Fonterra Whareroa Monitoring Programme Annual Report 2017-2018

Technical Report 2018-39

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Taranaki Regional Council
Private Bag 713
STRATFORD

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Executive summary

Fonterra Co-operative Group Ltd (Fonterra) operates a dairy processing complex located on Whareroa Road at Hawera, in the Tangahoe, Tawhiti and Tasman catchments. Fonterra holds a total of 24 resource consents related to activities undertaken at the Whareroa site to allow for the abstraction of water from the Tawhiti Stream and Tangahoe River; the discharge of river silt and sand 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 stormwater and sediment to land; the discharge of dairy factory wastewater to the Tasman Sea; the discharge of laboratory waste and unprocessable wastes to waste pits; the discharge of dairy liquids to land and the discharge of emissions to air. This report for the period July 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess Fonterra's environmental and consent compliance performance during the period under review. This report also details the results of the monitoring undertaken and assesses the environmental effects of their activities.

During the monitoring period, Fonterra demonstrated a level of environmental performance which required improvement.

The Council's monitoring programme for the year under review included 10 scheduled site inspections; three composite samples from the outfall discharge for inter-laboratory comparison; 30 samples of stormwater pond discharges collected for physicochemical analysis; 10 grab samples of the outfall discharge for physicochemical and microbiological analysis; one freshwater inspection downstream of the stormwater pond discharge points; one freshwater biomonitoring survey; two intertidal surveys; 30 deposition gauging samples; four nitrogen oxide (NO_x) samples and two periods of fine airborne particulate (PM_{10}) monitoring in relation to air emissions, and auditing of monitoring data collected by Fonterra.

Monitoring showed that the site was generally well managed, however a number of incidents also occurred during the year under review. A water abstraction consent limit was breached on one occasion, resulting in Fonterra being issued with an infringement notice. The stormwater systems remained compliant in terms of discharge quality, however, a decline in macroinvertebrate community health was detected at one of the downstream monitoring sites. Three incidents occurred in relation to marine outfall, including a milk spill and a cream spill. The Tasman Sea was noticeably discoloured at the site of the outfall following two of the events. Two infringement notices were issued in response. No environmental impacts were detected beyond the site boundary during air discharge monitoring. In summary, four incidents were recorded during the year under review, three of which resulted in detectable environmental effects or follow up enforcement action.

During the year, Fonterra demonstrated a high level of administrative performance, however improvement is required with the Fonterra's environmental performance and compliance with their resource consents.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance was slightly lower in the period under review.

This report includes recommendations for the 2018-2019 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2017 to June 2018 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Fonterra Co-operative Group Ltd (Fonterra). Fonterra operates a dairy processing complex situated on Whareroa Road at Hawera.

The report includes 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 and Tawhiti catchments and discharges to the Tasman Sea. This report also covers 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* (RMA) 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 25th combined annual report by the Council for Fonterra.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consents held by the Fonterra relating to activities on and around the Whareroa site;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted in Fonterra's site/catchment.

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

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

Section 4 presents recommendations to be implemented in the 2018-2019 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 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 (for example recreational, cultural, or aesthetic); and

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 and administrative performance

Besides discussing the various details of the performance and extent of compliance by Fonterra, this report also assigns them a rating for their environmental and administrative performance during the period under review.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. Administrative performance is concerned with Fonterra's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (that is a defence under the provisions of the RMA can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

High: No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. 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 in relation to such impacts.

Good: Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

High: The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.

Good: Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

Improvement required: Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

Poor: Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

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 ha and is situated on Whareroa Road, east of Hawera (Photo 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 co-generation 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 (1,845 m). Energy is mainly sourced from two on-site gas-fired co-generation plants, operated as a joint venture with Todd Energy Ltd. The 68 Mega Watt plants provide all the steam and electricity requirements for the site.

The consolidation of the dairy processing 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.

In the 2014-2015 season, a new distribution centre was constructed at the Whareroa site, almost doubling the site's total dry storage capacity to 70,000 tonnes. A new rail loop and siding were constructed to enable increased load out of product by rail. Together, these developments mean a reduction in freight movements by road and more movements by rail.

In the 2015-2016 season, a new chemical storage facility was installed at the tanker workshop, and a new water treatment plant was built (commissioned in August 2016). The plant enables Fonterra to produce water that meets drinking water standards while minimising the amount of water abstracted from the two rivers. The new plant uses less water for back-flushing the filters. The construction of two settling lagoons allows for the recycling of up to 10% of the back-flushing water through the treatment plant.

Environmental improvements in the 2016-2017 season included:

- Installation of a Reverse Osmosis Plant in the Utilities Department. This plant treats evaporator condensate water through membranes, producing up to 90,000 L/h. The purified water can then be used on site, reducing the amount of water that the site abstracts from the rivers.
- Numerous improvements in the plants to reduce losses and maximum yield of product have resulted in a decrease in fat, COD and suspended solids in the wastewater as compared to previous seasons.
- Installation of particulate meters in the dryer exhaust stacks of two or the powder plants. These are used to enable real-time monitoring of the quality of the air emissions, providing assurance that emissions control measures are working correctly.

Further plant upgrades were undertaken in the 2017-2018 season, as discussed in Section 2.1.

Photo 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 held water permit **0047** to cover the abstraction of water from the Tawhiti Stream (Photo 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, this being the fourth version of this consent granted since 1973. It expired in June 2015, however, in accordance with Section 124 of the RMA, the consent holder applied to renew the consent prior to its expiry, and therefore, continued to operate under the expired consent until the renewal was completed on 8 November 2017 (detailed later in this section).

There are five special conditions attached to the consent (1 July to 8 November 2017).

Condition 1 requires that the abstraction shall be managed to ensure a flow of not less than 50 litres per second (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 than 150 Nephelometric Turbidity Units (NTU).

Photo 2 Tawhiti intake weir

Fonterra held 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, this being the second version of the consent granted since 1994. It expired in June 2015, however, in accordance with Section 124 of the RMA, the consent holder applied to renew the consent prior to its expiry, and therefore, continued to operate under the expired consent until the renewal was completed on 8 November 2017 (detailed next).

There are three special conditions attached to the consent (1 July to 8 November 2017).

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 Fonterra 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.

When water permits 0047 and 4508 were renewed on 8 November 2017, both activities were permitted under one resource consent; **0047-4**. The consent covers the taking of water from the Tawhiti Stream and the Tangahoe River for the purposes of processing and manufacturing dairy products, cleaning of plant, cooling, domestic use and for a co-generation plant. The consent's next review date is in June 2021 and will expire on 1 June 2052.

There are 28 special conditions attached to the consent (8 November 2017 onwards).

Conditions 1 and 2 concern the rate of water take from both abstraction points.

Conditions 3 to 7 concern minimum flow requirements in both the Tawhiti Stream and the Tangahoe River.

Conditions 8 to 10 stipulate requirements for monitoring equipment and fish screens.

Conditions 11 to 19 state the requirements for various monitoring and management plans.

Conditions 20 to 24 outline Fonterra's reporting requirements.

Conditions 25 to 27 specify Fonterra's obligations for financial contributions towards environmental enhancement projects.

Condition 28 deals with review provisions.

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 held coastal permit **1450** to cover the discharge of 40,000 cubic metres per day (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 expired in June 2015, however, in accordance with Section 124 of the RMA, the consent holder applied to renew the consent prior to its expiry, and therefore, continued to operate under the expired consent until the renewal was completed on 8 November 2017.

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 (1 July to 8 November 2017).

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 Fonterra 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 Fonterra 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 Fonterra to supply plans and design details for the outfall extension and condition 8 establishes a 200 m 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 Fonterra 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 Fonterra 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.

The renewed discharge consent, **1450-3**, permits the discharge of all wastewater from dairy factory processes and associated processes undertaken at the Whareroa dairy processing site through a marine outfall into the Tasman Sea. The consent's next review date is in June 2021 and will expire on 1 June 2052.

There are 20 special conditions attached to the consent (8 November 2017 onwards).

Conditions 1 to 8 outlines specific discharge requirements, including the location, nature and quality of the discharge, as well as Fonterra's obligations to improve the treatment process.

Conditions 9 to 16 state the requirements for various monitoring and management plans.

Conditions 17 and 18 outline Fonterra's reporting requirements.

Conditions 19 and 20 deal with reviewing 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 renewed on 26 June 2018. At present, the monitoring of this consent is reported separately.

Fonterra holds water discharge permits **3902**, **3907** and **4133** to discharge stormwater from the Whareroa sites. These consents were originally issued by the Council in June 1999 under Section 87(e) of the RMA. The consents were re-issued on 14 February 2014 and are due to expire on 1 June 2028.

Discharge permit 3902 provides for the discharge of stormwater from the Whareroa milk processing site 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 the Whareroa milk processing site into an unnamed tributary of the Tawhiti Stream.

Discharge permit 4133 covers the discharge of stormwater from the Whareroa milk processing site into unnamed coastal stream 18.

There are eight special conditions attached to consent 3907, while consents 3902 and 4133 both have nine. The conditions of these consents are essentially the same as each other and are discussed below.

Condition 1 deals with best practicable option to prevent or minimise adverse environmental effects.

Condition 2 states the catchment area for each pond.

Conditions 3 and 4 require the preparation and maintenance of contingency and stormwater management plans.

Conditions 5 to 7 deal with effects on the receiving waters.

Condition 8 (in 3902 and 4133) requires maintenance of existing fencing and plantings downstream.

Condition 9 (8 in 3907) deals with review provisions.

Fonterra held 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 to the Tawhiti Stream. This consent was issued by the Council in May 1996 under Section 87(e) of the RMA. It expired in June 2015, however, in accordance with Section 124 of the RMA, the consent holder applied to renew the consent prior

to its expiry, and therefore, continued to operate under the expired consent until the renewal was completed on 8 November 2017.

There are four special conditions attached to this consent (1 July to 8 November 2017).

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 m 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 m mixing zone.

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

The renewed discharge consent, **4927-2**, permits the discharge of river silt and sand from mechanical pre-filtering of river water during abstraction of water, by returning it into the Tawhiti Stream. The consent's next review date is in June 2018 and will expire on 1 June 2052.

There are four special conditions attached to this consent (8 November 2017 onwards).

Condition 1 specifies that there shall be no adverse effects in the receiving environment after reasonable mixing.

Conditions 2 and 3 require the preparation and implementation of a monitoring plan associated with the discharge.

Condition 4 deals with review provisions.

Fonterra held 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 expired in June 2015, however, in accordance with Section 124 of the RMA, the consent holder applied to renew the consent prior to its expiry, and therefore, continued to operate under the expired consent until the renewal was completed on 8 November 2017.

There are three special conditions attached to this consent (1 July to 8 November 2017).

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 m mixing zone.

Condition 3 allows the Council to undertake a review of the special conditions on the consent.

The renewed discharge consent, **5148-2**, permits the discharge of river silt and sand from mechanical pre-filtering of river water during abstraction of water, by returning it into the Tangahoe River. The consent's next review date is in June 2018 and will expire on 1 June 2052.

There are four special conditions attached to this consent (8 November onwards).

Condition 1 specifies that there shall be no adverse effects in the receiving environment after reasonable mixing.

Conditions 2 and 3 require the preparation and implementation of a monitoring plan associated with the discharge.

Condition 4 deals with review provisions.

Fonterra held consent **9621** to cover the discharge of stormwater and sediment from earthworks onto and into land in circumstances where it may enter water. This consent was issued by the Council on 25 July 2013 under Section 87(e) of the RMA. It expired in June 2018.

There are six special conditions attached to this consent.

Condition 1 gives more information on the authorisation.

Condition 2 requires the consent holder to notify Council prior to commencement of works.

Conditions 3 and 5 deal with sediment control measures.

Condition 4 requires that exposed areas must be stabilised within six months of completion of disturbance activities.

Condition 6 deals with the best practicable option.

1.3.3 Other water permits

Fonterra held 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. After expiring in June 2015, the structures have since been classified as a permitted activity, in accordance with Rule 18 (damming and diverting) and Rules 52 and 53 (using and maintaining structures) in the Regional Freshwater Plan (RFWP).

Fonterra held consent **5016** to allow the permanent diversion of the unnamed stream, which passes through the access way 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. After expiring in June 2015, the structures have since been classified as a permitted activity, in accordance with Rule 18 (damming and diverting) in the Regional Freshwater Plan (RFWP).

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. After expiring in June 2015, the structures have since been classified as a permitted activity, in accordance with Rule 18 (damming and diverting) and Rules 52 and 53 (using and maintaining structures) in the Regional Freshwater Plan (RFWP).

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 held consent **4977** to allow Fonterra to erect, place and maintain a marine outfall and diffuser structure of approximately 1,845 metres length in the coastal marine area. Consent 4977 was a restricted coastal activity (RCA) where the consent was issued by the Minister of Conservation in 1996. It expired in June 2015, however, in accordance with Section 124 of the RMA, the consent holder applied to renew the consent prior to its expiry, and therefore, continued to operate under the expired consent until the renewal was completed on 8 November 2017. The renewal of this consent is covered later in this section.

There were seven special conditions attached to this consent (1 July to 8 November 2017).

Conditions 1 and 2 require the consent holder 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 held 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 expired in June 2015, however, in accordance with Section 124 of the RMA, the consent holder applied to renew the consent prior to its expiry, and therefore, continued to operate under the expired consent until the renewal was completed on 8 November 2017.

There were eight special conditions attached to this consent (1 July to 8 November 2017).

Condition 1 requires a notification period of three 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 effects at least 200 m either side of the rock wall.

Condition 6 states that should erosion be occurring Fonterra 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.

When coastal permits 4977 and 5013 were renewed on 8 November 2017, both activities were permitted under one resource consent; **5013-2**. The consent covers the occupation and routine maintenance in the coastal marine area for the marine outfall, diffuser, rock wall and associated structures. The consent's next review date is in June 2021 and will expire on 1 June 2052.

There are six special conditions attached to this consent (8 November 2017 onwards).

Condition 1 states that the structures must be maintained so that they continue to function effectively for their intended purpose.

Condition 2 outlines the inspection and reporting requirements for the outfall pipeline.

Condition 3 requires the consent holder to provide a Maintenance Work Plan to the Council, in the event that maintenance is required following the inspection.

Condition 4 requires the consent holder to provide a written confirmation to Council following the completion of any maintenance works.

Condition 5 states that the outfall pipeline shall not be visible on the foreshore at any time.

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

1.3.5 Air discharge permit

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 holds 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.

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 staff 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.

During the year under review, two separate amendments were made to permit 4103 (4103-2.1 and 4103-2.2). The amendments were granted in order for Fonterra to dry whey powder in the Powder-3 drier stack over a temporary trial period. During this period, the concentration limit for emissions from Powder-3 was increased from 125 to 400 mg/m^3 0ºC, 1 atmosphere pressure, dry gas.

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 consent holder 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 consent holder 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 (Photo 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.

Photo 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 (Photo 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.

Fonterra held air discharge permit **9620** to cover the discharge of contaminants (dust) to air from earthworks associated with construction activities. This permit was issued by the Council on 25 July 2013 under Section 87(e) of the RMA. The consent expired in June 2018.

There were ten special conditions attached to the consent.

Conditions 1 and 2 require the preparation and adherence of/to a dust control management plan.

Condition 3 deals with best practicable option.

Condition 4 requires that the soil exposure not exceed 15.15 ha.

Condition 5 requires that the consent holder notify Council prior to exercising the consent.

Conditions 6 and 7 deal with dust deposition beyond the property boundary.

While conditions 8 to 10 deal with any complaints received.

Photo 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 consent holder 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 of 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 result in any 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. Changes were made to the conditions of the consent in December 2012 in order to provide for irrigation of unprocessable wastes onto land.

There are 18 special conditions attached to this consent.

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

Condition 2 states application loading limits for when irrigating unprocessable dairy factory wastes to land.

Condition 3 requires that the consent is undertaken in accordance with documentation submitted in support of the applications.

Condition 4 provides the allowable volumes of discharge of the different types of waste.

Condition 5 requires the consent holder to provide a management plan for the discharge site within three months of granting the consent, and updated regularly as required.

Conditions 6 and 7 require that the discharge shall not occur within 50 m of any bore, well or spring used for water supply purposes, nor within 25 m of any surface water body, or within 100 m from the coastal cliff edge, and the disposal pits shall not intercept the water table.

Conditions 8 and 9 require that the exercise of the consent shall not lead to contaminants entering a waterbody from overland surface flows, or result in any adverse impacts on groundwater as a result of leaching, or surface water including aquatic ecosystems.

Conditions 10 and 11 require that the discharged material shall be covered with up to 50 mm of earth or suitable cover, within a period of seven days, and all liquid shall be removed from the disposal pit prior to the application of covering material.

Condition 12 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 13 and 14 require each disposal pit to be reinstated 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 15 states that disposal of waste shall not give rise to objectionable or offensive odours beyond the property boundary.

Condition 16 requires the consent holder to maintain a record of all discharges to land including date, volume discharged, product type, and the reason for discharge and that these records be available to the Council upon request.

Condition 17 states that the discharge of unprocessable waste shall only occur after all other reasonable waste disposal options have been exhausted.

Condition 18 allows the Council to undertake a review of the special conditions on the consent.

Fonterra holds consent **9908** to discharge dairy liquids into land and associated emissions to air in various locations throughout the Taranaki region. This permit was issued by the Council in June 2014 under Section 87(e) of the RMA. Its next optional review date is June 2020 and will expire in June 2034.

There are 19 special conditions attached to this consent.

Condition 1 specifies the types of dairy liquids which may be discharged.

Condition 2 requires all discharges to occur in accordance with a Dairy Liquids Spreading Management Plan prepared by Fonterra and approved by Council.

Condition 3 requires notification of the intended dairy liquid discharges.

Condition 4 states that the discharge shall not result in ponding for more than 30 minutes.

Condition 5 states that no discharged liquids shall reach surface water, subsurface drainage or adjacent properties.

Condition 6 requires Fonterra to adopt the best practicable at all times to prevent or minimise adverse effects on the environment.

Condition 7 prohibits spray drift at or beyond the boundaries of properties which are spray irrigating.

Condition 8 specifies the sodium adsorption ratio limit for discharged dairy liquids.

Condition 9 specifies nitrogen loading rate limits.

Condition 10 specifies minimum buffer distances.

Condition 11 prohibits any discharges occurring within, adjacent to or directly impacting on any Statutory Acknowledgement Areas.

Condition 12 states that there shall be no offensive or objectionable odours at or beyond the boundary of properties where discharges are occurring.

Condition 13 requires notification of any accidental discharge or other occurrence which may lead to a breach in consent conditions.

Condition 14 requires the consent holder to maintain a complaints register.

Condition 15 requires notification in an event which may lead to contamination of surface waters which are abstracted for drinking purposes.

Condition 16 requires Fonterra to maintain a record of application sites.

Condition 17 requires Fonterra to maintain a register of farms used for spreading dairy liquids.

Condition 18 is a consent lapse clause.

Condition 19 allows the Council to undertake a review of the special conditions on the consent.

1.3.7 Land use permits

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 held land use permit **5015** to dam an unnamed stream which passes through the accessway gully for stream flow control and marine outfall pipeline installation purposes. The unnamed stream is dammed approximately 700 m from the cliff edge to create a pond. This consent was issued by the Council in 1996 under Section 87(a) of the RMA. After expiring in June 2015, the structures have since been classified as a permitted activity, in accordance with Rule 18 (damming and diverting) and Rules 52 and 53 (using and maintaining structures) in the Regional Freshwater Plan (RFWP).

Fonterra held land use permit **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(a) of the RMA. After expiring in June 2015, the structures are now classified as a permitted activity, in accordance with Rules 52 and 53 (using and maintaining structures) in the Regional Freshwater Plan (RFWP).

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. After expiring in June 2015, the structures have since been classified as a permitted activity, in accordance with Rules 52 and 53 (using and maintaining structures) in the Regional Freshwater Plan (RFWP).

Fonterra holds consent **10208** to provide for the construction, placement and use of a new water intake structure in bed of the Tangahoe River. This consent was granted on 25 February 2016 under Section 87(d) of the RMA. The review dates for this consent are June 2022 and June 2028. The consent will expire on 1 June 2034.

There are 20 special conditions attached to this consent.

Condition 1 states that the structure shall be constructed in accordance with specified documentation.

Condition 2 states the requirements for signage.

Condition 3 requires a meeting to be held with a Monitoring Officer from the Council prior to the commencement of the works.

Condition 4 refers to documentation specifying the requirements for erosion control.

Condition 5 outlines requirements for sediment control.

Condition 6 outlines requirements for the stabilisation of earthworks.

Condition 7 is a requirement for works notification.

Condition 8 requires concrete work to be isolated from running water.

Condition 9 requires new concrete to remain isolated from running water for 48 hours.

Condition 10 specifies requirements for the installation of bank protection structures in relation to the installation of the coffer dam.

Condition 11 states that no instream works shall take place between 1 May and 31 October inclusive.

Condition 12 requires stream bed disturbance to be minimised and reinstated as far as practicable.

Condition 13 requires that all reasonable steps are taken to minimise instream effects from sediment.

Condition 14 requires best practicable option to be adopted at all times to prevent/minimise adverse effects.

Condition 15 requires that water flow is not adversely affected.

Condition 16 specifies that the river banks shall not be steeper than the existing natural banks following the works.

Condition 17 specifies that the works, and any subsequent effects (e.g. erosion), remain the responsibility of the consent holder.

Condition 18 outlines protocols that are to be adopted if archaeological remains are discovered during construction.

Condition 19 is a consent lapse clause.

Condition 20 is a provision for review of the 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. This consent expired in June 2015, however, the legality of the structure has a permitted activity is currently being investigated.

These summaries of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consents which are appended to this report.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

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 seven 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 consent reviews, renewals or new consent applications;
- 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 10 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 Fonterra were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Discharge sampling

1.4.4.1 Water

The stormwater discharge was sampled on 10 occasions (from three points) and the samples analysed for alkalinity, COD, biological oxygen demand (BOD and filtered carbonaceous BOD), conductivity, pH, free and total chlorine, oil and grease and suspended solids.

The outfall discharge was sampled on 10 occasions and analysed for E. coli and enterococci, total grease, suspended solids, COD, pH and conductivity.

Inter-laboratory comparisons of a 24 hour time-proportional sample were carried out on three occasions and analysed for conductivity, pH, fats, COD, alkalinity, BOD, suspended solids, nitrogen, phosphorus, faecal coliforms 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 areas surrounding the site.

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

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

Monitoring of ambient nitrogen oxide (NO_x) levels at the site was conducted on two occasions using passive absorption discs at four sampling sites.

1.4.5 Freshwater ecological surveys

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

A six site biomonitoring survey was undertaken 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.

A fish survey is undertaken in the Tawhiti Stream every three years in order to assess if the intake, fish pass, or discharge of sediment undertaken in relation to the Fonterra Whareroa water abstraction have had any impact on the fish communities of the Tawhiti Stream. This survey was carried out in the 2016-2017 monitoring year and is next due to be undertaken in 2019-2020.

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 physical, chemical and biochemical parameters. Results are forwarded to the Council along with data relating to water abstractions from the Tangahoe catchment.

Fonterra's independent consultants, CRL Energy Ltd, carried out powder emission measurements on drier exhaust stacks between August 2017 and March 2018. The Council undertook a review of all data upon receipt.

2 Results

2.1 Plant upgrades and improvements

Several projects were completed during the 2017-2018 period. These projects were driven by internal targets for reducing energy use, water use and waste volumes, whilst increasing product yield. Some examples of these projects are included below.

Particulate meters were installed in the drier exhaust stacks in Powder 2 and Whey Products. These meters can assess the instantaneous concentration of emissions and provide real-time feedback to the plants. This information has resulted in the plants making a number of decisions to inspect and replace socks, and to bring forward full sock replacement; thereby avoiding excess emissions to atmosphere.

A project in the Casein plant has enabled recovery of the curd "wash water" for further processing, which previously went to drain. This has significantly reduced the protein, fat and lactose in the plant wastewater.

Condensate water recovery has been recommissioned in Powder 2. This diverts water for use in other plants, rather than going to wastewater.

The site has a major capital project underway to install inline real-time monitoring of the site stormwater (for pH, conductivity and suspended solids) with the ability to divert contaminated stormwater to newly constructed Contingency Ponds. This project is due to be completed late in 2018.

Energy and water use was reduced in the Milk Treatment department by reducing the rinse times during CIPs (clean in place).

The wastewater loss monitoring and loss reduction programs continued with increased focus in the 2017-2018 season. Losses are reported at daily management meetings, while water and energy usage is reported on a weekly basis.

2.2 Water

2.2.1 Inspections

Routine site inspections were conducted on a monthly basis throughout the 2017-2018 dairy season. A total of ten site inspections were undertaken between August 2017 and May 2018, with each visit including an assessment of stormwater management, chemical storage, truck wash areas, and general site maintenance and management. The three stormwater discharges and the wastewater discharge to the Tasman Sea were also inspected during the visits.

No major issues were identified during inspections in the year under review. However, a reoccurrence of corroding and leaking valves on the bulk chemical containers highlighted the importance of routine maintenance checks. The leaks that were discovered were minor in nature and were contained within bunds.

Overall, site management was found to be good throughout the monitoring period. Based on the inspections that were undertaken, the site remained in compliance with consent conditions.

2.2.2 Water abstraction

Up until 8 November 2017, Fonterra held two resource consents to take up to a total volume of 30,000 m^3/day of water from two locations in the Tangahoe catchment; including the Tawhiti Stream (consent 0047) and the Tangahoe River (consent 4508). The two takes have been assessed under a single consent, 0047-4, since their renewal on 8 November 2017. Exercise of these consents are monitored by both Fonterra and the Council.

Fonterra continuously measures abstraction rates for both intakes and daily abstraction rate data has been supplied on a monthly basis to the Council for review. Since March 2018, instantaneous abstraction data has also been telemetered to the Council's database.

Photo 5 Tangahoe River intake

The Council maintains a telemetered hydrological recorder in the Tawhiti Stream, downstream of the abstraction point, to monitor compliance with flow restrictions on consent 0047. During the current monitoring period, a hydrological recorder was also installed in the Tangahoe River, downstream of the abstraction point.

For simplicity, Fonterra's compliance with all applicable consents is summarised here in terms of abstraction rate limits, and minimum flows, for each site.

Abstraction rate limits

Prior to consent renewal, the maximum allowable rate of abstraction from the Tangahoe River (Photo 5) was 16,000 m^3/day (with a maximum instantaneous rate of 210 L/s). The new consent does not limit the amount of water that may be taken from the Tangahoe River, provided that the total amount abstracted from the catchment over 24 hours (from 06:00 to 06:00) does not exceed 30,000 m^3 (with a maximum instantaneous rate of 347 L/s). A summary of the abstraction data provided by Fonterra is presented in Table 2. Compliance with the maximum daily abstraction volume has been determined in terms of number of days that limits were breached. Fonterra was found to be compliant with these conditions for the duration of the monitoring period. Prior to the consent renewal on 8 November 2017, the maximum daily abstraction for the Tangahoe River was 13,475 m^3, and the maximum combined abstraction rate for the monitoring year was 28,195 m^3/day. The instantaneous abstraction rate limits were complied with at the Tangahoe River in the period under review.

Table 2 Summary of abstraction rate data for 2017-2018

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	2,936	3,200	0	3,200	13,475	0	9,607	15,932	0
August	10,607	14,468	0	9,183	12,679	0	19790	24702	0
September	12,485	18,000	0	8,694	11,878	0	21,179	25,074	0
October	12,665	14,704	0	8,792	12,886	0	21,456	27,397	0
November	12,486	13,200	0	9,476	12,868	0	21,962	25,144	0
December	6,766	12,403	0	13,853	22,748	0	20,619	24,643	0
January	1,270	15,421	0	19,341	23,350	0	20,610	24,779	0
February	0	0	0	20,010	28,195	0	20,010	28,195	0
March	0	0	0	19,148	22,232	0	19,148	22,232	0

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
April	0	0	0	15,977	22,195	0	15,977	22,195	0
May	0	0	0	11,511	15,919	0	11,511	15,919	0
June	0	0	0	2,778	8,156	0	2,778	8,156	0

Prior to consent renewal, the maximum allowable rate of abstraction from the Tawhiti Stream was 30,000 m^3/day (with a maximum instantaneous rate of 347 L/s). The new consent does not limit the amount of water that may be taken from the Tawhiti Stream, provided that the total amount abstracted from the catchment over 24 hours (from 06:00 to 06:00) does not exceed 30,000 m^3. Compliance with the maximum daily abstraction volume has been determined in terms of number of days that limits were breached. Fonterra was found to be compliant with these conditions for the duration of the monitoring period (Table 2). Prior to the consent renewal in November 2017, the maximum daily abstraction for the Tawhiti Stream was 18,000 m^3, and the maximum combined abstraction rate for the monitoring year was 28,195 m^3/day.

For periods when the residual flow in the Tawhiti Stream was greater than 800 L/s, the instantaneous abstraction rate remained below the maximum limit of 347 L/s, as required by the consent. Prior to 8 November 2017, during times when the flow in the Tawhiti was less than 800 L/s and turbidity in the Tangahoe was less than 150 NTU, the maximum allowable rate of abstraction was 184 L/s. The flow never dropped below 800 L/s during this period, therefore this condition was not applicable. Since 8 November 2017, during times when the flow in the Tawhiti was less than 800 L/s, the maximum allowable rate of abstraction was 184 L/s, (unless the turbidity in the Tangahoe was greater than 850 NTU, in which case the maximum allowable abstraction rate was 347 L/s). This limit was exceeded once, on 6 January for 9 ½ hours, with an abstraction rate of 209 L/s and a residual flow less than 800 L/s. This exceedance was self-reported to the Council and is discussed further in Section 2.4.

Minimum flows

The results obtained from the Council's recorder in the Tawhiti Stream show that the minimum residual flow of 50 L/s, required under consent 0047 prior to consent renewal, was maintained. The lowest flow recorded during this period was 629 L/s (Figure 1). The renewed consent requires a minimum residual flow of 240 L/s, below which no taking is permitted (though this can be as low as 50 L/s during an 'emergency period' of up to 48 hours). The lowest flow recorded during the rest of the year under review was 256 L/s (Figure 2); compliance was therefore maintained.

Prior to the consent renewal, the minimum residual flow required for the Tangahoe River was 495 L/s, below which no taking was permitted. Since 8 November 2017, the minimum residual flow required for the Tangahoe River is 450 L/s (though this can be as low as 273 L/s during an 'emergency period' of up to 48 hours). Additionally, for 21 days of the monitoring year, Fonterra are able to continue abstracting from the Tangahoe when the flow is between 300 and 450 L/s. The minimum flow consent requirements were complied with during the year under review (Figure 3).

The hydrographs for the Tawhiti Stream and Tangahoe River for the 2017-2018 monitoring period are presented in Figure 1, Figure 2 and Figure 3.

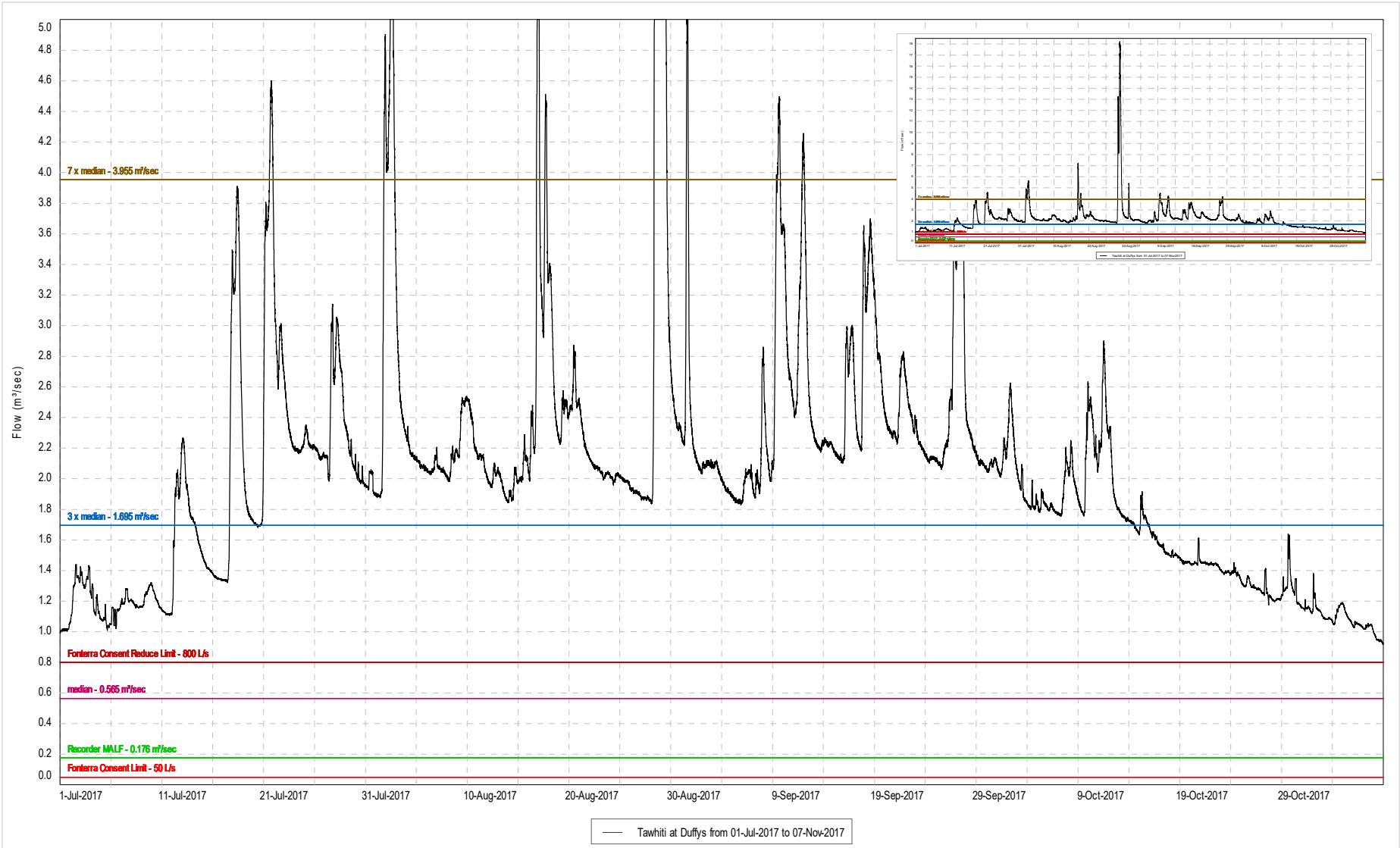

Figure 1 Tawhiti Stream flow (m^3/second) at Duffy's Farm, from 1 July 2017 to 7 November 2017, with consent limits. Inset: complete range of flows for same period

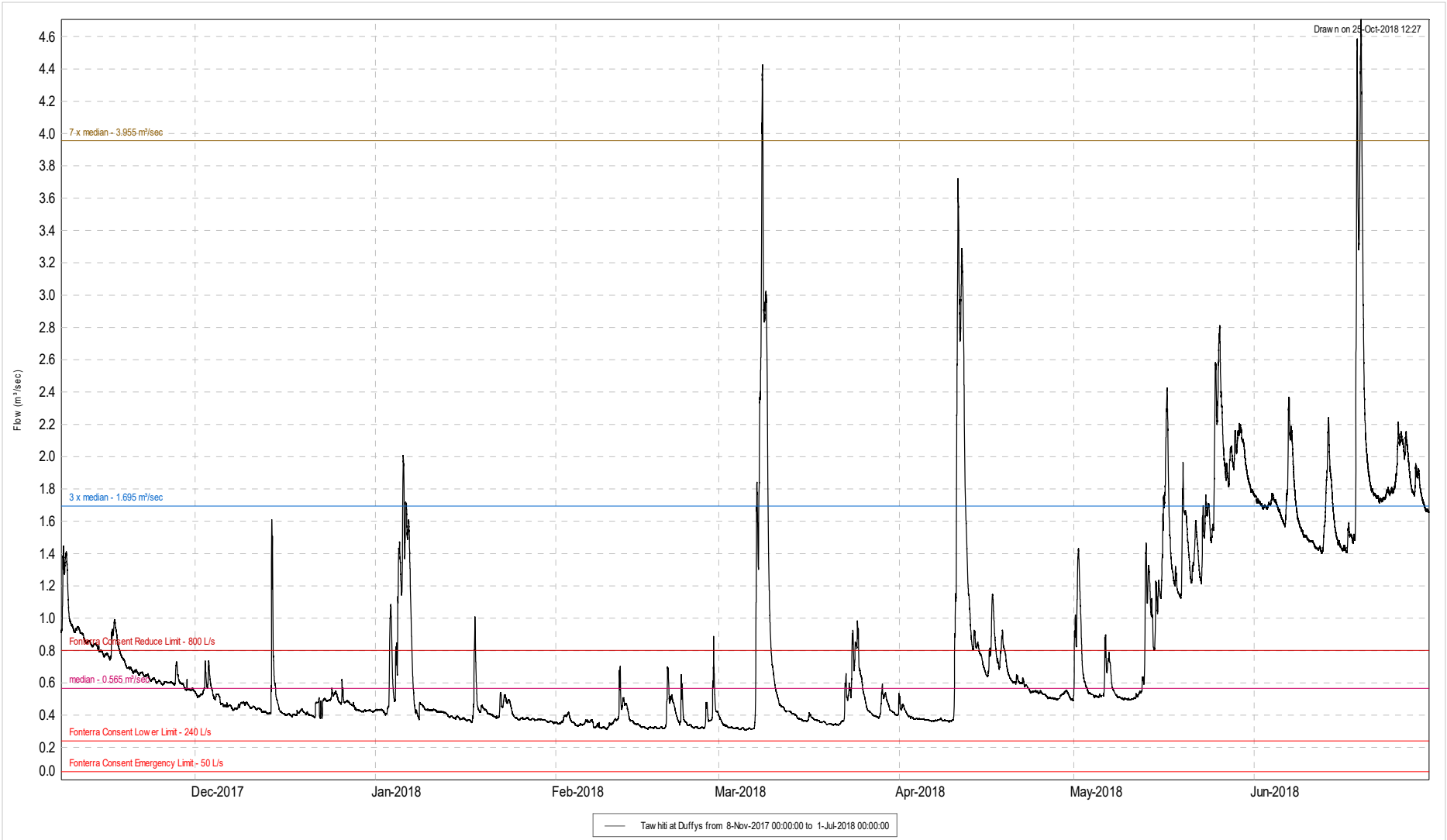

Figure 2 Tawhiti Stream flow (m^3/second) at Duffy's Farm, from 8 November 2017 to 30 June 2018, with new consent limits

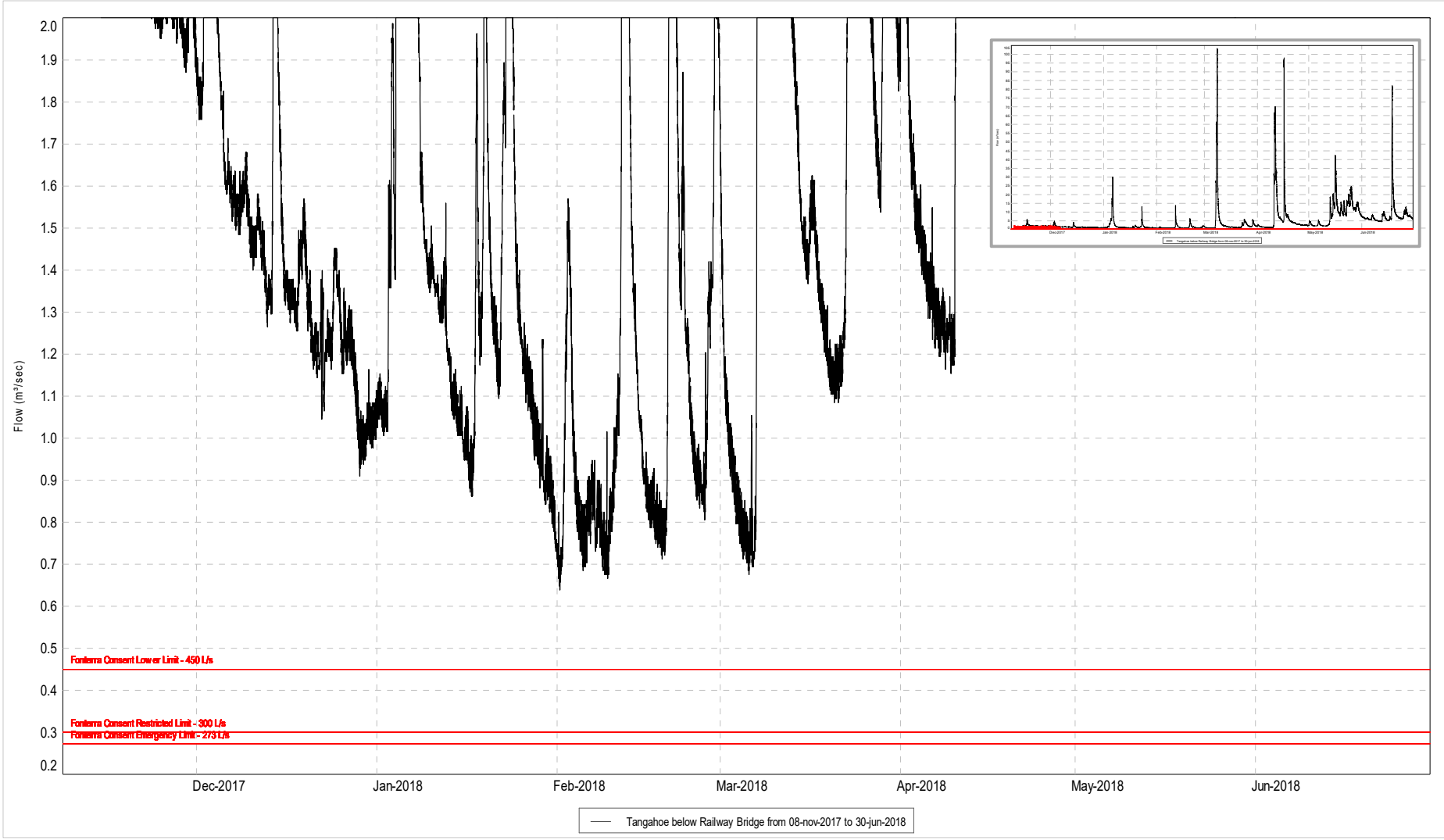

Figure 3 Tangahoe River flow (m^3/second), 8 November 2017 to 30 June 2018 with relevant consent limits. Inset: Complete range of flows over same period

2.2.3 Stormwater

Figure 4 Approximate stormwater catchments at the Whareroa site

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 drains 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 4.

