notification was received concerning a skim milk discharge from the Whareroa plant via the outfall into the Tasman Sea. Investigation found that approximately 50 m^3 of skim milk had been discharged. Factory staff shut off the sump pumps as soon as possible and sucker trucks were used to remove the remaining product. At the time of inspection no significant visual affects were observed around the outfall.

6) On 23 February 2013 self notification was received from Fonterra regarding a milk spill (85 m^3) from a train to the Tasman Sea via the marine outfall. A milk train unexpectedly moved forward 5 m while unloading, resulting in milk from two wagons spilling to the ground and flowing to wastewater drainage. The remainder of the milk train cargo was transferred to the factory by road tanker. Due to the time of day that the spill occurred (early evening) no observation of the ocean outfall was made that day. A visual inspection of the outfall was made at 8.30 am the following morning and no significant visual affects were observed. The composite loss-monitoring sample taken of the effluent over the relevant 24-hour period showed no breach of consent limits.

7) On 22 April 2013 Fonterra notified Council that 40 m^3 of whole milk with a fat content of 3 to 5% had escaped the site due to a valve failure. Inspection found a small plume on the sea surface (approximately 100m x 50m). This was within consent conditions and no further monitoring or action was required.

8) Analysis of stormwater pond samples taken during routine monthly inspections towards the end of the 2012-2013 season (February, March, April and May) confirmed that a series of BOD non-compliances had occurred. An explanation was received from Fonterra on 2 May 2013 outlining extensive, on-going actions taken to address non-compliant stormwater discharges. These explanations were accepted and no further action was required.

3. Discussion

3.1 Discussion of plant performance and environmental effects

3.1.1 Water

3.1.1.1 Inspections

Regular inspections of the Whareroa site did not note any major areas of concern. Minor issues were resolved in a timely manner.

3.1.1.2 Abstractions

Throughout the 2012-2013 monitoring period, Fonterra was in compliance with conditions of the Company's consents to abstract water from the Tangahoe River. Water abstraction from the Tawhiti Stream complied with consent conditions. The minimum residual flow of 50 l/s in the Tawhiti Stream was maintained at all times, where the minimum flow recorded was 128 l/s on 9 March 2013.

Inspections showed no adverse effect on the appearance of the streams in connection with the discharge of back-washings from the mechanical pre-filters. In view of the demonstrated lack of effect of filter back-washings on the Tawhiti Stream and Tangahoe River, biological monitoring of those two streams was suspended after the 1999-2000 monitoring period. Should the results of inspection indicate any undue increase in rate of sand filter backwashing, or adverse effect of such discharges on those streams, the biological monitoring may recommence.

3.1.1.3 Wastewater discharge

Since June 1997, wastewater from the Whareroa dairy complex has been discharged through a 1,845 m long marine outfall. Previously, the wastewater was discharged at the low water mark.

A discharge of up to 40,000 m^3/day of dairy factory wastewater is provided for by consent **1450**. Changes to the consent in September 2006 added specific limits on the concentration of fats, suspended solids and COD. The consent also controls the environmental effects of the discharge by narrative standards placed on the effects of the discharge at the boundary of a mixing zone, no discharge of raw or treated milk, or milk products, cream, whey or whey permeate is allowed, except under emergency provisions defined in a contingency plan.

Remedial measures undertaken to reduce wastewater in recent years have included: increased level of resourcing in the loss monitoring/CIP optimisation personnel, installation of a second grade water system that reuses up to 3,000,000 litres/day of water, and a chemical recovery extension to the nitric acid cleaning system.
Over recent monitoring years, video surveillance has found that the new long outfall had performed according to design. The effluent field that formed above the diffuser moved parallel to the coast, and was not observed to impinge upon the shore. The plume was conspicuous (subjectively) for a small percentage of time.
Occasional surface films formed which did not impact adversely at the shore. There was no evidence of accumulation of material on the seabed near the outfall.
Monitoring of the wastewater discharge during the reporting period consisted of measurement of flow and chemical composition by the Company, occasional

sampling by the Council, and ecological monitoring of the effects of the discharge on the marine intertidal environment.

The limit on the daily volume of wastewater discharged was not exceeded during the 2012-2013 season. Results of wastewater composite monitoring (daily) by Fonterra showed that consent conditions were mostly complied with throughout the monitoring period. Suspended solids exceeded the limit imposed by the consent on one occasion.

Grab samples were collected by the Council on 12 occasions during the monitoring period and the results complied with consent conditions on all occasions.

An inter-laboratory comparison performed on two occasions found a generally good level of agreement between the Council laboratory and the Fonterra laboratory.

3.1.1.4 Marine ecological surveys

The results of the intertidal surveys over the 2012-2013 period (Appendix II) indicate that the combined Fonterra dairy factory and Hawera Oxidation Ponds wastewater discharge was not having detectable adverse effects on the intertidal communities at the Waihi Reef, 350 m NW of the outfall, Pukeroa Reef and 200 m SE of the outfall sites.

Treated wastewater from Hawera municipal oxidation ponds was introduced to the outfall in February 2001, under consent **5079** held by South Taranaki District Council (STDC). The Regional Council has carried out monitoring of shoreline water quality and shellfish to assess the effects of the addition. Although some high counts were obtained for faecal coliforms in mussel flesh, they were not linked to the municipal discharge. Details are given in the Council's annual report on the monitoring of Hawera municipal oxidation ponds (TRC report 13-93).

3.1.1.5 Stormwater discharges

There are three stormwater discharges from the Fonterra site. Each discharge flows into a detention pond system and then to a small stream. The northern stormwater discharges to a three-pond system, and then to an unnamed tributary of the Tawhiti Stream. The eastern stormwater discharges to a two-pond detention system and then to an unnamed tributary of the Tangahoe River. The southern stormwater discharges to a wetland and pond system and then to an unnamed coastal stream.

Chemical monitoring of each of the three stormwater discharges was undertaken on ten occasions during the reporting period. For the Northern Stormwater Pond discharge, there was only one exceedance of consent limits for suspended solids. Improvement on the monitoring results from previous years (i.e. prior to 2011) is likely due to changes to clean up procedures on site and extensive works on the stormwater system undertaken by Fonterra. Poorer results with respect to consent compliance were recorded for the Eastern Stormwater Pond discharge, where there were several consent breaches for pH (2), suspended solids (1), and BOD (4). The weakest compliance record was obtained for the Southern Stormwater Pond discharge where there were numerous consent breaches for suspended solids (1), and BOD (6) and carbonaceous filtered BOD (7).

Extensive work is planned for the Eastern and Southern Stormwater Ponds during 2014 and 2015 with the aim of improving water quality of the stormwater pond discharges.

Freshwater biomonitoring surveys were conducted in all three unnamed tributaries which receive the stormwater discharges. During the 2012-2013 dairy season the tributaries were surveyed on one occasion, with three sites in the Tangahoe, two in the Tawhiti and one in the unnamed coastal stream. The results of the May 2013 survey indicated a continuing recovery in the macroinvertebrate community in the unnamed tributary of the Tawhiti following the improvements made to the stormwater system by Fonterra in 2011. There was little evidence of any effects of the stormwater discharge on the macroinvertebrate communities recorded in all three unnamed tributaries.

It is noted that management of the three stormwater catchments within the site is specifically addressed in Fonterra's Environmental Management Manual, and that improvements are an ongoing process in which the Council is closely involved.

3.1.2 Air

Emissions to air were monitored through visual inspection, odour survey, gauging of milk powder deposition, measurement of ambient nitrogen concentration, and PM_{10} monitoring. Throughout the 2012-2013 dairy season, Fonterra was found to be compliant with conditions of the Company's consents to discharge emissions to air.

3.1.2.1 Results of discharge monitoring on receiving environment

Atmospheric particulate matter can arise from a number of sources, both natural and from human activity e.g., vegetation pollens, smoke and ash, sea spray, dust from soils and paved surfaces, and manufacturing processes. While extremely fine particles may remain floating in the atmosphere for weeks or months, coarser dusts may settle out within timeframes ranging from a few seconds to minutes.

Deposition gauging was conducted around the Whareroa site for the eighteenth year during the 2012-2013 monitoring period. The results from the deposition gauging indicated the highest values of TMPD at or outside the boundaries were recorded for sites downwind (in relation to the prevailing winds from the north-west quadrant) of the powder plants. The staff car park entrance (AIR002409) recorded significantly higher levels of milk powder compared with the other sites. Levels recorded were similar to those for previous years, and peaked around October through to December, around the peak time of maximum milk powder production. These results continue the trend over recent years of improvement in the rate of TMPD since the 1997-1998 monitoring period. This improvement is credited to the success of the Powder 4 wet scrubber in 1997, the upgrade of Powder 2 plant in 2000, and improved management practices.

Powder emission analysis was undertaken at the Whareroa site by consultants to Fonterra. All stacks tested were below the consent limit for consent 4103 of 125 mg/m^3 for gas flow on powder emissions to the atmosphere from the spray drying process cyclone exhaust.

The NO_x levels recorded during the 2012-2013 monitoring period were generally similar to the levels recorded since 1997, when the second co-generation plant was commissioned. Results of both the one-hour and 24-hour averages were well within the limits prescribed by consent 6273 (i.e. not exceeding 200 µg/m^3 and 100 µg/m^3 respectively).

3.1.2.2 Reporting

Condition 4 of consent 6273 requires:

> The consent holder shall provide to the Council within five years from the granting of this consent and every six years thereafter a written report:
>
> a) reviewing any technological advances in the reduction or mitigation of emissions, how these might be applicable and/or implemented at the Whareroa site, and the costs and benefits of these advances;
>
> b) detailing an inventory of emissions from the site of such contaminants as the Chief Executive, Taranaki Regional Council, may from time to time specify following consultation with the consent holder;
>
> c) detailing any measures that have been taken by the consent holder to improve the energy efficiency of the Whareroa site; and
>
> d) addressing any other issue relevant to the minimisation or mitigation of emissions from the Whareroa site that the Chief Executive, Taranaki Regional Council, considers should be included.

This report was due in October 2011 and has not yet been received from Fonterra. This matter was being followed up by Council officers at the end of the period under review.

3.2 Evaluation of performance

A summary of the Company's compliance record for the year under review is set out in Tables 17-40.

Table 17 Summary of performance for Consent 0047 - to take water from Tawhiti Stream for use in manufacturing, cleaning and cooling

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Minimum river flow	Council's telemetered sites	Yes
2. Maintenance of a measuring device for recording daily rates of abstraction	Results are forwarded to the Council and reviewed by Council officers	Yes
3. Reserved right to temporarily suspend abstraction		N/A
4. Optional review provision re environmental effects	No further reviews available	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Limited rate of abstraction under certain flow and turbidity conditions	Council's telemetered sites	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 18 Summary of performance for Consent 1450 - discharge of dairy factory wastewater into the Tasman Sea

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge of lactose solids managed in accordance with application	Not discharged during period under review	N/A
2. Approx 400m^3 lactose solids to be discharged prior to 1 August 2007	Not discharged during period under review	N/A
3. Removal of whey from wastewater	LOSS monitoring and Council composite inter-lab samples	Yes
4. Maintenance of a waste minimisation programme	LOSS monitoring	Yes
5. Limits on wastewater	LOSS monitoring, physicochemical monitoring	Mostly
6. Installation of an outfall extension	Outfall extended in 1997	Yes
7. Design details for outfall extension		N/A
8. Discharge cannot cause specified adverse effects beyond mixing zone	Visual inspections	**No** **Discharge beyond 200m mixing zone** **See Photograph 10**
9. Discharge complies with specified quality standards (prior to construction of outfall		N/A
10. Discharge of domestic sewage not permitted	Outfall samples tested for faecal indicator bacteria levels	Yes
11. Implementation of a contingency plan for action to be taken in the event of a spillage	Contingency plan submitted to Council	Yes
12. Installation of a pipeline monitoring system	The Company carries out an annual dive inspection of the entire length of the outfall pipeline. As a result of this inspection, any necessary repairs of maintenance works are carried out. Dive inspection was carried out on 28January 2013.	Yes
13. Review of technological advancements in dairy wastewater management	Fonterra submitted report to Council	Yes
14. Regular consultation with interested parties	Re-consenting meeting held in May 2013	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
15. Optional review provision re adverse effects attributable to discharge	No further reviews available, expires June 2015	N/A
16. Optional review provision re environmental effects		N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Good**

N/A = not applicable

Table 19 Summary of performance for Consent 3902-discharge of stormwater into Tangahoe River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Wastewater or processing waste not permitted in stormwater	Physicochemical sampling and freshwater biomonitoring surveys	Yes
2. Stormwater diverting facilities operated in accordance with consent	Site inspections	Yes
3. Retention ponds to treat stormwater prior to discharge	Site inspections	Yes
4. Implementation of a contingency plan for action to be taken in the event of a spillage	Plan submitted and reviewed by Council officers	Yes
5. Discharge occurs at the end of retention pond system	Site inspections	Yes
6. Discharge cannot cause specified adverse effects beyond mixing zone	Site inspections and freshwater biomonitoring surveys	**No** **Sewage fungus present** **See Photograph 6**
7. Limits on chemical composition of discharge	Physicochemical analysis	**No** **Multiple breaches: pH x2 , SS x1, BOD x 4**
8. Fencing and planting of riparian margin to mitigate effects of discharge	Area has been fenced and planted	Yes
9. Limit on carbonaceous BOD of 2.0 gm^{-3} in eight out of ten samples	Physicochemical analysis	Yes
10. Optional review provision re environmental effects	Next optional review in June 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Poor**

N/A = not applicable

Table 20 Summary of performance for Consent 3907- discharge of stormwater into Tawhiti Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge not to exceed 850 l/sec		Yes
2. Wastewater or processing waste not permitted in stormwater	Physicochemical sampling and freshwater biomonitoring surveys	Yes
3. Stormwater diverting facilities operated in accordance with consent	Site inspections	Yes
4. Retention ponds to treat stormwater prior to discharge	Site inspections	Yes
5. Implementation of a contingency plan for action to be taken in the event of a spillage	Plan submitted and reviewed by Council officers	Yes
6. Discharge occurs at the end of retention pond system	Site inspections	Yes
7. Discharge cannot cause specified adverse effects beyond mixing zone	Site inspections and freshwater biomonitoring surveys	Yes
8. Limits on chemical composition of discharge	Physicochemical analysis	**No Breach: SS x1**
9. Limit on carbonaceous BOD of 2.0 gm^{-3} in eight out of ten samples	Physicochemical analysis	Yes
10. Optional review provision re environmental effects	Next optional review in June 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Good**

N/A = not applicable

Table 21 Summary of performance for Consent 4103 – discharge to air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to prevent or minimise adverse effects	Review of contingency and management plans and air quality monitoring	Yes
2. Measures representing best practicable option may be reviewed		N/A
3. Any alterations to the plant, processes or operations must be approved by Council	No alterations	N/A
4. Written report with regard to emissions, improvements and mitigation within 5 years and every 6 thereafter	Report submitted 9 July 2013	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. BPO to minimise environmental effects		Yes
6. Use of most appropriate process equipment and controls to minimise emissions and impacts	Report detailing emissions and technology received	Yes
7. Powder emissions to atmosphere <125mg/m^3	Air quality monitoring, review of emission data from site	Yes
8. Limits on depositions beyond boundary	Air quality monitoring	Yes
9. PM_{10} not to exceed 50 µg/m^3	Air quality monitoring	Yes
10. No odour at or beyond boundary	Inspections	Yes
11. Monitoring of emissions	Air quality monitoring	Yes
12. Annual meeting with Council and submitters	Meeting undertaken with interested parties	Yes
13. Powder 5 can only process skim milk powder if Council are given 5 days notice and a monitoring programme for the emissions is developed		N/A
14. Review of conditions if Condition 13 activated		N/A
15. Council may review consent for the purpose of dealing with any adverse effects	Next optional review in June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 22 Summary of performance for Consent 4133 - discharge of stormwater to unnamed coastal stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge not to contain processing wastes, industrial or domestic wastewater	Physicochemical sampling	Yes
2. Stormwater diverting facilities operated in accordance with consent	Site inspections	Yes
3. Retention ponds to treat stormwater prior to discharge	Pond system present	Yes
4. Implementation of a contingency plan for action to be taken in the event of a spillage	Plan received	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Discharge point at the end of retention pond system		N/A
6. Discharge cannot cause specified adverse effects beyond mixing zone	Site inspections, physicochemical sampling and freshwater biomonitoring surveys	Yes
7. Limits on chemical composition of discharge	Physicochemical analysis	**No** **Multiple breaches: SS x3, BOD x 6**
8. Fencing and planting of riparian margin to mitigate effects of discharge	Site inspections	Yes
9. Limit on carbonaceous BOD of 2.0 gm^{-3} in eight out of ten samples	Physicochemical analysis	**No** **Multiple breaches: BODCF x 7**
10. Optional review provision re environmental effects	Next optional review in June 2014	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Poor**

N/A= not applicable

Table 23 Summary of performance for Consent 4406 - discharge of laboratory wastes onto land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of action likely to minimise adverse effects on the environment	Management plan reviewed by Council officers	Yes
2. Enacted in accordance with the terms of the application	No longer disposed of to land	N/A
3. Limitations on size of discharge	No longer disposed of to land	N/A
4. Management plan for discharge site provided	Reviewed by Council officers	Yes
5. Siting of discharge pits	No longer disposed of to land	N/A
6. Limitations on placing of discharge sites	No longer disposed of to land	N/A
7. Disposal pits cannot intercept water table	No longer disposed of to land	N/A
8. Contaminants entering other bodies of water not permitted	No longer disposed of to land	N/A
9. Cannot lead to adverse impacts on surrounding bodies of water	No longer disposed of to land	N/A
10. Items permitted to be discharged	No longer disposed of to land	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. Earth cover over discharge	No longer disposed of to land	N/A
12. Soil and vegetation cover over pits	No longer disposed of to land	N/A
13. Maintenance of soil cover	No longer disposed of to land	N/A
14. Records to be kept on pit usage	No longer disposed of to land	N/A
15. Optional review provision re environmental effects	Next optional review in June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A consent not currently in use**

N/A = not applicable

Table 24 Summary of performance for Consent 4508 – abstraction of water from Tangahoe

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Reserved right to temporarily suspend abstraction		N/A
2. Maintenance of a measuring device for recording daily rates of abstraction	Measuring device is well maintained	Yes
3. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 25 Summary of performance for Consent 4927 - discharge of river silt and sand

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge operated on a continuous purge basis	Management plan was reviewed	Yes
2. Raising the suspending solids of the receiving water not permitted	Freshwater biomonitoring originally took place but was stopped due to no adverse effects	Yes
3. Adverse effects not to be present below discharge	Management plan and inspections	Yes
4. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 26 Summary of performance for Consent 4953 - erect, place and maintain earth dams

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Safe maintenance and operation of dams	Management plan and site inspections	Yes
2. Notification of maintenance work		N/A
3. Prevention of discharge into the watercourse during maintenance		N/A
4. Removal of structures when no longer required		N/A
5. Optional review provision re environmental effects	No further reviews available, expires June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 27 Summary of performance for Consent 4977 - erect, place and maintain marine outfall

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification of maintenance work		N/A
2. Construction and maintenance in accordance with documentation		N/A
3. Adoption of action likely to minimise adverse effects on the environment		N/A
4. Reinstatement of intertidal construction area		N/A
5. Visibility of outfall pipeline	Site inspections	Yes
6. Removal of outfall pipeline when no longer required		N/A
7. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 28 Summary of performance for Consent 5013 - construction and maintenance of a rock seawall

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to maintenance works		N/A
2. To be constructed and maintained in accordance with the application		N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Minimisation of disturbance to seabed and foreshore		N/A
4. Revegetation following the completion of the wall		N/A
5. Monitoring of erosion	Marine ecological inspections	Yes
6. Compensation to neighbours in the event of loss of land from erosion		N/A
7. Removal of rock wall when no longer required		N/A
8. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 29 Summary of performance for Consent 5015 - damming of unnamed stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to maintenance works	No works undertaken during period under review	N/A
2. To be constructed and maintained in accordance with the application		Yes
3. Minimisation of discharge of contaminants		N/A
4. Removal of dam when no longer required		N/A
5. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A consent not in use during period under review**

N/A = not applicable

Table 30 Summary of performance for Consent 5016 - diversion of unnamed stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to maintenance works	No works undertaken during period under review	N/A
2. To be constructed and maintained in accordance with the application		N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Minimisation of discharge of contaminants		N/A
4. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A consent not in use during period under review**

N/A = not applicable

Table 31 Summary of performance for Consent 5017 - to drain and excavate an unnamed stream, and erect and use an outfall on the streambed

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to maintenance works	No works undertaken during period under review	N/A
2. To be constructed and maintained in accordance with the application		Yes
3. Natural colour of outfall		Yes
4. Revegetation of site following construction		Yes
5. Removal of dam when no longer required		N/A
6. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A consent not in use during period under review**

N/A = not applicable

Table 32 Summary of performance for Consent 5036 - discharge of waste material onto land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of action likely to minimise adverse effects on the environment	Review of management plan	Yes
2. To be constructed and maintained in accordance with the application	Site inspections	Yes
3. Maximum discharge volume	Site inspections and management plan	Yes
4. Approval of a management plan	Reviewed by Council officers	Yes
5. Limitations on placing of discharge sites	Site inspections	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Disposal pits intercepting the water table no permitted	Site inspections	Yes
7. Contaminants entering other bodies of water not permitted	Site inspections	Yes
8. Cannot lead to adverse impacts on surrounding bodies of water	Site inspections	Yes
9. Earth cover over discharge	Site inspections	Yes
10. Removal of liquid from disposal pit	Site inspections	Yes
11. Only authorised material to be discharged to disposal pits	Management plan and site inspections	Yes
12. Thickness of soil cover	Site inspections and requirements in management plan	Yes
13. Maintenance of cover soil layer	Site inspections	Yes
14. Record of pit usage	Report provided for the 2012-2013 year	Yes
15. Optional review provision re environmental effects	Next optional review in June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 33 Summary of performance for Consent 5044 - discharge of emissions into air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of action likely to minimise adverse effects on the environment	Set out in management plan and emission report submitted to Council	Yes
2. To be constructed and maintained in accordance with the application	Site inspections	Yes
3. Approval of a management plan	Reviewed by Council officers	Yes
4. Discharges resulting in no objectionable odours at site boundary	Site inspections	Yes
5. Characteristics of an objectionable odour		N/A
6. Optional review	Next optional review in June 2016	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 34 Summary of performance for Consent 5143 - erect, place and maintain and use a water intake structure

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to maintenance works		N/A
2. To be constructed and maintained in accordance with the application		Yes
3. Adoption of action likely to minimise adverse effects on the environment	Requirements of the management plan and visited during site inspections	Yes
4. Minimisation of disturbance to the riverbed	Management plan and site inspections	Yes
5. Removal of infrastructure when no longer required		N/A
6. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 35 Summary of performance for Consent 5148 - discharge of river silt and sand

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge operated on a continuous purge basis	Management plant	Yes
2. Discharge cannot cause specified adverse effects beyond mixing zone	Site inspections and previous freshwater biomonitoring surveys	Yes
3. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 36 Summary of performance for Consent 5337 - to dam an unnamed tributary of the Tawhiti Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to maintenance works		N/A
2. Adoption of action likely to minimise discharge of contaminants and adverse effects on the environment	Management plan and site inspections	Yes
3. Safe operation and maintenance of the dam		N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Optional review provision re environmental effects	No further reviews available, expires June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 37 Summary of performance for Consent 5845 - removal, reconstruction and maintenance of a dam (with fish pass)

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification before removal of structure		N/A
2. Notification before maintenance work		N/A
3. To be constructed and maintained in accordance with the application		Yes
4. Adoption of action likely to minimise discharge of contaminants and adverse effects on the environment	Management plan and site inspection	Yes
5. Adoption of action likely to minimise discharge of contaminants and adverse effects on water quality	Reviewed in management plan	Yes
6. Minimisation of disturbance to streambed		N/A
7. Reinstatement of disturbed areas		Yes
8. Obstruction if fish passage not permitted	Fish pass constructed	Yes
9. Design of fish passage required prior to construction		N/A
10. Screening of intake		Yes
11. Maintenance of structures		Yes
12. Reinstatement of area after structure no longer required		N/A
13. Optional review provision re environmental effects	No further reviews available, expires June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

Table 38 Summary of performance for Consent 6257 – emissions to air from fuel centre

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option to prevent or minimise adverse environmental effects	Consent not yet exercised	N/A
2. Exercise of consent in accordance with application	Consent not yet exercised	N/A
3. Characteristics of coal similar to that described in application	Consent not yet exercised	N/A
4. Report on best practicable option within 3 months of commissioning	Consent not yet exercised	N/A
5. Review of measures relating to best practicable option	Consent not yet exercised	N/A
6. Minimisation of emissions	Consent not yet exercised	N/A
7. Minimum height of discharges 60 m	Consent not yet exercised	N/A
8. Approval from Council prior to plant alterations	Consent not yet exercised	N/A
9. Discharges not to exceed 20% obscuration	Consent not yet exercised	N/A
10. Discharges of particulate not to exceed 100 mg/Nm^3	Consent not yet exercised	N/A
11. Sulphur dioxide discharges not to exceed 385 kg/hr	Consent not yet exercised	N/A
12. Discharges of particulate not to exceed 43 kg/hr	Consent not yet exercised	N/A
13. Discharges of nitrogen oxides not to exceed 319 kg/hr	Consent not yet exercised	N/A
14. Maximum ground level concentration of sulphur dioxide not to exceed 350 mg/m^3	Consent not yet exercised	N/A
15. Maximum ground level concentration of nitrogen dioxide not to exceed 350 mg/m^3	Consent not yet exercised	N/A
16. Maximum ground level concentration of PM_{10} not to exceed 50 mg/m^3	Consent not yet exercised	N/A
17. Maximum ground level concentration of each or any metal not to exceed guideline values	Consent not yet exercised	N/A
18. Maximum ground level concentration of other contaminants not to exceed workplace exposure standards	Consent not yet exercised	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
19. Discharges not to give rise to significant ecological effects	Consent not yet exercised	N/A
20. Analysis of coal on a monthly basis	Consent not yet exercised	N/A
21. Consent holder to install and maintain various measuring devices	Consent not yet exercised	N/A
22. Consent holder to undertake annual source emission monitoring	Consent not yet exercised	N/A
23. Monitoring programme prepared	Provisional programme in place	Yes
24. Reporting regarding advances in technology	Consent not yet exercised	N/A
25. Reporting regarding emissions	Due 12 months from exercise of consent	N/A
26. Cultural impact report	Due 12 months from exercise of consent	N/A
27. Consent holder to undertake annual liaison meetings	Within 12 months of commissioning of energy centre	N/A
28. Consent lapse		N/A
29. Review of conditions	Next optional review in June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A Consent not yet exercised**

N/A = not applicable

Table 39 Summary of performance for Consent 6273 – emissions to air from Cogen I and II

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practical option to minimise adverse effects on environment	Site inspections, report as required by condition 4	Yes
2. Review of best practical option measures	No review undertaken	N/A
3. Approvals to be obtained for alterations	No alterations during period under review	N/A
4. Report on emissions and new technologies	First report due by October 2011, every 6 years thereafter	**No. Report not received**
5. Carbon monoxide < 10 mg/m^3 (8 hour exposure) or <30 mg/m^3 (one-hour exposure)	Not monitored during period under review	N/A
6. Sum of nitrogen oxides not to exceed 48 g/s	Not monitored during period under review	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
7. Nitrogen dioxide not to exceed 200 µg/m^3 (one-hour average) or 100 µg/m^3 (24-hour average)	Air quality monitoring	Yes
8. PM_{10} not to exceed 50 µg/m^3 (24-hour average)	Air quality monitoring	Yes
9. Control of emissions so that max concentration of any contaminant is not increased by more than 1/30th of the relevant Workplace Exposure Standard	Not monitored during period under review	N/A
10. Minimum height of discharge 17.5m above ground		Yes
11. Minimisation of emissions and impacts by selection of most appropriate equipment etc.	Air quality monitoring As discussed in Report required by condition 4	Yes
12. Consent holder to undertake monitoring of emissions and their effects	Monitoring plan in place	Yes
13. No emissions of visible smoke or plume of water vapour	Inspections	Yes
14. Water treatment regime to the satisfaction of Council	Inspections	Yes
15. Optional review of consent	Next optional review in June 2015	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Improvement Required**

N/A = not applicable

Table 40 Summary of performance for Consent 7465 – emissions to air from combustion of wood

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Only untreated timber packaging to be burned	Site inspections	Yes
2. Total volume not to exceed 4m^3	Site inspections	Yes
3. Best practicable option to minimise environmental effects	Site inspections	Yes
4. Regard to wind and weather conditions	Site inspections	Yes
5. Discharge not to give rise to contaminants beyond boundary	No complaints received	Yes
6. Discharge not to give rise to odour beyond the boundary	No complaints received	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
7. Records to be maintained of burning events		Yes
8. Consent lapse if not given effect before 2014	Activity undertaken	N/A
9. Optional review of consent	Next scheduled optional review in June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**

N/A = not applicable

During the 2012-2013 year, the Company demonstrated a variable level of environmental performance that requires improvement for certain consents (in particular those relating to stormwater discharges). During the year under review there were eight incidents associated with the Whareroa site (five incidents linked with milk spills requiring disposal of product via the marine outfall, two incidents involving stormwater pond non-compliances and one incident requiring the disposal of milk permeate to land). One Infringement Notice was issued during the 2012-2013 period relating to non-compliant stormwater discharge.

