Taranaki Regional Council

AGENDA
Operations & Regulatory

Tuesday 7 February 2023, 9.00am

Operations and Regulatory Committee

07 February 2023 09:00 AM

Whakataka te hau

Karakia to open and close meetings

Whakataka te hau ki te uru	Cease the winds from the west
Whakataka te hau ki tonga	Cease the winds from the south
Kia mākinakina ki uta	Let the breeze blow over the land
Kia mātaratara ki tai	Let the breeze blow over the ocean
Kia hī ake ana te atakura	Let the red-tipped dawn come with a sharpened air
He tio, he huka, he hauhu	A touch of frost, a promise of glorious day
Tūturu o whiti whakamaua kia tina.	Let there be certainty
Tina!	Secure it!
Hui ē! Tāiki ē!	Draw together! Affirm!

Nau mai e ngā hua

Karakia for kai

Nau mai e ngā hua	Welcome the gifts of food
o te wao	from the sacred forests
o te ngakina	from the cultivated gardens
o te wai tai	from the sea
o te wai Māori	from the fresh waters
Nā Tāne	The food of Tāne
Nā Rongo	of Rongo
Nā Tangaroa	of Tangaroa
Nā Maru	of Maru
Ko Ranginui e tū iho nei	I acknowledge Ranginui above and
Ko Papatūānuku e takoto ake nei	Papatūānuku below
Tūturu o whiti whakamaua kia tina	Let there be certainty Secure it!
Tina! Hui e! Taiki e!	Draw together! Affirm!

Purpose of Operations and Regulatory Committee meeting

This committee attends to all matters in relation to resource consents, compliance monitoring and pollution incidents, biosecurity monitoring and enforcement.

Responsibilities

Consider and make decisions on resource consent applications pursuant to the *Resource Management Act 1991.*

Ensure adequate compliance monitoring of resource use consents and receive decisions on enforcement actions in the event of non-compliance, pursuant to the *Resource Management Act 1991.*

Consider and make decisions on monitoring and enforcement matters associated with plant and animal pest management.

Other matters related to the above responsibilities.

Membership of Operations and Regulatory Committee

Councillor S W Hughes (Chairperson)
Councillor B J Bigham
Councillor M J Cloke
Councillor D L Lean
Councillor C L Littlewood (ex officio)
Councillor D M Cram (Deputy Chairperson)
Councillor M G Davey
Councillor D H McIntyre
Councillor N W Walker (ex officio)

Representative Members

Mr D Luke (Iwi Representative)
Mr Ā White (Iwi Representative)
Mr R Buttimore (Iwi Representative)
Mr P Muir (Taranaki Federated Farmers Representative)

Health and Safety Message

Emergency Procedure

In the event of an emergency, please exit through the emergency door in the committee room by the kitchen.

If you require assistance to exit please see a staff member.

Once you reach the bottom of the stairs make your way to the assembly point at the birdcage. Staff will guide you to an alternative route if necessary.

Earthquake

If there is an earthquake - drop, cover and hold where possible. Please remain where you are until further instruction is given.

Date 7 February 2023

Subject: **Operations and Regulatory Committee Minutes - 22 November 2022**

Approved by: A J Matthews, Director - Environment Quality

S J Ruru, Chief Executive

Document: 31340975

Recommendations

That the Taranaki Regional Council:

a) receives the minutes of the Operations and Regulatory Committee meeting of the Taranaki Regional Council at the Taranaki Regional Council, 47 Cloten Road, Stratford on Tuesday 22 November 2022 at 10.30am

b) adopts the recommendations therein.

Matters arising

Appendices/Attachments

Document 3124846: Minutes Operations and Regulatory Committee - 22 November 2022.

Date 22 November 2022, 10.30am

Venue: Taranaki Regional Council Boardroom, 47 Cloten Road, Stratford

Document: 3124846

Members	Councillor	S W Hughes	*Chairperson*
		D M Cram	*Deputy Chairperson*
		M J Cloke	
		B J Bigham	*Via Zoom*
		M G Davey	
		D H McIntyre	
		D L Lean	*Via Zoom*
		N W Walker	*ex officio*
		C L Littlewood	*ex officio*
Representative Members	Mr	D Luke	Iwi Representative
Attending	Mr	S J Ruru	Chief Executive
	Ms	A J Matthews	Director - Environment Quality
	Mr	A D McLay	Director – Resource Management
	Mr	M J Nield	Director – Corporate Services
	Mrs	V McKay	Manager – Environmental Assurance
	Mr	B Pope	Compliance Manager
	Mrs	J Allen	Manager – Resource consents
	Miss	N A Chadwick	EA to Chief Executive and Chair
	Mrs	M G Jones	Governance Administration
	Mr	C Woollen	Communications Manager
	One member of the media.		
	One member of Public		

Opening Karakia The meeting opened with a group karakia.

Apologies No Apologies were received.

Hughes/Davey

Conflicts of Interest
Iwi Representative Mr D Luke declared his position of Environmental Lead, at Te Korowai ō Ngāruahine.
Councillor C L Littlewood declared her interest in Port Taranaki.

Notification of Late Items:
Mr A D McLay and several members of the committee acknowledged Mr B Pope for his valuable 30 plus year's service with the Council and wished him well for his upcoming retirement.

1. Resource Consents Issued under Delegated Authority and Applications in Progress

1.1 Mrs J Allen, Consents Manager, spoke to the memorandum to advise the Council of consents granted, consents under application and of consent processing actions since the last meeting.

Resolved

That the Taranaki Regional Council:

a) received the report, the schedule of resource consents granted and other consent processing actions, made under delegated authority.

Walker/Littlewood

2. Consent Monitoring Annual Reports

2.1 Mrs V McKay, Manager – Environmental Assurance, spoke to the memorandum to advise the Council of the 19 compliance monitoring reports tabled since the last meeting.

Resolved

That the Taranaki Regional Council:

a) received the compliance monitoring report listed in Table 1 and noted the specific Recommendations therein

Cram/Cloke

3. Incident, Compliance Monitoring Non-compliances and Enforcement Summary – 12 August 2022 to 27 October 2022.

3.1 Mr B Pope, Compliance Manager, spoke to the memorandum to consider and receive the summary of the incidents, compliance monitoring non-compliances and enforcement for the period 12 August 2022 to 27 October 2022.

Resolved

That the Taranaki Regional Council:

a) received this memorandum Incident, Compliance Monitoring Non-Compliances and Enforcement Summary – 12 August 2022 to 27 October 2022
b) received the summary of the incidents, compliance monitoring non-compliances and enforcement for the period from 12 August 2022 to 27 October 2022, notes the action taken by staff acting under delegated authority and adopts the recommendations therein.

Davey/Littlewood

4. Analysis of the 2021-2022 Compliance Monitoring and Enforcement metrics for the Regional Sector

4.1 Mr A D McLay, Director – Resource Management, spoke to the memorandum to receive and note Compliance Monitoring & Enforcement metrics arising from the regional sector survey that shows the Council's compliance monitoring and enforcement regime is well established and resourced.

Resolved

That the Taranaki Regional Council:

a) received the Memorandum Analysis of the 2021/2022 Compliance and Enforcement metrics for the Regional Sector

b) noted the survey show this Council's compliance monitoring and enforcement regime is well established and resourced

c) noted the Council's compliance monitoring and enforcement regime compare very well against that existing elsewhere in the country.

Littlewood/Davey

5. Prosecution Sentencing Decision – C Boyd

5.1 Mr B Pope, Compliance Manager, spoke to the memorandum to give an update on the successful prosecution of Mr C Boyd. An appeal on the sentence will be heard early in December.

Resolved

That the Taranaki Regional Council:

a) received this report and noted the successful outcome of the prosecution of Mr C Boyd.

McIntyre/Cram

There being no further business the Committee Chairperson, Councillor S W Hughes, declared the public meeting of the Operations and Regulatory Committee closed at 11.05am.

Operations and Regulatory Committee Chairperson: _____

S W Hughes

Date 7 February 2023

Subject: **Resource consents issued under delegated authority and applications in progress**

Approved by: A D McLay, Director – Resource Management

S J Ruru, Chief Executive

Document: 3141036

Purpose

1. The purpose of this memorandum is to advise the Council of consents granted, consents under application and of consent processing actions since the last meeting. This information is summarised in attachments at the end of this report.

Executive summary

2. Memorandum to advise the Council of recent consenting actions made under regional plans and the Resource Management Act 1991, in accordance with Council procedures and delegations.

Recommendation

That the Taranaki Regional Council:

a) receives the schedule of resource consents granted and other consent processing actions, made under delegated authority.

Background

3. The attachments show resource consent applications, certificates of compliance and deemed permitted activities that have been investigated and decisions made by officers of the Taranaki Regional Council. They are activities having less than minor adverse effects on the environment, or having minor effects where affected parties have agreed to the activity. In accordance with sections 87BB, 104 to 108 and 139 of the Resource Management Act 1991, and pursuant to delegated authority to make these decisions, the Chief Executive or the Director—Resource Management, has allowed the consents, certificates of compliance and deemed permitted activities.

4. The exercise of delegations under the Resource Management Act 1991 is reported for Members' information. Under the delegations manual, consent processing actions are to be reported to the Consents and Regulatory Committee.

5. In addition to the details of the activity consented, the information provided identifies the Iwi whose rohe (area of interest) the activity is in. If the activity is in an area of overlapping rohe both Iwi are shown. If the activity is within, adjacent to, or directly affecting a statutory acknowledgement (area of special interest), arising from a Treaty settlement process with the Crown, that is also noted.
6. Also shown, at the request of Iwi members of the Council, is a summary of the engagement with Iwi and Hapū, undertaken by the applicant and the Council during the application process. Other engagement with third parties to the consent process is also shown. The summary shows the highest level of involvement that occurred with each party. For example, a party may have been consulted by the applicant, provided with a copy of the application by the Council, served notice as an affected party, lodged a submission and ultimately agreed with the consent conditions. In that case the summary would show only 'agreed with consent conditions', otherwise reporting becomes very complicated.
7. The attachment titled 'Consent Processing Information' includes the figure 'Consent Applications in Progress' which shows the total number of applications in the consent processing system over the last twelve months. The number of applications for the renewal of resource consents is also shown. The difference between the two is the number of new applications, including applications for a change of consent conditions. New applications take priority over renewal applications. Renewal applications are generally put on hold, with the agreement of the applicant, and processed when staff resources allow. A consent holder can continue to operate under a consent that is subject to renewal. The above approach is pragmatic and ensures there are no regulatory impediments to new activities requiring authorisation.
8. The attachment also includes:
    - Applications in progress table - the number of applications in progress at the end of each month (broken down into total applications and the number of renewals in progress) for this year and the previous two years
    - Potential hearings table outlining the status of applications where a hearing is anticipated and the decision maker(s) (e.g. a hearing panel) has been appointed
    - Consents issued table - the number of consents issued at the end of each month for this year and the previous two years
    - Breakdown of consents issued. This is the number of consents issued broken down by purpose – new, renewals, changes or review
    - Types of consents issued, further broken down into notification types – non-notified, limited notified or public notified
    - Number of times that the public and iwi were involved in an application process for the year so far
    - Application processing time extensions compared to the previous years
    - Consent type process shows the notification type including applications submitted on and the pre-hearing resolution numbers
    - Applications that have been returned because they are incomplete.

Decision-making considerations

9. Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual Plan

10. This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

11. This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Iwi considerations

12. This memorandum and the associated recommendations are consistent with the Council's policy for the development of Māori capacity to contribute to decision-making processes (schedule 10 of the *Local Government Act 2002*) as outlined in the adopted long-term plan and/or annual plan. Similarly, iwi involvement in adopted work programmes has been recognised in the preparation of this memorandum.

Legal considerations

13. This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Appendices/Attachments

Document 3140609: List of non-notified & limited-notified consents

Document 3140666: Schedule of non-notified consents

Document 3141040: Schedule of limited-notified consents

Document 3140598: Consents processing charts for Agenda

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

Discharge Permit						
Consent	**Holder**	**Subtype**	**Industry Primary**	**Industry Secondary**	**Purpose Primary**	**Activity Purpose**
R2/0409-4.0	Stratford District Council	Water - Misc	Local Government	Swimming Pools		Replace
R2/0533-4.0	Thornehayes Farm Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/0659-3.0	Arthur Griffith Reeve Williams Estate & Edna Williams	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/0664-3.0	Caskey Farms	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/0794-3.0	Oberwil Farms Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/0799-4.0	Creathnach Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/0873-3.0	Stanley Joseph & Mary-Rose Dravitzki	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/1011-3.0	Airport Farm Trustee Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/1521-4.0	Kelly B No 2 Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/1587-4.0	Keitra Farms Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/1919-3.0	Dairy Trust Taranaki	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/1955-3.0	John Gerard & Donna-Maree Reynolds	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/1991-3.0	Otoka Farms	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2011-3.0	Coastal Milk Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2110-3.0	RJ & SB Richards Family Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2161-3.0	The Penrith Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2219-4.0	Beckett Family Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2321-3.0	Peter Anthony Myers	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2350-3.0	David Michael Steele & Andrea Fay Steele Partnership	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2357-3.0	Hwitan Tune Holdings Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2360-3.0	Edendale Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2443-3.0	MN Schrader Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2525-3.0	U3 Farm Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2527-3.0	Altene Partnership	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2531-3.0	Hann Brothers	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2532-3.0	Estate RO Hann	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2587-3.0	Makara Valley Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2648-3.0	Mount Rail Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2656-3.0	Dennis Eugene Hurley	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2714-3.0	John Dwyer Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2718-3.0	GFJ Farms Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2721-3.0	Mark & Lisa Miller	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2748-3.0	Romill Partners	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2826-3.0	Rodney Gordon & Sharon Joy Joblin	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/2929-3.0	JA & MJ Gardner Trusts Partnership	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2936-3.0	Micheal Richard Eggink	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3008-3.0	Serendipity Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3009-3.0	Dwyer Farms Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3015-3.0	TD Stokes Trust No 1	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3027-3.0	Makowhai Dairies Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3032-3.0	Milton James Morrison	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3033-3.0	Turangarere Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3035-3.0	Dairy Trust Taranaki	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3041-3.0	Page Dairies Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3042-3.0	RP & CJ Ballantine Family Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3110-3.1	Punarima Farm	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3157-3.0	Murray Prankerd Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3161-3.0	Grove Dairy Farm (2008) Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3328-3.0	Pinehill Dairies (2018) Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3472-3.0	Mangapoua Farms Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3534-3.0	KJ & MT Dwyer Trust Partnership	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3540-3.0	Go 2 Milk Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3553-3.0	Westhaven Farms 2012 Ltd	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3556-3.0	Wayne Douglas & Sandra Christine Morrison	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3557-3.0	Christine Nola Good	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3617-3.0	KJ & HA Dravitzki Partnership	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3641-3.0	Colebrooke Farm Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3759-3.0	Rory Laurence & Frances May Hurley	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3780-3.0	Mullford Trusts Partnership	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3804-3.0	Pukengahu Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/3813-3.0	WN & BM Boddie Family Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/4146-3.0	Thurlow Properties Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/4342-3.0	Ireen Edna & Allan John Hurley	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/4864-3.0	Willoughby Farms	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/4903-4.0	Kevin & Heather Zimmerman	Water - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	New
R2/4949-3.0	Lupton Trust	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/5205-2.1	New Plymouth District Council	Air - Industry	Local Government	Crematorium	General Services	Change
R2/6899-2.2	Hall Family Partnership	Land/Water - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/7056-2.0	Joblin Partners Limited	Land - Animal Waste	Agriculture	Farming - Dairy	Effluent disposal	Replace
R2/7855-1.1	Greymouth Petroleum Turangi Limited	Air - Industry	Energy	Wellsite	Exploration and Production	Change
R2/11043-1.0	Ryman Healthcare Limited	Land - Stormwater	Property Development		Commercial Development	New
R2/11050-1.0	Michael Douglas & Anne Kathryn Gordon	Land - Misc	Waste Management		Waste water (sewage)	New
R2/11051-1.0	Gordon Family Trustees 2016 Limited	Land - Misc	Waste Management		Waste water (sewage)	New
R2/11059-1.0	ICE Properties Ltd	Water - Stormwater	Property Development	Storage		New

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

Land Use Consent						
Consent	**Holder**	**Subtype**	**Industry Primary**	**Industry Secondary**	**Purpose Primary**	**Activity Purpose**
R2/7133-2.0	Gilmour T & C Family Trust	Structure - Culvert	Agriculture	Farming - Dairy	Land Improvement	Replace
R2/11003-1.0	Layne Christopher Greensill	Structure - Culvert	Property Development		Access	New
R2/11024-1.0	C & W Developments GP Limited	Structure - Culvert	Property Development		Subdivision	New
R2/11025-1.0	C & W Developments GP Limited	Excavate	Property Development		Subdivision	New
R2/11026-1.0	C & W Developments GP Limited	Earthworks	Property Development		Subdivision	New
R2/11028-1.0	C & W Developments GP Limited	Vegetation clearance	Property Development		Subdivision	New
R2/11053-1.0	First Gas Limited	Structure - Erosion Control	Energy	Gas Supply	Erosion protection	New
R2/11058-1.1	Nilock & Camole Trusts	Stockholding	Agriculture	Farming - Dairy	Effluent disposal	New
Water Permit						
Consent	**Holder**	**Subtype**	**Industry Primary**	**Industry Secondary**	**Purpose Primary**	**Activity Purpose**
R2/11027-1.0	C & W Developments GP Limited	Divert	Property Development		Subdivision	New

Limited Notified authorisations issued by the Taranaki Regional Council

Land Use Consent						
Consent	**Holder**	**Subtype**	**Industry Primary**	**Industry Secondary**	**Purpose Primary**	**Activity Purpose**
R2/6643-2.0	New Plymouth District Council	Dam/Weir	Local Government		Flood Control	Replace

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/0409-4.0

Stratford District Council

Commencement Date: 14 Nov 2022

Expiry Date: 01 Jun 2040

Review Dates: Jun 2028, Jun 2034

Activity Class: Discretionary

Location: Stratford Public Swimming Pool, Portia Street, Stratford

Application Purpose: Replace

To discharge water from the Stratford Public Swimming Pool into the Patea River for the purposes of emptying the pool for maintenance

Rohe:

Ngaa Rauru Kiitahi (Statutory Acknowledgement)

Ngāruahine (Statutory Acknowledgement)

Ngāti Ruanui (Statutory Acknowledgement)

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Applicant provided application
Te Korowai o Ngāruahine Trust	Response received

Comments from Ngāruahine

Te Korowai o Ngāruahine Trust highlighted relevant policies in their environmental plan Te Uru Taiao o Ngāruahine. Te Korowai noted that their preference is for wastewater to be discharged to land in the first instance rather than water and noted there is potential loss of river values should temperature residual chlorine concentrations not be managed appropriate. Te Korowai o Ngāruahine Trust's comments/questions were as follows:

- *A detailed description of how the discharge will be 'naturally dechlorinated' be provided;*
- *What is the residual chlorine content that will be discharged? and*
- *What is the temperature that the water will be eventually discharged at?*

Response and considerations during processing of application

There is agreeance that should the discharge not be managed appropriately with regards to temperature and residual chlorine, that there is the potential for a loss in river values. Consent conditions have been developed by TRC that allow for potential losses in river values to be avoided, as well as the need for appropriate management plans and therefore the discharge is considered to have effects that are less than minor.

It is considered best practice for applicants to undertake consultation prior to submission. It is considered the proposal is within the scope of the application and in accordance with consent conditions and an appropriate discharge management plan, will not contravene the directives and aspirations as identified in the Te Uru Taiao o Ngāruahine.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/0533-4.0

Thornehayes Farm Limited

Commencement Date: 19 Dec 2022

Expiry Date: 01 Dec 2045

Review Dates: Jun 2027, Jun 2033, Jun 2039

Activity Class: Controlled

Location: 370 Ngāti maru Road, Tikorangi

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Te Kotahitanga o Te Atiawa Trust — Response received

Comments from Te Kotahitanga

Thank you for providing a copy of the resource consent application. The application site is in the rohe of Otaraua Hapū and contains tributaries of the Waitara River. The Waitara River and its tributaries are identified as areas subject to statutory acknowledgement in the Te Atiawa Claims Settlement Act 2016. Statutory acknowledgements are formal recognition of the traditional, historical, cultural, and spiritual association with the identified areas.

After reviewing the application and aligning it with the relevant provisions of Tai Whenua, Tai Tangata, Tai Ao (the Te Atiawa Iwi Environmental Management Plan), we provide the following comments:

- *Otaraua Hapū and Te Kotahitanga o Te Atiawa Trust shall be identified as affected parties in accordance with Section 95E of the Resource Management Act 1991 and limited notified of the application under Section 95B of the Resource Management Act 1991 – the discharge of effluent to waterways has a significant adverse effect on the cultural values associated with our waterways;*
- *We are opposed to the discharge of effluent to our waterways, Otaraua and TKOTAT are of the opinion that the Council should not renew any existing consent to discharge effluent to waterways (Gen. Ob. TTOM1.4, Pol. TTOM6.3). No details are provided in the application on how the conditions for a controlled activity will be met under rule 36 of the Regional Freshwater Plan;*
- *The application lacks sufficient information, which makes an informed review difficult. No details of the existing consent have been provided. No assessment is provided against the relevant provisions of Tai Whenua, Tai Tangata, Tai Ao, Sections 6(e), 7(a) and 8 of the Resource Management Act 1991 are considered relevant to the Part II assessment, and no assessment against the relevant provisions of the National Policy Statement for Freshwater 2020 is provided;*
- *No details are provided around when and how the applicant will transition to discharge to land only, or what is currently preventing that from happening now. In our opinion, no effluent discharge to waterways is acceptable or a 'best practicable option';*
- *We require any discharge to be to land only. Discharges to land can also have adverse effects on soil health and water quality. We require any discharges to land to be going to appropriate soil types and topographies, and for the over-saturation and over-contamination of soil to be avoided (Pol. TTAN9.1, 9.2);*
- *We require regular monitoring of soil health, groundwater, and surface water to be undertaken, and the results sent Otaraua Hapū and Te Kotahitanga o Te Atiawa Trust. Where the results show the discharge is adversely affecting the mauri of the soil, groundwater, or surface water (to be determined via a cultural impact assessment), the discharge shall cease until this is rectified (Pol. TTAN9.3, 9.4).*

We recommend:

- *Otaraua Hapū and Te Kotahitanga o Te Atiawa Trust shall be identified as affected parties in accordance with Section 95E of the Resource Management Act 1991 and limited notified of the application in accordance with Section 95B of the Resource Management Act 1991;*

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

- *Further information shall be requested in accordance with Section 92 of the Resource Management Act 1991 to determine if the activity meets the conditions for a controlled activity under rule 36 of the Regional Freshwater Plan;*
- *We are opposed to the discharge of effluent to waterways. Any consent issued shall be for the discharge to land only and conditions of consent applied in line with the response provided above.*

Response and considerations during processing of application

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM)

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem;*
- *second, the health and needs of people; and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/0659-3.0

Arthur Griffith Reeve Williams Estate & Edna Williams

Commencement Date: 23 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 794 Ohangai Road, Ohangai

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Ruanui (Statutory Acknowledgement)

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/0664-3.0

Caskey Farms

Commencement Date: 30 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 1456 East Road, Stratford

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Maru

Ngāti Ruanui (Statutory Acknowledgement)

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/0794-3.0
Oberwil Farms Limited

Commencement Date: 17 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 486 Hursthouse Road, Alton
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/0799-4.0
Creathnach Trust

Commencement Date: 19 Dec 2022
Expiry Date: 01 Dec 2045
Review Dates: Jun 2027, Jun 2033, Jun 2039
Activity Class: Controlled

Location: 172 Durham Road Upper, Norfolk
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Te Kotahitanga o Te Atiawa Trust	Response received

Comments from Te Kotahitanga

Thank you for providing a copy of the application. Pukerangiora Hapū and Te Kotahitanga o Te Atiawa have now reviewed.

The application site is traversed by the Ngatoronui Stream and tributaries of the Ngatoronui Stream, a tributary of the Ngatoro Stream, a tributary of the Manganui River. The Manganui River and its tributaries are scheduled Statutory Acknowledgement to Te Atiawa under the Te Atiawa Claims Settlement Act 2016. Statutory acknowledgement is recognition of the cultural, traditional, historical and spiritual relationship Te Atiawa has with those areas.

The application has been aligned with the Te Atiawa iwi environmental management plan Tai Whenua, Tai Tangata, Tai Ao (EMP). Discharge to land is generally the preferred discharge method; however, as detailed under issue TTAN1 of the EMP, point source discharges to waterbodies from farming activities must be avoided (pol. TTAN1.1) and are opposed.

The proposed discharge to land is generally in accordance with the objectives and policies set out in the EMP specifically section Te Tai Awhi Nuku Inland and Coastal Whenua for intensive farming and discharges to land (Ob. TTAN1.1, 1.2, 1.8; Ob. TTAN9.1; Pol. TTAN9.1, 9.3, 9.4); however, as detailed above, the direct discharge to water is opposed.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

The application is considered to be deficient in a number of areas. We specifically make the following comments:

- *Pukerangiora Hapū and Te Kotahitanga have not been engaged to inform the application.*
- *Completing a form is not considered to be an assessment of environmental effects.*
- *No details of the previous consent has been supplied, including*
    - *No details of the previous cow numbers and if they have changed.*
    - *No details of the activity status of the activity.*
- *No details of the dairy storage facility or the required storage. No details of the redundant ponds.*
- *No details of the travelling irrigator and honeywagon and how the discharge to land occurs and the setbacks for the potential 50ha that will be discharged to, in particular setback from waterways.*
- *No stormwater diversion details supplied.*
- *No details of the riparian planting adjacent to waterbodies provided.*
- *No map and/ or aerial photograph provided indicating discharge areas.*
- *No Part 2 of the Resource Management Act 1991 assessment provided. We consider sections 6(e), 6(f), 7(a) and 8 to be most relevant to this proposal.*
- *No assessment under the Regional Freshwater Plan for Taranaki, the Regional Policy Statement for Taranaki and the National Policy Statement for Freshwater Management (2020). The higher order planning documents are considered to be relevant to the proposals.*
- *No assessment against Tai Whenua, Tai Tangata, Tai Ao.*

For the Taranaki Regional Council to give consideration to the comments provided, Pukerangiora Hapū and Te Kotahitanga o Te Atiawa recommend:

1. *The application is returned as incomplete in accordance the section 88 of the Resource Management Act 1991 processes;*
2. *Further information is requested in accordance with the section 92 of the Resource Management Act 1991 processes;*
3. *The discharge to water is refused in accordance with section 104 of the Resource Management Act 1991;*
4. *Pukerangiora Hapū and Te Kotahitanga o Te Atiawa are identified as affected parties in accordance with the section 95 of the Resource Management Act 1991 processes.*

<u>Response and considerations during processing of application</u>

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM).

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem*
- *second, the health and needs of people and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

R2/0873-3.0

Stanley Joseph & Mary-Rose Dravitzki

Commencement Date: 21 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 450 East Road, Toko

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Maru

Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/1011-3.0
Airport Farm Trustee Limited

Commencement Date: 10 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 3280 Mountain Road, Midhirst
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāruahine (Statutory Acknowledgement)
Ngāti Maru
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make
Te Korowai o Ngāruahine Trust	Response received

Comments from Ngāruahine

There has been no pre-application consultation from the applicant with Te Korowai or the relevant Hapū.

Te Korowai will advocate for the fencing and riparian planting of all tributaries to the Piakau Stream to provide the maximum protection available to this valued waterway. It is our expectation that this goes beyond the minimum requirements of TRC's Riparian Management Plans.

Te Korowai would like the applicant to provide a copy of their most recent Riparian Management Plan (If available). This will assist us in assessing the potential impacts of the discharge activity on the Piakau Stream and its tributaries.

Response and considerations during processing of application

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM)

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem*
- *second, the health and needs of people and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

The Council has also followed up with the consent holder to provide the Riparian Plan as requested by Ngāruahine. This will be sent through once we have a response.

R2/11003-1.0

Layne Christopher Greensill

Commencement Date: 21 Dec 2022

Expiry Date: 01 Jun 2037

Review Dates: Jun 2025, Jun 2031

Activity Class: Discretionary

Location: 7 Wairau Road, Oakura

Application Purpose: New

To install and use a culvert in the Matekai Stream

Rohe:

Taranaki (Statutory Acknowledgement)

Engagement or consultation:

New Plymouth District Council	Written approval provided
Te Kahui o Taranaki Trust	No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11024-1.0
C & W Developments GP Limited

Commencement Date: 15 Nov 2022
Expiry Date: 01 Jun 2038
Review Dates: Jun 2024, Jun 2032
Activity Class: Discretionary

Location: 33E Airport Drive, Bell Block
Application Purpose: New

To install and use a culvert in the bed of a river

Rohe:
Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

New Plymouth District Council	Written approval provided
Puketapu Hapu	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Response received

Comments from Te Kotahitanga

The statement that Puketapu are in support of the proposal is not entirely correct. There are outstanding matters that have not been resolved and I understand cannot be resolved through consent conditions at this time. We are in the process of preparing a more detailed response but would suggest requesting further information including engagement with Puketapu in accordance with section 92 of the Resource Management Act 1991 to ensure cultural effects are appropriately addressed.

Response and considerations during processing of application

This application aims to restore and protect a waterway and Council considers that the physical environmental effects have will be appropriately managed. No sites of significance have been identified near the works site by the applicant or iwi and hapū representatives.

An assessment of the relevant policies of the Te Atiawa Iwi Environmental Management Plan has been provided by the applicant which demonstrates the application is generally consistent with the Plan.

Iwi and hapū have been involved in discussions through the scoping and design of the proposal and will continue to be involved. Puketapu hapū will have continued involvement with input into the Landscaping and Planting Plan. Consultation with Iwi and hapū to date has been included as Appendix I of the application.

Council considers that the applicant has undertaken an appropriate level of engagement to understand and mitigate against the potential adverse effects of the proposal on tangata whenua and mana whenua. The adverse effects of the proposal on tangata whenua and mana whenua have been assessed as less than minor.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11025-1.0

C & W Developments GP Limited

Commencement Date: 15 Nov 2022

Expiry Date: 01 Jun 2028

Review Dates:

Activity Class: Discretionary

Location: 33E Airport Drive, Bell Block

Application Purpose: New

To excavate and modify the bed of a river

Rohe:

Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

New Plymouth District Council	Written approval provided
Puketapu Hapu	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Response received

Comments from Te Kotahitanga

The statement that Puketapu are in support of the proposal is not entirely correct. There are outstanding matters that have not been resolved and I understand cannot be resolved through consent conditions at this time. We are in the process of preparing a more detailed response but would suggest requesting further information including engagement with Puketapu in accordance with section 92 of the Resource Management Act 1991 to ensure cultural effects are appropriately addressed.

Response and considerations during processing of application

This application aims to restore and protect a waterway and Council considers that the physical environmental effects have will be appropriately managed. No sites of significance have been identified near the works site by the applicant or iwi and hapū representatives.

An assessment of the relevant policies of the Te Atiawa Iwi Environmental Management Plan has been provided by the applicant which demonstrates the application is generally consistent with the Plan.

Iwi and hapū have been involved in discussions through the scoping and design of the proposal and will continue to be involved. Puketapu hapū will have continued involvement with input into the Landscaping and Planting Plan. Consultation with Iwi and hapū to date has been included as Appendix I of the application.

Council considers that the applicant has undertaken an appropriate level of engagement to understand and mitigate against the potential adverse effects of the proposal on tangata whenua and mana whenua. The adverse effects of the proposal on tangata whenua and mana whenua have been assessed as less than minor.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11026-1.0
C & W Developments GP Limited

Commencement Date: 15 Nov 2022
Expiry Date: 01 Jun 2028
Review Dates:
Activity Class: Discretionary

Location: 33E Airport Drive, Bell Block
Application Purpose: New

To undertake earthworks within 10 metres of a natural wetland

Rohe:

Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

New Plymouth District Council	Written approval provided
Puketapu Hapu	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Response received

Comments from Te Kotahitanga

The statement that Puketapu are in support of the proposal is not entirely correct. There are outstanding matters that have not been resolved and I understand cannot be resolved through consent conditions at this time. We are in the process of preparing a more detailed response but would suggest requesting further information including engagement with Puketapu in accordance with section 92 of the Resource Management Act 1991 to ensure cultural effects are appropriately addressed.

Response and considerations during processing of application

This application aims to restore and protect a waterway and Council considers that the physical environmental effects have will be appropriately managed. No sites of significance have been identified near the works site by the applicant or iwi and hapū representatives.

An assessment of the relevant policies of the Te Atiawa Iwi Environmental Management Plan has been provided by the applicant which demonstrates the application is generally consistent with the Plan.

Iwi and hapū have been involved in discussions through the scoping and design of the proposal and will continue to be involved. Puketapu hapū will have continued involvement with input into the Landscaping and Planting Plan. Consultation with Iwi and hapū to date has been included as Appendix I of the application.

Council considers that the applicant has undertaken an appropriate level of engagement to understand and mitigate against the potential adverse effects of the proposal on tangata whenua and mana whenua. The adverse effects of the proposal on tangata whenua and mana whenua have been assessed as less than minor.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11027-1.0
C & W Developments GP Limited

Commencement Date: 15 Nov 2022
Expiry Date: 01 Jun 2038
Review Dates: Jun 2028, Jun 2032
Activity Class: Discretionary

Location: 33E Airport Drive, Bell Block
Application Purpose: New

To divert water within 100 metres of a natural wetland

Rohe:
Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

New Plymouth District Council	Written approval provided
Puketapu Hapu	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Response received

Comments from Te Kotahitanga

The statement that Puketapu are in support of the proposal is not entirely correct. There are outstanding matters that have not been resolved and I understand cannot be resolved through consent conditions at this time. We are in the process of preparing a more detailed response but would suggest requesting further information including engagement with Puketapu in accordance with section 92 of the Resource Management Act 1991 to ensure cultural effects are appropriately addressed.

Response and considerations during processing of application

This application aims to restore and protect a waterway and Council considers that the physical environmental effects have will be appropriately managed. No sites of significance have been identified near the works site by the applicant or iwi and hapū representatives.

An assessment of the relevant policies of the Te Atiawa Iwi Environmental Management Plan has been provided by the applicant which demonstrates the application is generally consistent with the Plan.

Iwi and hapū have been involved in discussions through the scoping and design of the proposal and will continue to be involved. Puketapu hapū will have continued involvement with input into the Landscaping and Planting Plan. Consultation with Iwi and hapū to date has been included as Appendix I of the application.

Council considers that the applicant has undertaken an appropriate level of engagement to understand and mitigate against the potential adverse effects of the proposal on tangata whenua and mana whenua. The adverse effects of the proposal on tangata whenua and mana whenua have been assessed as less than minor.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11028-1.0

C & W Developments GP Limited

Commencement Date: 15 Nov 2022

Expiry Date: 01 Jun 2028

Review Dates:

Activity Class: Discretionary

Location: 33E Airport Drive, Bell Block

Application Purpose: New

To undertake vegetation clearance within the bed of a river

Rohe:

Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

New Plymouth District Council	Written approval provided
Puketapu Hapu	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Consulted by applicant
Te Kotahitanga o Te Atiawa Trust	Response received

Comments from Te Kotahitanga

The statement that Puketapu are in support of the proposal is not entirely correct. There are outstanding matters that have not been resolved and I understand cannot be resolved through consent conditions at this time. We are in the process of preparing a more detailed response but would suggest requesting further information including engagement with Puketapu in accordance with section 92 of the Resource Management Act 1991 to ensure cultural effects are appropriately addressed.

Response and considerations during processing of application

This application aims to restore and protect a waterway and Council considers that the physical environmental effects have will be appropriately managed. No sites of significance have been identified near the works site by the applicant or iwi and hapū representatives.

An assessment of the relevant policies of the Te Atiawa Iwi Environmental Management Plan has been provided by the applicant which demonstrates the application is generally consistent with the Plan.

Iwi and hapū have been involved in discussions through the scoping and design of the proposal and will continue to be involved. Puketapu hapū will have continued involvement with input into the Landscaping and Planting Plan. Consultation with Iwi and hapū to date has been included as Appendix I of the application.

Council considers that the applicant has undertaken an appropriate level of engagement to understand and mitigate against the potential adverse effects of the proposal on tangata whenua and mana whenua. The adverse effects of the proposal on tangata whenua and mana whenua have been assessed as less than minor.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11043-1.0

Ryman Healthcare Limited

Commencement Date: 21 Dec 2022

Expiry Date: 01 Jun 2027

Review Dates:

Activity Class: Controlled

Location: 83 Barrett Road, New Plymouth (earthworks site) & 2 Byron Place, New Plymouth (discharge Point)

Application Purpose: New

To discharge stormwater and sediment from earthworks associated with the extension of the Jean Sandel Retirement Village into a pipe and into an unnamed tributary of the Herekawe Stream

Rohe:

Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Te Kotahitanga o Te Atiawa Trust — Response received

Comments from Te Kotahitanga

Te Kotahitanga (TKoTA) provided comments on the application which are summarised as follows:

- *Lack of consultation from the applicant in terms of the application and the associated land use application with New Plymouth District Council (NPDC).*
- *Lack of Te Atiawa Environmental Management Plan assessment, (Tai Whenua, Tai Tangata, Tai Ao).*
- *Lack of assessment of the effects on the statutory acknowledgement has been undertaken.*
- *Proposal unclear as to how to Te Mana o te Wai, the key objective of the National Policy Statement for Freshwater Management 2020 will be given effects to.*
- *No conditions have been recommended proposing how to monitor the water quality from the site.*
- *The application form suggests alternatives have been considered; however, these alternatives are not assessed in the application.*
- *Advice sought from the Taranaki Regional Council in regard to the appropriateness of the erosion and sediment control plan submitted with the application*

Response and considerations during processing of application

In response to the comments of TKoTA and Council's assessment of the application, much of the aforementioned information lacking was requested to be provided by the applicant through the Section 92 process. The applicant submitted a response that satisfied the request.

Council sent this response to TKoTA advising that taking into account:

- *the status of the application;*
- *that the ESCP will be sufficient in ensuring potential adverse effects from erosion and sedimentation will be addressed on-site; and*
- *the scale and significance of the activity;*

Council considered the response to be sufficient and the Section 92 request to be satisfied.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11050-1.0

Michael Douglas & Anne Kathryn Gordon

Commencement Date: 14 Nov 2022

Expiry Date: 01 Jun 2032

Review Dates: Jun 2024, Jun 2026, Jun 2028, Jun 2030

Activity Class: Discretionary

Location: 41 Whakapaki Street, Urenui

Application Purpose: New

To discharge treated domestic effluent from a septic tank onto and into land within 25 metres of the Urenui River

Rohe:

Ngāti Mutunga (Statutory Acknowledgement)

Engagement or consultation:

Te Rūnanga o Ngāti Mutunga	Response received

Comments from Ngāti Mutunga

Confirmation was sought that no prior concerns had been raised about this septic system during Council monitoring, and that this consent would be monitored in line with similar permitted discharges in the area.

Response and considerations during processing of application

After the Council confirmed the past and future monitoring of the consent, no further concerns were raised by Ngāti Mutunga.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11051-1.0
Gordon Family Trustees 2016 Limited

Commencement Date: 29 Nov 2022
Expiry Date: 01 Jun 2032
Review Dates: Jun 2024, Jun 2026, Jun 2028, Jun 2030
Activity Class: Discretionary

Location: 43 Whakapaki Street, Urenui
Application Purpose: New

To discharge treated domestic effluent from a septic tank onto and into land within 25 metres of the Urenui River

Rohe:
Ngāti Mutunga (Statutory Acknowledgement)

Engagement or consultation:

Te Rūnanga o Ngāti Mutunga	Response received

Comments from Ngāti Mutunga

Confirmation was sought that no prior concerns had been raised about this septic system during Council monitoring, and that this consent would be monitored in line with similar permitted discharges in the area

Response and considerations during processing of application

After the Council confirmed the past and future monitoring of the consent, no further concerns were raised by Ngāti Mutunga.

R2/11053-1.0
First Gas Limited

Commencement Date: 22 Nov 2022
Expiry Date: 01 Jun 2027
Review Dates:
Activity Class: Discretionary

Location: Waiinu Beach Road, Waitotara
Application Purpose: New

To install and use erosion protection structures in the Waitotara River

Rohe:
Ngaa Rauru Kiitahi (Statutory Acknowledgement)

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received
Te Kaahui o Rauru	Consulted by applicant

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/11058-1.1
Nilock & Camole Trusts

Commencement Date: 12 Dec 2022
Expiry Date: 01 Jun 2029
Review Dates: Jun 2023, Jun 2025, Jun 2027
Activity Class: Discretionary

Location: 1065 Manaia Road, Kaponga
Application Purpose: New

To use land for holding cattle in a stockholding area

Rohe:
Ngāruahine (Statutory Acknowledgement)

Engagement or consultation:

Te Korowai o Ngāruahine Trust	No return correspondence was received
Te Korowai o Ngāruahine Trust	Consulted by applicant

R2/11059-1.0
ICE Properties Ltd

Commencement Date: 24 Nov 2022
Expiry Date: 01 Jun 2027
Review Dates:
Activity Class: Controlled

Location: 212 Connett Road, Bell Block
Application Purpose: New

To discharge stormwater and sediment into an unnamed tributary of the Waitaha Stream via the New Plymouth District Council reticulated stormwater network

Rohe:
Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Te Kotahitanga o Te Atiawa Trust	No return correspondence was received within timeframes

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/1521-4.0
Kelly B No 2 Trust

Commencement Date: 09 Dec 2022
Expiry Date: 01 Dec 2047
Review Dates: Jun 2029, Jun 2035, Jun 2041
Activity Class: Controlled

Location: 834 Skeet Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāruahine (Statutory Acknowledgement)

Engagement or consultation:

Te Korowai o Ngāruahine Trust	Response received

Comments from Ngāruahine

There has been no pre-application consultation from the applicant with Te Korowai or the relevant Hapū.

We acknowledge that Section 36A of the RMA does not require applicants to consult with anyone about resource consent applications.

However, it is the expectation of Te Korowai that applicants and consultants are following best practice for the planning industry by engaging early with Hapū and Iwi to identify potential issues.

Te Korowai acknowledges the applicant is moving from a discharge to water permit, to a land discharge permit.

This aligns with the bottom lines of Te Uru Taiao o Ngāruahine which opposes discharges of any type directly to water bodies within the rohe of Ngāruahine. This is regardless of whether the discharge is treated or untreated.

Te Korowai would like the applicant to provide a copy of their riparian management plan (If available) to enable us to assess the impacts of the land discharge.

Te Korowai encourages the applicant to fence and riparian plant all waterways to the Inaha Stream on the site, to a width of twenty metres.

These expectations are beyond those of TRC but ensure that the maximum possible protection is afforded to this waterway which is highly valued by mana whenua.19. Te Korowai notes the numerous recommendations contained in the recent report by AgEnviro Solutions.

We acknowledge the applicants' active efforts and the expense incurred to realise these recommended solutions and trust that they will all be implemented over time.

Response and considerations during processing of application

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM)

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem;*
- *second, the health and needs of people; and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

The Council has also followed up with the consent holder to provide the Riparian Plan as requested by Ngāruahine. This will be sent through once we have a response.

R2/1587-4.0

Keitra Farms Limited

Commencement Date: 17 Nov 2022

Expiry Date: 01 Dec 2048

Review Dates: Jun 2030, Jun 2036, Jun 2042

Activity Class: Controlled

Location: 1011 Waiteika Road, Opunake

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Taranaki (Statutory Acknowledgement)

Engagement or consultation:

Te Kahui o Taranaki Trust — No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/1919-3.0
Dairy Trust Taranaki

Commencement Date: 29 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 44 East Road, Stratford
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngaa Rauru Kiitahi (Statutory Acknowledgement)
Ngāti Maru (Statutory Acknowledgement)
Ngāti Ruanui (Statutory Acknowledgement)

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received
Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/1955-3.0
John Gerard & Donna-Maree Reynolds

Commencement Date: 15 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 221 Wilford Road, Hurleyville
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/1991-3.0
Otoka Farms

Commencement Date: 05 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 872 Fraser Road, Normanby
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/2011-3.0
Coastal Milk Limited

Commencement Date: 06 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 282 Wilson Road, Patea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngaa Rauru Kiitahi (Statutory Acknowledgement)
Ngāti Ruanui (Statutory Acknowledgement)

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/2110-3.0
RJ & SB Richards Family Trust

Commencement Date: 06 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 121 Garsed Road, Kakaramea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2161-3.0

The Penrith Trust

Commencement Date: 21 Dec 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 2571A Ohura Road, Strathmore

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Maru

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust — No return correspondence was received

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R2/2219-4.0

Beckett Family Trust

Commencement Date: 16 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 200 Skinner Road, Stratford

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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R2/2321-3.0

Peter Anthony Myers

Commencement Date: 09 Dec 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 488 Manawapou Road, Hawera

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2350-3.0
David Michael Steele & Andrea Fay Steele Partnership

Commencement Date: 14 Nov 2022
Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 126 Mokoia Road, Mokoia
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:
Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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R2/2357-3.0
Hwitan Tune Holdings Limited

Commencement Date: 06 Dec 2022
Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 742 Fraser Road, Normanby
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:
Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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R2/2360-3.0
Edendale Trust

Commencement Date: 05 Dec 2022
Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 226 Ngarongo Road, Normanby
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:
Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2443-3.0
MN Schrader Trust

Commencement Date: 17 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 240 Clifford Road, Hurleyville
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/2525-3.0
U3 Farm Limited

Commencement Date: 06 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 243 Beaconsfield Road, Midhirst
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Maru
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2527-3.0
Altene Partnership

Commencement Date: 23 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 136 Raupuha Road, Huinga
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Maru
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/2531-3.0
Hann Brothers

Commencement Date: 22 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 401 Bird Road, Stratford
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/2532-3.0
Estate RO Hann

Commencement Date: 22 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 148 Skinner Road, Stratford
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2587-3.0

Makara Valley Limited

Commencement Date: 29 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 58 Barclay Road, Stratford

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāruahine (Statutory Acknowledgement)

Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received
Te Korowai o Ngāruahine Trust	Response received

Comments from Ngāruahine

There has been no pre-application consultation from the applicant with Te Korowai or the relevant Hapū.

We acknowledge that Section 36A of the RMA does not require applicants to consult with anyone about resource consent applications.

However, it is the expectation of Te Korowai that applicants and consultants are following best practice for the planning industry by engaging early with Hapū and Iwi to identify potential issues. Te Korowai acknowledges this application is for a renewal of a discharge permit to land. This aligns with bottom lines of Te Uru Taiao o Ngāruahine which opposes discharges of any type directly to water bodies within the rohe of Ngāruahine. This is regardless of whether the discharge is treated or untreated.

The Konini Stream and one of its unnamed tributaries flows through the discharge area.

Te Korowai would like the applicant to provide a copy of their riparian management plan (If available) to enable us to assess the impacts of the land discharge.

We note that on the 2nd of August 2022 the applicant also lodged a 14-lot subdivision application (RC510) for 58 Barclay Road with the Stratford District Council.

In our response to the subdivision application, Te Korowai advocated for the applicant to commit to:

a. *Extending riparian planting of the Konini stream and its tributaries;*
b. *providing an esplanade strip or reserve to enhance the water quality and native biodiversity of the Konini stream and its tributaries.*

Te Korowai encourages the applicant to fence and riparian plant all waterways to the Konini Stream on the site, to a width of 20 metres. These expectations are beyond those of TRC but ensure that the maximum possible protection is afforded to those waterways which are highly valued by mana whenua.

These expectations remain whether the applicant is continuing to discharge farm dairy effluent to land or is subdividing their land.

Response and considerations during processing of application

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

The National Policy Statement for Freshwater Management (NPS-FM)

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem;*
- *second, the health and needs of people and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

The Council has also followed up with the consent holder to provide the Riparian Plan as requested by Ngāruahine and this has been emailed through as requested.

R2/2648-3.0

Mount Rail Trust

Commencement Date: 25 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 1477 South Road, Manutahi

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2656-3.0
Dennis Eugene Hurley

Commencement Date: 17 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 157 Hurley Road, Hurleyville
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/2714-3.0
John Dwyer Trust

Commencement Date: 17 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 167 Taranaki Road, Patea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/2718-3.0
GFJ Farms Limited

Commencement Date: 17 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 105 Toko Road, Toko
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Maru
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2721-3.0
Mark & Lisa Miller

Commencement Date: 09 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 559 Toko Road, Huinga
Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:
Ngāti Maru
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/2748-3.0
Romill Partners

Commencement Date: 08 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 332 Henson Road, Waitotara
Application Purpose: Replace

To discharge farm dairy effluent by spray irrigation onto land

Rohe:
Ngaa Rauru Kiitahi

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received

R2/2826-3.0
Rodney Gordon & Sharon Joy Joblin

Commencement Date: 17 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 105A Hunts Road, Mokoia
Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/2929-3.0
JA & MJ Gardner Trusts Partnership

Commencement Date: 22 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 48 Wood Street, Kakaramea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/2936-3.0
Micheal Richard Eggink

Commencement Date: 09 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 340 Ararata Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/3008-3.0
Serendipity Trust

Commencement Date: 24 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 123 Ararata Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3009-3.0
Dwyer Farms Limited

Commencement Date: 18 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 339B South Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/3015-3.0
TD Stokes Trust No 1

Commencement Date: 08 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 518 South Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/3027-3.0
Makowhai Dairies Limited

Commencement Date: 14 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2028
Activity Class: Controlled

Location: 45 Makowhai Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3032-3.0
Milton James Morrison

Commencement Date: 28 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 178 Upper Okotuku Road, Waverley
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngaa Rauru Kiitahi

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received

R2/3033-3.0
Turangarere Trust

Commencement Date: 08 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 74 Lower Ball Road, Kakaramea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/3035-3.0
Dairy Trust Taranaki

Commencement Date: 29 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 44 Nowell Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3041-3.0
Page Dairies Limited

Commencement Date: 21 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 1172 Meremere Road, Ohangai
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:
Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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R2/3042-3.0
RP & CJ Ballantine Family Trust

Commencement Date: 16 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 573 South Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:
Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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R2/3110-3.1
Punarima Farm

Commencement Date: 28 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 397 Meremere Road, Hawera
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:
Te Rūnanga o Ngāti Ruanui Trust — No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3157-3.0
Murray Prankerd Trust

Commencement Date: 20 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 425 Maata Road, Maata
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/3161-3.0
Grove Dairy Farm (2008) Limited

Commencement Date: 24 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 63 Joll Road, Patea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/3328-3.0
Pinehill Dairies (2018) Limited

Commencement Date: 20 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: Patea Road, Patea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngaa Rauru Kiitahi
Ngāti Ruanui

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

R2/3472-3.0
Mangapoua Farms Limited

Commencement Date: 20 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 60 Mangapoua Road, Normanby
Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

R2/3534-3.0
KJ & MT Dwyer Trust Partnership

Commencement Date: 08 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 641 Hursthouse Road, Kakaramea
Application Purpose: Replace

To discharge effluent from a farm dairy onto land

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

R2/3540-3.0
Go 2 Milk Limited

Commencement Date: 20 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 40B Upper Waiau Road, Waverley
Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:
Ngaa Rauru Kiitahi

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3553-3.0
Westhaven Farms 2012 Ltd

Commencement Date: 14 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 463 Otauto Road, Patea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngaa Rauru Kiitahi
Ngāti Ruanui

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/3556-3.0
Wayne Douglas & Sandra Christine Morrison

Commencement Date: 14 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 56 Elslea Road, Waverley
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngaa Rauru Kiitahi (Statutory Acknowledgement)
Ngāti Ruanui (Statutory Acknowledgement)

Engagement or consultation:

Te Kaahui o Rauru	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3557-3.0

Christine Nola Good

Commencement Date: 24 Nov 2022

Expiry Date: 01 Dec 2048

Review Dates: Jun 2024, Jun 2030, Jun 2036, Jun 2042

Activity Class: Controlled

Location: 182 Oeo Road, Manaia

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāruahine (Statutory Acknowledgement)

Engagement or consultation:

Te Korowai o Ngāruahine Trust — Response received

Comments from Ngāruahine

There has been no pre-application consultation from the applicant or their consultant, with Te Korowai or the relevant Hapū.

We acknowledge that Section 36A of the RMA does not require applicants to consult with anyone about resource consent applications.

It is the expectation of Te Korowai that applicants and consultants are following best practice for the planning industry by engaging early with Hapū and Iwi to identify potential issues. Te Korowai acknowledges this application is a renewal discharge permit to land with existing effluent storage. This aligns with bottom lines of Te Uru Taiao o Ngāruahine which opposes discharges of any type directly to water bodies within the rohe of Ngāruahine. This is regardless of whether the discharge is treated or untreated.

It appears that over time the small tributary to the Wahamoko Stream closest to Oeo Road, and South bound, behind the property has been piped and covered.

Te Korowai advocates for daylighting of any piped streams as per Policies 5.8 and 5.10 of Te UruTaiao o Ngāruahine.

The applicant or their consultant have not attached any maps to outline the areas where the discharge will take place.

For Te Korowai to make informative comments, we need to view a detailed map that accurately features, the property boundaries, discharge boundaries, and any added features the applicant has ticked on the application i.e. Cowshed, streams/wetlands.19. We ask TRC to send this application back to the applicant as incomplete, until they attach a detailed map that includes all features as stated above.

Response and considerations during processing of application

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM)

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem;*
- *second, the health and needs of people; and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

The Council supplied as requested, a map of the discharge area.

R2/3617-3.0

KJ & HA Dravitzki Partnership

Commencement Date: 29 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 339 Toko Road, Hungia

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngāti Maru

Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3641-3.0
Colebrooke Farm Limited

Commencement Date: 14 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 194 Makino Road, Hurleyville
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/3759-3.0
Rory Laurence & Frances May Hurley

Commencement Date: 18 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 96 Crompton Road, Alton
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/3780-3.0
Mullford Trusts Partnership

Commencement Date: 09 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 17 Spence Road, Kakaramea
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/3804-3.0
Pukengahu Trust

Commencement Date: 14 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 52 Pukengahu Road, Stratford
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/3813-3.0
WN & BM Boddie Family Trust

Commencement Date: 06 Dec 2022
Expiry Date: 01 Dec 2047
Review Dates: Jun 2029, Jun 2035, Jun 2041
Activity Class: Controlled

Location: 215 Rotokare Road, Eltham
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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R2/4146-3.0
Thurlow Properties Limited

Commencement Date: 15 Dec 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 511 Ingahape Road, Whakamara
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/4342-3.0
Ireen Edna & Allan John Hurley

Commencement Date: 22 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 2 Clifford Road, Hurleyville
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

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R2/4864-3.0
Willoughby Farms

Commencement Date: 24 Nov 2022
Expiry Date: 01 Dec 2046
Review Dates: Jun 2028, Jun 2034, Jun 2040
Activity Class: Controlled

Location: 42 Tiromoana Road, Maata
To discharge farm dairy effluent onto land

Application Purpose: Replace

Rohe:
Ngāti Ruanui

Engagement or consultation:

Te Rūnanga o Ngāti Ruanui Trust	Responded they had no comment to make

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Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/4903-4.0
Kevin & Heather Zimmerman

Commencement Date: 28 Nov 2022
Expiry Date: 01 Dec 2024
Review Dates: Jun 2023, Jun 2024
Activity Class: Controlled

Location: 431 Smart Road, New Plymouth
Application Purpose: New

To discharge farm dairy effluent from an oxidation pond treatment system into the Manganaha Stream

Rohe:

Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Te Kotahitanga o Te Atiawa Trust — Response received

Comments from Te Kotahitanga

Thank you for providing a copy of the application. Ngāti Tawhirikura and Te Kotahitanga o Te Atiawa have now reviewed.

The application affects the Manganaha Stream, a tributary of the Waiwhakaiho River. The Waiwhakaiho River and its tributaries are scheduled statutory acknowledgement to Te Atiawa under the Te Atiawa Claims Settlement Act 2016. Statutory acknowledgement is the recognition of the cultural, traditional, historical and spiritual relationship Te Atiawa has with those areas. Notwithstanding this, our relationship with te taiao is not limited to only water, water is however the source of life.

Ngāti Tawhirikura and Te Kotahitanga o Te Atiawa have aligned the proposal with the Te Atiawa iwi environmental management plan Tai Whenua, Tai Tangata, Tai Ao. The proposal is inconsistent with the objectives and policies of Tai Whenua, Tai Tangata, Tai Ao and the wishes of Ngāti Tawhirikura kuia who fought for the reduction of pollution to enable the return of the Ngāti Tawhirikura mahinga kai species in the 1980s.

Unfortunately the efforts of our kuia were in vain and our species have not returned in abundance, they have reduced even further since that time which has resulted in the loss of knowledge and ability to exercise our customary harvesting techniques and furthermore to show manaaki to our manuhiri through the sharing of kai.

As previously expressed to the applicant in the attached email, Ngāti Tawhirikura and Te Kotahitanga remain vehemently opposed to the discharge of dairy effluent to our awa.

Ngāti Tawhirikura and Te Kotahitanga request affected party status in accordance with section 95 of the Resource Management Act 1991 processes and that the application be refused.

Response and considerations during processing of application

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM)

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem;*
- *second, the health and needs of people; and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

The Council generally does not support continued discharging of farm dairy effluent to water, and when such consents expire the expectation is that the discharge will change to a land. However in this case the recommendation was to allow the discharge to continue for a further two years because the applicant is intending to retire the property as dairy farm land, using the property for crops and a small drystock herd instead.

R2/4949-3.0

Lupton Trust

Commencement Date: 30 Nov 2022

Expiry Date: 01 Dec 2046

Review Dates: Jun 2028, Jun 2034, Jun 2040

Activity Class: Controlled

Location: 368 Lennox Road, Waverley

Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:

Ngaa Rauru Kiitahi

Engagement or consultation:

Te Kaahui o Rauru — No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/5205-2.1
New Plymouth District Council

Commencement Date: 28 Nov 2022
Expiry Date: 01 Jun 2032
Review Dates: Jun 2026
Activity Class: Discretionary

Location: 629 Junction Road, New Plymouth
Application Purpose: Change

To discharge emissions into the air from the operation of a crematorium

Change of consent conditions to enable the replacement of the existing Newton Cremator with the new Austeng Joule Cremator

Rohe:
Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Te Kotahitanga o Te Atiawa Trust	No return correspondence was received

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R2/6899-2.2
Hall Family Partnership

Commencement Date: 30 Nov 2022
Expiry Date: 01 Jun 2028
Review Dates: Jun 2023, Jun 2025, Jun 2027
Activity Class: Controlled

Location: 545 Radnor Road, Midhirst
Application Purpose: Replace

To discharge farm dairy effluent onto land and after treatment in an oxidation pond system into Piakau Stream if the land disposal area is unsuitable for effluent disposal

Rohe:
Ngāruahine (Statutory Acknowledgement)
Ngāti Maru
Ngāti Ruanui (Statutory Acknowledgement)

Engagement or consultation:

Te Rūnanga o Ngāti Maru (Taranaki) Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received
Te Korowai o Ngāruahine Trust	Response received

Comments from Ngāruahine

There has been no pre-application consultation from the applicant with Te Korowai or the relevant Hapū.

We acknowledge that Section 36A of the RMA does not require applicants to consult with anyone about resource consent applications.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

However, it is the expectation of Te Korowai that applicants and consultants are following best practice for the planning industry by engaging early with Hapū and Iwi to identify potential issues. Te Korowai request the applicant consult with Ngāti Ruanui and Ngāti Maru in the interests of integrity and best practice.

Because there has been no pre-consultation with any Iwi entities, Te Korowai would like to know what information the applicant or their consultant has based their assumption that "pre-European occupation in the direct area between Mt Taranaki and Mt Tongariro was traditionally low which shows in the low number of maraes in the Stratford rohe." It is mana whenua who will determine if this statement is true.

Te Korowai acknowledges this consent is for a dual discharge to land and then water when storage is exceeded, and soil conditions are unsuitable to discharge to land.

However, Te Korowai absolutely opposes the direct discharge of wastewater, farm dairy effluent or contaminants to all water bodies within the rohe of Ngāruahine be that treated or untreated. Te Mana o Te Wai imposes a clear hierarchy of obligations which prioritises the health and wellbeing of water first.

Te Korowai opposes the granting of any dual discharge consents regardless of the financial commitments and plans of applicants. This opposition is in line with our bottom line for freshwater and the hierarchy of obligations under Te Mana o te Wai.

<u>Response and considerations during processing of application</u>

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM)

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem;*
- *second, the health and needs of people; and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

In the processing officers opinion the farm's high rainfall and steep topography mean that it is not practicable to discharge effluent exclusively to land at this stage. However in future, after gaining experience at managing a dual disposal system, discharging to land only may be feasible. Advances in technology may also help by reducing the storage requirement.

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/7056-2.0
Joblin Partners Limited

Commencement Date: 07 Nov 2022
Expiry Date: 01 Dec 2047
Review Dates: Jun 2029, Jun 2035, Jun 2041
Activity Class: Controlled

Location: 83 Lower Stuart Road, Eltham
Application Purpose: Replace

To discharge farm dairy effluent onto land

Rohe:
Ngāruahine (Statutory Acknowledgement)

Engagement or consultation:

Te Korowai o Ngāruahine Trust — Response received

Comments from Ngāruahine

There has been no pre-application consultation from the applicant with Te Korowai or the relevant Hapū.

We acknowledge that Section 36A of the RMA does not require applicants to consult with anyone about resource consent applications.

However, it is the expectation of Te Korowai that applicants and consultants are following best practice for the planning industry by engaging early with Hapū and Iwi to identify potential issues. Te Korowai would like clarification, is this application for a renewal or new consent? Te Korowai acknowledges this application is for a renewal of a discharge permit to land with existing effluent storage. This aligns with bottom lines of Te Uru Taiao o Ngāruahine which opposes discharges of any type directly to water bodies within the rohe of Ngāruahine. This is regardless of whether the discharge is treated or untreated.

Te Korowai would like the applicant to provide a copy of their most recent Riparian Management Plan (If available). This will assist us in assessing the potential impacts of the discharge activity near the Waingongoro River and its tributaries.

Te Korowai will advocate for the fencing and riparian planting of all tributaries to the Waingongoro River to provide the maximum protection available to this valued waterway. It is our expectation that this goes beyond the minimum requirements of TRC's Riparian Management Plans. We ask TRC to return this application as incomplete as the applicant has failed to complete the following:

a. *Section 4.7 of the consent application, the applicant needs to identify how they will dispose of solid waste.*
b. *Section 6.1 of the consent application, the applicant cannot name the closest stream to the discharge area.*
c. *Section 10 of the consent application, the applicant has not adopted the RMA assessment or attached an alternative assessment.*

Response and considerations during processing of application

We have provided below, a response to your comments, which hopefully provides a better understanding of the Taranaki Regional Council's (the Council) position and steps which were taken during the assessment of this application.

The National Policy Statement for Freshwater Management (NPS-FM)

The NPS-FM contains a hierarchy of obligations (as expressed in the objective of the NPS-FM) that the Council must have regard to in its assessment of the effects of a proposed activity for which resource consent is sought. This means as part of its assessment of an application, the Council must consider whether a proposed activity will:

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

- *first, prioritise the health and well-being of a particular water body/freshwater ecosystem;*
- *second, the health and needs of people; and*
- *third, the ability of people and communities to provide for their social, economic and cultural well-being.*

Similarly, the Council must have regard to the objectives and policies of the Regional Policy Statement for Taranaki (RPS) and the Regional Freshwater Plan for Taranaki (RFWP). The situation is more challenging in this case where the activity is a controlled activity.

Almost every application for a farming dairy effluent consent received is for a replacement of an existing activity, and a controlled activity under Rules 35 & 36 of the Regional Freshwater Plan for Taranaki. The Council must have regard to the NPS-FM, the RPS as well as the RFWP when considering a resource consent application. If an activity is described as a controlled activity, Council must grant a resource consent, and the power to impose conditions on the consent is restricted to the matters over which control is reserved (sections 87A and 104A of the Resource Management Act). Rules 35 and 36 of the RFWP do not include any matters of control that expressly allow for the consideration of matters such as those expressed in the NPS-FM objective. Given that the Council can only consider policies that relate to the matters over which the Council has reserved control through the plan itself, the Council is unable to take into account matters that fall outside this scope.

In terms of the notification assessment and when deciding whether a person is an affected person, the Council is limited in terms of matters that it can take into account when determining an application for a controlled activity.

The Council has also followed up with the consent holder to provide the Riparian Plan as requested by Ngāruahine and this has been emailed through as requested. Applications now undergo a full S88 check by an Environmental Planner before they are sent for comment.

R2/7133-2.0

Gilmour T & C Family Trust

Commencement Date: 21 Dec 2022

Expiry Date: 01 Jun 2041

Review Dates: Jun 2029, Jun 2035

Activity Class: Discretionary

Location: Cnr Brookes and Mountain Road, Stratford

Application Purpose: Replace

To use a culvert in an unnamed tributary of the Mangawharawhara Stream

Rohe:

Ngāruahine (Statutory Acknowledgement)

Ngāti Ruanui

Engagement or consultation:

Te Korowai o Ngāruahine Trust	No return correspondence was received
Te Rūnanga o Ngāti Ruanui Trust	No return correspondence was received

Non-notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/7855-1.1

Greymouth Petroleum Turangi Limited

Commencement Date: 14 Nov 2022

Expiry Date: 01 Jun 2027

Review Dates:

Activity Class: Discretionary

Location: Turangi-B wellsite, 42 Upper Turangi Road, Motunui

Application Purpose: Change

To discharge emissions to air associated with exploration activities at the Turangi-B wellsite, including:
" flaring of hydrocarbons associated with well clean-up and well testing; and
" emissions from other miscellaneous activities

Change of consent condition 1 of 7855-1 to allow exploration flaring for up to 24 wells at Turangi-B

Rohe:

Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Kim Richard Topless	Written approval provided
Ngāti Rahiri Hapu O Te Atiawa (Taranaki) Society Inc	Consulted by applicant
Ralston John Topless	Written approval provided
Te Kotahitanga o Te Atiawa Trust	No return correspondence was received
Te Kotahitanga o Te Atiawa Trust	Applicant provided application

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Limited Notified authorisations issued by the Taranaki Regional Council between 05 Nov 2022 and 31 Dec 2022

R2/6643-2.0

New Plymouth District Council

Commencement Date: 05 Dec 2022

Expiry Date: 01 Jun 2032

Review Dates: Jun 2026, Jun2030

Activity Class: Discretionary

Location: Scout Road, Korito

Application Purpose: Replace

To dam water and use then remove an existing weir in the Mangorei Stream

Rohe:

Taranaki

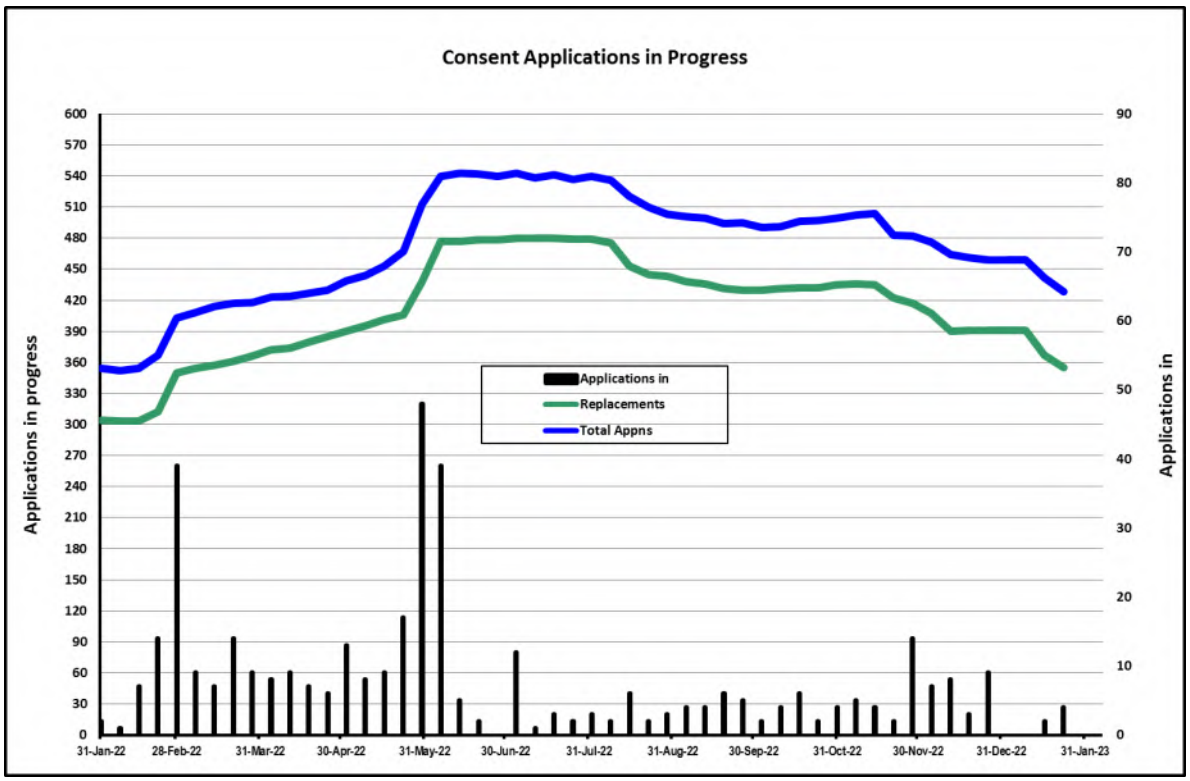
Te Atiawa (Statutory Acknowledgement)

Engagement or consultation:

Department of Conservation	Served Notice
Fish & Game New Zealand	Submitter - withdrawn
Te Kahui o Taranaki Trust	Provided with application
Te Kotahitanga o Te Atiawa Trust	Submitter - withdrawn

Consent Processing Information

1) Applications in progress



2) Month Ending

	July		Aug		Sept		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun	
	Total	R	Total	R	Total	R	Total	R	Total	R	Total	R	Total	R	Total	R	Total	R	Total	R	Total	R	Total	R
2022/2023	540	479	520	453	490	430	499	435	482	417	459	391												
2021/2022	310	274	310	277	276	246	258	235	311	280	367	313	354	304	403	350	423	372	439	390	466	406	542	480
2020/2021	196	157	187	157	221	182	221	180	263	219	257	216	262	217	300	229	297	259	293	258	271	238	312	271

R = Replacements

3) Potential Hearings

Nil

Doc# 3120760--v1

4) Consents Processed (running totals)

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
2022-2023	7	53	82	86	139	171						
2021-2022	17	37	87	114	123	136	152	162	184	202	218	225
2020-2021	20	38	53	75	94	116	131	154	178	209	247	269

5) Breakdown of consents processed

	New	Replace	Change	Review	Totals
2022-2023 - to December	**31**	**129**	**6**	**5**	**171**
2021-2022 Total	54	149	16	6	**225**
2021-2021 Total	71	148	39	11	**269**

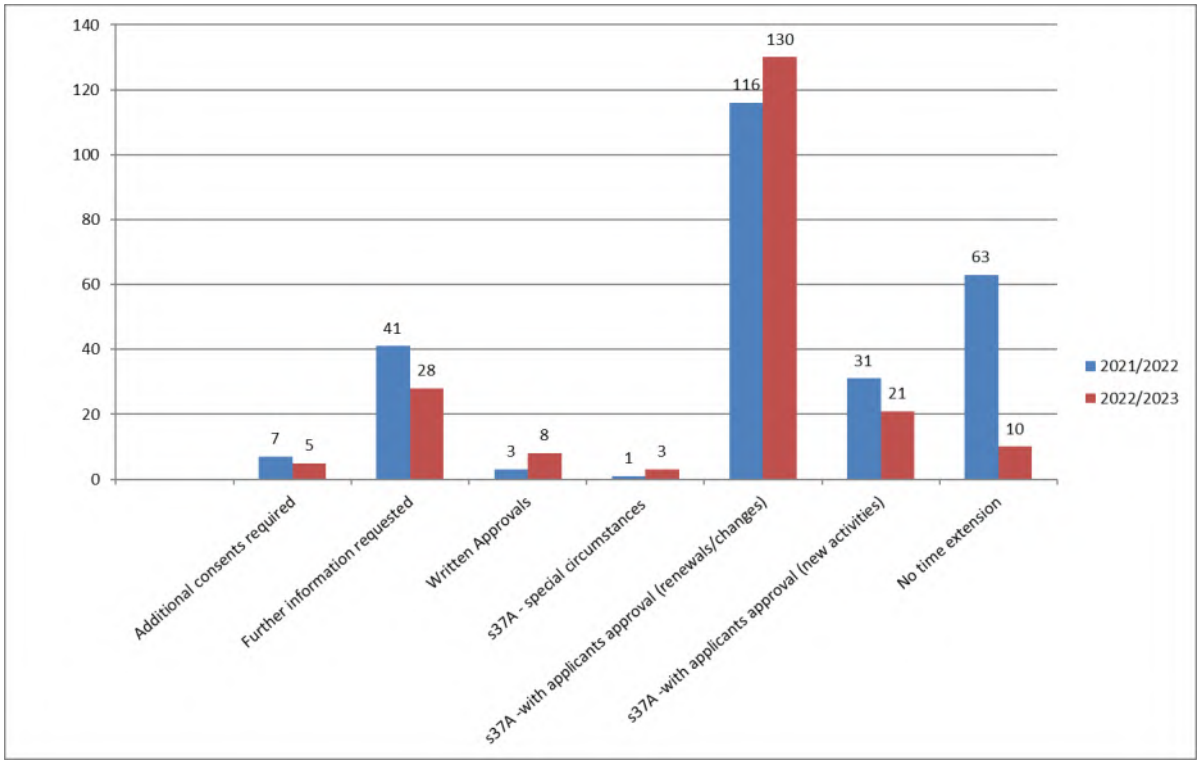
6) Types of consents issued - year to date comparison

	Agricultural	Central/Local Government	Energy	Forestry	Other	Total publically notified		Agricultural	Central/Local Government	Energy	Forestry	Other	Total Limited Notified		Agricultural	Central/Local Government	Energy	Forestry	Other	Total Non-notified		Grand Total
	Publically Notified					%		Limited					%		Non Notified					%		
July 2020 to June 2021	0	0	0	0	2	**0.7%**	**2**	0	1	0	0	0	**0.4%**	**1**	146	20	44	6	50	**98.9%**	**266**	**269**
July 2021 to June 2022	0	0	8	0	0	**3.6%**	**8**	1	0	0	0	0	**0.4%**	**1**	132	36	18	3	27	**96.0%**	**216**	**225**
July 2022 to December 2022	**0**	**0**	**0**	**0**	**0**	**0.0%**	**0**	**1**	**1**	**0**	**0**	**0**	**0.0%**	**2**	**127**	**8**	**4**	**0**	**30**	**98.8%**	**169**	**171**

7) Involvement with third parties for applications processed year to date

	Consultation/ Involved (number of parties)	Number of Affected Party Approvals (written)	Totals
Councils	**1**	**12**	**13**
DOC	**0**	**0**	**0**
Environmental/Recreational Groups	**0**	**0**	**0**
Fish & Game	**0**	**0**	**0**
Individuals/Neighbours/Landowners	**0**	**8**	**8**
Network Utilities	**0**	**0**	**0**
Non Govt Organisations	**0**	**0**	**0**
Other Govt Departments	**0**	**0**	**0**
Iwi/hapu	**234**	**0**	**234**
Totals - December 2022	**235**	**20**	**255**

8) Application processing time extensions used 2021/2022 versus 2022/2023



9) Consent type process

	Last 10 year average 2013 - 2022	July 2021 to June 2022	July 2022 to December 2022
Total consents granted	347	225	171
Publically Notified	9	8	0
Limited-notified	10	1	2
Non-notified	330	216	169
Applications submitted on (in opposition and to be heard)	13	9	2
Application Pre-hearing resolution (%)	7 81%	8 89%	2 100%
Hearings (no. of applications)	1 (6)	1 (1)	0 (0)
Appeals (no. of applications)	1 (6)	0 (0)	0 (0)
Total current consents	4714	4372	4412

10) Applications returned incomplete under Section 88

For the 2022-2023 financial year, 12 applications have been returned incomplete under S88 of the RMA for insufficient information. Four of those applications have since been resubmitted by the applicant.

11) Deemed Permitted Activities issued

Date Issued	DPA No	Holder	Activity	Plan	Rule
30-Nov-22	6580-2.0	Beach Energy Resources NZ (Kupe) Limited	Structure - Bridge	RFWP	52
30-Nov-22	6966-2.0	Beach Energy Resources NZ (Kupe) Limited	Structure - Bridge	RFWP	52

Date 7 February 2023

Subject: **Consent Monitoring Annual Reports**

Approved by: A J Matthews, Director - Environment Quality

S J Ruru, Chief Executive

Document: 3138352

Purpose

1. The purpose of this memorandum is to advise Council of 24 tailored compliance monitoring reports, for the 2021-2022 reporting year.

Executive summary

2. The Council considers the regular reporting of comprehensive and well-considered compliance monitoring is vital to undergird:
    - Community standing and reputation enhancement for companies that consistently attain good or high levels of environmental performance. Informed feedback is appropriate and valuable, and assists a proactive alignment of industry's interests with community and Resource Management Act 1991 expectations.
    - A respectful and responsible regard for the Taranaki region's environment and our management of its natural resources. Reporting allows evaluation and demonstration of the overall rate of compliance by sector and by consent holders as a whole, and of trends in the improvement of our environment.
    - The Council's accountability and transparency. Reporting gives validity to investment in monitoring and to assessments of effective intervention.
3. These compliance monitoring reports have been submitted to each consent holder for comment and confirmation of accuracy prior to publication. All reports provide environmental performance and administrative compliance ratings for each consent holder in relation to their activities over the period reported. Recommendations pertaining to each site or programme are set out in the relevant report. These recommendations may include continuation of existing monitoring programmes in the case of acceptable environmental performance, or alternatively amendments as appropriate.
4. There are 24 tailored compliance monitoring reports. Within the reports, overall environmental ratings assigned included 33 high and five good, while three required improvement (Table 1).

Table 1 List of annual reports with overall environmental performance rating

	Report Name	Performance Rating	Document Number
3	Lower Waiwhakaiho Airshed Monitoring Programme Annual Report 2021-2022	2 x high, 1 x imprvmt req	3118220
6	STDC Hāwera Oxidation Ponds Monitoring Programme Annual Report 2021-2022	1 x high	3127101
7	SDC Stratford WWTP Monitoring Programme Annual Report 2021-2022	1 x imprmnt req	3125186
8	STDC Eltham WWTP & Closed Landfill Monitoring Programme Annual Report 2021-2022	1 high	3088564
9	STDC Pātea WWTP & Emergency Outfall, STDC Manaia WWTP, STDC Waverley WWTP and Stock Truck Wastes Disposal, STDC Kaponga WWTP Monitoring Programme Annual Report 2021-2022	1 x high	3125512
10	STDC Ōpunake WWTP & Ocean Outfall Monitoring Programme Annual Report 2021-2022	1 x high	3119582
14	Mangati Stream [integrated] Monitoring Programme Annual Report 2021-2022	13 x high, 1 x good	3126202
19	Tawhiti Stream Monitoring Programme Annual Report 2021-2022	3 x high	3102654
20	Methanex Motunui and Waitara Valley Monitoring Programme Annual Report 2021-2022	1 x high	3131486
33	NPDC Water Supplies Programme 2021-2022 Monitoring Programme Annual Report 2021-2022	1 x good	3116510
34	STDC Water Supplies Monitoring Programme Annual Report 2021-2022	1 x good	3116340
36	NPDC Inglewood WWTP Monitoring Programme Annual Report 2021-2022	1 x high	3095419
37	NPDC Colson Rd Landfill Monitoring Programme Annual Report 2021-2022	1 x good	3111121
43	TWN Ltd Partnership - Waihapa Production Station Monitoring Programme Annual Report 2021-2022	1 x high	3118107
74	Flexgas Ltd Ahuroa-B Gas Storage Project Monitoring Programme Annual Report 2021-2022	1 x high	3118668
76	OMV Taranaki Ltd - Maui Production Station Monitoring Programme Annual Report 2021-2022	1 x high	3097021
81	Greymouth Petroleum Ltd - Northern Sites Monitoring Programme Annual Report 2021-2022	1 x good	3119474
89	Todd McKee Production Station Monitoring Programme Annual Report 2021-2022	1 x high	3120635
90	McKechnie Aluminium Solutions Ltd Monitoring Programme Annual Report 2021-2022	1 x high	3118089
91	Todd Energy Limited Deep Well Injection Monitoring Programme Annual Report 2021-2022	1 x high	3117876
92	NPDC Mangapouri Cemetery Monitoring Programme Annual Report 2021-2022	1 x imprmnt req	3118381
93	New Zealand Energy Corperation (NZEC) - Deep Well Monitoring Programme Annual Report 2021-2022	1 x high	3126059
94	Westown Haulage - Cowling Rd cleanfill Monitoring Programme Annual Report 2021-2022	1 x high	3117504
95	Water Permits - minor takes, Golf course water takes, pasture irrigation schemes	1 x high	3123793

5. For reference, in the 2021-2022 year, consent holders were found to achieve a high level of environmental performance and compliance for 876 (88%) of a total of 998 consents monitored through the Taranaki tailored monitoring programmes, while for another 97 (10%) of the consents a good level of environmental performance and compliance was achieved. A further 24 (2%) of consents monitored required improvement in their performance, while the remaining one (<1%) achieved a rating of poor (Table 2).

Table 2 Historical annual environmental and compliance performance ratings from July 2012 to June 2022. Please note that the breakdown of consents that achieved 'Improvement required' or 'Poor' levels of environmental performance and compliance were not reported separately prior to 2017-2018.

Year	High	Good	Improvement Required	Poor
2012-2013	59%	35%	6%	
2013-2014	60%	29%	11%	
2014-2015	75%	22%	3%	
2015-2016	71%	24%	5%	

Year	High	Good	Improvement Required	Poor
2016-2017	74%	21%	5%	
2017-2018	76%	20%	3%	1%
2018-2019	83%	13%	3%	1%
2019-2020	81%	17%	2%	0%
2020-2021	86%	11%	2.5%	0.5%
2021-2022	88%	10%	2%	<1%

6. Ministry for the Environment (MfE) Best Practice Guidelines for Compliance, Monitoring and Enforcement under the Resource Management Act 1991 recommend that councils provide regular reports to the public on compliance monitoring and enforcement activities. Council public reporting of these activities provides public transparency around how rules/policies are being enforced and how council responds to non-compliance. The Council has been providing annual compliance reports to consent holders and the public for over three decades. Copies of individual compliance reports are available on request, or via the Taranaki Regional Council website.

Recommendations

That the Taranaki Regional Council:

a) receives the 24 compliance monitoring reports listed in Table 1

b) notes any specific recommendations therein.

Discussion

7. Findings and recommendations of each of the compliance monitoring reports are summarised below.

22-03 Lower Waiwhakaiho Airshed Monitoring Programme Annual Report 2021-2022

8. The Lower Waiwhakaiho area of New Plymouth accommodates several industries that include two abrasive blasting operations and an asphalt plant. The companies hold three resource consents for discharges to air, which include a total of 72 special conditions setting out the requirements that the companies must satisfy.

9. Overall, of the three companies assessed in this Lower Waiwhakaiho Air Discharge Compliance Monitoring Programme, two demonstrated an overall high level of environmental and administrative performance (Downer EDI Works Ltd and Dialog Fitzroy Ltd), while Katere Surface Coatings Ltd. demonstrated a level of environmental performance that required improvement and a good level of administrative performance.

10. The Council's monitoring during the year under review included nine inspections and two deposition gauge surveys. The deposition gauge surveys found that, in relation to dust resulting in deposited particulates, ambient air quality in the area during the year under review was high.

11. This report includes recommendations relating to monitoring in the 2022-2023 year, including a recommendation relating to an optional review of consents 4475-3 and 10881-1 in June 2023.

22-06 STDC Hāwera Municipal Oxidation Ponds Monitoring Programme Annual Report 2021-2022

12. The South Taranaki District Council (STDC) operates seven municipal oxidation pond systems within the district of South Taranaki. This report for the period July 2021 to June 2022, focusses on the oxidation ponds system for the Hāwera Wastewater Treatment Plant (HWWTP), which comprises an anaerobic lagoon, two primary/facultative ponds in parallel, and a maturation pond.

13. During the monitoring period, STDC demonstrated a high level of environmental performance and high level of administrative performance.

14. STDC holds three resource consents for the site which include a total of 39 conditions setting out the requirements that STDC must satisfy. STDC holds consent 5079-2 for operation of the HWWTP, consent 7520-1 to discharge to an unnamed stream in the event of high rainfall, and consent 10810-1 to discharge emissions into the air from desludging and dewatering related activities at the HWWTP.

15. The Council's monitoring programme for the year under review included six inspections, during which effluent samples were collected from the aerobic ponds and maturation pond. Shellfish and seawater samples were also collected during the year, and one marine ecological survey was undertaken. The Council also reviewed monitoring data provided by STDC.

16. The monitoring found that there were no odour issues beyond the plant boundary during the year. Sampling results found that the quality of the final effluent was comparable with previous years. The dissolved oxygen concentrations in the two aerobic ponds remained compliant with the resource consent. The volume of discharge remained compliant during the 2021-2022 monitoring year, with the majority of discharges within the normal operating consent limit.

17. Low levels of norovirus were detected in green-lipped mussel samples on one out of two sampling occasions during the year. No other adverse environmental effects associated with the HWWTP discharge were discovered during 2021-2022.

18. 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 remained at a high level in the year under review.

19. This report includes recommendations for the 2022-2023 year.

22-07 SDC Stratford WWTP Monitoring Programme Annual Report 2021-2022

20. The Stratford District Council (SDC) operates a municipal wastewater treatment plant (WWTP) located on Victoria Road at Stratford, in the Pātea catchment.

21. During the monitoring period, SDC demonstrated a level of environmental performance that required improvement and good level of administrative performance.

22. SDC holds one resource consent to discharge treated wastewater into the Pātea River. Consent 0196-5 includes a total of 17 conditions setting out the requirements that they must satisfy.

23. The Council's monitoring programme for the year under review included four inspections, wastewater analyses, and physicochemical and biological surveys (macroinvertebrate and periphyton) of the receiving waters of the Pātea River.
24. In recent years, improvements in SDC's maintenance programme have generally enhanced the appearance of the plant and effectively controlled any produced odour. No complaints were received in relation to the operation of the WWTP. Regular inspections indicated no immediate problems with the performance of the plant. There was one overflow to land recorded during the monitoring year.
25. Wastewater and river quality was generally good at the time of the low flow summer receiving water physicochemical survey. However, summer and autumn biomonitoring surveys indicated a potentially ecologically significant impact on macroinvertebrate health between sites upstream and downstream of the effluent point, coincident with discharges from the Stratford WWTP. The results from the second year of monitoring periphyton indicated that the discharge was having an effect on biomass immediately downstream. The desirability of reducing such effects within the receiving waters has been recognised for some years. SDC has been working to find a solution to the excess nutrients and proposes to reduce the phosphorus in the influent, via a new Trade Waste Policy and Trade Waste Bylaw. This together with implementing a Diatomix process in Pond 2 should reduce phosphorus, nitrogen and algae levels downstream.
26. 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 is improving.
27. This report includes recommendations for the 2022-2023 year, including a recommendation relating to an optional review of consent 0196-5 due in June 2023.

22-08 STDC Eltham WWTP Monitoring Programme Annual Report 2021-2022

28. The South Taranaki District Council (STDC) operates a municipal wastewater treatment plant (WWTP) located on Castle Street at Eltham, in the Waingongoro catchment.
29. **During the monitoring period, South Taranaki District Council demonstrated a high level of environmental performance and high level of administrative performance.**
30. The Council's monitoring programme for the year under review included four inspections and associated odour surveys, four pond effluent and 36 downstream water samples collected for physicochemical analysis. Seven additional samples (discharge, upstream and downstream) were collected in relation to a consented overflow.
31. The monitoring showed that activities at the Eltham WWTP were generally well managed. The majority of wastewater was pumped to the Hāwera WWTP, with one consented overflow to the unnamed tributary of the Mangawhero Stream.
32. As in previous years, the monitoring indicated a continual improvement in water quality of the downstream environment associated with the diversion of wastes out of the Mangawhero Stream to the Hāwera WWTP since the 2010-2011 period.
33. 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 remains at a high level.
34. This report includes recommendations for the 2022-2023 year.

22-09 STDC Patea WWTP & Emergency Outfall, STDC Manaia WWTP, STDC Waverley WWTP and Stock Truck Wastes Disposal, STDC Kaponga WWTP Monitoring Programme Annual Report 2021-2022

35. The South Taranaki District Council (STDC) operates eight wastewater treatment plant (WWTP) systems within the district of South Taranaki. This report addresses performances of four of these systems, located in the Kaponga, Manaia, Pātea and Waverley townships[1].

36. During the monitoring period, STDC demonstrated an overall high level of environmental performance and a high level of administrative performance.

37. STDC holds seven resource consents for the Waverley, Kaponga, Manaia and Pātea treatment plants, which include a total of 92 conditions setting out the requirements that they must satisfy. Four consents allow STDC to discharge treated wastewater from the various municipal oxidation ponds sewage treatment systems, one consent is held to discharge treated stock truck effluent (Waverley), one consent covers the discharge of untreated municipal sewage in emergencies (Pātea), and one consent allows for the placement and use of a discharge structure in the Coastal Marine Area (Pātea).

38. Monitoring was undertaken to ensure continued maintenance and efficient operation of all treatment systems, plus compliance with discharge permit conditions.

39. During the year, STDC demonstrated a high level of environmental and high level of administrative performance with the resource consents held in relation to the Kaponga WWTP. The Kaponga WWTP was well maintained and operated, and performed satisfactorily throughout the monitoring period. The effluent quality data was indicative of well-treated wastewater, with parameters typical of a municipal oxidation pond system receiving minimal industrial waste loadings. No significant impacts on the Kaupokonui River were recorded from the physicochemical parameters analysed during the mid-summer survey conducted in January 2022, when a low discharge rate of well-treated wastewater characterised this system. No significant impacts of the effluent discharge were indicated by MCI scores through the reach of the river surveyed.

40. During the year, STDC demonstrated a good level of environmental and a high level of administrative performance with the resource consents held in relation to the Manaia WWTP. The Manaia WWTP was generally well maintained and operated, and performed satisfactorily throughout the monitoring period. Although localised impacts of the pond discharge on the receiving waters have reduced markedly following the incorporation of wetlands into the treatment system, impacts from the discharge in relation to aesthetic water quality of the Manaia Creek were observed.

41. During the year, STDC demonstrated a high level of environmental and administrative performance with the resource consents in relation to the Pātea WWTP. The Pātea WWTP and emergency overflow was well maintained and operated, and performed satisfactorily throughout the monitoring period. Since the upgrade to the system and the pumping station, the discharge effluent quality has shown marked improvement over the quality typical of the previous single pond treatment system receiving minimal industrial waste loadings. No significant impacts associated with the discharges were measured on the bacteriological quality of the lower reaches of the Pātea River.

[1] The Eltham, Wai-inu, Hāwera, and Ōpunake Wastewater Treatment Plants are the subject of separate reports by the Taranaki Regional Council.

42. During the year, STDC demonstrated a good level of environmental and a high level of administrative performance with the resource consents in relation to the Waverley WWTP. The Waverley WWTP was well maintained and operated, and performed satisfactorily throughout the monitoring period. The performance of the system was considered to be typical of a biological treatment system receiving essentially domestic wastes, and continued to show some improvements compared to historical wastewater quality. Minor impacts from the discharge were noted on the water quality of the Wairoa Stream tributary. However, these and other effects were readily assimilated, first by the aquatic weed growth in the tributary, and then in the extensive Ihupuku Wetland area located downstream of Beach Road.
43. This report also addresses monitoring of the use of STDC stock truck wastewater disposal system near Waverley, where the consent allows for on-site land discharge of anaerobic-aerobic ponds' treated stock truck effluent. The presence of appropriate signage and surveillance by the consent holder have been effective in maintaining compliance at the facility. Increased monitoring of this facility was instigated by the Council and will continue in conjunction with the programme for the Waverley municipal oxidation ponds system (where the stock truck wastes were disposed of originally).
44. 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 remains at a high level.
45. This report includes recommendations for the 2022-2023 year, including a recommendation relating to an optional review of consents 0861-3 and 1204-4 in June 2023.

22-10 STDC Ōpunake WWTP & Ocean Outfall Monitoring Programme Annual Report 2021-2022

46. South Taranaki District Council (STDC) operates a municipal wastewater treatment plant (WWTP) located on South Road at Ōpunake, in the Otahi and Heimama catchments. This is a three-stage treatment system comprised of a primary oxidation pond, a wetlands treatment system, and a subsurface, reticulated soakage trench system that subsequently discharges to an unnamed coastal stream between the Otahi Stream and the Heimama Stream.
47. **During the monitoring period, STDC demonstrated a high level of environmental performance and high level of administrative performance.**
48. STDC holds one resource consent to discharge treated wastewater, which includes a total of 10 conditions setting out the requirements that it must satisfy. It also holds one resource consent allowing the (emergency) discharge of screened wastewater from an ocean outfall in Middleton Bay, and another to occupy the coastal marine area with the outfall structure. These include a total of 11 conditions setting out requirements that STDC must satisfy.
49. The Council's monitoring programme for the year under review included four inspections and 77 water samples collected for physicochemical analysis (ten samples analysing the effluent quality from the system, four measuring effects on receiving waters, and 63 samples monitoring water quality at nearby contact recreational beach bathing sites).

50. As in previous years, the monitoring indicated that the treatment system was treating the municipal wastewater to the extent that no significant effects were noted in the receiving waters of the Tasman Sea. The water quality of nearby popular beach bathing sites was generally good, although this showed significant deterioration during overflow events in February 2022. Signage was in place during this time to alert recreational users to the higher health risk.
51. 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 remains at a high level.
52. This report includes recommendations for the 2022-2023 year.