Each of the discharges is 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 are now two stormwater ponds in the southern catchment (the unnamed coastal stream) following major upgrade works undertaken during the 2014-2015 year (Photo 6). The second pond was installed to ensure sufficient capacity to treat the stormwater following the site expansion. The construction of the new distribution centre increased the size of the catchment area for the southern stormwater discharge.

Photo 6 Southern stormwater pond following upgrade (surrounded by native riparian plantings)

The detention pond system at the headwaters of the unnamed tributary of the Tawhiti Stream (Photo 7) 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 repairing the stormwater isolation sump adjacent to the water treatment plant. A marked improvement in pond water quality has occurred following completion of these works.

Photo 7 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 (Photo 6), 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 2017-2018 reporting period, the monitoring of stormwater discharges consisted of three components; the collection of stormwater discharge samples, a freshwater biological inspection of each of the unnamed tributaries and a macroinvertebrate survey of six sites in an unnamed tributary of the Tawhiti stream, the Tangahoe River, and an unnamed coastal stream.

2.2.3.1 Discharge monitoring

Discharge samples were collected during each site inspection. The samples were analysed for temperature, conductivity, pH, alkalinity, oil and grease, total residual chlorine, free chlorine, suspended solids, turbidity, chemical oxygen demand (COD), biochemical oxygen demand (BOD) and filtered carbonaceous biochemical oxygen demand (BODCF). Parameters, with associated consent limits, are listed in Table 3. It should be noted that, due to the Council's laboratory closing down towards the end of the 2017-2018 year, samples for April and May 2018 were analysed by Hill Laboratories. It should be noted that since the change, a more sensitive Oil and Grease test method has been adopted, and chlorine testing is now undertaken in the field.

Table 3 Limits for stormwater composition for each parameter 2017-2018 (consents 3902, 3907, 4133)

Parameter	Units	Consent limit*		
		3902	3907	4133
Temperature	°C	25	25	25
Oil and grease	g/m^3	5	5	5
Total residual chlorine	g/m^3	0.2	0.2	0.2
pH	pH	6.0 - 9.0	6.0 - 9.0	6.0 - 9.0
Suspended solids	g/m^3	30	30	100
BOD	g/m^3	10	10	10
BODCF	g/m^3	2.0	2.0	2.0

* Consent limits apply to eight out of ten consecutive samples over the course of an annual monitoring period

Tributary of Tawhiti Stream

Samples of the discharge to the Tawhiti tributary are taken at the outlet of the three-pond system. Since the construction of the three-pond system, there has been a considerable decrease in the levels of BOD and suspended solids in the discharge, while temperature, conductivity and pH have remained constant. Oil and grease (O&G) and free chlorine levels have typically remained low since the site upgrade.

Samples results for the discharge to the Tawhiti tributary are presented in Table 4. A summary of previous results, since the installation of the three-pond system in 1998, is also included for comparison.

Table 4 Sample results for the stormwater discharge to an unnamed tributary of the Tawhiti Stream

Parameter	Alkalinity	BODCF	BOD	COD	Cond.	O&G	pH	SS	Turb.	Temp.	Total Cl_2	Free Cl_2
Unit	**g/m^3 $CaCO_3$**	**g/m^3**	**g/m^3**	**g/m^3**	**mS/m @ 20°C**	**g/m^3**	**pH**	**g/m^3**	**NTU**	**°C**	**g/m^3**	**g/m^3**
Summary statistics previous data (November 1998 to June 2017)												
Minimum	23	0.06	0.25	2.5	15.0	0.25	7.0	2	1.0	8.0	0.005	0.005
Maximum	157	19	21	210	40.8	7.3	9.9	660	350	22.5	0.3	0.3
Median	65	0.5	1	11	27.4	0.2	7.6	8	5.8	15.5	0.05	0.05
Number	129	78	140	135	137	131	135	133	96	134	134	133
2017-2018 monitoring results (TRC Laboratory)												
16 Aug 2017	61	0.25	1.2	13	24.8	<0.5	7.4	6	11	12.1	<0.1	<0.1
28 Sep 2018	58	0.25	1.1	10	23.6	<0.5	7.5	5	4.9	15.0	<0.1	<0.1
25 Oct 2017	62	1.3	8.0	30	25.4	<0.5	7.9	17	7.8	15.7	<0.1	<0.1
22 Nov 2017	75	0.8	3.4	16	27.0	<0.5	**9.4**	6.0	5.4	21.0	<0.1	<0.1
11 Dec 2017	86	0.8	2.0	11	30.4	<0.5	7.8	7	9.2	22.1	<0.1	<0.1
17 Jan 2018	79	1.0	1.8	13	26.7	<0.5	7.3	6	11	20.7	<0.1	<0.1
21 Feb 2018	78	0.8	2.2	12	26.7	<0.5	7.7	4	5.8	20.8	<0.1	<0.1

Parameter	Alkalinity	BODCF	BOD	COD	Cond.	O&G	pH	SS	Turb.	Temp.	Total Cl_2	Free Cl_2
Unit	g/m^3 $CaCO_3$	g/m^3	g/m^3	g/m^3	mS/m @ 20°C	g/m^3	pH	g/m^3	NTU	°C	g/m^3	g/m^3
21 Mar 2018	67	0.6	2.0	22	25.8	**7.6**	7.6	5	3.8	19.4	<0.1	<0.1
2017-2018 monitoring results (Hill Laboratories)												
19 Apr 2018	55	<2	<2	<6	27	**6**	6.9	3	5.3	14.2	<0.1	<0.1
23 May 2018	49	<2	N/D	<6	N/D	<5#	7.3	9	9.4	12.1	<0.1	<0.1
Consent limit*	**-**	**2.0**	**10**	**-**	**-**	**5**	**6.0 – 9.0**	**30**	**-**	**25**	**0.2**	**-**

Refer to glossary for an explanation of abbreviations
* Consent limits apply to eight out of ten consecutive samples over the course of an annual monitoring period
# Equivalent Hills method tested in TRC Laboratory

Oil and grease measured 7.6 and 6 g/m^3 on 21 March and 19 April 2018, respectively. Additionally, pH measured 9.4 on 22 November 2017. These elevated results did not constitute a breach of consent as consent limits apply to eight out of ten consecutive samples over the course of the monitoring period. No other stormwater contaminants exceeded consent limits during the 2017-2018 monitoring year. Results for the contaminants not assessed against consent limits were comparable with those from previous surveys.

Tributary of Tangahoe River

Samples of the discharge to the Tangahoe tributary are taken at the outlet of the two-pond system. The characteristics of the discharge have changed since the construction of the ponds. On average, the temperature, conductivity, alkalinity, BOD and O&G values recorded have decreased, while the pH and chlorine values have increased.

Samples of the discharge to the Tangahoe tributary are presented in Table 5. A summary of previous results, since the installation of the two-pond system in 1996, is also included for comparison.

Table 5 Sample results for the stormwater discharge to an unnamed tributary of the Tangahoe River

Parameter	Alkalinity	BODCF	BOD	COD	Cond.	O&G	pH	SS	Turb.	Temp.	Total Cl_2	Free Cl_2
Unit	g/m^3 CaCO3	g/m^3	g/m^3	g/m^3	mS/m @ 20°C	g/m^3	pH	g/m^3	NTU	°C	g/m^3	g/m^3
Summary statistics previous data (May 1996 to June 2017)												
Minimum	28	0.6	0.6	5	4.0	<0.5	6.8	1	0.67	8.1	0.005	0.005
Maximum	235	93	93	220	57.6	1.7	9.8	110	42	23.5	0.5	0.4
Median	118	5.4	5.4	22	36.2	0.2	7.9	11	5.65	16.4	0.1	0.05
Number	135	140	140	139	140	136	141	139	94	136	135	135
2017-2018 monitoring results (TRC Laboratory)												
16 Aug 2017	109	<0.5	1.9	16	39.9	<0.5	7.7	4	3.0	12.0	<0.1	<0.1
28 Sep 2018	96	1.2	4.6	17	33.9	<0.5	7.5	4	5.7	14.6	0.1	<0.1
25 Oct 2017	132	1.2	3.0	17	42.1	<0.5	8.0	5	3.5	16.2	0.1	<0.1

Parameter	Alkalinity	BODCF	BOD	COD	Cond.	O&G	pH	SS	Turb.	Temp.	Total Cl_2	Free Cl_2
Unit	**g/m³ CaCO3**	**g/m³**	**g/m³**	**g/m³**	**mS/m @ 20°C**	**g/m³**	**pH**	**g/m³**	**NTU**	**°C**	**g/m³**	**g/m³**
22 Nov 2017	147	1.2	2.8	15	42.0	<0.5	7.8	4.3	3.4	19.8	0.1	<0.1
11 Dec 2017	168	0.7	2.7	18	45.3	<0.5	8.1	5	5.0	22.4	0.1	0.1
17 Jan 2018	137	1.7	**14**	62	37.1	<0.5	7.9	**54**	48	21.8	<0.1	<0.1
21 Feb 2018	163	0.9	7.2	24	46.4	<0.5	8.1	15	8.4	21.5	0.1	0.1
21 Mar 2018	136	1.0	5.0	20	45.8	<0.5	8.3	8	2.7	19.7	<0.1	<0.1
2017-2018 monitoring results (Hill Laboratories)												
19 Apr 2018	116	<2	4	16	45.9	<4	8.3	13	6.2	14.2	<0.1	<0.1
23 May 2018	121	<2	N/D	8	N/D	<5#	7.4	3	2.6	12.9	<0.1	<0.1
Consent limit*	-	**2.0**	**10**	-	-	**5**	**6.0 – 9.0**	**30**	-	**25**	**0.2**	-

Refer to glossary for an explanation of abbreviations

* Consent limits apply to eight out of ten consecutive samples over the course of an annual monitoring period
# Equivalent Hills method tested in TRC Laboratory

Suspended solids and BOD both exceeded consent limits on 17 January 2018, with results of 54 and 14 g/m^3, respectively. Turbidity, COD and BODCF were also elevated during this inspection, although these contaminants are not assessed against consent limits. The elevated results reported for 17 January 2018 did not constitute a breach of consent however, as consent limits apply to eight out of ten consecutive samples over the course of the monitoring period.

Unnamed coastal stream

Samples of the discharge to the unnamed coastal stream are presented in Table 6. A summary of previous results, since November 1994, is also included for comparison.

Table 6 Sample results for the stormwater discharge to an unnamed coastal stream

Parameter	Alkalinity	BODCF	BOD	COD	Cond.	O&G	pH	SS	Turb.	Temp.	Total Cl_2	Free Cl_2
Unit	**g/m³ CaCO3**	**g/m³**	**g/m³**	**g/m³**	**mS/m @ 20°C**	**g/m³**	**pH**	**g/m³**	**NTU**	**°C**	**g/m³**	**g/m³**
Summary statistics previous data (November 1994 to June 2017)												
Minimum	16	0.8	0.8	2.5	3.6	0.25	6.6	1	1.3	7.7	0.005	0.005
Maximum	130	22	22	97	51.2	2.8	8.5	78	44	23.5	0.7	0.6
Median	71	7.6	7.6	31	28.2	0.2	7.4	17	9.8	15.7	0.05	0.05
Number	137	143	143	141	141	139	142	141	92	138	138	140
2017-2018 monitoring results (TRC Laboratory)												
16 Aug 2017	56	<0.5	0.8	9	26.6	<0.5	7.4	8	6.1	10.8	<0.1	<0.1
28 Sep 2018	54	<0.5	0.8	11	25.4	<0.5	7.3	6	3.6	13.9	<0.1	<0.1

Parameter	Alkalinity	BODCF	BOD	COD	Cond.	O&G	pH	SS	Turb.	Temp.	Total Cl_2	Free Cl_2
Unit	**g/m³ CaCO3**	**g/m³**	**g/m³**	**g/m³**	**mS/m @ 20°C**	**g/m³**	**pH**	**g/m³**	**NTU**	**°C**	**g/m³**	**g/m³**
25 Oct 2017	66	0.9	1.1	10	30.9	<0.5	7.4	3	1.1	15.4	<0.1	<0.1
22 Nov 2017	74	0.6	0.9	7	33.1	<0.5	7.4	2.3	1.4	19.6	<0.1	<0.1
11 Dec 2017	85	0.7	1.2	7	33.9	<0.5	7.7	1	1.3	22.1	<0.1	<0.1
17 Jan 2018	87	1.1	3.3	9	32.3	<0.5	7.4	5	2.2	22.0	<0.1	<0.1
21 Feb 2018	82	0.6	1.8	10	29.0	<0.5	7.6	2	2.0	20.7	<0.1	<0.1
21 Mar 2018	73	0.6	1.0	10	29.1	<0.5	7.6	3	1.2	19.5	<0.1	<0.1
2017-2018 monitoring results (Hill Laboratories)												
19 Apr 2018	50	<2	<2	<6	27.6	5	7.5	<3	1.06	13.7	<0.1	<0.1
23 May 2018	52	<2	N/D	<6	N/D	<5#	7.2	<3	1.96	12.6	<0.1	<0.1
Consent limit*	-	**2.0**	**10**	-	-	**5**	**6.0 – 9.0**	**100**	-	**25**	**0.2**	-

Refer to glossary for an explanation of abbreviations

* Consent limits apply to eight out of ten consecutive samples over the course of an annual monitoring period

Equivalent Hills method tested in TRC Laboratory

No stormwater contaminants exceeded consent limits during the 2017-2018 monitoring year. Results for the contaminants not assessed against consent limits were comparable with those from previous surveys.

2.2.3.2 Freshwater biomonitoring

A six-site biomonitoring survey was undertaken on 9 February 2018 using either the Council's standard '400 ml sweep-net' method or a combination of '400 ml sweep-net' and 'kick-sampling' methods. The survey was conducted 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 adversely affected the macroinvertebrate communities of these streams during the period under review (Figure 5; Table 7). Samples were processed to provide the number of taxa (taxa richness), macroinvertebrate community index (MCI) scores and semi-quantitative MCI values ($SQMCI_S$) at each site. They were also checked for heterotrophic growths.

The MCI is a measure of the overall sensitivity of macroinvertebrate communities 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 taxon abundance 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 the MCI or $SQMCI_S$ between sites indicate the extents of any adverse effects of the discharges being monitored. The presence of masses of heterotrophic organisms can also be an indicator of organic enrichment within a stream.

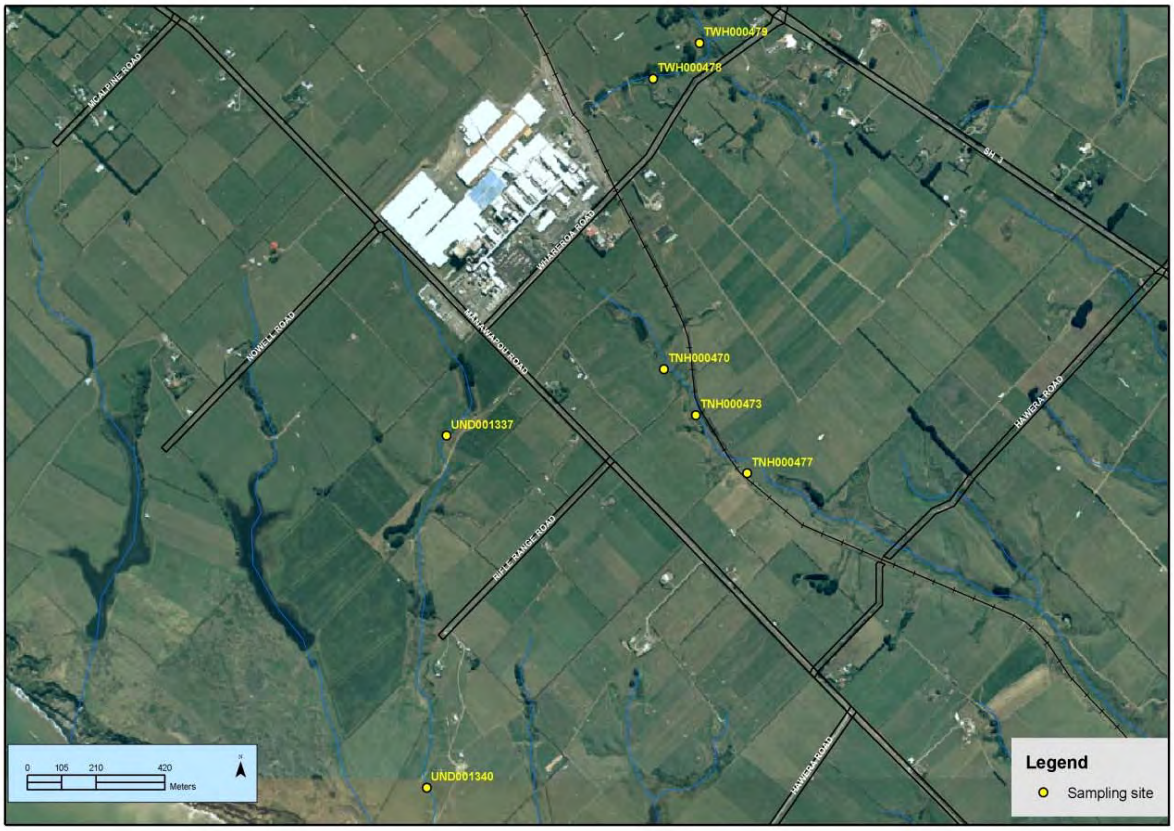

Figure 5 Locations of freshwater biological sampling sites in the tributaries of the Tangahoe River and Tawhiti Stream, and an unnamed coastal stream

Table 7 Freshwater biomonitoring sites in unnamed tributaries of the Tawhiti Stream and Tangahoe River, and an unnamed coastal stream

Stream	Site No.	Site code	Method	Time (NZST)	Water temp (°C)
Tawhiti Stream tributary	B1	TWH000478	Kick-sampling	0930	16.0
	B2	TWH000479	Vegetation sweep	0850	15.9
Unnamed tributary of the Tangahoe River	1	TNH000470	Vegetation sweep	1115	18.4
	2	TNH000473	Vegetation sweep	1035	17.0
	3	TNH000477	Vegetation sweep	1015	16.4
Unnamed coastal stream	S2	UND001340	Kick-sampling	1130	17.4

An unauthorised discharge recorded in the unnamed tributary of the Tawhiti Stream in 2011 resulted in the proliferation of undesirable heterotrophic growths ('sewage fungus') downstream of the stormwater discharge, at sites B1 and, to a lesser extent, B2. 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 2012-2013 survey suggested an improvement in water quality at these sites since the stormwater upgrade was completed in April 2011. Since then, water quality has continued to improve at the monitored sites, supported by the results from the current survey. As with the previous four surveys, the

$SQMCI_S$ score for site B1 was markedly higher than the historical median. In addition, the $SQMCI_S$ score recorded for site B2 was higher than the historical median for the site.

In the unnamed tributary of the Tangahoe Stream, the macroinvertebrate communities present at the three sites were of 'poor' quality at the time of the current survey. The MCI scores recorded had decreased at site 1 but were typical for sites 2 and 3. There were no significant changes in MCI scores between the current survey, previous survey and historic medians at site 2, however site 3 recorded a MCI score significantly (Stark, 1998) lower than the preceding survey for the site, and site 1 recorded a score significantly lower (Stark 1998) than the historical median. In addition, there were substantial improvements in $SQMCI_s$ scores from historical medians at sites 2 and 3, but a substantial decrease at site 1. All three macroinvertebrate metrics recorded their lowest scores to date at site 1, potentially indicating that this site is impacted by the stormwater discharges. Further support is provided by the decline in MCI over the last four surveys.

The results of this survey continued to reflect improvements in the macroinvertebrate community that have been recorded over the past ten 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.

The survey results from February 2018 indicate that stormwater discharges from Fonterra Whareroa have not had recent detrimental effects upon the streambed communities in the unnamed tributary of the Tawhiti Stream, or the unnamed coastal stream. However, the results at site 1 indicate that the unnamed tributary of the Tangahoe River may be impacted by this stormwater discharge. It is therefore recommended that consideration is given to carrying out a spring biomonitoring survey at this site instead of the current biological inspection.

A full copy of this report is included in Appendix II.

2.2.3.3 Freshwater biological inspection

The inclusion of a spring biological inspection in the monitoring programme is a direct response to the discovery of undesirable heterotrophic growths in the Tawhiti Stream tributary in January 2011. 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 small samples which were sorted on site to assess what live invertebrates were present. As the sorts were not performed using magnification, the level of identification was quite low, except for those invertebrates that could be easily identified to a higher taxonomic level e.g. the sandfly *Austrosimulium* sp.

This year's inspection found no undesirable heterotrophic growths in any of the streambeds downstream of the three stormwater pond discharges. 'Moderately sensitive' taxa were present in the tributary of the Tawhiti Stream and the Unnamed Coastal Stream. However, signs of mildly eutrophic conditions were found in the tributary of the Tangahoe River. Notwithstanding this evidence, the inspection found no clear indication of significant adverse effects from any of the three stormwater discharges on the associated downstream macroinvertebrate communities.

A full copy of this report is included in Appendix III.

2.2.3.4 Fish survey

The Tawhiti Stream fish survey was not undertaken during the period under review. This is next scheduled for the 2019-2020 monitoring year.

2.2.4 Wastewater

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 concentrations 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: an increased level of resourcing in loss monitoring/CIP optimisation personnel, the installation of a second grade water system that reuses up to 3,000,000 L/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 is performing according to design. The effluent field that forms above the diffuser moves parallel to the coast, and has not been observed to impinge upon the shore under standard conditions.

Although occasional surface films form, there has been no evidence of accumulation of material on the seabed near the outfall.

2.2.4.1 Discharge composite samples

Fonterra forwards monitoring results to the Council monthly. These results include daily discharge volumes, as well as the concentrations of fats and suspended solids, COD, pH and mean daily temperature of the discharge. The chemical measurements are based on 24 hour time-proportioned composite samples. A summary of wastewater volume data for the period under review is provided in Table 8.

Table 8 Summary of wastewater volume data for 2017-2018

Month	Mean volume (m^3/day)	Maximum volume (m^3/day)	No. of non-compliance days (> 40,000 m^3/day)
July	7,661	14,822	0
August	22,380	30,629	0
September	27,275	30,674	0
October	27,849	31,187	0
November	27,634	29,877	0
December	25,068	28,801	0
January	23,878	31,088	0
February	22,883	26,177	0
March	22,161	32,240	0
April	18,452	29,365	0
May	13,165	18,199	0
June	2,420	7,613	0

The highest maximum daily volume discharged was 32,240 m^3, on 7 March 2018. October 2017 had the highest average daily volume discharged (27,849 m^3), coinciding with the period of highest processing

throughput. As with the previous seven monitoring periods, the maximum allowable discharge rate of 40,000 m^3/day was not exceeded.

Daily discharge volumes for the 2017-2018 monitoring period are presented in Figure 6. 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 7 to 9 and summarised in Table 9 and Table 10.

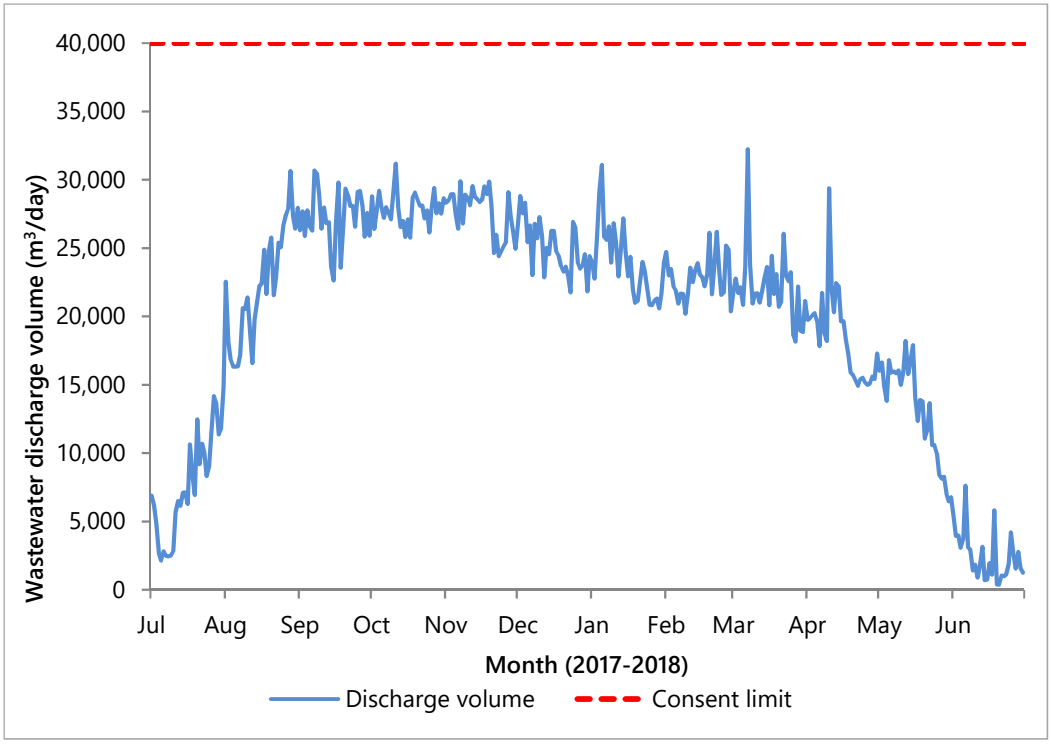

Figure 6 Daily volumes of wastewater discharged through the ocean outfall

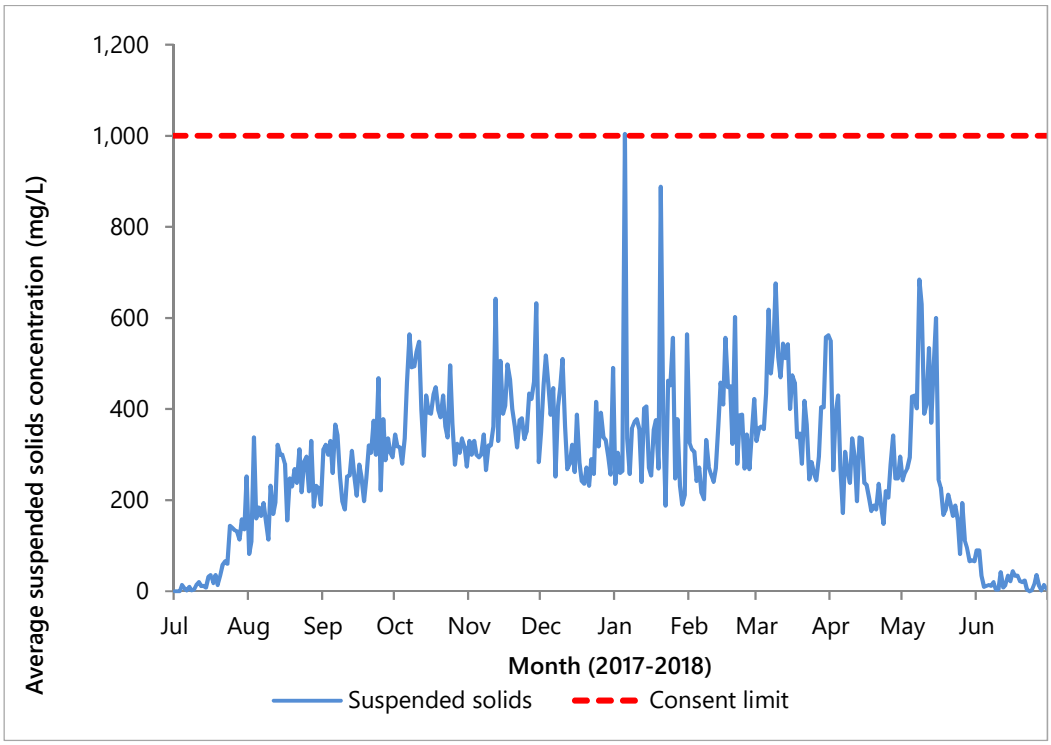

Figure 7 Daily, average concentrations of suspended solids in wastewater discharge, based on 24 hour time-proportioned composite samples

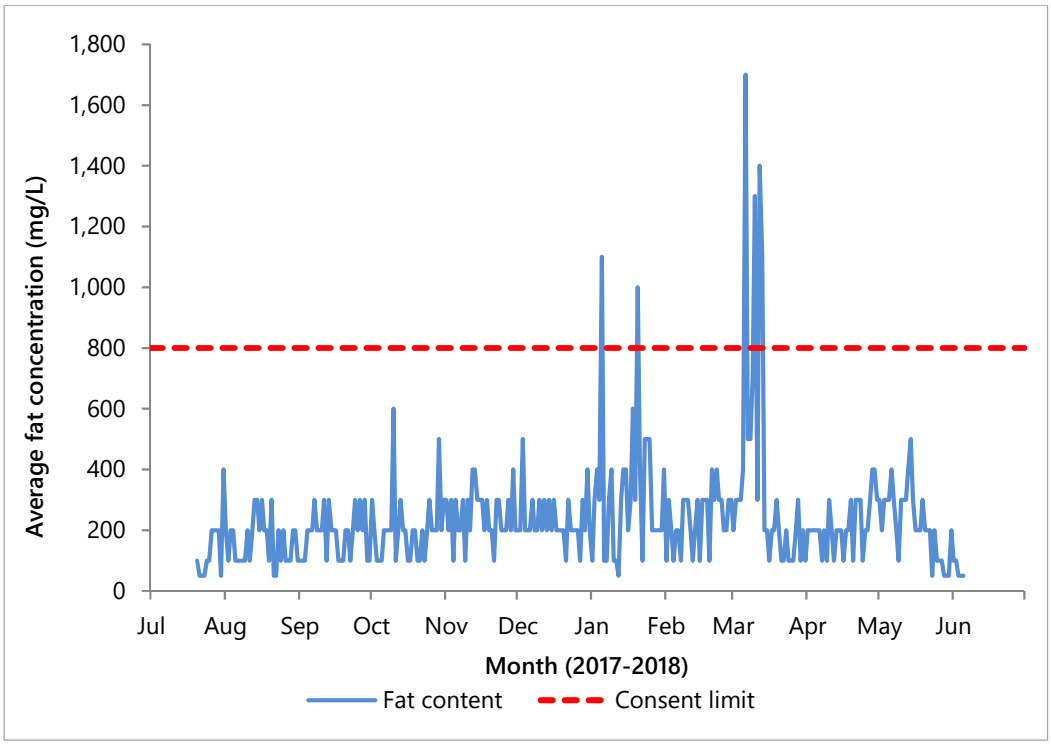

Figure 8 Daily, average concentrations of fats in wastewater discharge, based on 24 hour time-proportioned composite samples

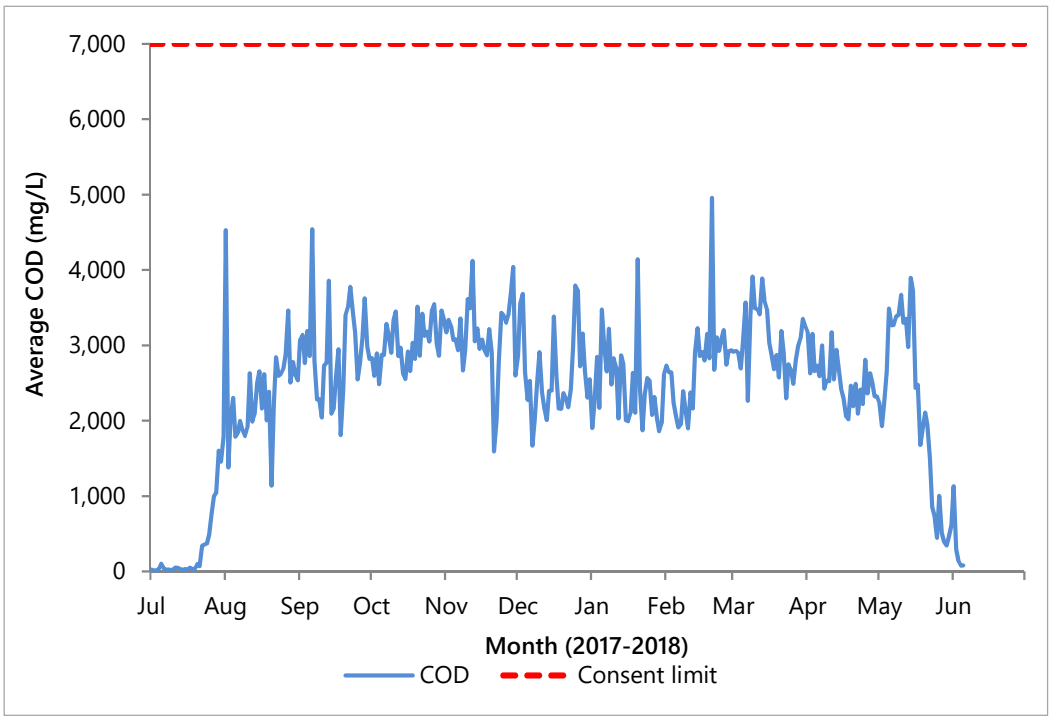

Figure 9 Daily, average COD in wastewater discharge, based on 24 hour time-proportioned composite samples

It should be noted that these data relate to 24 hour time-proportioned samples, and therefore represent daily average values. The Council analysed three 24 hour time-proportioned samples taken from the discharge of this wastewater and these results are presented in Section 2.2.5.3 (Table 12).

The daily discharge volumes and average concentrations of COD complied with consent conditions during the entire monitoring period (Figures 6 & 9; Table 9). Average fat concentrations exceeded the consent limit

on six occasions during the monitoring year, and the suspended solids concentration limit was exceeded on one occasion (Figures 7 & 8).

Table 9 Summary of daily wastewater discharge composition data (2017-2018)

Month	Suspended solids concentration			Fat concentration			COD		
	Mean (mg/L)	Max (mg/L)	Breach days	Mean (mg/L)	Max (mg/L)	Breach days	Mean (mg/L)	Max (mg/L)	Breach days
July	54	252	0	100	400	0	323	1,786	0
August	217	338	0	200	300	0	2,366	4,529	0
September	290	468	0	187	300	0	2,915	4,539	0
October	389	564	0	200	600	0	3,030	3,545	0
November	382	642	0	300	400	0	3,118	4,119	0
December	347	518	0	200	500	0	2,627	3,792	0
January	369	1,004	**1**	300	1,100	**2**	2,476	4,141	0
February	342	602	0	200	400	0	2,727	4,957	0
March	422	676	0	400	1,700	**4**	3,058	3,914	0
April	267	550	0	200	400	0	2,546	3,175	0
May	286	684	0	200	500	0	2,134	3,895	0
June	23	90	0	0	100	0	343	1,130	0
Consent limit	**≤ 1,000**			**≤ 800**			**≤ 7,000**		
Total no. of breach days	1			6			0		

For the 2017-2018 monitoring year, 7,321,210 m^3 of wastewater was discharged through the outfall, a decrease from the previous monitoring period when 7,663,420 m^3 was discharged (Table 10). The estimated total masses of suspended solids and fats in the wastewater discharged during the year under review were slightly greater than in the 2016-2017 monitoring period, while the total COD of the wastewater slightly decreased.

The volumes of wastewater and masses of contaminants discharged over the past five years have fluctuated in response to changing volumes of milk production. However, the average concentrations of constituents in the wastewater have remained relatively stable over this period. In the 2017-2018 monitoring period, the average concentrations of suspended solids and fats increased slightly and the average COD of the wastewater decreased, in comparison with the previous monitoring year.

Table 10 Summary of estimated annual total masses and average concentrations of wastewater discharge constituents over the past five monitoring years, for the 11-month dairy season (July – May)

Monitoring year	Volume discharged (m^3)	Suspended solids		Fat		COD	
		Estimated total mass (tonnes)	Average mg/L	Estimated total mass (tonnes)	Average mg/L	Estimated total mass (tonnes)	Average mg/L
2013-14	7,996,557	3,364	408	2,327	296	22,548	2,673
2014-15	8,398,543	3,997	480	2,220	270	24,797	2,914
2015-16	8,187,622	3,677	517	2,410	297	19,829	2,422
2016-17	7,663,420	2,265	280	1,671	222	19,661	2,582
2017-18	7,321,210	2,410	283	1,741	246	19,555	2,447

2.2.4.2 Discharge grab samples

Grab samples of the wastewater, prior to discharge through the Fonterra outfall, were collected by the Council on 10 occasions during the 2017-2018 dairy season (Table 11). These samples were analysed for temperature, COD, conductivity, pH, suspended solids, total grease (TG), *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.

Table 11 Results of wastewater grab sample analyses for 2017-2018

Parameter	COD	Conductivity	*E. coli*	Enterococci	pH	SS	Temp.	TG
Unit	g/m^3	mS/m @ 20°C	cfu/100ml	cfu/100ml	pH	g/m^3	°C	g/m^3
Summary statistics (July 2007 to June 2017)								
Minimum	50	11.6	0.5	1	2.1	12	22.4	2.5
Maximum	8,320	653.0	120,000	8,500,000	12.5	2,000	43.6	790
Median	2,300	203.5	44.5	83,000	11.0	310	30.6	110
2017-2018 monitoring results (TRC Laboratory)								
16 Aug 2017	2,900	197.0	5	1,950	11.1	420	28.9	48
28 Sep 2017	1,280	N/D	N/D	N/D	12.5	200	31.0	85
25 Oct 2017	1,740	277.0	5	816,400	11.7	270	35.2	150
22 Nov 2017	2,300	308.0	10	8,660	4.7	360	29.2	95
11 Dec 2017	1,900	262.0	3,450	130,000	11.3	280	36.6	110
17 Jan 2018	970	43.2	11,200	81,600	8.1	340	29.1	720
21 Feb 2018	1,100	413.0	5	14,400	12.2	360	35.6	120
21 Mar 2018	1,960	305.0	9,210	86,600	6.3	250	30.4	94

Parameter	COD	Conductivity	*E. coli*	Enterococci	pH	SS	Temp.	TG
Unit	g/m³	mS/m @ 20°C	cfu/100ml	cfu/100ml	pH	g/m³	°C	g/m³
2017-2018 monitoring results (RJ Hill Laboratory)								
19 Apr 2018	3,300	126.8	17*	700,000	9.8	132	25.3	89
23 May 2018	350	28.8	16,000	3,500	9.1	64	16.0	132

* *E. coli* quantified by MPN with LT Broth method

High concentrations of faecal indicator bacteria, in particular enterococci, were recorded in the grab samples (Table 11). 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 currently being undertaken by Fonterra.

In most 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 wastewater potentially depressing the growth of the latter (Palliser *et al*., 2013). Accordingly, the relatively high *E. coli* count recorded for sample collected on 23 May 2018 may be attributed to the cooler temperature of the sample. While wastewater temperatures mostly remained in the range of previous results, the sample collected on 23 May 2018 was 6.4°C colder than the historical minimum for the past 10 years. This was most likely attributed to a downturn in site activity at the time.

COD and suspended solids concentrations were below the consent limits associated with Fonterra's composite sampling programme and were comparable with historical median results. Likewise, wastewater total grease concentrations were mostly within the range of previous results. A particularly high concentration of 720 g/m^3 was recorded on 17 January 2018, however. As is often seen in the grab samples, wastewater pH levels fluctuated about the historical median during the monitoring period. The grab sample pH was found to be particularly high in September 2017, matching the historical maximum, and comparatively low in November 2017.

2.2.4.3 Discharge inter-laboratory comparisons

An inter-laboratory comparison was performed on three occasions during the 2017-2018 monitoring period on the 24 hour time-proportioned samples taken from the wastewater discharge. The results obtained by both laboratories are presented in Table 12. The Council's May comparison samples were analysed by Hill Laboratories.

Table 12 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 are considered acceptable. Differences of 10-25% are considered to constitute a difference between the two laboratories and differences of greater than 25% are considered significantly different.

Table 12 Inter-laboratory comparisons performed on 24 hour composite wastewater samples (2017-2018)

Parameter	Unit	22 November 2017			21 March 2018			23 May 2018		
		Council	Fonterra	Agree	Council	Fonterra	Agree	Council	Fonterra	Agree
COD	g/m^3	1,500	2,006	*	2,200	3,192	**	990	855	✓

Parameter	Unit	22 November 2017			21 March 2018			23 May 2018		
		Council	Fonterra	Agree	Council	Fonterra	Agree	Council	Fonterra	Agree
pH	pH	7.0	7.3	✓	11.0	8.4	**	11.4	11.4	✓
Suspended solids	g/m^3	400	376	✓	450	418	✓	191	188	✓

Note: ✓ = acceptable agreement

* = within 10% - 25% difference from the mean

** = significantly different (i.e. > 25% difference from the mean)

COD concentrations varied slightly between the samples analysed by the Council and Fonterra in November 2017, and both COD and pH varied significantly between the samples from the subsequent comparison in March 2018. Unfortunately, these differences were not subjected to further investigation due to the closure of the Council Laboratory. The remaining analyses were found to be in acceptable agreement.

2.2.4.4 Marine ecological surveys

In order to assess the effects of the Fonterra dairy factory and Hawera Wastewater Treatment Plant combined outfall discharge on the nearby intertidal communities, a spring survey was conducted in December 2017 (peak season) at three sites, and a summer survey was carried out in March-May 2018 (post-peak season) at four sites (Figure 10). The surveys included three potential impact sites either side of the outfall (two southeast and one northwest) and one control site (further northwest). It was 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. The two survey reports, including statistical analyses of results and further discussion of the findings, are included in Appendix IV. The main findings of these survey reports are summarised below, and are presented in Figures 11 to 14.