Water abstraction from the Tawhiti Stream and from the Tangahoe River were in accordance with consent conditions.

Wastewater discharge volume complied with conditions of consent 1450. Monitoring of the wastewater showed that discharges were mostly within consent conditions.

An inter-laboratory comparison between the Council and Fonterra showed an acceptable level of agreement between the Council laboratory and the Fonterra laboratory.

The results of the marine ecological monitoring over the 2012-2013 period (Appendix II) did not indicate that adverse effects were occurring at Waihi Reef, Pukeroa Reef, 350m NW or 200m SE sites, as a result of the combined Fonterra and Hawera Oxidation Ponds wastewater discharge.

Stormwater monitoring showed that in the Northern Stormwater Pond the discharge was, on most occasions, in compliance with the consent conditions. A greater number of non-compliant discharges were recorded in the Southern and Eastern Stormwater Ponds. Since the 2010-2011 monitoring period Fonterra has implemented additional monitoring, procedural changes, and changes on site to address issues with high suspended solids and BOD in the stormwater. The results from the period under review indicate that these measures have been successful in relation to the Northern Stormwater Pond. Fonterra are planning future work on the Southern and Eastern Stormwater Ponds in order to improve the quality of discharge to the receiving environment.

Macroinvertebrate surveys undertaken during the monitoring period indicated continued recovery in the macroinvertebrate community in the unnamed tributary of

the Tawhiti following the improvements made to the stormwater system by the Company in 2011. There was little evidence of any effects of the stormwater discharge on the macroinvertebrate communities in the unnamed tributaries of the Tangahoe and the unnamed coastal stream.

Emissions to air were in compliance with consent conditions and relevant air quality guidelines.

A cultural impact report, as required by condition 26 of consent **6257** will be due after the consent has been exercised.

3.3 Recommendations from the 2011-2012 Annual Report

In the 2011-2012 Annual Report, it was recommended:

1. THAT monitoring of air emissions from the Whareroa plant in the 2012-2013 year continues at the same level as in 2011-2012.

2. THAT monitoring of water discharges (including stormwater) and abstractions for the Whareroa plant in the 2012-2013 year continues at the same level as in 2011-2012.

3. THAT freshwater and marine ecological monitoring in the 2012-2013 year continues at the same level as in 2011-2012.

4. THAT combined inspections of the Whareroa plant for monitoring of air emissions and of water abstractions and discharges in the 2012-2013 year continues at the same level as in 2011-2012.

These recommendations were all implemented.

3.4 Alterations to monitoring programmes for 2013-2014

In designing and implementing the monitoring programmes for air and water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, the obligations of the RMA in terms of monitoring emissions, 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 Whareroa site, the programme for 2012-2013 was unaltered from 2011-2012.

It is proposed that the monitoring programme for 2013-2014 remain unaltered from that of 2012-2013.

A recommendation to this effect is attached to this report.

4. Recommendations

1. THAT monitoring of air emissions from the Whareroa plant in the 2013-2014 year continues at the same level as in 2012-2013.

2. THAT monitoring of water discharges (including stormwater) and abstractions for the Whareroa plant in the 2013-2014 year continues at the same level as in 2012-2013.

3. THAT freshwater and marine ecological monitoring in the 2013-2014 year continues at the same level as in 2012-2013.

4. THAT combined inspections of the Whareroa plant for monitoring of air emissions and of water abstractions and discharges in the 2013-2014 year continues at the same level as in 2012-2013.

Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Anlene	Arange of dairy products enriched with a scientifically-formulated complex of essential bone nutrients. These include vitamin D, zinc, magnesium and, in New Zealand and Asia Phyto K or Phylloquinone, which acts to lock in bone nutrients. Anlene is available in 13 countries across Asia and Australasia. In New Zealand it is available as a fresh low-fat milk drink and yoghurt.
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.
Casein	Either acid casein or rennet casein. Acid casein is produced by the controlled acidification of pure, pasteurised skim milk to pH 4.6. Acidification is achieved by the addition of a mineral acid or lactic fermentation. Rennet casein is produced by the controlled precipitation of casein from pure, pasteurised skim milk through the action of rennet. Casein is suitable for making nutritional foods and processed cheese. Casein also has a long history of use in non-food applications such as paper and cardboard coating, adhesives, leather tanning and plastics.
BODCF	Carbonaceous filtered 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.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
E.coli	*Escherichia coli*, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
Free Cl_2	Free available chlorine.
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.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident
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.
MPC	Milk protein concentrates. Manufactured by membrane filtration through which dairy proteins are isolated from fresh skim milk. Milk protein concentrates are used in infant formula, adult medical foods, enteral foods, weight management products, liquid nutritional beverages, cheese products, cultured foods, powdered dietary supplements, and sports nutrition products.
NO_x	Nitrogen oxides in emissions to air.
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).
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	<easurement of both physical properties(e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PLC	Programmable Logic Controller, a type of computer with multiple input and output arrangements commonly used in industry for automation of processes.
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.
SMP	Skim milk powder.
$SQMCI_5$	Tkes into account taxa abundances as well as sensitivity to pollution.
SS	Suspended solids.
TDMP	Total deposited milk powder.
Temp	Ttemperature, measured in °C.
Total Cl_2	Ttotal available chlorine.
UI	Unauthorised Incident.
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
WMP	Whole milk powder.
WPC	Whey protein concentrates are manufactured from fresh whey by membrane filtration processes. They are suitable for use in a variety of applications such as yoghurts, beverages, dairy desserts and meat systems, nutritional products and infant food.

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

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Appendix I

Resource consents held by Fonterra Whareroa

Consent 0047-3

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Water Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Change To Conditions Date:	22 May 1998 [Granted: 1 May 1996]

Conditions of Consent

Consent Granted:	To take up to 30,000 cubic metres/day [347 litres/second] of water from the Tawhiti Stream in the Tangahoe Catchment for processing and manufacture of dairy products, cleaning of plant and cooling purposes, provided the total abstraction in the Tangahoe Catchment by the consent holder does not exceed 30,000 cubic metres/day at any time at or about GR: Q21:229-780
Expiry Date:	1 June 2015
Review Date(s):	June 1999, June 2004
Site Location:	Main South Road Hawera
Legal Description:	Lot 1 DP 3710 Pt Lot 1 DP 2629 Lot 1 DP 1087 Blk X Hawera SD
Catchment:	Tangahoe
Tributary:	Tawhiti

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That the abstraction shall be managed to ensure that a flow of not less than 50 litres/second is maintained at all times in the Tawhiti Stream, as measured at the flow recorder site at or about Q21:243-773.

2. That the consent holder shall maintain, to the satisfaction of the Chief Executive, Taranaki Regional Council, a measuring device capable of recording daily rates of abstraction and shall make such records available to the Chief Executive, Taranaki Regional Council, upon request.

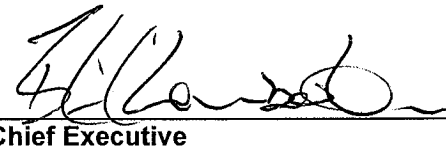
3. That the Taranaki Regional Council reserves the right to temporarily suspend or reduce the abstraction during extreme low flow events, in order to protect the biological communities in the stream, in accordance with section 329 of the Resource Management Act 1991.

4. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 1999 and/or June 2004 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the abstraction on the environment.

5. That all times when the flow in the Tawhiti Stream, as measured at the flow recorder site at or about Q21:243-773, is less than 800 litres/second, and, when the turbidity of the Tangahoe River at or about Q21:258-742 is less than 150 nephelometric turbidity units [NTU], then, the maximum rate of abstraction shall not exceed 184 litres/second.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council



Chief Executive

Consent 0439-3

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Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited P O Box 444 HAWERA 4640
Consent Granted Date:	25 June 2010

Conditions of Consent

Consent Granted:	To discharge treated farm dairy effluent from an oxidation pond treatment system into the Motumate Stream at or about (NZTM) 1697539E-5627105N
Expiry Date:	1 December 2029
Review Date(s):	June 2017, June 2023
Site Location:	Manaia Road, Manaia
Legal Description:	Lot 1 DP 6039 Blk III Waimate SD
Catchment:	Motumate

Treatment/Discharge System[s]:

three oxidation ponds:	length	width	depth	[metres]
anaerobic:	40	20	4.5	
first aerobic:	40	18	1.2	
second aerobic:	40	17	1.2	

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The effluent discharged shall be from the milking of no more than 450 cows.

2. The discharge point shall be located at or about 1697320E-5627191N.

3. A minimum dilution rate of 1 part effluent to 100 parts receiving water shall be maintained at all times in the receiving water at the point of discharge.

4. After treatment in an oxidation pond treatment system, the concentrations of the constituents shown in the table below shall not be exceeded in the effluent discharged:

Constituent	Concentration
Total carbonaceous BOD_5	110 gm^{-3}
Suspended solids	100 gm^{-3}

5. After allowing for mixing, within a mixing zone extending 4 metres downstream of the discharge point, the discharge shall not cause the concentrations shown in the following table to be exceeded:

Constituent	Concentration
Unionised ammonia	0.025 gm^{-3}
Filtered carbonaceous BOD_5	2.0 gm^{-3}

6. After allowing for mixing, within a mixing zone extending 4 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving water:

   (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   (b) any conspicuous change in the colour or visual clarity;
   (c) any emission of objectionable odour;
   (d) the rendering of fresh water unsuitable for consumption by farm animals;
   (e) any significant adverse effects on aquatic life, habitats or ecology;
   (f) the generation of undesirable heterotrophic growths [sewage fungus].

7. The treatment and discharge system shall be designed, managed, operated and regularly maintained to ensure that the conditions of this consent are met.

8. Where, for any cause [accidental or otherwise], untreated or partially treated effluent associated with the consent holder's operations escapes to surface water, the consent holder shall:

   (a) immediately notify the Taranaki Regional Council on Ph 0800 736 222 [notification must include either the consent number or farm dairy number]; and
   (b) stop the discharge and immediately take steps to control and stop the escape of untreated or partially treated effluent to surface water; and
   (c) immediately take steps to ensure that a recurrence of the escape of untreated or partially treated effluent to surface water is prevented; and
   (d) report in writing to the Chief Executive, Taranaki Regional Council, describing the manner and cause of the escape and the steps taken to control it and to prevent it reoccurring. The report shall be provided to the Chief Executive within seven [7] days of the occurrence.

9. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2017 and/or June 2023, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this consent, which either were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 25 June 2010

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 1450-2

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Coastal Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Change To Conditions Date:	29 June 2007 [Granted: 12 September 1995]

Conditions of Consent

Consent Granted:	To discharge up to 40,000 cubic metres per day of dairy factory wastewater from the Whareroa Dairy Factory Complex and to temporarily discharge lactose solids from Fonterra Kapuni via a marine outfall into the Tasman Sea at or about GR: Q21:214-747
Expiry Date:	1 June 2015
Review Date(s):	June 2007, June 2010
Site Location:	Tasman Sea, Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 & Foreshore Blks IX & X Hawera SD
Catchment:	Tasman Sea

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

Conditions 1 and 2 - new

1. The discharge of lactose solids shall be managed in accordance with the documentation submitted in support of application 4679 [dated 5 June 2007]. In the case of any contradiction between the documentation submitted in support of application 4679 and the conditions of this consent, the conditions of this consent shall prevail.

2. Lactose solids from the Fonterra Kapuni site, with a volume of approximately 400 m^3, may be discharged before 1 August 2007. No other discharge of lactose from the Kapuni site is authorised.

Conditions 3 to 16 – unchanged (previously conditions 1 to 14)

3. All whey and whey permeate shall be removed from the wastewater to the satisfaction of the Chief Executive, Taranaki Regional Council, by 31 December 1996, except as provided for in condition 11.

4. The consent holder shall maintain, to the satisfaction of the Chief Executive, Taranaki Regional Council, a loss minimisation programme to reduce product losses to wastewater throughout the term of this consent.

5. Wastewater may include all wastewater from dairy factory processes and associated processes, and stormwater, and shall comply with the following standards, based on analysis of 24 hour composite time-proportioned samples:

suspended solids	≤ 1,000 milligrams/litre
total fats	≤ 800 milligrams/litre
chemical oxygen demand [COD]	≤ 7000 milligrams/litre

6. The consent holder shall, by 31 August 1996, or such later time before 31 August 1997 as the Chief Executive, Taranaki Regional Council, may approve, install an outfall extension to the satisfaction of the Chief Executive, Taranaki Regional Council, which will result in the achievement of no significant visual, chemical or ecological impacts attributable to the discharge, outside a mixing zone, established in condition 8, or above mean low water spring level.

7. The consent holder shall supply plans and design details for the outfall extension and diffuser to the satisfaction of the Chief Executive, Taranaki Regional Council, by 28 February 1996.

8. Following the outfall extension, the discharge authorised by this consent shall not give rise to any of the following effects in the Tasman Sea beyond a mixing zone of 200 metres from the centre line of the outfall diffuser:

   a) the production of conspicuous oil or grease films, scums or foams, or floatable suspended materials;
   b) any conspicuous change in the colour or visual clarity
   c) any emission of objectionable odour;
   d) any significant adverse effects on aquatic life.

9. Up to such time as an outfall extension is installed and operational, the discharge shall comply with the following standards, based on analysis of 24-hour flow-proportioned samples:

suspended solids	< 1,000 milligrams/litre
fats [total]	< 600 milligrams/litre
pH within range	4.5 - 11.5

10. There shall be no direct discharge of raw or treated domestic sewage from the Whareroa site pursuant to this consent.

11. The consent holder shall provide for written approval of the Chief Executive, Taranaki Regional Council, a contingency plan outlining all procedures to be undertaken in the event of a spillage of stored chemicals, accidental discharge, accumulation of off-specification effluent or accumulation under emergency conditions of whey or whey permeate which, if discharged, would result in the breaching of other conditions of this consent; such a plan to be in the hands of the Chief Executive, Taranaki Regional Council, no later than 1 December 1995.

12. The consent holder shall install, to the satisfaction of the Chief Executive, Taranaki Regional Council, a system to monitor pipeline structural performance.

13. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, a report reviewing any technological advances in dairy wastewater management and how these might be applicable at the Whareroa site, and detailing any measures taken by the consent holder to improve or minimise the wastewater discharge.

14. The consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with representatives of Tangahoe Iwi, Ngati Ruanui Iwi and other submitters to the consent, and any other interested party, at the discretion of the Chief Executive, Taranaki Regional Council, to discuss any matter relating to the exercise of this resource consent, in order to facilitate ongoing consultation.

15. The Taranaki Regional Council may review, under section 128 of the Resource Management Act 1991, the conditions of this consent if, at any time after the outfall extension is installed, any significant visual, chemical or ecological impacts attributable to the discharge occur beyond a mixing zone established in condition 8 or above mean low water spring level.

16. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2007 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 29 June 2007

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA 4640
Decision Date [review]:	7 November 2011
Commencement Date [review]:	7 November 2011 [Granted: 9 June 1999]

Conditions of Consent

Consent Granted:	To discharge up to 6,825 cubic metres/day [500 litres/second] of stormwater from a milk processing industry site into an unnamed tributary of the Tangahoe River at or about (NZTM) 1711850E-5615068N
Expiry Date:	1 June 2016
Review Date(s):	June 2012, June 2014
Site Location:	Whareroa Road, Hawera
Legal Description:	Pt Sec 235 Pt Lot DP 2777 Blk X Hawera SD
Catchment:	Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. That the discharge shall not contain processing wastes, or industrial or domestic wastewater.

2. That facilities capable of diverting contaminated stormwater, that arises as a result of the initial effects of a rainfall event, from the site to the marine outfall shall be operated and maintained in order to meet the conditions of this consent.

3. That the consent holder shall provide two retention ponds to treat the stormwater prior to discharge. This pond system shall be maintained and operated in order to meet the conditions of this consent.

4. That the consent holder shall maintain a contingency plan, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent, and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. This contingency plan shall be updated on an annual basis.

5. That the point of discharge shall be taken as being the point where the stormwater discharges at the end of the retention pond system.

6. That after allowing for reasonable mixing, within a mixing zone extending 50 metres below the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters:

   a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   b) any conspicuous change in the colour or visual clarity;
   c) any emission of objectionable odour;
   d) the rendering of fresh water unsuitable for consumption by farm animals;
   e) any significant adverse effects on aquatic life, habitats or ecology; and
   f) any visible bacterial and/or fungal growths.

7. That the discharge shall not exceed the following limits at all times:

Oil and grease [Freon extractable]	5 gm-3
pH	6.0-9.0
Suspended solids	30 gm-3
SOD [5-day Winkler method]	10 gm-3
Temperature	25 0C
Total residual chlorine	0.2 gm-3

This condition shall apply prior to the entry of the discharge into the receiving water at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

8. That the consent holder shall undertake fencing and planting of the riparian margins of the receiving water body for a distance of 500 metres downstream of the discharge point for the purpose of mitigating the effects of the discharge.

9. Filtered Carbonaceous BOD in the discharge shall be no greater than 2.0 gm^{-3} in eight of ten consecutive samples taken at least two weeks apart over the course of an annual monitoring period.

10. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2012 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 November 2011

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA 4640
Decision Date [review]:	7 November 2011
Commencement Date [review]:	7 November 2011 [Granted: 9 June 1999]

Conditions of Consent

Consent Granted:	To discharge stormwater, back flushing from the sand filters, and intermittent discharges of treated water from a reservoir, from a milk processing industry site into an unnamed tributary of the Tawhiti Stream in the Tangahoe catchment at or about (NZTM) 1711917E-5615323N
Expiry Date:	1 June 2016
Review Date(s):	June 2012, June 2014
Site Location:	Whareroa Road, Hawera
Legal Description:	Sub 2 Pt Sub 3 Secs 194 & 195 Pt Secs 194-196 231-234 Blk X Hawera SD & Lot 3 DP 19882 Lot 1 DP 15204 Pt Lot 2 DP 15204 Blk X Hawera SD Lot 3 DP 19882 Lot 1 DP 15204 Pt Lot 2 DP 15204 Blk X Hawera SD
Catchment:	Tangahoe
Tributary:	Tawhiti

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The discharge shall not exceed a total of 850 litres/second.

2. That the discharge shall not contain processing wastes, or industrial or domestic wastewater.

3. That facilities capable of diverting contaminated stormwater, that arises as a result of the initial effects of a rainfall event, from the site to the marine outfall shall be operated and maintained in order to meet the conditions of this consent.

4. That the consent holder shall provide three retention ponds to treat the stormwater prior to discharge. This pond system shall be maintained and operated in order to meet the conditions of this consent.

5. That the consent holder shall maintain a contingency plan, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent, and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. This contingency plan shall be updated on an annual basis.

6. That the point of discharge shall be taken as being the point where the stormwater discharges at the end of the retention pond system.

7. That after allowing for reasonable mixing, within a mixing zone extending 50 metres below the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters:

    a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
    b) any conspicuous change in the colour or visual clarity;
    c) any emission of objectionable odour;
    d) the rendering of fresh water unsuitable for consumption by farm animals;
    e) any significant adverse effects on aquatic life, habitats or ecology; and
    f) any visible bacterial and/or fungal growths.

8. That the discharge shall not exceed the following limits at all times:

oil and grease [freon extractable]	5 gm-3
pH	6.0-9.0
suspended solids	30 gm-3
BOD [5-day Winkler method]	10 gm-3
temperature	25 0C
total residual chlorine	0.2 gm-3

This condition shall apply prior to the entry of the discharge into the receiving water at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

9. Filtered Carbonaceous BOD in the discharge shall be no greater than 2.0 gm^{-3} in eight of ten consecutive samples taken at least two weeks apart over the course of an annual monitoring period.

10. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2012 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 November 2011

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA 4640
Decision Date [review]:	7 November 2011
Commencement Date [review]:	7 November 2011 [Granted: 9 June 1999]

Conditions of Consent

Consent Granted:	To discharge up to 5,400 cubic metres/day [500 litres/second] of stormwater from a milk processing industry site into an unnamed coastal stream between the Tangahoe River and the Waihi Stream at or about (NZTM) 1711550E-5614968N
Expiry Date:	1 June 2016
Review Date(s):	June 2012, June 2014
Site Location:	Whareroa Road Hawera
Legal Description:	Pt Lot 13 DP 2625 Blks IX & X Hawera SD
Catchment:	Unnamed catchment 18

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. That the discharge shall not contain processing wastes, or industrial or domestic wastewater.

2. That facilities capable of diverting contaminated stormwater, that arises as a result of the initial effects of a rainfall event, from the site to the marine outfall shall be operated and maintained in order to meet the conditions of this consent.

3. That the consent holder shall provide a retention pond to treat and attenuate the volume of the stormwater prior to discharge. This pond system shall be maintained and operated in order to meet the conditions of this consent.

4. That the consent holder shall maintain a contingency plan, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent, and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. This contingency plan shall be updated on an annual basis.

5. That the point of discharge shall be taken as being the point where the stormwater discharges at the end of the retention pond system.

6. That after allowing for reasonable mixing, within a mixing zone extending 50 metres below the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters:

   a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   b) any conspicuous change in the colour or visual clarity;
   c) any emission of objectionable odour;
   d) the rendering of fresh water unsuitable for consumption by farm animals;
   e) any significant adverse effects on aquatic life, habitats or ecology; and
   f) any visible bacterial and/or fungal growths.

7. That the discharge shall not exceed the following limits at all times:

Oil and grease [Freon extractable]	5 gm-3
pH	6.0-9.0
Suspended solids	30 gm-3
BOD [5-day Winkler method]	10 gm-3
Temperature	25°C
Total residual chlorine	0.2 gm-3

This condition shall apply prior to the entry of the discharge into the receiving water at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

8. That the consent holder shall undertake fencing and planting of the riparian margins of the receiving water body for a distance of 500 metres downstream of the discharge point for the purpose of mitigating the effects of the discharge.

9. Filtered Carbonaceous BOD in the discharge shall be no greater than 2.0 gm^{-3} in eight of ten consecutive samples taken at least two weeks apart over the course of an annual monitoring period.

10. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2012 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 7 November 2011

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 4103-2

TARANAKI REGIONAL COUNCIL
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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	4 October 2006

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the manufacture and processing of milk products and associated processes at or about GR: Q21:215-766
Expiry Date:	1 June 2025
Review Date(s):	June 2010, June 2015, June 2020
Site Location:	Whareroa Road, Hawera
Legal Description:	Lot 1 DP 12929 Lots 1 & 2 DP 13689 Lot 1 DP 17308 Lot 1 DP 17686 Lots 1-3 DP 19722 Pt Sec 234 Blk X Hawera SD

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

www.trc.govt.nz

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the environment from the site.

2. The measures representing the best practicable option may be reviewed in accordance with the procedure provided for in condition 15.

3. Prior to undertaking any alterations to the plant, processes or operations, as specified in applications 92/151, 95/141, 96/233, 97/112, 346, 391, and 2747 which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and any amendments.

4. The consent holder shall provide to the Taranaki Regional Council within five years from the granting of this consent, and every six years thereafter a written report:

a) reviewing any technological advances in the reduction or mitigation of emissions, especially but not exclusively in respect of milk powder and other particulate emissions, how these might be applicable and/or implemented at the Whareroa site, and the costs and benefits of these advances; and

b) detailing an inventory of emissions from the site of such contaminants as the Chief Executive, Taranaki Regional Council, may from time to time specify following consultation with the consent holder; and

c) addressing any other issue relevant to the minimisation or mitigation of emissions from the Whareroa site that the Chief Executive, Taranaki Regional Council, considers should be included.

5. The consent holder shall be permitted to discharge into the air emissions of contaminants arising from the spray drying processes in the facilities known as WPC, Alamin, Powder-1, Powder-2, Powder-3, Powder-4, Powder-5, Casein-1 and Casein-2, together with other milk processing facility and supporting utility services, as described in applications 92/151, 95/141, 96/233, 97/112, 346, 391, and 2747 to the Taranaki Regional Council, at all times adopting the best practicable option or options to prevent or minimise the adverse effects of the discharges on the environment provided.

6. The consent holder shall minimise the emissions and impacts of air contaminants discharged from the site by the selection of the most appropriate process equipment, process control equipment, emission control equipment, methods of control, supervision and operation, and the proper and effective operation, supervision, control and maintenance of all equipment and processes.

7. Powder emissions to the atmosphere from the spray drying process cyclone exhausts shall not exceed 125 milligrams per cubic metre [mg/m^3] of gas flow, adjusted to 0 degrees Celsius, 1 atmosphere pressure, and dry gas basis.

8. The discharges authorised by this consent shall not give rise to suspended or deposited dust at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable. For the purposes of this condition, effects in excess of the following limits are deemed to be offensive or objectionable:

   a) deposition of milk powder equivalent to 0.13 grams total deposited milk powder per square metre per day [$g/m^2/day$]; and/or

   b) a suspended milk powder level of 1 milligram per cubic metre [mg/m^3].