22-14 Mangati Stream [integrated] Monitoring Programme Annual Report 2021-2022

53. This report is the Annual Report for the period July 2021 to June 2022 by the Taranaki Regional Council (the Council) describing the monitoring programme associated with 13 industries within the catchment of the Mangati Stream, Bell Block.
54. **Overall, a high level of environmental performance was achieved by the consent holders in the industrial area of the Mangati Stream catchment.**
55. The Mangati catchment has, in the past, been heavily utilised for the disposal of stormwater and wastewaters from a large number of industrial sites. As a consequence of inadequate treatment and management of discharges and minimal dilution capacity in the past, the water quality and aquatic ecosystems of the stream were significantly impacted. The Mangati Stream catchment is listed in the Regional Freshwater Plan for Taranaki (Appendix III) as having been identified for enhancement of natural, ecological and amenity values, and life supporting capacity. The Council has addressed this by requiring consents for discharges from every industrial site within the catchment that has significant potential for contamination. A combined monitoring programme has been implemented by Council to monitor these discharges, and since the 2002-2003 year a holistic approach has been applied to the monitoring of abstractions and discharges to all media.
56. During the 2021-2022 monitoring period a total of 16 water discharge consents, four air discharge consents and one discharge to land consents were held by industries in this catchment. This report covers the results and findings during this monitoring period for these 21 consents, which contain a total of 221 special conditions that the consent holders must satisfy.
57. Monitoring during the year under review included 50 site inspections, discussions with site operators over site management, 27 discharge samples, six receiving water samples, 16 macroinvertebrate samples, two deposition gauging surveys, and several odour surveys.
58. Historically, chemical and biological monitoring results for the Mangati catchment have shown there to be a two-stage reduction in water quality, one below the main stormwater outlet from Tegel Foods poultry processing plant, the other below the industrial drain which joins the stream at the main highway.
59. Receiving water monitoring results for the year were generally in line with historical ranges. However, as occasionally noted in recent years, the results at the top of the catchment for some parameters (suspended solids, turbidity, biological oxygen demand

and dissolved reactive phosphorus) were elevated when compared to sites sampled within and below the industrial area.

60. During the period under review, the instream dissolved zinc and copper concentrations met the appropriate USEPA acute or chronic exposure guidelines in all six samples. None of the instream samples taken during the period under review exceeded the 0.025 g/m^3 Regional Freshwater Plan unionised ammonia guideline, or the 0.9 g/m^3 total ammonia national guideline.
61. Overall, the results of the survey indicated that macroinvertebrate health was generally 'poor' for the surveyed sites in the Mangati Stream. However, macroinvertebrate health was similar among the surveyed sites and in particular between the 'control' and 'impact' sites and there was not sufficient evidence to indicate that there had been any recent preceding poor water quality that had a significant effect on macroinvertebrate communities in the Mangati.
62. There were no non-compliances recorded in the Mangati catchment during the period under review which related to the consented companies monitored under this catchment programme.
63. During the year, the following consent holders demonstrated a **high** level of environmental and administrative performance and compliance with their resource consents: First Gas Ltd; Greymouth Petroleum Acquisition Company Limited; J Swap; McKechnie Aluminium Solutions Ltd; NPDC; Nexans New Zealand Ltd; OMV New Zealand Ltd; Schlumberger; Tasman Oil Tools Ltd; Tegel Foods Ltd (Feed Mill); Tegel Foods Ltd (Poultry Processing); and W Abraham Ltd.
64. During the year, TIL Freighting Ltd demonstrated a **high** level of environmental performance and compliance with their resource consent. The Company demonstrated a good level of administrative performance as defined in Appendix II.
65. During the year, Barton Holdings Limited demonstrated a **good** level of environmental and administrative performance and compliance with their resource consents.
66. In terms of overall environmental and compliance performance by the consent holders over the last several years, this report shows that overall the consent holders' performance remained at a high level in the year under review.
67. This report includes recommendations for the 2022-2023 year, including a recommendation relating to an optional review of consents 2335-4 and 3470-4-1 in June 2023.

22-19 Tāwhiti Stream Monitoring Programme Annual Report 2021-2022

68. The Tāwhiti Stream catchment, east of Hāwera, is the location of several industries that include an abattoir and meat processing plant, a by-products rendering plant, and a trout hatchery. The companies that run these industries hold a number of resource consents to allow abstraction of water, discharge of water and stormwater to the stream, discharge of emissions into the air, disposal of paunch material to land, and use and maintenance of a dam structure. Twelve resource consents are held by the companies, which include a total of 102 conditions setting out the requirements that they must satisfy.
69. **During the monitoring period, all three consent holders demonstrated a high level of environmental performance and either a high or good level of administrative performance.**

70. The Council's monitoring programme included site inspections, the collection of discharge water samples, and sampling of the receiving water body for physico-chemical analysis. A hydrometric station is maintained on the stream for the continuous measurement of flow rate and temperature.
71. During the monitoring period, Silver Fern Farms Ltd demonstrated a **high** level of environmental performance and **good** level of administrative performance.
72. Silver Fern Farms Ltd holds six resource consents, to allow it to maintain a dam and to take water from the Tāwhiti Stream; to discharge to the stream and to land; and to discharge emissions into the air.
73. A stormwater system upgrade commenced during the 2020-2021 monitoring period and was completed in the current reporting period. A draft stormwater management plan relating to the upgraded system was provided in October 2021, however at the time of writing a finalised version of this plan had not been provided to the Council.
74. Abstraction volumes complied with the consent limit, and inspections and sampling demonstrated compliance with their consents.
75. During the monitoring period, Graeme Lowe Protein Ltd demonstrated a **high** level of environmental and administrative performance.
76. Graeme Lowe Protein Ltd holds four resource consents, to allow it to take from and discharge to the Tāwhiti Stream, and to discharge emissions into the air.
77. In general, compliance monitoring indicated that the consent holder was meeting the requirements of their consents.
78. During the monitoring period, Taranaki Fish and Game Council demonstrated a **high** level of environmental and administrative performance.
79. Taranaki Fish and Game Council holds two resource consents, to allow it to take and use water from, and discharge to the Tāwhiti Stream. Four inspections were conducted during the review period, which indicated that contaminants in the discharge to the Tāwhiti Stream were minimal and had no significant environmental effect.
80. Physico-chemical surveys of Tāwhiti Stream, carried out on four occasions in dry and wet weather conditions during the review period, showed no adverse effect on the stream as the result of activities at the sites of Silver Fern Farms Ltd, Graeme Lowe Protein Ltd and Taranaki Fish and Game.
81. During the period under review, there were no unauthorised incidents reported in relation to activities at any of these sites.
82. This report contains recommendations for the 2022-2023 year.

22-20 Methanex Motunui and Waitara Valley Monitoring Programme Annual Report 2021-2022

83. Methanex New Zealand Ltd (Methanex) operates methanol production facilities located at Motunui and Waitara Valley, in the Manu, Waihi and Waitara River catchments.
84. **During the monitoring period, Methanex demonstrated a high level of environmental and administrative performance.**
85. Methanex holds 11 resource consents, which include a total of 111 special conditions setting out the requirements that Methanex must satisfy. Methanex holds two consents to allow it to take and use water from two abstraction points on the Waitara River. Six

consents allow the discharge of effluent/stormwater into the Manu and Waihi Streams and the Tasman Sea via the Waitara marine outfall. Methanex also holds two consents to discharge emissions into the air at its sites. Finally, one consent provides for a structure in the Waitara River associated with the water take.

86. The Council's monitoring programme for the year under review included three inspections, continuous self-monitoring by Methanex (specifically involving collection of water samples for physicochemical analysis), review of regularly provided consent holder data and one inter-laboratory comparison.

87. The monitoring showed that Methanex operated both sites in accordance with the requirements of their resource consents. As in previous years, the facilities were well managed and a high level of housekeeping was maintained.

88. 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 remains at a high level in the year under review.

89. This report includes recommendations for the 2022-2023 year.

22-33 NPDC Water Supplies Programme 2021-2022 Monitoring Programme Annual Report 2021-2022

90. New Plymouth District Council (NPDC) operates five water supply schemes in the New Plymouth District.

91. During the monitoring period, NPDC demonstrated a good level of environmental performance and high level of administrative performance.

92. NPDC holds 20 resource consents relating to those water supply systems, which included a total of 159 conditions setting out the requirements that the consent holder must satisfy. This included seven consents to take and use water, three consents to discharge to water, nine consents to maintain structures, and one consent to discharge filter backwash onto and into land.

93. The Council's monitoring programme for the year under review included an annual inspection of each water supply scheme, two hydrological gauging's, four samples collected for water quality analysis, one fish survey, and an assessment of the abstraction and discharge data provided by NPDC.

94. The monitoring showed that overall the NPDC water schemes are well operated and maintained and appeared to be having no adverse effects on the environment. There were no unauthorised incident/s recording non-compliance in respect of NPDC's water supply schemes during the period under review.

95. This report includes recommendations for the 2022-2023 year.

22-34 STDC Water Supplies Monitoring Programme Annual Report 2021-2022

96. The South Taranaki District Council (STDC) operates a total of ten water treatment plants (WTPs) throughout the district. Supplying municipal water supply to the district's towns and water to the rural communities.

97. During the monitoring period, STDC demonstrated a good level of environmental performance and high level of administrative performance.

98. The Council's monitoring programme for the year under review included ten inspections, the collection of six water samples for physicochemical analysis, three

biomonitoring surveys of receiving water, and two fish surveys. Abstraction, stream flow and discharge data, provided by the consent holder, was analysed and reviewed.

99. Discharge quantity data showed that STDC were non-compliant for discharge volumes at both the Ōpunake and Waimate West WTPs, with ongoing discussions occurring between Council and STDC. Enforcement action will likely occur in relation to these breaches and will be reported on in the 2022-2023 report.

100. Chemical sampling of discharges and receiving waters and macroinvertebrate surveys indicated that the water supply schemes were not causing any adverse environmental effects. A fish survey in the Kapuni Stream and Mangawhero Stream found no evidence that the weir structures presented a barrier to fish passage.

101. By comparison with previous years, the monitoring indicated that STDC had a decline in their performance in terms of discharge volumes to water at the Ōpunake and Waimate West WTP's.

102. 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 remains at a good - high level.

103. This report includes recommendations for the 2022-2023 year, including a recommendation relating to an optional review of consents 0989-3, 1811-4, 3770-3, 3927-3, 3928-3, 4826-3, 5365-32 5451-2 and 5452-2 in June 2023.

22-36 NPDC Inglewood WWTP Monitoring Programme Annual Report 2021-2022

104. The New Plymouth District Council (NPDC) operates a municipal wastewater treatment plant (WWTP) located on Lincoln Road at Inglewood, in the Kurapete catchment.

105. During the monitoring period, NPDC demonstrated a high level of environmental and administrative performance.

106. NPDC holds one resource consent to intermittently discharge treated wastewater to the Kurapete Stream, which includes a total of nine conditions setting out the requirements that they must satisfy.

107. The Council's monitoring programme for the year under review included five inspections, wastewater effluent analyses, three water samples collected from the Kurapete Stream for physicochemical analysis, and one biomonitoring survey of receiving waters.

108. NPDC's maintenance programme continues to generally enhance the operation and appearance of the plant and effectively control any produced odour. No complaints were received in relation to the operation of the WWTP. Regular inspections indicated no immediate problems with the performance of the plant.

109. Four consented overflows were recorded during the monitoring year. No adverse environmental impacts were observed in the receiving waters as a result of these.

110. 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 remains at a high level.

111. This report includes recommendations for the 2022-2023 year.

22-37 NPDC Colson Rd Landfill Monitoring Programme Annual Report 2021-2022

112. The New Plymouth District Council (NPDC) operates a regional landfill located on Colson Road, New Plymouth, in the Waiwhakaiho catchment. Stage 3 of the site has a design capacity of approximately 800,000 m^3. Stage 3 ceased accepting waste in the 2020-2021 year and is now in the process of being capped. There is capacity remaining within the design volume and NPDC have indicated that this may be used for contingency disposal. Stages 1 and 2 have been closed and are fully reinstated.

113. During the monitoring period, NPDC demonstrated an overall good level of environmental performance, while improvement was required in their administrative performance.

114. NPDC holds ten resource consents, which include a total of 135 conditions setting out the requirements that NPDC must satisfy. NPDC holds one consent to discharge uncontaminated stormwater into the Puremu Stream, two consents to discharge contaminated stormwater and minor amounts of leachate into the Puremu Stream, two consents to discharge emissions into the air, one consent to discharge solids onto and into land and three consent to discharge stormwater and sediment from earthworks. One of these earthworks consents was re-issued and one was granted during the year under review. NPDC also holds one consent to divert water.

115. The Council's monitoring programme for the year under review included 12 routine compliance monitoring inspections, six stormwater/discharge samples, 21 surface water samples, 16 groundwater samples, two biomonitoring surveys of receiving waters, and four ambient air quality surveys. NPDC also collected eight leachate samples and six under liner drainage samples for physicochemical analysis.

116. Inspection issues found that the site was generally well managed during the year under review, however continued attention to the installation and maintenance of localised erosion and sediment controls is required.

117. The issue of cap management and maintenance on Stage 2 remained unresolved at the end of the monitoring period. Extensive investigations into the cap depth and compaction were carried out during the 2018-2019 year and the remediation necessary was identified. It was found that there were areas where the cap depth needed to be increased. An abatement notice was issued allowing NPDC until March 2020 to complete the work so that the appropriate methodology could be developed and then be undertaken during the next dry weather construction season. It was agreed that this could be delayed to prioritise working on the Stage 3 cap following the landfill closure to municipal waste (August 2019) and special waste (October 2020) on the basis that this would minimise the potential discharge of contaminants from the site as a whole. During the year under review, the due date on the abatement notice was extended to May 2023.

118. Groundwater and under liner drainage sampling indicated that although there is no significant contamination occurring in the local aquifer as a result of the landfill's presence, there are emerging trends of increasing, but still low level, concentrations of chloride and nitrate/nitrite nitrogen in some bores and a number of parameters in the under liner drainage. An abatement notice has been issued and the monitoring programme been expanded so that the potential for future adverse effects can be evaluated. The abatement notice has an extended date of 30 April 2023 so that these potential effects can be taken into account during an early consent renewal application.

119. Chemical and bacteriological monitoring of the Puremu and Manganaha Streams found that the receiving water quality criteria on the consents were met for the majority of parameters at the time of the three scheduled sampling surveys. The exceptions to this were faecal coliforms that were above the consent limit at the time of two of the three surveys. In each case, the faecal coliforms was elevated in the upstream samples, so this was not considered to be a consent non-compliance. During the year under review there were no non-compliances with the manganese concentrations in the receiving waters, however these did remain elevated in the discharge from the large silt pond, and further investigation may be required to ensure continued consent compliance.
120. Overall, both biological monitoring surveys indicated that the discharge of treated stormwater and leachate discharges from the Colson Road landfill site had not had any significant detrimental effect on the macroinvertebrate communities of the Puremu and Manganaha Streams. In the unnamed tributary, no significant detrimental effects were found at the time of the November survey. At the time of the March survey the results suggested poor preceding water quality that may be indicative of adverse effects associated with the landfill leachate.
121. Air quality monitoring showed that there were no significant adverse effects in relation to suspended particulates, dust deposition rates or odour beyond the site boundary.
122. An enclosed gas flare system was installed for air quality control during the 2017-2018 monitoring period and there were no substantiated odour complaints received during the 2021-2022 period that were associated with the Colson Road landfill. However, the flare was not continuously maintained at above 750°C for periods of time between January and the end of May 2022. Suitable mitigation measures have now been put in place.
123. Overall, NPDC demonstrated a good level of environmental performance, however an improvement is required in their administrative performance and compliance with the resource consents as defined in Appendix II. During the year under review there were on-going, and still unresolved, issues with the compliance of the cap on Stage 2, with an abatement notice in place requiring the works to be undertaken by 1 May 2023. The abatement notices issued during the 2020-2021 year in relation to, water quality changes in the groundwater in the under liner drain, and monitoring plan requirements is still in effect with works required to be undertaken by 30 April 2023. There appear to be some legacy issues that are affecting the water quality in the receiving environment. These have resulted in some consent non-compliances, however, they have not resulted in any non-compliant results in the surface waters or had significant adverse effects on the receiving waters during the year under review. Monitoring requirements have been revised and evaluation is on-going. Additional investigations are also being undertaken by NPDC, when required, to ensure that any appropriate interventions are implemented where improvements are required. There were two non-compliances during the year under review in relation to ponding within the landfill footprint, and inadequate localised erosion and sediment controls. There was one non-compliance in relation to the landfill gas flare not being continuously operated above the required temperature. There were no significant adverse effects found as a result of these non-compliances.
124. 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 had improved. However, in the year under review and in the previous two years, there is still an improvement required with their administrative performance and compliance with some consent conditions.

125. This report includes recommendations for the 2022-2023 year.

22-43 TWN Ltd Partnership - Waihapa Production Station Monitoring Programme Annual Report 2021-2022

126. TWN Ltd Partnership (the Company) operates a hydrocarbon production station located on Bird Road, Stratford, in the Pātea catchment. The Waihapa Production Station processes oil and gas from numerous associated wellsites.

127. During the monitoring period, TWN Ltd Partnership demonstrated a high level of environmental and administrative performance.

128. The Company holds three resource consents in relation to the Waihapa Production Station, which include a total of 41 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to discharge treated impounded stormwater from the Waihapa Production Station into the Ngaere Stream and to discharge treated stormwater from perimeter drains to land where it may enter the Ngaere Stream, one consent to abstract water from the Ngaere Stream, and one consent to discharge emissions related to production activities into the air at the site.

129. The Council's monitoring programme for the year under review included four inspections, 12 water samples collected for physicochemical analysis, two biomonitoring surveys of receiving waters, and two ambient air quality surveys. The Company provided the results of monitoring of impounded stormwater, abstraction volumes, and flaring data.

130. Stormwater system and receiving water inspections and monitoring of discharges and receiving waters showed that discharges from the site at the time complied with consent conditions. Biological surveys of the receiving water showed that the discharges were not causing any adverse effects on the Ngaere Stream at the time of monitoring.

131. There were no adverse effects on the environment resulting from the exercise of the air discharge consent. Ambient air quality monitoring at the site showed that levels of carbon monoxide, combustible gases, PM_{10} particulates, and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections and there were no complaints in relation to air emissions from the site.

132. During the year, the Company demonstrated an overall high level of both environmental performance and administrative compliance with the resource consents.

133. 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 remains at a high level.

134. This report includes recommendations for the 2022-2023 year.

22-74 Flexgas Ltd Ahuroa-B Gas Storage Project Monitoring Programme Annual Report 2021-2022

135. OMV Taranaki Ltd (OMV) operates the Maui Production Station located on Tai Road, Ōaonui, in the Ngapirau catchment.

136. During the monitoring period, OMV Taranaki Ltd demonstrated a high level of environmental and administrative performance.

137. OMV holds four resource consents, which include a total of 40 conditions setting out the requirements that they must satisfy. OMV holds two consents relating to discharges to water, one consent to discharge emissions to the air, and one to maintain a structure in the coastal marine area.

138. The Council's monitoring programme for the year under review included four inspections, six discharge and receiving water samples collected for physicochemical analysis, and two ambient air quality analyses. The consent holder supplied information on flaring and the results of discharge and receiving water quality analysis.

139. Council inspections and sampling, in conjunction with sampling conducted by OMV during the 2021-2022 period, showed that the discharges from the production station were unlikely to be causing any adverse effects on the Ngapirau Stream.

140. PFAS/PFOS was detected in low levels in the Ōaonui and Ngapirau streams downstream of the Maui Production Station. Total PFOS in the Ngapirau Stream samples fell within the 90% and 95% range of the species protection guideline value for freshwater, while Ōaonui Stream samples fell within the 95-99% range of the guideline.

141. There were no adverse effects noted on the environment resulting from the exercise of the air discharge consent. The ambient air quality monitoring at the Maui Production Station showed that levels of carbon monoxide, combustible gases, PM_{10} particulates, and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundaries during inspections.

142. 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 remains at a high level.

143. This report includes recommendations for the 2022-2023 year.

22-76 OMV Taranaki Ltd - Maui Production Station Monitoring Programme Annual Report 2021-2022

144. OMV Taranaki Ltd (OMV) operates the Maui Production Station located on Tai Road, Ōaonui, in the Ngapirau catchment.

145. During the monitoring period, OMV Taranaki Ltd demonstrated a high level of environmental and administrative performance.

146. OMV holds four resource consents, which include a total of 40 conditions setting out the requirements that they must satisfy. OMV holds two consents relating to discharges to water, one consent to discharge emissions to the air, and one to maintain a structure in the coastal marine area.

147. The Council's monitoring programme for the year under review included four inspections, six discharge and receiving water samples collected for physicochemical analysis, and two ambient air quality analyses. The consent holder supplied information on flaring and the results of discharge and receiving water quality analysis.

148. Council inspections and sampling, in conjunction with sampling conducted by OMV during the 2021-2022 period, showed that the discharges from the production station were unlikely to be causing any adverse effects on the Ngapirau Stream.

149. PFAS/PFOS was detected in low levels in the Ōaonui and Ngapirau streams downstream of the Maui Production Station. Total PFOS in the Ngapirau Stream

samples fell within the 90% and 95% range of the species protection guideline value for freshwater, while Ōaonui Stream samples fell within the 95-99% range of the guideline.

150. There were no adverse effects noted on the environment resulting from the exercise of the air discharge consent. The ambient air quality monitoring at the Maui Production Station showed that levels of carbon monoxide, combustible gases, PM_{10} particulates, and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundaries during inspections.

151. 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 remains at a high level.

152. This report includes recommendations for the 2022-2023 year.

22-81 Greymouth Petroleum Ltd - Northern Sites Monitoring Programme Annual Report 2021-2022

153. Greymouth Petroleum Ltd (the Company) operates the Turangi Production Station located on Turangi Road at Motunui, in the Parahaki catchment. The Turangi Production Station processes oil and gas from the Company's northern Taranaki operations, including the Ohanga, Onaero and Turangi group of wellsites. The Company also operate the Kowhai-A Production Station, located on Ngatimaru Road at Tikorangi. The Kowhai-A Production Station processes product from the Kowhai-A, B, C and D wellsites.

154. During the monitoring period, Greymouth Petroleum Ltd demonstrated a good level of environmental performance and high level of administrative performance.

155. The Company holds four resource consents in relation to the Turangi and Kowhai-A production stations, which include a total of 80 conditions setting out the requirements that the Company must satisfy. The Company holds two consents to discharge stormwater and two consents to discharge emissions related to production activities into the air. An additional consent relating to the discharge of treated stormwater and produced water from exploration activities at the Turangi-B wellsite was also actively monitored during the period under review.

156. The Council's monitoring programme for the year under review included four inspections of the Turangi and Kowhai-A production stations, two inspections of the Turangi-B wellsite, and an annual inspection of wellsites associated with the production stations. Three water samples were collected for physicochemical analysis, two biomonitoring surveys of receiving waters were conducted, and two ambient air quality surveys were undertaken in relation to the Turangi Production Station.

157. The monitoring showed that the production station sites were generally well managed. There were some issues noted at the Turangi Production Station with regards to bunding and spills around the rig. Sampling of discharges and receiving waters in relation to Turangi Production Station did not find any significant adverse effects at the time of sampling, while biomonitoring in the receiving waters did not show any effect from discharges on the communities in the stream.

158. There were no adverse effects on the environment resulting from the exercise of the air discharge consent. Ambient air quality monitoring at the Turangi Production Station showed that levels of carbon monoxide, combustible gases, PM_{10} particulates, and

nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections.

159. Works were undertaken at the Turangi-B wellsite to increase the soakage area to prevent stormwater discharging directly to the Parahaki Stream. No further discharges were observed subsequent to the work being undertaken, however the abatement notice issued in the 2020-2021 year remains in place as it is considered there is still potential for the consent to be breached. Inadequate bunding was observed at the site early in 2021-2022 and works were undertaken by the Company to remedy this.

160. 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 remains at a good level.

161. This report includes recommendations for the 2022-2023 year.

22-89 Todd McKee Production Station Monitoring Programme Annual Report 2021-2022

162. Todd Energy Ltd (Todd Energy) operates a petroleum production station located on Otaraoa Road near Tikorangi, bridging the Waitara and Onaero catchments. The McKee and Mangahewa Production Station (MMPS) processes condensate and natural gas from Todd Energy's McKee and Mangahewa groups of wellsites and includes electricity cogeneration and LPG production facilities.

163. During the monitoring period, Todd Energy Ltd demonstrated a high level of environmental and administrative performance.

164. Todd Energy holds ten resource consents, which include a total of 104 conditions setting out the requirements that Todd Energy must satisfy. Todd Energy holds one consent to allow for the take and use of water, three consents to discharge stormwater and wastewater, three consents to discharge emissions into the air, one consent to allow the diversion of unnamed tributaries of the Mangahewa Stream, and two consents regarding the installation and use of structures.

165. The Council's monitoring programme for the year under review included five inspections of the MMPS and one annual inspection of associated wellsites, nine water samples and six stream sediment samples collected for physicochemical analysis, two biomonitoring surveys of receiving waters, and two ambient air quality surveys. Todd Energy provided results of impounded stormwater samples and information on flaring and various water abstractions through the year.

166. Stormwater system inspections showed that discharges from the site complied with consent conditions at the time.

167. As has been the case in previous surveys, it appears that some factor is having a detrimental impact on the macroinvertebrate communities of the Mangahewa Stream. Hydrocarbon contamination of sediments was proposed as a potential cause for this and Todd Energy commissioned an investigation into the contamination. Initial conclusions are that the contamination is a result of a prior event (rather than current activities at the site) and that periodic stream bank erosion is releasing hydrocarbons. Todd Energy have undertaken to fence and plant approximately 100 m of bank upstream with the goal of minimising erosion and the release of legacy contaminants.

168. Although the results of the fish survey undertaken during the previous monitoring period did not conclusively conclude that the weir poses a significant barrier to fish

passage it is recommended that Todd investigate improvements that could be made to the weir to increase the likelihood of comprehensive passage for fish.

169. There were no adverse effects on the environment resulting from the exercise of the air discharge consents. The ambient air quality monitoring at the production station showed that levels of carbon monoxide, combustible gases, PM_{10} particulates, and nitrogen oxides were all below levels of concern at the time of sampling. No offensive or objectionable odours were detected beyond the boundary during inspections.

170. 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 is remains at a high level.

171. This report includes recommendations for the 2022-2023 year.

22-90 McKechnie Aluminium Solutions Ltd Monitoring Programme Annual Report 2021-2022

172. McKechnie Aluminium Solutions Ltd (MASL) operates an aluminium foundry and extrusion plant located at Bell Block, in the Mangaone and Mangati catchments. Processing of copper and brass (copper/zinc) at the plant ceased in June 2002 and January 2003, respectively.

173. During the monitoring period, McKechnie Aluminium Solutions Ltd demonstrated a high level of environmental and administrative performance.

174. MASL holds two resource consents that are covered within this particular report: consent 1857-6 to discharge stormwater into an unnamed tributary of the Mangaone Stream, and consent 4034-3 to discharge emissions into the air, which together include a total of 22 conditions setting out the requirements that they must satisfy.

175. The Council's monitoring programme for the year under review included four inspections, 15 water samples collected for physicochemical analysis, two biomonitoring surveys of receiving waters, and one deposition gauge survey in the vicinity of the foundry site.

176. Sample results during the period under review support the trend of reductions in the levels of contaminants in the receiving water at Sanger's Intake seen during recent years. No samples outside of the mixing zone exceeded the relevant USEPA receiving water criteria for the protection of aquatic ecosystems for zinc or copper, and all other parameters were below levels stipulated by consent conditions.

177. Biomonitoring results indicated that treated stormwater discharged from the site was not having a detrimental effect on the macroinvertebrate communities of the unnamed tributary of the Mangaone Stream.

178. The results from deposition gauging indicated that there was an environmentally acceptable level of particulate deposition in the vicinity of the foundry site. No visible emissions or odour issues were noted during inspections and no complaints were received during the period under review. There were no unauthorised incidents recorded at the site during the year.

179. 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 remains at a high level.

180. This report includes recommendations for the 2022-2023 year.

22-91 Todd Energy Limited Deep Well Injection Monitoring Programme Annual Report 2021-2022

181. Todd Energy Limited and its subsidiary (the Company) operate a number of wellsites across the Taranaki region including the Tuhua, Pouri, Mangahewa and McKee wellsites, located east of New Plymouth and the Kapuni wellsites, located south of Stratford. Each wellsite contains varying numbers of producing wells and associated production infrastructure.

182. During the monitoring period, the Company demonstrated an overall high level of environmental and administrative performance.

183. The Company held nine resource consents for DWI activities, which included a total of 170 conditions setting out the requirements that the Company must satisfy. Six of the nine consents were exercised during the period being reported.

184. The Council's monitoring programme for the year under review included eight annual site inspections, four injectate samples and 22 groundwater samples collected for physicochemical analysis. The monitoring programme also included a significant data review component, with all injection data submitted by the Company assessed for compliance on receipt.

185. The monitoring showed that the Company's DWI activities were carried out in compliance with the conditions of the applicable resource consents. There is no evidence of any issues with any injection well currently in use, or the ability of the receiving formations to accept injected fluids. The results of groundwater quality monitoring undertaken show no adverse effects of the activity on local groundwater resources. Inspections undertaken during the monitoring year found sites being operated in a professional manner.

186. In terms of overall environmental and compliance performance by the Company over the last several years, this report shows that the Company's performance generally remains at a high level.

187. This report includes recommendations to be implemented during the 2022–2023 monitoring period.

22-92 NPDC Mangapouri Cemetery Monitoring Programme Annual Report 2021-2022

188. New Plymouth District Council (NPDC) operates the Mangapouri Cemetery (the Cemetery) located on Junction Road (SH3) between New Plymouth and Egmont Village, in the Waiwhakaiho catchment. The Cemetery site is gated and includes an access road, landscaped greens, storage buildings and washroom facilities.

189. During the monitoring period, NPDC demonstrated a level of environmental performance that required improvement and a high level of administrative performance.

190. NPDC held one resource consent that allows for the discharge of contaminants into land where it may enter water. The consent included a total of eight conditions setting out the requirements that they must satisfy.

191. The Cemetery opened to the public in May 2019 and the compliance monitoring programme commenced following the first internment in July 2019. The monitoring programme for the period under review included an annual site inspection, water quality sampling of the receiving waters (groundwater and surface water) and

continuous groundwater level monitoring. The monitoring programme also included a significant data review component, with all data submitted by NPDC assessed for compliance upon receipt.

192. The monitoring showed that the activities were generally being carried out in compliance with the conditions of the resource consent. The results of surface and groundwater quality monitoring undertaken show no adverse effects of the activity on local fresh water resources. Site visits undertaken found the site to be tidy and well managed and there were no unauthorised incidents in relation to the consent.

193. A breach of consent conditions occurred during the previous monitoring period and again during the period under review when, following higher than average rainfall the minimum separation distance between burial sites and the water table was not met in some areas of the Cemetery. An abatement notice (EAC-24486) was issued on 28 March 2022 and NPDC are currently working with a consultant to improve drainage at the site to prevent any further breaches of the consent occurring.

194. This report includes recommendations to be implemented during the 2022–2023 monitoring period.

22-93 New Zealand Energy Corperation (NZEC) - Deep Well Monitoring Programme Annual Report 2021-2022

195. New Zealand Energy Corporation (the Company) and its subsidiaries operate the Tariki, Toko, Waihapa and Waitapu wellsites.

196. During the monitoring period, the Company demonstrated a high level of environmental and administrative performance.

197. The Company holds seven resource consents, which include a total of 103 conditions setting out the requirements that the Company must satisfy. Four of the seven consents were exercised during the reporting period.

198. The Council's monitoring programme for the year under review included seven inspections, two injectate samples and twelve groundwater samples collected for physicochemical analysis. The monitoring programme also included a significant data review component, with all injection data submitted by the Company assessed for compliance on receipt.

199. The monitoring showed that the Company's DWI activities were being carried out in compliance with the conditions of the applicable resource consents. There is no evidence of any issues with any injection well currently in use, or the ability of the receiving formation to accept injected fluids. The results of groundwater quality monitoring undertaken show no adverse effects of the activity on local groundwater resources. Inspections undertaken during the monitoring year found sites being operated in a professional manner. Consent 3688-2 was reviewed as recommended in the 2020-2021 report, during the period under review.

200. In terms of overall environmental and compliance performance by the Company over the last several years, this report shows that the Company's performance remains at a high level in the year under review.

201. This report includes recommendations for the 2022-2023 year.

22-94 Westown Haulage - Cowling Rd cleanfill Monitoring Programme Annual Report 2021-2022

202. Westown Haulage Limited/Westown Agriculture Limited (the Company) operates a cleanfill located on Cowling Road in Hurdon, in the Huatoki catchment[2]. The activity relates to the filling of the southern portion of a gully with cleanfill material, with a contingency to receive a small amount of untreated sawdust from the Taranaki Pine site in Bell Block. The activity commenced towards the end of the 2020-2021 monitoring year.

203. During the monitoring period, the Company demonstrated an overall high level of environmental performance and required improvement regarding their administrative performance.

204. The Company holds one resource consent for the discharge to land, which include a total of 15 conditions setting out the requirements that the Company must satisfy.

205. The Council's monitoring programme for the year under review included three inspections and two water samples collected for physicochemical analysis.

206. The monitoring showed that only acceptable materials were discharged at the site during the period under review. Previously, silt retention structures had been an issue at this site, however during the last inspection of this monitoring year, it was noted that silt fences have been put in place, which appeared to be working. Results of the water samples showed that the discharge had no adverse effects on the receiving waters downstream of the clean fill area and no visual effects were noted during routine inspections.

207. During the 2021-2022 monitoring period, the Company demonstrated a high level of environmental performance and required improvement regarding their administrative performance with the resource consents as defined in Appendix II of this report. In the first half of the monitoring year, the Company exhibited minor issues with the installation and maintenance of silt retention structures, which were resolved during the rest of the monitoring year. In regards to the administrative performance, the required erosion and sediment control plan was still outstanding at the end of the monitoring period. However, the Council has since received the plan in August 2022 as required by the abatement notice issued in July 2022.

208. This report includes recommendations for the 2022-2023 year.

22-95 Water Permits - minor takes, Golf course water takes, pasture irrigation schemes

209. This report for the period July 2021 to June 2022 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the environmental and consent compliance performance of irrigation consent holders across the Taranaki region. The assessment covers resource consents held for pastoral, horticultural and golf course irrigation.

210. During the monitoring period, the irrigation consent holders demonstrated a high level of environmental and administrative performance.

211. At 30 June 2022, a total of 66 resource consents to take and use freshwater for irrigation purposes were registered in the Council's database. Of these, 48 were for pasture irrigation, 8 for horticultural activities and 10 for recreational purposes (golf clubs).

[2] This is a second site at 180 Cowling Road, separate from their cleanfill and woodwaste site at 80 Cowling Road that is permitted by consent 9854-1 and reported on separately

Fifty-three of these consents authorised abstraction of surface water (80%) and 13 from groundwater sources (20%).

212. The Council's monitoring of irrigation water permits comprises a range of components including site inspections, the collection and assessment of abstraction data, residual flow monitoring, water quality analysis, data review and compliance assessments. The specific range of monitoring carried out for each consent is dictated by the water source, weather and flow conditions, and system design.

213. A total of 52 irrigation consents were exercised during the 2021-2022 monitoring year, with south Taranaki commencing irrigation in November and the rest of the region beginning in January. Irrigation concluded late April through to early May across the region. Rainfall recorded at the Council's monitoring locations over the summer irrigation period ranged between 82% and 203% of historical mean values. Even though rainfall volumes were higher than previous years, the irrigation season was longer with total irrigation water usage of 6,960 ML during the 2021-2022 season. This was higher than the preceding 2020-2021 monitoring year, which recorded 5,567 ML.

214. The Council carried out compliance monitoring inspections at all active irrigation sites during 2021-2022 period. Compliance with residual flow conditions for surface water abstractions was assessed by the Council on 32 separate occasions, across 19 waterways. Consent holder performance for the year was assessed on compliance with their authorised abstraction rates/volumes, maintenance of minimum residual flows, provision of abstraction records and all other general conditions of their consent(s).

215. Monitoring found the majority of takes being well managed and operating within relevant consent conditions during the 2021-2022 period. The Council was required to enter three incidents in relation to irrigation consents over this period, with all non-compliances deemed sufficiently minor not to warrant further action from Council. The overall rate of non-compliance across all exercised consents was 5%, which was the same as that seen during the 2020-2021 period.

216. During the 2021-2022 year, 96% of exercised irrigation consents in Taranaki achieved a high level of environmental performance and compliance with their consents, while 4% are required to improve their compliance performance.

217. In terms of overall environmental and compliance performance by the irrigation water consent holder's over the last several years, this report shows that the consent holder performance is remains at a high level in the year under review.

218. This report includes recommendations for the 2022-2023 year.

Financial considerations - LTP/Annual Plan

219. This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

220. This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Iwi considerations

221. This memorandum and the associated recommendations are consistent with the Council's policy for the development of Māori capacnity to contribute to decision-making processes (schedule 10 of the *Local Government Act 2002*) as outlined in the adopted long-term plan and/or annual plan. Similarly, iwi involvement in adopted work programmes has been recognised in the preparation of this memorandum.

222. Seeking continued improvement in the environmental and administrative performance of consented activities through Council's compliance monitoring programmes contributes to addressing a range of issues and priorities identified by iwi/hapū, such as those as set out in Iwi Management Plans.

Community considerations

223. This memorandum and the associated recommendations have considered the views of the community, interested and affected parties and those views have been recognised in the preparation of this memorandum.

Legal considerations

224. This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Date 7 February 2023

Subject: **Incidents, Compliance Monitoring Non-Compliances and Enforcement Summary - 28 October 2022 to 16 January 2023**

Approved by: A D McLay, Director - Resource Management

S J Ruru, Chief Executive

Document: 3141281

Purpose

1. The purpose of this memorandum is to allow the Council to consider and receive the summary of the incidents, compliance monitoring non-compliances and enforcement for the period 28 October 2022 to 16 January 2023.
2. The annual inspection for farm dairy effluent monitoring programme commences in September each year and usually finishes around March, however follow up inspections and winter milking inspections are also carried out during the rest of the year.

Executive summary

Incidents

3. There are one hundred and thirteen (113) incidents reported.
4. Sixty four (64) of the incidents were found to be compliant and thirty four (34) were found to be non-compliant. Fourteen (14) of the incidents reported relate to non-compliances from previous periods (updates). The action taken on the incidents is set out for Members information.

Compliance monitoring non-compliances

5. There are forty two (42) compliance monitoring non-compliances reported. Twenty one (21) of the compliance monitoring non-compliances reported are updates from previous periods.
6. Twenty eight (28) of the non-compliances reported are as a result of the annual dairy inspection round.

Recommendations

That the Taranaki Regional Council:

a) receives this memorandum *Incident, Compliance Monitoring Non-Compliances and Enforcement Summary – 28 October 2022 to 16 January 2023*

b) receives the summary of the incidents, compliance monitoring non-compliances and enforcement for the period from 28 October 2022 to 16 January 2023, notes the action taken by staff acting under delegated authority and adopts the recommendations therein.

Background

7. The Council receives and responds to pollution events and public complaints throughout the year. Consent compliance monitoring undertaken can also identify non-compliance. This information is recorded in the IRIS database together with the results of investigations and any follow-up actions. Such incidents and non-compliances are publicly reported to the Council through the Consents and Regulatory Committee via the Incidents, Compliance Monitoring Non-compliances and Enforcement Report or the Annual Compliance Monitoring Reports.

8. Attached is the summary of the Incidents, Compliance Monitoring Non-compliances and Enforcement for the period from 28 October 2022 to 16 January 2023.

9. Staff have been delegated by the Council to undertake enforcement actions. The enforcement policy and procedures are approved by the Council and then consistently implemented and reported on by staff.

Disclosure Restrictions

10. The incident register information presentation was reviewed in 2014-2015 to increase reader understanding in this complex area. The first section addresses compliant incidents and can be publicly discussed. The second section provides an update on non-compliant incidents from previous meetings and where an incident has been resolved it can be publicly discussed. The third and fourth sections provide information on non-compliant incidents and non-compliances found during compliance monitoring during the period that are still under investigation and staff are limited in terms of public disclosure of information, while the investigation is ongoing and enforcement responses have not been determined. The incident flow chart and definition of terms provide further operational detail.

Discussion

11. Council responds to all complaints received with most complaints responded to within four hours. This usually involves a site visit. Responses to complaints and non-compliances with rules in the Council's regional plans, resource consents and the Resource Management Act 1991 are recorded in the IRIS database. Where necessary, appropriate advisory or enforcement actions are undertaken. The latter may include issuing an inspection, abatement or infringement notice, or initiating a prosecution. Where an infringement notice or prosecution is possible, details of the information in the Incidents, Compliance Monitoring Non-compliances and Enforcement agenda item and staff comment will be restricted for legal disclosure reasons. Further information will be provided at a later date to the Council and for prosecutions a detailed report will be provided for information purposes, in the confidential section of the agenda.

12. A summary of Incidents, Compliance Monitoring Non-compliances and Enforcement for the period 28 October 2022 to 16 January 2023 is attached. The 'compliant' incidents are presented first in a table and the 'non-compliant' incidents are presented after in a more detailed summary, followed by the compliance monitoring non-compliances.
13. Generally, incidents in the 'compliant' table have a recommendation of 'no further action'. However, an incident is considered 'compliant' until such time as a non-compliance is found. Therefore, occasionally an incident in the 'compliant' table will have a recommendation of 'investigation continuing', if an ongoing investigation is still underway to confirm compliance.
14. A series of graphs are also attached comparing the number of incidents between 2016-2017 and 2021-2022, and also showing how the incidents are tracking in 2021-2022 in relation to environment type and compliance status. There is a graph showing the non-compliances found during compliance monitoring. There is also a graph showing enforcement action taken to date during 2021-2022.
15. The data in the graphs for 2021-2022 to date is showing that there are more incidents but less compliance monitoring non-compliances. Although in the first month of this period, there is limited data.

Decision-making considerations

16. Part 6 (Planning, decision-making and accountability) of the *Local Government Act 2002* has been considered and documented in the preparation of this agenda item. The recommendations made in this item comply with the decision-making obligations of the *Act*.

Financial considerations—LTP/Annual Plan

17. This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

18. This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Iwi considerations

19. This memorandum and the associated recommendations are consistent with the Council's policy for the development of Māori capacity to contribute to decision-making processes (schedule 10 of the *Local Government Act 2002*) as outlined in the adopted long-term plan and/or annual plan. Similarly, iwi involvement in adopted work programmes has been recognised in the preparation of this memorandum.

Community considerations

20. This memorandum and the associated recommendations have considered the views of the community, interested and affected parties and those views have been recognised in the preparation of this memorandum.

Legal considerations

21. This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Appendices/Attachments

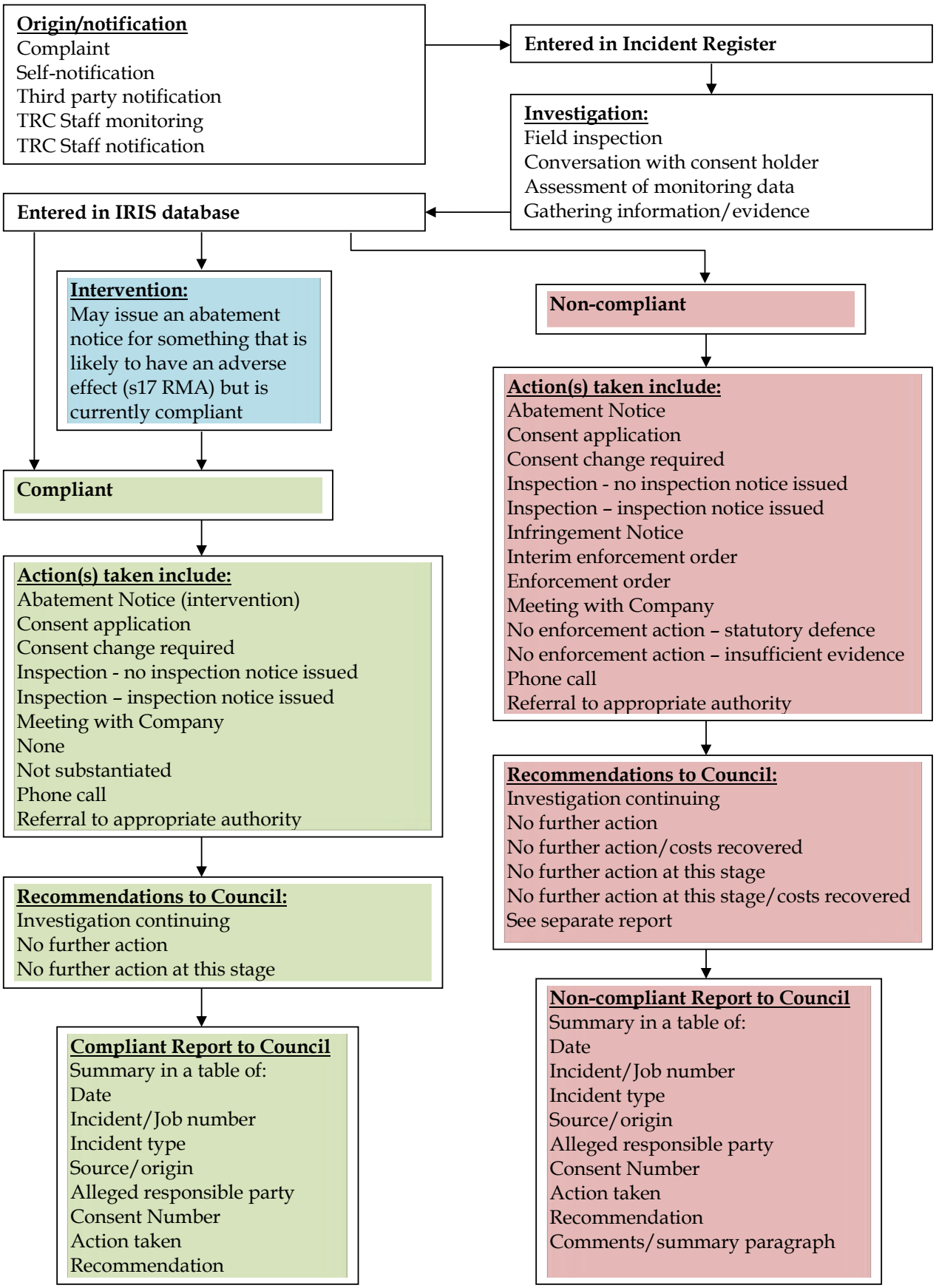
Document 1081324: Incident flowchart and terms explained

Document 3141278: Incident and Enforcement Graphs to 31 December 2022

Document 3141545: Incidents, Compliance Monitoring and Enforcement Summary 28 Oct 2022 to 16 Jan 2023

Incident flow chart

Doc # 1081324



Terms explained

Compliance rating

Compliant	After investigation the incident was found to be compliant with environmental standards or other regulations, permitted rules in a regional plan (e.g. RFWP, RAQP, RCP allowed), a resource consent and/or the Resource Management Act 1991.
Non-compliant	After investigation the incident was found to be non-compliant with environmental standards or other regulations, rules in a regional plan, a resource consent and/or the Resource Management Act 1991

Origin/Notification:

Complaint	Notification of incident received from public.
Self notification	Notification of incident received from the responsible party.
Third Party Notification	Notification of incident received from third party such as New Zealand Fire, District Council etc.
TRC Staff monitoring	Notification of incident found during routine compliance monitoring.
TRC Staff notification	Notification of incident found during unrelated monitoring/field work.

Action/s Taken:

14 day Letter	A letter was sent requesting an explanation for the non-compliance and why enforcement action should not be considered. The recipient is given 14 days to reply.
Abatement Notice	A notice was issued requiring something to be undertaken or something to cease to ensure compliance with Rules in the regional plans, resource consent or Resource Management Act 1991. Notice must be complied with or further enforcement action can be considered.
Consent application	A consent application has been received as a result of the investigation.
Consent change required	During the investigation it was found that a consent change was required.
Emergency Works	Emergency works was allowed under section 330 of the RMA. Often a subsequent resource consent is required.
Enforcement Order	An enforcement order has been issued by the Environment Court requiring action to be undertaken or something to cease. Notice must be complied with or further enforcement action can be

	considered.
Infringement Notice ($xxx.xx)	An infringement notice was issued under Section 338(1)(a) of the Resource Management Act 1991 and Councils delegated authority.
Inspection Notice	An inspection was undertaken and a notice of advice/instruction was issued to landowner/alleged offender.
Inspection/no notice issued	An inspection was undertaken, however no inspection notice was issued as there was no alleged offender/landowner to issue one to (natural event, unsourced etc).
Interim Enforcement Order	An interim enforcement order has been issued by the Environment Court requiring action to be undertaken or something to cease. Notice must be complied with or further enforcement action can be considered.
Meeting with Company	A meeting was held with the Company to discuss the incident and ways to resolve any issues.
None	No action was required.
Not Substantiated	The incident could not be substantiated (i.e. it is not likely/possible/probable that the alleged incident could have taken place).
Phone call	A phone call was made to the alleged offender/authority.
Prosecution	A prosecution is being initiated for this incident.
Referral to Appropriate Authority	The incident was referred to the appropriate authority (District Council, Department of Conservation etc).

Recommendations to Council

Investigation continuing	Outcome has not been finalised. Investigation is continuing on this incident, information/evidence still being gathered. Further action, including enforcement are being considered and therefore legally all information cannot be reported on this incident at this stage. These incidents will continue to be reported as updates in the following agendas.
No Further Action	Investigation is completed, any required enforcement action has been undertaken and no further action is required.
No Further Action At This Stage	Investigation is completed, any required enforcement action has been undertaken and further action may be required at a later date.
No Further Action/Costs Recovered	Investigation is completed, any required enforcement action has been undertaken and no further action is required. Costs will be recovered from the alleged offender for the investigation.

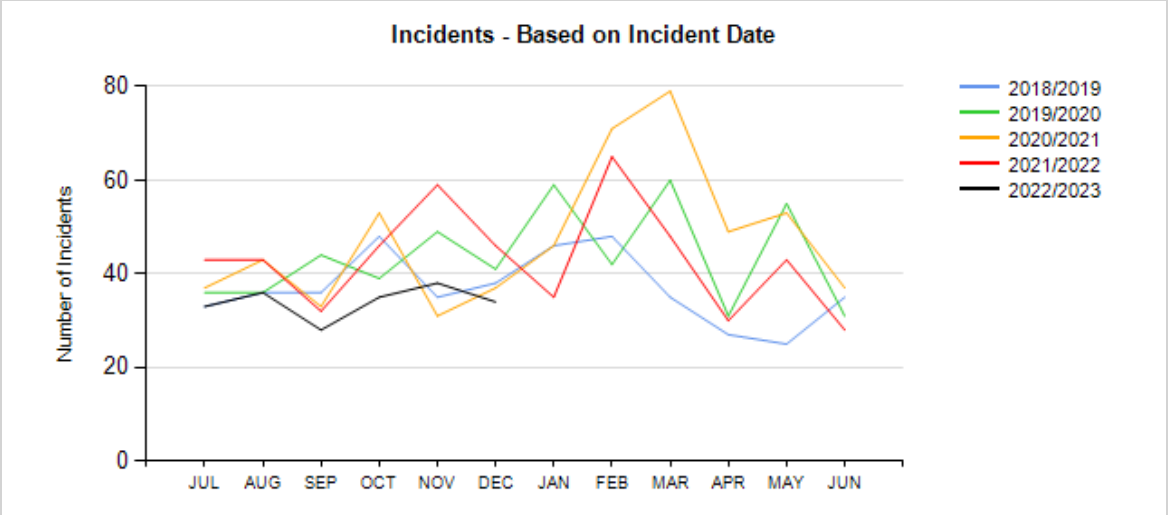
No further Action at this Stage/Costs Recovered	Investigation is completed, any required enforcement action has been undertaken and further action may be required at a later date (reinspection of Abatement Notice etc). Costs will be recovered from the alleged offender for the investigation.

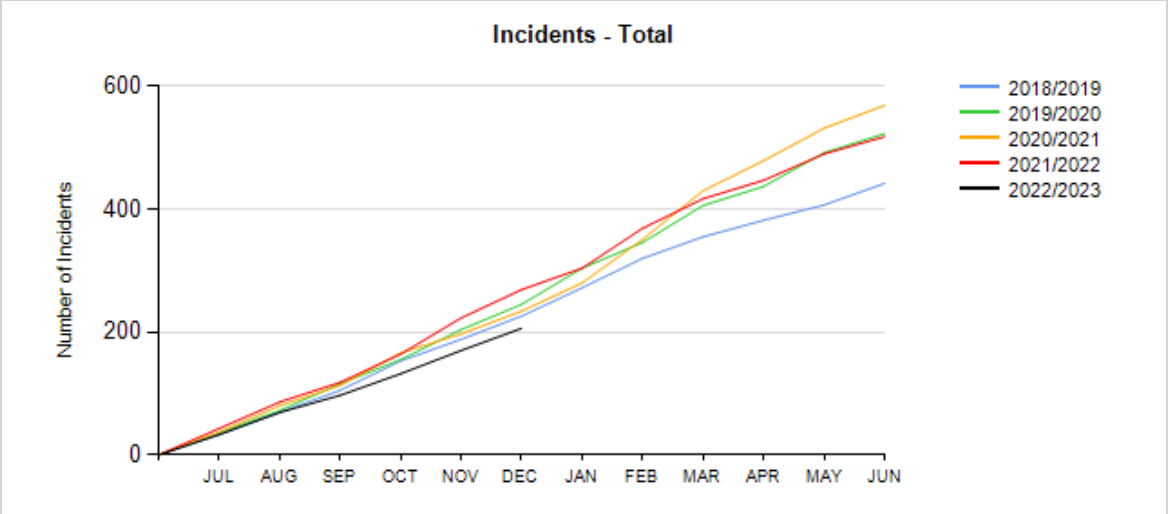
Defences under Sections 340 and 341 of the Resource Management Act 1991

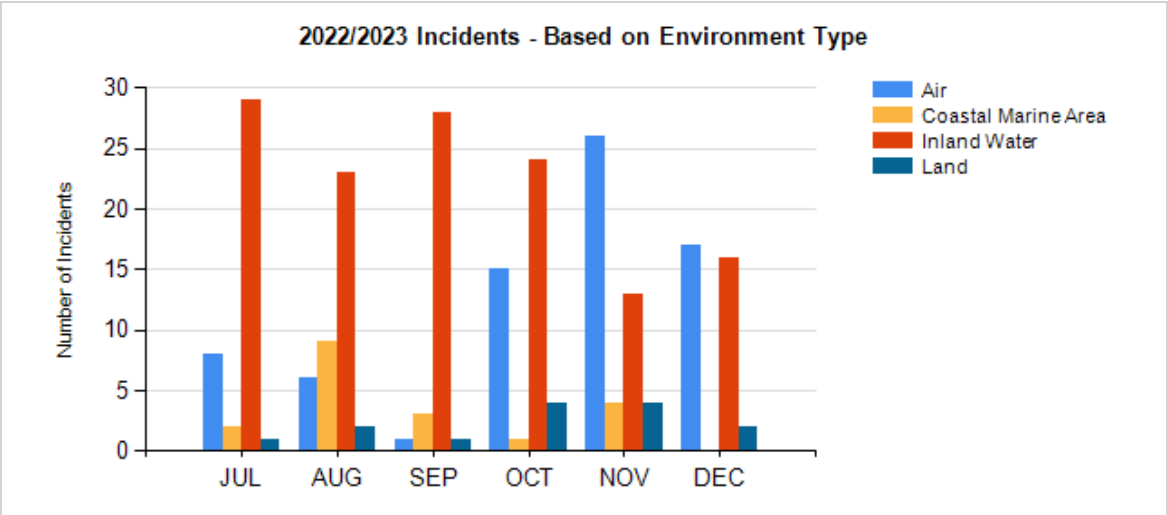
Sometimes no enforcement action is undertaken against an alleged offender for a non-compliant incident as they have a defence under Section 340 of the Resource Management Act 1991 including reasons such as:

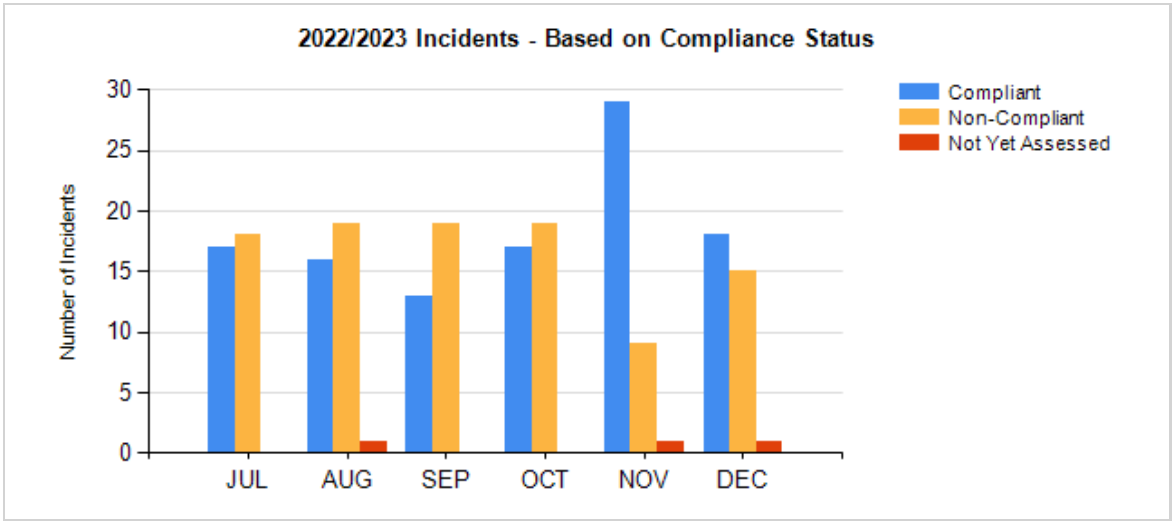
- the defendant can prove that he or she did not know, and could not reasonably be expected to have known that the offence was to be or was being committed, or
- that he or she took all reasonable steps to prevent the commission of the offence, or
- the action or event could not reasonably have been foreseen or been provided against by the defendant.

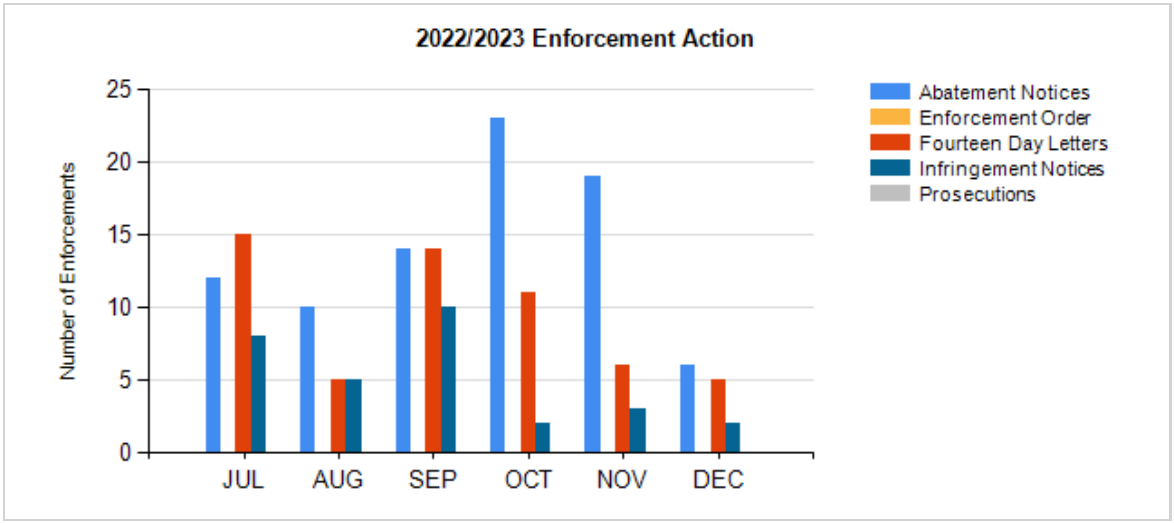
Incident and Enforcement Graphs to 31 December 2022

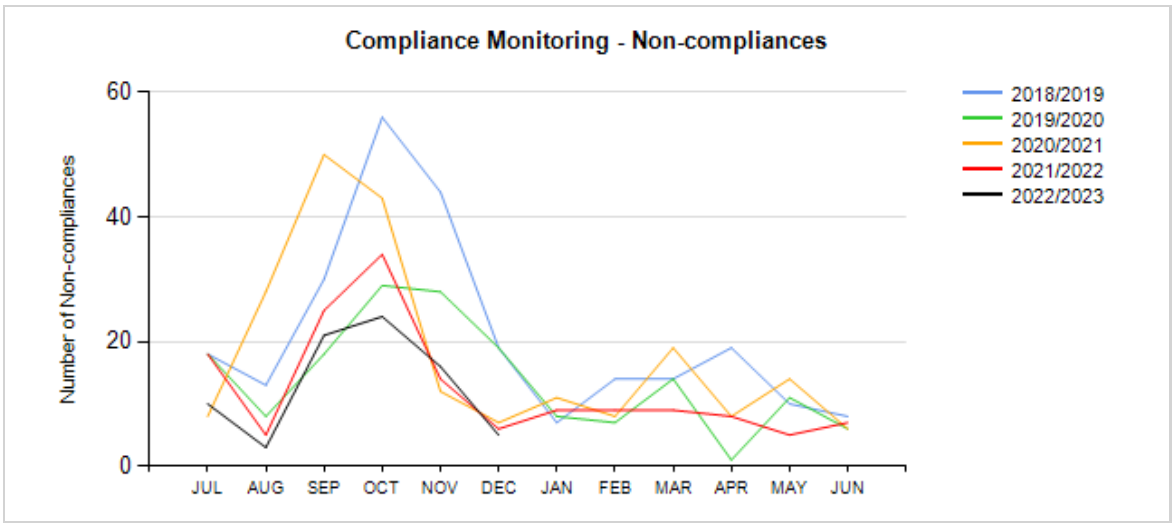


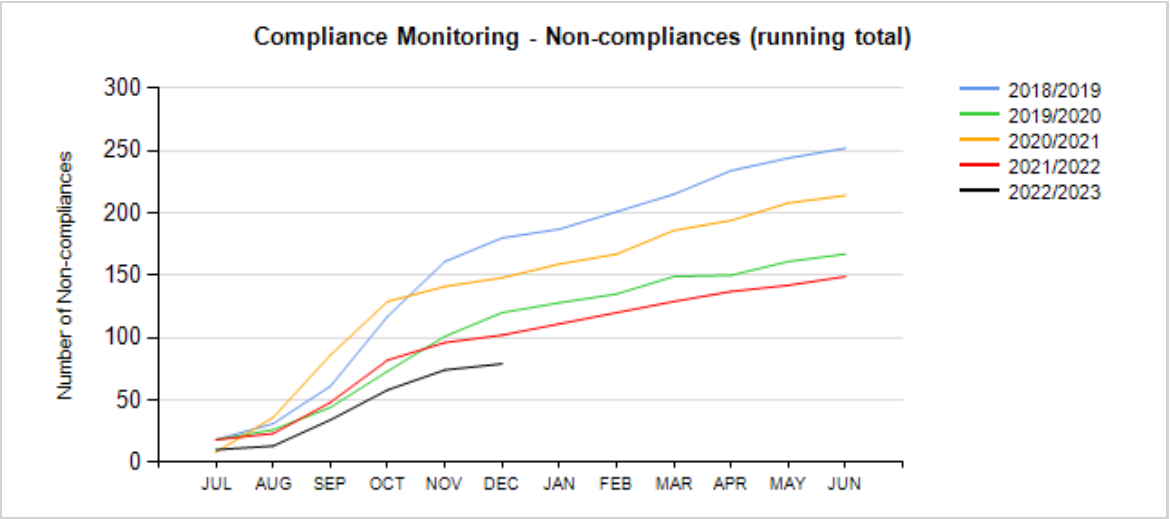





2022/2023 Incidents - Based on Compliance Status
Number of Incidents
30
25
20
15
10
5
0
JUL
AUG
SEP
OCT
NOV
DEC
Compliant
Non-Compliant
Not Yet Assessed


2022/2023 Enforcement Action
Number of Enforcements
25
20
15
10
5
0
JUL
AUG
SEP
OCT
NOV
DEC
Abatement Notices
Enforcement Order
Fourteen Day Letters
Infringement Notices
Prosecutions


Compliance Monitoring - Non-compliances
Number of Non-compliances
60
40
20
0
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
2018/2019
2019/2020
2020/2021
2021/2022
2022/2023


Compliance Monitoring - Non-compliances (running total)
Number of Non-compliances
300
250
200
150
100
50
0
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
2018/2019
2019/2020
2020/2021
2021/2022
2022/2023

Compliant Incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Compliance Status	Recommendation
28 Sep 2022	3301-23-099 IN/46123	Alleged dust - cnr Eliot and Courtenay Street, New Plymouth	Complaint	Nikau Contractors Limited		RAQP Allowed	No Further Action
28 Oct 2022	3301-23-134 IN/46334	Alleged land drainage - Upper Newall Road, Warea	Complaint	Diane Honeyfield		RFWP Allowed	No Further Action
31 Oct 2022	3301-23-138 IN/46355	Alleged spraydrift - Mahuru Lane, Okato	Complaint	Layne Christopher & Helen Dianne Greensill		RAQP Allowed	No Further Action
31 Oct 2022	3301-123-139 IN/46361	Alleged fertiliser odour - Ketemarae Road, Normanby	Complaint	Holdem Contracting Ltd Jason Holdem		RAQP Allowed	No Further Action
1 Nov 2022	3301-23-140 IN/46363	Alleged green Stream - Upper Weld Road, Oakura	Complaint	John & Fiona Henchman	R2/1519-3	Consent Compliance	No Further Action
2 Nov 2022	3301-23-141 IN/46376	Alleged odour - South Road, Opunake	Complaint	Stanley Bros Trust	R2/10671-1.1 R2/5251-2.2	Consent Compliance	No Further Action
2 Nov 2022	3301-123-142 IN/46377	Alleged river dam - Kent Terrace, Midhirst	Complaint	Francis Prior		RFWP Allowed	No Further Action
2 Nov 2022	3301-23-143 IN/46779	Alleged dust - Port Taranaki, New Plymouth	Complaint	Port Taranaki Limited		RAQP Allowed	No Further Action
3 Nov 2022	3301-23-144 IN/46384	Alleged paint/plaster discharge - Rifle Range Road, New Plymouth	Complaint	Unsourced		RFWP Allowed	No Further Action
3 Nov 2022	3301-23-145 IN/46385	Alleged dust - Port Taranaki, New Plymouth	Complaint	Port Taranaki Limited		RAQP Allowed	No Further Action

Compliant Incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Compliance Status	Recommendation
3 Nov 2022	3301-23-147 IN/46434	Alleged discoloured stream - Hurford Road, Omata	Complaint	Zenith Farms Family Trust	R2/1702-3	Consent Compliance	No Further Action
3 Nov 2022	3301-23-160 IN/46859	Alleged earthworks - Tawa Street, Inglewood	Self-Notification	All Good Properties Limited		RFWP Allowed	No Further Action
4 Nov 2022	330123-076 IN/46388	Alleged burn pile - London Street, Eltham	Complaint	New Zealand Fire Service		RAQP Allowed	No Further Action
4 Nov 2022	3301-23-150 IN/46398	Alleged farm dump - Upper Kina Road, Opunake	Complaint	Francis Mullan		RFWP Allowed	No Further Action
6 Nov 2022	3301-23-153 IN/46408	Alleged odour - Paraite Road, Bell Block	Complaint	Tegel Foods Limited	R2/4026-3.0	Consent Compliance	No Further Action
8 Nov 2022	3301-23-155 IN/46409	Alleged effluent on boat ramp - Cape Egmont	Complaint	Unsourced		RCP Allowed	No Further Action
8 Nov 2022	3301-23-156 IN/46410	Alleged odour - Mokau Road, Uruti	Complaint	Remediation (NZ) Limited	R2/5839-2	Consent Compliance	No Further Action
10 Nov 2022	3301-23-043 IN/46427	Alleged dust - Oropuriri Road, New Plymouth	Complaint	Jones Quarry Limited		RAQP Allowed	No Further Action
10 Nov 2022	3301-23-157 IN/46428	Alleged spray drift - Wills Road, Bell Block	Complaint	Spreading FBT Ltd		RAQP Allowed	No Further Action
10 Nov 2022	3301-23-158 IN/46430	Alleged dust - Airport Drive, Bell Block	Complaint	BTW Company Limited	R2/11024-1.0	Consent Compliance	No Further Action

Compliant Incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Compliance Status	Recommendation
10 Nov 2022	3301-23-162 IN/46433	Alleged dust - Colson Road, New Plymouth	Complaint	New Plymouth District Council		RAQP Allowed	No Further Action
10 Nov 2022	3301-23-163 IN/46438	Alleged smoke - Veale Road, New Plymouth	Complaint	Warren Stokes		RAQP Allowed	No Further Action
13 Nov 2022	3301-23-164 IN/46446	Alleged odour - Kohito Road, Okaiawa	Complaint	Taranaki By-Products Limited	R2/4058-4	Consent Compliance	No Further Action
14 Nov 2022	3301-23-165 IN/46454	Alleged hydrocarbon discharge - Pioneer Road, New Plymouth	TRC Staff Notification	Meco Engineering Co Ltd		RFWP Allowed	No Further Action
15 Nov 2022	3301-23-166 IN/46464	Alleged dust - South Road, Spotswood	Complaint	Graham Harris Limited		RAQP Allowed	No Further Action
15 Nov 2022	3301-23-167 IN/46467	Alleged smoke - Parklands Avenue, Bell Block	Complaint	Mangati Properties (2001) Limited		RAQP Allowed	No Further Action
16 Nov 2022	3301-23-168 IN/46468	Alleged foamy discharge - Herekare Stream - New Plymouth	Complaint	Unsourced		RFWP Allowed	No Further Action
16 Nov 2022	3301-23-169 IN/46469	Alleged hydrocarbon discharge - Various streets, New Plymouth	Self-Notification	EnviroWaste New Zealand Limited New Plymouth District Council		RFWP Allowed	No Further Action
17 Nov 2022	3301-23-170 IN/46490	Alleged odour - Mokau Road, Uruti	Complaint	Remediation (NZ) Limited	R2/5839-2	Consent Compliance	No Further Action

Compliant Incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Compliance Status	Recommendation
23 Nov 2022	3301-23-171 IN/46525	Alleged odour - Centennial Drive, New Plymouth	Complaint	Corteva Agriscience New Zealand Limited Nikau Contractors Limited		RAQP Allowed	No Further Action
24 Nov 2022	3301-23-172 IN/46530	Alleged odour - Kohiti Road, Okaiawa	Complaint	Taranaki By-Products Limited	R2/4058-4	Consent Compliance	No Further Action
25 Nov 2022	3301-23-175 IN/46539	Alleged sediment discharge - Otaraoa Road, Tikorangi	Complaint	Unsourced		RFWP Allowed	No Further Action
30 Nov 2022	3301-23-178 IN/46570	Alleged odour - Kohiti Road, Okaiawa	Complaint	Taranaki By-Products Limited	R2/4058-4	Consent Compliance	No Further Action
30 Nov 2022	3301-23-179 IN/46576	Alleged smoke - Lady's Mile, Eltham	Complaint	Lyall Wotton		RAQP Allowed	No Further Action
2 Dec 2022	3301-23-180 IN/46577	Alleged smoke - Kerry Lane, Hawera	Complaint	Martin Joseph & Christine Powell		RAQP Allowed	No Further Action
2 Dec 2022	3301-23-181 IN/46578	Alleged waste discharge - Carthew Street, Okato	Complaint	Coastal Meat Processors		RFWP Allowed	No Further Action
5 Dec 2022	3301-23-185 IN/46599	Alleged dust - Cutfield Street, Inglewood	Complaint	Ken G Moratti Limited		RAQP Allowed	No Further Action
6 Dec 2022	3301-23-189 IN/46617	Alleged earthworks - Tukapa Street, New Plymouth	Complaint	Smudgy Developments Limited	R2/10585-1.0	Consent Compliance	No Further Action
8 Dec 2022	3301-23-187 IN/46611	Alleged dust - Radnor Road, Midhirst	Complaint	Julie Rowlands		RAQP Allowed	No Further Action

Compliant Incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Compliance Status	Recommendation
9 Dec 2022	3301-23-203 IN/46640	Alleged land drainage - Parris Street, Waitara	Complaint	Kurt Ross		RFWP Allowed	No Further Action
12 Dec 2022	3301-23-192 IN/46637	Alleged burying of hedging - Radnor Road, Midhirst	Complaint	Allan Rowlands		RFWP Allowed	No Further Action
12 Dec 2022	3301-23-193 IN/46641	Alleged smoke - Tawhiti Road, Hawera	Complaint	Jaap DePrinse		RAQP Allowed	No Further Action
13 Dec 2022	3301-23-194 IN/46644	Alleged discoloured stream - Mid Puneho Road, Okato	Complaint	Unsourced		RFWP Allowed	No Further Action
13 Dec 2022	3301-23-197 IN/46669	Alleged smoke - Upper Lepper Road, Inglewood	Complaint	Egmont Skins & Hides Limited		RAQP Allowed	No Further Action
13 Dec 2022	3301-23-198 IN/46671	Alleged odour - Mokau Road, Uruti	Complaint	Remediation (NZ) Limited	R2/5839-2	Consent Compliance	No Further Action
16 Dec 2022	3301-23-223 IN/46702	Alleged soil in river - Okau Road, Tongaporutu	Complaint	Unsourced		Not Applicable/Natural Event	No Further Action
19 Dec 2022	3301-23-205 IN/46696	Alleged flooding - Cheal Road, Ngaere	Third Party Notification	Natural Event		Not Applicable/Natural Event	No Further Action
20 Dec 2022	3301-23-206 IN/46694	Alleged odour - Mokau Road, Uruti	Complaint	Remediation (NZ) Limited	R2/5839-2	Consent Compliance	No Further Action
21 Dec 2022	3301-23-207 IN/46699	Alleged dust - Strandon Place, New Plymouth	Complaint	Gareth Collins		RAQP Allowed	No Further Action

Compliant Incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Compliance Status	Recommendation
26 Dec 2022	3301-23-213 IN/46784	Alleged waste delivery - Mokau Road, Uruti	Complaint	Remediation (NZ) Limited	R2/5839-2	Consent Compliance	No Further Action
27 Dec 2022	3301-23-211 IN/46729	Alleged sewage discharge - Ardern Place, Oakura	Self-Notification	New Plymouth District Council	R2/10406-1.0	RFWP Allowed	No Further Action
28 Dec 2022	3301-23-212 IN/46733	Alleged smoke - Port Taranaki, New Plymouth	Complaint	Unsourced		RAQP Allowed	No Further Action
31 Dec 2022	3301-23-217 IN/46736	Alleged dust - Victor Street, New Plymouth	Complaint	GJ Gardner		RAQP Allowed	No Further Action
31 Dec 2022	3301-23-218 IN/46741	Alleged vehicles on beach - Mohakatino	Complaint	Unsourced		Not Applicable/Natural Event	No Further Action
1 Jan 2023	3301-23-220 IN/46737	Alleged molasses discharge - St Aubyn Street, New Plymouth	Third Party Notification	Tranzport NZ LTD		RFWP Allowed	No Further Action
2 Jan 2023	3301-23-221 IN/46738	Alleged smoke - SH3, Bell Block	Complaint	Don Caskey		RAQP Allowed	No Further Action
4 Jan 2023	3301-23-215 IN/46731	Alleged odour - Mountain Road, Inglewood	Complaint	Osflo Fertiliser Limited	R2/10578-1.0	Consent Compliance	No Further Action
4 Jan 2023	3301-23-222 IN/46739	Alleged discoloured Stream - Allison/Dommett Streets, New Plymouth	Complaint	Unsourced		RFWP Allowed	No Further Action
8 Jan 2023	3301-23-225 IN/46743	Alleged sewage discharge - Bronte Place, New Plymouth	Complaint	New Plymouth District Council		RFWP Allowed	No Further Action

Compliant Incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Compliance Status	Recommendation
9 Jan 2023	3301-23-226 IN/46758	Alleged oil spill - Huatoki Stream/out to sea	Complaint	Natural Event		Not Applicable/Natural Event	No Further Action
9 Jan 2023	3301-23-227 IN/46766	Alleged effluent on road - South Road, Opunake	Complaint	Unsourced		RFWP Allowed	No Further Action
10 Jan 2023	3301-23-228 IN/46764	Alleged digger works in river - Graves Road, Eltham	Complaint	Allan Joblin		RFWP Allowed	No Further Action
13 Jan 2023	3301-23-230 IN/46791	Alleged chemical spill - Acacia Place, Bell Block	Complaint	Michael Jackson		RFWP Allowed	No Further Action
16 Jan 2023	330-23-237 IN/46862	Alleged dust - Port Taranaki, New Plymouth	Complaint	Port Taranaki Limited		RAQP Allowed	No Further Action

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
4 Jul 2022 Update	3301-23-003 IN/45574	Silt and erosion - Mangamahoe Stream, New Plymouth	Complaint	Downer EDI Works (29406) New Plymouth District Council (9565)	R2/10192-1.0	EAC-24642 - Explanation Requested - Letter EAC-24646 - Explanation Requested - Letter EAC-24647 - Abatement Notice	Investigation Continuing
Comments: A complaint was received concerning silt and sediment discharging into the Mangamahoe Stream near Lake Mangamahoe, New Plymouth. Investigation found that there had been work undertaken on an instream structure known as the Lower Head Dam. A significant amount of silt and sediment had been discharged downstream of the structure. Upstream of the structure it was evident that significant erosion had occurred and would continue to occur. Further investigation found that silt controls that had been installed downstream had become overwhelmed and were offering no sediment control. Photographs, videos, and samples were taken. Letters of explanation have been received. Enforcement action is being considered.							
11 Jul 2022 Update	3301-23-008 IN/45622	Unauthorised discharge into stream - Rimutauteka Road, Inglewood	TRC Staff Compliance Monitoring	Codylan Farms Limited (36519)	R2/10321-1.0	EAC-24667 - Abatement Notice EAC-24669 - Abatement Notice EAC-24830 - Infringement Notice ($750)	Investigation Continuing
Comments: During unrelated monitoring of a wellsite, it was found that farm dairy effluent was discharging to a skimmer pit outfall and then into surface water at Rimutauteka Road, Inglewood. Photographs, video and samples were taken. Whilst collecting a sample of the discharge it was also noted that silage leachate was discharging to the stream causing sewage fungus growths downstream of the discharge. The discharge of farm dairy effluent was in contravention of consent conditions and the discharge of leachate was in contravention of Rule 30 of the RFWP. Abatement notices were issued requiring the discharge of dairy effluent to cease and for works to be undertaken to prevent the discharge of silage leachate. Reinspection found the abatement notice was not being complied with. Further enforcement action is being considered.							

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
15 Aug 2022 Update	3301-23-44 IN/45845	Green stream - Hurford Road, Omata	Complaint	Martin Strauss (74270) Nicholas & Christine Barrett (3403) Zenith Farms Family Trust (36016)	R2/1702-3	EAC-24698 - Abatement Notice EAC-24703 - Abatement Notice EAC-24704 - Abatement Notice EAC-24705 - Abatement Notice EAC-24739 - Explanation Requested - Letter EAC-24896 - Infringement Notice ($750) EAC-24900 - Infringement Notice ($750)	No Further Action/Costs Recovered

Comments: A complaint was received concerning a 'green' stream at Hurford Road, Omata. Investigation found that farm dairy effluent had overflowed from the sandtrap and discharged into a waterbody which flows into an unnamed tributary of the Ngakara Stream. Abatement notices were issued requiring works to be undertaken to ensure consent compliance. Reinspection found that the abatement notices were being complied with at the time of inspection.

25 Aug 2022 Update	3301-23-068 IN/45916	Stream works - Sisson Terrace, Lepperton	Complaint	Donald Searle (11191)		EAC-24723 - Explanation Requested - Letter	No Further Action

Comments: A complaint was received concerning stream works in the Waiongana Stream at Sisson Terrace, Lepperton. Investigation found that there had been earthworks undertaken on the riverbed of the stream. Vegetation was removed and rock armoring undertaken as part of flood control/erosion control measures. However, this Council's Rivers Officer had previously advised that the works could not be done until October, as this would be a contravention of Rule 61(h) of the Regional Fresh Water Plan for Taranaki. A letter of explanation was received and accepted.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
7 Sep 2022 Update	3301-23-080 IN/46007	Stream realignment - Komene Road, Okato	Complaint	Denis James & Raewyn Edna Gladys Goodwin (2605)		EAC-24741 - Abatement Notice EAC-24744 - Abatement Notice EAC-24852 - Explanation Requested - Letter EAC-24853 - Explanation Requested - Letter	Investigation Continuing

Comments: A complaint was received concerning instream works being undertaken on a property at Komene Road, Okato. Investigation found that works had been undertaken to realign two sections of stream, totalling approximately 380 metres. The works were in contravention of rules in the Regional Fresh Water Plan for Taranaki and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020. An abatement notice was issued requiring works to be undertaken to reinstate the streams. Reinspections undertaken so far have found that the majority of the works required to ensure compliance with the abatement notices have been completed. Further reinspections will be undertaken. A letter of explanation has been received. Further enforcement action is being considered.

8 Sep 2022 Update	3301-23-078 IN/46005	Stream realignment - Opunake Road, Opunake	TRC Staff Notification	Neville Lynsay & Beverley Louisa Ardern (3462)		EAC-24762 - Explanation Requested - Letter	No Further Action At This Stage

Comments: During unrelated monitoring it was found that a section of stream had been realigned on a dairy farm at Opunake Road, Opunake. Investigation found that the work had been undertaken in 2020. A meeting was held with the landowner and steps are being undertaken to achieve compliance with the Resource Management (National Environmental Standards for Freshwater) Regulations 2020. Council staff are working with the landowner and consultant to achieve compliance.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
13 Sep 2022 Update	3301-23-081 IN/46021	Dairy effluent - Hurford Road, Omata	Complaint	Martin Strauss (74270) Nicholas & Christine Barrett (3403) Zenith Farms Family Trust (36016)	R2/1702-3	EAC-24753 - Explanation Requested - Letter EAC-24754 - Explanation Requested - Letter EAC-24903 - Infringement Notice ($750) EAC-24904 - Infringement Notice ($750)	No Further Action/Costs Recovered

Comments: A complaint was received concerning a discharge of farm dairy effluent into a stream at Hurford Road, Omata. Investigation found that an upstream dairy effluent disposal system was not operating within resource consent conditions and an abatement notice issued as a result of a previous non-compliance. An explanation has been received.

19 Sep 2022 Update	3301-23-088 IN/46053	Green stream - Hurford Road, Omata	Complaint	Martin Strauss (74270) Nicholas & Christine Barrett (3403) Zenith Farms Family Trust (36016)	R2/1702-3	EAC-24921 - Infringement Notice ($750) EAC-24922 - Infringement Notice ($750)	No Further Action/Costs Recovered

Comments: A complaint was received concerning a ‘green’ stream at Hurford Road, Omata. Investigation found that farm dairy effluent was discharging into two streams, on an upstream property, as a result of an overflowing holding pond and poor irrigation practises. This is the third such incident in a two monthly period. Works have been undertaken to upgrade the effluent disposal system.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
19 Sep 2022 Update	3301-23-093 IN/46082	Stream piping - Komene Road, Okato	TRC Staff Compliance Monitoring	JMC Earthworks Limited (74554) P & E Grylls (33912)		EAC-24765 - Explanation Requested - Letter EAC-24835 - Explanation Requested - Letter EAC-24862 - Abatement Notice EAC-24907 - Infringement Notice ($500)	No Further Action At This Stage
Comments: During unrelated monitoring it was found that a 300 metre section of the headwaters of a ephemeral stream had been piped on a drystock property at Komene Road, Okato. Investigation found that the works had recently been completed and were in contravention of the Resource Management (National Environmental Standards for Freshwater) Regulations 2020. A letter of explanation was received. A meeting was be held with the landowner. An abatement notice was issued requiring remediation works to be undertaken. A riparian plan is being developed for the property.							
20 Sep 2022 Update	3301-23-090 IN/46061	Dairy effluent - Skeet and Hunter Road, Eltham	Complaint	GJ & DA Carter Family Trust (21880) Mark Carter (74368)	R2/3786-2.2	EAC-24756 - Explanation Requested - Letter EAC-24850 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: A complaint was received concerning dairy effluent in a stream at the corner of Skeet and Hunter Roads, Eltham. Investigation found the unnamed tributary was running slightly green at the time of the inspection. Investigation of upstream properties found that an effluent irrigator had been running the previous night and effluent had ponded and run off into a tributary. A letter of explanation was received.							

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
21 Sep 2022 Update	3301-23-091 IN/46075	Discoloured Stream - Connett Road, Bell Block	Complaint	Taranaki Sawmills Limited (10015)	R2/2333-4.4	EAC-24757 - Abatement Notice EAC-24758 - Explanation Requested - Letter EAC-24851 - Infringement Notice ($750)	No Further Action/Costs Recovered

Comments: A complaint was received concerning a 'black' stream at Connett Road, Bell Block. Investigation found the Waitaha Stream was running 'black' at the time of inspection. Investigation of an upstream business found that the stormwater discharge point from timber treatment site was black in colour as a result of high tannin concentration. The outlet to the pond was blocked off to prevent further discharge. An abatement notice was issued requiring works to be undertaken. Reinspection found that the abatement notice was being complied with at the time of inspection.

27 Sep 2022 Update	3301-23-106 IN/46213	Farm dump - Waitara River - Waitara	Complaint	Collin Megaw (74400)		EAC-24780 - Abatement Notice EAC-24908 - Infringement Notice ($750)	No Further Action

Comments: A complaint was received concerning a farm dump on the bank of the Waitara River, near Waitara Road, Waitara. Investigation, using a drone, found that there was a farm dump on the bank of the river. An abatement notice was issued requiring works to be undertaken to comply with Rule 30 of the Regional Fresh Water Plan for Taranaki. Reinspection found that the abatement notice had been complied with.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
30 Sep 2022 Update	3301-23-102 IN/46131	White stream - Cloten Road, Stratford	Complaint	Downer New Zealand Limited (50648)		EAC-24782 - Explanation Requested - Letter EAC-24875 - Infringement Notice ($750)	No Further Action

Comments: A complaint was received concerning a 'white' stream at Cloten Road, Stratford. Investigation found that an unnamed tributary of the Patea River was running white at the time of inspection. Investigation upstream found that water was running over the unpaved surface of the state highway and was picking up fine silt and sediment which was discharging into the reticulated stormwater system. No silt and sediment controls were in place. Samples were taken. An explanation was received from the roading Company, who admitted responsibility.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
6 Oct 2022 Update	3301-23-109 IN/46177	Green stream - Cape Road, Rahotu	Complaint	Haidee Parkinson (74416) Nash Winter (74415) PJ Radford Estate (70044)	R2/3495-2	EAC-24785 - Explanation Requested - Letter EAC-24787 - Explanation Requested - Letter EAC-24788 - Explanation Requested - Letter EAC-24790 - Abatement Notice EAC-24791 - Abatement Notice EAC-24792 - Abatement Notice EAC-24793 - Abatement Notice EAC-24880 - Infringement Notice ($750)	No Further Action/Costs Recovered

Comments: A complaint was received concerning a 'green' stream at Cape Road and Parihaka Road, Pungarehu. Investigation found that a stormwater diversion was broken on an upstream property and some farm dairy effluent was discharging directly to the stream. Samples were taken. Abatement notices were issued requiring works to be undertaken to ensure compliance with resource consent conditions. Reinspection found that the abatement notices were being complied with at the time of inspection. Letters of explanation were received.

26 Oct 2022 Update	3301-23-131 IN/46319	Green stream - Salisbury Road, Midhirst	Complaint	Shane Helms (72152)	R2/2696-3.0	EAC-24818 - Explanation Requested - Letter	No Further Action/Costs Recovered

Comments: A complaint was received concerning a 'green' stream at Salisbury Road, Midhirst. Investigation found the stream was discoloured at the time of inspection and the discharge from an upstream oxidation pond system was discoloured. Samples were taken and analysis of results found compliance with parameters in resource consent conditions however, was still considered non-compliant with visual requirements of the discharge. A letter of explanation was received and accepted.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation

Non-compliant incidents for the period 28 Oct 2022 to 16 Jan 2023

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
13 Sep 2022	3301-23-199 IN/46665	Unconsented culvert - tributary of Wairau Stream - Oakura	TRC Staff Compliance Monitoring	Waka Kotahi NZ Transport Agency (72000)			Investigation Continuing
Comments: During routine compliance monitoring it was found that a resource consent had expired for a culvert installed in an unnamed tributary or the Wairau Stream at Oakura. Also works were required to comply with fish passage requirements in the Regional Fresh Water Plan for Taranaki. An abatement notice will be issued requiring works to be undertaken to ensure compliance with Rules in the Regional Fresh Water Plan for Taranaki.							
13 Sep 2022	3301-23-200 IN/46666	Unconsented culvert - tributary of Waimoku Stream - Oakura	TRC Staff Compliance Monitoring	Waka Kotahi NZ Transport Agency (72000)			Investigation Continuing
Comments: During routine compliance monitoring it was found that a resource consent had expired for a culvert installed in an unnamed tributary or the Waimoku Stream at Oakura. An abatement notice will be issued requiring works to be undertaken to ensure compliance with Rules in the Regional Fresh Water Plan for Taranaki.							
13 Sep 2022	3301-23-201 IN/46667	Unconsented culvert - Mangati Stream - Bell Block	TRC Staff Compliance Monitoring	Waka Kotahi NZ Transport Agency (70589)			Investigation Continuing
Comments: During routine compliance monitoring it was found that a resource consent had expired for a culvert installed in an unnamed tributary or the Mangati Stream at Bell Block. An abatement notice will be issued requiring works to be undertaken to ensure compliance with Rules in the Regional Fresh Water Plan for Taranaki.							

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
20 Oct 2022	3301-23-148 IN/46392	Irrigation pipe failure - Mokau Road, Uruti	Self-Notification	Remediation (NZ) Limited (30679)	R2/5838-2.2		No Further Action/Costs Recovered

Comments: Self-notification was received concerning an unforeseen failure of a contaminated stormwater disposal irrigation line at a composting facility on Mokau Road, Uruti. Investigation found that the irrigation pipe leading to one of the irrigators had disconnected, resulting in the discharge of contaminated stormwater to land via an open pipe. Staff on site had checked the pipe before irrigation and it was operational, however, the failure had occurred during irrigation. The failure was subsequently identified by staff and the discharge was ceased immediately. It was observed that some of the discharge had entered surface water. Staff onsite utilised a trash pump to collect the contaminated stormwater from a ponded area within the tributary and pumped it to another location within the irrigation paddock where it could be assimilated by the pasture and not run-off to water.

28 Oct 2022	3301-23-135 IN/46337	Sewage Overflow - Brois Street, New Plymouth	Self-Notification	New Plymouth District Council (9565)	R2/0882-4.1 R2/10406-1.0	No Enforcement Action - Statutory defence	No Further Action

Comments: Self-notification was received regarding a sewage overflow at Brois Street, New Plymouth. Investigation found a sewage overflow, which had been caused by an unforeseen blockage, had discharged overland and into water. At the time of inspection the discharge had ceased and City Care were on-site undertaking clean up and putting out warning signs.

31 Oct 2022	3301-23-136 IN/46350	Fertiliser discharge - Te Ngahoro Road, Omata	Complaint	Westown Horticulture Ltd (15091)			No Further Action

Comments: A complaint was received regarding fertiliser overspray on a property at Te Ngahoro Road, Omata. Investigation found that a small amount of fertiliser had discharged beyond the boundary onto the road. The responsible party was spoken to and immediately undertook sweeping of the road with a tractor. Reinspection the following day found that no further discharge onto the road had occurred.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
1 Nov 2022	3301-23-137 IN/46356	Dairy effluent overspray - Petch Road, Patea	Complaint	Damian Roper (34494) Vanner Gavin Trust No 1 & 2 (17033)	R2/0517-2	EAC-24815 - Explanation Requested - Letter EAC-24816 - Explanation Requested - Letter EAC-24916 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: A complaint was received concerning dairy effluent discharging onto the road at Petch Road, Patea. Investigation found that dairy effluent from an irrigator was ponding and discharging beyond the boundary of the property onto the road and roadside verge. The consent holder was advised and ceased the discharge immediately. A letter of explanation was received.							
4 Nov 2022	3301-23-146 IN/46389	Backyard burning - South Road, Manaia	Complaint	David Seekely (74508)			No Further Action
Comments: A complaint was received concerning smoke discharging from a small fire burning on a property on the corner of South Road and Rangauri Street, Manaia. Investigation found that a fire was burning within the defined urban area. The responsible party was advised of rules in the Regional Air Quality Plan for Taranaki and the fire was immediately extinguished.							
5 Nov 2022	3301-23-152 IN/46406	Sewerage overflow - tributary of Huatoki Stream	TRC Staff Notification	New Plymouth District Council (9565)	R2/10406-1.0	EAC-24941 - Explanation Requested - Letter	Investigation Continuing
Comments: Notification was received of a sewage overflow into a tributary of the Huatoki Stream in New Plymouth. Investigation found that due to a blockage, sewage had overflowed from a manhole into the tributary. The adverse effects caused by the discharge were significant, with trees dying and sewage fungus covering the stream bed. Photographs and samples were taken. Works were immediately undertaken by City Care to unblock the pipe and remediate the land by burying the remaining sewage and spreading lime. New Plymouth District Council were also contacted and requested to carry out an investigation as this is the second blockage in the same location in two years. Enforcement action is being considered.							

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
7 Nov 2022	3301-23-154 IN/46407	Burning - Ngatai Street, Manaia	Complaint	Mark Reason (74523)		EAC-24878 - Infringement Notice ($300)	No Further Action
Comments: A complaint was received regarding burning on a property at Ngatai Street, Manaia. Investigation found burning was occurring within a defined urban area in contravention of rules in the Regional Air Quality Plan for Taranaki. It was also found that prohibited material such as plastics and tanalised timber had been burnt.							
9 Nov 2022	3301-23-176 IN/46537	Unauthorised structure - Mt Messenger Bypass Development	TRC Staff Compliance Monitoring	Waka Kotahi NZ Transport Agency (70589)	R2/10650-1.0		No Further Action At This Stage/Costs Recovered
Comments: During routine monitoring of Te Ara O Te Ata (Mt Messenger Bypass developments) earthworks, it was found that a culvert installed in Zone 7 did not comply with special conditions of Resource Consent 10650-1 - Culvert 18. Subsequent review of the information submitted during the consenting process for this consent, found that the culvert was not installed under Resource Consent 10650-1. Therefore, the temporary culvert about the location of the Culvert 18 permanent culvert was non-compliant with Rule 57 of the Regional Fresh Water Plan for Taranaki and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020. A retrospective consent is being applied for.							
10 Nov 2022	3301-23-159 IN/46431	Dust - Carrington Street, New Plymouth	Complaint	Darcy Keene Earthmoving Limited (4298)		EAC-24827 - Abatement Notice EAC-24828 - Abatement Notice EAC-24879 - Infringement Notice ($300)	No Further Action
Comments: A complaint was received concerning dust discharging from a subdivision development site at Carrington Street, New Plymouth. Investigation found that objectionable dust was discharging beyond the boundary of the site, affecting neighbouring properties.							