Figure 10 Map of sampling sites in relation to the outfall

The potential impact sites located 350 m NW of the outfall and at Pukeroa Reef were found to have significantly greater species richness and diversity than Waihi Reef (the control site) during the summer survey, while the remaining potential impact site located 200 m SE of the outfall showed signs of recovery after having been buried by a slip in 2015. The control site was not assessed during the spring survey for reasons beyond the Council's control, i.e. inclement weather leading to unsafe survey conditions. There is no evidence of the potential impact sites declining in species richness or diversity over time, relative to the control site.

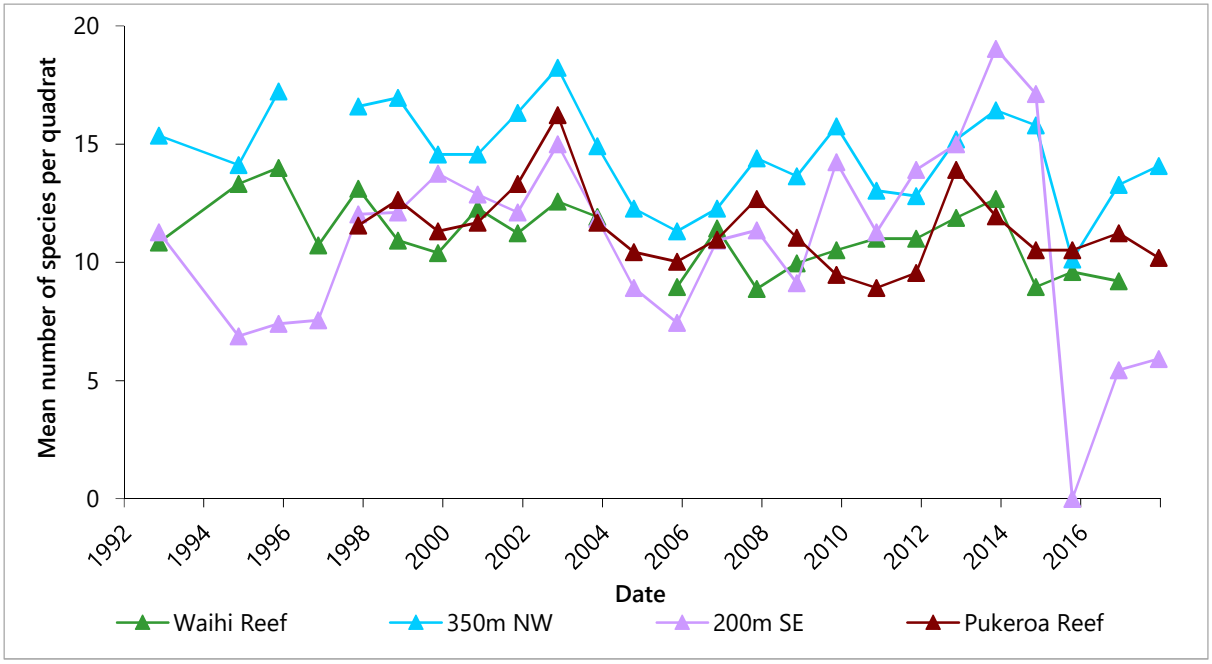

Figure 11 Mean number of species per quadrat for spring surveys (1992-2018)

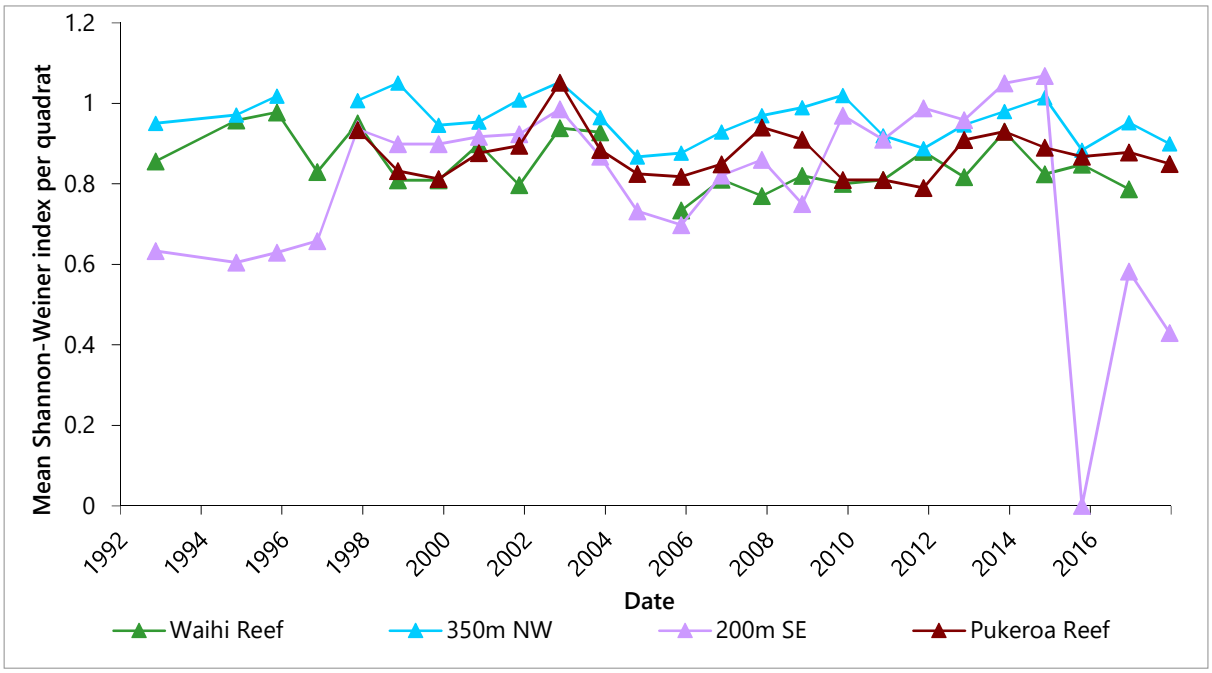

Figure 12 Mean Shannon-Weiner indices per quadrat for spring surveys (1992-2018)

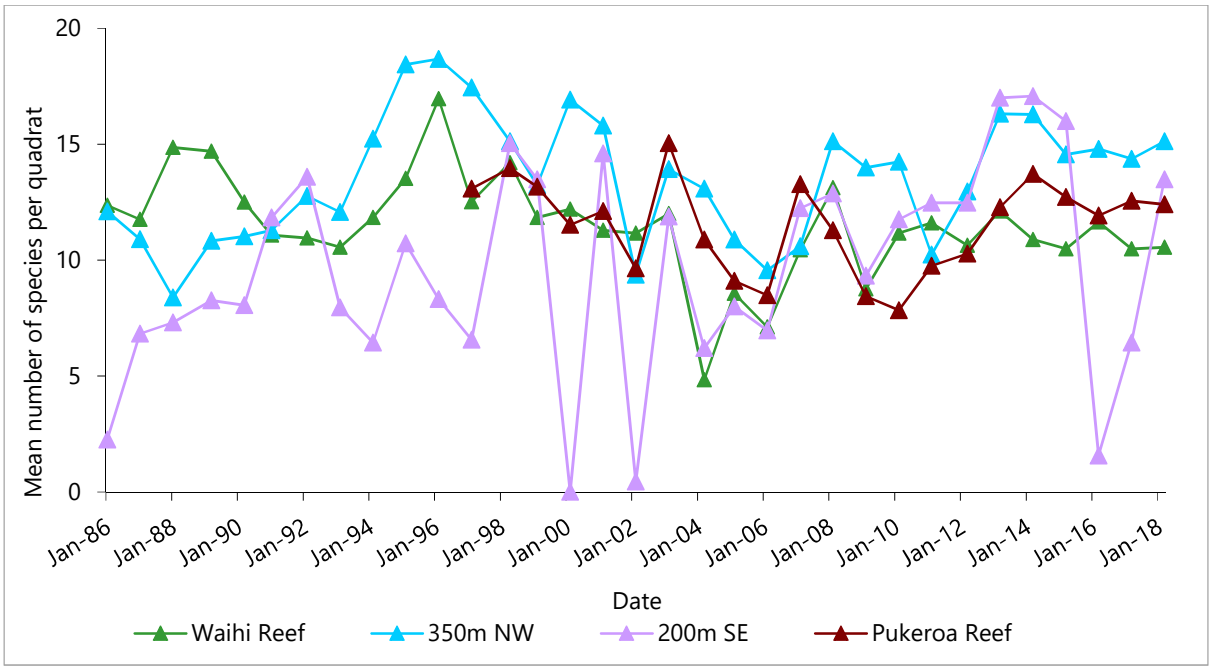

Figure 13 Mean number of species per quadrat for summer surveys (1986-2018)

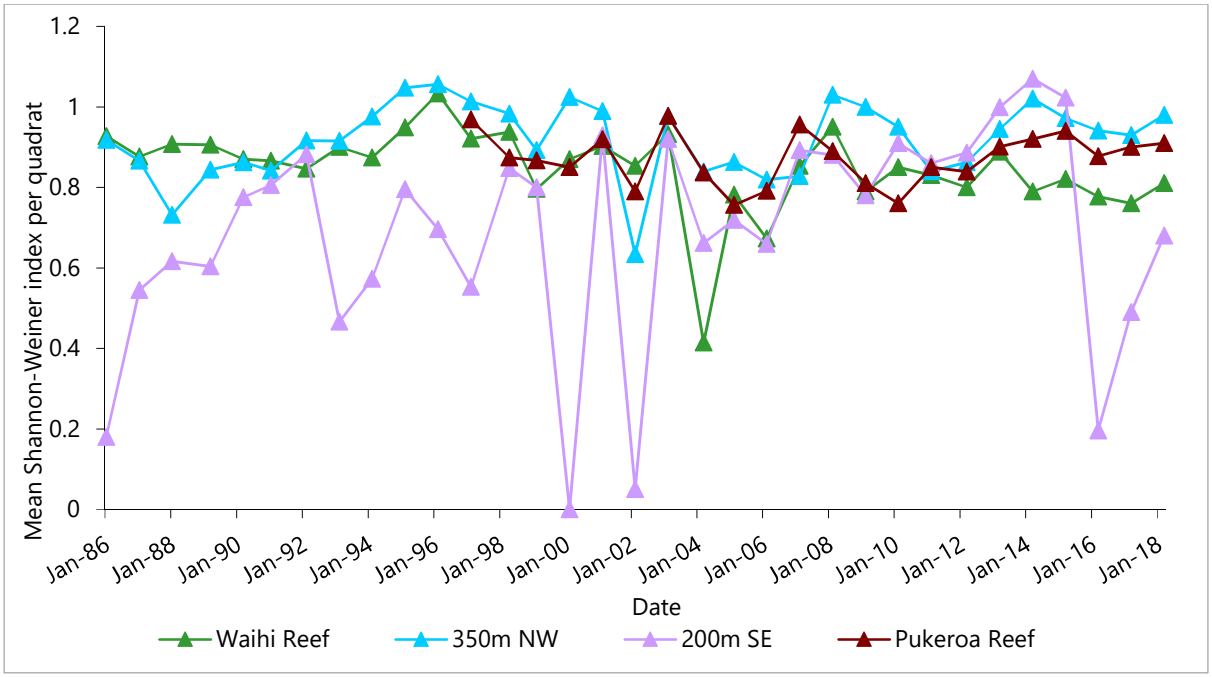

Figure 14 Mean Shannon-Weiner Indices per quadrat for summer surveys (1986-2018)

Overall, neither survey provided evidence to suggest that the outfall was having any adverse effects on the intertidal reef communities of South Taranaki. Natural environmental factors, including coastal erosion, exposure and substrate mobility, appear to remain the dominant drivers of species richness and diversity at the sites surveyed.

2.3 Air

2.3.1 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 objectionable or offensive and did not occur beyond the boundaries of the site. Onsite milk powder deposition ranged from very slight to high over the monitoring period.

2.3.2 Emission source analysis

Consent 4103 places a limit of 125 mg/m^3 of gas flow on powder emissions to the atmosphere from the spray drying process cyclone exhaust.

Fonterra's independent consultants, CRL Energy Ltd, carried out powder emission measurements on drier exhaust stacks (Powders 2, 3, 4, 5, whey products, and casein) between December 2017 and February 2018. Powder 3 was monitored during whole milk powder production. These results are presented in Table 13. Powder 1 was not in operation over the 2017-2018 season. The North and South stacks of Powder 4 were not monitored as they were not operating at the time of this survey.

Table 13 Emission source analysis results for 2017-2018

Plant		Date	Emission concentration (mg/m^3 0°C, 1 atm, dry gas)
Powder 1	North stack	-	-
	South stack		-
Powder 2	Exhaust	12 December 2017	10.6
Powder 3 (whole milk powder)	East stack	21 February 2018	45
	West stack		47
	Fluid Bed exhaust		19
Powder 3 (WPC trial)	East stack	3 August 2017	95
	West stack		98
	Fluid Bed exhaust		141
Powder 3 (WPC trial)	East stack	5 August 2017	92
	West stack		99
	Fluid Bed exhaust		149
Powder 3 (WPC trial)	East stack	14 December 2017	74
	West stack		120
	Fluid Bed exhaust		6.8
Powder 3 (WPC trial)	East stack	27 March 2018	101
	West stack		97
	Fluid Bed exhaust		84
Powder 4	North stack	-	-
	South stack	-	-
	Wet scrubber	11 December 2017	14

Plant		Date	Emission concentration (mg/m^3 0ºC, 1 atm, dry gas)
Powder 5	East stack	11 December 2017	75
	West stack		85
	North stack		32
	South stack		28
Whey products	Exhaust	12 December 2017	6
Casein	Drier stack 1	21 February 2018	23
	Drier stack 2		22
Consent limit			**125**

The results from all of the tested driers were below the limit of 125 mg/m^3 prescribed by consent 4103. The emission concentrations recorded from Powder 3 during the WPC trials between August 2017 and March 2018 were compliant with condition 8, consent 4103, which allowed for elevated emission concentrations (up to 400 mg/m^3) for trial periods between 22 July 2017 and 21 July 2018 (Table 13).

2.3.3 Deposition gauging

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

Deposition gauges are modified buckets, elevated on a stand to approximately 1.6 m. The buckets contain deionised 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 the growth of algae and bacteria.

Deposition gauges were deployed at five sampling sites on six occasions around the Whareroa site for periods of approximately three weeks, between August and December 2017. The contents of the gauges were analysed for COD. 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 locations of the five air deposition monitoring sites are provided in Figure 15.

Figure 15 Location of air deposition sites

TDMP values for each monitoring site are presented in Table 14. The Council's nuisance guideline value for total deposited particulate is 130 mg/m^2/day. The Council does not have a specific guideline value for milk powder deposition. The Fonterra deposition survey determines deposition due to milk powder only, rather than total deposition.

Table 14 Total deposited milk powder values (mg/m^2/day) for each monitoring site during the 2017-2018 monitoring year

Site ID	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
	2 August to 23 August	23 August to 12 September	12 September to 4 October	4 October to 27 October	27 October to 14 November	14 November to 6 December
AIR002409	15.29	69.25	**183.03**	**310.61**	**262.28**	25.56
AIR002416	92.57	22.13	88.36	53.13	85.05	30.3
AIR002422	47.61	23	44.02	46.49	55.54	13.57
AIR002424	35.71	23	33.14	7.17	40.5	8.84
AIR002426	39.67	21.26	37.87	36.22	52.07	16.09
Council guideline	**130 mg/m^2/day**					

As expected, the TDMP was higher at sites downwind of the powder plants, in relation to the prevailing winds from the north-west quadrant (Table 14). The highest TDMP values were recorded at the staff car park entrance (AIR002409); the only site which exceeded the Council guideline for total deposited particulate. Recorded values were similar to those found in previous years, and peaked during October to November, coinciding with the peak of maximum milk powder production.

The results for TDMP 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 concern, provided that the stormwater management systems perform satisfactorily.

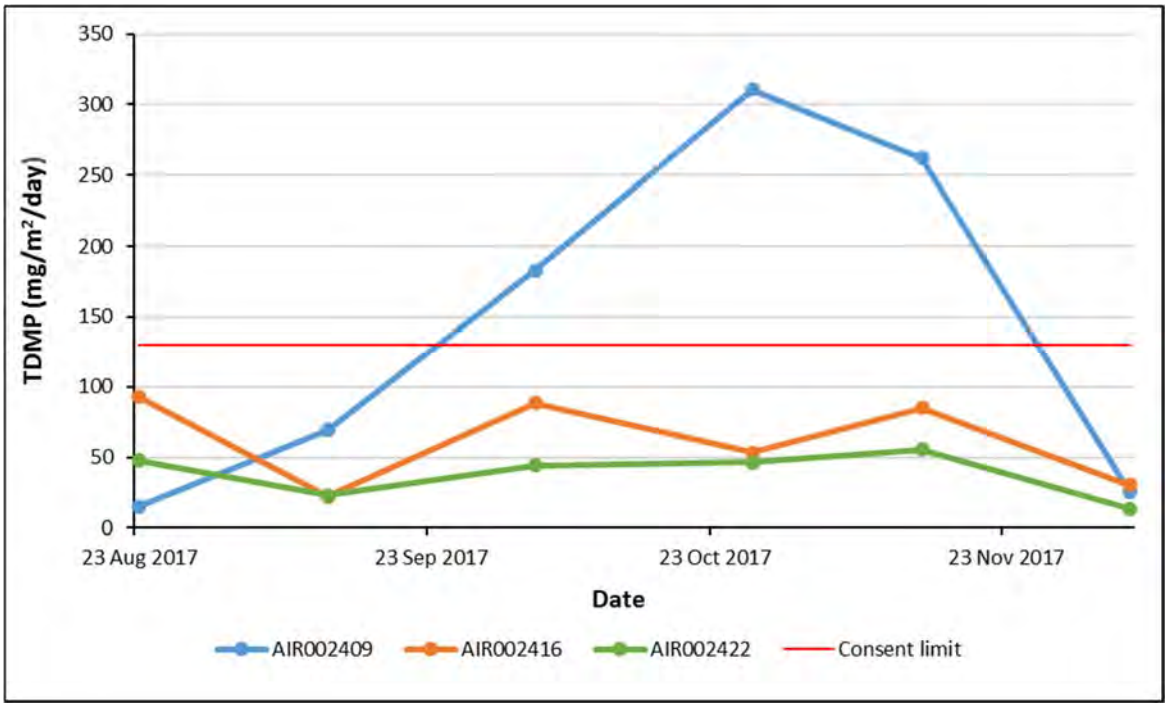

Figure 16 Milk powder fallout at three air deposition sites surrounding Whareroa during the 2017-2018 monitoring year, for each run (August to December 2017)

2.3.4 Inhalable particulate (PM_{10}) monitoring

Special condition 9 of consent 4103 sets a limit on the emissions of 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 approximately 43 to 47 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.

During the first 43-hour run, from 7 to 9 November 2017, the average recorded PM_{10} concentrations for the first and second 24-hour periods were 16.17µg/m³ and 11.95µg/m³, respectively. These daily means equate to 32.3% and 23.9%, respectively, of the 50 µg/m³ value that is set by both the National Environmental Standard and the resource consent.

During the second 47-hour run, from 29 June to 1 July 2018, the average recorded PM_{10} concentrations for the first and second 24-hour periods were 35.48 µg/m³ and 43.90 µg/m³, respectively. These daily means equate to 70.9% and 87.8%, respectively, of the 50 µg/m³ value that is set by both the National Environmental Standard and the resource consent 4103-2.

The regional background PM_{10} level has been determined to be approximately 11 µg/m³.

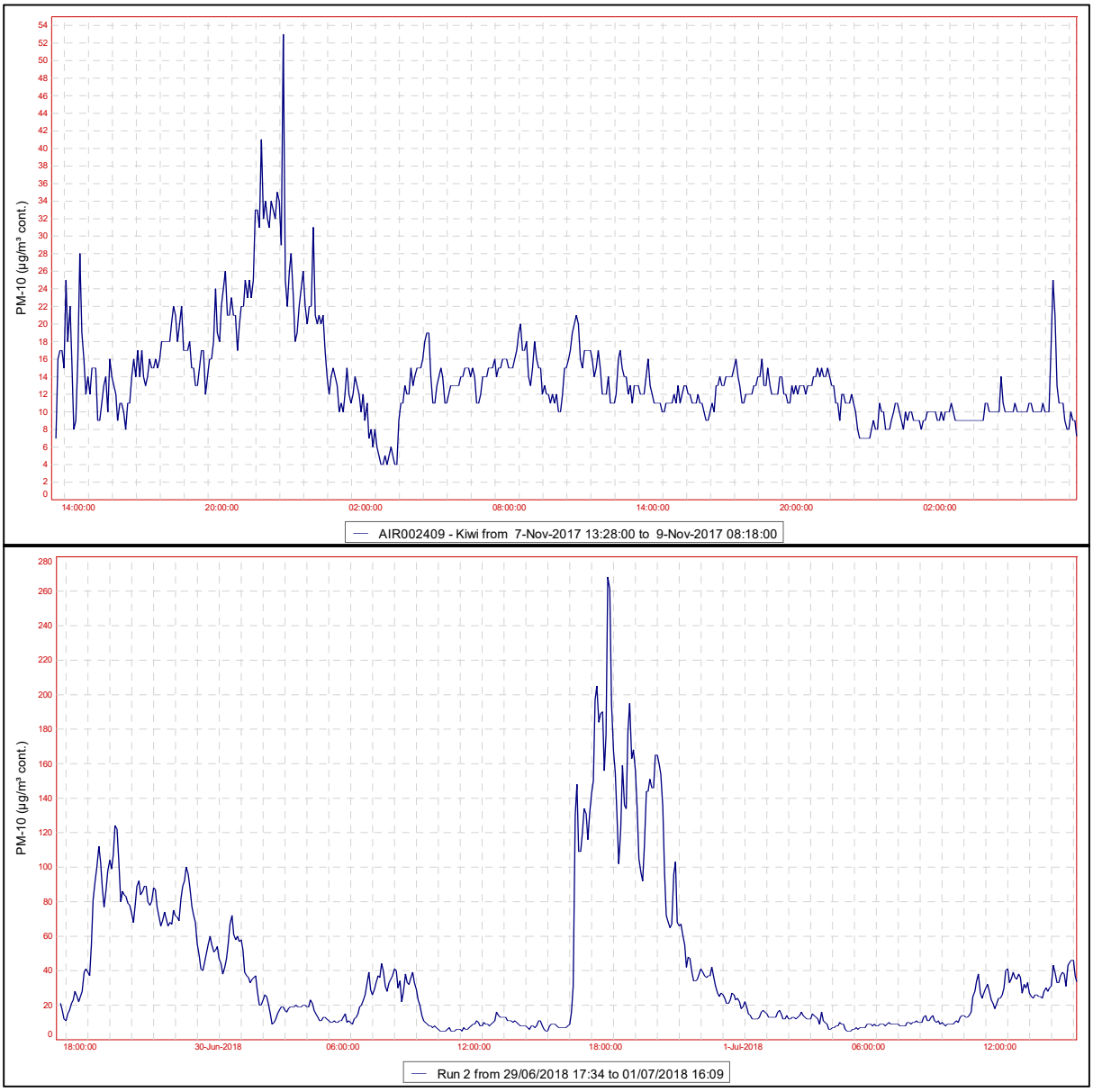

Figure 17 PM_{10} concentrations (µg/m³) at the Whareroa dairy complex

The full report for PM_{10} monitoring at the Whareroa site over the 2017-2018 monitoring period is provided in Appendix V.

2.3.5 Nitrogen oxide (NO_x) monitoring

Ambient NO_x monitoring was incorporated into the monitoring programme in 1996-1997, to monitor the effects of the co-generation plant at the site. In October 1997, Fonterra commissioned a second co-generation plant (Co-gen 2) in response to increased milk coming to the site. NO_x is the main emission of concern associated with Fonterra's co-generation plants, from the perspective of potential environmental effects. Special condition 7 of consent 6273 set limits for nitrogen dioxide emissions:

> *"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 [µg/m³] [one-hour average], or 100 µg/m³ [twenty-four hour average], at or beyond the boundary of the site."*

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

Passive NO_x discs were placed in four locations surrounding the Fonterra site (Figure 18) on two occasions during the 2017-2018 monitoring year.

Figure 18 NO_x sample site locations around the Fonterra plant

From the average concentration measured, it is possible to calculate a theoretical maximum daily concentration that may have occurred during the exposure period. There are mathematical equations used by air quality scientists to predict the maximum concentrations over varying time periods. These are somewhat empirical, in that they take little account of factors such as local topography, micro-climates and diurnal variation. Nevertheless, they are applied conservatively and have some recognition of validity.

One formula generally used is:

$$C(t2) = C(t_1) \times \left(\frac{t_1}{t_2}\right)^P$$

where C(t) = the average concentration during the time interval t, and p = a factor lying between 0.17 and 0.20. When converting from longer time periods to shorter time periods, using p = 0.20 gives the most conservative estimate (i.e. the highest calculated result for time period t2, given a measured concentration for time period t1). Using the 'worst case' factor of p = 0.20, the monitoring data reported above has been converted to equivalent 'maximum' 24 hour exposure levels.

Table 15 presents the actual levels found, theoretical maximum 1 hour and 24 hour concentrations of NO_x, and consent 6273 limits.

Table 15 NO_x levels and theoretical 1 hour and 24 hour maximums for each air monitoring site at Fonterra (2017-2018)

Monitoring period	NO_x concentration µg/m^3											
	AIR002410			AIR002411			AIR002412			AIR002413		
	NOx (Lab)	1 h (Cal)	24 h (Cal)	NOx (Lab)	1 h (Cal)	24 h (Cal)	NOx (Lab)	1 h (Cal)	24 h (Cal)	NOx (Lab)	1 h (Cal)	24 h (Cal)
16 January to 8 February 2018	9	31.81	16.85	9.8	34.64	18.35	2	7.07	3.74	2.2	7.78	4.12
Consent limit		**200**	**100**		**200**	**100**		**200**	**100**		**200**	**100**

1 h = 1 hour theoretical maximum

24 h = 24 hour theoretical maximum

Throughout the 2017-2018 monitoring period NO_x concentrations remained well below consent condition limits (consent 6273, special condition 7 – 200 mg/m^3 one hour average, 100 mg/m^3 24 hour average).

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

Since 2014, the Council has coordinated a region-wide monitoring programme to measure NO_x, not only at individual compliance monitoring sites near industries that emit NO_x, but simultaneously at urban sites (from the Council's regional state of the environment programme) to determine exposure levels for the general population. The programme involves deploying all measuring devices on the same day, with retrieval three weeks later. This approach enables the Council to further evaluate the effects of local and regional emission sources and ambient air quality in the region.

Figure 19 presents the average NO_x levels (theoretical 1 hour concentrations) from 11 industrial sites monitored around the region from January 2014 to February 2018. The full report for regional NO_x monitoring is provided in Appendix VI.

The results from Figure 19 show that NO_x levels at Fonterra are comparable with some of the larger production stations around Taranaki.

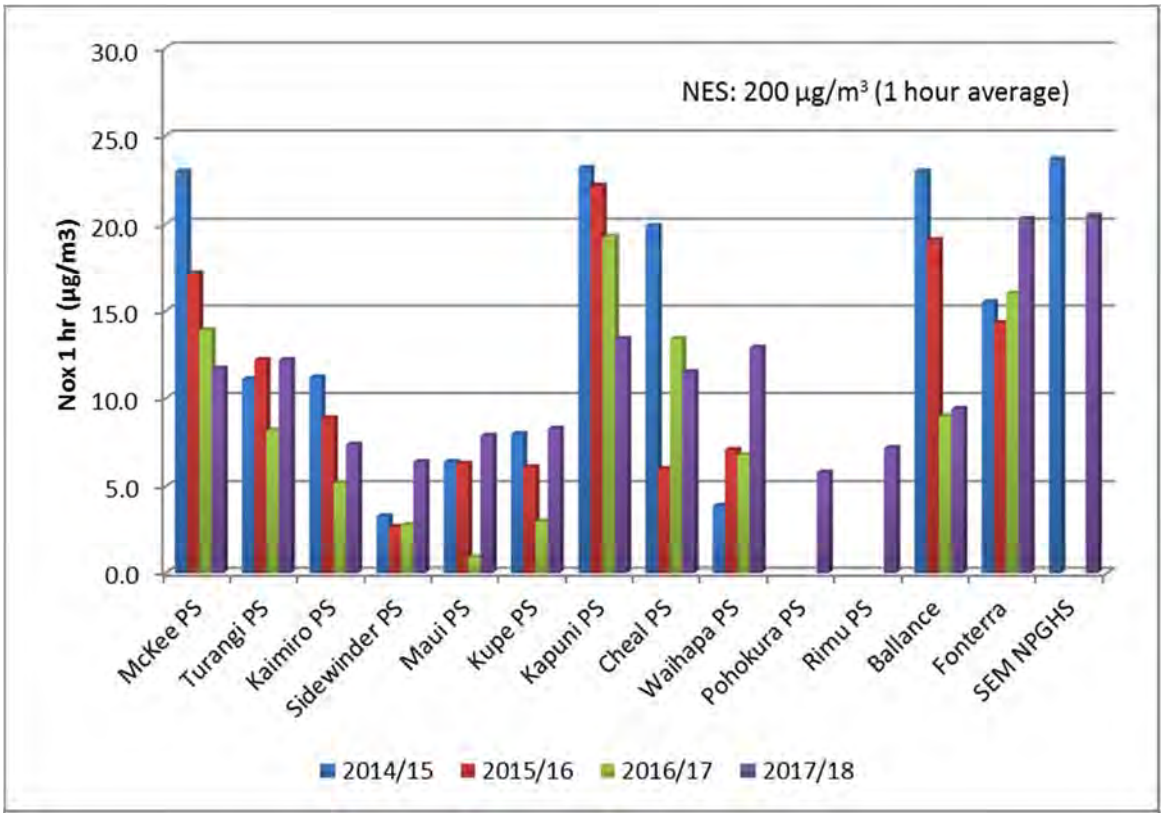

Figure 19 Average NO_x levels at 11 monitored industrial sites throughout the region

2.4 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 Fonterra. During the year matters may arise which require additional activity by the Council, for example 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 incident register includes events where Fonterra 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 2017-2018 period there were five recorded incidents in association with the Whareroa site, three of which resulted in infringement notices being issued.

1. On 27 October 2017, Council were notified that Fonterra had discharged approximately 60,000 L of skim milk into the Tasman Sea via the ocean outfall. As a result, the sea was noticeably discoloured beyond the 200 metre mixing zone (special condition 8 (b), resource consent 1450-3) (Photo 8). Consent compliance was maintained with regards to the wastewater composition.

   The subsequent investigation attributed the discharge to plant equipment failure. A number of steps have since been taken to prevent this from occurring in the future. The monitoring system was also reviewed to ensure operators are made aware of such events as early as possible.

   No further enforcement action was taken in response to this event.

Photo 8 Discoloration of Tasman Sea following milk discharge, 27 October 2017

2. On 8 January 2018, Council were notified that Fonterra's 24 hour wastewater composite sample, collected from 06:00 5 January to 06:00 6 January, had exceeded the concentration limits for fat and suspended solids. The fat content in the sample was 1,100 mg/L, exceeding the 800 mg/L limit stipulated in special condition 4 of resource consent 1450-3. The suspended solids content in the sample was 1,004 mg/L, exceeding the 1,000 mg/L limit stipulated in the same consent. No effects were reportedly observed on Ohawe Beach, as a result of the non-compliant discharge.

   A number of matters were investigated to understand the cause of this exceedance, though no definitive conclusion was reached. It was theorised that high rainfall preceding 6 January may have filled the wastewater lines above normal levels and flushed out fat that had accumulated over time. Fonterra were pursuing recent video inspection records to assess the likelihood of this scenario.

   The Council issued Fonterra with an Infringement Notice in response to this incident.

3. On 8 January 2018, Council were also notified that Fonterra had exceeded the maximum consented abstraction limit for taking water from the Tawhiti Stream, from 23:45 on 6 January to 21:15 on 7 January. The maximum allowable abstraction rate over that time was 184 L/s, given the residual flow was less than 800 L/s (special condition 2, resource consent 0047-4). Fonterra abstracted up to 209 L/s during this period, which lasted 21.5 hours. The minimum residual flow required by the consent, 240 L/s, was maintained during this period.

   There were a number of factors which gave rise to this incident. Heavy rainfall (and increased stream flow above 800 L/s) preceding the event lead to plant operators increasing the abstraction rate at the Tawhiti intake, as provided for in the consent. However, the operators failed to decrease the abstraction rate when the flow dropped back below 800 L/s. The automation system (which was designed to prevent consent limit exceedances), had been reinstalled incorrectly following commissioning the new Water Treatment Plant.

   The Council issued Fonterra with an Infringement Notice in response to this incident. Fonterra have since undertaken the appropriate corrective and preventative actions to ensure that this does not happen again.

4. On 21 January 2018, Council were notified that approximately 36,000 L of cream had discharged to the wastewater stream over a 10 hour period, due to a leaking silo. Fonterra's 24 hour wastewater composite sample, collected from 06:00 20 January to 06:00 21 January, subsequently exceeded the fat concentration limit. The fat content in the sample was 1,000 mg/L, exceeding the 800 mg/L limit stipulated in special condition 4 of resource consent 1450-3. Additionally, the Tasman Sea was noticeably discoloured beyond the 200 metre mixing zone (special condition 8 (b), resource consent

1450-3). No effects were observed on Ohawe or Waihi Beaches, as a result of the non-compliant discharge.

An investigation into the event found that the direct cause of the cream discharge was due to a drain valve at the bottom of a silo being left open while a cream silo was in use. A number of corrective and preventative actions have since been taken, including plant and procedural improvements that have been implemented across all ten manufacturing plants on site.

The Council issued Fonterra with an Infringement Notice in response to this incident.

5. On 7 March 2018, Council were notified that Fonterra's 24 hour wastewater composite sample, collected from 06:00 6 March to 06:00 7 March, had subsequently exceeded the fat concentration limit. The fat content in the sample was 1,700 mg/L, exceeding the 800 mg/L limit stipulated in special condition 4 of resource consent 1450-3. Following that result, three further non-compliances occurred. The daily site wastewater composite samples for 10, 12 and 13 March all returned results that were over the consent limit for fat concentration.

   Investigative efforts determined that damaged sampling equipment was the cause for these exceedances. The composite sampler's tubing had become unattached from its bracket in the wastewater sump and was instead floating on the surface of sump. This resulted in a non-homogenous and non-representative sample of wastewater being taken, whereby solids were being 'skimmed' off the surface.

   Given these findings, Fonterra were deemed to have remained compliant with consent conditions, and no enforcement action was pursued.

3 Discussion

3.1 Discussion of site performance

3.1.1 Inspections

Routine inspections found site management was generally good throughout the monitoring period. Any minor issues that were identified were promptly resolved.

3.1.2 Provision of data

Fonterra provided its self-monitoring data (i.e. abstraction and wastewater volume and composition information) to the Council in a timely manner.

3.1.3 Reporting

The report required for consent 6273, condition 4 was received November 2014 and is next due in 2020.

The report required for consent 4103, condition 4 was received in July 2013 and is next due in 2019.

3.2 Environmental effects of exercise of consents

3.2.1 Abstractions

Fonterra remained compliant with the conditions set out in both water abstraction consents prior to their renewal on 8 November 2018. Following their renewal (and consolidation), Fonterra were non-compliant on one occasion over 6 and 7 January 2018, where the Tawhiti abstraction rate exceeded the maximum allowable limit. Despite this exceedance, the residual flow in the Tawhiti Stream remained greater than the minimum flow required by the consent (240 L/s). It is expected that any adverse effects on instream communities were mitigated due to the maintenance of this minimum flow.

3.2.2 Stormwater

Discharge sampling from the Tawhiti, Tangahoe and coastal stormwater ponds was undertaken on ten occasions over the 2017-2018 monitoring year. All discharge constituents were compliant with their respective consent limits, despite a number of elevated results (a discharge constituent must exceed the limit on three occasions in order to be non-compliant with the consent condition). No sewage fungus or heterotrophic growths were found at any of the three discharge points during sample collection. At the Tawhiti discharge, pH exceeded the limit once and oil and grease exceeded the limit on two consecutive occasions. At the Tangahoe discharge, BOD and suspended solids exceeded their respective limits on one occasion, in January. Associated parameters were also elevated on this occasion, providing further evidence that stormwater treatment was inadequate at this time. All discharge constituents sampled from the coastal stormwater pond were within consent limits. Based on discharge samples Whareroa's stormwater system has continued to perform well compared with recent monitoring years where there have been multiple breaches of the consent limit for BOD, SS and pH.

It must be noted that since April, the samples have been analysed by an external laboratory. The two significant analytical changes that have resulted involve the oil and grease test method, and the chlorine test method. Technically, the new oil and grease test method is more sensitive, as it is able to detect a wider range of plant and animal oils than the previous test. Chlorine is now tested in the field while the samples are collected, rather than at the laboratory.

Both a freshwater biomonitoring survey and a freshwater biological inspection were undertaken during the 2017-2018 monitoring period in each of the tributaries that drain the stormwater ponds. In summary, the results from the surveys and inspections indicated that stormwater discharges from the factory had not had recent detrimental effects upon the streambed communities in the unnamed tributary of the Tawhiti Stream, or the unnamed coastal stream. However, biomonitoring results in the unnamed tributary of the Tangahoe River indicate a decline in stream health. This decline was most pronounced at the site closest to the discharge. These results corroborate initial findings from the biological inspection undertaken in spring, which were indicative of mildly eutrophic conditions.

Since being informed of the biomonitoring results from the unnamed tributary of the Tangahoe River, Fonterra have endeavored to understand the potential causes for the decline. An internal review of these results has been scheduled. Initially, suggestions for further work have included additional monitoring and streambank improvement works (e.g. planting).

3.2.3 Wastewater

A number of routine monitoring components were used to assess the wastewater discharge and its environmental effects. Fonterra measured effluent outflow and collected 24-hour composite samples to analyse the wastewater composition. The Council collected ten wastewater grab samples and undertook three inter-laboratory comparisons of 24-hour composite samples with Fonterra. In terms of environmental effects, the marine outfall was visually inspected from the coastal look out during each Council inspection, and two marine ecological surveys were undertaken.

The limit on the daily volume of wastewater discharged was not exceeded during the 2017-2018 season. Results of composite monitoring by Fonterra showed that suspended solids exceeded the consent limit once, and fat exceeded the limit on six occasions during the year under review. However, the final four fat exceedances were ultimately attributed to faulty sampling equipment, and as such were not considered to be a breach of consent. The three remaining exceedances were attributed to two events. The first of these, from 5 to 6 January, was suspected to be caused by a rain event flushing the wastewater lines, in which fat had accumulated over an extended dry period. The second event, from 20 to 21 January, was due to an accidental cream discharge. No environmental effects were observed following the first event, however, the sea was considerably discolored (beyond the permitted mixing zone), following the cream spill, though no residual effects were observed along the shoreline. These three breaches of consent (1 SS, 2 fat) represents a worse performance than in the 2016-2017 year, where there were no breaches of this consent condition. However, it is a better environmental performance than that of the 2015-2016 year, when there were 14 breaches of consent (12 SS, 2 fat).

Wastewater grab samples were collected by the Council on 10 occasions during the monitoring period. All of the results complied with consent limits. As the consent limits in special condition 5, consent 1450 apply to the composite samples and not the grab samples, any exceedances would not have counted as a breach of consent. Bacteriological results have remained high; an issue that warrants ongoing investigation.

Visual inspections of the outfall discharge undertaken from the coastal lookout during routine inspections found no evidence of the discharge adversely affecting the coastal environment beyond the mixing zone designated in resource consent 1450. However, two incidents resulted in considerable discoloration of the Tasman Sea during the monitoring period. In addition to the January cream spill discussed previously, a milk spill that occurred earlier in the year also led to discoloration beyond the mixing zone.

Spring and summer marine ecological surveys were undertaken in the year under review. Neither survey provided evidence to suggest that the outfall was having any 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.

Although monitoring did not detect any further impacts, milk and cream spills can have insidious effects in the marine environment. These events can potentially lead to short-lived proliferations of bacterial and algal communities in the receiving environment, due to the high BOD and nutrient content. Following these proliferation events, or blooms, dissolved oxygen content is depleted from the water column, leading to hypoxic or even anoxic conditions. Further adverse effects may also arise, from increased loading of suspended solids, for example.

3.2.4 Air discharges

Throughout the 2017-2018 monitoring period, emissions to air were monitored with visual inspections, odour surveys, testing of particulate emissions, gauging of milk powder deposition, measurement of ambient nitrogen concentration and PM_{10} monitoring.

No environmental impacts were detected beyond the site boundary with visual inspections or odour surveys. Based on the milk powder deposition results, the environmental impact of milk powder deposition beyond the site boundary was negligible during the year under review.

Monitoring indicated that PM_{10} concentrations at Fonterra Whareroa remained below the consent limit and National Environmental Standard.

Fonterra remained compliant with consent 6273 during the 2017-2018 monitoring period. Ambient NOx concentrations at Fonterra Whareroa were comparable with those at some of Taranaki's larger hydrocarbon production stations.

Fonterra have recently undertaken trials at the Whareroa site to test the feasibility of drying whey protein concentrate (WPC) in the Powder-3 facility (which was typically used for the manufacture of whole milk powder and butter milk powder). To facilitate these trials, the emissions concentration consent limit for Powder-3 was adjusted with two consent changes (4103-2.1, May 2017 and 4103-2.2, August 2017). Specifically, the emissions concentration consent limit was increased from 125g/m^3 to 400g/m^3. During the trial period, various stages of the drying process were modified in order to minimise particulate emission concentrations. Trial results indicated that the process could operate below, but close to, the original consent limit. No adverse environmental effects were observed during the trial period.