9. The consent holder shall control all emissions of fine particulates [PM_{10}] to the atmosphere from the site, in order that the maximum ground level concentration of fine particulates [PM_{10}] arising from the exercise of this consent measured under ambient conditions does not exceed 50 micrograms per cubic metre [$\mu g/m^3$] [twenty-four hour average], at or beyond the boundary of the site.

10. The discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable.

11. The consent holder, in conjunction with the Taranaki Regional Council, shall undertake monitoring of emissions and their effects upon the environment as required by the Chief Executive, Taranaki Regional Council.

12. The consent holder shall convene an annual meeting of representatives of the Taranaki Regional Council, and interested submitters to application 2747, to discuss any matter relating to the exercise of this consent.

13. The Powder-5 facility may process skim milk powder only if the consent holder has:

    a) given five [5] days prior notice to the Chief Executive, Taranaki Regional Council,; and

    b) developed a monitoring programme for the emissions and their effects upon the environment as required by the Chief Executive, Taranaki Regional Council,.

14. The Council shall, within six [6] months of notice under condition 13, serve notice that it intends to review the conditions of this consent, in accordance with section 128(1)(a) of the Resource Management Act 1991, for the purpose of dealing with any significant adverse effect on the environment arising from the use of the Powder-5 plant for skim milk powder production.

15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent within six months of receiving a report prepared by the consent holder pursuant to condition 4 of this consent, or in any case in June 2010 and/or June 2015 and/or June 2020, for the purposes of:

    a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review; and/or

    b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge; and/or

    c) to alter, add, or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant or contaminants; and/or

    d) taking into account any Act of Parliament, regulation, national policy statement, national environmental standard, regional policy statement or regional rule which relates to limiting, recording, or mitigating airborne contaminants and which is relevant to emissions from the milk and milk product processing plants and/or associated processes.

Signed at Stratford on 4 October 2006

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 4406-2

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	3 February 2004

Conditions of Consent

Consent Granted:	To discharge laboratory wastes onto and into land at or about GR: Q21:215-750
Expiry Date:	1 June 2022
Review Date(s):	June 2010, June 2016
Site Location:	Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 Blks IX & X Hawera SD
Catchment:	Tangahoe Waihi

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The exercise of this resource consent shall be undertaken generally in accordance with the documentation submitted in support of application 2746. In the case of any contradiction between the documentation submitted in support of application 2746 and the conditions of this consent, the conditions of this resource consent shall prevail.

3. The discharge authorised by this consent shall not exceed 1 m^3/day.

4. The consent holder shall provide a management plan for the discharge site to the Chief Executive, Taranaki Regional Council, for written approval within three months of the granting of this consent, and regularly updated as required, to ensure that the conditions of this consent can be met, including but not limited to:

i) means of pit excavation;
ii) pit preparation;
iii) dimensions of each pit;
iv) placement and covering of wastes;
v) stormwater control;
vi) site control;
vii) nature of wastes;
viii) location of all present and previous pits; and
ix) an outline of the site options for future pit use.

5. The siting of each discharge pit shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

6. The discharge shall not occur within 50 metres of any bore, well or spring used for water supply purposes, nor within 25 metres of any surface water body, nor within 100 metres from the coastal cliff edge.

7. The disposal pit(s) shall not intercept the water table.

8. The exercise of this consent, including the design and management of the disposal pit(s), shall not lead to or be liable to lead to contaminants entering a water body from overland surface flows.

9. The exercise of this consent shall not result in any adverse impacts on groundwater as a result of leaching, or surface water including aquatic ecosystems, and/or result in a change to the suitability of use of the receiving water as determined by the Chief Executive, Taranaki Regional Council.

10. The only wastes to be discharged shall be petri dishes, their content and the plastic which they are wrapped in.

11. The discharged material shall be covered with up to 50 millimetres of earth or other suitable cover, within a period of four hours or less following each disposal.

12. Each disposal pit shall be reinstated with a low permeability, clean, compacted soil cover with a minimum thickness of 0.5 metre to be placed over the material, and vegetation re-established to the satisfaction of the Chief Executive, Taranaki Regional Council.

13. The consent holder shall compact, contour, and maintain the cover layer of soil so as to ensure its integrity at all times to the satisfaction of the Chief Executive, Taranaki Regional Council.

14. The consent holder shall keep records of all uses of the pits including date, volume discharged, and product type, and make these available to the Chief Executive, Taranaki Regional Council, upon request.

15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2016, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 3 February 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 4508-2

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Water Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Change To Conditions Date:	17 September 1997 [Granted: 1 May 1996]

Conditions of Consent

Consent Granted:	To take up to 16,000 cubic metres/day [210 litres/second] of water from the Tangahoe River for processing and manufacture of dairy products, cleaning of plant and cooling purposes, provided the total abstraction in the Tangahoe Catchment by the consent holder does not exceed 30,000 cubic metres/day at any time at or about GR: Q21:258-742
Expiry Date:	1 June 2015
Review Date(s):	June 1999, June 2004
Site Location:	Tangahoe River Rail Bridge Abutment, Hicks Road, Hawera
Legal Description:	Pt Blk I DP 5506 Pt Sec 248, 250 & 251 Patea Dist Blk X Hawera SD
Catchment:	Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That the Taranaki Regional Council reserves the right to temporarily suspend or reduce the abstraction during extreme low flow events, in order to protect the biological communities in the stream, in accordance with section 329 of the Resource Management Act 1991.

2. That the consent holder shall install and operate, to the satisfaction of the Chief Executive, Taranaki Regional Council, a measuring device capable of recording daily rates of abstraction and shall make such records available to the Chief Executive, Taranaki Regional Council, upon request.

3. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 1999 and/or June 2004 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the abstraction on the environment.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 4927-1

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	1 May 1996

Conditions of Consent

Consent Granted:	To discharge up to 1.05 cubic metres/day of river silt and sand from mechanical pre-filtering of river water during abstraction of water, by returning it into the Tawhiti Stream in the Tangahoe Catchment at or about GR: Q21:229-780
Expiry Date:	1 June 2015
Review Date(s):	June 1999, June 2004
Site Location:	Main South Road, Hawera
Legal Description:	Lot 1 DP 3710 Pt Lot 1 DP 2629 Lot 1 DP 1087 Blk X Hawera SD
Catchment:	Tangahoe
Tributary:	Tawhiti

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That the discharge must be operated on a continuous purge basis in order to mitigate adverse effects on the receiving water of the Tawhiti Stream.

2. That allowing for a mixing zone of 50 metres downstream of the discharge pipe, the discharge shall not raise the suspended solids of the receiving water by greater than 30% or by greater than 30 gm^{-3}, whichever is less.

3. That allowing for a mixing zone of 50 metres extending downstream of the discharge pipe, the discharge shall not give rise to any of the following effects in the receiving water of the Tawhiti Stream:

(i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(ii) any conspicuous change in the colour or visual clarity;
(iii) any emission of objectionable odour;
(iv) the rendering of fresh water unsuitable for consumption by farm animals;
(v) any significant adverse effects on aquatic life, habitats, or ecology.

4. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 1999 and/or June 2004 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 4953-2

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Land Use Consent

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	20 January 1999

Conditions of Consent

Consent Granted:	To erect, place and maintain two earth dams at the headwaters of an unnamed tributary of the Tangahoe River for stormwater collection and treatment purposes at or about GR: Q21:219-765
Expiry Date:	1 June 2016
Review Date(s):	June 2004, June 2010
Site Location:	Whareroa Road Hawera
Legal Description:	Pt Sec 235 Pt Lot DP 2777 Blk X Hawera SD
Catchment:	Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That it is the responsibility of the consent holder to maintain and operate the dams in a safe and appropriate manner and the Taranaki Regional Council accepts no responsibility in this regard.

2. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to commencement of any work or maintenance associated with the dams.

3. That during work or maintenance, the consent holder shall observe every practicable measure to prevent the discharge or placement of silt and/or organics and/or any other contaminant into the watercourse, to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. That the consent holder shall remove all structures covered by this consent and reinstate the area, to the satisfaction of the Chief Executive, Taranaki Regional Council, if and when they are no longer required.

5. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2004 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 4977-1

TARANAKI REGIONAL COUNCIL

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Coastal Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NZMP Whareroa P O Box 444 HAWERA
Consent Granted Date:	7 October 1996

Conditions of Consent

Consent Granted:	To erect, place and maintain a marine outfall and diffuser structure of approximately 1845 metres length in the coastal marine area adjacent to the end of Rifle Range Road, Hawera at or about GR: Q21:214-747
Expiry Date:	1 June 2015
Review Date(s):	June 2000, June 2005, June 2010
Site Location:	Off Rifle Range Road Hawera
Legal Description:	Pt Lot 13 DP 2625 And Foreshore Blks IX & X Hawera SD
Catchment:	Tasman Sea

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. THAT the consent holder shall notify the Taranaki Regional Council at least three days prior to the commencement of construction or any major maintenance works.

2. THAT the marine outfall and diffuser structure shall be constructed and maintained in accordance with the documentation submitted in support of application 96/109.

3. THAT during the construction phase and any subsequent maintenance works, the consent holder must observe every practicable measure to minimise any discharge of contaminants to the environment and to minimise the disturbance of the foreshore and seabed.

4. THAT following construction, the consent holder shall reinstate, as far as practicable, the intertidal construction area.

5. THAT the intertidal section of the outfall pipeline shall not be visible at any stage of the tide.

6. THAT the consent holder shall remove the marine outfall and diffuser structure covered by this consent and reinstate the area if and when it is no longer required.

7. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2000 and/or June 2005 and/or June 2010 for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects of the structure on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Transferred at Stratford on 31 October 2001

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 5013-1

TARANAKI
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Coastal Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NZMP Whareroa P O Box 444 HAWERA
Consent Granted Date:	30 August 1996

Conditions of Consent

Consent Granted:	To construct and maintain a rock wall 100 metres in length in the coastal marine area for the protection of outfall and stream diversion pipelines and associated structures at or about GR: Q21:214-747
Expiry Date:	1 June 2015
Review Date(s):	June 2000, June 2005, June 2010
Site Location:	Off Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 And Foreshore Blks IX & X Hawera SD
Catchment:	Tasman Sea

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

Consent 5013-1

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
   i) the administration, monitoring and supervision of this consent; and
   ii) charges authorised by regulations.

Special conditions

1. THAT the consent holder shall notify the Taranaki Regional Council at least three days prior to the commencement of construction or any major maintenance works.

2. THAT the rock wall shall be constructed and maintained in accordance with the documentation submitted in support of application 96/160 and to the satisfaction of the Chief Executive, Taranaki Regional Council.

3. THAT the construction and maintenance of the rock wall shall be undertaken in a manner which minimises both disturbance of the seabed and foreshore and the discharge of contaminants, to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. THAT following completion of the rock wall, the consent holder shall revegetate and reinstate the construction site, to the satisfaction of the Chief Executive, Taranaki Regional Council.

5. THAT the consent holder shall monitor erosion at the cliff top at least 200 metres either side of the rock wall:
   a) at twelve monthly intervals; or
   b) immediately following storm events as requested by the Chief Executive, Taranaki Regional Council;

   in order to determine whether the rock wall is causing accelerated erosion to neighbouring properties.

6. THAT should the rock wall be shown to be causing accelerated erosion affecting neighbouring properties, the consent holder shall reasonably compensate any affected neighbours for the loss of land.

7. THAT the consent holder shall remove the rock wall covered by this consent and reinstate the area, to the satisfaction of the Chief Executive, Taranaki Regional Council, if and when it is no longer required.

8. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2000 and/or June 2005 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this consent.

Transferred at Stratford on 31 October 2001

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 5015-1

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Land Use Consent

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NZMP Whareroa P O Box 444 HAWERA
Consent Granted Date:	23 August 1996

Conditions of Consent

Consent Granted:	To dam an unnamed stream between the Tangahoe River and the Waihi Stream for stream flow control and marine outfall pipeline installation purposes at or about GR: Q21:214-747
Expiry Date:	1 June 2015
Review Date(s):	June 2000, June 2005, June 2010
Site Location:	Off Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 and Foreshore Blks IX & X Hawera SD
Catchment:	Waihi Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. THAT the consent holder shall notify the Taranaki Regional Council at least three days prior to the commencement of construction or any major maintenance works.

2. THAT the dam shall be constructed and maintained in accordance with the documentation submitted in support of application 96/162 and to the satisfaction of the Chief Executive, Taranaki Regional Council.

3. THAT during the construction period and any subsequent maintenance, the consent holder shall observe every practicable measure to prevent the discharge or placement of silt and/or organics and/or any other contaminant into the stream and to minimise disturbance of the stream bed, to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. THAT the dam and any associated structures covered by this consent shall be removed and the area reinstated, to the satisfaction of the Chief Executive, Taranaki Regional Council, if and when it is no longer required.

5. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2000 and/or June 2005 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this consent.

Transferred at Stratford on 31 October 2001

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 5016-1

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
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STRATFORD
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PHONE 06-765 7127
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Please quote our file number on all correspondence

Water Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	23 August 1996

Conditions of Consent

Consent Granted:	To permanently divert an unnamed stream between the Tangahoe River and the Waihi Stream for the purpose of protecting an outfall pipeline and associated structures at or about GR: Q21:214-747
Expiry Date:	1 June 2015
Review Date(s):	June 2000, June 2005, June 2010
Site Location:	Off Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 and foreshore Blks IX & X Hawera SD
Catchment:	Waihi Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall notify the Taranaki Regional Council at least three days prior to the commencement of construction or any major maintenance works.

2. That the diversion shall be constructed and maintained in accordance with the documentation submitted in support of application 96/163 and to the satisfaction of the Chief Executive, Taranaki Regional Council.

3. That during the construction of the diversion and any subsequent maintenance, the consent holder shall observe every practicable measure to prevent the discharge or placement of silt and/or organics and/or any other contaminants into the stream and to minimise disturbance of the stream bed, to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2000 and/or June 2005 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this consent.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 5017-1

TARANAKI REGIONAL COUNCIL

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Land Use Consent

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	NZMP Whareroa P O Box 444 HAWERA
Consent Granted Date:	23 August 1996

Conditions of Consent

Consent Granted:	To drain and excavate the bed of an unnamed stream between the Tangahoe River and the Waihi Stream and to erect, place, use and maintain outfall and stream diversion pipelines and associated structures in or on that bed at or about GR: Q21:214-747
Expiry Date:	1 June 2015
Review Date(s):	June 2000, June 2005, June 2010
Site Location:	Off Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 and foreshore Blks IX & X Hawera SD
Catchment:	Waihi Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. THAT the consent holder shall notify the Taranaki Regional Council at least three days prior to the commencement of excavation or construction or any major maintenance works.

2. THAT works associated with this consent shall be constructed and maintained in accordance with the documentation submitted in support of application 96/164 and to the satisfaction of the Chief Executive, Taranaki Regional Council.

3. THAT the outfall and stream diversion pipelines and any associated structures shall be of a colour in keeping with the natural character of the coastal environment.

4. THAT following construction, the consent holder shall revegetate the construction site, to the satisfaction of the Chief Executive, Taranaki Regional Council.

5. THAT the consent holder shall remove the outfall and stream diversion pipelines and any associated structures covered by this consent and reinstate the area, to the satisfaction of the Chief Executive, Taranaki Regional Council, if and when the structures are no longer required.

6. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2000 and/or June 2005 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the envirionment arising from the exercise of this consent.

Transferred at Stratford on 31 October 2001

For and on behalf of
Taranaki Regional Council

Chief Executive

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited P O Box 444 HAWERA 4640
Decision Date (Change):	19 December 2012
Commencement Date (Change):	19 December 2012 (Granted: 3 February 2004)

Conditions of Consent

Consent Granted:	To discharge waste material from stormwater sumps and road sump and unprocessable dairy factory wastes onto and into land at or about (NZTM) 1711451E-5613271N
Expiry Date:	1 June 2022
Review Date(s):	June 2016
Site Location:	Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 Blks IX & X Hawera SD (Discharge source & site)
Catchment:	Unnamed catchment 18

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General condition

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

   i) the administration, monitoring and supervision of this consent; and
   ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. Wherever practicable, the consent holder shall seek to dispose of unprocessable dairy factory wastes as authorised by this consent by irrigation to land in accordance with the following application loading limits:

   Nitrogen (N) – 250 kg/ha/year

   Chemical Oxygen Demand (COD) – 4500 kg/ha/day

3. The exercise of this resource consent shall be undertaken generally in accordance with the documentation submitted in support of applications 2748, 3326 and 7284. In the case of any contradiction between the documentation submitted in support of applications 2748, 3326 and 7284 and the conditions of this consent, the conditions of this resource consent shall prevail.

4. The discharge of stormwater sump cleanings and road sump cleanings authorised by this consent shall not exceed 120 cubic metres per week. The discharge of unprocessable dairy wastes authorised by this consent shall not exceed 250 cubic metres per day.

5. The consent holder shall provide a management plan for the discharge site to the Chief Executive, Taranaki Regional Council, for written approval within three months of the granting of this consent, and regularly updated as required, to ensure that the conditions of this consent can be met, including but not limited to:

   For Pit Disposal;

   i) Means of pit excavation;
   ii) Pit preparation;
   iii) Dimensions of each pit;
   iv) Placement and covering of wastes;
   v) Stormwater control;
   vi) Site control;
   vii) Nature of wastes
   viii) Location of all present and previous pits;
   ix) An outline of site options for future pit use;

   For Irrigation Disposal;

   x) Location and area (ha) of area used for irrigation;
   xi) Volume of material applied;
   xii) Application loading rates (N and COD);
   xiii) Mitigation measures for odour control.

6. The discharge shall not occur within 50 metres of any bore, well or spring used for water supply purposes, nor within 25 metres of any surface water body, nor within 100 metres from the coastal cliff edge.

7. The disposal pit(s) shall not intercept the water table.

8. The exercise of this consent, including the design and management of the burial pit(s), shall not lead to or be liable to lead to contaminants entering a water body from overland surface flows.

9. The exercise of this consent shall not result in any adverse impacts on groundwater as a result of leaching, or surface water including aquatic ecosystems, and/or result in a change to the suitability of use of the receiving water as determined by the Chief Executive, Taranaki Regional Council.

10. Where the discharge is to pits, the discharged material shall be covered with up to 50 millimetres of earth or other suitable cover, within a period of 7 days or less following each discharge.

11. All liquid shall be removed from the disposal pit prior to the application of covering material as required in special condition 9.

12. Only those materials as authorised by this consent and outlined in applications 2748, 3326 and 7284 shall be discharged of to the disposal pits or irrigated to land. Prior to each discharge operation the consent holder shall remove all non-biodegradable material entrained in the material to be discharged, as far as is practicable to the satisfaction of the Chief Executive, Taranaki Regional Council.

13. Each disposal pit shall be reinstated with a low permeability, clean, compacted soil cover with a minimum thickness of 0.5 metre to be placed over the material, and vegetation re-established to the satisfaction of the Chief Executive, Taranaki Regional Council.

14. The consent holder shall compact, contour, and maintain the cover layer of soil so as to ensure its integrity at all times to the satisfaction of the Chief Executive, Taranaki Regional Council.

15. The disposal of wastes as authorised by this consent shall not give rise to objectionable or offensive odours beyond the property boundary.

16. The consent holder shall keep records of all discharges to land including date, volume discharged, disposal method, disposal location, product type, and the reason for discharge and make these available to the Chief Executive, Taranaki Regional Council, upon request.

17. The discharge of unprocessable dairy waste under this consent shall only occur after all other reasonable waste disposal options have been exhausted, and the consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing of the options assessed.

18. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2016, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 19 December 2012

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Consent 5036-2

TARANAKI REGIONAL COUNCIL

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NEW ZEALAND
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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Change To Conditions Date:	8 November 2004 [Granted: 3 February 2004]

Conditions of Consent

Consent Granted:	To discharge waste material from stormwater sumps and road sump and unprocessable dairy factory wastes onto and into land at or about GR: Q21:215-750
Expiry Date:	1 June 2022
Review Date(s):	June 2010, June 2016
Site Location:	Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 Blks IX & X Hawera SD
Catchment:	Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

2. The exercise of this resource consent shall be undertaken generally in accordance with the documentation submitted in support of applications 2748 and 3326. In the case of any contradiction between the documentation submitted in support of applications 2748 and 3326 and the conditions of this consent, the conditions of this resource consent shall prevail.

3. The discharge of stormwater sump cleanings and road sump cleanings authorised by this consent shall not exceed 120 cubic metres per week. The discharge of unprocessable dairy wastes authorised by this consent shall not exceed 250 cubic metres per day.

4. The consent holder shall provide a management plan for the discharge site to the Chief Executive, Taranaki Regional Council, for written approval within three months of the granting of this consent, and regularly updated as required, to ensure that the conditions of this consent can be met, including but not limited to:

   i) means of pit excavation;
   ii) pit preparation;
   iii) dimensions of each pit;
   iv) placement and covering of wastes;
   v) stormwater control;
   vi) site control;
   vii) nature of wastes;
   viii) location of all present and previous pits; and
   ix) an outline of the site options for future pit use.

5. The discharge shall not occur within 50 metres of any bore, well or spring used for water supply purposes, nor within 25 metres of any surface water body, nor within 100 metres from the coastal cliff edge.

6. The disposal pit(s) shall not intercept the water table.

7. The exercise of this consent, including the design and management of the burial pit(s), shall not lead to or be liable to lead to contaminants entering a water body from overland surface flows.

8. The exercise of this consent shall not result in any adverse impacts on groundwater as a result of leaching, or surface water including aquatic ecosystems, and/or result in a change to the suitability of use of the receiving water as determined by the Chief Executive, Taranaki Regional Council.

9. The discharged material shall be covered with up to 50 millimetres of earth or other suitable cover, within a period of 7 days or less following each discharge.

10. All liquid shall be removed from the disposal pit prior to the application of covering material as required in special condition 9.

11. Only those materials as authorised by this consent and outlined in applications 2748 and 3326 shall be discharged of to the disposal pits. Prior to each discharge operation the consent holder shall remove all non-biodegradable material entrained in the material to be discharged, as far as is practicable to the satisfaction of the Chief Executive, Taranaki Regional Council.

12. Each disposal pit shall be reinstated with a low permeability, clean, compacted soil cover with a minimum thickness of 0.5 metre to be placed over the material, and vegetation re-established to the satisfaction of the Chief Executive, Taranaki Regional Council.

13. The consent holder shall compact, contour, and maintain the cover layer of soil so as to ensure its integrity at all times to the satisfaction of the Chief Executive, Taranaki Regional Council.

14. The consent holder shall keep records of all uses of the pits including date, volume discharged, product type, and the reason for discharge and make these available to the Chief Executive, Taranaki Regional Council, upon request.

15. The discharge of unprocessable dairy waste under this consent shall only occur after all other reasonable waste disposal options have been exhausted, and the consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing of the options assessed.

16. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2016, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 8 November 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 5044-2

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	3 February 2004

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the disposal of laboratory wastes, and stormwater and sump cleanings onto and into land at or about GR: Q21:215-750
Expiry Date:	1 June 2022
Review Date(s):	June 2010, June 2016
Site Location:	Rifle Range Road, Hawera
Legal Description:	Lot 13 DP 2625 Blks IX & X Hawera SD

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.

2. The exercise of this resource consent shall be undertaken generally in accordance with the documentation submitted in support of application 2749. In the case of any contradiction between the documentation submitted in support of application 2749 and the conditions of this resource consent, the conditions of this resource consent shall prevail.

3. The consent holder shall provide a management plan for the discharge site to the Chief Executive, Taranaki Regional Council, for written approval within three months of the granting of this consent, and regularly updated as required, outlining methods to adopt the best practicable option to prevent or minimise adverse effects on the environment with respect to discharges to air.

4. That the discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that is offensive or objectionable.

5. For the purposes of condition 4, without restriction, an odour shall be deemed to be offensive or objectionable if:

(a) it is held to be so in the opinion of an officer of the Taranaki Regional Council, having regard to the duration, frequency, intensity and nature of the odour; and/or
(b) an officer of the Taranaki Regional Council observes that an odour is noticeable, and either it lasts longer than three (3) hours continuously, or it occurs frequently during a single period of more than six (6) hours; and/or
(c) no less than three individuals from at least two different properties that are affected at the time, each declare in writing that an objectionable or offensive odour was detected beyond the boundary of the site, provided the Council is satisfied that the declarations are not vexatious and that the objectionable or offensive odour was emitted from the site as specified in (b). Each declaration shall include the individuals' names and addresses, the date and time the objectionable or offensive odour was detected, the location of the individual when it was detected and the prevailing weather conditions during the event. The declarations shall be signed and dated.

6. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2016, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 3 February 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 5143-1

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Land Use Consent

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	20 May 1997

Conditions of Consent

Consent Granted:	To erect, place, use and maintain a water intake structure in the bed of the Tangahoe River for industrial water supply purposes at or about GR: Q21:258-742
Expiry Date:	1 June 2015
Review Date(s):	June 1999, June 2004
Site Location:	3 Hicks Road Hawera Property Owner: M Carr
Legal Description:	Lot 3 DP 5506 Pt Sec 248, 250 & 251 Patea District Blk X Hawera SD
Catchment:	Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall notify the Taranaki Regional Council, at least 48 hours prior to the commencement and upon completion of, the initial construction and again prior to and upon completion of, any subsequent maintenance works which would involve disturbance of, or deposition to the river bed or discharges to water.

2. That the structure authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.

3. That the consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the river bed and to avoid or minimise the disturbance of the river bed and any adverse effects on water quality .

4. That the consent holder shall ensure that the area and volume of river bed disturbance shall so far as is practicable, be minimised and any areas which are disturbed, shall so far as is practicable be reinstated.

5. That the structure authorised by this consent shall be removed and the area reinstated, if and when the structure is no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structure removal and reinstatement.

6. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 1999 and/or June 2004, for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at the time.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 5148-1

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	28 May 1997

Conditions of Consent

Consent Granted:	To discharge up to 1.2 cubic metres/day of river silt and sand from mechanical pre-filtering of river water during abstraction of water, by returning it into the Tangahoe River at or about GR: Q21:258-742
Expiry Date:	1 June 2015
Review Date(s):	June 1999, June 2004
Site Location:	Tangahoe River Rail Bridge Abutment, Hicks Road, Hawera
Legal Description:	Lot 3 DP 5506 Pt Sec 248, 250 & 251 Patea Dist Blk X Hawera SD
Catchment:	Tangahoe

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That the discharge must be operated on a continuous purge basis in order to mitigate the potential for adverse effects on the receiving water of the Tangahoe River.

2. That allowing for a mixing zone of 100 metres downstream of the discharge pipe, the discharge shall not give rise to all or any of the following effects in the receiving water of the Tangahoe River:

i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

ii) any conspicuous change in the colour or visual clarity;

iii) any emission of objectionable odour;

iv) the rendering of fresh water unsuitable for consumption by farm animals;

v) any significant adverse effects on aquatic life, habitats, or ecology.

3. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 1999 and/or June 2004 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the discharge on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at the time.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 5337-1

TARANAKI REGIONAL COUNCIL

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Please quote our file number on all correspondence

Land Use Consent

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	26 May 1998

Conditions of Consent

Consent Granted:	To dam an unnamed tributary of the Tawhiti Stream in the Tangahoe Catchment for stormwater and backwash water collection and treatment purposes at or about GR: Q21:222-773
Expiry Date:	1 June 2016
Review Date(s):	June 2004, June 2010
Site Location:	Unnamed Tributary Of Tawhiti Stream, Whareroa Road, Hawera
Legal Description:	Sub 2 Pt Sub 3 Secs 194, 195 Pt Secs 194-196 231-234 Blk X Hawera SD
Catchment:	Tangahoe
Tributary:	Tawhiti

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to commencement and upon completion of construction, and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of, or discharge to, the unnamed tributary.