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
10 Nov 2022	3301-23-161 IN/46432	Earthworks - East Road, Toko	TRC Staff Notification	Shane Jordan (74531)		EAC-24824 - Explanation Requested - Letter EAC-24825 - Abatement Notice EAC-24918 - Infringement Notice ($300)	No Further Action

Comments: During unrelated monitoring it was found that earthworks were being undertaken within a wetland at a property at East Road, Toko, in contravention of the Resource Management (National Environmental Standards for Freshwater) Regulations 2020. An abatement notice was issued requiring works to be undertaken to reinstate the wetlands. Reinspection found that the abatement notice had been complied with.

24 Nov 2022	330123-174 IN/46536	Rubbish Dump - Tapuae Stream	Complaint	Raymond Hector Barron (36375)			Investigation Continuing

Comments: A complaint was received regarding an exposed historical farm dump on the coastal edge of a farm at South Road, Omata. The land owner confirmed that the historic farm dump was present on his land and due to coastal erosion some of the land and rubbish had slipped away. The Council is working with the landowner to ensure works are undertaken to prevent any non-compliances with the Regional Fresh Water Plan for Taranaki.

25 Nov 2022	3301-23-173 IN/46534	Unauthorised dam - Waitotara Valley Road, Waitotara	Complaint	Andrew & Annette Pearce (31157)			No Further Action At This Stage

Comments: A complaint was received concerning an unauthorised dam that was built between 2016 and 2018 at a property at Waitotara Valley Road, Waitotara. Investigation found that the historical dam had been constructed. The dam was not compliant with Rule 57 of the Regional Fresh Water Plan for Taranaki. Discussions are ongoing with the landowner who is intending to remove the dam.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
2 Dec 2022	3301-23-182 IN/46580	Backyard burning - Glasgow Street, Hawera	Complaint	Cameron Hasler (74607)			Investigation Continuing

Comments: A complaint was received concerning smoke discharging from a fire at a property at Glasgow Street, Hawera. Investigation found burning was occurring in a small 100 litre steel drum, on the property within the defined urban area. There was minimal offsite effects occurring at the time of inspection. Advice and information was provided around rules in the Regional Air Quality Plan for Taranaki. The fire was extinguished.

2 Dec 2022	3301-23-183 IN/46588	Backyard burning - Morressey Street, Hawera	Complaint	Peter Zhang (74578)			No Further Action

Comments: A complaint was received concerning backyard burning at a property at Morressey Street, Hawera. Investigation found a small burn pile of greenwaste which was almost out, with no visible smoke, at the property within the defined urban area. The responsible party were new residents from overseas and were not aware that burning was prohibited on the property. Advice and information was given and the fire was extinguished immediately.

5 Dec 2022	3301-23-184 IN/46590	Green Stream - Stockman Road, Tikorangi	Complaint	Unsourced (9768)			No Further Action

Comments: A complaint was received concerning a 'green' stream on Stockman Road, Tikorangi. Investigation found that the stream was running green. Samples were taken. Extensive investigation of properties upstream could not find any unauthorised discharges. Reinspection the following day found the stream to be running clear.

5 Dec 2022	3301-23-186 IN/46605	Rubbish - Bertrand Road bridge - Tikorangi	Complaint	Unsourced (9768)			No Further Action

Comments: A complaint was received via New Plymouth District Council, regarding chairs on the riverbed at the Bertrand Road suspension bridge at Tikorangi. Investigation found a chair on the bed of the river which was removed by the officer.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
8 Dec 2022	3301-23-188 IN/46614	Dust - Monmouth Road, Stratford	Complaint	Hey Trust (28679)		EAC-24855 - Abatement Notice	No Further Action
Comments: A complaint was received concerning dust discharging from a quarry operation at Monmouth Road, Stratford. Investigation found that objectionable dust was discharging from the driveway, as a result of vehicle movements. The dust was observed to be discharging beyond the boundary of the property and affecting neighbouring properties. Photographs and videos were taken. An abatement notice was issued requiring works to be undertaken to ensure that no objectionable or offensive dust discharges beyond the boundary of the property. Reinspection found that abatement notice was being complied with at the time of inspection.							
10 Dec 2022	330123-190 IN/46670	Green Stream - Puneho Road, Okato	Complaint	Darrell Hickey (10673)	R2/3796-2	EAC-24927 - Infringement Notice ($750)	No Further Action
Comments: A complaint was received concerning the Matanehunehu Stream running 'green' at Puneho Road, Okato. Investigation found that the stream was discoloured and there was an unauthorised discharge of dairy effluent from a farm race into an unnamed tributary of the Matanehunehu Stream. The farmer was advised and he undertook works to cease the discharge. Reinspection found that the discharge had ceased.							
12 Dec 2022	3301-23-191 IN/46632	Odour - Gloag Street, Waverley	Complaint	Kurahaumarangi Cunningham (74604)			No Further Action
Comments: A complaint was received concerning an odour emanating from a neighbouring property at Gloag Street, Waverley. Investigation found an odorous decomposing deer or goat leg approximately one metre from boundary of the property. The responsible party removed the rotting material.							
14 Dec 2022	3301-23-195 IN/46650	Dead animal in stream - Stratford	Complaint	Unsourced (9768)			No Further Action
Comments: A complaint was received regarding a dead puppy in a river, near the high school entrance to the Eastern Loop walking track in Stratford. Investigation found that there was a dead cat in the Patea River, which was removed at the time of inspection by the officer and disposed appropriately.							

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
14 Dec 2022	3301-23-196 IN/46656	Sludge spill - Rifle Range Road, New Plymouth	Self-Notification	New Plymouth District Council (9565)	R2/2982-4		No Further Action/Costs Recovered

Comments: Self-notification was received concerning a sludge spill at the New Plymouth Waste Water Treatment Plant on Rifle Range Road, New Plymouth. Investigation found that the discharge had occurred due to dewatered activated sludge not being thick enough as it went up a conveyor belt, causing the contaminant to discharge onto ground. An employee washed a small amount of the contaminant into the stormwater drain. At the time of inspection, the tributary that the stormwater discharged to was running clear. Signage around stormwater drains will be upgraded to prevent reoccurrence.

15 Dec 2022	3301-23-202 IN/46663	Discoloured stream - Omuturangi Road, Otakeho	Complaint	Unsourced (9768)			No Further Action

Comments: A complaint was received concerning a 'green' stream at a property at Omuturangi Road, Opunake. Investigation found the stream was discoloured at the time of inspection. Extensive investigation upstream could find no unauthorised discharges. The stream cleared during the inspection.

19 Dec 2022	3301-23-219 IN/46732	Flash flooding/land slips/forestry slash - Wingrove Road, Rawhitiroa.	Complaint	Allied Forests New Zealand Limited (52800)		No Enforcement Action - Statutory defence	No Further Action At This Stage

Comments: A complaint was received concerning forestry slash discharging onto a property causing damage to fencing and infrastructure, at a property on Wingrove Road, Rawhitiroa. Investigation found that during an extreme localised heavy rainfall event flash flooding had occurred causing multiple slips on farmland and in a forestry block. Silt, live trees and forestry slash had discharged onto a number of properties causing siltation in streams, blockage of culverts and damage to fencing. Drone footage was gathered during the inspection, which revealed that skid sites and landings on the forestry site were still intact. Council is in communication with the forestry Company with regards to assistance with cleanup.

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
21 Dec 2022	3301-23-208 IN/46703	Backyard burning - Galt Street, Hawera	Complaint	Liani Smith (74612)			No Further Action
Comments: A complaint was received concerning smoke from burning at a property at Galt St Hawera. Investigation found that there was a small fire, burning household rubbish, on a property in the defined urban area. The responsible party was advised of rules in the Regional Air Quality Plan for Taranaki. The fire was extinguished.							
25 Dec 2022	3301-23-209 IN/46727	Discoloured stream - Flint Road, Stratford	Complaint	Unsourced (9768)			No Further Action
Comments: A complaint was received concerning a discoloured stream at Flint Road, Stratford. Investigation found that the stream was slightly discoloured. Extensive investigation upstream could not find any unauthorised discharges. The stream cleared during the inspection.							
27 Dec 2022	3301-23-210 IN/46728	Dead animal in stream - Mangorei Road, New Plymouth	Complaint	Unsourced (9768)			No Further Action
Comments: A complaint was received concerning a dead animal in the Waiwhakaiho River at Mangorei Road, New Plymouth. Investigation found a small piglet carcass in the river. The carcass was removed at the time of inspection and disposed of appropriately.							
30 Dec 2022	3301-23-216 IN/46735	Dust - Carrington Street, New Plymouth	Complaint	Darcy Keene Earthmoving Limited (4298) Naki Development Limited (68680)			Investigation Continuing
Comments: A complaint was received concerning dust discharging from a subdivision development site at Carrington Street, New Plymouth. Investigation found that objectionable dust was discharging beyond the boundary of the site affecting neighbouring properties. The site is the subject of an abatement notice and further enforcement action is being considered.							

Updates of Non-Compliant incidents from previous agendas

Incident Date	Job Number IRIS ID	Incident Type	Source	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
4 Jan 2023	3301-23-214 IN/46730	Backyard burning - Park Lane, Kaponga	Complaint	Darian Cooper (74620)			No Further Action
Comments: A complaint was received concerning smoke from burning at a property at Park Lane, Kaponga. Investigation found a small smouldering fire of grass clippings was burning on the property within the defined urban area. There were no offsite effects occurring at the time of inspection. Advice and information was given about rules in the Regional Air Quality Plan for Taranaki.							
7 Jan 2023	3301-23-224 IN/46759	Discoloured stream - Watson Street, New Plymouth	Complaint	Unsourced (9768)			No Further Action
Comments: A complaint was received concerning a tributary of the Te Henui Stream running a 'milky white' colour. Investigation found that the stream was a milky white colour. Extensive investigation upstream could not find any unauthorised discharges occurring. The stream was running clear within two hours of the complaint.							
11 Jan 2023	3301-23-229 IN/46772	Burst sewer pipe - Clawton Street, New Plymouth	Complaint	New Plymouth District Council (9565)	R2/10406-1.0 R2/0882-4.1	EAC-24905 - Abatement Notice	Investigation Continuing
Comments: A complaint was received regarding a sewage discharge at Clawton Street, New Plymouth. Investigation found that sewage was discharging from a sewer main that crosses over the Waimea Stream. At the time of inspection City Care were onsite, flushing the pipe and undertaking temporary repairs. An abatement notice was issued requiring works to be undertaken to ensure that no contaminants enter any waterbody. Reinspection will be undertaken after 13 February 2023.							
14 Jan 2023	3301-23-231 IN/46808	Backyard burning - Manawapou Road, Hawera	Complaint	Mike Henry (74718)			No Further Action
Comments: A complaint was received concerning smoke from backyard burning at Manawapou Road, Hawera. Investigation found that a small fire was burning on a property within the defined urban area. Advice and information was given about rules in the Regional Air Quality Plan for Taranaki. The fire was extinguished at the time of inspection.							

Updates of Compliance Monitoring – Non-compliances from previous agendas

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
7 Jul 2022 Update	332123-057 ENF-23691	Annual Inspection	Non-compliance	Waitotara Kiwifruit Limited Partnership (72630)	R2/10916-1.0	EAC-24821 - Abatement Notice	No Further Action/Costs Recovered
Comments: During routine monitoring it was found that there was no data logger installed on a water abstraction site at State Highway 3, Waitotara, in contravention of resource consent conditions. An abatement notice was issued requiring works to be undertaken to ensure compliance with resource consent conditions. The abatement notice is currently being complied with.							
13 Jul 2022 Update	332123-005 ENF-23577	Dairy Non-compliant Re-inspection	Significant non-compliance	Beaufort Farm Trust (23628) Marcus Smith (16291)	R2/4347-2.1	EAC-24672 - Explanation Requested - Letter	No Further Action/Costs Recovered
Comments: During a compliance monitoring inspection it was found that the farm dairy effluent disposal system was not operating within resource consent conditions and an abatement notice, issued as a result of a previous non-compliance at Opunake Road, Cardiff. A letter requesting explanation was sent. Reinspection found the abatement notice was being complied with at the time of inspection.							
18 Jul 2022 Update	332123-049 ENF-23617	Annual Inspection	Non-compliance	Te Rua O te Moko 2B Ahuwhenua Trust (31494)	R2/7497-1	EAC-24802 - Explanation Requested - Letter	No Further Action/Costs Recovered
Comments: During routine monitoring it was found that the abstraction rates and abstraction daily volumes were contravened on numerous occasions between 2 October 2021 and 18 May 2022. A letter of explanation was received, which outlined that improvement works have been undertaken to ensure compliance. Future compliance will be ascertained during routine monitoring.							

Updates of Compliance Monitoring – Non-compliances from previous agendas

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
25 Jul 2022 Update	332123-015 ENF-23619	Office Assessment	Non-compliance	Intergroup Limited (50186)	R2/4776-2.0	EAC-24831 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples taken during routine monitoring it was found that the suspended solids limit in resource consent conditions had been contravened at a site at Hudson Road, Bell Block. The discharge was also in contravention of Abatement Notice EAC-24188, issued as a result of a previous non-compliance. An explanation was received.							
27 Jul 2022 Update	332123-030 ENF-23658	Annual Inspection	Non-compliance	Roger Dickie Family Trust (16312)	R2/5807-2.0	EAC-24796 - Explanation Requested - Letter	No Further Action/Costs Recovered
Comments: During routine monitoring it was found that there was no power to the data logger at a water abstraction site at Waverley Beach Road, Waverley. No data could be downloaded from the data logger. A letter of explanation was received. It was advised that the sharemilker had unknowingly switched off the main switch when doing maintenance, it was subsequently switched back on and operating as required. Compliance will be ascertained during routine monitoring.							
24 Aug 2022 Update	332123-007 ENF-23605	Annual Inspection	Non-compliance	Tractormeisters Limited (21002)	R2/3602-2	EAC-24718 - Abatement Notice EAC-24716 - Abatement Notice	Investigation Continuing
Comments: During the annual dairy inspection round, it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Hu Road, Eltham. Abatement notices were issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that Abatement Notice EAC-24718 was not being complied with. An explanation was requested. Further enforcement action is being considered.							

Updates of Compliance Monitoring – Non-compliances from previous agendas

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
1 Sep 2022 Update	332123-029 ENF-23685	Compliance Monitoring Insp.	Non-compliance	Malandra Downs Limited (34941)	R2/7374-1.5		No Further Action At This Stage/Costs Recovered
Comments: During routine monitoring it was found that resource consent conditions were not being complied with at a green waste disposal site at Albany Street, Patea. Site management was not adequate to ensure consent compliance. The consent holder has established a planting plan to ensure consent compliance. Compliance will be ascertained during routine monitoring.							
2 Sep 2022 Update	332123-041 ENF-23665	Annual Inspection	Significant non-compliance	Ian Honeyfield Trust (37545)	R2/1129-2	EAC-24800 - Abatement Notice	Investigation Continuing
Comments: During analysis of samples (11 October 2002), taken during the annual dairy inspection round (02 September 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions at Patea Road, Whenuakura. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that the abatement notice was being complied with at the time of inspection. Further enforcement action is being considered.							
2 Sep 2022 Update	332123-042 ENF-23680	Annual Inspection	Significant non-compliance	Crawford AM & TF Trust (24209) Otauto Farms Limited (56833)	R2/3436-3.0	EAC-24893 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples (13 October 2022), taken during the annual dairy inspection round (02 September 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions and Abatement Notice EAC-24349, issued as a result of a previous non-compliance, at Otauto Road, Patea. Reinspection found that the abatement notice was being complied with at the time of inspection.							

Updates of Compliance Monitoring – Non-compliances from previous agendas

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
6 Sep 2022 Update	332123-035 ENF-23684	Annual Inspection	Non-compliance	Drought & Kalin Family Trusts Partnership (35241)	R2/1579-3		No Further Action/Costs Recovered
Comments: During analysis of samples (21 September 2022), taken during the annual dairy inspection round (06 September 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions at Kearin Road, Hawera. The discharge was ceased and reinspection confirmed compliance with resource consent conditions and the abatement notice.							
19 Sep 2022 Update	332123-024 ENF-23647	Annual Inspection	Non-compliance	Tynedale Farms (12587)	R2/1594-3	EAC-24832 - Infringement Notice ($750) EAC-24777 - Explanation Requested - Letter	No Further Action/Costs Recovered
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions and Abatement Notice EAC-23472, issued as a result of a previous non-compliance, at Manihi Road, Rahotu. A letter requesting explanation was sent.							
28 Sep 2022 Update	332123-051 ENF-23645	Annual Inspection	Non-compliance	Wayne Douglas & Sandra Christine Morrison (27091)	R2/3556-2	EAC-24864 - Infringement Notice ($750) EAC-24783 - Explanation Requested - Letter EAC-24775 - Abatement Notice	No Further Action/Costs Recovered
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions at Elslea Road, Waverley. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that the abatement notice was being complied with at the time of inspection. A letter of explanation was received.							

Updates of Compliance Monitoring – Non-compliances from previous agendas

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
5 Oct 2022 Update	332123-025 ENF-23650	Office Assessment	Non-compliance	Riverlands Eltham Limited (9422)	R2/5569-1		No Further Action/Costs Recovered
Comments: During routine monitoring it was found that the groundwater monitoring bores had not been maintained to a standard that was safe for monitoring to occur, at a property at Lower Stuart Road, Eltham. The Company was contacted and advised of the technical contravention of resource consent conditions. Maintenance works was undertaken on the monitoring bores and compliance will be ascertained during routine monitoring.							
7 Oct 2022 Update	332123-046 ENF-23673	Annual Inspection	Significant non-compliance	Joblin Partners Limited (35408)	R2/7056-1	EAC-24909 - Infringement Notice ($750) EAC-24810 - Abatement Notice	No Further Action/Costs Recovered
Comments: During analysis of samples (02 November 2022), taken during the annual dairy inspection round (07 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions and Abatement Notice EAC-23513, issued as a result of a previous non-compliance at Lower Stuart Road, Eltham. An abatement notice was issued requiring the discharge of dairy effluent to cease until the resource consent conditions can be complied with. Reinspection found that the abatement notices were being complied with at the time of inspection.							
10 Oct 2022 Update	332123-045 ENF-23666	Annual Inspection	Significant non-compliance	Delbrae Farms (2015) Limited (52646)	R2/0527-2	EAC-24910 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples (20 October 2022), taken during the annual dairy inspection round (10 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions and Abatement Notice EAC-23652, issued as a result of a previous non-compliance, at Hastings Road Matapu. Reinspection found the abatement notice was being complied with at the time of inspection.							

Updates of Compliance Monitoring – Non-compliances from previous agendas

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
14 Oct 2022 Update	332123-061 ENF-23683	Annual Inspection	Non-compliance	Goodin Farms Limited (1692) Tom Goodin (72669)	R2/0400-3		No Further Action/Costs Recovered
Comments: During analysis of samples (8 November 2022), taken during the annual dairy inspection round (14 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions and Abatement Notice EAC-21821, issued as a result of a previous non-compliance, at Mid Kahui Road, Rahotu. Reinspection found that the abatement notice and resource consent were being complied with at the time of inspection.							
17 Oct 2022 Update	332123-064 ENF-23689	Annual Inspection	Significant non-compliance	Mataikahawai Land Holdings Limited (31925) Paul O'Rorke (52063)	R2/1518-3		Investigation Continuing
Comments: During analysis of samples (01 November 2022), taken during the annual dairy inspection round (17 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions and Abatement Notice EAC-22272, issued as a result of a previous non-compliance, at Waiteika Road, Opunake. Further enforcement action is being considered.							
19 Oct 2022 Update	332123-065 ENF-23690	Annual Inspection	Significant non-compliance	Matthew Lawn (74449) MPL Farms Limited (54245)	R2/1445-3	EAC-24823 - Abatement Notice EAC-24822 - Abatement Notice	Investigation Continuing
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Watino Road, Opunake. Abatement notices were issued requiring the unauthorised discharge of dairy effluent to cease and for works to be undertaken to ensure consent compliance. Reinspection found that the abatement notices were being complied with at the time of inspection. Further enforcement action is being considered.							

Updates of Compliance Monitoring – Non-compliances from previous agendas

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
20 Oct 2022 Update	332123-056 ENF-23675	Annual Inspection	Significant non-compliance	Francis Mullan (2715)	R2/1176-3	EAC-24817 - Explanation Requested - Letter EAC-24813 - Abatement Notice	Investigation Continuing
Comments: During analysis of samples (02 November 2022), taken during the annual dairy inspection round (20 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions at Lower Kahui Road, Rahotu. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection will be undertaken. Further enforcement action is being considered							
21 Oct 2022 Update	332123-066 ENF-23681	Annual Inspection	Significant non-compliance	Arnold Fitzgerald (72212) Fitzgerald AG & EE Trusts Partnership (10546)	R2/1665-3	EAC-24911 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples (8 November 2022), taken during the annual dairy inspection round (21 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions and Abatement Notice EAC-22143, issued as a result of a previous non-compliance, at Eltham Road, Kaponga. Reinspection found that the abatement notice and resource consent were being complied with at the time of inspection.							

Compliance Monitoring – Non-compliances for the period 28 Oct 2022 to 16 Jan 2023

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
10 Oct 2022	332123-069 ENF-23713	Annual Inspection	Significant non-compliance	Luttrell Trust Partnership (16921)	R2/0832-3	EAC-24883 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples (29 October 2022), taken during the annual dairy inspection round (10 October 2022), it was found that the farm dairy effluent disposal system was not operating within resource consent conditions and Abatement Notice EAC-23559, which was issued as a result of a previous non-compliance at Main South Road, Oeo. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that the abatement notice and resource consent were being complied with at the time of inspection.							
28 Oct 2022	332123-058 ENF-23671	Annual Inspection	Significant non-compliance	Sophie Lance (54141) The Tom Lance Trust (51397) Tom Lance (54140)	R2/3309-3.0	EAC-24914 - Infringement Notice ($750) EAC-24819 - Abatement Notice EAC-24814 - Abatement Notice	Investigation Continuing
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Parahaki Road, Waverley. Abatement notices were issued requiring the unauthorised discharge of dairy effluent to cease and for works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that an abatement notice was not being complied with at the time of inspection. Further enforcement action is being considered.							
31 Oct 2022	332123-068 ENF-23703	Annual Inspection	Significant non-compliance	Neil Laurence & Kim Stephanie Bailey (4484)	R2/4398-2	EAC-24915 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples (10 November 2022), taken during the annual dairy inspection round (31 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions and Abatement Notice EAC-23677, which was issued as a result of a previous non-compliance, at Duthie Road, Stratford.							

Compliance Monitoring – Non-compliances for the period 28 Oct 2022 to 16 Jan 2023

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
31 Oct 2022	332123-067 ENF-23707	Annual Inspection	Non-compliance	Kevin & Diane Gooch (2331)	R2/2182-3	EAC-24834 - Abatement Notice	No Further Action/Costs Recovered
Comments: During analysis of samples (21 November 2022), taken during the annual dairy inspection round (31 October 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions at Opunake Road, Stratford. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that the abatement notice and resource consent were being complied with at the time of inspection							
9 Nov 2022	332123-074 ENF-23757	Annual Inspection	Non-compliance	Kandahar Neilson Farm Limited (74300)	R2/2833-2		No Further Action/Costs Recovered
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Wiremu Road, Opunake. Reinspection found that resource consent conditions were being complied with at the time of inspection.							
10 Nov 2022	332123-070 ENF-23704	Annual Inspection	Non-compliance	Helen Dimock (55035)	R2/1524-3	EAC-24829 - Abatement Notice	No Further Action/Costs Recovered
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Hastings Road, Mahoe. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that the abatement notice and resource consent was being complied with at the time of inspection.							

Compliance Monitoring – Non-compliances for the period 28 Oct 2022 to 16 Jan 2023

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
11 Nov 2022	332123-078 ENF-23751	Compliance Monitoring Insp.	Non-compliance	AML Limited (Trading as Allied Concrete) (30416)	R2/4539-2	EAC-24888 - Explanation Requested - Letter EAC-24887 - Abatement Notice	Investigation Continuing

Comments: During analysis of samples taken during routine monitoring it was found that suspended solids in the stormwater discharge exceeded allowable limits in resource consent conditions at a concrete batching site at Hurlstone Drive, Bell Block. An abatement notice was issued requiring works to be undertaken to ensure compliance with resource consent conditions. Compliance with the abatement notice will be ascertained during routine monitoring. A letter requesting explanation was sent. Further enforcement action is being considered.

17 Nov 2022	332123-081 ENF-23761	Compliance Monitoring Insp.	Non-compliance	Barton Holdings Limited (56677)	R2/7707-1	EAC-24894 - Explanation Requested - Letter EAC-24889 - Abatement Notice	Investigation Continuing

Comments: During analysis of samples taken during routine monitoring it was found that suspended solids in the stormwater discharge was in contravention of allowable limits in resource consent conditions at an industrial site at Paraite Road, Bell Block. An abatement notice was issued requiring works to be undertaken to ensure compliance with resource consent conditions. Compliance with the abatement notice will be ascertained during routine monitoring. A letter requesting explanation was sent. Further enforcement action is being considered.

Compliance Monitoring – Non-compliances for the period 28 Oct 2022 to 16 Jan 2023

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
17 Nov 2022	332123-082 ENF-23763	Compliance Monitoring Insp.	Non-compliance	Nexans New Zealand Limited (52112) OMV New Zealand Limited (21295)	R2/3913-3.1	EAC-24892 - Explanation Requested - Letter EAC-24891 - Abatement Notice	Investigation Continuing
Comments: During analysis of samples taken during routine monitoring it was found that suspended solids in the stormwater discharge was in contravention of allowable limits in resource consent conditions at an industrial site at Paraite Road, Bell Block. An abatement notice was issued requiring works to be undertaken to ensure compliance with resource consent conditions. Compliance with the abatement notice will be ascertained during routine monitoring. A letter requesting explanation was sent. Further enforcement action is being considered.							
18 Nov 2022	332123-072 ENF-23716	Annual Inspection	Non-compliance	Estate of MJ Abbott (72137)	R2/2983-3.0	EAC-24843 - Abatement Notice	No Further Action/Costs Recovered
Comments: During analysis of samples (01 December 2022), taken during the annual dairy inspection round (18 November 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions at Eltham Road, Kaponga. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that the abatement notice and resource consent were being complied with at the time of inspection.							
21 Nov 2022	332123-073 ENF-23720	Annual Inspection	Significant non-compliance	CE Johnson (33094)	R2/1831-3	EAC-24919 - Infringement Notice ($750) EAC-24847 - Explanation Requested - Letter	No Further Action/Costs Recovered
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions and Abatement Notice, EAC-23765, which was issued as a result of a previous non-compliance at Eltham Road, Kaponga. A letter requesting explanation was sent.							

Compliance Monitoring – Non-compliances for the period 28 Oct 2022 to 16 Jan 2023

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
21 Nov 2022	332123-075 ENF-23747	Annual Inspection	Significant non-compliance	Edward & Beverley Baylis (1855)	R2/1401-3		No Further Action/Costs Recovered
Comments: During analysis of samples (07 December 2022), taken during the annual dairy inspection round (21 November 2022), it was found that the farm dairy effluent disposal system was not operating within resource consent conditions and Abatement Notice EAC-23663, which was issued as a result of a previous non-compliance, at Eltham Road, Opunake. Reinspection found that the abatement notice and resource consent conditions were being complied with at the time of inspection. No further enforcement action was undertaken due to a recent family bereavement.							
21 Nov 2022	332123-060 ENF-23711	Annual Inspection	Non-compliance	Kaweora Farms Limited (35318)	R2/4262-2	EAC-24841 - Abatement Notice EAC-24840 - Abatement Notice	No Further Action/Costs Recovered
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Kaweora Road, Opunake. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection found that the abatement notice and resource consent were being complied with at the time of inspection.							
22 Nov 2022	332123-055 ENF-23710	Annual Inspection	Significant non-compliance	Keith Leonard & Dell Eileen Harvey (2916)	R2/1609-4.0	EAC-24839 - Abatement Notice EAC-24838 - Abatement Notice	Investigation Continuing
Comments: During the annual dairy inspection round it was found that the farm dairy oxidation ponds were not operating within resource consent conditions at Mid Paihaka Road, Pungarehu. Abatement notices were issued requiring the discharge to cease, and for works to be undertaken to ensure compliance with resource consent conditions. Reinspection found that the abatement notice and resource consent were being complied with at the time of inspection. Further enforcement action is being considered.							

Compliance Monitoring – Non-compliances for the period 28 Oct 2022 to 16 Jan 2023

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
29 Nov 2022	332123-076 ENF-23731	Annual Inspection	Significant non-compliance	Milly Dairy Farms Limited (53362)	R2/0396-3	EAC-24924 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples (08 December 2022), taken during the annual dairy inspection round (29 November 2022), it was found that the farm dairy effluent disposal system was not operating within resource consent conditions and Abatement Notice EAC-22572, which was issued, as a result of a previous non-compliance at Rowan Road, Kaponga.							
29 Nov 2022	332123-080 ENF-23732	Annual Inspection	Significant non-compliance	Sunman Farms Limited (34685)	R2/1605-3	EAC-24923 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During analysis of samples (14 December 2022), taken during the annual dairy inspection round (29 November 2022), it was found that the farm dairy effluent disposal system was not operating within resource consent conditions and Abatement Notice EAC-24568, which was issued as a result of a previous non-compliance at Rowan Road, Kaponga.							
30 Nov 2022	332123-083 ENF-23719	Annual Inspection	Non-compliance	Graeme Forsyth (3126)	R2/3622-2	EAC-24881 - Infringement Notice ($750) EAC-24846 - Abatement Notice	No Further Action At This Stage/Costs Recovered
Comments: During a compliance monitoring inspection, it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Nopera Road, Pihama. An abatement notice was issued requiring works to be undertaken to the farm dairy effluent disposal system to ensure compliance with resource consent conditions. Reinspection will be undertaken after 31 January 2023.							

Compliance Monitoring – Non-compliances for the period 28 Oct 2022 to 16 Jan 2023

Inspection Date	Job Number IRIS ID	Inspection Type	Compliance Status	Alleged Responsible Party	Consent Number	Action Taken	Recommendation
30 Nov 2022	332123-071 ENF-23744	Compliance Monitoring Insp.	Non-compliance	Jones Quarry Uruti Stone Limited (55305)	R2/6272-2.0		Investigation Continuing
Comments: During routine monitoring it was found that there was an uncontrolled discharge of sediment laden washwater into surface water, as a result of a failed pump onsite, at a quarry site at Mokau Road, Uruti. Samples were taken. Analysis of samples confirmed contravention of resource consent conditions. A letter of explanation has been received. Enforcement action is being considered.							
1 Dec 2022	332123-077 ENF-23743	Compliance Monitoring Insp.	Non-compliance	Hintz Family Trust Partnership (12720)	R2/10561-1.1	EAC-24876 - Explanation Requested - Letter	Investigation Continuing
Comments: During a compliance monitoring inspection, it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Cardiff Road, Cardiff. A letter requesting explanation was sent. Enforcement action is being considered.							
6 Dec 2022	332123-079 ENF-23735	Annual Inspection	Significant non-compliance	Coral Gargan (56841) Robert Gargan (1652)	R2/0780-3	EAC-24926 - Infringement Notice ($750)	No Further Action/Costs Recovered
Comments: During the annual dairy inspection round it was found that the farm dairy effluent disposal system was not operating within resource consent conditions on Opunake Road, Awatuna. Works were undertaken to ensure compliance.							
9 Dec 2022	332123-086 ENF-23774	Annual Inspection	Significant non-compliance	Peter & Jillian Myers (2237)	R2/2321-2		Investigation Continuing
Comments: During analysis of samples (24 January 2023), taken during the annual dairy inspection round (09 December 2022), it was found that the farm dairy effluent oxidation pond disposal system was not operating within resource consent conditions at Manawapou Road, Hawera. Enforcement action is being considered.							

Date 7 February 2023

Subject: **Farm Dairy Discharge Consent Trends and Implications for the Council**

Approved by: A D McLay, Director - Resource Management

S J Ruru, Chief Executive

Document: 3127544

Purpose

1. The purpose of this memorandum is to identify some trends in farm dairy effluent consent applications and the associated implications for the Council.
2. The number of farm dairy effluent consents moving from a treated discharge to water, to a discharge to land, has increased with a need to review the monitoring programme.

Executive Summary

3. Dairying is a major traditional activity in the region and comprises 33% of total resource consents granted. The number of farm dairy discharge consents continues to decline, due to farm amalgamations and those exiting the industry, and currently stands at 1,531. A monitoring programme is in place for these consents and is the largest in the region.
4. Since the Council instigated changes at consent renewal time and other factors, more than ten years ago, the number of consents to discharge to land has dramatically increased with positive changes for freshwater quality. As a result, it is appropriate that the farm dairy effluent monitoring programme will be reviewed and reported back to this Committee for feedback.

Recommendations

That the Taranaki Regional Council:

a) receives this memorandum Farm Dairy Discharge Consents trends and implications for the Council

b) notes the increase in land based farm dairy discharges

c) notes the pending review of the farm dairy discharge monitoring programme given the focus is now more on land based discharge systems

d) determines that this decision be recognised as not significant in terms of section 76 of the *Local Government Act 2002*

e) determines that it has complied with the decision-making provisions of the *Local Government Act 2002* to the extent necessary in relation to this decision; and in accordance with section 79 of the Act, determines that it does not require further information, further assessment of options or further analysis of costs and benefits, or advantages and disadvantages prior to making a decision on this matter.

Background

5. As Members will be aware dairying is a major traditional activity in the Taranaki region and 33% of all resource consents are held for farm dairy discharges. The Council has had in place for over 40 years, a comprehensive regulatory programme for the industry. The monitoring programme is the largest monitoring programme undertaken by the Taranaki Regional Council. The programme is associated with water quality management, which remains a key resource management issue for the region going forward, notwithstanding the progress made to date.

6. The programme has contributed significantly to the region's policy objective of maintaining or enhancing water quality. It is a strategic component of resource management in the region. This involves policy being developed with the community; it being implemented by non-regulatory (advice and information) means, under-girded by regulatory (consents and enforcement) provisions; compliance and state of the environment monitoring being undertaken, to assess both consent compliance and the overall state of the environment; policy effectiveness being assessed using both sets of monitoring results and science; and policy being reviewed as appropriate in the light of this feedback.

7. The Council has had a longstanding programme to annually monitor farm dairy discharges in place and the results have been of interest to dairy industries, iwi, the community and environmental groups.

8. In mid 2012 the Council signalled a change to the management of farm dairy effluent. A working paper was prepared and a working party was formed. In summary, it was decided to gradually move away from discharges of treated farm dairy effluent to water and to direct such discharges to land, wherever possible. The change would occur when the consent was up for renewal or earlier by agreement with the consent holder.

Consent Trends

9. In 2012, a total of 1,792 farm dairy effluent consents existed. Seven hundred and fifty six (42%) allowed discharge to land. Eight hundred and ninety two (50%) allowed discharge to water and one hundred and forty (8%) allowed discharge to land and water.

10. Eleven years later a total of 1,531 farm dairy effluent consents existed. Of these 321 (21%) allowed discharge to water. One thousand and twenty seven (67%) allowed discharge to land and 183 (12%) allowed discharge to land and water. Some discharges to water were for short periods to allow farmers to change land use away from dairying and to allow the implications of the Natural Resources Plan to come into effect. The overwhelming majority of farmers wanted to discharge to land, where this was possible.

11. While the change at consent renewal is the main contributor to the reduction of water discharges other factors include:

    - consent compliance issues for water discharge systems and additional monitoring and associated costs;

- consent holders recognising the fertiliser benefits of effluent and associated payback for any system upgrade investment;
- dairy industry sustainability requirements;
- iwi concerns; and
- lower annual monitoring charge.

12. The decrease in resource consents held is significant (15%) over the period. Average herd size increased from about 280 to 300 cows per farm.
13. Over the next two years there will be 272 farm dairy effluent consents up for renewal and of these 95 are discharges to water where changes will occur. From this point onward, the Natural Resources Plan is likely to formally establish the current regime whereby discharges to water are phased out, in all but the upper ring plain where land disposal and high treatment systems for water discharges will be required for when the irrigation areas are saturated. These matters will be considered as part of the Plan process and have input from iwi and others.
14. In the upper ring plain there are 120-150 farm dairy effluent consents discharging treated farm dairy effluent to water. A group of farmers has been established to identify options for effluent management in this area where land based discharge systems are very difficult to operate all the time without an option to discharge to water of highly treated waste.

Monitoring Programme Review

15. With the change to mainly land based discharge systems it is timely to review the Farm Dairy Discharge Monitoring Programme. The current document summarises all aspects of the programme and touches on related activities such as consenting and enforcement. The programme sets out expectations, procedures and standards, and is aimed at providing clarity and certainty for all parties that the Farm Dairy Discharge Monitoring Programme is an integrated, cost effective, fair, comprehensive, robust, and scientifically-based programme designed and managed to deliver sustainable management of natural and physical resources in Taranaki.

Financial considerations—LTP/Annual Plan

16. This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

17. This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Iwi considerations

18. This memorandum and the associated recommendations are consistent with the Council's policy for the development of Māori capacity to contribute to decision-making processes (schedule 10 of the *Local Government Act 2002*) as outlined in the adopted long-

term plan and/or annual plan. Similarly, iwi involvement in adopted work programmes has been recognised in the preparation of this memorandum.

19. Iwi are involved in the consent and planning processes for farm dairy effluent discharges.

Community considerations

20. This memorandum and the associated recommendations have considered the views of the community, interested and affected parties and those views have been recognised in the preparation of this memorandum.

Legal considerations

21. This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Date 7 February 2023

Subject: **Appeal judgement - C Boyd**

Approved by: A D McLay, Director - Resource Management

S J Ruru, Chief Executive

Document: 3138153

Purpose

1. The purpose of this memorandum is to update Members on the unsuccessful appeal, by Mr C Boyd, for his $95,750 fine for illegal stream works and failing to comply with two subsequent abatement notices.

Executive summary

2. Mr C D Boyd pleaded guilty and was sentenced in October 2022.
3. He then appealed the sentence claiming the District Court Judge misconstrued the evidence relating to the environmental effects of the offending.
4. In December 2022, the appeal was dismissed, by Justice J Grice, noting that it was not considered that the District Court Judge made any errors in her assessment of the evidence and that she evaluated the evidence correctly; and that the sentence was appropriate in the circumstances.

Recommendation

That the Taranaki Regional Council:

a) receives this report and notes Mr C D Boyd's appeal was unsuccessful.

Background

5. On 4 October 2022, Mr C D Boyd was sentenced for a contraventions of sections 13, 15(1)(a), 15(1)(b) and 338(1)(c) of the Resource Management Act 1991, for diverting a 530 metre section of an unnamed tributary of the Mangatengahu Stream (via two separate diversion channels), between 15 October 2019 and 29 November 2019; and failing to comply with two subsequent abatement notices requiring all earthworks to cease and to ensure silt and sediment controls were installed and maintained about the works site.
6. Judge Dickey's decision is attached.

7. Mr Boyd was fined $78,750 for the three discharge and reclamation charges and $17,000 for the abatement notice charge, $95,750 in total.
8. The Court also issued an Enforcement Order requiring reinstatement of the unnamed tributary of the Mangatengehu Stream and infilling of a diversion channel.

Appeal update

9. Mr Boyd appealed the sentence and a hearing was held on 13 December.
10. The essence of the appeal was that the District Court Judge misconstrued the evidence relating to the environmental effects of the offending in that she failed to recognise the dominant cause of any effects noted was the effects of historical drainage work undertaken by Mr Boyd.
11. On 15 December 2022, the appeal was dismissed and the appeal judgement is attached.
12. Justice Grice determined that the District Court Judge had not made any errors in her assessment of the evidence, evaluated the evidence correctly and the level of sentencing was appropriate in the circumstances.
13. The District Court Judge had ample evidence from the three Council expert witnesses, to determine the significant detrimental effects caused

Financial considerations—LTP/Annual Plan

14. This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan and estimates. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

15. This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Iwi considerations

16. This memorandum and the associated recommendations are consistent with the Council's policy for the development of Māori capacity to contribute to decision-making processes (schedule 10 of the *Local Government Act 2002*) as outlined in the adopted long-term plan and/or annual plan. Similarly, iwi involvement in adopted work programmes has been recognised in the preparation of this memorandum.

Community considerations

17. This memorandum and the associated recommendations have considered the views of the community, interested and affected parties and those views have been recognised in the preparation of this memorandum.

Legal considerations

18. This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

Appendices/Attachments

Document 3115712: Boyd – Sentencing decision – 14-10-22

Document 3138569: Boyd – Appeal judgement – 15-12-22

IN THE DISTRICT COURT
AT NEW PLYMOUTH

I TE KŌTI-Ā-ROHE
KI NGĀMOTU

CRI-2020-043-000533
[2022] NZDC 19123

TARANAKI REGIONAL COUNCIL
Prosecutor

v

COLIN DAVID BOYD
Defendant(s)

Hearing:	22 July 2022 via AVL
Appearances:	K de Silva for the Prosecutor PJ Mooney for the Defendant
Judgment:	4 October 2022

JUDGMENT OF JUDGE MJL DICKEY

Introduction

[1] The defendant, Mr Colin Boyd, pleaded guilty to four charges relating to the discharge of contaminants, namely sediment, into water being an unnamed tributary of the Mangatengehu Stream (in October 2019),[1] the reclamation of that unnamed tributary (in October 2019)[2] and the breach of an abatement notice (between December 2019 and 13 March 2020).[3]

[2] The maximum penalty for each charge is a fine not exceeding $300,000.

[1] CRN 20043500159 and CRN20043500160.
[2] CRN 20043500162.
[3] CRN 20043500165.

[3] Ms de Silva, for the Council, proposed a starting point of at least $100,000 for the discharge and reclamation charges and a separate starting point of $30,000 for the abatement notice offence. Mr Mooney, for the defendant, proposed a starting point of $40,000, with an increase of $5,000 for the abatement notice offence.

Background[4]

[4] The offences occurred at Mr Boyd's farm **(the Farm)** at Surrey Road, Inglewood. The Farm is approximately 480 hectares and is predominantly used as a dairy platform, however quarrying and land farming (disposal of waste drilling muds and fluids) activities are also undertaken on the Farm.

[5] The Farm is owned by Mile Square Farms Limited. Prior to this Mr Boyd owned the Farm for approximately 25 years. Mr Boyd is the sole director and shareholder of Mile Square Farms Limited.

[6] The Farm covers approximately six land titles, however it is run as one single farming operation. The works were carried out on one of these titles, namely Identifier TNJl/397, comprising approximately 63.5043 hectares.

[7] The Mangatengehu Stream and a tributary flow west to east through the Farm. The tributary has large bends and pools within it and its banks harbour a riparian margin with vegetation that is very mature in places.

Circumstances of the offending[5]

[8] The Defendant carried out a significant amount of earthworks on part of the land (title TNJ1/397) in and around a section of the tributary **(the Site)** to reclaim part of the bed of the tributary. There was discharge of sediment into the tributary because the silt and sediment controls were inadequate.

[9] On the evening of 27 October 2019, a Council Officer responded to a complaint that the tributary below the Site was discoloured.

[4] Summary of facts dated 7 March 2022 at [2] – [8].
[5] Summary of facts at [12] – [35].

[10] Between 27 October 2019 and 13 March 2020, a number of inspections were undertaken at the Site.

29 October 2019 - inspection

[11] On 29 October 2019 Council Officers inspected the Site. They found that the following works had been undertaken to reclaim the bed of the tributary. The works that resulted in the reclamation included diversion of the tributary and therefore the following description of the works includes "diversion":

(a) a diversion (**Diversion 2**) was under construction at the Site;[6]

(b) the Diversion 2 channel intercepted the tributary and directed both surface water and ground water into an existing land drainage channel which then directed the flow back into the tributary approximately 180 metres downstream at a neighbouring property;

(c) significant scour/erosion of the Diversion 2 channel had occurred resulting in silt/sediment discharging into the tributary in the neighbouring property. No silt control measures were in place throughout the worked area;

(d) the cross-sectional area of the channel of Diversion 2 ranged from approximately 4 metres deep and 5 metres wide (20 m^2) to smaller sections of 2.5 metres deep to 3 metres wide (7.5 m^2); and

(e) as a result of the construction of the Diversion 2 channel, a 160 metre length of the tributary, between the upper point where the Diversion 2 channel intersected the tributary and the lower point on the neighbouring property where the water was reintroduced into the tributary from the diversion channel, has been drained.

[12] A 278 m long section (approximately) of the tributary had been reclaimed as a result of diversion and/or filling in and the majority of associated riparian vegetation had been removed.

[6] A charge CRN 20043500163 relating to Diversion 1 was withdrawn.

30 October 2019 – Abatement notices

[13] On 30 October 2019, two abatement notices were served on Mr Boyd:

(a) Abatement Notice EAC-22969 required Mr Boyd to immediately cease all earthworks and the associated silt and sediment discharge which are in contravention of Rules 55 and 74 of the Regional Freshwater Plan for Taranaki (**RFWP**); and

(b) Abatement Notice EAC-22970 required Mr Boyd to install silt and sediment controls and ensure that runoff from disturbed areas is directed through the silt controls by 3 November 2019.

4 November 2019 – Re-inspection

[14] On 4 November 2019 a re-inspection was undertaken to assess compliance with the Abatement Notices.

[15] Silt and sediment controls had been installed within the channel of Diversion 2 but were insufficient to cope with significant rainfall events. A significant amount of erosion had occurred within the channel of Diversion 2.

21 November 2019 – Re-inspection

[16] On 21 November 2019, a re-inspection found contravention of Abatement Notice EAC- 22969 (there is no charge for this contravention):

(a) the installed silt and sediment controls had failed within the channel of Diversion 2 and were providing no treatment of the water within the channel prior to discharging into the tributary; and

(b) significant erosion had occurred within the channel of Diversion 2 and surrounding areas.

25 November 2019 – Abatement notice

[17] On 25 November 2019, a Council Officer spoke with the Defendant via phone about the inspection on 21 November 2019 and advised him of the requirement to maintain silt and sediment controls at the Site.

[18] On 25 November 2019, a further Abatement Notice (EAC-23018) was posted and emailed to Mr Boyd. The Notice required Mr Boyd to:

> Action 1. Install silt and sediment controls to replace the silt and sediment controls that have failed.
>
> Action 2. Ensure that all storm water runoff from disturbed area is directed through the silt and sediment controls.
>
> Action 3. Check and maintain the silt and sediment controls.
>
> Action 4. Replace any silt and sediment controls that fail.

29 November 2019 – Re-inspection

[19] On 29 November 2019, a re-inspection of the Site found contravention of Abatement Notice EAC-22969.[7]

[20] A large yellow digger was found at the Site. The digger was not in operation at the time of the inspection.

[21] Further works had been undertaken sometime after the 21 November 2019 inspection:

(a) a large concrete culvert had been installed within the tributary and a significant amount of scouring and erosion was observed on the downstream (eastern) side of the Large Culvert; and

(b) further north and bordering on the boundary of the Site was evidence that further works had been conducted within the tributary.

[7] The charge for contravention of Abatement Notice EAC-22969 has been withdrawn.

[22] The Officer phoned Mr Boyd and discussed the recently discovered Works. Mr Boyd stated that he believed that he could do the works as he believed the cease Abatement Notice (EAC- 22969) only applied to the immediate area about the diversion works.

3 December 2019 – Re-inspection

[23] On 3 December 2019, a re-inspection of the Site found contravention of Abatement Notice EAC-23018. The charge CRN 20043500165 is for contravention of Abatement Notice EAC-23018.

[24] At the time there was sustained light rainfall, the installed silt and sediment controls were operating, however were offering minimum treatment:

(a) there was heavy silting within the tributary downstream of the discharge from the Site;

(b) there had been no further silt and sediment controls installed;

(c) the two controls were full of silt and offering no treatment; and

(d) a significant amount of erosion of the batter within the channel of Diversion 2 had occurred since the previous inspection and rilling from overland water flow was evident on exposed areas.

13 March 2020 – Re-inspection

[25] On 13 March 2020, a re-inspection of the Site found contravention of Abatement Notice EAC-23018.

[26] At the time there was light water flows within the channel of Diversion 2:

(a) there was heavy silting within the channel of Diversion 2 and the installed silt controls were full and offering no treatment;

(b) there had been no further silt and sediment controls installed;

(c) a significant amount of erosion of the batter of the channel of Diversion 2 had occurred since the previous inspection; and

(d) the silt and sediment controls had not been maintained.

Regional Freshwater Plan for Taranaki[8]

[27] Rule 74 allows for minor realignments or modifications of a stream as a permitted activity, provided the stated conditions can be met. Rule 74 contains nine conditions to avoid, remedy or mitigate actual or potential adverse effects that could potentially arise from the activity. The works undertaken breached a number of conditions of Rule 74, including those set out in the Table below.

Rule 74 - Conditions breached	**Assessment of Works undertaken**
Drainage channel shall be no greater than 4m^2 in cross-sectional area	The Diversion 2 channel had been cut through the land and, at points measured in excess of 5m across and 4m deep.
No significant erosion, scour or deposition shall result or be liable to result from channel modification	Significant amounts of silt and sediment evident in the tributary.
Realignment or modification shall not restrict the passage of fish	Parts of the tributary had been filled in for the purposes of land reclamation. Any filling in of a stream results in the permanent loss of fish habitat and passage.
Realignment or modification shall not cause flooding or erosion of downstream or adjacent properties	Significant erosion as evident from the amounts of silt and sediment discharged and/or deposited in the tributary.

[28] The works are not expressly allowed by a national environmental standard or a resource consent.

[8] Summary of facts at [36] – [38].

Sentencing principles

[29] The purposes and principles of the Sentencing Act 2002 are relevant. The High Court in *Thurston v Manawatu Wanganui Regional Council*[9] provides a useful summary of the approach to be taken to sentencing, which includes consideration of culpability; precautions taken to prevent discharges; the vulnerability or importance of the affected environment; extent of damage; deterrence; capacity to pay a fine; disregard for abatement notices; co-operation and guilty pleas.

Environmental effects

[30] There was a disputed facts hearing on this matter. The central disputed facts related to the environmental effects of the offending. In my decision I found:[10]

> [36] Having taken all the evidence presently available to me into account, I find beyond reasonable doubt that the unnamed tributary the subject of this prosecution would have retained either a permanent or intermittent flow of water, which would have supported instream biodiversity and which in turn has been adversely affected by Diversion 2. The extent to which historical works upstream of this area would have impacted flows in the unnamed tributary is not clear. However, the only evidence I have on effects of the offending works is that provided by the Council witnesses.
>
> …
>
> [38] Having determined that the unnamed tributary in which works were undertaken was either a permanent or intermittent stream at the time the offending works were undertaken, there is no basis to reject the evidence of the Council's witnesses on effects.
>
> [39] Further, I accept the evidence of the Council's witnesses that their assessments and conclusions as to the effects of the offending relate to Diversion 2. Therefore, for the purpose of assessing the environmental effects of the offending, I would place significant weight on the reports of the Council witnesses.

[31] Reports from the Council were provided by:

(a) Mr DR Harrison, Director-Operations at the Council. He provided a tracked change version of his report dated 11 March 2022 entitled *Reclamation and diversion of an unnamed tributary of Mangatengehu*

[9] *Thurston v Manawatu Wanganui Regional Council* HC Palmerston North CRI-2009-454-24, -25, -27, 27 August 2010.
[10] *Taranaki Regional Council v Boyd* [2022] NZDC 10744 at [36] – [39].

Stream and deposition of material in the channel at the Mile Square Farms Limited property, *Derby Road, Tariki*;

(b) Mr PJ Deegan is an Environmental Scientist – Freshwater Biology with the Council. He provided a tracked-change version of his report entitled *Assessment of effects on freshwater fish in unnamed tributaries of the Mangatengehu Stream in relation to unauthorised earthworks and reclamation at a property at Derby Road*;

(c) Ms BR Zieltjes is an Environmental Scientist with the Council. Her report is entitled *Report on bio-monitoring of an unnamed tributary of the Mangatengehu Stream in relation to unauthorised earthworks at a property at Derby Road*.

[32] Mr Harrison made several observations about the effects of the recent works in his report:

> 14. The infilled channel has been completely removed from the environment and no longer provides natural ecological, hydrological and geological services.
>
> …
>
> 18. The excavated channels are steep sided, run in straight lines with occasional 90 degree bends, and typically have a uniform cross-section and grade. The ground material that the channels have been cut into predominantly consists of loose gravels, sand overlain with clay, and a thin layer of topsoil (see Figure 5).
>
> 19. This gravel and sand material is highly erodible …
>
> …
>
> 24. … The excavated channels have no riparian vegetation.
>
> 25. Riparian vegetation provides habitat and food for a range of native and beneficial organisms.
>
> 26. This reach was a stream of high naturalness that supported instream biodiversity and was a continuation of the natural channel upstream and downstream of the works area, allowing geomorphic processes, such as gravel transport and erosion, to happen naturally.
>
> 27. The excavated channel would not have the same life supporting capacity as the natural channel. Erosion rates will be high for many years, and geomorphic and hydrological processes will be altered indefinitely.

> 28. In my opinion, the potential adverse effects of infilling the natural channel and diverting the stream into an excavated channel will be significant and long lasting.

[33] Mr Harrison concluded that the work undertaken to modify the unnamed tributary "has caused significant adverse effects on the environment, and still has the potential to cause further adverse effects on the environment". He said:

> 29. It is my view that the work undertaken to modify the unnamed tributary of Mangatengehu Stream on the Mile Square Farms Ltd Property on Derby Road, Tariki, has caused significant adverse effects on the environment, and still has the potential to cause further adverse effects on the environment.
>
> 30. Adverse effects include: pollution of water and the downstream streambed from a discharge of silt and sediment; habitat loss in downstream reaches caused by silt and sediment smothering streambed gravels and cobbles; habitat loss caused by the destruction of mature riparian vegetation; habitat loss caused by the destruction of the streambed over the modified reach.
>
> 31. Potential adverse effects include: ongoing silt and sediment loss caused by disturbed earth and erosion of the excavated channel; increased flood flows; reduced summer low flows; and a major adjustment to natural geomorphic processes causing an increase in downstream erosion, and damage and loss of capacity to downstream culverts and bridges.
>
> 32. The adverse effects have been significant and will continue for many years.

[34] Mr Deegan's summary and conclusion includes:[11]

> The stream channel that was altered by reclamation no longer provided any suitable permanent fish habitat as a result of the infilling of the Stream. The work likely resulted in the loss of all fish within that 278 metre stretch (as per the agreed summary of facts) of stream, by result of crushing from dirt and other substrates. … It is expected that anywhere from 200-600 non-juvenile fish were killed by the direct infilling of the Stream, although in terms of total fish life stages killed this could be a very conservative figure depending on the abundance of larvae or juvenile non-migratory bully species, or other species that spawn in the headwaters of streams, such as lamprey and shortjaw kokopu.
>
> … In my professional opinion, based on the sediment loading I have witnessed, I expect that there has been a significant displacement of fish from the Stream above the confluence as a result of the loss of habitat diversity. I also expect that the effects of prolonged exposure of fish to suspended sediment and deposited sediment reach beyond the confluence, although the level of effects is hard to quantify, and will be lower than that above the confluence due to the additional flows from Stream 2. The discharge of

[11] At pages 18 – 19.

> sediment has and likely continues to be causing damage to fish gills (and the subsequent increased risk of infection, disease, and predation for those fish), the changing of normal behaviours of resident fish (including migration away from the area and feeding activities), and the loss of food resources available to those fish (loss of macroinvertebrates displaced by sediment). Deposited sediments will also be smothering egg habitat for fish, and making it less available, resulting in the loss of eggs and increasing the competition for egg laying locations respectively.
>
> It is important to outline the long term effects of habitat loss from stream reclamations. In contrast to 'one off' contaminant discharge incidents where recruitment into an affected area can instantly begin when the water quality is below chronic and acute levels (in most cases), it can take years to thousands of years for the habitat values of reclaimed stream to become available either through anthropogenic intervention or natural processes. The implications of loss of habitat can extend for a significant period, and therefore, the effects can be cumulative over many generations for fish species. …
>
> Overall, I believe the earthworks and reclamation in the Stream has resulted in the significant loss of and loss of access to high quality habitat for a variety of fish species. The works have likely resulted in the deaths of a significant of fish over several species, some of which may have had a conservation status of at risk declining and possibly nationally vulnerable, and that were also regionally significant species.

[35] Ms Zieltjes' report concluded:[12]

> Extensive sediment was evident throughout the Stream below the unauthorised earthworks. The impacts from the sediment discharge from the works will likely be problematic for some time. It is probable the sediment will only be removed by high flows, and is expected to require numerous floods to be completely removed, provided there is no additional input of sediment into the Stream. Overall, in my opinion, the unauthorised earthworks and reclamation of the Stream has resulted in significant loss of high quality macroinvertebrate habitat. It has resulted in the displacement and likely death of numerous macroinvertebrates and fish. These works resulted in the discharge of sediment into the Stream, which will have had chronic impacts on biota for hundreds of metres downstream.

[36] A cultural impact statement was provided by Anaru Parker White and Sarah Katarina Mako on behalf of Pukerangiora Hapū and Te Kotahitanga o Te Atiawa Trust (**Te Kotahitanga**). Te Kotahitanga is the post settlement governance entity for Te Ataiwa. The statement records:

> In our opinion, the works have not recognised and provided for the relationship and culture and traditions of Pukerangiora and Te Atiawa with our ancestral lands and waters, nor the cultural, traditional, historical and spiritual relationship Pukerangiora and Te Atiawa have with the area as statutory acknowledgement.

[12] At page 11.

[37] The statement identified that the works undertaken are inconsistent with principles, values, objectives and policies of *Tai Whenua, Tau Tangata and Tai Ao – Te Atiawa environmental management plan*. The objectives include the protection and enhancement of mauri or life supporting potential of freshwater resources. The policies include opposing man-made alterations to river courses.

[38] The statement further observes:

> It is important to note that these are not the first works Mr Boyd has undertaken on his property. These works contribute to a continuation of cumulative effects from works Mr Boyd has undertaken on the ancestral lands and waters of Pukerangiora. Those cultural and environmental effects include, but are not limited to:
>
> a. Pollution of water and the downstream streambed from discharge of silt and sediment;
>
> b. Habitat loss caused by the diversion and in the downstream reaches caused by silt and sediment smothering streambed gravels and cobbles;
>
> c. Habitat loss caused by the destruction of mature riparian vegetation;
>
> d. Habitat loss caused by the destruction of the streambed over the modified reach;
>
> e. Increased flood flows;
>
> f. Adjustment to natural geomorphic processes;
>
> g. The loss of a significant number of fish over several fish species, including taonga species.

[39] Mr Mooney referred to my decision on the disputed facts and submitted that I can still consider the impact of earlier work, which would have had cumulative effects on the environment. In my decision I noted that the impact of those works on flows in the tributary was not clear. However, the evidence I received on effects of the works in terms of other matters is clear.

[40] I accept the conclusions on environmental effects from the three report writers. The effects include loss of biodiversity, impacts on geomorphic and hydrological processes, increased erosion rates, pollution, habitat loss, displacement and killing of macroinvertebrates and fish, exposure of fish to sediments, and smothering of egg habitat for fish. I agree with the report writers that the effects are significant, cumulative and long-lasting. I am concerned with the effects on the relationship,

culture and traditions of Pukerangiora and Te Atiawa. In all the circumstances I determine that the environmental and cultural effects of this offending are serious.

Culpability

[41] Ms de Silva submitted that Mr Boyd's culpability falls into the most serious category as the works were deliberate and blatant and there were no attempts to comply.

[42] Ms de Silva submitted Mr Boyd was well aware that the work was in breach of the RMA. She submitted Mr Boyd's history of non-compliance is relevant here but in the sense that, given the extraordinary level of non-compliance and resulting interaction with the Council, Mr Boyd was well aware that a resource consent was required for the work, in particular:

(a) the enforcement order that he agreed to in December 2013 required remedial work including erosion and sediment controls; and

(b) his convictions and sentence in August 2016 were for work in and adjacent to the Mangatengehu Stream: one charge for contravention of the December 2013 enforcement order; and seven charges under ss 13, 14 and 15 of the RMA involving the damage of habitats in the bed of the Stream, discharge of sediment into the Stream, reclaiming and disturbing the bed of the Stream, diverting water and draining the bed of the Stream and depositing in the bed of the Stream;

(c) the six abatement notices issued in relation to earthworks in 2011, 2013 and 2018; and

(d) all of the site inspections and other communication from the Council in relation to the above enforcement action.

[43] Ms de Silva highlighted that the Court found in the 2016 sentencing decision that the work was undertaken to improve farm productivity and was deliberate.[13] The same can be said of the work discovered in October 2019.

[13] *R v Boyd* [2016] NZDC 16558 at [4] – [6].

[44] Ms de Silva submitted Mr Boyd was well aware that the tributary was of high quality and contained a number of species of fish and sediment would affect habitats downstream because this was noted by the Court in the 2016 sentencing decision.[14]

[45] Mr Mooney disputed that the offending falls within the most serious category. Mr Boyd was aware that he was permitted to construct drains within the property; he had done so over many years without criticism.

[46] In relation to the 2016 offending, Mr Mooney advised that related to a stream that was 830 metres long which had been dammed and diverted away. The stream that was diverted was significantly different from what had been flowing beneath the original diversion which is not the subject of these charges. Further, any water flow within the diversion channel was as much a reflection of underground springs as opposed to any surface water.

[47] It is disputed that the contravention of the abatement notice was blatant. Rather, Mr Mooney submitted, it reflects a failure by the defendant to maintain the silt and sediment controls. In terms of the abatement notice the controls had been installed but were 'insufficient to cope with significant rain fall events'. It was submitted a blatant disregard would have been a failure to install any controls at all.

[48] Mr Boyd's history of interactions with the Council and the past prosecution would have put him on notice of the need to take care in undertaking earthworks on the property. Mr Boyd maintains that he can construct drains as a permitted activity, and has done so without criticism. I am to infer, I think, that this offending therefore is somewhat of an aberration and not indicative of a deliberate or blatant failure to observe the rules. I do not agree.

[49] Given the nature and extent of the works undertaken I conclude that Mr Boyd was highly reckless in his approach to earthworks and in his response to directions from Council officers and abatement notices. Mr Boyd could have checked with the Council prior to undertaking the works but chose not to. He could have taken more

[14] At [16] and [17].

care in his response to the Abatement Notices. No reason has been offered for that failure.

Starting point

[50] Ms de Silva referred me to the following cases: *Taranaki Regional Council v Potroz* (***Potroz***);[15] *Hardegger & Hardegger Trustees Ltd v Southland Regional Council (**Hardegger**)*;[16] *R v Boyd*;[17] *Otago Regional Council v Gibson (**Gibson**)*;[18] and *Taranaki Regional Council v Bunn Earthmoving Ltd (**Bunn Earthmoving**)*.[19]

[51] Ms de Silva submitted the *Potroz* case is the most relevant comparison, in relation to the nature of the environment and extent of damage. She submitted the point of difference is culpability; Mr Potroz was found to be highly reckless and she submitted Mr Boyd's culpability falls into the most serious category.

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[15] *Taranaki Regional Council v Potroz* [2020] NZDC 9077 – three representative charges relating to draining the bed of a stream, damming water and discharging contaminants into water undertaken on the defendant's farm in an unnamed tributary. The Court concluded that the effects of the works on the environment were significant and highly adverse. Regarding Mr Potroz's culpability, the Court found that he had been highly reckless in his approach to trying to resolve his water supply issues. Starting point of $65,000.

[16] *Hardegger & Hardegger Trustees Ltd v Southland Regional Council* [2017] NZHC 469 – three charges relating to excavating and disturbing the bed of the Oreti River, placing a culvert in the bed of Starvation Creek and disturbing the bed of the Creek. The High Court adopted a global starting point of $50,000, apportioned as $35,000 to Mr Hardegger and $15,000 to the company.

[17] *R v Boyd* [2016] NZDC 16558 – eight charges, seven related to damaging habitats in or on the bed of a river, discharging silt and sediment into water, reclaiming and disturbing the bed of a river, diverting water draining the bed of a river and depositing substances in the bed of a river, one charge of contravening an enforcement order. The environment affected by the offending was almost a kilometre of the original stream and the works had a significant impact on the stream environment. Meanders were cut off and dried, sediment deposited and the habitat of freshwater fish, crayfish, bullies and other species destroyed. Further, the resulting erosion led to significant deposition of sediment further downstream. Given Mr Boyd's long history in farming and his connections with quarrying and the earthmoving industry, the Court said there was no doubt that Mr Boyd must have been aware of the need to obtain resource consents prior to undertaking the works; however, no such application was made. The Court concluded that the works were a considered and deliberate breach of known responsibilities. Starting point $60,000.

[18] *Otago Regional Council v Gibson* [2016] NZDC 14362 – four defendants to a joint charge relating to the unlawful disturbance of the bed of a stream, used a digger to remove vegetation over 1.3km. In the case of this particular waterbody the effects were serious. Starting points ranging from $20,000 to $30,000.

[19] *Taranaki Regional Council v Bunn Earthmoving Ltd* DC New Plymouth CRI-2013-021-473, 5 November 2013 – three charges related to work in and around a tributary of a river on a farm. A combination of factors led the Court to conclude that this was a matter of some considerable seriousness: the extent of the works; the seriously detrimental effects on the stream environment; the extent of discernible effects and the fact that it was not possible to reinstate the tributary to its original condition. Further, the offending was deliberate. Starting point $70,000.

[52] Ms de Silva submitted the starting point for Mr Boyd for the s 15(1)(a), s 15(1)(b), and s 13(1)(e) charges should be at least $100,000 to reflect his much higher culpability.

[53] Ms de Silva submitted there should be a separate starting point for the abatement notice offence of $30,000. She referred to *Southland Regional Council v Dodds* in which the Court stated:[20]

> Turning to the charge of breach of abatement notice, I record the Court's common observations that such breaches are inherently serious matters in and of themselves and warrant the imposition of penalties which deter non-compliance with legally issued Council notices. Abatement notice penalty considerations without any particularly aggravating factors commonly range in the $20,000-$30,000 range.

[54] Ms de Silva submitted that penalties should ensure that it is unattractive to take the risk of offending on economic grounds; the penalty should have a sting and cause the polluter to internalise the environmental cost.

[55] Ms de Silva submitted there is a real need for specific deterrence because Mr Boyd has complete disregard for the RMA. She also submitted there is a need for general deterrence because:

(a) the offending was in a sensitive waterway which was the habitat of at Risk-Declining Nationally Vulnerable and Regionally Significant fish;

(b) this type of offending can go undetected. When the activity is undertaken without a consent, the Council will usually only discover the activity via a complaint as happened here; and

(c) in this case (and those she referred to) the work was undertaken to "improve" the farm.

[56] Mr Mooney observed the facts of each case are always different and comparisons are often difficult. In relation to the cases referred to by the prosecution he made the following comments:

[20] *Southland Regional Council v Dodds* [2021] NZDC 16836 at [16].

(a) in relation to *Potroz*, he submitted that the offending in that case was a much higher level. Mr Potroz dammed a river such that water backed up 90 metres upstream. Mature riparian vegetation had been removed for a distance of about 250 metres. In the current case, there was no damming or similar, rather, it was the earlier drainage work (and associated diversion) that caused a significant reduction in the flow in the unnamed tributary. There was no riparian planting;

(b) in *Hardegger*, he submitted that involved more significant offending. The river was a significant river;

(c) in *Boyd*, that involved a diversion of an 830 m section of a stream;

(d) in *Gibson*, it was submitted the facts of that case are significantly more serious. A digger was used to remove vegetation from a water body over 1.3 km. The reservoir downstream of the work was a regionally significant brown trout fishery and the waterway was one of two spawning streams which stocked the reservoir;

(e) in *Bunn Earthmoving*, there were significant adverse effects for between 2100 and 3000 metres. The waters were rendered toxic. The effects persisted for at least a month.

[57] Mr Mooney submitted that this case is not dissimilar from *Waikato Regional Council v Tui Glen Farm*.[21]

[58] Mr Mooney stated that the main difficulty for the prosecutor in this case is that it is unable to isolate any adverse effects when any supposed effects are a reflection of earlier work undertaken on the farm. In the circumstances, it was submitted that a starting point of $40,000 would be appropriate.

[21] *Waikato Regional Council v Tui Glen Farm* DC Hamilton CRI-2011-072-126, -129, -130, -131, - 132, -135, 14 August 2012 – earthworks undertaken for farming purposes without resource consent. Regarding the effects by Tui Glen Farm Ltd the effects on the environment were minimal. The Court found that Mr Walling had a somewhat cavalier attitude to the issue of sediment and erosion control, and ought to have known that a more precautionary approach was required. Tui's behaviour, as exhibited by Mr Walling, was reckless, though not at the highest level. Starting point $40,000. As to the offending by Walling Family Farms Ltd, Mr Walling was extremely careless in his approach to the checking of a resource consent to see if it covered the works in question. Starting point $35,000.

[59] Mr Mooney submitted that there could be an increase for the breach of the abatement notice. He submitted that any such breach was a reflection of the installed controls not being able to cope with heavy weather conditions. He submitted an increase of $5,000 would be appropriate, bringing the starting point to $45,000.

[60] There is a considerable difference in starting points proposed by counsel. The cases to which I was referred provided some assistance, but are not determinative of the outcome. *Potroz* and the earlier case involving Mr Boyd assist. It needs to be remembered, however, that the environmental effects of this offending are serious and ongoing. Further, I have found Mr Boyd to have been highly reckless in his approach to these works and insufficiently responsive to the abatement notices issued requiring the installation and maintenance of silt and sediment controls.

[61] In these circumstances I impose starting points of $75,000 for the discharge and reclamation charges and $20,000 for the abatement notice offence.

Aggravating and mitigating factors

Uplift

[62] Mr Boyd has previous convictions under the RMA and abatement notices, infringement notices and enforcement orders issued to him:[22]

(a) enforcement order dated 18 December 2013 requiring remedial works including installation of erosion and sediment controls for earthworks and stream works discovered by the Council in 2013;

(b) convictions for earthworks undertaken in 2013 in and around the Mangatengehu Stream;[23]

(c) conviction for obstruction in 2001;[24] and

[22] Summary of Facts at [10].
[23] *R v Boyd* [2016] NZDC 16558.
[24] *Taranaki Regional Council v Boyd* DC New Plymouth CRN0043008466-68, 5 November 2001 – obstructing or hindering enforcement officers, fined $750.

(d) a total of 17 abatement notices (2009, 2011, 2012, 2013, 2014, 2016, 2017, 2018 and 2019) and six infringement notices (2015, 2016 and 2018).

[63] Ms de Silva submitted an uplift should be applied for Mr Boyd's previous convictions. She referred me to a number of cases where an uplift has been applied for previous convictions.[25] Most of those cases refer to *Yates v Taranaki Regional Council* where the High Court described an uplift of one-third of the starting point as being within the upper range appropriate to reflect previous offending.[26] Factors such as lapse of time since the previous offending, similarity with previous offending, relative seriousness of respective offences and the number of offending incidents will all come into play.

[64] Ms de Silva submitted an uplift of 25 percent is appropriate for Mr Boyd when the following factors are applied:

(a) Mr Boyd had eight convictions imposed in 2016 for offences found in November 2013. These offences are serious with a combined starting point of $60,000;

(b) the previous offending is very similar: earthworks and stream works; in the same catchment, on the same farm and a few hundred metres from the offences discovered in October 2019;

(c) the 2013 enforcement order, 17 abatement notices and six infringement notices are also relevant;

[25] *Otago Regional Council v Clutha District Council* [2020] NZDC 26125 – one previous conviction, five percent uplift; *Gisborne District Council v PF Olsen Ltd* [2020] NZDC 19089 – two previous convictions, 10 percent uplift; *Southland Regional Council v Fernlea Farm Ltd & W Carpenter* [2020] NZDC 10046 – 18 previous offences, uplift of 25 percent; *Waikato Regional Council v B & B Singh Ltd & G Singh* [2019] NZDC 15895 – one previous conviction on four charges, 10 percent uplift; *Southland Regional Council v Gladvale Farms Ltd & G Lindsay* [2018] NZDC 25071 – previous conviction, uplift of 10 percent; *Porirua District Council v Judgeford Heights Ltd, McPhee & C&M Transport Ltd* [2017] NZDC 27346 – one previous conviction, defendants subject to 57 infringement notices, 20 percent uplift; *Yates v Taranaki Regional Council* HC New Plymouth CRI-2010-443-8, 14 May 2010 – two previous convictions, one-third uplift.

[26] *Yates v Taranaki Regional Council* HC New Plymouth CRI-2010-443-8, 14 May 2010.

(d) it is acknowledged that the conviction imposed in 2001 for obstruction is not very relevant.

[65] Mr Mooney submitted that if an uplift is reflected as a percentage, then any such percentage when expressed in dollar terms must be such that it does not become a significant penalty when compared with the original penalty imposed for those earlier offences. It was thus submitted that an uplift of 20 percent may be more appropriate.

[66] Having regard to the previous conviction in 2016 and the numerous abatement notices and infringement notices issued since 2009, I determine that an uplift of 25 per cent is appropriate. That is to be applied to the discharge and reclamation charges.

Guilty plea

[67] Ms de Silva highlighted that the guilty pleas were entered on 9 March 2022 as a result of an agreement reached on 7 March 2022. The trial was scheduled for 21 – 24 March 2022. She submitted the pleas are very late and that the appropriate discount is 10 percent.

[68] Mr Mooney submitted the discount should be higher. He noted that Mr Boyd originally faced a number of other charges. The matter was resolved following discussions whereby some of those earlier charges were withdrawn. He submitted that in such circumstances a discount of between 15 percent and 20 percent would be more appropriate.

[69] The Council, having first reconsidered its position proposed 15 per cent but has now retracted that and remains with its original proposal of 10 percent. Ms de Silva noted that the three charges withdrawn were lesser charges. Counsel referred to a number of decisions where a guilty plea was made on the day of or very close to the hearing. In those cases the discounts were between 10 and 15 per cent.[27]

[27] *Huka View Dairies v Manawatu-Whanganui Regional Council* [2021] NZHC 1462; *Te Kinga Farms Ltd v West Coast Regional Council* [2015] NZDC 293; *Banora v Auckland Council* [2019] NZHC 2545.

[70] Ms de Silva submitted that the Council expected sentencing to proceed on 22 March 2022. Instead a disputed facts hearing was necessary. The Council's position is that the appropriate discount should be 10 percent because of the findings in the decision on the disputed facts.

[71] Ms de Silva referred to *Bay of Plenty Regional Council v Specialised Container Services (Tauranga) Ltd*,[28] a prosecution for discharge of hydraulic oil. There was a disputed facts hearing and an early guilty plea. The Court allowed a discount of 15 percent.

[72] Given the outcome of the disputed facts hearing and the relatively late entry of four guilty pleas I allow a discount of 15 per cent.

Enforcement order

[73] The Council seeks an enforcement order for remedial work as part of the sentence.

[74] After several opportunities for discussion, the parties agreed on the terms of a draft enforcement order.

[75] Ms de Silva submitted that Mr Boyd should not be given credit for work required by an enforcement order because this falls into the category described in *Thurston*; that the defendant must comply with environmental obligations and should get no credit for having belatedly done so. Mr Mooney submitted that a discount of five percent is appropriate for his co-operation in agreeing an enforcement order.

[76] While the works that have been agreed are in effect Mr Boyd remedying a situation of his own creation, I find it is appropriate to recognise that agreement and allow a discount of five per cent on the discharge and reclamation charges.

[28] *Bay of Plenty Regional Council v Specialised Container Services (Tauranga) Ltd* [2018] NZDC 23159.

[77] In the circumstances I consider it desirable to make orders largely on the terms proposed in the draft orders attached to the joint memorandum dated 17 August 2022. The orders are attached as **Appendix 1**.

Financial circumstances

[78] In the hearing there was some discussion as to how the fine ought to be paid. Following further enquiry from the Court in a Minute dated 16 September 2022 I understand there to be no issue as to payment of the fine.

Outcome

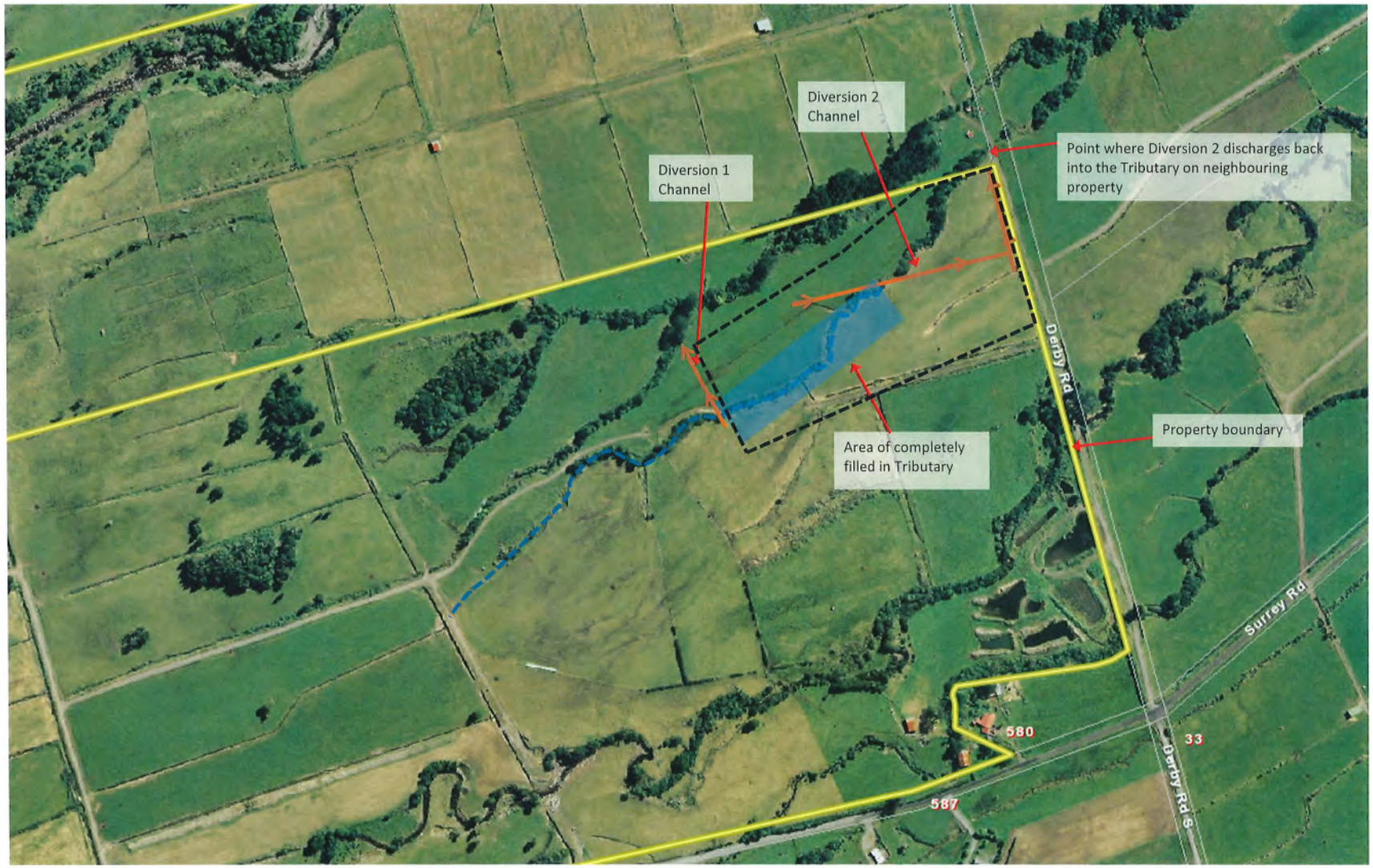
[79] I have adopted the two-step methodology outlined by the Court in *Moses v R*.[29]

[80] Accordingly, Mr Boyd is convicted and ordered to pay a fine of $78,750 for the discharge and reclamation charges and $17,000 for the abatement notice charge. In terms of s 342(2) of the RMA, I order that 90 percent of the fine be paid to the Taranaki Regional Council. The fine is to be paid within 28 days of the date of this Judgement.

_____
Judge MJL Dickey
District Court Judge | Kaiwhakawā o te Kōti ā-Rohe
Date of authentication | Rā motuhēhēnga: 04/10/2022

[29] *Moses v R* [2020] NZCA 296 at [45] to [47].

Annexure "A" to Enforcement Orders. Taranaki Regional Council v Colin David Boyd. The approximate boundary of the Area is shown by the dotted black line.



Constructed Diversion 2 Channel with stream flow direction. The Diversion 1 Channel is included as a reference point.

Doc # 3052097

Annexure B

Mile Square Farms Limited, the owner of the land, contained in Record of Title identifier TNJ1/397 (legal description: Part Section 13 Block XII Egmont Survey District), situated at Surrey Road, Inglewood (**the Property**) agrees, on an unconditional and irrevocable basis, to allow:

1. The work required by the Enforcement Orders; and

2. Any access required by Mr Colin David Boyd and any experts, contractors, Taranaki Regional Council staff and representatives of Pukerangiora Hapū, Te Kotahitanga o Te Atiawa Trust and any other parties to the Property to allow compliance and monitoring and any other necessary work for the Enforcement Orders.

C D Boyd

.....

Colin David Boyd, sole director and shareholder of Mile Square Farms Limited

16-8-22

.....

Date

Appendix 1

IN THE ENVIRONMENT COURT
AT AUCKLAND

I TE KŌTI TAIAO O AOTEAROA
KI TĀMAKI MAKAURAU

Decision [2022] NZEnvC 185
ENV-2022-AKL-000177

IN THE DISTRICT COURT
AT NEW PLYMOUTH

I TE KŌTI-Ā-ROHE
KI NGAMOTU

Decision [2022] NZDC 19123
CRI-2020-043-000553

IN THE MATTER OF	enforcement orders under sections 339(5)(a), 314(1)(a)(i), 314(1)(b)(ii), 314(1)(d), 314(2), 314(3) and 314(5) of the Resource Management Act 1991
BETWEEN	TARANAKI REGIONAL COUNCIL Applicant/Prosecutor
AND	COLIN DAVID BOYD Respondent/Defendant

Date of Issue: 4 October 2022

ENFORCEMENT ORDERS

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[1] The District and Environment Courts make the following Enforcement Orders under sections 339(5)(a), 314(1)(a)(i), 314(1)(b)(ii), 314(1)(d), 314(2), 314(3) and 314(5) of the Resource Management Act 1991 (**the RMA**).

Remedial works orders

[2] Colin David Boyd (**the Respondent**) shall instruct experts, namely WSP New Zealand Limited and Mr Hugh Barnes, Consultant Engineer of Hugh Barnes Consultants Limited to prepare a proposed plan (**the Plan**) in (as a minimum) the approximate area shown by the dotted black line (**the Area**) on annexure "**A**" for remedial works (**the Remedial Works**) at the property, which is described in Record of Title identifier TNJ1/397 (legal description: Part Section 13 Block XII Egmont Survey District) situated at Surrey Road, Inglewood (**the Property**) being:

(a) reinstatement of the unnamed tributary of the Mangatengehu stream (**Tributary**); and

(b) the infilling of the Diversion 2 Channel.

[3] The Plan is to include the following (inter alia):

(a) a requirement to appoint one or more of the experts as a Project Manager (**the Project Manager**) to supervise the Remedial Works;

(b) details of suitably experienced contractor/contractors to undertake the Remedial Works;

(c) a requirement for the Project Manager to notify Pukerangiora Hapū and Te Kotahitanga o Te Atiawa Trust and provide them with an opportunity to identify cultural values and issues of tikanga for the Remedial Works;

(d) consideration of cultural values and issues of tikanga identified by Pukerangiora Hapū and Te Kotahitanga o Te Atiawa Trust;

(e) a requirement to adopt and implement best practice for erosion and sediment control for the Remedial Works;

(f) the objectives of the Remedial Works shall include restoration of the riparian margins and instream habitat;

(g) a requirement for fencing of the Area in order to protect the Remedial Works once the Remedial Works are completed;

(h) consideration of whether the Remedial Works should include area(s) outside of the approximate area shown by the dotted black line (identified on annexure "**A**") in order to achieve the objectives of the Remedial Works and any of the requirements listed above in 10 d) – g);

(i) a schedule with the date by which each step of the Remedial Works is to be completed and information explaining why the dates are considered reasonable;

(j) a requirement for the Remedial Works to be completed within one year of the date of issue of these Enforcement Orders;

(k) information about the appropriate applications and consents required, to complete and implement the Plan, in accordance with the requirements of the RMA, the Regional Freshwater Plan for Taranaki and the Resource Management (National Environmental Standards for Freshwater) Regulations 2020;

(l) a requirement to undertake regular monitoring and maintenance of the Remedial Works including: maintenance of fencing for stock exclusion; monitoring and mitigation works to control erosion within the vicinity of the Remedial Works; maintenance of fish passage throughout the Remedial Works; maintenance of riparian margins; and monitoring and maintenance to ensure suitable aquatic habitat is maintained.

[4] The Respondent shall, submit the proposed Plan, to the Council by Monday, 14 November 2022.

[5] The Council may obtain a review of the proposed Plan, by appropriately qualified expert(s) (either Council staff and/or external experts), and make any amendments to

the proposed Plan on their recommendations, for the Remedial Works. The Council shall either approve or amend the proposed Plan and provide to the Respondent the approved or amended Plan, by Monday, 19 December 2022.

[6] Once the Plan has been approved or amended by the Council, the Respondent shall:

(a) Ensure that any necessary resource consents are applied for and obtained in accordance with the requirements of the RMA to complete the Plan; and

(b) Arrange for the Remedial Works to be undertaken in accordance with the Plan.

Prohibition orders

[7] The Respondent is prohibited from undertaking any earthworks and/or streamworks and/or any activity that compromise the Remedial Works, on the Property, except as permitted by: resource consent and/or any Regional Plan and/or the Resource Management (National Environmental Standards for Freshwater) Regulations 2020; and/or these or any other enforcement orders.

Further orders, terms and conditions

Correspondence with Council & Respondent

[8] Correspondence with the Council shall be made (in relation to notifications, agreements and timeframes within these Enforcement Orders) by contact with Jared Glasgow at jared.glasgow@trc.govt.nz or another representative of the Council as notified, in writing, by the Council to the Respondent.

[9] Correspondence with the Respondent shall be made (in relation to notifications, agreements and timeframes within these Enforcement Orders) by contact with the Respondent at 9 Kohe Place, Inglewood 4330 or a representative of the Respondent at another address as notified, in writing, by the Respondent to the Council.

Costs

[10] The Council pursuant to sections 314(1)(d) and 314(2) is entitled to recover from the Respondent any actual and reasonable costs and expenses incurred by the Council for: monitoring and steps to require compliance by the Respondent with these Enforcement Orders; and any review and amendments of the Plan referred to in order 5 of these Enforcement Orders.

Applies to personal representatives, successors and assigns of the Respondent

[11] An order pursuant to section 314(5) of the RMA that all obligations of the Respondent, Colin David Boyd shall apply to each of his personal representatives, successors or assignees to the same extent as it applies to the Respondent.

Commencement of orders

[12] These Enforcement Orders shall take effect when the Orders are issued.

Service of orders

[13] These orders shall be served on the Respondent and the owner of the Property, Mile Square Farms Limited. The Court records the owner's consent to the works required by the orders: see Annexure **B**.

Registration in the Environment Court

[14] These Enforcement Orders made in the District and Environment Courts and shall be registered in the Environment Court at Wellington so that any further proceedings under the RMA in relation to these Enforcement Orders may be commenced, dealt with and heard in the Environment Court at Wellington.

MJL Dickey
District Court and Environment Judge

IN THE HIGH COURT OF NEW ZEALAND
NEW PLYMOUTH REGISTRY

I TE KŌTI MATUA O AOTEAROA
NGĀMOTU ROHE

CRI-2022-443-000057
[2022] NZHC 3451

BETWEEN	COLIN DAVID BOYD Appellant
AND	TARANAKI REGIONAL COUNCIL Respondent

Hearing: 13 December 2022

Appearances: P J Mooney for Appellant
K J L de Silva for Respondent

Judgment: 15 December 2022

JUDGMENT OF GRICE J
(Sentence Appeal)

Introduction

[1] The appellant, Colin David Boyd, appeals his sentence relating to charges under the Resource Management Act 1991. The charges are for the discharge of contaminants into an unnamed tributary of the Mangatengehu stream, for reclaiming that unnamed tributary and for breaching of an abatement notice. He was fined $95,750.00 in total.

[2] The appellant challenges the decision of the District Court arising out of a disputed facts hearing and the sentence imposed based on those facts.[1]

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1 *Taranaki Regional Council v Boyd* [2022] NZDC 10744 [Disputed facts decision].

Background

[3] The facts are taken from the notes of sentencing.[2]

[4] The appellant is the sole director of Miles Square Farms Limited (the Company). The Company owns a property (the farm) of approximately 480 hectares which is predominantly farmed as a dairy farm. There are six land titles across the farm, including Identifier TNJI/397 (the site), on which significant earthworks was being carried out.

[5] The Mangatengehu Stream and a tributary flow west to east through the farm. The tributary has large bends and pools within it, harbouring a riparian margin with vegetation on its banks.

[6] The purpose of the earthworks on the site was to reclaim part of the bed of the tributary. There was a discharge of sediment into the tributary because the silt and sediment controls were ineffective. This led to a complaint that the tributary below the site of the earthworks was discoloured.

[7] Between 27 October 2019 and 13 March 2020, a number of inspections were undertaken at the site. In particular, on 29 October 2019 council officers inspected the site and found that certain works had been undertaken to reclaim the bed of the tributary. The diversion included approximately 278 metres of the tributary having been reclaimed and removal of the majority of the associated riparian vegetation.

[8] On 30 October 2019 two abatement notices were served on the appellant: requiring him to immediately cease all earthworks and the associated silt and sediment discharge in contravention of rr 55 and 74 of the Regional Freshwater Plan for Taranaki (Abatement Notice 1); and requiring the appellant to install silt and sediment controls and ensure that runoff from disturbed areas is directed through the silt controls by 3 November 2019 (Abatement Notice 2).

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2 *Taranaki Regional Council v Boyd* [2022] NZDC 19123 [Sentencing decision].

[9] On 4 November 2019 a reinspection was undertaken to assess compliance with these abatement notices. It was found that silt and sediment controls had been installed within the channel of the diversion but were insufficient to cope with significant rainfall. As a result, a significant amount of erosion had occurred within the channel of the diversion.

[10] On 21 November 2019 another inspection found contravention of Abatement Notice 1 though this did not lead to a charge. On 25 November a council officer spoke with the appellant about the inspection and advised him of the requirement to maintain silt and sediment controls at the site. A further abatement notice (Abatement Notice 3) was issued. It required the appellant to install silt and sediment controls and replace the ones that had failed, ensure all storm water runoffs from the disturbed area was directed through these controls, check and maintain the controls and replace any controls that fail.

[11] On 29 November a re-inspection of the site found yet another contravention of Abatement Notice 1. A large yellow digger was found at the site, although not in operation during the inspection. Further works had been undertaken – a large concrete culvert had been installed within the tributary and a significant amount of scouring and erosion was observed on the downstream (eastern) side of what was described as the "Large Culvert". There was also evidence that further north and bordering on the boundary of the site further works had been conducted within the tributary. When asked about these newly discovered works, the appellant stated he believed he could do the works because he believed Abatement Notice 1 only applied to the immediate area of the diversion works.

[12] On 3 December 2019 a re-inspection of the site found that Abatement Notice 3 had been contravened. This gave rise to the charge for contravening an abatement notice under s 338(1)(c) of the Resource Management Act 1991. Although the silt and sediment controls were operating, they were offering minimum treatment.

[13] On 13 March 2020, a re-inspection of the site found again a contravention of Abatement Notice 3. There was heavy silting within the channel of the diversion and the installed silt controls were full and offering no treatment. No further silt and

sediment controls were installed and a significant amount of erosion of the batter of the channel of the diversion had occurred since the previous inspection. The controls had also not been maintained.

The disputed facts hearing

[14] The disputed facts hearing was centred on the effects of the offending. The hearing took place before a Judge of the Environment Court. The appellant claimed that the Council, in its evidence, had focussed on effects arising "not only from the works that are the subject of these prosecutions but also historic works".[3]

[15] The appellant's position was that over the last 25 years he and the Company had undertaken a significant amount of drainage work that included the construction of a diversion upstream of the part of the tributary which was subject to the current charges. That was the historic work referred to by the Judge as the original diversion, Diversion 1. The diversion that is subject to the current charges is referred to as Diversion 2. In response, the Council argued that the three experts from whom it had obtained reports had amended their reports to remove reference to Diversion 1 and had taken into account the impact of that removal in their analysis and conclusions. The appellant's concerns remained that that these amendments did not substantially change the report writers' conclusions on the environmental effects. Accordingly, Mr Boyd disputed those conclusions. Mr Boyd's case, the Judge recorded, was that the historical works "must have adversely impacted the unnamed tributary", and that those impacts should not be factored into the analysis of effects on the environment of this offending.[4]

[16] The Judge had before her the three reports (amended) from the Council provided by Mr D R Harrison (Director-Operations), Mr P J Deegan (Environmental Scientist – Freshwater biology), and Ms B R Zieltjes (Environmental Scientist) and a statement of evidence provided by a consultant engineer, Mr H R Barnes, for the appellant. The primary focus became Mr Harrison's report and evidence and Mr Barnes' evidence.[5]

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3 Disputed facts decision, above n 1, at [3].
4 At [13].
5 At [10].

[17] Mr Harrison's report concluded that the work undertaken to modify the tributary "has caused significant adverse effects on the environment, and still has the potential to cause further adverse effects on the environment".[6] Meanwhile Mr Barnes' evidence was based on the geography of the area, the groundwater table, and aerial photographs of the farm with commentary on what they showed, including loss of vegetation and reduction of flows in the unnamed tributary.[7] He did not address the environmental effects of the works under prosecution. The main areas of disagreement between Mr Harrison and Mr Barnes' evidence were around what the aerial photographs suggested and the coloured plan sourced by Mr Barnes.

[18] All the experts were called and cross-examined before the Judge.