Following the trials, Fonterra applied to change the consent to reflect the WPC drying operation in Powder-3 going forward (4103-2.3, July 2018). Although the emissions concentration consent limit was increased from 125g/m^3 to 150g/m^3, the production changes were such that the potential mass load discharged from the dryer stacks would not increase. This would be achieved by removing Powder-1 dryer from the consent and decommissioning the plant.

3.3 Evaluation of performance

A summary of Fonterra's compliance record for the year under review is set out in Tables 16-40.

3.3.1 Water abstraction

Table 16 Summary of performance for Consent 0047-3.0 (until 8 November 2017)

Purpose: ***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

Purpose: *To take water from Tawhiti Stream for use in manufacturing, cleaning and cooling*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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
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 Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 17 Summary of performance for Consent 4508-2.3 (until 8 November 2017)

Purpose: *To abstract water from the Tangahoe River*		
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	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 18 Summary of performance for Consent 0047-4.0 (from 8 November 2017)

Purpose: *To take water from the Tawhiti Stream and the Tangahoe River for various plant purposes*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Combined total abstraction limit of 30,000 m^3 over 24 hours	Fonterra monitor compliance. Abstraction data is also telemetered to the Council and reviewed by Council officers	Yes

Purpose: *To take water from the Tawhiti Stream and the Tangahoe River for various plant purposes*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
2. Maximum abstraction rate in Tawhiti Stream when flow is less than 0.8 m^3	Fonterra monitor compliance. Abstraction data is also telemetered to the Council and reviewed by Council officers	**No** 8 January 2018, see Section 2.4
3. Maintenance of minimum flows	Council's telemetered sites	Yes
4. Reduced minimum flow in Tangahoe River for maximum of 21 days	Council's telemetered site	N/A
5. Maintenance of minimum flows during an emergency situation of no more than 48 hours	Council's telemetered sites	N/A
6. Report requirement following an emergency situation	Council review	N/A
7. Requirements for measuring and recording flow	Equipment inspected by Council. Data telemetered to Council	Yes
8. Requirements for installation of water meters, data loggers, and turbidity meters	Equipment inspected by Council. Data telemetered to Council	Yes
9. Requirement for installation of fish screens at intakes	Installation due by 8 November 2019. Equipment to be inspected by Council	N/A
10. Certification of water meters and data loggers	Equipment inspected by Council	Yes
11. Preparation, implementation and compliance with all plans required by consent	Kaitiaki Group meetings, self-reporting, Council monitoring	Yes
12. Preparation and submission of Tangata Whenua Involvement Plan (TWIP)	TWIP submitted to Council	Yes
13. Purpose of the TWIP	Council review	Yes
14. Minimum requirements of the TWIP	Council review	Yes
15. Provision for consent holder review and amendment of TWIP	Review not undertaken during monitoring period	N/A
16. Monitoring Plan requirement	Monitoring Plan revisions underway	Yes
17. Provision of Monitoring Plan to Fish and Game for review	Monitoring Plan revisions underway	N/A
18. Implementation and compliance with Monitoring Plan	Monitoring Plan revisions underway	N/A
19. Preparation of Low Flow Contingency Plan	Plan published April 2018	Yes
20. Recording and reporting of turbidity, abstraction volumes and river flow in accordance with consent	Council review	Yes

Purpose: *To take water from the Tawhiti Stream and the Tangahoe River for various plant purposes*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
21. Consent holder to notify Council if measuring or recording equipment malfunctions	No issues during monitoring year	N/A
22. Equipment to be readily accessible for Council Officers to inspect and verify	Council inspection	Yes
23. Provision of Annual Performance Data Summary Report	Report received 5 July 2018	Yes
24. Water Efficiency BPO Report	First report due 1 June 2021	N/A
25. Provision of financial contribution for the mitigation of adverse environmental effects	First payment received	Yes
26. Specification for financial contribution	Council review	Yes
27. Annual provision of Financial Contribution and Environmental Enhancement Report (FCEER)	Report in development	Yes
28. Council review provision	Next optional review in June 2021	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Improvement required** **High**

N/A = not applicable

3.3.2 Water discharges

Table 19 Summary of performance for Consent 1450-2.0 (until 8 November 2017)

Purpose: *To discharge 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		N/A
2. Approx. 400 m^3 lactose solids to be discharged prior to 1 August 2007		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 of composite samples	Yes

Purpose: *To discharge dairy factory wastewater into the Tasman Sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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** 27 October 2017, see Section 2.4
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	Fonterra carries out an annual dive inspection of the entire length of the outfall pipeline. As a result of this inspection, any necessary repairs or maintenance works are carried out The most recent dive inspections were carried out in June 2018	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 Oct 2017	Yes
15. Optional review provision re. adverse effects attributable to discharge	No further reviews available	N/A
16. Optional review provision re. environmental effects	No further reviews available	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Improvement required** **High**

Table 20 Summary of performance for Consent 1450-3.0 (from 8 November 2017)

Purpose: *To discharge dairy factory wastewater into the Tasman Sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Discharge to only occur through outfall and diffuser	Diving inspections	Yes

Purpose: *To discharge dairy factory wastewater into the Tasman Sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
2. Discharge volume not to exceed 40,000 m^3 over 24 hours	Council review of Fonterra monitoring data	Yes
3. Discharge shall not include sewage	Council wastewater sampling and review of Fonterra monitoring data	Yes
4. Constituent limits for wastewater discharge	Council wastewater sampling and review of Fonterra monitoring data	**No**
5. No adverse effects on receiving environment beyond mixing zone	Council monitoring	**No** 8, 21 January 2018 See Section 2.4
6. Measure, record and report rate and volume of wastewater data	Council review of Fonterra monitoring data	Yes
7. Installation and commission of Dissolved Air Flotation (DAF) Unit	DAF Unit to be commissioned by 1 August 2021	N/A
8. Provision of DAF Performance Report	Report due by 1 June 2022	N/A
9. Preparation, implementation and compliance with all plans required by consent	Kaitiaki Group meetings, self-reporting, Council monitoring	Yes
10. Preparation and submission of Tangata Whenua Involvement Plan (TWIP)	TWIP submitted to Council	Yes
11. Purpose of the TWIP	Council review	Yes
12. Minimum requirements of the TWIP	Council review	Yes
13. Provision for consent holder review and amendment of TWIP	Review not undertaken during monitoring period	N/A
14. Monitoring Plan requirement	Monitoring Plan revisions underway	Yes
15. Implementation and compliance with Monitoring Plan	Monitoring Plan revisions underway	Yes
16. Preparation of Contingency Plan	Plan provided Dec 2018 (v2)	Yes
17. Provision of Annual Performance Data Summary Report	Report received 5 July 2018	Yes
18. Water Efficiency BPO Report	First report due 1 June 2021	N/A
19. Council review provision	Next optional review in June 2021	N/A
20. Provision for review of condition 4, upon receipt of DAF Performance Report	Report due by 1 June 2022	N/A

Purpose: *To discharge dairy factory wastewater into the Tasman Sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Improvement required** **High**

Table 21 Summary of performance for Consent 3902-3.0

Purpose: *To discharge stormwater into Tangahoe River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practicable option to prevent or minimise adverse effects	Site inspections	Yes
2. Catchment area not to exceed 10 ha	Site inspections	Yes
3. Consent holder to prepare and maintain contingency plan	Completed August 2014	Yes
4. Consent holder to prepare and maintain stormwater management plan	Completed August 2014	Yes
5. Effects on receiving waters	Site inspections, physicochemical analysis, freshwater biomonitoring surveys	**No** see Section 3.2.2
6. No visible bacterial and/or fungal growths downstream	Site inspections and freshwater biomonitoring surveys	Yes
7. Limits on chemical composition of discharge	Physicochemical analysis	Yes
8. Maintenance of fencing and planting of riparian margin	Site inspections	Yes
9. Optional review provision re. environmental effects	Next optional review in June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Good** **High**

Table 22 Summary of performance for Consent 3907-3.0

Purpose: *To discharge stormwater into Tawhiti Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practicable option to prevent or minimise adverse effects	Site inspections	Yes

Purpose: *To discharge stormwater into Tawhiti Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
2. Catchment area not to exceed 13 ha	Site inspections	Yes
3. Consent holder to prepare and maintain contingency plan	Completed August 2014	Yes
4. Consent holder to prepare and maintain stormwater management plan	Completed August 2014	Yes
5. Effects on receiving waters	Site inspections, physicochemical analysis, freshwater biomonitoring surveys	Yes
6. No visible bacterial and/or fungal growths downstream	Site inspections and freshwater biomonitoring surveys	Yes
7. Limits on chemical composition of discharge	Physicochemical analysis	Yes
8. Maintenance of fencing and planting of riparian margin	Site inspections	Yes
9. Optional review provision re. environmental effects	Next optional review in June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 23 Summary of performance for Consent 4133-3.1

Purpose: *To discharge stormwater to the unnamed coastal stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practicable option to prevent or minimise adverse effects	Site inspections	Yes
2. Catchment area not to exceed 21 ha	Site inspections	Yes
3. Consent holder to prepare and maintain contingency plan	Completed August 2014	N/A
4. Consent holder to prepare and maintain stormwater management plan	Completed August 2014	N/A
5. Effects on receiving waters	Site inspections, physicochemical analysis, freshwater biomonitoring surveys	Yes
6. No visible bacterial and/or fungal growths downstream	Site inspections and freshwater biomonitoring surveys	Yes
7. Limits on chemical composition of discharge	Physicochemical analysis	Yes

Purpose: *To discharge stormwater to the unnamed coastal stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Maintenance of fencing and planting of riparian margin	Site inspections	Yes
9. Optional review provision re. environmental effects	Next optional review in June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 24 Summary of performance for Consent 4927-1.0 (until 8 November 2017)

Purpose: *To discharge river silt and sand to the Tawhiti Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Discharge operated on a continuous purge basis	Management plan	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	Biological inspection, fish survey	Yes
4. Optional review provision re. environmental effects	No further reviews	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 25 Summary of performance for Consent 4927-2.0 (from 8 November 2017)

Purpose: *To discharge river silt and sand to the Tawhiti Stream*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. No adverse effects beyond mixing zone	Implementation of Monitoring Plan	N/A
2. Preparation of a Monitoring plan	Monitoring plan under revision	Yes
3. Implementation and compliance with Monitoring plan	Monitoring plan yet to be established	N/A
4. Optional review provision re. environmental effects	Next review due in June 2021	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 26 Summary of performance for Consent 5148-1.1 (until 8 November 2018)

Purpose: ***To discharge river silt and sand into the Tangahoe River***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Discharge operated on a continuous purge basis	Management plan	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	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 27 Summary of performance for Consent 5148-2.0 (from 8 November 2018)

Purpose: ***To discharge river silt and sand into the Tangahoe River***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. No adverse effects beyond mixing zone	Implementation of Monitoring Plan	N/A
2. Preparation of a Monitoring plan	Monitoring plan under revision	Yes
3. Implementation and compliance with Monitoring plan	Monitoring plan yet to be established	N/A
4. Optional review provision re. environmental effects	Next review due in June 2021	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

3.3.3 Coastal permits

Table 28 Summary of performance for Consent 4977-1.0 (until 8 November 2017)

Purpose: ***To erect, place and maintain a marine outfall***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notification of maintenance work	No maintenance work undertaken	N/A
2. Construction and maintenance in accordance with documentation	Council review	N/A

Purpose: *To erect, place and maintain a marine outfall*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 29 Summary of performance for Consent 5013-1.0 (until 8 November 2018)

Purpose: *To construct and maintain a rock seawall*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notification prior to maintenance works	Maintenance not required during the period under review	N/A
2. To be constructed and maintained in accordance with the application	Council review	N/A
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	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 30 Summary of performance for Consent 5013-2.0 (from 8 November 2018)

Purpose: *To occupy CMA with, and maintain, a rock wall, outfall and diffuser structure*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Structures to be maintained so that they function effectively	Structures were deemed to be functioning effectively during period under review	Yes
2. Annual outfall inspection and report	Council review	Yes
3. Provision of Maintenance Work Plan, if necessary	No maintenance required during period under review	N/A
4. Confirmation of completion of works, if undertaken	No maintenance required during period under review	N/A
5. Outfall pipeline shall not be visible at any time	Marine ecological inspections	Yes
6. Optional review provision re. environmental effects	Next review option in June 2021	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

3.3.4 Air discharges

Table 31 Summary of performance for Consent 4103-2.0

Purpose: *To discharge emissions to air from the manufacture and processing of milk products*		
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	Powder-3 WPC trials authorised by Council through consenting processes	Yes
4. Written report with regard to emissions, improvements and mitigation within five years and every six thereafter	Report submitted July 2013, next due July 2019	N/A
5. BPO to minimise environmental effects	Liaison with consent holder, review of report submitted as per condition 4	Yes
6. Use of most appropriate process equipment and controls to minimise emissions and impacts	Report detailing emissions and technology received	Yes

Purpose: *To discharge emissions to air from the manufacture and processing of milk products*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
7. Powder emissions to atmosphere <125 mg/m^3 (and increased limits for Powder-3 during trials)	Air quality monitoring	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	Whareroa community meeting held May 2018	Yes
13. Powder 5 can only process skim milk powder if Council are given five 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 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 32 Summary of performance for Consent 5044-2.0

Purpose: *To discharge emissions into the air from the disposal of laboratory wastes, and stormwater and sump cleanings onto and into land*		
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

Purpose: *To discharge emissions into the air from the disposal of laboratory wastes, and stormwater and sump cleanings onto and into land*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
5. Characteristics of an objectionable odour		N/A
6. Optional review	No further reviews available, expires June 2022	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 33 Summary of performance for Consent 6257-1.1

Purpose: *To discharge emissions to air from dual fuel boilers*		
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 three 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

Purpose: *To discharge emissions to air from dual fuel boilers*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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
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	Consent will lapse 1 June 2034 unless given effect to earlier	N/A
29. Review of conditions	Next optional review in June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A Consent not yet exercised**

Table 34 Summary of performance for Consent 6273-1.0

Purpose: ***To discharge emissions into the air from 'Cogen I' and 'Cogen II' gas-fired co-generation energy generating plants***		
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	Next report due in 2020	N/A
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
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 17.5 m 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 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 35 Summary of performance for Consent 7465-1.0

Purpose: *To discharge emissions into the air from the combustion of waste wood packaging*		
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
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 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

3.3.5 Discharges of waste to land

Table 36 Summary of performance for Consent 4406-2.0

Purpose: *To discharge laboratory wastes onto and into 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

Purpose: *To discharge laboratory wastes onto and into land*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
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
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	No further reviews available, expires June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A consent not currently in use**

Table 37 Summary of performance for Consent 5036-2.0

Purpose: *To discharge 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. Disposal of unprocessable wastes via irrigation to comply with nitrogen and COD loading limits	Not monitored during period under review	N/A
3. Exercise of consent in accordance with applications	Site inspections and liaison with consent holder	Yes
4. Limits on discharge of stormwater sump cleanings and unprocessable dairy waste	Site inspections and liaison with consent holder	Yes
5. Consent holder to provide management plan	Latest version received January 2017	Yes
6. Discharge not within 50 m of bore, 25 m of surface water, 100 m from cliff	Site inspections and liaison with consent holder	Yes
7. Disposal pit(s) not to intercept the water table	Site inspections and liaison with consent holder	Yes

Purpose: *To discharge waste material onto land*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Exercise of consent not to lead to contaminants entering a water body via overland surface flows	Not monitored during period under review; no incidents reported	N/A
9. Exercise of consent not to result in adverse impacts on groundwater	Not monitored during period under review; no incidents reported	N/A
10. Discharged material to be covered by 50 mm soil	Site inspections and liaison with consent holder	Yes
11. Liquid to be removed from disposal pits prior to covering	Site inspections and liaison with consent holder	Yes
12. Only materials outlined in application to be discharged	Site inspections and requirements in management plan	Yes
13. Disposal pits to be reinstated and re-vegetated	Site inspections and liaison with consent holder	Yes
14. Cover layer to be suitably maintained	Site inspections and liaison with consent holder	Yes
15. Disposal not to give rise to objectionable or offensive odours beyond boundary	Site inspections and liaison with consent holder	Yes
16. Consent holder to maintain records of discharge	Records of dates and volume of discharges available	Yes
17. Discharge of unprocessable wastes to occur only after all other options have been exhausted	Site inspections, liaison with consent holder	Yes
18. Optional review provision re. environmental effects	No further reviews available, expires June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

Table 38 Summary of performance for Consent 9908-1.0

Purpose: *To discharge dairy liquids onto land and the associated emissions to air, in various locations throughout the Taranaki region*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Dairy liquids to be discharged; limited to dairy by-products, unprocessable dairy products and surplus dairy products	Information provided by Fonterra	Yes
2. Exercise of consent in accordance with Dairy Liquids Spreading Management Plan	Information provided by Fonterra	Yes

Purpose: *To discharge dairy liquids onto land and the associated emissions to air, in various locations throughout the Taranaki region*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
3. Notify the Council of the intent to discharge dairy liquids to land	Email providing notification and relevant information on 30 May 2017	Yes
4. Discharge shall not result in any liquids ponding for more than 30 minutes	Inspection	Yes
5. Discharge shall not result in any liquids reaching surface water, any subsurface drainage system or any adjacent property	Inspection	Yes
6. Best practicable option to minimise environmental effects		Yes
7. No spray drift beyond the boundary of the property	Inspection	Yes
8. Sodium adsorption ratio not exceeding 15	Information provided by Fonterra	Yes
9. Nitrogen loading rate shall not exceed limits provided in consent	Information provided by Fonterra	Yes
10. Discharge shall not occur within the minimum buffer distances provided in consent	Inspection	Yes
11. No discharge within, adjacent to or directly impacting on any Statutory Acknowledgement Area	Information provided by Fonterra	Yes
12. No offensive or objectionable odour beyond property boundary	Inspection	Yes
13. Notify the Council within 48 hours of any accidental discharge		N/A
14. Maintain a complaints register		N/A
15. Notify the Council of event having significant adverse effect on water quality		N/A
16. Record of application sites	Records available	Yes
17. Farm register	Version 7 of register provided July 2017	Yes
18. Consent shall lapse 2019 if not exercised		N/A
19. Optional review of consent	Next scheduled optional review in June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

3.3.6 Land use permits

Table 39 Summary of performance for Consent 10208-1.0

Purpose: *To construct, place and use a water intake structure in the bed of the Tangahoe River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Structure shall be constructed in accordance with specified documentation	Site inspections and liaison with consent holder	Yes
2. Signage requirements	Site inspections and liaison with consent holder	Yes
3. Meet with a Council Officer prior to commencement of works	Site inspections and liaison with consent holder	Yes
4. Erosion control requirements	Site inspections and liaison with consent holder	Yes
5. Sediment control requirements	Site inspections and liaison with consent holder	Yes
6. Earthwork stabilisation requirements	Site inspections and liaison with consent holder	Yes
7. Works notification requirement	Liaison with consent holder	Yes
8. Concrete work to be isolated from running water	Site inspections and liaison with consent holder	Yes
9. Concrete to remain isolated from running water for 48 hours	Site inspections and liaison with consent holder	N/A
10. Bank protection structures shall be installed following the installation of the coffer dam (in accordance with specified documentation)	Site inspections and liaison with consent holder	N/A
11. No instream works between 1 May and 31 October inclusive	Site inspections and liaison with consent holder	Yes
12. Streambed disturbance to be minimised and reinstated as far as practicable	Site inspections and liaison with consent holder	Yes
13. Reasonable steps taken to minimise instream effects from sediment	Site inspections and liaison with consent holder	Yes
14. Adopt best practicable option to prevent/ minimise adverse effects	Site inspections and liaison with consent holder	Yes
15. Water flow shall not be adversely affected	Site inspections and liaison with consent holder	Yes
16. Following works, river banks shall not be steeper than the existing natural banks	Site inspections and liaison with consent holder	N/A
17. Works to remain responsibility of Consent Holder (and subsequent erosion, etc)	Site inspections and liaison with consent holder	N/A
18. Protocols adopted if archaeological remains are discovered	Site inspections and liaison with consent holder	N/A
19. Consent lapse clause	Consent has been exercised	N/A

Purpose: *To construct, place and use a water intake structure in the bed of the Tangahoe River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
20. Consent review clause	Next optional review in June 2022	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

During the year, Fonterra demonstrated a high level of administrative performance, however improvement is required with their environmental performance and compliance with their resource consents. Ratings are as defined in Section 1.1.4

3.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report, it was recommended:

1. THAT in the first instance monitoring of air emissions from the Whareroa plant in the 2017-2018 year continues at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT monitoring of water discharges (including stormwater) and abstractions for the Whareroa plant in the 2017-2018 year continues at the same level as in 2016-2017.
4. THAT freshwater and marine ecological monitoring in the 2017-2018 year continues at the same level as in 2016-2017.
5. THAT combined inspections of the Whareroa plant for monitoring of air emissions and of water abstractions and discharges in the 2017-2018 year continues at the same level as in 2016-2017.

These recommendations were all implemented during the 2017-2018 period.

3.5 Alterations to monitoring programmes for 2018-2019

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account 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 exercising resource consents.

It is proposed that for 2018-2019 the monitoring programme includes an additional three site biomonitoring survey undertaken in the unnamed tributary of the Tangahoe River, in place of the usual biological inspection at this site during spring. Further monitoring components may also be adopted to fulfil

the requirements of resource consents 1450, 0047, 4927 and 5148, pending agreement between the Kaitiaki Group.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2018-2019.

A recommendation to this effect is attached to this report.

4 Recommendations

1. THAT in the first instance monitoring of air emissions from the Whareroa plant in the 2018-2019 year continues at the same level as in 2017-2018.
2. THAT monitoring of water discharges (including stormwater) and abstractions for the Whareroa plant in the 2018-2019 year continues at the same level as in 2017-2018.
3. THAT freshwater and marine ecological monitoring in the 2018-2019 year continues at the same level as in 2017-2018, with the inclusion of an additional three site biomonitoring survey (as discussed in Section 3.5).
4. THAT combined inspections of the Whareroa plant for monitoring of air emissions and of water abstractions and discharges in the 2018-2019 year continues at the same level as in 2017-2018.
5. THAT additional monitoring components may be incorporated into the programme to satisfy new consent requirements (1450, 0047, 4927 and 5148), pending agreement between the Kaitiaki group.
6. THAT the wastewater and coastal components of the 2018-2019 monitoring programme are reported in conjunction with the Hawera Wastewater Treatment Plant monitoring programme as a combined outfall report.
7. THAT the freshwater, land and air components of the 2018-2019 monitoring programme are reported together, separate from the combined outfall report.
8. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

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.
BODCF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m^3s^{-1}).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E. coli	*Escherichia coli*, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
$g/m^2/day$	grams/$metre^2$/day.
g/m^3	Grams per cubic metre, and equivalent to milligrams 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.
Incident register	The 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.

L/s	Litres per second.
m^2	Square metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM_{10}	Relatively fine airborne particles (less than 10 micrometre diameter, respectively).
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 including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.

For further information on analytical methods, contact a Science Services Manager.

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Appendix I

Resource consents held by Fonterra

(For a copy of the signed resource consent
please contact the TRC Consents department)

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

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 Limited PO Box 444 Hawera 4640
Decision Date:	17 October 2017
Commencement Date:	8 November 2017

Conditions of Consent

Consent Granted:	To take water from the Tawhiti Stream and the Tangahoe River for the purposes of processing and manufacturing dairy products, cleaning of plant, cooling, domestic use and for a co-generation plant
Expiry Date:	1 June 2052
Review Date(s):	June 2021 and at 5-yearly intervals thereafter
Site Location:	Main South Road & 135 Hicks Road, Hawera
Grid Reference (NZTM)	1712861E-5616233N (Tawhiti) 1715769E-5612503N (Tangahoe)
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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

Rate of taking

1. The total amount of water taken from the Tawhiti Stream and the Tangahoe River in any 24 hour period ending at 6.00am (New Zealand Standard Time) shall not exceed 30,000 cubic metres.

2. When the flow in the Tawhiti Stream is less than 800 litres per second, as measured at the 'Tawhiti at Duffys' flow recorder site (Grid Ref NZTM 1714275-5615594), the rate of taking from the Tawhiti Stream shall not exceed 184 litres per second, unless the turbidity of the Tangahoe River at the take site (Grid Ref NZTM 1715770-5612494) is greater than 850 NTU, then the rate shall not exceed 347 litres per second.

   Advice Note:
   For the avoidance of doubt, this condition does not limit the amount of water that may be taken from the Tangahoe River, provided the amount does not exceed 30,000 cubic metres in accordance with condition 1.

Minimum flows

3. Except as provided for by conditions 4 and 5, no taking shall occur:
   (a) when the flow immediately downstream of the Tangahoe River take site is less than 450 litres per second; or
   (b) from the Tawhiti Stream when the flow, as recorded at the 'Tawhiti at Duffys' flow recorder site, is less than 240 litres per second.

4. On no more than 21 days during any period commencing 01 July and ending 30 June of the following year, taking may occur from the Tangahoe River if its flow is between 300 litres per second and 450 litres per second.

5. During an emergency situation, taking in accordance with condition 1 may occur for a period not exceeding 48 hours from the:
   (a) Tawhiti Stream when the flow at the 'Tawhiti at Duffys' flow recorder site is more than 50 litres per second; and
   (b) Tangahoe River when the flow immediately downstream of the intake is more than 273 litres per second.

   For the purposes of this condition, an emergency situation is the inability of the consent holder to take, pump, or treat the water taken, due to an event beyond the control of the consent holder, including: failure of power supply; contamination of river water, and damage to infrastructure (pumping station, pipeline, treatment plant).

6. On each occasion that condition 5 is exercised, the consent holder shall within seven working days of the emergency ceasing provide a written report to the Chief Executive, Taranaki Regional Council giving reasons for the emergency, the volumes of water abstracted, the minimum flows that occurred, the water conservation measures adopted during the emergency and any measures that can be adopted to prevent a reoccurrence. A copy of each report shall also be provided to Tangata Whenua and Fish & Game New Zealand (Taranaki).

7. The consent holder shall ensure that the flow in the river downstream of each take site is measured and recorded at intervals not exceeding 15 minutes to an accuracy of +10% for flows less than:

   (a) 2000 litres per second for the Tangahoe River; and
   (b) 1000 litres per second for the Tawhiti Stream.

   Advice Note:
   For the avoidance of doubt, the river flow gauging stations downstream of each take site, and any associated data telemetry, is owned and operated by the Taranaki Regional Council. This flow data shall be provided to the consent holder so it can manage the takes from each take site in accordance with the conditions of this consent.

Installation of Monitoring Equipment and Screens

8. Before exercising this consent the consent holder shall:

   (a) install, and thereafter maintain a water meter and a datalogger at each site of taking (or a nearby site in accordance with Regulation 10 of the *Resource Management (Measurement and Reporting of Water Takes) Regulations 2010*. Water meters and dataloggers shall be tamper-proof and shall measure and record the rate and volume of water taken to an accuracy of ± 5% at intervals not exceeding 15 minutes;

   (b) install, and thereafter maintain equipment that records the turbidity of the Tangahoe River at the take site to an accuracy of ± 5% at intervals not exceeding 15 minutes;

9. Within two years of the commencement date of this consent, the consent holder shall install screens on each water intake structure for the purpose of preventing fish from entering the intake. The screens shall have a mesh aperture not exceeding 2 mm and the sweep velocity shall exceed the approach velocity.

10. Within 30 days of the commencement date of this consent, the consent holder shall provide the Taranaki Regional Council with a document from a suitably qualified person certifying that the water meter and datalogger at each site of taking required by condition 8(a) of this consent:

    (a) has been installed and/or maintained in accordance with the manufacturer's specifications; and/or
    (b) has been tested and shown to be operating to an accuracy of ± 5%.

    The documentation shall also be provided:

    (c) at other times when reasonable notice is given by the Chief Executive, Taranaki Regional Council who has reasonable evidence that the equipment may not be functioning as required by this consent; and
    (d) no less frequently than once every five years.

Monitoring and Management Plans

11. The consent holder shall prepare, implement and comply with its obligations under all plans required by the conditions of this consent.

Tangata Whenua Involvement Plan

12. Within 3 months of the commencement date of this consent, the consent holder shall prepare and submit to the Taranaki Regional Council a Tangata Whenua Involvement Plan ("TWIP"). The TWIP shall be developed in consultation with Te Runanga o Ngati Ruanui Trust and Te Korowai o Ngaruahine Trust (collectively referred to as "Tangata Whenua" for the purposes of this consent).

13. The purpose of the Plan is to recognise Tangata Whenua's kaitiakitanga responsibilities and to identify the process and extent of involvement by Tangata Whenua in:

    (a) the development, implementation and review of the Monitoring Plan (condition 16) and Water Efficiency BPO Report (condition 24);
    (b) the development and implementation of environmental enhancement projects in accordance with condition 25.
    (c) monitoring the conditions of this consent.
    (d) the establishment of a Kaitiaki Group.

14. As a minimum the TWIP shall detail:

    (a) *Development of Plans* - A process for Tangata Whenua to have input into and provide feedback to the consent holder and Taranaki Regional Council on the development of the Monitoring Plan (condition 16) and Water Efficiency BPO Report (condition 24) prior to each being lodged with the Taranaki Regional Council.

    (b) *Implementation and review of Plan*s - A process for Tangata Whenua to have input into and provide feedback on the implementation and reviews of:
        (i) the Monitoring Plan;
        (ii) monitoring of the effects of the takes;
        (iii) the Annual Performance and Data Summary Reports; and
        (iv) the Water Efficiency BPO Report.

    (c) *Information Sharing* - A process for ongoing information sharing between Tangata Whenua and the consent holder to enable an improved understanding of the relevant cultural values that may be affected by the activities authorised by this consent and the traditional/cultural uses of the Tawhiti Stream and Tangahoe River.

    (d) *Kaitiaki Group* - A process to establish and maintain a Kaitiaki Group (KG), which shall include:
        (i) the process by which the Taranaki Regional Council, Te Runanga o Ngati Ruanui Trust, Te Korowai o Ngaruahine Trust and the consent holder will be invited to become members of the KG;
        (ii) the process by which membership may be amended and advisers appointed and/or engaged by the KG;

(iii) the terms of reference for the KG, which shall be:
- the conditions of this consent and their implementation; and
- the environmental enhancement projects to be carried out pursuant to condition 25;

(iv) the way the KG will operate, including frequency of meetings and methods of communication between members; and

(v) the reasons the KG may cease to function and the process for that.

15. The consent holder may review and amend the TWIP from time to time in consultation with Tangata Whenua. A copy of the amended plan shall be provided to the Taranaki Regional Council.

Monitoring Plan

16. Within 6 months of the date of commencement of this consent, the consent holder shall ensure a Monitoring Plan is prepared. The purpose of the Monitoring Plan is to identify the techniques, methodologies and procedures that will be employed to acquire data in relation to, and monitor compliance with the conditions of this consent, and the effects of the taking authorised by this consent on:

(a) instream habitat values and macroinvertebrate communities within the Tawhiti Stream and Tangahoe River; and

(b) native fish populations within the Tawhiti Stream and Tangahoe River.

Advice Note:
The Taranaki Regional Council assumes responsibility for the preparation and implementation of the Monitoring Plan for annual compliance purposes.

17. The consent holder shall provide a copy of the Monitoring Plan to Fish and Game New Zealand for comment prior to it being approved by the Taranaki Regional Council.

18. At all times, the consent holder shall implement and comply with those aspects of the Monitoring Plan that the consent holder is responsible for (as detailed in the Monitoring Plan).

Low Flow Contingency Plan

19. Within 6 months of the commencement date of this consent, the consent holder shall prepare a Low Flow Contingency Plan and provide a copy of the plan to the Taranaki Regional Council, Tangata Whenua and Fish and Game New Zealand. The purpose of the Low Flow Contingency Plan is to identify the techniques, methods and procedures that will be employed by the consent holder to reduce the amount of water taken from the Tawhiti Stream and Tangahoe River to the greatest extent that is practicable during periods when the flow downstream of the Tangahoe River take site is between 300 litres per second and 450 litres per second and abstraction is occurring in accordance with conditions 4 and 5.

Reporting

20. Within 6 months of the commencement date of this consent, the consent holder shall begin recording turbidity, the volumes of water taken and river flow in accordance with the conditions of this consent. The records taken shall:

    (a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
    (b) specifically record the water taken as 'zero' when no water is taken;
    (c) be transmitted to the Taranaki Regional Council's computer system within 2 hours of being recorded.

21. If any measuring or recording equipment required by the conditions of this consent, which is owned and operated by the consent holder, breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council as soon as is reasonably practicable after the consent holder becomes aware of the breakdown or malfunction, by emailing hydro@trc.govt.nz. Any repairs or maintenance to the equipment must be undertaken by a suitably qualified person.

22. All measuring or recording equipment required by the conditions of this consent shall be accessible to Taranaki Regional Council officers at all reasonable times for inspection and/or data retrieval. In addition the data logger shall be designed and installed so that Taranaki Regional Council officers can readily verify that it is accurately recording the required information.

Annual Performance Data Summary Report

23. Each year by 31 August, the consent holder shall prepare an Annual Performance Data Summary Report and provide a copy of the report to the Chief Executive, Taranaki Regional Council. The Annual Performance Data Summary Report shall relate to the preceding 12 month period ending 30 June and summarise:

    (a) Data relating to the performance of major components within the water take systems and compliance with the conditions of this consent; and
    (b) Any results of monitoring undertaken in accordance with the Monitoring Plan.

Water Efficiency BPO Report

24. Before 1 June 2021 and at 5 yearly intervals thereafter, the consent holder shall undertake a water efficiency study that assesses the overall water use efficiency on site, identifies the best practicable options ("BPO") to improve water use efficiency and makes recommendations about the implementation of any BPOs. The study shall also include a review of hydrological records to determine whether the minimum flows specified in conditions 3(a), 4, 5 and 19 should be increased. The consent holder shall then prepare a Water Efficiency BPO Report which summarises the study and its findings and recommendations and provide a copy of it to the Chief Executive, Taranaki Regional Council, Tangata Whenua and Fish and Game New Zealand within 30 working days of the study being completed.

For the purposes of the consent, best practicable option means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—

(a) the nature of the taking and the sensitivity of the receiving environment to adverse effects; and
(b) the financial implications, and the effects on the environment, of that option when compared with other options; and
(c) the current state of technical knowledge and the likelihood that the option can be successfully applied.

Financial Contributions

25. The consent holder shall make a $10,000 (plus GST and adjusted for inflation) payment to the Taranaki Regional Council for each year of this consent as a financial contribution for the purpose of mitigating the adverse environmental effects of the taking. The first payment shall be made within 30 days of the commencement date of this consent and subsequent payments shall be made annually before 1 September.

26. The contribution that is to be made in accordance with condition 25 shall only be used for specific environmental enhancement projects within the Tangahoe River catchment that have been agreed to by the Kaitiaki Group and the Chief Executive, Taranaki Regional Council including, but not limited to:

(a) Riparian planting and fencing of waterbodies;
(b) Enhancement, fencing and protection of wetlands;
(c) Enhancement of the native fishery;
(d) Enhancement of the Tangahoe River mouth/estuary; and
(e) Removal of fish barriers.

Advice Note:
If the financial contributions paid pursuant to this consent accumulate with the Taranaki Regional Council over a period of 5 years or more without being spent and/or there are no agreed projects pursuant to condition 26 that the fund is to be applied to, the consent holder may make an application under section 127 of the RMA, to change, suspend or waive the contributions required under this condition or to otherwise modify this condition.

27. Annually before 1 August the consent holder shall submit a "Financial Contribution and Environmental Enhancement Report" ("FCEER") to the Chief Executive, Taranaki Regional Council. The purpose of the FCEER shall be to document the environmental enhancement project(s) that have occurred in the previous year pursuant to conditions 26, and it shall include as a minimum:

(a) the projects initiated and completed; and
(b) the total cost of each project.

Review

28. 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 2021 and at 5-yearly intervals thereafter, for the purposes of:

    (a) 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; or

    (b) implementing a best practicable option with respect to improving water use efficiency identified in a Water Efficiency BPO Report prepared in accordance with condition 24;

    (c) increasing the flows specified in conditions 3(a), 4, 5 and 19 in accordance with any recommendation as a result of the Tangahoe River hydrological data review required by condition 24.

Signed at Stratford on 17 October 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

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

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Director-Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	17 October 2017
Commencement Date:	8 November 2017

Conditions of Consent

Consent Granted:	To discharge all wastewater from dairy factory processes and associated processes undertaken at the Whareroa dairy processing site through a marine outfall into the Tasman Sea
Expiry Date:	1 June 2052
Review Date(s):	June 2021 and at 5-yearly intervals thereafter
Site Location:	Tasman Sea, Rifle Range Road, Hawera
Grid Reference (NZTM)	Between 1711371E-5612940N & 1710410E-5611381N
Catchment:	Tasman Sea

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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

Discharge requirements

1. The discharge shall only occur through the outfall and diffuser located between the points defined by map references (NZTM) 1711371E-5612940N and 1710410E-5611381N.

2. The discharge over any 24-hour period ending at 6.00am New Zealand Standard Time (NZST) shall not exceed 40,000 cubic metres.

3. The discharge may include any wastewater from dairy factory processes and associated processes undertaken at the Whareroa dairy processing site and site stormwater, but shall not include any sewage.

4. The discharge, as determined by any 24 hour composite time-proportioned sample taken as the discharge leaves the Whareroa dairy processing site shall meet the standards below

   (a) suspended solids concentration no greater than 1,000 milligrams/litre;
   (b) total fats concentration no greater than 800 milligrams/litre; and
   (c) Chemical Oxygen Demand [COD] concentration no greater than 7000 milligrams/litre.

5. 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; or
   (d) any significant adverse effects on marine life, in particular: benthic communities; and intertidal aquatic life in and around Pukeroa Reef.

6. The consent holder shall measure and record the rate and volume of wastewater discharged to an accuracy of ± 5%. Records of the date, time, rate and cumulative volume of discharge from 6.00am (NZST), taken at intervals not exceeding 15 minutes shall be transmitted to the Taranaki Regional Council's computer system within 2 hours of being recorded.

7. Before 1 August 2021 the consent holder shall install and commission a Dissolved Air Flotation Unit (DAF) to treat all wastewater from the Cream, Cheese and Milk Treatment processing plants prior to its discharge.

8. By 1 June 2022 the consent holder shall submit to the Taranaki Regional Council a report that:

   (a) summarises the performance of the DAF unit required by condition 7,including the wastewater characteristics to and discharging from the DAF unit;
   (b) summarises any change in the wastewater characteristics discharged pursuant to this consent post installation and commissioning the DAF unit; and
   (c) includes an analysis of whether it is appropriate to amend the discharge standards specified in condition 4 (a)-(c) of this consent to more accurately reflect any ongoing reductions of suspended solids, total fats or COD concentrations in the discharge which are occurring as a result of higher levels of treatment by the DAF unit, and makes any recommendations to that effect.

Monitoring and Management Plans

9. The consent holder shall prepare, implement and comply with its obligations under all plans required by the conditions of this consent.

Tangata Whenua Involvement Plan

10. Within 3 months of the commencement date of this consent, the consent holder in conjunction with South Taranaki District Council shall prepare and submit to the Taranaki Regional Council a Tangata Whenua Involvement Plan ("TWIP"). The TWIP shall be developed in consultation with Te Runanga o Ngati Ruanui Trust and Te Korowai o Ngāruahine Trust (collectively referred to as "Tangata Whenua" for the purposes of this consent).

11. The purpose of the TWIP is to recognise Tangata Whenua's kaitiakitanga responsibilities and to identify the process and extent of involvement by Tangata Whenua in:

   (a) the development, implementation and reviews of the Monitoring Plan, Contingency Plan, and Wastewater Management BPO Report;
   (b) monitoring the conditions of this consent; and
   (c) the establishment of a Kaitiaki Group.

12. As a minimum the TWIP shall detail:
   (a) *Development of Plans* - A process for Tangata Whenua to have input into and provide feedback to the consent holder and Taranaki Regional Council on the development of the Monitoring Plan (condition 14), Contingency Plan (condition 16) and Wastewater Management BPO Report (condition 18) prior to each being lodged with the Taranaki Regional Council.

   (b) *Implementation and review of Plans* - A process for Tangata Whenua to have input into and provide feedback on the implementation and reviews of:
      (i) the Monitoring Plan;
      (ii) the Contingency Plan;
      (iii) monitoring of the effects of the discharge;
      (iv) the Annual Performance and Data Summary Reports; and
      (v) Wastewater Management BPO Reports.

(c) *Information Sharing* - A process for ongoing information sharing between Tangata Whenua and the consent holder to enable an improved understanding of the relevant cultural values that may be affected by the activities authorised by this consent.

(d) *Kaitiaki Group* - A process to establish and maintain a Kaitiaki Group (KG), which shall include:
   (i) the process by which the Taranaki Regional Council, Te Runanga o Ngati Ruanui Trust, Te Korowai o Ngāruahine Trust, South Taranaki District Council and the consent holder will be invited to become members of the KG;
   (ii) the process by which membership may be amended and advisers appointed and/or engaged by the KG;
   (iii) the terms of reference for the KG, which shall be the conditions of this consent and any other consent authorising a discharge from the same outfall, and their implementation;
   (iv) the way the KG will operate, including frequency of meetings and methods of communication between members; and
   (v) the reasons the KG may cease to function and the process for that.

13. The consent holder may review and amend the TWIP from time to time in consultation with Tangata Whenua. A copy of the amended plan shall be provided to the Taranaki Regional Council.

Monitoring Plan

14. Within 6 months of the commencement date of this consent, the consent holder shall ensure a Monitoring Plan is prepared The purpose of the Monitoring Plan is to identify the techniques, methodologies and procedures that will be employed to acquire data in relation to, and to monitor compliance with the conditions of this consent, and the effects of the discharge authorised by this consent and any other consent authorising a discharge from the same outfall on:

    (a) Benthic sediments and marine ecology; and
    (b) Pukeroa Reef.