2. That during the construction and any subsequent maintenance, the consent holder shall observe every practicable measure to prevent the discharge or placement of silt and/or organics and/or any other contaminants into, and to minimise the disturbance of, the bed of the unnamed tributary.

2. That it is the responsibility of the consent holder to maintain and operate a safe dam[s] and the Taranaki Regional Council accepts no responsibility in this regard.

4. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2004 and/or June 2010 and/or in the twelfth month following the exercise of this consent, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Consent 5845-1

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
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STRATFORD
NEW ZEALAND
PHONE 06-765 7127
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Please quote our file number on all correspondence

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	31 July 2001

Conditions of Consent

Consent Granted:	To remove, reconstruct, erect, place and maintain a dam structure and associated fish pass on the Tawhiti Stream for water intake purposes at or about GR: Q21:229-780
Expiry Date:	1 June 2015
Review Date(s):	June 2004, June 2010
Site Location:	Main South Road, Hawera
Legal Description:	Pt Lot 1 DP 2629 Pt Lot 1 DP 3710 Sec 689 Blk X Hawera SD
Catchment:	Tangahoe
Tributary:	Tawhiti

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall notify the Chief Executive, Taranaki Regional Council, at least 48 hours prior to the commencement of removal of the existing structure and upon completion of all works licensed by this consent.

2. The consent holder shall notify the Chief Executive, Taranaki Regional Council, at least 48 hours prior to any maintenance works of the structure[s] or fish pass licensed by this consent which would involve disturbance of, or deposition to, the streambed or discharges to water.

3. The works licensed by this consent shall be undertaken in accordance with the documentation submitted in support of application 1471.

4. During the works licensed by this consent, the consent holder shall observe every practicable measure to prevent the discharge or placement of silt and/or organics and/or cement products and/or any other contaminants into the watercourse and to minimise disturbance of the streambed.

5. The consent holder, during removal of the existing structure and reconstruction of the structure and fish pass and maintenance, shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the streambed and to avoid or minimise any adverse effects on water quality.

6. The consent holder shall ensure that the area and volume of streambed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.

7. All areas disturbed in association with the works, including the diversion channel, fences and replanting of vegetation, shall be reinstated to the satisfaction of the Chief Executive, Taranaki Regional Council.

8. The structure[s] licensed by this consent shall not obstruct fish passage.

9. Prior to construction of the fish pass, the consent holder shall supply a final design for the approval of the Chief Executive, Taranaki Regional Council.

10. The consent holder shall ensure that the intake is appropriately screened to avoid the entrapment of native fish.

11. The structure[s] authorised by this consent shall be maintained to ensure the conditions of this consent are met.

12. The structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure is no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the removal of the structures and reinstatement of the area.

13. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2004 and/or June 2010, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 4 November 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

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Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited P O Box 444 HAWERA
Consent Granted Date:	7 December 2005

Conditions of Consent

Consent Granted:	To discharge emissions into the air from dual fuel boilers [gas or coal] with a maximum energy output of 250 MW together with associated processes at or about GR: Q21:219-769
Expiry Date:	1 June 2034
Review Date(s):	June 2010, June 2016, June 2022, June 2028
Site Location:	Whareroa Road, Hawera
Legal Description:	Pt Lot 2 DP 15204 Lot 1 DP 15204 Lot 3 DP 19882 Blk X Hawera SD

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

Best practicable option and mitigation

1. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the environment from the site.

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 2785. In the case of any contradiction between the documentation submitted in support of application 2785 and the conditions of this consent, the conditions of this consent shall prevail.

3. Other than as set out within this consent, the characteristics of any coal burned in the exercise of this consent shall be as generally described and/or achieve a similar level of environmental performance as set out in the documentation supporting the application for this consent.

4. A general outline of the methods, specifications, operating guidelines or other measures which represent the best practicable option at the time of commissioning shall be supplied by the consent holder to the Chief Executive, Taranaki Regional Council, within three months of the commissioning of the energy centre, and thereafter attached to this consent as Schedule A. Matters to be addressed in Schedule A shall include, but not be limited to: preferred fuel type and specification; air pollution abatement systems; combustion temperatures; definitions of 'cold start' and 'warm start'; measures to be used in the case of sudden loss of boiler capacity; minimum operating temperatures for baghouses; air fuel ratios; discharge [stack exit] velocities; and protocols for measuring the sulphur content of fuel on an on-going basis. This schedule can be amended by the consent holder at any time during the term of this consent to reflect changes in the methods, specifications, operating guidelines or other measures.

5. The measures representing the best practicable option may be reviewed in accordance with the procedure provided for in condition 29.

6. The consent holder shall minimise the emissions and impacts of air contaminants discharged from the site by the selection of the most appropriate process equipment, process control equipment, emission control equipment, methods of control, supervision and operation, and the proper and effective operation, supervision, control and maintenance of all equipment and processes.

7. The minimum height of discharges to the atmosphere from the energy centre boiler stack shall be 60 metres above the ground level prevailing at the time of lodging the application for this consent.

8. Prior to undertaking any alterations to the plant, processes or operations, as specified in application 2785, which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and any amendments.

Emission limits

9. Discharges to the atmosphere from the energy centre boiler stack shall not exceed 20% obscuration, as measured by the photoelectric obscuration gauge and corrected for path length and temperature as set out in Addendum No. 1 [1972] to 2BS2742:1969, or any replacement measurement standard, for any continuous period of 2 minutes or for more than 4 minutes cumulative in any 60 minute period, except:

   (a) for up to 120 hours [cumulative] per boiler for initial commissioning of each boiler; and

   (b) for up to 250 hours [cumulative] per year for the purpose of lighting up all boilers from cold; and

   (c) for up to 100 hours [cumulative] per year for the purpose of lighting up all boilers from warm.

10. Discharges to the atmosphere of particulate from the energy centre boiler stack shall not exceed 100 milligrams per cubic metre [mg/Nm^3] adjusted to 12% carbon dioxide [CO_2] on a dry gas basis, except during those circumstances described in special condition 9(a), 9(b), and 9(c).

11. The sum of all discharges to the atmosphere of sulphur dioxide from the energy centre boiler stack shall not exceed 385 kilograms per hour [kg/hr].

12. The sum of all discharges to the atmosphere of particulate from the energy centre boiler stack shall not exceed 43 kilograms per hour [kg/hr].

13. The sum of all discharges to the atmosphere of nitrogen oxides from the energy centre boiler stack shall not exceed 319 kilograms per hour [kg/hr].

Ambient and workplace limits

14. The consent holder shall control all discharges of sulphur dioxide to the atmosphere from the site, in order that the maximum ground level concentration of sulphur dioxide arising from the exercise of this consent measured under ambient conditions on land does not exceed 350 micrograms per cubic metre [one-hour average exposure] or 120 micrograms per cubic metre [twenty-four hour average exposure] at or beyond the boundary of the site.

15. The consent holder shall control all discharges of nitrogen dioxide or its precursors to the atmosphere from the energy centre boiler stack, whether alone or in conjunction with any other discharges to the atmosphere from the site, in order that the maximum ground level concentration of nitrogen dioxide arising from the exercise of this consent measured under ambient conditions does not exceed 200 micrograms per cubic metre [one hour average exposure], or 100 micrograms per cubic metre [twenty-four hour average exposure], at or beyond the boundary of the site.

16. The consent holder shall control all discharges of particulate of effective diameter of less than 10 micrometres [PM_{10}] to the atmosphere from the energy centre boiler stack, whether alone or in conjunction with any other discharges to the atmosphere from the site, in order that the maximum ground level concentration of PM_{10} arising from the exercise of this consent measured under ambient conditions does not exceed 50 micrograms per cubic metre [twenty-four hour average exposure], at or beyond the boundary of the site, or at points within the site boundary where non-occupational exposure is likely to occur [such as residential dwellings].

17. The consent holder shall control all discharges of metals to the atmosphere from the energy centre boiler stack, whether alone or in conjunction with any other discharges to the atmosphere from the site, in order that the maximum ground level concentration of each or any metal arising from the exercise of this consent measured under ambient conditions does not exceed their respective guideline value set out in the 'Ambient Air Quality Guidelines 2002 Update', Air Quality Report No 32, Prepared by the Ministry for the Environment and the Ministry of Health, May 2002.

18. The consent holder shall control discharges to the atmosphere from the energy centre boiler stack of contaminants other than carbon dioxide and those addressed in conditions 10 to 17 above, whether alone or in conjunction with any discharges to the atmosphere from the site, in order that the maximum ground level concentration for any particular contaminant arising from the exercise of this consent measured at or beyond the boundary of the site, is not increased above background levels:

    (a) by more than $1/30^{th}$ of the relevant Workplace Exposure Standard-Time Weighted Average, or by more than the Workplace Exposure Standard-Short Term Exposure Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour]; or

    (b) if no Short Term Exposure Limit is set, by more than the General Excursion Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

19. The discharges authorised by this consent shall not give rise to any direct significant adverse ecological effect on any ecosystems in the Taranaki region, including but not limited to habitats, plants, animals, microflora and microfauna.

Recording and reporting

20. Analysis of the coal [including but not limited to the sulphur and ash content of the coal] shall be undertaken on a monthly basis during the processing season. This shall be undertaken upon the coal blend that is supplied to the consent holder. The sampling of the coal blend shall be a composite sample generated by daily sub-sampling of the coal blend that is delivered to the consent holder. The information shall be provided to the Chief Executive, Taranaki Regional Council, upon request.

21. The consent holder shall install, operate, maintain and calibrate :

    (a) opacity meters;
    (b) sulphur dioxide meters;
    (c) temperature meters;
    (d) oxygen meters; and
    (e) carbon monoxide meters

    for the measuring and recording of the respective parameters in the discharge stack from the boilers, to the satisfaction of the Chief Executive, Taranaki Regional Council.

22. The consent holder shall annually undertake source emission monitoring to the satisfaction of the Chief Executive, Taranaki Regional Council. The monitoring shall include a determination of the exhaust concentrations of sulphur dioxide, total suspended particulates, and PM_{10} particulates, in the manner set out in condition F1 within the application lodged for this consent, or to an equivalent standard. In addition, the consent holder shall monitor for mercury and arsenic, and the temperatures of the exhaust gases together with the generation loads prevailing at the time giving rise to those concentrations and mass emissions as determined in monitoring of the emissions. The results of the monitoring shall be provided to the Chief Executive, Taranaki Regional Council, and shall be made available annually to those invited to the liaison meeting convened under special condition 27.

23. A monitoring programme agreed between the consent holder and the Taranaki Regional Council, and provided to the Taranaki District Health Board and interested submitters to application 2785, shall be prepared within three months of the granting of this consent. The monitoring programme shall cover [at a minimum]: monitoring for ground level ambient concentrations of sulphur dioxide; soil and vegetation levels of mercury, arsenic, and sulphates at reference sites; levels of mercury and arsenic within aquatic species; and a model validation monitoring survey for PM_{10} [monitoring to be carried out to a recognised standard, by an accredited laboratory].

24. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, within two years from the granting of this consent and again at four years from the granting of this consent and every six years thereafter a written report:

    (a) reviewing any technological advances in the reduction or mitigation of emissions, especially but not exclusively in respect of sulphur dioxide, dioxins, and heavy metals, how these might be applicable and/or implemented at the energy centre, and the costs and benefits of these advances; and

(b) addressing any other issue relevant to the minimisation or mitigation of emissions from the site that the Chief Executive, Taranaki Regional Council, reasonably considers should be included.

25. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, within twelve months from the exercising of this consent and again every 12 months thereafter while the consent is being exercised, a written report:

(a) detailing an inventory of emissions from the site of such contaminants as the Chief Executive, Taranaki Regional Council, may from time to time specify [in accordance with the emissions identified in the application] following consultation with the consent holder;

(b) detailing any measures that have been taken by the consent holder to improve the energy efficiency of the energy centre; and

(c) detailing average sulphur content and maximum sulphur content [based on monthly analyses of daily representative samples] of all fuel consumed at the site and volume of fuel consumed, during the previous twelve months.

26. The consent holder shall develop or procure a cultural impact report within 12 months of the granting of this consent.

Liaison meeting

27. The consent holder shall invite staff of the Taranaki Regional Council and interested submitters to application 2785 to meet annually to discuss any matter relating to the exercise of this consent. The first liaison meeting shall be held within 12 months of the commissioning of the energy centre.

Lapse and review

28. This consent shall lapse on the expiry of 10 years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

29. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent within two months of receiving a report prepared by the consent holder pursuant to conditions 24, 25, and 26 of this consent, or following non-compliance with special condition 14, or in any case in June 2010 and/or June 2016 and/or June 2022 and/or June 2028, for the purposes of:

(a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was either not foreseen at the time the application was considered or which it is appropriate to deal with at the time of the review;

(b) requiring the holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge;

(c) altering, adding, or deleting limits on discharge, receiving environment or ambient concentrations of any contaminant or contaminants, for the purpose of dealing with any significant adverse ecological effect on any ecosystem; or

(d) taking into account any Act of Parliament, regulation, national policy statement or national environmental standard which relates to setting maximum discharge or ambient concentrations of any air contaminant, and/or limiting, recording, or mitigating emissions of carbon dioxide, PM_{10} particulate, heavy metals, sulphur dioxide, and/or nitrogen dioxide, and which is relevant to the air discharge from the consent holder's energy centre if it is the express intention of any such mechanism to apply retrospectively to existing activities.

Signed at Stratford on 7 December 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 6273-1

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Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	4 October 2006

Conditions of Consent

Consent Granted:	To discharge emissions into the air from 'Cogen-I' and 'Cogen-II' gas-fired co-generation energy generating plants with an energy output of 70 MW together with associated processes at or about GR: Q21:215-766
Expiry Date:	1 June 2025
Review Date(s):	June 2010, June 2015, June 2020
Site Location:	Whareroa Road, Hawera
Legal Description:	Lot 1 DP 12929 Lots 1 & 2 DP 13689 Lot 1 DP 17308 Lot 1 DP 17686 Lots 1-3 DP 19722 Pt Sec 234 Blk X Hawera SD

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants into the environment from the site.

2. The measures representing the best practicable option may be reviewed in accordance with the procedure provided for in condition 15.

3. Prior to undertaking any alterations to the plant, processes or operations, as specified in applications 92/151, 95/141, 96/233, 97/112, 346, 391, and 2811 which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and any amendments.

4. The consent holder shall provide to the Taranaki Regional Council within five years from the granting of this consent and every six years thereafter a written report:

a) reviewing any technological advances in the reduction or mitigation of emissions, how these might be applicable and/or implemented at the Whareroa site, and the costs and benefits of these advances; and

b) detailing an inventory of emissions from the site of such contaminants as the Chief Executive, Taranaki Regional Council, may from time to time specify following consultation with the consent holder; and

c) detailing any measures that have been taken by the consent holder to improve the energy efficiency of the Whareroa site; and

d) addressing any other issue relevant to the minimisation or mitigation of emissions from the Whareroa site that the Chief Executive, Taranaki Regional Council, considers should be included.

5. The consent holder shall control all emissions of carbon monoxide to the atmosphere from the site, in order that the maximum ground level concentration of carbon monoxide arising from the exercise of this consent measured under ambient conditions does not exceed 10 milligrams per cubic metre [mg/m^3] [eight- hour average exposure], or 30 milligrams per cubic metre [mg/m^3] [one-hour average exposure] at or beyond the boundary of the site.

6. The sum of all discharges to the atmosphere of nitrogen oxides from the cogeneration plant shall not exceed 48 grams per second [g/s].

7. The consent holder shall control all emissions of nitrogen dioxide or its precursors to the atmosphere from the site, so as to ensure that the maximum ground level concentration of nitrogen dioxide measured under ambient conditions does not exceed 200 micrograms per cubic metre [$\mu g/m^3$] [one-hour average], or 100 micrograms per cubic metre [$\mu g/m^3$] [twenty-four hour average], at or beyond the boundary of the site.

8. The consent holder shall control all emissions of fine particulates [PM_{10}] to the atmosphere from the site, in order that the maximum ground level concentration of fine particulates [PM_{10}] arising from the exercise of this consent measured under ambient conditions does not exceed 50 micrograms per cubic metre [$\mu g/m^3$] [twenty-four hour average], at or beyond the boundary of the site.

9. The consent holder shall control all emissions to the atmosphere from the site of contaminants other than carbon dioxide, carbon monoxide, and nitrogen oxides, in order that the maximum ground level concentration for any particular contaminant arising from the exercise of this consent measured at or beyond the boundary of the site is not increased above background levels:

   a) by more than $1/30^{th}$ of the relevant Workplace Exposure Standard-Time Weighted Average, or by more than the Workplace Exposure Standard Short Term Exposure Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour]; or

   b) if no Short Term Exposure Limit is set, by more than the General Excursion Limit at any time [all terms as defined in Workplace Exposure Standards, 2002, Department of Labour].

10. The minimum height of discharge of products of combustion from the Cogen I plant shall be 15 metres above ground level, and from Cogen II plant shall be 17.5 metres above ground.

11. The consent holder shall minimise the emissions and impacts of air contaminants discharged from the site by the selection of the most appropriate process equipment, process control equipment, emission control equipment, methods of control, supervision and operation, and the proper and effective operation, supervision, control and maintenance of all equipment and processes.

12. The consent holder, in conjunction with the Taranaki Regional Council, shall undertake monitoring of emissions and their effects upon the environment as required by the Chief Executive, Taranaki Regional Council.

13. Notwithstanding conditions 1 and 11 above, the co-generation plants shall not be operated so as to generate emissions of visible smoke, nor shall any plume of visible water vapour from the cooling towers cross the boundary of the site.

14. The water treatment regime used in the cooling water system associated with Cogen I and Cogen II shall be to the satisfaction of the Chief Executive, Taranaki Regional Council.

15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent within six months of receiving a report prepared by the consent holder pursuant to condition 4 of this consent, or in any case in June 2010 and/or June 2015 and/or June 2020, for the purposes of:

    a) dealing with any significant adverse effect on the environment arising from the exercise of the consent which was not foreseen at the time the application was considered and which it is appropriate to deal with at the time of the review; and/or

    b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge; and/or

    c) to alter, add, or delete limits on mass discharge quantities or discharge or ambient concentrations of any contaminant or contaminants; and/or

    d) taking into account any Act of Parliament, regulation, national policy statement, national environmental standard, regional policy statement or regional rule which relates to limiting, recording, or mitigating products of combustion and which is relevant to emissions from the co-generation plants.

Signed at Stratford on 4 October 2006

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 7465-1

TARANAKI REGIONAL COUNCIL

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Discharge Permit

Pursuant to the Resource Management Act 1991 a resource consent is hereby granted by the Taranaki Regional Council

Name of Consent Holder:	Fonterra Co-operative Group Limited, Whareroa P O Box 444 HAWERA
Consent Granted Date:	31 March 2009

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the combustion of waste wood packaging at or about (NZTM) 1711447E-5613278N
Expiry Date:	1 June 2028
Review Date(s):	June 2016, June 2022
Site Location:	Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 Blks IX & X Hawera SD

For General, Standard and Special conditions pertaining to this consent please see reverse side of this document

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent only authorises the combustion of untreated timber packing waste originating from the Whareroa Dairy Factory site.

2. The total volume of waste that can be burned in calendar month shall not exceed 4 cubic metres.

3. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent by ensuring proper and effective methods of control and supervision of the discharge at all times.

4. The consent holder, prior to lighting any fire, shall have regard to wind direction and speed so as to minimise adverse effects upon neighbours. No burning shall occur during foggy conditions.

5. The discharges authorized by this consent shall not give rise to a level of a contaminant or contaminants at or beyond the boundary of the site that is noxious or toxic.

6. The discharges authorized by this consent shall not give rise to an odour at or beyond the boundary of the site that is offensive or objectionable.

7. The consent holder shall maintain a record of each burning event, including: the date, time and duration; the wind conditions [strength and direction] over the duration of the burning; any problems or issues that occurred; and details of any complaints received about the burning. This record shall be made available to the Chief Executive, Taranaki Regional Council upon request.

8. This consent shall lapse on 31 March 2014, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

9. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2016 and/or June 2022 for the purpose or purposes of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 31 March 2009

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix II
Marine ecological monitoring reports

Internal Memorandum

To: Scientific Officer, James Kitto
Environmental Monitoring Manager, Keith Brodie
From: Scientific Officer, Emily Roberts
File: #124022
Date: 4 September 2013

Fonterra Whareroa/Hawera Municipal Combined Outfall – Marine Ecological Survey November 2012

Introduction

Consent 1450 allows the discharge of dairy factory wastewater from the Fonterra Whareroa factory via a marine outfall. The consent allowing this discharge was renewed in September 1995, requiring the Company to install a long outfall by 31 August 1997. Prior to the renewal of this consent, the wastewater was discharged via a short marine outfall at approximately mean low water spring (MLWS) level which caused significant adverse effects on marine intertidal ecology to at least 1000m southeast of the outfall.

In February 2001, wastewater from the Hawera Oxidation Ponds was connected to the long outfall by consent 5079, allowing a municipal wastewater discharge of 10,000 m^3/day. By comparison, the Fonterra Whareroa wastewater discharge limit was 26,000 m^3/day. As of 19 September 2006, the permitted volume of wastewater discharge increased to 40,000 m^3/day. The oxidation pond discharge was also increased to 12,000 m^3/day in December 2007.

Special condition 6 of consent 1450 and special condition 3 of consent 5079 requires there to be no significant visual, chemical or ecological impacts outside of a 200m mixing zone or within the intertidal zone. Specifically, consent 5079 requires the consent holder to ensure that a monitoring programme is established to record and analyse the effects on the intertidal reefs and water quality adjacent to the discharge. Accordingly, two intertidal surveys of the intertidal zone were carried out as part of the 2012-2013 monitoring programme for the combined marine outfall. The first survey for the 2012-2013 monitoring period was conducted at four sites between 12 and 15 November 2012.

Methods

Field Work

Of the four sites surveyed, three have been identified by NIWA as having shoreline contact with the wastewater discharged from the outfall (Palliser *et al*., 2013): 350m northwest of the outfall (SEA906049), 200m southeast of the outfall (SEA906057) and 1550m southeast of the outfall on Pukeroa Reef (SEA906067) (Photographs 1-3, Figure 1). The control site at Waihi Reef (Photograph 4, Figure 1), approximately 4500m northwest of the outfall (SEA906025), has been identified by NIWA as unlikely to be impacted by the discharged wastewater (Palliser *et al*., 2013).

Photograph 1 Surveying 350m northwest of the outfall with Mere Brooks and Phoebe Paraha

Photograph 2 Survey site 200m southeast of the outfall

Photograph 3 Surveying Pukeroa Reef with Will and Maakere Edwards

Photograph 4 Survey control site Waihi Reef

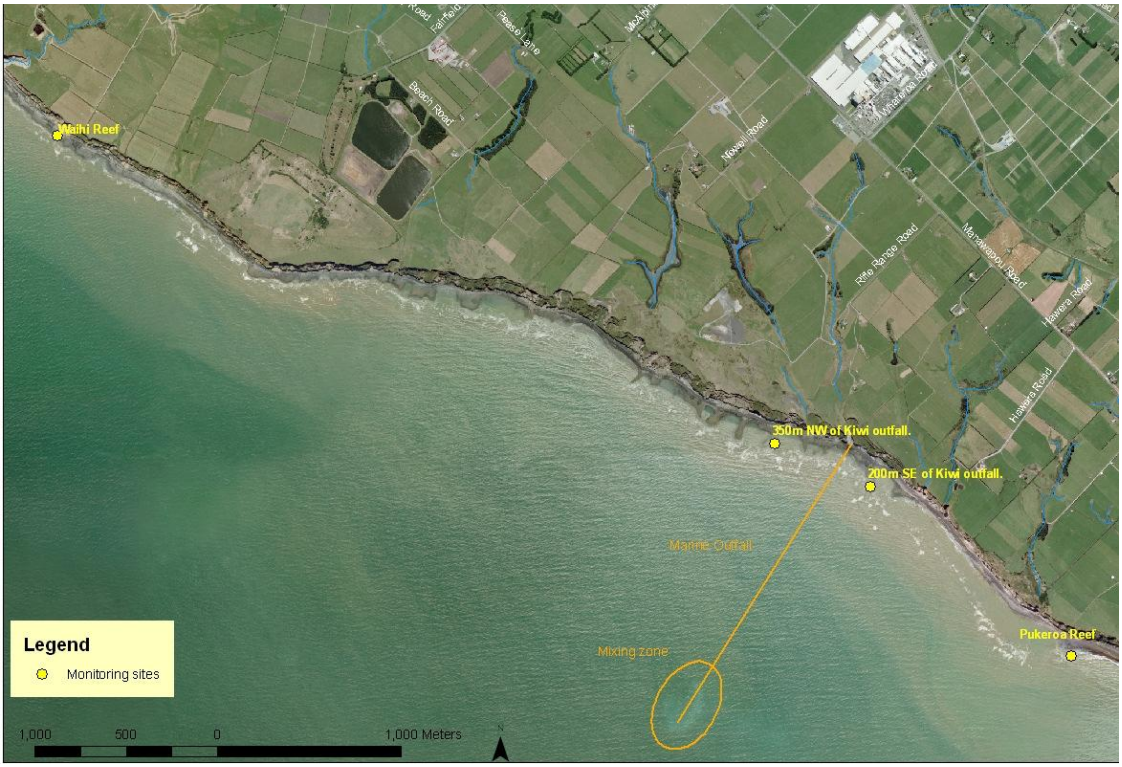


Figure 1 Survey sites in relation to the outfall

At each site, a 50m transect was used to establish five 5m x 3m blocks. Within each block, five random 0.25m^2 quadrats were laid giving a total of 25 random quadrats (Photograph 5). For each quadrat the percentage cover of algae and encrusting animal species was estimated using a grid. For all other animal species, individuals larger than 3mm were counted. Under boulder biota was counted where rocks and cobbles were easily overturned.

Photograph 5 Survey at 200m southeast of the outfall showing the quadrat and transect used

Results

Summary statistics, including the mean number of species per quadrat and the mean Shannon-Weiner indices, are shown in Table 1. The site 350m NW had the highest number of species, followed by 200m SE, Pukeroa Reef and Waihi Reef respectively. Diversity (Shannon-Weiner index) was highest at the site 200m SE followed by 350m NW, Pukeroa reef and Waihi reef respectively.

Table 1 Mean results for the November 2012 survey

Site	No. of quadrats	Mean number of species per quadrat			Mean Shannon-Weiner indices per quadrat		
		Algae	Animals	Total Species	Algae	Animals	Total Species
Waihi Reef	25	2.92	8.96	11.88	0.32	0.72	0.82
350m NW	25	4.64	10.56	15.20	0.50	0.84	0.95
200m SE	25	7.44	7.56	15.00	0.67	0.73	0.96
Pukeroa Reef	25	4.04	9.88	13.9	0.52	0.77	0.91

Number of Species per Quadrat

Figure 2 shows the total number of species per quadrat as a box and whisker plot. The notched area of the box represents the median plus and minus a 95% confidence interval for the median. This form of graphical representation allows a quick comparison to be made between sites. Generally, if the notched areas of the boxes for the different sites do not overlap, one would expect to obtain a significantly different result with ANOVA.