[19] The Judge found "beyond reasonable doubt that the unnamed tributary the subject of this prosecution would have retained either a permanent or intermittent flow of water, which would have supported instream biodiversity and which in turn has been adversely affected by Diversion 2".[8] Her Honour noted the only evidence she had on the effects of the offending works was that provided by the Council's witnesses. Her Honour held:

> [38] Having determined that the unnamed tributary in which works were undertaken was either a permanent or intermittent stream at the time of the offending works were undertaken, there is no basis to reject the evidence of the Council's witnesses on effects.
>
> [39] Further, I accept the evidence of the Council's witnesses that their assessments and conclusions as to the effects of the offending relate to Diversion 2. Therefore, for the purpose of assessing the environmental effects of the offending, I would place significant weight on the reports of the Council's witnesses.

Appeal

[20] The essence of the appeal is that the District Court Judge misconstrued the evidence relating to the environmental effects of the offending in that she failed to recognise that the dominant cause of any effects noted was in fact earlier drainage work undertaken by the appellant – work that was not the subject of the prosecution.

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6 At [15].
7 At [22].
8 At [36].

The appellant says that the Judge misunderstood the effects of the historical works on the relevant flow of water and specifically:

(a) the Judge failed to recognise the significance of the cross-examination of Mr Harrison where he accepted that the solid blue lines drawn on that photograph fairly represented the flow of water that has originally flowed in the unnamed tributary. Mr Harrison said "but there is also potential for significant ground water to be entering the down stream channel which would result in a permanent flow"

(b) The key significance is that when the other Council experts, in particular Ms Zieltjes, referred to impacts they are taking measurements from a fully functioning stream whereas it is submitted that the effects of Mr Harrison's evidence is that following the construction of Diversion 1 there is much less water flow.

(c) Mr Harrison acknowledged that he is not disputing that the flow was impacted and acknowledged later that he could not provide an actual measure as to the effect of the change in flow.

(d) Mr Harrison stated, after referring to a photo where Diversion 2 enters into a drain that ultimately makes it way to the unnamed tributary, "this demonstrates to me that given there is no contributing streams upstream of this photo, yet you can see flowing water within the channel, that flowing water occurs in these channels whether or not there is an upstream tributary and this is because the water from the ground water is seeping into the channel and causing it to flow". The appellant says the importance of that acknowledgement is that the environmental effects on ground water is significantly different from streams flowing above ground.

Assessment

[21] Under s 244 of the Criminal Procedure Act 2011 the appellant has a right to appeal against his sentence. The appeal must be allowed if the Court is satisfied that

for any reason there is an error in the sentence, and that a different sentence ought to be imposed.[9]

[22] The Court of Appeal recently in *Roulston v R*[10] noted that a determination on a disputed facts requires the Judge to make an evaluative assessment of the evidence. The appellate court has an obligation to consider the evidence and reach its own opinion on the facts and the dispute.

[23] In the District Court, it was noted by the Judge that Mr Boyd's case was that the historical works must have adversely impacted the unnamed tributary and those impacts had not been factored properly into the experts' analysis of the effects on the environment of that offending. On appeal, Mr Mooney refined his argument. In essence, it amounted to recapping the argument made before the District Court that it was the historical impacts which caused the most significant detrimental effects on the waterway. That is because the Judge had failed to recognise the significance of, in particular, the evidence of the Council expert Mr Harrison, in relation to the source of the water flowing into the unnamed tributary. Mr Mooney argued that Mr Harrison had accepted that there was "significant groundwater" entering the downstream channel rather than surface water. He argued that the relevance of that was that the Judge had misunderstood the environmental effects which would result from the fact that it was groundwater (largely) rather than surface water flowing into the channel.

[24] Mr Mooney submitted that the environmental effects on groundwater would be "significantly different from streams flowing above ground".[11] The evidential basis for that submission, Mr Mooney said, could be found in the evidence of Mr Harrison who had "acknowledged that there is no aquatic life and groundwater until it enters the stream."[12] In Mr Mooney's submission, this was the "key issue which the Learned Judge overlooked".[13]

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9 Criminal Procedure Act 2011, s 250(2).
10 *Roulston v R* [2020] NZCA 255 at [20].
11 Submissions on behalf of appellant dated 5 December 2022 at [26].
12 At [26].
13 At [27].

[25] Mr Mooney said that evidence concerning the environmental effects given by the expert witnesses, Mr Deegan and Ms Zieltjes was undermined by Mr Harrison's concession about groundwater. That was because if the water flow was as a result of groundwater, then any "measurements by either Mr Deegan or Ms Zieltjes as to fish diversity, or the like is irrelevant as they do not exist in groundwater."[14] Their evidence could therefore not be relied on by the Judge to assess the vulnerability or importance of the affected environment and the extent of the damage to it. Therefore, Mr Mooney argued, the Judge's conclusion that the environmental effects were serious and ongoing was in error because the Judge had failed to recognise the effect of Mr Harrison's evidence. As a result of the Judge's error, the sentence was based on a misunderstanding as to the seriousness of the detrimental effects involved. The sentence was therefore excessive. Rather than the starting point taken by the Judge of $75,000 for the discharge and reclamation charges and a further $20,000 fine for the Abatement Notice offence, Mr Mooney submitted that a starting point of $40,000 may have been more appropriate with an increase for the charge relating to the abatement notice and a discount for the appellant's pleas of guilty, as well as his undertaking to carry out remedial work.

[26] The Judge had regard to three reports from experts called by the Council, against a background of several inspections and re-inspections and inadequate responses from the appellant to the Council's concerns. Mr Harrison was an employee of the respondent. As Rivers Manager he had assessed the works undertaken by the appellant. He had qualifications in natural resource management and forestry, and over 13 years' experience in river and drainage engineering works. Mr Deegan was also an employee of the respondent as an Environmental Scientist, Freshwater Biology. He had qualifications and experience in ecology and environmental science. Ms Zieltjes was an employee of the respondent as an Environmental Scientist and had science qualifications in biology. The expert called by the appellant, Mr Barnes, was a consultant engineer in private practice with civil engineering qualifications and experience in a wide range of engineering and construction projects. Mr Barnes did not make any findings on the environmental effects of Diversion 2 but directed his evidence to trying to prove the environmental effects were caused by historical

[14] At [34].

earthworks. Mr Barnes accepted he was not qualified to give evidence as to the environmental effects.

[27] The appeal rests on the argument that the evidence did not allow a finding by the Judge that the relevant water the subject of the environmental testing, in particular by Ms Zieltjes, and Mr Deegan was largely groundwater that would not exhibit the biodiversity or have the same life supporting capacity that would have been the case if it had been largely surface water that had been flowing in the stream.

[28] I do not accept that submission. As Ms de Silva pointed out, the evidence was that while there may have been a significant groundwater contribution to the flow, this did not mean that there would be no aquatic life when the groundwater entered the relevant stream. In addition, the Judge was cognisant of the presence of significant groundwater in the flow. The appellant pointed out that:

(a) the Judge noted in her decision that there was a significant groundwater table relatively close to the surface from which a number of natural springs "either flow underground or on occasion break the surface. On that, he [Mr Barnes] and Mr Harrison were in agreement".[15]

(b) the Judge noted that Mr Harrison considered the groundwater contribution to flow would have been significant.[16]

(c) Mr Harrison's evidence when cross-examined on this issue had been that the water in the tributary "and all streams when it's not raining comes from groundwater. This is no different." He went on to say that "water in streams comes from other streams and water coming off the mountain, but it also comes from groundwater. There is a very well-known fact that there's a clear connection between groundwater and streams and rivers. So therefore, the flow in streams and rivers is derived from groundwater other than when it's raining".[17]

15 Disputed facts decision, above n 1, at [23].
16 At [29].
17 Notes of evidence, cross-examination of Mr Harrison, at 14.

(d) Mr Harrison accepted that groundwater beneath the surface may have no aquatic life (although that was not necessarily the case), however, it did have aquatic life when it entered the stream.

[29] The text of the cross-examination of Mr Harrison, upon which the appellant had relied for his primary submission that the significant groundwater meant that there would be no or little aquatic life in the stream and therefore the environmental effects of diversion were far less than Ms Zieltjes and Mr Deegan had reported, insofar as relevant went as follows (emphasis added):[18]

> Q. Isn't it the case that what's happened is that the channel has been dug down to a point where it's capturing underground water that would not normally be caught?
>
> A. No, I don't agree with that. This demonstrates to me that given that there is no contributing streams upstream of this photo yet you can see flowing water within the channel, that flowing water occurs in these channels whether or not there is an upstream tributary and this is because the water from the groundwater is seeping into the channel and causing it to flow.
>
> Q. And that's my very point. Is that the water in this channel has come from groundwater, hasn't it?
>
> *A. Just like the water in the, in this tributary, and all streams when it's not raining comes from ground water. This is no different.*
>
> A. Well no. Water and streams do not come only from underground water, they come from rivers and streams flowing off the mountain, don't they?
>
> *A. No, that's not right. You're correct in that water in streams comes from other streams and water coming off the mountain, but it also comes from groundwater. There is a very well-known fact that there's a clear connection between groundwater and streams and rivers. So therefore, the flow in streams and rivers is derived from groundwater other than when it's raining.*
>
> Q. In the open tributary, southern tributary that was ultimately impacted by these north south channels and so on, there was clearly water flowing at some point over the years in that tributary, wasn't there?
>
> A. Yes, there would have been, yes.
>
> Q. And you're saying to us that that was sourced, among other things, from groundwater?
>
> A. Yes I am, yes.
>
> Q. okay. I can't dispute that. But my question of you I suppose, comes down to this. That once that tributary was impacted by the north south channels, and we've gone through - there was perhaps about four of them over 10 years or so?
>
> A. Yes.

[18] At 14-19.

Q. The only source of water would have been that channel that we can see there in 18A and 17A and so on, is groundwater, isn't it?

Q. It is, yes. And it's flowing water as you can see.

….

Q. Paragraph 10 of your reply, you say that the groundwater contribution to the flow would have been significant. Right?

A. Yes.

Q. Now normally the groundwater is by definition below the surface, isn't it?

A. Yeah, absolute-

Q. Until it bubbles through to a stream?

A. Absolutely. Yes.

Q. So when it's groundwater beneath the surface there's no aquatic life is there?

A. Not until it enters the stream. Although to be fair there is actually evidence of aquatic life existing in aquifers in Canterbury below the surface. Small shrimp life creatures

[30] The Judge referred to the evidence of Mr Harrison in her sentencing decision as follows:

> [32] Mr Harrison made several observations about the effects of the recent works in his report:
>
> 14. The infilled channel has been completely removed from the environment and no longer provides natural ecological, hydrological and geological services.
>
> …
>
> 18. The excavated channels are steep sided, run in straight lines with occasional 90 degree bends, and typically have a uniform cross-section and grade. The ground material that the channels have been cut into predominantly consists of loose gravels, sand overlain with clay, and a thin layer of topsoil (see Figure 5).
>
> 19. This gravel and sand material is highly erodible …
>
> …
>
> 24.… The excavated channels have no riparian vegetation.
>
> 25. Riparian vegetation provides habitat and food for a range of native and beneficial organisms.

> 26. This reach was a stream of high naturalness that supported instream biodiversity and was a continuation of the natural channel upstream and downstream of the works area, allowing geomorphic processes, such as gravel transport and erosion, to happen naturally.
>
> 27. The excavated channel would not have the same life supporting capacity as the natural channel. Erosion rates will be high for many years, and geomorphic and hydrological processes will be altered indefinitely.
>
> 28. In my opinion, the potential adverse effects of infilling the natural channel and diverting the stream into an excavated channel will be significant and long lasting.

[33] Mr Harrison concluded that the work undertaken to modify the unnamed tributary "has caused significant adverse effects on the environment, and still has the potential to cause further adverse effects on the environment". He said:

> 29. It is my view that the work undertaken to modify the unnamed tributary of Mangatengehu Stream on the Mile Square Farms Ltd Property on Derby Road, Tariki, has caused significant adverse effects on the environment, and still has the potential to cause further adverse effects on the environment.
>
> 30. Adverse effects include: pollution of water and the downstream streambed from a discharge of silt and sediment; habitat loss in downstream reaches caused by silt and sediment smothering streambed gravels and cobbles; habitat loss caused by the destruction of mature riparian vegetation; habitat loss caused by the destruction of the streambed over the modified reach.
>
> 31. Potential adverse effects include: ongoing silt and sediment loss caused by disturbed earth and erosion of the excavated channel; increased flood flows; reduced summer low flows; and a major adjustment to natural geomorphic processes causing an increase in downstream erosion, and damage and loss of capacity to downstream culverts and bridges.
>
> 32. The adverse effects have been significant and will continue for many years.

[31] Ms Zieltjes was clear that the biomonitoring survey upon which she relied to investigate the effects of the impacts of Diversion 2 were undertaken at four sample sites, which would not have been influenced by Diversion 1 or the works, upstream of

Diversion 1 due to the historic nature of Diversion 1.[19] Under cross-examination Mr Zieltjes remained adamant that her survey assessed the impacts from Diversion 2. She said:[20]

> Q. So the earthworks up there have had an impact on what you're recorded at site 2 and indeed site 3?
>
> A. The earthworks and subsequent discharge of silt and sediment impacted site 3. The impacts on site 2 were predominantly due to the dewatering of the stream and the filling of the stream bed.
>
> Q. Indeed though the effects have occurred long before the area that *we've* talked about but indeed have been impacted by earthworks to the west, closer to the mountain, of that diversion that was originally called diversion 1 and indeed by other north south channels that were constructed over the years, doesn't it?
>
> A. The survey that I conducted was not assessing prior works that were occurring upstream of channel 2. My survey was designed to assess any impacts that silt and sediment, the discharge from diversion 2 had on the unnamed tributary.
>
> Q. When with respect to site number 2 you say that the score is fair, MCI score is fair?
>
> A. Yes, mhm.
>
> Q. *Would you agree with me that that reflects earthworks not only in the immediate vicinity but earthworks much closer to the mountain?*
>
> *A. No, I disagree.*
>
> Q. *Well were you aware that there had been significant earthworks closer to the mountain along what had been the course of that tributary over the years?*
>
> *A. That's not what I was assessing with this biomonitoring survey*.
>
> Q. Okay. So were you not aware of that?
>
> A. I was assessing the works in question which involved the infilling of the stream and the discharge of silt and sediment from diversion 2. ·
>
> Q. Okay. Well let me put it to you another way. If you were told that there had been significant earthworks to the west, closer to the mountain, over a period of perhaps 10 or 15 years in which the flow within that tributary, that southern tributary, had been impacted, that must of itself impacted upon the score that you recorded at that second site. Would you agree?
>
> A. No, that's a hypothetical question not relevant to the survey that I conducted.

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19 Brooke Zieltjes' Statement of Evidence at 7-10.
20 Notes of evidence, pages 26-29

(emphasis added)

[32] The appellant submitted that Ms Zieltjes had referred to detrimental impacts based on samples taken "from a fully functioning stream, whereas… the effects of Mr Harrison's evidence is that following the construction of Diversion 1, there is much less water flow and indeed he makes particular reference to the significant groundwater." This is not correct, Ms Zieltjes said Site 2 was undertaken in the dewatered reach of the affected tributary which she said showed "*severely depleted macroinvertebrate populations*".[21]

[33] The Judge commented on Ms Zieltjes evidence in her decision on disputed facts as follows:

> [34] Ms Zieltjes was asked about the survey she conducted. She confirmed tht [sic] the survey was not assessing prior works upstream of channel 2. It was designed to address any impacts of Diversion 2.
>
> [35] Ms Zieltjes was asked about prior earthworks in the vicinity and their effects. She maintained that she had not assessed the effects of those works

[34] In her sentencing decision, the Judge also referred to Mr Zieltjes report as follows:

> [35] Ms Zieltjes' report concluded:
>
> > Extensive sediment was evident throughout the Stream below the unauthorised earthworks. The impacts from the sediment discharge from the works will likely be problematic for some time. It is probable the sediment will only be removed by high flows, and is expected to require numerous floods to be completely removed, provided there is no additional input of sediment into the Stream. Overall, in my opinion, the unauthorised earthworks and reclamation of the Stream has resulted in significant loss of high quality macroinvertebrate habitat. It has resulted in the displacement and likely death of numerous macroinvertebrates and fish. These works resulted in the discharge of sediment into the Stream, which will have had chronic impacts on biota for hundreds of metres downstream.

[21] Brooke Zieltjes' Statement of Evidence at 9.

[35] The Judge also had before her, the evidence of Mr Deegan. She outlined his summary and conclusion in her sentencing decision as follows:[22]

> [34] Mr Deegan's summary and conclusion includes:
>
> > The stream channel that was altered by reclamation no longer provided any suitable permanent fish habitat as a result of the infilling of the Stream. The work likely resulted in the loss of all fish within that 278 metre stretch (as per the agreed summary of facts) of stream, by result of crushing from dirt and other substrates. … It is expected that anywhere from 200-600 non-juvenile fish were killed by the direct infilling of the Stream, although in terms of total fish life stages killed this could be a very conservative figure depending on the abundance of larvae or juvenile non-migratory bully species, or other species that spawn in the headwaters of streams, such as lamprey and shortjaw kokopu.
> >
> > … In my professional opinion, based on the sediment loading I have witnessed, I expect that there has been a significant displacement of fish from the Stream above the confluence as a result of the loss of habitat diversity. I also expect that the effects of prolonged exposure of fish to suspended sediment and deposited sediment reach beyond the confluence, although the level of effects is hard to quantify, and will be lower than that above the confluence due to the additional flows from Stream 2. The discharge of sediment has and likely continues to be causing damage to fish gills (and the subsequent increased risk of infection, disease, and predation for those fish), the changing of normal behaviours of resident fish (including migration away from the area and feeding activities), and the loss of food resources available to those fish (loss of macroinvertebrates displaced by sediment). Deposited sediments will also be smothering egg habitat for fish, and making it less available, resulting in the loss of eggs and increasing the competition for egg laying locations respectively.
> >
> > It is important to outline the long term effects of habitat loss from stream reclamations. In contrast to 'one off' contaminant discharge incidents where recruitment into an affected area can instantly begin when the water quality is below chronic and acute levels (in most cases), it can take years to thousands of years for the habitat values of reclaimed stream to become available either through anthropogenic intervention or natural processes. The implications of loss of habitat can extend for a significant period, and therefore, the effects can be cumulative over many generations for fish species. …
> >
> > Overall, I believe the earthworks and reclamation in the Stream has resulted in the significant loss of and loss of access to high quality habitat for a variety of fish species. The works have likely resulted in the deaths of a significant of fish over several species, some of which may have had a conservation status of at risk declining and possibly

[22] Sentencing decision, above n 2, at [34].

> nationally vulnerable, and that were also regionally significant species.

[36] There was ample evidence from the three experts called for the Council upon which the Judge could reach conclusions as to the significant detrimental effects caused by Diversion 1.

[37] In addition, the Judge had before her a cultural impact statement concerning the potential significant and long-lasting adverse effects of the diversion[23] on the culture and traditions of Pukerangiora and Te Atiawa.

[38] The Judge aptly concluded that the environmental and cultural effects of the offending were serious, putting it as follows:[24]

> [40] I accept the conclusions on environmental effects from the three report writers. The effects include loss of biodiversity, impacts on geomorphic and hydrological processes, increased erosion rates, pollution, habitat loss, displacement and killing of macroinvertebrates and fish, exposure of fish to sediments, and smothering of egg habitat for fish. I agree with the report writers that the effects are significant, cumulative and long-lasting. I am concerned with the effects on the relationship, culture and traditions of Pukerangiora and Te Atiawa. In all the circumstances I determine that the environmental and cultural effects of this offending are serious.

[39] As will be apparent I do not consider that the Judge made any errors in her assessment of the evidence. I am of the view that she evaluated the evidence correctly. The basis for the appeal was that the Judge was in error in her assessment of the environmental evidence. There was no argument otherwise directed at the level of the sentencing on the basis of her findings as to the significance of the environmental and other effects. In those circumstances, I am satisfied that she adopted an appropriate starting point. There was no specific criticism made of the deductions and uplifts applied. They were appropriate in the circumstances.

[40] Accordingly, the appeal is dismissed.

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[23] At [36].
[24] At [40].

Grice J

Solicitors:
Mooney & Webb, New Plymouth
Karenza de Silva, Auckland

Date 7 February 2023

Subject: **Dow Paritūtū Site, New Plymouth**

Approved by: AJ Matthews, Director - Environment Quality

S J Ruru, Chief Executive

Document: 3137330

Purpose

1. The purpose of this memorandum is to brief the Committee on the history and legacy of the Dow site at Paritūtū, provide an overview of the roles and responsibilities of key stakeholders in relation to current and future management, and outline the next steps for the site.

Executive summary

2. The Dow Paritūtū agrichemical manufacturing site occupies a 16 hectare land parcel located between Paritūtū Road and Centennial Drive in north-western New Plymouth. The site and associated operations have been of ongoing interest to the local community as a result of concerns raised around the potential environmental and human health impacts of activities carried out at the site over the past 60 years.
3. Ivon Watkins first commenced manufacturing agricultural chemicals at the Paritūtū site in 1960. Four years later, the Dow Chemical Company acquired a 50% stake in Ivon Watkins to create Ivon Watkins-Dow Ltd. Following a number of company changes, Corteva Agriscience NZ Ltd became the owner and operator of the Paritūtū site in 2019. The company announced the closure of the site the following year.
4. On 1 February 2023, Dow Chemical (NZ) Ltd assumed ownership of the site. Dow has committed to undertaking a full detailed site investigation and remedial works, as required. No future use of the site has been proposed at this stage. Future use will be the subject of further discussion with regulatory authorities, iwi/hapū and the community as the investigation evolves.
5. Two hapū and two iwi have an association with Paritūtū. It is a shared interest area between Taranaki Iwi and Te Atiawa; Ngāti Tairi Hapū (Taranaki) and Ngāti Te Whiti Hapū (Te Atiawa) have associations with the Dow Paritūtū site. It is understood urupā are located on the property, which was also a papakāinga (settlement) and a battle ground. The property sits within a broader cultural landscape of significance.

6. Iwi and hapū have a special relationship with Paritūtū, and have expressed a strong interest in being engaged in the investigation and remediation project, including ongoing direct communication with Dow.
7. The area is also of interest to the wider community, given its proximity to both a residential area of New Plymouth and to Back Beach, a popular recreation area.
8. Demolition of site infrastructure took place in late 2022. While no further manufacturing is to be undertaken, Dow continues to hold two resource consents for the Paritūtū site: one to discharge stormwater to the Herekawe Stream at Back Beach (expiring 2026) and another to discharge contaminants to air (expiring 2044).
9. The current compliance monitoring programme for the site, undertaken by Council, includes regular site inspections, odour surveys, biomonitoring of the Herekawe Stream, and an annual marine survey of the northern end of Back Beach. For more detailed information, copies of annual compliance monitoring reports can be found on the Council's website.
10. In November 2022, Dow and Corteva jointly announced the sale of the Paritūtū site to Dow. Site demolition to ground level was completed in December 2022. On 1 February 2023, Dow assumed full ownership and responsibility for the ongoing management of the site, with the intention of undertaking site investigations and the development of a remediation plan. Dow has its own remediation team, which has extensive international experience in contaminated site investigation and remediation. It has also secured New Zealand-based contaminated land experts from Tonkin+Taylor to assist with delivery of the project.
11. On 21 November 2022, Dow and Tonkin+Taylor presented a draft remediation roadmap to the regulatory authorities and iwi/hapū for discussion. This roadmap is still in draft, awaiting formal feedback from stakeholders. It sets out, at a high level, a plan to take the site from demolition through to ongoing use. Interim steps include undertaking sampling and testing, risk assessment, consenting and planning, to develop a remediation plan based on the test results and compliance with regulatory requirements.
12. The project is long-term and expected to take a number of years to complete. The geology and hydrogeology at the site are complex. A thorough and complete site investigation is essential to ascertain the level of contamination, where it is located and the mechanisms by which contamination can move around in the environment.
13. Early work involving planning and site investigations is likely to take between two and four years to complete. Site remediation will be guided by the findings of the earlier investigations, and will likely take a further two to four years to complete. These time frames are estimates only and will depend on the complexity of the site, the nature of any contamination, and available options to remediate the site.
14. Taranaki Regional Council (TRC) and New Plymouth District Council (NPDC) as the regulatory authorities, with iwi/hapū, will work alongside and in consultation with Dow throughout the life of the project. Dow has proposed that iwi/hapū and the wider community will have opportunities to have input into the development of remediation goals for the site as the project progresses.
15. Council officers will be seeking independent technical review of any work undertaken by Dow. Where possible, we will work alongside NPDC and iwi/hapū to undertake this work however, we also acknowledge the right of the parties to seek their own independent advice throughout the project.

16. Any independent technical advice commissioned by the Council will be sought and secured independently of Dow however, where appropriate, we will seek reimbursement to keep costs to the community to a minimum.

Recommendations

That the Taranaki Regional Council:

a) receives the memorandum entitled *Dow Paritūtū site, New Plymouth.*

b) notes the ongoing nature of the project, and the role and responsibilities of Council in regard to the investigation and remediation work programme proposed.

Background

17. The Dow Paritūtū agrichemical manufacturing site occupies a 16 hectare land parcel located between Paritūtū Road and Centennial Drive in north-western New Plymouth (Figure 1). Prior to the demolition works in 2022, the site comprised numerous process and storage buildings, an office and laboratory, a dedicated high temperature incinerator building, hazardous substances storage area, trade waste treatment plant, small tank farm, two stormwater retention ponds, and large grassed areas to the west and south.

Figure 1: Dow Paritūtū site, New Plymouth. The site boundary is indicated by the yellow line.

18. Demolition of the site in late 2022 involved the removal of all above ground structures, with the exception of the hazardous substance storage area and the stormwater retention systems. Concrete buildings that are integral to the retaining walls of the raised process area in the east of the site have also been left in place. Figure 2 below shows an aerial image of the site during demolition, taken around October 2022.

Figure 2: Aerial photograph of the Paritūtū site during demolition, around October 2022.

Site ownership and management

19. Ivon Watkins Ltd began formulating pesticides at their premises on Buller St, New Plymouth in 1941. After leasing land from the Taranaki Harbour Board and commissioning purpose-built facilities, Ivon Watkins commenced manufacturing agricultural chemicals at the Paritūtū site in 1960. Four years later, the Dow Chemical Company (a US multinational) acquired a 50% stake in Ivon Watkins to create Ivon Watkins-Dow Ltd (IWD).
20. The Paritūtū site was operated by IWD for 25 years until Dow purchased the remaining 50% stake in conjunction with Eli Lilly and Company (another US multinational) in 1989 to create DowElanco (NZ) Ltd. In 1997, Dow acquired the company outright and the following year rebranded it as Dow AgroSciences (NZ) Ltd.
21. In 1991, during the tenure of DowElanco, the Taranaki Harbour Board's land holdings were transferred to TRC, including the Paritūtū site. The Council owned the site and administered the lease for six years until Dow purchased the property in 1997. Concerns raised by TRC regarding potential contamination of the property led to DowElanco launching its Environmental Assessment Project (EAP) in 1992. This project culminated in the EAP Management Plan in 1997 for evaluation and protection of soil and groundwater at the site, which subsequently became the Groundwater Management Plan (GMP) in 2001. Dow continues to administer the GMP with sampling of dedicated monitoring wells undertaken annually.
22. Following the 2015 international merger of Dow and DuPont, the agricultural business was developed as an independent public company. Corteva Agriscience NZ Ltd became the owner and operator of the Paritūtū site in 2019 and announced its closure the

following year. All production and packaging activities were ceased by the end of 2021 and demolition of all above ground structures was completed by the close of 2022.

23. Dow Chemical (NZ) Ltd assumed ownership of the site on 1 February 2023. Dow has committed to a full detailed site investigation and to work with regulatory authorities, iwi/hapū and the wider community to undertake site investigations and develop a remediation plan. No future use of the site has been proposed at this stage.

Iwi and hapū interest in the site

24. The hapū and iwi of Taranaki largely identify land management practices as having a significant impact on soil quality and soil contamination. Each hapū and iwi promotes the use of sustainable methods to protect not only Papatūānuku but also all other areas of the environment, noting the cumulative effects of land management practices. Hapū and iwi have also identified soil contamination from chemicals as an issue of significant concern, particularly near kai gathering locations.

25. Two hapū and two iwi have an association with Paritūtū. It is a shared interest area between Taranaki Iwi and Te Atiawa; Ngāti Tairi Hapū (Taranaki) and Ngāti Te Whiti Hapū (Te Atiawa) have associations with the Dow Paritūtū site. It is understood urupā are located on the property, which was also a papakāinga (settlement) and a battle ground. The property sits within a broader cultural landscape of significance.

26. Mana whenua have a special relationship with Paritūtū and have expressed a strong interest in being engaged in the investigation and remediation project, including ongoing direct communication with Dow. Ngāti Te Whiti and Te Kotahitanga o Te Atiawa have had recent experience with collaboration on the Otūmaikuku (former Barrett Street Hospital) contaminated land work and would like to build on this model for the Paritūtū site.

27. Dow is to discuss resourcing for hapū and iwi and community involvement with the relevant groups, including the possibility of independent oversight of the project.

Overview of previous investigations

28. Historically, Dow has owned (and in some cases, continues to own) additional sites in the New Plymouth district. This includes the Waireka Research Station on Sutton Road, Omata, and the Ngahoro farm site on Beach Road near Paritūtū. During the 1970s, when such practices were commonplace, wastes from agrichemical production were disposed of at these sites under Health Department authority. Issues with seepage from the dumps was discovered in the early 1980s, prompting the remediation of the dumpsites and creation of the Waireka Secure Containment Facility to hold contaminated material and soils which could not be safely disposed of otherwise.

29. The Waireka facility still exists today under Dow ownership – along with the surrounding research farm – and is subject to an NPDC land use consent. Management of the facility includes a leak detection system, regular environmental monitoring and a five-yearly technical review of potential methods for treatment of the contaminated wastes. No such methods have so far been considered feasible for the large quantity of material held in the Waireka facility.

30. A number of environmental investigations have been undertaken over the years in response to community concerns around activities at the Paritūtū plant, particularly the manufacture of the compound 2,4,5-T and its dioxin by-products, and alleged agrichemical dumpsites. The first was a dioxin study of the Paritūtū area by the New Zealand Health Department in the mid-1980s, identified in a 2002 report by Pattle Delamore Partners Ltd (PDP). Further studies into dioxins in people and soil were

initiated by the Ministry of Health (MoH) and Ministry for the Environment (MfE), respectively, in the late 1990s.

31. In 2000, the Paritūtū Community Health Liaison Group was established as a forum to discuss the community's concerns about possible dioxin pollution from the Paritūtū site. It represented the Ratepayers' Association, the Paritūtū Residents Association, the Multiple Sclerosis Society, the Cancer Society, Ngāti Te Whiti hapū, the Dioxin Investigation Action Group, the Dioxin Investigation Network, the Dioxin Legal Action Group, NPDC and Taranaki Health.
32. After comprehensive consultation with the community and wide-ranging investigations, the Council published its final report on alleged agrichemical waste disposal sites in New Plymouth in 2001 (TRC, 2001). Potential disposal sites identified in consultation with the community were investigated, however no sites were found to present a risk to the environment.
33. The results of MfE's dioxins in soil investigation were published in 2002 (PDP, 2002). Although levels of dioxins were found to be elevated above background in parts of the Paritūtū area, they were below relevant guidelines and were determined not to present a risk to human health.
34. In 2005, the final blood serum dioxin study results were published by MoH (MoH, 2005). The Paritūtū Community Health Liaison Group was subsequently disbanded as members felt their concerns had been addressed.
35. The laying of stormwater pipes at the northern end of New Plymouth's Marfell Park in 2009 uncovered the remains of two crushed drums amongst other municipal waste. The drums contained a small amount of residue that was sampled by the Council and found to be chemicals formerly used for the manufacture of herbicides. To address community concerns that there may be dioxin and other contaminants within the landfill underlying the park, the Council engaged PDP to undertake a comprehensive investigation.
36. It was found that there was little evidence of man-made contamination of surface soils and all sampled locations presented minimal risk to the public. Overall, the park was deemed suitable for its current use (PDP, 2009).

Current consents and monitoring (including groundwater and stormwater)

37. Presently, there are two resource consents for the Paritūtū site: one to discharge stormwater to the Herekawe Stream at Back Beach (expiring 2026) and another to discharge contaminants to air (expiring 2044). These consents were transferred from Corteva Agriscience New Zealand Ltd to Dow Chemical (NZ) Ltd on 1 February 2023. Although the activities which required these permits are no longer undertaken, Dow has elected to retain both consents for the duration of the site investigation.
38. During the operation, decommissioning, cleaning and demolition of the site, all stormwater from the process areas was collected in the site retention ponds and tested for contaminants prior to release to the Herekawe Stream.
39. Prior to the removal of buildings from the site, all underground pipework was sealed and sumps were filled with concrete. Clean bunded areas, which previously drained to tradewaste while product was present, were hence discharging to the retention ponds. It is believed that this resulted in residual contaminants being entrained in the stormwater system causing a slight exceedance of the stringent discharge limits for total herbicides when the ponds were tested in July 2022.

40. Because the discharge of stormwater to the Herekawe Stream with even trace amounts of herbicides is not permitted, Corteva elected to irrigate the ponds to the large grassed areas of the site as permitted under Rule 29 of the Regional Freshwater Plan (RFP) which provides for the discharge of contaminants from industrial and trade premises onto or into land. No environmental effects are anticipated as a result of this activity as the contaminants present are intended for use on grass and pasture at much higher concentrations than what is present in the site stormwater.
41. Following this, and for the remainder of the demolition, all stormwater was irrigated to grassed areas of the site. It is our understanding that there have been no direct discharges to the Herekawe Stream since mid-2022. Dow has indicated that this approach to stormwater management will continue during the site investigation.
42. The current compliance monitoring programme for the Paritūtū site, undertaken by Council, includes site inspections, odour surveys, biomonitoring of the Herekawe Stream, and an annual marine survey of the northern end of Back Beach. Discharge monitoring will resume if the stormwater consent is exercised in the future.
43. Copies of Council's consent compliance monitoring reports for the site can be found on the Council's website under 'Corteva Agriscience New Zealand Ltd (Formerly Dow AgroSciences (NZ) Ltd)': https://www.trc.govt.nz/council/plans-and-reports/monitoring-reports/consent-compliance-monitoring-reports/industry/

Discussion

44. In November 2022, Dow and Corteva jointly announced the sale of the Paritūtū site to Dow. On 21 November both Dow and Corteva met with Council staff (NPDC and TRC), along with representatives of Te Atiawa and Taranaki Iwi to discuss the next steps for the site, and to seek feedback on a proposed work programme for investigation and possible remediation of the site. This programme is discussed later in this memorandum.
45. On 1 February 2023, Dow assumed ownership and responsibility for the ongoing management of the site.

Roles and responsibilities

46. The Council's primary function in relation to contaminated land is to investigate land within its region for the purposes of identifying and monitoring contaminated land. Territorial authorities have a more substantial function, being required to regulate the development and use of contaminated land to prevent and mitigate adverse effects.
47. In essence, regional councils have an identifying and monitoring function in relation to contaminated sites, following from their role as the principal regulator of discharges. In contrast, territorial authorities are required to regulate the development and use of contaminated land to prevent and mitigate adverse effects.
48. There is some overlap between regional council and territorial authority functions, and section 35 of the RMA places a general duty on all local authorities to gather information (including undertaking or commissioning research) and monitor the state of the environment in their region or district, as is necessary to carry out their functions effectively. Section 35 does not necessarily require regional councils to undertake work separately from the territorial authorities, if work undertaken in conjunction with that territorial authority is sufficient to meet its obligations under section 35 (and vice versa).
49. The Council may find it appropriate to instruct an external expert to review the data produced by Dow in its site investigation. Depending on the findings, it may also be

appropriate for the Council to undertake its own site analysis, pursuant to its investigative powers. In terms of the RMA provisions, the responsibility for overseeing the remedial action plan lies principally with NPDC.

50. Council officers will continue to work constructively with all parties to provide technical advice and guidance, and to ensure that any site investigation and/or remediation works are carried out appropriately.

Dow's draft remediation road map

51. Dow has multiple legacy sites around the world that require/have required remediation. Dow has an international remediation team with extensive experience, and has recently secured New Zealand-based contaminated land experts from Tonkin+Taylor to assist with delivery of the project.
52. On 21 November 2022, Dow presented a draft remediation roadmap to the regulatory authorities and mana whenua for discussion. This is currently awaiting formal feedback from stakeholders. The roadmap sets out, at a high level, a plan to take the site from demolition through to ensuring the suitability of the site for future use. Interim steps include undertaking a site investigation including sampling and testing, risk assessment, and any necessary consenting and planning, with a view to develop a remediation plan based on the test results and compliance with regulatory requirements.
53. The proposed roadmap sets out a number of steps, which are conceptually shown in Figure 3, and described further below.

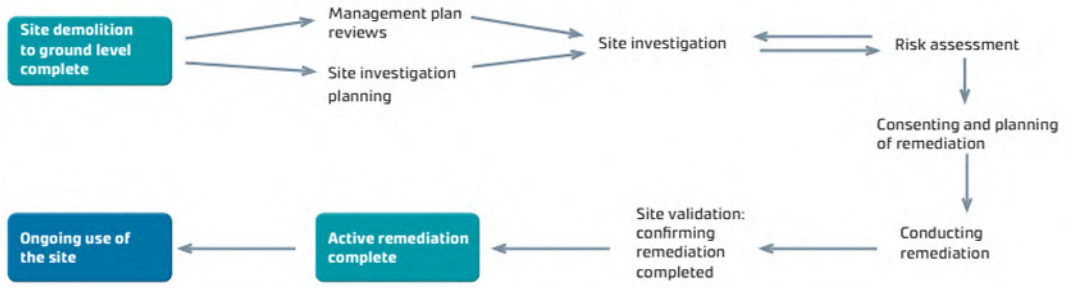

Figure 3: Conceptual framework for the remediation of the Dow Paritūtū site, as set out in the *Draft Remediation Road Map for Discussion – Overview* by Tonkin+Taylor.

54. **Phase 1: Site demolition to ground level**. Demolition was completed in December 2022.
55. **Phase 2(a): Review of existing management plans**. Likely duration: 3 - 6 months. During this phase, a review of the existing site plans (e.g. stormwater and groundwater management plans) is proposed to be undertaken in consultation with TRC, NPDC and iwi/hapū. The plans can then be updated to reflect the current demolished site status and submitted to TRC, NPDC and iwi/hapū for approval. Ongoing site management and monitoring would be undertaken in accordance with the plans.
56. **Phase 2(b): Site investigation planning**. Likely duration: 6 - 12 months. This phase involves a review of existing data to ensure that Dow has all documents relating to site activities and previous investigations undertaken by the Council. This also provides iwi/hapū with an opportunity to share their knowledge around the history and importance of the site. This phase is likely to include but not be limited to:

- Compiling historical information about the site use and potentially contaminating activities;
- Discussions with former employees about site activities;
- Updating the preliminary conceptual site model; and
- Identifying knowledge gaps that will require further investigation.

57. The input of iwi/hapū at this stage will also ensure that any proposed investigations and excavations within or near wāhi tapu sites are given particular focus, and/or avoided.
58. Once all historical data has been reviewed and data gaps identified, the site investigation can be planned. This is likely to involve soil and groundwater sampling, together with the preparation of a Sampling and Analysis Plan (SAP). Consents may be required for the installation of new groundwater monitoring wells and/or soil disturbance. Dow will prepare any necessary consent applications and submit to TRC and NPDC together with the SAP for approval, prior to any work commencing.
59. It is important to note that the geology and hydrogeology at the site are complex. It is the view of Council officers that a thorough and complete site investigation is essential to ascertain the level of contamination, where it is located and the mechanisms by which contamination can move around in the environment. This stage is critical in determining the suitability of the site for future use.
60. **Phase 3(a) and (b): Site investigation and risk assessment**. Likely duration depending on results: 6 -12 months. Soil and groundwater sampling and analysis would be undertaken in accordance with the agreed SAP and any relevant consent conditions. Site investigation results can then be reviewed and a risk assessment developed for the site to understand what impact any contamination may have on human health and the environment.
61. Phase 3 is expected to be an iterative process. If further investigation is required to provide a more complete understanding of the site risks, then it would be undertaken at this stage. Once the investigation is complete, the key findings can be communicated to the wider community.
62. **Phase 4: Consenting and planning phase**. Likely duration: 6-12 months. This stage determines the remediation goals for the site, taking into account the site investigation results. Dow has proposed that any remediation goals will be developed in discussion with TRC, NPDC, and iwi/hapū. The wider community will also have the opportunity at this stage to provide input into the remediation goals for the site.
63. In discussion with TRC and NPDC, Dow will determine the necessary consent requirements. Consents are likely to be required, however the exact nature of these will depend on the intended future use of the site, and the remediation methods proposed. Dow will then develop and submit the necessary consent documentation to each council, which will include Assessment of Environmental Effects, Contaminated Site Management Plan and Long-term Management Plan. Dow has indicated that iwi/hapū and the wider community will have the opportunity to provide input to the consent application, this would be in addition to any engagement Council would normally undertake as part of a consenting process.
64. **Phase 5**: Active remediation phase. Likely duration: 2-4 years. Once consent approval is granted, Dow will be in a position to implement its remediation action plan and undertake any site works in line with the approved consents. During this phase site inspections/ kaitiaki monitoring and supervision is expected to be undertaken by

regulatory authorities and iwi/hapū. Regular updates would be provided to the wider community during this phase.

65. **Phase 6: Site validation confirming remediation complete**. Duration is dependent on the site remediation goals. Once the remediation is complete, site validation can be undertaken. This involves further investigations and monitoring to confirm that the site remediation and management targets are achieved. During this phase site inspections/ kaitiaki monitoring and supervision would continue to be undertaken by the regulatory authorities and iwi/hapū.

66. Council officers will be seeking independent technical review of any work undertaken by Dow. Where possible, we will work alongside NPDC and iwi/hapū to undertake any technical peer review, but also acknowledge the right of these parties to seek their own independent technical advice throughout the project. Any independent advice will be sought and secured independently of Dow however where appropriate we will seek reimbursement of costs in line with Long-term Plan/Annual Plan charge out rates, to keep costs to the community to a minimum.

Financial considerations—LTP/Annual Plan

67. This memorandum and the associated recommendations are consistent with the Council's adopted Long-Term Plan however the work being undertaken on this project is new and not included within Long-term Plan estimates. Where possible, costs will be accommodated within existing budgets and recovered in line with current Council charge-out rates.

68. Any financial information included in this memorandum has been prepared in accordance with generally accepted accounting practice.

Policy considerations

69. This memorandum and the associated recommendations are consistent with the policy documents and positions adopted by this Council under various legislative frameworks including, but not restricted to, the *Local Government Act 2002*, the *Resource Management Act 1991* and the *Local Government Official Information and Meetings Act 1987*.

Iwi considerations

70. Taranaki Iwi and Te Atiawa, along with Ngāti Tairi Hapū (Taranaki) and Ngāti Te Whiti Hapū (Te Atiawa) have an interest in the Paritūtū site. Dow are currently seeking feedback from iwi/hapū around the proposed investigation and rehabilitation process.

71. This memorandum and the associated recommendations are consistent with the Council's policy for the development of Māori capacity to contribute to decision-making processes (schedule 10 of the Local Government Act 2002) as outlined in the adopted long-term plan and/or annual plan. Similarly, iwi involvement has been recognised in the preparation of this memorandum.

Community considerations

72. This memorandum and the associated recommendations have considered the views of the community, interested and affected parties and those views have been recognised in the preparation of this memorandum.

Legal considerations

73. This memorandum and the associated recommendations comply with the appropriate statutory requirements imposed upon the Council.

References

Document 1845358: Pattle Delamore Partners Ltd. 2002. *Dioxin Concentrations in Residential Soil, Paritūtū, New Plymouth*. PDP technical report, 26 Sept 2002.

Document 3141870: Ministry of Health. 2005. *A Study of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Exposures in Paritūtū, New Zealand*. MoH technical report, Feb 2005.

Document 2004382: Taranaki Regional Council. 2001. *Investigation of alleged agrichemical waste disposal sites in New Plymouth*. TRC Technical Report 2001-42, Aug 2001.

Document 3141871: Pattle Delamore Partners Ltd. 2009. *Marfell Park, New Plymouth, Environmental Investigation*. PDP technical report, Aug 2009.

Dioxin Concentrations in Residential Soil, Paritutu, New Plymouth

Prepared for
The Ministry for the Environment
and
The Institute of Environmental Science and Research Limited

26 September 2002

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Quality Control Sheet

TITLE	**Dioxin Concentrations In Residential Soil, Paritutu, New Plymouth**
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Graeme Proffitt

Limitations: This report has been prepared on the basis of visual observations, and the testing of 47 samples for 2,3,7,8-TCDD and full dioxin profiles. This information has been used to comment on the soil conditions, but these conditions cannot be guaranteed. The information applies to the times of sampling (28 May to 5 June 2002). With time the site conditions could change so that the reported assessment and conclusions are no longer valid.

The report has been prepared for the Ministry for the Environment and the Institute of Environmental Science and Research Limited, according to their instructions, for the particular objectives described in the report. Any reliance on this report by any other party shall be at such party's sole risk.

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Appendices:

Environment and Health Statement

Low Levels of Dioxin in Residential Soils at Paritutu in New Plymouth

- **Soils from residences at Paritutu contained less than thirty million millionths of a part of dioxin. The Ministry for the Environment and the Ministry of Health see the risk for current and future residents to be so low as to be negligible.**
- **No clean up of people's lawns, gardens or public use areas is necessary.**
- **This study is a comprehensive assessment of dioxin levels in soil, and no further study of this type is needed.**

Introduction

Pattle Delamore Partners Limited has released a report of a study of the levels of dioxin (more correctly 2,3,7,8-tetrachlorodibenzo-p-dioxin) in soil at residential properties in the New Plymouth suburb of Paritutu.

This Environment and Health Statement explains what the measurements mean for people living in the area.

Background to the study

There have been longstanding community issues with the history of dioxin emissions from the former Ivon Watkins-Dow, now Dow AgroSciences, chemical plant located in Paritutu. There was uncertainty over dioxin levels in the environment.

An initiative to measure the level of dioxin in residential soil was presented to community groups at a meeting of the Paritutu Community Health Liaison Group on 7 March 2002. This proposal received universal support from those present.

How the study was carried out

In February 2002, the Ministry for the Environment appointed the Institute of Environmental Science and Research Limited and Pattle Delamore Partners to carry out the soil study. During April and May, consultation was held with the community over how best to undertake the study. A study proposal was then prepared incorporating, as far as practicable, the views of the community expressed during this consultation. This included the collection of additional soil samples at specific locations identified by the Dioxin Investigation Network.

Sampling was carried out in the last week of May and the first week of June. Forty seven samples were collected from 35 residential properties and public areas. Samples were taken from lawns (at two different depths for some sites), gardens and open spaces. A representative from the Dioxin Investigation Network accompanied Pattle Delamore Partners for all but one of the sites sampled. A second set of samples were taken from each site and provided to the Dioxin Investigation Network.

Chemical analysis was carried out by AgriQuality New Zealand Limited, using a method approved by the United States Environmental Protection Agency for measuring dioxin in soil. Two samples were also analysed by Pace Analytical Services Inc., an independent laboratory in the United States, following discussions and agreement with the Dioxin Investigation Network.

What the study found

This comprehensive study found that there were detectable levels of dioxin in the soils at all sites investigated. The low levels measured mean that any risk to a person's health is negligible.

Concentrations tend to be highest close to the Dow AgroSciences plant, and drop off rapidly within 800 to 1000 metres from the plant. Concentrations to the east of the Dow plant, towards Mount Moturoa Domain, are higher than to the south of the plant. This is consistent with the prevailing winds in the area.

Dioxin was present in concentrations measured in nanograms per kilogram (ng/kg). One nanogram per kilogram means one gram of dioxin in every million tonnes of soil.

On residential properties nearest to the Dow plant, soil dioxin concentrations were typically in the range 5 to 15 ng/kg of soil, falling to a range of 1 to 5 ng/kg further out. One sample had a concentration of 27 ng/kg. There was 92 ng/kg measured at a non-residential site, on the west-facing slope of Mount Moturoa Domain.

Generally there was little difference between soil dioxin levels in lawn areas compared with gardens on the same property. Typically lawn areas tended to be marginally higher. Similarly, there was little difference in soil dioxin levels between surface soils (that is, between 0 and 7.5 cm deep) and soils sampled at a depth between 7.5 and 15 cm.

A summary of results for the 47 soil samples is shown in Figure 1.

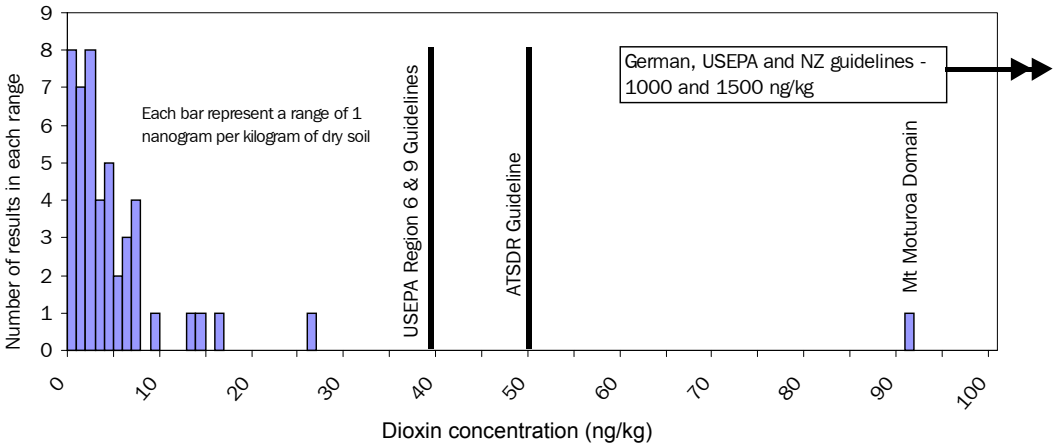

Figure 1. Soil dioxin concentrations, with New Zealand and international guidelines

This figure shows the number of soil samples that had dioxin concentrations within a certain range. For example, there were seven soil samples having a concentration within the range 1–2 ng/kg, and one soil sample having a concentration within the range 9–10 ng/kg. The black vertical lines represent the adjusted (see text) United States Environmental Protection Agency (USEPA) Region 6 and Region 9 guidelines, and the Agency for Toxic Substances and Disease Registry (ATSDR) guideline value for dioxin in residential soil. The guideline values from New Zealand, Germany and the federal United States Environmental Protection Agency are off the scale to the extreme right hand side.

A previous study by the Ministry for the Environment, published in 1998, did not find dioxin in urban soils in any other parts of the country. Although the current study of residential soils consistently measured low levels of dioxin in Paritutu, these levels are not considered to be a health concern.

Our assessment of the results

Guidelines designed to protect people's health from dioxin in residential soil have been developed in New Zealand, Germany, the United States, and in other countries.

In all cases, the levels of dioxin in residential soil in Paritutu are below the New Zealand and German criteria, and are below the guidelines set by the United States Environmental Protection Agency and the United States Agency for Toxic Substances and Disease Registry. These levels are also below guidelines set by local United States Environmental Protection Agency offices (when adjusted to account for differences in their method of derivation compared to the New Zealand guidelines), including those set by United States Environmental Protection Agency Region 6 and Region 9.

Consequently, the levels of dioxin measured in soil in residences at Paritutu are not considered to be a health concern.

The comparison of the dioxin levels measured in this study with these guidelines is illustrated in Figure 1.

The result for Mount Motorua Domain is above the “trigger” level of the United States Environmental Protection Agency (Region 6 and Region 9) and the United States Agency for Toxic Substances and Disease Registry guidelines. “Trigger” levels, if exceeded, trigger a more detailed assessment, rather than being a level at which health effects will occur. When the result for the Domain is considered in the context of how a person may be exposed to dioxin (for example, how long a person may spend on the Domain on any day), it is concluded that, at the level of dioxin measured in this study, there is a negligible health risk to recreational users of the Domain.

We can be confident with the results

There are several ways in which the quality of the data from this study can be measured. One way is to compare the results from the New Zealand laboratory with those obtained from the United States laboratory. Here we find that the levels of 2,3,7,8-TCDD measured by these two independent laboratories are very similar. This, and other quality assurance procedures that were implemented throughout the sampling and analytical work, tells us that we can be very confident about the quality of the information and the findings of this study.

Is health at risk and is a clean-up necessary?

The Ministry for the Environment and the Ministry of Health consider that the concentration of dioxin in the soil is so low that there is negligible health risk to current and future Paritutu residents.

Dioxin contaminated land can only present a health risk if there is actual exposure to the contaminant. People can be exposed by eating contaminated soil or foods (such as meat, milk or eggs) from animals raised on the contaminated land and, to a lesser extent, by eating homegrown vegetables, breathing in dust, and skin contact with contaminated soil. If exposure does occur, many factors, such as how much dioxin the person is exposed to and for how long, influence whether this actually affects health.

Given the study design and the consistency of the results, the Ministry for the Environment and the Ministry of Health believe that these soil results are representative of residential properties in Paritutu. Therefore, we consider that the risk to the health of current and future Paritutu residents from dioxin contaminated soil is negligible.

Because dioxin is very stable in the environment, levels measured now are considered to be an accurate reflection of historical levels when the Dow plant was manufacturing pesticides.

The community has many criteria for deciding if a clean up is required. If the levels of dioxin found in the soil are used as the yardstick, these levels do not indicate a requirement for clean up.

Do further studies need to be undertaken?

The current study covered a broad cross-section of residential properties in Paritutu. It is the single largest environmental study for dioxin of residential properties undertaken anywhere in New Zealand. We consider that this study provides comprehensive information on dioxin soil levels throughout Paritutu. The findings of this study support the results of earlier measurements of dioxin in residential soils in Paritutu, which have been made over the past decade. No further study of this type is warranted.

The Government continues to fund other studies on dioxin exposure and possible health effects in New Plymouth. A serum survey to determine the current amount of dioxin stored in the body of potentially highly exposed Paritutu residents is in the planning phases. Planning has taken longer than anticipated, but it is important that the methodology for this serum study is as robust as available information permit. Completion of the planning for the serum study has also been dependent on publication of the results of the Ministry for the Environment's soil study, so that these results can be used to assist in deciding how best the serum study should be carried out.

How to obtain more information

Further information on this study is available to all members of the public.

From libraries and councils: A copy of the Pattle Delamore Partners report and of this Environment and Health Statement has been provided to local libraries in Paritutu, and to the central New Plymouth library. In addition, a copy of the report has been provided to the Taranaki District Health Board's public health service, the New Plymouth District Council and the Taranaki Regional Council.

From the internet: A copy of the Pattle Delamore Partners report, the Environment and Health Statement and all other relevant documents (for example, the initial study design) are available from the Ministry for the Environment's web site at www.mfe.govt.nz.

If you seek further information, please write to:

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Executive Summary

Introduction

Agricultural chemicals, including the herbicide 2,4,5-trichlorphenoxyacetic acid (2,4,5-T), were historically manufactured in a plant, currently owned by Dow AgroSciences Ltd (Dow), located in the New Plymouth suburb of Paritutu. Dioxin, or more precisely 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), was a manufacturing contaminant of 2,4,5-T. 2,3,7,8-TCDD is recognised as a human carcinogen, and may cause a variety of other adverse health effects.

Concern has been expressed within the community that dioxin may be present in the soil within residential areas of Paritutu, as a result of air emissions from the Dow plant during the manufacture of 2,4,5-T, between 1960 and 1987. 2,3,7,8-TCDD is a very stable compound and could be expected to remain in the soil for many decades. Earlier soil studies have shown 2,3,7,8-TCDD in and around the plant, but a comprehensive survey of residential soils had not been carried out prior to this study.

Pattle Delamore Partners Limited (PDP) was engaged to carry out soil sampling and analysis for dioxin in residential areas of Paritutu, on behalf of the Ministry for the Environment (MfE). The objective of the work was to measure dioxin concentrations in residential properties close to the Dow plant, establishing soil concentrations both laterally and with distance from the plant. The assumptions of the study were that:

- The former IWD plant was the principal source of 2,3,7,8-TCDD present in the soil in the area.
- Contamination occurred via discharges to air with subsequent deposition over the residential neighbourhood.

This report sets out the background to the study, describes the study design, sampling protocols and fieldwork, and presents the concentrations of dioxins measured. The results are compared with previous soil sampling carried out in the area, with studies elsewhere in New Zealand, and with New Zealand and overseas guidelines for 2,3,7,8-TCDD in soil.

Community Consultation

Community consultation was an important part of this study. During the preparation of the study design, the Paritutu Community Health Liaison Group was consulted, and a draft version of the study design was provided to local action groups and central and local government agencies. The Dioxin Investigation Network (DIN) was consulted at key stages of the laboratory analysis programme.

Property owners and/or occupiers were approached individually to obtain information about their property, to explain the sampling and obtain their consent.

Property occupiers and owners received a copy of their individual results prior to the release of this report. Simultaneous with the release of this report a further letter drop

was made to all Paritutu residents, providing a summary of findings and a copy of the Environment and Health statement (also bound into this report), jointly prepared by the Ministry for the Environment and the Ministry of Health. Copies of the report have been deposited in public libraries in the area.

Study Design and Sampling

The study focused on residential properties to the east and south of the Dow plant, but a small number of residential properties to the north-east of the factory were also sampled. The study design considered areas of likely maximum dioxin deposition through a review of meteorological data, topography, age and location of residential areas and results of the earlier soil investigations. However, given the considerable community interest in Paritutu, it was important that the study considered not just the likely areas of maximum deposition, but also the broader residential areas around the plant.

The primary study area is the arc of residential properties running from Maui Place and Rangitake Drive to the south-west of the Dow plant, to the residential properties in Findlay and Catherine streets and Ngamotu Road, adjacent to the industrial land to the east. A limited number of samples were taken from residential areas up to 2.5 km in the predominant downwind (eastward) direction, and from within or close to four residential, or former, residential properties within the industrial area close to the plant.

The study was to measure 2,3,7,8-TCDD concentration trends within surface soil (defined as 0 – 75mm) within the residential area. It was recognised that there could be local variations arising from particular wind conditions or topography, but it was not the intention of the study to establish the fine detail of localised concentration “highs” or “lows”. Secondary aims were to determine the 2,3,7,8-TCDD concentration within a further depth increment (75 – 100 mm) immediately below the surface sample locations, in selected properties, and also 2,3,7,8-TCDD concentrations in soil from a number of gardens.

The sampling was carried out on a curved grid, centred about the Dow plant. Sites were selected as close as possible to each pre-defined grid point based on:

- The occupant having lived there for as long as possible, preferably since 1960;
- Sampling soil that had not been disturbed since the Dow plant was established (lawn areas were considered the best targets);
- Sample locations were away from obstructions (buildings, high fences, large trees);
- Wood that may have been treated with pentachlorophenol (PCP) was avoided, because dioxin is known to be associated with PCP chemicals;
- The sampling area was large enough to allow a number of sub-samples to be taken.

The fieldwork was carried out in late May and early June 2002, with a total of 35 sites sampled. From these, 35 surface-soil samples, six deeper samples and six garden samples were collected. Both the deeper and garden samples were collected from sites distributed across the study area. The sampling was carried out in accordance with

rigorous sampling protocols to avoid any possibility of contamination between samples. Samples were collected as composites of six soil cores from each site to ensure they were representative of the site. A DIN representative observed the sampling and was provided with a duplicate set of samples, to store or analyse as they saw fit.

Laboratory analysis was carried out in accordance with the United States Environmental Protection Agency (USEPA) Method 1613, by AgriQuality New Zealand Limited, Lower Hutt. A total of 47 soil samples were analysed for 2,3,7,8-TCDD from the 35 sites. Eight of these samples, distributed across the study area, were analysed for full dioxin profiles, including the sample with the maximum concentration of 2,3,7,8-TCDD. The full profiles allowed the calculation of toxic equivalents (TEQ), a method of representing the toxicity of the dioxin congener mixture relative to 2,3,7,8-TCDD. Two samples were selected for independent analysis for 2,3,7,8-TCDD by Pace Analytical Services Inc., Minneapolis, USA, for confirmatory analysis. The results of the independent verification were excellent.

Dioxin Concentration Results

Surface Soil Samples

2,3,7,8-TCDD was detected in all 35 surface soil samples at concentrations ranging from 0.71 to 92 ng/kg (parts per trillion). The majority (31 out of 35) had 2,3,7,8-TCDD concentrations less than 10 ng/kg and 23 results were less than 5 ng/kg. TEQ concentrations for the eight full profiles ranged from 2.6 to 79 ng/kg. The TEQ value calculated from the congener profile is dominated by the 2,3,7,8-TCDD concentration.

The eight full dioxin profiles showed a close similarity with profiles obtained in earlier MfE soil studies of other urban areas in New Zealand, except for the presence of 2,3,7,8-TCDD in the current study. 2,3,7,8-TCDD was not detected in any of the 22 MfE urban soil samples from other centres, but was detected in the two New Plymouth samples. The dioxin profiles from this study and the two early New Plymouth samples (and Paritutu) results are typical of other towns and cities in New Zealand except there is an “overlay” of 2,3,7,8-TCDD and to a lesser extent 1,2,3,7,8-pentachlorodinenzo-p-dioxin.

The spatial distribution of 2,3,7,8-TCDD in surface soils reflects the prevailing wind direction, from the west, and the topography. Concentrations to the east of the Dow plant, towards and beyond Mount Moturoa, are higher than to the south of the plant. In addition, land that slopes towards the plant, in particular Mount Moturoa, shows higher concentrations relative to flat or away-sloping areas. The steep-sided valley running between Ngamotu and Pioneer roads shows distinctly lower concentrations. Concentrations are higher at the plant boundary and drop off rapidly within 800 – 1000 m from the plant. To the east, 2,3,7,8-TCDD can still be detected 2.5 km from the plant.

Deeper Samples

The concentration of 2,3,7,8-TCDD in deeper samples (75 – 150 mm) ranged from 0.71 to 17 ng/kg. There is a good relationship between the surface and corresponding deeper samples, with the 2,3,7,8-TCDD concentration in the deeper samples being about 70% of the surface samples. A rapid drop-off in TCDD concentration with depth is expected, as TCDD binds very strongly to soil and has a low solubility. However, the results indicate vertical migration has occurred to at least 150 mm. The extent of deeper migration is not clear from this study.

Garden Samples

Concentrations of 2,3,7,8-TCDD in six soil samples taken from gardens ranged from 2 to 7.3 ng/kg. The garden samples also show a good relationship with the corresponding surface samples, with one exception, averaging approximately 80% of the corresponding lawn-soil samples. The garden soil concentrations are higher than would be expected to result from garden cultivation mixing in deeper “clean” soil. Possible factors include:

- Soil mixing has been relatively shallow, perhaps less than 200 mm.
- 2,3,7,8-TCDD has reached deeper in the soil column than expected.
- Deposition of 2,3,7,8-TCDD onto lawns has been added to gardens as grass clippings, either directly or as compost.

Comparison with Previous Paritutu Studies

A number of less extensive studies have previously been carried out in Paritutu. Comparing the results of the earlier studies with the current studies is problematic, because of uncertainties in sampling techniques, locations and basis for reporting, and differences in analytical techniques. However, sampling carried out by Taranaki Regional Council in 2001 and by MfE in 1996 appears to be consistent with the current study. Two samples analysed on behalf of a community group in 2001 are within the range of concentrations measured in this study, although the precise locations of these samples are not known.

Making comparison with samples taken in 1985 and 1986, by Dow and the then Department of Health is of uncertain validity, because of the uncertainties associated with these data. Overall, samples from residential areas are the same order of magnitude as the current study, but some results are higher than the current study.

While the earlier studies provide additional confidence in the results of the current study, they do not allow a definitive assessment of whether residents may, in the past, have been exposed to higher average concentrations. However, based on a half life for 2,3,7,8-TCDD of the order of 25 – 100 years for soil below the top few millimetres, it is not expected that soil concentrations in residential areas would have been markedly higher than those currently measured.

Comparison with International Guidelines

A variety of international soil criteria have been developed against which the results of this study may be compared. In this study, guidelines for a soil in residential areas from New Zealand (1,500 ng TEQ/kg), Germany (1000 ng TEQ/kg) and three different guidelines from the United States have been used. The most conservative criteria are from the United States; 39 ng /kg (2,3,7,8-TCDD) derived from guidelines issued by the Region 6 and Region 9 offices of the USEPA and 50 ng TEQ/kg by the United Sates Agency for Toxic Substances and Disease Registry (ATSDR). These US criteria are "screening levels" which if exceeded trigger further investigation at a site. Exceeding a screening level does not immediately imply there is a health risk. Any risk will be relative to the exposure assumed in the derivation of the guideline and the exposure likely in the actual situation.

All but one of the results for the samples collected fell within the most conservative residential guidelines used for comparison in this study (the USEPA Region 6 and 9 and ATSDR screening levels). All values fell within the higher New Zealand and German criteria by large margins. The single result that fell outside the USEPA Region 6 and 9, and ATSDR values, is the 2,3,7,8-TCDD concentration of 92 ng/kg in the sample collected from the west-facing slope of Mount Moturoa Domain.

It is concluded that residential properties of Paritutu, with the possible exception of a few properties backing onto the north-west slopes of Mount Moturoa, will have 2,3,7,8-TCDD soil concentrations (and TEQ values) less than the most conservative of the international risk-based residential guidelines currently in force. This is on the assumption that soil concentrations will not be markedly different between sample locations.

Within Mount Moturoa Domain, and on the north-west slopes of Mount Moturoa, 2,3,7,8-TCDD concentrations could be between about 20 and 90 ng/kg. Concentrations will be lowest on the lower slopes. Considering the likely exposure of recreational users of the Domain, a screening level of at least an order of magnitude greater than the residential guideline is considered appropriate. Similarly, the standard residential guideline is not appropriate for the high-density residential properties on the north-west side of Mount Moturoa, given the amount of paving on these properties. A screening level of at least twice the residential value is appropriate.

Conclusion

The results demonstrate that 2,3,7,8-TCDD is present at detectable but generally low concentrations in surface soil over the complete study area. The soil concentrations generally reflect distance from the Dow plant and the prevailing wind directions, with some variation apparent as a result of the topography. Comparatively higher concentrations were found on and around Mount Moturoa, immediately to the east of the Dow plant.

All soil sample results were below the New Zealand soil guideline for 2,3,7,8-TCDD, and with one exception, complied with all risk-based international guidelines. The exception,

in Mount Moturoa Domain, is considered acceptable for the expected recreational use of that land. The results indicate further investigation of soil in residential areas of Paritutu is not warranted.

Previous studies have not found 2,3,7,8-TCDD in other urban areas elsewhere in New Zealand. The profile of dioxin contamination in Paritutu, and in particular the detection of 2,3,7,8-TCDD, is consistent with the nature of contamination associated with 2,4,5-T production. The findings of this study corroborate earlier investigations of the Dow plant being the source of 2,3,7,8-TCDD in the area.

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Taranaki Regional Council (Brian Calkin and Gary Bedford) assisted with the site selection process by carrying out preliminary site inspections and interviewing owners. New Plymouth District Council (René Laan) assisted with providing aerial photographs and mapping information.

Initial drafts of this report were provided to the Ministry for the Environment, the Institute of Environmental Science and Research, Ministry of Health, Taranaki District Health Board and Taranaki Regional Council. Their assistance is also acknowledged.

The contributions of the various community groups is acknowledged, in particular the members of the Paritutu Community Health Liaison Group, Andrew Gibbs of the Dioxin Investigation Network and Paddy Burt of the Dioxin Action Group.

Finally, the assistance of the individual property owners and occupiers is acknowledged. This study would not have been possible without the information they provided about their properties and their co-operation during the sampling. The permission of the majority to publish the results with their properties identified is particularly appreciated.

1.0 Introduction

Agricultural chemicals have been historically manufactured in a plant, currently owned by Dow AgroSciences Ltd, located in the Paritutu area of New Plymouth. Products manufactured at the plant included the phenoxy herbicide 2,4,5 trichlorophenoxyacetic acid (2,4,5-T). Dioxins[2] (in particular 2,3,7,8-tetrachlorodibenzo-p-dioxin or 2,3,7,8-TCDD) were a manufacturing contaminant of 2,4,5-T. 2,3,7,8-TCDD is recognised as a human carcinogen, and may cause a variety of other adverse health effects, including effects on the immune system, reproduction and development (Smith and Lopipero, 2001).

Some people within the New Plymouth community, and in particular those living in the suburb of Paritutu, have expressed concern that dioxin may be present in the soils in the area. Pattle Delamore Partners Limited (PDP) has been engaged to carry out soil sampling and analysis for dioxin from residential properties in Paritutu, on behalf of the Ministry for the Environment. This work is part of wider government activity on dioxins, both in New Plymouth and nationally. The Institute of Environmental Science and Research (ESR) are managing the project, in conjunction with other government studies.

The objective of the work, as set out in the study brief (appended to the Study Design and Sampling Protocol, PDP 2002) was to:

> *Measure dioxin concentrations in residential properties close to the Dow AgroSciences (formerly Ivon Watkins-Dow [IWD]) site in Paritutu, New Plymouth, establishing soil concentrations both laterally and with distance from the factory source.*

The study was carried out in such a manner that the findings could contribute to subsequent studies for:

i) the identification of individuals who may have been maximally exposed to dioxins when resident in New Plymouth, and

ii) the assessment of human health risks to the population from exposure to dioxin.

The assumption is that long-stay residents, or residents in the area during the period of 2,4,5-T manufacturing at the Dow plant, will have been exposed to higher levels of dioxin in the soil, derived from emissions and discharges from the plant, than short-stay or more recent residents. However, it is not the intent of this study to undertake a health risk assessment, or to identify actual maximally exposed individuals. It was also not the intent of the study to establish the exact source or period of discharges from the plant.

The study is intended to integrate with a study to measure dioxin in blood serum being carried out by ESR on behalf of the Ministry of Health. This study, described in Baker

[2] The collective term for polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). 2,3,7,8-TCDD is also commonly referred to as dioxin.

et al., (2002, in prep.), is intended to identify a group of long-term, most likely highly exposed, Paritutu residents, obtain blood serum samples and compare the dioxin levels in the blood fats with a New Zealand population group from an earlier Ministry for the Environment study (Buckland *et al*., 2001).

This report sets out the background to the current study, describes the study design, sampling protocols and fieldwork, and then presents the concentrations of dioxins measured. The results are compared with previous sampling carried out in the area, with studies elsewhere in New Zealand and with New Zealand and overseas guidelines for 2,3,7,8-TCDD in soil.

2.0 Background

2.1 Structure and Properties of PCDDs and PCDFs

A description of the structure and properties of PCDDs and PCDFs is contained in Appendix A. Appendix A has been compiled from a number of MfE reports (Buckland *et al.*, 2001, Buckland *et al.*, 1998, Smith and Lopipero, 2001). A summary is given below.

2.1.1 Structure and Toxicity

PCDDs and PCDFs are two groups of chlorinated aromatic[3] compounds. Both groups of chemicals may have up to eight chlorine atoms attached. Each individual compound is referred to as a congener, with each specific congener identified by the number and position of chlorine atoms around the aromatic nucleus. There are 75 possible PCDD congeners and 135 possible PCDF congeners. Groups of congeners with the same number of chlorine atoms are known as homologues.

Most PCDD and PCDF congeners are thought to be of no toxicological significance, however, the 17 congeners with chlorine atoms substituted in the 2,3,7,8-positions are thought to pose a risk to human and environmental health. Of the 17 congeners, the most toxic, and widely studied, is 2,3,7,8-TCDD.

2.1.2 Toxic Equivalents

PCDDs and PCDFs occur as complex mixtures of congeners in the environment. To represent the toxicity of a mixture as a single number, a system of toxic equivalents (TEQs) has been developed, based on a set of weighting factors, each of which expresses the toxicity of a particular congener in terms of an equivalent amount of 2,3,7,8-TCDD.

Multiplication of the concentration of a PCDD or PCDF congener by its toxic equivalency factor (TEF) gives an equivalent 2,3,7,8-TCDD TEQ concentration. The toxicity of a mixture of PCDDs and PCDFs is then derived by summing the individual TEQ concentrations to obtain the 'Total TEQ' for the mixture. This approach assigns a TEF to each of the 17 toxic 2,3,7,8- PCDDs and PCDFs. The remaining non-2,3,7,8-chlorinated congeners are considered biologically inactive and are assigned a TEF of zero.

The latest internationally accepted TEFs for the PCDDs and PCDFs, as agreed at a 1997 World Health Organization (WHO) consultation (Van den Berg *et al.*, 1998), are shown in Appendix A. Earlier TEF schemes for the PCDDs and PCDFs, such as the international TEQ scheme (I-TEQ) (Ahlborg, 1989; Kutz *et al.*, 1990), have been widely used to assess the combined toxicity of these compounds.

[3] Aromatic compounds contain one or more benzene molecules, which consist of six carbon atoms arranged in a hexagonal ring. PCDDs and PCDFs both have two benzene rings connected by oxygen atoms.

The WHO-TEF values are used to calculate TEQ values in this study (i.e. WHO-TEQs, henceforth referred to simply as TEQs). As will be seen later, given the dominance of the 2,3,7,8-TCDD congener in the dioxin contamination of 2,4,5-T, these values are little different from the previously widely used International-TEQ (I-TEQ) values, and for the purposes of this study the two schemes are effectively interchangeable.

2.1.3 Sources

PCDDs and PCDFs are not produced intentionally, but are released to the environment from a variety of industrial discharges, combustion processes and as a result of their occurrence as unwanted by-products in various chlorinated chemical formulations. Historically, the manufacture and use of chlorinated aromatic chemicals have been major sources of PCDDs and PCDFs in the environment. Notable examples include the wood preservative and biocide pentachlorophenol (PCP) and 2,4,5-T.

Combustion processes are a particularly important source of PCDDs and PCDFs. Most thermal reactions involving the burning of chlorinated organic or inorganic compounds appear to result in the formation of these substances. PCDDs and PCDFs have been detected in emissions from the incineration of various types of wastes, from the production of iron and steel and other metals, from fossil fuel plants, domestic coal and wood fires, backyard burning, and from automobile engines as well as from accidental fires.

2.1.4 Physical and Chemical Properties and Environmental Fate

In general, PCDDs and PCDFs have low water solubility, high octanol-water partition coefficients[4] and low vapour pressure, and are resistant to chemical degradation under normal environmental conditions. These properties mean that they are extremely persistent in the environment, and their highly lipophilic[5] nature results in bio-concentration into biota and biomagnification through the food chain.

In soil, sediment, water and (to a lesser extent) ambient air, PCDDs and PCDFs are primarily associated with particulate and organic matter. Once adsorbed to particulate matter, PCDDs and PCDFs exhibit little potential for significant leaching or volatilisation. PCDDs and PCDFs are extremely stable compounds with environmental persistence measured in decades.

The only environmentally significant transformation process in soil is photodegradation[6] at the soil–air interface (ground surface). Although some volatilisation of PCDDs and PCDFs on soil does occur, the predominant fate of these chemicals adsorbed to soil is to remain in place near the surface of undisturbed soil, or to move to water bodies with soil erosion.

[4] Measure of affinity to be absorbed to organic material
[5] Fat-loving – tendency to dissolve into and remain in (body) fat
[6] Destruction by the effects of sunlight

The wind erosion of surface-soil may also lead to the re-suspension of particle-bound PCDDs and PCDFs into the atmosphere.

2.2 The Dow Plant

The former Ivon Watkins Ltd (later Ivon Watkins-Dow (IWD), now Dow AgroSciences (NZ) Ltd) agricultural chemical manufacturing and formulating plant was established on its current Paritutu site in 1960. The plant manufactured a number of chemicals, including the selective herbicide 2,4,5-T. 2,4,5-T was once widely used for control of woody weeds such as gorse. The manufacture of 2,4,5-T in New Zealand ceased in 1987, although some stocks remained that were likely to have been used after this date.

At the time the plant was built on the Paritutu site (having moved from a site in Buller Street in central New Plymouth) the surrounding area was largely sand dunes and rural land. The area has subsequently been developed, with residential areas now to the south and south east of the site (Photograph 1, Figure 1).

A key intermediate in the manufacture of 2,4,5-T was trichlorophenol (TCP). Formation of 2,3,7,8-TCDD occurred during the TCP manufacturing process and remained as a contaminant in 2,4,5-T. No additional TCDD[7] is produced in the 2,4,5-T manufacturing process in the phenoxy plant. Until 1969 IWD used imported TCP, but from 1969 sodium trichlorophenate (Na-TCP) was manufactured on the Paritutu site (Pilgrim, 1986). During the first eight years of manufacturing Na-TCP, a xylene and trichloroanisole waste stream was significantly contaminated with 2,3,7,8-TCDD. This waste was initially stored, but was subsequently incinerated on site between late 1975 and April 1979.

Photograph 1: Panoramic view of sample area from Paritutu, overlooking the Dow plant and residential areas beyond

[7] Where the context is clear, TCDD is used interchangeably with 2,3,7,8-TCDD in this report.

Figure 1: Location of study area

Modifications to the TCP production process in 1977 significantly reduced the production of 2,3,7,8-TCDD and eliminated the xylene/trichloroanisole waste stream. While 2,3,7,8-TCDD was still produced in the TCP process, from 1982 this was further reduced, using an improved solvent (xylene) extraction/purification. The resultant contaminated xylene was then recovered by distillation, with the residues being incinerated. Manufacturing of 2,4,5-T ceased at the Paritutu plant in late 1987.

The liquid waste incinerator was established in 1975 and operated for 3½ years. Pilgrim (1986) calculated an overall destruction efficiency of TCDD for the period 1975 to 1979 of better than 99.98%. The incinerator was not used between 1979 and 1985, but with the commissioning of the solvent distillation unit in the phenoxy plant in 1982, the incinerator was again used to destroy accumulated distillation residues in 1985 and 1988 (Pilgrim *et al.*, 1990). The liquid waste incinerator is no longer in operation and has been removed.

A solid waste incinerator was established in 1981 for destroying an accumulated backlog of chemical wastes and chemically contaminated packaging. This incinerator is still in use[8]. Monitoring of dioxin emissions from the solid waste incinerator suggest negligible amounts are being emitted (Pilgrim *et al.*, 1990; G Bedford, TRC, 2002, pers comm.).

It is presumed that 2,3,7,8-TCDD (and possibly other PCDDs and PCDFs) has been released into the atmosphere to varying degrees as fugitive emissions from the TCP and phenoxy herbicide processes, from plant ventilation stacks and from the burning of liquid and solid wastes in the two incinerators on the site. It is further assumed that the majority of 2,3,7,8-TCDD emissions occurred over the period of TCP use (and later production) and 2,4,5-T production, from 1960 until 1987.

During the time 2,4,5-T was manufactured, a number of changes occurred in processes at the plant and in regulatory requirements, with distinct reductions in 2,3,7,8-TCDD contamination in the TCP and also in the 2,4,5-T produced. Fugitive emission of 2,3,7,8-TCDD (whether from the TCP process or the phenoxy plant) presumably also reduced to reflect these changes.

Chemical release incidents have also occurred at the plant. At least two incidents are known. These were an explosion in the 4-(4-chloro-2-methylphenoxy) butanoic acid (MCPB) plant in November 1972 and a venting accident in the TCP plant in April 1986. The latter incident is known to have released TCDD (Pilgrim, 1986), but there is no information as to whether the earlier incident did. Dioxin is not a manufacturing contaminant of MCPB.

2.3 Previous Soil Studies

Over the years there have been a number of investigations into the manufacture of 2,4,5-T in New Plymouth and potential impacts on the local community and environment.

[8] In later years this incinerator was modified to allow it to incinerate waste sludges.

These include a ministerial committee of inquiry (Brinkman *et al.*, 1986, 1987) and a report into the use of 2,4,5-T in New Zealand (Coster *et al.*, 1986). More recently, the TRC have investigated alleged incidents of waste disposal (TRC, 2001) and the local Medical Officer of Health has investigated rates of illness, including cancers and birth defects (O'Connor, 2001, 2002).

A summary of soil dioxin concentrations from previous studies in Paritutu is included in Appendix B. Sampling has been carried out on five occasions. They are:

- A study carried out on 17 April 1985 by the Regional Air Pollution Group, Department of Health (Pilgrim, 1986);
- Two sets of soil samples taken in April 1986 by the Department of Health following the TCP accident (Pilgrim, 1986);
- Samples collected in New Plymouth in 1996 as part of the MfE national environmental survey (Buckland *et al*, 1998);
- Investigation of alleged dump sites carried out by the Taranaki Regional Council in 2001 (TRC, 2001);
- Sampling carried out on behalf of the Community Residents Action Group in 2001 by Kingett Mitchell and Associates (The Daily News, 2001).

These studies are of variable quality. It is not clear from the reports of some of the early studies whether the results given are total TCDD or 2,3,7,8-TCDD, and it is also not clear whether reporting is wet or dry weight. It would be normal to report dry weights. Also, some of the 1985 and 1986 sample locations are rather vague, being shown as large crosses or areas over which composites were taken on sampling diagrams accompanying the results. This makes it difficult to compare these results with the specific locations of this study. Finally, detection limits for the early results were rather high, typically 20 – 30 ng/kg [9], which considerably reduces their usefulness in comparing with the current study.

The sample locations for the sampling carried out by Kingett Mitchell and Associates are also not known, nor, with any certainty, whether the results are 2,3,7,8-TCDD or TEQ values. The results are only known through a newspaper article and have not been formally released. Attempts to obtain the full results have been unsuccessful. In the absence of specific information, this study is of limited value to the current investigation, with the two quoted results only useful for comparison in a general way.

[9] ng/kg = nanogram per kilogram, or one part per trillion. A nanogram is one billionth of a gram. To give a sense of scale, a part per trillion is equivalent to a teaspoonful distributed through 5,000,000 m^3 of soil, which is the same as a teaspoon within the top 1 metre of soil over a thousand rugby fields, each 100 m x 50 m.

3.0 Study Design and Site Investigation

3.1 Study Design

The detail of the study design is set out in Appendix C, which is in turn based on the Study Design and Sampling Protocol prepared for the investigation (PDP, 2002).

The study brief required the basic target of the study to be 2,3,7,8-TCDD, and assumed that its presence would be an indication of escape from the manufacturing process, whether through fugitive emissions, the 1986 incident or release of TCDD from the incineration of waste (this release may be from breakthrough of TCDD contaminated waste or from TCDD formation and release during incineration). The study design was therefore based on the assumptions that:

1. The former IWD plant was the principal source of 2,3,7,8-TCDD present in the soil in the area;
2. Contamination occurred via discharges to air with subsequent deposition over the residential neighbourhood, and
3. Sampling was to be focused on residential properties, specifically, properties to the east and south of the factory. The industrial or reserve land to the north or west of the factory were not to be sampled unless residential properties were identified within the industrial areas, in which case sampling of those properties would be considered.

The intent of the study was to measure general 2,3,7,8-TCDD concentration trends within surface soil (defined as 0 – 75mm) within the residential area. The general expectation was for a trend of decreasing concentration further from the site, and higher concentrations to the east of the site than to the south as a result of the prevailing wind direction. It was recognised that there could also be local concentration variations as a result of particular wind conditions or topographic variations. However, it was not the intention of the study to establish the fine detail of localised concentration “highs” or “lows”, which would have required a much higher density of sampling. In addition, high-concentration “hotspots” from aerial discharge and deposition over particular small areas were not expected, and there was no information to suggest that particular locations should be targeted.

Secondary aims were to determine 2,3,7,8-TCDD concentrations within a further depth increment (75 – 100 mm) immediately below the surface sample locations in selected properties and also 2,3,7,8-TCDD concentrations in soil from a number of vegetable gardens within properties from which surface soil samples had been taken. Both the deeper and garden samples were to be collected from sites distributed about the study area. A further aim was to examine the relationship between 2,3,7,8-TCDD and the full dioxin profile, by analysing some samples for the full profile.

The study design considered areas of likely maximum deposition through a review of meteorological data, topography, age and location of residential areas and results of the

earlier dioxin soil investigations. However, given the considerable community interest in Paritutu, it was important that the study considered not just the likely areas of maximum dioxin deposition, but also the broader residential areas around the plant.

The primary study area was defined as the arc of residential properties running from Maui Place and Rangitake Drive to the south-west of the Dow plant, to the residential properties in Findlay and Catherine streets and Ngamotu Road, adjacent to the industrial land to the east (Figure 1). In addition, following community consultation, it was decided to take samples from residential areas up to 2.5 km in the predominant downwind directions, and from within or close to any residential land to the north or north east of the plant.

In developing the study design, no attempt was made to calculate dioxin emission rates or to differentiate between the various sources over time. It was considered that the current dioxin concentration in soil would represent the majority of the dioxin deposited over the period of manufacture, given its slow degradation in soil (half-life of 25 – 100 years (Paustenbach *et al.*, 1992, as reported in Buckland *et al.*, 2000)). Further, it was assumed that the measured concentrations would be typical of concentrations that occupants may have been exposed to over at least the last 15 years, since 2,4,5-T manufacturing stopped at the plant.

3.2 Site Selection

It was decided to sample on a curved grid (Figure 2). The detail of the grid design is given in Appendix C. Sites were then selected as close as possible to each grid point based on a set of selection criteria;

- The occupant had lived there for as long as possible, preferably since 1960;
- The samples were to be from areas of soil that had not been excavated, filled, or otherwise disturbed, since the Dow plant was established (lawn areas were considered the best targets);
- Sample locations were away from the lee of buildings or large trees, and at least 5 m from obstructions (buildings, high fences, large trees);
- Sample locations were at least 5 m away from wooden structures that may have been treated with pentachlorophenol, e.g. poles, fences and sleepers used for landscaping;
- The sampling area was large enough to allow a number of sub-samples to be taken over a several square metre area so that the resulting composite would be representative of the location.

PARITUTU DIOXIN SOIL SAMPLING

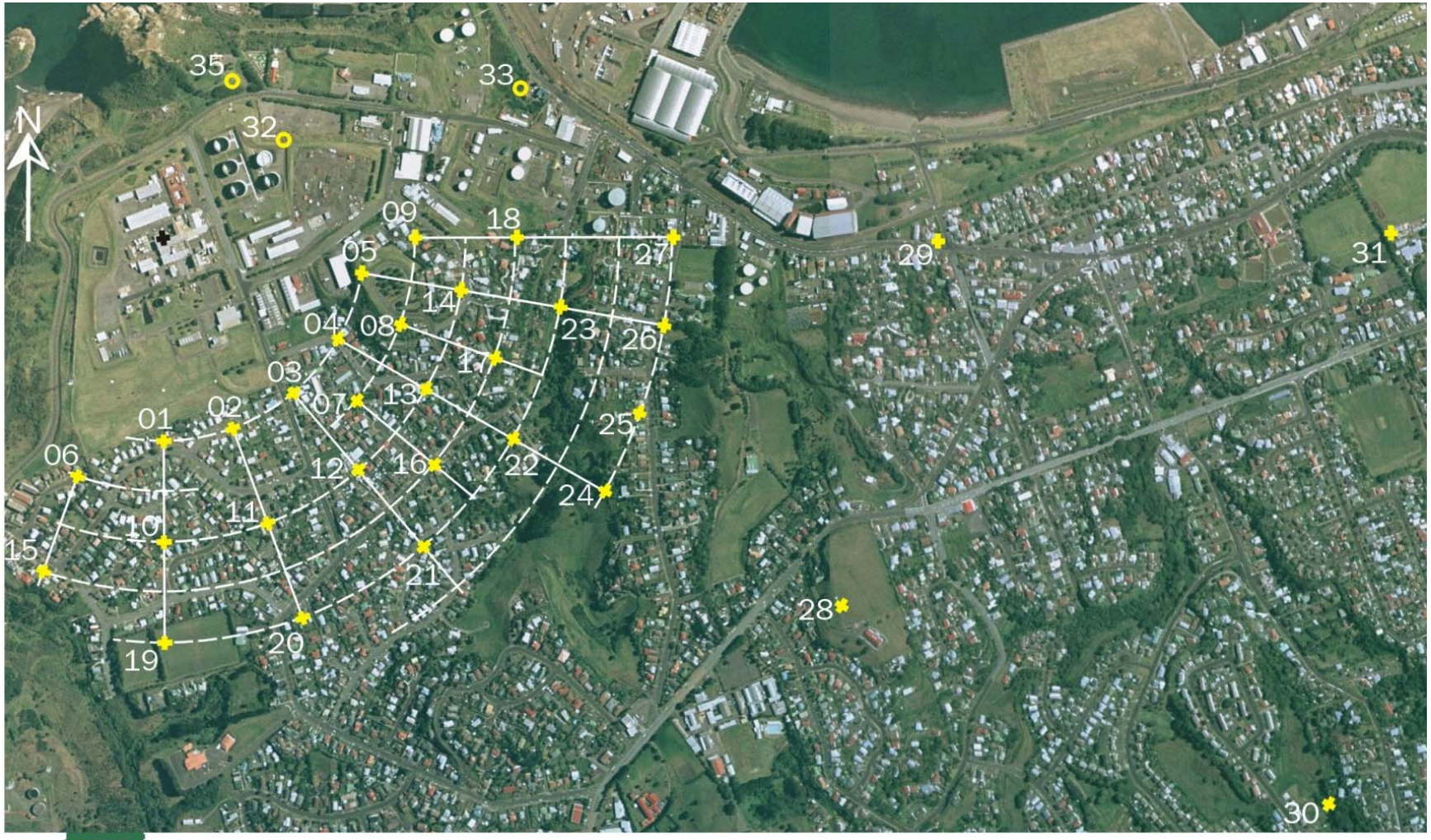

Figure 2: Predetermined sampling grid and additional sampling sites

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The sites to be sampled as part of the main sampling grid (labelled 01 to 27 on Figure 2) were first identified as a desktop exercise. The information used to determine the suitability of the sites included reference to aerial photos, a topographical map overlay, drainage plans and building permit dates. This information was then passed onto the TRC, who visited each of the properties with a checklist of desirable attributes, with this information subsequently used by PDP to determine the optimum sites. The TRC visit included questioning occupants on their duration of residence.

The final sites sampled were largely as identified by the TRC, with a few exceptions, where occupants could not be contacted, information was incomplete or it was considered that a more suitable site was required.

As a result of community consultation on the study design, additional sites at nominal distances of 1 km, 1.5 km and 2 km east of the Dow plant, were sampled. These sites (labelled 28 to 31 on Figure 2) were given nominal grid locations prior to the fieldwork, but were finally selected in the field. These sites were to meet the general site-selection criteria, except they were to be on public land where possible (to avoid having to get permission from private owners at short notice) and road reserves were also to be avoided. The actual sites were between 80 m and 130 m from the nominal pre-defined grid locations because of a lack of suitable public land closer to the grid points.

During the community consultation, the Dioxin Investigation Network (DIN) identified several residential properties, or former residential properties, within the nearby industrial area north-east of the plant. In addition to the normal selection criteria, there was a preference for these sites to be on public land, although two of the four sites that eventuated (labelled 32 to 35 on Figure 2) were on private properties.

Given that the Paritutu area had been progressively developed over a number of years, there was a range of property ages and length of time since the properties had possibly remained undisturbed. The newest areas were developed in the 1970s in the vicinity of Herekawe Drive. Marama Crescent and the streets off Marama Crescent, close to the southern boundary of the Dow Plant, were developed in the mid to late 1960s as worker housing for the construction of the New Plymouth Power Station. The oldest areas were generally along Paritutu Road, Ngamotu Street and around Mount Moturoa.

Most residents had not occupied their properties for as long as was desirable (i.e. 30 to 40 years). This was particularly true of the predominantly rental housing made up of former construction housing in and around Marama Crescent. Few occupants in this area had been there for more than two years.

There was also a general absence of vegetable gardens over the study area, particularly within areas of rental housing close to the Dow plant southern boundary. The garden samples were therefore collected from whatever gardens were available, generally ornamental gardens.

Other departures from the site selection criteria and sampling brief are outlined in the individual property summaries. Such departures were mainly where fences or high

obstacles were closer than 5 m to the sampling location. In such cases, the obstacles were to either side of the sampling location. Other cases were where it was not possible to entirely avoid tree canopies.

3.3 Fieldwork

The fieldwork was carried out on 27 to 31 May 2002, and 4 and 5 June 2002. Weather during the initial sampling period was squally, with periods of heavy rain. The weather during the subsequent period was calmer, with relatively light winds and rain showers.

At least one representative of DIN observed all sampling, with the exception of Site 14 due to a misunderstanding. At each site the optimum sampling location was generally identified in accordance with the sampling brief, but also in agreement with the DIN representative. In some instances it was agreed that, although a site did not comply with all the desired criteria, it was sampled because it was the best option available.

3.3.1 Sampling Equipment

AgriQuality New Zealand Ltd (AgriQuality), Lower Hutt, the primary testing laboratory, supplied the sample jars, acetone, hexane, and Teflon squeeze bottles for the acetone and hexane. The sample jars were 280 ml glass, pre-cleaned, and the lids were supplied pre-lined with cleaned aluminium foil. The analyte free water was supplied in glass bottles by R J Hill Laboratories Limited, Hamilton.

The soil sample corers were new, and had a slightly tapered 75 mm long stainless steel barrel with an inside diameter of 25 mm. The scissors used to cut any long grass, and the tamping rod used to push the samples out of the corer, were made of stainless steel.

3.3.2 Sampling Protocol

Samples were collected as composites of six soil cores from each site, with the soil cores collected on a grid defined by the vertices and mid-points of a 2m equilateral triangle. All samples were collected in duplicate – the duplicate core being taken from within 50 mm of the initial core. The duplicate composite-samples were passed to the DIN representative at the end of each day.

The work at each site followed the pattern:

- Occupant/owner permission obtained, generally at least a day in advance.
- Discussions with the occupant regarding the past history of the site, and any site activities that might affect the choice of sampling locations.
- An appropriate sampling location was selected.
- The grid was paced out with the six sample points marked using flags on wire stems, one at each vertex, and one midway along each side.