    Advice Note: *The Taranaki Regional Council assumes responsibility for the preparation and implementation of the Monitoring Plan for annual compliance purposes.*

15. At all times, the consent holder shall implement and comply with those aspects of the Monitoring Plan that the consent holder is responsible for (as detailed in the Monitoring Plan).

Contingency Plan

16. The consent holder shall maintain and regularly update a 'Contingency Plan' that details measures and procedures that will be undertaken to prevent and remedy any environmental effects from a spillage or any discharge of contaminants not authorised by this consent. The plan and any amended versions shall be provided to the Chief Executive of the Taranaki Regional Council.

Reporting

Annual Data and Performance Report

17. Each year by 31 August, the consent holder shall prepare an Annual Data and Performance Report and forward a copy of the report to the Chief Executive, Taranaki Regional Council. The Annual Data and Performance Report shall relate to the preceding 12 month period ending 30 June and summarise:

    (a) Data relating to the performance of major components within the consent holder's wastewater system and compliance with the conditions of this consent;
    (b) Any results of monitoring undertaken in accordance with the Monitoring Plan; and
    (c) Any incidents involving spills or accidental discharges and the measures taken to avoid, remedy or mitigate the adverse environmental effects of such a spill or discharge.

Wastewater Management BPO Report

18. Before 1 June 2021 and at 5-yearly intervals thereafter, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, a 'Wastewater Management BPO Report' reviewing relevant best practicable options ("BPO") 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.

    For the purposes of the consent, **best practicable option** means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to-

    (a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
    (b) the financial implications, and the effects on the environment, of that option when compared with other options; and
    (c) the current state of technical knowledge and the likelihood that the option can be successfully applied.

Review

19. 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 2021 and at 5-yearly interval thereafter, for the purposes of:

    (a) 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; or

    (b) implementing a best practicable option in dairy wastewater management as identified in the Wastewater Management BPO Report prepared in accordance with condition 18.

20. 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 condition 4 of this resource consent by giving notice of review within 6 months of receipt of the report required by condition 8, for the purposes of setting discharge standards more appropriate for the higher level of treatment.

Signed at Stratford on 17 October 2017

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	14 February 2014
Commencement Date:	14 February 2014

Conditions of Consent

Consent Granted:	To discharge stormwater from the Whareroa milk processing site into an unnamed tributary of the Tangahoe River
Expiry Date:	1 June 2028
Review Date(s):	June 2016, June 2022
Site Location:	89 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 (Discharge source) Lot 2 DP 2777 Blk X Hawera SD (Discharge site)
Grid Reference (NZTM)	1711975E-5614565N
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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

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 stormwater discharged shall be from a catchment area not exceeding 10 hectares.

3. Before 31 August 2014, the consent holder shall prepare and maintain a contingency plan that details measures and procedures to be undertaken to prevent spillage or any discharge of contaminants not authorised by this consent. The contingency plan shall be followed in the event of a spill or unauthorised discharge and shall be certified by the Chief Executive, Taranaki Regional Council as being adequate to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

4. Before 31 August 2014, the consent holder shall prepare and maintain a stormwater management plan that documents how the site is to be managed to minimise the contaminants that become entrained in the stormwater. This plan shall be followed at all times, shall be certified by the Chief Executive, Taranaki Regional Council, and shall include but not necessarily be limited to:

   a) cleaning procedures for the site catchments discharging to the Eastern Pond; and
   b) details of maintenance and cleaning programmes to remove the accumulated sediment from the ponds.

   A Stormwater Management Plan template is available in the Environment section of the Taranaki Regional Council's web site www.trc.govt.nz.

5. After allowing for reasonable mixing, within a mixing zone extending 10 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 emissions of objectionable odour;
   d. the rendering of fresh water unsuitable for consumption by farm animals; and
   e. any significant adverse effects on aquatic life, habitats or ecology.

6. There shall be no visible bacterial and/or fungal growths downstream of the discharge.

7. Constituents of the discharge shall meet the standards shown in the following table for eight of ten consecutive samples taken at least two weeks apart over the course of an annual monitoring period:

Constituent	Standard
Oil and grease	Concentration not greater than 5 gm^{-3}
pH	Within the range 6.0 to 9.0
Suspended solids	Concentration not greater than 30 gm^{-3}
BOD	Concentration not greater than 15 gm^{-3} for the first two years following the date of issue of this consent, and 10 gm^{-3} thereafter
Filtered carbonaceous BOD	Concentration not greater than 3.5 gm^{-3} for the first two years following the date of issue of this consent, and 2 gm^{-3} thereafter
Temperature	Not greater than 25°C
Total residual chlorine	Concentration not greater than 0.2 gm^{-3}

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

8. The consent holder shall maintain the existing 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. 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 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 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	14 February 2014
Commencement Date:	14 February 2014

Conditions of Consent

Consent Granted:	To discharge stormwater, back flushing from the sand filters and intermittent discharges of treated water from a reservoir, from the Whareroa milk processing site into an unnamed tributary of the Tawhiti Stream
Expiry Date:	1 June 2028
Review Date(s):	June 2016, June 2022
Site Location:	89 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 (Discharge source) Pt Lot 2 DP 15204 Blk X Hawera SD (Discharge site)
Grid Reference (NZTM)	1711919E-5615318N
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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

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 stormwater discharged shall be from a catchment area not exceeding 13 hectares.

3. Before 31 August 2014, the consent holder shall prepare and maintain a contingency plan that details measures and procedures to be undertaken to prevent spillage or any discharge of contaminants not authorised by this consent. The contingency plan shall be followed in the event of a spill or unauthorised discharge and shall be certified by the Chief Executive, Taranaki Regional Council as being adequate to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

4. Before 31 August 2014, the consent holder shall prepare and maintain a stormwater management plan that documents how the site is to be managed to minimise the contaminants that become entrained in the stormwater. This plan shall be followed at all times, shall be certified by the Chief Executive, Taranaki Regional Council, and shall include but not necessarily be limited to:

   a) cleaning procedures for the site catchments discharging to the Northern Pond; and
   b) details of maintenance and cleaning programmes to remove the accumulated sediment from the ponds.

   A Stormwater Management Plan template is available in the Environment section of the Taranaki Regional Council's web site www.trc.govt.nz.

5. After allowing for reasonable mixing, within a mixing zone extending 10 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 emissions of objectionable odour;
   d. the rendering of fresh water unsuitable for consumption by farm animals; and
   e. any significant adverse effects on aquatic life, habitats or ecology.

6. There shall be no visible bacterial and/or fungal growths downstream of the discharge.

7. Constituents of the discharge shall meet the standards shown in the following table for eight of ten consecutive samples taken at least two weeks apart over the course of an annual monitoring period:

Constituent	Standard
Oil and grease	Concentration not greater than 5 gm^{-3}
pH	Within the range 6.0 to 9.0
Suspended solids	Concentration not greater than 30 gm^{-3}
BOD	Concentration not greater than 10 gm^{-3}
Filtered carbonaceous BOD	Concentration not greater than 2 gm^{-3}
Temperature	Not greater than 25°C
Total residual chlorine	Concentration not greater than 0.2 gm^{-3}

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

8. 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 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 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date (Change):	24 July 2018
Commencement Date (Change):	24 July 2018 (Granted Date: 2 August 2017)

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the manufacture and processing of milk products and associated processes
Expiry Date:	1 June 2025
Review Date(s):	June 2020
Site Location:	Whareroa Road, Hawera
Grid Reference (NZTM)	1711450E-5614870N (Powder 3) 1711600E-5614624N (DAF plant)

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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

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 16.

3. Prior to undertaking any alterations to the plant, processes or operations, as specified in the information provided in support of the original application for this consent, and with any subsequent application to change consent conditions 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-2, Powder-3, Powder-4, Powder-5, Casein-1 and Casein-2, together with other milk processing facility and supporting utility services (including the dissolved air floatation plant), as described in the information provided in support of the original application for this consent, and with any subsequent application to change consent conditions. Where there is conflict between applications the later application shall prevail, and where there is conflict between an application and consent conditions the conditions shall prevail.

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. Subject to condition 8, 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. Powder emissions to the atmosphere from the Powder-3 cyclone exhausts shall not exceed 150 milligrams per cubic metre (mg/m^3) of gas flow, adjusted to 0 degrees Celsius, 1 atmosphere pressure, and dry gas basis.

9. 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).

10. 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.

11. 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.

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. 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.

14. 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.

15. The Taranaki Regional Council shall, within six (6) months of notice under condition 14, 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.

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 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 24 July 2018

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date (Change):	12 January 2016
Commencement Date (Change):	12 January 2016 (Granted Date: 14 February 2014)

Conditions of Consent

Consent Granted:	To discharge stormwater, backwash and treated process water from the Whareroa milk processing site and the Water Treatment Plant into Unnamed Stream 18
Expiry Date:	1 June 2028
Review Date(s):	June 2016, June 2022
Site Location:	89 Whareroa Road, Hawera
Legal Description:	Lot 2 DP 2777 Blk X Hawera SD (Discharge source) Lot 1 DP 18056 Blk X Hawera SD (Discharge site)
Grid Reference (NZTM)	1711420E-5614456N
Catchment:	Tangahoe
Tributary:	Unnamed Stream 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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

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 storm water, backwash and treated process water discharged shall be from a catchment area not exceeding 22 hectares.

3. Before 31 August 2014, the consent holder shall prepare and maintain a contingency plan that details measures and procedures to be undertaken to prevent spillage or any discharge of contaminants not authorised by this consent. The contingency plan shall be followed in the event of a spill or unauthorised discharge and shall be certified by the Chief Executive, Taranaki Regional Council as being adequate to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

4. Before 31 August 2014, the consent holder shall prepare and maintain a stormwater management plan that documents how the site is to be managed to minimise the contaminants that become entrained in the stormwater. This plan shall be followed at all times, shall be certified by the Chief Executive, Taranaki Regional Council, and shall include but not necessarily be limited to:

   a) cleaning procedures for the site catchments discharging to the Western Pond; and
   b) details of maintenance and cleaning programmes to remove the accumulated sediment from the ponds.

   A Stormwater Management Plan template is available in the Environment section of the Taranaki Regional Council's web site www.trc.govt.nz.

5. Prior to commissioning the Water Treatment Plant, the consent holder shall update and maintain the stormwater management plan required under condition 4 that documents how the site is to be managed to minimise the additional contaminants that became entrained in the stormwater. This plan shall be followed at all time, shall be certified by the Chief Executive, Taranaki Regional Council, and shall include but not necessarily be limited to cleaning procedures for the site catchments discharging to the Pond.

6. After allowing for reasonable mixing, within a mixing zone extending 10 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 emissions of objectionable odour;
   d. the rendering of fresh water unsuitable for consumption by farm animals; and
   e. any significant adverse effects on aquatic life, habitats or ecology.

7. There shall be no visible bacterial and/or fungal growths downstream of the discharge.

8. Constituents of the discharge shall meet the standards shown in the following table for eight of ten consecutive samples taken at least two weeks apart over the course of an annual monitoring period:

Constituent	Standard
Oil and grease	Concentration not greater than 5 gm^{-3}
pH	Within the range 6.0 to 9.0
Suspended solids	Concentration not greater than 100 gm^{-3}
BOD	Concentration not greater than 15 gm^{-3} for the first two years following the date of issue of this consent, and 10 gm^{-3} thereafter
Filtered carbonaceous BOD	Concentration not greater than 3.5 gm^{-3} for the first two years following the date of issue of this consent, and 2 gm^{-3} thereafter
Temperature	Not greater than 25ºC
Total residual chlorine	Concentration not greater than 0.2 gm^{-3}

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

9. The consent holder shall maintain the existing 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.

10. 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 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 12 January 2016

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	3 February 2004
Commencement Date:	3 February 2004

Conditions of Consent

Consent Granted:	To discharge laboratory wastes onto and into land
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
Grid Reference (NZTM)	1711450E-5613270N
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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	17 October 2017
Commencement Date:	8 November 2017

Conditions of Consent

Consent Granted:	To discharge river silt and sand from mechanical pre-filtering of river water during abstraction of water, by returning it into the Tawhiti Stream
Expiry Date:	1 June 2052
Review Date(s):	June 2018 and at 3-yearly intervals thereafter
Site Location:	Main South Road, Hawera
Grid Reference (NZTM)	1712861E-5616233N
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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. After allowing for reasonable mixing within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not give rise to all or any of the following effects in the receiving water of the Tawhiti Stream:

   (a) the production of any conspicuous oil or grease films, scums or foams, or
   (b) floatable or suspended materials;
   (c) any conspicuous change in the colour or visual clarity;
   (d) any emission of objectionable odour;
   (e) the rendering of fresh water unsuitable for consumption by farm animals;
   (f) any significant adverse effects on aquatic life, habitats, or ecology;
   (g) an increase in turbidity of more than 50% (as determined using NTU - nephelometric turbidity units).

2. Within 6 months of the commencement date of this consent, the consent holder shall ensure a Monitoring Plan is prepared (the "Monitoring Plan"). The purpose of the Monitoring Plan is to identify the techniques, methods and procedures that will be employed to acquire data in relation to, and monitor compliance, with:

   (a) the conditions of this consent; and
   (b) the effects of the discharge authorised by this consent on:
      (i) instream habitat values, water quality and macroinvertebrate communities within the Tawhiti Stream; and
      (ii) native fish populations within the Tawhiti Stream.

   Advice Note:
   The Taranaki Regional Council assumes responsibility for the preparation and implementation of the Monitoring Plan for annual compliance purposes.

3. At all times, the consent holder shall implement and comply with those aspects of the Monitoring Plan for which the consent holder is responsible (as detailed in the Monitoring Plan).

4. 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 2018 and at 3-yearly intervals thereafter for the 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 17 October 2017

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date (Change):	19 December 2012
Commencement Date (Change):	19 December 2012 (Granted Date: 03 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
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)
Grid Reference (NZTM)	1711451E-5613271N
Catchment:	Unnamed catchment 18

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. 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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	3 February 2004
Commencement 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
Expiry Date:	1 June 2022
Review Date(s):	June 2016
Site Location:	Rifle Range Road, Hawera
Legal Description:	Lot 13 DP 2625 Blks IX & X Hawera SD
Grid Reference (NZTM)	1711450E-5613270N

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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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

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

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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 Limited PO Box 444 Hawera 4640
Decision Date:	17 October 2017
Commencement Date:	8 November 2017

Conditions of Consent

Consent Granted:	To discharge river silt and sand from mechanical pre-filtering of river water during abstraction of water, by returning it into the Tangahoe River
Expiry Date:	1 June 2052
Review Date(s):	June 2018 and at 3-yearly intervals thereafter
Site Location:	135 Hicks Road, Hawera
Grid Reference (NZTM)	1715769E-5612503N
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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. After allowing for reasonable mixing within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not give rise to all or any of the following effects in the receiving water of the Tangahoe River:

   (a) the production of any conspicuous oil or grease films, scums or foams, or
   (b) floatable or suspended materials;
   (c) any conspicuous change in the colour or visual clarity;
   (d) any emission of objectionable odour;
   (e) the rendering of fresh water unsuitable for consumption by farm animals;
   (f) any significant adverse effects on aquatic life, habitats, or ecology;
   (g) an increase in turbidity of more than 50% (as determined using NTU - nephelometric turbidity units).

2. Within 6 months of the commencement date of this consent, the consent holder shall ensure a Monitoring Plan is prepared (the "Monitoring Plan"). The purpose of the Monitoring Plan is to identify the techniques, methods and procedures that will be employed to acquire data in relation to, and monitor compliance, with:

   (a) the conditions of this consent; and
   (b) the effects of the discharge authorised by this consent on:
      (i) instream habitat values, water quality and macroinvertebrate communities within the Tangahoe River; and
      (ii) native fish populations within the Tangahoe River.

   Advice Note:
   The Taranaki Regional Council assumes responsibility for the preparation and implementation of the Monitoring Plan for annual compliance purposes.

3. At all times, the consent holder shall implement and comply with those aspects of the Monitoring Plan for which the consent holder is responsible (as detailed in the Monitoring Plan).

4. 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 2018 and at 3-yearly intervals thereafter for the 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 17 October 2017

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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

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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 Limited PO Box 444 Hawera 4640	
Decision Date (Change):	9 June 2015	
Commencement Date (Change):	9 June 2015	(Granted: 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
Expiry Date:	1 June 2034
Review Date(s):	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
Grid Reference (NZTM)	1711850E-5615170N

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 1 June 2034, 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 9 June 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640	
Decision Date (Change):	23 October 2018	
Commencement Date (Change):	23 October 2018	(Granted Date: 4 October 2006)

Conditions of Consent

Consent Granted:	To discharge emissions into the air from 'Cogen-I' and 'Cogen-II' co-generation energy generating plants with an energy output of 70 MW together with associated processes
Expiry Date:	1 June 2025
Review Date(s):	June 2020
Site Location:	Whareroa Road, Hawera
Grid Reference (NZTM)	1711450E-5614870N

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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

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 19.

3. Prior to undertaking any alterations to the plant, processes or operations, as specified in the original application and any subsequent applications to change consent conditions which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, 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, 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 considers should be included.

5. The boilers shall only be heated using natural gas, except that diesel may be used in the following circumstances:
   a) for temporary emergency heat/steam supply in the event of natural gas supply interruption; and
   b) for short duration testing purposes.

6. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing on each occasion that diesel combustion is used in the co-generation plants. The notification shall include the date and duration of the activity, the reason for the use of diesel, and shall be emailed to worknotification@trc.govt.nz.

7. Diesel combusted in the boilers shall comply with Schedule 2 of the Engine Fuel Specifications regulations 2011, or subsequent amendments.

8. The consent holder shall control all emissions 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 125 micrograms per cubic metre (twenty-four hour average exposure) at or beyond the boundary of the site.

9. 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.

10. The sum of all discharges to the atmosphere of nitrogen oxides from the cogeneration plant shall not exceed 48 grams per second (g/s).

11. 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.

12. 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.

13. 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).

14. 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.

15. 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.

16. 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.

17. Notwithstanding conditions 1 and 15 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.

18. 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.

19. 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, 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 23 October 2018

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	31 March 2009
Commencement Date:	31 March 2009

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the combustion of waste wood packaging
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
Grid Reference (NZTM)	1711447E-5613278N

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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	25 July 2013
Commencement Date:	25 July 2013

Conditions of Consent

Consent Granted:	To discharge contaminants (dust) to air from earthworks associated with construction activities
Expiry Date:	1 June 2018
Site Location:	84 Whareroa Road, Hawera
Legal Description:	Lot 1 DP 19882 (Discharge source & site)
Grid Reference (NZTM)	1711183E-5615361N

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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The consent holder shall prepare a dust control management plan that details the methodology that will be used to ensure that discharges to air comply with the conditions of this consent, in particular special conditions 3, 6 and 7. The plan shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, at least 10 working days prior to earthworks commencing.

2. The consent holder shall at all times adhere to the dust control management plan, approved under condition 1 of this consent

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.

4. The area of soil exposed on the site at any time shall not exceed 15.15 ha.

5. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least seven days prior to the exercise of this consent. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.

6. The dust deposition rate beyond the property boundary arising from the discharge shall be less than 4.0 g/m^2/30 days or 0.13 g/m^2/day.

7. Any discharge to air from the site shall not give rise to any offensive, objectionable, noxious or toxic levels of dust at or beyond the boundary of the property, and in any case, suspended particulate matter shall not exceed 3 mg/m^3 (measured under ambient conditions) beyond the boundary of the site.

8. The consent holder shall maintain a permanent record of any complaints received alleging adverse effects from or related to the exercise of this consent. This record shall include the following, where practicable:

    a) the name and address of the complainant, if supplied;
    b) date, time and details of the alleged event;
    c) weather conditions at the time of the alleged event (as far as practicable);
    d) investigations undertaken by the permit holder in regards to the complaint and any measures adopted to remedy the effects of the incident/complaint; and
    e) measures put in place to prevent occurrence of a similar incident.

9. The consent holder shall notify the Chief Executive, Taranaki Regional Council, or his delegate, of any complaints received, which relate to the exercise of this permit, within 24 hours of being received. At the grant date of this consent, the Council's phone number is 0800 736 222 (24 hr service).

10. The consent holder shall make the complaints record available to officers of Taranaki Regional Council, on request.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	25 July 2013
Commencement Date:	25 July 2013

Conditions of Consent

Consent Granted:	To discharge stormwater and sediment from earthworks onto and into land in circumstances where it may enter water
Expiry Date:	1 June 2018
Site Location:	84 Whareroa Road, Hawera
Legal Description:	Lot 1 DP 19882 (Discharge source & site)
Grid Reference (NZTM)	1711183E-5615361N
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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. This consent authorises the discharge of stormwater from (no more than 15.15 hectares of land where earthworks is being undertaken for the purpose of constructing the expansion of the Whareroa Distribution Centre at the Fonterra facility, as shown in the drawings provided with the application for this consent.

2. At least 7 working days prior to the commencement of works the consent holder shall notify the Taranaki Regional Council of the proposed start date for the work. Notification shall include the consent number and a brief description of the activity consented and shall be emailed to worknotification@trc.govt.nz.

3. All run off from any area of exposed soil shall pass through settlement ponds or sediment traps with a minimum total capacity of:

   a) 100 cubic metres for every hectare of exposed soil between 1 November to 30 April; and

   b) 200 cubic metres for every hectare of exposed soil between 1 May to 31 October;

   unless other sediment control measures that achieve an equivalent standard are agreed to by the Chief Executive of the Taranaki Regional Council.

4. All earthwork areas shall be stabilised vegetatively or otherwise as soon as is practicable and no longer than 6 months after completion of soil disturbance activities.

5. The obligation described in condition 3 above shall cease to apply, and accordingly the erosion and sediment control measures may be removed, in respect of any particular area only when the site is stabilised.

   Note: For the purpose of conditions 3 and 5 'stabilised' in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council and as specified in the Taranaki Regional Council's Guidelines for Earthworks in the Taranaki Region, 2006. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by an officer of the Taranaki Regional Council, an 80% vegetative cover has been established.

6. 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 actual or likely adverse effect on the environment associated with the discharge of contaminants from the site.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	03 June 2014
Commencement Date:	03 June 2014

Conditions of Consent

Consent Granted:	To discharge dairy liquids onto land and the associated emissions to air, in various locations throughout the Taranaki region
Expiry Date:	01 June 2034
Review Date(s):	June 2017, June 2020, June 2023, June 2026, June 2029, June 2032
Site Location:	Various locations throughout the Taranaki region
Legal Description:	Various locations throughout the Taranaki region
Grid Reference (NZTM)	Various locations throughout the Taranaki region
Catchment:	Various locations throughout the Taranaki region

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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The dairy liquids to be discharged shall be limited to the following:

   (a) ***Dairy by-products***, which typically include, but are not limited to biomass or biosolids (drawn off from biological treatment plants); unused intermediate product of residue streams (such as stockfood and whey) and dissolved air flotation (DAF) sludge (fat and protein skimmed off liquid streams);

   (b) ***Unprocessable dairy products***, which typically include, but are not limited to silo and tank sediments; raw milk not accepted at the manufacturing site and other dairy products either contaminated or unfit for further processing; and

   (c) ***Surplus dairy products***, such as raw milk, permeate (PM18 and PM30) and buttermilk (including secondary skim and beta serum) that the consent holder is unable to process.

2. The exercise of this consent shall be in accordance with a Dairy Liquids Spreading Management Plan (DLSMP), prepared by the consent holder and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The DLSMP shall detail how the discharge activity will be managed to achieve compliance with the conditions of this consent and shall include, but not limited to, the following:

   (a) storage of dairy liquids;
   (b) designated application areas and buffer zones for streams and property boundaries;
   (c) selection of appropriate irrigation methods for different types of terrain;
   (d) application rate and duration;
   (e) application frequency and nitrogen loading rate;
   (f) farm management and operator training;
   (g) soil and herbage management;
   (h) prevention of runoff and ponding;
   (i) minimisation and control of odour and spray drift effects off site;
   (j) operational control and maintenance of the spray irrigation system;
   (k) monitoring of the effluent (physicochemical);
   (l) recording of application sites, discharge volumes, rates, frequency, duration, dates and equipment operator details;
   (m) remediation measures;
   (n) mitigation measures including screening of any storage facilities and riparian planting;
   (o) reporting monitoring data;
   (p) procedures for responding to complaints; and
   (q) notification to the Taranaki Regional Council of non-compliance with conditions of this consent.

3. Before July 15 each year, the consent holder shall notify the Taranaki Regional Council, by sending an email to worknotification@trc.govt.nz of the intent to discharge dairy liquids to land, including details of the locations and Farm IDs onto which the discharges will occur (as shown in the register). If dairy liquids are subsequently intended to be discharged onto any other land in that season, the consent holder shall notify the Taranaki Regional Council of that intention at least 2 working days in advance of such discharge occurring.

4. The discharge shall not result in any liquids ponding for more than 30 minutes.

5. The discharge shall not result in any liquids reaching surface water, any subsurface drainage system or any adjacent property.

6. 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.

7. There shall be no spray drift as a result of the irrigation of dairy liquids at or beyond the boundary of the property or properties on which spray irrigation is occurring.

8. The dairy liquids for discharge shall not have a sodium adsorption ratio (SAR) exceeding 15.

9. The nitrogen loading rate on land irrigated with dairy liquids, as a consequence of:

   (a) the exercise of this consent; and/or
   (b) the disposal of dairy farm effluent; and/or
   (c) the disposal of any other waste or fertilizer;

   shall not exceed a combined total of:

   (d) 200 kilograms of nitrogen per hectare per year on land used for grazing; or
   (e) 300 kilograms of nitrogen per hectare per year where a crop such as maize, silage or hay is harvested from the land in the same season that dairy liquids are applied.

10. The discharge shall not occur within the following minimum buffer distances:

    (a) 25 metres from the banks of any watercourse;
    (b) 20 metres from any public road;
    (c) 20 metres from any property boundary, unless the written approval of the adjoining occupier has been obtained to allow the discharge at a lesser distance;
    (d) 50 metres from any bore, well or spring used for water supply purposes;
    (e) 150 metres from any dwelling house or place of public assembly unless the written approval of the occupier has been obtained to allow the discharge at a lesser distance; and
    (f) 300 metres from any school property.

11. There shall be no discharge within, adjacent to or directly impacting on any Statutory Acknowledgment Area.

12. There shall be no offensive or objectionable odour at or beyond the boundary of the property or properties on which a discharge occurs.

13. The consent holder shall notify the Taranaki Regional Council as soon as practicable and, as a minimum, within 48 hours, of any accidental discharge, equipment breakdown or other event which is likely to result in a breach of the conditions of this consent.

14. The consent holder shall maintain a complaints register for all aspects of the dairy liquids application activity. The register shall detail the date, time and type of complaint, cause of the complaint and action taken by the consent holder in response to the complaint. The register shall be available to the Taranaki Regional Council at all reasonable times. The consent holder shall forward a copy of each complaint received regarding odour, runoff or spray drift to the Taranaki Regional Council as soon as practicable but in any event within 48 hours of the complaint being made.

15. If, as a consequence of the activities authorised by these consents, an event occurs that may have a significant adverse effect on water quality at any registered drinking-water supply abstraction point, the consent holder shall, as soon as reasonably practicable, telephone the Taranaki Regional Council and the water supply operator and notify them of the event.

16. The consent holder shall keep a record of the application sites for the discharge of dairy liquids, including , but not limited to the following information:

    (a) Type/characteristics of dairy liquids discharged;
    (b) Date of discharge;
    (c) Time/ duration of discharge;
    (d) Volume and rate of discharge;
    (e) Method of discharge;
    (f) Name of equipment operator; and
    (g) Location of the nearest watercourse, bore, property boundary; dwelling house; school, community halls, marae, and public road.

    This record shall be kept and made available to the Chief Executive, Taranaki Regional Council, on request.

17. The following details of all farms used for dairy liquids spreading shall be recorded in a Farm Register, which shall be submitted to the Taranaki Regional Council:

    (a) Name of the farm/property;
    (b) Owner of the property;
    (c) Physical address, Legal description and NZTopo50 map reference;
    (d) Area available for irrigation (ha);
    (e) General soil type, if known;
    (f) Distance to any sensitive neighbours if closer than 300 metres from the farm, e.g. schools, community halls, marae.

    Any new farms that become available for dairy liquids spreading shall be added the Farm Register, and the updated Register shall be provided to the Taranaki Regional Council.

18. This consent shall lapse on 30 June 2019, unless the consent is given effect to before the end of that period, of the Taranaki Regonal Council fixes a longer period pursuant to Section 125(1)(b) of the Resource Management Plan 1991.

19. 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 2017 and/or June 2020, and/or June 2023, and/or June 2026, and/or June 2029, and/or June 2032 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 03 June 2014

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	03 June 2014
Commencement Date:	03 June 2014

Conditions of Consent

Consent Granted:	To discharge emissions to air after treatment with a biofilter from the storage of dairy liquids in a pond
Expiry Date:	01 June 2034
Review Date(s):	June 2017, June 2020, June 2023, June 2026, June 2029, June 2032
Site Location:	Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 Blks IX & X Hawera SD (Discharge source & site)
Grid Reference (NZTM)	1711450E–5613270N

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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The exercise of this consent shall be in accordance with an Odour Management Plan (OMP), prepared by the consent holder and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The OMP shall detail the methods adopted by the consent holder to ensure compliance with the conditions of this consent and address mitigation measures for odour control.

2. At all times 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 air from the site.

3. There shall be no offensive or objectionable odour at or beyond the boundary of the property or properties on which a discharge occurs.

4. The consent holder shall notify the Taranaki Regional Council as soon as practicable and, as a minimum, within 48 hours, of any accidental discharge, equipment breakdown or other contingency which is likely to result in a breach of the conditions of this consent.

5. The consent holder shall maintain a complaints register for all aspects of the storage of dairy liquids activity. The register shall detail the date, time and type of complaint, cause of the complaint, and action taken by the consent holder in response to the complaint. The register shall be available to the Taranaki Regional Council at all reasonable times. The consent holder shall forward a copy of each complaint received regarding odour to the Taranaki Regional Council as soon as practicable but in any event within 48 hours of the complaint being made.

6. This consent shall lapse on 30 June 2019, unless the consent is given effect to before the end of that period, of the Taranaki Regonal Council fixes a longer period pursuant to Section 125(1)(b) of the Resource Management Plan 1991.

7. 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 2017 and/or June 2020, and/or June 2023, and/or June 2026, and/or June 2029, and/or June 2032 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 03 June 2014

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

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 Limited PO Box 444 Hawera 4640
Decision Date:	03 June 2014
Commencement Date:	03 June 2014

Conditions of Consent

Consent Granted:	To discharge stormwater and sediment from earthworks associated with the construction of a storage pond, into land in circumstances where it may enter Unnamed Stream 17
Expiry Date:	01 June 2019
Site Location:	Rifle Range Road, Hawera
Legal Description:	Pt Lot 13 DP 2625 Blks IX & X Hawera SD (Discharge source & site)
Grid Reference (NZTM)	1711450E–5613270N
Catchment:	Unnamed catchment 17

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 all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. This consent authorises the discharge of stormwater from soil disturbance involving no more than 12,000 m^3, over no more than 0.3 hectares of land.

2. 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 actual or likely adverse effect on the environment associated with the discharge of contaminants from the site.

3. At least 7 working days prior to the commencement of works the consent holder shall notify the Taranaki Regional Council of the proposed start date for the work. Notification shall include the consent number and a brief description of the activity consented and shall be emailed to worknotification@trc.govt.nz.

4. All run off from any area of exposed soil shall pass through settlement ponds or sediment traps with a minimum total capacity of:

   a) 100 cubic metres for every hectare of exposed soil between 1 November to 30 April; and

   b) 200 cubic metres for every hectare of exposed soil between 1 May to 31 October;

   unless other sediment control measures that achieve an equivalent standard are agreed to by the Chief Executive of the Taranaki Regional Council.

5. Before commencing any earthworks, the consent holder shall ensure that they (or their representatives) meet on site with a Taranaki Regional Council officer who is directly responsible for monitoring compliance with the conditions of this consent. The purpose of the meeting shall be to obtain specific advice from the Taranaki Regional Council about the measures required to ensure compliance with conditions 2 and 4.

6. The sediment control measures necessary to comply with condition 4 above shall be constructed before soil is exposed at the site and shall remain in place, in respect of any particular area, until that area is stabilised.

   Note: For the purpose of conditions 6 and 7, 'stabilised' in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council and as specified in the Taranaki Regional Council's Guidelines for Earthworks in the Taranaki Region, 2006. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by an officer of the Taranaki Regional Council, an 80% vegetative cover has been established.

7. All earthworked areas shall be stabilised vegetatively or otherwise as soon as is practicable and no longer than 6 months after the completion of soil disturbance activities.

Signed at Stratford on 03 June 2014

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

Appendix II

Biomonitoring report

To	Job Manager, Thomas McElroy
From	Environmental Scientist, Katie Blakemore
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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, February 2018

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
3902-3	To discharge stormwater from the Whareroa milk processing site into an unnamed tributary of the Tangahoe River
3907-3	To discharge stormwater, back flushing from the sand filters, and intermittent discharges of treated water from a reservoir, from the Whareroa milk processing industry site into an unnamed tributary of the Tawhiti Stream
4133-3.1	To discharge stormwater, backwash and treated process water from the Whareroa milk processing site and the Water Treatment Plant into Unnamed Stream 18

There are three stormwater catchments covering the Whareroa dairy complex. 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 3907-3). 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 3902-3). This pond system has been in place since May 1996. Treated farm dairy effluent previously was 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). This discharge was diverted to land in March 2015.

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 4133-3.1).

This summer survey was the only one scheduled for the 2017-2018 monitoring period, although a spring biological survey was also carried out. Surveys are conducted annually but due to an oversight no survey was completed for the 2013-2014 monitoring period. Results from previous biological surveys performed in relation to the Whareroa site are discussed in the biomonitoring reports listed in the references.

Methods

This survey was undertaken on 9 February 2018, at two established sites in an unnamed tributary of the Tawhiti Stream (B1 and B2), at three established sites in an unnamed tributary of the Tangahoe Stream (1, 2 and 3) and at one established site in an unnamed coastal stream (S2) (Table 2, Figure 1). All sites are located downstream of stormwater outfalls from the Fonterra Whareroa plant. The discharge point for the treated farm dairy effluent into the unnamed tributary of the Tangahoe River, prior to the diversion of this discharge to land, was located between sites 1 and 2 (Table 2, Figure 1).

The Tawhiti Stream tributary site B1 was relocated further upstream during the spring 2006 survey, closer to the discharge point from Fonterra Whareroa stormwater ponds (TWH000473), as it was thought that this may be a more appropriate 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	Time	Water temp (°C)
Tawhiti Stream tributary	B1	TWH000478	Kick-sampling	0930	16.0
	B2	TWH000479	Vegetation sweep	0850	15.9
Unnamed tributary of the Tangahoe River	1	TNH000470	Vegetation sweep	1115	18.4
	2	TNH000473	Vegetation sweep	1035	17.0
	3	TNH000477	Vegetation sweep	1015	16.4
Unnamed coastal stream	S2	UND001340	Kick-sampling	1130	17.4

The 'vegetation sweep' technique was used to collect streambed macroinvertebrates at sites B2, 1, 2 and 3, while the 'kick-sampling' techniques was used at sites B1 and S2. The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocols C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZWMG) protocols for macroinvertebrate samples in wadeable streams (Stark et al. 2001).

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 based on the abundance categories in Table 3.

Table 3 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	>499

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. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. However, other physical variables such as sedimentation, temperatures, water velocity, and dissolved oxygen levels may also affect the MCI scores because the taxa that are able to tolerate extremes in these variables generally have lower sensitivity scores. More 'sensitive' communities inhabit less polluted waterways. A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki Streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark 2000) is shown in Table 4. A difference of eleven or more MCI units is considered statistically significant (Stark 1998).

Table 4 Macroinvertebrate community health based on MCI ranges adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000)

Grading	MCI
Excellent	>140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

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, so that its corresponding range of values is 20x lower.

The samples were checked for undesirable heterotrophic growths while being processed for macroinvertebrates.

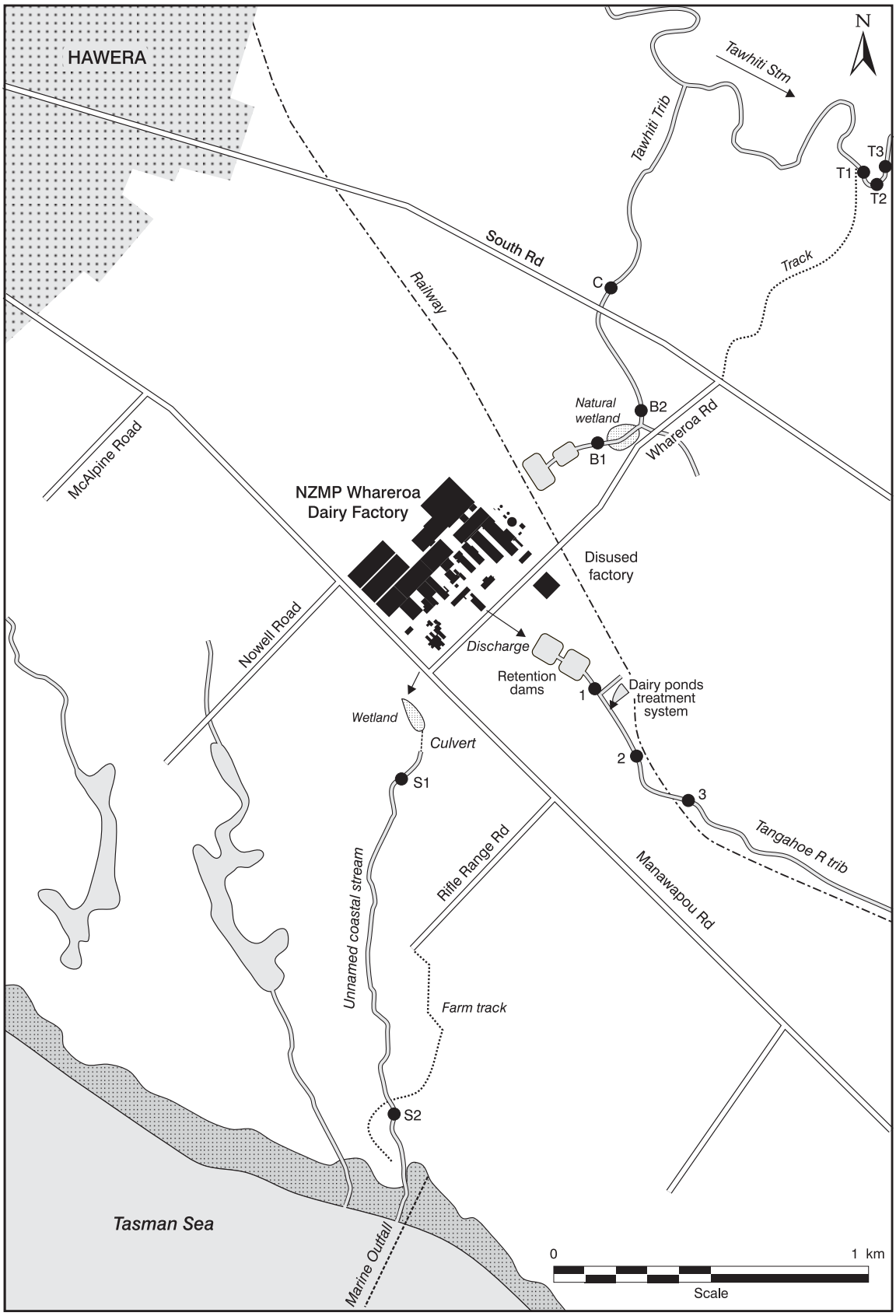

Figure 1 Biomonitoring sites related to the Fonterra Whareroa dairy factory discharges

Results

This February 2018 survey followed a period of 121 days since a fresh of 3x median flow and 154 days since a fresh in excess of 7x median flow.

At the time of this survey, water temperature in the unnamed tributary of the Tawhiti Stream ranged from 15.9 °C – 16.0 °C. There was a clear, uncoloured very low flow, which was steady at site B1 and very slow/still at site B2. Substrate at site B1 was entirely hard clay, while site B2 had a mixture of hard clay, silt, sand, gravels and wood/root. Macrophytes were present on the streambed at site B2, but absent at site B1. Leaves were patchy on the streambed at site B1 and absent at site B2. No periphyton was recorded at either site. Iron oxide was present at site B1, while a silt coating was present at both sites. Overhanging vegetation provided complete shading at site B1 and partial shading at site B2.

In the unnamed tributary of the Tangahoe River, water temperatures ranged from 16.4 °C- 18.4 °C. There was a clear, uncoloured, slow, very low flow at all three sites. Substrate comprised entirely silt at sites 1 and 2, and a mixture of silt, hard clay, sand, fine gravel and wood/root at site 3. Macrophytes were present on the stream margins at sites 1 and on the streambed at sites 2 and 3. Periphyton was not present at any of the three sites. A silt coating was present on the streambed at all three sites, and overhanging vegetation provided partial shading at all three sites.

Site S2 in the unnamed coastal stream was 17.4 °C. A low, steady, clear and uncoloured flow was recorded. Substrate was dominated by sand with some wood/root present also. No periphyton was present at the site, while macrophytes were present on the stream margins and leaves were patchy on the streambed. Undercut banks and overhanging vegetation provided partial shading at this site.

Heterotrophic growths

No undesirable biological growths were observed in any of the three streams at the sampled sites, nor were they found 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 5.

Table 5 Summary of results from previous macroinvertebrate surveys performed 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	45	3-26	15	12	40-83	68	73	34	1.2-4.0	2.7	4.1
B2	44	6-26	18	10	37-83	70	76	35	2.4-4.4	4.1	4.3
1	26	11-27	18	10	65-79	71	60	26	1.7-4.1	2.9	1.1
2	57	5-29	17	10	44-77	67	70	36	1.2-4.9	2.9	4.8
3	47	6-32	19	12	50-93	71	75	35	1.1-5.4	3.3	4.2
S2	34	6-23	17	9	58-95	72	87	25	2.7-5.0	4.0	3.9

Full macroinvertebrate communities recorded in the current survey are presented in Table 6 for sites in the unnamed tributary of the Tawhiti Stream, Table 7 for sites in the unnamed tributary of the Tangahoe River and Table 8 for site S2 in the unnamed coastal stream.