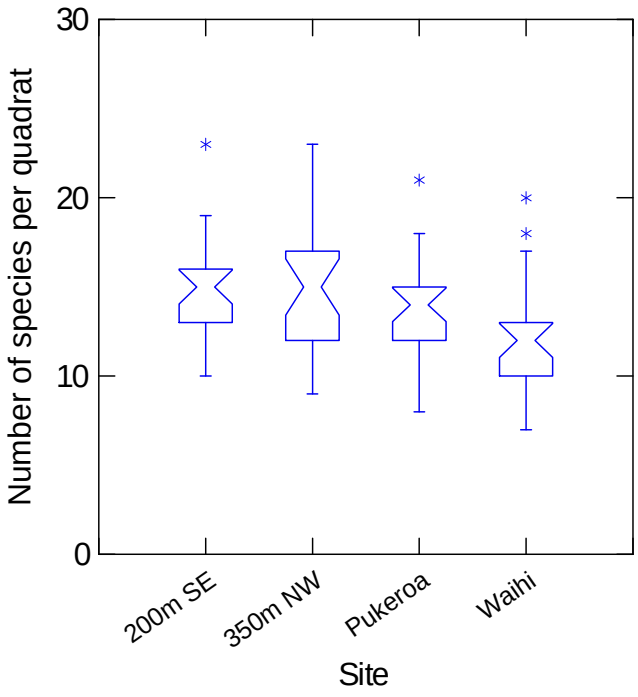


Figure 2 Box and whisker plots of mean number of species per quadrat

Only one site (200m SE) showed a significant deviation from normal distribution at the 95% confidence level (Lilliefors test, n = 25, P = 0.036). There was a significant difference in mean number of species per quadrat between the sites (ANOVA, n = 25, F = 5.93, P = 0.001).

Table 2 Tukey's multiple comparison test of number of species per quadrat

Site	Waihi Reef	350m NW	200m SE
350m NW	SIG		
200m SE	SIG	NS	
Pukeroa Reef	NS	NS	NS

SIG = Significant difference
NS = No significant difference

Significant differences between sites were determined using Tukey's multiple comparison test (Table 2). At Waihi Reef the mean number of species per quadrat was significantly lower than that at 350m NW and 200m SE.

Shannon-Weiner Diversity Index

Figure 3 shows the mean Shannon-Weiner index data at each site as a box and whisker plot.

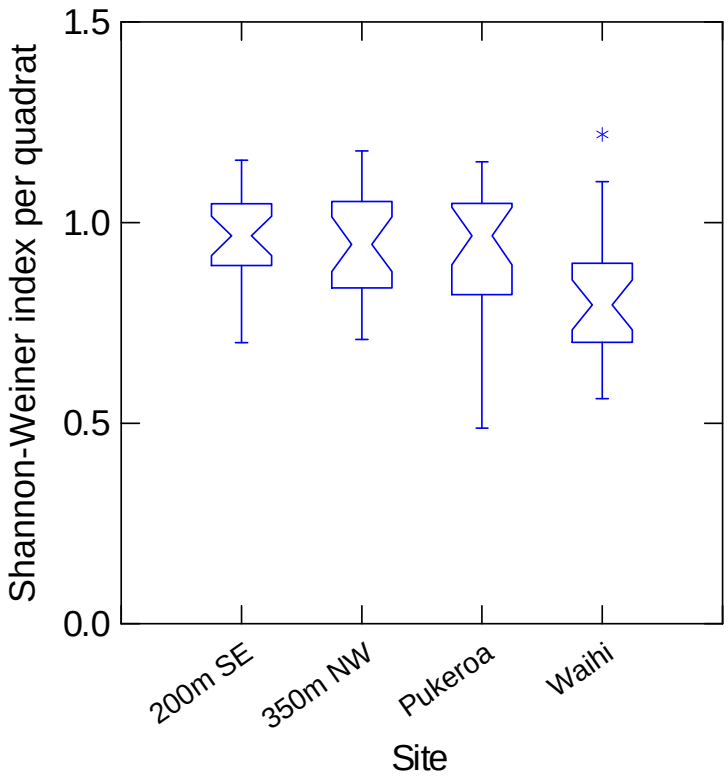


Figure 3 Box and whisker plots of mean Shannon-Weiner indices per quadrat

Only one of the sites (Pukeroa) showed a significant deviation from normal distribution at the 95% confidence level (Lilliefors test, n = 25, P = 0.009). There was a significant difference

in the mean Shannon-Weiner index per quadrat between sites (ANOVA, n = 25, F = 4.501, P 0.005).

Table 3 Tukey multiple comparison test of Shannon-Weiner index per quadrat

Site	Waihi Reef	350m NW	200m SE
350m NW	SIG		
200m SE	SIG	NS	
Pukeroa Reef	NS	NS	NS

SIG = Significant difference
NS = No significant difference

Significant differences between sites were determined using Tukey's multiple comparison test (Table 3). At Waihi Reef the mean Shannon-Weiner index per quadrat was significantly lower than that at 200 m SE and 350m NW.

Sand Coverage

The level of sand cover was low (<12%) at all sites (Table 4). Abundance and diversity of intertidal species/communities can be significantly impacted by sand cover of 30% and higher.

Table 4 Mean percentage sand cover per quadrat

Site	Mean coverage per quadrat (%)
Waihi Reef	3.4
350m NW	11.5
200m SE	2.4
Pukeroa Reef	1.0

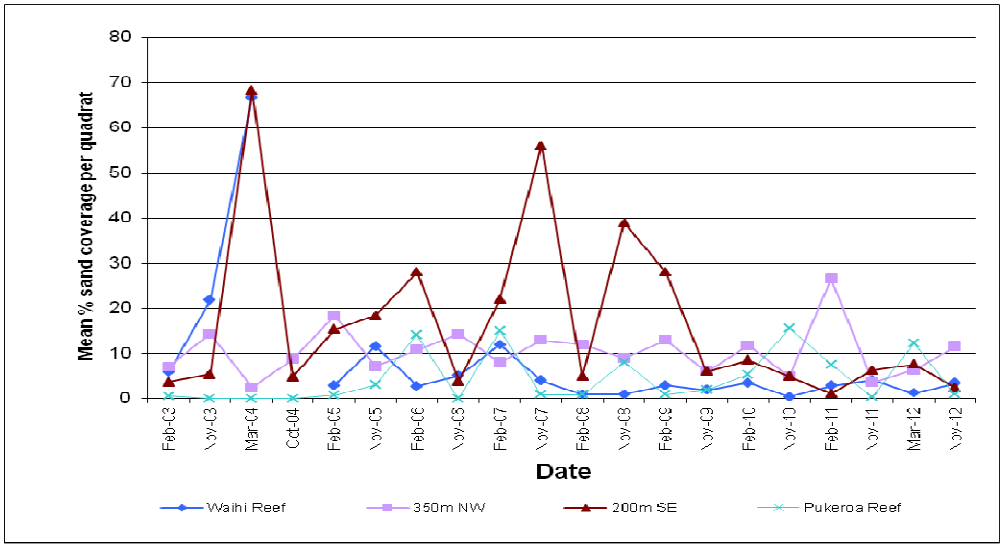


Figure 4 Mean percentage sand cover (summer & spring) by site since February 2003

Trends over time

Species number and diversity

Comparisons of the mean number of species per quadrat (Figure 5) and mean Shannon-Weiner diversity index per quadrat (Figure 6) for all spring surveys undertaken since November 1992 are shown below.

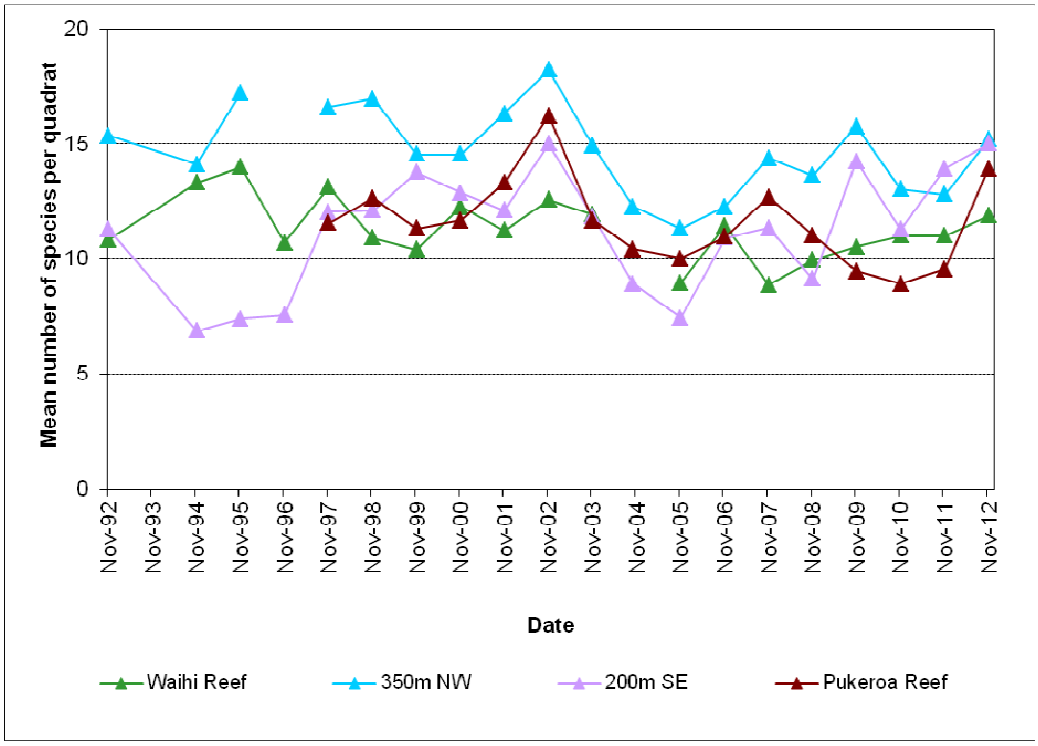


Figure 5 Mean number of species per quadrat for spring surveys 1992-2012

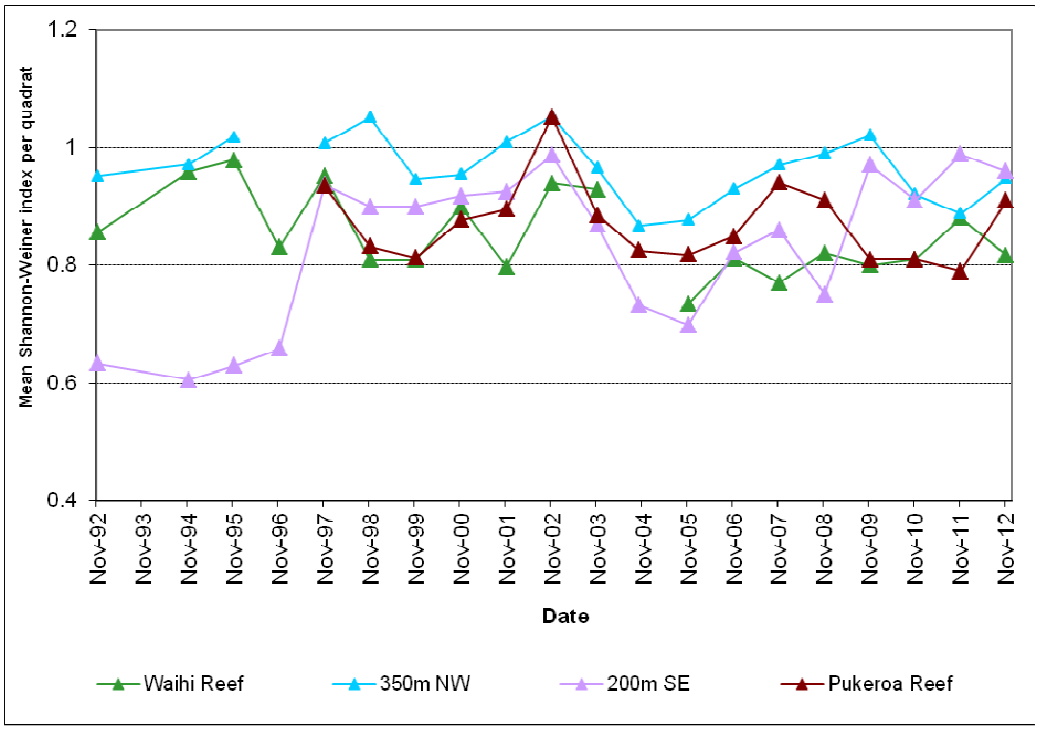


Figure 6 Mean Shannon-Weiner indices per quadrat for spring surveys 1992-2012

Prior to the installation of the long marine outfall in August 1997, there was notably lower species richness and diversity (number of species and Shannon-Weiner Index per quadrat) at the impact site 200m SE relative to the control site at Waihi Reef (Figures 5 and 6). A sharp increase in species diversity occurred at the site 200m SE following installation of the outfall (Figures 5 and 6). Since then (1997), sites have shown interannual variability in both number of species and Shannon-Weiner Index, but there has been no noticeable difference in trends between the impact site and the control sites over this period.

In previous survey reports, concern had been expressed regarding the general decline in both number of species and Shannon-Weiner Index per quadrat for the site at Pukeroa Reef since 2007 (Figures 5 and 6). The results of the November 2012 survey show a change in this trend, with number of species and Shannon-Weiner Index per quadrat increasing at all three impact sites, including Pukeroa Reef (Figures 5 and 6).

Discussion

Previous surveys have shown that the dairy factory wastewater discharged through the near-shore outfall prior to 1997 (Photograph 1) was having significant adverse effects on the local intertidal community. The adverse effects recorded included the coating of rocks and tidal pools with fats, significant coverage by filamentous bacterial growths and a significant decrease in ecological diversity. The nature and magnitude of adverse effects varied with distance from the outfall, and were most apparent at the sites 30m and 200m southeast of the outfall (note that the former site is no longer surveyed as of 2007). In 1997 the dairy company installed a long outfall to discharge the wastewater nearly 2km offshore in order to mitigate the adverse effects occurring along the coastline. Numerous spring and summer intertidal surveys have now been undertaken along the Hawera coastline subsequent to installation of the long outfall. Results show a general improvement in the health of intertidal communities following installation of the outfall. In February 2001 the Hawera Oxidation Ponds municipal wastewater was also connected to the long outfall.

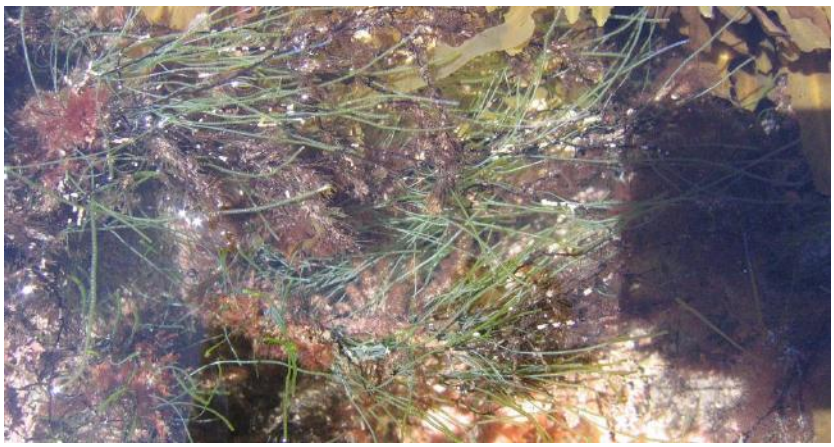
Photograph 6 Discharge from the dairy factory near-shore outfall prior to 1997

Impacts of the marine outfall discharge on the local intertidal communities were not evident from the November 2012 survey results (Figures 2 and 3). The impact sites 350m NW and 200m SE had a significantly higher number of species per quadrat than the control site at Waihi Reef.

Sand cover was low (<12%) at all sites during the November 2012 survey. Long term monitoring of intertidal rocky reefs around the Taranaki coastline have shown the abundance and diversity of these communities can be adversely affected when sand levels exceed 30% cover. Although it is not expected that sand cover would have impacted the reef communities monitored during the November 2012 survey, high percentage sand cover (>30%) has previously been recorded at the site 200m SE (Figure 4).

The historical record of survey results (Figures 5 and 6) showed no obvious impact of the marine outfall discharge on the local intertidal communities since installation of the long outfall in 1997. Both control and potential impact sites showed interannual variability and there were no obvious declining trends at the impact sites closest to the outfall relative to the control site. It must be noted that the high energy receiving environment combined with the effects of suspended sediments from nearby rivers/streams and eroding cliffs prevent the development of stable biological communities along the South Taranaki coastline (Clark *et al*., 2012). Such communities could potentially mask any subtle ecological effects from the outfall wastewater discharge. However, in spite of these limitations, the long term record indicates that the intertidal surveys are useful for detecting more noticeable effects from the wastewater, as the impact on intertidal communities prior to installation of the outfall is clearly evident (Figures 5 and 6, Clark *et al*., 2012).

The most notable change in species composition since the commissioning of the long outfall is the decline of *Chaetomorpha* sp. (Photograph 2) and the absence of filamentous bacterial growths at 200m SE (Figures 7 and 8). The adverse effects recorded prior to the long outfall also included the coating of rocks and tidal pools with fats and a significant decrease in ecological diversity. Sand/silt inundation resulting from cliff erosion (Photograph 8) can be an important factor effecting species composition and diversity along the South Taranaki coastline. The coast is in a constant state of erosion with layers of sand and silt often smothering marine life at some sites. Resulting high seawater turbidity can also affect light availability impacting on macroalgae. Observations indicate that freshly fallen boulders from the cliffs provide a poor habitat for intertidal organisms.



Photograph 7 Green filaments of ***Chaetamorpha***, an algal genus often associated with high nutrient concentrations (North Taranaki)

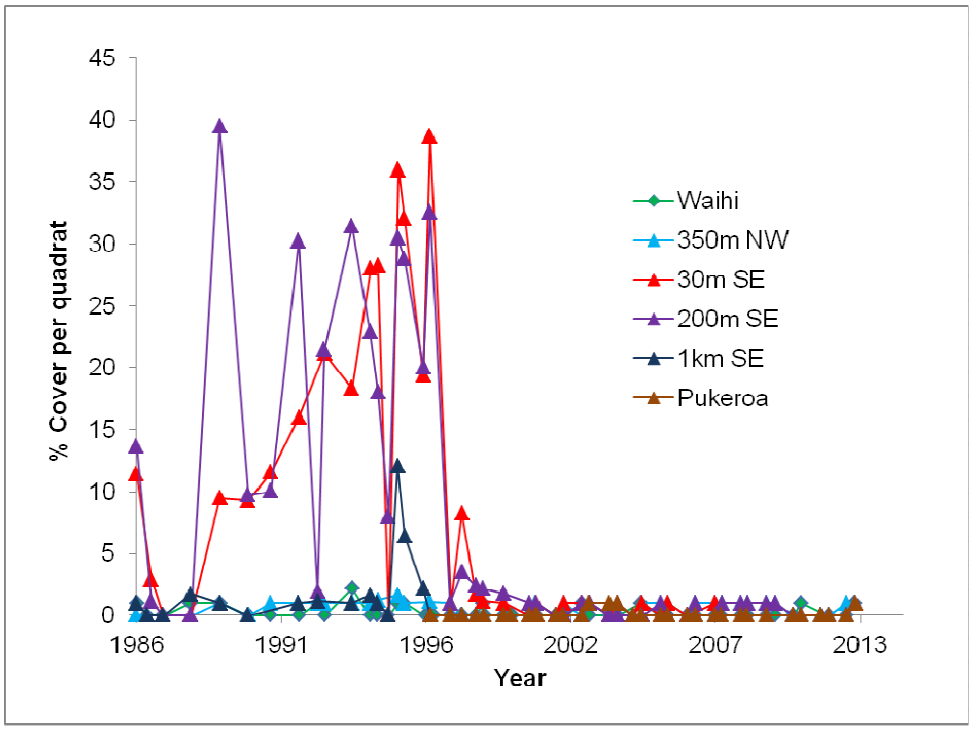


Figure 7 Percentage cover per quadrat of ***Chaetamorpha*** since 1986

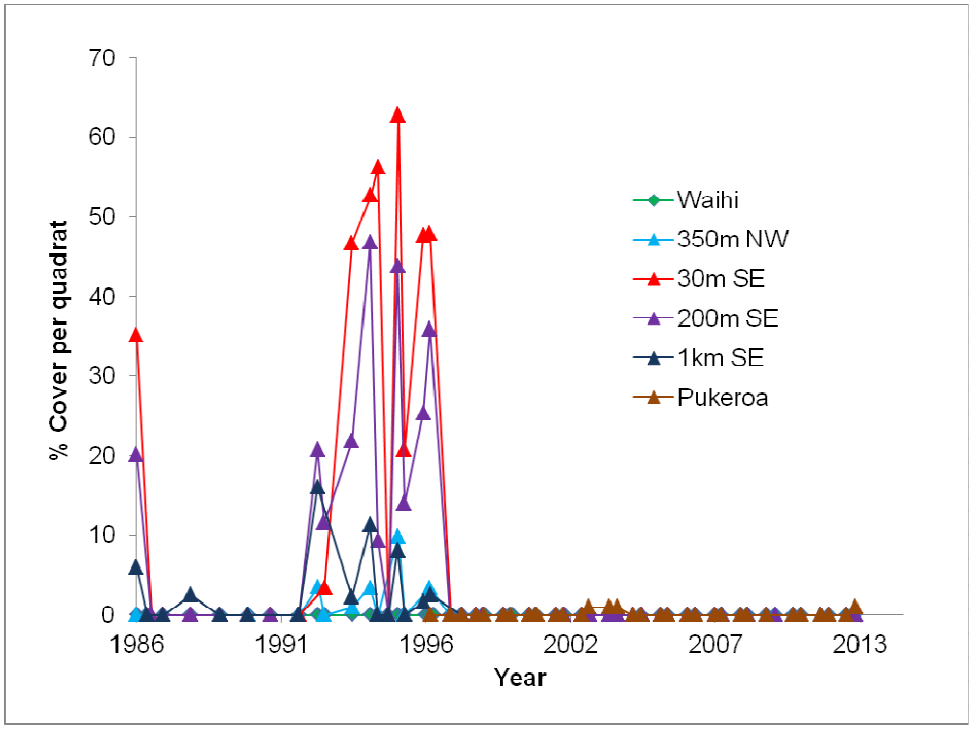


Figure 8 Percentage cover per quadrat of filamentous bacteria since 1986

N.B. Since 2007, the sites 30m SE and 1km SE are no longer monitored as part of the Fonterra Whareroa intertidal survey.

Photograph 8 Erosion of the cliffs close to Pukeroa Reef (2006)

Conclusions

In order to assess the effects of the Fonterra Whareroa and Hawera Waste Water Treatment Plant outfall discharge on the nearby intertidal communities, surveys were conducted between 12 and 15 November 2012 at four sites. These surveys included three potential impact sites either side of the outfall (two southeast and one west) and one control sites to the northwest. It is expected that adverse effects of the marine outfall discharge on the intertidal communities would have been evident as a significant decline in species richness and diversity at the potential impact sites relative to the control site.

As both species richness and diversity were higher at the two potential impact sites closest to the outfall relative to the control site, and results from sites closest to the outfall had not declined notably in recent years, the results indicate that the marine outfall discharge was not having detectable adverse effects on the intertidal reef communities of South Taranaki. Natural environmental factors, including coastal erosion, exposure and substrate mobility, appeared to be dominant drivers of species richness and diversity at the sites surveyed.

Emily Roberts
Marine Ecologist

References

Palliser, C., McBride, G., Goodhune, N., Bell, R., Stott, R. (2013) Fonterra Whareroa Dairy Factory and Hawera WWTP, Stage 2 QMRA based on the combines discharge. NIWA Client Report No. HAM2013-050

Clark, D., Barter, P., Clement, D., Tremblay, L., Forrest, R. (2013) Whareroa Marine Outfall ecological investigation 2012. Cawthron Report No. 2348

Internal Memorandum

To: Scientific Officer, James Kitto
Environmental Monitoring Manager, Keith Brodie
From: Scientific Officer, Emily Roberts
File: #1246957
Date: 6 September 2013

Fonterra Whareroa/Hawera Municipal Combined Outfall – Marine Ecological Survey March 2013

Introduction

Consent 1450 allows the discharge of dairy factory wastewater from the Fonterra Whareroa factory via a marine outfall. The consent allowing this discharge was renewed in September 1995, requiring the Company to install a long outfall by 31 August 1997. Prior to the renewal of this consent, the wastewater was discharged via a short marine outfall at approximately mean low water spring (MLWS) level which caused significant adverse effects on marine intertidal ecology to at least 1000m southeast of the outfall.

In February 2001, wastewater from the Hawera Oxidation Ponds was connected to the long outfall by consent 5079, allowing a municipal wastewater discharge of 10,000 m^3/day. By comparison, the Fonterra Whareroa wastewater discharge limit was 26,000 m^3/day. As of 19 September 2006, the permitted volume of wastewater discharge increased to 40,000 m^3/day. The oxidation pond discharge was also increased to 12,000 m^3/day in December 2007.

Special condition 6 of consent 1450 and special condition 3 of consent 5079 requires there to be no significant visual, chemical or ecological impacts outside of a 200m mixing zone or within the intertidal zone. Specifically, consent 5079 requires the consent holder to ensure that a monitoring programme is established to record and analyse the effects on the intertidal reefs and water quality adjacent to the discharge. Accordingly, two intertidal surveys of the intertidal zone were carried out as part of the 2012-2013 monitoring programme for the combined marine outfall. The second survey for the 2012-2013 monitoring period was conducted at four sites between 27 February and 14 March 2013.

Methods

Field Work

Of the four sites surveyed, three have been identified by NIWA as having shoreline contact with the wastewater discharged from the outfall (Palliser *et al*., 2013): 350m northwest of the outfall (SEA906049), 200m southeast of the outfall (SEA906057) and 1550m southeast of the outfall on Pukeroa Reef (SEA906067) (Photographs 1-3, Figure 1). The control site at Waihi Reef (Photograph 4, Figure 1), approximately 4500m northwest of the outfall (SEA906025), has been identified by NIWA as unlikely to be impacted by the discharged wastewater (Palliser *et al*., 2013).