- The sampling equipment, being the soil corer, the tamping rod for sample-core removal, and the grass trimming scissors (if needed), were decontaminated. The decontamination process stepped through: cleaning in tap water; scrubbing using phosphate free detergent; rinsing in tap water; rinsing in analyte free water; rinsing with acetone; and rinsing with hexane (the waste acetone and hexane were collected and returned to AgriQuality). Following decontamination, the tamping rod was normally stored within the corer barrel until needed.
- Where necessary, the grass on either side of the marker flags was trimmed to ground level, taking care not to touch the sampling area with anything but the scissors.
- Two 280-mL sample jars were labelled – both on the side and lid. The jars were then placed in the sampling area, or, where wind or rain caused problems, within some nearby shelter.
- The soil corer was used to collect the sample cores. All six sample cores at each location were collected into a single jar. The six sample cores for the duplicate sample (for DIN) were collected into a separate jar. Both the main and the duplicate sample cores were collected from each of the six coring locations at the same time. The sample cores were eased into the sample jars using the tamping rod to push the core up and out of the tapered corer, ensuring minimal soil residue remained in the corer following sample removal. The first sample core in each jar was normally laid on the tinfoil lined lid to prevent the tinfoil blowing away; the remainder were placed directly into the jars. In cases where the core compressed in the corer resulting in an ill-defined sampling depth, or where little core was recovered, the core was discarded and another core was collected.
- The main sample jar was placed into a resealable plastic bag and placed into an ice filled chilly bin. The duplicate sample jar was either placed into the DIN representative's chilly bin, or the PDP chilly bin pending later collection by the DIN representative.
- If a deeper sample core was to be taken, a spade was used to break out a 200 mm square, 75 mm thick, turf at each of the six shallower core locations. Care was taken to not let the blade of the spade touch the exposed base of the hole left by removing the turf. The procedure for collecting the deeper sample core then followed that outlined above.
- If a suitable garden was observed, a set of garden-sample cores was collected. The procedure followed that outlined above, but no specific location was marked for the cores, with the cores being collected randomly from throughout the garden.
- If a rinsate blank was to be collected, the equipment was cleaned as described, then analyte free water was poured over the corer, and collected into a sample jar.
- If a trip/field blank was to be collected, the jar of analyte-free water was opened for the duration of the sampling at the particular location.

Following the completion of sampling, a plug of new turf was placed in the core holes. The turf was obtained from a commercial turf supplier in Waitara. Photographs were taken, a site sketch made, other sampling details noted, the occupant notified of the completion of sampling, and the site was then vacated. The sampling details for each property are recorded in property information sheets in Appendix E.

3.4 Laboratory Analysis

The laboratory analysis is detailed in Appendix F. The analysis followed United States Environmental Protection Agency (USEPA) Method 1613.

Samples were dried and homogenised prior to analysis. A sample was then taken from each primary sample to be analysed. The primary samples included all surface (0-75 mm) samples collected, a selection of deeper (75-150 mm) samples collected, distributed across the sampling area and a selection of samples taken from gardens, also distributed across the sampling area. All these samples were subjected to analysis for 2,3,7,8-TCDD.

When the results were received eight surface-samples were selected, in consultation with MfE and DIN, for full dioxin profile analysis (the 17 PCDD and PCDF congeners with chlorines at the 2,3,7 and 8 positions and totals for the tetra, penta, hexa and hepta homologue groups). The samples selected for full profile analysis were:

- The sample with the highest TCDD concentration (sample SS#05);
- A sample some distance from the Dow plant that was unexpectedly high (sample SS#27);
- Six other samples distributed across the sampling area to give both a good range of 2,3,7,8-TCDD concentrations and a good spatial distribution (samples SS#04, SS#06, SS#11, SS#13, SS#22 and SS#24).

Two samples were also selected for independent analysis for 2,3,7,8-TCDD on the basis of the initial 2,3,7,8-TCDD results from AgriQuality. These were the sample with the highest concentration (SS#27) and a sample with low, but detectable, 2,3,7,8-TCDD from close to the Dow plant (SS#02). MfE and DIN were consulted on the sample selection.

The two samples selected for independent analysis were split from the previously homogenised samples by AgriQuality and sent to Pace Analytical Services Inc., Minneapolis, USA. Pace was not aware of the original results nor did they have any communication with AgriQuality, other than confirmation that the samples had been received. PDP requested Pace analyse the samples in accordance with USEPA Method 1613, and received the report of the results direct from Pace.

The laboratory analytical certificates are included in Appendix F. In these certificates surface soil samples are identified in the form SS#nn, where nn is the site number. Garden samples have the letter G as a suffix, i.e. SS#nn-G. Deeper soil samples are identified with a suffix 75mm, i.e. SS#nn-75mm.

Note that the laboratory certificates refer to a sample SS#37. This is actually sample SS#27 and was mislabelled in the field. There is no SS#37 and the date of sampling and other information provides certainty that the sample labelled as SS#37 was actually SS#27. No other samples were mislabelled. The sample is referred to as sample SS#27 in all other references in this report.

A summary of all samples taken and analyses carried out is given in Table 1.

3.5 Community Consultation

Community consultation was carried out throughout the preparation of the study design, the carrying out of the fieldwork and the subsequent laboratory analysis and reporting.

As part of preparing the study design, the Paritutu community was consulted, with the draft and final versions of the sampling brief being distributed, and comments incorporated into the study design, as appropriate. A PDP representative attended a meeting of the Paritutu Community Health Liaison Group in New Plymouth in March to explain the proposed study. The opportunity was also taken to visit the Dow plant to be briefed by the general manager of Dow AgroSciences (NZ) Ltd on the operation and layout of the plant, and a meeting was held with DIN and Dioxin Action Group (DIAG) members.

Prior to the fieldwork commencing, a letter drop was carried out in Paritutu, explaining the purpose of the study and providing brief details of the proposed sampling. A copy of the letter may be found appended to the Study Design and Sampling Protocol (PDP, 2002).

A draft study design and sampling protocol was provided to MfE, ESR, MoH, TRC, and DIN and DIAG for their comment prior to finalising the document. The final document was provided to all these organisations, as well as the New Plymouth District Council, the Taranaki District Health Board and Dow AgroSciences (NZ) Ltd.

Individual property occupiers were approached prior to the commencement of the fieldwork to obtain information about their properties and to explain the sampling. The occupiers were again telephoned just prior to the sampling. At each property, the occupant was requested to sign a consent form. The consent form authorised the collection of the soil samples, and the reporting of the site's address in this report. The resident could grant the former authorisation, but the owner's consent was required for the latter permission where the site was a rental property. A copy of the consent form may be found in the Study Design and Sampling Protocol (PDP, 2002). Where permission to report the address was not given, an alternative site was selected if possible. Property occupiers and owners received a copy of their individual results prior to the release of this report.

Table 1: Samples collected [1] and analyses carried out [2, 3, 4]

Site no.	Address	Date Sampled	Surface (0-75 mm)	Deeper (75-150)	Garden	Rinsate Blank	Trip Blank
01	36 Marama Crescent	31 May	✓❖		✓		
02	12A Tahora Place	28 May	✓❖ P	✓❖			
03	42 Paritutu Road	4 June	✓❖		✓❖	✓	
04	11 Simons Street	30 May	✓❖✪	✓❖	✓❖		
05	Mt Moturoa Domain	30 May	✓❖✪P				
06	52A Marama Crescent	31 May	✓❖✪				
07	28A Simons Street	29 May	✓❖				
08	29 Scott Street	28 May	✓❖				
09	19 Port View Road	29 May	✓❖	✓❖	✓❖		
10	12 Tohu Place	30 May	✓❖				
11	8 Tumai Place	31 May	✓❖✪	✓❖			
12	12A Paritutu Road	28 May	✓❖		✓❖		
13	36 Simons Street	30 May	✓❖✪		✓		
14	7 Findlay Place	31 May	✓❖		✓❖		
15	19 Rangitake Place	31 May	✓❖				
16	79 Ngamotu Road	29 May	✓❖	✓❖	✓		
17	58 Ngamotu Road	30 May	✓❖		✓		
18	9 Catherine Crescent	31 May	✓❖		✓	✓❖	✓
19	Onuku Taipari Domain	29 May	✓❖				
20	133 Ngamotu Road	4 June	✓❖				
21	20 Rospeath Crescent	29 May	✓❖				
22	55A Ngamotu Road	30 May	✓❖✪				
23	37 Ngamotu Road	30 May	✓❖	✓❖	✓❖		
24	108 Pioneer Road	5 June	✓❖✪				
25	Ngamotu Domain – 81 Pioneer Road	4 June	✓❖				
26	Ngamotu Domain – 53 Pioneer Road	4 June	✓❖				
27	AW [5]	5 June	✓❖✪				
28	81 South Road	4 June	✓❖				
29	cnr Whiteley & Breakwater	4 June	✓❖				
30	70 Banks Street	4 June	✓❖				
31	St Josephs School, Calvert Road	4 June	✓❖				
32	105 Centennial Drive	5 June	✓❖				
33	151 Breakwater Road	5 June	✓❖				
34	AW [5]	5 June	✓❖			✓	✓
35	100 Centennial Drive – NPDC Domain	5 June	✓❖			✓	

1. ✓ = sample collected
2. ❖ = sample analysed for 2,3,7,8-TCDD by AgriQuality Ltd.
3. ✪ = sample analysed for dioxin congener profile by AgriQuality Ltd.
4. P = sample independently analysed for 2,3,7,8-TCDD by Pace Analytical.
5. AW = Address withheld. Permission to release address refused

As noted in Section 3.3, above, a DIN representative observed the sampling and received duplicate samples.

Following receipt of the 2,3,7,8-TCDD results from AgriQuality, DIN was consulted on the samples to be selected for full profile analysis, as required by the MfE study brief. DIN was also consulted on the two samples selected for confirmatory analysis by Pace Analytical Services, USA.

Simultaneous with the release of this report, a further letter drop was made to all Paritutu residents, providing a summary of the findings. This letter drop included a copy of the Environmental Health statement that has been released by the MfE and MoH. Copies of this report will be deposited in public libraries in the area.

4.0 Dioxin Concentration Results

4.1 Introduction

This section discusses the dioxin concentrations measured in residential soils in Paritutu. Within this report, the address of most sites is given, but, for two sites, consent to report the address was not granted. For these sites the location is identified in only a general way on various maps. The aerial photograph showing sampling sites (Figure 2 in both the Study Design and Sampling Protocol (PDP, 2002) and this report) shows the design grid, not the actual sampling sites, and should not be used to identify particular site locations. No occupant or owner names are listed in this report.

The results are presented and analysed in a variety of ways, both in tabulated and graphical form. Firstly, the results for all the samples are summarised against each property location in Table 2, and their spatial relationship presented in map form in Figure 3. Table 2 also shows samples that were collected but not analysed. The results for each property are also presented in the property information sheets in Appendix E.

This section initially examines the range of 2,3,7,8-TCDD concentrations. The differences between the surface and deeper samples, and surface and garden samples, are then examined. Next, TEQ values are calculated from the eight samples for which full profiles were analysed and the relationship between TEQ and 2,3,7,8-TCDD is established. From this relationship, TEQ equivalent concentrations are predicted for those samples that were not analysed for a full dioxin profile. Congener profiles are then plotted and compared with profiles obtained from previous studies in New Zealand.

Finally, the spatial distribution of the results is examined, and TCDD contours plotted. TCDD concentrations from previous studies are compared with the current results.

The data interpretation in this section is dependent on the quality of the data obtained from the sampling and laboratory analysis. The data quality, which the various quality checks showed to be satisfactory, is discussed at the end of this section.

Table 2: Concentration of 2,3,7,80-TCDD in Parituta soils (ng/kg, dry weight basis)

Site Number	Address	Date Sampled [1]	Surface (0-75 mm)	Deeper (75-150 mm)	Garden	Rinsate Blank	Trip Blank
01	36 Marama Crescent	31 May	5.9		NT [2]		
02	12A Tahora Place	28 May	4.8	3.2			
03	42 Paritutu Road	4 June	5.8		4.5	NT	
04	11 Simons Street	30 May	7.4	2.2	4.9		
05	Mt Moturoa Domain	30 May	92				
06	52A Marama Crescent	31 May	15				
07	28A Simons Street	29 May	3.4				
08	29 Scott Street	28 May	6.1				
09	19 Port View Road	29 May	17	14	2.8		
10	12 Tohu Place	30 May	3.6				
11	8 Tumai Place	31 May	2.0	1.6			
12	12A Paritutu Road	28 May	2.9		2		
13	36 Simons Street	30 May	6.2		NT		
14	7 Findlay Place	31 May	8.0		7.3		
15	19 Rangitake Place	31 May	1.9				
16	79 Ngamotu Road	29 May	1.8	1.2	NT		
17	58 Ngamotu Road	30 May	0.93		NT		
18	9 Catherine Crescent	31 May	4.5		NT	ND [3]	NT
19	Onuku Taipari Domain	29 May	1.0				
20	133 Ngamotu Road	4 June	4.8				
21	20 Rospeath Crescent	29 May	0.75				
22	55A Ngamotu Road	30 May	0.76				
23	37 Ngamotu Road	30 May	0.71	0.61	1.3		
24	108 Pioneer Road	5 June	2.7				
25	Ngamotu Domain – 81 Pioneer Road	4 June	2.2				
26	Ngamotu Domain – 53 Pioneer Road	4 June	3.0				
27	AW [4 5]	5 June	27				
28	81 South Road	4 June	0.88				
29	cnr Whiteley & Breakwater	4 June	3.3				
30	70 Banks Street	4 June	2.4				
31	St Josephs School, Calvert Road	4 June	0.81				
32	105 Centennial Drive	5 June	6.1				
33	151 Breakwater Road	5 June	10				
34	AW [4]	5 June	7.3			NT	NT
35	100 Centennial Drive – NPDC Domain	5 June	2.3			NT	

1. All samples collected between 28 May and 5 June 2002
2. NT = sample collected, but not analysed
3. ND = non detect (LOD = 0.01 ng/L)
4. AW = Address withheld. Permission to release address not given.
5. incorrectly labelled as SS#37 in the laboratory report

Figure 3: Sampling locations and 2,3,7,8-TCDD concentrations

4.2 Range of Concentrations of 2,3,7,8-TCDD in Paritutu Soils

The concentrations of 2,3,7,8-TCDD presented in Table 2 are plotted as a histogram in Figure 4 to show the range of concentrations obtained. The histogram is broken down into the three sample sources, that is, surface (0 – 75 mm), deeper (75 – 150 mm) and garden samples. It can be seen that the great majority of the 47 results are less than 10 ng/kg, with only four results, of which two are surface and deeper samples from the same location, above that value. There is one much higher result, 92 ng/kg, from the west-facing slope of Mount Moturoa Domain.

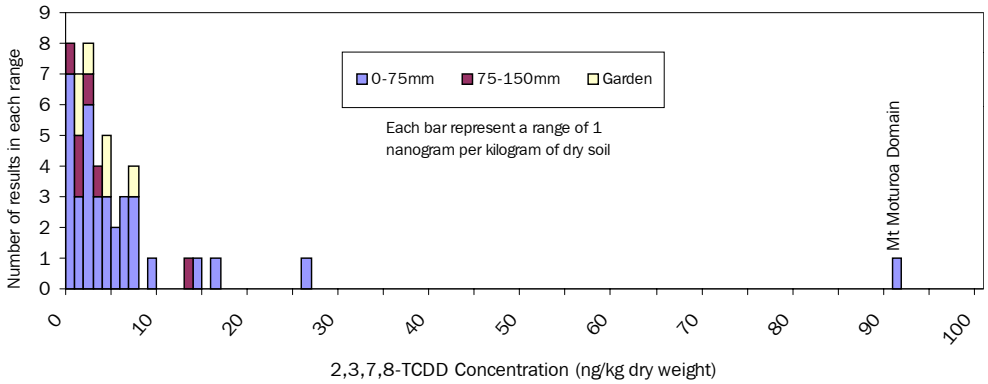


Figure 4: Histogram of surface, deeper and garden 2,3,7,8-TCDD results

4.3 Spatial Distribution of 2,3,7,8-TCDD in Surface Samples

The spatial distribution of 2,3,7,8-TCDD in surface soils is shown in Figure 5. Concentration contours have been drawn, although some anomalous results make contouring uncertain at a number of locations. Figure 5 also shows the predominant wind directions in a wind rose, but note that the wind rose has been plotted in the reverse of the normal convention, to show the direction the wind is blowing in, rather than the direction the wind is coming from. Several things are apparent in Figure 5:

- Concentrations to the east of the Dow plant, towards Mount Moturoa are higher than to the south of the plant. This is consistent with winds from the westerly quadrant being more frequent (about 30% of the time) than northerly winds (13% of the time). Mount Moturoa falls in the 45º sector directly east of the plant, with winds blowing in this direction more than 20% of the time.
- There is an influence of topography on the concentration distribution. Faces that slope towards the plant (in particular Mount Moturoa) show higher concentrations relative to flat or away-sloping areas. The steep-sided valley running between Ngamotu and Pioneer roads shows distinctly lower concentrations.

- Concentrations are higher at the plant boundary and drop off rapidly within 800 – 1000 m from the plant, with some anomalies. However, to the east and east-south-east, 2,3,7,8-TCDD can still be detected 2.5 km from the plant, with 2.4 ng/kg being detected on a Banks Street property (Site 30) and 0.81 ng/kg on a Calvert Street property (Site 31).
- There is conflicting evidence as to whether there is a significant drop in concentration between 1.5 and 2.5 km from the plant, with the two results at 1.5 km (3.3 and 0.88 ng/kg) being similar to the two results at 2.5 km (0.81 and 2.4 ng/kg). It would appear that concentrations of the order of 1 to 3 ng/kg might be typical at these distances, noting that the MfE national environmental survey (Buckland *et al.*, 1998) detected 2,3,7,8-TCDD at a concentration of 0.53 ng/kg in a composite from three locations several kilometres further east (see Appendix B, Section B.3).
- There is insufficient data from the study to draw firm conclusions with regard to the industrial area to the east-north-east of the plant. There is some suggestion of greater carry towards the port, possibly a result of wind funnelling between the higher land of Paritutu and Mount Moturoa. However, TCDD concentrations further north in Centennial Drive (Site 32; 6.1 ng/kg and Site 35; 2.3 ng/kg) are typical of the results to the south of the plant, closest to the plant boundary, consistent with the wind blowing from the south at a similar frequency to that from the north.
- There are several anomalous results. The concentration of 15 ng/kg measured at the surface at Site 06 is somewhat higher than that expected from concentrations measured on nearby properties. However, it is consistent with the deeper sample taken from the same location. The sample at Site 06 was taken from close to the boundary of the plant and may represent the southern extremity of higher concentrations measured within the plant in earlier studies – as discussed in Section 4.8.
- Surface sample SS#20 from Site 20 in Ngamotu Road returned a concentration of 4.8 ng/kg, more in keeping with concentrations several hundred metres closer to the plant boundary. Neither prevailing wind direction nor topography provide an explanation for this higher than expected result. However, it should be noted that the concentration, while relatively higher than surrounding concentrations, is, in absolute terms, only 3 or 4 ng/kg higher than its neighbours. The TCDD measured in this property is probably of very limited extent and is considered to be of no particular consequence.
- Sample SS#27 at Site 27 has a considerably higher concentration than its neighbours, with no obvious reason from topographic or wind considerations. Unfortunately little further can be said about this site, as the owner has requested that its location not be published. The site, like many other urban properties in New Zealand, may have used 2,4,5-T for the control of weeds. However, the 2,3,7,8-TCDD concentration detected is markedly higher than that expected from “normal” application of 2,4,5-T, even if the 2,4,5-T contained 2,3,7,8-TCDD at

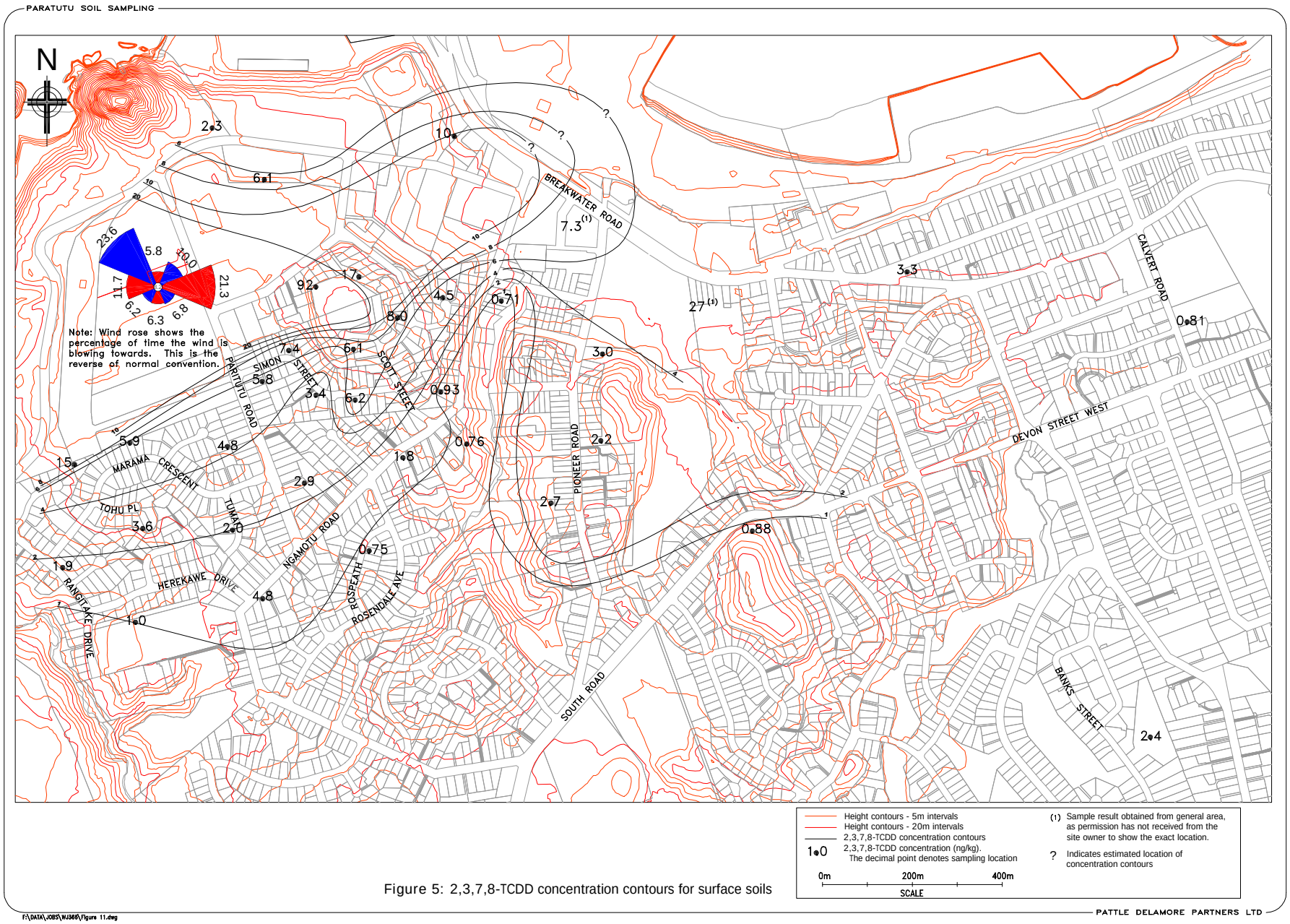


Figure 5: 2,3,7,8-TCDD concentration contours for surface soils

1 mg/kg as occurred prior to 1972 (Coster *et al.*, 1986). The concentration measured in sample SS#27 is not expected to be generally representative of the area.

In summary, the sampling suggests that residential properties in Paritutu within 1000 m of the Dow plant are likely to have 2,3,7,8-TCDD concentrations in the range 1 to 8 ng/kg. Properties further afield may have TCDD concentrations in the range 0.5 to 3 ng/kg.

4.4 Comparison of Surface Soils with Deeper Soils

Deeper soil samples, from 75 mm to 150 mm, were taken immediately below the surface samples at six locations. This was to determine whether there was a significant change with depth in 2,3,7,8-TCDD concentration. In general terms, TCDD concentration would be expected to reduce rapidly with depth at a location that has not been disturbed, because TCDD binds very strongly to soil and therefore would not be expected to be transported deeper by leaching. The results are shown in Table 3, and the locations and concentrations are also shown in Figure 6 (see also Figures 3 and 5).

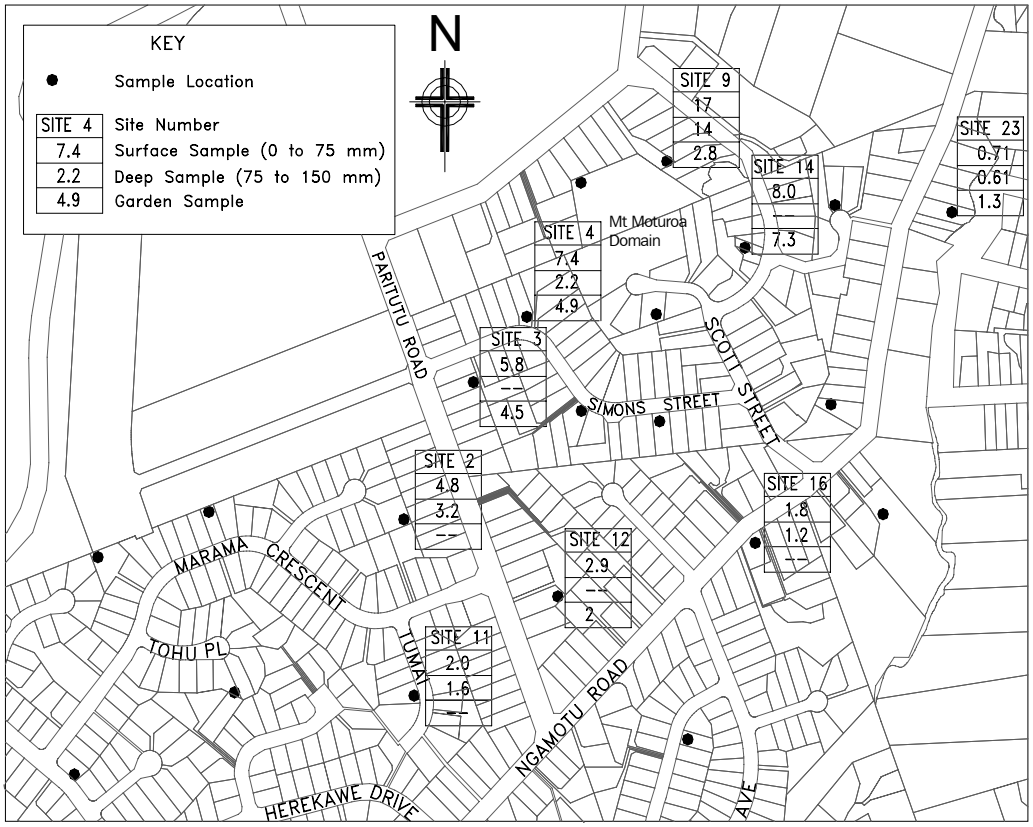


Figure 6: Comparison of garden and surface sample concentrations (ng/kg dry weight)

Table 3: Concentration of 2,3,7,8-TCDD (ng/kg dry weight) in surface and deeper soils

Site Number	Surface (0 – 75 mm)	Deeper (75 – 150 mm)
02	4.8	3.2
04	7.4	2.2
09	17	14
11	2.0	1.6
16	1.8	1.2
23	0.71	0.61

There is a good relationship between the surface and deeper soils, as shown in Figure 7, which plots the surface sample TCDD concentration (the x or horizontal axis) against the TCCD concentration of the deeper samples (the y or vertical axis), at the same location. A linear least-squares regression[10] has been performed to fit a line through the data. The slope of the line (0.735) shows that the TCDD concentration in the deeper soil concentration is, on average, roughly 70% of the surface soil concentration.

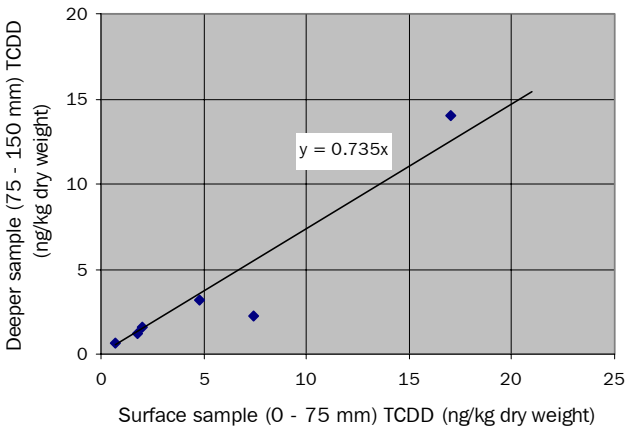


Figure 7: Correlation of 2,3,7,8-TCDD concentrations between surface and deeper samples

A drop-off in TCDD concentration with depth is expected, as TCDD binds very strongly to soil and has a low solubility, therefore little leaching to greater depth is expected.

[10] Least squares regression line is a mathematical technique to obtain a best-fit line to a data set by minimising the square of the deviations of the data points from the line. In this case the line has been forced to pass through zero, and the slope of the line gives the relationship between the two sets of data, ie. deeper concentration (y-axis) = slope x surface concentration (x-axis).

However, some vertical migration would be expected, including the physical movement of soil by soil biota, and the flushing of small soil particles and fine sediment through soil pores and cracks. It is not clear from this study at what depth 2,3,7,8-TCDD would no longer be detected. A deeper vertical profile of samples would be required to assess this.

4.5 Comparison of Surface Soils with Garden Soils

Eleven samples were taken from gardens from a number of properties, and of these, six samples were analysed for 2,3,7,8-TCDD. The locations and TCDD concentrations are shown in Figure 6. Garden samples were taken to:

- Determine whether there were any significant differences in TCDD concentrations between areas that were supposed to be undisturbed soil (i.e. lawn areas) with areas that were clearly cultivated.
- Better understand the potential for human exposure to TCDD for people who are consumers of home-grown vegetables.

Garden cultivation might be expected to result in lower TCDD concentrations, as deeper soil (with presumably less contamination) would be mixed with the shallower more contaminated soil. The amount of dilution would depend on the depth of cultivation and the extent to which TCDD penetrates otherwise undisturbed soil. Further, adding imported soil or compost to gardens could result in additional dilution.

On the other hand, gardening activities might deposit additional TCDD in gardens. Much of the TCDD will initially be deposited on the leaves of grass making up lawn areas rather than be deposited directly on the soil surface. TCDD attached to the grass may undergo transformation (e.g. photodegradation on the leaf surface) or drop or be washed to the soil surface attached to particulate matter. However, if the lawn is cut before transformation or loss to the soil occurs, some of the TCDD attached to the grass would be removed as lawn cuttings. Depending on the gardening practices of the particular household, the lawn clippings could then be spread on gardens, either directly or after composting. This could result in a total mass of TCDD deposited per square metre being greater than for undisturbed soil, with the soil concentrations then being dependent on the amount of vertical mixing (and dilution) that occurred during gardening activities.

The results of the garden samples compared with the surface samples from the same properties are shown below in Table 4 and on Figure 8. A least squares regression has been performed in a similar manner to that performed between the surface and deeper samples (see previous section).

Apart from the garden result from Site 09, a good correlation exists between the surface and garden samples. Ignoring Site 09, the slope of the line shows that the garden TCDD concentration averaged approximately 80% of the concentration of the nearby surface lawn-soil concentration.

Table 4: Concentration of 2,3,7,8-TCDD (ng/kg dry weight) in surface and garden samples

Site no.	Surface (0 – 75 mm)	Garden	Garden Type
03	5.8	4.5	Vegetable garden
04	7.4	4.9	Ornamental, raised, old
09	17	2.8	Terraced, ornamental, from filled area.
12	2.9	2	Ornamental lawn border.
14	8.0	7.3	Terraced, from natural ground level.
23	0.71	1.3	Ornamental lawn border, slightly raised.

The garden sample results are somewhat higher than expected if substantial mixing in of "clean" deeper soil occurs during garden cultivation. Three reasons are suggested for the lack of apparent dilution:

- Garden cultivation has been relatively shallow, perhaps less than 200 mm, with the result that minimal deeper soil has been brought to the surface. The nature of some of the gardens suggests this is a possibility. Many of the sampled properties do not have gardens and, of those that did, most had only ornamental gardens. Ornamental gardens would generally be cultivated to a shallower depth than vegetable gardens, but also, of the properties that did have gardens, few had the appearance of being the work of "keen" gardeners, who might cultivate to greater depths.
- TCDD has reached deeper in the soil column than expected, certainly more than 150mm in the sites where deeper samples were taken from lawn areas, and presumably other similar locations.
- Addition of grass clippings to gardens has indeed resulted in greater accumulation of TCDD in the soil.

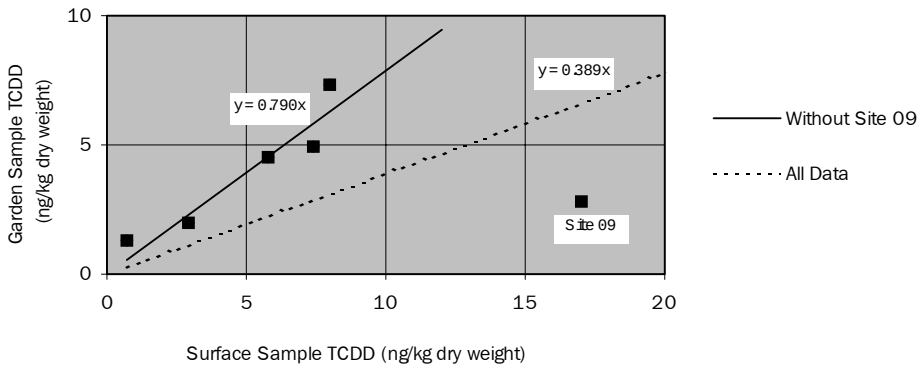


Figure 8: Correlation between surface and garden samples.

The garden sample from Site 09 is thought to be anomalous, as it was taken from the built-up part of a terraced garden. The appearance of the garden suggests that the terraces have been formed by cutting into the slope and the excavated soil used to fill the slope below the cut section. Imported soil may also have been used as terrace-fill. The resultant garden may therefore have undergone greater mixing and dilution than the other gardens sampled.

4.6 Calculation of TEQ Values

Toxic equivalent concentrations have been calculated for the eight samples analysed for full dioxin profiles using both the World Health Organization (WHO) and International TEFs. The results are presented in Table 5. It can be seen that, in absolute terms, the WHO-TEQ concentrations are typically less than 1 ng/kg higher than the corresponding I-TEQ concentrations, and 1 – 10% higher, in relative terms. For these particular samples, the difference is mainly a result of there being sufficient 1,2,3,7,8-PeCDD to have an effect because of the difference in the 1,2,3,7,8-PeCDD TEF between the two schemes (1 in the WHO scheme versus 0.5 for the International scheme). As discussed previously, in practical terms the difference is small, as the TEQ is dominated by the contribution of 2,3,7,8-TCDD, which has the same TEF in both the WHO and International schemes.

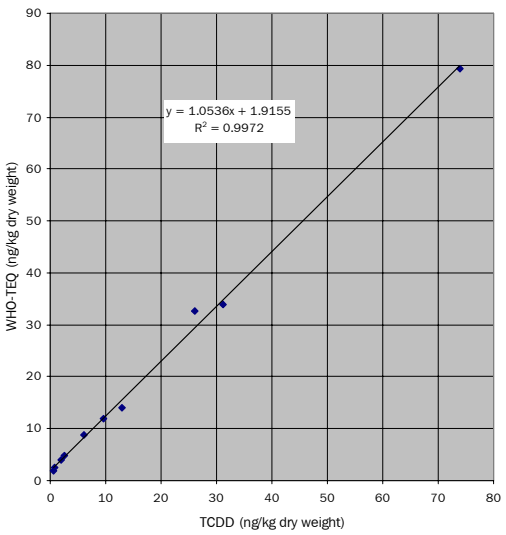


Figure 9: Correlation of WHO-TEQ with 2,3,7,8-TCDD concentrations

The full dioxin profile analyses also present the opportunity to compare 2,3,7,8-TCDD concentrations with TEQ values. Figure 9 is a plot of 2,3,7,8-TCDD versus TEQ. The plot includes concentration data from the two New Plymouth samples collected by MfE as part of their national environmental survey (see Appendix B, Section B.3). A least squares regression line has been calculated.

Table 5: 2,3,7,8-PCDD and PCDF concentrations and TEQ values (ng/kg, dry weight basis)

	I-TEFs	WHO-TEFs	SS#04	SS#05	SS#06	SS#11	SS#13	SS#22	SS#24	SS#27
2,3,7,8-TCDD	1	1	9.7	74	13	2	6.1	0.8	2.5	26
1,2,3,7,8-PeCDD	0.5	1	1.2	4.1	0.53	1.2	1.2	<0.7	1	3.8
1,2,3,4,7,8-HxCDD	0.1	0.1	0.64	1.4	<0.2	0.51	0.67	<1	0.64	1.6
1,2,3,6,7,8-HxCDD	0.1	0.1	1.3	2.1	0.55	1.3	1.3	1.1	1.6	2.6
1,2,3,7,8,9-HxCDD	0.1	0.1	0.86	1.3	0.54	0.91	1.6	1.3	1.2	1.7
1,2,3,4,6,7,8-HpCDD	0.01	0.01	30	20	10	16	15	25	25	34
OCDD	0.001	0.0001	300	160	80	100	110	180	220	230
2,3,7,8-TCDF	0.1	0.1	0.28	1	0.23	<0.6	0.95	0.64	0.95	3.1
1,2,3,7,8-PeCDF	0.05	0.05	0.23	0.35	0.16	0.64	0.64	0.54	0.85	1.5
2,3,4,7,8-PeCDF	0.5	0.5	<0.7	<0.8	<0.4	<0.5	1	0.8	0.59	1.8
1,2,3,4,7,8-HxCDF	0.1	0.1	<0.6	0.45	<0.6	<0.6	0.87	0.88	0.77	1.4
1,2,3,6,7,8-HxCDF	0.1	0.1	<0.8	<1	<0.4	<0.5	0.64	0.7	0.6	<1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.39	0.56	0.34	<0.7	0.89	0.9	1	1.6
1,2,3,7,8,9-HxCDF	0.1	0.1	<0.3	<0.3	<0.2	<0.2	<0.4	<0.5	<0.2	<0.8
1,2,3,4,6,7,8-HpCDF	0.01	0.01	7.4	5.4	2.8	4.3	5	8.5	9.7	13
1,2,3,4,7,8,9-HpCDF	0.01	0.01	<0.8	<0.6	<0.3	<0.6	<0.4	<0.7	<0.4	0.6
OCDF	0.001	0.0001	24	14	6.5	2	5	12	17	16
I-TEQ[1]			11.6	77.4	13.8	3.47	8.26	2.56	4.6	30.9
WHO-TEQ[1]			11.9	79.3	14.0	3.98	8.76	2.56	4.90	32.6
WHO-TEQ / I-TEQ (%)			103%	102%	101%	115%	106%	100%	106%	105%

Notes:

1. TEQ values calculated using half the limit of detection where a congener was not detected and a detection limit was reported.

There is a close correlation[11] between the 2,3,7,8-TCDD concentration and the TEQ value, with the regression equation being:

TEQ concentration = 1.92 + 1.053 x (2,3,7,8-TCDD concentration)

In simple terms, the TEQ value is approximately 5% higher than the TCDD concentration plus about 2 ng/kg. Clearly, the TCDD dominates the TEQ for the results considered.

The regression equation can be used to estimate TEQ values from the 2,3,7,8-TCDD concentrations for the other samples from this study which were not analysed for a full dioxin profile, but for which specific 2,3,7,8-TCDD analysis was carried out. This prediction assumes that there is a common source of the dioxin contaminants (and hence similar dioxin profiles) for all samples. The estimated TEQ values are shown in Table 6. In general, the differences are sufficiently minor that the TCDD concentration can be used to approximate the TEQ value for most purposes.

4.7 PCDD and PCDF Congener Profiles

PCDD and PCDF congener profiles can display characteristic signatures typical of particular sources. For example, dioxins produced from the incineration of waste will have a different signature to a chemical process source (Cleverly *et al*., 1997). There are a number of ways of presenting congener profiles. One method is to present the concentrations of each of the seventeen 2,3,7,8-substituted PCDD and PCDF congeners as a percentage of the total ($Cl_4 - Cl_8$) PCDD and PCDF[12] concentration.

This procedure has been performed for the eight samples analysed for full profiles in this study, and also on profile data from eight provincial towns and cities and from industrial and residential areas in Auckland city from the 1996 MfE national environmental survey study (Buckland *et al.*, 1998). A similar procedure could also have been carried out for data from Christchurch. The provincial centre profiles include the two New Plymouth results mentioned previously. The profiles are presented in Figure 10. (Note that the MfE study also has data for Christchurch, which, when plotted as congener profiles, shows a similar pattern to the Auckland profiles and therefore has not been presented here.)

There are some remarkable similarities but also some significant differences in the profiles. All profiles are dominated by OCDD, with lesser contributions from OCDF, 1,2,3,4,6,7,8-HpCDD and 1,2,3,4,7,8,9-HpCDF. However, there are significant differences in the detection of 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD in samples from the current study and in the samples collected for the MfE national environmental study in New Zealand urban areas other than New Plymouth. In the MfE national environmental

[11] The R^2 value of 0.997 from the regression indicates good correlation. $R^2 = 1$ signifies perfect correlation.
[12] The sum of PCDD and PCDF congeners with four to eight chlorine atoms attached.

Table 6: 2,3,7,8-TCDD concentrations and TEQ values compared with guidelines (ng/kg)

New Zealand guideline (MfE/MoH, 1997)	1,500	I-TEQ	
Germany (BMU, 1999)	1,000	I-TEQ	
USEPA (Fields, 1998)	1,000	TEQ	
EPA Region 6 (2001) & Region 9 (2000)	39	2,3,7,8-TCDD	
US ATSDR (ATSDR, 1998)	50 1,000	TEQ - Screening Level TEQ - Action Level	

Sample ID	Address	2,3,7,8-TCDD [1]	TEQ [2]	TEQ [3] Estimated
SS#01	36 Marama Crescent	5.9		8.1
SS#02	12A Tahora Place	4.8		7.0
SS#03	42 Paritutu Road	5.8		8.0
SS#04	11 Simons Street	7.4 (9.7)	11.9	9.7
SS#05	Mt Moturoa Domain	92 (74)	79.3	99
SS#06	52A Marama Crescent	15 (13)	14.0	18
SS#07	28A Simons Street	3.4		5.5
SS#08	29 Scott Street	6.1		8.3
SS#09	19 Port View Road	17		20
SS#10	12 Tohu Place	3.6		5.7
SS#11	8 Tumai Place	2.0 (2.0)	3.98	4.0
SS#12	12A Paritutu Road	2.9		5.0
SS#13	36 Simons Street	6.2 (6.1)	8.76	8.4
SS#14	7 Findlay Place	8.0		10
SS#15	19 Rangitake Place	1.9		3.9
SS#16	79 Ngamotu Road	1.8		3.8
SS#17	58 Ngamotu Road	0.93		2.9
SS#18	9 Catherine Crescent	4.5		6.7
SS#19	Onuku Taipari Domain	1.0		3.0
SS#20	133 Ngamotu Road	4.8		7.0
SS#21	20 Rospeath Crescent	0.75		2.7
SS#22	55A Ngamotu Road	0.76 (0.8)	2.56	2.7
SS#23	37 Ngamotu Road	0.71		2.7
SS#24	108 Pioneer Road	2.7 (2.5)	4.90	4.8
SS#25	Ngamotu Domain	2.2		4.2
SS#26	Ngamotu Domain	3.0		5.1
SS#27	AW [4]	27 (26)	32.6	30
SS#28	81 South Road	0.88		2.8
SS#29	cnr Whiteley & Breakwater roads	3.3		5.4
SS#30	70 Banks Street	2.4		4.4
SS#31	St Josephs School, Calvert Road	0.81		2.8
SS#32	105 Centennial Drive	6.1		8.3
SS#33	151 Breakwater Road	10		13
SS#34	AW [4]	7.3		9.6
SS#35	100 Centennial Drive	2.3		4.3
Geometric means [5]		3.7	11.6	6.5

1. 2,3,7,8-TCDD Concentrations from specific analysis, with concentration from full profile analysis in brackets.
2. TEQ values from Table 5.
3. Estimated TEQ value using least squares regression (see Section 4.6).
4. AW = Address withheld. Permission to release address not given.
5. Geometric mean is a better estimate than arithmetic mean for data that appear to be log-normally distributed.

survey (Buckland *et al*., 1998), 24 samples were collected from urban areas in Auckland, Christchurch and provincial centres, including two samples in New Plymouth. 2,3,7,8-TCDD was not detected in any of the samples (detection limit range 0.1 – 1 ng/kg, median 0.4 ng/kg), except the two New Plymouth samples. In the same 24 samples, 1,2,3,7,8-PeCDD was also not detected, except in a single New Plymouth sample (detection limit range 0.1 – 3 ng/kg, median 0.6 ng/kg).

In the current study, 2,3,7,8-TCDD was detected in all 47 samples for which 2,3,7,8-TCDD analysis was carried out (minimum concentration 0.81 ng/kg) and 1,2,3,7,8-PeCDD was detected in all but one of the eight full dioxin profile analyses that were carried out (detection limit 0.7 ng/kg).

Further comparisons may be made with TEQ values calculated from the full dioxin profiles from the MfE national environmental survey and the current study. The MfE study reported I-TEQ values. The MfE TEQ values have therefore been recalculated using the WHO TEFs, assuming values for non-detects of half the analytical detection limit. The range of TEQ values is shown in Table 7, compared with the data from the current study. The two New Plymouth results have been left out of the provincial centre dataset on the assumption that the New Plymouth results are not typical of other provincial towns and cities in New Zealand. The differences in congener profiles between the New Plymouth dataset and other urban areas in New Zealand, as discussed earlier and illustrated in Figure 10, supports this assumption.

Table 7: Comparison of TEQ results from this study with the MfE national environmental survey (ng/kg)

Dataset	No of Results	TEQ Range	Mean TEQ	TCDD & PeCDD Detection Limit Range
Current study	8	2.56 – 77.4	19.8 [1]	-
Current study recalculated [2]	8	0.98 – 3.20	1.86	0.5 (assumed)
Provincial towns and cities [3, 4]	7	0.77 – 3.15	1.29	0.1 – 0.3 TCDD (actual) 0.3 – 0.8 PeCDD (actual)
Auckland [4]	9	1.09 – 4.97	2.16	0.3 – 1 TCDD (actual) 0.3 – 3 PeCDD (actual)

Notes

1. This arithmetic mean is biased by samples SS#05 and SS#27 and should not be taken as representing the TEQ for the study area. It is given for completeness to compare with the other mean values. A better estimate for the mean TEQ of the study area is the geometric mean of 6.5 ng/kg from Table 6.
2. Recalculated with 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD at an assumed limit of detection and taking half the limit of detection in the TEQ calculation.
3. Excluding two New Plymouth results.
4. Data from the national environmental survey (Buckland *et al*., 1998)

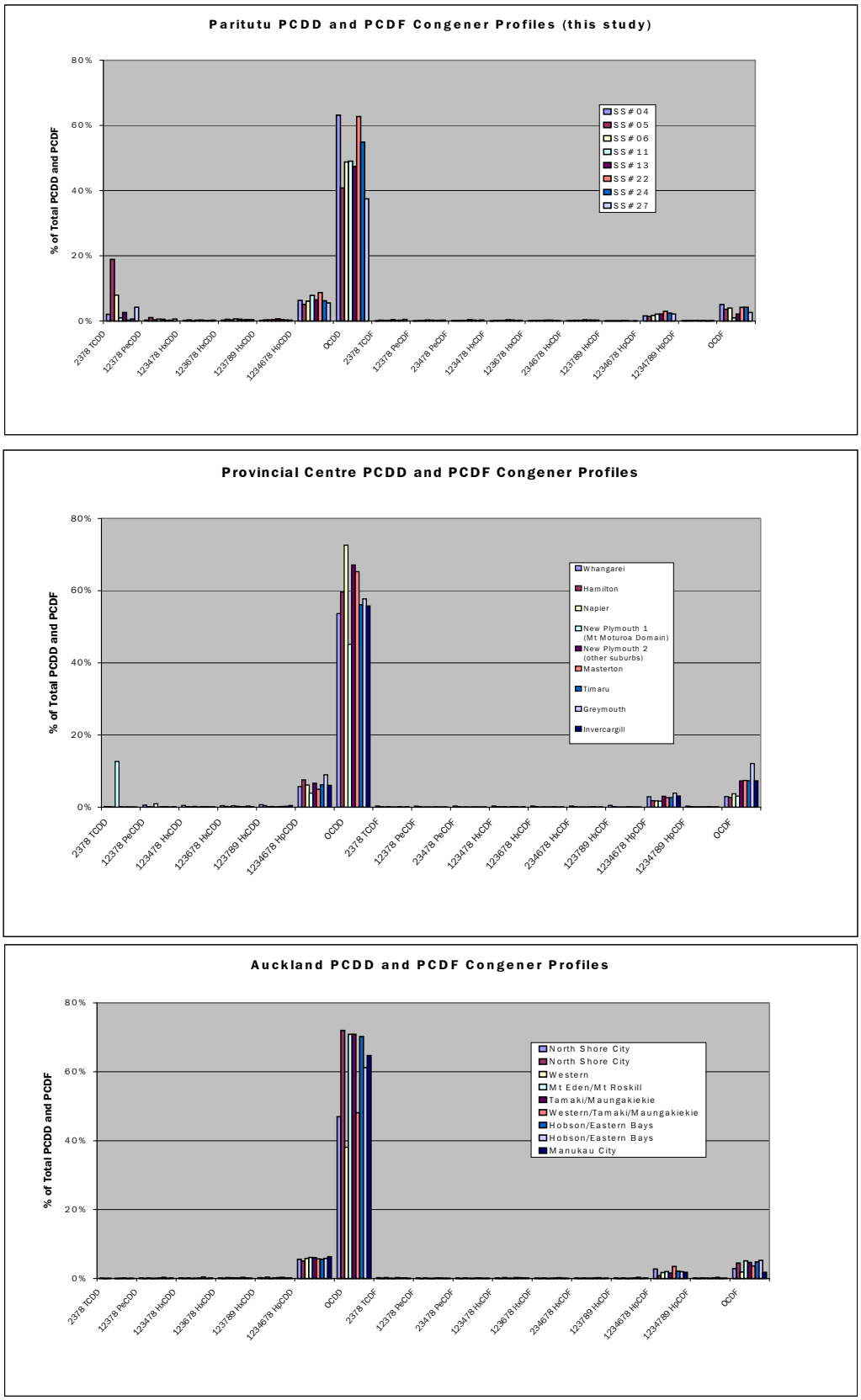


Figure 10: PCDD and PCDF congener profile comparisons

Table 7 also shows the TEQ value for the current study recalculated with the concentration for 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD set to 0.25 ng/kg, to simulate non-detects at a detection limit of 0.5 ng/kg, roughly the mean detection limit in the MfE national environmental survey (Buckland *et al.*, 1998) for these congeners.

It can be seen that the range and mean TEQ value for Auckland, the provincial centres (excluding New Plymouth) and the recalculated current study values (where TCDD and PeCDD have been set to a simulated detection limit) are all similar. In interpreting these values, it should be noted that typically 0.5 – 0.8 ng/kg of the TEQ is a mathematical artefact of setting non-detect values at half the detection limit. As has already been pointed out, the majority of the TEQ from the current study is from 2,3,7,8-TCDD. What the recalculation also shows is that without this contribution, and to a lesser extent the contribution of 1,2,3,7,8-PeCDD, the TEQ is similar to other urban centres in New Zealand.

In summary, it would appear that the New Plymouth (and Paritutu) results are typical of other towns and cities in New Zealand except there is an “overlay” of 2,3,7,8-TCDD and to a lesser extent 1,2,3,7,8-PeCDD.

4.8 Comparison with Previous Paritutu Studies

Results from earlier studies of dioxin concentrations in the Paritutu area (Appendix B), where the sampling locations are known, have been added to the contour plot from the current study in Figure 11.

It is difficult to relate many of these historical studies to the current study, particularly those carried out in 1985 and 1986 (as reported in Pilgrim, 1986), as the precise sample locations are not known and many of the samples were taken as composites collected over distances of several hundred metres. There are also uncertainties with the reporting basis of these earlier studies, but for the purposes of comparison it is assumed that all results are concentrations of 2,3,7,8-TCDD, dry weight. Because of these uncertainties, no attempt has been made to modify the concentration contours to take account of the earlier data. The contours are presented merely to facilitate comparison of the earlier data with the current study results.

Looking firstly at the more recent studies, of particular interest is the MfE national environmental survey (Buckland, *et al.*, 1998). This study included a sample from Mount Moturoa Domain, which returned a concentration of 31.2 ng/kg 2,3,7,8-TCDD. The sample was taken from the flat top of Mt Moturoa, and fits in well with values obtained in the current study.

Three samples were collected by TRC (2001) within residential properties (two were in the same property), but none reported quantified concentrations of TCDD. Detection limits were up to 6 ng/kg for these samples. However, assuming concentrations lie somewhere in the range 0 to 6 ng/kg, the results are consistent with the current study.

Soil samples recently collected and analysed on behalf of the Community Residents Action Group returned concentrations of 0.7 and 19 ng/kg. As previously discussed it is not known where the samples were collected nor whether the results are for 2,3,7,8-TCDD or TEQ, although the distinction is not expected to be important in this case. The lower concentration is consistent with the lower concentrations from the current study. The higher result is higher than that generally found within the residential areas, although it is consistent with what might be expected on the west and north facing slopes of Mount Moturoa, along the western and possibly southern boundaries of the Dow plant, or within industrial land to the east and reserve land to the north-west of the plant.

The 1985 and 1986 studies (pilgrim, 1986) tend to conflict with some of the results of the more recent studies. Results from the April 1986 study in Marama Crescent, Simons Street/Paritutu Road, Port View Road/Mt Moturoa and Centennial Drive north-east of the plant can all be compared to varying degrees with the current results. The Simons Street/Paritutu Road composite sample returned a non-detect, with a limit of detection of 10 ng/kg, which is not inconsistent with the current study. The Port View Road/Mt Moturoa composite (110 ng/kg) is also consistent with the current study, being similar to the 92 ng/kg recorded in this study on Mt Moturoa. However, the measured concentrations for the composites from Marama Crescent (20 ng/kg) and Centennial Drive (100 ng/kg) are higher than the current study by about four and 20 times, respectively.

The TRC soil samples at pylons 3 and 4, adjacent to Centennial Drive to the west of the plant (TRC, 2001), may be compared with composite samples taken in April 1986 immediately after the TCP plant incident (Pilgrim, 1986). The samples taken in 2001 returned concentrations of 2,3,7,8-TCDD eight to 40 times lower than the 1986 values.

There are several reasons why earlier concentrations may be higher than those measured in the current study or the TRC study from 2001:

- Soil concentrations may vary considerably over relatively short distances. However, the mode of deposition and the earlier and current results suggest that this is not generally the case.
- Differences in sampling technique, in particular the shallower sampling depth of some of the earlier studies, may result in higher concentrations. This is likely to be an important factor, accounting for some of the differences in observed concentrations.
- Differences in analytical techniques and the analytical standards used to quantify TCDD concentrations. It is reasonable to expect that the current methods and standards are more reliable than those used in the past due to significant improvements that have occurred over the last 15 years.
- Attenuation has occurred through volatilisation, degradation, leaching, and dust and soil removal. As discussed previously, 2,3,7,8-TCDD is particularly persistent and is generally not susceptible to degradation or leaching once it is bound to soil

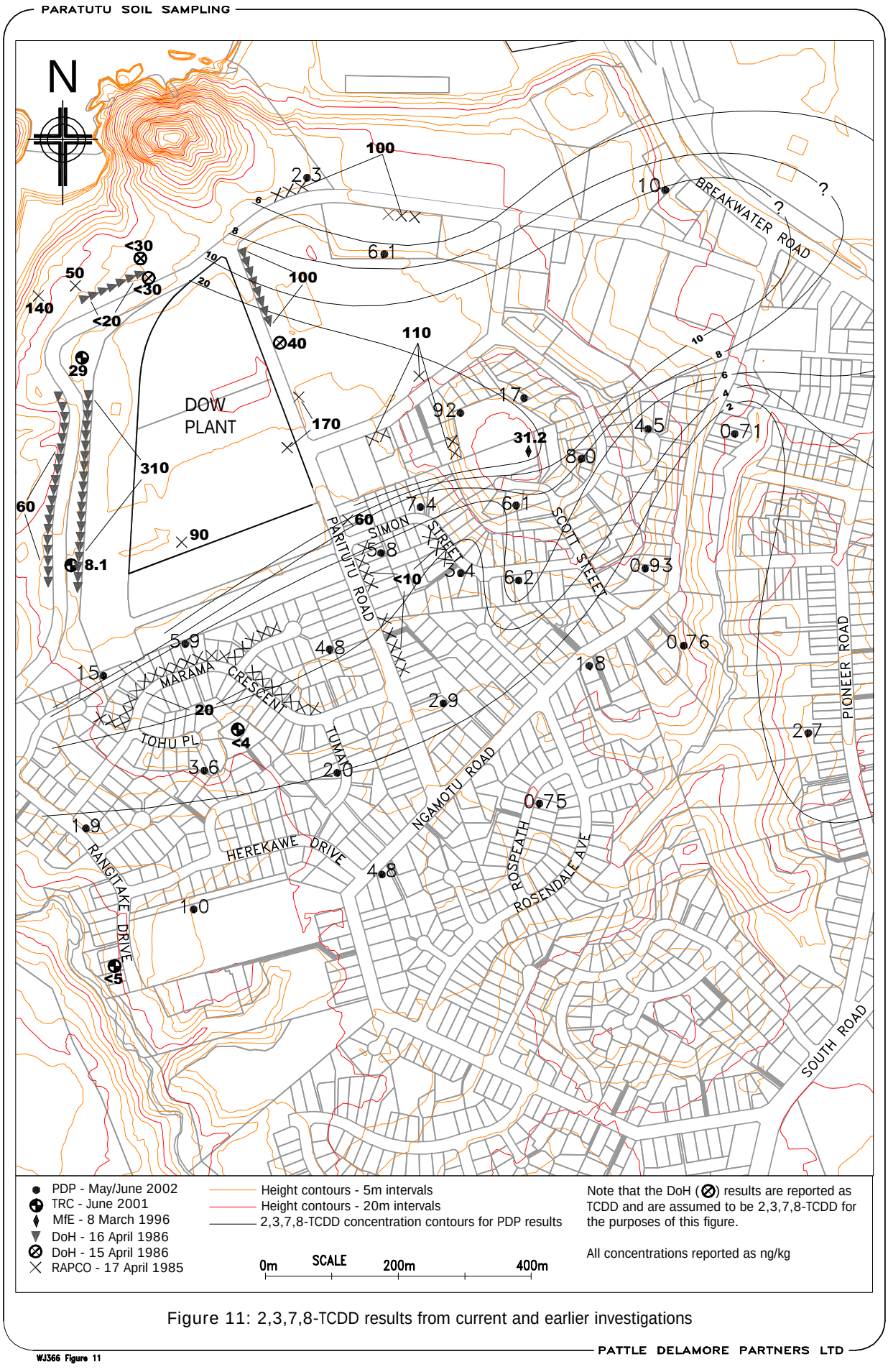


Figure 11: 2,3,7,8-TCDD results from current and earlier investigations

active deposition, and, in particular, the 1986 samples were taken immediately after the TCP incident. The samples may be biased by 2,3,7,8-TCDD that is at high concentrations at the very surface, which may have subsequently been removed or degraded to some extent. There is evidence that at the very surface (top few millimetres) the half life of TCDD may be 9 – 15 years (Paustenbach *et al*., 1992) as reported in Buckland *et al*., 2000). This may account for a reduction to perhaps 25% of the original value at the very surface. However, it is unlikely to account for any significant reduction below the first few millimetres of soil, where half-lives of 25 – 100 years in sub-surface soil have been reported (Paustenbach *et al*., 1992).

- The areas have been subjected to soil disturbance or soil build-up, such that, in effect, a different soil profile was sampled.

It is not possible to assess the relative importance of these potential causes for the differences observed between the earlier and more recent studies. Nor is it possible to definitively assess whether residents may, in the past, have been exposed to somewhat higher average concentrations in soil than are currently observed. However, on the basis of a 2,3,7,8-TCDD half-life in soil measured in decades, it is not expected that soil concentrations in residential areas would have been markedly higher than those measured in the current study.

4.9 Data Quality

A variety of data are available to assess the quality of the results of this study. Equipment rinsate blanks and trip blanks were collected during the sampling. One rinsate blank was analysed and returned a non-detect for 2,3,7,8-TCDD, at a detection limit of 0.01 ng/L. In the absence of obvious errors in the primary results, no further rinsate and no trip blanks were analysed.

Laboratory quality control is reported on the analytical certificates (Appendix F). The analytical procedure is also summarised in Appendix F. The primary laboratory (AgriQuality) processed a laboratory blank with each batch of samples (typically 8 – 10 samples per batch). All blanks were reported as non-detects. The AgriQuality method statement reports an on-going performance and recovery standard was analysed with each batch of samples to assess method precision. Recoveries of all isotopically labelled surrogate standards (reported on each analytical certificate) were also within the required limits specified by USEPA Method 1613.

As discussed previously, eight samples were reanalysed for a full dioxin profile to enable TEQ concentrations to be determined. This provides the opportunity to compare the 2,3,7,8-TCDD concentration from the full profile analysis with the result from the 2,3,7,8-TCDD specific analysis. In addition, two split samples were analysed for 2,3,7,8-TCDD by Pace Analytical to provide an independent check of the primary analytical laboratory. These results are presented in Table 8.

The majority of the full profile 2,3,7,8-TCDD concentrations were generally close (typically within 20%) to 2,3,7,8-TCDD specific analysis. The largest discrepancy was for sample SS#05. Differences may arise for two main reasons. Firstly, separate sub-sample were analysed for the 2,3,7,8-TCDD specific and full profile analyses, and while the two sub-samples were taken from the same homogenised sample and should have been identical, inhomogenities in the sample may result in different concentrations for 2,3,7,8-TCDD. Secondly, during the 2,3,7,8-TCDD specific analysis, the GC-MS equipment is specifically calibrated to detect 2,3,7,8-TCDD. However, for the analysis for the full congener profile, a compromise calibration has to be used to accommodate the measurement of a wide range of ion[13] masses. This compromise can result in a different concentration being quantified for the two analyses. Overall the comparison between the two sets of results is considered excellent.

Similarly, there was a good agreement (Table 8) in the results from the analysis of two cross-check samples by AgriQuality and Pace Analytical. The good agreement provides confidence that the primary analytical laboratory results are reliable.

Table 8: 2,3,7,8-TCDD concentration quality assessment

Sample ID	TCDD specific [1]	Full profile [1]	Independent [2]
SS#02	4.8	-	3.9
SS#04	7.4	9.7	
SS#05	92	74	94
SS#06	15	13	
SS#11	2	2	
SS#13	6.2	6.1	
SS#22	0.76	0.8	
SS#24	2.7	2.5	
SS#27	27	26	

1. Analysed by AgriQuality, Lower Hutt
2. Analysed by Pace Analytical Services, USA

[13] An ion is an atom or group of atoms carrying an electrical charge. During the analytical process the dioxin compounds are ionised to enable them to be separated out for identification and quantification.

5.0 Comparison with International Guidelines

5.1 Introduction

A variety of international soil criteria exist for dioxin against which the results of this study may be compared. Several soil criteria and their basis are set out in Appendix C.

Most of the soil criteria do not have statutory force, but are issued as guidelines in recognition that:

- The science is not definitive.
- The assumed exposure scenarios are conservative assumptions of what might occur in reality.
- Exposure on a site will vary on a case by case basis depending on the land use and the receptors present on the site.
- The measurement of contaminant concentrations in soil is not an absolute process, with, for some situations, concentrations potentially varying over short distances.

While a result in excess of a guideline criteria may indicate a potential for a health risk to occur, it should be not be immediately assumed that a health risk will eventuate. Any risk will be relative to the exposure assumed in the derivation of the guideline and the exposure likely in the actual situation. The guidelines set out in Appendix C are for a residential (and in some cases parkland) scenario in which long-term frequent exposure through soil ingestion, and in some cases ingestion of produce grown on site, inhalation of dust and dermal contact with soil, is assumed. Exposure as a child is factored in. Residential exposure scenarios will result in lower guideline values than an industrial exposure scenario, where only adults are considered, the exposure duration and frequency is restricted to working hours and the opportunity for and degree of exposure to soil is less.

Some guidelines assume an tolerable daily intake (TDI), based on animal studies in which a “no observable adverse effects level” (NOAEL) in the animals concerned is factored down, generally by several orders of magnitude, to take account of experimental and interspecies uncertainty.

For human carcinogens, some guidelines assume there is no threshold TDI below which no effects will occur, but adopt the approach that there is some low frequency of cancer end points that is “acceptable”. The USEPA uses this approach for carcinogens, adopting a incremental cancer risk in a lifetime of 10^{-6} (1 in 1,000,000) on the basis that this will result in a cancer risk of 10^{-4} to 10^{-6} for exposure to the mixtures of chemicals typically found on Superfund sites (USEPA, 1996a). Superfund sites are major, federally listed contaminated sites in the US.

In New Zealand, for setting soil guidelines the Ministry for the Environment and the Ministry of Health have adopted a similar approach to the USEPA with respect to carcinogens (MfE/MoH, 1997, MfE, 1997, 1999), but have assumed a cancer risk of 10^{-5} (1 in 100,000). The MoH have also used a cancer risk of 10^{-5} in setting drinking-water

standards. This cancer risk is in the middle of the range that the USEPA considers acceptable.

Many soil criteria documents use terms such as “screening level” and “action level”, which may or may not be tied into local regulatory practices. Typically a screening level is a trigger to carry out further investigation at a hazardous waste site (ATSDR, 1998, USEPA R9, 2000), but it is not considered a remediation level. An action level would typically trigger some sort of intervention, but not necessarily remediation. Other intervention could include site-specific exposure assessments, behaviour modification for occupants or institutional controls to prevent sensitive site uses. This is consistent with the concept of the soil criteria being guidelines, rather than regulatory numbers.

5.2 Guidelines Used for this Study

Five different guidelines have been chosen for comparison with the results of this study, as set out in Table 9 below.

Table 9: Residential soil guidelines (ng/kg)

Country	Guideline	Comment
New Zealand guideline (MfE/MoH, 1997)	1,500	I-TEQ – Interim guideline currently under review
Germany (BMU, 1999)	1,000	I-TEQ - Action level
USEPA (Fields, 1998)	1,000	TEQ
EPA Region 6 (2001) & Region 9 (2000)	39[1]	2,3,7,8-TCDD
US ATSDR (ATSDR, 1998)	50 1000	TEQ – Screening Level TEQ – Action Level

1. Set at 3.9 ng/kg for a one in a million cancer risk. Figure of 39 ng/kg is adjusted value for 1 in 100,000 cancer risk, consistent with other NZ guideline values.

The United States has a number of different guidelines promulgated by both state and federal agencies. The Federal EPA, the primary agency for developing regulations for soil in the US, has a preliminary remediation goal (PRG) of 1,000 ng TEQ/kg for residential soil. In response to a number of EPA regions setting their own criteria, the Office of Solid Waste and Emergency Response has issued a directive stating that this level (i.e. 1000 ng TEQ/kg) is to be generally used as a PRG for dioxin in surface soil at residential sites (Fields, 1998).

Two USEPA regional offices have issued their own, very much lower, risk-based guidelines for 2,3,7,8-TCDD - Region 6 and Region 9. Both these guidelines have similar derivations, being consistent with the Soil Screening Guidance: User's Guide and Technical Background Document (USEPA 1996a,b), and combine exposure from ingestion, dermal contact and inhalation of dust. To make the values consistent with the

New Zealand approach of using a cancer risk of 1 in 100,000 the USEPA Region 6 and 9 guideline values have been multiplied by 10 in Table 9 (see Appendix C). The Region 6 and 9 values are considered to be screening values which, if exceeded, indicate further investigation, rather than remediation, is required.

Canada has recently issued a revised residential/parkland soil guideline to replace the interim soil quality criterion set in 1991. The new value of 4 ng TEQ/kg (CCME, 2001) is not an effects-based value, but is based on a policy decision to classify dioxin as "toxic" under the Canadian Environmental Protection Act. As such, dioxin is slated for virtual elimination and the guideline has been set at a value considered to be representative of the mean background concentration of dioxins in Canadian soils. The same value also applies to agricultural, commercial and industrial land. The supporting documentation notes that the soil quality guidelines for dioxins are considered to be management levels, rather than levels that are protective of human or environmental health, because the guideline is not effects based. Accordingly, it is not considered appropriate to compare the results of the current study with the Canadian guideline, as the guideline does not provide a measure of the health risk posed by a value exceeding the guideline.

5.3 Guideline Comparison and Risk Assessment

The results reported in Section 4 are compared with the five guideline values in Table 6. A comparison is also made in histogram form in Figure 12.

The histogram shows all but one of the results fall below both the USEPA Region 6 and Region 9 guidelines and the ATSDR guideline. All values fall below the New Zealand, German and Federal USEPA criteria by large margins.

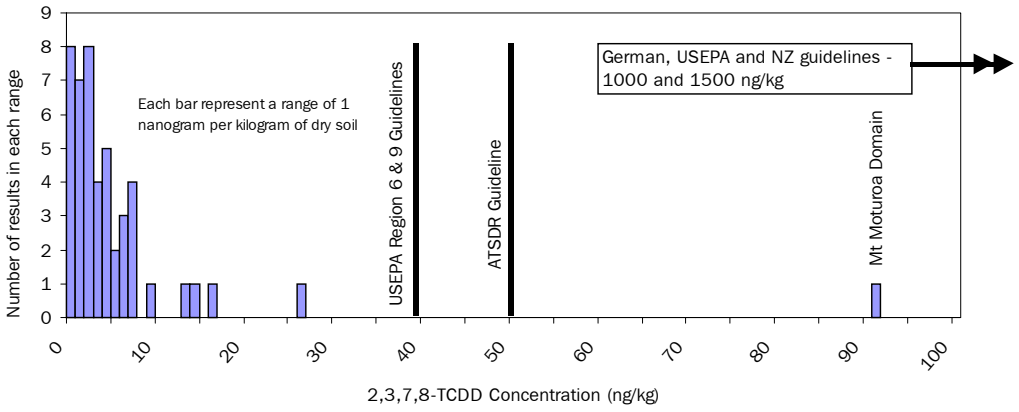


Figure 12: Histogram of 2,3,7,8-TCDD results showing guideline values

The single result (92 ng/kg) that falls outside the USEPA Region 6 and 9, and ATSDR guidelines is the sample from the west-facing slope of Mount Moturoa Domain, a recreational reserve. The MfE result (Buckland *et al.*, 1998) from elsewhere on the Domain (31.2 ng/kg TCDD,) complies with these guidelines. The dioxin concentration collected for the community action group (as reported in the Daily News, Appendix B), and all the TRC samples collected on residential and reserve land, are also below the Region 6 and 9 and ATSDR screening guidelines.

Examining the spatial distribution of the results from the current study (Figure 12), it is reasonable to conclude that, for the residential area of Paritutu, apart from part of the west-facing slopes of Mount Moturoa Domain, the surface soil can be expected to have 2,3,7,8-TCDD (and TEQ) values less than the USEPA Region 6 and 9 screening values.

The land immediately to the west, and below Mount Moturoa, towards the Dow plant is in industrial use (see Figure 2), for which the residential criteria does not apply. The USEPA Region 6 screening values for indoor and outdoor industrial workers are 200 and 540 ng TCDD/kg, respectively (adjusted for the New Zealand cancer risk of 1 in 100,000). All the earlier sampling (Appendix B) of industrial land, whether within or outside the Dow property, gave 2,3,7,8-TCDD concentrations that were below the upper value and all but one result were below the lower value.

Within Mount Moturoa Domain there is likely to be an area with 2,3,7,8-TCDD concentrations in excess of the USEPA Region 6 and 9 and ATSDR guidelines. The extent of this area is not known. It is considered that the concentration at Site 05 (Sample SS#05; 92 ng TCDD/kg) will be close to the maximum expected, given that the sample was taken from the highest and most westerly point of Mount Moturoa. The “leading edge” of Mount Moturoa is expected to intercept an air-borne plume travelling from the Dow Plant to a greater degree than any other point to the east of the plant. Previous sampling on Mount Moturoa measured a 2,3,7,8-TCDD concentration markedly lower than that recorded in the current study (Buckland, *et al.*, 1998).

It is appropriate to consider the likely exposure to soil of users of the Domain, in considering whether concentrations in the order of 100 ng TEQ/kg present a risk to recreational users (noting that only part of the Domain will have concentrations of that magnitude, as demonstrated by the markedly lower MfE sample (Buckland *et al.*, 1998)). The Domain has little if any exposed soil, being well covered by grass. Thus the opportunity for exposure to soil will be less than a residential situation with exposed soil in gardens. Further, the residential exposure scenario used in the derivation of the USEPA Region 6 and 9 guideline assumes exposure for a large part of each day for 350 days over a 30 year duration, in a 70 year lifetime.

While it is conceivable that an individual might visit the Domain every day for many years, the duration of daily exposure is likely to be at least an order of magnitude less than the residential situation. The lower opportunity for soil exposure afforded by the grass cover reduces the probability of exposure further. It is therefore considered that a reasonable screening level for a recreational user of Mount Moturoa Domain would be at least an

order of magnitude higher than the residential scenario, that is, 390 ng 2,3,7,8-TCDD/kg, and possible higher. On this basis, the likelihood of an area on Mount Moturoa Domain having 2,3,7,8-TCDD concentrations (or TEQ) in excess of this level is considered to be extremely remote, and consequently there is no need to investigate the Domain further.

The concentrations measured around the western edge of the Domain suggest the possibility of 2,3,7,8-TCDD concentrations being somewhere in the range between 90 ng/kg and about 20 ng/kg (i.e. falling within the concentrations measured in samples SS#05 and SS#09) in the three or four residential properties on the north-west side of Mount Moturoa, in Port View Road. Concentrations are likely to be lowest at the base of the hill, and increase with elevation and more westerly aspect.

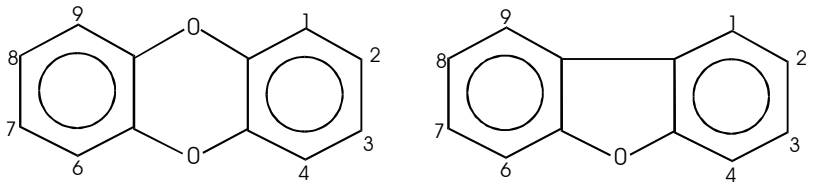
Considering the site-specific characteristics of the Port View Road properties, there appears to be little opportunity for exposure to soil, as these properties have multi-unit flats surrounded by mostly paved surfaces. A high-density residential exposure scenario would therefore be more appropriate than the standard residential scenario, with an appropriate guideline being at least a factor of two higher (the Australian soil guidelines suggests a factor of four, NEPC 1999) than for the standard residential guideline. On that basis, there is no need to investigate these properties further.

Appendix A Background Information on PCDDs and PCDFs

This appendix has been compiled from a number of MfE reports (Buckland *et al.*, 2001, Buckland *et al.*, 1998, Smith and Lopipero, 2001).

A.1 Chemical Structure and Toxicity

The PCDDs and PCDFs are chemically classified as halogenated hydrocarbons. They are tricyclic aromatic compounds, comprising two benzene rings joined via either one or two oxygen atoms at adjacent carbons on each of the benzene rings, as shown in Figure A-1, below.



Dibenzo-p-dioxin Dibenzofuran

Figure A-1: Structures of dibenzo-p-dioxin and dibenzofuran

Both groups of chemicals may have up to eight chlorine atoms attached at carbon atoms 1 to 4 and 6 to 9. Each individual compound resulting from this is referred to as a congener. Each specific congener is distinguished by the number and position of chlorine atoms around the aromatic nuclei. In total, there are 75 possible PCDD congeners and 135 possible PCDF congeners. Groups of congeners with the same number of chlorine atoms are known as homologues. The number of congeners in each homologue group is shown in Table A-1. The most widely studied of the PCDDs and PCDFs is 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). This congener is often generically referred to as ‘dioxin’, and is the reference compound for this class of chemicals.

Congeners containing one, two or three chlorine atoms are thought to be of no toxicological significance. However, 17 congeners with chlorine atoms substituted in the 2, 3, 7 and 8- positions are thought to pose a risk to human and environmental health. Toxic responses include dermal toxicity, immunotoxicity, carcinogenicity and adverse effects on reproduction, development and endocrine functions. Increasing substitution from four to eight chlorine atoms generally results in a marked decrease in potency.

Table A-1: Homologues and congeners of PCDDs and PCDFs

Abbreviation	Homologue name	No. of possible congeners	No. of possible 2,3,7,8-chlorinated congeners
MCDD	Monochlorodibenzo-p-dioxin	2	0
DiCDD	Dichlorodibenzo-p-dioxin	10	0
TrCDD	Trichlorodibenzo-p-dioxin	14	0
TCDD	Tetrachlorodibenzo-p-dioxin	22	1
PeCDD	Pentachlorodibenzo-p-dioxin	14	1
HxCDD	Hexachlorodibenzo-p-dioxin	10	3
HpCDD	Heptachlorodibenzo-p-dioxin	2	1
OCDD	Octachlorodibenzo-p-dioxin	1	1
MCDF	Monochlorodibenzofuran	4	0
DiCDF	Dichlorodibenzofuran	16	0
TrCDF	Trichlorodibenzofuran	28	0
TCDF	Tetrachlorodibenzofuran	38	1
PeCDF	Pentachlorodibenzofuran	28	2
HxCDF	Hexachlorodibenzofuran	16	4
HpCDF	Heptachlorodibenzofuran	4	2
OCDF	Octachlorodibenzofuran	1	1

A.2 Toxic Equivalency Factors and Toxic Equivalents

In environmental media, PCDDs and PCDFs occur as complex mixtures of congeners, which therefore complicates any environmental or human health risk evaluation. However, because it is widely accepted that the toxicological action of PCDDs and PCDFs is via a common mechanism of action (in the initial stages, at least), these compounds have been assigned individual toxic equivalency factors (TEF) values, as agreed by international convention (see, for example, Kutz *et al*., 1990; Van den Berg *et al*., 1998). This mechanism of action is believed to involve the binding of a congener to a cellular protein known as the 'Ah receptor'. The importance of the TEF approach is that it allows the combined toxicity of a complex mixture of congeners to be represented in terms of a single numerical value, or 'toxic equivalents' (TEQ). The TEQ contribution of each congener is calculated by multiplying its concentration by the TEF for that congener. This approach facilitates risk assessment and regulatory control of exposure to these mixtures.

The TEQ method is based on toxicological and in vitro biological data, and knowledge of structural similarities among this group of chemicals. In essence, TEFs are estimates of the relative toxicities of individual PCDD and PCDF congeners compared to the toxicity of 2,3,7,8-TCDD, which, as the reference compound for this group of chemicals, is assigned

a TEF of 1. All 2,3,7,8-PCDDs and PCDFs have been assigned TEF values, which are generally less than 1, reflecting their lower toxic potency. Periodically, these TEFs are revised based on new toxicological data. The latest internationally accepted TEFs for the PCDDs and PCDFs, as agreed at a 1997 World Health Organization (WHO) consultation (Van den Berg *et al*., 1998), are shown in Table A-2. The earlier "International" TEF (Kutz *et al*., 1990) scheme (I-TEF) is also shown in Table A-2.

The use of TEFs assumes that the toxicity of the various congeners acts in an additive fashion. The toxic potency of a mixture of PCDDs and PCDFs (i.e. the TEQ) is the sum of the products of the concentration of each congener present in the mixture and that congener's TEF. Thus, the TEQ represents 2,3,7,8-TCDD toxic equivalents for mixtures of PCDDs and PCDFs.

Table A-2: Toxic equivalency factors for PCDDs and PCDFs

PCDD and PCDF congener	WHO-TEF (Van den Berg *et al*., 1998)	I-TEF (Kutz *et al*., 1990)
2,3,7,8-TCDD	1	1
1,2,3,7,8-PeCDD	1	0.5
1,2,3,4,7,8-HxCDD	0.1	0.1
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.01
OCDD	0.0001	0.001
2,3,7,8-TCDF	0.1	0.1
1,2,3,7,8-PeCDF	0.05	0.05
2,3,4,7,8-PeCDF	0.5	0.5
1,2,3,4,7,8-HxCDF	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01
OCDF	0.0001	0.001

A.3 Sources

PCDDs and PCDFs are not produced intentionally, but are released to the environment from a variety of industrial discharges, combustion processes and as a result of their

occurrence as unwanted by-products in various chlorinated chemical formulations. Historically the manufacture and use of chlorinated aromatic chemicals have been major sources of PCDDs and PCDFs in the environment. Most notable examples include the wood preservative and biocide pentachlorophenol (PCP), 2,4,5-trichlorophenoxy acetic acid (2,4,5-T) and the polychlorinated biphenyls (PCBs). Other processes, such as the production of chlorine-bleached pulp, have led to environmental contamination by PCDDs and PCDFs, as well as the trace contamination of pulp and paper products.

Combustion processes are recognised as being another important source of PCDDs and PCDFs. Most thermal reactions which involve the burning of chlorinated organic or inorganic compounds appear to result in the formation of these substances. PCDDs and PCDFs have been detected in emissions from the incineration of various types of wastes, particularly municipal, medical and hazardous wastes, from the production of iron and steel and other metals, including scrap metal reclamation, from fossil fuel plants, domestic coal and wood fires, and automobile engines (especially when using leaded fuels) as well as accidental fires. An extensive review of PCDD and PCDF sources has been published by Fiedler *et al*. (1990), and more recently by the United States Environmental Protection Agency (USEPA, 1998). Although natural, non-anthropogenic, combustion sources (like forest fires) have probably always been a source of PCDDs and PCDFs, the background levels associated with the pre-industrial processes (before the 1930s/1940s) are found to be negligible when compared to those resulting from more recent industrial activities (Kjeller *et al*., 1991; Beurskens *et al*., 1993; Jones and Alcock, 1996).

An inventory of dioxin emissions to air, land and water in New Zealand has been published (Buckland *et al.*, 2000)

A.4 Physical and Chemical Properties and Environmental Fate

In general, PCDDs and PCDFs have low water solubility, high octanol-water partition coefficients, low vapour pressure and are resistant to chemical degradation under normal environmental conditions. These properties mean that dioxin-like compounds are extremely persistent in the environment, and their highly lipophilic nature results in bio-concentration into biota and biomagnification through the food chain.

In soil, sediment, water and (to a lesser extent) ambient air, PCDDs and PCDFs are primarily associated with particulate and organic matter because of their high lipophilicity and low water solubility. The lower chlorinated congeners have a relatively higher vapour pressure, and more readily partition into the gaseous phase. Once adsorbed to particulate matter, PCDDs and PCDFs exhibit little potential for significant leaching or volatilisation. The available data indicate that these are extremely stable compounds under most environmental conditions, with environmental persistence measured in decades.

The only environmentally significant transformation process for PCDD/F congeners is considered to be photodegradation in the gaseous phase and at the soil–air or water–air

interface. PCDDs and PCDFs entering the atmosphere are removed either by photodegradation or by wet or dry deposition. Although some volatilisation of PCDDs and PCDFs on soil does occur, the predominant fate of these chemicals adsorbed to soil is to remain in place near the surface of undisturbed soil, or to move to water bodies with soil erosion. The scouring of surface soil through wind erosion may also lead to the re-suspension of particle-bound PCDDs and PCDFs into the atmosphere. PCDDs and PCDFs entering the water column primarily undergo sedimentation and burial. The ultimate environmental sink of these PCDDs and PCDFs is believed to be aquatic sediments.

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Appendix B New Plymouth Historical Soil Investigations

Information on historical soil investigations of dioxin concentrations in soil in New Plymouth is presented in this Appendix. The summary focuses on studies undertaken in the suburb of Paritutu, where the Dow AgroSciences (formerly Ivon Watkins Dow, or IWD) chemical manufacturing plant is located.

Since 1985, five separate investigations have been undertaken. These studies, and their findings, are described below. Care must be taken when comparing the dioxin results from these historical studies with the findings of the current investigation, because:

- For many of the historical investigations, especially those from the 1980s, little information was provided in the study reports on either analytical methods or data quality assurance. In addition, in a number of cases, the precise location of the sampling site was not clearly reported. When such information is lacking, the accuracy, completeness and representativeness of the results cannot be assumed.
- The sampling programmes used in the various studies were not necessarily the same, varying particularly in the depth to which soils were taken. For example, one study took soil scrapes to a depth of 150 mm, whereas other studies took soil cores to depths of 50 mm and 100 mm.

B.1 Regional Air Pollution Control Group Investigation, 1985

The first study to measure dioxin soil levels was undertaken by the Regional Air Pollution Control Group (RAPCO), Department of Health, on 17 April 1985. The results were reported in a submission to the ministerial committee of inquiry set up to investigate possible health effects of manufacture of 2,4,5-T in New Plymouth (Pilgrim, 1986).

RAPCO and IWD personnel collected soil samples inside and outside IWD's boundary. Ten sample sets were obtained, each comprising seven to nine 25 mm diameter by 50 mm deep soil cores. Samples were divided into two groups; sets A being from within IWD's premises, and sets B outside their premises, generally being 300 to 800 metres from the centre of the manufacturing complex. The area sampled covered all wind directions. The locations are given in Figure B-1. Samples were analysed by the Department of Scientific and Industrial Research (DSIR), Lower Hutt, for 2,3,7,8-TCDD using gas chromatography mass spectrometry. The concentrations measured are reported in Table B-1.

The submission to the committee of enquiry notes "*the highest results were from sample sets North West B (140 ng/kg) and from East A (170 ng/kg), followed by East B (110 ng/kg). These results are consistent with the prevailing wind directions*[14] *– south-easterly at about 22% of the time and westerly at about 22% of the time. The results from North East B (100 ng/kg) also corresponds well to the south westerly wind direction*

[14] Wind data from the Waireka meteorological station.

at about 14% of the time, and South A (90 ng/kg) corresponds with the north and north easterly wind directions (5% and 7% respectively)" (Pilgrim, 1986).

Table B-1: TCDD in soils within and around the IWD plant[1]

Sample number[2]	Sample description	2,3,7,8-TCDD (ng/kg)[3]
IWD 1	North B	50
IWD 2	North West B	140
IWD 3 (composite sample)	West B	No result reported
IWD 4 (composite sample)	North East B	100
HD 5	South A	90
HD 6 (composite sample)	South B	20
HD 7	South East A	60
HD 8 (composite sample)	South East B	nd (< 10)[4]
HD 9 (composite sample)	East A	170
HD 10 (composite sample)	East B	110

1. Source: Pilgrim, 1986
2. IWD sample numbers are results provided by IWD. HD sample numbers are results provided by DSIR, Lower Hutt
3. Not specified whether results are reported on a dry weight or wet weight basis
4. nd = not detected at 10 ng/kg

For samples taken from inside and outside the IWD perimeter (sample sets A and B respectively), higher 2,3,7,8-TCDD concentrations were consistently measured in the samples taken from within the IWD premises than from outside when considered along the same compass direction.

B.2 Department of Health Investigations, 1986

Following the trichlorophenol (TCP) process chemical release at the IWD plant on 15 April 1986, sampling was undertaken by the Department of Health that day, with further sampling the following day.

B.2.1 Sampling – 15 April 1986

Soil samples were collected during the morning of 15 April 1986 immediately following the TCP process chemical release (Pilgrim, 1986). These samples consisted of "*bulked*

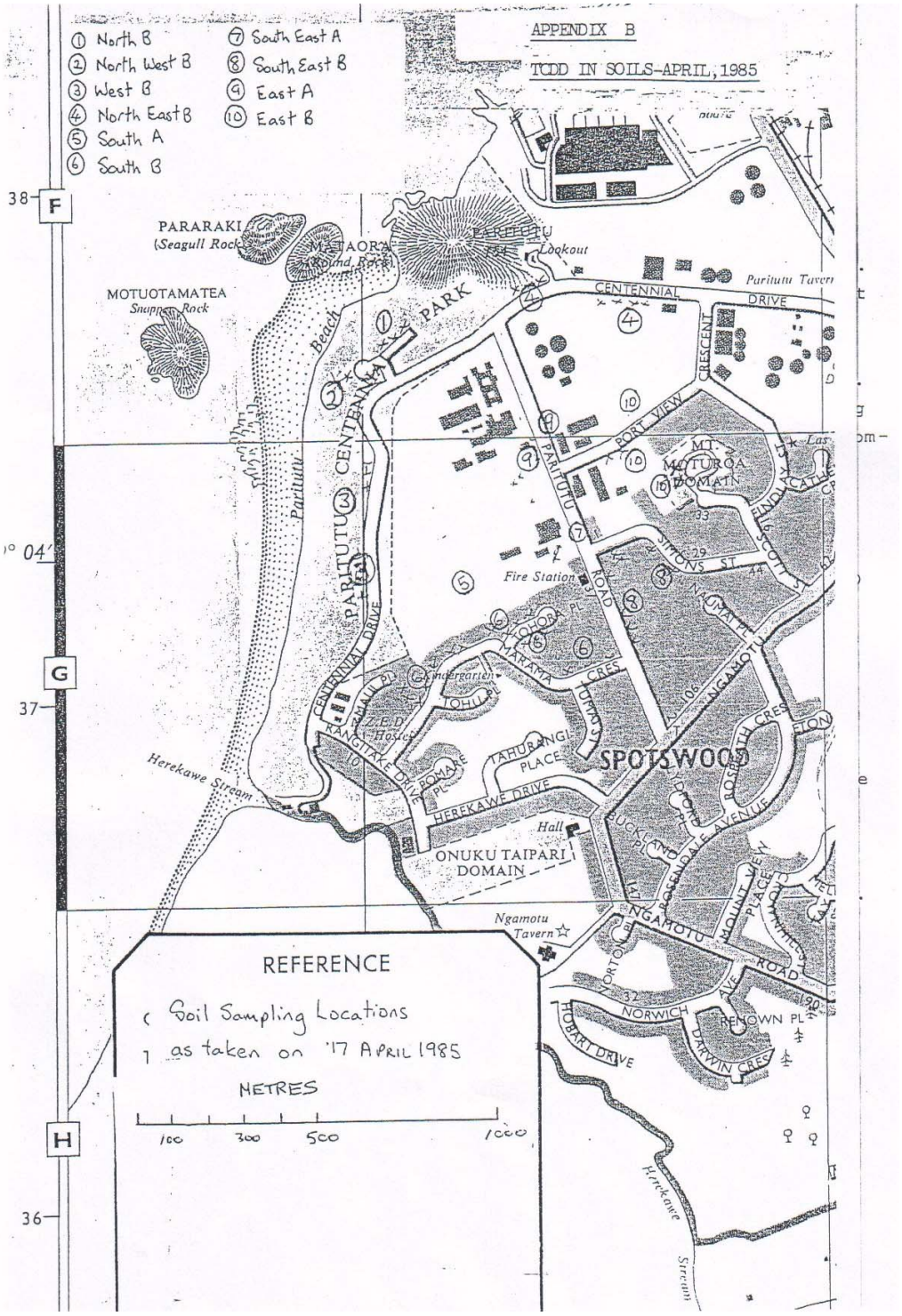


Figure B-1: Sampling locations for RAPCO investigations. Source: Pilgrim, 1986 [Appendix B]

scrapes 10 to 15 mm in depth from several areas in close proximity"[15]. Samples were analysed by the DSIR for TCDD. The data reported (Pilgrim, 1996) are given in Table B-2.

Table B-2: Department of Health soil scrapes (collected 15/04/86)[1]

Sample number	**TCDD (ng/kg)[2]**
S8	nd (< 30)[3]
S9	40
S10	nd (< 30)

1. Source: Pilgrim, 1986
2. Not specified whether results are reported on a dry weight or wet weight basis. Similarly, not specified whether data are for 2,3,7,8-TCDD or for total TCDD congeners
3. nd = not detected at 30 ng/kg

Only one sample (S9) had a measurable TCDD concentration (40 ng/kg) above the limit of detection (30 ng/kg). This sample also had the highest TCP concentration at 500 μg/kg. The soil from which sample S9 was taken (adjacent to the Shell Todd driveway) was described as having an "*oily deposit*" (Pilgrim, 1996).

Wipe tests were also undertaken during the morning of 15 April. The locations of the wipe and soil samples are given in Figure B-2.

B.2.2 Sampling – 16 April 1986

Additional soil scrapes (together with grass samples) were collected by the Department of Health from all areas adjacent to IWD's perimeter on 16 April (Pilgrim, 1986). These composite samples comprised 10 to 15 random samples taken over a defined sector. The location of these samples is given in Figure B-3. Samples were analysed by the DSIR for 2,3,7,8-TCDD. The concentrations measured in the soil scrapes are reported in Table B-3.

[15] Unclear whether "*in close proximity*" refers to the proximity of the sampling sites to the process plant, or, the proximity of the areas from where soil scrapes were taken relative to each other.