Tawhiti Stream tributary

Table 6 Macroinvertebrate fauna of an unnamed tributary of the Tawhiti Stream in relation to Fonterra Whareroa, sampled on 9 February 2018

Taxa List	Site Number	MCI score	B1	B2
	Site Code		TWH000478	TWH000479
	Sample Number		FWB18051	FWB18052
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	-	R
NEMERTEA	Nemertea	3	R	R
ANNELIDA (WORMS)	Oligochaeta	1	-	C
MOLLUSCA	*Physa*	3	R	-
	Potamopyrgus	4	A	VA
	Sphaeriidae	3	R	-
CRUSTACEA	Ostracoda	1	C	VA
	Paracalliope	5	A	XA
	Phreatogammarus	5	-	A
	Talitridae	5	R	A
TRICHOPTERA (CADDISFLIES)	*Polyplectropus*	6	-	C
	Oxyethira	2	R	-
	Triplectides	5	R	-
DIPTERA (TRUE FLIES)	Hexatomini	5	R	-
	Polypedilum	3	R	-
ACARINA (MITES)	Acarina	5	R	C
		No of taxa	12	10
		MCI	73	76
		SQMCIs	4.1	4.3
		EPT (taxa)	1	1
		%EPT (taxa)	8	10
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa	

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Site B1 (TWH000478)

A moderately low macroinvertebrate community richness of 12 taxa was recorded at this site. This is five taxa fewer than was recorded in the preceding survey and three taxa fewer than the median richness (median richness 15 taxa) for this site (Table 5). The macroinvertebrate community was characterised by only two taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and one 'tolerant' taxon [mud snail (*Potamopyrgus*)] (Table 6).

The MCI score of 73 units indicated 'poor' macroinvertebrate community health (Table 4), which was similar to the previously recorded median for the site (median MCI score 68 units) and to the score recorded in the preceding survey (69 units) (Table 4Table 5). The $SQMCI_S$ score of 4.1 units was significantly higher (Stark 1998) than the previously recorded median $SQMCI_S$ score for this site (median $SQMCI_S$ score 2.7 units) and slightly higher than the score recorded in the preceding survey (3.7 units) (Table 5). This is also the highest $SQMCI_s$ score recorded at this site to date (Table 5).

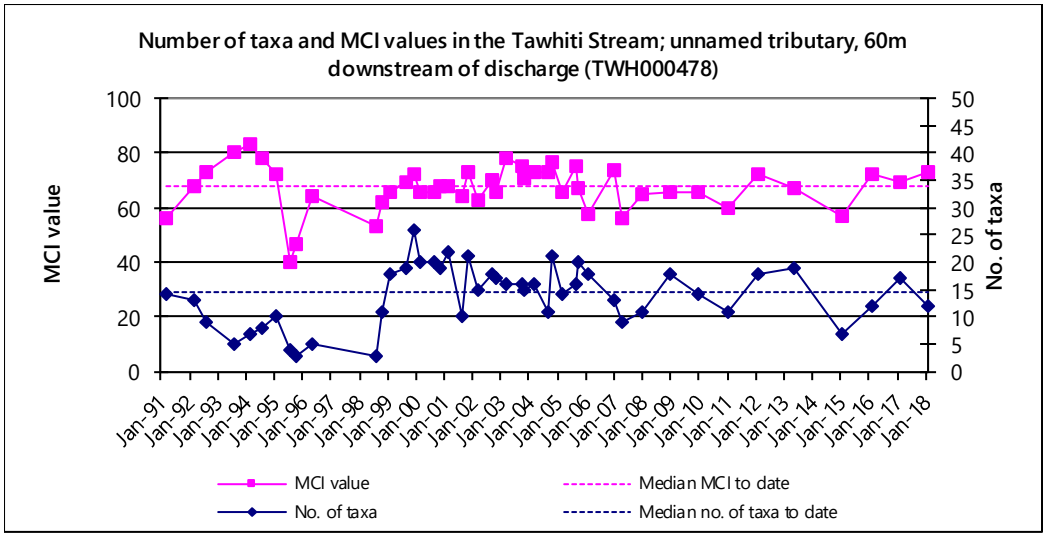

Figure 2 Number of taxa and median MCI values recorded since 1991 at site B1

Site B2 (TWH000479)

A moderately low macroinvertebrate community richness of 10 taxa was recorded at this site, which is five taxa less than was recorded in the preceding survey and eight taxa less than the median richness for this site (median richness 18 taxa) (Table 5, Figure 3). The macroinvertebrate community was characterised by five taxa, three 'moderately sensitive' taxa [amphipods (*Paracalliope*, *Phreatogammarus* and (Talitridae)] and two 'tolerant' taxa [mud snail (*Potamopyrgus*) and seed shrimp (Ostracoda)] (Table 6).

The MCI score of 76 units categorised the site as having 'poor' macroinvertebrate community health (Table 4). This score was not significantly higher (Stark 1998) than the previously recorded median score for this site (median MCI score 70 units) or the score recorded in the preceding survey (69 units) (Table 5, Figure 3). The $SQMCI_S$ score of 4.3 units was similar to the median score for this site (median $SQMCI_S$ score 4.1 units) and to the score recorded in the preceding survey (4.4 units) ((Table 5).

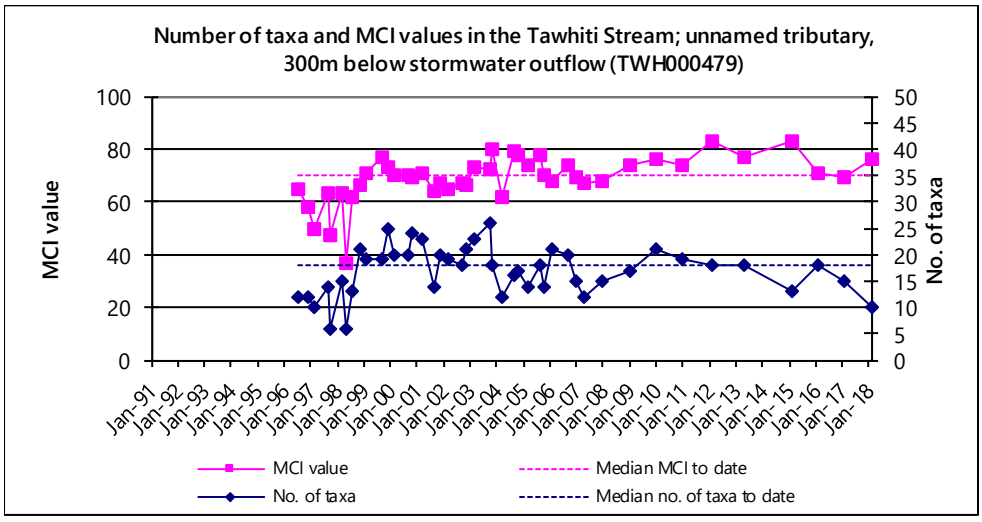

Figure 3 Number of taxa and median MCI values recorded since 1991 at site B2

Tangahoe River tributary

Table 7 Macroinvertebrate fauna of an unnamed tributary of the Tangahoe River in relation to Fonterra Whareroa, sampled on 9 February 2018

Taxa List	Site Number	MCI score	1	2	3
	Site Code		TNH000470	TNH000473	TNH000477
	Sample Number		FWB18053	FWB18054	FWB18055
COELENTERATA	Coelenterata	3	C	-	-
ANNELIDA (WORMS)	Oligochaeta	1	VA	C	A
MOLLUSCA	*Gyraulus*	3	R	R	-
	Physa	3	C	-	-
	Potamopyrgus	4	R	C	A
	Sphaeriidae	3	A	-	-
CRUSTACEA	Ostracoda	1	XA	A	VA
	Paracalliope	5	-	XA	XA
	Paranephrops	5	-	-	R
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Orthopsyche)*	9	-	-	R
	Polyplectropus	6	R	A	R
	Triplectides	5	R	-	-
DIPTERA (TRUE FLIES)	*Zelandotipula*	6	-	R	-
	Chironomus	1	C	R	C
	Polypedilum	3	-	R	R
	Tanypodinae	5	-	C	-
	Paradixa	4	-	-	R
	Empididae	3	-	-	R
	Austrosimulium	3	-	-	R
	No of taxa		10	10	12
	MCI		60	70	75
	SQMCIs		1.1	4.8	4.2
	EPT (taxa)		2	1	2
	%EPT (taxa)		20	10	17
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa		

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Site 1 (TNH000470)

A moderately low taxa richness of 10 taxa was recorded, eight taxa less than the median for this site (median richness 18 taxa) and six taxa less than was recorded in the preceding survey (Table 5, Figure 4). It is the lowest richness recorded at this site to date, by one taxon (Table 5, Figure 4). The macroinvertebrate community was characterised by three 'tolerant' taxa [oligochaete worms, pea clams (Sphaeridae) and seed shrimps (Ostracoda)] (Table 7).

A MCI score of 60 units was recorded, categorising the site as having 'poor' macroinvertebrate community health (Table 4). This score was not significantly different to the score recorded in the preceding survey (69 units), but was significantly lower (Stark 1998) than the median previously recorded score at this site (Table 5, Figure 4). This MCI score was the lowest recorded to date at this site (Table 5). The $SQMCI_S$ score of 1.1 units was significantly lower than the score recorded in the preceding survey (4.1 units) and the median score for this site (2.9 units) (Table 5). This is also the lowest score recorded to date at this site, by 0.6 unit (Table 5). This low score results from the numerical dominance of two very low scoring taxa, oligochaete worms and seed shrimps (both taxa have a MCI tolerance value of 1).

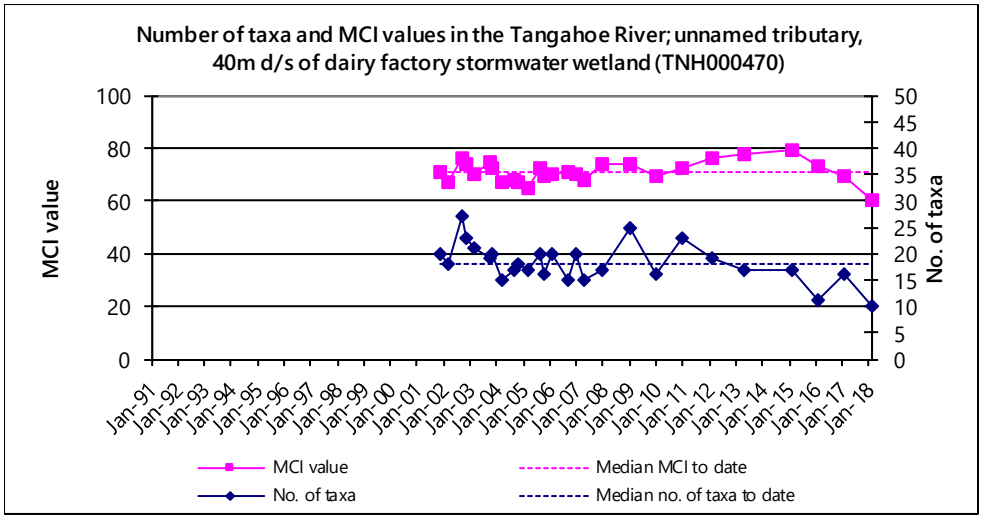

Figure 4 Number of taxa and MCI values recorded since 1991 at site 1

Site 2 (TNH000473)

A moderately low macroinvertebrate community richness of 10 taxa was recorded, which was seven taxa less than the median richness for this site and four taxa less than was recorded in the preceding survey (Table 5, Figure 5). The macroinvertebrate community was characterised by three taxa, two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and caddisfly (*Polyplectropus*)] and one 'tolerant' taxon [seed shrimp (Ostracoda)] (Table 7).

The MCI score of 70 units categorised the site as having 'poor' macroinvertebrate community health (Table 4). This score was a non-significant (Stark 1998) 7 units lower than that recorded in the preceding survey (MCI score 77 units) and three units higher than the median score for this site (median MCI score 67 units) (Table 5, Figure 5). The $SQMCI_S$ score of 4.8 units was similar to the score recorded in the preceding survey (4.4 units but was significantly higher (Stark 1998) than the median score for this site (median $SQMCI_S$ score 2.9 units) (Table 5).

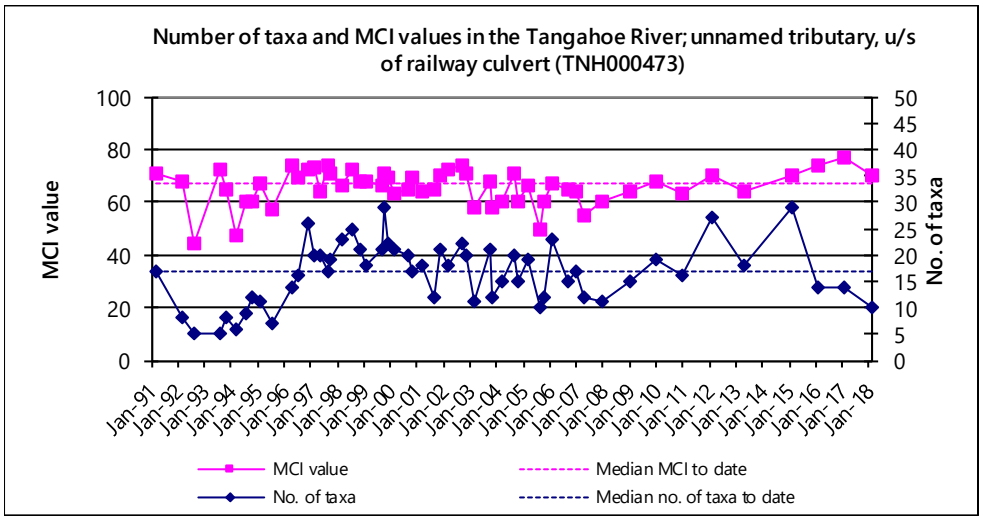

Figure 5 Number of taxa and MCI values recorded since 1991 at site 2

Site 3 (TNH000477)

A moderately low macroinvertebrate community richness of 12 taxa was recorded, seven taxa less than the median for this site and four taxa less than was recorded in the preceding survey (Table 5, Figure 6). The macroivertebrate community was characterised by four taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and three 'tolerant' taxa [oligochaete worms, mud snail (*Potamopyrgus*) and seed shrimp (Ostracoda)] (Table 7).

The MCI score of 75 units categorised the site as having 'poor' macroinvertebrate community health (Table 4). This score was slightly higher than the median score for this site (median MCI score 71 units) but significantly lower (Stark 1998) than the preceding score (93 units) (Table 5, Figure 6). The $SQMCI_S$ score of 4.2 units was significantly higher (Stark 1998) than the median score for this site (median $SQMCI_S$ score 3.3 units) but significantly lower (Stark 1998) than the score recorded in the preceding survey (5.4 units) (Table 5).

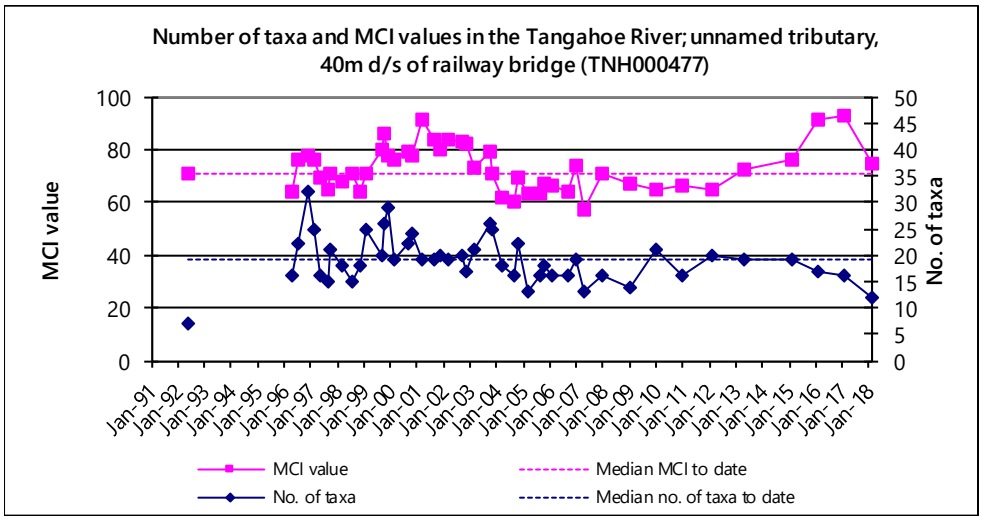

Figure 6 Number of taxa and MCI values recorded since 1991 at site 3

Unnamed coastal stream

Table 8 Macroinvertebrate fauna of an unnamed coastal stream in relation to Fonterra Whareroa, sampled on 9 February 2018

Taxa List	Site Number	MCI score	S2
	Site Code		UND001340
	Sample Number		FWB18056
ANNELIDA (WORMS)	Oligochaeta	1	C
MOLLUSCA	*Potamopyrgus*	4	A
CRUSTACEA	Ostracoda	1	R
	Paracalliope	5	C
	Paranephrops	5	R
EPHEMEROPTERA (MAYFLIES)	*Zephlebia group*	7	R
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Orthopsyche)*	9	R
DIPTERA (TRUE FLIES)	*Paradixa*	4	R
	Austrosimulium	3	R
		No of taxa	9
		MCI	87
		SQMCIs	3.9
		EPT (taxa)	2
		%EPT (taxa)	22
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa	

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Site S2 (UND001340)

A moderately low macroinvertebrate community richness of nine taxa was recorded, eight taxa less than the median richness for this site and five taxa less than was recorded in the preceding survey (Table 5, Figure 7). The macroinvertebrate community was categorised by only one 'tolerant' taxon [mud snail (*Potamopyrgus*)] (Table 8).

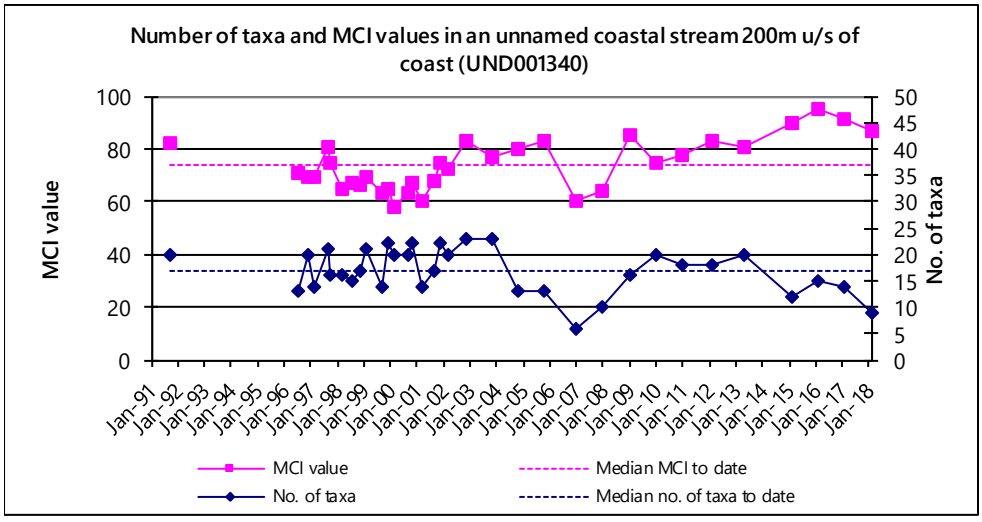

Figure 7 Number of taxa and MCI values recorded since 1991 at site S2

The MCI score of 87 units categorised the site as having 'fair' macroinvertebrate community health (Table 4). This score was significantly higher (Stark 1998) than the median score for this site (median MCI score 72 units) and slightly lower than the score recorded in the preceding survey (93 units) (Table 5, Figure 7). The

$SQMCI_S$ score of 3.9 units was slightly lower than the median score for this site (median $SQMCI_S$ score 4.0 units) and the preceding result (4.6 units) (Table 5).

Discussion and conclusions

Unnamed tributary of the Tawhiti Stream

Results from the 2011 survey indicated the occurrence of an unauthorised wastewater 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 the 2012 and 2013 surveys, the absence of heterotrophic growths (including 'sewage fungus') at both sample sites in the tributary during both surveys suggested that improvements to the stormwater system had been effective in improving the quality of the stormwater discharge into the stream. The current survey also found no heterotrophic growths. The low scoring 'tolerant' *Chironomus* blood worm was found to be very 'abundant' at site B1 in the 2011 survey, probably 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. The absence of this taxon from site B1 in the 2012, 2013 and 2015 surveys, and in the current survey, provides further evidence that current stormwater discharges did not have high levels of organic waste.

Results from the current survey indicated the both sites B1 and B2 had 'poor' macroinvertebrate community health, reflecting the dominance of 'tolerant' taxa in the macroinvertebrate community. Both sites recorded similar results for all three metrics. MCI and $SQMCI_S$ scores had not changed significantly since the preceding (February 2017) survey, although taxa richnesses were 5 taxa lower than the preceding survey at both sites. Taxa richnesses were also substantially lower than historical medians at both sites.

Overall, there was no evidence that discharges into the unnamed tributary of the Tawhiti Stream were causing detrimental impacts on the macroinvertebrate communities at site B1 and site B2.

Unnamed tributary of the Tangahoe River

The macroinvertebrate communities at the three sites in this unnamed tributary of the Tangahoe River showed 'poor' macroinvertebrate community health, reflecting the habitat present at the sites. Taxa richnesses were similar at the three sites, and were lower than the preceding survey and substantially lower than historic medians for each site respectively. The MCI score recorded at site 1 was significantly lower than at site 3, while site 2 was similar to both sites 1 and 3. The score at sites 1 and 2 were similar to those recorded in the preceding survey, while site 3 had decreased significantly since this time. When compared against historic medians, site 1 was significantly lower while sites 2 and 3 were similar. The $SQMCI_S$ scores were similar at sites 2 and 3, with scores significantly higher than their respective medians. Site 1 recorded a significantly lower score than sites 2 and 3, and significantly lower than the historical median for this site. Sites 1 and 3 recorded scores significantly lower than the preceding survey, while site 2 was similar to the preceding survey.

It is notable that site 1 recorded the lowest scores to date for all three metrics in the current survey. This is likely related to habitat conditions, with a very low, slow flow and substrate comprised entirely of silt. The low $SQMCI_S$ score at site 1 is the result of the numerical dominance of the two taxa, oligochaete worms and ostracod seed shrimps, both of which are associated with silt and macrophytes and neither of which were dominant at sites 2 and 3. However, the habitat at this site is similar to that recorded in previous surveys. The MCI score at site 1 has also showed a steady decline over the past four surveys, and the taxa richness has also been lower than the median richness over this time period, by between one and eight taxa. This is

indicative of potential impacts caused by the discharges at site 1. It is therefore recommended that consideration is given to carrying out two full biomonitoring surveys per year in spring and summer, instead of the current spring biological inspection and summer biomonitoring survey.

Unnamed coastal stream

The macroinvertebrate community at site S2 had 'fair' macroinvertebrate community health and moderately low taxa richness. The MCI score of 87 units was slightly lower than recorded in the preceding survey but significantly higher than the median for this site. The community was characterised by only one taxon, which resulted in the $SQMCI_S$ score of 3.9 units, similar to the preceding survey and the historical median for this site. An improvement in the health of the macroinvertebrate community over the past ten 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' method or the 'kick-sampling' method, 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, 2013, 2015 and 2016 surveys suggested an improvement in water quality at these sites since the stormwater upgrade was completed in April 2011. Results from current survey also suggest a continued improvement in preceding water quality at these sites. The $SQMCI_S$ score, similarly to the last four survey results, was markedly higher than the historical median at site B1, and was the highest $SQMCI_S$ score recorded at this site to date. In addition, the $SQMCI_S$ score recorded at site B2 was higher than the historical median for the site.

In the unnamed tributary of the Tangahoe Stream, the macroinvertebrate communities present at the three sites were of 'poor' quality at the time of the current survey. The MCI scores recorded were decreased at site 1 but typical for sites 2 and 3. There were no significant changes in MCI scores between the current survey, previous survey and historic medians at site 2, however site 3 recorded a MCI score significantly (Stark, 1998) lower than the preceding survey for the site, and site 1 recorded a score significantly lower (Stark 1998) than the historical median. In addition, there were substantial improvements in $SQMCI_s$ scores from historical medians at sites 2 and 3, but a substantial decrease at site 1. All three macroinvertebrate metrics recorded their lowest scores to date at site 1, potentially indicating that this site is impacted by the stormwater discharges. Further support is provided by the decline in MCI over the last four surveys.

The results of this survey continued to reflect improvements in the macroinvertebrate community that have been recorded over the past ten 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.

The results of this February 2018 survey of the three small streams around the Fonterra Whareroa factory indicated that stormwater discharges from the factory had not had recent detrimental effects upon the streambed communities in the unnamed tributary of the Tawhiti Stream, or the unnamed coastal stream. However, the results at site 1 indicate this the unnamed tributary of the Tangahoe River may be impacted by these stormwater discharges. It is therefore recommended that consideration is given to carrying out a full biomonitoring survey in spring instead of the current biological inspection.

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Appendix III

Freshwater biological inspection

To	Job Manager, Emily Roberts
From	Scientific Officer, Katie Blakemore
Report	KB026
Document	1947695
Date	13 Oct 2017

Biological inspection of unnamed tributaries of the Tawhiti Stream and Tangahoe River, an an unnamed coastal stream, in relation to discharge of stormwater from the Fonterra Whareroa dairy factory, October 2017

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: 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 2017-2018 monitoring year to monitor the effects of these discharges. This was conducted on 13 October 2017. This is the sixth time that this biological inspection has been undertaken, with the results of previous inspections discussed in reports included in the reference section.

A full biomonitoring survey of these streams is also scheduled during summer for the 2017-2018 monitoring period. 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 small samples which were sorted on site to assess what live invertebrates were present. As the sorts were not performed using magnification, the level of identification was quite low, except for those invertebrates that could be easily identified to a higher taxonomic level e.g. the sandfly *Austrosimulium*. It should also be noted that the survey was carried out following an exceptionally wet winter and early spring period, which is likely to have impacted on the macroinvertebrate communities in these tributaries.

Observations

Tawhiti Tributary

The stream flowing from the stormwater ponds had a high water level, with no clearly defined channel. The water was uncoloured but slightly cloudy. The macroinvertebrate habitat downstream of the stormwater discharge was comprised of macrophytes, with a small amount of woody debris. The substrate of the

stream was predominantly silt, sand and wood and was very easily disturbed. No heterotrophic growths, periphyton, iron oxide or moss was noted at this partially shaded site. An invertebrate sample was collected using the 'vegetation-sweep' method, which was live-sorted on site. The sample contained snails (*Potamopyrgus*), chironomid midge larvae, nematode worm, one cased caddisfly (*Pyncnocentria*) and amphipods. Chironomid midge larvae numerically dominated the sample, with no Chironomus blood worms observed. The presence of species such as oligochaete worms may be an indication of some organic enrichment. However, the presence of the caddisfly (*Pyncocentria*) 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

The Tangahoe tributary near the ponds had a moderate steady flow that was cloudy and uncoloured. The substrate was comprised predominantly of hard clay covered in a fine silt layer. The site was completely shaded by steep-sided banks and dense overhanging grasses. No heterotrophic growths, periphyton, or moss was noted, however there was some iron oxide visible on the streambed. The streambed supported widespread periphyton mats (cyanobacteria) and large patches of short green filamentous algae. Some accumulations of organic foam were noted where overhanging grasses created eddies in the flow. An invertebrate sample was collected using a combination of the 'vegetation-sweep' and 'streambed kick' methods, which was then live-sorted on site. The sample contained amphipods, snails (*Potamopyrgus*) and oligochaete worms. Amphipods were the numerically dominant taxon. The live-sort results indicate a mildly eutrophic stream typical of lowland farmland. Though pollution 'tolerant' oligochaete worms were present in the sample there numbers were low and combined with the lack of heterotrophic growths and chironomid blood worms suggest limited organic enrichment. Overall, these results, including the lack of undesirable heterotrophic growths on the streambed, indicate that 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 aome distance below the stormwater pond. At the time of the inspection, the stream had a moderate, steady flow of clear and uncoloured water. The substrate comprised predominantly fine gravel and coarse gravel with some cobble, silt and sand. Slippery algal mats were recorded growing on the streambed. There were no macrophytes observed, however the channel was covered entirely by overhanging *Carex* grasses. The live sample collected contained an extremely abundant population of mud snails (*Potamopyrgus*). Amphipods were also abundant in this sample. A number of other taxa were also observed, but in reduced abundance, including sandflies (*Austrosimulium*), chironomid midge larvae, oligochaete worms and ostracod seed shrimps. This community is a typical result for this type of habitat. The presence of 'moderately sensitive' taxa, and the lack of any undesirable heterotrophic growths on the streambed, indicates 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

Marine ecological monitoring reports

To	**Science Manager – Hydrology/Biology, Regan Phipps**
From	Scientific Officer, Thomas McElroy and Technical Officer, Angela Smith
Document	2100490
Date	3 August 2018

Fonterra Whareroa/Hawera WWTP Combined Outfall – Marine Ecological Survey Spring 2017-18

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 1000 m 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 5 of consent 1450 and special condition 7 of consent 5079 requires there to be no significant visual, chemical or ecological impacts outside of a 200 m 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. By conducting two surveys a year (one in spring and one in summer) it is possible to capture information on the seasonal variation of the intertidal communities and any possible effects from the outfall. Accordingly, two surveys of the intertidal zone were carried out as part of the 2017-2018 monitoring programme for the combined marine outfall. The 2017-2018 spring survey was conducted at three sites on 5 and 6 December 2017; an intertidal survey could not be carried out at the fourth site due to weather constraints. The results of the spring survey are reported in this memo.

Methods

Of the four sites typically surveyed, three have been identified by NIWA as having shoreline contact with the wastewater discharged from the outfall (Palliser *et al*., 2013): 350 m northwest of the outfall (SEA906049), 200 m southeast of the outfall (SEA906057) and 1.55 km southeast of the outfall on Pukeroa Reef (SEA906067) (Photographs 1-3, Figure 1). The control site at Waihi Reef (Photograph 4, Figure 1), approximately 4.5 km northwest of the outfall (SEA906025), has been identified by NIWA as unlikely to be impacted by the discharged wastewater (Palliser *et al*., 2013).

Photo 1 Surveying the potential impact site 350 m northwest of the outfall (6 December 2017)

Photo 2 Surveying the potential impact site 200 m southeast of the outfall (6 December 2017)

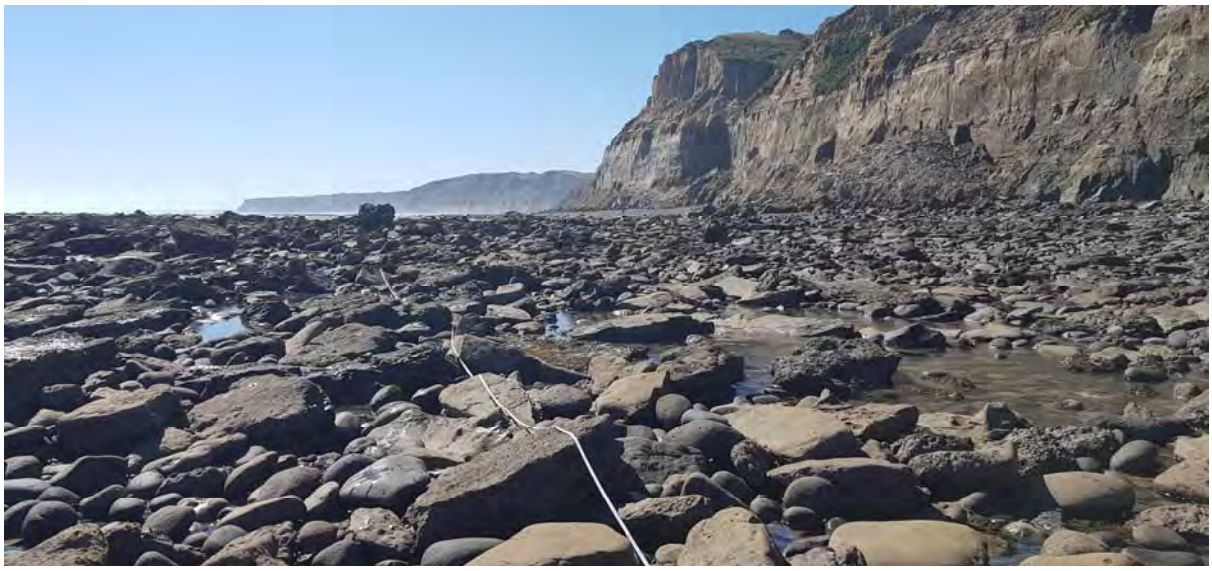

Photo 3 Surveying Pukeroa Reef, a potential impact site (5 December 2017)

Figure 1 Map of sampling sites in relation to the outfall

At each site, a 50 m transect was used to establish five 5 m x 3 m blocks. Within each block, five random 0.25 m^2 quadrats were laid giving a total of 25 random quadrats (Photo 4). 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 3 mm were counted. Under boulder biota was counted where rocks and cobbles were easily overturned.

Photo 4 Survey at the site located 200 m SE of the outfall, showing the transect in use

Results

Summary statistics, including the mean number of species per quadrat and the mean Shannon-Weiner indices, are shown in Table 1. Both the mean number of species and Shannon-Wiener index were highest at the site 350 m NW of the outfall, followed by Pukeroa Reef and the site 200 m SE of the outfall.

Table 1 Mean results for the 2017-2018 spring 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
350 m NW	25	6.32	7.76	14.08	0.63	0.66	0.90
200 m SE	25	1.96	3.96	5.92	0.22	0.31	0.43
Pukeroa Reef	25	2.64	7.56	10.20	0.38	0.722	0.85

Number of species per quadrat

Figure 2 shows the total number of species per quadrat as a box and whisker plot.

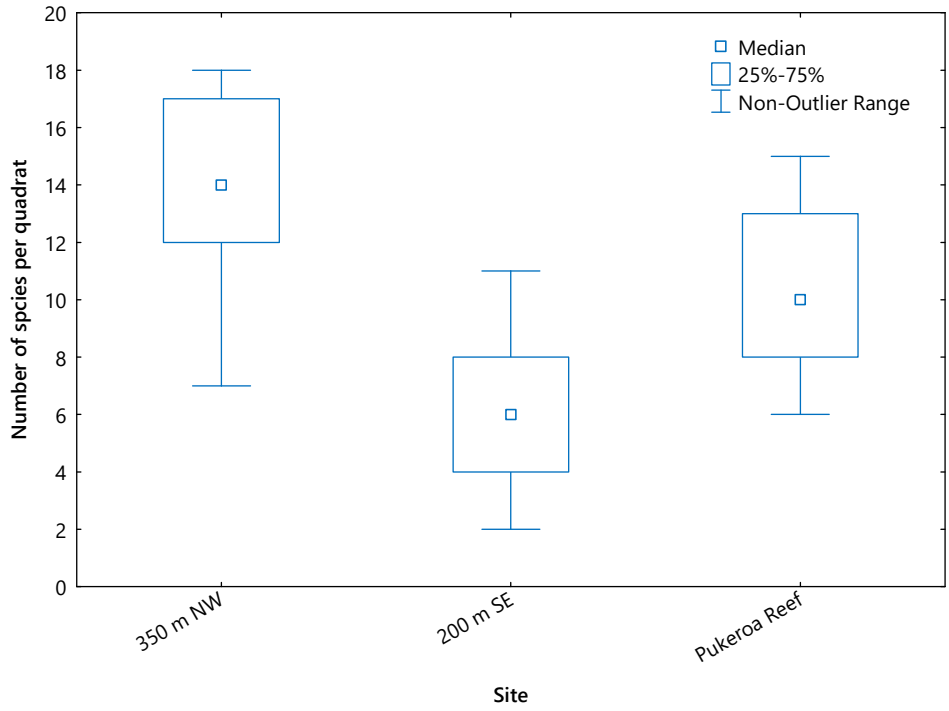

Figure 2 Box and whisker plots of the number of species per quadrat at three sites for the spring 2017-2018 survey

The data obtained from each of the three surveys conformed to the assumption of normality (Lilliefors test, $P > 0.05$), and the boxplots in Figure 2 showed homoscedasticity for the 200 m SE and Pukeroa Reef surveys. However, data from the 350 m NW survey were found to have uneven variance. As both ANOVA assumptions could not be met, the remaining analyses were conducted using the raw data with non-parametric tests.

There was a significant difference in the number of species per quadrat between sites (Kruskal-Wallis, H = 43.95, degrees of freedom (df) = 2, P < 0.001)[1]. Significant differences between sites were determined using the Wilcoxon signed-ranks test, and are presented in Table 2. The total number of species found varied significantly between each site surveyed. The highest mean number of species occurred at the site located 350 m NW of the outfall, followed by Pukeroa Reef and then the site located 200 m SE of the outfall (n = 25, P < 0.05; Figure 2).

Table 2 Wilcoxon signed ranks test with number of species per quadrat

Site	Pukeroa Reef	350 m NW
350 m NW	SIG	
200 m SE	SIG	SIG

Key: SIG = significant difference at 95% confidence level

NS = no significant difference

Shannon-Weiner Diversity Index

Figure 3 shows the distribution of Shannon-Weiner Indices recorded at each site as box and whisker plots.

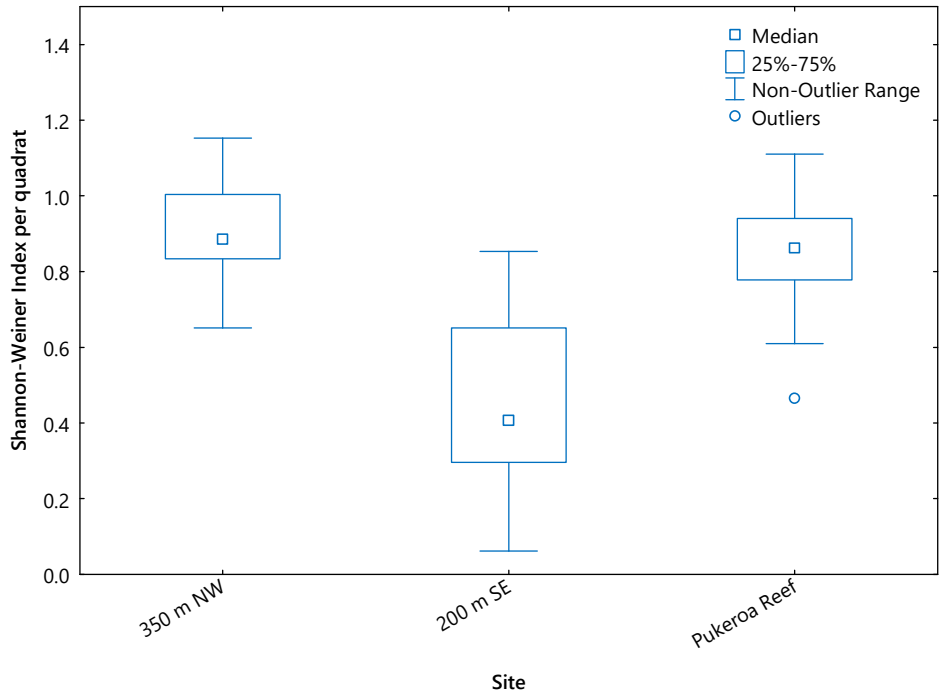

Figure 3 Box and whisker plots of Shannon-Weiner Indices at each site

The data obtained from each of the three surveys was found to be normally distributed (Lilliefors test, n = 25, P > 0.05). The boxplots in Figure 3 showed homoscedasticity across the three surveys. Given that the data was normally distributed and that there was even variance across the surveys, the necessary assumptions for an ANOVA test were met.

[1] The Kruskal-Wallis and Wilcoxon signed ranks tests are both non-parametric tests. This means they are not testing for differences in sample means (or medians) but rather they are testing for differences in the locations of sample distributions.

There was a significant difference in the Shannon-Weiner Indices between sites using ANOVA ($F_{2,72}$ = 53.21, P < 0.001). Significant differences between sites were determined using the Tukey test, and are presented in Table 3. The Shannon-Weiner Indices were significantly lower per quadrat at the site 200 m SE of the outfall than at any of the other sites (n = 25, P < 0.05; Figure 3). There was no significant difference in the Shannon-Weiner Indices between Pukeroa Reef and the site located 350 m NW of the outfall (n = 25, P > 0.05; Figure 3).

Table 3 Tukey test with Shannon-Weiner Indices per quadrat

Site	Pukeroa Reef	350 m NW
350 m NW	NS	
200 m SE	SIG	SIG

Key: SIG = significant difference at 95% confidence level

NS = no significant difference

Sand coverage

The level of sand cover was low at the Pukeroa and 200 m SE sites (Table 4). Sand cover was high at the site located 350 m NW of the outfall. Abundance and diversity of intertidal species/communities can be significantly impacted by sand cover of 30% and higher.

Table 4 Mean percentage sediment cover per quadrat observed during the 2017-2018 spring survey

Site	Mean sand coverage (%)	Mean silt coverage (%)	Total sand, silt and mud coverage (%)
350 m NW	21.80	0.04	21.84
200 m SE	6.36	0.40	6.76
Pukeroa Reef	6.36	0.00	6.36

Trends over time

Species number and diversity

Comparisons of the mean number of species per quadrat (Figure 4) and mean Shannon-Weiner diversity index per quadrat (Figure 5) for all spring surveys undertaken since 1992 are shown below.