Photograph 1 Surveying 350m northwest of the outfall with Mere Brooks and Phoebe Paraha

Photograph 2 Survey site 200m southeast of the outfall

Photograph 3 Surveying Pukeroa Reef with Will and Maakere Edwards

Photograph 4 Survey control site Waihi Reef

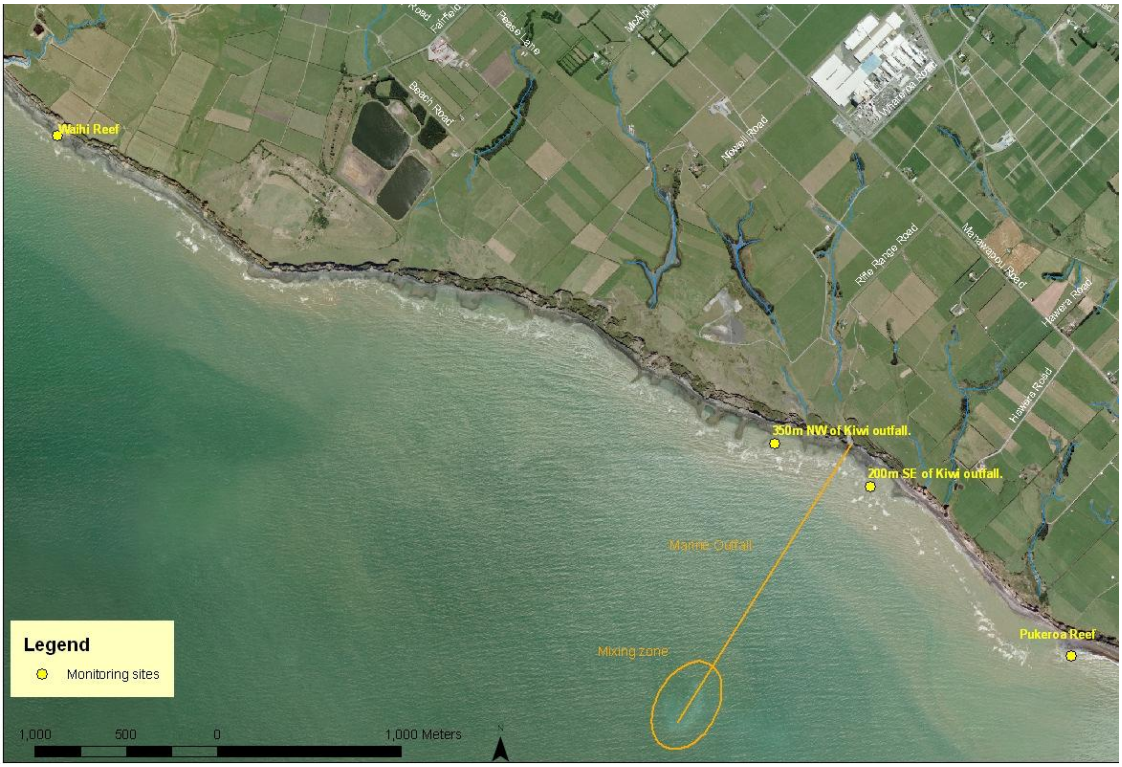


Figure 1 Survey sites in relation to the outfall

At each site, a 50m transect was used to establish five 5m x 3m blocks. Within each block, five random 0.25m^2 quadrats were laid giving a total of 25 random quadrats (Photograph 5). For each quadrat the percentage cover of algae and encrusting animal species was estimated using a grid. For all other animal species, individuals larger than 3mm were counted. Under boulder biota was counted where rocks and cobbles were easily overturned.

Photograph 5 Survey at 200m southeast of the outfall showing the transect used

Results

Summary statistics, including the mean number of species per quadrat and the mean Shannon-Weiner indices, are shown in Table 1. The site 200m SE had the highest number of species and diversity (Shannon-Weiner index), followed by 350m NW, Pukeroa Reef and Waihi Reef respectively.

Table 1 Mean results for the March 2013 survey

Site	No. of quadrats	Mean number of species per quadrat			Mean Shannon-Weiner indices per quadrat		
		Algae	Animals	Total Species	Algae	Animals	Total Species
Waihi Reef	25	3.24	8.88	12.12	0.36	0.76	0.89
350m NW	25	5.24	11.08	16.32	0.51	0.80	0.95
200m SE	25	7.80	9.20	17.00	0.65	0.78	1.00
Pukeroa Reef	25	3.56	8.72	12.28	0.47	0.74	0.90

Number of Species per Quadrat

Figure 2 shows the total number of species per quadrat as a box and whisker plot. The notched area of the box represents the median plus and minus a 95% confidence interval for the median. This form of graphical representation allows a quick comparison to be made between sites. Generally, if the notched areas of the boxes for the different sites do not overlap, one would expect to obtain a significantly different result with ANOVA.

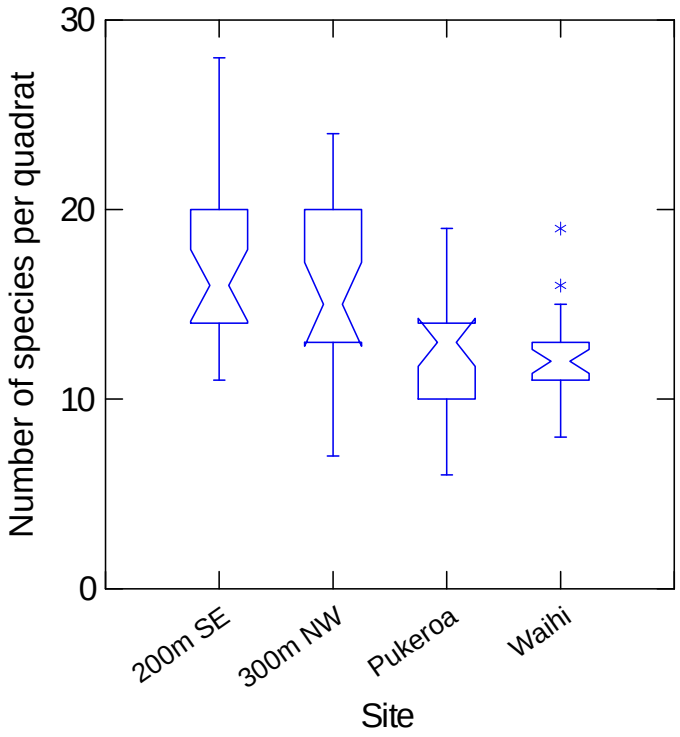


Figure 2 Box and whisker plots of mean number of species per quadrat

Only one site (Waihi) showed a significant deviation from normal distribution at the 95% confidence level (Lilliefors test, n = 25, P = 0.007). There was a significant difference in mean number of species per quadrat between the sites (ANOVA, n = 25, F = 12.193, P <0.001).

Table 2 Tukey's multiple comparison test of number of species per quadrat

Site	Waihi Reef	350m NW	200m SE
350m NW	SIG		
200m SE	SIG	NS	
Pukeroa Reef	NS	SIG	SIG

SIG = Significant difference
NS = No significant difference

Significant differences between sites were determined using Tukey's multiple comparison test (Table 2). At 200m SE and 350m NW the mean number of species per quadrat was significantly higher than that at Pukeroa Reef and Waihi Reef.

Shannon-Weiner Diversity Index

Figure 3 shows the mean Shannon-Weiner index data at each site as a box and whisker plot.

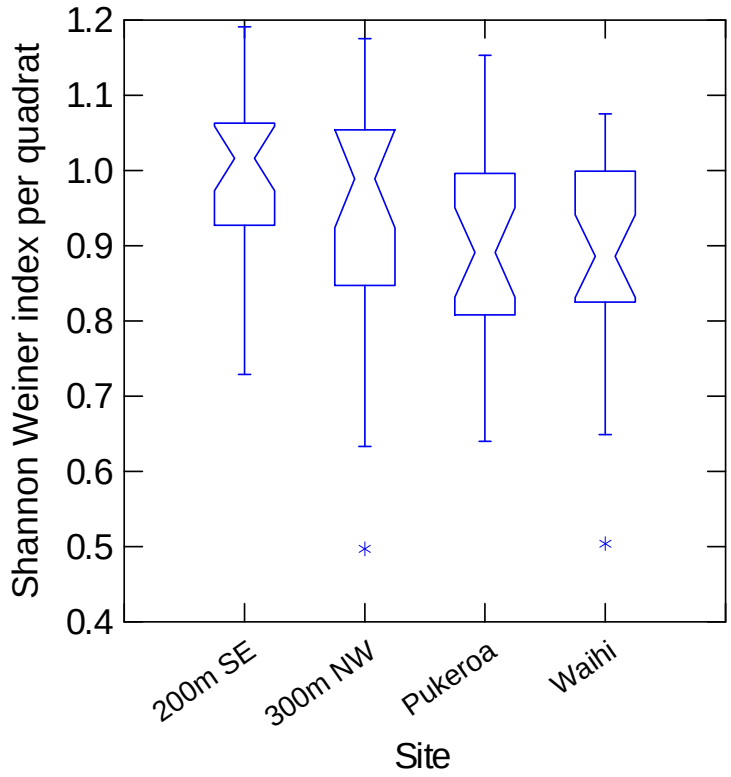


Figure 3 Box and whisker plots of mean Shannon-Weiner indices per quadrat

At all four sites, there was no significant deviation from normal distribution at the 95% confidence level (Lilliefors test, n = 25, P >0.05). There was a significant difference in the mean Shannon-Weiner index per quadrat between sites (ANOVA, n = 25, F = 3.095, P = 0.031).

Table 3 Tukey multiple comparison test of Shannon-Weiner index per quadrat

Site	Waihi Reef	350m NW	200m SE
350m NW	NS		
200m SE	SIG	NS	
Pukeroa Reef	NS	NS	NS

SIG = Significant difference
NS = No significant difference

Significant differences between sites were determined using Tukey's multiple comparison test (Table 3). At Waihi Reef the mean Shannon-Weiner index per quadrat was significantly lower than that at 200 m SE.

Sand Coverage

The level of sand cover was relatively low (<17%) at all sites (Table 4). Abundance and diversity of intertidal species/communities can be significantly impacted by sand cover of 30% and higher.

Table 4 Mean percentage sand cover per quadrat

Site	Mean coverage per quadrat (%)
Waihi Reef	6.7
350m NW	16.3
200m SE	6.5
Pukeroa Reef	5.2

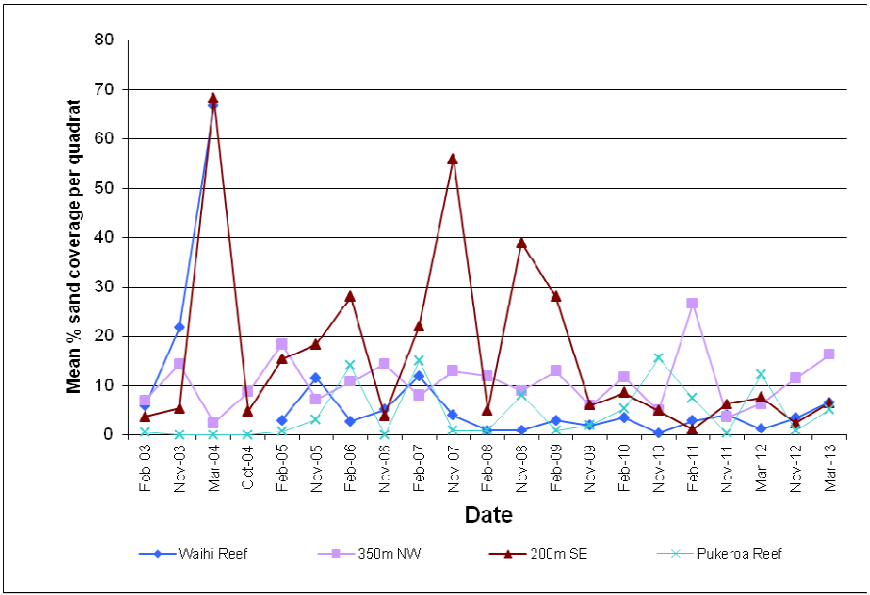


Figure 4 Mean percentage sand cover (summer & spring) by site since February 2003

Trends over time

Species number and diversity

Comparisons of the mean number of species per quadrat (Figure 5) and mean Shannon-Weiner diversity index per quadrat (Figure 6) for all summer surveys undertaken since January 1986 are shown below.

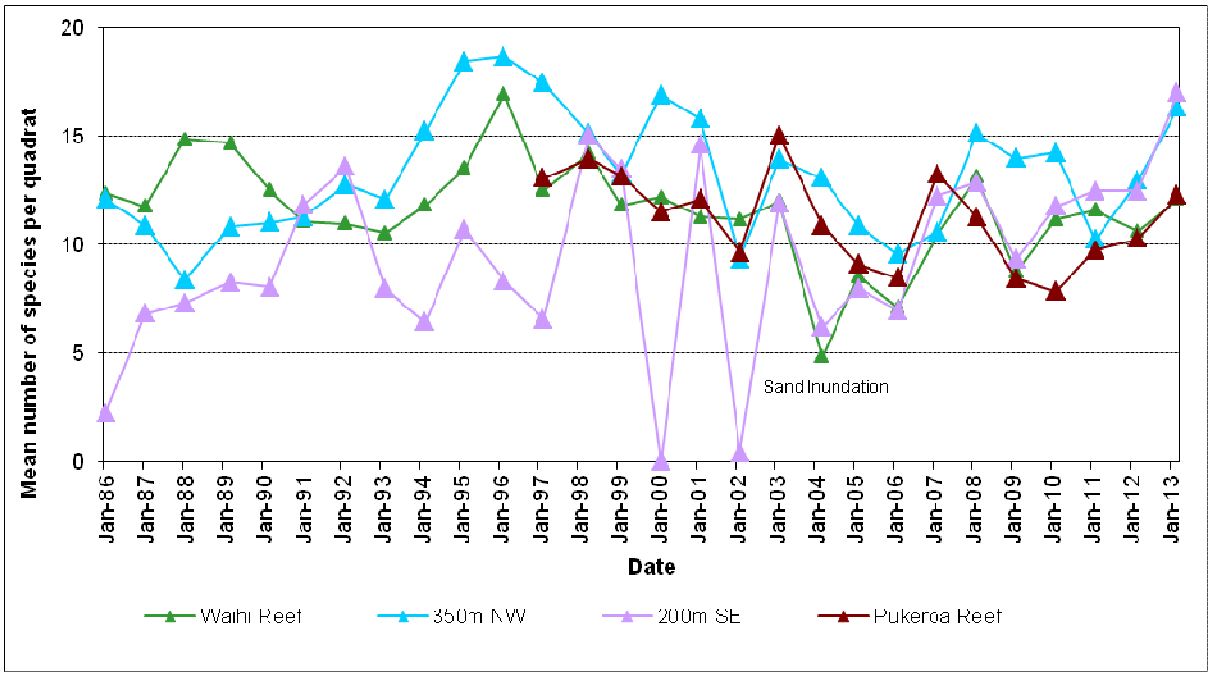


Figure 5 Mean number of species per quadrat for summer surveys 1986-2013

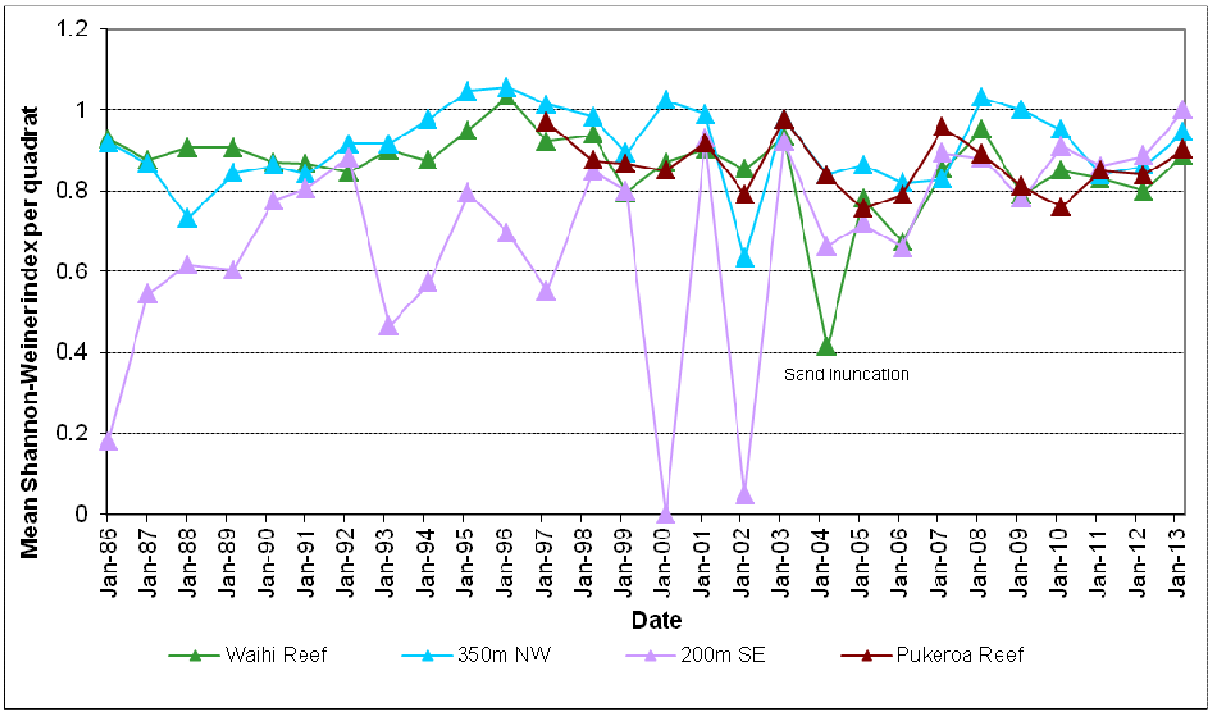


Figure 6 Mean Shannon-Weiner indices per quadrat for summer surveys 1986-2013

Prior to the installation of the long marine outfall in August 1997, both number of species and Shannon-Weiner Index per quadrat at the impact site 200m SE were generally lower than at the control site at Waihi Reef (Figures 5 and 6). Since then (1997), sites have shown interannual variability in both number of species and Shannon-Weiner Index, but there has been no noticeable difference in trends between the impact site and the control sites over this period, with the exception of years with heavy sand inundation (e.g. 2000 and 2002 at 200m SE, Figures 5 and 6).

Discussion

Previous surveys have shown that the dairy factory wastewater discharged through the near-shore outfall prior to 1997 (Photograph 1) was having significant adverse effects on the local intertidal community. The adverse effects recorded included the coating of rocks and tidal pools with fats, significant coverage by filamentous bacterial growths and a significant decrease in ecological diversity. The nature and magnitude of adverse effects varied with distance from the outfall, and were most apparent at the sites 30m and 200m southeast of the outfall (note that the former site is no longer surveyed as of 2007). In 1997 the dairy company installed a long outfall to discharge the wastewater nearly 2km offshore in order to mitigate the adverse effects occurring along the coastline. Numerous spring and summer intertidal surveys have now been undertaken along the Hawera coastline subsequent to installation of the long outfall. Results show a general improvement in the health of intertidal communities following installation of the outfall. In February 2001 the Hawera Oxidation Ponds municipal wastewater was also connected to the long outfall.

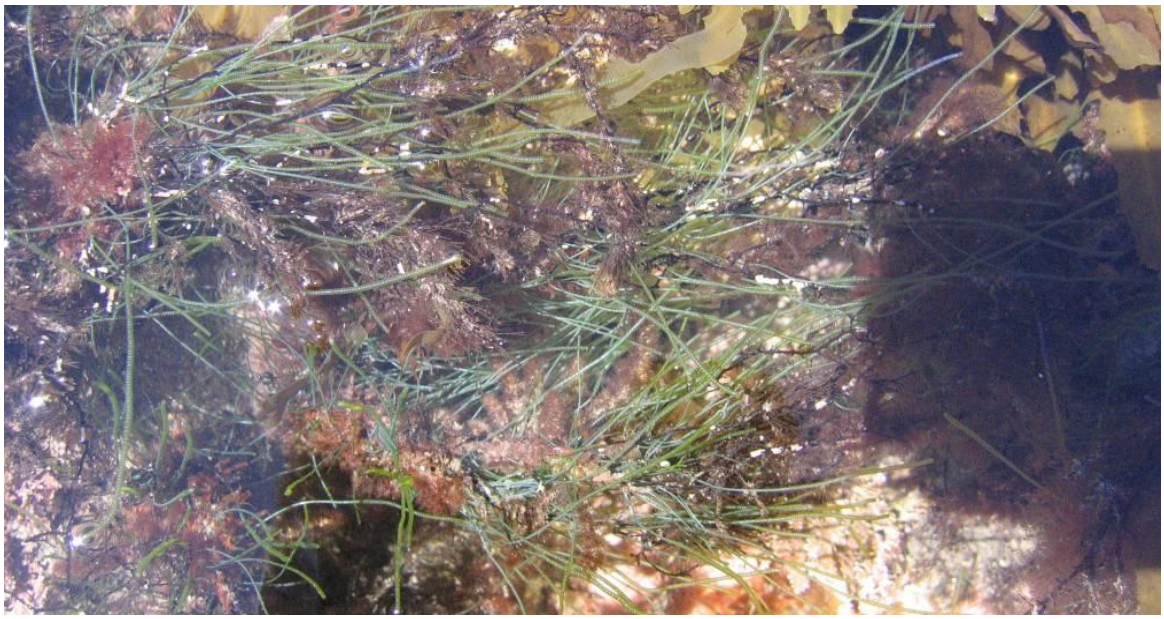
Photograph 6 Discharge from the dairy factory near-shore outfall prior to 1997

Impacts of the marine outfall discharge on the local intertidal communities were not evident from the March 2013 survey results (Figures 2 and 3). The impact sites 350m NW and 200m SE had a significantly higher number of species per quadrat than the control site at Waihi Reef.

Sand cover was low (<17%) at all sites during the March 2013 survey. Long term monitoring of intertidal rocky reefs around the Taranaki coastline have shown the abundance and diversity of these communities can be adversely affected when sand levels exceed 30% cover. Although it is not expected that sand cover would have impacted the reef communities monitored during the March 2013 survey, high percentage sand cover (>30%) has previously been recorded at the site 200m SE (Figure 4).

The historical record of survey results (Figures 5 and 6) showed no obvious impact of the marine outfall discharge on the local intertidal communities since installation of the long outfall in 1997. Both control and potential impact sites showed interannual variability and there were no obvious declining trends at the impact sites closest to the outfall relative to the control site. It must be noted that the high energy receiving environment combined with the effects of suspended sediments from nearby rivers/streams and eroding cliffs prevent the development of stable biological communities along the South Taranaki coastline (Clark *et al*., 2012). Such communities could potentially mask any subtle ecological effects from the outfall wastewater discharge. However, in spite of these limitations, the long term record indicates that the intertidal surveys are useful for detecting more noticeable effects from the wastewater, as the impact on intertidal communities prior to installation of the outfall is clearly evident (Figures 5 and 6, Clark *et al*., 2012).

The most notable change in species composition since the commissioning of the long outfall is the decline of *Chaetomorpha* sp. (Photograph 2) and the absence of filamentous bacterial growths at 200m SE (Figures 7 and 8). The adverse effects recorded prior to the long outfall also included the coating of rocks and tidal pools with fats and a significant decrease in ecological diversity. Sand/silt inundation resulting from cliff erosion (Photograph 8) can be an important factor effecting species composition and diversity along the South Taranaki coastline. The coast is in a constant state of erosion with layers of sand and silt often smothering marine life at some sites. Resulting high seawater turbidity can also affect light availability impacting on macroalgae. Observations indicate that freshly fallen boulders from the cliffs provide a poor habitat for intertidal organisms.



Photograph 7 Green filaments of ***Chaetamorpha***, an algal genus often associated with high nutrient concentrations (North Taranaki)

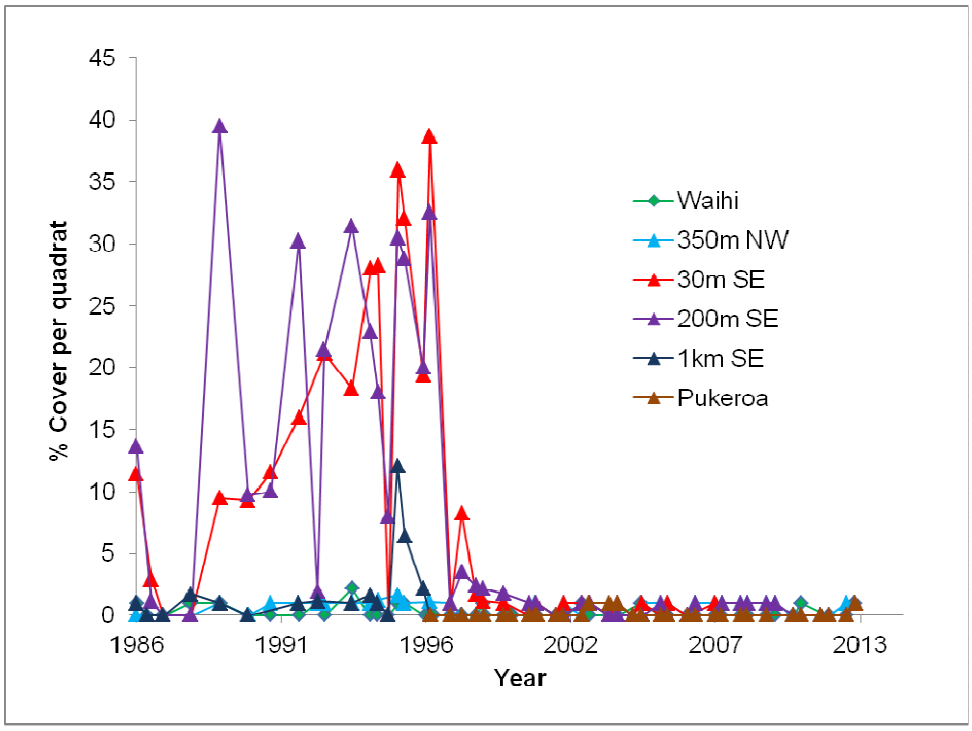


Figure 7 Percentage cover per quadrat of ***Chaetamorpha*** since 1986

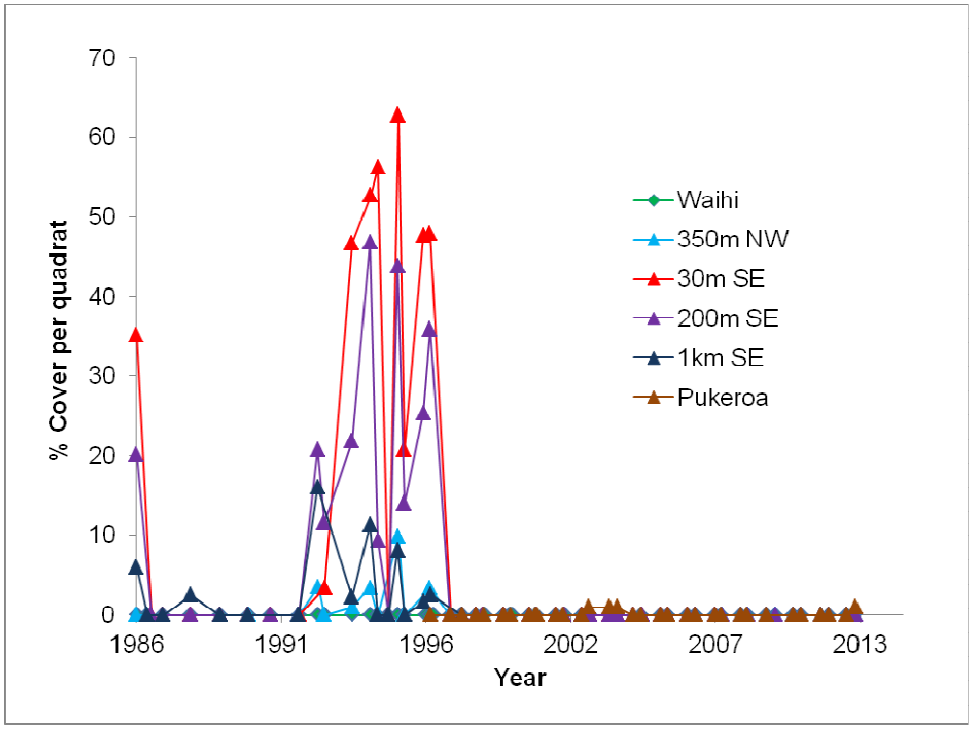


Figure 8 Percentage cover per quadrat of filamentous bacteria since 1986

N.B. Since 2007, the sites 30m SE and 1km SE are no longer monitored as part of the Fonterra Whareroa intertidal survey.