Table B-3: Department of Health soil scrapes (collected 16/04/86)[1]

Sample number	Sample description	2,3,7,8-TCDD (ng/kg)[2]
DEM 16/4/86/1	Sector E – Inside IWD western boundary fence, from north to south	310
DEM 16/4/86/2	Sector A – Grass embankment at the front (west side) of Shell BP and Todd tank farm. Across road from IWD	100
DEM 16/4/86/4	Sector B – Centennial Park across Centennial Drive from IWD. From Paritutu Road to car park	nd (< 20)[3]
DEM 16/4/86/6	Sector C – West of IWD on west side of Centennial Drive	60

1. Source: Pilgrim, 1986
2. Not specified whether results are reported on a dry weight or wet weight basis
3. nd = not detected at 20 ng/kg

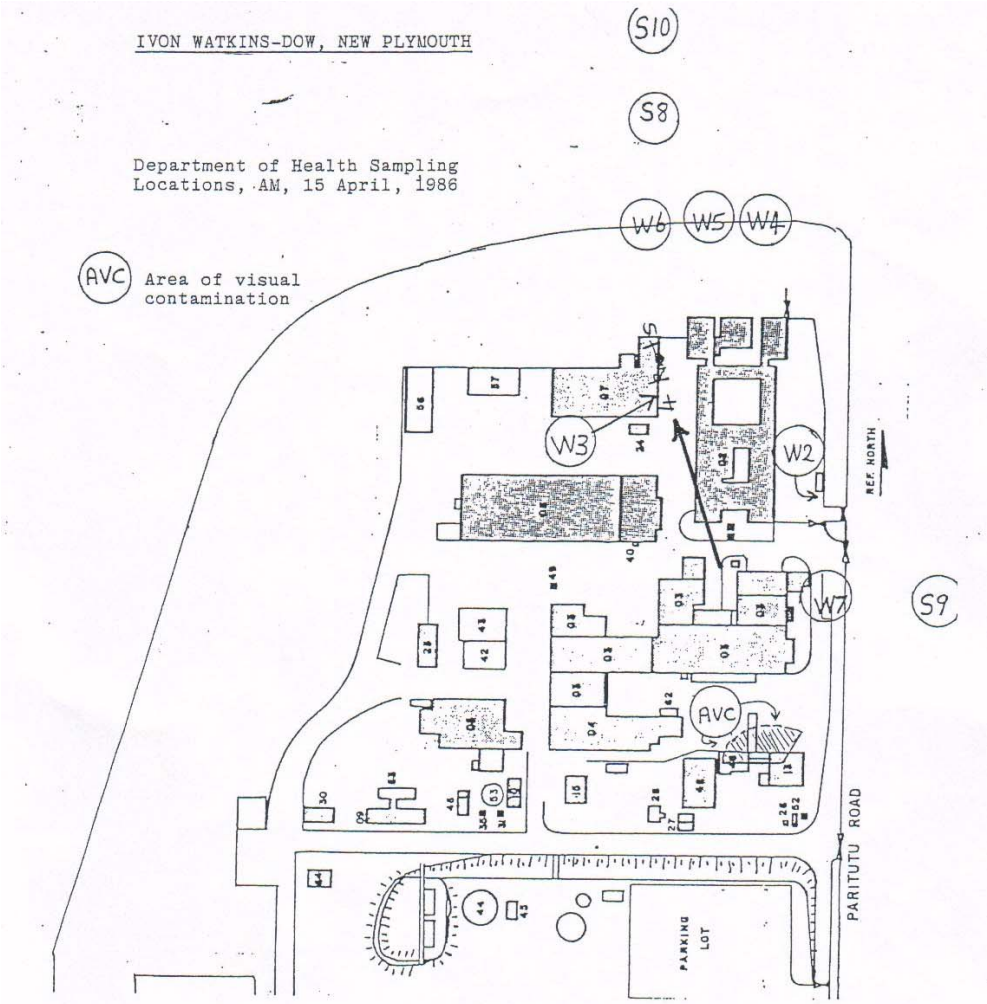
B.3 Ministry for the Environment National Environmental Survey, 1996

The Ministry for the Environment has reported on a national environmental survey for organochlorine chemicals, including dioxin. This survey included the investigation of dioxin soil levels from parks and reserves in eight provincial towns (Whangarei, Hamilton, Napier, New Plymouth, Masterton, Timaru, Greymouth, Invercargill) (Buckland *et al.*, 1998). The New Plymouth samples were collected on 8 March 1996 from:

- Mt Moturoa Domain (map reference: NZMS 260 P19/992,374)
- Churchill Heights, Western Park (NZMS 260 P19/021,373)
- Marsland Hill (NZMS 260 P19/376,029)
- Brooklands Park (NZMS 260 P19/037,365).

Mt Moturoa Domain is located less than 1 km from the Dow AgroSciences plant in an easterly direction. Churchill Heights, Marsland Hill and Brooklands Park are located approximately 3.5 km, 4 km and 5 km from the plant respectively, also in an easterly direction.

Nine soil cores, taken to a depth of 100 mm, were collected from each site. A composite sample was prepared with the soil cores from Mt Moturoa Domain, and a second composite sample was prepared from the 27 cores taken from Churchill Heights, Marsland Hill and Brooklands Park. Both composite samples were analysed for PCDDs and PCDFs. Analysis was undertaken by high-resolution mass spectrometry (isotope dilution). Concentrations of 2,3,7,8-TCDD, PCDDs and PCDFs are reported in Table B-4. The full results for New Plymouth and the other provincial centres are given in Figure B-4.



DEPARTMENT OF HEALTH WIPE TESTS AND SOIL SCRAPES
(Analyses by DSIR, Lower Hutt)

SAMPLE	WIPE AREA(m^2)	TCA(ng)(ng/m^2)		TCP(ng)(ng/m^2)		TCDD(ng)(ng/m^2)
Wipe (Blank)	----	90		40		6
W 2	0.248	290	1170	70	280	N.D. at 3
W 3	0.093	50	540	360	3870	N.D. at 3
W 4	0.065	20	310	100	1540	8 123
W 5	0.070	20	290	110	1570	N.D. at 2
W 6	0.062	50	810	230	3700	N.D. at 2
W 7	0.310	40	130	1120	3600	N.D. at 3
Soils		TCA(µg/Kg)		TCP(µg/Kg)		TCDD(ng/Kg)
S 8	---	N.D.at 50		20		N.D. at 30
S 9	---	120		500		40
S 10	---	N.D. at 50		30		N.D. at 30

N.D.= Not detected at --- ng = nanogram ug = microgram
µg/Kg= Parts per billion (ppb)
ng/Kg= Parts per trillion (ppt)

Figure B-2: Sampling locations for Department of Health investigations, 15/04/86. Source: Pilgrim, 1986 [Appendix 6]

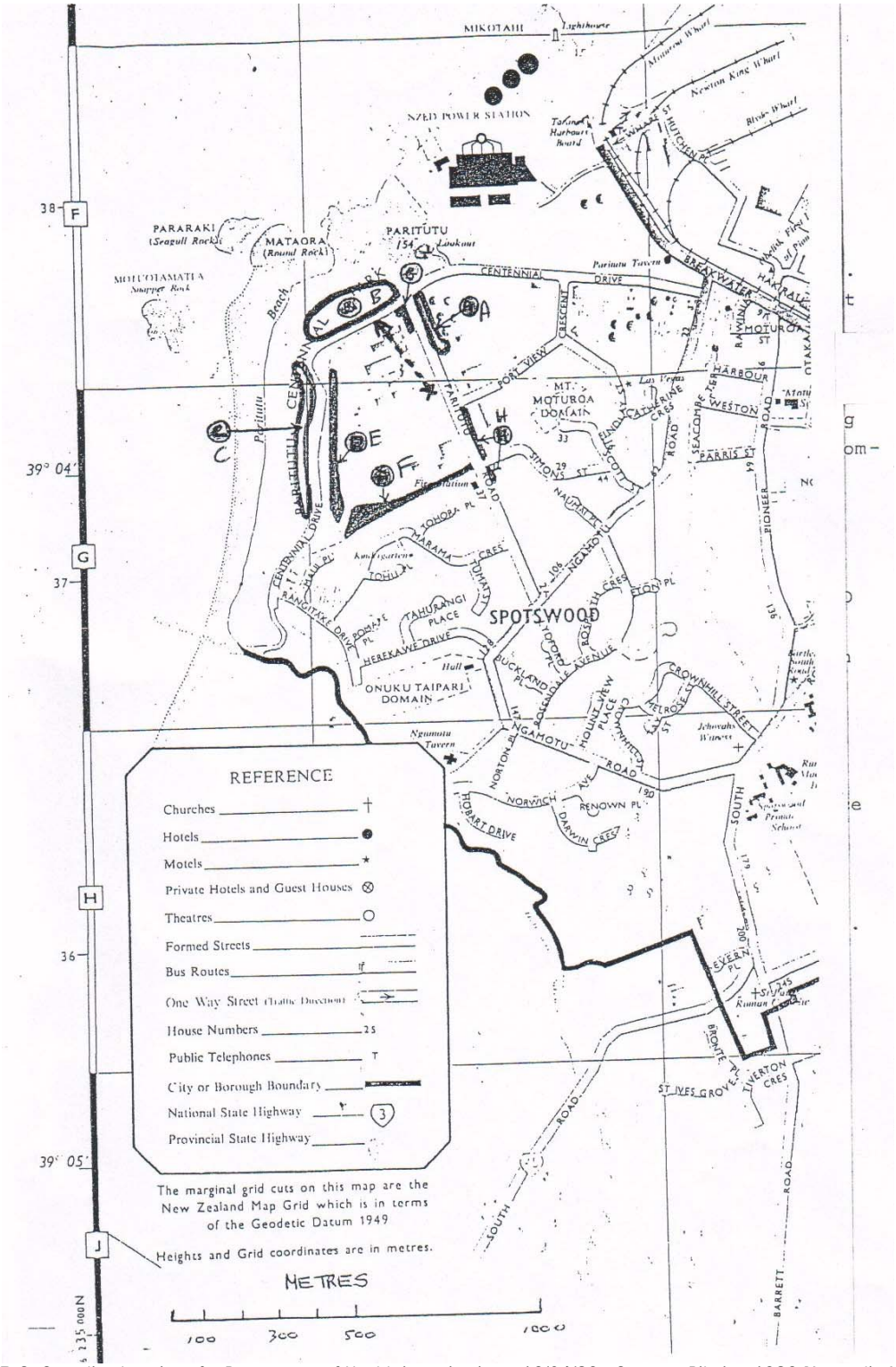


Figure B-3: Sampling locations for Department of Health investigations, 16/04/86. Source: Pilgrim, 1986 [Appendix A]

Table B-4: Ministry for the Environment soil survey of provincial centres[1]

Sample location	2,3,7,8-TCDD (ng/kg dry wt)	PCDD and PCDF (ng I-TEQ/kg dry wt)
Mt Moturoa Domain	31.2	33.0
Churchil Heights, Marsland Hill and Brooklands Park	0.53	2.23
National average[2]	nr [3]	1.50

1. Source: Buckland *et al*., 1998
2. These data represent the national average for all eight provincial towns, excluding the Mt Moturoa Domain site
3. The national average for 2,3,7,8-TCDD was not reported (nr) because 2,3,7,8-TCDD was not detected in any other provincial centre.

The predominant congener quantified in the sample from Mt Moturoa Domain was 2,3,7,8-TCDD (contributing 95% of the I-TEQ level), characteristic of the PCDD and PCDF micro-contaminant profile of the herbicide 2,4,5-T.

The full results from the national soil survey, together with the sampling strategy, analytical method and quality assurance programme are reported in *Organochlorines in New Zealand: Ambient Concentrations of Selected Organochlorines in Soil* (Buckland *et al.*, 1998).

B.4 Taranaki Regional Council Environmental Investigations, 2001

The Taranaki Regional Council has undertaken investigations into possible dump sites in New Plymouth and surrounds, arising from the alleged inappropriate disposal of agrichemical waste from operations at IWD (TRC, 2001). These investigations involved the collection of soil (plus other media) from a variety of sites, including residential properties and parklands within the vicinity of the Dow AgroSciences plant. Five soil samples were collected from the following four sites (Table B-5):

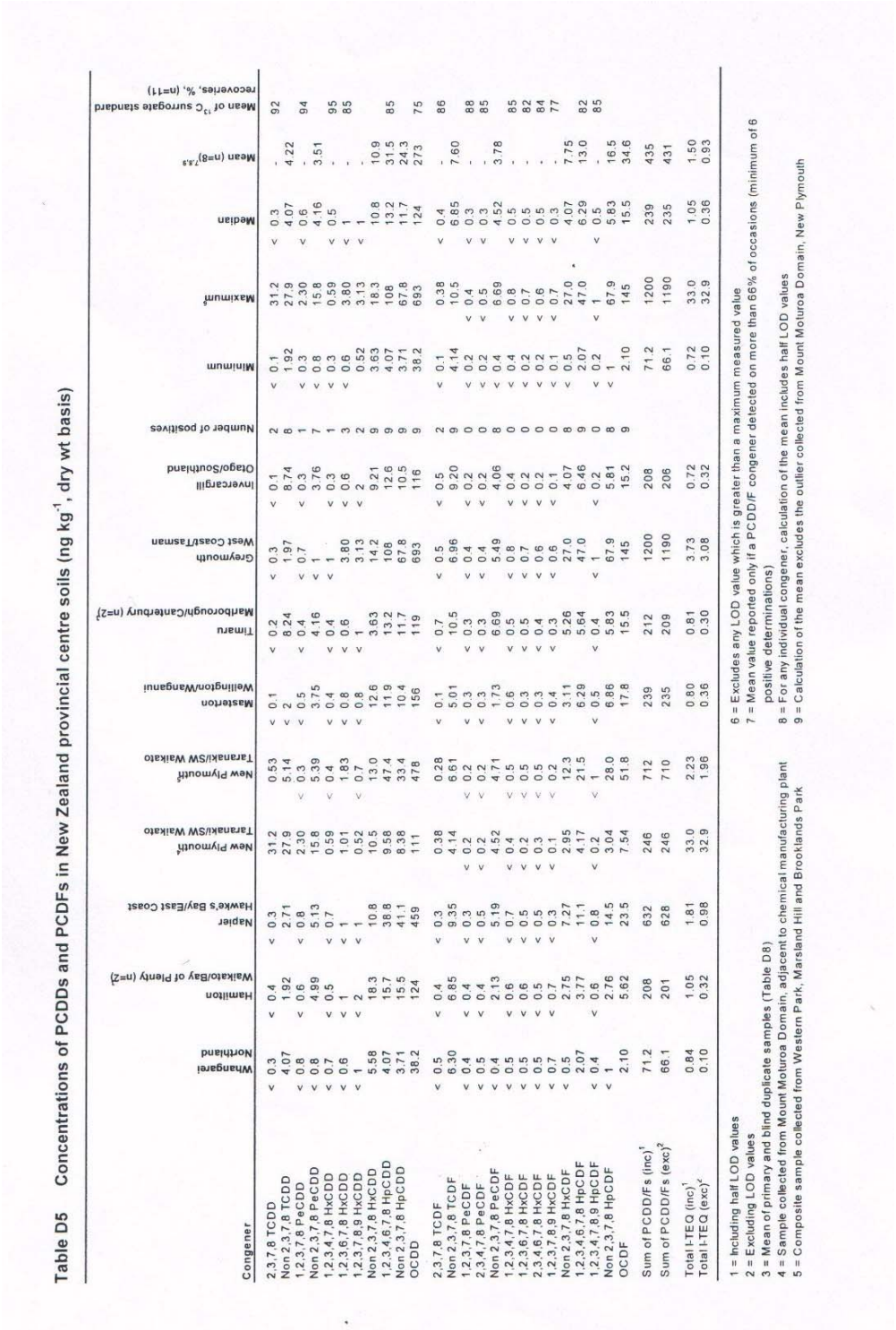


Table D5 Concentrations of PCDDs and PCDFs in New Zealand provincial centre soils (ng kg^{-1}, dry wt basis)

Congener	Whanganui Northland	Hamilton Waikato/Bay of Plenty (n=2)	Napier Hawke's Bay/East Coast	New Plymouth Taranaki/SW Waikato	New Plymouth[5] Taranaki/SW Waikato	Masterton Wellington/Wanganui	Timaru Marlborough/Canterbury (n=2)[7]	Greymouth West Coast/Tasman	Invercargill Otago/Southland	Number of positives	Minimum	Maximum[2]	Median	Mean (n=8)[7,8,9]	Mean of ^{13}C surrogate standard recoveries, %, (n=11)
2,3,7,8 TCDD	< 0.3	< 0.4	< 0.3	31.2	0.53	< 0.1	< 0.2	< 0.3	< 0.1	2	< 0.1	31.2	< 0.3	-	92
Non 2,3,7,8 TCDD	4.07	1.92	2.71	27.9	5.14	< 2	8.24	1.97	8.74	8	1.92	27.9	4.07	4.22	
1,2,3,7,8 PeCDD	< 0.8	< 0.6	< 0.8	2.30	< 0.3	< 0.5	< 0.4	< 0.7	< 0.3	1	< 0.3	2.30	< 0.6	-	94
Non 2,3,7,8 PeCDD	< 0.8	4.99	5.13	15.8	5.39	3.75	4.16	< 1	3.76	7	< 0.8	15.8	4.16	3.51	
1,2,3,4,7,8 HxCDD	< 0.7	< 0.5	< 0.7	0.59	< 0.4	< 0.4	< 0.4	< 1	< 0.3	1	< 0.3	0.59	< 0.5	-	95
1,2,3,6,7,8 HxCDD	< 0.6	< 1	< 1	1.01	1.83	< 0.8	< 0.6	3.80	< 0.6	3	< 0.6	3.80	< 1	-	85
1,2,3,7,8,9 HxCDD	< 1	< 2	< 1	0.52	< 0.7	< 0.8	< 1	3.13	< 2	2	0.52	3.13	< 1	-	
Non 2,3,7,8 HxCDD	5.58	18.3	10.8	10.5	13.0	12.6	3.63	14.2	9.21	9	3.63	18.3	10.8	10.9	
1,2,3,4,6,7,8 HpCDD	4.07	15.7	38.8	9.58	47.4	11.9	13.2	108	12.6	9	4.07	108	13.2	31.5	85
Non 2,3,7,8 HpCDD	3.71	15.5	41.1	8.38	33.4	10.4	11.7	67.8	10.5	9	3.71	67.8	11.7	24.3	
OCDD	38.2	124	459	111	478	156	119	693	116	9	38.2	693	124	273	75
2,3,7,8 TCDF	< 0.5	< 0.4	< 0.3	0.38	0.28	< 0.1	< 0.7	< 0.5	< 0.5	2	< 0.1	0.38	< 0.4	-	86
Non 2,3,7,8 TCDF	6.30	6.85	9.35	4.14	6.61	5.01	10.5	6.96	9.20	9	4.14	10.5	6.85	7.60	
1,2,3,7,8 PeCDF	< 0.4	< 0.4	< 0.3	< 0.2	0.2	< 0.3	< 0.3	< 0.4	< 0.2	0	< 0.2	< 0.4	< 0.3	-	88
2,3,4,7,8 PeCDF	< 0.5	< 0.4	< 0.5	< 0.2	0.2	< 0.3	< 0.3	< 0.4	< 0.2	0	< 0.2	< 0.5	< 0.3	-	85
Non 2,3,7,8 PeCDF	< 0.4	2.13	5.19	4.52	4.71	1.73	6.69	5.49	4.06	8	< 0.4	6.69	4.52	3.78	
1,2,3,4,7,8 HxCDF	< 0.5	< 0.6	< 0.7	< 0.4	< 0.5	< 0.6	< 0.5	< 0.8	< 0.4	0	< 0.4	< 0.8	< 0.5	-	85
1,2,3,6,7,8 HxCDF	< 0.5	< 0.6	< 0.5	< 0.2	< 0.5	< 0.3	< 0.5	< 0.7	< 0.2	0	< 0.2	< 0.7	< 0.5	-	82
2,3,4,6,7,8 HxCDF	< 0.5	< 0.5	< 0.5	< 0.3	< 0.5	< 0.3	< 0.4	< 0.6	< 0.2	0	< 0.2	< 0.6	< 0.5	-	84
1,2,3,7,8,9 HxCDF	< 0.7	< 0.7	< 0.3	< 0.1	< 0.2	< 0.4	< 0.3	< 0.6	< 0.1	0	< 0.1	< 0.7	< 0.3	-	77
Non 2,3,7,8 HxCDF	< 0.5	2.75	7.27	2.95	12.3	3.11	5.26	27.0	4.07	8	< 0.5	27.0	4.07	7.75	
1,2,3,4,6,7,8 HpCDF	2.07	3.77	11.1	4.17	21.5	6.28	5.64	47.0	6.46	9	2.07	47.0	6.29	13.0	82
1,2,3,4,7,8,9 HpCDF	< 0.4	< 0.6	< 0.8	< 0.2	< 1	< 0.5	< 0.4	< 1	< 0.2	0	< 0.2	< 1	< 0.5	-	85
Non 2,3,7,8 HpCDF	< 1	2.76	14.5	3.04	28.0	6.86	5.83	67.9	5.81	8	< 1	67.9	5.83	16.5	
OCDF	2.10	5.62	23.5	7.54	51.8	17.8	15.5	145	15.2	9	2.10	145	15.5	34.6	
Sum of PCDD/Fs (inc)[1]	71.2	208	632	246	712	239	212	1200	208		71.2	1200	239	435	
Sum of PCDD/Fs (exc)[2]	66.1	201	628	246	710	235	209	1190	206		66.1	1190	235	431	
Total I-TEQ (inc)[1]	0.84	1.05	1.81	33.0	2.23	0.80	0.81	3.73	0.72		0.72	33.0	1.05	1.50	
Total I-TEQ (exc)[4]	0.10	0.32	0.98	32.9	1.96	0.36	0.30	3.08	0.32		0.10	32.9	0.36	0.93	

1 = Including half LOD values
2 = Excluding LOD values
3 = Mean of primary and blind duplicate samples (Table D8)
4 = Sample collected from Mount Moturoa Domain, adjacent to chemical manufacturing plant
5 = Composite sample collected from Western Park, Marsland Hill and Brooklands Park
6 = Excludes any LOD value which is greater than a maximum measured value
7 = Mean value reported only if a PCDD/F congener detected on more than 66% of occasions (minimum of 6 positive determinations)
8 = For any individual congener, calculation of the mean includes half LOD values
9 = Calculation of the mean excludes the outlier collected from Mount Moturoa Domain, New Plymouth

Figure B-4: Dioxin concentrations measured in provincial centres from the Ministry for the Environment national soil survey. Source: Buckland et al., 1998 [Appendix D]. Source: Pilgrim, 1986 [Appendix 6]

Table B-5: Taranaki Regional Council soil samples details and descriptions

Sample location	Sample details and description
Pylon 3, Centennial Drive	GPS: 2598521E, 6237539N Date sampled: 28/06/01 This site comprises an area of land (part recreational area) between the Dow north-west boundary and Back Beach extending to Mt Moturoa, with a pylon outside the boundary corner of the Dow property and extending to the beech. A composite soil sample (six cores) was collected from beneath and adjacent to Pylon 3.
Pylon 4, Herekawe Cliff site	GPS: 2598475E, 6237228N Date sampled: 28/06/01 This site comprises an area below a pylon on the west boundary of the Dow property, extending to the beach. A composite soil sample (six cores) was collected from beneath and adjacent to Pylon 4.
44 Rangitake Drive	GPS: 2598570E, 6236617N Date sampled: 28/06/01 This site was at the southern end of Rangitake Drive, and includes the house site and an adjacent vacant section (42 Rangitake Drive). A composite sample of six soil cores was collected from 42 Rangitake Drive only, as 44 Rangitake Drive showed evidence of soil disturbance (Bedford, personal communication).
23C Tahurangi Place	GPS: 2598732E, 6236974N Date sampled: 26/06/01 A residential property. One sample (composite of six cores) was collected along the rear (up gradient) boundary of the site. A second sample (composite of six cores) was collected from below the house.

Each sample was taken from an area representing surface soils at the property that had remained undisturbed since initial establishment (i.e. the land had not been modified as a result of earthworks/landscaping/building construction).

All soil cores were 25 mm diameter by 75 mm deep; vegetation was removed together with the top 25 to 30 mm of soil prior to sampling. Samples were analysed by AgriQuality (formerly DSIR), Lower Hutt, for 2,3,7,8-TCDD using high-resolution mass spectrometry (isotope dilution). Concentrations measured are reported in Table B-6.

Table B-6: Taranaki Regional Council investigations

Sample location	2,3,7,8-TCDD (ng/kg)[1]
Pylon 3, Centennial Drive	29
Pylon 4, Herekawe Cliff site	8.1
44 Rangitake Drive	nd (< 5)[2]
23C Tahurangi Place	nd (< 4) nd (< 6)

1. The TRC report does not specify the basis for reporting of results, but subsequently confirmed as dry weight (Bedford, personal communication)
2. nd = not detected; limit of detection in parenthesis

The full details of these investigations are given in the report *Investigation of Alleged Agrichemical Waste Disposal Sites in New Plymouth* (TRC, 2001).

B.5 Community Residents Action Group Soil Sampling, 2001

In 2001, the environmental consulting firm Kingett Mitchell and Associates, Auckland, collected soil samples from residential properties in Paritutu on behalf of a community action group. Four of the samples collected were sent to the United States for dioxin analysis. Two results are publicly available following reports of this work in the local New Plymouth newspaper (The Daily News, 2001). Concentrations of 19 ng/kg and 0.7 ng/kg were quoted. It is understood that these data are TEQ values from a full PCDD and PCDF analysis.

At present, no other details or written report on this study is publicly available. Despite several attempts, the Ministry for the Environment has been unable to confirm important aspects of the work, specifically the:

- concentrations of PCDDs and PCDFs measured in other samples analysed
- concentrations of 2,3,7,8-TCDD measured
- locations of the properties sampled
- basis for reporting of results (i.e. dry weight or wet weight).

B.6 References

Bedford, G. 2001. G. Bedford, Taranaki Regional Council, personal communication to S Buckland, Ministry for the Environment.

Buckland, SJ, HK Ellis, RT Salter (1998). *Organochlorines in New Zealand: Ambient Concentrations of Selected Organochlorines in Soils*, Ministry for the Environment, Wellington, Wellington, December 1998

Pilgrim, RC (1986). *Submission to the Committee of Enquiry into Possible Health Effects of Manufacture of Agricultural Chemicals in New Plymouth*, Central Regional Air Pollution Group, Department of Health, Wellington, July 1986.

The Daily News (2001). *Scientist offers proof of high dioxin level,* New Plymouth, 20 August 2001

TRC (2001). *Investigation of Alleged Agrichemical Waste Disposal Sites in New Plymouth*, Taranaki Regional Council, August 2001

Appendix C Study Design

C.1 Introduction

The detail of the study design is set out in the Study Design and Sampling protocol document (PDP, 2002) and is based on the study brief appended to that document. The study brief required the basic target of the study to be 2,3,7,8-TCDD on the assumption that this is the principal dioxin contaminant of 2,4,5-T, and that its presence would therefore be an indication of escape from the manufacturing process, whether through fugitive emissions, the 1986 incident or breakthrough of TCDD from the incineration of TCDD contaminated waste. While it was recognised that PCDDs and PCDFs are generated by combustion processes (including back-yard burning), such processes generate a broad range of dioxin congeners, with 2,3,7,8-TCDD being a minor or absent component.

From the brief, the study was based on the assumptions that:

1. The former IWD plant was the principal source of dioxin soil contamination in the area;
2. Contamination occurred via discharges to air with subsequent deposition over the residential neighbourhood, and
3. Sampling was to be focused on residential properties, that is, properties to the east and south of the factory. The industrial or reserve land to the north or west of the factory, where previous studies of dioxin contamination have been carried out (TRC, 2001; Pilgrim, 1986), was not to be sampled unless residential properties were identified within the industrial areas, in which case sampling of those properties was to be considered.

The study design considered areas of likely maximum deposition through the review of meteorological data, topography, age and location of residential areas and results of the earlier studies. However, given the considerable community interest in Paritutu, it was important that the study considered not just the likely areas of maximum dioxin deposition, but also the broader residential areas surrounding the plant. The primary study area was therefore defined as the arc of residential properties running from Maui Place and Rangitake Drive to the south-west of the Dow plant, to the residential properties in Findlay and Catherine streets and Ngamotu Road, adjacent to the industrial land to the east. In addition, samples were to be taken from residential areas up to 2.5 km in the predominant downwind directions, and from within or close to any residential land that might be situated within the primarily industrial land to the north and north east of the plant.

Sampling was primarily to measure 2,3,7,8-TCDD in surface soil, which was defined as being between 0 and 75 mm deeper. In addition a small number of deeper samples (75 – 150 mm) were to be taken distributed around the study area to measure deeper effects.

Given that the intent of the study was to measure cumulative effects, it was an obvious requirement to target areas that had been minimally disturbed over the period of deposition or since. However, it was also decided to measure concentrations in gardens at a small number of locations distributed about the study area.

C.2 Study Design Considerations

In developing the study design, no attempt was made to calculate dioxin emission rates or to differentiate between the various sources over time, as this was not part of the study brief. It was considered that the current dioxin concentration in soil would represent the majority of the dioxin deposited into the soil over the period of manufacture, given its slow degradation in soil. In addition, the measured dioxin concentrations in the soil were expected to be representative of current exposure of site occupants to dioxin from soil. Further, these concentrations are assumed to be typical of concentrations that occupants may have been exposed to over at least the last 15 years, since 2,4,5-T manufacturing stopped at the plant.

This assumption ignores the deposition of dioxin emitted from the incinerator that the Dow plant still operates. However, resource consent compliance monitoring (reported to TRC by Dow) shows the incineration process is under good control, with very low emissions. These emissions are expected to be a negligible contribution to present-day soil concentrations compared with the plant emissions between 1960 and 1987.

The direction and strength of the wind is a significant factor in the pattern of deposition from air emissions. There are two predominant wind directions in the New Plymouth area. Data were obtained from the National Institute of Water and Atmospheric Research (NIWA) climate database for New Plymouth airport, several kilometres east, and from Omata (the Waireka research farm operated by Dow), a few kilometres south-east, and also from the TRC for a site they operate in Fitzroy. Examination of wind records for a number of periods in the 1970's, 80's and 90' show the wind is predominantly either from the west or from the south-east. Winds from the north are rare and light. Data for the Omata climate station for the five-year period 1976 – 1980 are shown in Table C-1. The wind pattern for the Paritutu area is expected to be similar.

Table C-1: Wind direction, Omata, 1976 – 1980

Wind Direction	N	NE	E	SE	S	SW	W	NW	Calm	Total
% of time	6.3	6.2	11.7	23.6	5.8	10.0	21.3	6.8	8.2	100

The south-easterly wind will carry emissions from the factory towards the coast, away from the residential areas to the south, south-east and east of the plant. The westerly winds will tend to carry emissions over industrial properties and the port, but also towards residential areas around Mount Moturoa Domain. Comparatively elevated dioxin

concentrations have previously been reported in these directions (see Pilgrim, 1986 and TRC, 2001). In general, emissions will not tend to be carried towards the residential properties to the south and south-east of the factory site, except during the time (about 13% of the time from the figures above) when the wind is blowing in that direction.

Despite there being a lower likelihood of deposition to the south and south-east of the site, there is considerable community interest in this area. It was therefore a requirement of the study that not only were residential properties in the predominant down-wind direction to be sampled, but also residential areas to the south and south-east of the Dow plant. A lower density of sampling was proposed for the area to the south and south-east than for the area to the east.

While the general expectation was that concentrations would show a trend of decreasing dioxin concentration further from the site, and higher concentrations to the east of the site than to the south, it was recognised that there could also be local concentration variations as a result of particular wind conditions or topographic variations. However, it was not the intention of the study to establish the fine detail of localised concentration "highs" or "lows", as the density of sampling to obtain this sampling would have been well in excess of the resources available. In addition, high-concentration "hotspots" from aerial discharge and deposition over particular small areas were not expected and there was no information to suggest that particular locations should be targeted. Rather, the study was aimed at establishing concentration trends over the general area.

The study design was also not intended to address the potential for "hotspots" as a result of dumped material. This would also require a significantly higher density of sampling. Previous investigations into alleged waste dumps have failed to detect elevated dioxin concentrations in residential areas (TRC, 2001).

A grid-sampling scheme was chosen as an appropriate method to achieve the study objectives.

C.3 Grid design

The choice of grid spacing is inevitably a compromise between a large number of sampling points (to be certain that spatial variability is being measured) and the resources available. A curved grid was chosen, with the sampling points being defined by the intersection of radii and concentric arcs centred about the Dow facility. This arrangement gave a smaller lateral spacing, and therefore more detail, closer to the plant. The grid was positioned so that expected variability as a result of wind direction or topography would be adequately measured. An average grid spacing of around 200 m (equivalent to the length/width of about five to eight residential properties, depending on orientation) was chosen. The resultant grid gave a primary spacing of between about 140 m and 270 m in the transverse direction and radial spacing of 200 m. Intermediate grid points were located in the eastern zone of the sample area, giving a diagonal spacing of about 150 m. This gave more detail where, based on wind patterns and topography, greater deposition could be expected.

The grid was positioned to optimise the coverage of the residential area by rotation of the grid about the Dow plant and to take into account the topography, particularly around Mount Moturoa. The grid was also adjusted at the western end so that the points fell within the area of residential properties.

The outermost arc of grid points is 800 m from the centre of the Dow plant. Based on past sampling (TRC, 2001 and Buckland *et al*, 1998) this was considered to be a reasonable distance over which 2,3,7,8-TCDD might be detected above the New Plymouth background concentration. However, provision was made to collect further samples out to 2500 m to the east of the plant, including four at 1000 m and two each at 1500 m and 2500 m, with the decision whether to analyse these made later.

The resultant grid had 23 primary and intermediate grid points, plus the further eight, more distant, points to the east, up to 2500 m from the centre of the Dow plant.

Information from the community had indicated that a small number of isolated houses are located within the industrial area to the north and north east of the plant. An allowance for four such properties to be sampled was made, the choice to be guided by information received from community groups.

C.4 Sampling Sites

The primary grid samples were located within residential properties, or if no residential properties could be sampled, nearby public lands such as parks. However, for the more distant points, samples were to be taken from public land, but road verges or other land in the immediate vicinity of roads would be avoided. The actual sampling location was to be a property or public space at or near the grid point that:

- is long-established, preferably dating from the 1960's, to maximise the opportunity for deposition of dioxin
- has remained undisturbed, with no major changes to the ground surface – by excavation, filling or cultivation – over that period
- has a current occupier, or an easily-traced previous occupier, who has resided at the property for as long as possible. This gives the opportunity to link this study with the blood serum study (see Section 2) and provide a more reliable site history for each site.
- meets the on-site criteria as set out in Section 4.3

It was decided that that lawn areas would provide the most suitable sampling sites as these will generally have a lower likelihood of disturbance. Garden areas, or areas that were previously garden, are less suitable as turning of soil during gardening is likely to reduce any dioxin contamination by dilution with deeper soil. However, up to six vegetable gardens were to be sampled in addition to lawn areas at selected properties. This was to benchmark gardens that may have received dioxin from:

- direct deposition from the air

- spreading of lawn clippings, or compost containing lawn-clippings, noting that some airborne 2,3,7,8-TCDD may bind to the grass in the vapour phase, and subsequently be cut and removed, rather than falling/being washed into the soil.

The vegetable gardens sampled were distributed as evenly as possible over the study area, with an emphasis on the properties at 400 m and 600 m from the Dow plant.

Public records held by the New Plymouth District Council and the TRC were initially searched to establish a short list of sites within 50 m of each grid point that appear to fit the criteria given above. Inquiries of owner/occupiers were then made (assisted by TRC staff) to ascertain site history and determine whether specific sampling sites were available. Local topography was also taken into account to ensure a site was not unusually sheltered relative to other nearby sites. When a property that fell on a grid point did not meet site criteria, the next adjacent suitable site/property was identified and considered for sampling.

C.5 References

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Pilgrim, RC (1986). *Submission to the Committee of Enquiry into Possible Health Effects of Manufacture of Agricultural Chemicals in New Plymouth*, Central Regional Air Pollution Group, Department of Health, Wellington, July 1986.

TRC (2001). *Investigation of Alleged Agrichemical Waste Disposal Sites in New Plymouth*, Taranaki Regional Council, August 2001.

Appendix D Summary of NZ and Overseas Soil Guidelines for Dioxin

D.1 Summary

A summary of dioxin soil criteria established for residential soil in New Zealand and overseas is provided in Table D-1. Further details for each country are provided following the summary table. References to dioxin in this summary are either to TCDD or to TEQ.

Table D-1: Summary of dioxin criteria

Country	Residential soil criteria	Comment [Reference]
New Zealand	1,500 ng I-TEQ/kg	Present criterion - set as an interim value in the timber treatment guidelines. Currently under review. (MfE/MoH, 1997).
Germany	1,000 ng I-TEQ/kg	Set as an "action value" by the Federal Soil Protection and Contaminated Sites Ordinance (BbodSchV) (BMU, 1999).
Japan	1,000 ng TEQ/kg	Environmental Quality Standard set under the Law Concerning Special Measures against Dioxin (Law No. 105 of 1999) (MoE, 2001)
Canada	4 ng TEQ/kg	Soil Quality Guideline. Derived using ambient background concentrations; i.e. is not effects based. (CCME, 2001)
United States Federal Environmental Protection Agency (USEPA)	1,000 ng TEQ/kg	Preliminary Remediation Goal. Based on criterion developed by Kimbrough *et al.* (1984).
USEPA Region 6	39 ng/kg (for TCDD)[1]	Screening Level for 2,3,7,8-TCDD [US EPA R6, 2001]
USEPA Region 9	39 ng/kg (for TCDD)[1]	Preliminary Remediation Goal for 2,3,7,8-TCDD (US EPA R9, 2000)
Michigan Department of Environmental Quality	90 ng TEQ/kg	Direct Contact Criterion. Derived based on a 1 in 100,000 cancer risk. (DEQ, 1998)
US Department of Health and Human Services – Agency for Toxic Substances and Disease Register	≤50 ng TEQ/kg >50 – <1,000 ng TEQ/kg ≥1,000 ng TEQ/kg	Screening level Evaluation level Action level. (ATSDR, 1998).

Notes:

1. Set at 3.9 ng/kg for a one in a million cancer risk. Figure of 39 ng/kg is adjusted value for 1 in 100,000 cancer risk, consistent with other NZ guideline values.

D.2 Country Specific Dioxin Criteria

D.2.1 New Zealand

The current New Zealand criterion of 1500 ng TEQ/kg dry weight is taken from the timber treatment guidelines published by the MfE and MoH (1997). This criterion was established as an interim guideline value.

The 1500 ng TEQ/kg value was derived using a risk methodology and was based on a tolerable daily intake (TDI) of 10 pg TEQ/kg bw/day. This TDI has since been superseded by an Interim Maximum Monthly Intake of 30 pg TEQ/kg bw/month (MoH, 2002), which, when expressed on a daily basis, is equivalent to one tenth the TDI used to derive the timber treatment guideline value.

The timber treatment guideline value is currently under review, which is expected to be completed by June 30 2003.

D.2.2 Germany

The Federal Soil Protection and Contaminated Sites Ordinance (BbodSchV) has set the following action values (ng I-TEQ/kg dry matter) for the protection of human health (BMU, 1999):

- Playgrounds 100
- Residential areas 1,000
- Parks and recreational facilities 1,000
- Land used for industrial and commercial purposes 10,000

The action values are for the direct intake of dioxins for the “soil-human health” pathway.

D.2.3 Japan

The Japanese Government have set an environmental quality standard for soil of 1,000 ng TEQ/kg, with an index of research of 250 ng TEQ/kg (MoE, 2001). If the soil concentration exceeds the index of research, then investigations need to be undertaken. The environmental quality standard is set under Article 7 of the Law Concerning Special Measures against Dioxin (Law No. 105 of 1999) (EA, 1999).

The environmental quality standard was established taking account of the direct intake of dioxin from soils, and is applied to residential (as well as agricultural and industrial) land (Takabatake, pers com).

The standard was set for the protection of human health and promotion of necessary policy measures. When an area’s dioxin contamination exceeds the environmental quality standard the responsible prefectural governor can specify it as a soil protection policy area based on the Law Concerning Special Measures against Dioxin. The local

government must take necessary corrective action, including removal of contaminated soil (EA, 1999; MoE, 2001b).

D.2.4 Canada

The basis for the Canadian policy on dioxins is their classification of dioxin as 'toxic' under the Canadian Environmental Protection Act. As such, they are slated for virtual elimination under the federal Toxic Substances Management Policy and the CCME Policy for the Management of Toxic Substances.

In 2001, as part of their Environmental Quality Guidelines, the Canadian Council of Ministers of the Environment (CCME) set a soil quality guideline for residential/parkland of 4 ng TEQ/kg (CCME, 2001). The same value also applies to agricultural, commercial and industrial land. This soil quality guideline replaces the interim soil quality criteria set in 1991.

The 4 ng TEQ/kg was set because it was considered representative of the mean background concentration of dioxins in Canadian soils. For residential/parkland use, exposure analysis showed that the estimated daily intake (EDI) for the most sensitive receptor was greater than the tolerable daily intake (TDI), and therefore according to CCME protocol, it is desirable to prevent or disallow any additional soil contamination above background levels. Consequently the soil quality guidelines were set based on mean background ambient concentrations.

The supporting documentation notes that:

> *the soil quality guidelines for dioxins are considered to be management levels, rather than levels that are protective of human or environmental health, because they are not effects based. However, due to the conservative nature of the TDI and EDI values and of the guideline derivation protocol, risks associated with ambient levels are considered to be minimal.*

D.2.5 United States

Federal EPA

The EPA is the primary agency for setting regulations for air, water and soil in the United States. It can receive input from other agencies, such as the Centres for Disease Control (CDC) or the ATSDR, and has often relied on data developed by these agencies, but it is not under any mandate to accept their recommendations.

The current preliminary remediation goal (PRG) adopted by the federal EPA is 1,000 ng TEQ/kg. This dates back to Times Beach and several other early cases of soil contamination. Renate Kimbrough, then employed by CDC, worked in an official capacity in evaluating the health effects at those sites. She and her co-workers developed the

criterion of 1,000 ng/kg for 2,3,7,8-TCDD, articulated in Kimbrough et al. (1984), which was subsequently adopted by CDC, ATSDR, and the EPA. Their paper states:

> *One ppb of 2,3,7,8-TCDD in soil is a reasonable level at which to begin consideration of action to limit human exposure to contaminated soil. This 1,000 ng/kg level was used as the clean-up standard for Times Beach.*

The policy directive for EPA's clean-up criteria is best articulated in a memo by Timothy Fields, Jr. Acting Administrator in the Office of Solid Waste and Emergency Response (OSWER), dated April 13 1998 (Fields, 1998). This is OSWER Directive 9200.4-26. It states:

> *One ppb (TEQs, or toxicity equivalents) is to be generally used as a starting point for setting cleanup levels for CERCLA removal sites and as a PRG for remedial sites for dioxin in the surface soil involving a residential exposure scenario.*

The EPA have urged the various EPA regions to follow this guidance and do not believe it is prudent to establish new, and possibly varying, precedents for dioxin levels in soil prior to the release of the EPA dioxin reassessment report (see actions taken by various EPA regions as outlined below). This is specifically addressed in the latter portion of the Fields memo:

> *In the interim, for sites that require the establishment of a final dioxin soil cleanup level prior to the release of the reassessment report and development of OSWER guidance, EPA should generally use 1 ppb (TEQs) as a starting point for residential soil cleanup levels for CERCLA non-time critical removal sites (time permitting, for emergency and time critical sites) and as a PRG for remedial sites.*

EPA Region 6 and Region 9

EPA Regions 6 and 9 have set their own risk-based criteria for 2,3,7,8-TCDD for residential land use. The derivations of these criteria are consistent with the USEPA Soil Screening Guidance (USEPA, 1996a, 1996b).

The Region 6 criterion, referred to as a Human Health Medium-Specific Screening Level, is 3.9 ng/kg for residential soil (USEPA R6, 2001). Similarly, the Region 9 criterion, referred to as a Preliminary Remediation Goal (PRG), is also 3.9 ng/kg for residential soil (USEPA R9, 2000).

These criteria are based on a one in 1,000,000 cancer risk, and take into consideration exposure via soil ingestion, inhalation of particles and dermal absorption. The method of their derivation allows for the criteria to be adjusted for different cancer risks. For a one in 100,000 cancer risk (the risk normally adopted for the setting of New Zealand standards and guidelines), the adjusted criteria for 2,3,7,8-TCDD become 39 ng/kg.

The Region 6 and Region 9 criteria are applied as a screening level, triggering further investigation, and are not regulatory values. Region 9 states that PRGs are considered to be protective of humans, including sensitive groups, over a lifetime. Chemical concentrations above these levels would not automatically designate a site as "dirty" or trigger a response action. However, exceeding a PRG suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate. Further evaluation may include additional sampling, consideration of ambient levels in the environment, or a reassessment of the assumptions contained in these screening-level estimates.

Michigan Department of Environmental Quality

The Department of Environmental Quality has established generic criteria for a range of contaminants in soil, including dioxin (DEQ, 1998). These direct contact criteria are risk based concentrations that are considered to be protective against adverse health effects due to long-term ingestion of and dermal contact with contaminated soil.

For residential land, and using a one in 100,000 cancer risk, the direct contact criterion for 2,3,7,8-TCDD is 90 ng/kg. This is also applied as 90 ng TEQ/kg for all PCDDs and PCDFs, which are considered as one hazardous substance. The residential land use setting includes single family dwellings, condominiums and apartment buildings.

Agency for Toxic Substances and Disease Registry

The ATSDR has adopted a policy guideline to assess the public health implications of dioxin and dioxin-like compounds in residential soils (ATSDR, 1998). The policy applies to human exposure for the direct ingestion of soils contaminated with dioxin.

The guideline specifies a screening level of ≤50 ng TEQ/kg, an evaluation level of >50 but <1,000 ng TEQ/kg and an action level of ≥1,000 ng TEQ/kg.

The screening level is based on a minimal risk level (MRL) of 1 picogram/kilogram body weight/day (1 pg/kg bw/day) for 2,3,7,8-TCDD.[16] When concentrations exceed 50 ng TEQ/kg, site specific evaluations are needed. Evaluation levels consider site specific factors such as bioavailability, ingestion rates, pathway analysis, soil cover, community concerns, background exposures. When exposures to dioxin concentrations in residential soils exceed I,000 ng TEQ/kg, public health actions such as surveillance, research, health studies and exposure investigations are considered. The ATSDR action level of 1,000 ng TEQ/kg is based on the original work of Kimbrough et al. (1984).

[16] An MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration and route of exposure. The Ministry of Health has recently adopted an interim maximum monthly intake of 30 pg/kg bw/month (MoH, 2002), which is equivalent to the MRL of 1 pg/kg bw/day recommended by the ATSDR and used by them to develop their dioxin screening level.

ATSDR conclude that:

> *the action level of 1 ng/kg (TEQ) for dioxin and dioxin-like compounds, when coupled to a site-specific context of evaluation for the range >50 ng/kg to <1,000 ng/kg TEQs in residential soil, is protective of public health and continues to represent a level at which consideration of health action to indirect exposure, including clean-up, should occur.*

D.2.6 Other Known Guideline Values

The following information is taken from AEA Technology (1999). This report provided a summary of European Union member-state legislation. However, the details given for soil criteria were not comprehensive, some questions remain about application of the dioxin values reported and their current standing is unknown.

D.2.7 Finland

The Ministry of the Environment, Department for Environmental Protection have proposed a guideline of 2 ng I-TEQ/kg and a limit value of 500 ng I-TEQ/kg for contaminated soils. The report (AEA Technology, 1999) indicates that the 500 ng I-TEQ/kg value is applicable to residential soils. When this guideline and limit value were set, and the basis for their derivation is not stated.

D.2.8 The Netherlands

No legislative standards have been set for dioxins in soil. In 1987 guidance levels were proposed for soil pollution that included values of 1000 ng I-TEQ/kg dry matter for residential areas and 10 ng I-TEQ/kg dry matter for dairy farming (AEA Technology, 1999; Zorge and Liem, 1994). The basis for these values is unclear; they are also somewhat old.

D.2.9 Sweden

There are generic guidance values for risk assessment involving dioxin concentrations in soil. They are not binding and are applicable when it is intended that the use of a contaminated area be changed to residential, agricultural and other such uses. If the current levels exceed the guidance values, decisions on site remediation must be taken on a case-by-case basis. The guidelines are:

- Land with sensitive use 10 ng I-TEQ/kg dry matter
- Land with less sensitive use 250 ng I-TEQ/kg dry matter.

AEA Technology (1999) indicates that residential soil is categorised as “land with sensitive use”, whereas industrial areas are “land with less sensitive use”. The basis for the derivation of these values is not stated.

D.3 References

AEA Technology (1999). *Compilation of EU Dioxin Exposure and Health Data: Task 1 – Member State Legislation and Programmes*. Report for the European Commission DG Environment and the UK Department of the Environment, Transport and Regions. http://europa.eu.int/comm/environment/dioxin/download.htm#Compilation%20of%20EU%20Dioxin%20exposure%20and%20health%20data

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USEPA (1996a). *Soil Screening Guidance: Technical Background Document*. EPA/540/R-95/128. Office of Emergency and Remedial Response, Washington DC. PB96-963502.

USEPA (1996b). *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018. Office of Emergency and Remedial Response, Washington DC. PB96-963505.

USEPA R6 (2001). USEPA Region 6, *Human Health Medium-Specific Screening Levels*, US Environmental Protection Agency, Region 6, Dallas, Texas, November 2001 revisions. http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm

USEPA R9 (2000). USEPA Region 9 *Preliminary Remediation Goals.* US Environmental Protection Agency, region 9, San Francisco California. 200 Updates. http://www.epa.gov/region09/waste/sfund/prg/index.htm

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PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

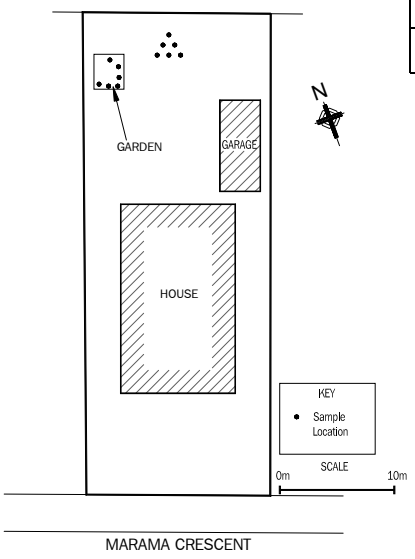
ADDRESS	36 Marama Crescent	Site no.: 01
DATE SAMPLED	31 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, windy	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This was the closest suitable site to the grid point, with the least likelihood of site alterations. The sampling location was chosen to be clear of some vehicle maintenance works and to be exposed to any wind borne deposition from the Dow plant. The garden was thought to be for vegetables, but may have been a sandpit.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	5.9	Not sampled	Sampled: not analysed	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Sand, grey, with minor brown silt

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	~30
Length of time at house: (Yr)	2



PATTLE DELAMORE PARTNERS LTD

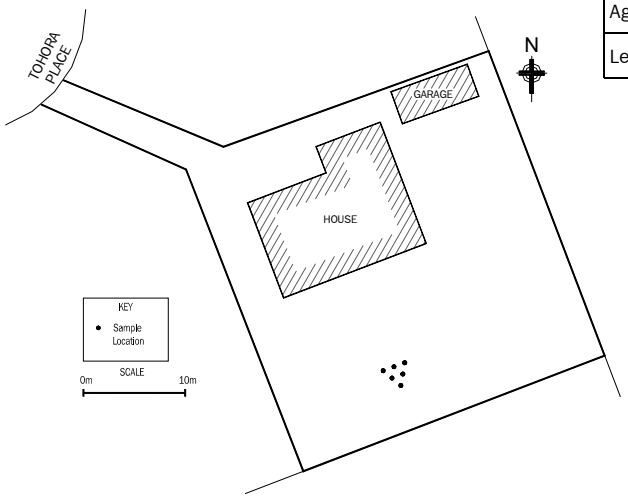
Paritutu Dioxin Soil Sampling

ADDRESS	12A Tahora Place	Site no.: 02
DATE SAMPLED	28 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Blustery with occasional squalls	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The lawn behind the house was selected as being the closest likely undisturbed location to the grid point. The sampling location was on the northern face of a small rise.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	4.8	3.2	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	35-40
Length of time at house: (Yr)	2

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

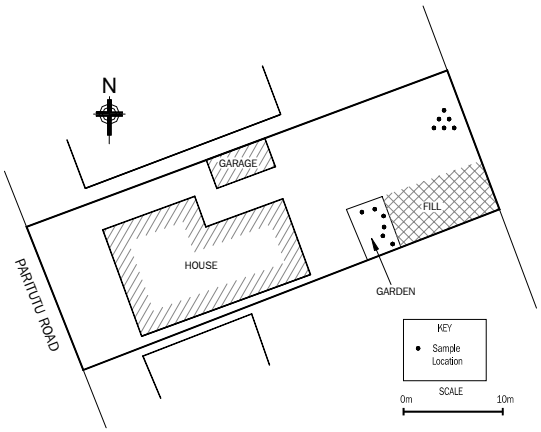
ADDRESS	42 Paritutu Road	Site no.: 03
DATE SAMPLED	4 June 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Clear skies with mild wind.	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This was the closest suitable open and undisturbed site to the grid point. Most of the other sites were either too closed in, or were likely to have recently disturbed ground. The sampling location was chosen to be clear of a vehicle entrance, from some filled area and from the shelter of the house. The garden was for vegetables.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	5.8	Not sampled	4.5	Sampled: not analysed	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Silt loam, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	35-40
Length of time at house: (Yr)	2



PATTLE DELAMORE PARTNERS LTD

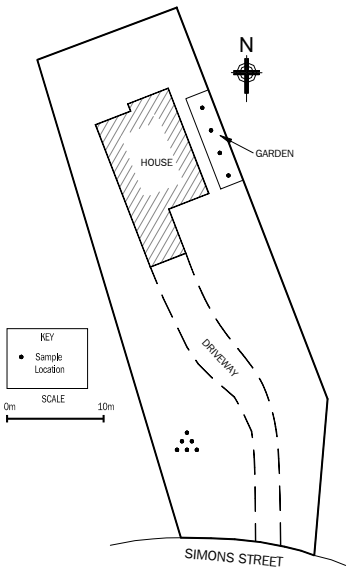
Paritutu Dioxin Soil Sampling

ADDRESS	11 Simons Street	Site no.: 04
DATE SAMPLED	30 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Windy with some rain showers.	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was the nearest open space to the grid point. The sampling location was chosen to be exposed to any wind borne deposition from the Dow plant, and to be clear of adjacent earthworks. The owner's father, who built the house, identified the sampling location as being a relatively untouched area. The garden was raised and ornamental.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	7.4	2.2	4.9	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Sandy with some silt, brown Garden: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	50
Length of time at house: (Yr)	2

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

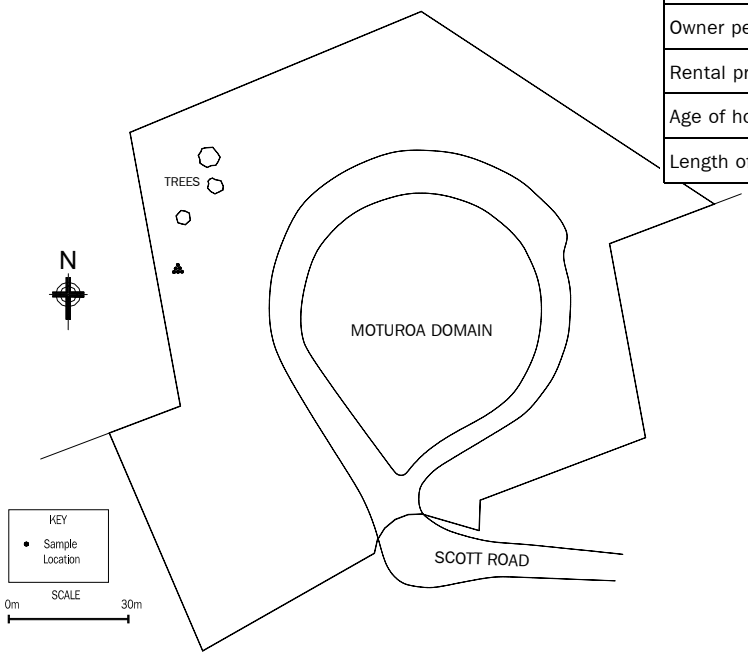
ADDRESS	Mt Moturoa Domain	Site no.: 05
DATE SAMPLED	30 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Windy.	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The sampling location was chosen to be exposed to any wind borne deposition from the Dow plant, and was as close as possible to the grid point. The ground slopes down towards the Dow site.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	92	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN

Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



PATTLE DELAMORE PARTNERS LTD

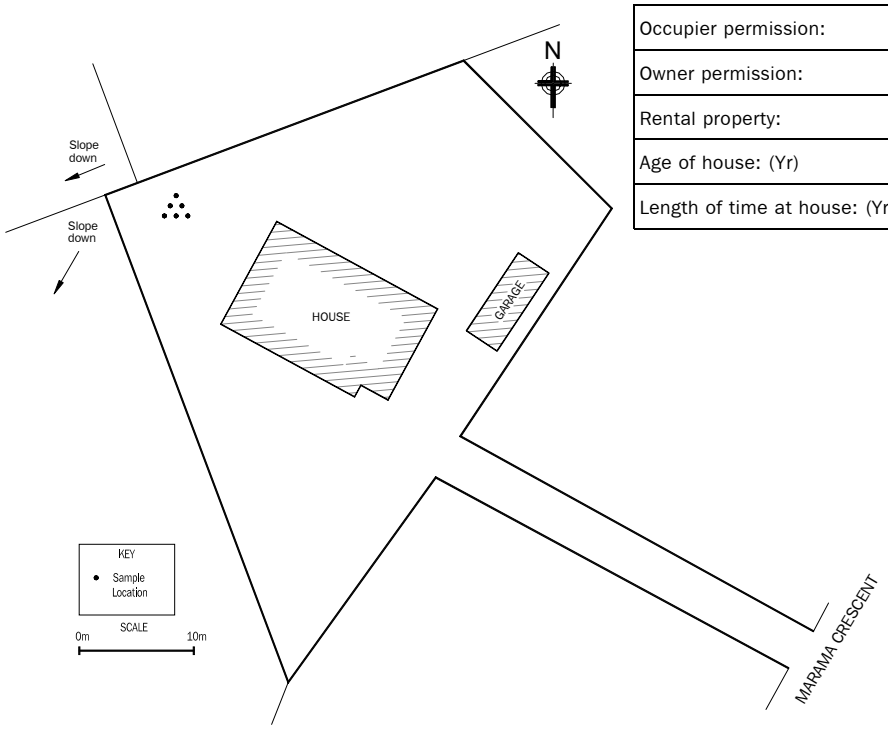
Paritutu Dioxin Soil Sampling

ADDRESS	52A Marama Crescent	Site no.: 06
DATE SAMPLED	31 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Windy, fine	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This was the closest site to the grid point. The site was at the top of a ridge, avoiding being on a slope facing away from the Dow plant, and thus less likely to accumulate wind carried particulate material. The sampling location was chosen to be exposed to any wind borne deposition from the Dow plant. The sampling location was about 3 m from a wire mesh fence.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	15	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	~35
Length of time at house: (Yr)	1.5

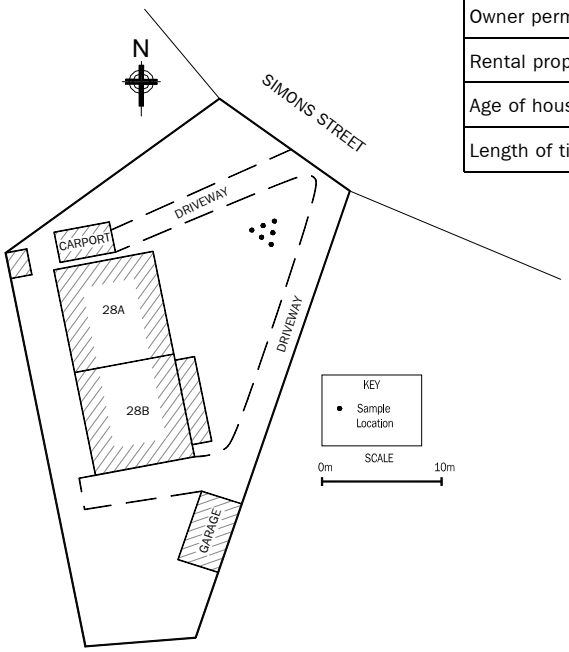
ADDRESS	28A Simons Street	Site no.: 07
DATE SAMPLED	29 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Squally rain	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The sampling location was chosen to be exposed to any wind borne deposition from the Dow plant, and to avoid possible ground disturbances. The sampling location was in a grassed patch between two driveways. It was later identified by the owner as probably being the oldest patch of ground on the site.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	3.4	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	20-30
Length of time at house: (Yr)	1.5



PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

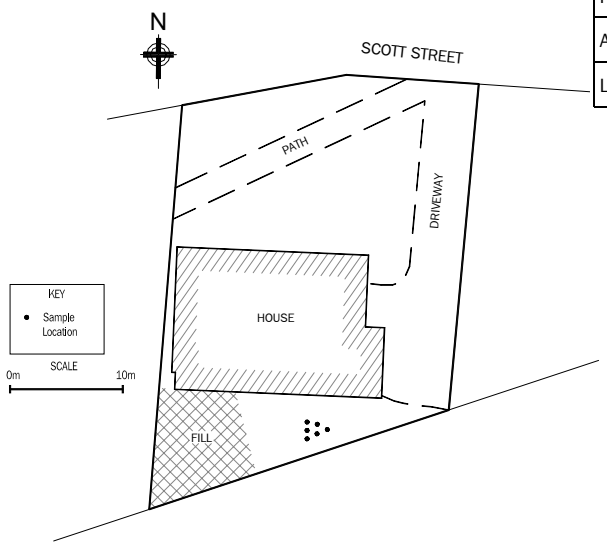
Address	29 Scott Street	Site no.: 08
Date Sampled	28 May 2002	
Observer(s)	DIN representative	
Field Conditions	Squally, driving rain and wind.	
Comments / Interviews/ Sampling Observations	This site was chosen as the closest open area to the grid point with undisturbed ground. The sampling location was chosen to be exposed to any wind borne deposition from the Dow plant, to avoid a filled area, and to avoid adjacent site works. The sampling location was within 1.6 m of a 1.2 m high fence, but there was >5 m of clear space in the direction of the Dow plant.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	6.1	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	30
Length of time at house: (Yr)	22



PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

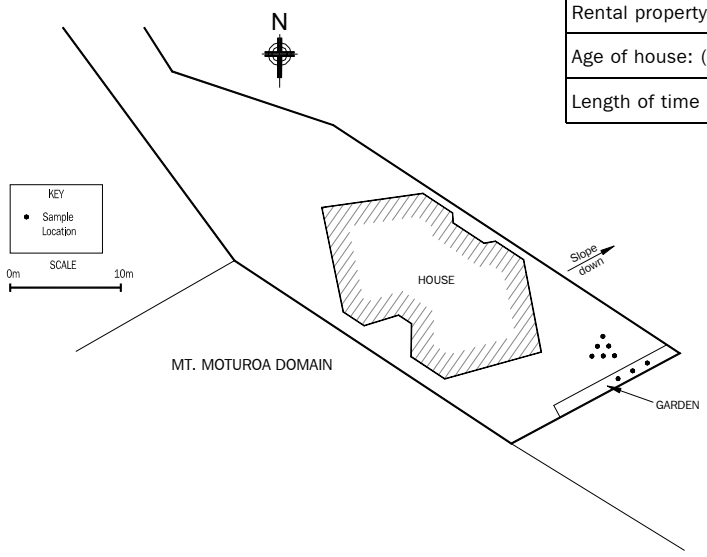
ADDRESS	19 Port View Road	Site no.: 09
DATE SAMPLED	29 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, sunny. Little wind due to shelter from house	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was the closest flat area to the grid point. The sampling location was chosen to be exposed to any wind borne deposition from the Dow plant, and to avoid a concrete drain across the lawn. The sample location was >5 m from the house. The garden was raised and ornamental.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	17	14	2.8	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Silt loam, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	33
Length of time at house: (Yr)	13

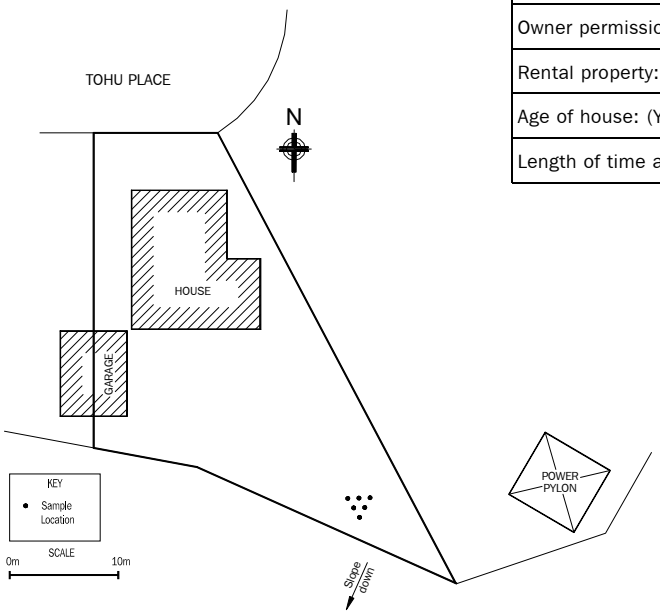


ADDRESS	12 Tohu Place	Site no.: 10
DATE SAMPLED	30 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, blustery	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The grid point was at the base of a slope facing away from the Dow plant, and thus less likely to accumulate wind borne deposition from the Dow plant. Therefore, the site at the top of the slope was selected for sampling. The sampling location was chosen to be exposed to any wind borne deposition from the Dow plant, and to avoid any possible ground disturbances. The sampling location was within 3 m of the boundary fences, but both fences were wire mesh.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	3.6	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	~30
Length of time at house: (Yr)	3

PATTLE DELAMORE PARTNERS LTD

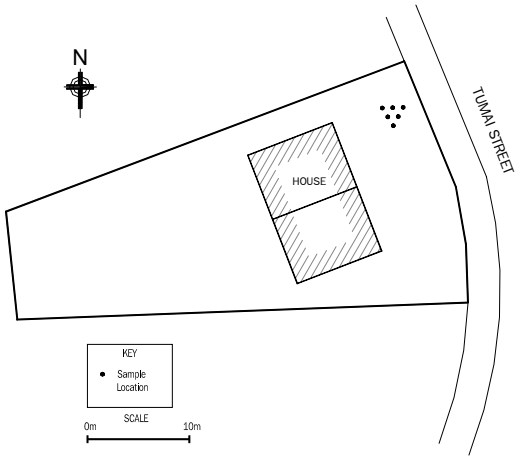
Paritutu Dioxin Soil Sampling

ADDRESS	8 Tumai Place	Site no.: 11
DATE SAMPLED	31 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Calm, no wind or rain.	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The front lawn was chosen as a sampling location, due to its exposure to any wind borne deposition from the Dow plant. No trees or high objects exist for 20 m in the direction of Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	2	1.6	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	~30
Length of time at house: (Yr)	3

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

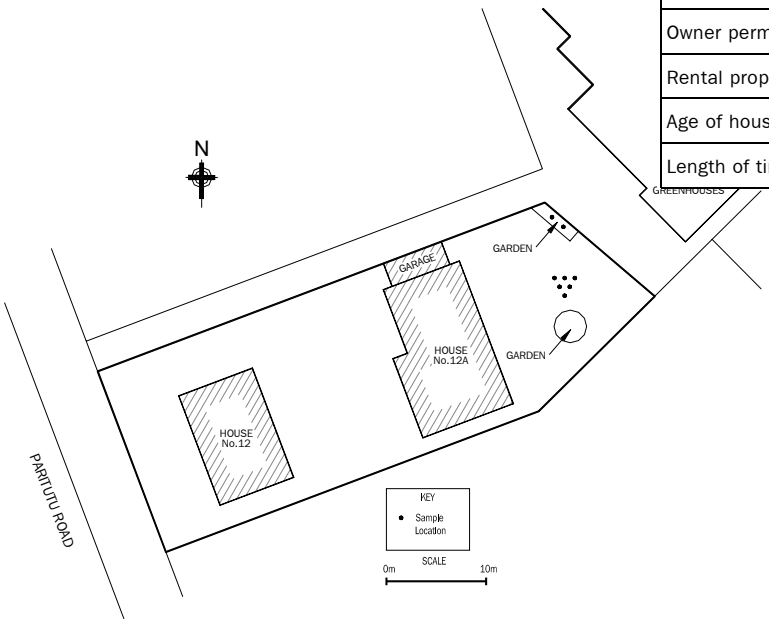
ADDRESS	12A Paritutu Road	Site no.: 12
DATE SAMPLED	28 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Windy, with occasional rain	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was the closest suitable open area to the grid point. The sampling location was chosen to be as far from the shelter of the house, and to avoid some filled areas.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	2.9	Not sampled	2	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Silt loam, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	28
Length of time at house: (Yr)	25



PATTLE DELAMORE PARTNERS LTD

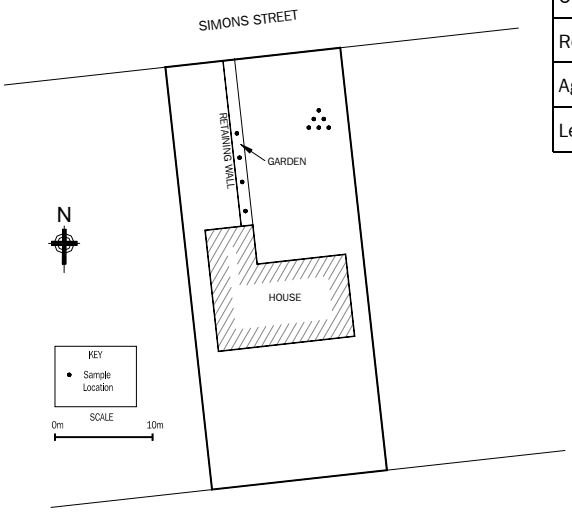
Paritutu Dioxin Soil Sampling

ADDRESS	36 Simons Street	Site no.: 13
DATE SAMPLED	30 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, mild wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This was the closest available site to the grid point. The sampling position was chosen to avoid some timber that was stacked on the lawn. The sampling location was 3 m from the lee fence, but was exposed to any wind borne deposition from the Dow plant. The garden was ornamental, along the top of a retaining wall adjoining the lawn.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	6.2	Not sampled	Sampled: not analysed	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	~30
Length of time at house: (Yr)	13

PATTLE DELAMORE PARTNERS LTD

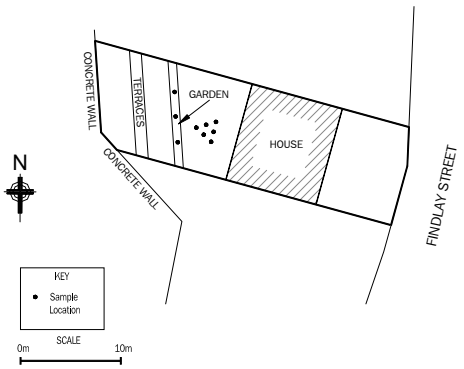
Paritutu Dioxin Soil Sampling

ADDRESS	7 Findlay Place	Site no.: 14
DATE SAMPLED	31 May 2002	
OBSERVER(S)	None	
FIELD CONDITIONS	Fine, but with occasional showers	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The lawn has been terraced – an estimated 20 to 28 years ago. The original slope is visible on adjoining properties. The sample location was chosen to be as far from surrounding walls as possible, and to be from near-to-original ground level, based on observations of the adjacent properties. The garden was ornamental, at the base of the terracing walls.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	8.0	Not sampled	7.3	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	28
Length of time at house: (Yr)	28

PATTLE DELAMORE PARTNERS LTD

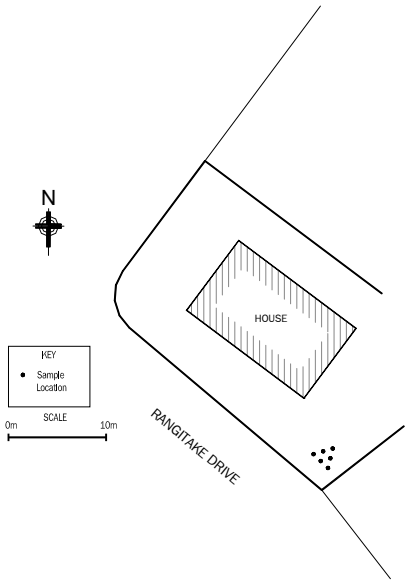
Paritutu Dioxin Soil Sampling

ADDRESS	19 Rangitake Place	Site no.: 15
DATE SAMPLED	31 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Sunny, not much wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This was the closest suitable site to the grid point. Closer sites were not considered suitable due to the short length of occupancy or because no permission was obtained for sampling. The sampling location was chosen to be as far as possible from the shelter of the house and upwind trees. A 2 m high fence was located 2.5 m to the side of the location, but was not considered to reduce any wind borne deposition from the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	1.9	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	~25
Length of time at house: (Yr)	8

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

Address	79 Ngamotu Road	Site no.: 16
Date Sampled	29 May 2002	
Observer(s)	DIN representative	
Field Conditions	Fine, windy	
Comments / Interviews/ Sampling Observations	This property was the closest suitable site to the grid point. The sampling location was chosen to be 2 m from a low concrete wall, to get the best exposure to any wind borne deposition from the Dow plant, to avoid a vehicle parking area, and to avoid some indentations that indicated former plants were nearer the fence. The garden was for vegetables, but was in the lee of some large trees and the house.	

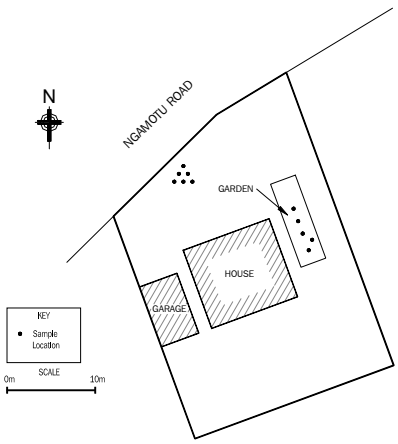
2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	1.8	1.2	Sampled: not analysed	Not sampled	Not sampled

Soil Description

Grassed area: Sandy silt loam, brown

Garden: Sandy sill loam, brown

Site Plan



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	~25
Length of time at house: (Yr)	7

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

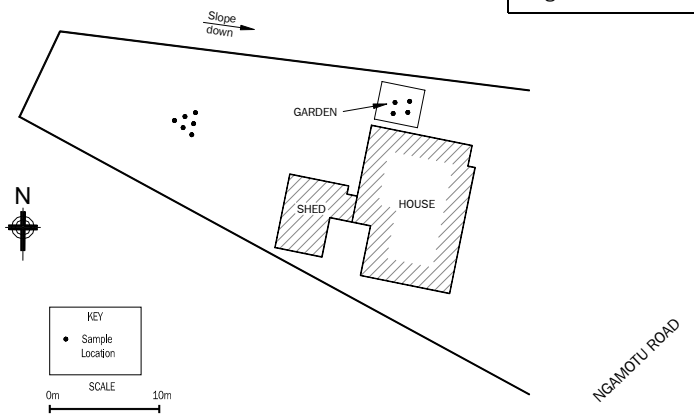
ADDRESS	58 Ngamotu Road	Site no.: 17
DATE SAMPLED	30 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Little wind, some showers	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was the closest open area to the grid point. The sampling location is on a slope facing away from the Dow plant, and thus has less exposure to any wind borne deposition from the Dow plant, but was chosen to be clear of the shelter of surrounding objects, including trees. The lawn is reported to have been sprayed by non-dioxin containing herbicides. The garden was for vegetables, but was in the shelter of some trees and the house.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	0.93	Not sampled	Sampled: not analysed	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Silt loam, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	57
Length of time at house: (Yr)	2



PATTLE DELAMORE PARTNERS LTD

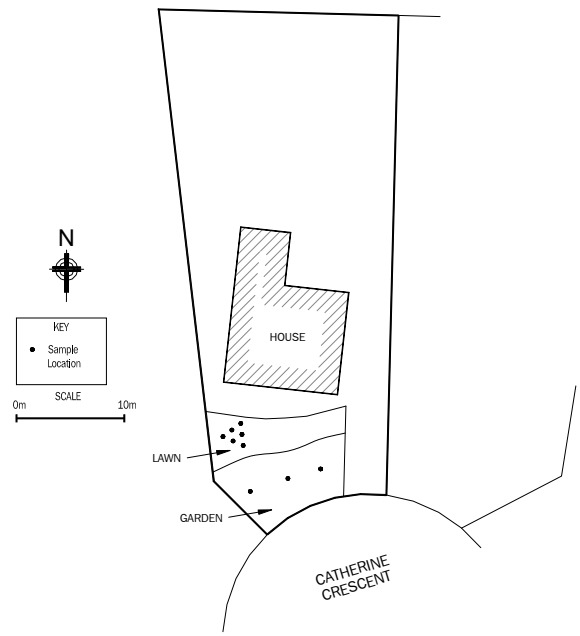
Paritutu Dioxin Soil Sampling

Address	9 Catherine Crescent	Site no.: 18
Date Sampled	31 May 2002	
Observer(s)	DIN representative	
Field Conditions	Little wind, some showers	
Comments / Interviews/ Sampling Observations	The site is the closest suitable residential site to the grid point. Other sites were considered unsuitable due to recent construction, returfing, and/or insufficient open area. The sampling location was a small front lawn, with no obstructions above a 30º angle in the direction of the Dow plant. The distance to the obstructions on either side was 2 m. The garden was ornamental.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	4.5	Not sampled	Sampled: not analysed	<0.01	Sampled: not analysed

Soil Description	Grassed area: Silt loam, brown Garden: Silt loam, brown

Site Plan



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	31
Length of time at house: (Yr)	6

PATTLE DELAMORE PARTNERS LTD

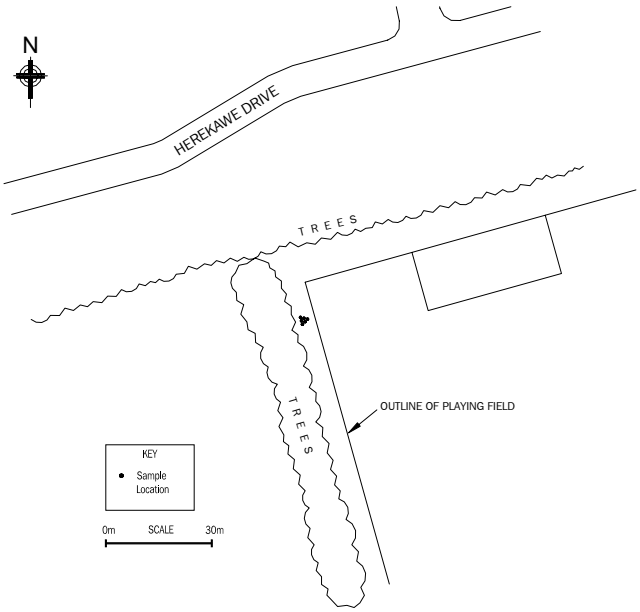
Paritutu Dioxin Soil Sampling

ADDRESS	Onuku Taipari Domain	Site no.: 19
DATE SAMPLED	29 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Windy, occasional showers	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The sampling location was chosen to be away from the sports playing surface, and from some underground lighting cables. A line of trees was located 3 m to the side, but there was 20 m clearance in the direction of the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	1.0	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN



Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA

PATTLE DELAMORE PARTNERS LTD

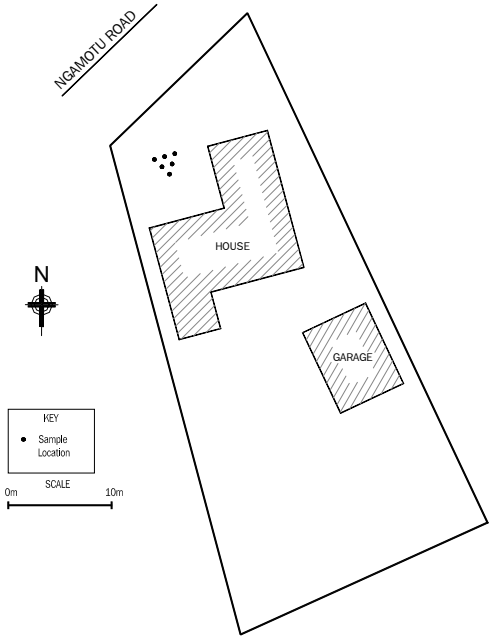
Paritutu Dioxin Soil Sampling

Address	133 Ngamotu Road	Site no.: 20
Date Sampled	4 June 2002	
Observer(s)	DIN representative	
Field Conditions	Showers, windy	
Comments / Interviews/ Sampling Observations	The sampling location was chosen to be on the front lawn rather than the back, to avoid being in the shelter of the house.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	4.8	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	40
Length of time at house: (Yr)	6

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

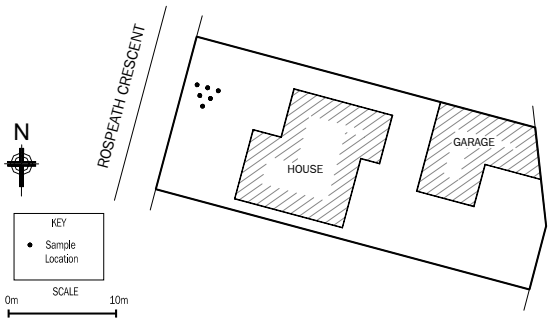
Address	20 Rospeath Crescent	Site no.: 21
Date Sampled	29 May 2002	
Observer(s)	DIN representative	
Field Conditions	Fine, windy	
Comments / Interviews/ Sampling Observations	The site is adjacent to that with the grid point. The sampled lawn is retained above the road level by a 1 m high concrete wall, but appears to have been largely untouched since the construction of the house.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	0.75	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	39
Length of time at house: (Yr)	10



PATTLE DELAMORE PARTNERS LTD

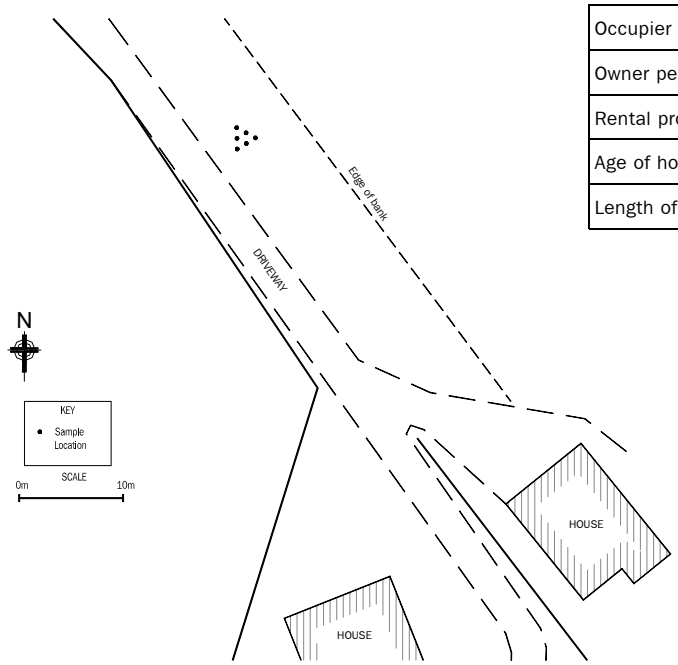
Paritutu Dioxin Soil Sampling

Address	55A Ngamotu Road	Site no.: 22
Date Sampled	30 May 2002	
Observer(s)	DIN representative	
Field Conditions	Sunny, windy	
Comments / Interviews/ Sampling Observations	The site is the closest suitable open area to the grid point. The sampling location was a grazed area beside the driveway, with a steep drop-off on the other side. It was chosen to be as far as possible from a sheltering upwind wall, and to be in a largely undisturbed area.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	0.76	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan



Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	30
Length of time at house: (Yr)	20

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

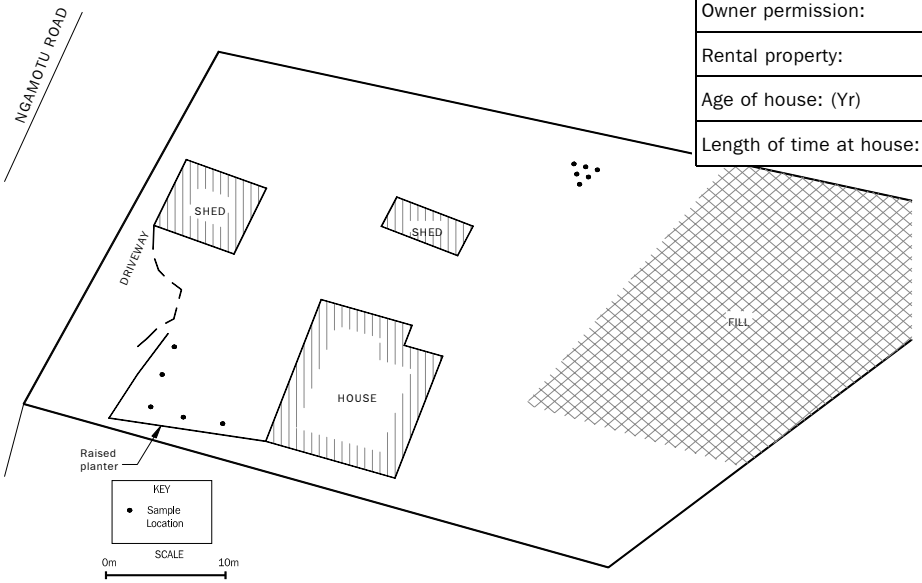
ADDRESS	37 Ngamotu Road	Site no.: 23
DATE SAMPLED	30 May 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, light wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The grid point location is thought to be in an area of fill. The sampling location was chosen to be as far from sheltering objects as possible, while avoiding an area of fill by at least 10 m. The garden was ornamental.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	0.71	0.61	1.3	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown Garden: Silty sand with friable matter, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	30
Length of time at house: (Yr)	11



PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

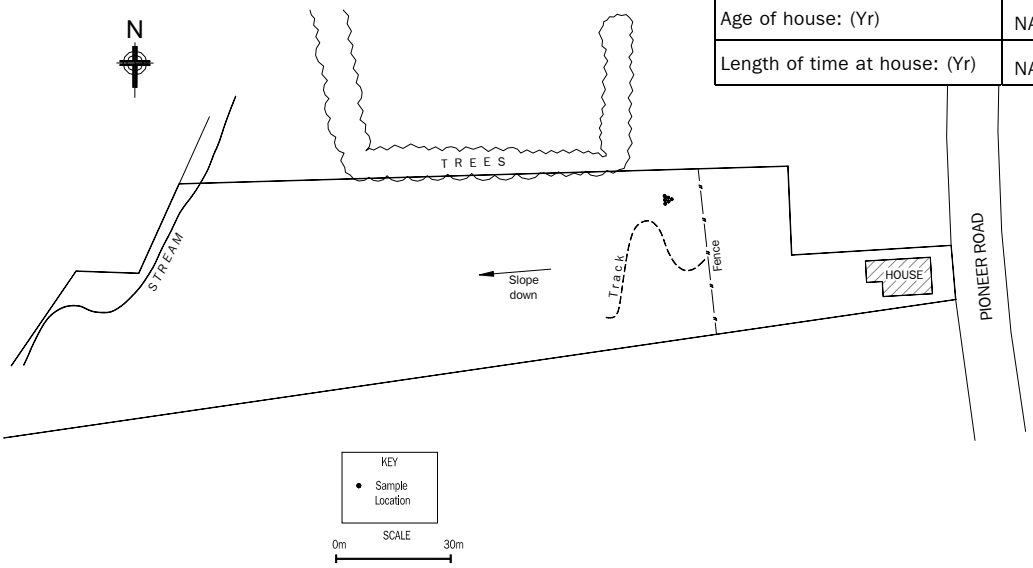
Address	108 Pioneer Road	Site no.: 24
Date Sampled	5 June 2002	
Observer(s)	DIN representative	
Field Conditions	Overcast, windy	
Comments / Interviews/ Sampling Observations	The sampling location was chosen to avoid a track on the property, and is on a slope that faces the Dow plant. A stand of radiata and Cyprus is 4 m to the side of the sampling location, but the trees were estimated by the DIN representatives to be about 10 years old, and thus would not have blocked any wind borne deposition from the Dow plant.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	2.7	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



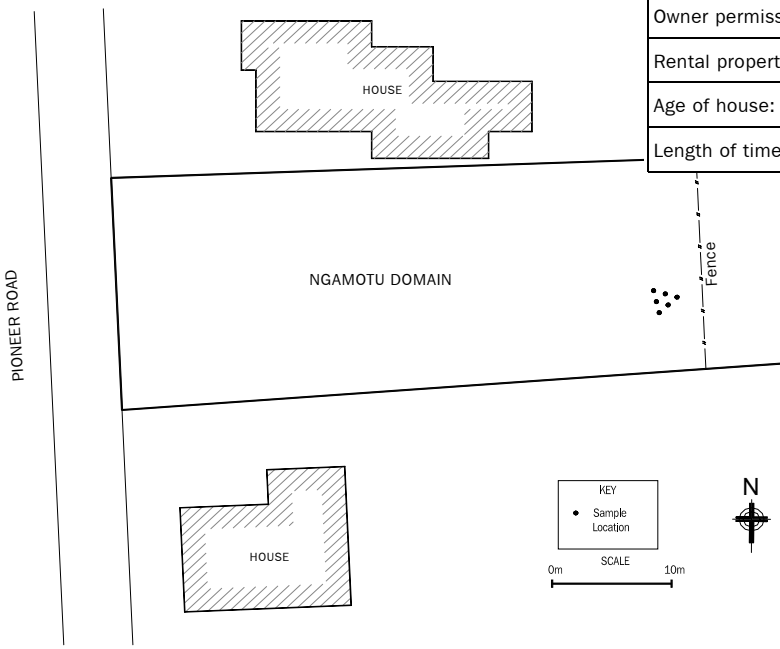
Address	81 Pioneer Road (Ngamotu Domain)	Site no.: 25
Date Sampled	4 June 2002	
Observer(s)	DIN representative	
Field Conditions	Windy, few showers	
Comments / Interviews/ Sampling Observations	The site was selected as being the nearest public land to the grid point. The sampling location, on a slope facing the Dow plant, was chosen to be away from the road and any tracks (the site is grazed by horses).	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	2.2	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan

Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



PATTLE DELAMORE PARTNERS LTD

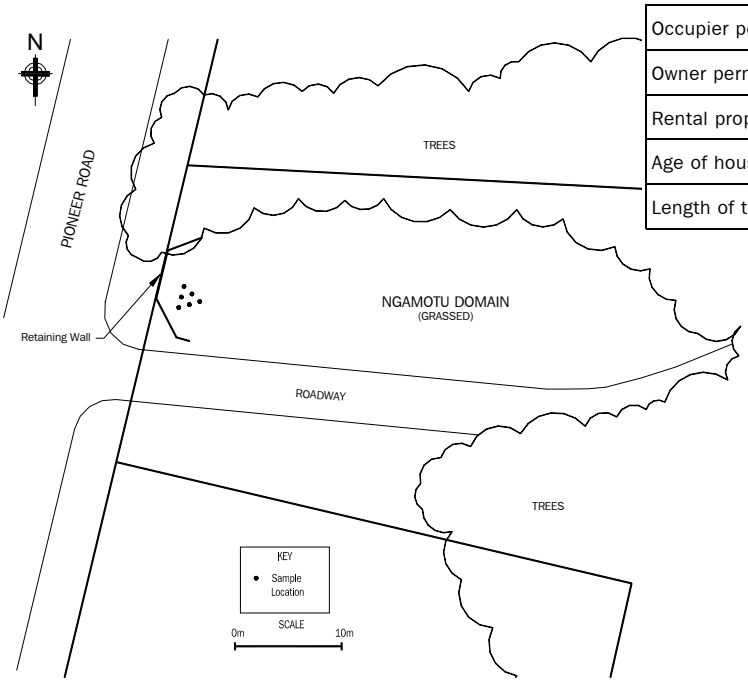
Paritutu Dioxin Soil Sampling

Address	53 Pioneer Road (Ngamotu Domain)	Site no.: 26
Date Sampled	4 June 2002	
Observer(s)	DIN representative	
Field Conditions	Windy, few showers	
Comments / Interviews/ Sampling Observations	The site had vehicle tracks across it, so the sampling location was chosen to be within 2 m of the front retaining wall to avoid vehicular wastes and to avoid the shelter of the surrounding trees. The soil is likely to be original, as it appears that the road was cut rather than the site being filled.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	3.0	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan



Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA

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Paritutu Dioxin Soil Sampling

Address	Permission to publish site address withheld	Site no.: 27
Date Sampled	5 June 2002	
Observer(s)	DIN representative	
Field Conditions	Windy, overcast.	
Comments / Interviews/ Sampling Observations	The selected sampling location was exposed in the direction of the Dow plant.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	27	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan

Permission to publish site address withheld

Occupier permission:	Yes
Owner permission:	No
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA

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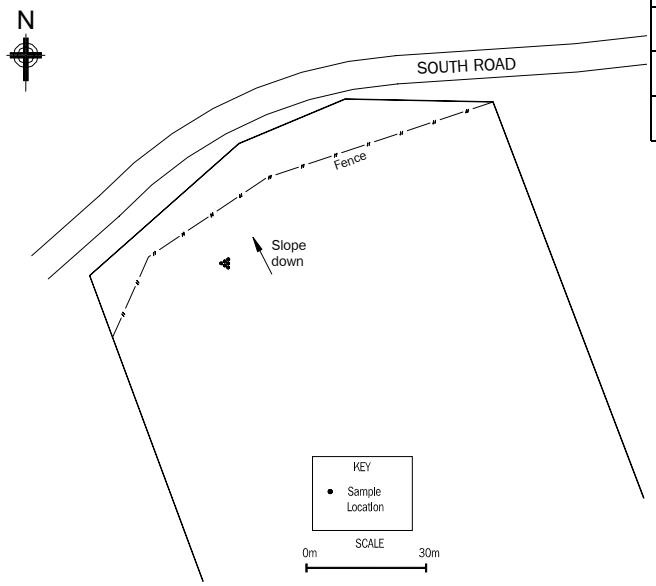
Paritutu Dioxin Soil Sampling

Address	81 South Road	Site no.: 28
Date Sampled	4 June 2002	
Observer(s)	DIN representative	
Field Conditions	Windy, overcast.	
Comments / Interviews/ Sampling Observations	The site was selected as the nearest suitable public land to the grid point. The sampling location, sited on a slope facing the Dow plant, was chosen for its exposure to any wind borne deposition from the Dow plant. The site is used for grazing.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	0.88	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan



Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

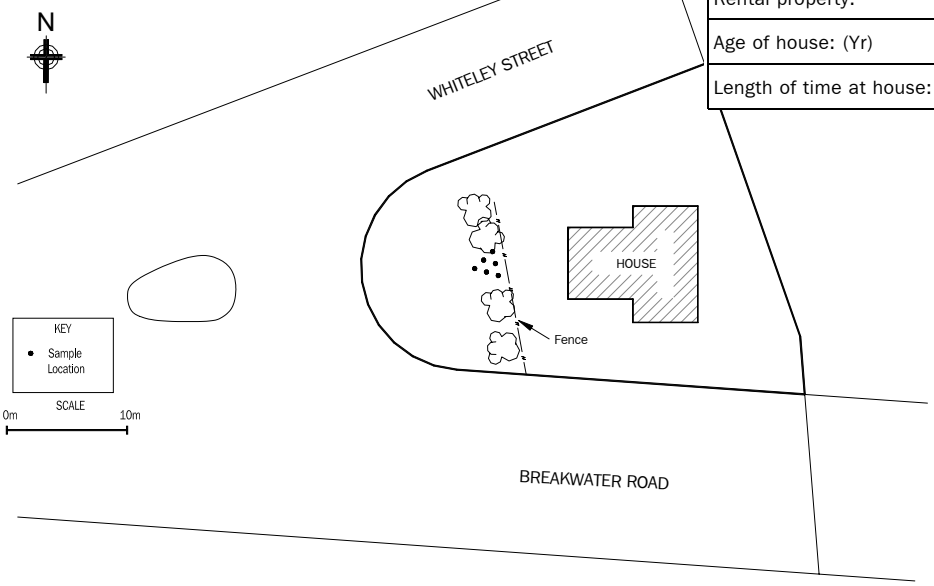
Address	cnr Whiteley & Breakwater	Site no.: 29
Date Sampled	4 June 2002	
Observer(s)	DIN representative	
Field Conditions	Windy, overcast.	
Comments / Interviews/ Sampling Observations	The site was selected as the nearest suitable public land to the grid point. All closer suitable land is privately owned. The sampling location was on road reserve. It was beneath some young trees (less than 10 years old), but was chosen because of its exposure to any wind borne deposition from the Dow plant.	