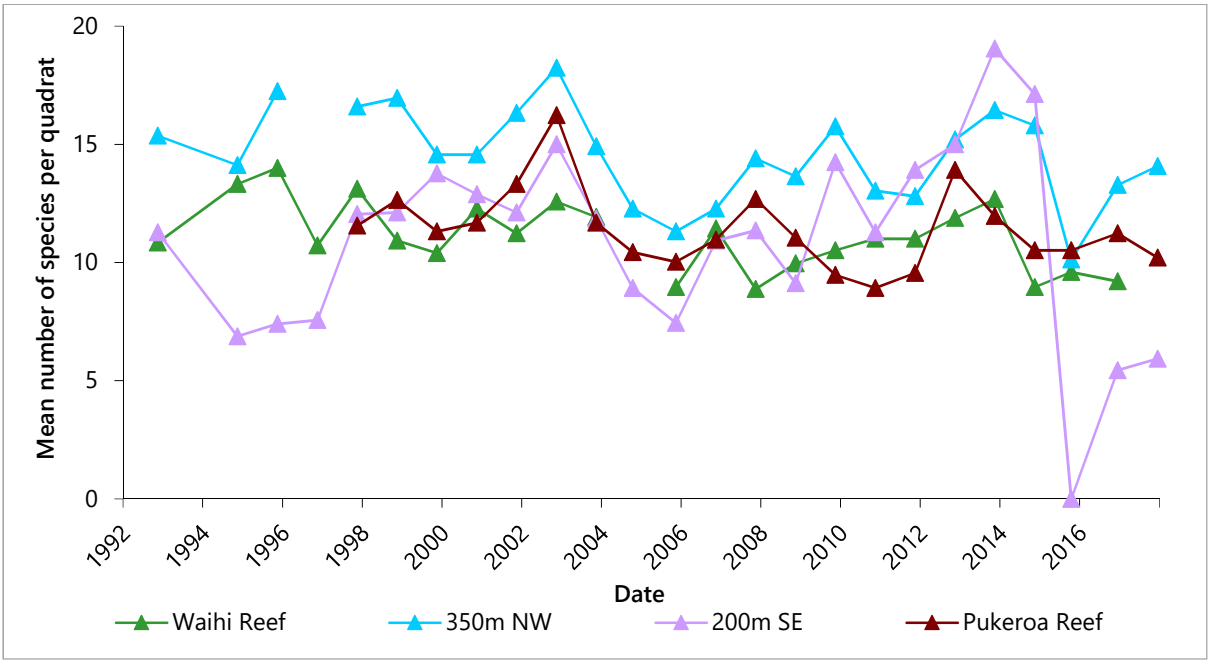

Figure 4 Mean number of species per quadrat for spring surveys 1992-2017

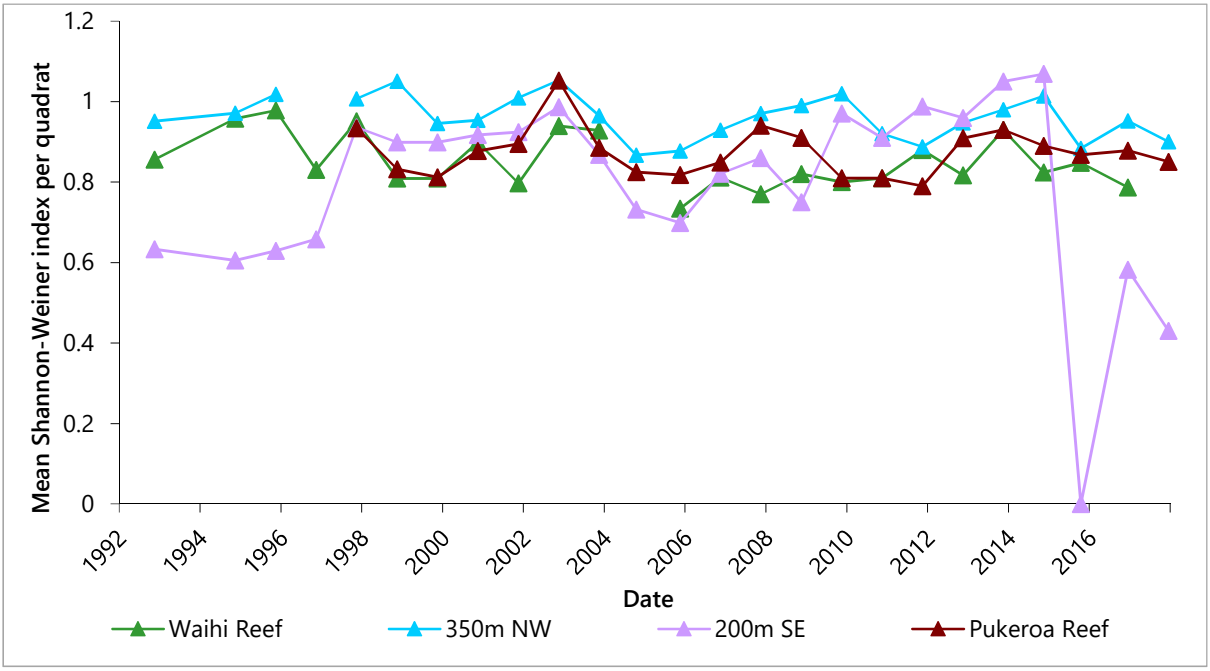

Figure 5 Mean Shannon-Weiner Indices per quadrat for spring surveys 1992-2017

The results from the 2017 spring survey show a small decrease in the mean number of species at Pukeroa Reef and slight increases for the 200 m SE and 350 m NW sites (Figure 4). There was a slight decrease in the mean Shannon-Wiener Index for all sites surveyed, from the previous spring survey (Figure 5).

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 200 m SE were generally lower than at the control site at Waihi Reef (Figures 6 and 7). Since 1997, the survey sites have shown interannual variability in both number of species and Shannon-Weiner Index. However, there has been no noticeable difference in trends between the impact sites and the control site over this period, with the only exceptions being the years with heavy sand inundation (see summer survey memos) or slips (e.g. 2016; Figures 4 and 5).

Sand coverage

Over time, sand cover has generally remained low across the sites (Figure 6). Occasionally, however, the reefs experience events of sand inundation, where coverage increases substantially. Over the past ten years, the sites worst affected by inundation events have been those 200 m SE and 350 m NW of the outfall.

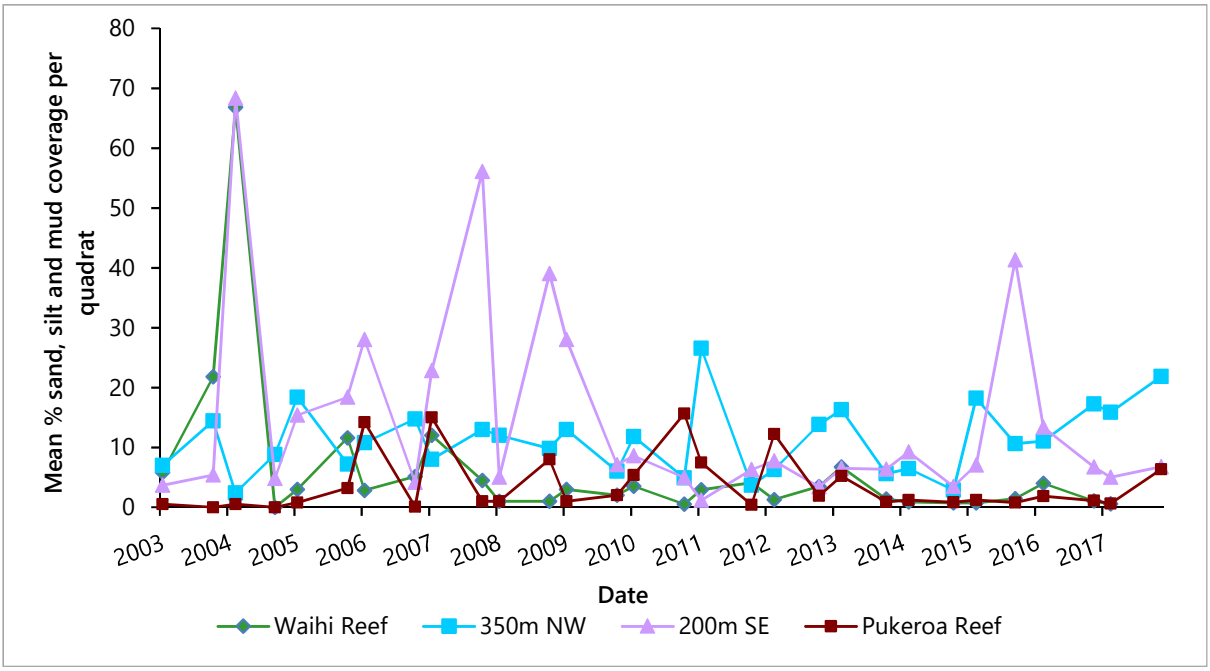

Figure 6 Mean sand cover per quadrat for spring surveys 1992-2017

Discussion

Previous surveys have shown that the dairy factory wastewater discharged through the near-shore outfall prior to 1997 (Photo 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 30 m and 200 m 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 2 km 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.

Photo 5 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 2017 spring survey results (Figures 4 and 5). The mean number of species (species richness) recorded at impact site 200 m SE, which was buried by a slip in the winter of 2015, was slightly higher in 2017 than in 2016; evidence of ongoing recovery. The degree of increase at this site was most likely limited by sand coverage, which was higher than in the previous year. The remaining two impact sites decreased slightly in terms of species richness and the Shannon-Wiener Index (species diversity) compared with the previous survey; this was also most likely due to increased sand coverage. The Council was unable to survey the control site, Waihi Reef, for reasons beyond its control. The impact site 350 m NW of the outfall had the greatest species richness and diversity recorded of all four sites, despite having the highest sand coverage. Long-term results do not indicate any differential trends between the impact sites and control sites regarding species richness or diversity.

Although a slight increase since 2016, the cover of sand, silt and mud was low (<7%) at Pukeroa Reef and the 200 m SE site during the 2017 spring survey. The site 350 m NW of the outfall had a relatively high level of cover (21.84%), which was also an increase since the previous survey. During the survey, it was evident that the slip material had been subjected to ongoing erosion, where the finer material was continually being washed away, leaving the larger rocks and gravels behind on the reef. The moderate cover of sand at

the site 350 m NW of the outfall suggests a degree of resilience on the reef considering the high level of species richness and diversity that was recorded. Long term monitoring of intertidal rocky reefs around the Taranaki coastline has shown that the abundance and diversity of these communities can be adversely affected when sand coverage exceeds 30%. High percentage sand cover (>30%) has previously been recorded at the site 200 m SE (Figure 6).

The historical record of survey results (Figures 4 & 5) show 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 show interannual variability and with no obvious declining trends at the impact sites closest to the outfall relative to the control site. It should be noted that the high-energy receiving environment, combined with the effects of suspended sediments from nearby rivers/streams and eroding cliffs, prevents 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 & 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. (Photo 7) and the absence of filamentous bacterial growths at the 200 m SE site (Figures 7 & 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.

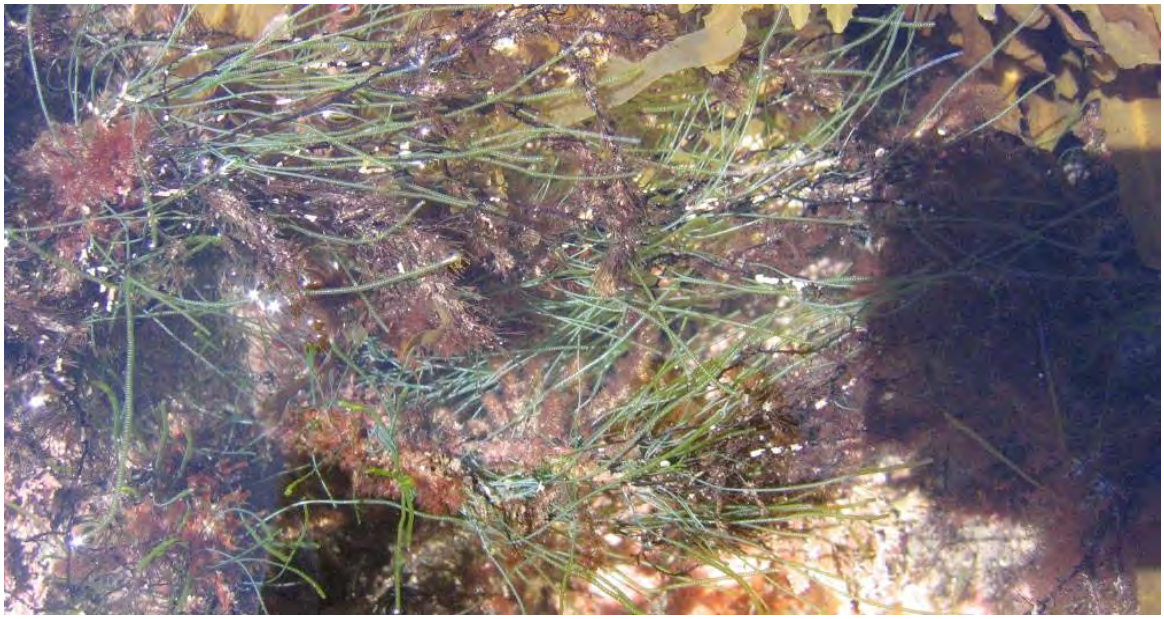

Photo 1 Green filaments of *Chaetamorpha*, an algal genus often associated with high nutrient concentrations (North Taranaki)

The inundation of earth, sand and silt resulting from cliff face erosion can be an important factor affecting species composition and diversity along the South Taranaki coastline. Indeed, the results presented here and in recent surveys have found land based erosion to be the single most influential factor affecting the intertidal communities at these sites, following the burial of the 200 m SE Reef site. The coast is in a constant state of erosion with layers of earth, sand and silt often deposited in the intertidal zone. Not only does fallen cliff material cripple marine communities through disturbance and burial, observations indicate that freshly fallen earth provides a poor habitat for intertidal organisms. This factor could limit the resilience of reef communities encountering erosion events by deterring organisms from settling and ultimately prolonging the recovery timeframe. Another consequence of erosion is increased suspended sediment in the seawater which can impact on filter feeding organisms and also algal growth through affecting light

availability. In the current survey, it was noted that some species are starting to return to the 200 m SE Reef site with much of the finer slip material having been washed away. The increased species diversity recorded during this survey indicates that the gravels and rocks which remain covering the reef are accommodating the settlement and recovery of the intertidal community (Photo 2).

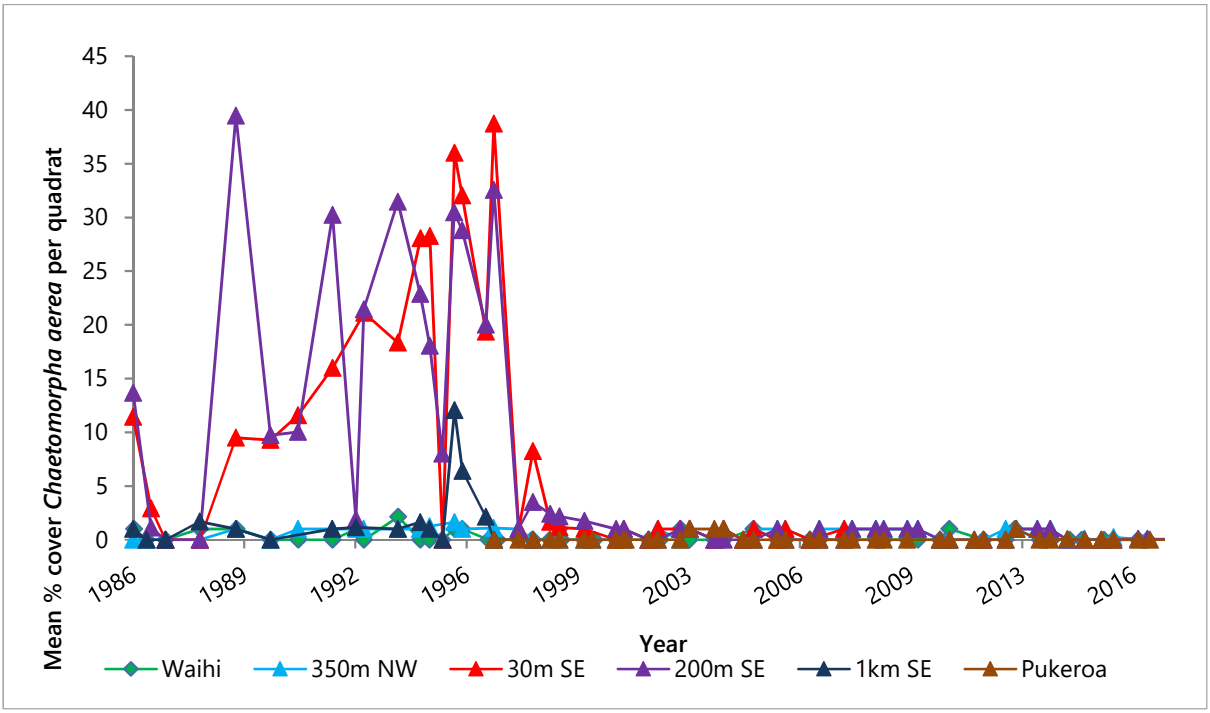

Figure 7 Percentage cover per quadrat of *Chaetomorpha,* 1986-2017

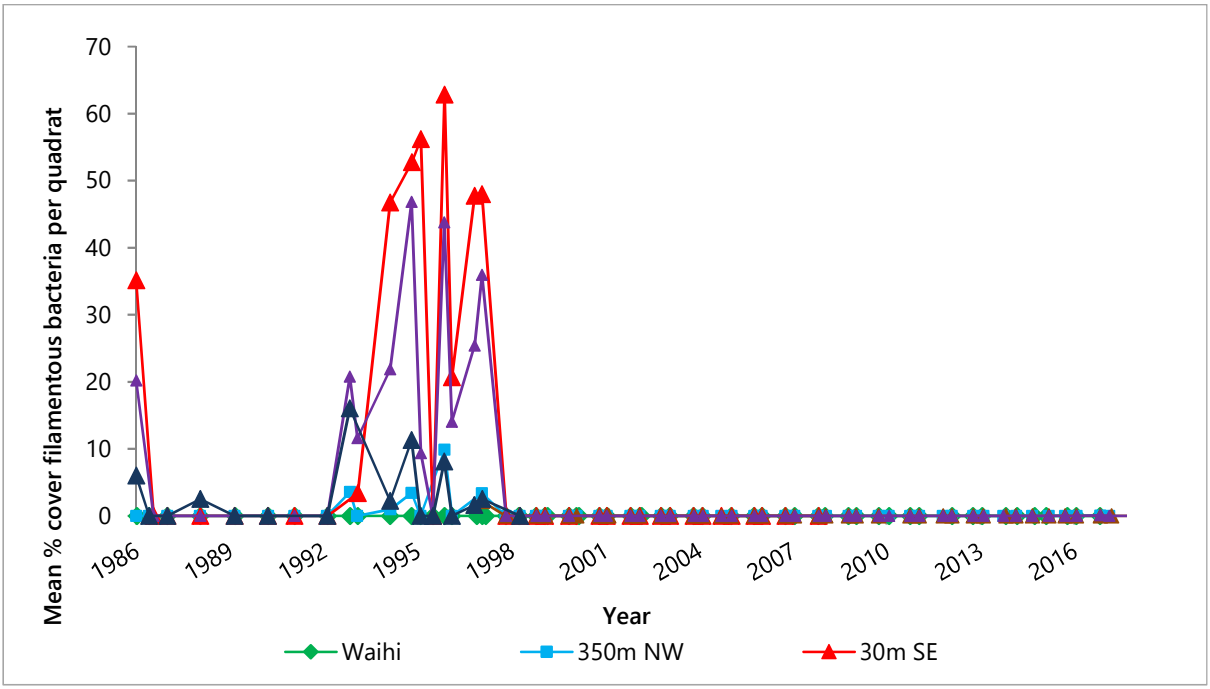

Figure 8 Percentage cover per quadrat of filamentous bacteria, 1986-2017

N.B. Since 2007, the sites 30 m SE and 1 km SE are no longer monitored as part of the Fonterra Whareroa intertidal survey.

Conclusions

In order to assess the potential effects of the Fonterra Whareroa and Hawera Waste Water Treatment Plant outfall discharge on the nearby intertidal communities, surveys were conducted on 5 and 6 December 2017 at three sites. These surveys included three potential impact sites either side of the outfall (two southeast and one west). The control site to the northwest was unable to be surveyed for reasons beyond the Council's control. It was 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 previous surveys.

None of the potential impact sites showed significant declines in species richness or diversity, and any decreases were attributable to increases in sand cover. The potential impact site 200 m SE of the outfall again showed signs of recovery after having been recently buried by a slip. Furthermore, there is no evidence of the potential impact sites declining in species richness or diversity over time, relative to the control site. These 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, appear to remain the dominant drivers of species richness and diversity at the sites surveyed.

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

To	**Science Manager – Hydrology/Biology, Regan Phipps**
From	Scientific Officer, Thomas McElroy and Technical Officer, Angela Smith
Document	2105990
Date	20 August 2018

Fonterra Whareroa/Hawera WWTP Combined Outfall – Marine Ecological Survey Summer 2017/18

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 1000 m 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 5 of consent 1450 and special condition 7 of consent 5079 requires there to be no significant visual, chemical or ecological impacts outside of a 200 m 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. By conducting two surveys a year (one in spring and one in summer) it is possible to capture information on the seasonal variation of the intertidal communities and any possible effects from the outfall. Accordingly, two surveys of the intertidal zone were carried out as part of the 2017-2018 monitoring programme for the combined marine outfall. The 2017-2018 summer survey was conducted at four sites between 29 March and 15 May 2018; the results are reported in this memo.

Methods

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): 350 m northwest of the outfall (SEA906049), 200 m southeast of the outfall (SEA906057) and 1.55 km southeast of the outfall on Pukeroa Reef (SEA906067) (Photos 1-3; Figure 1). The control site at Waihi Reef (Photo 4; Figure 1), approximately 4.5 km northwest of the outfall (SEA906025), has been identified by NIWA as unlikely to be impacted by the discharged wastewater (Palliser *et al.*, 2013).

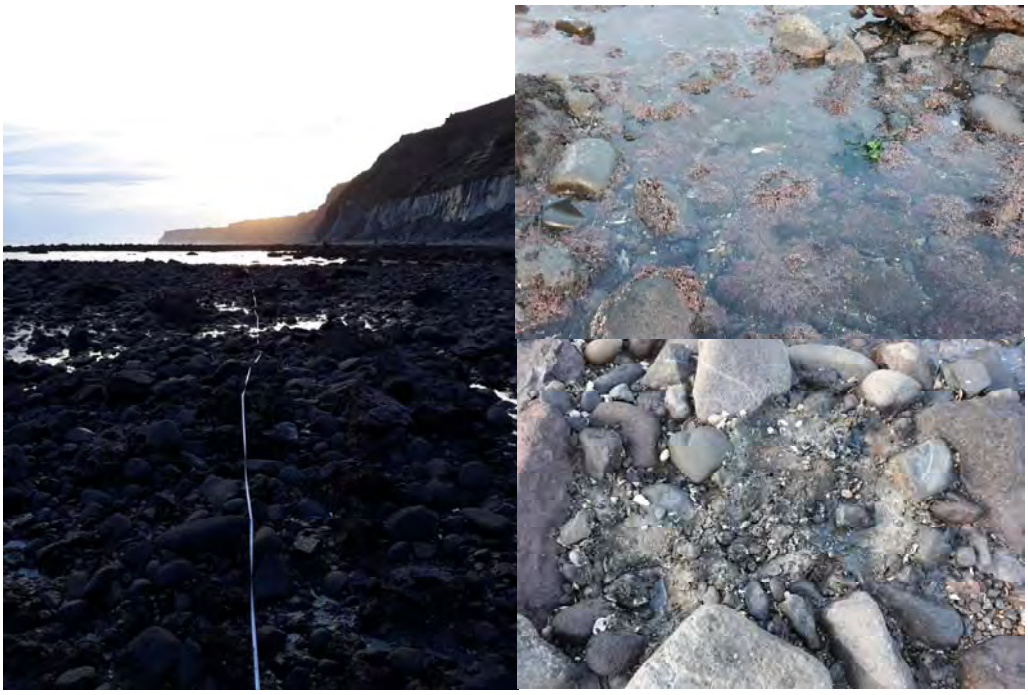

Photo 1 Surveying the potential impact site 350 m northwest of the outfall (15 May 2018)

Photo 2 Surveying the potential impact site 200 m southeast of the outfall (15 February 2018)

Photo 3 The survey site at Pukeroa Reef (29 April 2018)

Photo 4 Surveying the site at Waihi Reef (29 March 2018)

Figure 1 Map of sampling sites in relation to the outfall

At each site, a 50 m transect was used to establish five 5 m x 3 m blocks. Within each block, five random 0.25 m^2 quadrats were laid giving a total of 25 random quadrats (Photo 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 3 mm were counted. Under boulder biota was counted where rocks and cobbles were easily overturned.

Photo 5 Survey at the site located 200 m SE of the outfall, showing the transect in use

Results

Summary statistics, including the mean number of species per quadrat and the mean Shannon-Weiner indices, are shown in Table 1. Both the mean number of species and Shannon-Wiener index were highest at the site 350 m NW of the outfall. Despite having the second highest mean number of species, the lowest Shannon-Wiener index was recorded for the 200 m SE site. The lowest mean number of species per quadrat was recorded at the Waihi Reef, with a mean total of 10.55 species found.

Table 1 Mean results for the 2017-2018 summer survey

Site	Number 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	2.65	7.90	10.55	0.25	0.76	0.81
350 m NW	25	4.48	10.64	15.12	0.58	0.81	0.98
200 m SE	25	5.44	8.04	13.48	0.69	0.48	0.68
Pukeroa Reef	25	2.92	9.48	12.40	0.41	0.79	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.

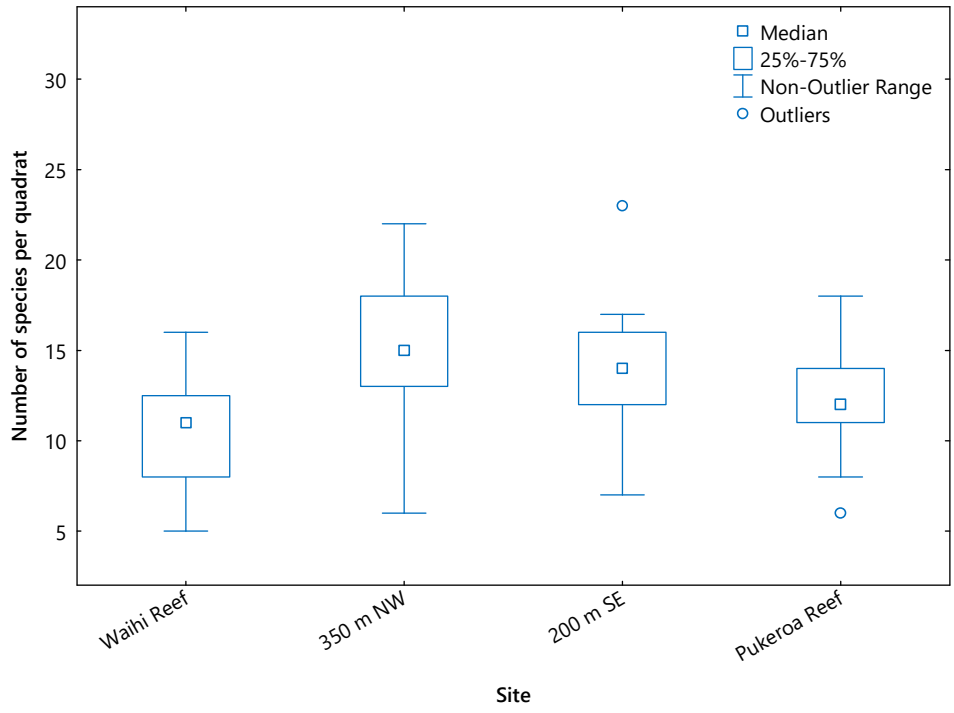

Figure 2 Box and whisker plots of the number of species per quadrat at each site, for the summer 2017-2018 survey

The data obtained from each of the four sites conformed to the assumption of normal distribution at the 95% confidence level (Lilliefors test, n=25, P>0.05). However, the boxplots in Figure 2 showed heteroscedasticity due to have uneven variance. As both ANOVA assumptions could not be met, the remaining analyses were conducted using the raw data with non-parametric tests.

There was a significant difference in the number of species per quadrat between sites (Kruskal-Wallis, H = 16.60, degrees of freedom (df)= 3, P < 0.001)[1]. Significant differences between sites were determined using the Wilcoxon signed-ranks test, and are presented in Table 2. The total number of species found at Waihi Beach was significantly lower than at each of the other three sites, and the number of species recorded at the site located 350 m from the outfall was significantly higher than that recorded at Pukeroa Reef (n = 25, P < 0.05; Figure 2).

Table 2 Wilcoxon signed ranks test of number of species per quadrat

Site	Waihi	350 m NW	200 m SE
350 m NW	SIG		
200 m SE	SIG	NS	
Pukeroa Reef	SIG	SIG	NS

Key: SIG = significant difference at 95% confidence level

NS = no significant difference

Shannon-Weiner Diversity Index

Figure 3 shows the distribution of Shannon-Weiner Indices recorded at each site as box and whisker plots.

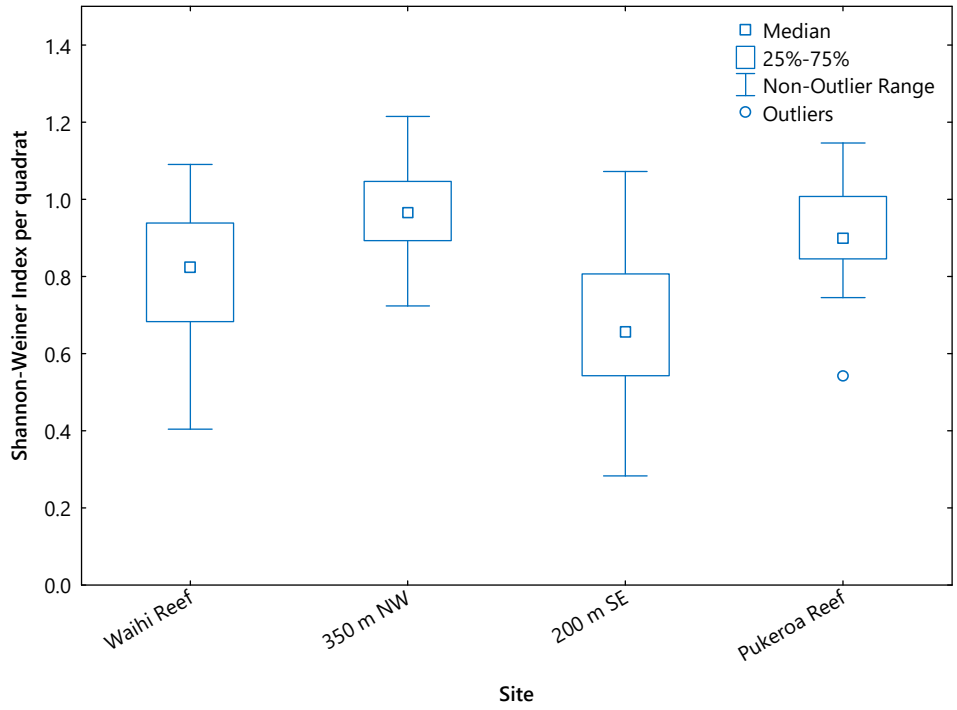

Figure 3 Box and whisker plots of Shannon-Weiner Indices at each site

[1] The Kruskal-Wallis and Wilcoxon signed ranks tests are both non-parametric tests. This means they are not testing for differences in sample means (or medians) but rather they are testing for differences in the locations of sample distributions.

The data obtained from each of the four surveys was found to be normally distributed (Lilliefors test, n = 25, P > 0.05). However, data variance was not homogeneous for all four of the sites (Figure 3). As this ANOVA assumption could not be met, the remaining analyses were conducted using the raw data with non-parametric tests.

There was a significant difference in the Shannon-Weiner Indices between sites (Kruskal-Wallis, H = 33.25, degrees of freedom (df) = 3, P < 0.001). Significant differences between sites were determined using the Wilcoxon signed-ranks test, and are presented in Table 3. The Shannon-Wiener Indices at Pukeroa Reef were not significantly different from those at the site 350 m NW of the outfall, and these two sites had significantly greater Shannon-Wiener Indices than the remaining two sites (n = 25, P < 0.05; Figure 3). The Shannon-Wiener Indices at the site 200 m SE of the outfall were significantly lower than at any other site (n = 25, P < 0.05; Figure 3).

Table 3 Wilcoxon signed ranks test with Shannon-Weiner index between sites

Site	Waihi	350 m NW	200 m SE
350 m NW	SIG		
200 m SE	SIG	SIG	
Pukeroa Reef	SIG	NS	SIG

Key: SIG = significant difference at 95% confidence level

NS = no significant difference

Sand coverage

The level of sand cover was low (<5%) at the Waihi Reef, Pukeroa and 200 m SE sites (Table 4). Sand cover was moderate (>10%) at the site located 350 m NW of the outfall. Abundance and diversity of intertidal species/communities can be significantly impacted by sand cover of 30% and higher.

Table 4 Mean percentage sediment cover per quadrat observed during the 2017-2018 summer survey

Site	Mean sand coverage (%)	Mean silt coverage (%)	Total sand, silt and mud coverage (%)
Waihi Reef	0.68	0.04	0.72
350 m NW	12.16	0.00	12.16
200 m SE	2.20	0.16	2.36
Pukeroa Reef	1.88	0.00	1.88

Trends over time

Species number and diversity

Comparisons of the mean number of species per quadrat (Figure 4) and mean Shannon-Weiner diversity index per quadrat (Figure 5) for all summer surveys undertaken since January 1986 are shown below.

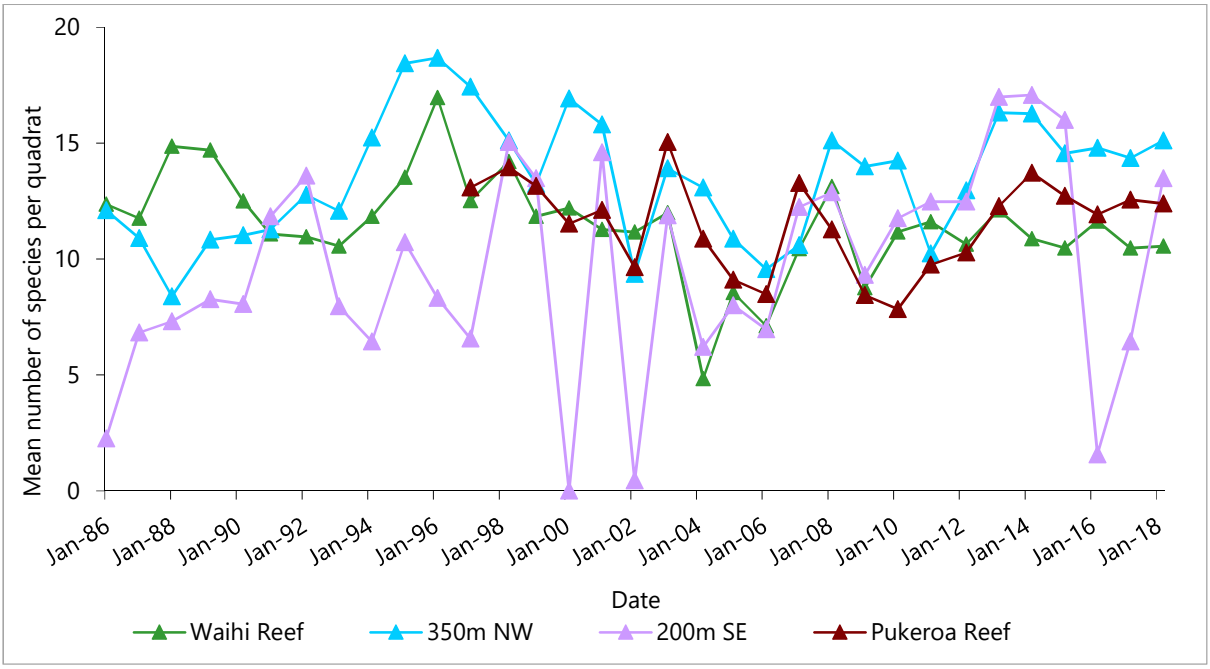

Figure 4 Mean number of species per quadrat for summer surveys (1986-2018)

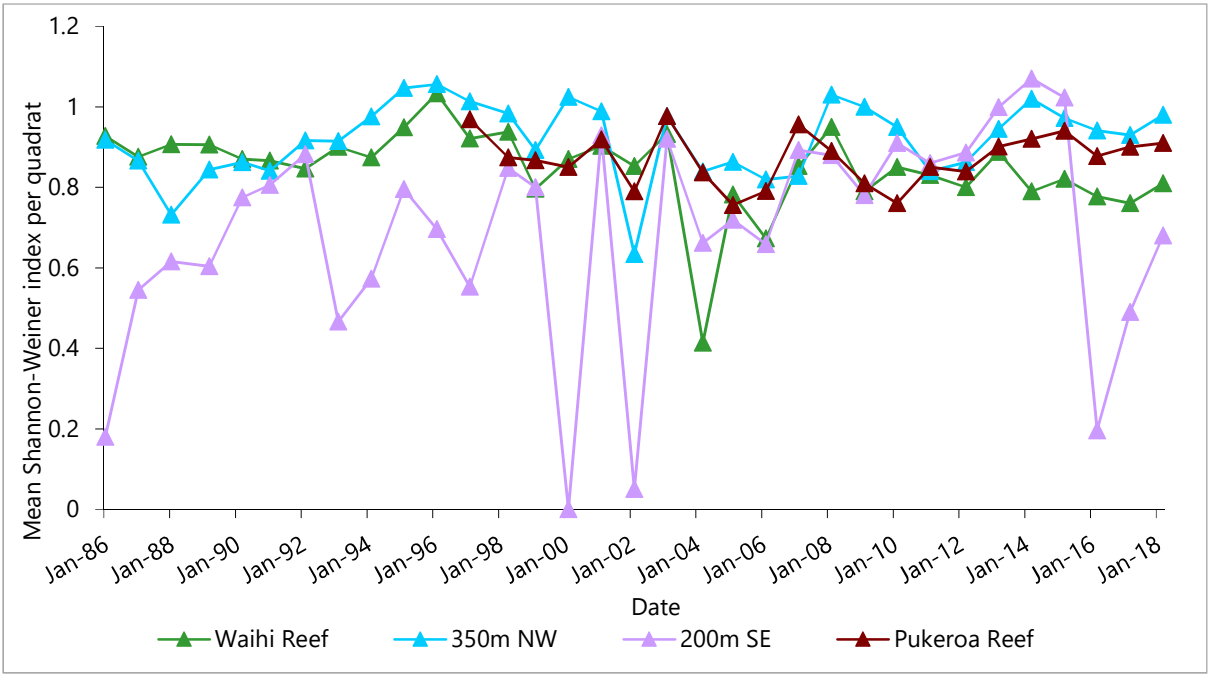

Figure 5 Mean Shannon-Weiner Indices per quadrat for summer surveys (1986-2018)

Prior to the installation of the long marine outfall in August 1997, both the number of species and the Shannon-Weiner Index per quadrat at the impact site 200 m SE were generally lower than at the control site at Waihi Reef (Figures 4 & 5). 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 or slips (e.g. 2000, 2002 and 2016 at 200 m SE, Figures 4 & 5).

The results of the 2018 summer survey showed a slight increase in the mean number of species and the Shannon-Weiner index at Waihi Reef and 350 m NW when compared with the previous summer (Figures 4 & 5). There was a slight decrease in the number of species recorded for Pukeroa Reef, despite an increase in

the Shannon-Weiner Index. The remaining site, located 200 m SE of the outfall, showed a considerable increase in both the mean number of species recorded per quadrat and Shannon-Weiner Index.

Sand coverage

Over time, sand cover has generally remained low across the sites (Figure 6). Occasionally, however, the reefs experience events of sand inundation where coverage increases substantially. Over the past ten years, the sites worst affected by inundation events have been those 200 m SE and 350 m NW of the outfall.

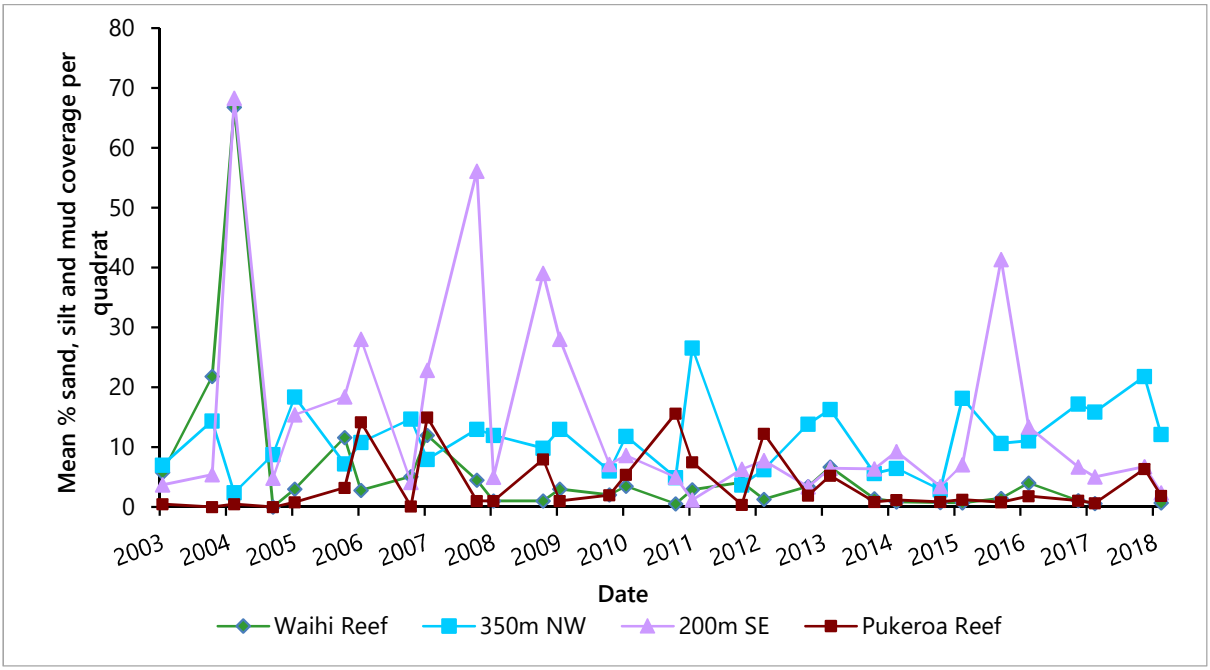

Figure 6 Mean percentage sand, silt and mud cover for summer and spring surveys (2003-2018)

Discussion

Previous surveys have shown that the dairy factory wastewater discharged through the near-shore outfall prior to 1997 (Photo 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 30 m and 200 m 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 2 km 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.