Photograph 8 Erosion of the cliffs close to Pukeroa Reef (2006)

Conclusions

In order to assess the effects of the Fonterra Whareroa and Hawera Waste Water Treatment Plant outfall discharge on the nearby intertidal communities, surveys were conducted between 27 February and 14 March 2013 at four sites. These surveys included three potential impact sites either side of the outfall (two southeast and one west) and one control sites to the northwest. It is expected that adverse effects of the marine outfall discharge on the intertidal communities would have been evident as a significant decline in species richness and diversity at the potential impact sites relative to the control site.

As both species richness and diversity were higher at the two potential impact sites closest to the outfall relative to the control site, and results from sites closest to the outfall had not declined notably in recent years, the results indicate that the marine outfall discharge was not having detectable adverse effects on the intertidal reef communities of South Taranaki. Natural environmental factors, including coastal erosion, exposure and substrate mobility, appeared to be dominant drivers of species richness and diversity at the sites surveyed.

Emily Roberts
Scientific Officer - Marine Ecologist

References

Palliser, C., McBride, G., Goodhune, N., Bell, R., Stott, R. (2013) Fonterra Whareroa Dairy Factory and Hawera WWTP, Stage 2 QMRA based on the combines discharge. NIWA Client Report No. HAM2013-050

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Appendix III

Freshwater biological monitoring reports

To Job Manager, Emily Roberts
From Scientific Officer, Brooke Thomas
Report No BT007
Doc. No. 1260429
Date 24 October 2013

Biomonitoring of unnamed tributaries of the Tangahoe River and the Tawhiti Stream, and an unnamed coastal stream which receive stormwater discharges from the Fonterra Whareroa dairy factory, May 2013

Introduction

Fonterra Co-operative Group Limited holds a number of resource consents for activities associated with the operations of the Whareroa dairy processing complex near Hawera. The resource consents most relevant to this biomonitoring survey are summarised in Table 1 below:

Table 1 Summary of resource consents held by Fonterra which are most relevant to this biological survey

Consent no.	Purpose
3902-2	To discharge up to 6,825 cubic metres/day [500 litres/second] of stormwater from a milk processing industry site into an unnamed tributary of the Tangahoe River
3907-2	To discharge stormwater, back flushing from the sand filters, and intermittent discharges of treated water from a reservoir, from a milk processing industry site into an unnamed tributary of the Tawhiti Stream in the Tangahoe catchment
4133-2	To discharge up to 5,400 cubic metres/day [500 litres/second] of stormwater from a milk processing industry site into an unnamed coastal stream between the Tangahoe River and the Waihi Stream
5819-1	To discharge treated farm dairy effluent from an oxidation pond treatment system and a constructed wetland into an unnamed tributary of the Tangahoe River

There are three stormwater catchments covering the Whareroa dairy complex site. Stormwater from the northern catchment of the site is directed to a detention pond system before being discharged into an unnamed tributary of the Tawhiti Stream (Consent 3907-2). This pond system was upgraded from a single pond to a three pond system in 1998 to increase the holding capacity of the system to better reflect stormwater loadings.

On the eastern side of the site, stormwater is conveyed to a two-pond detention system prior to discharge into an unnamed tributary of the Tangahoe River (Consent 3902-2). This pond system has been in place since May 1996. Treated dairy farm effluent is also discharged from a pond treatment system, through a tertiary treatment wetland and into the same unnamed tributary of the Tangahoe River, downstream of the Fonterra Whareroa eastern stormwater catchment discharge (Figure 1, 5819-1).

Stormwater from the southern end of the site is directed through a single pond and wetland system prior to discharge into an unnamed coastal stream (Consent 4133-2).

Biological surveys have been performed in the unnamed tributaries of the Tawhiti Stream and the Tangahoe River and the unnamed coastal stream since the mid-1990's to assess the effects of these stormwater discharges on the macroinvertebrate communities in these streams.

This summer survey was the only one scheduled for the 2012-2013 monitoring period. Results from previous biological surveys performed in relation to the Whareroa site are discussed in numerous biomonitoring reports listed in the references.

Methods

This survey was undertaken on 24 May 2013, at two established sites in an unnamed tributary of the Tawhiti Stream (B1 and B2), at three sites in an unnamed tributary of the Tangahoe Stream (1, 2 and 3) and at one site in an unnamed coastal stream (S2) (Table 2 and Figure 1). All of these sampling sites are located downstream of stormwater outfalls from the Fonterra Whareroa plant. The discharge point for the treated dairy farm effluent into the unnamed tributary of the Tangahoe River authorised under consent 5819-1 is located between sites 1 and 2 (Figure 1).

The Tawhiti Stream tributary site B1 was relocated during the spring 2006 survey to further upstream, closer to the discharge point from Fonterra Whareroa stormwater ponds (TWH000473), as it was thought that this may be a more appropriate monitoring site in terms of habitat.

Table 2 Biomonitoring sites in unnamed tributaries of the Tawhiti Stream and Tangahoe River, and an unnamed coastal stream

Stream	Site No.	Site code	Method of sampling	Time of sampling (NZST)	Water temperature (°C)
Tawhiti Stream tributary	B1	TWH000478	Vegetation sweep	1005	10.8
	B2	TWH000479	Kick/sweep	0940	10.4
Unnamed tributary of the Tangahoe River	1	TNH000470	Kick sampling	1120	12.2
	2	TNH000473	Vegetation sweep	1100	11.9
	3	TNH000477	Vegetation sweep	1040	10.6
Unnamed coastal stream	S2	UND001340	Vegetation sweep	1205	12.0

In this survey, the standard 'vegetation sweep' sampling technique was used at sites B1, 2, 3 and S2 to collect streambed macroinvertebrates (Table 2). This 'sweep-net' technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

The standard '400ml kick-sampling' technique was used to collect streambed macroinvertebrates from site 1 in the unnamed tributary of the Tangahoe River (Table 2). This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

A combination of 'vegetation sweep' sampling and 'kick-sampling' was used at site B2.

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark *et al.* 2001). Macroinvertebrate taxa found in each sample were recorded as:

R (rare) = less than 5 individuals;
C (common) = 5-19 individuals;
A (abundant) = estimated 20-99 individuals;

VA (very abundant) = estimated 100-499 individuals;
XA (extremely abundant) = estimated 500 individuals or more.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. Recently, a similar scoring system has been developed for macroinvertebrate taxa found in soft bottomed streams (SBMCI) (Stark and Maxted, 2004, 2007). The SBMCI is not included in this report due to varying sampling techniques (both over time and between samples), which can make comparisons difficult.

Although the MCI was designed for use in stony streams, it can be useful in weedy stream habitats if there is a baseline of weedy stream macroinvertebrate data for comparison. MCI results from weedy streams are naturally lower than MCI results from most stony streams. The MCI was designed as a measure of the response of macroinvertebrate communities to the effects of organic pollution, however, MCI results can also reflect the effects of warm temperatures, and low dissolved oxygen levels, because the taxa capable of tolerating these conditions generally have low sensitivity scores. Usually more 'sensitive' communities inhabit less polluted waterways. Weedy stream macroinvertebrate communities tend to be dominated by more 'tolerant' taxa than stony stream communities, and therefore it may require more severe organic pollution to cause a significant decline in weedy stream MCI values.

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, therefore $SQMCI_s$ values range from 1 to 10.

Sub-samples of algal and detrital material taken from the macroinvertebrate samples were scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at a microscopic level. The presence of these organisms is an indicator of organic enrichment within a stream.

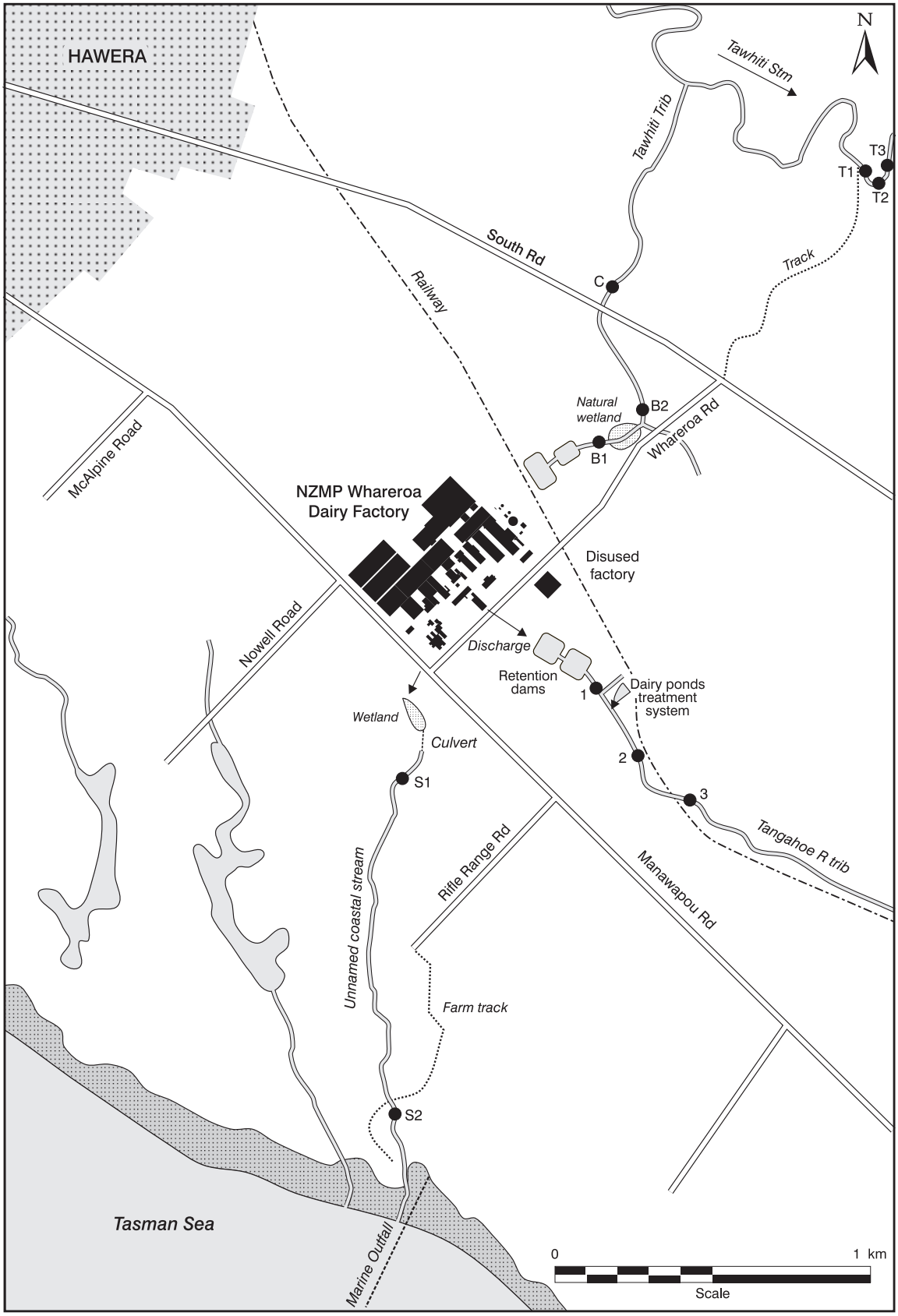

Figure 1 Biomonitoring sites related to the Fonterra Whareroa dairy factory discharges

Results

This May 2013 survey followed a period of 193 days since a fresh in excess of three times median flow, and 276 days since a fresh in excess of seven times median flow in the three streams involved in this survey.

At the time of this survey, water temperatures in the unnamed tributary of the Tawhiti Stream ranged from 10.4°C to 10.8°C. There was a moderate flow of steady moving, uncoloured and clear water at site B1. A steady moderate flow of uncoloured, clear water was recorded at site B2. The substrate at site B1 comprised 100% silt. At site B2 there were equal amounts of silt, sand and wood and root with smaller amounts of fine gravel. No periphyton growth was recorded at site B1 while slippery films were recorded at site B2. Sites B1 and B2 were partially shaded, with macrophytes on the bed of the stream at site B1 whilst only at the edges of the stream at B2.

In the Tangahoe tributary, the water temperatures ranged between 10.6°C and 12.2°C. At sites 1, 2 and 3, there was a steady moderate flow of uncoloured clear water. The substrate at site 1 consisted of hard clay and silt, with smaller amounts of sand and fine gravel. Substrate comprised 100% silt at sites 2 and 3. Slippery periphyton mats were present at site 1, no filamentous algae was visible. Algal filaments and mats were absent at sites 2 and 3. No shading was apparent at sites 2 and 3, although macrophytes were present on the streambed and banks. In contrast site 1 was partially shaded and no macrophytes were visible.

The water temperature recorded at site S2 was 12.0°C. A steady and moderate flow of brown cloudy water was recorded at this site. The substrate comprised predominantly silt with sand, bedrock and fine gravel. There was no periphyton recorded at the site. Macrophytes were observed along the edges of the stream and on the streambed too. The stream bed at site S2 was partially shaded.

Heterotrophic growths

No undesirable biological growths were observed in any of the three streams, at the sites sampled, nor were they observed during sample processing.

Macroinvertebrate communities

Previous results from surveys performed at the six sites around the Fonterra, Whareroa plant, together with current results, are summarised in Table 3, with the full results presented in Table 4, Table 5 and Table 6.

Table 3 Summary of results from previous macroinvertebrate surveys performed at sites in tributaries of the Tawhiti Stream and Tangahoe River, and unnamed coastal stream, together with current results

Site	No. surveys	Numbers of taxa			MCI scores			$SQMCI_s$ scores			
		Range	Median	Current	Range	Median	Current	No. surveys	Range	Median	Current
B1	41	3-26	15	19	40-83	68	67	30	1.2-4.0	2.4	3.9
B2	40	6-26	18	18	37-83	69	77	31	2.4-4.4	4.0	4.2
1	22	15-27	19	17	65-76	71	78	22	1.7-3.9	2.9	2.3
2	53	5-29	17	18	44-74	66	64	32	1.2-4.4	2.7	1.3
3	43	6-32	19	19	50-91	71	72	31	1.1-5.2	3.0	3.6
S2	30	6-23	18	20	58-85	70	81	21	2.7-5.0	4.0	4.7

Tawhiti Stream tributary

Site B1 (TWH000478)

Nineteen taxa were recorded at site B1, four taxa more than the median number of taxa from previous surveys at this site (Table 3).The macroinvertebrate community was characterised by one 'tolerant' taxon, extremely abundant (snail *Potamopyrgus*), although lymnaeid limpets were also abundant (Table 4).

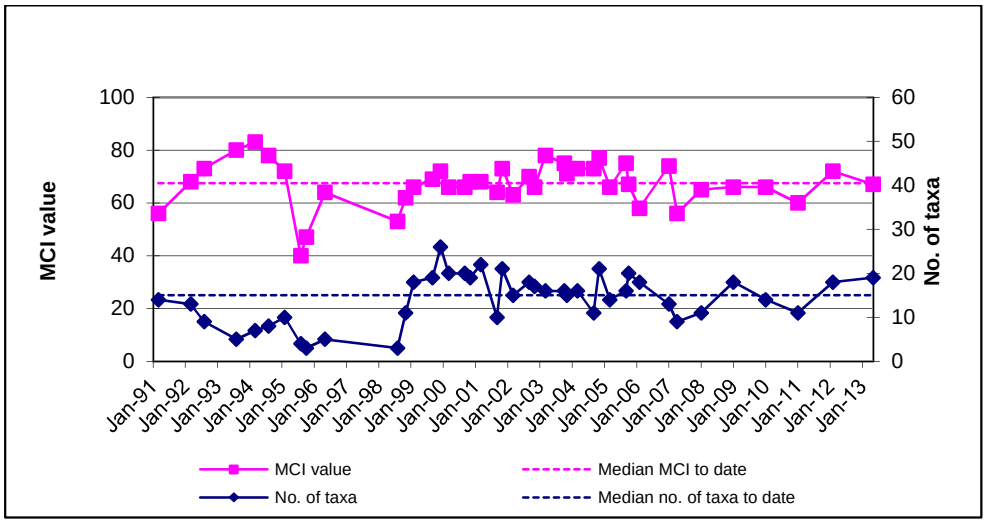

Figure 2 Number of taxa and MCI values recorded since 1991 at site B1

A low proportion of 'sensitive' taxa (21%) was recorded at this site which resulted in an MCI score of 67 units. This MCI score was very similar to the historical median score for the site (68 units) and represented a small decrease from the MCI score recorded in the previous survey (72 units) (Table 3 and Figure 2).

The numerical dominance of the low scoring 'tolerant' taxon (*Potamopyrgus* snail (extremely abundant)) resulted in a $SQMCI_s$ score of 3.9 units. This score was significantly (Stark, 1998) higher than the historical median score recorded at the site (Table 3) but similar to the $SQMCI_s$ score at the site from the previous survey (3.5 units) (Smith, 2012).

Table 4 Macroinvertebrate fauna of an unnamed tributary of the Tawhiti Stream in relation to Fonterra, Whareroa sampled on 24 May 2013

Taxa List	Site Number	MCI score	Site B1	Site B2
	Site Code		TWH000478	TWH000479
	Sample Number		FWB13204	FWB13205
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	R	-
NEMERTEA	Nemertea	3	R	R
ANNELIDA (WORMS)	Oligochaeta	1	C	R
	Lumbricidae	5	R	C
MOLLUSCA	Lymnaeidae	3	A	R
	Physa	3	C	R
	Potamopyrgus	4	XA	XA
	Sphaeriidae	3	C	-
CRUSTACEA	Ostracoda	1	C	R
	Isopoda	5	-	C
	Paracalliope	5	C	VA
	Paraleptamphopidae	5	R	C
ODONATA (DRAGONFLIES)	*Austrolestes*	4	-	C
	Xanthocnemis	4	R	R
HEMIPTERA (BUGS)	*Microvelia*	3	C	-
TRICHOPTERA (CADDISFLIES)	*Psilochorema*	6	-	R
	Triplectides	5	-	C
DIPTERA (TRUE FLIES)	Hexatomini	5	-	R
	Paralimnophila	6	R	-
	Orthocladiinae	2	C	C
	Paradixa	4	-	R
	Empididae	3	R	-
	Ephydridae	4	C	R
	Sciomyzidae	3	R	-
	Austrosimulium	3	R	-
		No of taxa	19	18
		MCI	67	77
		SQMCIs	3.9	4.2
		EPT (taxa)	0	2
		%EPT (taxa)	0	11

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Site B2 (TWH000479)

Eighteen taxa were recorded at site B2, near to the number of taxa recorded at site B1 and equal to the historical median recorded at the site (Table 3 and Figure 3). Macroinvertebrates typical of slower flowing, weedy streams dominated the community of this site including the 'moderately sensitive' amphipod *Paracalliope* (very abundant) and the 'tolerant' *Potamopyrgus* snail (extremely abundant) (Table 4).

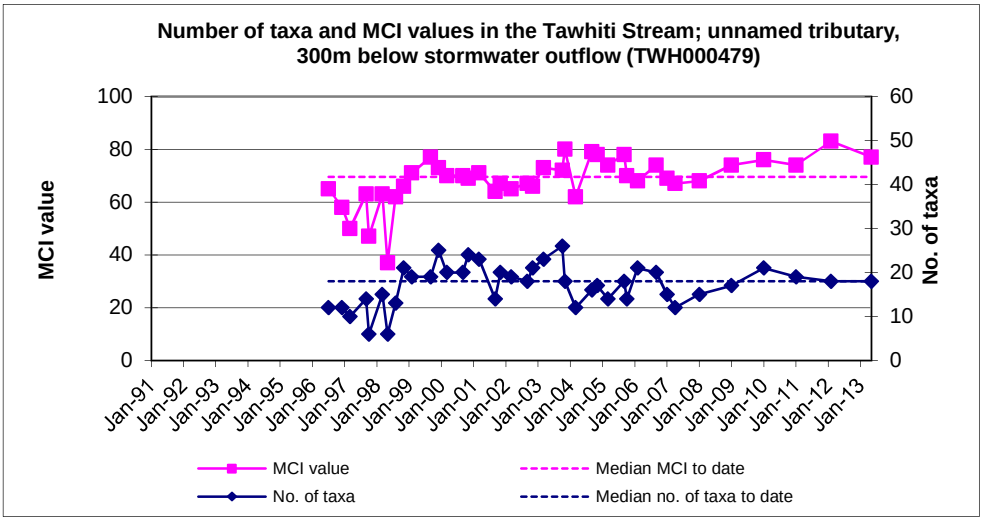

Figure 3 Number of taxa and MCI values recorded since 1996 at site B2

The MCI score of 77 units recorded at this site was 8 units greater than the median for this site. This MCI score represented a slight decrease from the previous survey and was higher than the score recorded at site B1 (by 10 units). This MCI score demonstrated no significant changes in the health of the community since the previous survey.

A moderate $SQMCI_s$ score of 4.2 units was recorded at this site, which was slightly more than both the historical median and what was recorded at site B1.

Tangahoe River tributary

Site 1 (TNH000470)

A moderately low richness of 17 taxa was recorded at site 1, two less than the historical median number of taxa for the site (Table 3 and Figure 4) and two less than the taxa richness recorded at this site in the previous survey (Smith, 2012). The macroinvertebrate taxa which dominated the community at this site included one 'sensitive' taxon (amphipod Paraleptamphopidae) and two 'tolerant taxa' (oligochaete worms and snail *Potamopyrgus*). Six other taxa were also recorded as abundant including three 'tolerant' taxa, and three 'sensitive' taxa.

Similar proportions of 'tolerant taxa'(53%) and 'sensitive' taxa (47%) present in this community led to an MCI score of 78 units (Table 3 and Figure 4), seven units more than the median score previously recorded at the site and also the maximum score ever recorded at site 1.

The extreme abundance of 'tolerant' oligochaete worms and *Potamopyrgus* snails was tempered by the abundance of the more 'sensitive' Paraleptamphopidae, resulting in a $SQMCI_s$ score of 2.3 units. This $SQMCI_s$ score was marginally lower than the median for the site and lower (by 0.8 unit) than the score recorded in the previous survey undertaken in February 2012 (Smith, 2012).

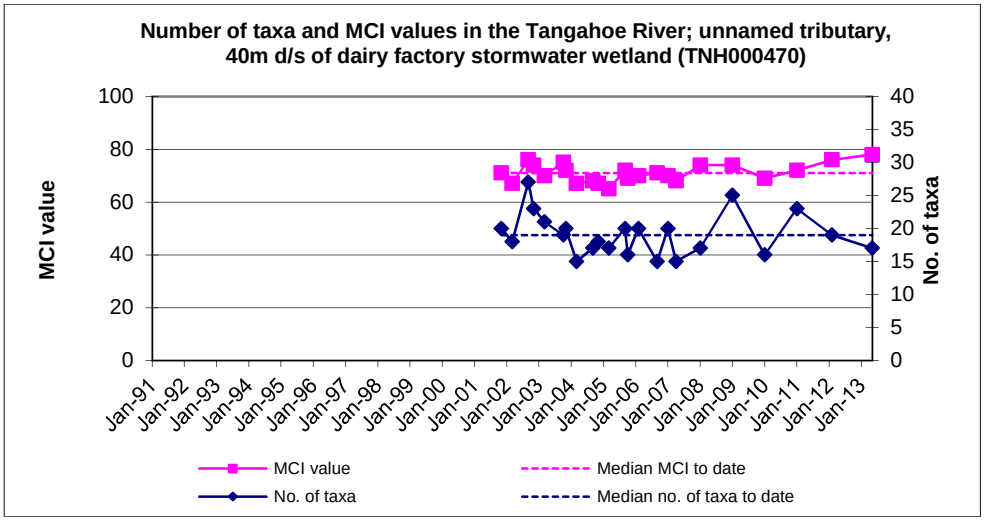

Figure 4 Number of taxa and MCI values recorded since 2001 at site 1

Site 2 (TNH000473)

Eighteen taxa were recorded at site 2, downstream of Fonterra's stormwater and dairy pond discharges (Table 3 and Figure 5). This was one more than the median number of taxa recorded at the site previously (17 taxa), but nine taxa less than what was recorded in the previous survey (Smith, 2012).

The community at site 2 was dominated by five 'tolerant' taxa (oligochaete worms, ostracod seed shrimps (both extremely abundant), *Chironomus* blood worm, and fly larvae *Polypedilum* (both very abundant) and amphipod *Paracalliope* (abundant)), and one 'sensitive' taxon, snail *Potamopyrgus* (abundant). *Chironomus* blood worms can often become abundant in streams receiving organically enriched discharges.

The MCI score of 64 units recorded at this site was 2 units less than the median score previously recorded at the site and 6 units less than what was recorded in the previous survey (Smith, 2012). This score was a significant 14 units less than the MCI score recorded at site 1 in this survey (Table 3 and Figure 5). This MCI score reflected the high proportion of 'tolerant' taxa recorded at site 2 in this survey.

The numerical dominance of four 'tolerant' taxa resulted in a low $SQMCI_s$ score of 1.3 units (Table 3 and Table 5). This $SQMCI_s$ score was significantly lower than the median score and significantly less than what was recorded in the previous survey (Smith, 2012).