2,3,7,8-TCDD Results ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	3.3	Not sampled	Not sampled	Not sampled	Not sampled

Soil Description	Grassed area: Silt loam, brown

Site Plan

Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



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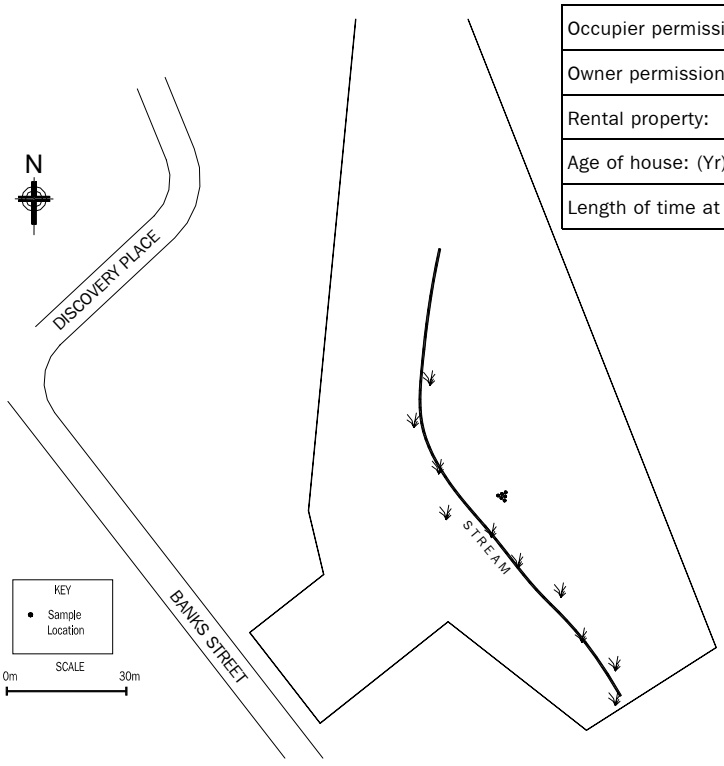
Paritutu Dioxin Soil Sampling

ADDRESS	70 Banks Street	Site no.: 30
DATE SAMPLED	4 June 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Overcast, no rain	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The site is grazed by stock, and has a stream flowing through the centre of it. The sampling location was chosen to be in an open area, and to be on a slope that faces the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	2.4	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN



Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA

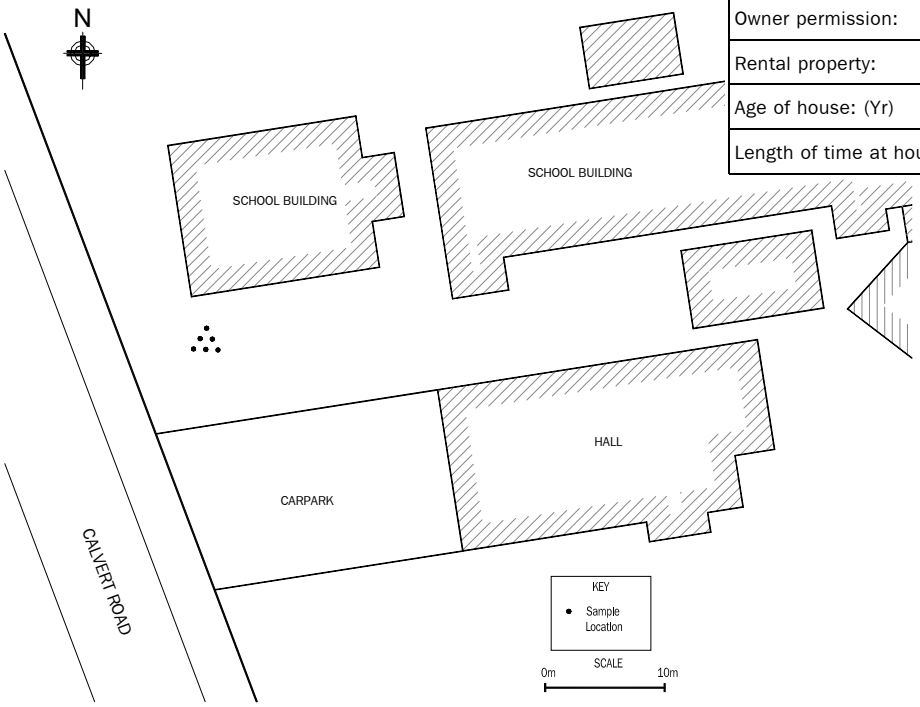
ADDRESS	St Josephs School	Site no.: 31
DATE SAMPLED	4 June 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, little wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	The site was the nearest site to the grid point. A possible public site in the area was not considered suitable, as it appeared to have been disturbed within the past few years. The sampling location was chosen to be on a slope that is likely to have remained undisturbed for most of the time since the school was established in 1926, and that was exposed to any wind borne deposition from the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	0.81	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	No
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

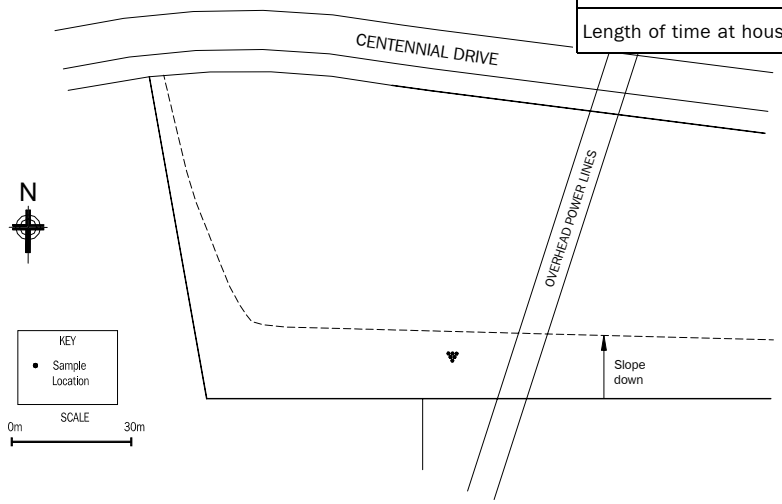
ADDRESS	105 Centennial Drive	Site no.: 32
DATE SAMPLED	5 June 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, little wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was selected in conjunction with DIN as being as close as possible to the former camp for the power station workers. The sampling location, on an embankment, was chosen to avoid most of the asphalt paved site, but, as a result, had less exposure to any wind borne deposition from the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	6.1	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown. Heavy grass cover.

SITE PLAN

Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



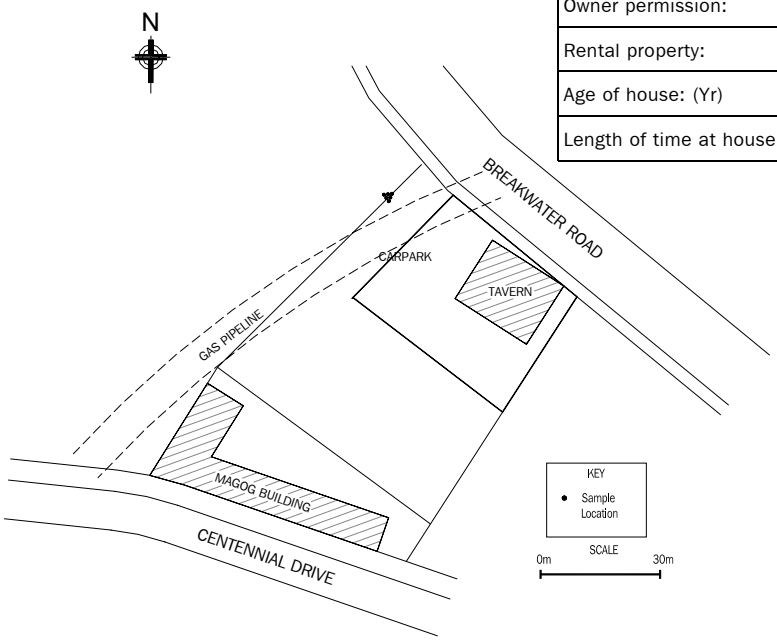
ADDRESS	151 Breakwater Road	Site no.: 33
DATE SAMPLED	5 June 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, little wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was selected in conjunction with DIN as being as close as possible to a residential address north of the Dow plant. The sampling location, the face of a bank at the edge of the property, was chosen as the only on-site location that avoided areas disturbed by a gas main, new fill, and onsite activities. However, it was sheltered from any wind borne deposition from the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	10	Not sampled	Not sampled	Not sampled	Not sampled

SOIL DESCRIPTION	Grassed area: Sand with little silt, brown

SITE PLAN

Occupier permission:	Yes
Owner permission:	Yes
Rental property:	Yes
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

ADDRESS	Permission to publish site address withheld	Site no.: 34
DATE SAMPLED	5 June 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, little wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was selected in conjunction with DIN as being indicative of impacts on residential properties near the port. The selected sampling location was exposed in the direction of the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	7.3	Not sampled	Not sampled	Sampled: not analysed	Sampled: not analysed

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN

Permission to publish site address withheld

Occupier permission:	Yes
Owner permission:	No
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA

PATTLE DELAMORE PARTNERS LTD

Paritutu Dioxin Soil Sampling

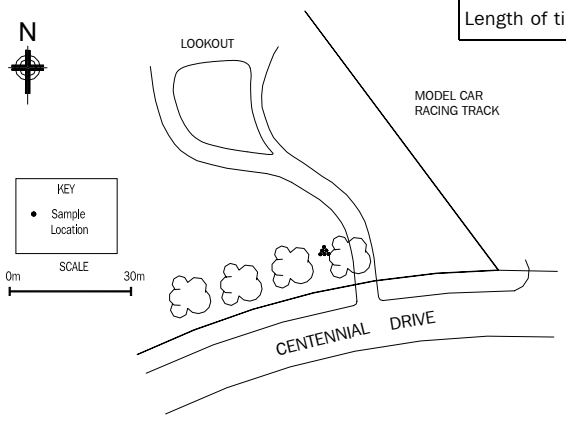
ADDRESS	100 Centennial Drive (NPDC Domain)	Site no.: 35
DATE SAMPLED	5 June 2002	
OBSERVER(S)	DIN representative	
FIELD CONDITIONS	Fine, little wind	
COMMENTS / INTERVIEWS/ SAMPLING OBSERVATIONS	This site was selected in conjunction with DIN as being as close as possible to the residential area of an adjacent marae. The selected area was beneath the canopy of some trees, but was considered to be the best location undisturbed by vehicular or human activities and was exposed to any wind borne deposition from the Dow plant.	

2,3,7,8-TCDD RESULTS ng/kg dry weight	Grassed area 0 mm – 75 mm	Grassed area 75 mm – 150 mm	Garden	Rinsate Blank	Trip Blank
	2.3	Not sampled	Not sampled	Sampled: not analysed	Not sampled

SOIL DESCRIPTION	Grassed area: Silt loam, brown

SITE PLAN

Occupier permission:	NA
Owner permission:	Yes
Rental property:	NA
Age of house: (Yr)	NA
Length of time at house: (Yr)	NA



REPORT FOR PATTLE DELAMORE PARTNERS LTD

SAMPLE PREPARATION AND ANALYSIS PROCEDURES FOR TCDD AND FULL CONGENER DIOXIN ANALYSIS

PREPARED BY

P C BRIDGEN

INTRODUCTION

This report describes the method of analysis of soil samples for the determination of 2,3,7,8 tetrachlorinated dibenzo-*p*-dioxin (TCDD), polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). The analytical methodology was based on USEPA Method 1613B.

SAMPLE PREPARATION

Following receipt at the laboratory, samples were stored at <-10 ºC pending analysis. Each soil sample was emptied onto an aluminium dish and dried in a 30 ºC oven overnight. The semi-dried sample was thoroughly homogenised by riffling. A sub-sample for analysis was then taken.

A separate sub-sample was taken for the determination of moisture.

SAMPLE EXTRACTION

The analytical sample was loaded into a soxhlet extractor body and spiked with a range of isotopically labelled standards (Wellington Laboratories). Details of nominal amounts of each surrogate standards added are given in Table 1. The soil was extracted by soxhlet ethanol/toluene (68:32). The extract was reduced using rotary evaporation and solvent exchanged into hexane

Table 1. Nominal Weights of Isotopically Labelled Surrogate Standards added to Samples

PCDD Analysis

$^{13}C_{12}$ PCDD Congener	pg added	$^{13}C_{12}$ PCDF Congener	pg added
2,3,7,8 TCDD	400	2,3,7,8 TCDF	400
1,2,3,7,8 PeCDD	400	1,2,3,7,8 PeCDF	400
1,2,3,4,7,8 HxCDD	400	2,3,4,7,8 PeCDF	400
1,2,3,6,7,8 HxCDD	400	1,2,3,4,7,8 HxCDF	400
1,2,3,4,6,7,8 HpCDD	400	1,2,3,6,7,8 HxCDF	400
OCDD	800	2,3,4,6,7,8 HxCDF	400
		1,2,3,7,8,9 HxCDF	400
		1,2,3,4,6,7,8 HpCDF	400
		1,2,3,4,7,8,9 HpCDF	400

SAMPLE PURIFICATION

The extract was purified by column chromatography as follows:

- acid modified silica gel (eluent: hexane)
- alumina (basic) (eluent: hexane, 50:50 DCM/hexane)

The extract was reduced by rotary evaporation and transferred to a blow down vial. A volume of $^{13}C_{12}$ labelled recovery spike (1,2,3,4 TCDD and 1,2,3,7,8,9 HxCDD) and keeper was added then blown down gently under a stream of nitrogen and transferred to a GCMS vial for analysis by HRGC-HRMS.

ANALYSIS

Extracts were analysed by GCMS. All extracts were run on ZB5 capillary column. If a peak was detected at the correct retention times for 2,3,7,8-TCDF, 2,3,7,8-TCDD, 2,3,4,7,8-PCDF, 1,2,3,4,7,8-HxCDF or 1,2,3,7,8,9-HxCDD, the extract was re-analysed on an SP2331 capillary column for full isomer specific quantification. Chromatographic and mass spectrometer conditions are given below.

HP6890 Series/HP6890N GC coupled with Micromass-Ultima HRMS

Column	60 m ZB5	60 m SP2331
Flowrate	1.5 mL min^{-1}	N/A
Carrier Gas Head Pressure	N/A	200 kPa
Injector Temperature	260 ºC	260 ºC
Injection	1 µl splitless	1 µl splitless
Temperature Programme	initial temp 180 ºC (hold 2 min), 30 ºC min^{-1} to 210 ºC, 3 ºC min^{-1} to 300 ºC (5.75 min).	initial temp 170 ºC (hold 1 min), 10 ºC min^{-1} to 210 ºC (1 min), 3 ºC min^{-1} to 250 ºC (16.7 min), 50 ºC min^{-1} to 270 ºC (6.6 min).

Table 2. Ions Monitored for PCDDs and PCDFs

Congener Group	^{12}C Quantification Ion (m/z)	^{12}C Confirmation Ion (m/z)	^{13}C Quantification Ion (m/z)	^{13}C Confirmation Ion (m/z)
TCDF	305.8987	303.9016	317.9389	315.9419
TCDD	321.8936	319.8965	333.9339	331.9368
PeCDF	339.8597	337.8626	351.9000	349.9029
PeCDD	355.8546	353.8575	367.8949	365.8978
HxCDF	373.8207	375.8178	385.8610	387.8580
HxCDD	389.8156	391.8127	401.8559	403.8530
HpCDF	407.7818	409.7788	419.8220	421.8191
HpCDD	423.7767	425.7737	435.8169	437.8140
OCDF	443.7398	441.7428		
OCDD	459.7347	457.7377	471.7750	469.7780

ANALYTE IDENTIFICATION CRITERIA

For positive identification the following criteria must be met:

- The retention time of the analyte must be within one second of the retention time of the corresponding $^{13}C_{12}$ surrogate standard
- The ion ratio obtained for the analyte must be plus or minus 10 % of the theoretical ion ratio
- The signal to noise must be greater than 3:1

QUANTIFICATION

Quantification was by the isotope dilution technique using the surrogate standards listed in Table 1. Relative response factors (RRFs) were calculated for each targeted analyte from a series of calibration standards analysed under the same conditions as the samples. Non 2,3,7,8 substituted PCDD and PCDF congeners were quantified using the RRF of the first eluting surrogate standard in each GCMS group. Targeting of all analytes was performed by the MS software (MassLynx). Text files created by the software were electronically transferred to a customised spreadsheet for further data reduction and preparation of final analytical report.

LIMITS OF DETECTION

If no peak was distinguishable above the background noise at the retention time for a targeted analyte or if a peak was present at the correct retention time for the targeted analyte but failed to meet all analyte identification criteria, the result was reported as a limit of detection.

ISOTOPICALLY LABELLED SURROGATE STANDARD RECOVERY CALCULATIONS

The recovery of the isotopically labelled surrogate standards was calculated using relative response factors, relative to the calibration standards.

QUALITY CONTROL

- The batch size was typically 8-10 samples
- A laboratory blank was analysed with each batch of samples
- An ongoing performance and recovery sample (OPR) was analysed with each batch of samples as a replicate to assess method precision
- The GCMS resolution, performance and sensitivity were established for each MS run
- The recoveries of all isotopically labelled surrogate standards were calculated and reported. The quality control acceptance criteria for surrogate standard recovery is given in USEPA method 1613B.

DATA REPORTING

All samples were reported as picograms per gram (pg/g) on a dry weight basis. The total toxic equivalents (I-TEQ) were calculated using international toxic equivalency factors (I-TEFs).

Laboratory blanks were calculated using the average dry weight of all samples analysed in batch.

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I-TEFs: USEPA Method 1613B

Analyte	I-TEFs
2378 TCDF	0.1
Total TCDF	0
2378 TCDD	1
Total TCDD	0
12378 PeCDF	0.05
23478 PeCDF	0.5
Total PeCDF	0
12378 PeCDD	0.5
Total PeCDD	0
123478 HxCDF	0.1
123678 HxCDF	0.1
234678 HxCDF	0.1
123789 HxCDF	0.1
Total HxCDF	0
123478 HxCDD	0.1
123678 HxCDD	0.1
123789 HxCDD	0.1
Total HxCDD	0
1234678 HpCDF	0.01
1234789 HpCDF	0.01
Total HpCDF	0
1234678 HpCDD	0.01
Total HpCDD	0
OCDF	0.001
OCDD	0.001

I-TEFs	= International toxic equivalency factors
I-TEQ	= Total toxic equivalence

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 188

Sample Type: Soil

Analysis: **2378 Tetrachlorinated dibenzo-*p*-dioxin (TCDD)**

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on a dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

L J Porter
AgriQuality UltraTrace™
AgriQuality New Zealand

P C Bridgen
AgriQuality UltraTrace™
AgriQuality New Zealand

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/1**

Sample Identification: **SS#1**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	5.9			82	25 - 164	
37Cl-2378 TCDD				86		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/3**

Sample Identification: **SS#2**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	4.8			86	25 - 164	
37Cl-2378 TCDD				92		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/4**

Sample Identification: **SS#2-75mm**

Date Received: 4 June 2002 Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	3.2			87	25 - 164	
37Cl-2378 TCDD				96		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB Data Analyst: CR Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/5**

Sample Identification: **SS#4**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	7.4			88	25 - 164	
37Cl-2378 TCDD				96		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/6**

Sample Identification: **SS#4G**

Date Received: 4 June 2002 Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	4.9			85	25 - 164	
37Cl-2378 TCDD				91		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB Data Analyst: CR Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/7**

Sample Identification: **SS#4-75mm**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.2			86	25 - 164	
37Cl-2378 TCDD				91		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/8**

Sample Identification: **SS#5**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	92			86	25 - 164	
37Cl-2378 TCDD				95		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/9**

Sample Identification: **SS#6**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	15			85	25 - 164	
37Cl-2378 TCDD				91		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank A**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 11 June 2002
Date Analysed U2: 13 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	0.6		90	25 - 164	
37Cl-2378 TCDD				92		

† = Results are calculated using the average weight of samples in this batch
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB Data Analyst: CR Authorised: Lawrence J Porter

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 188

Sample Type: Soil

Analysis: **2378 Tetrachlorinated dibenzo-*p*-dioxin (TCDD)**

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on a dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

L J Porter
AgriQuality UltraTrace™
AgriQuality New Zealand

P C Bridgen
AgriQuality UltraTrace™
AgriQuality New Zealand

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/10**

Sample Identification: **SS#7**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	3.4			87	25 - 164	
37Cl-2378 TCDD				91		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/11**

Sample Identification: **SS#8**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	6.1			74	25 - 164	
37Cl-2378 TCDD				95		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/12**

Sample Identification: **SS#9**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	17			88	25 - 164	
37Cl-2378 TCDD				94		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/13**

Sample Identification: **SS#9-G**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.8			83	25 - 164	
37Cl-2378 TCDD				93		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/14**

Sample Identification: **SS#9-75mm**

Date Received: 4 June 2002 Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	14			86	25 - 164	
37Cl-2378 TCDD				95		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB Data Analyst: CR Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/15**

Sample Identification: **SS#10**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	3.6			88	25 - 164	
37Cl-2378 TCDD				94		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/16**

Sample Identification: **SS#11**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.0			89	25 - 164	
37Cl-2378 TCDD				96		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/17**

Sample Identification: **SS#11-75mm**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	1.6			86	25 - 164	
37Cl-2378 TCDD				88		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/18**

Sample Identification: **SS#12**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.9			87	25 - 164	
37Cl-2378 TCDD				94		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/19**

Sample Identification: **SS#12G**

Date Received: 4 June 2002 | Date Analysed U2: 13 June 2002

Date Extracted: 11 June 2002 | Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2			92	25 - 164	
37Cl-2378 TCDD				97		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: CR | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank B**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 11 June 2002
Date Analysed U2: 13 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	0.2		86	25 - 164	
37Cl-2378 TCDD				95		

† = Results are calculated using the average weight of samples in this batch
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB Data Analyst: CR Authorised: Lawrence J Porter

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 188

Sample Type: Soil

Analysis: **2378 Tetrachlorinated dibenzo-*p*-dioxin (TCDD)**

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on a dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

L J Porter
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23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/20**

Sample Identification: **SS#13**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	6.2			85	25 - 164	
37Cl-2378 TCDD				91		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/22**

Sample Identification: **SS#14**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	8.0			98	25 - 164	
37Cl-2378 TCDD				96		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/23**

Sample Identification: **SS#14-G**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	7.3			89	25 - 164	
37Cl-2378 TCDD				87		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/24**

Sample Identification: **SS#15**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	1.9			87	25 - 164	
37Cl-2378 TCDD				88		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/25**

Sample Identification: **SS#16**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	1.8			94	25 - 164	
37Cl-2378 TCDD				100		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/27**

Sample Identification: **SS#16-75mm**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	1.2			87	25 - 164	
37Cl-2378 TCDD				91		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/28**

Sample Identification: **SS#17**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	0.93			84	25 - 164	
37Cl-2378 TCDD				86		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/30**

Sample Identification: **SS#18**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	4.5			84	25 - 164	
37Cl-2378 TCDD				87		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/34**

Sample Identification: **SS#19**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	1.0			90	25 - 164	
37Cl-2378 TCDD				90		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/35**

Sample Identification: **SS#21**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 | Date Analysed SP2331: 18 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	0.75			75	25 - 164	
37Cl-2378 TCDD				74		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank C**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 12 June 2002
Date Analysed U2: 17 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	0.09		87	25 - 164	
37Cl-2378 TCDD				91		

† = Results are calculated using the average weight of samples in this batch
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR Data Analyst: BC Authorised: Lawrence J Porter

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 188

Sample Type: Soil

Analysis: **2378 Tetrachlorinated dibenzo-*p*-dioxin (TCDD)**

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on a dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/36**

Sample Identification: **SS#22**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 13 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	0.76			94	25 - 164	
37Cl-2378 TCDD				94		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/37**

Sample Identification: **SS#23**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 13 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	0.71			90	25 - 164	
37Cl-2378 TCDD				94		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/38**

Sample Identification: **SS#23-G**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 13 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	1.3			97	25 - 164	
37Cl-2378 TCDD				100		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/39**

Sample Identification: **SS#23-75mm**

Date Received: 4 June 2002 | Date Analysed U2: 17 June 2002

Date Extracted: 13 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	0.61			89	25 - 164	
37Cl-2378 TCDD				88		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR | Data Analyst: BC | Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank D**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 13 June 2002
Date Analysed U2: 17 June 2002
Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	0.07		87	25 - 164	
37Cl-2378 TCDD				91		

† = Results are calculated using the average weight of samples in this batch
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit

Lab Analyst: RR Data Analyst: BC Authorised: Lawrence J Porter

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 188

Sample Type: Aqueous

Analysis: **2378 Tetrachlorinated dibenzo-*p*-dioxin (TCDD)**

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per litre (pg/L), equivalent to ppq, on an as received basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/33**

Sample Identification: **SS#18-B**

Date Received: 4 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/L)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	10		84	25 - 164	
37Cl-2378 TCDD				89		

† = Results are reported on an as received basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: TG Data Analyst: CR Authorised: Lawrence J Porter

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank E**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 18 June 2002
Date Analysed U2: 21 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	2		83	25 - 164	
37Cl-2378 TCDD				83		

† = Results are calculated using the average weight of samples in this batch
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit

Lab Analyst: TG Data Analyst: CR Authorised: Lawrence J Porter

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 188

Sample Type: Soil

Analysis: **Polychlorinated dibenzo-*p*-dioxins (PCDDs)**
Polychlorinated dibenzofurans (PCDFs)

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on an as dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries. The sum of PCDDs and PCDFs is calculated and reported to three significant figures both including and excluding DL values.

The total toxic equivalence (I-TEQ) was calculated for the samples using international toxic equivalency factors (I-TEFs). The total I-TEQ level is reported both including and excluding the DL values.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/5**

Sample Identification: **SS#4**

Date Received: 4 June 2002 | Date Analysed U2: 4 July 2002

Date Extracted: 2 July 2002 | Date Analysed SP2331: 8 July 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	0.28			96	24 - 169	
Total TCDF	5.0					
2378 TCDD	9.7			83	25 - 164	
Total TCDD	40					
$^{37}Cl_4$ TCDD				91	35 - 197	
12378 PeCDF	0.23			96	24 - 185	
23478 PeCDF	ND	0.7		93	21 - 178	
Total PeCDF	6.3					
12378 PeCDD	1.2			95	25 - 181	
Total PeCDD	8.5					
123478 HxCDF	ND	0.6		93	26 - 152	
123678 HxCDF	ND	0.8		96	26 - 123	
234678 HxCDF	0.39			87	28 - 136	
123789 HxCDF	ND	0.3		82	29 - 147	
Total HxCDF	9.7					
123478 HxCDD	0.64			87	32 - 141	
123678 HxCDD	1.3			86	28 - 130	
123789 HxCDD	0.86					
Total HxCDD	11					
1234678 HpCDF	7.4			95	28 - 143	
1234789 HpCDF	ND	0.8		82	26 - 138	
Total HpCDF	19					
1234678 HpCDD	30			85	23 - 140	
Total HpCDD	51					
OCDF	24					
OCDD	300			80	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	475	475	pg/g
Total I-TEQ:	11.4	11.9	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: RR | Data Analyst: SD | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/8**

Sample Identification: **SS#5**

Date Received: 4 June 2002 | Date Analysed U2: 4 July 2002

Date Extracted: 2 July 2002 | Date Analysed SP2331: 8 July 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	1.0			82	24 - 169	
Total TCDF	7.6					
2378 TCDD	74			93	25 - 164	
Total TCDD	110					
$^{37}Cl_4$ TCDD				103	35 - 197	
12378 PeCDF	0.35			103	24 - 185	
23478 PeCDF	ND	0.8		101	21 - 178	
Total PeCDF	6.3					
12378 PeCDD	4.1			100	25 - 181	
Total PeCDD	17					
123478 HxCDF	0.45			87	26 - 152	
123678 HxCDF	ND	1		85	26 - 123	
234678 HxCDF	0.56			85	28 - 136	
123789 HxCDF	ND	0.3		80	29 - 147	
Total HxCDF	6.3					
123478 HxCDD	1.4			89	32 - 141	
123678 HxCDD	2.1			78	28 - 130	
123789 HxCDD	1.3					
Total HxCDD	19					
1234678 HpCDF	5.4			90	28 - 143	
1234789 HpCDF	ND	0.6		82	26 - 138	
Total HpCDF	9.5					
1234678 HpCDD	20			61	23 - 140	
Total HpCDD	42					
OCDF	14					
OCDD	160			66	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	392	392	pg/g
Total I-TEQ:	77.2	77.7	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: RR Data Analyst: SD Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/9**

Sample Identification: **SS#6**

Date Received: 4 June 2002 | Date Analysed U2: 4 July 2002

Date Extracted: 2 July 2002 | Date Analysed SP2331: 8 July 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	0.23			110	24 - 169	
Total TCDF	5.3					
2378 TCDD	13			82	25 - 164	
Total TCDD	28					
$^{37}Cl_4$ TCDD				94	35 - 197	
12378 PeCDF	0.16			126	24 - 185	
23478 PeCDF	ND	0.4		117	21 - 178	
Total PeCDF	3.5					
12378 PeCDD	0.53			111	25 - 181	
Total PeCDD	5.6					
123478 HxCDF	ND	0.6		89	26 - 152	
123678 HxCDF	ND	0.4		93	26 - 123	
234678 HxCDF	0.34			86	28 - 136	
123789 HxCDF	ND	0.2		81	29 - 147	
Total HxCDF	5.0					
123478 HxCDD	ND	0.2		85	32 - 141	
123678 HxCDD	0.55			82	28 - 130	
123789 HxCDD	0.54					
Total HxCDD	6.3					
1234678 HpCDF	2.8			83	28 - 143	
1234789 HpCDF	ND	0.3		77	26 - 138	
Total HpCDF	5.1					
1234678 HpCDD	10			65	23 - 140	
Total HpCDD	19					
OCDF	6.5					
OCDD	80			61	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	164	164	pg/g
Total I-TEQ:	13.7	14	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: RR Data Analyst: SD Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank F**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 2 July 2002
Date Analysed U2: 4 July 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	ND	0.09		87	24 - 169	
Total TCDF	ND	0.09				
2378 TCDD	ND	0.2		80	25 - 164	
Total TCDD	ND	0.2				
$^{37}Cl_4$ TCDD				91	35 - 197	
12378 PeCDF	ND	0.09		92	24 - 185	
23478 PeCDF	ND	0.3		92	21 - 178	
Total PeCDF	ND	0.3				
12378 PeCDD	ND	0.2		89	25 - 181	
Total PeCDD	ND	0.2				
123478 HxCDF	ND	0.3		99	26 - 152	
123678 HxCDF	ND	0.2		105	26 - 123	
234678 HxCDF	ND	0.2		89	28 - 136	
123789 HxCDF	ND	0.2		77	29 - 147	
Total HxCDF	ND	0.7				
123478 HxCDD	ND	0.2		91	32 - 141	
123678 HxCDD	ND	0.2		84	28 - 130	
123789 HxCDD	ND	0.2				
Total HxCDD	ND	0.2				
1234678 HpCDF	ND	0.1		95	28 - 143	
1234789 HpCDF	ND	0.2		83	26 - 138	
Total HpCDF	ND	0.2				
1234678 HpCDD	ND	0.6		91	23 - 140	
Total HpCDD	ND	0.6				
OCDF	ND	0.4				
OCDD	ND	5		76	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	0	11.2	pg/g
Total I-TEQ:	0	0.628	pg/g

† = Results are calculated using the average weight of samples in this batch

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: RR Data Analyst: SD Authorised: Scott V Leathem

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23 July 2002

Certificate of Analysis

Client:	Pattle Delamore Partners Ltd PO Box 6136 Wellington
Attention:	Richard Lucy
Laboratory Reference:	188
Sample Type:	Soil
Analysis:	**Polychlorinated dibenzo-*p*-dioxins (PCDDs)** **Polychlorinated dibenzofurans (PCDFs)**
Method:	Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on an as dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries. The sum of PCDDs and PCDFs is calculated and reported to three significant figures both including and excluding DL values.

The total toxic equivalence (I-TEQ) was calculated for the samples using international toxic equivalency factors (I-TEFs). The total I-TEQ level is reported both including and excluding the DL values.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/20**

Sample Identification: **SS#13**

Date Received: 4 June 2002 Date Analysed U2: 17 June 2002

Date Extracted: 12 June 2002 Date Analysed SP2331: 15 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	0.95			77	24 - 169	
Total TCDF	19					
2378 TCDD	6.1			85	25 - 164	
Total TCDD	23					
$^{37}Cl_4$ TCDD				92	35 - 197	
12378 PeCDF	0.64			86	24 - 185	
23478 PeCDF	1.0			83	21 - 178	
Total PeCDF	9.8					
12378 PeCDD	1.2			92	25 - 181	
Total PeCDD	6.3					
123478 HxCDF	0.87			62	26 - 152	
123678 HxCDF	0.64			75	26 - 123	
234678 HxCDF	0.89			68	28 - 136	
123789 HxCDF	ND	0.4		57	29 - 147	
Total HxCDF	8.4					
123478 HxCDD			0.67	75	32 - 141	
123678 HxCDD	1.3			77	28 - 130	
123789 HxCDD	1.6					
Total HxCDD	14					
1234678 HpCDF	5.0			70	28 - 143	
1234789 HpCDF	ND	0.4		68	26 - 138	
Total HpCDF	8.0					
1234678 HpCDD	15			86	23 - 140	
Total HpCDD	28					
OCDF	5.0					
OCDD	110			75	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	232	232	pg/g
Total I-TEQ:	8.17	8.28	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: PD Data Analyst: SD Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank G**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 12 June 2002
Date Analysed U2: 17 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	ND	0.2		71	24 - 169	
Total TCDF	ND	0.2				
2378 TCDD	ND	0.1		87	25 - 164	
Total TCDD	ND	0.1				
$^{37}Cl_4$ TCDD				92	35 - 197	
12378 PeCDF	ND	0.1		96	24 - 185	
23478 PeCDF	ND	0.1		81	21 - 178	
Total PeCDF	ND	0.1				
12378 PeCDD	ND	0.2		92	25 - 181	
Total PeCDD	ND	0.2				
123478 HxCDF	ND	0.2		63	26 - 152	
123678 HxCDF	ND	0.1		91	26 - 123	
234678 HxCDF	ND	0.2		67	28 - 136	
123789 HxCDF	ND	0.3		48	29 - 147	
Total HxCDF	ND	0.3				
123478 HxCDD	ND	0.2		80	32 - 141	
123678 HxCDD	ND	0.2		87	28 - 130	
123789 HxCDD	ND	0.2				
Total HxCDD	ND	0.2				
1234678 HpCDF	ND	0.2		59	28 - 143	
1234789 HpCDF	ND	0.5		39	26 - 138	
Total HpCDF	ND	0.5				
1234678 HpCDD	ND	0.9		91	23 - 140	
Total HpCDD	ND	1				
OCDF	ND	0.3				
OCDD	ND	4		95	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	0	6.9	pg/g
Total I-TEQ:	0	0.435	pg/g

† = Results are calculated using the average weight of samples in this batch.
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit
$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: PD Data Analyst: SD Authorised: Scott V Leathem

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23 July 2002

Certificate of Analysis

Client:	Pattle Delamore Partners Ltd PO Box 6136 Wellington
Attention:	Richard Lucy
Laboratory Reference:	188
Sample Type:	Soil
Analysis:	**Polychlorinated dibenzo-*p*-dioxins (PCDDs)** **Polychlorinated dibenzofurans (PCDFs)**
Method:	Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per grams (pg/g), equivalent to ppt, on an as dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries. The sum of PCDDs and PCDFs is calculated and reported to three significant figures both including and excluding DL values.

The total toxic equivalence (I-TEQ) was calculated for the samples using international toxic equivalency factors (I-TEFs). The total I-TEQ level is reported both including and excluding the DL values.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/36**

Sample Identification: **SS#22**

Date Received: 4 June 2002 Date Analysed U2: 17 June 2002

Date Extracted: 13 June 2002 Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	0.64			104	24 - 169	
Total TCDF	5.3					
2378 TCDD	0.80			95	25 - 164	
Total TCDD	3.0					
$^{37}Cl_4$ TCDD				93	35 - 197	
12378 PeCDF	0.54			118	24 - 185	
23478 PeCDF	0.80			107	21 - 178	
Total PeCDF	4.4					
12378 PeCDD	ND	0.7		115	25 - 181	
Total PeCDD	0.88					
123478 HxCDF	0.88			55	26 - 152	
123678 HxCDF	0.70			65	26 - 123	
234678 HxCDF	0.90			77	28 - 136	
123789 HxCDF	ND	0.5		72	29 - 147	
Total HxCDF	9.2					
123478 HxCDD	ND	1		76	32 - 141	
123678 HxCDD	1.1			83	28 - 130	
123789 HxCDD	1.3					
Total HxCDD	12					
1234678 HpCDF	8.5			57	28 - 143	
1234789 HpCDF	ND	0.7		65	26 - 138	
Total HpCDF	16					
1234678 HpCDD	25			90	23 - 140	
Total HpCDD	44					
OCDF	12					
OCDD	180			90	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	287	287	pg/g
Total I-TEQ:	2.31	2.81	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: RR Data Analyst: SD Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank H**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 13 June 2002
Date Analysed U2: 17 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	ND	0.08		85	24 - 169	
Total TCDF	ND	0.08				
2378 TCDD	ND	0.08		98	25 - 164	
Total TCDD	ND	0.08				
$^{37}Cl_4$ TCDD				99	35 - 197	
12378 PeCDF	ND	0.1		88	24 - 185	
23478 PeCDF	ND	0.1		75	21 - 178	
Total PeCDF	ND	0.1				
12378 PeCDD	ND	0.2		91	25 - 181	
Total PeCDD	ND	0.2				
123478 HxCDF	ND	0.1		73	26 - 152	
123678 HxCDF	ND	0.1		91	26 - 123	
234678 HxCDF	ND	0.1		81	28 - 136	
123789 HxCDF	ND	0.2		66	29 - 147	
Total HxCDF	ND	0.2				
123478 HxCDD	ND	0.3		88	32 - 141	
123678 HxCDD	ND	0.3		100	28 - 130	
123789 HxCDD	ND	0.2				
Total HxCDD	ND	0.3				
1234678 HpCDF	ND	0.2		70	28 - 143	
1234789 HpCDF	ND	0.2		60	26 - 138	
Total HpCDF	ND	0.2				
1234678 HpCDD	ND	0.4		93	23 - 140	
Total HpCDD	ND	0.4				
OCDF	ND	0.4				
OCDD	ND	2		92	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	0	3.96	pg/g
Total I-TEQ:	0	0.383	pg/g

† = Results are calculated using the average weight of samples in this batch.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: RR Data Analyst: SD Authorised: Scott V Leathem

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23 July 2002

Certificate of Analysis

Client:	Pattle Delamore Partners Ltd PO Box 6136 Wellington
Attention:	Richard Lucy
Laboratory Reference:	188
Sample Type:	Soil
Analysis:	**Polychlorinated dibenzo-*p*-dioxins (PCDDs)** **Polychlorinated dibenzofurans (PCDFs)**
Method:	Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on an as dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries. The sum of PCDDs and PCDFs is calculated and reported to three significant figures both including and excluding DL values.

The total toxic equivalence (I-TEQ) was calculated for the samples using international toxic equivalency factors (I-TEFs). The total I-TEQ level is reported both including and excluding the DL values.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

S V Leathem
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S R Dutt
AgriQuality UltraTrace™
AgriQuality New Zealand

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/16**

Sample Identification: **SS#11**

Date Received: 4 June 2002 Date Analysed U2: 13 June 2002

Date Extracted: 12 June 2002 Date Analysed SP2331: 14 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	ND	0.6		102	24 - 169	
Total TCDF	16					
2378 TCDD	2.0			88	25 - 164	
Total TCDD	13					
$^{37}Cl_4$ TCDD				95	35 - 197	
12378 PeCDF	0.64			117	24 - 185	
23478 PeCDF	ND	0.5		104	21 - 178	
Total PeCDF	9.1					
12378 PeCDD	1.2			102	25 - 181	
Total PeCDD	5.9					
123478 HxCDF	ND	0.6		84	26 - 152	
123678 HxCDF	ND	0.5		106	26 - 123	
234678 HxCDF	ND	0.7		91	28 - 136	
123789 HxCDF	ND	0.2		55	29 - 147	
Total HxCDF	8.0					
123478 HxCDD	0.51			89	32 - 141	
123678 HxCDD	1.3			97	28 - 130	
123789 HxCDD	0.91					
Total HxCDD	14					
1234678 HpCDF	4.3			68	28 - 143	
1234789 HpCDF	ND	0.6		30	26 - 138	
Total HpCDF	5.9					
1234678 HpCDD	16			80	23 - 140	
Total HpCDD	30					
OCDF	2.0					
OCDD	100			68	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	204	204	pg/g
Total I-TEQ:	3.21	3.73	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: CH Data Analyst: SD Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **188/Blank I**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 12 June 2002
Date Analysed U2: 13 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	ND	0.1		89	24 - 169	
Total TCDF	ND	0.1				
2378 TCDD	ND	0.2		86	25 - 164	
Total TCDD	ND	0.2				
$^{37}Cl_4$ TCDD				95	35 - 197	
12378 PeCDF	ND	0.1		98	24 - 185	
23478 PeCDF	ND	0.1		90	21 - 178	
Total PeCDF	ND	0.1				
12378 PeCDD	ND	0.2		87	25 - 181	
Total PeCDD	ND	0.2				
123478 HxCDF	ND	0.3		91	26 - 152	
123678 HxCDF	ND	0.3		109	26 - 123	
234678 HxCDF	ND	0.3		93	28 - 136	
123789 HxCDF	ND	0.3		69	29 - 147	
Total HxCDF	ND	0.7				
123478 HxCDD	ND	0.3		87	32 - 141	
123678 HxCDD	ND	0.2		109	28 - 130	
123789 HxCDD	ND	0.3				
Total HxCDD	ND	0.3				
1234678 HpCDF	ND	0.5		83	28 - 143	
1234789 HpCDF	ND	0.2		56	26 - 138	
Total HpCDF	ND	0.5				
1234678 HpCDD	ND	0.9		88	23 - 140	
Total HpCDD	ND	1				
OCDF	ND	0.5				
OCDD	ND	6		70	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	0	9.6	pg/g
Total I-TEQ:	0	0.588	pg/g

† = Results are calculated using the average weight of samples in this batch.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: CH Data Analyst: SD Authorised: Scott V Leathem

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 265

Sample Type: Soil

Analysis: **2378 Tetrachlorinated dibenzo-*p*-dioxin (TCDD)**

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on a dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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P C Bridgen
AgriQuality UltraTrace™
AgriQuality New Zealand

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/1**

Sample Identification: **SS#3**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	5.8			89	25 - 164	
37Cl-2378 TCDD				96		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/2**

Sample Identification: **SS#3-G**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	4.5			91	25 - 164	
37Cl-2378 TCDD				99		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/3**

Sample Identification: **SS#20**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	4.8			93	25 - 164	
37Cl-2378 TCDD				98		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/4**

Sample Identification: **SS#24**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.7			91	25 - 164	
37Cl-2378 TCDD				96		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/5**

Sample Identification: **SS#25**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.2			93	25 - 164	
37Cl-2378 TCDD				98		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/6**

Sample Identification: **SS#26**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	3.0			98	25 - 164	
37Cl-2378 TCDD				104		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/7**

Sample Identification: **SS#28**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	0.88			96	25 - 164	
37Cl-2378 TCDD				96		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/8**

Sample Identification: **SS#29**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	3.3			92	25 - 164	
37Cl-2378 TCDD				95		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/9**

Sample Identification: **SS#30**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.4			95	25 - 164	
37Cl-2378 TCDD				95		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/10**

Sample Identification: **SS#31**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	0.81			97	25 - 164	
37Cl-2378 TCDD				104		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/11**

Sample Identification: **SS#32**

Date Received: 18 June 2002 Date Analysed U2: 27 June 2002

Date Extracted: 10 June 2002 Date Analysed SP2331: 2 July 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	6.1			94	25 - 164	
37Cl-2378 TCDD				95		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: CH Data Analyst: PB Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/12**

Sample Identification: **SS#33**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	10			85	25 - 164	
37Cl-2378 TCDD				97		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/13**

Sample Identification: **SS#34**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	7.3			88	25 - 164	
37Cl-2378 TCDD				93		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/BLANK-A**

Sample Identification: **Laboratory Blank A**

Date Received: Not applicable
Date Extracted: 18 June 2002
Date Analysed U2: 21 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	0.1		94	25 - 164	
37Cl-2378 TCDD				92		

† = Results are calculated using the average weight of samples in this batch
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit

Lab Analyst: PD Data Analyst: BC Authorised: Scott V Leathem

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 265

Sample Type: Soil

Analysis: **2378 Tetrachlorinated dibenzo-*p*-dioxin (TCDD)**

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on a dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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AgriQuality New Zealand

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/16**

Sample Identification: **SS#35**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 19 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	2.3			89	25 - 164	
37Cl-2378 TCDD				93		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/18**

Sample Identification: **SS#37**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 19 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	27			89	25 - 164	
37Cl-2378 TCDD				91		

† = Results are reported on a dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

ND = Not detected

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB | Data Analyst: BC | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/Blank-B**

Sample Identification: **Laboratory Blank B**

Date Received: Not applicable
Date Extracted: 19 June 2002
Date Analysed U2: 21 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDD	ND	0.2		94	25 - 164	
37Cl-2378 TCDD				96		

† = Results are calculated using the average weight of samples in this batch
⚐ = Recovery outside method guidelines
NQ = Not quantitated

DL: Sample specific estimated detection limit
EMPC: Estimated maximum possible concentration
^{13}C %RE: Labelled compound recovery
LCL-UCL: Lower control limit - upper control limit

Lab Analyst: EB Data Analyst: BC Authorised: Scott V Leathem

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23 July 2002

Certificate of Analysis

Client: Pattle Delamore Partners Ltd
PO Box 6136
Wellington

Attention: Richard Lucy

Laboratory Reference: 265

Sample Type: Soil

Analysis: **Polychlorinated dibenzo-*p*-dioxins (PCDDs)**
Polychlorinated dibenzofurans (PCDFs)

Method: Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on an as dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries. The sum of PCDDs and PCDFs is calculated and reported to three significant figures both including and excluding DL values.

The total toxic equivalence (I-TEQ) was calculated for the samples using international toxic equivalency factors (I-TEFs). The total I-TEQ level is reported both including and excluding the DL values.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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S R Dutt
AgriQuality UltraTrace™
AgriQuality New Zealand

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/4**

Sample Identification: **SS#24**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 18 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	0.95			102	24 - 169	
Total TCDF	18					
2378 TCDD	2.5			92	25 - 164	
Total TCDD	32					
$^{37}Cl_4$ TCDD				98	35 - 197	
12378 PeCDF	0.85			105	24 - 185	
23478 PeCDF	0.59			95	21 - 178	
Total PeCDF	5.5					
12378 PeCDD	1.0			97	25 - 181	
Total PeCDD	6.7					
123478 HxCDF	0.77			90	26 - 152	
123678 HxCDF	0.6			97	26 - 123	
234678 HxCDF	1.0			87	28 - 136	
123789 HxCDF	ND	0.2		79	29 - 147	
Total HxCDF	13					
123478 HxCDD	0.64			93	32 - 141	
123678 HxCDD	1.6			81	28 - 130	
123789 HxCDD	1.2					
Total HxCDD	24					
1234678 HpCDF	9.7			83	28 - 143	
1234789 HpCDF	ND	0.4		69	26 - 138	
Total HpCDF	17					
1234678 HpCDD	25			87	23 - 140	
Total HpCDD	48					
OCDF	17					
OCDD	220			71	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	401	401	pg/g
Total I-TEQ:	4.60	4.62	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: PD | Data Analyst: SD | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/Blank C**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 18 June 2002
Date Analysed U2: 21 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	ND	0.4		91	24 - 169	
Total TCDF	ND	0.4				
2378 TCDD	ND	0.1		95	25 - 164	
Total TCDD	ND	0.1				
$^{37}Cl_4$ TCDD				94	35 - 197	
12378 PeCDF	ND	0.1		92	24 - 185	
23478 PeCDF	ND	0.1		86	21 - 178	
Total PeCDF	ND	0.1				
12378 PeCDD	ND	0.2		90	25 - 181	
Total PeCDD	ND	0.2				
123478 HxCDF	ND	0.3		97	26 - 152	
123678 HxCDF	ND	0.3		104	26 - 123	
234678 HxCDF	ND	0.3		92	28 - 136	
123789 HxCDF	ND	0.5		79	29 - 147	
Total HxCDF	ND	0.5				
123478 HxCDD	ND	0.3		97	32 - 141	
123678 HxCDD	ND	0.3		100	28 - 130	
123789 HxCDD	ND	0.2				
Total HxCDD	ND	0.3				
1234678 HpCDF	ND	0.7		83	28 - 143	
1234789 HpCDF	ND	0.4		68	26 - 138	
Total HpCDF	ND	0.7				
1234678 HpCDD	ND	2		93	23 - 140	
Total HpCDD	ND	3				
OCDF	ND	0.4				
OCDD	ND	7		84	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	0	12.7	pg/g
Total I-TEQ:	0	0.553	pg/g

† = Results are calculated using the average weight of samples in this batch.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: PD Data Analyst: SD Authorised: Scott V Leathem

AgriQuality New Zealand Limited
Huarangi Aotearoa

Gracefield Road
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Lower Hutt, New Zealand

Phone: +64 4 570 8800
Facsimile: +64 4 569 4500

23 July 2002

Certificate of Analysis

Client:	Pattle Delamore Partners Ltd PO Box 6136 Wellington
Attention:	Richard Lucy
Laboratory Reference:	265
Sample Type:	Soil
Analysis:	**Polychlorinated dibenzo-*p*-dioxins (PCDDs)** **Polychlorinated dibenzofurans (PCDFs)**
Method:	Based on USEPA Method 1613B (Isotope Dilution)

Results are reported in picograms per gram (pg/g), equivalent to ppt, on an as dry weight basis to two significant figures. The DL value is reported to one significant figure. Results have been corrected for recoveries. The sum of PCDDs and PCDFs is calculated and reported to three significant figures both including and excluding DL values.

The total toxic equivalence (I-TEQ) was calculated for the samples using international toxic equivalency factors (I-TEFs). The total I-TEQ level is reported both including and excluding the DL values.

Unless requested, samples will be disposed of three months from the date of this report.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

S V Leathem
AgriQuality UltraTrace™
AgriQuality New Zealand

S R Dutt
AgriQuality UltraTrace™
AgriQuality New Zealand

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/18**

Sample Identification: **SS#37**

Date Received: 10 June 2002 | Date Analysed U2: 21 June 2002

Date Extracted: 19 June 2002 | Date Analysed SP2331: 19 June 2002

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	3.1			99	24 - 169	
Total TCDF	49					
2378 TCDD	26			90	25 - 164	
Total TCDD	120					
$^{37}Cl_4$ TCDD				93	35 - 197	
12378 PeCDF	1.5			110	24 - 185	
23478 PeCDF	1.8			106	21 - 178	
Total PeCDF	36					
12378 PeCDD	3.8			108	25 - 181	
Total PeCDD	22					
123478 HxCDF	1.4			94	26 - 152	
123678 HxCDF	ND	1		103	26 - 123	
234678 HxCDF	1.6			89	28 - 136	
123789 HxCDF	ND	0.8		80	29 - 147	
Total HxCDF	24					
123478 HxCDD	1.6			93	32 - 141	
123678 HxCDD	2.6			76	28 - 130	
123789 HxCDD	1.7					
Total HxCDD	30					
1234678 HpCDF	13			91	28 - 143	
1234789 HpCDF	0.6			78	26 - 138	
Total HpCDF	23					
1234678 HpCDD	34			88	23 - 140	
Total HpCDD	64					
OCDF	16					
OCDD	230			77	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	614	614	pg/g
Total I-TEQ:	30.8	31.0	pg/g

† = Results are reported on an as dry weight basis.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: SS | Data Analyst: SD | Authorised: Scott V Leathem

23 July 2002

Results: USEPA Method 1613B

Laboratory Reference: **265/Blank D**

Sample Identification: **Laboratory Blank**

Date Received: Not applicable
Date Extracted: 19 June 2002
Date Analysed U2: 21 June 2002
Date Analysed SP2331: Not applicable

Analyte	Conc.† (pg/g)	DL	EMPC	^{13}C %RE	LCL-UCL	Qualifiers
2378 TCDF	ND	0.1		99	24 - 169	
Total TCDF	ND	0.1				
2378 TCDD	ND	0.2		95	25 - 164	
Total TCDD	ND	0.2				
$^{37}Cl_4$ TCDD				98	35 - 197	
12378 PeCDF	ND	0.06		121	24 - 185	
23478 PeCDF	ND	0.06		107	21 - 178	
Total PeCDF	ND	0.06				
12378 PeCDD	ND	0.2		112	25 - 181	
Total PeCDD	ND	0.2				
123478 HxCDF	ND	0.1		84	26 - 152	
123678 HxCDF	ND	0.1		105	26 - 123	
234678 HxCDF	ND	0.1		81	28 - 136	
123789 HxCDF	ND	0.2		69	29 - 147	
Total HxCDF	ND	0.2				
123478 HxCDD	ND	0.2		89	32 - 141	
123678 HxCDD	ND	0.2		89	28 - 130	
123789 HxCDD	ND	0.2				
Total HxCDD	ND	0.2				
1234678 HpCDF	ND	0.2		72	28 - 143	
1234789 HpCDF	ND	0.5		52	26 - 138	
Total HpCDF	ND	0.5				
1234678 HpCDD	ND	0.7		87	23 - 140	
Total HpCDD	ND	1				
OCDF	ND	0.3				
OCDD	ND	4		80	17 - 157	

	Minimum	Maximum	Units
Sum of PCDD and PCDF congeners:	0	6.76	pg/g
Total I-TEQ:	0	0.471	pg/g

† = Results are calculated using the average weight of samples in this batch.

⚐ = Recovery outside method guidelines

NQ = Not quantitated

DL: Sample specific estimated detection limit

EMPC: Estimated maximum possible concentration

^{13}C %RE: Labelled compound recovery

LCL-UCL: Lower control limit - upper control limit

$^{37}Cl_4$ TCDD: Clean-up recovery spike

Lab Analyst: SS Data Analyst: SD Authorised: Scott V Leathem

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DETERMINATION OF 2,3,7,8-TCDD LEVELS

Prepared for:
Pattle Delamore Partners Ltd.
Attn: Richard Lucy
PO Box 6136
Wellington
New Zealand

ACCREDITED IN ACCORDANCE WITH nelac

This report contains 18 pages.

The results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

Project: Chemical Analysis

Client Purchase Order Number: NA

REPORT OF LABORATORY ANALYSIS

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REPORT OF: CHEMICAL ANALYSES

PROJECT: TCDD ANALYSES

DATE: August 7, 2002

ISSUED TO: Pattle Delamore Partners Ltd.
Attn: Mr. Richard Lucy
PO Box 6136
Wellington
New Zealand

REPORT NO: 02-1060110

INTRODUCTION

This report presents the results from the analysis performed on two samples which were submitted by a representative of Pattle Delamore Partners Ltd. The samples were analyzed for the presence or absence of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) using a modified version of USEPA Method 1613 as described below.

SAMPLE IDENTIFICATION

Client ID	Sample Type	Date Received	Pace ID
SS#2 188-3	Solid	07/05/02	103695656
SS#5 188-8	Solid	07/05/02	103695664

METHODOLOGY

Sample Extraction

A portion of each sample was spiked with 2.0 nanograms (ng) of $^{13}C_{12}$-labeled 2,3,7,8-TCDD internal standard and extracted with methylene chloride in a seperatory funnel. Each extract was quantitatively transferred to a Kuderna-Danish flask, concentrated, solvent exchanged to hexane, and processed through the analyte enrichment procedures described below.

Analyte Enrichment

The extraction procedure often removes a variety of compounds, in addition to 2,3,7,8-TCDD from the sample matrix. Some of these compounds, for example polychlorinated biphenyls, can directly interfere with the analyses. Other compounds can overload the capillary column, causing a degradation in chromatographic resolution or sensitivity. The analyte enrichment steps described below were used to remove interfering compounds from the extract.

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PROJECT: TCDD ANALYSES **DATE:** August 7, 2002

 REPORT NO: 02-1060110

Analyte Enrichment (Continued)

Each extract was diluted to 100 mL with hexane, spiked with $^{37}Cl_4$-2,3,7,8-TCDD and washed with concentrated sulfuric acid, 1 N sodium hydroxide, and aqueous sodium chloride (5% w/v) as needed. Each extract was then quantitatively transferred to a liquid chromatography column containing alternating layers of silica gel, 40% concentrated sulfuric acid on silica gel, and 33% 1 N sodium hydroxide on silica gel. The column was eluted with 90 mL of hexane and the entire eluate was collected and concentrated, under ambient conditions, to a volume of 1 mL.

Each extract was then fractionated on a liquid chromatography column containing 4 g of activated alumina. The column was eluted with 20 mL of hexane followed by 15 mL of 60% methylene chloride/hexane. The 60% methylene chloride/hexane fraction was concentrated to 1 mL under a stream of dry nitrogen and applied to the top of a chromatography column containing 1 g of 5% AX-21 activated carbon in silica gel. The column was eluted with two 2 mL portions of hexane, 2 mL of cyclohexane/methylene chloride (50:50 v/v) and cyclohexane/methanol/toluene (75:20:5 v/v) in the forward direction, and then with toluene in the reverse direction. The toluene fraction was collected, spiked with recovery standards (1,2,3,4-TCDD-$^{13}C_{12}$) and taken to a final volume of 20 uL.

HRGC/HRMS Analyses

Each sample extract was analyzed for the presence of 2,3,7,8-TCDD using combined capillary column gas chromatography/high resolution mass spectrometry (HRGC/HRMS). The instrumentation consisted of a Hewlett Packard Model 6890 gas chromatograph interfaced to a Micromass Ultima high-resolution mass spectrometer. The capillary column was interfaced directly into the ion source of the mass spectrometer, thus providing the highest possible sensitivity while minimizing degradation of the chromatographic resolution.

The mass spectrometer was operated in the electron impact ionization mode at a mass resolution of 10,000-11,000 (M/ΔM, 10 percent valley definition). Operating parameters for the HRGC/HRMS analyses are summarized in Table 1. The data were acquired by selected-ion-recording (SIR), monitoring a group of ion masses as described in EPA Method 1613. Two ion masses were monitored for each native and $^{13}C_{12}$-labeled class so that the ratio between the low and high ion masses could be compared to the expected theoretical value (0.77). The actual ion masses monitored are listed below.

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PROJECT: TCDD ANALYSES

DATE: August 7, 2002

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HRGC/HRMS Analyses (Continued)

	Native TCDD	$^{13}C_{12}$-labeled TCDD
Ion Masses	319.8965	331.9367
	321.8936	333.9338

A lock mass was used by the data system to automatically correct the mass focus of the instrument. Most modern mass spectrometers are stable on a short term basis (1 - 10 minutes); however, they can drift from the center of the mass peak during the course of a 30 - 60 minute analysis. The data system determined the centroid of the lock mass during each data acquisition cycle and corrected the mass focus of the analyte and internal standard ion masses to assure that the centers of the mass peaks were monitored.

The criteria used to judge positive responses for the 2,3,7,8-TCDD included:

- Simultaneous response at both ion masses
- Signal to noise ratio equal to or greater than 2.5:1.0 for both ion masses
- Chlorine isotope ratio within 15 percent of the theoretical value
- Chromatographic retention times within +/- 2 seconds of the expected retention time

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PROJECT: TCDD ANALYSES **DATE:** August 7, 2002

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Quantification and Calculations

The 2,3,7,8-TCDD was quantified by comparison of its responses to the responses of the labeled internal standard. Relative response factors were calculated from analyses of standard mixtures containing the natives at five concentration levels, and the internal standards at fixed concentration levels, as shown in Table 2. The response factors were calculated by comparing the sum of the responses from the two ion masses monitored for the native compound to the sum of the responses from the two ion masses of the isotopically labeled internal standard. The formula for the response factor calculation is:

$$Rf = \frac{An \times Qis}{Ais \times Qn}$$

where:

Rf = Response factor
An = Sum of integrated areas for analyte
Qis = Quantity of internal standard
Ais = Sum of integrated areas for internal standard
Qn = Quantity of analyte

The level of 2,3,7,8-TCDD in each sample was quantified using the following equation:

$$C = \frac{An \times Qis}{Ais \times W \times Rf}$$

where:

C = Concentration of 2,3,7,8-TCDD
An = Sum of integrated areas for 2,3,7,8-TCDD
Qis = Quantity of labeled internal standard added to the sample
Ais = Sum of integrated areas for the labeled internal standard
W = Sample amount
Rf = Response factor

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REPORT OF: CHEMICAL ANALYSES

PROJECT: TCDD ANALYSES **DATE:** August 7, 2002

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Quantification and Calculations (Continued)

The Pace Reporting Limit (PRL), equivalent to the practical quantitation limit, was determined based on the sample aliquot weight that was extracted, the volume of the final extract, and the concentration of the lowest level in the standard curve. A PRL was calculated using the following equation:

$$PRL = \frac{(C \times V)}{W}$$

where:

PRL = Pace Reporting Limit
C = Concentration of Lowest Level Standard
V = Volume of Final Extract
W = Initial Sample Amount

The recoveries of the 2,3,7,8-TCDD-$^{13}C_{12}$, relative to 1,2,3,4-TCDD-$^{13}C_{12}$, were calculated using the following equation:

$$\%R = \frac{Ais \times Qrs \times 100\%}{Rfr \times Ars \times Qis}$$

where:

%R = Percent recovery of the labeled internal standard
Ais = Sum of integrated areas of labeled internal standard
Qrs = Quantity of recovery standard
Ars = Sum of integrated areas of recovery standard
Rfr = Response factor of the labeled internal standard relative to the recovery standard
Qis = Quantity of the labeled internal standard added to the sample

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PROJECT: TCDD ANALYSES **DATE:** August 7, 2002

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Quality Control

The performance of the sample processing steps and the instrumentation are monitored on a routine basis. The procedures and criteria are summarized below.

One method blank and one laboratory spike sample are typically prepared with each ten samples of any given matrix. Recoveries of the native analytes in the laboratory spike samples generally range from 70 to 130%. Recoveries of selected analytes outside this range do not invalidate the data but provide information which is used by the laboratory to monitor recovery trends and to assure optimization of the method.

Internal standards are spiked into each sample prior to extraction in order to monitor the level of recovery which is achieved for each individual sample. Acceptable recoveries range from 25 to 150 percent unless a deviation is due to variation in instrument response as a result of analytical interferences.

The resolution of the mass spectrometer is verified prior to each analysis to be 10,000 or greater. Hardcopies of the reference peaks are printed at the beginning and end of each analysis day. The resolving power of the DB-5MS chromatographic column is checked daily by analyzing a standard solution containing 2,3,7,8-TCDD and the adjacent TCDD isomers. Acceptable performance is achieved when 2,3,7,8-TCDD is resolved from the adjacent isomers by a valley of 25% or less.

Initial calibrations are generated by analyzing standard solutions (see Table 2) containing target native and labeled compounds. Response factors are calculated and averaged for each compound. These averages are used for quantification and for comparison to the daily continuing calibration. The relative standard deviation for each native compound must be 20% or less ($\pm$ 30% or less for the labeled compounds) as specified in Method 8290. A continuing calibration standard is analyzed at the beginning of each 12-hour shift on days when initial calibrations are not performed. The initial calibration is considered to be valid when the values obtained from the continuing calibration analyses fall to within the ranges specified in Method 1613.

RESULTS

The results from the 2,3,7,8-TCDD analyses are summarized in the following:

Appendix A - Chain of Custody Documentation
Appendix B - 2,3,7,8-TCDD Analysis Results

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REPORT OF: CHEMICAL ANALYSES

PROJECT: TCDD ANALYSES **DATE:** August 7, 2002

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DISCUSSION

The isotopically-labeled 2,3,7,8-TCDD internal standard in the extracts were recovered at 70%, indicating a level of efficiency through the extraction and enrichment steps that is considered typical for this matrix. All of the labeled internal standard recoveries obtained for this project were within the target range specified in Method 1613. Since the quantification of the native 2,3,7,8-TCDD is based on isotope dilution, the data are automatically corrected for recovery and accurate values are obtained.

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results, included at the beginning of Appendix B, show that 2,3,7,8-TCDD was not detected at the reported limit of detection. This indicates that the sample processing steps were free of background levels of this isomer.

A laboratory quality control spike sample was also prepared with the sample batch by extracting clean sand that had been fortified with native standard material. The results, included at the end of Appendix B, show that the spiked native 2,3,7,8-TCDD was recovered at 98%. This indicates a high degree of accuracy for these determinations.

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REPORT OF: CHEMICAL ANALYSES

PROJECT: **TCDD ANALYSES** **DATE:** August 7, 2002

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REMARKS

The sample extracts will be retained for a period of 30 days from the date of this report and then discarded unless other arrangements are made. The raw mass spectral data will be archived on magnetic tape for a period of not less than one year. Questions regarding the data contained in this report may be directed to the authors at the numbers provided below.

Pace Analytical Services, Inc.

Scott C. Unze
Project Manager, Dioxins
(612) 607-6383

REPORT OF LABORATORY ANALYSIS

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TABLE 1. HRGC/HRMS Operating Parameters

Mass Resolution	10,000-11,000 (M/ΔM, 10% valley)
Instrument	VG 70SE
Electron Energy	32 electron volts
Accelerating Voltage	8,000 volts
Source Temperature	275°C
Preamplifier Gain	10^{-6} amp/volt
Electron Multiplier Gain	~10^{5}
Chromatographic Column	60M DB-5MS
Transfer Line Temperature	260°C
Injection Mode	Splitless
Carrier Gas	Helium
Carrier Flow Velocity	~30 cm/sec

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TABLE 2. High Resolution TCDD Calibration Solutions

		Concentration (pg/uL)		
Solution#	TCT#	2,3,7,8-TCDD	1,2,3,4-TCDD-$^{13}C_{12}$	2,3,7,8-TCDD-$^{13}C_{12}$
1	CS1	0.5	100	100
2	CS2	2.0	100	100
3	CS3	10	100	100
4	CS4	40	100	100
5	CS5	200	100	100

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APPENDIX A

REPORT OF LABORATORY ANALYSIS

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Attn: Richard Lacy

1060110

FAXED

REQUEST FOR ANALYSES / CHAIN OF CUSTODY

Project : WJ366

Laboratory : AgriQuality

SHEET 1 of 2

Pattle Delamore Partners Ltd
wellington

REQUEST FOR ANALYSES

Sample I.D.	Date	Lab ID	Container	Sample Type	Analyses Requested	
SS#1	31-5-2002	188-1	250mL Glass	Soil	Hold Cold	2378-TCDD
SS#1G	"	2				
SS#2	30/May	3				103695656
X SS#2-GX	"	Not Received				
SS#2-75mm	"	4				
~~SS#4~~ SS#4-G	30/May	5				
SS#4-75mm	"	7				
SS#5	30/May	8				103695664
SS#6	31/May	9				
SS#7	29 May	10				
SS#8	28 May	11				
SS#9	29 May	12				
SS#9-G	"	13				
SS#9-75mm	"	14				
SS#10	30 May	15				
SS#11	31 May	16				
SS#11-75mm	"	17				
SS#12	28 May	18				
SS#12G	"	19				
SS#13	30 May	20				
SS#13-G	"	21				
* SS#4-G	30 May	6				

CHAIN OF CUSTODY

	Signature	Affiliation	Date	Time	Quote Details:
Collected by :	[signature]	Pattle Delamore Partners Ltd	31-5-2002	6pm	20 Samples will
Transferred to :	[signature]	AgriQuality	4-6-2002	9am	be reported today 19/6
Transferred to :	[signature]	Rupe	7-5-02	10:30	remainder will be reported
					early next week

NOTE: Please acknowledge receipt of these samples by signing this form and faxing it to: Pattle Delamore Partners Ltd, Wellington. Fax number 04 - 472 1958

T=22°C

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APPENDIX B

REPORT OF LABORATORY ANALYSIS

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Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612-607-6444

Method 1613B Blank Analysis Results

Client - PATTLE

Lab Sample ID	BLANK-1942	Matrix	SOLID
Filename	F20728A_04	Dilution	NA
Total Amount Extracted	10.2 g	Extracted	07/24/2002
ICAL Date	05/04/2002	Analyzed	07/28/2002 20:17
CCal Filename(s)	F20728A_01	Injected By	BAL

Native Isomers	Conc ng/Kg	EMPC ng/Kg	PRL ng/Kg	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDD	ND	-----	0.98	2,3,7,8-TCDD-13C	2.00	75
				Recovery Standard 1,2,3,4-TCDD-13C	2.00	NA
				Cleanup Standard 2,3,7,8-TCDD-37Cl4	0.20	83

Conc = Concentration
EMPC = Estimated Maximum Possible Concentration
PRL = Pace Analytical Reporting Limit.
I = Interference
P = Recovery outside of method 1613 control limits
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....02-1060110

REPORT OF LABORATORY ANALYSIS

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Pace Analytical™

Method 1613B Analysis Results

Client - PATTLE

Client's Sample ID	SS#2 188-3		
Lab Sample ID	103695656		
Filename	U20729B_08		
Injected By	CVS		
Total Amount Extracted	11.57 g	Matrix	SOLID
% Moisture	11.7	Dilution	NA
Dry Weight Extracted	10.2 g	Collected	05/30/2002
ICAL Date	07/28/2002	Received	07/05/2002
CCal Filename(s)	U20729A_17	Extracted	07/24/2002
Method Blank ID	BLANK-1942	Analyzed	07/30/2002 07:11

Native Isomers	Conc ng/Kg	EMPC ng/Kg	LOD ng/Kg	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDD	3.9	-----	0.14	2,3,7,8-TCDD-13C	2.00	70
				Recovery Standard 1,2,3,4-TCDD-13C	2.00	NA
				Cleanup Standard 2,3,7,8-TCDD-37Cl4	0.20	75

Results reported on a dry weight basis

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
LOD = Limit of Detection. Totals are averages of individual isomer LODs.
D = Result obtained from analysis of diluted sample
B = Less than 10 times higher than method blank level
P = Recovery outside of method 1613 control limits
J = Concentration detected is below the calibration range
Nn = Value obtained from additional analysis

I = Interference
E = PCDE Interference
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....02-1060110

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612-607-6444

Pace Analytical™

Method 1613B Analysis Results

Client - PATTLE

Client's Sample ID	SS#5 188-8		
Lab Sample ID	103695664		
Filename	U20729B_09		
Injected By	CVS		
Total Amount Extracted	13.59 g	Matrix	SOLID
% Moisture	26.1	Dilution	NA
Dry Weight Extracted	10.0 g	Collected	05/30/2002
ICAL Date	07/28/2002	Received	07/05/2002
CCal Filename(s)	U20729A_17	Extracted	07/24/2002
Method Blank ID	BLANK-1942	Analyzed	07/30/2002 08:00

Native Isomers	Conc ng/Kg	EMPC ng/Kg	LOD ng/Kg	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDD	94	-----	0.28	2,3,7,8-TCDD-13C	2.00	70
				Recovery Standard 1,2,3,4-TCDD-13C	2.00	NA
				Cleanup Standard 2,3,7,8-TCDD-37Cl4	0.20	87

Results reported on a dry weight basis

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
LOD = Limit of Detection. Totals are averages of individual isomer LODs.
D = Result obtained from analysis of diluted sample
B = Less than 10 times higher than method blank level
P = Recovery outside of method 1613 control limits
J = Concentration detected is below the calibration range
Nn = Value obtained from additional analysis

I = Interference
E = PCDE Interference
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....02-1060110

REPORT OF LABORATORY ANALYSIS

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Method 1613B Laboratory Control Spike Results

Client - PATTLE

Lab Sample ID	SPIKE-1943		
Filename	F20728A_02	Matrix	SOLID
Total Amount Extracted	10.42 g	Dilution	NA
ICAL Date	05/04/2002	Extracted	07/24/2002
CCal Filename	F20728A_01	Analyzed	07/28/2002 18:09
Method Blank ID	BLANK-1942	Injected By	BAL

Compound	Cs	Cr	Lower Limit	Upper Limit	% Rec.
2,3,7,8-TCDD	10	9.8	7.3	14.6	98
2,3,7,8-TCDD-37Cl4	10	8.5	3.7	15.8	85
2,3,7,8-TCDD-13C	100	65.6	25.0	141.0	66

Cs = Concentration Spiked (ng/mL)
Cr = Concentration Recovered (ng/mL)
Rec. = Recovery (Expressed as Percent)
Control Limit Reference: Method 1613, Table 6a, 10/94 Revision
X = Background subtracted value
P = Recovery outside of control limits
* = See Discussion

Report No.....02-1060110

REPORT OF LABORATORY ANALYSIS

Appendix G Abbreviations and Terms

2,3,7,8- and similar	In organic chemistry, positions of atoms or functional groups substituted in place of hydrogen atoms around the base molecule. In the case of dioxin, chlorine atoms on up to eight possible positions around two joined benzene molecules.
2,4-D	2,4-dichlorophenoxyacetic acid – a selective herbicide.
1,2,3,7,8-PeCDD	1,2,3,7,8-pentachlorobdibenzo-p-dioxin
2,3,7,8-TCDD	2,3,7,8-tetrachlorobdibenzo-p-dioxin
2,4,5-T	2,4,5-trichloropheoxyacetic acid – a herbicide for woody plants
AgriQuality	AgriQuality New Zealand Limited
ATSDR	Agency for Toxic Substance and Disease Registry (USA)
DIAG	Dioxin Action Group
dibenzo	Molecule with two hexagonal benzene rings
dioxin	Generic term for PCDDs and PCDFs (see below) but also commonly used for 2,3,7,8-TCDD.
DIN	Dioxin Investigation Network
Dow	Dow AgroSciences (NZ) Limited
ESR	Institute of Environmental Research and Science limited
GC-MS	Gas chromatograph-mass spectrometer – equipment for chemical analysis
heptachloro	seven chlorine atoms
hexachloro	six chlorine atoms
I-TEQ	TEQ calculated using the “International” TEF scheme – see WHO-TEQ
LOD	limit of detection
MfE	Ministry for the Environment
MoH	Ministry of Health
MCPB	4-(4-chloro-2-methylphenoxy) butanoic acid – a selective herbicide
MRL	minimum risk level
ng	nanogram – a billionth of a gram
ng/kg	nanogram/kilogram = parts per trillion (by mass)
nk/L	nanogram/litre = parts per trillion in water

NOAEL	no observable adverse affects level
OCDD	octachlorodibenzo-p-dioxin
OCDF	octachlorodibenzofuran
cctachloro	eight chlorine atoms
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzo-furan
PCP	pentachlorophenol – a wood-treatment fungicide
pentachloro	five chlorine atoms
PDP	Pattle Delamore Partners Limited
PRG	preliminary remediation goal
TDI	Tolerable daily intake
TCDD	tetrachlorinated dibenzo-p-dioxin =2,3,7,8-TCDD
TCP	trichlorophenol – raw material for 2,4,5-T
TEF	toxic equivalency factor (relative to 2,3,7,8-TCDD)
TEQ	toxic equivalent concentration (of 2,3,7,8-TCDD)
tetrachloro	four chlorine atoms
TDHB	Taranaki District Health Board
TRC	Taranaki Regional Council
trichloro	three chlorine atoms
USEPA	United States Environmental Protection Agency
WHO	World Health Organisation
WHO-TEQ	TEQs calculated using the WHO TEF scheme

A Study of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Exposures in Paritutu, New Zealand

A Report to the New Zealand Ministry of Health

by
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February 2005

FW0521

A Study of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Exposures in Paritutu, New Zealand

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Science Programme Manager

Peer Reviewers:
Dr Wayne Dwernychuk, PhD
Dr Erik Dybing, PhD
Dr Larry Needham, PhD
Professor Neil Pearce, PhD

Lou Gallagher, PhD
Project Leader

ERRATA

There is an error in the text on page ii. Third paragraph: *"Specifically, participants with 15 years or more residence time between 1962 and 1987 had mean and geometric mean TCDD levels of 14.6 and 12.4 pg/g lipid respectively (n = 15), compared to age and gender-adjusted backgrounds of 2.4 (mean) and 2.2 (geometric mean) pg/g lipid. Those with less than 15 years exposure during this period had a mean TCDD concentration of 3.2 pg/g lipid (n = 37), compared to an expected mean of 1.5 pg/g lipid for a group of similar age and gender."*

The text should instead read: *"Specifically, participants with 15 years or more residence time between 1962 and 1987 had mean and geometric mean TCDD levels of 14.7 and 12.4 pg/g lipid respectively (n = 14), compared to age and gender-adjusted backgrounds of 2.4 (mean) and 2.2 (geometric mean) pg/g lipid. Those with less than 15 years exposure during this period had a mean TCDD concentration of 3.6 pg/g lipid (n = 38), compared to an expected mean of 1.5 pg/g lipid for a group of similar age and gender."*

Consequently, on page iii. Discussion. The second bullet point: *"...(14.6 pg/g lipid, on average)"* should be: *"...(14.7 pg/g lipid, on average)"*.

There is an error in the text on Section 3.2, page 18: *"Of the 37 people who had lived in the area for less than 15 years, from 1962-1987, only one was demonstrably elevated (17.9 pg/g), and the next highest serum result in this group was only moderately elevated at 7.1 pg/g. The mean serum TCDD level in the 37 participants living less than 15 years in this area was 3.2 pg/g. In contrast, those 15 people having lived at least 15 years in the area from 1962-1987 had a mean serum TCDD level of 14.6 pg/g lipid."*

The text should instead read: *"Of the 38 people who had lived in the area for less than 15 years, from 1962-1987, two were demonstrably elevated (17.9 and 14 pg/g). The next highest serum result in this group was only moderately elevated at 7.1 pg/g. The mean serum TCDD level in the 38 participants living less than 15 years in this area was 3.6 pg/g. In contrast, those 14 people having lived at least 15 years in the area from 1962-1987 had a mean serum TCDD level of 14.7 pg/g lipid."*

The line 7 of the Discussion should similarly replace "*14.6 pg/g lipid*" with "*14.7 pg/g lipid*".

On page 14 *"...15 long term residents"* should be *"14 long term residents"*; *"... 31.6 pg/g..."* should be *"....31.1 pg/g..."*, *"...15 individuals..."* should be *"...14 individuals..."* and *"...16.9 pg/g lipid observed..."* should be *"...16.4 pg/g lipid observed..."*.

None of the above corrections impact the tables, figures, or conclusions of the report in any way. The lead author apologises for any confusion that might have resulted from these errors.

IMPORTANT - MINISTRY OF HEALTH DISCLAIMER

The data and analyses contained in *A Study of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Exposures in Paritutu, New Zealand A Report to the New Zealand Ministry of Health* have been supplied to the Ministry of Health by the Institute of Environmental Science and Research Ltd (ESR). The Ministry of Health cannot confirm the accuracy of the data and the analyses, and accepts no liability or responsibility for any acts or omissions, done or omitted in reliance, in whole or in part, on the data or the analyses.

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ACKNOWLEDGEMENTS

Many people contributed helpful advice and analysis to this project. ESR would like to particularly thank the Paritutu community study participants, Professor Dale Hattis (Clark University, USA), Dr Wayne Dwernychuk (Hatfield Consultants, Canada), Professor Neil Pearce (Massey University), Dr Larry Needham (U.S. Center for Disease Control), Dr Erik Dybing (Norwegian Institute of Public Health), Dr Joel Michalek (U.S. Air Force), Ms Tammy Voice (ESR), Ms Ruth Pirie (ESR), Ms Dinusha Fernando (ESR), Mr John Dempsey, Dr Patrick O'Connor and Joy Farley (Taranaki District Health Board), Dr Richard Doehring (Taranaki District Health Board), Dr Deborah Read (NZ Ministry of Health), Ms Annie Coughlan (NZ Ministry of Health), Ms Sally Gilbert (NZ Ministry of Health), the New Plymouth District Council, and the Taranaki Regional Council, Gloria Crossley (LabCare Pathology, New Plymouth Hospital), and Axys Analytical Services, Canada.

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GLOSSARY OF TERMS

Term	Description
Air dispersion model	Uses meteorological information and geographical features to estimate how much of a pollutant travels in any given direction, and is deposited at ground level.
Congener	A chemical variant within a family of chemical compounds. Dioxins, furans, and PCBs all have various congeners. TCDD is one congener in the dioxin family.
Detection limit	The amount of chemical, below which, the analytical method cannot provide an accurate measure.
Dioxin	Refers generally to all of the chlorinated dioxin and furan congener families with TCDD-like toxicological properties when calculating a TEQ.
Furan	A family of compounds similar in structure to dioxins, usually associated with combustion processes.
Half-life	This is the amount of time required for half of a chemical to leave the body. For TCDD this forms a range of estimated values depending on age, sex, and body fat composition.
Multipathway exposure assessment	An approach to risk assessment that encompasses environmental exposures from air, food, water, and skin contact for a given individual.
PCB	Polychlorinated biphenyl. A type of chemical associated with heavy industrial uses, such as in transformers. Although certain PCBs have dioxin-like toxicity, they generally have very different routes of entry into the environment from dioxins and furans.
TCDD	Technically, this refers to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin – one of the chlorinated dioxin family, and the specific chemical of interest in the current serum study. This particular dioxin congener is a contaminant in the previously existing herbicide 2,4,5-T. It is the most potent of all the dioxin congeners.
TEQ	Toxic Equivalent: This is the internationally accepted way to express the combined TCDD-like toxic potency of all of the dioxin, furan, and PCB congeners in a sample. In this report we use the World Health Organization definition of TEQ, published by Van den Berg et al. (1998)
Toxicokinetic model	The fate of a toxic chemical once inside the body. Refers in this case to the elimination rate of TCDD.

SUMMARY

Background

In October 2001 the Ministry of Health (MoH) contracted the Institute of Environmental Science & Research (ESR) to investigate non-occupational exposure to dioxins among residents of Paritutu, a suburb of New Plymouth.

The investigation into suspected exposure to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) related to a point source of production of the herbicide 2-4-5,T, namely the Ivon-Watkins Dow [IWD] plant, currently operating as Dow AgroSciences.

Subsequent to community consultation, environmental soil dioxin testing and ethics committee approval, the blood of 52 selected residents was analysed for polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). Twenty-four of these participants were also analysed for polychlorinated biphenyls (PCBs).

Methods

Individuals were selected for testing based on spatial, toxicokinetic, and multipathway exposure modelling, particularly individuals from different residential periods in order to determine the timing and extent of exposure to airborne emissions of TCDD. The exposure model considered the location and years of residence in relation to various time periods between 1962 and 1987.

Individuals were selected from a pool of 830 respondents to advertisements. Of the 830 current or former residents, 31 were initially selected for testing using the exposure model described above. A total of 24 participants in this first round were able to give blood in February 2004. The group comprised five demographic subgroups of four to six individuals corresponding to the age/sex strata from the Organochlorines Programme (OCP) conducted in 1997. The formation of these subgroups was based on the modelled prediction of individuals most likely to show a statistically significant elevation in serum TCDD, if previous exposure had occurred. Participants with a history of possible occupational exposure were excluded from the study.

A second round of testing was conducted in October 2004, the primary purpose being to ascertain the role of more recent years of relevant residence (over the 1972-86 period) on individual TCDD levels. Twenty-eight participants were selected from the database (excluding those with occupational exposure) based on age, gender and surrogate exposure values using modelled TCDD soil concentration and years of residence.

The results of serum TCDD and other dioxin and PCB congeners from the total 52 selected individuals were subsequently compared with national serum TCDD data from the Ministry for the Environment's national OCP.

A quality control sample was tested at the US Center for Disease Control and Prevention in Atlanta, Georgia, in addition to repeat samples run at the Axys Analytical Services, Vancouver, Canada.

Results

A statistically significant elevation in serum TCDD compared to national TCDD serum concentrations was found in the combined study group of 52 participants. The range of individual TCDD concentrations was 0.85 – 33.3 pg/g lipid, representing a range from no increase above background in 6 of 52 people, to a greater than 15-fold increase in TCDD in the highest individual. The mean and geometric mean TCDD concentrations across all 52 participants were 6.5 and 4.0 pg/g lipid, compared to the overall expected mean and geometric mean of 1.7 and 1.5 pg/g lipid, respectively. Expected values were calculated based on the age and gender of the study group.

TCDD exposure to residents is likely to have been the result of gradual accumulation over a long period of time, as duration of residence was the key factor in determining the likelihood of measuring an increase in serum TCDD. Specifically, participants with 15 years or more residence between 1962 and 1987 had mean and geometric mean TCDD levels of 14.6 and 12.4 pg/g lipid respectively (n = 15), compared to expected age and gender-adjusted backgrounds of 2.4 (mean) and 2.2 (geometric mean) pg/g lipid. Those with less than 15 years exposure during this period had a mean TCDD concentration of 3.2 pg/g lipid (n = 37), compared to an expected mean of 1.5 pg/g lipid for a group of similar age and gender.

On average, TCDD made up 35% of the test participants' total dioxin toxic equivalents (TEQ) using the WHO TEQ calculation, which is approximately double the proportion observed in the 1997 national serum study and higher than that seen in other studies overseas. Although there was a significant elevation in serum TCDD among participants, the elevation in TEQ was less pronounced, and not statistically significant when compared on an age-group basis. There was no elevation in PCB compared with expected background for the first 24 individuals tested. Analysis for PCBs was dropped from the subsequent round of testing. The average elevation in TEQ was 1.2-fold for all 52 individuals, but the increase was 2-fold for participants living in the area for more than 15 years during the 1962-1987 period. TCDD was the only consistently elevated compound in sera analyses. Subtracting the contribution of TCDD to TEQ resulted in no significant differences between study participants and background results.

Consumption of home-grown produce of a specific nature appeared to contribute significantly to elevations in serum TCDD. This included leafy vegetables, apples, pears, and any food with a surface exposed to the atmosphere that is then consumed. There was no indication of a significant contribution to exposure from root vegetables, protected fruits (citrus, feijoas, etc), poultry or eggs, or kai moana (seafood).

Discussion

These findings support the premise that historical aerial emissions containing TCDD are responsible for the soil and serum dioxin concentrations in Paritutu. Observed chemical profiles of dioxin and its congeners in the Paritutu environment, its residents and the measured TCDD elevations are most likely to be the result of fugitive emissions and not a result of combustion processes, such as incineration. Evidence for exposure was observed throughout the production years (1962-1987). Whether these emissions were a result of regular, or more episodic releases cannot be determined by the current study.

The multipathway exposure modelling, in particular, duration and time of residence, predicted elevations in serum TCDD with statistical significance, whereas soil TCDD concentrations alone did not.

Based on the current data, there appear to be a number of findings of particular relevance to assessing the nature of exposure to dioxins in Paritutu:

- Elevations in serum TCDD reflect primarily duration of residence over the period 1962 – 1987 in areas of modelled soil TCDD in excess of 3.4 pg/g.
- Participants residing in the area for more than 15 years between 1962-1987 exhibited marked elevations in TCDD (14.6 pg/g lipid, on average) compared to expected background levels (2.4 pg/g lipid).
- Observed elevations are, in all probability, mainly due to inhalation exposures from aerial emissions originating from the IWD plant.
- Some contribution from consumption of fruits and vegetables exposed to the local atmosphere is apparent.
- Present soil contamination is not likely to be the source of the observed levels, nor is it likely to represent a significant source of ongoing exposure.
- The elevation in dioxin TEQ among all participants was not statistically different from 1997 background levels (1.2-times greater, on average).
- Elevations in TEQ were twice that of background in participants who lived in the area for more than 15 years between 1962-1987.
- There was evidence of exposure to TCDD both pre- and post-1974, but no clearly demarcated exposure periods within the overall 25-year 2,4,5-T production period (i.e. 1962-1987) were evident.

The following questions remain unanswered by the study:

- The temporal variation in exposures during the period 1962 to 1987.
- Serum TCDD levels in individuals who resided in areas where soil TCDD exceeded those in this study.
- Whether there was a contribution to TCDD exposure from production of chlorinated phenolic products other than 2,4,5-T.
- The potential health impact in people significantly exposed.
- The potential exposure of residents not included in this study.
- The amount of exposure to workers at the IWD plant

1. INTRODUCTION AND BACKGROUND

In October 2001 the Ministry of Health (MoH) contracted the Institute of Environmental Science & Research (ESR) to investigate non-occupational exposure to dioxins among residents of Paritutu, a suburb of New Plymouth. ESR conducted the investigation in three phases.

An initial consultation phase (Phase I, see Appendix A) took place between October 2001 and May 2002, resulting in majority agreement of the community consultation group as to the next phase (Phase II), which included:

Phase II Part I (May 2002 – May 2004)

- seeking and obtaining consent from the appropriate ethics committee;
- administration of questionnaires to current and former residents who met inclusion criteria;
- identification of a possible high exposure group through the use of a multipathway exposure model;
- discussion and informed consent to participation both for the questionnaire and blood testing;
- taking of venous blood from selected individuals;
- analysis of the blood samples for the congeners of dioxin of human toxicological significance, and comparison with serum levels of the wider NZ population; and
- dissemination of individual, group and comparative results.

Phase II Part II (May 2004 - January 2005)

- obtaining a total of 50 samples to complete the original study plan
- identification of individuals with residence times that could assist with answering questions about temporal variation in exposure, especially residence times post 1973
- participants selected on the basis of age, gender and timing of exposure

Methods for addressing these issues, in concert with findings of the study, are addressed in this report.

It should be noted that the purpose of this study was to assess only the potential exposures to dioxins in the community through measuring blood levels of dioxin. This report does not include any assessment of possible health effects related to measured dioxin.

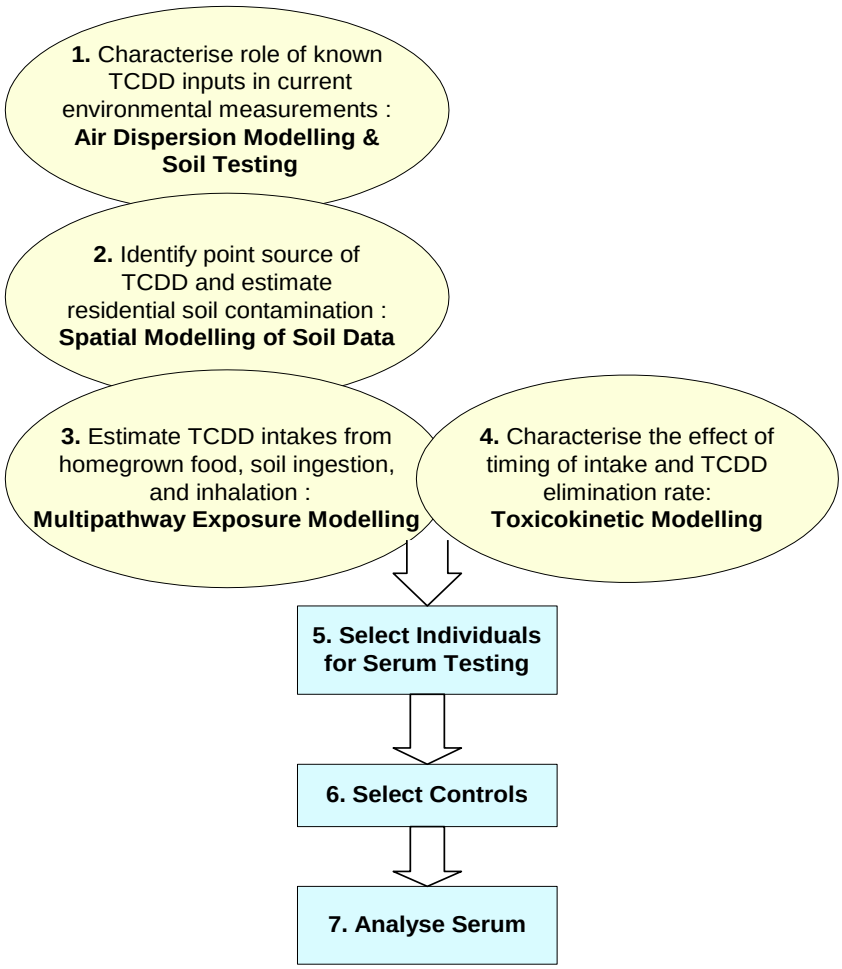
1.1. Ethical Approval

Prior to commencing the project, ethical approval was sought from the Taranaki Regional Ethics Committee. Approval for the study was granted, reference TRK/03/05/014.

2. METHODOLOGY

A number of modelling exercises were conducted to characterise the Paritutu environment, taking account of: Published reports of TCDD emissions from the IWD plant, construct exposure/uptake scenarios of inhalation and dietary intake at each address, and individual variations in TCDD elimination rate. These processes are depicted in Figure 1.

Figure 1. Sequence of modelling studies in the estimation of individual dioxin exposures in Paritutu, used as a basis for selection of study participants.



Data from two questionnaires from Paritutu residents were used to populate these models as tools to select participants. All details of model development and use are presented in a series of technical appendices. The general approach to each aspect of the study is described below for key areas:

2.1. Air Dispersion and Deposition Model (see Appendix B)

Objective: To ascertain the potential role of the IWD liquid and solid waste incinerators, in the observed soil TCDD concentrations.

Inputs/Assumptions: Incinerator parameters (stack height, location, temperatures, etc) and emissions data obtained from Pilgrim 1986, and DSIR 1986. Meteorological data from National Institute of Water and Atmospheric Research (1999) was used in the Air Pollution Model (TAPM) model.

Method: The Air Pollution Model (TAPM) developed by the Australian CSIRO was used to develop a meteorological dispersion modelling data set for the Paritutu area (http://www.dar.csiro.au/pollution/localscale/sld018.htm). The USEPA ISC3 air dispersion model was used to estimate ground concentrations and deposition rates of dioxins from the IWD point source (http://www.epa.gov/scram001/tt22.htm).

2.2. Spatial Model (see Appendix C)

Objective: To estimate TCDD concentrations in soils in the Paritutu area based on measured soil TCDD data.

Inputs/Assumptions: Soil TCDD test results from the Pattle Delamore Partners, Ltd. report to the Ministry for the Environment (PDP 2002). For the modelling, included were 34 data points from the PDP report, and 39 data points from sampling conducted in

- 1985 (Department of Health and IWD);
- 1986 (Ministry of Health); and
- 1997 (Ministry for the Environment).