Photo 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 2018 summer survey results (Figures 4 & 5). Impact site 200 m SE, which was buried by a slip in the winter of 2015, had increased notably in terms of mean number of species (species richness) and Shannon-Wiener Index (diversity) compared to the previous survey; evidence of ongoing recovery. Compared with the previous survey, Pukeroa Reef marginally increased in terms of species richness and decreased in terms of diversity, while marginal increases in species richness and diversity were recorded for the 350 m NW site and the control site, Waihi Reef. The impact site 350 m NW of the outfall had the greatest species richness and diversity recorded of all four sites, despite having the highest sand coverage. Long-term results do not indicate any differential trends between the impact sites and control sites regarding species richness or diversity.

The results of the 2018 summer survey showed a slight increase in the mean number of species and the Shannon-Weiner index at Waihi Reef and 350 m NW when compared with the previous summer (Figures 4 & 5). There was a slight decrease in the number of species recorded for Pukeroa Reef, despite an increase in the Shannon-Weiner Index. The remaining site, located 200 m SE of the outfall, showed a considerable increase in both the mean number of species recorded per quadrat and Shannon-Weiner Index.

Minimal coverage of silt and mud was observed at the Waihi Reef and 350 m NW sites during the 2018 summer survey, with no coverage recorded for the remaining two sites. Sand coverage had decreased at all four sites since the previous survey, and was highest at the 350 m NW site. The slip material deposited at site 200 m SE in 2015 had largely washed away, facilitating the recovery of impacted intertidal communities. The moderate cover of sand at the site 350 m NW of the outfall suggests a degree of resilience on the reef, considering the high level of species richness and diversity that was recorded. Long-term monitoring of intertidal rocky reefs around the Taranaki coastline has shown that the abundance and diversity of these communities can be adversely affected when sand coverage exceeds 30%. High percentage sand cover (>30%) has previously been recorded at the site 200 m SE of the outfall (Figure 6).

The historical record of survey results (Figures 4 & 5) shows no obvious impact of the marine outfall discharge on local intertidal communities since the installation of the long outfall in 1997. Control and potential impact sites show interannual variability, and there are 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, prevents 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 4 & 5; Clark *et al*., 2012).

The most notable change in species composition since the commissioning of the long outfall is the decline of *Chaetomorpha* sp. (Photo 7) and the absence of filamentous bacterial growths at the site 200 m SE of the outfall (Figures 7 & 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.

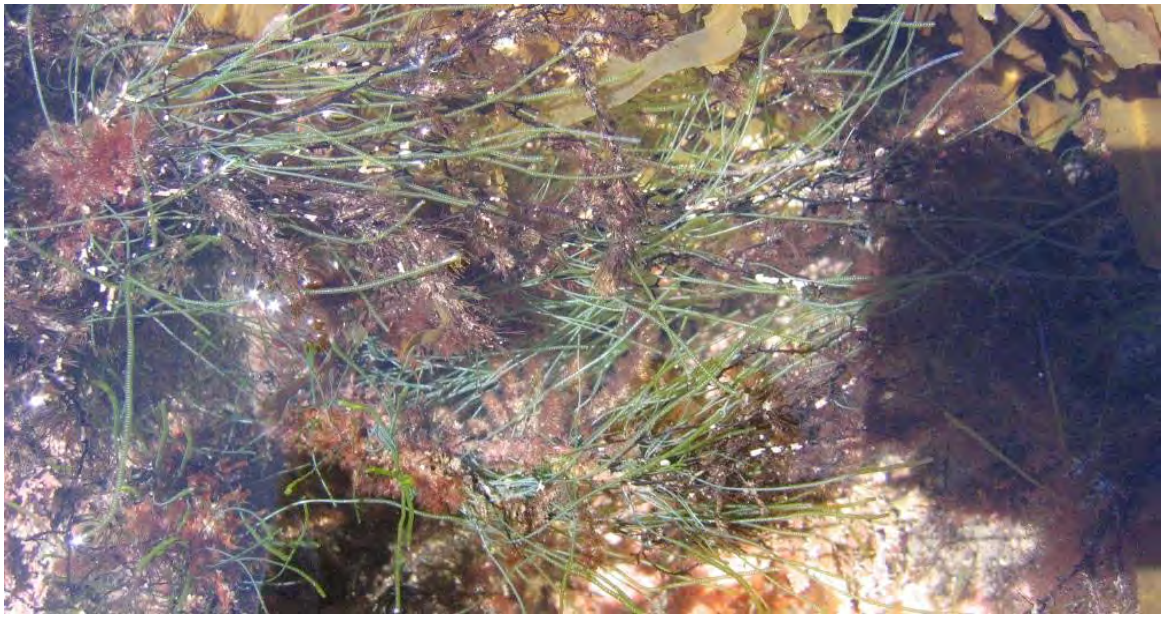

Photo 7 Green filaments of *Chaetamorpha*, an algal genus often associated with high nutrient concentrations (North Taranaki)

The inundation of earth, sand and silt resulting from cliff face erosion can be an important factor affecting species composition and diversity along the South Taranaki coastline. Indeed, the results presented here, and in recent surveys, have found land-based erosion to be the single most influential factor affecting the intertidal communities at these sites, following the burial of the 200 m SE reef site. The coast is in a constant state of erosion with layers of earth, sand and silt often deposited in the intertidal zone. Not only does fallen cliff material cripple marine communities through disturbance and burial, but observations indicate

that freshly fallen earth provides a poor habitat for intertidal organisms. This factor could limit the resilience of reef communities encountering erosion events by deterring organisms from settling and ultimately prolonging the recovery timeframe. Another consequence of erosion is increased suspended sediment and restricted light availability in the seawater, which can impact on filter feeding organisms and algal growth respectively. In the current survey, it was noted that some species are starting to return to the 200 m SE Reef site, with much of the finer slip material having been washed away. The increased species richness and diversity recorded during this survey indicates that the gravels and rocks which remain on the reef are accommodating the settlement and recovery of the intertidal community (Photo 2).

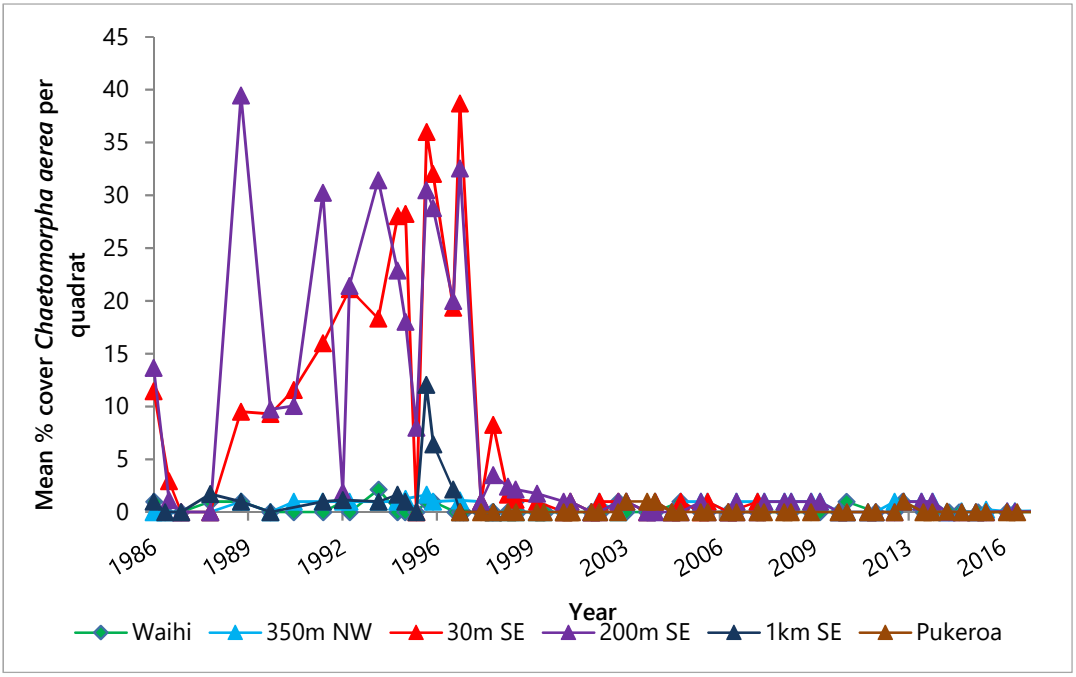

Figure 7 Mean percentage cover per quadrat of *Chaetomorpha aerea,* 1986-2018

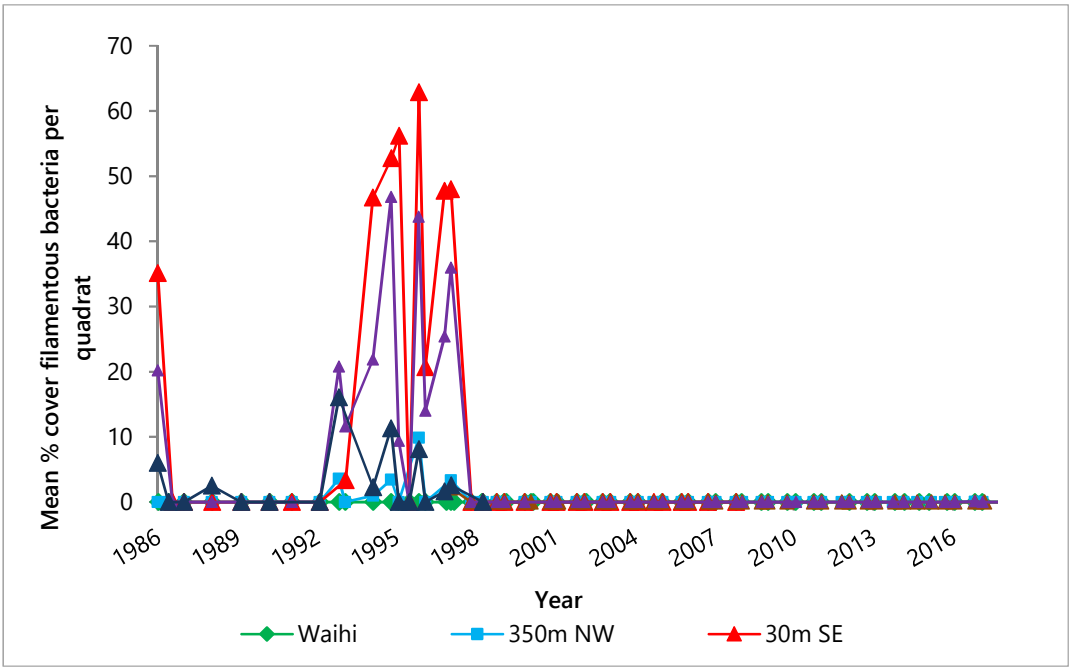

Figure 8 Mean percentage cover per quadrat of filamentous bacteria, 1986-2018

N.B. Since 2007, the sites 30 m SE and 1 km SE are no longer monitored as part of the Fonterra Whareroa intertidal survey.

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 29 March and 15 May 2018 at four sites. These surveys included three potential impact sites either side of the outfall (two southeast and one west) and one control site to the northwest. It was 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.

None of the potential impact sites showed significant declines in species richness or diversity in relation to the control site. Instead, all three of the potential impact sites had significantly greater species richness than Waihi Reef (the control site), and the 350 m NW and Pukeroa Reef sites had greater species diversity. The potential impact site located 200 m SE of the outfall continued to show signs of recovery after having been buried by a slip in 2015. Furthermore, there is no evidence of the potential impact sites declining in species richness or diversity over time, relative to the control site. These 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, appear to remain the dominant drivers of species richness and diversity at the sites surveyed.

Thomas McElroy

Scientific Officer - Marine Ecologist

Angela Smith

Technical Officer

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

Appendix V

PM_{10} monitoring report

To Job Manager, Thomas McElroy

From Environmental Scientist - Air Quality, Brian Cheyne

File 2090634

Date 18 July 2018

PM 10 monitoring at Fonterra Whareroa Dairy Complex

Figure 1 PM10 monitoring sites in 2017-2018 monitoring year

In September 2004 the Ministry for the Environment formally made public the National Environmental Standards (NESs) relating to certain air pollutants. The NES for PM10 is 50 µg/m3 (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 from approximately 43 to 46 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 3 presents wind roses and statistics for the two monitoring periods.

Table 1 Daily mean of PM10 results during five days' monitoring at Whareroa dairy complex

	Run 1 (43 hrs) (7-9/10/2017)		**Run 2 (46 hrs) (29/06 to 01/07/2018)**	
24 hr. set	Day 1 (Start to 24 hrs*)	Day 2 (24 hrs to end*)	Day 1 (Start to 24 hrs*)	Day 2 (24 hrs to end*)
Daily average	16.2 µg/m^3	11.9 µg/m^3	35.5 µg/m^3	43.9 µg/m^3
NES	50µg/m^3			

Findings

First run

During the first 43-hour run, from 7 to 9 November 2017, the average recorded PM_{10} concentrations for the first and second 24-hour periods were 16.2µg/m^3 and 11.9µg/m^3, respectively. These daily means equate to 32.3% and 23.9%, respectively, of the 50 µg/m^3 value that is set by both the National Environmental Standard and the resource consent.

Second run

During the second 47-hour run, from 29 June to 1 July 2018, the average recorded PM_{10} concentrations for the first and second 24-hour periods were 35.5 µg/m^3 and 43.9 µg/m^3, respectively. These daily means equate to 70.9% and 87.8%, respectively, of the 50 µg/m^3 value that is set by both the National Environmental Standard and the resource consent 4103-2.

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

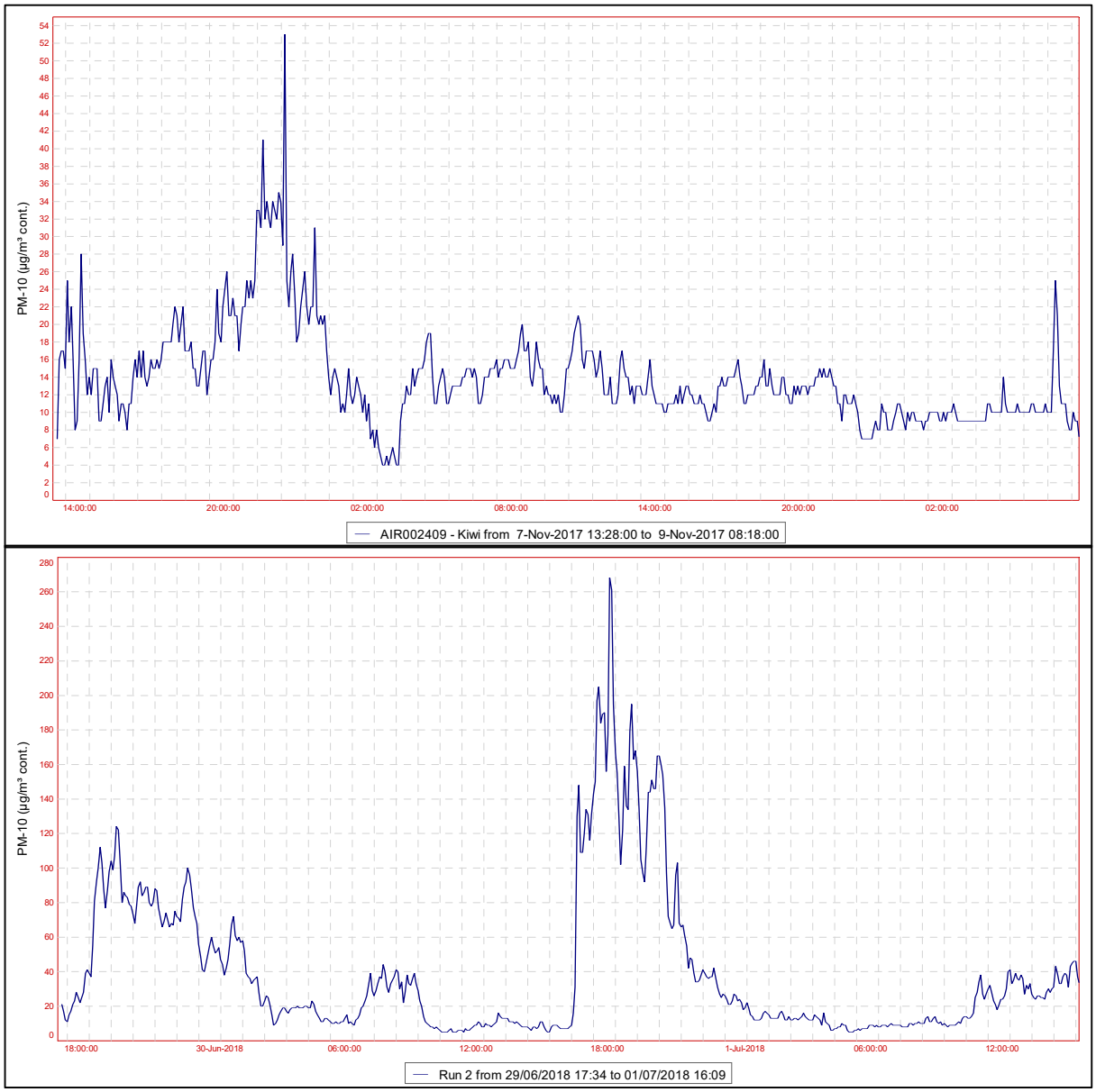

Figure 2 PM10 concentrations (µg/m³) at the Fonterra Whareroa dairy complex (2017-2018)

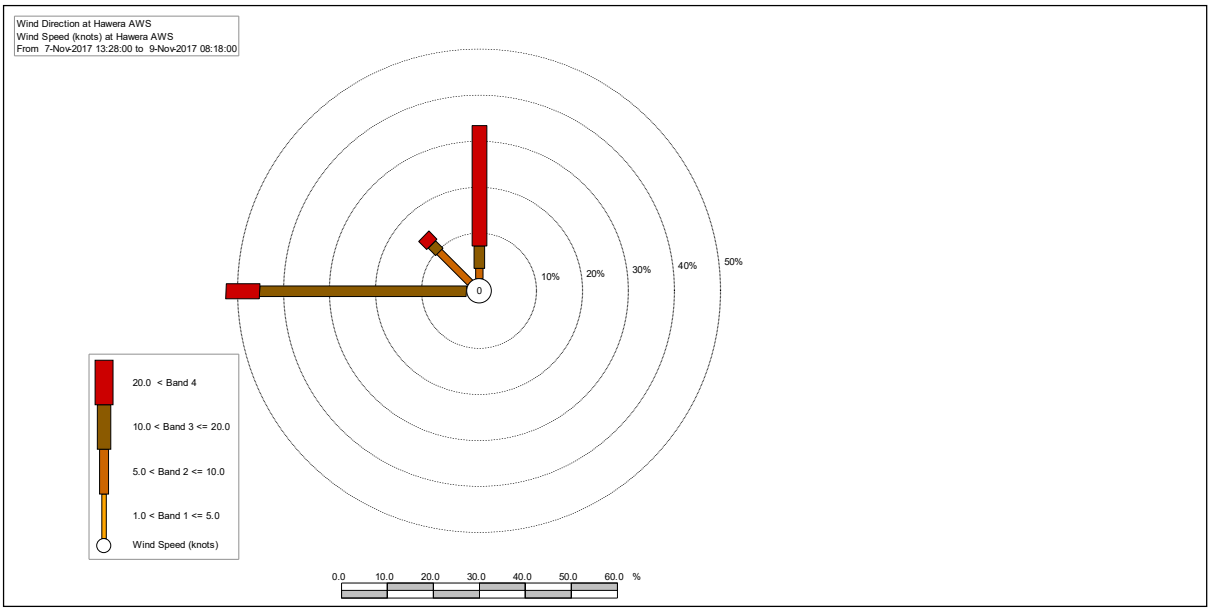

Figure 3 Wind roses and stats for the first PM10 monitoring period

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~~~ Hilltop Hydro ~~~ Version 6.59                          18-Jul-2018
~~~ PLWind ~~~

Source is R:\UNAUDITED-DATA\METEOROLOGICAL.hts
Wind Direction at Hawera AWS and Wind Speed (knots) at Hawera AWS
From  7-Nov-2017 13:28:00 to  9-Nov-2017 08:18:00

Number of data points read               :      42
Number of directions <0.0 or >360.0 deg.  :       0
Limits for Wind Speed (knots) are 0.0 to 50.0
Number of readings outside limits        :       0
Number of data points used               :      42

                      Percentange of time in each band
  Direction        Band 1      Band 2      Band 3      Band 4         Total
337.5 -  22.4        0.0         2.4         4.8        26.2          33.3
 22.5 -  67.4        0.0         0.0         0.0         0.0           0.0
 67.5 - 112.4        0.0         0.0         0.0         0.0           0.0
112.5 - 157.4        0.0         0.0         0.0         0.0           0.0
157.5 - 202.4        0.0         0.0         0.0         0.0           0.0
202.5 - 247.4        0.0         0.0         0.0         0.0           0.0
247.5 - 292.4        0.0         0.0        45.2         7.1          52.4
292.5 - 337.4        0.0         9.5         2.4         2.4          14.3
        Total        0.0        11.9        52.4        35.7         100.0
                                              Percentage  <=  1.0       0.0
Wind Speed (knots) bands
 1.0 < Band 1 <=  5.0     5.0 < Band 2 <= 10.0

10.0 < Band 3 <= 20.0     Band 4 >  20.0
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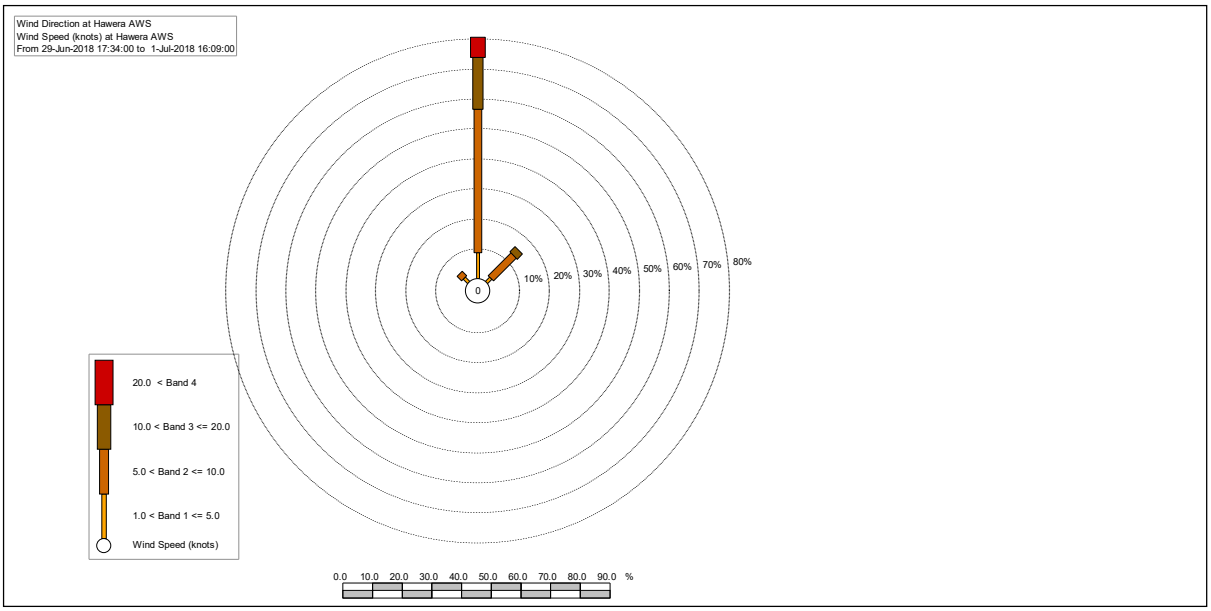

Figure 4 Wind roses and stats for the second PM10 monitoring period

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~~~ Hilltop Hydro ~~~ Version 6.59                          18-Jul-2018
~~~ PLWind ~~~

Source is R:\UNAUDITED-DATA\METEOROLOGICAL.hts
Wind Direction at Hawera AWS and Wind Speed (knots) at Hawera AWS
From 29-Jun-2018 17:34:00 to  1-Jul-2018 16:09:00

Number of data points read                :      46
Number of directions <0.0 or >360.0 deg.  :       0
Limits for Wind Speed (knots) are 0.0 to 50.0
Number of readings outside limits         :       0
Number of data points used                :      46

                        Percentange of time in each band
  Direction         Band 1      Band 2      Band 3      Band 4          Total
337.5 -  22.4         8.7        47.8        17.4         6.5           80.4
 22.5 -  67.4         2.2        10.9         2.2         0.0           15.2
 67.5 - 112.4         0.0         0.0         0.0         0.0            0.0
112.5 - 157.4         0.0         0.0         0.0         0.0            0.0
157.5 - 202.4         0.0         0.0         0.0         0.0            0.0
202.5 - 247.4         0.0         0.0         0.0         0.0            0.0
247.5 - 292.4         0.0         0.0         0.0         0.0            0.0
292.5 - 337.4         2.2         2.2         0.0         0.0            4.3
        Total        13.0        60.9        19.6         6.5          100.0
                                                Percentage  <=  1.0      0.0
Wind Speed (knots) bands
 1.0 < Band 1 <=  5.0     5.0 < Band 2 <= 10.0

10.0 < Band 3 <= 20.0          Band 4 >  20.0
```

Appendix VI

NO_x monitoring report

To	Fiza Hafiz, Scientific Officer – State of the Environment
	Job Managers - Callum MacKenzie, Thomas McElroy, Darin Sutherland
From	Brian Cheyne, Scientific Officer – Air Quality
Document	2089257
Date	20 July 2018

Monitoring of nitrogen oxides (NOx) levels in Taranaki near the NOx emitting sites, year 2017-2018

From 2014 onwards, the Taranaki Regional Council (TRC) has implemented a coordinated region-wide monitoring programme to measure NOx, not only at individual compliance monitoring sites near industries that emit NOx, but simultaneously at urban sites (the Council regional state of the environment programme) to determine exposure levels for the general population. The programme involves deploying all measuring devices on the same day, with retrieval three weeks later. This approach will assist the Council to further evaluate the effects of local and regional emission sources and ambient air quality in the region.

Nitrogen oxides

Nitrogen oxides (NOx), a mixture of nitrous oxide (N_2O), nitric oxide (NO) and nitrogen dioxide (NO_2), are produced from natural sources, motor vehicles and other fuel combustion processes. Indoor domestic appliances (gas stoves, gas or wood heaters) can also be significant sources of nitrogen oxides, particularly in areas that are poorly ventilated. NO and NO_2 are of interest because of potential effects on human health.

Nitric oxide is colourless and odourless and is oxidised in the atmosphere to form nitrogen dioxide. Nitrogen dioxide is an odorous, brown, acidic, highly corrosive gas that can affect our health and environment. Nitrogen oxides are critical components of photochemical smog – nitrogen dioxide produces the brown colour of the smog.

Environmental and health effects of nitrogen oxides

Nitrogen dioxide is harmful to vegetation, can fade and discolour fabrics, reduce visibility, and react with surfaces and furnishings. Vegetation exposure to high levels of nitrogen dioxide can be identified by damage to foliage, decreased growth or reduced crop yield.

Nitric oxide does not significantly affect human health. On the other hand, elevated levels of nitrogen dioxide cause damage to the mechanisms that protect the human respiratory tract and can increase a person's susceptibility to, and the severity of, respiratory infections and asthma. Long-term exposure to high levels of nitrogen dioxide can cause chronic lung disease. It may also affect sensory perception, for example, by reducing a person's ability to smell an odour.

National environmental standards and guidelines

In 2004, national environmental standards (NES) for ambient (outdoor) air quality were introduced in New Zealand to provide a guaranteed level of protection for the health of New Zealanders. The national standard for nitrogen dioxide (NO_2) is set out below.

In any 1-hour period, the average concentration of nitrogen dioxide in the air should not be more than 200 µg/m³.

Before the introduction of the national environmental standards, air quality was measured against the national air quality guidelines. The national guidelines were developed in 1994 and revised in 2002 following a comprehensive review of international and national research and remain relevant. The national guideline for nitrogen dioxide (NO_2) is set out below.

In any 24-hour period, the average concentration of nitrogen dioxide in the air should not be more than 100 µg/m³.

Nitrogen dioxide limits are also set in the special conditions of resource consents issued by the Council. The consents limits are the same as those imposed under the NES and MfE's guideline.

Measurement of nitrogen oxides

The Taranaki Regional Council has been monitoring nitrogen oxides (NOx) in the Taranaki region since 1993 using passive absorption discs. Research to date indicates that this is an accurate method for measuring average exposure, with benefits of simplicity of use and relatively low cost. To date more than 720 samplers of nitrogen oxides have been collected in Taranaki region. Discs are sent to EUROFINS ELS Ltd. Lower Hutt for analysis. Passive absorption discs are placed at the nominated sites. The gases diffuse into the discs and any target gases (nitrogen dioxide or others) are captured.

In the 2017-18 year, passive absorption discs were placed on one occasion at 30 sites, staked about two metres off the ground for a period of 21 days, for the purpose of compliance monitoring.

Conversion of exposure result to standardised exposure time period

From the average concentration measured, it is possible to calculate a theoretical maximum daily or one hour concentrations that may have occurred during the exposure period. Council data on NOx is gathered over a time period other than exactly 24 hours or one hour. There are mathematical equations used by air quality scientists to predict the maximum concentrations over varying time periods. These are somewhat empirical, in that they take little account of local topography, micro-climates, diurnal variation, etc. Nevertheless, they are applied conservatively and have some recognition of validity.

One formula in general use is of the form:

$$C(t_2) = C(t_1) \times \left(\frac{t_1}{t_2}\right)^p$$

where C(t) = the average concentration during the time interval t, and p = a factor lying between 0.17 and 0.20. When converting from longer time periods to shorter time periods, using p = 0.20 gives the most conservative estimate (i.e. the highest calculated result for time period t_2 given a measured concentration for time period t_1). Using the 'worst case' factor of p = 0.20, the monitoring data captured by the Council has been converted to equivalent 'maximum' 1-hour and 'maximum'24-hour exposure levels.

Results

The location of the NOx monitoring sites are shown in Figure 1 and the details of the NOx results are presented in Table 1 and Figure 2.

Table 1 Actual (laboratory) and recalculated ambient NOx results, NES and MfE guideline.

	Survey at	Site code	NOx(µg/m3) Lab. results		NOx 1/hr (µg/m3) Theoretical max.		NOx 24/hr (µg/m3) Theoretical max.	
Petrochemical	McKee PS	AIR007901		3.8		13.4		7.1
		AIR007902		2.8		9.9		5.2
	Turangi PS	AIR007822		3.8		13.4		7.1
		AIR007824		3.1		11.0		5.8
	Kaimiro PS	AIR007817		2.2		7.8		4.1
		AIR007818		2.0		7.1		3.7
	Sidewinder PS	AIR007831		1.8		6.4		3.4
		AIR007832		1.8		6.4		3.4
	Maui PS	AIR008201		1.8		6.4		3.4
		AIR008214		2.7		9.5		5.0
	Kupe PS	AIR007827		2.6		9.1		4.9
		AIR007830		2.1		7.4		3.9
	Kapuni PS	AIR003410		3.6		12.7		6.7
		AIR003411		4.0		14.1		7.5
	Cheal PS	AIR007841		2.8		9.9		5.2
		AIR007842		3.7		13.8		6.9
	Waihapa PS	AIR007815		2.4		8.5		4.5
		AIR007816		4.9		17.3		9.2
	Ballance AUP	AIR003401		2.7		9.5		5.0
		AIR003404		2.6		9.2		7.9
	Pohokura PS	AIR003101		1.9		6.7		3.6
		AIR003103		1.4		4.9		2.6
	Rimu PS	AIR012501		2.3		8.1		4.3
		AIR012502		1.8		6.4		3.4
Dairy factory	Fonterra	AIR002410		9.0		31.8		16.8
		AIR002711		9.8		34.6		18.3
		AIR002412		2.0		7.1		3.3
		AIR002413		2.2		7.8		4.1
SEM	NPGHS	AIR000012(SW)		6.1		21.6		11.4
		AIR000012(NE)		5.5		19.4		10.3
National Environmental Standard (NES) and MfE guideline						**200 (NES)**		**100 (MfE)**

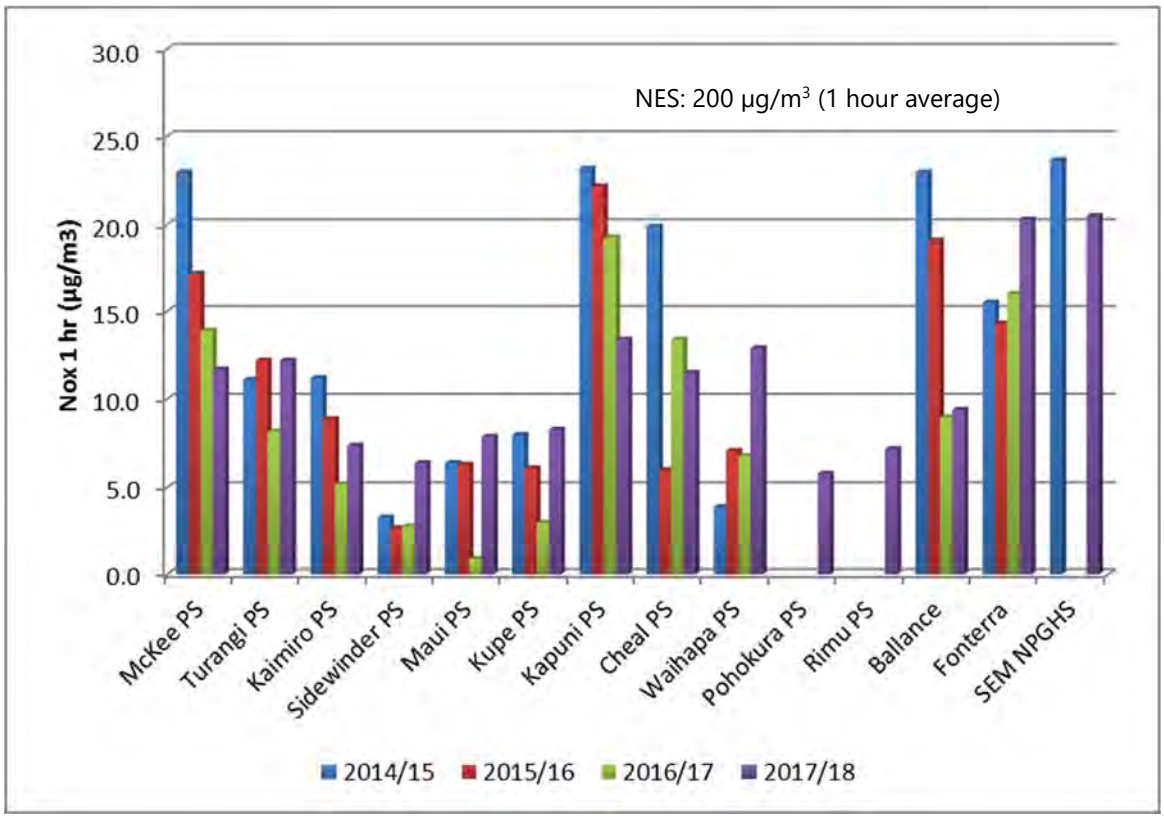

Figure 2 Average NOx levels at 14 surveyed locations throughout the region (year 2017-2018).

Discussion

The calculated 1-hour and 24-hour theoretical maximum concentrations (using a power law exponent of 0.2) ranged from 5.0µg/m³ to 34.6 µg/m³, and from 2.6 µg/m³ to 18.3 µg/m³ respectively (Table 1). The highest results in 2017-18 monitoring year were obtained from the NOx emitting sites at five different locations:

1. In the Kapuni heavy industrial area around the STOS production station.
2. Around the Fonterra's Whareroa co-generation plant.
3. From the sites at McKee production station.
4. Around the Waihapa production station.
5. And In New Plymouth's urban area near a busy traffic intersection.

All values were well within the National Environmental Standards, Ministry for the Environment Ambient Air Quality Guidelines and the respective resource consents limits. This continues the pattern found in previous years.

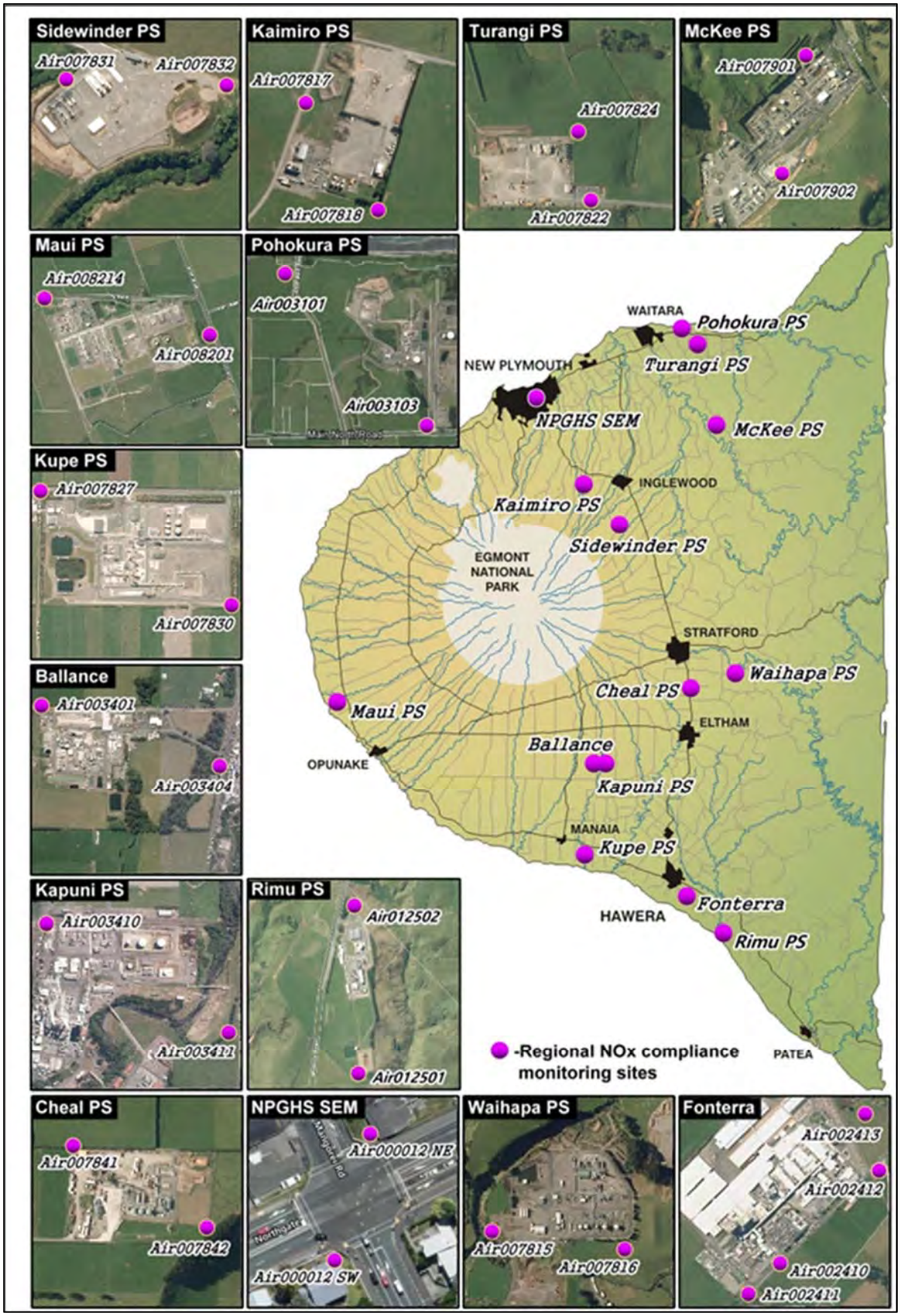

Figure 1 NOx monitoring sites in Taranaki Region, 2017-2018

Ministry for the Environment environmental performance indicator

Ministry for the Environment uses an environmental performance indicator to categorise air quality. These categories are set out in Table 2 and further details of the entire NOx results are set out in Table 3.

Table 2 Environmental Performance Indicator air quality categories

Measured value	Less than 10% of NES	10-33% of NES	33-66% of NES	66-100% of NES	More than 100% of NES
Category	excellent	good	acceptable	alert	action

Table 3 Categorisation of results (2017-2018 monitoring year)

National Environmental Standard for NO2 = 200 µg/m3- 1 hour average.		
Category	**Measured values**	
Excellent	<10% of the NES, (0-20µg/m^3)	**27** (90%)
Good	10-33% of the NES, (20-66µg/m^3)	**3** (10 %)
Acceptable	33-66% of the NES, (66-132 µg/m^3)	**0** (0%)
Alert	66-100% of the NES, (132-200 µg/m^3)	**0** (0%)
Total number of samples		**30** (100%)

Conclusion

The monitoring showed that 90% of the 1-hour average results fell into Ministry's 'excellent' categories and 3% of the results lay within Ministry's 'good' category. No results ever entered the 'acceptable' or 'alert' categories, i.e., no results ever exceeded the National Environmental Standard of 200µg/m^3.

These results, and all regional monitoring to date, have shown that Taranaki has very clean air, and on a regional basis there are no significant pressures upon the quality of the air resource.