Table 5 Macroinvertebrate fauna of an unnamed tributary of Tangahoe River in relation to Fonterra Whareroa sampled on 24 May 2013

Taxa List	Site Number	MCI score	Site 1	Site 2	Site 3
	Site Code		TNH000470	TNH000473	TNH000477
	Sample Number		FWB13206	FWB13207	FWB13208
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	C	R	C
NEMERTEA	Nemertea	3	R	C	-
NEMATODA	Nematoda	3	-	R	R
ANNELIDA (WORMS)	Oligochaeta	1	XA	XA	A
	Lumbricidae	5	-	-	R
HIRUDINEA (LEECHES)	Hirudinea	3	-	R	-
MOLLUSCA	*Physa*	3	-	C	A
	Potamopyrgus	4	VA	A	XA
	Sphaeriidae	3	A	R	R
CRUSTACEA	Ostracoda	1	A	XA	VA
	Isopoda	5	A	-	-
	Paracalliope	5	A	A	VA
	Paraleptamphopidae	5	VA	R	-
HEMIPTERA (BUGS)	*Microvelia*	3	-	R	R
COLEOPTERA (BEETLES)	Dytiscidae	5	-	R	-
	Hydrophilidae	5	-	-	R
TRICHOPTERA (CADDISFLIES)	*Psilochorema*	6	R	-	-
DIPTERA (TRUE FLIES)	*Paralimnophila*	6	R	-	R
	Zelandotipula	6	R	-	R
	Chironomus	1	-	VA	C
	Orthocladiinae	2	C	-	-
	Polypedilum	3	-	VA	C
	Tanypodinae	5	R	-	-
	Paradixa	4	-	-	R
	Empididae	3	R	-	-
	Ephydridae	4	-	R	C
	Austrosimulium	3	A	C	A
ACARINA (MITES)	Acarina	5	A	C	C
		No of taxa	17	18	19
		MCI	78	64	72
		SQMCIs	2.3	1.3	3.6
		EPT (taxa)	1	0	0
		%EPT (taxa)	6	0	0

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

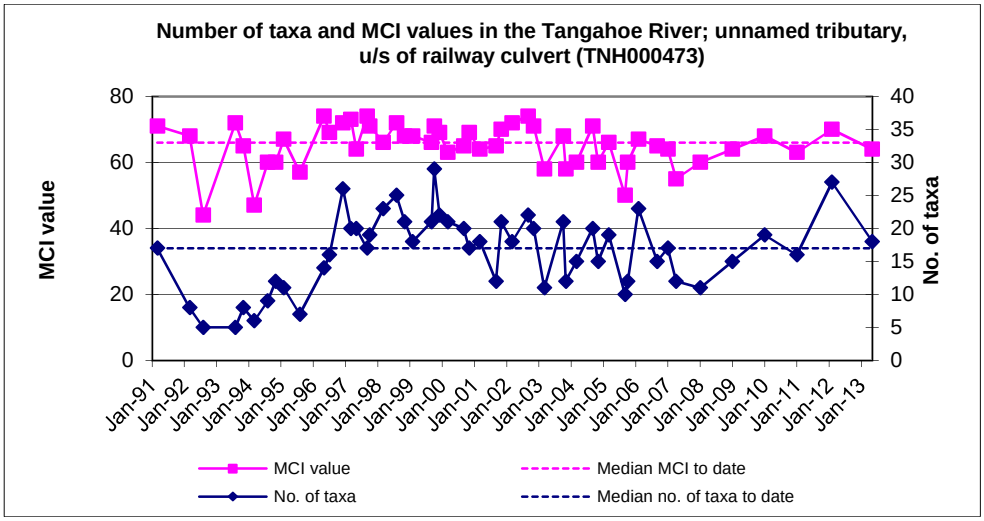

Figure 5 Number of taxa and MCI values recorded since 1991 at site 2

Site 3 (TNH000477)

At site 3, 300 metres further downstream, a total of nineteen taxa was recorded (Table 3 and Figure 6). This taxa richness was equal to the median number of taxa recorded at the site and one less than what was recorded in the previous survey (Smith, 2012). It was also the highest richness recorded in the unnamed tributary of the Tangahoe River for the current survey.

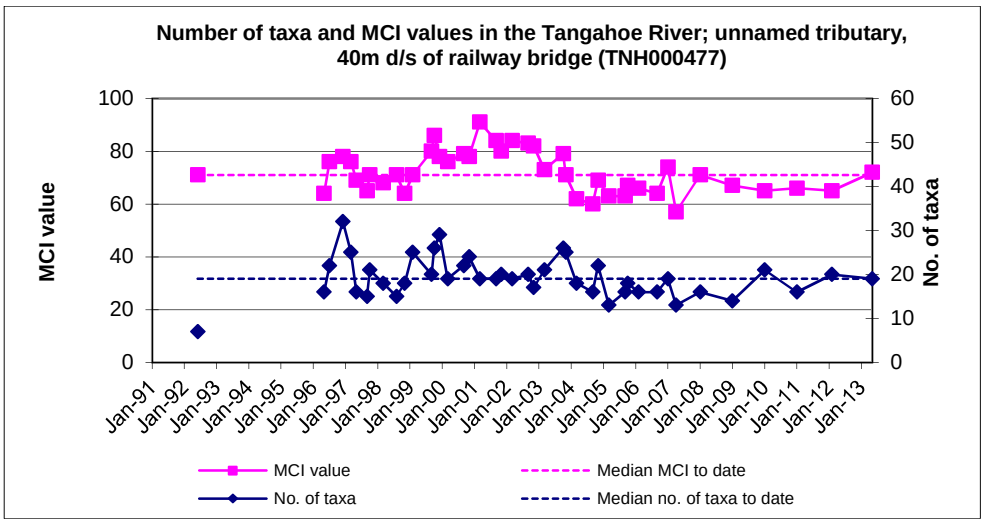

Figure 6 Number of taxa and MCI values recorded since 1992 at site 3

The community at site 3 was characterised by one 'sensitive' taxon (amphipod *Paracalliope*) and five 'tolerant' taxa (oligochaete worms, snails (*Physa* and *Potamopyrgus*), sandfly larvae *Austrosimulium* and seed shrimp Ostracoda) (Table 5).

The high proportion of 'tolerant' taxa (68%) recorded at this site in the current survey resulted in a MCI score of 72 units, one unit more than the median MCI score recorded at the site previously (Table 3 and Figure 6). This MCI score was 7 units greater than what was recorded in the previous survey (Smith, 2012).

The $SQMCI_s$ score of 3.6 units recorded at this site was higher (by 0.6 unit) than the historical median score for the site and significantly higher than the $SQMCI_s$ scores recorded at the two upstream sites (1 and 2), however it was significantly lower than what was recorded in the previous survey (by 1.0 unit).

Unnamed coastal stream

Site S2 (UND001340)

A moderate richness of 20 taxa was recorded at site S2, two more than the richness recorded at the site in the previous survey (Smith, 2012) and two taxa more than the median previously recorded at the site (Table 3 and Figure 7).

Three sensitive taxa (amphipod *Paracalliope*, mayfly *Zephlebia* and amphipod Paraleptamphopidae) along with three 'tolerant' taxa' (oligochaete worms, sandfly larvae *Austrosimulium* and snail *Potamopyrgus*) dominated the community at site S2 (Table 6).

The moderate proportion of 'sensitive' taxa recorded at this site resulted in an MCI score of 81 units which was significantly (Stark, 1998) higher than the historical median score for the site and only four units less than the maximum score ever recorded at site S2 (Table 3 and Figure 7). A relatively moderate $SQMCI_s$ score of 4.7 units was recorded at this site, 0.7 unit higher than the median score recorded at the site, and 0.5 unit higher than what was recorded in the previous survey.

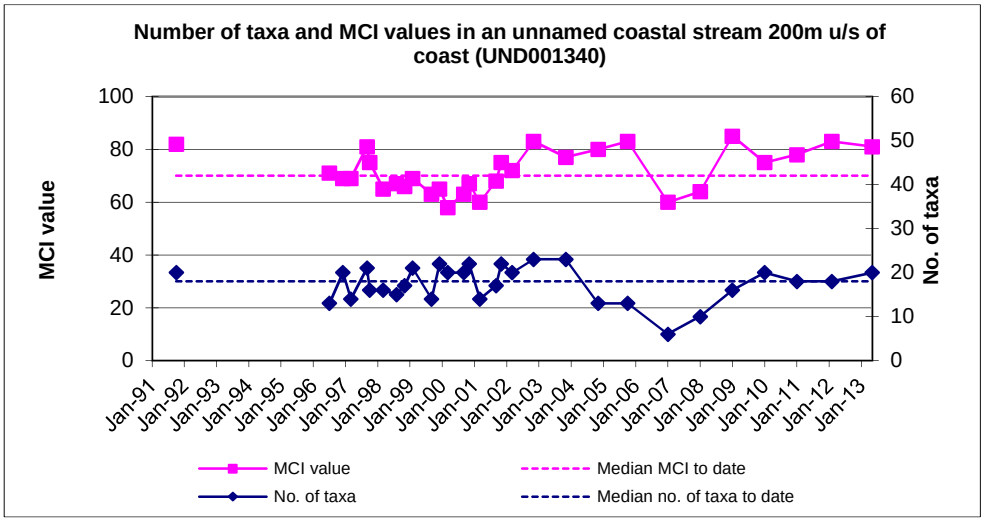

Figure 7 Number of taxa and MCI values recorded since 1996 at S2

Table 6 Macroinvertebrate fauna of an unnamed coastal stream re Fonterra, Whareroa sampled on 24 May 2013

Taxa List	Site Number	MCI score	Site (S2)
	Site Code		UND001340
	Sample Number		FWB13209
NEMERTEA	Nemertea	3	C
ANNELIDA (WORMS)	Oligochaeta	1	A
MOLLUSCA	*Potamopyrgus*	4	XA
	Sphaeriidae	3	R
CRUSTACEA	Ostracoda	1	R
	Paracalliope	5	XA
	Paraleptamphopidae	5	XA
	Paranephrops	5	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	C
	Zephlebia group	7	VA
HEMIPTERA (BUGS)	*Microvelia*	3	R
COLEOPTERA (BEETLES)	Dytiscidae	5	R
DIPTERA (TRUE FLIES)	*Paralimnophila*	6	C
	Zelandotipula	6	R
	Orthocladiinae	2	R
	Empididae	3	R
	Ephydridae	4	R
	Sciomyzidae	3	R
	Austrosimulium	3	VA
ACARINA (MITES)	Acarina	5	C
		No of taxa	20
		MCI	81
		SQMCIs	4.7
		EPT (taxa)	2
		%EPT (taxa)	10
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa	

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Discussion and conclusions

Unnamed tributary of the Tawhiti stream

Results from the unnamed tributary of the Tawhiti Stream in 2011 indicated the occurrence of unauthorised discharge which resulted in a proliferation of sewage fungus in the stream. As a result of this incident, improvements were made to the stormwater management system at the Whareroa site to rectify the problem. In 2012, the absence of heterotrophic growths (including 'sewage fungus') at both sample sites in the tributary during this survey suggested that these improvements to the stormwater system had been effective in improving the quality of the stormwater discharge into the stream. Results from the current survey continue to reflect the improvement of quality of stormwater discharge to the stream since the unauthorised discharge in 2011.

Results from the current survey indicated no significant changes in the condition of the macroinvertebrate community at site B1 since the previous survey. The MCI score was

similar to the historical median and similar to the last survey. The $SQMCI_s$ scores recorded were insignificantly (Stark, 1998) higher than in the previous survey, but were significantly higher than historical medians for the site.

The low scoring 'tolerant' *Chironomus* blood worm was found to be very abundant at site B1 in the 2011 survey as a result of the unauthorised discharge. The abundance of this taxon can be indicative of the presence of an organic discharge, although it can also be found in water with low dissolved oxygen. In this case, it was considered likely that both factors had resulted in the abundance of *Chironomus* blood worms at this site. The absence of this taxon from site B1 in the 2012 and current survey was indicative of a significant improvement in preceding water quality at the site following the stormwater upgrade in 2011.

In this survey, there were no significant changes recorded at site B2 in MCI score or $SQMCI_s$ score between the current survey, previous survey and historic medians. The poor MCI score of 77 units is a reflection of the numerical dominance of the 'tolerant' *Potamopgyrus* snail, a species common to soft-bottom streams that grazes on both algae and macrophytes. The difference in the MCI scores between the two sites may in part relate to the proximity of these sites to the stormwater discharge point but also relate to differences in habitat between the two sites.

Unnamed tributary of the Tangahoe River

The macroinvertebrate communities at sites 1 and 2 contained (extremely abundant) 'tolerant' oligochaete worms. At site 3 they were found to be abundant. Oligochaete worms can tolerate low dissolved oxygen and are often found in large numbers in organically polluted habitats. The 'sensitive' Paraleptamphopid amphipod, a common and widespread amphipod especially in slow flowing soft-bottom streams, was also very abundant at site 1. At site 2 Paraleptamphopids were rare and at site 3 absent, indicating a possible reduced water quality downstream of the dairy pond treatment system discharge.

Chironomus blood worms were recorded as absent at site 1, very abundant at site 2, and common at site 3. The dairy shed was discharging at the time of the current survey. It is reasonable to conclude that the increase in numbers of *Chironomus* blood worms at site 2, proximal to the discharge point, is reflective of some deterioration in water quality as a result of the treated dairy effluent discharge. The decline in abundance of this taxon at site 3 to common and the addition of three 'sensitive' taxa was indicative of an improvement in water quality between sites 2 and 3, which suggests the impact of the dairy effluent discharge had decreased downstream and away from the source.

The $SQMCI_s$ score recorded at site 1 was similar to the historical median and reflective of the nature of the stream. The $SQMCI_s$ score at site 2 was significantly less than the historical median, indicating a reduction in water quality at the time of sampling, due to the dairy pond treatment system discharge. A significant decrease in $SQMCI_s$ score also occurred at site 3 compared to the 2012 survey, however the $SQMCI_s$ score was not significantly lower than the historical median.

Unnamed coastal Stream

The macroinvertebrate community at site S2 contained a moderate number of taxa and an MCI score of 81 units which was significantly higher than the historical median for the site.

The community was numerically dominated by one 'tolerant' taxon (*Potamopyrgus* snail (extremely abundant)) and two moderately sensitive taxa (amphipods *Paracalliope* and Paraleptamphopidae) which resulted in a moderate $SQMCI_s$ score of 4.7 units. An improvement in the health of the macroinvertebrate community and subsequent increases in MCI and $SQMCI_s$ scores over the past 5 years has been attributed to the fencing and planting of the stream in the vicinity of the site.

Summary

A six site biomonitoring survey was undertaken using either the Council's standard '400 ml sweep-net', 'kick-sampling'methods or a combination of both methods, in tributaries of the Tawhiti Stream (two sites), Tangahoe River (three sites) and an unnamed coastal stream (one site) to assess whether stormwater discharges had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site. They were also checked for heterotrophic growths.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundances as well as sensitivity to pollution. It may indicate subtle changes in communities, and therefore be the more relevant index if non-organic impacts are occurring. Significant differences in either the MCI or the $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored. The presence of masses of heterotrophic organisms can be an indicator of organic enrichment within a stream.

An unauthorised discharge recorded in the unnamed tributary of the Tawhiti stream in 2011 resulted in the proliferation of undesirable heterotrophic growths 'sewage fungus' at site B1 and to a lesser extent at site B2 downstream of the stormwater discharge. In response to this incident, Fonterra carried out a number of improvements to the stormwater management system at the Whareroa site between February and April 2011. Results from the 2012 survey and the current survey suggested an improvement in preceding water quality at these sites since the stormwater upgrade was completed in April 2011. The $SQMCI_S$ score although similar to the previous survey results was significantly higher than the historical median at site B1. No significant changes, from historical median scores were recorded at site B2.The macroinvertebrate community was dominated by species that would be expected in this slower flowing and weedy stream (amphipods (*Paracalliope*) and snails (*Potamopyrgus*)).

In the unnamed tributary of the Tangahoe Stream, MCI and $SQMCI_s$ scores recorded at site 1 were generally similar to the historical medians recorded at this site and were reflective of the nature of the stream. At site 2 a significant a decrease in $SQMCI_S$ score was recorded, suggestive of possible adverse effects from the dairy discharge. The abundance of *Chironomus* blood worms at site 2 was most likely indicative of the effects of the effluent given the absence of this taxon at site 1 which is located above the discharge point. However, a marked decrease in the abundance of these taxa at site 3 indicated an improvement in preceding water quality between sites 2 and 3 which suggested that the dairy discharge may be mostly assimilated at site 3.

The results of this survey continued to reflect improvements in the macroinvertebrate community that have been recorded over the past 5 years at site S2 in the unnamed coastal

stream. This improvement has been attributed to the fencing and planting of the stream in the vicinity of this site. There was no evidence of any effects of the stormwater discharge on the macroinvertebrate community in the unnamed coastal tributary.

In summary, the results of this survey indicated a continued recovery in the macroinvertebrate community in the unnamed tributary of the Tawhiti following the improvements made to the stormwater management system by the Company in the early part of 2011. There was some evidence to suggest that the nutrient enriched dairy pond discharge may be influencing the macroinvertebrate community of the unnamed tributary of the Tangahoe at site 2 and to a lesser extent at site 3. Above average macroinvertebrate health continued to be recorded at site S2 in the unnamed coastal stream.

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To	Job Manager, Emily Roberts
From	Scientific Officer, Bart Jansma
Report No	BJ215
Document No.	1268864
Date	24 October 2013

Biological inspection of unnamed tributaries of the Tawhiti Stream and Tangahoe River, and an unnamed coastal stream, in relation to the discharge of stormwater from the Fonterra Whareroa dairy factory, September 2012

1. Introduction

Fonterra Co-operative Group Limited holds a number of resource consents for activities associated with the operations of the Whareroa dairy processing complex near Hawera. This includes three consents to discharge stormwater into three separate streams, being an unnamed tributary of the Tawhiti Stream, an unnamed tributary of the Tangahoe River, and an unnamed coastal stream. A brief biological inspection was scheduled in the 2011-2012 monitoring year to monitor the effects of these discharges. This was conducted on 25 September 2012, and this constitutes the first time this biological inspection has been undertaken.

A full biomonitoring survey of these streams is scheduled in this monitoring period, to be undertaken in summer. The inclusion of a spring biological inspection in the monitoring programme is a direct response to the results of water quality and biological monitoring undertaken in January 2011 (Jansma, 2011). At this time, the discharge to the Tawhiti Stream tributary was found to have caused the establishment of undesirable heterotrophic growths. It became apparent that these growths may have been present since spring. As a result, the monitoring programme was augmented to include a spring biological inspection, to increase monitoring at a time when factory throughput is often the highest.

Due to the layout of the stormwater treatment systems, no upstream site is available in any of the tributaries. As a result only downstream observations were possible. The inspection included the collection of a small sample, which was then sorted on site to assess what live invertebrates were present in the community. As the fresh sort was not performed using magnification, the level of identification was quite low, except for those invertebrates that could be easily identified to a higher level e.g. Austrosimulium.

2. Observations

Tawhiti Tributary

The stream flowing from the stormwater ponds had a moderate but uncoloured flow. There was however some iron oxide precipitation noted at the time of the inspection at the discharge point. The macroinvertebrate habitat downstream of the stormwater discharge was sparse, as the water cress, which is the predominant habitat at this site, had not yet recovered from the winter die back. Nevertheless, the small invertebrate sample, which was live-sorted on site, contained damselfly larvae, *Triplectides*

caddisfly larvae, snails and hemipterans. No *Chironomus* blood worms or oligochaete worms were observed in the sample. The presence of these species, especially *Chironomus*, can be an indication of organic enrichment. In addition to these observations, no undesirable heterotrophic growths (sewage fungus) was observed, either on the water cress habitat, or at the outflow of the stormwater pond.

The presence of some caddisfly larvae, which are a moderately sensitive taxon, and the lack of undesirable heterotrophic growths on the bed, indicates that any preceding discharges from the dairy factory site had not had a significant adverse effect on the macroinvertebrate communities of the unnamed tributary of the Tawhiti Stream.

Tangahoe Tributary

As with the Tawhiti tributary, the Tangahoe tributary had a moderate and uncoloured flow where it flowed from the stormwater ponds. There were few macrophytes growing in the stream bed downstream of these ponds, and the live sample was primarily collected from grass, and fine grade substrate (silt). This is not ideal macroinvertebrate habitat, but nevertheless the live sort recorded oligochaete worms, amphipods, *Triplectides* caddisfly larvae, fingernail clams and extremely abundant snails. No undesirable heterotrophic growths (sewage fungus) were observed growing on the sampled habitat, and neither was there any collected in the live sample. However, there did appear a small amount of such growth on the concrete ramp over which the discharge flowed. This may be an indication that the biological oxygen demand in the discharge was slightly elevated.

The presence of caddisfly larvae and amphipods, which are moderately sensitive taxa, and the lack of undesirable heterotrophic growths on the bed, indicates that any preceding discharges from the dairy factory site had not had a significant adverse effect on the macroinvertebrate communities of the unnamed tributary of the Tangahoe River.

Unnamed coastal Stream

The unnamed coastal stream was inspected immediately below the stormwater pond, which is some way upstream of the site sampled during the full biomonitoring survey. At the time of this inspection, the stream had a moderate and clear flow. There was a good growth of water cress and duckweed, which indicated little impact from high flows, and that these macrophytes had not died off in the winter. The live sample collected contained an extremely abundant population of oligochaete worms. Snails were also very abundant, while cura, water strider (*Microvelia*) water boatman, amphipods and damselfly larvae were also observed. The relatively high community richness, presence of 'moderately sensitive' taxa, and the lack of any sewage fungus, indicate that any preceding discharges from the dairy factory site had not had a significant adverse effect on the macroinvertebrate communities of the unnamed coastal stream.

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Appendix IV

PM_{10} monitoring report

Memorandum

To Job Manager, Emily Roberts
From Scientific Officer -Air Quality, Brian Cheyne
File FRODO# 1359793
Date June 11, 2014

PM 10 monitoring at Fonterra Whareroa Dairy Complex

Figure 1 PM10 monitoring sites in 2012-2013 monitoring year

In September 2004 the Ministry for the Environment promulgated National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM10 is 50 µg/m^3 (24-hour average). Special condition 9 of the Consent 4103 sets the same limit on the emissions of fine particulates [PM10] to the atmosphere from the site, that is –

"the maximum ground level concentration of fine particulates [PM10] arising from the exercise of this consent measured under ambient conditions does not exceed 50 micrograms per cubic metre [50µg/m^3] [twenty-four hour average], at or beyond the boundary of the site."

Particulates can be derived from many sources, including motor vehicles (particularly diesels), solid and oil-burning processes for industry and power generation, incineration and waste burning, photochemical processes, and natural sources such as pollen, abrasion, and sea spray.

PM10 particles are linked to adverse health effects that arise primarily from the ability of particles of this size to penetrate the defences of the human body and enter deep into the lungs significantly reducing the exchange of gases across the lung walls. Health effects from inhaling PM10 include increased mortality and the aggravation of existing respiratory and cardiovascular conditions such as asthma and chronic pulmonary diseases.

During the reporting period, a "DustTrak" PM10 monitor was deployed on two occasions in the vicinity of the dairy complex. The deployments lasted approximately from fifty-two to sixty-eight hours, with the instrument placed in a down-wind position at the start of the deployment. Monitoring consisted of continual measurements of PM10 concentrations. The locations of the "DustTrak" monitor during the sampling runs are shown in Figure 1.

The details of the sample runs are presented in Figure 2 and Table 1.

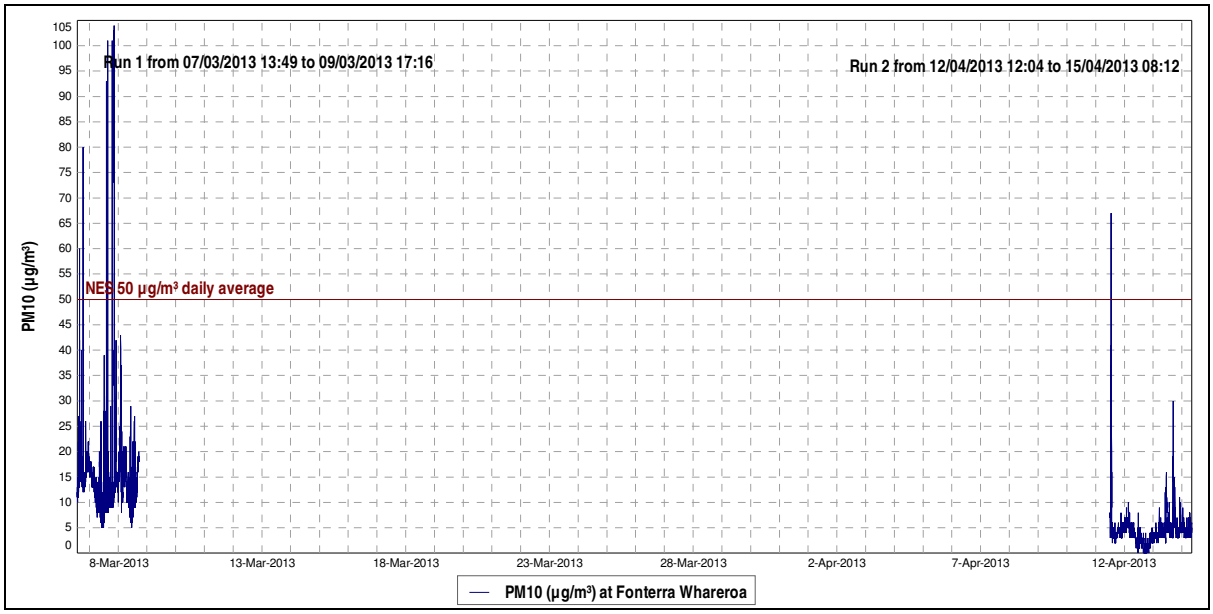

Figure 2 PM10 concentrations (µg/m³) at the Fonterra Whareroa dairy complex (2012-13)

	Run 1 (52 hours) (07-09/03/2013)		Run 2 (68 hours) (12-15/04/2011)		
24 hr. set	Day 1	Day 2	Day 1	Day 2	Day 3
Daily average	13.4 µg/m³	15.5 µg/m³	4.5 µg/m³	3.1 µg/m³	5.0 µg/m³
NES	50µg/m³				

Table 1 Daily mean of PM10 results during five days' monitoring at Whareroa dairy complex

Findings

First run:
During the first 52-hour run, from 7th of March to 5th of March 2013, the average recorded PM_{10} concentration for the first twenty-four hour period was 13.4µg/m³ and 15.5µg/m³ for the second twenty-four hour period. These daily means equate to 26.8% and 30.1%, respectively, of the 50 µg/m³ value that is set by both the National Environmental Standard and the resource consent.

Second run:
During the second 68-hour run, from 12th of April to 15th of April 2013, the average recorded PM_{10} concentration for the first twenty-four hour period was 4.55µg/m³, 3.11µg/m³ for the second twenty-four hour period and 5.05µg/m³ for the third twenty-four hour period . These daily means equate to 9.1%, 6.2% and 10.1%, respectively, of the 50 µg/m³ value that is set by both the National Environmental Standard and the resource consent 4103.

Background levels of PM_{10} in the region have been found to be around 11 µg/m³.

Appendix VI

Explanation of Box and Whisker Plots

Explanation of box and whisker plots

Box and whisker plots are a useful method of summarising data in a graphical form that allows rapid comparisons of data groups. The data is represented as a box with a whisker from each end.

The median (middle value of the sorted data; half of the data is either side of the median is represented by a single horizontal line. The notch, symmetrically spread around the median represents the 95% confidence interval of the median). It is a feature that allows rapid comparison between groups. If notches overlap, there is no significant difference between groups (at the 95 % confidence interval). If notches do not overlap, a statistical difference is expected.

The top and bottom of the box represent the upper and lower hinges respectively. The median splits the ordered group of data in half and the hinges split the remaining halves in half again. This means that 50% of the data lies within the box.

Hspread, comparable to the interquartile (25% and 75%) range is the difference between the values of the two hinges, ie, Upper hinge – Lower hinge = Hspread. The inner fences are defined as follows:

Lower fence = lower hinge – (1.5 x Hspread)
Upper fence = upper hinge + (1.5 x Hspread)

The outer fences are defined as follows:

Lower fence = lower hinge – (3 x Hspread)
Upper fence = upper hinge + (3 x Hspread)

The whiskers show the range of values that lie within the inner fences. Values outside the inner fence are plotted as asterisks (*). values outside the outer fence are plotted as open circles (o).