A 25-year half-life correction was applied to the earlier samples to bring them to approximate 2002 levels for the combined map. In all, 73 measured soil TCDD values served as inputs to the model.

Method: ArcView Geospatial Analyst software was used to conduct Ordinary Kriging of all of the available measured TCDD soil data. The spatial model assisted in the identification of the point source, as well as defining the general area of interest for sampling.

2.3. Multipathway Exposure Model (see Appendices B and D)

Objective: To estimate TCDD exposures of residents in Paritutu from:

a) Inhalation of TCDD in air;
b) TCDD in food from home gardens and poultry; and
c) Possible ingestion of soil contaminated with TCDD.

Inputs/Assumptions: In the assessment the possible intake routes through which residents may have been exposed included:

- Inhalation of particulate and gas phase dioxins;
- Ingestion of contaminated soil;
- Ingestion of below-ground vegetables (e.g. potatoes, carrots);
- Ingestion of ‘protected’ above-ground vegetables and fruits (e.g. sweet corn, citrus, nuts);

- Ingestion of 'exposed' above ground vegetables and fruits (e.g. lettuce, apples); and
- Ingestion of home-grown poultry and eggs.

Produce is defined as either 'protected' or 'exposed' depending upon whether the edible proportion of the fruit or vegetable is likely to have been exposed directly to dioxin congeners either through direct deposition from the air or via vapour uptake by the plant's foliage. For instance, fruits such as oranges whose skins are not generally consumed are classified as 'protected'. The major route of contamination for 'protected' and below ground produce is via root uptake of contaminants present in the soil. As it is possible that some residents could have kept poultry for eggs or (less likely) meat, the additional intakes of dioxins associated with these pathways have also been considered in the assessment.

Total dietary intakes of eggs and poultry are based upon the estimates used in the OCP, for which the fat intakes are the same as those from the New Zealand National Nutrition Survey and similar to USEPA estimates. In the calculations it is assumed that the typical fat content of eggs is 11.2% and chicken meat 8.4%.

The MfE OCP assessment of dietary intakes for dioxins and dioxin-like PCBs was used based on diets selected to be representative of the adult New Zealand male population (Buckland et al., 2001). Dietary exposure calculations have been based on a 'typical' 80 kg adult New Zealand male, due to the relatively larger intakes of males.

The typical air inhalation rate of $20m^3$/day used is the value recommended by the USEPA (USEPA 1998) for an adult male. The intake of soil used (25 mg/day for an adult), is the same as that used by the MfE in "Health and Environmental Guidelines for Selected Timber Treatment Chemicals" (MoH, MfE, 1997).

Intakes were calculated assuming that the average resident would be potentially exposed to contaminated soil, produce and air for 350 days in a typical year. The resident is assumed to have been away from the immediate vicinity for the other 15 days and, therefore, not exposed to media contaminated by the plant. This assumption is consistent with the USEPA risk assessment methodology (USEPA 1998b).

Appendices B and D detail the methodology and calculations used to derive estimated TCDD intakes. Briefly, the intake scenarios assumed that a typical resident obtained 10% of their daily fruit and vegetables, and chicken and egg intakes from their place of residence. Therefore, 10% of typical dietary produce and poultry intakes was assumed to be contaminated by dioxin emissions. The calculations approximated exposures for a person who spends most of their day at home (ie. 100% of soil ingestion and air intake was from the home environment). A summary of intake rates used in the multipathway exposure analysis for the study of the incinerator emissions is presented in Appendix D.

Method: The USEPA Human Health Risk Assessment Protocol (1998b) (HHRAP) was followed in the multipathway exposure modeling. Exposed and protected above ground produce consumption rates are also based upon the HHRAP

recommendations. The HHRAP is based on data from the Exposure Factors Handbook (US EPA, 1997). The below-ground produce intake is taken from "Health and Environmental Guidelines for Selected Timber Treatment Chemicals" (MoH, MfE, 1997).

The estimation of airborne TCDD required to result in the measured soil TCDD concentrations was done using two models: USEPA (1998a) and McLachlan (1997) models were used to form a range of predicted inhalation rate scenarios and corresponding serum TCDD concentrations. These two models employ different assumptions regarding TCDD deposition rates into soil organic matter, and, therefore, provide differing air concentrations. These different predictions translated into a range of predicted inhalation exposures for the residents, and a corresponding range of modelled serum TCDD concentrations. The McLachlan model resulted in the best predictions of actual measured serum TCDD.

2.4 Toxicokinetic Model (see Appendices E, F and P)

Objective: To estimate age/gender-specific TCDD elimination half-life rates based on analysis of existing data, in order to assist in selecting individuals most likely to show elevated TCDD in 2004 from a past exposure, to assist in any back-calculations of original exposure and body burdens. The model predicts the TCDD body burden for New Zealanders in the years 1997 and 2000, based upon estimated historical TCDD intakes and changing body composition over an individual's lifetime.

Inputs/Assumptions: To be effective, the toxicokinetic model required an estimate of the time of exposure. We assumed initially that the key period for individual exposures to TCDD releases was most likely to be the period from 1962 to 1975. For Phase II Part II we focused on the period after 1973 as there were indications from Phase II Part I that this later period was influential in determining serum TCDD levels. The annual variation in 2,4,5-T production volumes is shown in Figure 2. TCDD emissions between 1962 and 1975 were assumed to vary in proportion to the annual 2,4,5-T production rates.

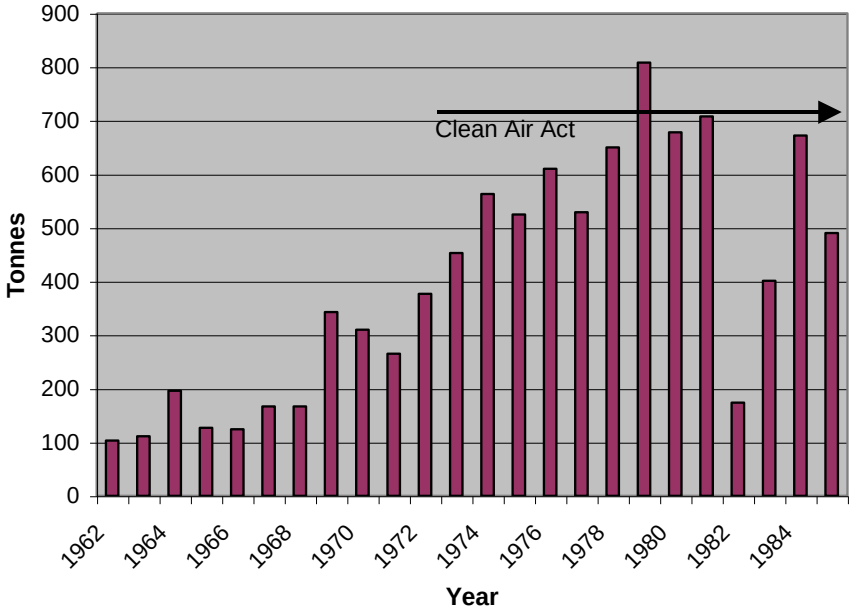
Additional elements in the calculation process are presented in detail in Appendix E and P. There are three major elements used to estimate TCDD body burden at the end of a simulated year:

1. Estimated amount of TCDD in the individual's body at the end of the previous year;

2. Elimination rate of TCDD, defined in terms of a half-life and assumed to be a function of the total percentage lipid content of the body (see peer reviewer comments in Appendix F); and

3. Intake rate of TCDD from contaminated environmental media such as food, air, and soil.

Figure 2. Annual 2, 4, 5-T herbicide production volumes at the IWD chemical plant.



Age groupings used in the model correspond to those in the OCP study to allow population of the model. In order to populate the model with the OCP serum results, we assumed that the observed TCDD blood lipid concentrations reflect the average TCDD concentration in the total body lipid (as predicted by the toxicokinetic model). In the absence of data to suggest otherwise, we have assumed that the elimination rate does not change for individuals beyond age 74.

Method: Dioxin body burdens are calculated on a year-by-year basis, accounting for variations in dietary and inhalation intakes, body weight and body fat. Profiles of male and female body compositions and dietary intakes are constructed for 'typical' New Zealanders aged between 1 and 90 years. These profiles are used to predict present TCDD blood lipid levels (picograms TEQ per gram lipid weight) based on assumed environmental media intake rates, TCDD half-lives in the body (based on total body fat), and the dilution of total TCDD body burden in total body fat.

The initial modelling was used to estimate a 'background intake' function which estimates relative changes in the concentration of TCDD in the New Zealand diet between 1937 and the year 1997 (see Appendix E). The background intake function focuses on picograms (pg) of TCDD per day, per megajoule of food ingested. The model assumes that the body absorbs all of the TCDD ingested (100%). Using any other absorption rate would proportionally increase the TCDD concentration per megajoule ingested by the inverse of that absorption rate (ie 1 / TCDD absorption rate).

The model was subsequently further developed and adapted to predict the expected incremental increase in individual blood lipid levels above background TCDD exposures for the year 2000 based upon their estimated historical exposure to TCDD contaminated environmental media both during and after the assumed emission period (see Appendix P). The estimated level of TCDD contamination in the modelled environmental media was calculated on a year-by-year basis using the integrated multipathway exposure model.

A gender-specific profile describing typical dietary intakes, body weight and percentage total body fat over an individual's lifecycle was constructed using national and international data. Each individual is assumed to follow the same life history regarding dietary intakes and body composition. An individual's body and intake characteristics are assumed to be constant over each year that is modelled. Though these assumptions are crude, they allowed us to make an initial screening/prioritisation ranking of individual participants so that objective decisions could be made regarding individual selections for serum testing.

2.5 Selection of Candidates for Serum Testing, Phase II

2.51 Part I

Part I Objective: To use predictions of individual TCDD intake, combined with estimated age/sex specific TCDD elimination rates, to derive a list of individuals having the best chance of showing any possible elevations in serum TCDD in 2004 from potential exposures beginning from 1962, in comparison with national averages and estimated variances for the individual age/sex strata.

Part I Inputs/Assumptions: Changes in body weight and body fat percentages for each of the participants were assumed to be comparable to the age dependent profiles developed for male and female New Zealanders. It was also assumed that all participants were exposed through non-occupational means, although this was not independently verified.

Two questionnaires were developed to provide input to the integrated multipathway and toxicokinetic modelling (See Appendices L, M and P). Questionnaire One is more pertinent to the selection process and provides data for the geo-spatial and multipathway exposure modelling. Questionnaire Two provides more detailed data relevant to the multipathway exposure and toxicokinetic modelling of the half-life of TCDD in the body. Questionnaire Two also provided information on some possible exclusion criteria, such as previous employment at the IWD plant, history of extensive use of herbicides, etc. These data assist with interpreting and explaining individual results, particularly the ratio of TCDD to total TEQ.

Part I Method: The sum of residential inhalation and dietary intake exposures, based on modelled air concentrations of TCDD as described in the multipathway exposure model (above). Subsequently, age/sex specific elimination rates were applied (see toxicokinetic model above), based on the assumed TCDD emission period between 1962-1975. Relative TCDD emission rates over the period corresponded to the reported annual production of 2,4,5-T herbicide at the IWD plant.

2.52 Part II

Part II Objective: A second round of testing was conducted in October 2004. The four participants who were unable to give blood in Part I were invited to give blood in Part II. New participants were selected from the database, using the same exclusion criteria as described in Part I. The objective of Part II was to select participants from the younger age groups with greatest exposure during the later years of plant operation. People with exposure in 1973 or earlier were excluded from Part II sampling.

Part II Inputs/Assumptions: A surrogate measure of exposure was estimated based on the years of residence at previously determined TCDD soil concentrations according to MfE soil sampling and subsequent kriging of the residential area grid (see figure 4, next section). The assumption was that soil concentrations were a valid estimate of historical exposure to fugitive emissions.

Part II Method: Surrogate exposure values for candidates were calculated for each participant using the following formula:

- Soil TCDD (ppt) at location * years at that location (between 1974 and 1987) = exposure surrogate value (ppt-years)

The soil TCDD ppt equals the modelled concentration based on the MfE soil study described above, at residential addresses previously geocoded according to x,y coordinates.

Note - for participants who lived at multiple locations within the study area, exposures were considered additive and summed together.

Selection criteria for Part II blood sampling;

a.) Participants from Phase II who were unable to give blood in previous sampling and wanted to participate in Part II
b.) Minimum exposure of 40 ppt-years (males) and 60 ppt-years (females). The relative difference between male and female minimum exposure values reflected the relative scarcity of males enrolled in the study population.
c.) Candidates in 1997 in the age-categories of 19-24, 25-34, 35-49 and 50-64 to supplement data gathered in Part I and to maximize the chance of detecting significant differences from age-adjusted background. (The variability in background TCDD blood lipid levels increases significantly after age 65).
d.) Those with residential exposure beginning in 1974 or later.

A total of 28 candidates with the highest exposure estimates were selected for sampling in Part II using the above sampling criteria, four of whom were re-invited from Part I.

2.6 Responses to the Questionnaires

A total of 830 questionnaires were sent out (Appendix L), as a number of people had requested questionnaires for partners and immediate family. A letter was sent with the questionnaires requesting the return of the completed questionnaire and consent form

to participate in the study by the 30th September 2003. A reminder letter was sent on the 25th September 2003.

Of the 830 questionnaires and information packets initially mailed out, 377 questionnaires were returned, giving a response rate of 45%. Fifteen declined to participate, and 438 remained outstanding, despite being sent reminder letters. Of the 377 returned questionnaires, 146 people were selected and sent the Questionnaire 2 package (see Appendix M) that included a consent form for giving blood. At this time the 231 people not selected were informed of this in writing.

2.7 The Group Selected for Testing

Blood was taken from 24 participants on the 23rd-27th February 2004, and from 28 participants on the 11th-15th October 2004. Several individuals were not given consent to participate by their GP for health reasons on either occasion; and, on the day of collection, three people had a haemoglobin level below NZ Blood service guidelines (Hb < 110 *g/l* using a Hemocue machine). These individuals (who could not give blood) included the female with the highest predicted TCDD level in the study (aged 65+), and the male with the highest predicted TCDD level (aged 50-64).

The average age of the 30 women and 22 men who gave blood was 58 years in 2004. Further statistics on the subgroups included for testing are described in Table 1:

Table 1. Overview of the Paritutu study subject selection process

	N
People registering an interest (before advertising)	151
Total people registering an interest (after advertising)	809#
Information packs and questionnaires mailed out *(Questionnaire 1)*	831
Questionnaire 1 returned	379
Modelling, initial selection, (*sent Questionnaire 2*)	146
Questionnaire 2 returned	134
Modelling, ranking and selection	58
Blood collected and tested	52

includes original 151.

It should be noted that the initial groups of 831 and 379 people included numerous individuals who were found not to have ever lived in the New Plymouth area, and many who lived in New Plymouth but never in the vicinity of Paritutu. Thus the response rate appears low, but in fact the rate was high among people who actually lived in the area (> 90%).

Each individual gave 120 - 200 mL blood, which was clotted for 1 hour, and then centrifuged at the hospital and serum immediately separated and stored at –20C. Blood was collected over consecutive days for both Parts I and II, over up to five days.

2.8 Selection of Controls and Statistical Comparisons (see Appendices G, H, and J)

Objective: To select a control group for the comparison of Paritutu resident TCDD serum dioxin concentrations.

Inputs/Assumptions: The national OCP study was conducted in 1997, representing a large number of New Zealanders grouped into pooled substrata. This information was assessed, and national, rather than regional (lower North Island), means and variances were selected for use since it was felt that these were a more robust measure for comparison (larger sample numbers minimises any effect that New Plymouth samples might have on pooled substrata). There is unanimous agreement among the scientists consulted in this project that the 1997 MfE background TCDD values overestimate what would be expected in 2004, due to declining TCDD intakes in the food supply. For this reason, we extrapolated expected background TCDD values from 1997 to 2004 for all age and gender groups, using the toxicokinetic model.

Method: Appendices G and H describe the statistical issues surrounding the estimation of variance from pooled substrata and the use of additional NZ-specific control data (Hannah et al., 1994). Means and estimated 95% confidence intervals for each stratum are also shown in Appendix G.

In the 1997 MfE survey, due to the relatively small volumes of blood collected from participants (compared to volumes needed for testing), blood samples were pooled into larger sample units. Each sample was pooled in one of 80 strata used to categorise the sample population. Each stratum was defined with respect to gender, ethnicity, age, and locality. Individuals who were likely to have been occupationally exposed to organochlorines were excluded from the blood pooling. Each individual contributed an equal volume to the total pooled blood volume.

The optimal age/gender make up of the participants in Part I was determined based on the best statistical chance of identifying elevations in TCDD compared with appropriate subgroups from the 1997 MfE survey, extrapolated to expected current day values. In Part II the criterion of residence post-1973 was added.

The primary basis for the modelled serum TCDD was the amount of time an individual spent at an address and the estimated average air concentration and modelled soil TCDD concentrations at that address. Additional factors were considered, including intakes of home produce and poultry/eggs at the address.

2.9 Serum Analyses

Sera were analysed for all seven of the 2,3,7,8-substituted chlorinated dioxins, ten furans, four coplanar PCBs and 8 mono-ortho chlorinated PCBs. For the first 24 participants, the ten coplanar and mono-ortho PCBs thought to contribute to dioxin-like activity were also included in the analyses. As PCBs were not systematically elevated in the 24 participants, they were not included in the analysis in the second group of 28. The list of dioxin and PCB congeners tested for is shown in Appendix N.

All sera samples of 120 – 200 ml were sent in sealed insulated containers via Federal Express courier to the Axys Analytical Services laboratory in Sydney, BC, Canada for testing. The Axys Analytical Services met WHO criteria for chlorinated dioxins and PCB measurements in human blood (Appendix I). Three quality control samples were sent either to the US Centers for Disease Control in Atlanta, Georgia, USA or to the Axys Analytical Services. One sample was split between Axys and USCDC, while two others were repeat blind samples sent to Axys in the second round of testing. QC results were within normal interlaboratory variation between Axys and USCDC, and the repeated samples were very consistent (less than 20% variance) between the two sampling time points.

The Axys laboratory used high-resolution gas chromatography coupled with high-resolution mass spectrometry to analyse for the full spectrum of chlorinated dioxins and furans and PCBs relevant to characterising an individual dioxin TEQ according to the WHO 1998 TEF scheme. Detection limits for TCDD were typically 0.1 pg/g lipid. Serum lipids were measured by a sub-contracting laboratory in Canada, and results were very closely matched (> 95% concordance) to that by USCDC.

It was not possible to calculate serum lipid concentrations standardised by age and gender due to the small number of observations in each category.

3. RESULTS

3.1. Serum TCDD Concentrations

The serum TCDD concentrations for Part I, Part II, and the combined group of 52 individuals are shown in Tables 2-4. In comparison to estimated national background levels in 2004 (Table 5), TCDD was seen to be elevated in all age groups and in both genders in the study. Across the group, the arithmetic mean value was 6.5 pg TCDD/g lipid, compared with an expected mean TCDD concentration in a similar group in 2004 of 1.7 pg/g lipid, or an increase of 3.8-fold.

Table 6 shows dioxin and PCB TEQ results, using TEFs from WHO (WHO 1998). The TEQ was not significantly elevated overall across the 52 participants in the study (16.6 pg/g lipid observed vs 13.7 pg/g lipid expected). However, for the 15 long-term residents (greater than 15 years residence between 1962 and 1987), the TEQ was significantly elevated two-fold compared to 1997 values for a group of similar age (TEQ = 31.6 pg/g lipid observed vs 16.9 pg/g lipid expected). The TEQ elevations in this group of 15 individuals became non-significant when TCDD was subtracted from the total TEQ (TEQ = 16.9 pg/g lipid observed vs 13.3 pg/g lipid expected). Therefore, across all groups TCDD is the major driving factor in total dioxin TEQ differences from national mean values.

Table 2: Mean serum TCDD levels: Part I

Age group	Paritutu Sample size (Part I)	TCDD (pg/g lipid)	
		Arithmetic Mean [95% CI]	Geometric Mean
Male			
35-49	1	**1.3**	**1.3**
50-64	6	**9.8** [1.3 - 18.3]	**7.5**
64+	4	**14.6** [0 - 35.4]	**10.9**
Subtotal	11	**10.8** [0.8 – 20.8]	
Female			
35-49	5	**6.2** [0.6 - 11.8]	**5.1**
50-64	4	**7.1** [0 - 14.4]	**5.9**
64+	4	**17.8** [5.0 - 30.6]	**16.2**
Subtotal	13	**10.0** [2.5 – 17.6]	
All ages	**24**	**10.4** [6.9 - 13.8]	**7.5**

95% CI = lower and upper 95% confidence interval around the mean.

Table 3: Mean serum TCDD levels: Part II

Age group	Paritutu Sample size (Part II)	TCDD (pg/g lipid)	
		Arithmetic Mean [95% CI]	Geometric Mean
Male			
25-34	2	**1.7** [0.7 – 2.7]	**1.6**
35-49	2	**2.1** [1.7 – 2.5]	**2.1**
50-64	6	**2.6** [2.0 – 3.2]	**2.5**
64+	1	**11.8**	**11.8**
Subtotal	11		
Female			
19-24	4	**1.7** [1.1 – 2.3]	**1.6**
25-34	4	**1.3** [1.1 – 1.6]	**1.3**
35-49	2	**3.3** [0 – 6.7]	**2.9**
50-64	7	**5.7** [1.7 – 9.7]	**4.6**
64+	-		
Subtotal	17		
All ages	**28**	**3.2** [1.6 – 5.0]	**2.5**

95% CI = lower and upper 95% confidence interval around the mean.

Table 4: Mean serum TCDD levels: all samples (N=52)

Age group	Paritutu Sample size (all samples)	TCDD (pg/g lipid)	
		Arithmetic Mean [95% CI]	Geometric Mean
Male			
25-34	2	**1.7** [0.7 – 2.7]	**1.6**
35-49	3	**1.9** [1.3 – 2.5]	**1.8**
50-64	12	**6.1** [2.3 – 10.0]	**4.3**
64+	5	**14.0** [4.1 – 24.0]	**11.1**
Subtotal	22	**6.9** [3.5 – 10.3]	**4.3**
Female			
19-24	4	**1.4** [0.8 – 2.1]	**1.6**
25-34	4	**1.3** [1.0 – 1.6]	**1.3**
35-49	7	**5.3** [2.3 – 8.3]	**4.3**
50-64	11	**6.0** [3.1 – 8.9]	**5.0**
64+	4	**17.8** [9.9 – 25.7]	**16.2**
Subtotal	30	**6.2** [3.8 – 8.6]	**4.1**
All ages	**52**	**6.5** [4.6 – 8.6]	**4.2**

95% CI = lower and upper 95% confidence interval around the mean.

Table 5: Background mean serum TCDD levels: MfE samples and projected concentrations in 2004.

Age group	Sample size (MfE)	MfE TCDD in 1997 (pg/g lipid) Mean [95% CI]	Projected mean TCDD in 2004 (pg/g lipid) Mean [95% CI]
Male			
25-34	145	**1.2** [1.1-1.4]	**0.6** [0.5-0.7]
35-49	199	**1.8** [1.6-2.0]	**1.1** [1.0-1.2]
50-64	170	**2.5** [2.3-2.7]	**1.5** [1.4-1.7]
64+	139	**3.0** [2.8-3.3]	**1.9** [1.7-2.1]
Female			
15-24	114	**1.1** [1.0-1.2]	**0.6** [0.5-0.7]
25-34	224	**1.5** [1.3-1.7]	**0.9** [0.8-1.1]
35-49	368	**2.1** [1.9-2.4]	**1.4** [1.3-1.6]
50-64	255	**3.6** [2.8-4.3]	**2.4** [1.9-2.8]
64+	242	**5.9** [5.1-6.7]	**4.1** [3.5-4.6]
Expected mean for this study group		**2.7** [2.4 – 3.0]	**1.7** [1.5 – 1.9]

95% CI = lower and upper 95% confidence interval around the mean.

Table 6. Mean serum total dioxin and PCB TEQ: All Paritutu participants and Ministry for the Environment 1997 Organochlorines Programme survey.

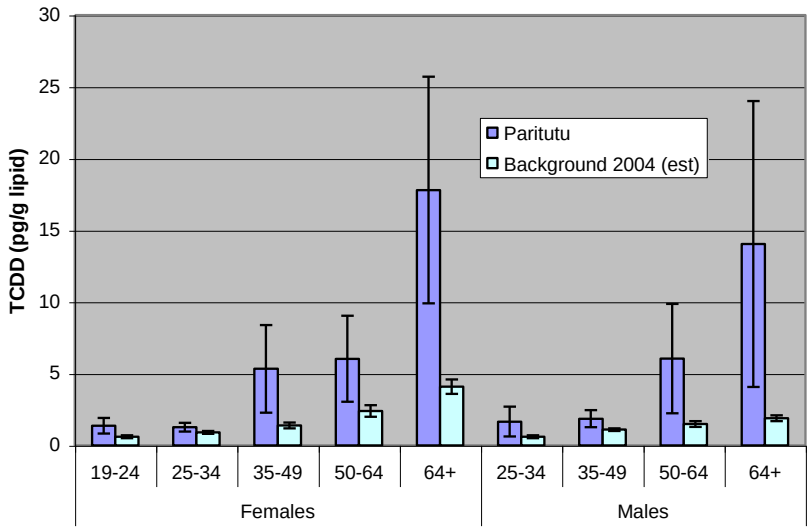
Age group	Paritutu dioxin TEQ (pg/g lipid) Mean [95% CI]	1997 MfE dioxin TEQ (pg/g lipid) Mean [95% CI]	Paritutu PCB TEQ (pg/g lipid) Mean [95% CI]	MfE PCB TEQ (pg/g lipid) Mean [95% CI]
Male				
25-34	**5.9** [0-11.4]	**7.4** [6.4-8.4]		
35-49	**8.0** [0-17.0]	**10.2** [9.4-11.0]		
50-64	**17.5** [5.3-22.7]	**13.9** [12.9-14.9]	**7.6** [3.1-12.1]*	**6.2** [6.1-6.3]
65+	**32.5** [1.7-63.3]	**14.8** [12.9-16.7]	**12.5** [9.0-16.0]*	**8.0** [7.9-8.1]
Female				
15-24	**4.8** [0-10.2]	**6.7** [5.7-7.7]		
25-34	**4.0** [0.1-7.9]	**8.5** [7.6-9.4]		
35-49	**13.8** [2.3-25.3]	**12.7** [11.8-13.6]	**5.5** [1.7-9.4]*	**6.5** [6.5-6.7]
50-64	**16.8** [3.8-29.8]	**16.7** [15.3-18.1]	**7.5** [0.5-14.5]*	**7.1** [7.0-7.2]
65+	**35.6** [0.2-71.0]	**23.7** [22.0-25.4]	**9.7** [3.0-16.4]*	**10.0** [9.9-10.1]
All ages	**16.6** [13.1 – 20.2]]	**13.7**	**8.1** [6.4 – 9.8]	**7.1**

95% CI = lower and upper 95% confidence interval around the mean
* PCBs were only measured in the first 24 participants

As shown in Tables 2 and 3, the overall increase in serum TCDD was less in Part II due to younger average age of participants, and residence in the area for fewer years.

Participant age and exposure duration were significantly associated with TCDD levels in generalised linear regression at $p<0.01$, but no other variables were. Figure 3 shows the arithmetic mean serum levels of TCDD and expected background for each age group of participants.

Figure 3. Arithmetic mean serum TCDD in all subgroups tested (N=52) by age and gender compared to background (means and 95% confidence intervals are shown)



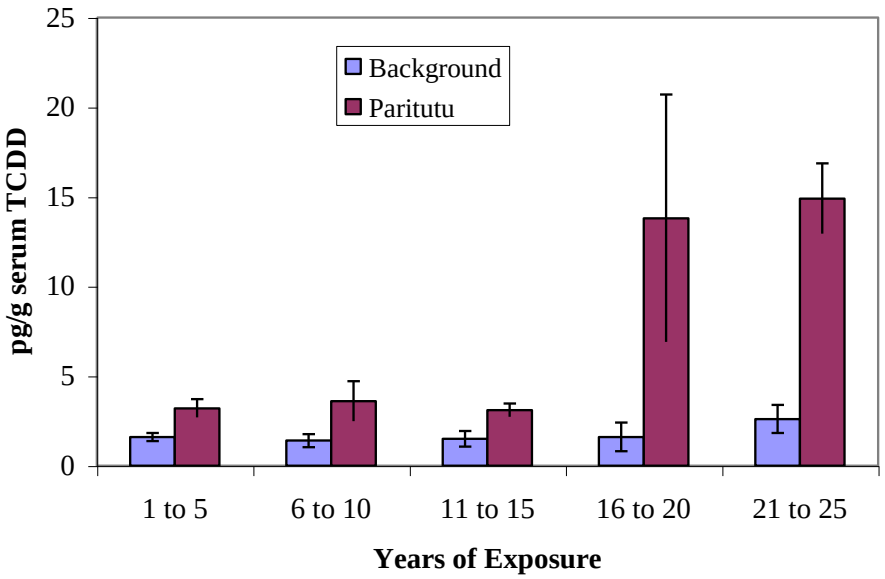
3.2 Role of Timing of Residence

Duration of residence was a key factor in the TCDD elevations found. Clear time periods of particular concern were not evident across the 25-year period of the 2,4,5-T production. Of the 37 people who had lived in the area for less than 15 years from 1962-1987 only one was demonstrably elevated (17.9 pg/g), and the next highest serum result in this group was only moderately elevated at 7.1 pg/g. The mean serum TCDD level in the 37 participants living less than 15 years in the area was 3.2 pg/g. In contrast, those 15 people having lived at least 15 years in the area from 1962-1987 had a mean serum TCDD level of 14.6 pg/g lipid. Figure 4 shows mean serum TCDD levels by the number of years of residential exposure, compared to background values expected for each group of residents (based on the age and gender composition of the group).

For participants living in the area for less than 15 years, the average age-adjusted increase in TCDD was 2.6 pg/g lipid among those living in the area prior to 1974, vs 1.5 pg/g lipid, for those with less than 15 years residence living there only after 1974. This difference was not statistically significant.

The need for a minimum 15-year residence time may also indicate a span of time necessary for exposure to multiple episodic releases of TCDD from the plant, but this cannot be ascertained with certainty with the current limited data.

Figure 4. Effect of years of exposure between 1962-1987 on arithmetic mean TCDD levels in sera of Paritutu residents and expected background (means and standard errors are shown).

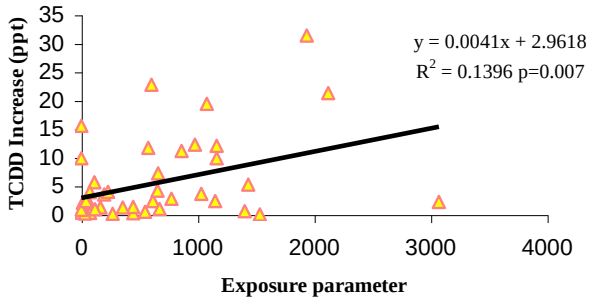


3.3 Role of Home Grown Produce as a Route of Exposure

The questionnaires collected information on the home produce consumption history of each study participant, including the type and extent of edible vegetation grown above and below ground, and also home grown poultry and egg consumption in the relevant years of residence. While all but five of the participants described some level of home vegetable/fruit gardening, only 13 of the 52 (25%) raised chickens for eggs, and only one for poultry meat *and* eggs.

There appeared to be a weak but statistically significant contribution of home gardening of 'exposed fruits and vegetables' (including rhubarb, apples, pears, grapes, silverbeet, cauliflower, cabbages, etc) to the level of serum TCDD in the participants ($p < 0.007$, for correlation, $p < 0.03$ for Spearman's non-parametric test, and $p < 0.014$ for simple regression) (Figure 5). The relationship was strongest when limited to analysis of participants who were over the age of 35 in 1997 (i.e. excluding children and adolescents from the exposure period). However, no relationship was seen for root vegetables, 'protected' fruits (i.e. citrus), or poultry eggs.

Figure 5. Contribution of consumption of exposed fruits and vegetables (i.e. silverbeet, lettuce, cabbages, apples, pears, etc) to TCDD exposure



In Figure 5, the formula used to describe the exposure parameter is:

TCDD increment

$$\propto \%ConsumptionRate * SoilConc * \frac{1}{k}\left[1 - e^{-kdt}\right]e^{-kt_2}$$

The incremental increase in blood lipid level is **proportiona**l to the above equation, **not equal** to it. Assumptions regarding elimination rates, intake and body composition are listed in Appendix P.

Where:

- k is the TCDD elimination rate (= Ln(2)/(half life)). For this calculation, an elimination half-life of 11 years was assumed, but the relationship holds for any assumed value in the published range (7.1 – 11.2 years).
- t_2 = years since last dioxin exposure in Paritutu
- dt is the number of years of exposure at Paritutu
- *%ConsumptionRate* is the percentage of the diet as home-grown produce, and
- *SoilConc* is the soil TCDD level predicted in 2002.

The weak but significant relationship seen with exposed fruit and vegetable garden produce consumption was not seen for 'protected' produce (i.e. citrus), root vegetables (i.e. potatoes, kumaras, carrots), or poultry/eggs. This supports air inhalation and direct deposition onto foods as significant routes of exposure, while indicating that ongoing exposure from soil uptake is not likely to have occurred. Therefore, it is concluded that while home gardening of exposed fruits and vegetables contributed to TCDD increases, generally this contribution was small compared to that from inhalation, and that there is no evidence of significant exposure of an ongoing nature (i.e. through the soil).

3.4 Spatial Analysis of Paritutu Soil Dioxin Levels and the Role of Waste Incinerators

The spatial analysis of measured soil TCDD concentrations in 2002 (and previous samples) showed that the TCDD in the soils around Paritutu most likely originated from the IWD plant (Appendix C). A Krige function using Geospatial Analyst (ArcGIS, ESRI®, Redlands, CA, USA) software showed a strong degree of spatial autocorrelation of soil TCDD concentrations, the highest occurring at the IWD plant, with a rapid decline south of the plant. The highest residential TCDD soil concentration predicted by the Krig function was 106 pg/g, with a total of 37 addresses predicted to be above 40 pg/g. The highest modelled soil concentration at a residence for which we were able to obtain a serum sample in this study was 42.9 pg/g soil.

The predicted soil TCDD concentrations from air dispersion modelling (at a 5 cm soil depth) emanating from the liquid waste incinerator emissions over the 1975-79 period were, maximally, in the range of 0.2-0.6 ng TEQ/kg (Appendix B). In contrast, the actual measured soil TCDD concentrations are in the range 100-300 ng TEQ/kg over the same area. The measured concentrations of TCDD in soil are, therefore, between 150 and 1500-times higher than those predicted by air dispersion and multipathway modelling.

The spatial analysis of the 2002 soil testing data is broadly consistent with a plume of TCDD emanating from the IWD plant, and extending to approximately 1000 meters; predominantly to the East, and approximately 400 meters to the South. The geostatistical model (Figure 6) illustrates this pattern, showing the highest concentrations outside the plant immediately east of the plant boundary.

This pattern of soil concentrations is not consistent with the dispersion/deposition modelling of emissions from the incinerator stacks. The model predicts much lower concentrations overall, and the highest concentrations in soils on Mt Moturoa, with relatively low concentrations immediately east of the IWD plant.

The principal conclusion is that the soil TCDD most likely originated predominantly from emissions that took place in years prior to the incineration operations as a result of one or more airborne releases from the site, or possibly from fugitive emissions from routine operations.

The modelled soil concentrations shown in Figure 6 and Table 7 indicate that there are over 500 addresses in the study area that are predicted to have soil TCDD concentrations in excess of 3.4 pg/g which was the lowest soil concentration in the current study that was associated with elevated serum TCDD after long term residence.

Figure 6. Prediction of soil TCDD concentrations in Paritutu. Areas above background for New Zealand are lightest yellow and background for New Plymouth is one shade darker.

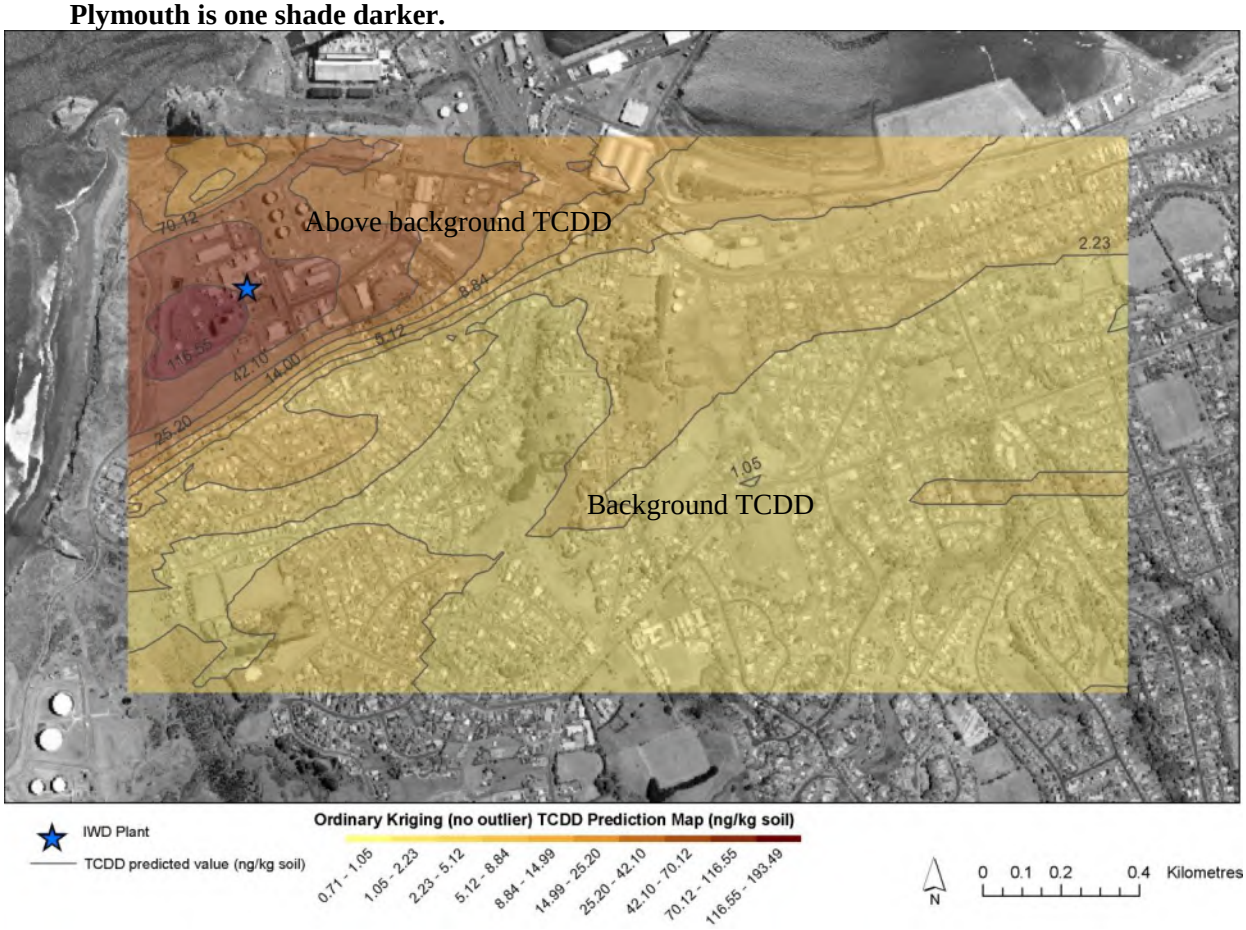


Table 7. Areas of modelled 2,3,7,8-TCDD soil contamination.

Soil TCDD (estimated – 2002 values)	Number of addresses that occur in study area
0 – 3.39	1,679
3.4 – 10	444
10 – 20	52
20 +	41

3.5 Evaluation of the Toxicokinetic Model

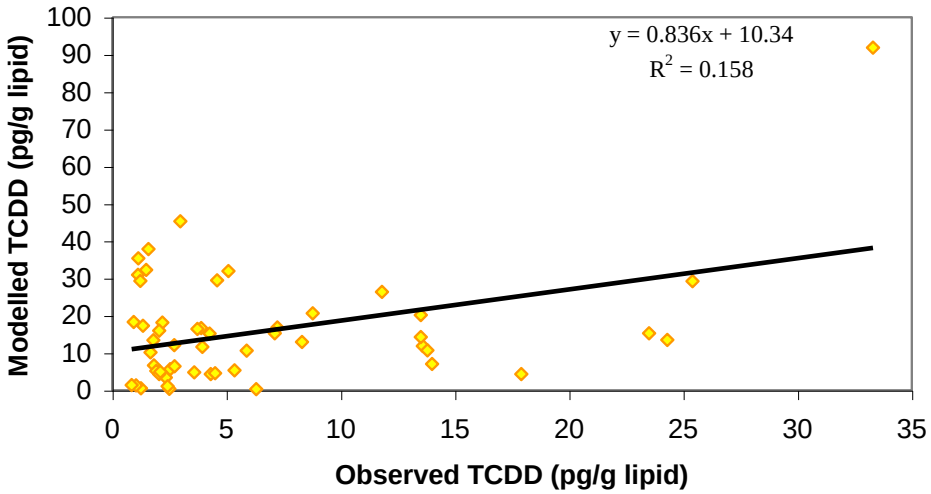
The toxicokinetic model developed for TCDD, estimated the expected magnitude of TCDD retention in subgroups, and helped inform the selection of individuals most likely to be able to show a significant elevation in 2004 (Figure 7; Appendices E, F). For the purposes of participant selection, this model included age and gender-

dependent TCDD background intake and half-life functions. Figure 7 illustrates the relationship between predicted and observed TCDD levels based on the assumed TCDD emission profile between 1962-1975. The y-intercept of 10.34 pg/g lipid indicates the tendency of the model to overpredict observed TCDD values. This may be partly explained by the assumed deposition rate used in the model overestimating ambient air TCDD concentrations and hence inhalation and exposed produce intakes during the emission period which are predicted to be a significant exposure pathways.

The toxicokinetic model can also be used to help back-calculate the extent of historical exposure, based on the individual serum TCDD in 2004, as it includes parameters that affect the elimination half-life of TCDD in the body, such as body fat content, breastfeeding, dietary patterns, and sudden weight loss. These parameters were collected from individuals via questionnaire before testing. The model encounters difficulties in estimating TCDD half-life in obese individuals; there is virtually no reliable information in the international literature on TCDD half-life in persons over the age of 70.

It should be noted that the uncertainties in estimating half-life for obese and elderly individuals was only a potential complication for forecasting the precise degree of serum TCDD elevation in 2004. These issues would not be expected to result in an increase in the probability of a false positive result, but could result in a false negative, or introduce such variability that a very large sample size would be needed to detect a statistically significant difference from background. This did not turn out to be the case in the current study.

Figure 7. Modelled vs observed TCDD in Paritutu participants



3.6 Exposure Reconstruction

An attempt was made to ascertain any significant variations in exposure through the 1962-1987 period. However, due to limited data, we were unable to identify confidently any clear time periods as being critical, or to rule out any particular time period within the 25-year 2,4,5-T production history of the plant. The most important variable observed to predict an increased TCDD was duration of residence. This was particularly evident in people who had lived in the area for a minimum of 15 years.

Ideally, identification of critical time periods of exposure would enable a back-calculation of peak body burden for each individual. If it is assumed that exposures were predominantly airborne, then it is reasonable to use either 1987 as the cut-off point for significant TCDD exposures or an earlier year if the resident moved away from the area prior to 1987.

It is also necessary to select an elimination half-life for TCDD, which varies from person to person, depending on age, gender, and body fat content.

A simplistic calculation of past peak TCDD levels in the test participants gives a range of increased TCDD between 0 (i.e. for those people tested who were at or below expected background in 2004) and 225 pg/g lipid (for the individual with the highest TCDD level), using a half-life value of 7.1 (USEPA 2000). The maximum past peak increase in TCDD was 98 pg/g lipid in the individual with the highest serum TCDD level when using an 11-year half-life (van der Molen et al 1998). These back-calculations assume that exposures ceased in 1987 or earlier if the residence ended before that date. A conservative estimate of peak values suggests an overall average increase in TCDD (above background) for the group of 52 participants of between at least 17 and 35 pg/g lipid. Among participants who lived in the area for more than 15 years, the peak increase above background was estimated to have been at least between 39 and 77 pg/g lipid.

These estimates are conservative in that higher levels of TCDD would have occurred if the exposures ceased earlier than 1987, and there is the possibility that including children in this calculation biases the estimated peak toward lower levels, since the elimination rate of TCDD in small children appears to be faster than adults.

4. DISCUSSION

This study has demonstrated elevations in serum TCDD in selected residents of Paritutu, significantly above that of the general New Zealand population. .

The mean measured TCDD serum concentration for all 52 participants was 6.5 pg/g lipid. The expected national mean for a similar group would be approximately 1.7 pg/g lipid (based on 1997 data extrapolated to 2004). For those 15 participants living in the area for more than 15 years, the average TCDD concentration in 2004 was 14.6 pg/g lipid, whereas the expected mean for the same group was 2.4 pg/g lipid.

Mean elevations in serum TCDD ranged up to 7.3 fold, with older people showing greater elevations than those in younger age groups (see figure 2). Older people have

been shown in overseas studies to have similarly elevated dioxin levels, most likely due to higher exposures in the past (Orloff et al., 2001). The mean elevation in serum dioxin TEQ compared to the 1997 OCP mean was 1.2-fold, due exclusively to the elevation in TCDD. Subtracting TCDD from the total TEQ removed elevations in TEQ among both women and men. Serum PCB levels among the first 24 participants were not significantly elevated by comparison with national background values.

International evidence suggests that TCDD body burdens are falling; for example, lipid-adjusted TCDD levels in the USA, Canada, Germany, and France were estimated to be approximately 2 pg/g lipid in 2000, and are likely to be less than that in 2004 (Aylward and Hayes 2002)[1]. Therefore, the use of 1997 OCP data for comparison is likely to underestimate the true relative magnitude of TCDD elevation in the study group over the general population, and the adjusted values used reflect the lower values expected in 2004.

The elevation in serum TCDD was usefully characterised by multipathway exposure and toxicokinetic modelling, most especially when using the air/soil TCDD deposition rate assumptions from McLachlan (1997). Inhalation of TCDD in air, and, to a lesser extent, uptake of TCDD through 'exposed' fruits and vegetables (silverbeet, apples, cabbages, etc) accounted for the elevated TCDD seen in the study group. There was no significant increase in TCDD for people who indicated regular consumption of seafood from the Paritutu shoreline. There was no evidence for soil uptake of TCDD as evidenced from the lack of association between protected and root vegetables and elevations in TCDD blood levels.

The geographic distribution of TCDD in soil is consistent with prevailing wind patterns and identifies the IWD plant as the source. However, the air dispersion and multipathway exposure modelling based on available data (i.e. incinerator operations and estimates of TCDD released from the 1986 'bursting disc failure') underestimate the observed soil TCDD concentrations by 150-1500 fold. In addition, the dioxin congener profile in soils and sera indicate that TCDD is the only consistently elevated compound, in contrast to the expected diverse profile of congeners arising from incineration. Therefore, one can reasonably conclude that the elevated TCDD in soil and sera is not a result of combustion processes associated with incineration.

Although participants in this study were chosen to optimise the chance of detection of serum TCDD elevations from a previous exposure, the soil spatial modelling indicates that there could be individuals with greater exposures than those represented by the current study group.

The following can reasonably be concluded, based on the data and the information currently available:

- Selected individuals in Paritutu have been exposed to 2,3,7,8-TCDD.
- The resulting (statistically significant) elevations in serum TCDD are correlated to soil TCDD, duration of residence from 1962 to 1987, age and gender.

[1] It it useful to note that TCDD levels are strongly influenced by the age distribution of the population tested.

- The mean dioxin TEQ was elevated, but this was not statistically significant except in those people living in the area for more than 15 years.
- TCDD was responsible for all elevations seen in TEQ above national means.
- Inhalation was the primary route of exposure. However, there is evidence for some additional exposure through 'exposed' (leafy) vegetables and fruits from home-gardening.
- Exposures occurred throughout the period 1962 – 1987.
- Exposures were not the result of a single release of material, but a continual release throughout the production period.

The following can reasonably be excluded, based on the data and the information currently available:

- Incineration as the source of exposure for the study population.
- Inhalation exposure to people born after 1987.
- Soil contamination as a source of significant serum TCDD elevations.

The following remain unanswered by the study:

- Characterising the exposure to residents not included in this study
- Serum TCDD levels in individuals who resided in areas where soil TCDD exceeded those in this study.
- The possibility of people raising poultry residing at addresses estimated to have the highest TCDD soil contamination, and whether some additional ongoing TCDD exposure is occurring in people living at these addresses.
- Characterising exposure to workers at the IWD plant
- Characterising the potential health effects attributable to TCDD exposure for people who were significantly exposed.
- The specific variation in exposures between 1962 and 1987.
- Whether there was a contribution to TCDD exposure from production of chlorinated phenolic products *other than* 2,4,5-T.

The purpose of this study was to characterise exposure of the Paritutu community to dioxins rather than to study the health risks associated with that exposure. A recent study of IWD plant workers by t'Manetje et al., (2005) provides an estimate of excess cancer deaths for those who had occupational exposures at the plant. However, since quantitative measures of exposure in these workers were not obtained, and significant differences between the populations and methods of exposure likely exist, these data are not directly applicable to the residential community surrounding the plant.

Having established dioxin exposure in this community, a logical next step is to establish the feasibility of an epidemiological study using geospatial analysis to determine whether or not the exposed Paritutu community demonstrates evidence of health effects as have been observed previously in other exposed communities (Bertazzi et al 2001, Pesatori et al 2003).

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Investigation of alleged agrichemical waste disposal sites in New Plymouth

AUGUST 2001

TARANAKI REGIONAL COUNCIL

STAGE TWO

Investigation of alleged agrichemical waste disposal sites in New Plymouth

Technical Report 2001-42

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Executive summary

This report represents the completion of Stage Two of the Council's investigations into allegations of the existence of dump sites arising from the inappropriate disposal of agrichemical waste from the Ivon Watkins Dow (now Dow AgroSciences Limited) plant on Paritutu Road, New Plymouth. The disposal of such wastes, contaminated in particular with dioxin as a byproduct of the manufacture of herbicides 2,4,5-T and 2,4-D was alleged to have occurred between 1960 and 1980.

Stage One of the Council's investigations was the establishment of the possible locations of such sites. The Council conducted some 80 interviews with interested people who believed they had information as to the location of such sites. The co-operation Council received from the public and interested parties, particularly the Dioxin Investigation Network and the Dioxin Investigation Action Group, was excellent. On 2 May 2001, Council considered the Stage One report and resolved on the basis of that report, to 'commence Stage Two investigations and sampling with urgency'. The report identified 36 sites for further investigation and sampling. The process by which the sites were identified was robust and open such that no party since the release of the Stage One report has queried or questioned the list of sites.

The purpose of Council in undertaking this investigation and the aims of Stage Two are most important. The allegations of inappropriate disposal of dioxin contaminated wastes were made most forcefully and publicly with intense media interest and speculation. The allegations were not simply of soil contamination but of substantial dump sites containing drums of toxic waste material. These allegations gave rise to considerable community disquiet and deserved immediate attention. The Council recognised its responsibilities under the Resource Management Act 1991 for the disposal of contaminants to land and water even if historical. The Council had previously in 1993/1994 investigated similar allegations of inappropriate disposal of dieldrin and aldrin pesticides in the 1960s and 1970s.

The purpose of Council's action in Stage Two of this investigation was firstly to ascertain whether there was any environmental risk arising from any of the identified alleged dump sites and secondly to ascertain whether any inappropriate dumping or disposal had occurred. If the investigation identified any such dumps with associated contamination and environmental risk, then appropriate action to clean up and remediate these sites would be considered as Stage Three of the investigation.

The sites identified for further investigation in Stage Two fell readily into four groupings. The first grouping covered eleven sites currently or historically held by IWD. All of these sites were known to and had been previously investigated by the Council. Five of the sites were the known dump sites rehabilitated in the 1980s.

The second grouping was of six sites where alleged historic surface contamination from stormwater from the IWD plant had occurred. The allegations associated with these sites did not involve dumping or burial of contaminated waste.

The third grouping of seven sites were known municipal landfills and sewage discharge outfalls operating during the period 1960 to 1980. With each of these sites there is no direct link to IWD. If disposal of contaminated wastes occurred it was in all probability in accordance with the standards of the time and undertaken by a range of parties ie, contractors, councils and the Company.

The fourth grouping of twelve sites centres on alleged substantial dump sites and alleged contaminated seepages. This grouping was of sites generally not known or previously investigated by the Council and was identified in the course of the Stage One interviews.

Details of the Stage Two investigations are set out in the report and associated appendices. The sampling and procedural protocols developed prior to the field work commencing were reviewed by DIN/DIAG, Ministry for the Environment and an independent consultant. The range of methods included detailed site inspections, analysis of aerial photographs and other historical records, probing with augers and the use of an excavator on two sites, the use of ground penetrating radar and sampling of soils, sediments, surface and groundwaters, leachate and marine biota. The particular methods used at each site varied as to the nature of the allegation, for example ground penetrating radar was not used on sites where the issue was potential contamination from stormwater runoff. Analysis of the samples was undertaken by AgriQuality NZ Ltd.

The methods to be used and samples taken were discussed with DIN/DIAG representatives before field work commenced and DIN/DIAG representatives accompanied Council staff and contractors in the field. The co-operation of all parties, DIN/DIAG, and particularly the owners and occupiers of the alleged sites was very much appreciated.

While this report contains the detailed results, summarising in terms of the four groupings of sites is valuable.

With respect to the first grouping of eleven sites on land currently or historically held by IWD the Council found no evidence of environmental risk arising from any of the sites. The investigations showed that the five known dump sites cleaned up in the 1980s harboured no further buried material and were effectively rehabilitated. The results for the two sites where IWD previously manufactured and stored herbicides gave no cause for concern. The four sites on the current Dow AgroSciences site on Paritutu Road showed some minor contamination of groundwater (already known) but no evidence of the alleged significant dumpsites or burial of waste. The known contamination presents no environmental risk.

The second grouping of six sites potentially contaminated by stormwater runoff from the IWD site included four residential sections. All were investigated and sampled with particular focus on the soil and sediment. Council is pleased to advise these property owners that the results indicate no contamination of the soil and hence no environmental risk.

The third grouping of seven sites consisted of the known landfills and outfalls operating at the time (1960s-1980s). Extensive sampling of sediment, surface and groundwater emanating from current and closed landfills did not indicate any environmental risk. As noted, if disposal of agrichemical wastes did occur at these locations, it was properly authorised in respect of the standards of the time. These sites will continue to be monitored as part of the Council's existing monitoring of closed and current landfills. With respect to the outfall sites, the results of the sampling of the adjacent marine biota indicate dioxin levels in accord with background levels elsewhere in New Zealand as measured by the Ministry for the Environment.

With respect to the results of the investigation of the fourth grouping of twelve sites consisting of alleged dump sites (9) and seepages (3), none of the seepages provided any evidence of inappropriate disposal of agrichemical waste or any environmental risk.

Much attention will naturally focus on the previously unknown alleged dump/drum disposal sites identified through the Stage One process. All these sites were investigated, at several, at DIN/DIAG's request, particular samples and analysis were undertaken. At two of the sites excavation was undertaken to investigate and confirm analysis provided by the ground penetrating radar. In no case was any evidence found of inappropriate disposal of agrichemical wastes contained in drums or otherwise. The sampling undertaken further confirmed no environmental risk arising from any of the sites.

In conclusion the results of the Council's Stage Two investigation indicate:

- At the five sites where disposal of agrichemical wastes is known to have occurred in the 1960s to 1980s the clean up and rehabilitation was found to be effective with no evidence of any additional unknown waste.
- There is no existence of any disposal of agrichemical wastes at any of the other 31 sites investigated.
- There is no evidence of environmental risk at any site, or in the marine environment in the vicinity of those sites that were on the coast.

The Council at this point has no evidence that any further action is required at any of the sites investigated. Council would like to acknowledge the input and assistance from members of DIN and DIAG and the residents groups. The co-operation of site owners and occupiers was also appreciated.

1. Introduction

This report has been prepared by the Taranaki Regional Council to describe the investigations conducted at a number of sites during the 2001 calendar year, arising from allegations that agrichemical wastes from Ivon Watkins Dow (IWD) were dumped at a number of sites around the New Plymouth area, in particular the Spotswood/ Ngamotu suburb, from the 1960's to the 1980's. The report describes the nature of investigations carried out at each site, and the findings of those investigations.

In the second half of 2000, concerns about a range of historical dioxin contamination issues began to be expressed by and on behalf of some residents in the area surrounding the site currently occupied by Dow AgroSciences.

The concerns culminated in a public meeting being held by New Plymouth District Council on 14 February 2001. At that meeting the Taranaki Regional Council's responsibilities in the matter were identified as:

- investigating alleged disposal of dioxin contaminated wastes; and
- air discharge monitoring since 1991.

The Council has reported the results and findings of its air quality monitoring annually. Summaries of the air quality information were also presented at meetings of the Consents and Regulatory Committee of the Council on 14 February and 21 March, specifically to address the concerns being raised publicly. At the same meetings, the Council confirmed its intention that a full investigation would be undertaken by the Taranaki Regional Council into the alleged historical disposal sites and that the findings would be reported publicly. The investigation was to be completed in three stages as follows:

Stage One - identification of the alleged historical dump sites and confirmation of inspection and sampling methods;
Stage Two - undertaking inspection and sampling, reporting of results; and
Stage Three - recommended response actions.

This report presents the findings of Stage Two of the investigation, in fulfilment of the Council's commitment.

Although the Company is referred to as IWD, it should be noted this was the name of the owner of the agrichemical plant for only part of its life. Originally the Company was known as Ivon Watkins Limited and then Ivon Watkins Dow Limited, and from 1990 to 1998 it was known as DowElanco (NZ) Ltd. It is only since 1998 that the Company has been known as Dow AgroSciences (NZ) Ltd. However, for simplicity the Company is referred to as IWD throughout this report, its name during the period of interest.

2. Background

2.1 Statutory requirements

Following the inception of the Taranaki Regional Council in 1989 and the coming into force of the Resource Management Act in 1991, the Council became responsible for regulating discharges to land, water, and air.

Prior to this time the Council's predecessor, the Taranaki Catchment Commission, was responsible for regulating discharges to water under the Water and Soil Conservation Act, 1967. The Taranaki Catchment Commission had no responsibility for discharges to land or to air. The control of the use of land was essentially a town and country planning matter for the respective city, county, borough or district councils, and discharges to air a matter for the Department of Health.

2.2 IWD Paritutu Road site

IWD have occupied the site on Paritutu Road, in Spotswood/Ngamotu, since 1960. (Both names for the suburb tend to be used interchangeably). This site was used for the manufacture of a variety of agrichemicals. Of particular note is that the manufacture of the herbicide 2,4,5-T was discontinued in 1988 and manufacture of 2,4-D was discontinued in 1997. Manufacture of all agrichemicals at the plant was discontinued in 1998. Currently only blending and packaging of agrichemicals takes place at the site.

In 1993 IWD conducted a comprehensive assessment of their Paritutu site. This investigation found two locations where soil and groundwater had been contaminated through operations on site. The nature of the contamination was determined to be leakage during product storage and not as the result of deliberate disposal of wastes.

A comprehensive site investigation and monitoring programme has been in place since the discovery of these two contaminated areas at the Paritutu Road site. IWD have kept the Council fully informed of the results and methodology used for these site investigations. The status of this work is publicly reported via the Council's annual compliance monitoring reports for the site.

The results of the study have confirmed that no detectable concentrations of any contaminants have or are likely to migrate from these areas. The levels of detection used for the analyses are far below guideline values for environmental concern. Council staff have in addition continued to survey the Back Beach foreshore in the vicinity of the plant as a precaution since 1994, and have found no evidence of any discharge of agrichemical residues.

2.3 IWD Buller Street site

IWD occupied a site at 14 to 24 Buller Street, New Plymouth as their manufacturing plant from about 1941 until 1959/60 when the Company moved to its current site on Paritutu Road.

The Buller Street site was investigated by the Taranaki Regional Council in October 1995 as a potentially contaminated site. Investigations included water and soil samples from and around the site and from a stormwater discharge from below Woolcombe Terrace.

Extremely low concentrations of DDT were found in site soils, far below any soil quality guidelines for environmental concern as a contaminated site.

IWD advised the Council in 1997 that, to the best of their records, there was no disposal of wastes at this site as Company practice at that time was to use municipal landfills. Based on this information, and the results of the Council's previous investigations at this site, the Council did not conduct further work on this property within the context of the study being reported.

2.4 Waireka landfill site

In 1975 and 1976 IWD disposed of various drums and bags of wastes by burial at two locations on their Waireka experimental farm. This disposal operation was undertaken with the approval of the Health Department as the relevant authority at the time. One of the locations identified in Stage One of this investigation by residents are these burial sites.

Discharges from the Waireka burial sites on to the beach near the Waireka Stream mouth were the subject of investigation in late 1982, after discharges of leachate-contaminated groundwater were noticed on the foreshore. IWD sought and were granted a water right regulating the management of the discharge, and subsequently installed a leachate collection and treatment system to intercept, treat and dispose of this discharge.

In 1986 IWD removed the entire contents of the two burial sites, together with associated contaminated soil, into a purpose built secure containment facility also located on the Waireka experimental farm. This secure facility, referred to as the Waireka landfill, still exists at the Waireka site inland from the two original burial sites.

The Waireka burial sites and associated discharges have held consents and been monitored since 1983, originally by the Taranaki Catchment Commission, and currently by the Council. The secure landfill is also licensed as a land use activity, previously by the Taranaki County Council and now by the New Plymouth District Council.

The level of contaminants now present in groundwater at the burial sites is now so low that the collection of leachate has been discontinued with Council approval. The resource consent for this discharge is in the process of being surrendered. Other than occasional odour at a couple of locations on the cliff face, there are no adverse environmental or ecological effects arising from the two burial sites.

Nevertheless, because of renewed concerns about potential contaminated discharges from the site, further investigations were carried out below the Waireka site as part of the present study. The work and results are detailed within this report.

Because there has never been any discharge from the secure Waireka landfill facility, IWD holds no resource consent issued by the Council, nor is it required to. Nevertheless Council staff have monitored for the possibility of either discharges to air or loss of leachate control from the secure Waireka landfill facility. No evidence of any escape has been found.

The environmental performance of the remedial measures undertaken at the two burial sites and the environmental performance of the Waireka landfill is a matter of public record through the Council's annual compliance monitoring reports. In summary this

monitoring has found no evidence of any leakage at the Waireka landfill and there are no adverse environmental or ecological effects arising from the two remediated burial sites.

2.5 Beach Road ("Ngahoro") site

It is a matter of public record that during 1974 IWD disposed of wastes in an area at the end of Beach Road near where the tank farm is now located. These wastes, together with associated contaminated soils were returned to the IWD main Centennial Drive site on Paritutu Road for disposal in 1981.

Council officers have inspected and monitored this area and the foreshore below it, since 1996 and found no evidence of any agrichemical residues remaining in the area. Nevertheless, because of renewed concerns about potential discharges from the site, further investigations were carried out below the Ngahoro site as part of the present study. The work and results are detailed within this report.

2.6 Monitoring by Taranaki Regional Council

2.6.1 1991-1999

Since 1991 and the implementation of the RMA the Taranaki Regional Council has monitored all discharges to the environment from Dow AgroSciences at both its properties on Paritutu Road (formulations plant) and at Waireka Road (Waireka experimental farm). Dow AgroSciences has an excellent record of compliance since that time. There have been no incidents of unauthorised disposal ("dumping"), nor any allegations of such having occurred since the Council began monitoring in 1991. The concerns raised by members of the public appear to be associated with activities of IWD held to have occurred during the 1960's and 1970's.

In the summer of 1994/95 a Council project sought to identify and investigate every old or informal rubbish disposal site in Taranaki. The investigations included site assessments and surveys and the sampling of any receiving waters. In the New Plymouth district organochlorine scans were also undertaken. Approximately 106 sites were identified throughout Taranaki and investigated.

At least five of those sites investigated in 1994/95 were among those recently identified as possible IWD disposal sites by concerned members of the public. One of these sites (Marfell Park) was the municipal landfill for New Plymouth at the time. Consequently it is highly likely that IWD did dispose of plant wastes at this site, as was common practice for other industries at that time.

The 1994/95 study found no evidence of the disposal of pesticides or agrichemical residues at any of the sites. The study found no evidence of pesticide residues remaining at any site and no indication of any pesticide residues in associated receiving waters. Five of the sites investigated were later identified by concerned members of the public during Stage One of these investigations.

2.6.2 2000-2001

In March 2000 the Council received a collection of comments and documents from Mr Andrew Gibbs referring to a number of sites of actual or alleged historical disposal of IWD plant wastes (1960s-1980s). Four of these sites (Buller Street, Waireka landfill, Beach

Road, and Marfell Park) had already been investigated by the Council between 1993 and 1995. Three additional sites where the disposal of IWD plant wastes may allegedly have occurred were also identified by Mr Gibbs, namely: the gully beside and west of Paritutu, the Herekawe/Rangitake Drive area, and the netball courts beside the Waiwhakaiho River. These sites were accordingly investigated in May 2000 by Tonkin and Taylor Ltd, who have considerable experience in contaminated site investigations, on behalf of the Council. Soil and/or water samples were collected from each of these sites. In addition, the Council's marine biologist inspected the foreshore in the vicinity of Paritutu Rock. The Council routinely undertakes freshwater surveys at the other two sites.

At no sites were there any immediate evidence of any pesticides found, nor evidence of dumping or burial of agrichemical wastes (other than at sites already known, as described above in Sections 2.4 and 2.5). No traces of agrichemicals were found in any of the collected samples. Mr Gibbs was advised of these findings in July 2000.

In November 2000 an article in a local newspaper reported further sites where IWD had allegedly disposed of contaminated wastes. This information had been provided to the newspaper by several people including Mr Gibbs.

The Council subsequently contacted Mr Gibbs offering to investigate any new alleged site identified. Accordingly six sites were subsequently visited by Council staff and Mr Gibbs in December 2000. Most of these sites were already known to the Council and had been previously investigated between 1993 and 1995.

Following media publicity and information provided by concerned members of the public during January and February 2001, the Taranaki Regional Council gave a public commitment to undertake a detailed investigation of environmental risks arising from sites where it was alleged that herbicide contaminated wastes were disposed.

3. Structure of investigations

3.1 Stage One investigations

Based on this Council's experience during the 1991 investigation into the alleged historical stockpiling and dumping of dieldrin, it was decided to undertake interviews of all persons who proffered information (Stage One), and to collate the information gathered to identify potential sites for further investigation (Stage Two). Given that this investigation was dealing with events that may have occurred up to forty years ago, recollections of localities and details can become uncertain, more so as the landscape may have changed dramatically.

In order to facilitate the investigation and to make it convenient for the interested parties in New Plymouth to have input, weekly operational meetings of Council staff were held in the Taranaki Emergency Management offices at Robe Street, New Plymouth. The meetings were attended by members of the Dioxin Investigation Network (DIN), the Dioxin Investigation Action Group (DIAG), Greens, Surfriders, Vietnam Veterans, Paritutu Property Rights Group, and the Paritutu Community Residents Group. Without their co-operation the investigation could not have proceeded. They brought to the Council the names of people they believed to be able to provide information relating to alleged dumping or discharging of wastes from IWD.

From late December 2000 onwards approximately 80 interviews were conducted. A list of the interviewees and names provided to the Council is attached to this report as Appendix I. Written records of the interviews are held in the Council files. These will be archived in due course, along with all other material relating to this investigation.

Sites had to be identified by an interviewee with sufficient clarity to avoid confusion. It was preferable that two persons separately identified the site.

Council staff subsequently visited every site, where possible with the interviewee, to confirm details of identification, to demarcate the site, and to log its suspected location by instrumental measurement (global positioning system, or GPS).

In addition to the names presented to Council staff by the various groups and following completion of the interviews, an advertisement was placed in the Daily News on Saturday, 7 April 2001 calling for any further interested parties to contact Council, as a check that all efforts had been made to contact those who potentially held information. The advertisement solicited no further response.

The interviews and preliminary site visits identified 38 sites where it was alleged that inappropriate historical disposal of dioxin contaminated waste had occurred. Thirty six of these were investigated in more detail following the methodologies outlined below. Of the original 38, two sets of two sites were found to be duplicates, referred to by different names.

A map showing all sites investigated is attached to this report as Appendix II.

3.2 Stage Two investigations

The Stage Two programme was developed in consultation with the DIAG/DIN representatives. It was designed as a comprehensive screening of the possible sites. It was not intended to be an exhaustive investigation of each site. Further study of

particular sites would be considered in Stage Three of the investigation of each site in the event that a risk is indicated, based on results being above guideline or known background values. For a Stage Three investigation, the Council would review the need for further, more detailed site-specific investigations e.g. core drilling and sampling, groundwater sampling, more intensive soil sampling, and/or biological surveys.

It should be clearly understood that the primary aim of the programme is to identify and address possible environmental risk from alleged dump sites. It is not intended to conclusively prove or disprove whether dioxin- containing wastes are present within a site, nor to provide data on concentrations of dioxin in surface soils generally throughout the suburb of Spotswood. Council has recommended that that issue is the subject of a separate investigation should the Ministry of Health see fit.

The Council focused on whether there is an actual or plausible environmental risk at any of the sites. It is considered that the primary route of exposure would be by release from any buried reservoir, via leaching into groundwater and thence into the surface environment. Therefore the site inspections and the sampling regime had as its fundamental focus, any seeps, drains, pipes, or other forms of leachate discharge. These were to be analysed for a range of contaminants that would indicate the possible presence of dioxins, as well as being environmental contaminants in their own right (namely acid herbicides and organochlorine pesticides).

Analysis for 2,3,7,8 TCDD was also undertaken in a number of situations. The analysis for 2,3,7,8 TCDD is based in part on the much higher cost of analysis for a full suite of dioxins, in part on the fact that 2,3,7,8 TCDD is the dioxin of most concern from a health perspective, and in part on the fact that 2,3,7,8 TCDD is the primary 'marker' of dioxin contamination in 2,4,5-T.

Once the collation of information and statements from witnesses was completed, on-site investigations, including detailed site inspections, geophysical surveys using ground penetrating radar (GPR) and electromagnetic induction systems, and appropriate sampling of identified site soil cover, discharges, receiving water courses, and sediments, was implemented. Depending on site-specific considerations, Council staff collected surface soil samples, samples of each discharge of leachate or groundwater, samples of soil over which any leachate discharge has flowed, samples from any stream below each site and sediment from receiving water courses. Marine biota were surveyed and sampled where appropriate.

A sampling and analytical protocol was agreed between the Council, the various action groups, Ministry for the Environment, and New Zealand's foremost dioxin scientists, to ensure the protocols were scientifically defensible and rigorous, and met the various needs and concerns of each party as far as practicable. The protocols are attached to this report as Appendix III.

Occupational health and safety issues involved in the investigation were addressed in the sampling protocols.

The archives of Taranaki Regional Council (formerly Taranaki Catchment Commission and Taranaki Catchment Board) and New Plymouth District Council (including the former North Taranaki County Council) were searched as part of the investigation.

No additional sites were identified as a result of the searches. Some information was gained in relation to the extent of the sites under investigation that had been local authority landfills.

Aerial photograph series of the New Plymouth area for 1958-59, 1974-76-77, and 1994 were viewed in detail in order to assist in the identification and determination of possible dump locations.

One location in particular, a large concrete bunker on the former IWD dairy farm at Ngahoro, was identified and investigated. The investigation confirmed that the bunker was constructed by a petroleum exploration company in the 1960s and contained drilling muds for some years. In the 1970s the drilling muds were disposed of and the bunker was used as a silage pit by sharemilkers on the property. The bunker was subsequently broken up and the site is beneath a current methanol storage tank on one of the tank farm sites (see the notes on Site Zk below).

No other additional sites were identified by this method.

While it was held by Council officers that previous monitoring and investigations at some of the sites of interest had been properly conducted, members of DIAG and DIN expressed the desire for repeat testing in some cases. The Council extended an invitation to these groups to have a representative on site during the surveys and sampling to improve understanding, and to provide confirmation that samples were collected from the areas of particular concern. Representatives of DIAG/DIN were present throughout the sampling and survey programme. All samples collected were split so that DIAG/DIN and any owner or occupier could hold sub samples for independent analysis as they wished.

It is not known whether any independent analyses were carried out, and no such results are reported in this document.

Ground penetrating radar/soil conductivity profiling (GPR) enables the rapid location and delineation of buried containers and soil contamination at depths of 5-20 metres. The members of DIAG and DIN consulted with, confirmed that if subsurface surveys indicated no grounds supporting an allegation of material buried on a site, then they would accept that result as evidence that that site was not a dumpsite. Some sites were under investigation as sites of alleged surface discharge of wastes, not of burial of wastes, and these sites were not the subject of GPR survey.

The investigation was designed so that the leachate/ground water and stream samples were analysed for acid herbicides (which would capture any 2,4,D, 2,4,5-T, MCPA, MCPB, mecoprop, dichlorprop, triclopyr, 2,4-DB, bentazone, fenoprop, or picloram) and for organochlorine pesticides (which would capture DDT and its decomposition products, lindane, dieldrin, endrin, and a number of other compounds). Dioxin occurs as a trace contaminant of some of these substances therefore the absence of these substances in a sample indicates there is no justification for testing for dioxins.

The soil and sediment samples of most interest to DIAG/DIN and Council staff were analysed for the 2,3,7,8 TCDD isomer of dioxin, as this is the most significant dioxin associated with 2,4,5-T.

It is important to note that the Council had a broader interest than dioxin alone and wished to confirm or eliminate the presence of a range of agrichemicals and hence associated environmental risks, at each site.

It is recognised that the absence of acid herbicides in a water or leachate sample, or even of dioxin in a surface soil or sediment sample, cannot be taken as absolutely guaranteeing that no dioxin is present within a soil body nearby. Dioxins tend to bind to soil and are therefore relatively immobile, while acid herbicides are more mobile. The

only way to achieve that level of certainty would have been to fully excavate every suspect site. This was unrealistic. The investigation methodology adopted was targeted at determining whether there was any plausible environmental risk arising from discharges or pathways into the environment. From the work done at the Waireka site, where the contents of the dump were removed almost twenty years ago, modern analytical methods can still detect traces of acid herbicide residues within the groundwater at levels below parts per billion, it is considered that the collection and analysis of discharge and surface samples is a robust methodology for investigating the concerns raised about relatively large scale buried dumps.

The offer was made to DIAG and DIN that regardless of the outcome of the acid herbicide and organochlorine screens, that at the sites of most concern to the group, analysis for TCDD in soils and sediments would be performed as they specified. The group requested surface soil analysis at Sites C (Pylon 3), P (42 Rangitake Drive), and Zi (Pylon 4).

Those groups also expressed a particular interest in dioxin levels in shellfish at up to five coastal sites where dumping or discharges may have occurred. The usefulness of shellfish as bioaccumulators of persistent toxins is well recognised. In addition, the health and state of the shellfish could serve as an indicator of possible biotoxic effects from a range of possible contaminants. Therefore an intertidal marine survey and sampling was carried out at five specific coastal sites related to known or alleged discharge points.

4. Findings of site investigations

4.1 Introduction

The 36 sites identified for investigation can be considered in four groupings.

The first grouping centres on alleged sites on land currently or historically held by IWD. There are eleven such alleged sites. Four of these involved allegations of inappropriate practice in the past, on the current Dow AgroSciences premises on Paritutu Road. Four other sites may be referred to as the Ngahoro suite, these relate to former dumpsites in the area south of the Omata Tank Farm that were already rehabilitated. They were known or found and cleaned-up by IWD in the late 1970's to mid 1980's. The remaining three sites in this grouping are the Waireka dumpsites and the original Ivon Watkins Buller Street factory and Tarahua Street warehouse. All were well known to Council and have been previously investigated as part of its resource consent monitoring or contaminated sites work.

The second grouping results from alleged impacts of stormwater emanating from the IWD Paritutu Road site in the past. Six sites were identified for further investigation including four residential sections. The allegations did not involve dumping or burial but related more to residential development at locations where contaminated stormwater is alleged to have given rise to contaminated soil.

The third grouping involves seven sites that are essentially associated with municipal waste disposal systems. These are largely known historical and existing municipal landfills and sewerage outfalls. All locations identified were known to Council through its previous work on landfill contaminated sites completed in 1994/95. With each of these sites there is no direct link to IWD, that is, if disposal occurred it was in all probability authorised in accordance with the standards of the time and undertaken by a range of parties i.e.; contractors, councils and perhaps the Company.

The fourth grouping is broader being essentially anything that does not fit in the previous three categories. Nine of these twelve alleged sites involved allegations of disposal by burial of dioxin contaminated waste, the remaining three involved cliff face seepages. In general these sites were of interest because they were identified in the course of the interviews undertaken and Council was not aware of them previously.

4.2 Sites and investigation details

Table 1 presents a summary of each of the 36 sites investigated and the nature of the investigations carried out at each site. Further details on the analyses conducted (acid herbicides, organochlorine pesticides, 2,3,7,8 TCDD) is provided in Appendix V.

Details of the sites and investigations are contained in Appendices to this report as follows:

Appendix I of this report presents a record of interviews conducted in Stage One of this investigation.

Appendix II contains a map of site locations identified in Stage One.

Appendix III contains the sampling protocols followed by staff in conducting the studies.

Appendix IV presents the report prepared by GPR Geotechnical Services Ltd on there findings of the geophysical investigations (Ground penetrating radar and electro-magnetic induction surveys).

Appendix V describes the sampling undertaken at each site.

Appendix VI describes the marine studies and sampling.

Appendix VII describes the findings of the site inspections.

Appendix VIII records the results of further excavations carried out at two sites.

Appendix IX presents the results of the acid herbicide, organochlorine pesticide, and 2,3,7,8 TCDD (dioxin) analyses conducted by AgriQuality for the Council.

Table 1 Sites and investigation details

	Archive inspection and Photographic perusal	GPR	Detailed inspection	Sampling and analysis	Marine biota
A Lawry Street - GPS 2600700E-6237180N. On the corner of Lawry Street and Devon Street West, and west of the garden centre on Devon Street West. The site is on the western bank of the Mangaotukutuku Stream.		*	*	*	
B Seaview Road - GPS 2600656E-6237096N. This alleged site is on the corner of Seaview Road and Devon Street West, behind the Shell service station and across from site-A. The site is on the eastern bank of the Mangaotukutuku Stream.		*	*	*	
C Pylon 3 - GPS2598377E-6237586N. The alleged site is immediately north/west of the IWD premises and is on both sides of Centennial Drive and includes an area approximately 100m x 150m in the Paritutu Centennial Park. The pipeline corridor transverses part of the site. There is an alleged discharge emanating from the cliffs below this site.	*	*	*	*	
Ca Centennial Drive - GPS25985535E-6237713N. This alleged site was addressed as part of the Council's dieldrin investigation in 1991 . Further work was therefore limited to a confirmatory detailed inspection			*		
D 34 Rangitake Drive - GPS2598513E-6236679N. The alleged site is at the rear of the property at 34 Rangitake Drive. Prior to residential development this site was above a small tributary of the Herekawe Stream that allegedly received stormwater from the IWD premises. At least three previous owners identified the site. Alleged burial	*	*	*	*	
Da 44 Rangitake Drive. As above.	*	*	*	*	
E Omata Reserve (east of the Methanex tank farm) - GPS2598382E-6236657N. The alleged site is on New Plymouth District Council reserve land on the eastern side of the Methanex tank farm. The site was identified by DIAG, previous occupiers do not support the allegations.	*	*	*		
F IWD-1 - GPS2598663E-6237173N. An alleged disposal site on the IWD premises.	*	*	*	*	
G Marfell Park - GPS2600682E-6236037N (identified by Andrew Gibbs and Ian McLeod), GPS2600734E-6236179N (identified by Trevor Fleming). This site was a known municipal landfill prior to being closed, grassed and used as playing fields in the late 1970's. Dumping of 200 litre drums was alleged. The Mangaotukutuku Stream is close by. Also wastes from the unblocking of the City sewerage system at the corner of Ngamotu Road and Centennial Drive were allegedly disposed of here. The wastes were identified as being phenol based	*		*	*	
H Ngamotu Domain - GPS2599875E-6237183N. This site is a known past municipal landfill. The site has also been covered, grassed and is used as playing fields. Wastes from the unblocking of the city sewerage system were disposed of at this site.	*		*		
I 7A Squire Place – GPS2600021E-6337111N. A stormwater pipe that allegedly could have contained leachate from the Ngamotu Domain landfill discharges at this location	*		*		
J Belt Road – GPS260143E-6238019N. This site is at the end of Belt Road (over the railway line to the right) on the coast. This is another site where wastes from the unblocking of city sewerage was disposed of. The wastes allegedly flowed over the cliffs and into the sea.			*	*	*
K Victoria Road, Oakura – GPS2593182E-6232055N. This site is the first farmlet up Victoria Road off SH45			*		
L 23C Tahurangi – GPS2598732E-6236974N. This is a residential site on Tahurangi Place. Prior to residential development it is alleged a stormwater pipe used to discharge from the IWD premises onto farm land where this property is situated.	*		*	*	
M Beach Road-1 – GPS2597532E-6235427N. This alleged site is at the end of Beach Road to the west and has been linked with the known and rehabilitated Ngahoro dump. A small spring is nearby.		*	*	*	
N Waireka rehabilitated dumpsite – GPS2596874E6234237N. This records the identification by a number of interviewees of the known rehabilitated dump sites (2) at Waireka. The sites are the subject of ongoing monitoring since 1986.					*
O Pioneer Road – GPS2599214E-6237257N. Further investigation showed this site was the road leading to the Ngamotu Domain (Site H)					

		Archive inspection and Photographic perusal	GPR	Detailed inspection	Sampling and analysis	Marine biota
P	26A Rangitake Drive – GPS2598481E-6236717N. This alleged site is at the rear of a residential property at 26A Rangitake Drive. Prior to residential development this alleged site was adjacent to a small tributary of the Herekawe Stream that may have received stormwater from the IWD premises.	*	*	*	*	*
Q	Rifle Range Road/Bewley Road – GPS2606429E-6239250N. This alleged site is located on Rifle Range Road next to the Waiwhakaiho River. Part of the developed area was a Taranaki County Council dump. The old landfill site has resource consents and is monitored.	*		*		
R	Beach Road-2 – GPS2598038E-6235117N. This alleged site is on the old IWD dairy farm on Beach Road approximately 750 metres from the sea and was identified arising from the extraction of chemicals from old dumpsites during the early 1980's.	*	*	*	*	
T	Colson Road Landfill – GPS2607397E-6237616N. This is a present municipal landfill and has been in use since the early 1970's. It is alleged that IWD waste products have been disposed of in this landfill during past years. This landfill has resource consents and is monitored.				*	
U	IWD-2 - Another alleged dumpsite on the IWD premises. The allegation refers to a concrete bunker used as an anisol storage facility.	*	*	*	*	
V	Centennial-2 – GPS2598524E-6237853N. This alleged site is the discharge point of the former stormwater line from the office blocks of the IWD premises. The stormwater system was apparently accessed during spills that occurred on site and was seen to be frothing before the mid 1980's.	*		*	*	*
W	Herekawe Stream – GPS2598309E-6236771N. This is the current stormwater discharge from the Dow AgroSciences premises. The discharge has resource consents and is monitored.				*	*
X	Roto Street – GPS2600775E-6234738N. This alleged site is located on a recent subdivision. The land was previously owned by a plant nursery. The allegation is that drums containing chemical had been dumped. A drain flows from the south-west end of the subdivision.	*	*	*	*	
Z	Ngahoro – GPS2597661E-6235515N. This is a known site on the old IWD dairy farm. In February 1981, 230 drums of waste were removed from this site and returned to Ivon Watkins-IWD Ltd for incineration or recycling. About 1000m^2 of soil was relocated from this site to the Waireka facility. It has been alleged that between thirty and fifty empty drums and assorted rubbish were left behind and covered with 1.5 to 3 metres of clean soil.	*	*	*	*	
Za	60 Marama Crescent – GPS2598529E-6236990N. This site is located at the rear of a residential property at 60 Marama Crescent. Recently part of a drum was dug up.	*	*	*		
Zb	Buller Street – GPS2603497E-6238487N. The site of the original Ivon Watkins Limited.	*		*		
Zc	Tarahua Road - GPS2604173E-6235524N. This is a former warehouse of the original Ivon Watkins Ltd. The site is either sealed, metalled or concreted and was referred by the present owners	*		*		
Zd	Tasman Sea – Adjacent to old Elliot Street sewer outfall					*
Ze	Tank 3500 – GPS2597888E-6235965N. This is a known site on the old IWD dairy farm that has been confused with Ngahoro but is separate. The site was discovered by the then Ministry of Works during the construction of tanks at the tank farm in April/May 1985. IWD were advised and clean-up was undertaken in 1985	*	*	*		
Zf	IWD-3 - Another alleged dumpsite on the IWD premises. The allegation refers to dumping of waste in a deep bunker.	*	*	*	*	
Zg	IWD-4 - Another alleged dumpsite on the IWD premises. The allegation refers to drums punctured near the current incinerator.	*	*	*	*	
Zh	Car Park – GPS2597919E-6236297N. This alleged site is near the car park west of the Herekawe Stream on a walking track to the beach and is often referred to Council as a chemical discharge and was included for completeness in this investigation.	*		*	*	*
Zi	Herekawe cliff (Pylon 4) – GPS2598205E-6237049N. This alleged site is to the east of the Herekawe Stream and is a cliff discharge that is seen by surfers. It is also referred to as a chemical discharge.	*		*	*	
Zk	Jury site – GPS2598766E-6236388N. This alleged site is at the end of Norwich Avenue and was originally a concrete bunker site on the former Jury farm in close proximity to the old Ngamotu Tavern. Old concrete is still visible. There is no waterbody nearby.	*		*		

4.3 Interpretation of results of chemical analyses

The findings of the investigations at each site are set out in Section 4.4 of this report. Details include the results of chemical analyses. The full results of the chemical analysis are attached to this report in Appendix IX.

The New Zealand soil criteria for dioxin are set out in Table 2 below. They have been prepared by the Ministry for the Environment and Ministry of Health (Health and Environmental Guidelines for Selected Timber Treatment Chemicals, 1997). Whether these soil criteria are appropriate is not a matter for the Council to determine. They are the criteria in use in New Zealand at the moment, and any query over their appropriateness is a matter for the Ministries of Health or Environment or ERMA to determine.

Table 2 NZ soil criteria for dioxin

	Agricultural	Residential	Industrial unpaved	Industrial paved	Industrial maintenance
Dioxins, ng I-TEQ kg^{-1}	10	1500	18 000	90 000	21 000

In interpreting reported numerical values for the levels of dioxin in the environment, it is critical to note the units used. Generally, trace levels of substances in the environment are measured at levels of parts per million and expressed as milligrammes per kilogramme (mg kg^{-1} for solids such as soils, or mg L^{-1} for liquids). For even lower levels, the units are parts per billion- a thousand times lower. These quantities are expressed as microgrammes per kilogramme (ug kg^{-1}). However, for dioxin, environmental levels are so low and the limits of detection with modern instrumentation so good, that even smaller units have to be used. Dioxin concentrations are generally at levels of parts per trillion- a thousand times lower again, and expressed as nanogrammes per kilogramme (ng kg^{-1}, as in Table 2 above), or even parts per quadrillion, a thousand times lower again, and expressed as picogrammes per kilogramme (pg kg^{-1}).

$$1 \text{ pg kg}^{-1} = 0.001 \text{ ng kg}^{-1} = 0.000\,001 \text{ ug kg}^{-1} = 0.000\,000\,001 \text{ mg kg}^{-1}.$$

There are two ways of indicating the significance of levels of dioxins in the environment. There are 75 different individual congeners or forms of dioxin, each differing according to the number and position of chlorine atoms around the basic structure. The most toxic are those with 4 chlorine atoms attached; of these, the most toxic is 2,3,7,8 TCDD. To enable an evaluation of complex mixtures of dioxins, a system of toxic equivalents has been developed (I-TEQ). Each individual dioxin is assigned a factor representing its toxicity in relation to 2,3,7,8 TCDD, which is assigned a value of 1. The dioxin 2,3,7,8 TCDD is the only congener assigned this value; the others have factors ranging from 0.5 down to 0.001. Most data and criteria reported in international literature report concentrations of dioxins in terms of I-TEQ units, rather than actual measured concentrations of individual congeners.

In this study, only 2,3,7,8 TCDD was analysed for. It is the most significant dioxin in terms of its toxicity. It is the primary dioxin of interest when the possible source is 2,4,5-T herbicide. And when present it would tend to dominate the I-TEQ value for a complete analysis, because of its comparatively high I-TEQ factor.

4.4 Findings at each site

Sites were identified and described in Stage One of this investigation. Following is a resume of activity and the findings at the sites, in relation to Stage Two. Detailed site inspections were conducted at each site discussed below, unless otherwise noted.

A Lawry Street

This site is alleged to have been used as an unauthorised dumping area prior to development of the property.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed that the majority of the site consists of fill material typical of a refuse tip. The data showed no evidence of a drum dumpsite. The site was already known to have been filled prior to subdivision.

Samples of soil, streambed sediment, and the stream water were collected at this site (4005, 4006, 4007, 4008). The streambed sample was analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:- no 2,3,7,8 TCDD was detected in the streambed sediment sample. The limit of detection was at a level of 8 parts per trillion. The limit of detection is far below the current residential guideline for NZ of 1500 ppt. There is no NZ guideline for recreational areas, which would typically be higher than for a residential area.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.

B Seaview Road

This site is alleged to have been used as an unauthorised dumping area prior to development of the property.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal soil strata across most of the site, with a small amount of fill material in one area. The data showed no evidence of a drum dumpsite. The site was already known to have been filled prior to development.

The streambed result reported above for Site A is below this site also.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.

C Pylon 3

This site was alleged to have been a casual dumping area prior to construction of Centennial Drive and development of the current industrial area. The site is probably the one where it is alleged a fenced off area containing liquid waste was sited.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed undisturbed soil strata across most of the site (a very large area). Data along and across Centennial Drive showed the presence of underground pipelines

running to the Port. At the southern end of the area, anomalous data gave some evidence of the possibility of disturbed subsurface strata and buried objects.

Following the receipt of this information, staff of the Council carried out an excavation within the area identified by the GPR operator as being the most critical area. This excavation found no evidence of disturbed subsurface layers, but instead found a natural iron pan, a hard impermeable layer of iron-rich minerals. There was no evidence of a drum dumpsite or of the disposal or burial of any wastes. The detailed record of the excavations is presented in Appendix VIII.

Samples of surface soil and sediment from beneath 2 areas of seep patches and from within the mouth of a pipe were collected at this site (4030, 4031, 4032, 4058). They were analysed for acid herbicides and organochlorine pesticides (seeps sediments) and for 2,3,7,8 TCDD (surface soil). The latter sample was collected at the request of DIAG/DIN. The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in the sediments. The limits of detection were 0.1-0.5 parts per million. No acid herbicides were detected in the sediments. The limit of detection was 0.1 parts per million.

The surface soil sample was collected as requested by DIAG/DIN from an area of undisturbed land. 2,3,7,8 TCDD was detected at a level of 29 parts per trillion in the surface soil sample. This result is consistent with the measurements of dioxin levels in this area made by the Department of Health in 1985, and by the Ministry for the Environment on Mount Moturoa in 1996. The level is far below the current residential guideline for NZ of 1500 ppt. There is no NZ guideline for recreational areas, which would normally be higher than for a residential area.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site.

Ca Centennial Drive

This site was alleged to have been a casual dumping area prior to construction of Centennial Drive and development of the current industrial area.

This site has previously been investigated by the Council in 1991, in regard to the collection and disposal of dieldrin in the 1960s and 1970s. Following a further detailed site inspection, it was considered there was no justification for any additional studies.

From the investigations carried out by the Council at this site, there is no evidence of inappropriate burial or disposal of agrichemical wastes at this site. There is no evidence of site contamination, or of an environmental risk.

D 34 Rangitake Drive

This site was alleged to have been a casual dumping area prior to subdivision and was in the path of a tributary alleged to have carried stormwater from the IWD site.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across most of the site. Anomalous data in one area indicated the possibility of a few buried objects. The data showed no evidence that the site had been used as a drum dumpsite or for disposal of other buried refuse. The section is known to have been filled prior to subdivision.

Samples of soil and sediment from beneath seep patches and from the bed of the Herekawe Stream were collected at and below this site (4049, 4050, 4051, 4052). They were analysed for acid herbicides and for organochlorine pesticides. The results are presented in full in Appendix IX. The results are as follows:-no organochlorine pesticides were detected in sediments taken on two different parts of the site, nor in sediments from the bed of the Herekawe Stream approximately 15 metres downstream of the property. The limits of detection were 0.1-0.5 parts per million. No acid herbicides were detected in any of the samples, at a detection limit of 0.1 ppm.

These results are at or below background levels of these chemicals.

From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liase with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.

Da 44 Rangitake Drive/ Rangitake Drive carriageway

This section was an alleged casual dumpsite prior to subdivision.

A GPR survey was conducted at this site. The detailed record is presented in Appendix IV. The survey showed normal data across most of the site. Anomalous data in one area indicated the possibility of a few buried objects. The data showed no evidence of a drum dumpsite or other buried refuse. The section is known to have been filled prior to subdivision.

A GPR survey was also conducted along the length of the carriageway of Rangitake Drive. The detailed record is presented in Appendix IV. The survey showed normal soil strata data along the street, with underground services. The data showed no evidence of a drum dumpsite or other buried refuse.

Samples of surface soil were collected at the request of DIAG/DIN at this site (4060). They were analysed for 2,3,7,8 TCDD. The results are presented in full in Appendix IX. The results are as follows:-2,3,7,8 TCDD was not detected in the surface soil sample. The limit of detection was less than 5 parts per trillion . This limit is far below the current residential guideline for NZ of 1500 ppt.

From the investigations carried out by the Council at this site, there is no evidence of the use of this site as a drum dumpsite or for the inappropriate burial or disposal of agrichemical wastes. Council staff will liase with the site owner if any further work to determine the nature of the objects shown in the GPR data is desired. There is no evidence of site contamination, or of an environmental risk.

E Omata Reserve

This section was an alleged casual dumpsite in the 1970's.

Two GPR surveys were conducted at this site, to cover separate areas. The detailed records are presented in Appendix IV. The surveys showed normal soil strata data across all of the site. The data showed no evidence of previous site excavations, a drum dumpsite, or other buried refuse.

Samples taken in the Rangitake Drive sites relate also to this site.